DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE

Copenhagen Wind Farm

Town of Denmark, Lewis County and
Towns of Rutland, Champion and Watertown,
Jefferson County, New York

Lead Agency: Town of Denmark Planning Board
3707 Roberts Road
Carthage, New York 13619

Project Sponsor: Copenhagen Wind Farm, LLC
c/o OwnEnergy
45 Main Street, Suite 538
Brooklyn, New York 11201
Contact: James Damon
Phone: (646) 898-3690

Prepared By: edr Companies
217 Montgomery Street, Suite 1000
Syracuse, New York 13202
Contact: Brian Schwabenbauer
Phone: (315) 471-0688

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## COMMONLY USED ACRONYMS AND ABBREVIATIONS

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<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>amsl</td>
<td>above mean sea level</td>
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<tr>
<td>ASR</td>
<td>airport surveillance radar</td>
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<td>BBA</td>
<td>Breeding Bird Atlas (New York State)</td>
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<td>BBS</td>
<td>Breeding Bird Survey</td>
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<tr>
<td>Commission</td>
<td>Refers to PSC</td>
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<tr>
<td>cy</td>
<td>cubic yard</td>
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<tr>
<td>dBA</td>
<td>decibels, A-rated</td>
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<tr>
<td>DEIS</td>
<td>Draft Environmental Impact Statement</td>
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<td>edr</td>
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<td>EIA</td>
<td>Energy Information Administration</td>
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<td>EIS</td>
<td>Environmental Impact Statement</td>
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<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>FCC</td>
<td>Federal Communications Commission</td>
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<tr>
<td>FEIS</td>
<td>Final Environmental Impact Statement</td>
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<tr>
<td>GIS</td>
<td>geographic information system</td>
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<tr>
<td>IDA</td>
<td>Lewis County Industrial Development Agency</td>
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<tr>
<td>kV</td>
<td>Kilovolt (1 kilovolt = 1,000 volts)</td>
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<tr>
<td>kW</td>
<td>Kilowatt (1 kilowatt = 1,000 watts)</td>
</tr>
<tr>
<td>kWh</td>
<td>Kilowatt hours (i.e., the amount of electricity generated)</td>
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<tr>
<td>MW</td>
<td>Megawatts (1 Megawatt = 1,000 Kilowatts) – is a measure of generating capacity</td>
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<tr>
<td>MWh</td>
<td>Megawatt hours (i.e., the amount of electricity generated)</td>
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<tr>
<td>NAAQS</td>
<td>National Ambient Air Quality Standards</td>
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<tr>
<td>NCF</td>
<td>Net Capacity Factor (annualized measurement of the efficiency of a wind project)</td>
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<td>NHP</td>
<td>Natural Heritage Program (New York State)</td>
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<td>NRCS</td>
<td>Natural Resources Conservation Service</td>
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<td>NRHP</td>
<td>National Register of Historic Places</td>
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<td>NWI</td>
<td>National Wetlands Inventory</td>
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<td>NYISO</td>
<td>New York Independent System Operator</td>
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<td>NYSA&amp;M</td>
<td>New York State Department of Agriculture and Markets</td>
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<td>NYSDEC</td>
<td>New York State Department of Environmental Conservation</td>
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<td>NYS DOT</td>
<td>New York State Department of Transportation</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>NYSOPRHP</td>
<td>New York State Office of Parks, Recreation &amp; Historic Preservation</td>
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<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
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<tr>
<td>O&amp;M</td>
<td>Operations and Maintenance</td>
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<tr>
<td>POD</td>
<td>Plan of Day</td>
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<td>PSC</td>
<td>Public Service Commission (New York State)</td>
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<tr>
<td>PILOT</td>
<td>payment in lieu of tax</td>
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<tr>
<td>POI</td>
<td>Point of Interconnection</td>
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<tr>
<td>PPA</td>
<td>Power Purchase Agreement</td>
</tr>
<tr>
<td>PTC</td>
<td>Production Tax Credit (a federal tax credit of $22.5 per MWh for 10 years) currently expiring on December 31, 2013</td>
</tr>
<tr>
<td>Project</td>
<td>Refers to the Copenhagen Wind Farm</td>
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<tr>
<td>Project Sponsor</td>
<td>Refers to OwnEnergy, Inc., the originator and developer of the Project</td>
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<tr>
<td>RECs</td>
<td>Renewable Energy Credits (as purchased by NYSERDA pursuant to its annual solicitations)</td>
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<tr>
<td>RFP</td>
<td>Request for Proposals</td>
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<tr>
<td>rpm</td>
<td>Wind turbine rotor rotations per minute</td>
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<td>RPS</td>
<td>Renewable Portfolio Standard</td>
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<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
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<td>SEQRA</td>
<td>State Environmental Quality Review Act</td>
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<td>SHPO</td>
<td>State Historic Preservation Office (New York)</td>
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<td>SPCC</td>
<td>Spill Prevention Control and Countermeasure Plan</td>
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<tr>
<td>SPDES</td>
<td>State Pollutant Discharge Elimination System</td>
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<tr>
<td>SWPPP</td>
<td>Stormwater Pollution Prevention Plan</td>
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<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
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<tr>
<td>USDA</td>
<td>U.S. Department of Agriculture</td>
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<tr>
<td>USFWS</td>
<td>U.S. Fish &amp; Wildlife Service</td>
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<td>USGS</td>
<td>U.S. Geological Survey</td>
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<tr>
<td>VIA</td>
<td>Visual Impact Assessment</td>
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<td>WCFZ</td>
<td>Worse Case Fresnel Zone</td>
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<td>FIRMS INVOLVED IN PREPARATION OF THE DEIS</td>
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<td><strong>edr Companies</strong></td>
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<tr>
<td>217 Montgomery Street</td>
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<tr>
<td>Suite 1000</td>
<td></td>
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<tr>
<td>Syracuse, New York 13204</td>
<td></td>
</tr>
<tr>
<td>Brian Schwabenbauer</td>
<td></td>
</tr>
<tr>
<td>(315) 471-0688</td>
<td></td>
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<tr>
<td><strong>Own Energy, Inc.</strong></td>
<td></td>
</tr>
<tr>
<td>45 Main Street</td>
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<tr>
<td>Suite 538</td>
<td></td>
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<tr>
<td>Brooklyn, New York 11201</td>
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<tr>
<td>James Damon</td>
<td></td>
</tr>
<tr>
<td>Phone: (646) 898-3690</td>
<td></td>
</tr>
<tr>
<td><strong>Hessler Associates, Inc.</strong></td>
<td></td>
</tr>
<tr>
<td>3862 Clifton Manor Place, Suite B</td>
<td></td>
</tr>
<tr>
<td>Haymarket, Virginia 20169</td>
<td></td>
</tr>
<tr>
<td>David M. Hessler, P.E., INCE</td>
<td></td>
</tr>
<tr>
<td>(703) 753-1602</td>
<td></td>
</tr>
<tr>
<td><strong>Comsearch</strong></td>
<td></td>
</tr>
<tr>
<td>19700 Janelia Farms Blvd.</td>
<td></td>
</tr>
<tr>
<td>Ashburn, Virginia 20147</td>
<td></td>
</tr>
<tr>
<td>Denise Finney</td>
<td></td>
</tr>
<tr>
<td>(703) 726-5650</td>
<td></td>
</tr>
<tr>
<td><strong>Young, Sommer &amp; Associates</strong></td>
<td></td>
</tr>
<tr>
<td>Executive Woods</td>
<td></td>
</tr>
<tr>
<td>5 Palisades Drive</td>
<td></td>
</tr>
<tr>
<td>Albany, NY 12205</td>
<td></td>
</tr>
<tr>
<td>Douglas H. Ward, Esq.</td>
<td></td>
</tr>
<tr>
<td>(518) 438-9907</td>
<td></td>
</tr>
<tr>
<td><strong>Fisher Associates</strong></td>
<td></td>
</tr>
<tr>
<td>135 Calkins Road</td>
<td></td>
</tr>
<tr>
<td>Rochester, New York 14623</td>
<td></td>
</tr>
<tr>
<td>Chris Smith</td>
<td></td>
</tr>
<tr>
<td>(585) 334-1310</td>
<td></td>
</tr>
<tr>
<td><strong>Sanders Environmental, Inc.</strong></td>
<td></td>
</tr>
<tr>
<td>322 Borealis Way</td>
<td></td>
</tr>
<tr>
<td>Bellefonte, Pennsylvania 16823</td>
<td></td>
</tr>
<tr>
<td>Chris Sanders</td>
<td></td>
</tr>
<tr>
<td>(814) 659-8257</td>
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1.0 EXECUTIVE SUMMARY

This Draft Environmental Impact Statement (DEIS) is for a proposed action known as the Copenhagen Wind Farm ("the Project"). A brief Project description is provided below, along with summaries of the regulatory process; the Project's purpose, need, and benefit; its potential environmental impacts; and proposed mitigation measures. Alternatives to the Project and its effect on use and conservation of energy are also summarized.

Project Description

OwnEnergy, Inc., (OwnEnergy or the Project Sponsor), is proposing to develop a wind-powered generating facility in the Town of Denmark, Lewis County and the Towns of Rutland, Champion and Watertown, Jefferson County, New York (Figure 2). The Project as currently proposed includes 62 wind turbine sites, among which 49 sites will be selected for turbine construction. When operational, the 49 turbines will deliver up to 79.9 MW of electrical power to the New York State grid. In addition to the wind turbines, the Project involves construction of associated components including three permanent meteorological towers, a system of gravel access roads, buried 34.5 kilovolt (kV) electrical collector lines, an operation and maintenance (O&M) building, and a collection and transforming substation. To deliver power to the New York State power grid, the Project Sponsor proposes to construct a 115 kV transmission line, and a Point of Interconnection (POI) facility located adjacent to the existing National Grid East Watertown substation in Watertown, NY. The transmission route will be approximately nine miles in length.

The proposed Project is located on approximately 9,700 acres of leased land, or land that is currently under negotiation to lease. Project construction is anticipated to occur in a single phase, starting in the late spring of 2014, and completed by December 31 of that year. Once built, the wind turbines and associated components will operate in almost completely automated fashion as described in more detail Section 2.7. The Project will, however, employ approximately seven to ten operations and maintenance (O&M) personnel. The wind turbine currently proposed is the GE 1.6 - 100 wind turbine (or equivalent) which has a minimum cut-in wind speed of approximately 3 meter/second (m/s)(6.7 mph) required to generate electricity. This turbine's maximum rotational speed is 16 rotations per minute (rpm). Each wind turbine has a computer to control critical functions, monitor wind conditions, and report data. Please refer to Appendix A for a summary of the GE 1.6 -100 wind turbine.

Regulatory Process

This DEIS has been prepared by edr Companies (edr) of Syracuse, New York. The document is intended to provide a basis for informed public comment and decision-making, and to facilitate the Project's environmental review.
process in accordance with the requirements of New York State’s Environmental Quality Review Act (SEQRA). The Town of Denmark Planning Board is acting as the lead agency pursuant to SEQRA.

Various plans and support studies have also been prepared in support of the Project, which provide detailed expert analysis on discrete topical areas in furtherance of the SEQRA evaluation. These studies include the following:

- Wetland and Ecological Report
- Preliminary Stormwater Pollution Prevention Plan (SWPPP)
- Phase 1A Cultural Resources Investigation
- Historic Architectural Resources Survey and Addendum Report
- Visual Impact Assessment
- Shadow Flicker Analysis
- Traffic and Transportation Study
- AM and FM Broadcast Analysis
- Cellular/PCS Telephone Analysis
- Off-Air Television Reception Analysis
- Licensed Microwave Search & Worst Case Fresnel Zone Study
- Land Mobile Radio Analysis
- Sound Level Assessment Report

**Purpose, Need, and Benefit**

The Project responds to objectives identified in the 2009 State Energy Plan (New York State Energy Planning Board, 2009), and the Renewable Portfolio Standard (RPS) in New York (NYSERDA, 2012). In September 2004, the Public Service Commission (PSC) approved the RPS and identified a renewable energy policy, which calls for an increase in renewable energy used in the State to 25% by the year 2013 (PSC, 2004). In 2008, the PSC increased the RPS goal to 30% by 2015 (NYSERDA, 2012). The New York State Energy Plan contains a series of mandatory policy objectives that the Project will assist in achieving, including increasing the use of energy systems that enable the State to significantly reduce greenhouse gas emissions, while stabilizing long-term energy costs and improving the State’s energy independence through development of in-state energy supply resources (New York State Energy Planning Board, 2009). The State Energy Plan recognizes that wind energy projects will play a role in fulfilling this objective. An updated New York State Energy Plan is scheduled to be released in March 2013, and is expected to provide further support for the development of renewable energy generation sources such as the Copenhagen Wind Farm.
In June 2007, former Governor Spitzer and then Lieutenant Governor Paterson formed the NYS Renewable Energy Task Force to investigate the implementation of increased renewable energy sources in the State. The Task Force published a report in February of 2008 that is intended to serve as a policy “road map” to address the many challenges we face in reducing our dependence on fossil fuels, stimulating investment in clean energy alternatives, and moving toward a Clean Energy Economy in New York State (Renewable Energy Task Force, 2008). In addition, in December 2012 the New York Energy Highway Task Force issued the “New York Energy Highway Blueprint,” on behalf of Governor Andrew Cuomo. Regarding the importance of renewable energy in New York State, the Blueprint states that “modernizing our generation assets promotes environmental and efficiency goals and preparing well in advance for the potential closure of power plants is critical to safeguarding system reliability and protecting consumers.” The Blueprint also contends that new renewable energy projects provide sustained environmental benefits through reduced local and state air emissions, and can also generate short and long-term economic development through construction, operation, and maintenance jobs, expenditures for supplies and materials, and tax payments to local communities (NY Energy Highway Task Force, 2012). The authors of these reports recognize the need for, and benefits of, a rapid transition toward the large-scale development of renewable energy sources such as the proposed Copenhagen Wind Farm.

Summary of Potential Impacts

In accordance with requirements of the SEQRA process, potential impacts arising from the proposed action are evaluated in this DEIS (see Section 3.0) with respect to an array of environmental and cultural resources. The identified and analyzed potential impacts are broadly summarized below.

<table>
<thead>
<tr>
<th>Environmental Factor</th>
<th>Potential Impacts</th>
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</table>
| Physiography, Geology, and Soils | Soil disturbance  
                               Soil erosion  
                               Soil compaction  
                               Loss of agricultural land  
                               Proximity of proposed wind turbines to the Cortland County landfill |
| Water Resources               | Temporary disturbance  
                               Siltation/sedimentation  
                               Stream crossings  
                               Alteration of private water supplies |
| Biological Resources          | Vegetation clearing/disturbance  
                               Incidental wildlife injury and mortality  
                               Loss or alteration of habitat |
<table>
<thead>
<tr>
<th>Environmental Factor</th>
<th>Potential Impacts</th>
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<tr>
<td>Climate and Air Quality</td>
<td>Construction vehicle emissions</td>
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<td></td>
<td>Dust during construction</td>
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<td>Reduced air pollutants and greenhouse gases</td>
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<tr>
<td>Aesthetic/Visual Resources</td>
<td>Visual change to the landscape</td>
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<td>Visual impact on sensitive sites/viewers</td>
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<td>Shadow-flicker impact on adjacent residents</td>
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<td>Cultural Resources</td>
<td>Visual impacts on architectural resources</td>
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<td></td>
<td>Disturbance of archaeological resources</td>
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<td>Sound</td>
<td>Construction noise</td>
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<td>Operational impacts on adjacent residents</td>
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<td>Transportation</td>
<td>Road wear/damage</td>
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<td>Traffic congestion/delays</td>
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<td>Road system improvements/upgrades</td>
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<td>Socioeconomic</td>
<td>Host communities to receive a payment in lieu of taxes (PILOT)</td>
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<td>Revenue to participating landowners</td>
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<td>Expenditures on goods and services</td>
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<td>Tourism</td>
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<td>Short-term and long-term employment</td>
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<td>Public Safety</td>
<td>Construction concerns related to large equipment, falling objects, open excavations, electrocution</td>
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<td>Possible ice shedding concerns</td>
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<td>Project components catching fire</td>
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<td>Low frequency noise</td>
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<td>Communication Facilities</td>
<td>Temporary interference to communication signals</td>
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<td>Degraded reception to off-air television signals</td>
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<td>Community Facilities and Services</td>
<td>Demands on police and emergency services</td>
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<td>Relocated utility distribution lines and poles</td>
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<tr>
<td>Land Use and Zoning</td>
<td>Adverse and beneficial impacts on forested land</td>
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<td>Changes in community character and land use trends</td>
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Construction of the Project will result in disturbance of up to 372 acres of soil and 590 acres of vegetation, most of which is forest land or active agriculture. In addition, approximately 14 acres of wetland could be disturbed by Project construction. However, the majority of these impacts will be temporary and will require U.S. Army Corp of Engineers approval. A total of 58 acres will be converted to built facilities, including 17 acres of forest land and 0.5 acre of wetland. Project construction will also result in some level of temporary disturbance and congestion on area roadways. The impacts are anticipated to be less than described above because only 49 of the 62 turbines will be constructed.

Project operation is expected to result in some level of avian and bat collision mortality. The turbines will be visible from many locations within the surrounding area, particularly in agricultural areas with wide open fields, but will also be fully or partially screened from viewers in many locations (e.g., in forested areas, developed settings and in parts of the valleys surrounding the Project area). Only very minor changes in land use within the Project area are...
anticipated as a result of Project implementation. The Project is expected to generate approximately $624,000 per year (15.5 million over 20 years) in PILOT revenues to local taxing jurisdictions, while requiring very little in terms of municipal services.

Summary of Mitigation Measures

Various measures will be taken to avoid, minimize and/or mitigate potential environmental impacts. General mitigation measures will include adhering to requirements of various local, state, and federal ordinances and regulations. To assure compliance with various environmental protection commitments and permit conditions, the Project Sponsor will provide funding for an independent, third party Environmental Monitor to oversee Project construction and restoration activities and to ensure compliance with all applicable environmental conditions. In addition, the Project Sponsor will implement a Community Outreach and Communication Plan. This plan sets forth an open communication link between the Towns and the Project Sponsor, and also establishes a complaint resolution procedure, including a toll free number set up by the Project Sponsor for use by local residents.

The proposed Project will result in positive impacts on socioeconomics (e.g., increased revenues to County and local municipality tax bases, payments to local contractors and hospitality sector service providers) and lease revenues to participating landowners, air quality (through reduction of emissions from fossil-fuel-burning power plants), and the climate (reduction of greenhouse gases that contribute to global warming). By eliminating pollutants and greenhouse gases, the Project will also benefit ecological and water resources as well as human health. These benefits also serve to mitigate unavoidable adverse impacts associated with Project construction and operation. Please see Section 3.0 for additional detail.

Specific measures designed to mitigate or avoid adverse potential environmental impacts during Project construction or operation include:

- Siting the Project away from population centers and areas of substantial residential development.
- Siting turbines and access roads so as to avoid or minimize impacts to wetlands and streams.
- Using the routing of existing logging roads and farm lanes for turbine access whenever possible to minimize disturbance to forest and agricultural land.
- Utilizing ‘best practice’ construction techniques that minimize disturbance to vegetation, streams, and wetlands.
- Implementing agricultural protection measures to avoid, minimize, or mitigate impacts on agricultural land and farm operations.
• Limiting turbine lighting to the minimum allowed by the Federal Aviation Administration (FAA) to reduce nighttime visual impacts, and following lighting guidelines to reduce the potential for bird collisions.
• Entering into a PILOT agreement with the local taxing jurisdictions to provide a significant predictable level of funding for the town, county, and school districts for the operational life of the Project.
• Close coordination with local first responders and other relevant community support services.

Alternatives

Alternatives to the proposed Project that were considered and evaluated include alternative Project area, alternative project design/layout, alternative project size, alternative technologies, alternative construction phasing, and no action. Analysis of these alternatives revealed that both the size of the Project and the configuration of the turbines as currently proposed are necessary to produce a commercially feasible project that minimizes adverse environmental impacts to the extent practicable. A smaller project would not fully capture the available wind resource in a manner to make the construction and interconnection of the Project to the existing New York grid economically feasible. A larger facility might theoretically provide more economic return, but it would force location of towers into areas with marginal wind power resources and greater proximity to residents, steep slopes, and undisturbed forest land, as well as landowners that may not be willing to participate. This would result in a greater number of potential adverse environmental impacts than currently anticipated. A larger number of smaller turbines, while perhaps reducing visibility from some areas, would not change the overall visual impact of the Project and would increase impacts associated with the more extensive road, foundation, and interconnect systems required. Alternative technologies (e.g., different sources of generation) eliminate many of the environmental advantages associated with the proposed Project. In summary, the alternatives analysis concluded that the Project as proposed offers the optimum use of resources with the fewest potential adverse impacts.

Effects on Use and Conservation of Energy Resources

The proposed Project will have significant, long-term beneficial effects on the use and conservation of energy resources. Energy will be expended during the construction phases of the Project, as well as for the maintenance of the wind turbines and support facilities on-site. However, the operating Project will possess a maximum of 79.9 MW of electricity generation capacity without consuming water or producing toxic emissions on an ongoing basis. This greatly exceeds the energy required to construct and operate the Project. Assuming that the average house in New York uses approximately 7.3-megawatt hours (MWh) of electric power per year and that the average house in the United States uses approximately 11.5 MWh of electric power per year (U.S. Energy Information Administration [EIA], 2012a), and assuming the Project generates approximately 35% of its nameplate generating capacity, this is enough
power to support between approximately 21,000 and 33,500 average homes in New York State (based on the New York and national averages).

The Project will add to and diversify the state's sources of power generation, accommodate future growth in power demand through the use of a renewable resource (wind), and over the long term will displace some of the state's older, less efficient, and less environmentally sustainable sources of power and/or the amount of energy imported into the state. Wind energy generation results in reductions in air emissions because of the protocol utilized to manage the electric power system. Generally, in the New York state wholesale energy market the most expensive energy consuming power sources (such as coal or natural gas) will be "backed down" first when there is a sufficient source of wind energy available. Within the wholesale energy markets governing the trading of energy, wind energy is a preferred power source on an economic basis because wind turbines consume no fuel. Also, since wind projects are able to access revenue from Production Tax Credits (PTCs) and Renewable Energy Credits (RECs) (refer to Section 2.3), wind projects are able continue to operate at during periods of low wholesale market pricing. Therefore, wind energy is one of the last forms of generation to be backed down. At times of excess generation capacity (i.e., when demand is low) wind energy typically displaces the need for generation from individual fossil fuel-fired power plants or units, thereby reducing fuel consumption and the resulting air emissions that would have otherwise occurred (Jacobson & High, 2008). The operation of the New York Independent System (NYISO) electricity market is discussed in further length in Section 2.2.

In summary, this Project is proposed at a time of significant energy uncertainty, at both the state and national levels and is being developed to contribute to satisfying the state's mandated targets for diversifying its energy mix. At 79.9 MW, the Project will generate enough energy annually to serve between approximately 21,000 and 33,500 New York homes.
2.0 DESCRIPTION OF PROPOSED ACTION

This DEIS is for a proposed action known as the Copenhagen Wind Farm (the Project). The Project consists of the construction and operation of up to 49 wind turbine generators, a nine-mile transmission line, and associated facilities, with an installed generating capacity of up to 79.9 megawatts (MW) connecting to the New York State power grid. The Project is expected to operate at an annual net capacity factor (NCF) of approximately 35%. This means that over the course of a full calendar year the Project would produce up to 244,973 MWh (i.e., 79.9 MW x 24 hrs/day x 365 days x 35%) of energy.

The Town of Denmark Planning Board is the Lead Agency pursuant to the New York State Environmental Quality Review Act (SEQRA) (6 NYCRR Part 617). The Town of Denmark Planning Board has required the preparation of this DEIS in order to evaluate the potential environmental, social and economic impacts of the Project, which is to be located within approximately 9,700 acres of land within the Town of Denmark, Lewis County, and the Towns of Rutland, Champion and Watertown, Jefferson County, New York. The purpose of this DEIS is to evaluate the potential impacts of the Project, evaluate alternatives, and consider mitigation measures.

The proposed Project is described below in terms of its components, location, construction, operation and maintenance, and decommissioning. The Project's purpose, need, and benefit; cost and funding; and permits and approvals are also discussed below, along with a description of the regulatory process and opportunities for public and agency involvement in that process.

2.1 INTRODUCTION

2.1.1 Project Sponsor

Copenhagen Wind Farm, LLC (the Project Sponsor), is proposing to develop a wind-powered generating facility in the Town of Denmark, Lewis County, and the Towns of Rutland, Champion and Watertown, Jefferson County, New York (Figure 2). The Project Sponsor is a subsidiary of OwnEnergy, a national leader in the wind energy industry with a specialization in mid-size and community wind farms, a rapidly growing segment of the wind energy business. With its team of wind industry experts in development, financing, construction and operations, OwnEnergy has the resources and know-how to deliver turnkey projects dependably and operate them reliably. OwnEnergy currently has a development pipeline of approximately 1,300 megawatts across 15 States.

In 2012, OwnEnergy received an investment from a subsidiary of New Jersey Resources, a publicly traded Fortune 1000 gas utility. The subsidiary, NJR Clean Energy Ventures, is an established developer and owner-operator of solar photovoltaic plants in New Jersey and has partnered with OwnEnergy to diversify its holdings into wind energy
projects. OwnEnergy may develop the Copenhagen Wind Farm and a portion of its near-term portfolio on a turnkey basis to be owned by NJR Clean Energy Ventures, or the Project may remain a joint venture between OwnEnergy and the Project’s local partners.

2.1.2 Project Components

The Project includes the construction and operation of up to 49 wind turbines, which will deliver up to 79.9 MW of electrical power to the New York state grid. As presently envisioned the Project will use the GE 1.6-100 wind turbine (or equivalent) currently having a rated capacity of 1.62 MW; please refer to Appendix A for further technical details for the GE 1.6-100. Each wind turbine will include a three-bladed upwind rotor, with a diameter of 100 meters (328 feet), mounted on a 96-meter (315-foot) tubular steel tower (total height 150 meters (492 feet)). The Project will also involve construction of up to 17 miles of gravel access roads, 24 miles of buried or overhead 34.5 kV electrical collector lines, a collection substation, and three permanent 100-meter (328 feet) tall meteorological towers, located in the Town of Denmark, Lewis County. To service the facility, an O&M building will house operations personnel, equipment and materials, and provide staff parking. To deliver power to the New York State power grid, the Project Sponsor proposes to construct a collection substation located north of Route 12 in the Town of Denmark. This station will connect to the power grid via a newly constructed 115 kV electrical interconnection line connecting to the National Grid East Watertown substation via a new POI station located in the Town of Watertown. The interconnection route will be comprised of approximately nine miles of overhead line on wooden or steel pole structures, and located within a right-of-way (ROW) located in the Towns of Rutland, Champion and Watertown, Jefferson County.

Although 49 wind turbines and associated infrastructure/facilities will be constructed, the Project Sponsor is evaluating up to 62 potential wind turbine sites. See Figure 3 for the proposed Project layout that includes all 62 potential turbine locations. Final wind turbine site locations will be selected based upon a balance of Project Sponsor objectives (such as wind optimization and landowner participation), with minimization of Project related impacts (such as sound, shadow flicker, and wetland/stream disturbance). It is currently proposed that each town will host the following Project components:

- Town of Denmark: up to 49 wind turbines, and a maximum of 17 miles of access roads, 24 miles of electrical collection lines, the collection substation, temporary construction staging area, meteorological towers, the O&M facility and approximately 0.8 miles of overhead transmission line.
- Town of Rutland: approximately 5.6-miles overhead transmission line
- Town of Champion: approximately 3.2-miles overhead transmission line
• Town of Watertown: approximately 0.2-mile overhead transmission line and POI station adjacent to the existing National Grid East Watertown substation.

The layout, location, and number of turbines evaluated during SEQRA includes a Project that is intended to optimize the benefits of the local wind resource, while either avoiding or minimizing adverse environmental impacts, and assuring that the Project is commercially viable. Because of ongoing agency consultation/input, environmental considerations, landowner negotiations, and potential unforeseen construction issues, all of the potential turbine locations are subject to minor adjustments prior to finalization of the Final Environmental Impact Statement (FEIS) and thereafter, construction. However, this DEIS analysis provides a basis for future decision-making that will assure that any such adjustments will, consistent with SEQRA, avoid or minimize adverse impacts to the maximum extent practicable, pursuant to thresholds and criteria established by the Lead Agency.

The Project is currently scheduled to be constructed in 2014, and market availability of wind turbines could dictate the use of an alternate turbine from the proposed GE 1.6 MW machine. Any wind turbine ultimately selected will be of similar technology, size, appearance, operating characteristics, and approximate generating capacity.

2.1.3 Project Lease Easements

The Project Sponsor will enter into an agreement with the participating landowners (the 72 landowners who have or would need to finally provide consent to Project components occupying portions of their land) in the form of a standard lease agreement (for the host of the wind towers) or easement (for hosting of access roads, electrical collection lines and related facilities), that provide for compensation during the Project’s development, construction, and operation. These leases and easements will secure all the land rights necessary to develop, construct, and operate the wind turbine generators along with all ancillary facilities.

2.2 PROJECT PURPOSE, NEED, AND BENEFIT

This section describes the purpose of the Project, how it would help meet economic and environmental needs, and how the proposed action is consistent with goals, objectives, orders, and directives issued by the executive and legislative branches of the U.S. and State Government.

2.2.1 Project Purpose

The purpose of the proposed Project is to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid to:
• Satisfy regional energy needs in an efficient and environmentally sound manner;
• Supplement and offset fossil-fuel electricity generation in the region, with emission free wind generated energy;
• Contribute to reducing the amount of electricity imported to New York State;
• Realize the full potential of the wind resource in the Project area;
• Promote the long-term economic viability of rural areas in New York State; and
• Assist New York State in meeting its proposed RPS for the consumption of renewable energy in the State.

The Copenhagen Wind Farm is expected to have an average annual NCF of approximately 35%, which is slightly higher than most operational commercial wind farms in New York State. There have been significant developments in wind turbine technology in the last 24 months and the turbine model proposed (GE 1.6-100) is designed to maximize wind energy yields at this site area. As further indicated in Appendix A, the GE 1.6-100 turbine provides the following:

• Value: Best in Class capacity factor, 53% at 7.5 m/s
• Reliability: GE fleet at 98%+ availability
• Experience: 16,500+ fleet, most 100 meter+ rotors, 2.1 million operating hours
• Finance-ability: Evolutionary design using proven technology from GEI 1.5 and 2.5 MW platforms

Annual NCF is a means of measuring the productivity of a wind power project (or another power production facility). This factor compares the actual, or predicted, production of a facility over the course of a year as compared to the potential production if the facility was running at full capacity for the full year. A 35% NCF means that on average, a facility will generate approximately 35% of its potential output over a given year. For a wind project, this does not mean that it will be generating power only 35% of the time (the turbines may actually be generating power 65% to 90% of the time, just not always at full capacity), but rather the Project will generate approximately 35% of its potential maximum output over the course of each year.

Total net electricity delivered to the existing New York power grid is expected to be up to approximately 244,973 MWh (i.e., 79.9 MW x 24 hours/day x 365 days x 35%), or enough electricity to meet the average annual consumption of between approximately 21,000 and 33,500 households, based on average annual electric consumption of 7.3 MWh for New York and 11.5 MWh for the U.S., respectively (EIA, 2012a).
2.2.2 New York State Policy

The Project responds to objectives identified in the 2009 State Energy Plan (New York State Energy Planning Board, 2009), and the RPS in New York (NYSERDA, 2012). In September 2004, the PSC approved the RPS and identified a renewable energy policy, which calls for an increase in renewable energy used in the State to 25% by the year 2013 (PSC, 2004). In 2008, the PSC increased the goal to 30% by 2015 (NYSERDA, 2008).

The New York State Energy Plan contains a series of mandatory policy objectives that the Project will assist in achieving (New York State Energy Planning Board, 2009). Among these objectives is to increase the use of energy systems that enable the State to significantly reduce greenhouse gas emissions while stabilizing long-term energy costs, the key objective being to increase the percentage of non-fuel consuming (‘renewable’) sources of generation, and improving the State’s energy independence through development of in-state energy supply resources. The State Energy Plan recognizes that wind energy projects will play a role in fulfilling this objective and thus reduce the impact on future cost increases in fossil fuel (either by way of regulation or future market price increases).

Based on the State Energy Plan, other public benefits of the Project related to energy use include the following:

- Production and use of in-state energy resources can increase the reliability and security of energy systems, reduce long-term energy costs (for the reasons referred directly above), and contribute to meeting climate change and environmental objectives.
- To the extent that renewable resources and natural gas are able to displace the use of higher carbon and particulate emitting fossil fuels, relying more heavily on these in-state resources will also reduce public health risks and environmental impacts posed by all sectors that produce and use energy.
- By focusing energy investments on in-state opportunities, New York can reduce the amount of dollars “exported” out of the State to pay for energy resources.
- By re-directing those dollars back into the State economy, New York will increase the amount of business and economic activity related to power generation within the state. Renewable energy contributes to the reduction of energy price volatility in the long-term and enables wind to displace other fossil based forms of generation – particularly when there is an excess of generation capacity.

In June 2007, former Governor Spitzer and then Lieutenant Governor Paterson formed the NYS Renewable Energy Task Force to investigate the implementation of increased renewable energy sources in the State. The Task Force published a report in February of 2008 that is intended to serve as a policy "road map" to address the many challenges we face in reducing our dependence on fossil fuels, stimulating investment in clean energy alternatives, and moving toward a Clean Energy Economy in New York State (Renewable Energy Task Force, 2008). In addition,
in December 2012, the New York Energy Highway Task Force issued the “New York Energy Highway Blueprint,” on behalf of Governor Andrew Cuomo. Regarding the importance of renewable energy in New York State, the Blueprint states that “modernizing our generation assets promotes environmental and efficiency goals and preparing well in advance for the potential closure of power plants is critical to safeguarding system reliability and protecting consumers.” The Blueprint also contends that new renewable energy projects provide sustained environmental benefits through reduced local and state air emissions, and can also generate short and long-term economic development through construction, operation and maintenance jobs, expenditures for supplies and materials, and tax payments to local communities (NY Energy Highway Task Force, 2012). The authors of these reports recognize the need for, and benefits of, a rapid transition toward the large-scale development of renewable energy sources such as the proposed Copenhagen Wind Farm.

In its 2012, annual RPS Report NYSERDA stated, “New York, through regulations adopted by the PSC, first enacted its RPS in 2004 with the goal of increasing the amount of renewable electricity used by consumers to 25% by 2013. Following a comprehensive mid-course review, and in an Order issued in January 2010, the Commission expanded the RPS target from 25% to 30% and extended the terminal year of the program from 2013 to 2015.”

As part of the 2004 Order, the PSC designated NYSERDA as the central procurement administrator for the RPS Program. Unlike most states with an RPS, New York uses the corresponding central procurement model whereby NYSERDA administers or is otherwise responsible for the majority of the RPS programs goals. Specifically, NYSERDA is responsible for obtaining the Main Tier (large utility scale resources – such as the being proposed by the Project) and Customer Sited Tier (CST) (smaller behind the meter resources – such as rooftop solar, etc.). Through December 31, 2011, NYSERDA has conducted seven competitive solicitations in pursuit of the Main Tier renewable energy procurement target. From these solicitations, NYSERDA currently has contracts with 56 large-scale projects. These projects will add approximately 1,841 MW of new renewable capacity to the state’s energy mix. Through December 31, 2011, NYSERDA’s progress at achieving the Main Tier and Customer Sited Tier targets are 48% and 39%, respectively (NYSERDA, 2012). On December 24, 2012, NYSERDA announced an eighth competitive solicitation for Main Tier renewable energy projects of up to $250 million. Bid awards are anticipated during the spring of 2013.

Progress in the program through December 31, 2011 has yielded, and is expected to yield, significant economic benefits to New York State and its associated locales. Economic benefits accrue from the planning, development, construction, and operation of renewable energy facilities. Using data from 2009 mid-course program evaluation conducted by independent program contractors, NYSERDA estimates that direct economic benefits associated with all projects selected in the first seven Main Tier solicitations will approach $2.4 billion over the next twenty years.
When the effects induced on the broader economy are considered, the total economic benefits are estimated at more than $4.9 billion.

According to NYSERDA (2012), implementation of the RPS has been highly cost effective. Program highlights include:

- Progress towards the NYSERDA Main Tier and Customer Sited Tier 2015 combined target of 10.4 million MWh is approximately 47% while funding committed to date toward this progress is 39% of the total approved RPS budget.
- Total new renewable capacity supported by the Main Tier and Customer Sited Tier could reach nearly 1,968 MW by the end of 2013, of which 1,898 MW will be located in New York.
- Under the Main Tier component of the program, 1,456 MW of new renewable capacity from 46 projects is in operation; an additional 384 MW, from 10 projects, are currently under development and/or construction.

2.2.3 Federal Policy

Further, Federal policy has recognized the need for increased supply of energy to the U.S., and for new renewable energy resources. The Project fulfills a need for the production and transmission of renewable energy, which would serve the public interest. The Project is consistent with Executive Order 13423 (dated May 18, 2001), which states, “The increased production and transmission of energy in a safe and environmentally sound manner is essential to the well-being of the American people. In general, it is the policy of this Administration that executive departments and agencies shall take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy.”

The PTC is a federal tax credit that provides for qualifying renewable facilities to access a tax credit currently valued at $22 for every MWh (equivalent to 2.2 cents per kWh) of renewable energy produced over the first ten years of operation. The PTC was created under the Energy Policy Act of 1992 at the value of $15 per MWh, which has since been adjusted annually for inflation. The PTC is enacted through tax legislation and hence is not an ongoing permanent mechanism. The PTC is currently set to expire December 31, 2013 and at the current time there is no guarantee that it will be renewed, extended or replaced. In a blueprint released by the White House in conjunction with the State of the Union address, President Obama stated a goal to double renewable energy production by 2020. Regarding this goal and the PTC, the blueprint states, “To once again double generation from wind, solar and geothermal sources by 2020, the President has called on Congress to make the renewable energy production tax credit permanent and refundable, as part of comprehensive corporate tax reform, providing incentives and certainty for investments in new clean energy” (The White House, 2013).
2.2.4 Project Benefits

In addition to partly satisfying goals set by the Executive Branch of New York State and Federal Policy, other benefits of the proposed action include:

- Local socioeconomic benefits:
  - Increased revenues to local municipalities.
  - Employment during the development phase.
  - Short-term employment of construction workers, and long-term employment of operating workers (Pedden, 2005; Flowers and Kelly, 2005).
  - Direct lease payments to participating landowners, who are participating in the Project on a voluntary basis.
  - "Direct economic effects" in the form of immediate payments to consultants, contractors, and the labor pool required to develop, build, and operate the Project (Ouderkirk and Pedden, 2004).
  - "Induced effects" in the form of everyday purchases made by the firms and employees working at the Project area (i.e., groceries, gas and supplies, hotel accommodations, patronization of various local establishments, etc.) (Ouderkirk and Pedden, 2004).
  - Economic benefits in the form of grants and direct donations from “WinDenmark,” an independent, local resident-led community group. The Project Sponsor will provide annual funding to WinDemmark through project revenues.

- Environmental benefits:
  - Within the New York electricity market, wind-generated electricity typically displaces the use of fossil fuels in conventional power plants, producing a reduction in the emission of key air pollutants; sulfur dioxide and nitrogen oxides (acid rain precursors); mercury; and carbon dioxide (tied to global climate change). NYSERDA found that if wind energy supplied 10% (3,300 MW) of the state’s peak electricity demand, 65% of the energy it displaced would come from natural gas, 15% from coal, and 10% from electricity imports. This equates to an annual displacement of 6,400 tons of nitrogen oxides and 12,000 tons of sulfur dioxide (GE Energy, 2005).
  - Energy efficiencies and renewable generation together will reduce New York’s greenhouse gas emission, helping to achieve the State’s CO₂ reduction goals (New York State Energy Planning Board, 2009).
  - The well-being of some ecosystems in the northeastern U.S., including New York State, is at serious risk as a result of the negative environmental externalities associated with fossil fuel based...
power plant emissions. Research conducted by scientists from the Hubbard Brook Research Foundation concluded that "hotspots" throughout the Northeastern U.S. have levels of mercury deposition "10 to 20 times higher than pre-industrial conditions, and 4 to 5 times higher than current EPA estimates". This research highlights "the connection between airborne mercury emissions from United States sources and the existence of highly contaminated biological hotspots...Emission reductions from high emitting-sources near biological hotspots in the United States will yield beneficial improvements in both mercury deposition and mercury levels in fish and wildlife" (Driscoll et al., 2007).

- Statewide economic benefits:
  - New York is the fourth largest energy consuming state (EIA, 2012), and spends approximately $65 billion annually for energy, of which 53% ($35 billion) pays for energy imports (New York State Energy Planning Board, 2009). The State Energy Plan goals promote diversity of the State’s economy through the use of alternative in-state energy sources, including renewable based energy (New York State Energy Planning Board, 2009).
  - An analysis undertaken for NYSERDA, by KEMA Inc. in 2009, concluded that approximately $6 billion in direct economic benefits are expected to accrue to New York from the Main Tier solicitations alone in the event of the 30% RPS target being achieved (NYSERDA, 2012 RPS Report).

- Human health benefits:
  - Airborne mercury, released primarily by coal-fired power plants, has contaminated numerous rivers, lakes, and streams across the State. While eating fish from State water bodies is not prohibited, the NYSDEC has issued advisories pertaining to fish consumption. Eighty-seven (87) of the 136 bodies of water with health advisories in New York State are listed in part or wholly because of mercury contamination. Pregnant women, women who may become pregnant, or children under the age of 15 are advised not to consume any fish, at any time, from any of the water bodies listed by the NYSDEC (NYSDOH, 2012).
  - Sulfur dioxide and nitrogen oxide emissions react with volatile organic compounds in the atmosphere (i.e., gasoline vapors or solvents) and produce compounds that can result in severe lung damage, asthma, and emphysema (Wooley, 2000).
  - Researchers at the Harvard School of Public Health estimated that air pollution from conventional energy sources across the U.S. kills between 50,000 and 70,000 Americans every year (Levy et al., 2000).
Research undertaken by the American Cancer Society, Harvard School of Public Health, and the Environmental Protection Agency (EPA) shows that residents in every single state across the Nation were at risk of premature death from air pollution (Cooper & Sovacool, 2007).

2.3 PROJECT COST AND FUNDING

Based on experience with other projects (both operational and in the advanced stages of development or currently in construction via partnerships), the Project Sponsor estimates that developing, permitting, and constructing the Project will total approximately $160 million, which will be provided by OwnEnergy and its strategic financing partners. The Project will be funded as a commercial, for-profit enterprise with all development and capital cost to be provided by its Sponsor and strategic financial partner, who will elect to finance this expenditure through commercial debt and/or other balance sheet resources. The electrical output from the Project will likely be sold in the NYISO wholesale power market or to other power buyers under bilateral power purchase agreements; and the renewable energy credits (RECs) will likely be sold separately to NYSERDA, under the RPS program, or to other buyers of clean power.

In New York State, large scale wind energy projects are typically financed based on three key sources of income received as a result of generating wind derived electricity, revenues are only earned in the event that the Project generates electricity and the electricity is accepted on the transmission system by NYISO. These three revenue components are explained below in more detail:

- Renewable Energy Credit (REC) Contract:
  The key element of financing any wind energy project in New York typically starts with securing a fixed price REC contract. The most likely scenario is that the Project would secure, by way of participation in a competitive request for proposals (RFP), a ten year fixed price contract with NYSERDA to sell RECs. As explained above, NYSERDA acts as the central procurement agency for the state to procure the RECs associated with the New York RPS targets. NYSERDA undertakes an annual competitive solicitation for RECs. Implementation of the RPS has been highly cost effective to date. Progress towards the combined NYSERDA Main and Customer Sited Tiers 2015 target of 10.4 million MWh is approximately 47% while funding committed toward this progress is 39% of the total approved RPS budget.

- Production Tax Credit (PTC)
  The PTC is a federal tax credit that provides for qualifying renewable facilities to access a tax credit currently valued at $22 for every MWh (equivalent to 2.2 cents per kWh) of renewable energy produced over
the first ten years of operation. The PTC was created under the Energy Policy Act of 1992 at the value of $15 per MWh, which has since been adjusted annually for inflation. The PTC is enacted through tax legislation and hence is not an ongoing permanent mechanism. The PTC is currently set to expire December 31, 2013 and at the current time there is no guarantee that it will be renewed, extended or replaced. For the purposes of the explanation of financing wind energy projects in New York, it has been assumed that the PTC will continue beyond 2013. In the event that it is not, then the financing structure would be dependent on another form of federal incentive being applicable or for the other two sources of revenue to be sufficient on their own to enable a project to be viable. In order for the PTC to accrue, the Project needs to generate electricity and the transmission grid needs to be able to receive the electricity.

- Energy Sales

Normally, the final component to concluding a financeable wind energy project structure in New York is execution of a mechanism to trade the electricity produced by the wind energy project. There are two key options for trading the energy from a wind energy project in New York.

- Wholesale Market: The NYISO, established in 1999, administers the wholesale power market for New York State. Wholesale power is accessible only from the high-voltage system, at quantities larger than one megawatt. While the NYISO is not involved in the retail market for electricity, the companies that provide retail electricity (utilities and energy service companies, for example) procure power through the NYISO’s wholesale electricity markets, which operate on both a day ahead and real time energy pricing based on locational marginal pricing. In order for most wind energy projects to be viable, a financial instrument is required, whereby typically an energy trading company commits to purchase the energy from the wind project over a five to seven year period for a known price mechanism, and thus takes the risk of trading the energy on the day ahead New York wholesale market.

- Bilateral Power Purchase Agreement: A project may enter a bilateral agreement with a suitably financially robust, intensive energy user, or collection of energy users, to sell the electricity for a pre-agreed price over a 10 to 20 year contract. The type of arrangement, often referred to as a power purchase agreement (PPA), would thus take the place of the energy hedge referred above.

2.4 GENERAL PROJECT LOCATION

The proposed Project is located on approximately 9,700 acres of land (either under lease or in negotiation pertaining thereto) in the Town of Denmark, Lewis County (location of wind turbines or generating area), and the Towns of Rutland, Champion and Watertown, Jefferson County, New York (location of electrical transmission or transmission area) (see Figure 1). The proposed location for wind turbines, access roads, 34.5 kV electrical collector lines, the
O&M facility, meteorological towers, substation/switchyard, POI station, and the 115 kV transmission line is located on 100 separate land parcels (owned by 72 landowners).

The generating Project area is generally located in the southwest portion of the Town of Denmark and the Village of Copenhagen is generally west to centrally-located within the Generating Site. The Generating Site is bounded to the south by the town boundaries of Lowville, Harrisburg and Pinckney, to the west by the Jefferson County boundary, and to the north/northeast by Stoddard Road and Old State Road (See Figure 2).

The Project area has a rural and low-density character, with forestland and agriculture as the dominant land uses. The Project area is mostly forested, with agricultural fields located along the valley roads and on nearby gentle rolling hills. Residential land use is minimal in the Project area, with single-family homes located along public roadways adjacent to the Project, including Mud Street and Plank, Doran, River, Stoddard, Hayes, Boni, Roberts, Halifax, and Number Three Roads.

To deliver power to the New York State power grid, the Project Sponsor must construct a 115 kV overhead electrical line to transmit power from the generating facility to an interconnection facility located adjacent to an existing 115 kV transmission line south of East River Road. The transmission Project area extends west from the western edge of the generating Project area and continues west to the POI station adjacent to the Watertown East National Grid substation, located in the Town of Watertown.

2.5 PROJECT LAYOUT AND COMPONENTS

2.5.1 Project Siting Criteria

The primary goal of wind turbine siting and design is to maximize the capture of wind energy to assure economic viability, while providing a design that minimizes environmental impacts and meets all turbine vendor site suitability requirements and local law considerations. As such, this is an iterative process with the final Project array design reflecting a balance of these factors. The proposed location and spacing of the wind turbines and support facilities is initially based upon site developability, landowner participation, wind resource assessment, environmental resource factors, and review of the site’s zoning constraints. Factors considered during preliminary and final placement of turbines and other Project components includes the following:

*Wind Resource Assessment.* Through the use of on-site meteorological data collected at 60-meter wind measurement towers, topographic and surface roughness data, wind flow modeling, and wind plant design software,
the wind turbines are selected and sited to optimize exposure to wind from all directions, with emphasis on exposure to the prevailing wind direction in the Project area.

_Sufficient Turbine Spacing._ Siting turbines too close to one another can result in decreased electricity production and excessive turbine wear, due to the creation of wind turbulence between and among the turbines. Each operating wind turbine creates downwind turbulence in its wake. As the flow proceeds downwind, there is a spreading of the wake and recovery to free-stream wind conditions. The Project turbines will have a final placement with enough space between them to minimize wake losses and maximize the capture of wind energy.

_Distance from Non-participating Land Parcels._ The turbine locations will maintain a minimum setback of 642 feet, (the height of the highest portion of the nacelle plus twice the length of one rotating blade), from the property line of all adjacent parcels owned by non-participating neighbors. In the event that a turbine is less than 642 feet from the property line of a non-participating landowner, a setback waiver will be sought in accordance with the Town of Denmark local law.

_Distance from Residences._ The turbine locations will maintain a minimum setback of at least 1,500 feet between the tower and the nearest occupied permanent residence (except by way of waiver). The substation is located at least 525 feet from the closest residence. The proposed 115 kV transmission line is located over 450 feet from the closest residence.

_Distance from Other Structures and Buildings._ The turbine locations will maintain a minimum setback of approximately 500 feet between the tower and all structures or buildings other than year round residences (unless the owner has granted a waiver of this setback requirement in accordance with the requirements of town law).

_Distance from Roads._ The turbine locations will also maintain a minimum setback of at least 642 feet from non-seasonal public roads.

_Wetlands and Waterbodies._ The O&M facility, temporary turbine construction staging area, substation, meteorological tower, and turbine foundations will not be located within State-regulated freshwater wetlands. Placement of the electrical collection/transmission lines and access road in wetlands/streams will be avoided to the extent possible.

_Communication Interference._ Turbines will be sited outside of known microwave pathways or Fresnel zones to minimize the effect that they may have on local communications.
Cultural Resources. Project construction will be conducted in such a way that does not cause any effect to prehistoric or historic archeological resources, as recommended by the Project's Cultural Resources Specialist.

As indicated in Section 2.4 above, the Project area has a rural and low-density character, and high density residential land use is not extensive. The Project has been sited to avoid interaction with sensitive natural resources (e.g., wetlands, streams). More detailed discussion on the Project's relationship to these features and other resources, such as schools, recreational lands, and historic properties is provided in Section 3.0. The individual components of the Project layout are described individually in the following sections. Please see Figure 3 for a depiction of the Project layout, which as currently illustrates up to 62 wind turbines, of which 49 will be constructed and operated and will deliver up to 79.9 MW of electrical power to the New York state grid.

2.5.2 Wind Turbines

The wind turbines currently anticipated to be used for this Project are manufactured by GE, model GE 1.6-100. Illustrations and additional information regarding these turbines is included in the manufacturer's brochure in Appendix A. This wind turbine was selected because it is a state of the art on-shore wind turbine, and because its performance and efficiency are suited to the wind resource/wind conditions on site. As previously described, because the Project is not currently scheduled to be built until 2014, market factors such as availability and cost could dictate use of an alternate turbine. However, any turbine ultimately selected will be similar in design, dimension and operating characteristics to the GE 1.6-100 machine.

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The height of the tower, or “hub height” (height from the base of the tower to the center of the rotor hub on top of tower) will be approximately 100 meters (328 feet). The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle. The rotor has a 100-meter (328-foot) diameter, and the total turbine height (i.e., height at the highest blade tip position) will be approximately 492 feet. Descriptions of each of the turbine components are provided below.

**Tower:** The tubular towers used for this Project are conical steel structures manufactured in five sections, each of which are trucked separately to the site and bolted together using internal flanges. The towers have a base diameter of approximately 15 feet and a top diameter of approximately 8.5 feet. Each tower will have an access door, internal lighting, and an internal ladder or personnel lift to access the nacelle. The towers will be painted white to make the structure less visually obtrusive.
Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed by a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery, and is approximately 29 feet long, 12 feet tall, and 12 feet wide. The nacelle is externally equipped with an anemometer and a wind vane that measure wind speed and direction (this information is used by the turbine controller to turn the machine on and off, and to yaw it into correct position). Attached to the top of some of the nacelles will be a single, medium intensity aviation warning light, per specifications of the FAA. These will be synchronized flashing red lights (L-864 or similar) and operated only at night. The nacelle is mounted on a sliding ring that allows it to rotate or “yaw” into the wind to maximize energy capture.

Rotor: A rotor assembly is mounted on the drive shaft, and is operated upwind of the tower. Each rotor consists of three fiberglass composite blades approximately 49 meters (160 feet) in length (total rotor diameter of 100 meters [328 feet]). The rotor attaches to the drive shaft at the front of the nacelle. Electric servo motors within the rotor hub vary the pitch of each blade according to wind conditions, which enable the turbine to operate efficiently at varying wind speeds. The wind turbines begin generating energy at wind speeds as low as 3.0 meters per second (m/s) (7 mph) and automatically shut down, and yaw out of the wind, at wind speeds above 25 m/s (56 mph). The maximum rotor speed is approximately 16 revolutions per minute (rpm).

2.5.3 Electrical System

The proposed Project is anticipated to have an electrical system that consists of the following parts: 1) a system of buried 34.5 kV shielded and insulated cables that will collect power from each wind turbine (electrical collection lines), 2) a collection substation to step up the power from 34.5 kV to 115 kV, 3) an overhead 115 kV electrical line, and 4) a POI substation located adjacent to an existing 115 kV transmission line and substation. Each of these components is described below and shown in Figure 3:

**Electrical Collection System:** A transformer located near the base of the tower, or the interior of the nacelle, will raise the voltage of electricity produced by the turbine generator from typically 690 volts up to the 34.5 kV voltage level of the collection system. From the transformer, three power cables along with the fiber optic communication cables will collect the electricity produced by wind turbine generators to be connected through underground circuits. The electrical collection system will total approximately 24 miles in length and...
will typically be installed adjacent to Project access roads. Although underground cabling is the preferred option for the electrical collector system, overhead cables may be used where requested by landowners or where underground installation is prohibited or infeasible due to constraints such as rivers, streams or creek crossings, bedrock etc.

Collection Substation: This is the terminus of the 34.5 kV collection system, which will likely consist of three to four incoming circuits, and will be located at the beginning of the 115 kV line. The proposed collection substation will be located in an agricultural field on the north side of Route 12 in the Town of Denmark. The collection substation transformer will increase the voltage of the buried collection system from 34.5 kV to 115 kV. The collection substation will include 34.5 and 115 kV busses, a transformer, circuit breakers, towers, a control building, and related structures, and will be enclosed by chain link fencing. The collection substation will occupy approximately 1.5 acres, and has been selected based on being located away from existing residences and such that it will be well screened from adjacent public roads. Please refer to Appendix A for a general arrangement drawing of the anticipated equipment to be located in the substation. The ground conditions at the proposed location are assumed to be consistent with those occurring generally across the Project and hence the Project Sponsor has not yet undertaken detailed geotechnical investigations to determine the extent of work required to achieve adequate grounding protection.

Overhead Transmission Line: As mentioned previously, the 115 kV transmission line runs approximately nine miles west and northwest from the collection substation to an interconnection point adjacent to the existing National Grid Watertown East substation. Although transmission line design is currently preliminary, it is anticipated that the line will be carried on steel or treated wood pole structures that range in height from 65 to 80 feet above ground level, and will have an average span length of approximately 400 feet.

Point of Interconnection Station: The POI station will be located immediately adjacent to the existing National Grid Watertown East substation at the terminus of the proposed 115 kV transmission line. The dimensions of the fence line will be approximately 100 by 150 feet in size (less than one half acre) and will encompass electrical switches and related equipment necessary to tie into an existing circuit that comprises the National Grid 115 kV electric transmission lines. The majority of the POI station will be owned and operated by National Grid. However, it is anticipated that the POI station will also house the command center of the Project’s supervisory control and data acquisition (SCADA) system, which allows an operator to control critical functions and the overall performance of each turbine. The Project Sponsor will operate this portion of the POI station.
2.5.4 Access Roads

The total length of access road required to service all proposed wind turbine locations and substation is approximately 17 miles, some of which will be upgrades to existing farm lanes/logging roads. Based on site specific investigations and layout development, access roads to turbines 10 through 14, 23, 33, 42, and 55 through 57 use existing farm lanes/roads, accounting for approximately four miles of the 17 miles of total proposed access roads. The proposed location of Project access roads is shown in Figure 3. Temporary access roads will be gravel surfaced and typically are 34 feet wide to accommodate construction vehicles/component delivery. The surface of all access roads constructed through agricultural fields shall be level with the adjacent field surface. Crane travel will not be necessary on all Project access roads, but because crane travel is not planned until selection of the crane operator/contractor, a worse case assumption of 40-foot width for all roads has been assumed in quantifying the impacts (see Table 1 below). Following construction, roads will be restored for use as permanent access roads. The permanent roads will be gravel-surfaced and typically are 16 feet in width (however, for impact calculation purposes a maximum finished width of 20 feet is assumed). Please note that improvements to public roads (such as modifications to intersection geometry) are addressed in Section 3.8.

2.5.5 Wind Measurement Tower

Three permanent 100-meter (328-feet) tall wind measurement towers (meteorological tower) will be installed to collect wind data and support performance testing of the Project. The towers will be guyed galvanized tubular or lattice steel structure, and will be equipped with wind velocity and directional measuring instruments at three different elevations and temperature and humidity monitors near ground level. The final locations of the meteorological towers are currently not finalized, but they are each anticipated to be located in upland areas (assumed agricultural land) in the Town of Denmark, (the generation portion of the Project area) on leased private land. The permanent meteorological towers will not be located in the exact same location as the temporary meteorological tower because turbines will be constructed in these locations. Preliminary locations for the permanent meteorological towers are shown in Figure 3.

2.5.6 Staging Area

Construction of the Project will require the development of a temporary construction staging area, which will accommodate construction trailers, storage containers, large project components, and parking for construction workers. The staging area is anticipated to be up to eight acres in size, and will be located on participating land immediately adjacent to the proposed O&M facility, south of the intersection of Route 12 and Number Three Road in Copenhagen Wind Farm.
the Town of Denmark (see Figure 3). The staging area is a temporary feature associated with construction of the Project, and no additional permanent fencing or permanent lighting of the staging area is proposed.

### 2.5.7 Operations and Maintenance Facility

An O&M facility and associated storage yard will be constructed initially to house a temporary construction site office, parking, operations personnel, equipment, and materials and provide staff parking. The permanent O&M staff offices will be located in the permanent O&M building, which will be an approximately 7,000 square foot single story structure. Staff will be on duty during normal business hours (eight hours a day, five days per week) with weekend shifts and extended hours as required. The O&M facility will also be used to store equipment as necessary, and is anticipated to be up to 3.5 acres in size and located adjacent to the staging area, as previously described. Impact calculations assume 3.5 acres of total impact and 2.5 acres of permanent impact.

### 2.6 PROJECT CONSTRUCTION

Project construction is anticipated to occur in a single phase. Pending the receipt of all required permits, construction is currently scheduled to start in the spring/summer of 2014 and be completed by December 31 of that year. Construction activities are anticipated to employ approximately 125 workers (see Section 3.9 for additional detail), and to proceed in the following general order: a) civil engineering work (e.g., site establishment, public road improvements, access roads construction, turbine foundation construction); b) electrical engineering work (e.g., installation of buried collector and overhead interconnect and construction of the interconnection facility); c) wind turbine installation; d) Project testing and commissioning; and e) restoration. Project construction will be performed in several stages and will include the following main elements and activities:

- Preconstruction activities, including survey and site preparation for construction,
- Grading of the staging/field construction office area and substation areas,
- Public road improvements or upgrades,
- Construction of access roads, crane pads, and turn-around areas,
- Construction of turbine tower foundations,
- Installation of the electrical collection system,
- Construction and installation of the substation,
- Construction of the transmission line and POI station,
- Assemble and erection of the wind turbines,
- Plant commissioning and energization.
The Project Sponsor will provide written protocols itemizing protective measures resulting from the SEQRA analysis. Among other things these protocols will include a construction routing plan, road improvement plan, emergency response plan/ public safety plan, and complaint resolution procedures. These protocols will be reviewed, coordinated and approved by the town, in order to assure that they include the protective measures identified in the SEQRA and Permit review which will avoid or minimize potential impacts to the maximum extent practicable.

2.6.1 Pre-construction Activities

Before construction commences, a site survey will be performed to stake out the exact location of proposed Project components. Once the surveys are complete, a detailed geotechnical investigation will be performed to verify subsurface conditions and allow development of final wind turbine foundation and electrical design, and other facility components as necessary. The geotechnical investigation involves a drill rig obtaining borings to identify the subsurface soil and rock types, strength and chemical properties (such as establishing sulfate content etc.), and will also document the presence and depth of any groundwater encountered. Testing is also done to measure the soil’s electrical properties to ensure proper grounding system design. Geotechnical borings will be conducted at all turbine locations.

Using all of the data gathered for the Project (including geotechnical information, environmental conditions, site topography, etc.), the Project Sponsor will develop a set of site-specific construction specifications for the various components of the Project. The design specifications will comply with construction standards established by various industry practice groups, and the Project engineering team will ensure that all aspects of the specifications, as well as the actual on-site construction, comply with all applicable federal, state, and local codes and good industry practice and required certification. The Project Sponsor and/or contractor will coordinate directly with the local code enforcement officers in order to assure that all aspects of Project specifications/inspections are properly communicated and understood.

To assure compliance with various environmental protection commitments and permit conditions, the Project Sponsor will provide funding for an independent, third party Environmental Monitor to oversee Project construction and restoration activities and to ensure compliance with all applicable environmental conditions. Prior to the start of construction at any given site, an Environmental Monitor and the contractor will conduct a walk-over of areas to be affected, or potentially affected, by proposed construction activities. This pre-construction walk-over will focus on the previously identified sensitive resources to avoid (e.g., wetlands, archeological, or agricultural resources), as well as the limits of clearing, location of wetland and stream crossings, location of drainage features (e.g., culverts, ditches),
location of underground utilities and tile lines, and layout of sedimentation and erosion control measures. Upon identification of these features, they will be marked in the field (by staking, flagging, fencing, etc.), specific construction procedures will be determined, and any modifications to construction methods or locations will be proposed before construction activities begin. See Section 4.3 (Environmental Compliance and Monitoring Program) of this DEIS for additional detail.

2.6.2 Staging Area Construction

The construction staging area will be developed by stripping and stockpiling the topsoil and grading and compacting the subsoil. Geotextile fabric and approximately 8 inches of gravel will then be installed to create a level working area. Electric and communication lines will be brought in from existing distribution poles to allow connection with construction trailers. At the end of construction, utilities, gravel, and geotextile fabric will be removed and the site restored to its preconstruction condition. Removed gravel may be reused elsewhere at the Project site, returned to the quarry, or properly disposed of. Disposal of all materials will be in accordance with all local, state, and federal regulations.

2.6.3 Site Preparation for Construction

Project construction will be initiated by clearing woody vegetation from all tower sites, access roads, and electrical interconnect routes. Trees cleared from the work area will be cut into logs and stockpiled on the edge of the work area or removed from the defined work area, while limbs and brush will be chipped and spread in upland areas (safely away from water resources) on-site so as not to interfere with existing land use practices. Landowners will have the right to any materials, including trees, taken from their property during site preparation, and any trees not claimed by the landowner will be sold to a local forestry operation or timber mill. For the purposes of this DEIS, it is assumed that a radius of 150-200 feet will be cleared around each tower, a 100-foot wide corridor will be cleared (or forested vegetation trimmed) along access roads, and a 25-foot-wide corridor will be cleared along underground electric collection lines that are not adjacent to access roads.

2.6.4 Public Road Improvements

Based upon field visits to the Project area and travel along public roads, it is not anticipated that any significant public road widening activities will be necessary. Preliminary delivery routes associated with the delivery of turbine components have been defined, as discussed in detail in Section 3.8. Although the travel route to be used for hauling gravel and concrete has yet to be finalized, they are not anticipated to result in impacts beyond those which
are defined for component delivery. Final haul routes will be determined in consultation with the turbine supplier, its transportation provider, the Town of Denmark, Lewis County, and NYSDOT.

Turn-outs at the intersection of Project access roads and certain town roads will be temporarily established, to allow an uninterrupted flow of construction activity. Public roadway intersections along the construction and delivery routes may also require spot radii improvements to accommodate the turning radius of over-length delivery vehicles, and surface treatment/reinforcement of some public roads may be necessary to support construction/delivery vehicles and equipment. A preliminary Traffic and Transportation Study has been conducted, which provides a detailed analysis of the anticipated delivery routes and associated improvements, and is discussed in more detail in Section 3.8 of this DEIS.

2.6.5 Access Road Construction

Wherever feasible, existing roads and farm drives will be upgraded for use as Project access roads in order to minimize impacts to both active agricultural areas and wetland/stream areas. Where an existing road or farm drive is unavailable or unsuitable, new gravel surfaced access roads will be constructed. Gravel and other aggregates to be used during construction may be sourced within the immediate vicinity of the Project area. However, specific sources of road material will depend on cost, availability and other considerations that are unknown at this time. The surface of all access roads constructed through agricultural fields shall be level with the adjacent field surface. Road construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled (and segregated from subsoil) along the road corridor for use in site restoration. Any grubbed stumps will be removed, chipped, or buried. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with 8 to 12 inches of gravel or crushed stone. A geotextile fabric or grid will be installed beneath the road surface, if necessary, to provide additional support.

Culverts and waterbars shall be installed to maintain natural drainage patterns. Appropriately sized culverts (minimum 12 inch) will be placed in any wetland/stream crossings in accordance with state and federal permit requirements. In other locations, culverts may also be used to assure that the roads do not impede cross drainage and provide stormwater control. If access road construction or improvements require the installation of culverts, the Project Sponsor will provide drainage design and calculations to the County or relevant Town for review. Any ditches or other water conveyance structures shall be assessed prior to any disturbance to determine if they are part of a stream or wetland and subject to U.S. Army Corps of Engineers (USACE) jurisdiction (see Section 3.2 for additional detail regarding stream and wetland resources). Where access roads are adjacent to, or cross, wetlands, streams or drainage ditches/swales, appropriate sediment and erosion control measures will be installed and maintained.
According to the Project-specific NYSDEC-approved SWPPP for the Project which is discussed in more detail in Section 3.1 of this DEIS.

During construction, access road installation and use could result in disturbance of a maximum width of 100 feet, with turning radii of 200 feet. In agricultural areas, topsoil will be stripped and wind-rowed (and segregated from subsoil) along the access road to prevent construction vehicles from driving over undisturbed soil and adjacent fields. Once construction is complete, temporarily disturbed areas will be restored (including removal of excess road material, de-compaction, and rock removal in agricultural areas) and returned to the approximate pre-construction contours. The typical finished access road will be 16 feet in width (accounting for road construction in agricultural land), with occasional wider pull-offs to accommodate passing vehicles, and earthen shoulders on either side to accommodate crane traffic. For purposes of impact calculation, a 20-foot road width is assumed, which accounts for the finished travel surface and sideslope grading. Typical access road details and recent construction photos are included in Appendix B.

2.6.6 Foundation Construction

Once the roads are complete for a particular group of turbine sites, turbine foundation construction will commence on that completed access road section. Foundation construction occurs in several stages including excavation, pouring of concrete mud mat, rebar and bolt cage assembly, outer form setting, casting and finishing of the concrete, removal of the forms, backfilling and compacting, and site restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations.

Initial activity at each tower site will involve clearing and leveling within a 150 to 200-foot radius around each tower location (maximum area of disturbance of up to 2.9 acres). Proper methods for segregating stockpiled and spoil material shall be implemented, and excavated soil will be reused to the maximum extent possible on the site that it was excavated from, as a means to limit opportunities for proliferation of non-native flora and other invasive species. Following topsoil removal, tracked excavators will be used to excavate the foundation. If bedrock is encountered it is anticipated to be rippable, it will be excavated. If blasting is required, it will be conducted in compliance with a detailed site specific blasting plan, and in accordance with all applicable regulations to avoid impacts to sensitive receptors (see Section 3.1 of this DEIS for additional information). If necessary, dewatering of foundation excavations will involve pumping the water to a discharge point, which will include measures/devices to slow water velocities and trap any suspended sediment. Dewatering activities will not result in the direct discharge of water into any streams or wetlands, and will be conducted in accordance with the project SWPPP.
Immediately prior to final turbine foundation design, a subsurface investigation will be performed at each proposed turbine location to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. These subsurface investigations will include soil borings, rock corings, seismic testing, and additional laboratory testing that will be performed to further evaluate the subsurface soil, bedrock, and groundwater conditions (see Section 3.1.2.1 for more information). However, pending the results of future geotechnical review, the foundation is currently anticipated to be a spread steel reinforced concrete type foundation. This foundation will be approximately 10 feet deep, approximately 50 to 60 feet in diameter, reinforced with pre-cut and bent reinforcement steel fixed on site and approximately 500 cubic yards (cy) of structural grade concrete. It is not anticipated that a project-specific concrete batch plant will be required assuming that the concrete necessary to support construction of the Project can be viably sourced from local concrete suppliers within the vicinity of the Project. Any excess concrete and concrete wash water at turbine sites will be properly disposed of by pouring it into an excavation (either into the existing excavation or into "wash-out pits" created for this purpose) and then burying it. In agricultural areas, excess concrete deposited in wash-out pits will not be buried, but will be removed once it solidifies.

Once the foundation concrete is sufficiently cured, the excavation area around and over it is backfilled with the excavated on-site material providing for suitable foundation drainage. The top of the foundation is typically an 18-foot diameter pedestal that extends 6 to 8 inches above grade. The base of each tower will be surrounded by a 6-foot wide gravel skirt, and an area approximately 115 feet by 66 feet will remain as a permanent gravel crane pad. The foundation will be constructed with adequate cableways and ducts to facilitate connection of the 34.5 kV underground collectors system, communications cabling and appropriate grounding conductors.

2.6.7 Electrical Collector System Installation

Direct burial methods through use of a cable plow, rock saw, rock wheel and/or trencher will be used during the installation of underground electrical collector system whenever possible. If a rock saw is used, water or other non-hazardous compound would be used as a lubricant. Direct burial will involve the installation of bundled cable (electrical and fiber optic bundles) directly into a “rip” in the ground created by the plow, saw blade or rock wheel. The rip disturbs an area approximately 24 inches wide with bundled cable installed to a minimum depth of 36 inches in most areas, and 48 inches in active agriculture and pasture lands. Sidestream material will be replaced with a small excavator or small bulldozer. All areas will be returned to pre-construction grades. Installation of buried electrical lines would typically require a width of up to 25 feet of vegetation clearing. However, in areas where buried electrical lines are collinear with proposed access roads or public roads, no additional soil disturbance, beyond that anticipated for road construction, is anticipated. Buried electrical lines along public roads will be buried in the right-of-way (ROW) adjoining land that is under lease to the Project. For purposes of a worst-case scenario, impact calculations
assume a 25-foot temporary disturbance for electrical gathering lines, but no permanent disturbance, as the cleared area along the buried electrical line will be allowed to regenerate naturally.

The installation of above ground or buried electrical collection will temporarily disturb streams and wetlands during construction as a result of clearing (brush hogging, or similar clearing method requiring no removal of rooted woody plants), and soil disturbance from burial of the electrical 34.5 kV collector lines or from pole installation (if above ground electrical 34.5 kV collector lines are required). Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by construction activities (e.g., removal of vegetation and soil disturbance). This indirect impact may occur at wetlands adjacent to work areas where no direct wetland impacts are anticipated. Where crossings of surface waters and wetlands are required, the Project Sponsor will employ Best Management Practices associated with particular, applicable streamside and wetland activities, as recommended by the NYSDEC and the USACE, and required by the issued wetland/waters permits (see Section 3.2.3 for additional detail).

2.6.8 Wind Turbine Assembly, Erection and Commissioning

Beyond the tower, nacelle, and rotor blades, other smaller wind turbine components include hubs, nose cones, cabling, control panels and internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Project area on flatbed transport trucks, and the main components will be off-loaded at the individual turbine sites. Turbine erection is performed in multiple stages including setting of the bus cabinet and ground control panels on the foundation, erection of the tower, erection of the nacelle, assembly and erection of the rotor, connection and termination of the internal cables and grounding system, and inspection and testing of the electrical system prior to energization.

Turbine assembly and erection involves mainly the use of large track mounted cranes, smaller rough terrain cranes, boom trucks, and rough terrain fork-lifts for loading and off-loading materials. The tower sections, rotor components, and nacelle for each turbine will be delivered to each site by flatbed trucks and unloaded by crane. A large erection crane will set the tower segments on the foundation, place the nacelle on top of the tower, and following ground assembly, place the rotor onto the nacelle (see typical photos in Appendix B). The erection crane(s) will primarily move from one tower to another along the designated Project access roads. In some instances the crane may “walk” from one turbine to another without the use of a designated access road (likely within the disturbance area of buried electrical interconnect), while other times the crane may need to be broken down and transported to the next turbine location in sections.
Turbine commissioning will occur once the wind turbines and substation are fully installed and the NYISO is ready to accept transport of power to the New York grid. The commissioning activities will consist of testing and inspection of electrical, mechanical, and communications systems. This activity can be summarized as follows:

- **Equipment Required**: Support trucks, which will be driven to the construction site.

- **Materials brought on site**: Gearbox oil, lubricating grease, two temporary portable generators. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and portable generators, gearbox oil, and lubricants. Fuel-handling will be conducted in compliance with the required mitigation measures and the Project-specific NYSDEC approved SWPPP.

- **Timing**: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall or winter depending on weather conditions.

- **Material generated**: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

### 2.6.9 Point of Interconnection Station and Transmission Line

The POI station construction will begin with clearing the site and stockpiling topsoil for later use in site restoration. Proper methods for segregating stockpiled and spoil material shall be implemented, and excavated soil will be reused to the maximum extent possible on the site that it was excavated from, as a means to limit opportunities for proliferation of non-native flora and other invasive species. The site will be graded, and a laydown area for construction trailers, equipment, materials, and parking will be prepared. Concrete foundations for major equipment and structural supports will be poured, followed by the installation of various conduits, cable trenches, and grounding grid conductors. Above-ground construction will involve the installation of structural steel, bus conductors and insulators, switches, circuit breakers, transformers, control buildings, etc. The final steps involve laying down crushed stone across the station, erecting the chain link fence, connecting the high voltage links, and testing the control systems. Restoration of the area immediately adjacent to the interconnection substation will then be completed.

Construction of the new 115 kV transmission line will initiate with clearing the proposed ROW corridor. The ROW will be clear cut to a width of up to 100 feet, with additional “danger trees” removed as appropriate. Vegetation will be managed in accordance with best management practices as necessary. Wooden poles will be delivered from the staging area and will be installed in augured holes, backfilled with gravel, guyed (if necessary) and anchored. It is
assumed that no concrete foundations will be required, and that no permanent access roads will be built on the ROW. However, during construction, it is assumed that vehicular activity will disturb a corridor up to 20 feet wide within the ROW. Miscellaneous hardware will be installed to complete the line construction.

2.6.10 Operations and Maintenance Facility Construction

The approximately 3.5-acre area (assuming the worst-case footprint analysis) will be cleared and graded in preparation for construction. Best practice methods for segregating stockpiled and spoil material shall be implemented, and excavated soil will be reused to the maximum extent feasible on the site that it was excavated from. Following construction of the building and parking areas, which will be in accordance with best practice procedures, (which will occupy approximately 2.5 acres), approximately one acre will be restored, including regrading and seeding.

2.6.11 Project Construction Summary

As a summary, Project components and their construction will result in disturbance to soil and vegetation and result in land displacement or conversion. Conservative assumptions associated with the Project’s limits of disturbance, used for the purposes of the SEQRA evaluation, are outlined in Table 1.

Table 1. Areas of Disturbance for Construction

<table>
<thead>
<tr>
<th>Project Components</th>
<th>Typical Area of Vegetation Clearing</th>
<th>Area of Total Soil Disturbance (temporary and permanent)</th>
<th>Area of Permanent Soil Disturbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Turbines and Workspaces</td>
<td>Up to 200’ radius per turbine</td>
<td>Up to 200’ radius per turbine</td>
<td>0.20 acres per turbine (pedestal plus crane pad)</td>
</tr>
<tr>
<td>Access Roads</td>
<td>100’ wide per linear foot of road</td>
<td>40’ wide per linear foot of road</td>
<td>20’ wide per linear foot of road</td>
</tr>
<tr>
<td>Buried Electrical Gathering Lines</td>
<td>25’ wide per linear foot of line</td>
<td>25’ wide per linear foot of line</td>
<td>None</td>
</tr>
<tr>
<td>Transmission Line</td>
<td>100’ wide per linear foot of line</td>
<td>20’ wide per linear foot of line</td>
<td>None, other than pole bases</td>
</tr>
<tr>
<td>Meteorological Towers</td>
<td>1 acre per tower</td>
<td>1 acre per tower</td>
<td>0.10 acre per tower</td>
</tr>
</tbody>
</table>
## Project Components

<table>
<thead>
<tr>
<th>Project Components</th>
<th>Typical Area of Vegetation Clearing</th>
<th>Area of Total Soil Disturbance (temporary and permanent)</th>
<th>Area of Permanent Soil Disturbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>O&amp;M Building and associated site</td>
<td>3.5 acres</td>
<td>3.5 acres</td>
<td>2.5 acres</td>
</tr>
<tr>
<td>(7,000 sf)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staging Area</td>
<td>8 acres (if required)</td>
<td>8 acres (if required)</td>
<td>None</td>
</tr>
<tr>
<td>Collection Station</td>
<td>2 acres</td>
<td>2 acres</td>
<td>1.5 acres</td>
</tr>
<tr>
<td>Substation</td>
<td>1 acre</td>
<td>1 acre</td>
<td>0.35 acre</td>
</tr>
</tbody>
</table>

Resource-specific disturbances are calculated based on the impact assumptions presented in Table 1, and are presented in detail in Section 3.0 of the DEIS.

### 2.7 OPERATIONS AND MAINTENANCE

Operation and maintenance of the Project will follow industry standard best management practices, as described below. The Project will require full time (during normal working hours) technical and administrative staff to maintain and operate the facility. The primary workers will be approximately seven to ten wind technicians (i.e., technicians who carry out maintenance on the turbines), along with a site supervisor and administrator.

The wind turbines will be operating when the wind speed is within the operating range (the operating wind speed range for the turbine the GE 1.6 – 100 is 3 m/s – 25 m/s [7 – 58 mph]) and there are no component malfunctions or NYISO grid constraints. Each turbine has a comprehensive control system that monitors the subsystems within the turbine and the local wind conditions to determine whether the conditions are suitable for operation. If an event occurs which is considered to be outside the normal operating range of the turbine (such as low hydraulic pressures, unusual vibrations, or high generator temperatures), the wind turbine will immediately and automatically shut down and report the condition to the operations center. A communication line connects each turbine to the operations center, which closely monitors and, as required, controls the operation of each turbine. The wind turbine system will be integrated with the electric interconnection SCADA to ensure that the Project critical controls, alarms, and functions are properly coordinated for safe, secure and reliable operation.
The turbines are equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. The system consists of aerodynamic braking by the rotor blades ('pitching') and by a separate hydraulic-disc brake system. Each wind turbine has a computer to control critical functions, monitor wind conditions, and report data back to the SCADA system.

O&M staff offices will be located in the O&M building, and staff will be on duty during normal business hours (eight hours a day, five days per week) with weekend shifts and extended hours as required. In the event of turbine or facility outages, the SCADA system (anticipated to be located in the interconnection substation) will send alarm messages to on-call technicians to notify them of the outage. The Project will always have an on-call local technician who can respond quickly in the event of any emergency. The wind turbines selected for the Project have been chosen in part for their high functional reliability. Each wind turbine manufacturer studies and reports on the frequency of operation problems and malfunctions that arise when the turbines are generating electricity. Data on the turbines’ reliability is summarized by the manufacturer in the turbine’s availability rating, which estimates the percentage of time that the turbine will function.

The Project Sponsor is responsible for the operation, inspection, and maintenance requirements of all Project components/improvements, both on-site and off-site. The Project Sponsor may subcontract this responsibility to GE, and if so, the turbines will be monitored from GE’s global wind energy center of operations and maintenance located in Schenectady, NY. The center is manned 24 hours a day, 365 days per year.

Scheduled Maintenance
Routine and preventative wind turbine maintenance activities are scheduled at six month intervals with specific maintenance tasks scheduled for each interval. Maintenance is done by removing the turbine from service and having two to three wind technicians climb the tower to spend a full day carrying out maintenance activities.

 Consumables such as various greases used to keep the mechanical components operating and oil filters for gearboxes and hydraulic systems are used for routine maintenance tasks. Following all maintenance work on the turbine, the area is cleaned up. All surplus lubricants and grease-soaked rags are removed and disposed of as required by applicable regulations. All maintenance activities will adhere to the same spill prevention industry best practices undertaken during the construction phase.

All costs including potential damage caused by hydraulic spills or other accidents resulting from Project maintenance activities will be adequately covered by the Project’s insurance. The Project Sponsor will maintain certain insurances such as general commercial liability insurance, workers compensation, and other statutory coverages throughout the
lifetime of the Project. The Project Sponsor shall maintain comprehensive general liability insurance in an amount of not less than Ten Million Dollars ($10,000,000.00) with a licensed insurance company authorized to carry on business in New York State throughout the lifetime of the Project.

**Unscheduled Maintenance**

Modern wind turbines are very reliable and the major components are designed to operate for up to 30 years. However, wind turbines are large and complex electromechanical devices with rotating equipment and many components. As a result, at times, turbines will require repair, most often for small components such as switches, fans, or sensors; typically, such repairs will take the turbine out of service for a short period of time until the component is replaced. These repairs can usually be carried out by a single technician visiting the turbine for several hours.

Events involving the replacement of a major component such as a gearbox or rotor are not typical. If they do occur, the use of large equipment, sometimes as large as that used to install the turbines, may be required. Typically only a small percentage of turbines would need to be accessed with large equipment during their operating life.

**Electrical System Maintenance**

The collector lines and substation will require periodic preventative maintenance. Routine maintenance will include condition assessment for aboveground infrastructure and protective relay maintenance of the substation in addition to monitoring of the secondary containment system for traces of oil. Finally, vegetation control will be required around the transmission line to prevent any damage to the line and ensure safe operation.

**Environmental Management**

All repair activities will be in accordance with all applicable federal, state, and local permits and associated conditions/requirements. To the extent practicable, all repairs will be facilitated through use of existing Project-related infrastructure (e.g., permanent gravel access roads, crane pads, etc.). If existing infrastructure is not adequate to accommodate certain repairs, any additional infrastructure improvements will be conducted in accordance with the applicable regulations (e.g., widening of an access road within or adjacent to a wetland will be conducted in accordance with Section 401 and 404 of the Clean Water Act, and Article 24 of the Environmental Conservation Law, as applicable).
2.8 DECOMMISSIONING AND CLOSURE PLANS

At the start of construction, an acceptable form of financial security, such as maintaining an acceptable investment grade credit rating (or provision of a letter of credit or parent company guarantee in the event that the credit rating is deemed inadequate to cover the costs of decommissioning), along with the projected salvage value of the towers and turbines (expected to be available from the dismantling of the Project), will be available to pay for the decommissioning of the Project at the end of its useful life. Specifically, the Project Sponsor shall, at reasonable intervals during the Project's operation, provide a bona fide estimate from an independent suitably qualified and experienced engineer for the Town's review and approval, in order to establish the cost of decommissioning the wind energy facility as compared to the capacity provided by the financial security.

The anticipated life of the Project is estimated to be a minimum of 25 years. The following describes how the Project will be dismantled following the operations phase of the Project.

Prior to the commencement of construction, the Project Sponsor shall formulate a decommissioning plan, or demonstrate that the private land leases provide adequate requirements for this plan. Unless otherwise agreed between the Town of Denmark and the Project Sponsor, and unless it can be demonstrated that the land leases adequately address this issue, the Decommissioning Plan shall include:

- Provision describing the triggering events for decommissioning of wind power facilities.
- Provisions for the removal of all above-ground structures and debris, but not the removal of anything below a 36-inch depth (e.g., tower foundations, buildings).
- Provisions for the removal of all below-ground structures to 48 inches in active agricultural land.
- Provisions for the restoration of the soil and vegetation.
- A timetable approved by the Town for site restoration.
- An estimate of decommissioning costs certified by an independent, Professional Engineer, to be repeated at reasonable intervals during the operational life of the Project.
- Form of Financial Security, secured by the Project Sponsor, naming the Town as the beneficiary in the event of a default by the Project Sponsor to comply with the terms of the Decommissioning Plan, for the purpose of adequately performing decommissioning, in an amount equal to the Professional Engineer's certified estimate of decommissioning cost, less the expected salvage cost of the wind farm components.
- Identification of procedures for the Town to access Financial Security at reasonable intervals throughout the operational life of the Project.
The current trend in the wind energy industry has been to replace or “re-power” older wind energy Projects by upgrading older equipment with more efficient turbines. However, if not upgraded or if the turbines are non-operational for an extended period of time (such that there is no expectation of their returning to operation), they will be decommissioned, in accordance with the Decommissioning Plan. In the event of a breach of the Project Sponsors’ obligations to decommission and remove the Project within twelve months of ceasing commercial operation, and in the absence of a mutual agreement for an extension of time, then the Town of Denmark shall be entitled to draw upon the Financial Security without the consent of the Project Sponsor.

As described in Section 2.7, the Project Sponsor will maintain insurance sufficient to cover unforeseen events, such as the collapse of a wind turbine. The Project Sponsor shall be obligated to furnish the Town of Denmark with evidence of adequate insurance as reasonably requested by the Town.

In the event of insolvency or bankruptcy of the Project Sponsor prior to decommissioning of the Project, then it would be anticipated that the financial institution that provided the financing for the Project would utilize its ‘step-in’ rights and take-over the operation of the Project until a new buyer could be found. In this event, the financial institution would be bound by the terms of the Decommissioning Plan. If the financial institution has not done so within a reasonable period of time (as specified within the Decommissioning Plan), then the Town would be entitled to draw upon the Financial Security.

Decommissioning would consist of the following activities:

- Wind turbines, including the blades, nacelles, and towers will be disassembled, and transported off site for reclamation and sale.
- All of the transformers will also be transported off-site for reuse or reclamation.
• Foundations at depths less than 42 inches below grade in non-agricultural land and 48 inches below grade in active agricultural land will be removed.

• Except as described otherwise for active agricultural fields (in the above bullet point), all buildings, structures, wind turbines, access roads and/or driveways and foundations at depths greater than 42 inches below finished grade will be left in place. Areas where subsurface components are removed will be graded to match adjacent contours, stabilized with an appropriate seed mix, and allowed to re-vegetate naturally. At the discretion of the landowner, access road materials will be removed and transported to a disposal location. Written approval by the landowner will be obtained for any access roads to remain in place.

All materials encountered during Project decommissioning will be handled and disposed of in accordance with all applicable safety and environmental regulations. Assuming proper handling/disposing, it is not anticipated that decommissioning activities will result in exposure to radiation hazards.

2.9 REQUIRED APPROVALS AND APPLICABLE REGULATORY PROGRAMS

Implementation of the Project will require certain permits and/or approvals from local, state, and federal agencies. The permits and approvals that are expected to be required are listed in Table 2.

Table 2. Permits and Approvals for the Copenhagen Wind Farm

<table>
<thead>
<tr>
<th>Agency</th>
<th>Agency SEQRA Status</th>
<th>Description of Permit or Approval Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town of Denmark Planning Board</td>
<td>Lead Agency</td>
<td>Acceptance of DEIS, SEIS, FEIS, and issuance of findings (as Lead Agency under SEQRA). Approval of Special Permit</td>
</tr>
<tr>
<td>Town of Denmark Departments (Public Works, Codes, Highway, etc.)</td>
<td>Involved Agencies</td>
<td>Issuance of building permits. Review and approval of highway work permits.</td>
</tr>
<tr>
<td>Town of Rutland Planning Board and Departments (Public Works, Codes, Highway, etc.)</td>
<td>Involved Agencies</td>
<td>Building permit, Site plan review and Zoning Permit, Local law compliance.</td>
</tr>
<tr>
<td>Town of Champion Planning Board and Departments (Public Works, Codes, Highway, etc.)</td>
<td>Involved Agencies</td>
<td>Building permit, Site plan review and Zoning Permit, Local law compliance.</td>
</tr>
<tr>
<td>Town of Watertown (Public Works, Codes, Highway, etc.)</td>
<td>Involved Agencies</td>
<td>Building permit, Site plan review and Zoning Permit, Local law compliance.</td>
</tr>
<tr>
<td>Lewis County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highway Department</td>
<td>Involved Agency</td>
<td>Highway work permits.</td>
</tr>
<tr>
<td>County Planning Board</td>
<td>Interested Agency</td>
<td>Recommendation pursuant to General Municipal Law 239-m.</td>
</tr>
<tr>
<td>Agency</td>
<td>Agency SEQRA Status</td>
<td>Description of Permit or Approval Required</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>New York State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Environmental Conservation</td>
<td>Involved Agency</td>
<td>Article 24 Permit for disturbance to state jurisdictional wetlands. Article 15 Permit for disturbance of protected streams. SPDES General Permit. Section 401 Water Quality Certification. Issuance of SEQRA findings.</td>
</tr>
<tr>
<td>Office of Parks, Recreation, and Historical Preservation</td>
<td>Interested Agency</td>
<td>Consultation pursuant to NY, Parks, Recreation and Historic Restoration Law (PRHPL) § 14.09 and § 106 of the National Historic Preservation Act.</td>
</tr>
<tr>
<td>Department of Health</td>
<td>Interested Agency</td>
<td>Approvals associated with installation of septic system and/or water supply well for the O&amp;M facility.</td>
</tr>
<tr>
<td>Department of Transportation</td>
<td>Involved Agency</td>
<td>Special Use Permit for oversize/overweight vehicles. Highway work permit.</td>
</tr>
<tr>
<td>Federal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Army Corps of Engineers</td>
<td>N/A</td>
<td>Section 404 or Nationwide Permit for placement of fill in federal jurisdictional wetlands/waters of the U.S. NEPA compliance.</td>
</tr>
<tr>
<td>Federal Aviation Administration</td>
<td>N/A</td>
<td>Lighting Plan and clearances for potential aviation hazard.</td>
</tr>
<tr>
<td>U.S. Fish and Wildlife Service</td>
<td>N/A</td>
<td>Informal consultation pursuant to Section 7 of the Endangered Species Act, associated with the aforementioned Section 404 Permit.</td>
</tr>
</tbody>
</table>

Based on the Project layout set forth herein and the associated resource-specific analyses (e.g., wetlands), it is also assumed that the NYSDEC and the NYSDOT will be SEQRA Involved Agencies as a result of the anticipated issuance of discretionary approvals. Per SEQRA regulations, federal agencies (e.g., U.S. Army Corps of Engineers) cannot be involved in the SEQRA process, which is limited to local, county, and state agencies. However, certain federal approvals will be required for this Project, as listed above. Lastly, as a result of certain approvals required at both the state and federal level, it is currently anticipated that consultation with the Office of Parks, Recreation, and Historic Preservation will be necessary to comply with the requirements of Section 14.09 and/or 106 of the Historic Preservation Act.

### 2.9.1 Public and Agency Outreach

Since first initiating development on the Project in 2011, the Project Sponsor has conducted multiple efforts towards public outreach. They have engaged a public relations organization, held and participated in numerous meetings with the Town Board and the Planning Board of the Town of Denmark, Copenhagen School Board, federal and state agencies, and the Lewis County Industrial Development Authority (IDA), and fostered the development of local partnerships.
OwnEnergy’s differentiated and proprietary development model dictates a more community-focused and inclusive development process than is typically seen in standard, commercial wind development. To accomplish this, OwnEnergy partners with landowners to develop renewable energy projects, with an initial focus on 20-80 MW wind energy projects. The partners take an active role in the development and wind turbine installation process and in return they are provided with a significant ownership stake in the resulting renewable wind energy project. By teaming up with landowners and local developers to develop mid-size wind farms, OwnEnergy capitalizes on the converging trends of consumers’ desire for clean energy and distributed generation.

Beginning in the summer of 2011, the Project Sponsor engaged the services of Trieste Associates, a recognized public relations and grass roots organization with experience in developing public outreach campaigns for wind development companies in New York State. Trieste Associates met with numerous area residents and officials to gain a greater understanding of the community dynamic. Trieste Associates also assisted OwnEnergy to find a local partner in the area, eventually choosing a long-time area resident and former teacher at the Copenhagen Central School. Since January 2012, the local partner has worked closely with Project managers on a variety of development-related tasks.

As an early agency outreach step, the Project Sponsor held a meeting on February 4, 2011 with the energy manager at Fort Drum, as well as procurement and legal representatives, to discuss the idea of partnering with Fort Drum on the Project and possibly arranging a PPA.

The Project Sponsors initiated contact with proposed landowners by telephone and mail in December, 2011. Nearly all of the initial landowners attended and participated in a dinner and meeting at the Copenhagen Fire House on February 7, 2012. At the meeting, Project Sponsors gave a presentation on the then-current state of the wind industry, background on OwnEnergy, and specific Project details, including a proposed timeline for development. Since then, the Project Sponsor has worked closely with landowners in the Project footprint to ensure their concerns and questions regarding placement of turbines and access roads, and Project development in general, are addressed and answered in a timely manner.

The Project Sponsor has also had continuous correspondence with the Town Board and Planning Board since early 2012 which has included monthly or bi monthly updates regarding project development progress.

Over the Summer of 2012, the Project Sponsor and local partner supported the formation of WinDenmark, an organization consisting of eight local civic and business leaders from Copenhagen, Castorland, and Denmark areas whose mission is to raise awareness of the Project during the development period and to invest funds it will receive.
from the Project to support economic development efforts and community initiatives. The Project Sponsor has also agreed to provide annual funding to the group during the development term of the Project.

### 2.9.2 SEQR A Process

On May 5, 2012 an application was submitted by Copenhagen Wind Farm, LLC to the Town of Denmark, along with a full Environmental Assessment Form (EAF), including a Project layout consisting of up to 62 wind turbines, for the proposed wind power Project. The submittal of this application, which requires discretionary approval, initiated the SEQRA process for the subject action. On July 7, 2012 the Town of Denmark Planning Board forwarded a declaration of intent to become SEQRA Lead Agency, along with a copy of the EAF document, to potentially interested/involved SEQRA agencies. It was stated in the letter of intent to act as lead agency that, subject to the agreement of all Involved Agencies, the lead agency determination would become effective 30 days from the date of the declaration letter. No agency objected to the Town of Denmark Planning Board assuming the role of Lead Agency. The Town of Denmark, as Lead Agency, subsequently issued a Positive Declaration on August 7, 2012 requiring the preparation of this DEIS.

On September 4, 2012, the Town of Denmark Planning Board accepted the Draft Scoping Document and adopted a motion that set forth a 30-day public comment period. Following review of all written and oral comments on the Draft Scoping Document, the Planning Board adopted the Final Scoping Document on October 30, 2012.

This document has been prepared in compliance with the requirements of SEQRA (6 NYCRR Part 617). The purpose of the DEIS is to assess the environmental impacts associated with construction of the Project. The SEQRA process for the Project includes the following future actions:

- DEIS accepted by Lead Agency
- File notice of completion of DEIS and notice of public hearing and comment period
- Public hearing on DEIS. A minimum 30-day public comment period
- Revise DEIS as necessary to address substantive comments received
- Prepare a Final EIS (FEIS)
- FEIS accepted by Lead Agency
- File notice of completion of FEIS
- Minimum 10-day public consideration period.
- Lead Agency issues Findings Statement, completing the SEQRA process
- Involved agencies issue Findings Statements
This DEIS, along with a copy of the public notice, will be distributed for review and comment to the public and to the agencies and parties listed in Table 3. Additionally, a 2005 amendment to SEQRA, (Chapter 641 of the NYS Laws of 2005; “Ch. 641”) requires every EIS to be posted on a publicly accessible internet website, as of February 26, 2006. A DEIS is to be posted as soon as it is accepted and remain posted until the FEIS is accepted. The FEIS should be posted when completed, and must remain posted until one (1) year after all final approvals have been issued for the Project that is the subject of the FEIS. In accordance with this amendment to SEQRA, the DEIS will be posted to the Project webpage located to:


Opportunities for detailed agency and public review in relation to this specific action will continue to be provided throughout the SEQRA process, as well as in conjunction with the review of applications for the other permits and approvals needed for the Project. With respect to the SEQRA process, the DEIS for the Copenhagen Wind Farm will be available for public review and agency comment as outlined above. In addition to a public comment period (during which time written comments will be accepted), a duly noticed public hearing concerning the DEIS will be organized and held, in accordance with SEQRA requirements.

This DEIS, along with a copy of a public notice, will be distributed for review and comment to the public, and to the parties identified in Table 3.

Table 3. Involved/Interested Agencies

<table>
<thead>
<tr>
<th>Town of Denmark Planning Board</th>
<th>Town of Denmark Highway Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcus Wuerschmidt, Chairman</td>
<td>Patrick Mahar, Superintendent</td>
</tr>
<tr>
<td>3707 Roberts Road</td>
<td>3707 Roberts Road</td>
</tr>
<tr>
<td>Carthage, New York 13619</td>
<td>Carthage, New York 13619</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Town of Denmark Town Board</th>
<th>Carthage Free Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas Fleming, Supervisor</td>
<td>412 Budd Street</td>
</tr>
<tr>
<td>3707 Roberts Road</td>
<td>Carthage, New York 13619</td>
</tr>
<tr>
<td>Carthage, New York 13619</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Town of Denmark Town Clerk</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rita J. Woodruff</td>
<td></td>
</tr>
<tr>
<td>3707 Roberts Road</td>
<td></td>
</tr>
<tr>
<td>Carthage, New York 13619</td>
<td></td>
</tr>
</tbody>
</table>
### Town of Rutland

**Town of Rutland Planning Board**  
Jonathan Boomhower, Chairman  
27988 Wadsworth Road  
Black River, New York 13612

**Town of Rutland Town Board**  
Ray Cramer, Superintendent  
26832 Cramer Road  
Copenhagen, New York 13626

**Town of Rutland Town Clerk**  
Elizabeth A. Berghorn  
28411 NYS Route 126  
Black River, New York 13612

**Sally Ploof Hunter Memorial Library**  
101 Public Works Drive  
Black River, New York 13612

### Town of Champion

**Town of Champion Planning Board**  
Peter LaBarge, Chairman  
10 North Broad Street  
West Carthage, NY 13619

**Town of Champion Town Board**  
Terry Buckley, Supervisor  
10 North Broad Street  
West Carthage, NY 13619

**Town of Champion Town Clerk**  
Christina Vargulick  
10 North Broad Street  
West Carthage, NY 13619

**Carthage Free Library**  
412 Budd Street  
Carthage, NY 13619

### Town of Watertown

**Town of Watertown Planning Board**  
Thomas Boxberger, Co-Chairman  
22941 Fralick Road  
Watertown, New York 13601

**Town of Watertown Town Board**  
Joel Bartlett, Supervisor  
22867 County Route 67  
Watertown, New York 13601

**Town of Watertown Town Clerk**  
Catherine M. Rich  
22867 County Road 67  
Watertown, New York 13601

**Flower Memorial Library**  
229 Washington Street  
Watertown, New York 13601

### Lewis County

**Lewis County Legislature**  
Lewis County Court House  
Room 310  
Lowville, New York 13367

**Lewis County Department of Planning**  
Director of Economic Development and Planning  
Eric Vickler  
7660 North State Street  
Lowville, New York 13367

**Lewis County Highway Department**  
David Becker Superintendent  
South State Street  
Lowville, New York 13367

**Lewis County Industrial Development Agency**  
IDA Executive Director Richard H. Porter  
PO Box 106  
Lowville New York 13367

### New York State

**NYS Dept. of Environmental Conservation**  
635 Broadway  
Albany, New York 12233-1011

**NYS Department of Public Service**  
Three Empire State Plaza  
Albany, New York 12223-1350
<table>
<thead>
<tr>
<th>New York State</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NYS Dept. of Environmental Conservation</strong></td>
</tr>
<tr>
<td>Division of Environmental Permits, Region 6</td>
</tr>
<tr>
<td>NYS Department of Transportation</td>
</tr>
<tr>
<td>50 Wolf Road, 6th Floor</td>
</tr>
<tr>
<td>Albany, New York 12232</td>
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<tr>
<td><strong>NYS Department of Agriculture and Markets</strong></td>
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<tr>
<td>10B Airline Drive</td>
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<tr>
<td>Albany, NY  12235</td>
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<tr>
<td>NYS Energy Research and Development Authority</td>
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<td>17 Columbia Circle</td>
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<td>Albany, NY  12203</td>
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<td>Region 3</td>
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<tr>
<td>State Office Building</td>
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<tr>
<td>333 E. Washington Street</td>
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<tr>
<td>Syracuse, NY 13202</td>
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<tr>
<td>NYS Historic Preservation Office</td>
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<tr>
<td>Peebles Island Resource Center</td>
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<tr>
<td>PO Box 189</td>
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<tr>
<td>Waterford, New York 12188</td>
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3.0 EXISTING CONDITIONS, POTENTIAL IMPACTS, AND MITIGATION MEASURES

This section describes the existing environmental conditions within the Project area and the surrounding area. It further describes the environmental impacts expected to result from the Project. Included are analyses of short-term impacts likely to occur as a result of construction activities, as well as impacts expected to result from long-term operation and maintenance of the Project. Finally, this section describes the various measures proposed to avoid, minimize or mitigate significant adverse environmental impacts. Information is presented on geology, soils and topography; water resources; biological resources; aesthetic/visual resources; land use and zoning; socioeconomics; transportation; cultural resources; communication facilities; sound; public safety; community services; groundwater; and property values.

Due to the nature, scope and scale of wind power project design and development, many potential impacts described herein, and the correlating mitigation options, are based upon a preliminary design and conservative evaluation of Project impacts. The analysis of impacts included an evaluation of 62 potential turbine sites, although only 49 will be constructed and operated. Therefore, for many resource areas such as surface waters and wetlands, vegetative communities/wildlife habitat, and soil disturbance, impacts are anticipated to be less and in some cases proportionately less. In many cases potential impacts are based upon preliminary design criteria, “worst case” assumptions and/or anticipated permit conditions. Based on these generally conservative impact assumptions, appropriate mitigation measures are then presented. For example, temporary construction-related transportation impacts are described based upon a preliminary transportation routing and delivery plan that will be finalized upon selection of a contractor, in accordance with town, county, and state issued highway work permits and road agreements. For the purposes of SEQRA analysis, worst case assumptions are made regarding the type and extent of construction related impacts that may be expected (e.g. increased turning radii, culvert replacement). Actual impacts and correlating avoidance, minimization, and/or mitigation measures will not be known until the appropriate reviewing agencies have seen detailed plans or engineering design and made a permit decision based upon this more detailed information. As a matter of law, these permit conditions may not be made until SEQRA review is concluded. However, because worst case assumptions have been applied during SEQR, these impacts will constitute thresholds sufficient for the Lead Agency to make informed decisions. This approach is typical to other projects of this scale, and in particular to wind power facilities, and is done in accordance with SEQRA.

The implementation of the various mitigation measures described herein is insured through various mechanisms including the town site plan review; county, state, and federal permit approval conditions; and the environmental compliance monitoring program (described further in Section 4.2). Therefore, implementation of the mitigation
measures described in the DEIS is assured through various regulatory approvals that are required prior to construction.

3.1 GEOLOGY, SOILS, AND TOPOGRAPHY

3.1.1 Existing Conditions

Information regarding topography, geology, and soils was obtained from existing published sources, including the Lewis and Jefferson County soil surveys (U.S. Department of Agriculture [USDA], 1960; USDA, 1989), USDA Web Soil Survey and Soil Survey Geographic (SSURGO) Database, U.S. Geological Survey (USGS) topographic mapping, statewide bedrock geology mapping (NYS Museum/NYS Geological Survey, 1999a), and New York State surficial geology mapping (NYS Museum/NYS Geological Survey, 1999b). Additionally, observations about localized topographic condition are made based upon reconnaissance level field surveys that were conducted in fall 2012.

3.1.1.1 Topography

The Project area is located on the edge of the Tug Hill Plateau physiographic province, near its descent to the Black River Valley. This area is marked by a series of nearly level limestone terraces, formed from glacial erosion of the soft limestone bedrock (USDA, 1960). Topography of the generating portion of the Project area is relatively flat with greater topographic relief along the transmission line route in the form of small drumlins. Elevations range from approximately 835 feet above mean sea level (amsl) near Staplin Creek at the terminus of the transmission line, to approximately 1,500 feet amsl along Hayes Road in the southwestern portion of the generating site (the area where wind turbines are proposed). Elevations at turbine sites range from approximately 1,150 feet amsl to approximately 1,450 feet. No turbines are proposed in the valley portions of the Project area.

Another prominent physiographic feature of the Project area is the Deer River valley, which bisects the generating site in a northeast/southwest orientation, eventually merging with the Black River valley north of the Project area. A small hydroelectric facility dams the Deer River just north of the village of Copenhagen. North of the dam (downstream) is High Falls, a dramatic waterfall that plunges more than 100 feet into the Deer River valley below. Project collection lines between turbines 42 and 46 cross the Deer River and County Route 55 in the valley, north of the village of Copenhagen, the hydroelectric dam, and High Falls. At the point of the collection line crossing, the river banks are very steep, rising more than 200 feet above the valley floor before leveling back to the flat topography more characteristic of the area.
3.1.1.2 Geology

Bedrock underlying the Project area consists primarily of Middle Ordovician limestone and black shale (of the Trenton Group and Utica Shale, respectively), with a small area of Upper Ordovician siltstone of the Pulaski Formation underlying the higher elevation area in the southwest (NYS Museum/NYS Geological Survey, 1999a). The primary surficial geological material in the Project area is till, with smaller areas of till moraine and surficial bedrock scattered throughout the Project area, small areas of kame deposits and outwash sand/gravel occurring along the transmission line corridor, and lacustrine delta material occurring in the Deer River Valley (NYS Museum/NYS Geological Survey, 1999b). According to mapping and soil descriptions provided in the county soil surveys, depth to bedrock within the Project area ranges from bedrock exposed at the surface (limestone escarpments in the northeastern portion of the Project area, along the rim of the Black River Valley) to depths greater than six feet (over roughly 50 percent of the Project area, in the southwestern portion of the generating site and intermittently along the transmission line). Aside from these two extremes, depth to bedrock in the remaining 50 percent of the Project area is generally in the range of one to three feet (USDA, 1960; USDA, 1989).

Other than the Deer River escarpment (and its associated ledges), and some small areas of rock outcroppings on each side of the River, no prominent and/or unique geological features (i.e., large boulders, ledges, or rock outcroppings) have been identified within the Project area.

3.1.1.3 Soils

The Lewis and Jefferson County soil surveys have mapped general soil associations and soil types within the Project area. The soil surveys indicate that 12 soil associations and 107 soil map units from 55 different soil series are present within the Project area (see Figure 4). Of these, Nellis is by far the most dominant soil series, covering over 3,100 acres or 32 percent of the Project area. Other prominent soil series (each covering greater than 500 acres within the Project area) include Amenia, Galway, Kendaia and Poland. Table 4 lists the soil associations found within the Project area and their characteristics. Table 5 summarizes the characteristics of the dominant soil series found within the Project area.
<table>
<thead>
<tr>
<th>Soil Association</th>
<th>Main Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madrid-Galway-Nellis (Jefferson County)</td>
<td>• Very deep and moderately deep soils</td>
</tr>
<tr>
<td></td>
<td>• Well drained and moderately well drained</td>
</tr>
<tr>
<td></td>
<td>• Loamy texture</td>
</tr>
<tr>
<td></td>
<td>• Found on uplands</td>
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<tr>
<td>Farmington-Galway-Benson (Jefferson County)</td>
<td>• Shallow and moderately deep soils</td>
</tr>
<tr>
<td></td>
<td>• Excessively drained to moderately well drained</td>
</tr>
<tr>
<td></td>
<td>• Loamy texture</td>
</tr>
<tr>
<td></td>
<td>• Found on plains</td>
</tr>
<tr>
<td>Nellis-Amenia (Lewis County)</td>
<td>• Deep soils on high-lime glacial till</td>
</tr>
<tr>
<td></td>
<td>• Well drained and moderately well drained</td>
</tr>
<tr>
<td></td>
<td>• Soils in association: Nellis (40-60%), Amenia (25-30%), Kendaia (10-15%), and Lyons (5-10%)</td>
</tr>
<tr>
<td>Poland-Mohawk-Manheim (Lewis County)</td>
<td>• Deep soils on high-lime glacial till</td>
</tr>
<tr>
<td></td>
<td>• Well drained and moderately well drained</td>
</tr>
<tr>
<td></td>
<td>• Soils in association: Poland (25-50%), Mohawk (25-50%), Manheim (15-25%), Ilion (10-25%), and Fonda (5-10%)</td>
</tr>
<tr>
<td>Poland-Turin-Ilion (Lewis County)</td>
<td>• Deep soils on high-lime glacial till</td>
</tr>
<tr>
<td></td>
<td>• Well drained and moderately well drained</td>
</tr>
<tr>
<td></td>
<td>• Soils in association: Poland (30-40%), Ilion (15-25%), Turin (25-40%), and Fonda (5-15%)</td>
</tr>
<tr>
<td>Nellis-Amenia, shallow (Lewis County)</td>
<td>• Shallow soils on high-lime glacial till</td>
</tr>
<tr>
<td></td>
<td>• Dominantly moderately well drained</td>
</tr>
<tr>
<td></td>
<td>• Soils in association: Nellis (50-75%), Amenia (20-35%), Kendaia (10-15%), and Lyons (0-5%)</td>
</tr>
<tr>
<td>Nellis-Kendaia (Lewis County)</td>
<td>• Shallow soils on high-lime glacial till</td>
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<td></td>
<td>• Well drained to poorly drained</td>
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<td></td>
<td>• Soils in association: Nellis (60-80%), Rockland (5-10%), Marcy (15-25%), and Kendaia (15-25%)</td>
</tr>
<tr>
<td>Turin-Ilion (Lewis County)</td>
<td>• Deep soils on high-lime glacial till</td>
</tr>
<tr>
<td></td>
<td>• Somewhat poorly drained</td>
</tr>
<tr>
<td></td>
<td>• Soils in association: Turin (40-60%), Poland (5-15%), Ilion (20-30%), and Fonda (5-15%)</td>
</tr>
<tr>
<td>Camroden-Pinckney-Marcy (Lewis County)</td>
<td>• Deep, acid soils on glacial till</td>
</tr>
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<td></td>
<td>• Neutral or slightly acid fragipan</td>
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<tr>
<td></td>
<td>• Well drained to moderately well drained</td>
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<tr>
<td></td>
<td>• Soils in association: Camroden (40-60%), Pinckney (20-35%), Marcy (15-25%), and Alden (10-15%)</td>
</tr>
<tr>
<td>Herkimer-Houseville (Lewis County)</td>
<td>• Medium texture to moderately coarse textured soils on glacial outwash, alluvial fans, and recent alluvium</td>
</tr>
<tr>
<td></td>
<td>• Well drained and moderately well drained</td>
</tr>
<tr>
<td></td>
<td>• Soils in association: Herkimer (35-55%), Houseville (25-35%), Colonie (10-30%), Glenfield (10-15%), and Westland (0-5%)</td>
</tr>
</tbody>
</table>

Draft Environmental Impact Statement
Copenhagen Wind Farm
### Soil Association

<table>
<thead>
<tr>
<th>Soil Association</th>
<th>Main Characteristics</th>
</tr>
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<tbody>
<tr>
<td>Scantic-Buxton (Lewis County)</td>
<td>• Medium-textured to fine-textured soils on glacial lake sediments&lt;br&gt;• Poorly drained to somewhat poorly drained&lt;br&gt;• Soils in association: Scantie (40-60%), Suffield (10-20%), Buxton (25-40%), and Biddeford (0-10%)</td>
</tr>
<tr>
<td>Rockland limestone (Lewis County)</td>
<td>• Dominated by rock and very shallow soils.&lt;br&gt;• Occurs on ledges and exposed rock, on the west side of Black River&lt;br&gt;• 60-80% Rockland limestone with Nellis and Amenia soils in between ledges</td>
</tr>
</tbody>
</table>

(USDA, 1960; USDA, 1989; USDA, 2012)

### Table 5. Dominant Soil Series within the Project area

<table>
<thead>
<tr>
<th>Soil Series</th>
<th>Main Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nellis Series (Lewis and Jefferson Counties)</td>
<td>• Well drained&lt;br&gt;• Developed on firm, highly calcareous glacial till&lt;br&gt;• Relief: Nearly level to moderately steep&lt;br&gt;• Depth to bedrock: 15 inches to many feet</td>
</tr>
<tr>
<td>Amenia Series (Lewis and Jefferson Counties)</td>
<td>• Moderately well drained to somewhat poorly drained&lt;br&gt;• Developed on firm, highly calcareous till&lt;br&gt;• Relief: Nearly level to strongly sloping&lt;br&gt;• Depth to bedrock: 12 to greater than 40 inches</td>
</tr>
<tr>
<td>Galway Series (Jefferson County)</td>
<td>• Well drained and moderately well drained&lt;br&gt;• Developed on glacial till&lt;br&gt;• Relief: 0-15% slopes&lt;br&gt;• Depth to bedrock: 20-40 inches</td>
</tr>
<tr>
<td>Kendaia Series (Lewis County)</td>
<td>• Poorly drained to somewhat poorly drained&lt;br&gt;• Developed on highly calcareous glacial till&lt;br&gt;• On depressions and swales along drainage ways&lt;br&gt;• Relief: Nearly level to gently sloping&lt;br&gt;• Depth to bedrock: 12 to greater than 48 inches</td>
</tr>
<tr>
<td>Poland Series (Lewis County)</td>
<td>• Well drained&lt;br&gt;• Developed on alkaline to weakly calcareous glacial till&lt;br&gt;• Relief: Undulating to moderately steep</td>
</tr>
</tbody>
</table>

(USDA, 1960; USDA, 1989; USDA, 2012)

The vast majority of soils in the Project area are loams and silt loams, but textures such as shaley silt loam, sandy loam, fine sandy loam, very stony silt loam, gravelly loam, and silty clay are present in small areas. Soil drainage is predominantly well drained, with approximately 55 percent of the on-site soils well drained, 17 percent excessively to somewhat excessively drained, six percent moderately well drained, and 22 percent somewhat poorly drained to very poorly drained (USDA, 1960; USDA, 1989). Soils that are listed as hydric by the NRCS cover approximately 34 percent of the Project area. Prominent hydric soils (each covering over 150 acres) include Kendaia silt loam (map...
units KcA and KbA), Galway silt loam (map unit GIA), Farmington loam (map unit FaB), Bombay loam (map unit BoB), New stead silt loam (map unit Nn) and Ilion silt loam (map unit laA; NRCS, 2012). Approximately 78 percent of the Project area contains soils classified as either prime farmland soils or farmland of statewide importance (USDA, 2012). For additional information about agricultural resources within the Project area, including designated Agricultural District lands, see Section 3.13 of this DEIS.

The county soil surveys provide the depth to the seasonally high water table, evaluated to a depth of six feet, for soils within the Project area. According to this information, the seasonally high water table is within one foot of the soil surface over approximately 22 percent of the Project area, generally in valley areas and near mapped streams and wetlands. The seasonally high water table is greater than 6 feet below the ground surface over approximately 51 percent of the Project area, generally in higher elevation and steep slope areas (USDA, 1960; USDA, 1989; USDA, 2012). For additional information about groundwater and surface waters in the Project area, see Section 3.2 of this DEIS.

Based on USDA soil survey data, shallow excavations in the generating site are rated as “somewhat limited” to “very limited” due to shallow groundwater, slopes, sloughing of excavation sidewalls, potential presence of dense soil layers, and shallow bedrock (USDA, 2012). The soils mapped within the transmission site are reported to have low shrink/swell potential (USDA, 1989) and, while the Lewis County soil survey does not report shrink/swell potential for soils in the generating site, it is presumed to be low due to the low clay content of these soils (predominantly loam/silt loam well drained soils). Significant volume changes due to wetting or drying that would have potential to damage structures are not anticipated. Additionally, based on a review of USGS hazard maps, the Project area has a low incidence of landslides (Godt, 2002). The erosion hazard of on-site soils is “low” for 94 percent of the Project area, “moderate” for three percent of the Project area and not rated for another three percent (comprised of areas of exposed bedrock and open water; USDA, 2012). Areas of moderate erosion hazard occur in small patches throughout the Project area, primarily associated with slopes in excess of 15 percent. This is limited to several small areas along the transmission line corridor, the location of Turbine 15 and associated buried interconnect, the access road approaching Turbines 36 through 38, and a small section of buried interconnect between Turbines 43 and 46.

3.1.2 Potential Impacts

3.1.2.1 Construction

Project components have been sited to avoid or minimize either temporary or permanent impacts to physiography, geology, and soils, to the extent practical. The Project is not anticipated to result in any significant impacts to geology, but depth to bedrock in the Project area is variable and it is likely that some turbine foundations will be set
into bedrock. In the event that bedrock is encountered, it is anticipated to be rippable due to its limestone content, and will thus be excavated using large excavators, rock rippers, or chipping hammers. If the bedrock is not rippable, it will likely be excavated by pneumatic jacking or hydraulic fracturing. If these methods are unsuccessful or not feasible, limited blasting may be used. If blasting is required to remove any bedrock, a detailed blasting plan will be prepared by the contractor for the town engineer’s review (see Appendix C for a preliminary blasting plan). It is anticipated that blasting of shallow bedrock could be performed in a controlled manner that would not damage adjacent structures or dwellings. Only temporary, minor impacts to physiography and geology are expected as a result of construction activities. For example, where turbine and access road sites are not located on completely level terrain, some cut and fill or addition of fill will be required; however, the impact to overall topography will be minor.

Immediately prior to final Project design, a subsurface geotechnical investigation will be performed at a statistically significant sampling of proposed turbine and ancillary structure locations to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. Prior to commencing construction the Project Sponsor will carry out similar investigations at each proposed turbine site. Subsurface investigation activities will consist of soil borings and rock coring at each of the proposed wind turbine and ancillary structure locations, along with test pits, seismic testing, and additional laboratory testing that will be performed to further evaluate the subsurface soil, bedrock, and groundwater conditions. The results of the site specific subsurface investigation will inform the final Project design and determine the need for additional analysis. For example, design of concrete and steel structures will be based on analysis of the soils including electrical resistivity, pH, chloride, and sulfate testing. At proposed construction sites identified during the subsurface investigation as being located adjacent to steep slopes, a slope stability analysis will be performed for any structures (i.e., turbine foundations, substations, and buildings). At proposed construction sites with soils identified during the subsurface investigation as having the potential for significant volume changes, the final designs may require soils to be over-excavated and replaced with structural fill beneath structures. Alternatively, the Project Sponsor may employ specialized foundation designs that utilize micropiles or other techniques to assure the foundation’s buoyancy and stability.

The primary impact to the physical features of the site will be temporary disturbance of soils during the development of the construction staging area, the O&M building, and the installation of access roads, turbine foundations, underground collector systems, overhead interconnection poles, three permanent meteorological towers, collection station, and interconnection substation. Based on the assumptions outlined in Section 2.6 (Project Construction), Table 1 (Impact Assumptions), soil disturbance from all anticipated construction activities will total approximately 372 acres. Earth moving and general soil disturbance will increase the potential for wind/water erosion and sedimentation into surface waters, particularly in areas with moderate erosion hazards. Construction on steep slopes
(i.e., in excess of 15%) is anticipated to be limited to a 100-foot span along the transmission line east of South Community Drive and installation of overhead collection lines between turbines 42 and 46, crossing the Deer River Valley. Construction activity also has the potential to impact soil in agricultural fields through rutting, mixing of topsoil and subsoil, and soil compaction. Mitigation measures will be implemented throughout the construction process to minimize the potential for these soil impacts (see Section 3.1.3 below).

The area of disturbance calculation presented above assumes that significant soil disturbance will occur in all areas that are proposed for the installation of infrastructure. The actual disturbance will be highly variable based on the specific construction activity, the construction techniques employed, and soil/weather conditions at the time of construction. For instance, in many locations installation of the buried electrical collection lines will involve relatively minor soil disturbance, restricted to the path of the rock saw or cable plow. Similarly, when soils are hard and dry, use of crane paths across open fields may result in no actual disturbance of the soil (beyond compaction) or only minor leveling. However, because such conditions cannot be guaranteed within the area of disturbance, for calculation purposes it is assumed that soils within the entire area of potential disturbance will be impacted during construction.

With respect to potential construction limitations at the POI station and the collection station, based on review of USGS digital elevation model data, slopes in both of these proposed locations are less than five percent. The specific depth to bedrock is not known at this time; however, based on the typical profile for the mapped soil types, depth to bedrock is anticipated to be approximately 1.5 feet at the Point of Interconnect station and greater than six feet at the collection station (USDA, 1960; USDA, 1989). With respect to depth to water, a portion of the collection station overlies a poorly drained soil that has the potential for the seasonally high water table to reach the soil surface. Other soils mapped at the collection station and POI station typically have a depth to the seasonally high water table of greater than six feet (USDA, 1960; USDA, 1989). Typically, these structures do not contain basements so permanent drainage systems will not be required even if water does prove to be close to the surface. The bedrock and groundwater depths with respect to the foundation systems, as well as any need for permanent drainage, will be evaluated and addressed once soil borings are performed and more information regarding the structures is established. However, based on desktop review of information available at these locations, all likely bedrock/water table conditions can be addressed and mitigated through relatively common engineering and construction techniques.

3.1.2.2 Operation

Overall, the Project will result in permanent conversion of up to 58 acres of land into built facilities (0.2-acre of crane pad and foundation at each tower site, maximum 20-foot-wide permanent access roads, a 1.5-acre collection
substation, a 0.35-acre POI station, a 2.5-acre O&M building, and 0.1-acre at each met tower location). Beyond occasional soil disturbance associated with Project maintenance and repair, impacts caused by the operation of this Project on physiology, geography, and soils are expected to be inconsequential.

3.1.3 Proposed Mitigation

Impacts to topography and geology have been largely avoided by siting Project components so as to minimize disturbances to steep slopes, sensitive soils, and bedrock to the extent practical. Reconnaissance-level investigations were conducted by edr personnel experienced with the permitting and construction of wind power projects, and these efforts resulted in relocation of certain Project components to avoid such resources.

As previously mentioned, any bedrock encountered during Project construction is anticipated to be rippable in shallow excavations using excavators, rock rippers, or chipping hammers. However, should any blasting be required, a Blasting Plan will be prepared, which will take into account site-specific underground features, and any necessary blasting will receive oversight by the Environmental Monitor. In addition, pre- and post-blasting surveys will be conducted as a groundwater well mitigation measure. The Project Sponsor will conduct structural, water quality, and water quantity inspections of any wells located within 500 feet of blasting activities before (to establish baseline quality and quantity) and after construction. Although not anticipated, any impacts identified through these inspections will be addressed on a case-by-case basis and appropriately mitigated.

Prior to commencing construction, a subsurface investigation will be performed at each proposed turbine and ancillary structure location to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. Subsurface investigation activities consisting of soil borings and rock coring at each of the proposed turbine and ancillary structure locations, test pits, seismic testing, and additional laboratory testing will be performed to further evaluate the subsurface soil, bedrock, and groundwater conditions. In addition, pre-notification signs and warnings to affected landowners, use of best management practices, and compliance with applicable permit requirements will be instituted as mitigation measures.

Siting turbines in relatively level locations and using existing roads for turbine access wherever possible have minimized potential impacts associated with soil disturbance. Impacts to soils will be further minimized by the following means:

- Public road ditches and other locations where Project-related runoff is concentrated will be armored with rip-rap to dissipate the energy of flowing water and to hold soils in place.
Prior to commencing construction activities, erosion control devices such as hay bales, sand bags or silt fences will be installed between the work areas and downslope areas, to reduce the risk of soil erosion and siltation. Erosion control devices will be monitored continuously throughout construction and restoration for function and effectiveness.

During construction activities, hay bales, silt fence, or other appropriate erosion control measures will be placed as needed around disturbed areas and stockpiled soils.

Following construction, all temporarily disturbed areas will be stabilized and restored in accordance with approved plans.

Impacts to soil resources will be minimized by adherence to best management practices that are designed to avoid or control erosion and sedimentation, stabilize disturbed areas, and prevent the potential for spills of fuels or lubricants. In addition, erosion and sedimentation impacts during construction will be minimized by the implementation of a SWPPP and associated erosion and sedimentation control plan developed as part of the State Pollution Discharge Elimination System (SPDES) General Permit for construction activities. Prior to construction, the Project Sponsor will be required to prepare a complete SWPPP, which will describe in specific terms the erosion and sediment control practices that will be implemented during construction activities and the stormwater management practices that will be used to reduce the pollutants in stormwater discharges after Project construction has been completed. edr prepared a Preliminary SWPPP, which is attached hereto as Appendix D. The Preliminary SWPPP provides information on stormwater management practices, including erosion and sediment control (vegetative and structural measures, temporary and permanent measures), construction phasing and disturbance limits, waste management and spill prevention, and site inspection and maintenance. To mitigate any potential impacts associated with erosion and sedimentation, the Project contractor will, at a minimum, implement and adhere to the measures set forth in the Preliminary SWPPP provided in Appendix D.

Mitigation measures to protect and restore any agricultural soils within the Project area will be undertaken during and after construction, and will include full restoration of temporarily disturbed agricultural land according to the New York Department of Agriculture and Markets Guidelines for Agricultural Mitigation for Windpower Projects (see NYSA&M Guidelines in Appendix E). For example, topsoil will not be stripped during saturated conditions when such actions would damage agricultural soils. Existing farm roads will be used for temporary access to farmland to the extent practicable. However, if temporary roads in new locations are necessary, topsoil in the work area will be stripped and stockpiled alongside the area of disturbance, (topsoil will be kept separate from subsoil), on the property from which it was removed. All vehicular movements and construction activity will be restricted to areas where topsoil has been removed. All temporarily disturbed agricultural soils will be restored following construction. This process will generally involve the following sequence of activities:
1. Removal of gravel or other temporary fill.
2. Decompaction of compacted subsoils to a depth of 18 inches using a deep ripper or heavy duty chisel plow.
3. Disking and removal of stones (four inches and larger in size) from decompacted subsoil.
4. Spreading of stockpiled topsoil over the decompacted subsoil, and reestablishing pre-construction contours to the extent practicable.
5. Disking and removal of stones (four inches and larger in size) following the spreading of topsoil.
6. Seeding and mulching topsoil. Seed selection in agricultural fields will be based on guidance provided by the landowner and NYSA&M personnel.

Soil impacts occurring during the construction of the Project will also be minimized by providing the contractor and all subcontractors copies of the final construction documentation and erosion and sediment control plans, which will contain all applicable soil protection, erosion control, and soil restoration measures. During construction, the Environmental Monitor will assure compliance with the construction plans/documentation and soil protection measures described above.

3.2 WATER RESOURCES

The Project area is located in the Black River and Salmon River-Sandy Creek drainage basins (USGS Hydrologic Units 04150101 and 04140102, respectively) of the Lake Ontario watershed. On-site surface waters, wetlands, and groundwater resources are described below.

3.2.1 Existing Conditions

3.2.1.1 Surface Waters

The majority of the generating site drains to the Black River, located north and east of the Project area, approximately two miles away at its nearest point. Within this drainage basin, the Deer River, Stony Creek and their associated unnamed tributaries pass through the generating site. The Black River flows west to Black River Bay and, ultimately Lake Ontario. The transmission site drains to the southwest via Sandy Creek and named tributaries including Stebbins Creek, Staplin Creek and Boynton Creek. Sandy Creek flows off-site to the southwest and drains directly into Lake Ontario.

Under Article 15 of the Environmental Conservation Law (Protection of Waters), the New York State Department of Environmental Conservation (NYSDEC) has regulatory jurisdiction over any activity that disturbs the bed or banks of protected streams. Any stream, or particular portion of a stream, that has been assigned by the NYSDEC any of the
following classifications or standards is considered a protected stream: AA, AA(t), A, A(t), B, B(t) or C(t) (6 NYCRR Part 701). A classification of AA or A indicates that the best use of the stream is as a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The best usages of Class B waters are primary and secondary contact recreation and fishing. The best usage of Class C waters is fishing and non-contact activities, and Class D waters represent the lowest classification standard. Streams designated (t) indicate that they support trout, and also include those more specifically designated (ts) which support trout spawning. Two class C(t) NYSDEC protected streams occur within the Project area; Boynton Creek and an unnamed tributary to Boynton Creek, which are located in the western portion of the Project area along the transmission site. All other streams within the Project area are classified by the NYSDEC as class C streams and are not subject to Protection of Waters regulations. However, all perennial and intermittent streams in the Project area are protected by the Corps of Engineers under Section 404 of the Clean Water Act. There are no streams regulated by Section 10 of the Rivers and Harbors Act of 1899 (navigable waters) within the Project area. In addition, based on the definition set forth at 6 NYCRR 608.1(u) of the Environmental Conservation Law, and site-specific investigations, it is not anticipated that any waters identified within the Project area would meet the New York State definition of “navigable”.

The Deer River bisects the eastern and western portions of the generating site (between Turbines 42 and 46), and is proposed to be spanned with an overhead electrical interconnect line. The portion of the Deer River within the Project area is classified as a “C” stream and therefore not NYSDEC protected. Within the Project area, and in the location of the proposed overhead crossing, the Deer River is located at the bottom of a large, deeply incised valley. Within the Project area the River is characterized as a perennial stream, between 20 to 40 feet wide, with a moderate to fast flow of water, and a stream substrate of bedrock and cobbles/rocks/boulders. Other streams in the Project area are primarily low-gradient drainage features that meander through wetlands, agricultural fields, hedgerows, and pastures. Most of these streams are less than 10 feet wide with variable substrates, and vegetative cover characteristics. Some Project area streams have well-defined and abrupt banks, while the banks of others transition gradually into adjacent wetland vegetation. There are also a few small farm ponds/open water areas interspersed throughout the area. Generally, they are found in farm settings, adjacent to houses and barns, or within wetlands. Water depths in these ponds, although not verified, are anticipated to be 4 feet or more. They may be used as a source of water for livestock as well as for fishing and aesthetic purposes.

3.2.1.2 Wetlands

Wetlands within the Project area have been examined through aerial photography interpretation, review of state and federal wetland mapping, review of the location of mapped hydric soils, and on-site reconnaissance-level field evaluations.
3.2.1.2.1 Existing Information

Review of NYSDEC mapping indicates that a number of freshwater wetlands occur within the Project area that are regulated under Article 24 of the Environmental Conservation Law (Figure 5). These wetlands are interspersed throughout the Project area and many of them are associated with mapped streams. Table 6 provides a summary of State-regulated wetlands in the Project area.

Table 6. State-Regulated Wetlands within the Project Area.

<table>
<thead>
<tr>
<th>Wetland</th>
<th>Class</th>
<th>Total Size (Acres)</th>
<th>Size Within Project area (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-10</td>
<td>3</td>
<td>18.3</td>
<td>5.0</td>
</tr>
<tr>
<td>C-12</td>
<td>3</td>
<td>31.2</td>
<td>13.8</td>
</tr>
<tr>
<td>C-13</td>
<td>3</td>
<td>15.9</td>
<td>4.9</td>
</tr>
<tr>
<td>C-14</td>
<td>3</td>
<td>14.9</td>
<td>7.1</td>
</tr>
<tr>
<td>C-15</td>
<td>3</td>
<td>44.6</td>
<td>16.4</td>
</tr>
<tr>
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<td>3</td>
<td>19.2</td>
<td>19.2</td>
</tr>
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<td>2</td>
<td>76.6</td>
<td>18.1</td>
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<td>3</td>
<td>16.8</td>
<td>12.9</td>
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<td>13.3</td>
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<tr>
<td>RU-28</td>
<td>2</td>
<td>17.4</td>
<td>17.4</td>
</tr>
</tbody>
</table>

1 NYS classification system. Four separate classes that rank wetlands according to their ability to provide functions and values (Class I having the highest rank, descending through Class IV).

National Wetland Inventory (NWI) mapping covers the transmission site and the western two-thirds of the generating site, however, no data is available for the eastern third of the generating site (Carthage and West Lowville USGS 7.5-minute quadrangles). Within the portion of the Project area where data is available, 169 wetland communities have been mapped by the NWI, cumulatively totaling 568 acres (note that many wetlands are comprised of two or more individually mapped wetland communities and as such, there are far fewer than 169 individual wetlands located on-site). Field reconnaissance indicates that a number of additional federally jurisdictional wetlands occur in the unmapped portion of the Project area. Federally mapped wetlands are identified in Figure 5. The NWI data indicate that freshwater broad-leaved deciduous forested wetlands are by far the dominant wetland community on-site, totaling approximately 346 acres. Other NWI-mapped wetland communities on site include freshwater scrub-shrub...
broad-leaved deciduous wetlands (138 acres), freshwater emergent wetlands (59 acres), freshwater forested needle-leaved evergreen wetlands (14 acres), and freshwater ponds (11 acres).

Review of the National Hydric Soil List for New York State in conjunction with soil mapping for the Project area indicates that potentially hydric soils cover approximately 34 percent of the Project area (NRCS, 2012). Prominent potentially hydric soils (each covering over 150 acres) include Kendaia silt loam (map units KcA and KbA), Galway silt loam (map unit GIA), Farmington loam (map unit FaB), Bombay loam (map unit BoB), Newstead silt loam (map unit Nn) and Ilion silt loam (map unit IaA). It is important to note that the National Hydric Soil List includes both soils that have either a major or a minor component that is, at least in part, hydric. Therefore, the list provides an indication of map units with the potential to contain hydric soils rather than indicating the actual extent of hydric soils present. The majority of the potentially hydric soils occur in the eastern portion of the generating site (east of the Deer River), and in the western portion of the transmission site (adjacent to tributaries of the North Brank Sandy Creek).

3.2.1.2.2  Field Review

During the 2012 growing season, edr identified wetlands and streams in areas likely to be disturbed by Project development, and areas identified for purposes of avoidance or minimization of disturbance. Reconnaissance level field surveys were conducted in the vicinity of proposed turbines, turbine workspaces, access roads, substation, O&M building, potential laydown areas, public road intersections (for potential widening/improvements), buried electrical interconnect lines, and the proposed transmission line. A wetland study area was created for wetland delineation fieldwork that focused on specific areas that included the area within approximately 100 feet of each identified project component (Survey Area). The Survey Area also included various project component alternatives that were investigated as a part of the wetland fieldwork. The Survey Area was field reviewed and wetlands and streams within this area were identified. However, for the purpose of this DEIS, the term Survey Area refers only to the wetlands and streams that are associated with the current Project layout. edr (2012b) identified a total of 97 wetlands and streams within this Survey Area that could potentially be under the jurisdiction of the USACE pursuant to Section 404 of the Clean Water Act. The complete wetland and stream inventory report can be found in Appendix F.

3.2.1.2.3  Wetland and Stream Descriptions

In general, jurisdictional wetlands identified within the Project area exist as one or a combination of the following types: 1) emergent wetland, 2) scrub-shrub wetland, 3) forested wetland, 4) farm ponds or 5) streams (ephemeral, intermittent and perennial). Wetland types were classified according to the Cowardin classification (Cowardin, et al.,
Wetlands and streams identified within the Project area are depicted in Figure 2 of Appendix F, and descriptions of each of the communities are presented below.

**Emergent wetland** – The majority of the wetlands within the Survey Area are characterized as emergent or are partially emergent. Emergent wetlands occur where surface water collects in shallow basins and/or adjacent to open water. These wetlands are dominated by herbaceous vegetation, and generally characterized by soils that remain saturated or inundated throughout the year. Although the Cowardin classification was used to classify wetlands, some of the emergent wetlands in this category could be best described according to the Reschke definition as wet meadow (Reschke, 1990). Wet meadow wetlands are usually found in poorly drained, low-lying depressional areas. Wet meadow wetlands may resemble grasslands and are typically drier than other marshes, except during periods of seasonal high water. They generally lack standing water for most of the year, though snow melt, stormwater runoff, and/or a high water table allows the soil to remain saturated for a significant portion of the growing season.

Emergent wetlands identified in the Survey Area are dominated by plants such as cattail (*Typha latifolia*), sedges (*Carex spp.*), rushes (*Juncus spp.*), green bulrush (*Scirpus atrovirens*), reed canary grass (*Phalaris arundinacea*), late goldenrod (*Solidago gigantea*), wool grass (*Scirpus cyperinus*), Joe-pye weed (*Eutrochium maculatum*), swamp milkweed (*Asclepias incarnata*), rice cutgrass (*Leersia oryzoides*), and boneset (*Eupatorium perfoliatum*). Evidence of wetland hydrology in the emergent wetlands identified within the Survey Area includes surface water, drainage patterns, saturated soils, microtopographic relief, and saturation visible on aerial imagery.

**Scrub-shrub wetland** – Many of the wetlands identified were found to be dominated by scrub-shrub vegetation. Scrub-shrub wetlands within the Survey Area are characterized by dense stands of shrub species less than 20 feet tall, including willows (*Salix spp.*), silky dogwood (*Cornus amomum*), red osier dogwood (*Cornus stolonifera*), gray dogwood (*Cornus racemosa*), speckled alder (*Alnus incana*), and common elderberry (*Sambucus nigra*). Herbaceous vegetation in these areas includes sensitive fern (*Onoclea sensibilis*), ostrich fern (*Matteuccia struthiopteris*), tearthum (*Persicaria arifolia*), field horsetail (*Equisetum arvense*), and various sedges. Evidence of wetland hydrology in the scrub-shrub wetlands identified within the Survey Area includes water-stained leaves, saturated soils, microtopographic relief, and saturation visible on aerial imagery.

**Forested wetland** – Forested wetland communities are dominated by trees that are 20 feet or taller, but also include an understory of shrub and herbaceous species. The wetlands within the Survey Area that are fully or partially forested include a mix of hydrophytic trees such as green ash (*Fraxinus pennsylvanica*),
American elm (*Ulmus americana*), red maple (*Acer rubrum*), black willow (*Salix nigra*), and speckled alder. They also occasionally contain an understory of shrubs including saplings of the above mentioned species, or shrub species such as dogwoods or willows. Herbaceous species in forested wetland include sedges, manna grasses (*Glyceria spp.*), spotted jewelweed (*Impatiens capensis*), pale jewelweed (*Impatiens pallida*), royal fern (*Osmunda regalis*), skunk cabbage (*Symplocarpus foetidus*), and sphagnum moss. Evidence of wetland hydrology in the forested wetlands identified within the Survey Area includes water-stained leaves, water marks, moss trim lines drainage patterns, saturated soils, microtopographic relief, and saturation visible on aerial imagery.

*Farm Ponds* - A few small farm ponds and recreation ponds are found within the Survey Area, generally in open field settings or adjacent to houses and barns. Typically, these ponds are excavated or diked, with well-defined banks. Emergent wetland vegetation tends to be limited or lacking. Although not verified, water depths are expected to be consistent with excavated ponds that are used as a source of water for livestock as well as for fishing and aesthetic purposes. Such ponds are typically a minimum of 4 feet deep.

*Streams* – Streams within the Project area are primarily located within agricultural fields, forests, hedgerows, and old-field communities, and generally have a gentle gradient (0-3%). The majority of the streams are located within the transmission site. Most of the identified streams are intermittent, with a rocky substrate, and did not have well defined and established riparian corridors typical of larger, perennial stream/river systems. The majority of streambeds did not have a large flow of water at the time of the field investigation, likely due to the lack of adequate precipitation during the 2012 growing season. Water depths within the channels with stream flow averaged 2-6 inches.

The functions provided by these wetlands appear to include maintaining surface water flows, recharging groundwater supplies, storm water detention, flood abatement, water quality improvement, wildlife habitat, and nutrient cycling. The functions of many on-site wetlands are limited due to 1) their small size, 2) location within or adjacent to agricultural fields, 3) lack of structural diversity, and 4) past or on-going physical disturbance (e.g., agriculture). However, some of the delineated wetlands are considered valuable to the overall ecology of the area due to their size (some wetlands identified within the Survey Area are portions of much larger systems), structural diversity, wildlife habitat, and hydrologic functions.
3.2.1.3 Groundwater

Review of existing aquifer mapping revealed that several mapped aquifers underlie the Project area and vicinity. The USGS has mapped principal aquifers, which are defined as “a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water” (USGS, 2012). Although this mapping is intended for use at a regional scale rather than for site-specific use, it does indicate that the northern portion of the Project vicinity overlies a principal carbonate rock aquifer. The USEPA has mapped sole source aquifers, which are defined as an aquifer “which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas can have no alternative drinking water source(s) which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water” (USEPA, 2010). Federally funded projects overlying designated sole source aquifers are subject to USEPA review to ensure they do not pose a significant public health hazard. The Northern Tug Hill sole source aquifer underlies the western half of the Project area (the transmission site and the western portion of the generating site), generally following the limits of the Sandy Creek watershed through this area. The Northern Tug Hill sole source aquifer is the principal source of drinking water for the Villages of Adams, Lacona, Mannsville and Sandy Creek, as well as the Hamlets of Adams Center and Pierrepont Manor (USEPA, 2010). The USEPA indicates that this aquifer is susceptible to contamination due to highly permeable soil characteristics and because the top of the aquifer is at ground surface in places (2010).

Additionally, the NYSDEC has mapped Primary and Principal Aquifers for New York State, three of which overlap portions of the Project area. Two of these mapped aquifers are located near where the Deer River crosses the Project area. The third is located on the western edge of the generating site, along the steep descent toward the Black River. All three of these mapped aquifers are unconfined with a yield in the range of 10 to 100 gallons per minute. The NYSDEC assigns the designation of Primary Water Supply Aquifer, or Primary Aquifer, to “highly productive aquifers presently utilized as sources of water supply by major municipal water supply systems” and assigns the designation of Principal Aquifers to aquifers “known to be highly productive or whose geology suggests abundant potential water supply, but which are not intensively used as sources of water supply by major municipal systems at the present time” (NYSDEC, 2012a). All three of the mapped aquifers that overlap the Project area are Principal Aquifers. While the mapped boundaries of these aquifers are not intended for detailed site evaluations, it appears that very little Project-related disturbance will occur over these resources.

The Draft Groundwater Assessment and Recommendations Report for the Black River Watershed (Bergman Associates, 2008) was also consulted. This report indicates that the Trenton Group Limestone, that underlies much of the Project area and follows the Black River Valley, contains a confined bedrock aquifer with potential yield of 1 to 50 gallons per minute, which may supply local springs and seeps. The report suggests that the Village of Copenhagen is a favorable location for development of groundwater resources (Bergmann Associates, 2008).
According to the EPA Safe Drinking Water Information System, surrounding municipalities that presently rely on groundwater for their drinking water supply include the Towns of Champion and Rutland and the Village of Castorland (EPA, 2012a). Of these municipalities, health-based violations reported to the EPA include exceedances of lead and copper in 2005 and coliform in 2012, both in the Town of Rutland.

3.2.1.4 Floodplains

Review of Federal Emergency Management Agency (FEMA) mapping indicates that portions of the floodplains associated with Deer Creek, Staplin Creek, Sandy Creek and Boynton Creek intersect the Project area. These areas include FEMA flood hazard Zones A and AE, which are subject to a 1% annual chance of flooding (also referred to as the 100-year flood). The difference between Zones A and AE is that Zone A areas have not been analyzed in detail and lack base flood elevation data that is available for Zone AE areas.

The floodplains associated with Staplin Creek, Boynton Creek and Sandy Creek are all designated as FEMA flood hazard Zone AE, and all occur within the transmission site portion of the Project area. However, only the floodplain associated with Boynton Creek is actually crossed by the proposed transmission line route. The floodplain associated with Deer Creek is designated as FEMA flood hazard Zone A and is proposed to be crossed by a segment of overhead interconnect line within the generating site, between Turbines 42 and 46.

3.2.2 Potential Impacts

Based upon the preliminary Project layout, field reconnaissance, and desktop evaluations conducted to date, an assessment of temporary and permanent impacts to wetlands and streams is presented below.

3.2.2.1 Construction

3.2.2.1.1 Surface Waters and Wetlands

To avoid or minimize permanent impacts to streams and wetlands, preliminary and final Project design will be guided by the following criteria during the siting of wind turbines and related infrastructure:

- Large built components of the Project, including wind turbine generators, the staging area, O&M facility, collection station and interconnection substation, are anticipated to avoid wetlands completely.
- The number and acreage of wetland impacts due to access road crossings will be minimized by routing around wetlands whenever possible and utilizing existing crossings and narrow crossing locations to the extent practicable.
- Buried 34.5 kV electric interconnect lines will avoid crossing forested wetlands whenever possible, cross wetlands at narrow points, and will utilize installation techniques that minimize temporary wetland impacts.
- The overhead transmission line will be designed to span wetlands whenever possible (i.e., no structures in wetlands), and cross wetlands at existing narrow points.

Other Project area environmental or logistical constraints, such as Project participants/lease holders, landowner concerns, buried utilities, and other current land use, may make further avoidance of wetlands and streams unfeasible.

During construction, potential direct or indirect impacts to wetlands and surface waters may occur as a result of the installation of access roads, the upgrade of local public roads, the installation of above-ground or buried electrical interconnects, installation of the transmission line, and the development and use of temporary workspaces around the turbine sites. Direct impacts, including clearing of vegetation, earthwork (excavating and grading activities), and the direct placement of fill in wetlands and surface waters, are typically associated with the development of access roads and workspaces around turbines. The construction of access roads, and possibly the upgrade of local public roads, is anticipated to result in both permanent (loss of wetland/surface water acreage) and temporary impacts to wetlands. The development and use of temporary workspaces will result in only temporary impacts to wetlands/streams. The installation of above-ground or buried electrical lines (transmission and interconnects) will temporarily disturb streams and wetlands during construction as a result of clearing (brushhogging, or similar clearing method requiring no removal of rooted woody plants), and soil disturbance from burial of the electrical 34.5 kV collector lines or from pole installation along the overhead transmission line. Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by adjacent construction activities (e.g., removal of vegetation and soil disturbance). This indirect impact may occur at wetlands adjacent to work areas where no direct wetland impacts are anticipated, including areas adjacent to proposed access road upgrade/construction, electrical collector and transmission routes, turbine sites, staging area(s), wind measurement towers, or the substations.

Detailed wetland delineations in accordance with USACE and NYSDEC methodology will be conducted during the 2013 growing season, which will then allow for more precise quantification of direct wetland impacts. For the time being, the approximate wetland boundaries have been used to calculate approximate wetland impacts.

Based on an analysis of the proposed Project layout and the approximate wetland boundaries, roughly 14 acres of temporary wetland/stream soil disturbance are anticipated to occur due to Project construction, including 1.70 acres of impacts to State-regulated freshwater wetlands. In addition, up to 1.23 acres of impact to State-regulated wetland adjacent areas (100-foot buffer) could also occur. These impacts will involve temporary placement of fill to
accommodate proposed Project access road construction and turbine work spaces, as well as temporary soil disturbance associated with the installation of buried electrical interconnect lines and the overhead electric transmission line.

To further minimize impacts to wetlands and streams, it is anticipated that trees within forested wetlands will be cleared manually and flush cut to ground level. Timber matting will be used, as needed, to accommodate temporary vehicular access across wetlands during construction. Wherever feasible, buried electrical interconnect lines will be installed co-linear with access roads to minimize disturbance to wetlands.

Following Project construction, temporarily impacted wetland areas will be restored. Restoration activities are anticipated to include the following:

- 200-foot radius turbine workspaces will be reduced to a permanent footprint of 0.2 acre (115-foot by 66-foot gravel crane pad, 18-foot diameter turbine pedestal, and a 6-foot wide gravel skirt around the tower base).
- Access roads will be reduced to maximum drivable width of 20 feet (except where unstable soil conditions or severe erosion hazard preclude road width reduction).
- The 100-foot crane paths will be allowed to regenerate naturally.
- Buried electrical interconnect line routes will be allowed to regenerate naturally.

Permanent impacts to surface waters and wetlands (loss of surface water/wetland acreage) will result from the footprint of permanent access roads necessary to accommodate long-term maintenance and operation activities. Other long-term impacts to wetlands will occur as a result of clearing activities (e.g., brushhogging within the buried interconnect line ROW) in forested wetlands. This activity will not result in a loss of wetland acreage, but will result in the conversion of forested wetlands to communities dominated by shrub and herbaceous vegetation (scrub-shrub/wet meadow/emergent). Based upon the proposed layout, the permanent footprint of access roads (drivable width of 20 feet wide) is anticipated to result in roughly 0.53 acre of permanent impacts to wetlands/streams. No permanent impacts to NYSDEC freshwater wetlands or protected streams are proposed.

Typically, Project access roads are designed to accommodate future truck traffic trips that may be required to perform maintenance on wind turbines and substation facilities. However, major repairs or decommissioning may require temporary upgrades for access of cranes or trucks that result in minor temporary impacts to streams and wetlands. These types of impacts are typically permitted by the Nationwide Permit program (i.e. Nationwide Permit No. 3 Maintenance) and are minor and do not require mitigation for unavoidable or significant adverse impacts.
Because major repairs and or decommissioning events are currently unknown, it is not feasible to estimate the quantity of impacts that may occur, but they are anticipated to be minor, localized and temporary in nature.

3.2.2.1.2 Groundwater

The proposed turbines will be located in higher elevation uplands, above and outside of the aquifer footprints located in the valleys. Excavations for foundations, roadways, and underground collector lines are expected to be relatively shallow, and are not anticipated to intercept groundwater within the surrounding aquifers. Additionally, construction of the Project will adhere to a Spill Prevention Control and Countermeasure (SPCC) plan and a SWPPP to prevent contamination and/or erosion due to surface runoff, thereby avoiding significant adverse impacts.

The Project will add only small areas of impervious surface, which will be dispersed throughout the Project area, and will have a negligible effect on groundwater recharge. However, construction of the proposed Project could result in certain localized impacts to groundwater, and the use of that water by adjacent landowners. These impacts could include:

- Minor localized disruption of groundwater flows down-gradient of proposed turbine foundations;
- Minor modification to surface runoff or stream-flow, thereby affecting groundwater recharge characteristics;
- Minor degradation of groundwater chemical quality from accidental spills and installation of concrete foundations; and
- Impacts to groundwater recharge areas (wetlands);
- Groundwater migration along collection line trenches.

Although soils within the Project are predominantly well drained, groundwater may be encountered in shallow excavations in areas of poorly drained soils and/or shallow bedrock. Additionally, ponding of surface and/or precipitation water may occur in open excavations and in low-lying areas. It is anticipated that groundwater and/or surface water that accumulates in shallow excavations of the upland areas can generally be controlled using conventional sump and pump methods. During dewatering activities, sediment laden water will be sufficiently filtered in upland locations and not discharged into water resources. Water velocity dissipation will be provided at all discharge points. Dewatering activities will not cause erosion in receiving channels or adversely impact water resources.

Installation of turbine foundations has the greatest potential for impacts to groundwater. Based on existing bedrock conditions and experience on the nearby Maple Ridge Wind Farm, it is anticipated that any bedrock encountered in shallow excavations will be rip-able using large excavators, rock rippers, or chipping hammers. Although not
anticipated at this site, if blasting is required to remove any bedrock, a detailed blasting plan will be required by the contractor in advance of construction (see Preliminary Blasting Plan in Appendix C). Blasting of shallow bedrock would be performed in a controlled manner that would not damage adjacent structures or dwellings. In addition, a detailed on-site study of the surface and subsurface geotechnical conditions will be conducted prior to final Project design.

Construction activities have the potential to impact localized groundwater flow paths in areas where excavation (or blasting) occurs below the water table. In these instances, water is anticipated to flow around the disturbance and resume its original flow direction down gradient of the disturbance. Groundwater that infiltrates into the excavation may require removal by pumping, which could have an effect on the elevation of the water table. However, this water will be pumped to the surface, discharged to the ground surface through a velocity dissipating device, and allowed to infiltrate back into the water table with negligible loss of volume due to evaporation. Therefore, any effect will be very localized and temporary.

Installation of the concrete foundations could cause a temporary, localized increase in groundwater chemistry (pH) during the curing process. This effect will not extend beyond the immediate area of the foundation and will not adversely affect groundwater quality. In the event that a perched groundwater condition should be encountered at a turbine site, temporary construction dewatering methods would be employed, as described above. Turbine foundations have typically been designed to resist hydrostatic forces, when required, rather than installing permanent drainage systems. Prior to Project construction, soil borings will be conducted to determine groundwater levels (among other factors) at the turbine locations. Should shallow/perched groundwater be encountered, related potential construction impacts are anticipated to be addressed through relatively common engineering measures and construction techniques.

In addition to impacts to groundwater due to turbine foundation installation, minor impacts could result from the installation of buried interconnect lines which may facilitate groundwater migration along trench backfill in areas of shallow groundwater. Due to the decompaction of soils within the trench of the buried interconnect, water could collect in the trench and migrate through the trench to areas of lower elevation, where it is naturally allowed to infiltrate back into the water table with negligible loss of volume.

An additional potential impact to groundwater is the introduction of pollutants to groundwater from the discharge of petroleum or other chemicals used during construction, operations or maintenance. Such discharges could occur in the form of minor leaks from fuel and hydraulic systems, as well as more substantial spills that could occur during refueling or due to mechanical failures and other accidents.
3.2.2.1.3 Floodplains

As previously indicated, 100-year floodplains associated with four different waterways intersect the Project area, however, only two of them are crossed by proposed Project components. The Boynton Creek 100-year floodplain is crossed by approximately 560 linear feet of the proposed transmission line route. Vegetation within the intersection of this floodplain and the transmission line 100-foot right-of-way is primarily herbaceous, with a few areas of shrubs, therefore minimal tree clearing is anticipated to occur within this floodplain. Final engineering is not complete at this time, but it is possible that some transmission line poles will be located within this floodplain, which will result in small areas of soil disturbance related to pole installation. The Deer River 100-year floodplain is crossed by roughly 280 linear feet of proposed overhead interconnect line, located between Turbines 42 and 46. It is not anticipated that any impacts would occur to the Deer River or its floodplain, as the River would be spanned by the overhead line and the poles would be located in upland locations.

Additionally, indirect impacts to floodplains could result from soil sedimentation caused by activities such as construction-related soil disturbance and the removal of vegetation immediately outside of the floodplain. However, with the implementation of an erosion and sedimentation control plan, no adverse indirect impacts to floodplains are anticipated. The erosion and sedimentation control plan will be developed as part of the SPDES General Permit for the Project. Erosion and sedimentation control measures shall, at a minimum, include the measures set forth in the Preliminary SWPPP (see Appendix D).

3.2.2 Operation

3.2.2.2.1 Surface Waters and Wetlands

Impacts to surface waters and wetlands primarily occur during Project construction. The operation of the constructed facility is not anticipated to have significant adverse impacts to wetlands, streams, or other surface waters within the Project area. Vehicular access to the turbines, substation, collection station, meteorological tower, and O&M facility will be completely established during Project construction, and routine operation and maintenance procedures are not anticipated to result in significant additional impacts. Minor and isolated incidences of impact may occur, during Project operation, including buried electrical collector line maintenance, access road washouts, culvert replacement/maintenance, or accidental fuel/chemical spills. All of these activities could have minor impacts on surface waters and wetlands. Appropriate operational procedures, training and mitigation measures (such as spill kits in all vehicles) will be implemented during the operational phase of the Project to mitigate these potential impacts. All repair activities will be in accordance with all applicable federal, state, and local permits and associated conditions/requirements.
To the extent practicable, all major repairs will be facilitated through use of existing Project-related infrastructure (e.g., permanent gravel access roads, crane pads, etc.). If existing infrastructure is not adequate to accommodate certain repairs, any additional infrastructure improvements will be conducted in accordance with the applicable regulations (e.g., widening of an access road within or adjacent to a wetland will be conducted in accordance with Sections 401 and 404 of the Clean Water Act, and Article 24 of the Environmental Conservation Law, as applicable). Please see Section 2.7 for a discussion of environmental considerations during decommissioning activities.

The proposed Project will not result in significant conversion of land to built/impervious surfaces. Tower bases, crane pads, access roads, and the substations in total will add approximately 58 acres of impervious surface to the 9,700-acre Project area (i.e., conversion of approximately 0.006%). Consequently, no significant changes to the rate or volume of stormwater runoff are anticipated. However, installation of permanent Project components have the potential to result in localized changes to runoff/drainage patterns and these will be assessed at the detailed design and construction phase in accordance with the SPDES General Permit. Specifically, the SPDES regulations indicate that the rate of stormwater runoff associated with the post-construction condition must not exceed the rate of stormwater runoff associated with the pre-construction condition. Therefore, hydrologic models (e.g., Hydraflow Hydrographs Extension for AutoCAD Civil 3D software) based upon measurable watershed characteristics will be utilized by professional engineers to calculate stormwater discharges. Stormwater runoff rates discharged from the site under existing conditions (pre-construction) will provide the basis for evaluation and comparison to proposed conditions (post-construction). Design points of interest will be established where stormwater runoff exits the site (e.g., where proposed Project access roads intersect with existing public roads/roadside ditches). These design points will provide fixed locations at which existing and proposed stormwater quantities can be compared. The areas draining to these design points will be delineated using land survey information and proposed grading plans, and a hydrologic analysis of each of the drainage areas will be conducted to model their discharges (typically for the 1, 2, 10, 25, 50 and 100-year storm events).

3.2.2.2 Groundwater

Most potential impacts to groundwater will occur during construction only. Over the long term, addition of small areas of impervious surface to the Project area in the form of permanent access roads, crane pads, the O&M facility, and the substations will have a minimal effect on groundwater recharge. Turbine foundations installed below the water table are not anticipated to have any measurable long-term effect on groundwater levels or flow patterns. The migration of groundwater along buried collector line trenches could have a minor effect on groundwater flow paths, and the ongoing potential for chemical spills during operation/maintenance could also affect groundwater.
3.2.2.3  Floodplains

Impacts to floodplains will occur during construction only; no additional impacts to floodplains are anticipated to occur during Project operation. The presence of transmission poles within the floodplain will not impact the function of the floodplain and will be constructed to withstand potential flood conditions. No significant changes to the rate or volume of stormwater runoff are anticipated as a result of Project operations.

3.2.3  Proposed Mitigation

If required, to mitigate for unavoidable permanent wetland and stream impacts and/or permanent conversion impacts (i.e. clearing of forested wetlands) associated with the Project, the Project Sponsor will undertake a suitable on-site or off-site compensatory mitigation project, ranging from the creation of in-kind wetland to contribution to an agency approved mitigation bank or in-lieu fee program. This suitable compensatory mitigation project will be developed in consultation with the NYSDEC and USACE during the Joint Application for Permit process.

No mitigation for indirect or temporary impacts to wetlands or streams is proposed, given the fact that these impacts will not result in any loss or permanent conversion of wetland acreage. However, temporary impacts to wetlands/streams will be minimized during construction as discussed below.

The direct impacts to wetlands/streams will be minimized by utilizing existing or narrow crossing locations whenever possible. Upgrading existing crossings that are under-maintained/undersized will have a long-term beneficial effect on water quality, as it will help to keep farm equipment and other vehicles out of surface waters. Special crossing techniques, equipment restrictions, herbicide use restrictions, and erosion and sedimentation control measures will be utilized to reduce adverse impacts to water quality, surface water hydrology, and aquatic organisms. In addition, clearing of vegetation along stream banks and in wetland areas will be kept to an absolute minimum.

Where crossings of surface waters and wetlands are required, the Project Sponsor will employ Best Management Practices associated with particular, applicable streamside and wetland activities, as recommended by the NYSDEC and the USACE, and required by the issued wetland/waters permits. Specific mitigation measures for protecting wetlands and surface water resources will include the following:

- No Equipment Access Areas: Except where crossed by permitted access roads or temporary timber matting, wetlands, and streams will be designated “No Equipment Access,” thus prohibiting the use of motorized equipment in these areas.
• **Restricted Activities Area:** A buffer zone of 100 feet, referred to as “Restricted Activities Area”, will be established where Project construction traverses streams, wetlands and other bodies of water. Restrictions will include:
  - No deposition of slash within or adjacent to a waterbody;
  - No accumulation of construction debris within the area;
  - Herbicide restrictions within 100 feet of a stream or wetland (or as required per manufacturer’s instructions);
  - No degradation of stream banks;
  - No equipment washing or refueling within the area; and
  - No storage of any petroleum or chemical material.
  - No disposal of excess concrete or concrete wash water.

• **Access Through Wetlands:** When crossing wetlands, routing around edges, utilizing higher ground, and crossing the narrowest portion of the wetland will be the preferred crossing options. Wherever feasible, low impact crossing methods will be used such as timber mats or similar materials. Geotextile mats, corduroy, and/or gravel may also be used to create temporary wetland road widening. Where permanent roadways are installed and impoundment of water is possible, the installation of properly-sized culverts will maintain the natural water levels/flows on each side of the road.

• **Sediment and Siltation Control:** A soil erosion and sedimentation control plan will be developed and implemented as part of the SPDES General Permit for the Project. To protect surface waters, wetlands, groundwater and stormwater quality, silt fence, hay bales, and temporary siltation basins will be installed and maintained throughout Project construction. Exposed soil will be seeded and/or mulched to assure that erosion and siltation is kept to a minimum along wetland boundaries. Specific control measures will be identified in the Project SWPPP, and the location of these features will be indicated on construction drawings and reviewed by the contractor and other appropriate parties prior to construction. These features will be inspected on a regular basis (minimum of once weekly) to assure that they function properly throughout the period of construction, and until completion of all restoration work (final grading and seeding).

Direct wetland impacts will be more precisely described and evaluated during the state and federal wetland permitting process. This process will require a Joint Application for Permit filed with the NYSDEC and the USACE, and will involve the following steps:
1. Submission of a wetland delineation report to USACE and NYSDEC, along with request for jurisdictional determination by these agencies.
2. Site visits by USACE and NYSDEC representatives to both verify the boundaries of delineated wetlands and determine which wetlands are under the jurisdiction of each agency (pursuant to Section 404 of the Clean Water Act and Article 24 of the Environmental Conservation Law).
3. Evaluation of opportunities for further wetland impact avoidance and minimization through minor adjustments in the proposed location of Project components.
4. Preparation of a Joint Application for Permit, including an analysis of wetland functions and values, a description and quantification of wetland and stream impacts (temporary and permanent), an alternatives analysis, and suggested mitigation plans. Wetland mitigation could include a number of possible options, including in-kind replacement of all permanently impacted wetlands through wetland creation, wetland enhancement, wetland preservation, wetland mitigation fee, or mitigation bank contribution.
5. USACE and NYSDEC processing/review of the permit application, including public notice and consultation with other state and federal agencies (SHPO, EPA, USFWS).
6. Permit issuance, including conditions for wetland protection, impact minimization, mitigation, and monitoring.
7. Preparation and submittal of final wetland mitigation plans to the agencies.

To assure compliance with proposed mitigation measures during construction, the Project Sponsor will provide the construction contractor copies of all NYSDEC (Article 24 and 15, Section 401 Water Quality Certification) and USACE (Section 404) permits, and site specific plans detailing construction methodologies, erosion and sedimentation control plans, and required natural resource protection measures. The Environmental Monitor will also be present during construction to ensure compliance with all plans and permit conditions, as further discussed in Section 4.2.

The contractor will adhere to any special conditions of permits issued by the NYSDEC and USACE, which may include low impact stream crossing techniques, seasonal work restrictions, and/or alternative stream crossing methods. Wetlands temporarily disturbed during construction will be restored to their original grade. This will allow wetland areas to regenerate naturally following construction.

Any increase in stormwater runoff will be negligible, as Project construction will result in limited addition of impervious surface. At the detailed design stage, the Project Sponsor will validate this assessment using proprietary runoff forecasting computer software (vflo™ or similar) to determine whether additional mitigations are likely to manage any stormwater run-off impacts arising from construction of the Project. Nevertheless, specific means of avoiding or minimizing stormwater-related adverse impacts during construction and operation of the Project include adhering to a
detailed soil erosion and sedimentation control plan, and the stormwater requirements set forth in the SPDES regulations (as previously described in Section 3.2.2.2.1 above). Additionally, a SPCC Plan that outlines procedures to be implemented to prevent the release of hazardous substances into the environment will be implemented. This plan will not allow refueling of construction equipment within 100 feet of any stream or wetland, and all contractors will be required to keep materials on hand to control and contain a petroleum spill. These materials will include a shovel, tank patch kit, and oil-absorbent materials. Any spills will be reported in accordance with state and/or federal regulations. Contractors will be responsible for ensuring responsible action on the part of construction personnel. Please see Appendix D for additional detail on spill prevention.

To avoid localized drainage problems, the Environmental Monitor will review construction plans with the contractor and identify the need for any additional ditches, water bars, culverts, and temporary sediment retention basins at each road and tower site prior to the initiation of construction. If drainage problems develop during or after construction, the Environmental Monitor will evaluate the problem (in consultation with the contractor, landowner, and/or agency representative) and recommend a solution. The contractor will take corrective actions after receiving the recommendation from the site construction manager.

In the event that shallow groundwater is encountered during construction activities such as foundation excavation, dewatering will likely occur (see Appendix B for typical photographs and details associated with dewatering). If dewatering is required, a temporary pit (or sediment trap) will be constructed in upland areas (i.e., not within or streams or wetlands) to trap and filter water prior to discharging it to a stable discharge area. Dewatering will involve pumping accumulated water to a device (e.g., sediment filter bag, silt fence barrier) that decreases discharge velocity and traps suspended sediment prior to outletting to undisturbed ground. The stable outlet must be capable of filtering further sediment and withstanding the velocity of the discharged water to prevent erosion.

The exact location of private water supply wells within the Project area will be determined and clearly marked to avoid potential damage during construction and operation of the Project. To determine well locations, existing databases (e.g., from the NYSDEC) will be reviewed. In addition, the Project Sponsor will mail a water well survey to all residences within 2,500 feet of a proposed turbine site. These surveys will ask landowners questions pertaining to the presence and number of water wells on each property, and whether the property is supplied with municipal water. For respondents stating that water well(s) are present on a particular property, the survey will request additional information such as the well installation date, depth to water within the well, well depth, approximate yield of well, well construction material, and the producing formation. Respondents will also be asked whether they have ever experienced any issues with water quality, or had to drill a new well as a result of lowering of the water table or poor well yield. The responses to the well survey will be compiled and included in the FEIS.

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A dewatering plan will be developed as part of the SPDES General Permit to assure that this activity does not adversely affect water supply wells. As indicated in Section 3.1, blasting is not anticipated. However, if blasting is necessary for construction of any wind turbine foundations, blasting will be conducted in accordance with the blasting plan (see Appendix C) as designed with appropriate charge weights and delays to localize bedrock fracturing to the proposed foundation area, minimizing the already unlikely chance of impacting water levels in residential wells. Prior to blasting in proximity to water supply wells, well water sampling and testing will be conducted. Sampling and testing would be conducted by a NYS certified water lab and include iron, turbidity, heavy metals, total coliform, total bacteria, BTX (Benzene, Toluene, and Xylene), as appropriate. (See Section 3.1 and Appendix C for additional information regarding the blasting plan.) As a further groundwater well mitigation measure, before and after construction, the Project Sponsor will conduct structural, water quality, and water quantity inspections of wells, if any occur within 500 feet of proposed wind turbines; however, no such wells are anticipated due to setbacks from residences. Any impacts identified through these inspections will be addressed on a case-by-case basis and appropriately mitigated through oversight of the Environmental Monitor. In addition, if complaints regarding well impacts should arise, they will be addressed through a complaint resolution procedure described in the Community Outreach and Communication Plan (see Section 4.2 and Appendix G).

Final Project design will be consistent with the NYSA&M Guidelines for Agricultural Mitigation for Wind Power Projects, to the extent practicable (see Appendix E). Therefore, soil decompaction will be conducted during restoration of active agricultural areas following construction. These practices will mitigate any potential impacts that soil compaction could have on infiltration of rain and snow melt.

3.3 BIOLOGICAL RESOURCES

3.3.1 Existing Conditions

3.3.1.1 Vegetation

Plant species and communities found within the Project area were identified and characterized during reconnaissance level field surveys conducted by edr during the fall of 2012. All of the plant species observed during the course of these surveys are common to the region and state.

3.3.1.1.1 Ecological Communities

Vegetative communities within the Project area were evaluated based on interpretation of aerial photography and field verification. All of the major plant communities found within the Project area are common to New York State.
Agricultural land is the dominant community type on the Project area, while forestland, successional shrubland, developed/disturbed, and successional old field communities occur to a lesser extent. Brief descriptions are provided below for each of these ecological communities, which are mapped in Figure 6. Wetlands and surface waters, including associated habitats such as riparian corridors and vernal pools, are described separately (see Section 3.2).

**Agricultural Land**

Agricultural land constitutes the largest community within the Project area, with approximately 5,566 acres (54%) of the land in row crops, field crops, or pastureland. Corn is the primary row crop. Hayfields are typically rotated into (and out of) row crop production (typically corn), and less often into pastureland. Consequently, the percentage in each agricultural type is constantly changing. Pastureland is primarily used for the grazing of dairy cows, and is typically characterized by mixed grasses and broad-leafed herbaceous species, including clovers, plantains, and dandelion.

**Mixed Deciduous/Coniferous Forestland**

Forestland constitutes the second largest ecological community type within the Project area, with approximately 3,174 acres (31%). Forests within the Project area resemble the beech-maple mesic forest community described in the Draft Ecological Communities of New York State (Edinger et. al., 2002). These forests occur throughout the Project area. Tree species vary somewhat, but dominant or co-dominant species in most locations include sugar maple, American beech, black cherry, yellow birch, and red maple. Other common tree species include white ash, basswood, eastern hemlock, white pine, quaking aspen, and white oak. Common herbaceous species include wood ferns, false nettle, jack-in-the-pulpit, white snakeroot, Christmas fern, and partridgeberry. This community also includes several conifer plantations. According to Edinger et al. (2002), a conifer plantation is “a stand of softwoods planted for the cultivation and harvest of timber products, or to provide wildlife habitat, soil erosion control, windbreaks, or landscaping.” Conifer plantations may be a mix of softwoods, but within the Project area are typically monocultures of Norway spruce and red pine.

**Successional Shrubland**

Successional shrubland occurs on approximately 1,030 acres (10%) of the Project area, and is frequently associated with old fields and young forestland on the periphery of agricultural areas. Shrubland areas are commonly found in poorly drained areas, on steep slopes, or other areas that limit agricultural production. Areas of young trees and shrubs are also intermixed with some forested areas. Herbaceous species similar to those found in successional old fields occur in this community. However, shrub species such as honeysuckle, arrowwood, buckthorn, hawthorn, and staghorn sumac dominate this community. Scrub-shrub wetlands were described in Section 3.2, and are dominated by species such as willows, dogwoods, alder, meadowsweet, and common elderberry.
Disturbed/Developed

Disturbed/developed constitutes approximately 327 acres (3%) of the Project area. Disturbed/developed land consists of a combination of several “cultural communities” as defined in the Draft Ecological Communities of New York State (Edinger et. al., 2002). Disturbed/developed lands occur throughout the Project area, and are characterized by the presence of buildings, parking lots, paved and unpaved roads, and lawns. Vegetation in these areas is generally either lacking or highly managed (i.e., mowed lawns or plants seeded along roadsides for erosion control). Volunteer vegetation in these areas is generally sparse, and comprised of old-field, often non-native, herbaceous species such as dandelion, thistle, ragweed, burdock, common mullein, and various upland grasses.

Successional Old Field

Successional old field constitutes approximately 214 acres (2%) of the Project area. As defined by the Draft Ecological Communities of New York State (Edinger et. al., 2002), a successional old field is a meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned. Species found in these areas include orchard grass, timothy, goldenrods, asters, clovers, common milkweed, and Queen Anne’s lace. Shrubs such as honeysuckle are also components of this community, but represent less than 50% of total vegetative cover.

3.3.1.1.2 Significant Natural Communities/Rare Plant Species

The United States Fish and Wildlife Service (USFWS) maintains a website to assist applicants in determining the possible occurrence of federally-listed, proposed, and candidate rare species by county. The lists include all such species known to occur in a given county, as well as those likely to occur there. This online consultation procedure was conducted for Lewis and Jefferson Counties on January 18, 2013. No federally-listed, proposed, or candidate species of plants have been documented in Lewis or Jefferson Counties.

A written request for information regarding state-listed threatened and endangered species and unique or significant natural communities was sent to the New York Natural Heritage Program (NHP). According to the response letters dated February 6, 2012 and January 30, 2013, an occurrence of a confined river has been documented in the vicinity of the Project area. The NYNHP considers this community to be a high quality occurrence of an uncommon community type, with high ecological and conservation value, and therefore, significant from a statewide perspective. In addition, the NYNHP database indicates records for one state-listed plant species in the vicinity of the Project area, rock cress (Draba arabisans). Each of these occurrences is described below:
Confined River
According to the NYNHP (2011a), confined rivers are relatively large, fast flowing sections of streams with a moderate to gentle gradient. They have a well-defined pattern of alternating pools, riffles, and runs, and usually have poorly defined meanders (i.e., low sinuosity). Confined rivers occur in confined valleys and are most typical of the mid-reaches of stream systems. These streams are typically of moderate depth, width, and low flow discharge, and usually represent a network of third- to fourth-order stream segments. Most of the erosion is lateral, creating braids, channel islands, and bars, and deposition is moderate with a mix of coarse rocky to sandy substrate. Waterfalls are often present. Other features include plunge pools, flumes, chutes, cascades, alluvial fans, and mussel beds. These streams have high water clarity, are well oxygenated, and have cool water. They are typically surrounded by open upland riverside communities including riverside sand/gravel bar, cobble shore, or one of the shoreline outcrop communities.

Although this community type has a state heritage ranking of S3, indicating that it is rare within the state, there are probably several hundred occurrences statewide. This community has statewide distribution, and includes several high quality examples. Many documented occurrences have good viability and are protected on public land or private conservation land. The current trend of this community is probably stable for occurrences on public land, or declining slightly elsewhere due to moderate threats related to development pressure or alteration to the natural hydrology (NYNHP, 2011a).

The 2012 letter from the NYNHP indicates that the occurrence of this community in the vicinity of the Project area consists of the Deer River along most of its length, terminating about 1.5 miles upstream of the confluence of Deer River with Black River. This is a large example with few and mostly minor instream disturbances. There is good habitat and species diversity, and mostly intact hydrology. The upper portions are in a large, recovering natural landscape, the lower portions are within a narrow forested corridor in an otherwise predominantly agricultural watershed. Approximately 1 mile of the Deer River flows through the Project area, northeast of the village of Copenhagen. The NYNHP database includes records of two other significant natural communities associated with the Deer River (shale cliff and talus community and riverside sand/gravel bar), but these communities only reach approximately 6 miles north of New Boston, and do not extend into the Project area.

Rock Cress
Also called Whitlow-grass, this member of the mustard family occurs in the northeastern U.S. and eastern Canada, from Minnesota and Ontario in the west, across the Upper Great Lakes states, Ontario, and New York to northern New England, Quebec, and Labrador. New York is on the southern boundary of its range. With a state heritage ranking of S2 and only 12 extant populations known statewide, the State of New York protects
rock cress with a state status of threatened. Habitat consists of dry cliffs, rocky ledges, talus slopes and open woodlands, often on calcareous soils. Most sites for this species are cliffs, and therefore relatively free from the threat of human disturbance. However, deer herbivory, fire, and ecological succession may threaten some populations (NYNHP, 2011b).

The NYNHP (2011b) recommends surveying for rock cress when the plant is in flower (from mid-May to June). Due to the timing of field surveys, the potential on-site occurrence of this rare plant within the Project area has not been assessed. The 2012 letter from the NYNHP indicates that the occurrence of rock cress in the vicinity of the Project area is located at the top of cliffs along the Deer River gorge. However, the population has not been re-located since 1923, and is considered “historical” by the NYNHP.

In summary, reconnaissance-level ecological surveys conducted by edr during 2012 suggested that common ecological communities dominate the Project area. No listed threatened and endangered plant species, or unique or significant natural communities that typically support such species, were observed on site. Follow-up field surveys will be conducted prior to Project construction to determine if any rare plants or significant natural communities occur on site.

### 3.3.1.1.3 Invasive Plant Species

An invasive species is an organism that has been purposefully or accidentally introduced outside its original geographic range, and is able to proliferate and aggressively alter its new environment, potentially causing harm to the economy, environment, or human health. Invasive plant species spread in a number of different ways. Dispersal mechanisms include wind, water, wildlife, vegetative reproduction, and human activity. Populations of invasive species typically establish most readily in places where the ground has been disturbed, thereby exposing the soil. Field surveys identified the following invasive species within the Project area: reed canary-grass (*Phalaris arundinacea*), European common reed grass (*Phragmites australis*), garlic mustard (*Alliaria petiolata*), common buckthorn (*Rhamnus cathartica*), and Morrow's honeysuckle (*Lonicera morrowii*).

### 3.3.1.2 Fish and Wildlife

Fish and wildlife resources within the Project area were identified through analysis of existing data sources, on-site avian and bat studies prepared by Sanders Environmental, Inc. (Sanders) (see Appendix H), correspondence with the NYNHP, and on-site field surveys conducted by edr. Specific information on fish and wildlife resources within the Project area is presented below, organized into sub-sections focused on birds, mammals, reptiles and amphibians, listed threatened and endangered species, fish, and wildlife habitat.
3.3.1.2.1 Birds

To determine the type and number of bird species present within the Project area, existing data sources were consulted and on-site field surveys were conducted. Sources of information included the following:

- USGS Breeding Bird Survey (BBS).
- NYS Breeding Bird Atlas (BBA).
- Audubon Christmas Bird Count (CBC).
- On-site breeding bird surveys conducted by Sanders during 2012.
- On-site raptor migration surveys conducted by Sanders during spring and fall 2012.
- On-site observations by edr ecologists during fall 2012.

Protocols for the on-site avian studies conducted by Sanders were developed in consultation with the NYSDEC. A draft Work Plan for Preconstruction Bird and Bat Studies was submitted to the NYSDEC in March 2012 that included studies consistent with NYSDEC Draft Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects.

Based on existing data, on-site investigations, existing habitat conditions, and species range, it appears that approximately 175 avian species could use the Project area at some time throughout a given year. Details on the Project area’s avian community are presented below:

**Breeding Birds Survey**

The North American Breeding Bird Survey (BBS), overseen by the Patuxent Wildlife Research Center of the USGS, is a long-term, large-scale, international avian monitoring program that tracks the status and trends of North American bird populations. Each survey route is 24.5 miles long, with 3-minute point counts conducted at 0.5-mile intervals. During the point counts, every bird seen or heard within a 0.25-mile radius is recorded. The Highmarket survey route is approximately 6.2 miles south of the nearest turbine. Most of the 140 species recorded on this route since 1968 have been common birds of forest, forest edge, woodland, old field, grassland, and wetland habitats. The most commonly observed species include red-winged blackbird, European starling, American robin, barn swallow, song sparrow, common yellowthroat, American goldfinch, bobolink, common grackle, chestnut-sided warbler, white-throated sparrow, savannah sparrow, red-eyed vireo, rock dove, and American crow. However, four state-listed threatened species (pied-billed grebe, least bittern, northern harrier, and upland sandpiper) and ten state-listed species of special concern (American bittern, Cooper's hawk, northern goshawk, whippoorwill, red-headed
woodpecker, horned lark, golden-winged warbler, cerulean warbler, vesper sparrow, and grasshopper sparrow) were observed during these surveys. These state-listed species have generally been detected in very low numbers. For example, one pied billed grebe was observed in 1985, and none have been detected since; similarly only one least bittern was observed (1977), one Cooper’s hawk (1996), one northern goshawk (1981), one whippoorwill (1978), etc. No federally-listed endangered or threatened species were observed (Sauer et al., 2011).

The BBA is a comprehensive, statewide survey that indicates the distribution of breeding birds in New York State (McGowan & Corwin, 2008). Point counts are conducted by volunteers within 5-km by 5-km survey blocks across the state. The turbine locations proposed for the Copenhagen Wind Farm are located within six New York State BBA blocks (4385B, 4386D, 4485A, 4485B, 4486C, and 4486D). The number of species observed per survey block in the Atlas 2000 project (covering 2000-2005) ranged from 64 to 87, for a cumulative total of 108 different species. The majority of the species identified in the BBA are typical of the mixed forest, successional, and agricultural habitats that dominate the Project area and surrounding area. These species are consistent with regularly occurring nesting species for the region, and are very similar to that indicated by the BBS. However, two state-listed threatened species (northern harrier and upland sandpiper) and five state-listed species of special concern (Cooper’s hawk, sharp-shinned hawk, horned lark, vesper sparrow, and grasshopper sparrow) were recorded in the 2000-2005 BBA. No federally-listed endangered or threatened species were observed in the vicinity of the Project area during either survey (NYSDEC, 2013).

On-site breeding bird surveys were conducted by Sanders (2012a) during the spring and summer of 2012 to provide site-specific information on nesting birds at the Project area. Three separate survey types were conducted: point count surveys, owl surveys, and meandering surveys. The methodology and results of each of the breeding bird surveys are described below:

**Point Count Surveys**

Breeding bird surveys were used to provide an estimate of the type and relative frequency of each species using the habitat in the Project area during nesting time. Based on the project size and configuration, 80 points were surveyed. Points were selected to include potential turbine sites and good grassland habitat near them. Several points also encompassed wetland areas and forested patches. Each sample point was surveyed four times during the breeding season, from late May through mid-July. Surveys were conducted in the morning, from one-half hour before sunrise until no later than 10:30 a.m. Each point count covered a circular plot survey centered on the observation point. Point counts were conducted for five minutes and all birds observed (identified by sight or sound) within approximately 100 meters were recorded. Data recorded for each survey included start and end time of the observation period, and weather information such as temperature, wind speed, wind direction, and cloud cover.
Species identification, number of individuals of each species, method of observation (visual or auditory), and behavior (nesting, flying, perching, singing, etc.) were recorded for each observation during the five minute point count.

A total of 2,529 individual birds, representing 81 different species were observed. The highest numbers of individuals were observed during the first survey in June, while the lowest numbers of individuals were observed during the last survey in June. The greatest species diversity was observed in the first and second round of June surveys. The lowest species diversity was observed in early July. The species composition was generally consistent with what would be anticipated based on habitat and the results of the BBS and BBA. Birds observed in highest relative frequency were red-winged blackbird (21.7%), song sparrow (10.5%), savannah sparrow (6.9%), American robin (6.7%), and common yellowthroat (5.6%). One state-listed species of special concern, horned lark, was observed during the early June survey. Another species of special concern, vesper sparrow, was observed incidentally while on-site, but not during any of the point count surveys. No state- or federally-listed threatened or endangered species were identified during the on-site point count breeding bird surveys (Sanders, 2012a).

Owl Surveys
Seventeen sample points were surveyed in early May specifically focused on detecting short-eared owls, a state-listed endangered species. The surveys were conducted from May 7 to May 11, and consisted of morning and evening surveys conducted at 17 of the breeding bird points. Audio recordings of short-eared owl calls were played at each sample point. Evening surveys were conducted one hour before sunset until two hours after sunset. Otherwise, methods were completed as described above for the point count surveys, except observations were recorded at each point for ten minutes instead of five. No owls of any species were detected during the owl surveys. A total of 419 individual birds representing 49 unique species were observed. The majority of the birds (72%) were observed during the morning survey. The most frequently observed bird species during the short-eared owl surveys were red-winged blackbird (17.9%), American robin (10.0%), song sparrow (9.1%), yellow warbler (6.4%), and bobolink (6.0%). One state-listed species of special concern, horned lark, was observed during the owl surveys. No state- or federally-listed threatened or endangered species were identified during the on-site owl surveys (Sanders, 2012a).

Meandering Surveys
Qualitative meander surveys were conducted within the Project area to supplement breeding bird point counts. Meander surveys are used to target unique habitats and/or species with cryptic behavior that may not be detected during traditional point counts. Here, meander surveys targeted the most suitable habitats for threatened, endangered, and rare grassland birds. Seven meander survey locations were selected to observe for breeding birds.
These areas were surveyed monthly (May, June, and July). Meander survey locations were selected based on 2009 and 2006 aerial photos, with the goal of selecting the most ideal grassland habitat available in the Project area. The locations were selected to target areas containing early successional characteristics, fallow agriculture areas, and active agriculture mixed with edge and wetland habitat. The observer surveyed each location and recorded all birds encountered. Sampling occurred between one half hour before sunrise and 10:30 AM. Each location was approached quietly in order to avoid disturbance of birds. The observer slowly walked around each search location for a minimum of thirty minutes and no more than sixty minutes. Time spent surveying was used as a measure of effort made by the observer and the bird data was interpreted as birds per party hour.

A total of 500 individual birds representing 50 unique species were observed at the seven meander survey locations. The greatest numbers of individual birds was recorded during the July round of surveys. Overall, 49.02 birds were observed per hour. The most frequently observed species were red-winged blackbird (N=83), American robin (N=60), European starling (N=38), savannah sparrow (N=37), and song sparrow (N=37). One state-listed species of special concern, horned lark, was observed during the meander surveys. No state- or federally-listed threatened or endangered species were identified during the on-site meander surveys (Sanders, 2012a).

Migrating Raptors

Spring migratory raptor surveys were conducted by Sanders (2013a) during favorable weather from an observation point near the proposed location for turbine 42, at least four days a week from March 1 to May 31, 2012. In the fall, surveys were conducted from August 15 to December 1 from an observation point near the proposed location for turbine 55, mostly five days a week. Survey count hours occurred from 9:00 AM until approximately 2 hours before sunset. If raptors continued to move through the area after this time, the surveys were extended. Field data on migrating raptors included species identified, number of individuals, sex and age class, flight direction, flight behavior, and estimated flight height. Additionally, weather information, such as temperature, precipitation, cloud cover, visibility, wind speed, and wind direction, were also recorded by the hour.

During the spring surveys, a total of 332 raptors of seven species were identified, 215 of which were considered to be migrants. Turkey vulture was the most frequently observed migrant (N=200), accounting for 93% of the raptors observed. Red-tailed hawk was the second most commonly observed raptor species (N=7), accounting for 3% of the observations. Two state-listed threatened species were observed during the spring raptor migration surveys, a single migrating bald eagle and three local (not migrating) northern harriers. During the fall surveys, a total of 55 raptors of six species were identified, 42 of which were considered to be migrants. Broad-winged hawk and red-tailed hawk were the most frequently observed migrant (N=14 and N=13, respectively), combining to account for 64% of the raptors observed. Turkey vultures were also relatively common (N=10), accounting for 24% of the observations.
Two state-listed species of special concern were observed during the fall raptor migration surveys, a single migrating sharp-shinned hawk and four migrating red-shouldered hawks. No federally-listed endangered or threatened species were observed at the Project area during the raptor surveys (Sanders, 2013a).

The Project area has a much lower raptor passage rate than three other sites in the region with publically available data. During the spring count, the passage rate was 0.492 overall, compared to an average passage rate of 10.2 at the three other sites in the region with spring data available. During the fall count, the passage rate was 0.069 overall, compared to an average passage rate of 8.07 at the three other sites in the region with fall data. The findings from the spring and fall migratory raptor surveys are consistent with knowledge of raptor migration in New York State away from the Great Lakes. Although the majority of raptors observed were flying within the rotor-swept zone of the proposed turbines, the Project area receives relatively low use by migratory raptors, and there is no evidence of a pronounced spring or fall migratory raptor corridor in the vicinity of the Project area (Sanders, 2013a).

Waterbirds

Waterfowl and wading birds are not well represented amongst the breeding birds documented within or near the Project area. The Project area is not located adjacent to any large lakes, marshes, or mudflats that would be expected to attract high numbers of migrating waterbirds. While there are several small marshes, ponds, and streams in the vicinity of the Project area, the site is not unique in this respect. Satellite imagery suggests that these habitat features are well distributed throughout Lewis and Jefferson Counties. Therefore, waterbirds that use these habitats for nesting or during migration will be spread throughout the landscape, not concentrated in any one area.

Wintering Birds

Large concentrations of birds do not winter in the Project area and diversity is low because of the harsh climate and general lack of food sources. Most species present in other seasons (e.g., warblers, flycatchers, and thrushes) migrate south for the winter, leaving only year-round species that are not seasonally displaced (e.g., great horned owl, pileated woodpecker) and some species (e.g., American tree sparrow, rough-legged hawk) that travel south from more northern climates to winter in New York. Data from the Audubon’s Christmas Bird Count (CBC) provides an overview of the birds that inhabit the region during early winter. The primary objective of the CBC is to monitor the status and distribution of wintering bird populations across the Western Hemisphere.

Counts take place on a single day during a three-week period around Christmas, when birdwatchers comb a 15-mile (24 km) diameter circle in order to tally up all bird species and individuals observed. The Watertown count circle is centered approximately 8.5 miles west of the Project area. The number of wintering species observed in this count circles ranged between 41 and 64 species per year over the last 10 years, with a total of 90 different species
recorded. The most common wintering bird species observed were American crow, Canada goose, European starling, rock dove, snow bunting, greater scaup, house sparrow, common redpoll, common merganser, mourning dove, common goldeneye, wild turkey, and mallard. The following state-listed avian species were also documented: short-eared owl (endangered); pied-billed grebe, bald eagle, and northern harrier (threatened); and common loon, sharp-shinned hawk, Cooper's hawk, northern goshawk, and horned lark (special concern). No federally-listed endangered or threatened species were recorded (National Audubon Society, 2013).

3.3.1.2.2 Mammals

Due to a lack of existing data regarding mammals within the Project area, the occurrence of mammalian species was documented entirely through on-site field surveys and evaluation of available habitat. This effort suggests that approximately 40 species of mammals could occur in this area. Field surveys conducted by edr and Sanders documented the presence of 13 species within the Project area, through direct visual observation or signs of their occurrence such as tracks or scat. These species include raccoon, whitetail deer, moose, beaver, woodchuck, skunk, coyote, and various bats (described in additional detail below). Species not observed, but likely to occur in the area include weasels, mink, muskrat, porcupine, foxes, and a variety of small mammals, such as mice and shrews. All of the observed species are common and widely distributed throughout New York State.

Bats

Nine species of bat occur in New York State (Stegemann & Hicks, 2008). These include six species of cave bats (big brown bat, eastern small-footed myotis, little brown bat, Indiana bat, northern myotis, and tri-colored bat) and three species of tree bats (silver-haired bat, eastern red bat, and hoary bat). Habitats utilized by these bats include wetlands, agricultural and reverting fields, forests, and developed areas with a variety of micro-habitats used for foraging, roosting, and maternity roosting. Cave bats require specialized habitats for winter hibernacula, where resident bat species congregate during hibernation periods (November through March). Identified hibernacula include limestone caves, old mines, and old well shafts, where a moderated constant temperature and humidity enable hibernating cave bats to survive over the winter. Resident bats migrate relatively short distances to these hibernacula, while migratory bat species travel farther south to warmer climates. Summer roosts are where bats rest during the day, and include buildings, exfoliating tree bark, tree cavities, rock piles, and caves depending on species-specific preferences. Tree bats roost in trees year round, migrating south in winter to maintain access to their insect prey.

Generally bats are solitary outside of mating and hibernation periods, although some colonial roosting does occur. The most common species of bats found in New York prior to the onset of white-nose syndrome were little brown bat,
tricolored bat, big brown bat, and eastern red bat. These species utilize a wide variety of habitat types including human-altered landscapes, and therefore are assumed to utilize the Project area. Population levels for the remaining bat species are not as well-known, therefore, their potential occurrence and abundance in the area are much more difficult to predict. Indiana bat is a state and federally-listed endangered species, and eastern small-footed myotis is listed as a species of special concern by New York State.

To characterize and document bat activity within the Project area, Sanders conducted acoustic monitoring and mist netting surveys (see Appendix H). Protocols for the on-site bat studies followed the NYSDEC’s 2009 *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Project* and the USFWS’s *Indiana Bat Mist Netting Guidelines*. Acoustic monitoring surveys were designed to gather information on the bat activity within the Project area, while the mist netting surveys were specifically designed to assess the presence or absence of the federally endangered Indiana bat.

The acoustic monitoring was conducted using two Pettersson D500x bat detectors deployed on/near the meteorological tower, which is located in the eastern portion of the Project area, in an agricultural field. A pulley system was used to position the upper detector at a height of 58 meters (198 feet), and to aim it away from the tower. The lower detector was fastened to a barrel, 1 meter (3.3 feet) above the ground, with a 30 degree upward angle. The D500X is a direct, ultrasound recording unit intended for long-term, unattended recording of bat calls. Each detector was equipped with an external battery and was contained in a padded modified surplus ammunition box to keep the system dry. During each visit, a fresh battery and memory cards were installed, and a quick inspection for problems in the pulley system and detector operation was conducted. Visits were undertaken every one to three weeks throughout the monitoring period, generally about once a week. Exact visit dates were determined by weather and the presence or absence of technical problems on prior visits. The detectors were maintained and monitored from April 15th through October 15th, 2012. The detectors were non-functional for a brief period at the end of April and beginning of May, when data was not recorded due to a computer error. Overall, the upper detector was operational for 1,926 hours (91.5% of the sample period), while the lower detector was operational for 2,054 hours (97.6% of the sample period). Weather data was provided by OwnEnergy. The data provided included two sets of temperature and wind speed, one near the height of each detector, with data recorded every ten minutes.

A total of 281 recordings were identified as bat calls. The upper detector recorded 182 calls during the 168 day operational period, for an average of 1.08 bat calls per night. The lower detector recorded 99 calls during the 179 operational days, for an average of 0.55 bat calls per night. Of the 182 calls recorded at the upper detector, the majority (N=162, 89%) were identified to species. Hoary bat was most frequently recorded (N=94, 51.6%), followed by silver-haired bat (N=59, 32.4%), red bat (N=7, 3.8%), and big brown bat (N=2, 1.1%). The remaining 20 calls
were only identifiable to group, but all consisted of either big brown bat or various tree bats. Of the 99 calls recorded at the lower detector, the majority (N=92, 93%) were identified to species. Silver-haired bat was most frequently recorded (N=41, 41.4%), followed by big brown bat (N=32, 32.3%), hoary bat (N=18, 18.1%), and red bat (N=1, 1%). The remaining seven calls, identifiable only to group, mostly consisted of big brown bat or various tree bats, but also included 1 call identified as a myotid species (i.e., either little brown bat or Indiana bat).

Overall, bats were most active during the 2nd and 3rd hours of recording, with the period from ½ hour after sunset to 2½ hours after sunset representing 46.7% of the calls recorded by the upper detector and 40.4% of the calls recorded by the lower detector. The majority of the calls were recorded between July 1st and September 1st (81.9% and 85.9% of calls recorded at the upper and lower detectors, respectively). After September 1st, only eight calls (4.4%) were recorded by the upper detector and six calls (6.1%) were recorded by the lower detector. Prior to July 1st, 25 calls (13.7%) were recorded by the upper detector and only eight calls (8.1%) were recorded by the lower detector. The majority of species recorded at both detectors were tree bats (upper= 171 calls, 94%; lower= 59 calls, 60%). Both detectors showed significant positive correlations between hourly bat activity and temperature. This suggests that as temperature increased, bat activity also increased. There was not a significant correlation between hourly bat activity and wind speed at either height (Sanders, 2012b).

Mist netting was conducted at 26 sites within the Project area between May 25 and June 14, 2012. In addition to following the USFWS netting guidelines, acoustic surveys were performed because of concerns about the effectiveness of netting alone in a post-white nose syndrome landscape. An acoustic detector was run near each net site concurrent with netting, at a location appropriate for capturing acoustic calls (i.e., a less cluttered/more open location than nets would normally be set in). One Pettersson D500X bat detector was deployed per night per site. The detectors were attached to the top of a four foot pole, with the microphone aimed at a 45 degree upward angle. The detectors were placed on the edge of open areas (fields, large corridors, creek corridors, etc.), which have fewer obstacles for bats to navigate around. This placement helps ensure call characteristics similar to those used as the basis for software that classifies bat calls to species (Sanders, 2013b).

A total of 41 bats of five species were captured during the mist netting: 29 big brown bats, six silver-haired bats, three northern myotis, two hoary bats, and one eastern red bat. Capture rates averaged 1.6 bats per mist net site. During the 267.5 hours of acoustic monitoring conducted concurrent with mist netting, 995 files were recorded, for an average of 3.7 identifiable calls/per hour. The acoustic detectors were functional 100% of the time mist net sampling was conducted. Identifiable call sequences were recorded from the following six species: big brown bat (N=446, 45%), hoary bat (N=232, 23%), silver-haired bat (N=202, 20%), red bat (N=35, 3.5%), little brown bat (N=31, 3.1%), and northern myotis (N=1, 0.1%). An additional 48 calls (4.8%) were not identifiable to species. Of these, 35 were
classified as evening bat, which does not occur in New York State. Sanders (2013b) indicated that these classifications are most likely fictitious, caused by approach phase or faint calls, and the true identity of these calls remains unknown. A total of 13 myotid calls were recorded at four different sites that could not be identified to the species level. Although neither species were captured in the nets at those sites, based on acoustic characteristics, the unknown myotid calls were tentatively identified as either little brown bat or Indiana bat (Sanders, 2013b). Since their calls are so difficult to distinguish from those of other more common myotids, acoustic surveys cannot rule out the possible presence of either Indiana bat or eastern small-footed bats.

3.3.1.2.3  Reptiles and Amphibians

Reptile and amphibian presence within the Project area was determined primarily through review of The Amphibians and Reptiles of New York State (Gibbs et al., 2007). This reptile and amphibian resource book is based on the New York State Amphibian and Reptile Atlas. The Atlas Project was a 10-year survey (1990 through 1999) designed to document the geographic distribution of the state’s herptofauna. Atlas data was collected and organized according to USGS 7.5-minute quadrangles (NYSDEC, 2007). Based on this data, along with documented species ranges and existing habitat conditions, it is estimated that approximately 22 reptile and amphibian species could occur in the area (NYSDEC, 2007; Gibbs et. al., 2007). Of these, three species were documented on-site by edr during ecological surveys in 2012: green frog, pickerel frog, and spring peeper. Species not observed, but likely to occur on the Project area include wood frog, bull frog, leopard frog, American toad, painted turtle, snapping turtle, red-spotted newt, spotted salamander, northern two-lined salamander, northern redback salamander, and common garter snake. All of these species are common and widely distributed throughout New York State.

3.3.1.2.4  Fish

Although no fisheries data has been obtained or field surveys conducted, ponds and streams within and adjacent to the Project area likely support both native and stocked fish populations. One state-classified trout streams flows through the Project area, Boynton Creek. This stream likely supports a cold-water fish community including trout, creek chub, and slimy sculpin. In addition, ponds and beaver impoundments in the vicinity of the Project area likely support a warm-water fish community (e.g., bass, sunfish, and shiners).

3.3.1.2.5  Wildlife Habitat

There are no New York State Wildlife Management Areas (WMAs) or Bird Conservation Areas (BCAs) within the Project area, nor any land designated by the National Audubon Society as an Important Bird Area (IBA). The nearest State WMAs include the Brownville WMA (located 9.3 miles northwest of the transmission site), the Tug Hill WMA (located 9.5 miles south of the generating site), the Dexter Marsh WMA (located 9.9 miles west of the transmission
site), the Perch River WMA (located 10.6 miles northwest of the transmission site), and the Little John WMA (located 13.3 miles southwest of the generating site). The Perch River BCA, encompassing the entire Perch River WMA, is the only New York State BCA in the vicinity of the Project area. The nearest IBAs include the Fort Drum Grasslands (located 4.8 miles north of the Project area), the Perch River Complex (located 5.1 miles northwest of the transmission site), and the Tug Hill IBA (located 9.3 miles south of the generating site).

As previously described, the Project area includes a variety of ecological community types. The value of these communities to various wildlife species is summarized below.

Forestland
Results of the on-site breeding bird survey indicate that forest habitat within the Project area provides habitat for wildlife species that require forest interior conditions, such as wood thrush, veery, red-eyed vireo, black-and-white warbler, hairy woodpecker, and pileated woodpecker (Sanders, 2012a). However, many of the forests on site have been subject to past and on-going logging activity. This activity has resulted in the thinning or clearing of overstory trees, and the development of forest roads and clearings in many forested areas on site. Consequently, these areas have already experienced some degree of forest fragmentation and may not provide the high quality forest interior conditions preferred by the afore-mentioned bird species. Mammals that utilize forested habitat include gray squirrel, red squirrel, eastern chipmunk, beaver, black bear, porcupine, and whitetail deer.

Successional Old Field and Wet Meadows
These grass/forb dominated areas occur primarily on reverting agricultural fields and in wetlands, as well as along roadsides and electrical right-of-ways. Due to their relatively small size, most of these areas do not provide preferred nesting and foraging habitat for grassland bird species such as bobolink, horned lark, eastern meadowlark, savannah sparrow, and song sparrow. However, the on-site BBS documented these species breeding in the Project area (Sanders, 2012a), and the vegetation in these fields provides forage in the form of seeds and foliage, which is utilized by a wide variety of birds, as well as small mammals (mice, shrews, etc.), whitetail deer, and eastern cottontail. Birds of prey, such as northern harrier and red-tailed hawk, and mammalian predators, such as red fox and eastern coyote, also use such habitats as hunting areas.

Successional Shrubland and Scrub-Shrub Wetland Habitats
Shrub-dominated habitats (both wetland and upland) provide nesting and escape cover for a variety of wildlife species. Various songbirds observed during the on-site BBS, such as gray catbird, American goldfinch, indigo bunting, and yellow warbler, require low brushy vegetation for nesting and escape cover (Sanders, 2012a). Whitetail deer and eastern cottontail are also typically found in brushy edge habitat. In addition, many of the shrub species
found in these areas produce berries, which provide food sources for birds and mammals such as raccoon, striped skunk, and opossum.

3.3.1.2.6 Threatened and Endangered Wildlife Species

As mentioned previously, a written request for listed species documentation was sent to the NYNHP. In addition, the results of on-site surveys and existing data sources, including the NYS Amphibian and Reptile Atlas, the BBS, the BBA, and the CBC, were consulted to assess the potential presence of state- and/or federally-listed threatened and endangered species.

The letters from the NYNHP indicate several occurrences of upland sandpiper within and immediately adjacent to the Project area. This species is listed as threatened in New York State, and is discussed in detail below.

Upland Sandpiper
Breeding adults are scaly brown in appearance, with a white throat and abdomen. They are 11-13 inches in size with long, yellow legs; a long, thin neck; and a small round head with large eyes ringed with white and a short, slightly curved bill. An obligate grassland species, their breeding range extends from southern Canada south through the central plains states from the Rocky Mountains east to the Appalachian Mountains. Preferred habitat includes large areas of short grass for feeding and courtship with interspersed or adjacent taller grasses for nesting and brood cover. In the northeastern U.S., airfields currently provide the majority of suitable habitat, though grazed pastures and grassy fields also are used. Heavy or early grazing, standing water, burning, and recent manure application may reduce or exclude nesting from fields accepted the previous year. Abandoned fields with invading shrubs and trees also sometimes exclude upland sandpipers. Large pastures with small perimeter/area ratios (i.e., fewer edges) seem to be preferred, particularly those that are homogenous in floristic structure (i.e., have few plant species) with nearby barns and fence posts for perching (NYNHP, 2011c).

The State of New York protects this species with a status of threatened. The state heritage rank for this species is S3B, indicating 21-100 breeding occurrences or limited breeding acreage. This species has declined dramatically within the state since the mid-1980s, both in distribution and abundance. The overall statewide distribution has decreased 65%, while abundance has declined by about 16% per year. All regions of the state showed steep declines in occupancy, and the statewide population appears to be collapsing toward its core in Jefferson County. The primary threats of agricultural conversion, fragmentation, and intensification are ongoing and expected to increase (NYNHP, 2011c).
In addition to occurrences within the Project area, the NYNHP also provides database records for avian species within 10 miles of the Project area and bat species within 40 miles of the Project area. The 2012 correspondence includes records for the following state-listed bird species: black tern and short-eared owl (endangered); and northern harrier, Henslow’s sparrow, sedge wren, bald eagle, least bittern, and pied-billed grebe (threatened). Eastern small-footed myotis (state-listed as special concern) and Indiana bat (state and federally-listed as endangered) have been documented within 40 miles of the Project area. The NYNHP letter also notes the presence of a waterfowl winter concentration area within 10 miles of the Project area.

As described above, the USFWS maintains a website to assist applicants in determining the possible occurrence of federally-listed, proposed, and candidate rare species by county. The lists include all such species known to occur in a given county, as well as those likely to occur there. This online consultation procedure was conducted for Lewis and Jefferson Counties on January 18, 2013. Piping plover and Indiana bat, both federally-listed as endangered, were identified as species that could potentially be affected by the proposed Project. Habitat requirements, distribution, threats, and likelihood of occurrence are assessed below for each of these species.

**Indiana Bat**

The Indiana bat is a small bat, approximately 2 inches in length and weighing approximately 0.2 to 0.3 ounces (Harvey et al., 1999; NYSDEC, 2006). The range of the Indiana bat includes much of the eastern United States. Hibernacula are known to occur in the following counties of New York State: Albany (N=1), Essex (N=2), Jefferson (N=1), Onondaga (N=1), Ulster (N=4), and Warren (N=1). Maternity colonies have been identified through radio-telemetry studies and mist-net captures in Dutchess, Essex, Jefferson, Onondaga, and Ulster counties. Bachelor colonies have also been identified through radio-telemetry studies and mist-net captures in Albany, Dutchess, Jefferson, Orange, and Ulster counties. The Indiana bat has both a state and federal protection status of endangered. The state heritage rank for this species is S1 indicating typically 5 or fewer occurrences, very few remaining individuals, or biological factors that make the species especially vulnerable in New York State (NYNHP, 2011d).

Indiana bats hibernate in caves and mines during the winter. Indiana bats radio-tracked from hibernacula in Jefferson, Essex, and Ulster Counties were found to move between approximately 12 and 40 miles to roost location on their foraging grounds. The roosts consisted of living, dying, and dead trees in both rural and suburban landscapes (NYNHP, 2011d).

The proposed turbines are potentially within the range of bats migrating from the Jefferson County hibernaculum, and the Project area supports suitable roosting and foraging habitat for this species. Since
acoustical monitoring cannot distinguish to the species level for the genus *Myotis*, there is the potential that Indiana bat could be present within the Project area. As described above, 1 myotid bat call was recorded during acoustical monitoring that could not be identified to species, but was thought to be either Indiana bat or little brown bat (Sanders, 2012b). Neither species was captured during mist netting, although the acoustic monitoring conducted concurrently with the netting effort recorded 13 myotid calls thought to have been made by either Indiana bat or little brown bat (Sanders, 2013b). However, the potential for Indiana bat presence within the Project area is considered low, because of the location of the site in relation to documented hibernaculum. The Glen Park hibernaculum is located in Jefferson County, approximately 13 miles northwest of the generating site. However, a 2005 NYSDEC radio telemetry study showed that female bats emerging from hibernation at the Glen Park hibernaculum generally fly north, northwest, west, southwest, and south to maternal roost sites. Of the 71 bats that were tracked in the study, 100% moved to summer roost sites in Jefferson County. No tracked bats flew southeast toward the Project area, and none flew to maternal roost sites in Lewis County (NYSDEC, unpublished data). This data suggests that Indiana bats from the Glen Park hibernaculum are unlikely to use trees within the Project area for maternal roost colonies.

Before the onset of white nose syndrome (WNS) in the winter of 2006, the ten Indiana bat hibernacula within New York State appeared to be stable. The maximum total count had increased from approximately 13,000 to 41,000 Indiana bats. Despite the increase in numbers, the population was still considered vulnerable, due to the concentration of overwintering bats at a few limited sites, many of which occur in areas subject to increasing development (NYNHP, 2011d). Since that time, WNS has decimated populations of cave-dwelling bats within New York State. By April 2012, the NYSDEC reported Indiana bat populations had declined 71% statewide from peak population numbers observed prior to the introduction of WNS (NYSDEC, 2012b).

**Piping Plover**

The piping plover is 5.5-7 inches in length, with orange legs and a short, stout bill. Adults in breeding plumage have a white breast, sand-colored upperparts, a dark forehead stripe, and a black neck-ring. Piping plovers are federally-listed as endangered in the Great Lakes, and as threatened on the Atlantic coast. The NYSDEC has listed this species as endangered in the state. Protection of nests and eggs from predators and disturbance has been successful at stabilizing numbers. Piping plovers nest on open, sparsely-vegetated beaches and sandflats between the primary dune and high tide line. Nests, which are shallow scrapes, are made during courtship and are sometimes lined with pebbles and/or shells. Vegetative cover is generally less than 20%. However, a small amount of vegetative cover may protect chicks from
exposure to the sun and wind. In the winter, piping plovers use both coastal and inland beaches, algal bay flats, mudflats, and sandflats along the Gulf of Mexico, inland bays, and Atlantic coast (NYNHP, 2011e).

Threats to piping plovers include habitat loss, nest and chick predation, human disturbance, and low population numbers. Habitat loss has occurred over time as beaches have been converted for residential and recreational use. Natural succession and vegetative regrowth of the open sand beaches used for nesting decrease habitat quality for this species. Habitat availability for this species will only continue to decline with rising sea-levels and increased storms due to global climate change. Habitat fragmentation may also be a significant issue in some areas. Beach management practices, including raking and allowing ORV traffic, may eliminate or reduce the wrack line left by the tide which is a prime foraging environment. Human activity not only limits habitat available to the plovers, but it is disruptive during the breeding season to adults and chicks. Human presence near nesting habitats has also likely increased nest predators such as raccoons, crows, and rats (NYNHP, 2011e).

The distribution of piping plovers in New York remained largely unchanged from the first BBA to the second. Seventy-five atlas blocks were occupied during the first atlas effort in 1980-1985 and 76 in the second effort in 2000-2005; an increase of 1% (McGowan & Corwin, 2008). However, NYSDEC population counts show that numbers are on the rise and stabilizing. There were only 114 breeding pairs in 1985, 187 in 1992, 294 in 1995, and 437 in 2009 (NYNHP, 2011e). The historical range in New York includes two subspecies: *Charadrius melodus* occupying Long Island and *C. m. circumcinctus* occupying the Great Lakes. The Great Lakes population was largely extirpated by 1955, with only one subsequent brood discovered during the first BBA in Oswego County in 1984. No Piping Plovers were found in the Great Lakes Region during the second BBA in 2000 to 2005 (McGowan & Plovers, 2008).

Suitable breeding habitat for piping plovers does not occur within the Project area. Furthermore, populations of this rare bird in New York State appear to be restricted to Long Island. Therefore, occurrence of this species within the Project area is considered extremely unlikely.

Other sources of information about listed species include publicly available databases such as the BBS, the BBA, the CBC, and the New York State Amphibian and Reptile Atlas. BBS survey data indicate that four state-listed threatened species (pied-billed grebe, least bittern, northern harrier, and upland sandpiper) and ten state-listed species of concern (American bittern, Cooper’s hawk, northern goshawk, whippoorwill, red-headed woodpecker, horned lark, golden-winged warbler, cerulean warbler, vesper sparrow, and grasshopper sparrow) have been recorded in the general area of the Project area (Sauer et al., 2011). According to BBA data, two state-listed
threatened species (northern harrier and upland sandpiper) and five state-listed species of special concern (Cooper's hawk, sharp-shinned hawk, horned lark, vesper sparrow, and grasshopper sparrow) have been documented in the vicinity of the Project area (NYSDEC, 2013). According to CBC data, one state-listed endangered species (short-eared owl), three state-listed threatened species (pied-billed grebe, bald eagle, and northern harrier) and five state-listed special concern species (common loon, sharp-shinned hawk, Cooper's hawk, northern goshawk, and horned lark) have been observed in the vicinity of the Project area (National Audubon Society, 2013).

The presence of state- and federally-listed threatened and endangered species was also assessed during site-specific ecological, avian, and bat studies. During spring and fall raptor migration surveys, two state-listed threatened species (northern harrier and bald eagle), and two state-listed special concern species (sharp-shinned hawk and red-shouldered hawk) were observed (Sanders, 2013a). During on-site breeding bird surveys, two state-listed special concern species (horned lark and vesper sparrow) were detected (Sanders, 2012a).

A summary of state-listed wildlife species documented to occur in the vicinity of the Project area is presented below in Table 7. Please note: only those species with an “OS” prefix in the source column were actually observed on-site.

Table 7. State-listed Wildlife Species Documented in the Vicinity of the Project area.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>NYS Legal Status</th>
<th>Source1</th>
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<tr>
<td>Birds</td>
<td></td>
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<tr>
<td>Short-eared Owl</td>
<td>Asio flammeus</td>
<td>Endangered</td>
<td>NHP, CBC</td>
</tr>
<tr>
<td>Piping Plover2</td>
<td>Charadrius melodus</td>
<td>Endangered</td>
<td>FWS</td>
</tr>
<tr>
<td>Black Tern</td>
<td>Chlidonias niger</td>
<td>Endangered</td>
<td>NHP</td>
</tr>
<tr>
<td>Henslow's Sparrow</td>
<td>Ammodramus henslowii</td>
<td>Threatened</td>
<td>NHP</td>
</tr>
<tr>
<td>Upland Sandpiper</td>
<td>Bartramia longicauda</td>
<td>Threatened</td>
<td>OS-NHP, NHP, BBS, BBA</td>
</tr>
<tr>
<td>Northern Harrier</td>
<td>Circus cyaneus</td>
<td>Threatened</td>
<td>OS-RMS, NHP, BBS, BBA, CBC</td>
</tr>
<tr>
<td>Sedge Wren</td>
<td>Cistothorus platensis</td>
<td>Threatened</td>
<td>NHP</td>
</tr>
<tr>
<td>Bald Eagle</td>
<td>Haliaeetus leucocephalus</td>
<td>Threatened</td>
<td>OS-RMS, NHP, CBC</td>
</tr>
<tr>
<td>Least Bittern</td>
<td>Ixobrychus exilis</td>
<td>Threatened</td>
<td>NHP, BBS</td>
</tr>
<tr>
<td>Pied-billed Grebe</td>
<td>Podilymbus podiceps</td>
<td>Threatened</td>
<td>NHP, BBS, CBC</td>
</tr>
<tr>
<td>Cooper's Hawk</td>
<td>Accipiter cooperii</td>
<td>Special Concern</td>
<td>BBS, BBA, CBC</td>
</tr>
<tr>
<td>Northern Goshawk</td>
<td>Accipiter gentilis</td>
<td>Special Concern</td>
<td>BBS, CBC</td>
</tr>
<tr>
<td>Sharp-shinned Hawk</td>
<td>Accipiter striatus</td>
<td>Special Concern</td>
<td>OS-RMS, BBA, CBC</td>
</tr>
<tr>
<td>Grasshopper Sparrow</td>
<td>Ammodramus savannarum</td>
<td>Special Concern</td>
<td>BBS, BBA</td>
</tr>
<tr>
<td>American Bittern</td>
<td>Botaurus lentiginosus</td>
<td>Special Concern</td>
<td>BBS</td>
</tr>
<tr>
<td>Red-shouldered Hawk</td>
<td>Buteo lineatus</td>
<td>Special Concern</td>
<td>OS-RMS</td>
</tr>
<tr>
<td>Whippoorwill</td>
<td>Caprimulgus vociferus</td>
<td>Special Concern</td>
<td>BBS</td>
</tr>
<tr>
<td>Cerulean Warbler</td>
<td>Dendroica cerulean</td>
<td>Special Concern</td>
<td>BBS</td>
</tr>
</tbody>
</table>
3.3.2 Potential Impacts

3.3.2.1 Construction

Anticipated construction-related impacts to vegetation, wildlife, and listed threatened and endangered species are outlined in the following section, based on the current Project layout and studies conducted to date.

3.3.2.1.1 Vegetation

Project construction will result in temporary and permanent impacts to vegetation within the Project area. However, Project components have been sited so as to minimize impact to undisturbed habitat. Many of the proposed turbines would be located within or adjacent to agricultural land, which generally does not support native plant species. No rare or endangered plant species are known to occur within the Project area; all of the plant species observed within the Project area are common in New York State. Therefore, it is anticipated that no plant species occurring in the Project area will be extirpated or significantly reduced in abundance as a result of construction activities.

Construction-related impacts to vegetation include cutting/clearing, removal of stumps and root systems, and increased exposure/disturbance of soil. Along with direct loss of (and damage to) vegetation, these impacts can result in a loss of wildlife food and cover, increased soil erosion and sedimentation, a disruption of normal nutrient cycling, and the introduction or spread of invasive plant species. Impacts to vegetation will result from site preparation, earth-moving, and excavation/backfilling activities associated with construction/installation of staging areas, access roads, foundations, and buried electrical interconnect and transmission line. Based on the area of impact assumptions described in Section 2.6 (Project Construction), these activities will result in disturbance to approximately 590 acres within the Project area. As indicated in Table 8, the majority of the calculated impacts will

---

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>NYS Legal Status</th>
<th>Source(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horned Lark</td>
<td><em>Eremophila alpestris</em></td>
<td>Special Concern</td>
<td>OS-BBS, BBS, BBA, CBC</td>
</tr>
<tr>
<td>Common Loon</td>
<td><em>Gavia immer</em></td>
<td>Special Concern</td>
<td>CBC</td>
</tr>
<tr>
<td>Red-headed Woodpecker</td>
<td><em>Melanerpes erythrocephalus</em></td>
<td>Special Concern</td>
<td>BBS</td>
</tr>
<tr>
<td>Vesper Sparrow</td>
<td><em>Poecetes gramineus</em></td>
<td>Special Concern</td>
<td>OS-BBS, BBS, BBA</td>
</tr>
<tr>
<td>Golden-winged Warbler</td>
<td><em>Vermivora chrysoptera</em></td>
<td>Special Concern</td>
<td>BBS</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indiana Bat(^2)</td>
<td><em>Myotis sodalis</em></td>
<td>Endangered</td>
<td>NHP, FWS</td>
</tr>
<tr>
<td>Eastern Small-footed Bat</td>
<td><em>Myotis leibii</em></td>
<td>Special Concern</td>
<td>NHP</td>
</tr>
</tbody>
</table>

\(^1\) Source: OS-BBS = On-Site Breeding Bird Survey (includes point count, meander, and owl survey methods); OS-RMS = On-Site Raptor Migration Surveys; BBS = USGS Breeding Bird Survey; BBA = New York State Breeding Bird Atlas; CBC = Christmas Bird Count; OS-NHP = Natural Heritage Program correspondence (species identified as occurring within the Project area); NHP = Natural Heritage Program correspondence (species identified as occurring within the 10 miles of the Project area for birds or within 40 miles for bats); FWS = US Fish & Wildlife Service consultation website (includes records for all of Jefferson and Lewis Counties).

\(^2\) Also federally-listed as endangered.
be temporary, and native vegetation will be allowed to regenerate following restoration of areas disturbed during construction. Construction-related impacts to wetlands were previously discussed in Section 3.2.

Table 8. Impacts to Vegetation

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Disturbance (acres)</th>
<th>Temporary Disturbance (acres)</th>
<th>Permanent Loss (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Turbines and Workspaces</td>
<td>178.8</td>
<td>166.4</td>
<td>12.4</td>
</tr>
<tr>
<td>Access Roads</td>
<td>205.0</td>
<td>164.0</td>
<td>41.0</td>
</tr>
<tr>
<td>Electrical Collection Lines</td>
<td>70.3</td>
<td>70.3</td>
<td>0</td>
</tr>
<tr>
<td>Transmission Line</td>
<td>118.3</td>
<td>118.3</td>
<td>0</td>
</tr>
<tr>
<td>MET Towers</td>
<td>3.0</td>
<td>2.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Staging Area</td>
<td>8.0</td>
<td>8.0</td>
<td>0</td>
</tr>
<tr>
<td>Collection Station</td>
<td>2.0</td>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Point of Interconnect Station</td>
<td>1.1</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td>O&amp;M Building</td>
<td>3.5</td>
<td>1.0</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>590.0</strong></td>
<td><strong>531.9</strong></td>
<td><strong>58.1</strong></td>
</tr>
</tbody>
</table>

Habitat fragmentation divides once continuous, large populations into many smaller ones, and can be a significant threat to rare and endangered plant species. By making populations smaller and more isolated, fragmentation can reduce genetic diversity, and eventually lead to local population or even species extinction. However, many plant species have evolved in naturally small, isolated populations and are thereby well adapted to surviving under these special conditions. Several types of rarity are acknowledged in plant ecology: (1) rare species may be confined to a geographically narrow range, such as alpine plants, (2) they may occur only in a narrow and very specific habitat range, such as wetlands, or (3) species may occur in small numbers and densities, which means that local population sizes are always small. Whether a rare species becomes endangered depends on mode of reproduction, dispersal ability, and habitat specificity, along with the structure of the intervening landscape (Lienert, 2004). As indicated above, no rare or endangered plant species are known to occur within the Project area. Therefore, Project-related habitat fragmentation is not anticipated to have significant impacts to plant species within the Project area.

As indicated above, an invasive species is an organism that not-native and is able to rapidly spread, aggressively alter its new environment, and cause harm to the economy, environment, or human health. Populations of invasive species typically establish most readily in places where the ground has been disturbed, thereby exposing the soil. As indicated above, construction activities will result in the disturbance of approximately 590 acres within the Project area. These areas will be especially vulnerable to the introduction of invasive species. Ecological surveys conducted during the fall of 2012 identified the following invasive species within the Project area: reed canary-grass, European common reed grass, garlic mustard, common buckthorn, and Morrow's honeysuckle. The Copenhagen Wind Farm will utilize an Invasive Species Control Plan (ISCP) to minimize the spread of invasive species within
federal and NYSDEC regulated wetlands, streams, and other riparian areas affected by wind development activities on-site. The goal of the ISCP is to prevent expansion of invasive species. The ISCP is described in more detail below in Section 3.3.3.1, and is attached to this DEIS as Appendix I.

3.3.2.1.2 Fish and Wildlife

Construction-related impacts to wildlife are anticipated to be limited to incidental injury and mortality due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth-moving activities, and displacement of wildlife due to increased noise and human activities. Each of these potential impacts is described below.

Incidental Injury or Mortality
Incidental injury and mortality should be limited primarily to sedentary/slow-moving species such as small mammals, reptiles, and amphibians that are unable to move out of the area being disturbed by construction. If construction occurs during the nesting season, wildlife subject to mortality could also include the eggs and/or young offspring of nesting birds, as well as immature mammalian species that are not yet fully mobile. More mobile species and mature individuals should be able to vacate areas that are being disturbed by construction. Vehicle-related mortality may increase temporarily due to the increased traffic during construction; however, as traffic decreases upon the completion of construction, so will wildlife-vehicle collisions.

Tall construction cranes used to erect the turbine components, including the tower, nacelle, and rotors, could potentially serve as obstacles to a small number of migrant birds. If collisions are to occur, they would most likely occur during nighttime because the cranes would be visible and easily avoided during daylight hours. Therefore, collision risk is expected to be greater among migratory songbirds (primarily nocturnal migrants) and waterbirds (occasional nocturnal migrants) than among raptors (primarily diurnal migrants). Erected turbines would not be operational during the construction period, but would pose a similar minor collision risk.

Silt and Sedimentation
Earth-moving activities (including foundation excavation and back-fill, widening of existing roads and construction of new access roads) may result in sediment and siltation impacts to aquatic habitat. These impacts could occur down slope of areas subject to significant earth-moving activity (e.g., turbine sites). Siltation and sedimentation of water bodies can adversely affect water quality and aquatic habitat. It can also interfere with the respiration of aquatic organisms and the survival of fish and amphibian eggs and larvae.
Habitat Disturbance/Loss

As mentioned previously, Project components have been sited so as to minimize impact to undisturbed habitat. Many of the proposed turbines would be located in or adjacent to agricultural land, which in general provides habitat for only a limited number of wildlife species. In addition, these areas are already subject to periodic disturbance in the form of mowing, plowing, harvesting, etc. However, approximately 531.9 acres of wildlife habitat will be temporarily disturbed during construction, while permanent loss through conversion of natural habitat to built facilities will total 58.1 acres. Ground-disturbing construction activities could also reduce the availability of stopover habitat for migratory birds within the landscape, directly through the loss of habitat and indirectly by inducing avoidance of stopover habitat in response to visual and/or noise disturbance (Strickland et al., 2011). Changes in vegetation could also influence the behavior of bats by changing microclimatic conditions and the quality of habitat for foraging or roosting bats (NRC, 2007). Bats may also become attracted to openings made in forested areas from tree clearing activities for turbines and access roads, as they may find foraging opportunities in the openings. It is anticipated that any bats that are present in the Project area would return to areas that were temporarily disturbed following the completion of construction activity. Significant adverse impacts on bat populations are not expected during construction of the Project, especially if tree clearing activity can be limited to the winter months.

On a landscape scale, there is abundant availability of habitats similar to those of the Project within the nearby landscape. It is anticipated that 290.5 acres of agricultural land will be directly impacted by Project construction. Natural communities will also experience construction-related disturbance, including approximately 192.5 acres of forest, 67 acres of shrubland, and 36 acres of old field that will be directly impacted by Project construction.

Construction impacts to bat species are expected to be even less than those experienced by birds. Bat habitat may be impacted by ground disturbance and tree removal. However, these activities are also associated with farming and logging, which are common in the area. At this stage of development, it cannot be verified when tree clearing activities will be conducted. Tree clearing during the winter months would present the lowest potential risk to bats by avoiding potential removal of roosting trees.

Displacement

Some wildlife displacement will also occur due to increased noise and human activity as a result of Project construction. The significance of this impact will vary by species and the seasonal timing of construction activities. However, the species most likely to be disturbed/displaced by Project construction include grassland bird species such as bobolink, eastern meadowlark, red-winged blackbird, and savannah sparrow. Within New York State, peak breeding time for birds common to agricultural and grassland habitat occurs in late spring and early summer. If construction begins before the initiation of breeding activities, then most breeding birds would likely avoid nesting in
active construction areas. If construction begins during the breeding season, then breeding birds that are
accustomed to similar disturbances, such as farming and logging, are expected to remain in the area while others will
likely relocate to adjacent suitable habitat, if available. These impacts are not expected to be significant because a
sizable amount of suitable habitat will remain undisturbed within and adjacent to the Project area. Outside of
localized construction disturbance and some temporary displacement in the immediate vicinity of turbines, access
roads, etc., no significant displacement impacts on breeding birds are anticipated during construction.

None of the construction-related impacts described above will be significant enough to affect local populations of any
resident or migratory wildlife species.

3.3.2.1.3 Threatened and Endangered Species

As discussed in Section 3.3.1.2.6, listed wildlife species documented in the vicinity of the Project area utilize a variety
of habitats, including wetlands/water bodies, forests, and grasslands. Project components have been sited to avoid
wetlands and streams to the extent practicable. In addition, the agricultural lands being affected are generally not
high quality grassland habitat, and forest land being impacted often does not display the characteristics of forest
interior habitat. Consequently, the habitat being impacted by Project construction is unlikely to receive significant use
by listed threatened and endangered species. However, to the extent that these species occur in the area, Project
construction could result in limited disturbance/displacement of these species due to human activity and noise, and/or
direct mortality impacts to eggs or young.

There are no known occurrences of rare or endangered plant species within the Project area. No construction-
related impacts to listed plants or significant natural communities are anticipated.

3.3.2.2 Operation

3.3.2.2.1 Vegetation

As indicated in Table 8, Project construction will result in permanent conversion of 58.1 acres of vegetated land to
unvegetated/built facilities (access roads, turbines, O&M building, collection station, and POI station) within the
Project area. This total will include approximately 31.1 acres of agricultural land, 5.0 acres of successional old field,
4.0 acres of successional shrubland, 0.5 acres of disturbed/developed land, and 17.5 acres of forest. It should be
noted that for vegetation, permanent impacts include both conversion of natural communities to built facilities, and
conversion of one vegetative community to another (e.g., forest to successional shrubland or old field) for the life of
the Project. This conversion will occur within a 200-foot radius of all tower sites and along the shoulders of access
roads located in forested areas. A total of 106.5 acres of forest land will be converted to successional communities.
for the duration of Project operation (i.e., maintained in a non-forested condition). An additional 68.5 acres will be cleared during Project construction, but allowed to regenerate once construction is complete (i.e., converted from mature forest to successional forest). Other than minor disturbance associated with routine maintenance and occasional repair activities, no additional disturbance to plants and vegetative communities are anticipated as a result of Project operation.

3.3.2.2.2  Fish and Wildlife

With respect to impacts to wildlife in general, a recent NYSERDA report compares the risk to wildlife from six different electricity generation types: coal, oil, natural gas, hydro, nuclear, and wind (Newman et al., 2009). For each generation method, a relative level of risk (lowest, lower, moderate, higher, and highest) was assigned for each of six different phases (resource extraction, fuel transportation, facility construction, generation, transmission and delivery, and decommissioning). While each of these generation methods pose risks to wildlife individuals and/or populations, the degree and extent of the risks depend on the energy generation source. The report concluded that non-renewable electricity generation sources, such as coal and oil, typically pose higher risks to wildlife than renewable sources, such as hydro and wind. “Coal as an electricity generation source is by far the largest contributor to risks to wildlife found in the NY/NE region.” Overall, the greatest risks to wildlife occur during the resource extraction and generation phases of power production. Since wind powered electricity production does not entail a resource extraction phase, threats from fuel extraction and transportation do not apply. For the other four phases, relative risk levels for wind ranged from “lowest” to “moderate.” In contrast, each of the other five electricity generation types had at least one phase with a risk level of “higher” or “highest” (Newman et al., 2009). With respect to avian impacts, a recent peer-reviewed article presented a contextual assessment of avian mortality caused by various sources of electricity generation. Initial estimates suggest that wind farms and nuclear power stations are responsible each for between 0.3 and 0.4 avian fatalities per gigawatt-hour (GWh) of electricity, while fossil-fueled power stations are responsible for approximately 5.2 avian fatalities per GWh (Sovacool, 2009).

However, wind power projects are not without impacts to wildlife, and operational impacts of the Copenhagen Wind Farm are expected to include loss of habitat, possible forest fragmentation, wildlife displacement due to the presence of the wind turbines, and avian and bat mortality as a result of collisions with operating turbines. Each of these potential impacts is described briefly below:

Habitat Loss
A total of 58.1 acres of wildlife habitat will be permanently lost from the Project area (i.e., converted to built facilities). This habitat loss represents 0.6% of the 9,705-acre Project area. As mentioned in the previous section, approximately 54% of this loss (approximately 31.1 acres) will occur in agricultural lands, which have limited wildlife
habitat value. In addition, approximately 192.5 acres of forest are expected to be lost or converted to a successional community (old field, shrubland, or saplings) for the life of the Project. Given the relatively small area of lost or converted natural communities, the cumulative habitat loss/conversion resulting from Project development is not considered significant.

Forest Fragmentation

Project components are generally located along the edges of open areas and active agricultural fields to minimize impacts to forestland habitats. To the extent practicable, the proposed Project utilizes existing farm lanes and logging roads to minimize forest clearing and fragmentation of forest habitat. However, in some locations impacts to contiguous forestland will occur. In total, the proposed Project will result in the conversion of 17.5 acres of forested habitat to built facilities, and 175 acres of forested habitat to successional communities for the life of the Project (106.5 acres to successional old field or shrubland and 68.5 acres to successional forestland).

Creating breaks in a large area of contiguous forest can alter the secluded forest interior conditions required by certain songbirds, such as wood thrush, rose-breasted grosbeak, and pileated woodpecker. However, in most instances where forested habitat will be impacted in the Project area, the forested parcels are used for commercial timber management. This logging activity has disturbed the forest by thinning the canopy and creating skid trails and landing sites. Therefore, Project-related fragmentation of forest habitat is not anticipated to be significant. However, the on-site BBS did document nesting by several forest-interior bird species (e.g., ovenbird and wood thrush), which suggests that forest clearing has the potential to impact such species (either through direct habitat loss or increased likelihood of nest parasitism by brown-headed cowbirds). Other avian species that are considered early successional specialists (e.g., indigo bunting, mourning warbler, eastern towhee) may benefit from forest fragmentation and the creation of additional edge habitat.

Disturbance/Displacement

Habitat alteration and disturbance resulting from the operation of turbines and other wind farm infrastructure can make a site unsuitable or less suitable for nesting, foraging, resting, or other wildlife use. As mentioned above, the footprint of turbine pads, roads, and other Project infrastructure represents a very small percentage of the site following construction. Therefore, overall land use is relatively unchanged by wind power development. However, the true amount of wildlife habitat altered by a wind power project can extend beyond the functional project footprint, due to the presence of tall structures and increased human activity.
Breeding Birds

While wildlife may become habituated to the presence of wind turbines within a few years, the rate (and degree) of habituation is currently unknown because few long-term studies have been conducted. Evidence indicates that some grassland species do not respond favorably to the presence of tall structures in their habitat. Studies conducted at wind power projects in southwest Minnesota and in Wyoming revealed that grassland nesting birds are found in reduced numbers as the proximity to wind turbines increases (Johnson et. al., 2000; Leddy et. al., 1999). Post-construction surveys at the Noble Wethersfield Windpark in Wyoming County, New York concluded that one avian species, the bobolink, showed an effect of turbine displacement following construction, with significantly fewer bobolinks within 246 feet (75 m) of turbines situated in hayfields. However, another species, the savannah sparrow, did not show a significant difference in abundance with distance from turbines (Kerlinger & Guarnaccia, 2010).

Most breeding grassland bird species are anticipated to habituate to the turbines over the long-term, though some permanent displacement may result. However, displacement is likely to be limited to the immediate area of each turbine, and is also likely to be influenced by other factors, such as size of field and agricultural practices. Any potential impacts to grassland-nesting species are anticipated to be much less than the impacts from existing hay mowing and pesticide use in the same area. Many of the proposed turbines are sited in active agriculture fields that are already subject to periodic disturbance and have limited habitat value. Therefore, there is a low risk of substantial displacement of breeding grassland birds.

Forest and forest edge birds are not likely to be significantly disturbed because these species are familiar with tall features (i.e., trees) in their habitat (Kerlinger & Guarnaccia, 2007). A post-construction study of 11 turbines located on a ridgeline in Searsburg, Vermont showed that some forest-nesting birds (such as blackpoll warbler, yellow-rumped warbler, white-throated sparrow, and dark-eyed junco) appeared to habituate to the turbines within a year of construction. The study did not document how close to the turbines these species nested, but it clearly demonstrated that forest-nesting birds foraged and sang within forest habitat about 100 feet (30 m) from the turbine bases. Other species found in pre-construction surveys, such as Swainson's thrush, were absent in the initial post-construction surveys and appeared to have been displaced by the turbines (Kerlinger, 2002). However, a subsequent visit to the Searsburg site six years later revealed that Swainson's thrushes were singing (and likely nesting) within the forest adjacent to turbines (Kerlinger & Guarnaccia, 2007). Minimal displacement in wooded areas was also documented following construction of the Noble Bliss Wind Farm in Wyoming County, New York. This study found that bird diversity rebounded following construction of the wind project, but abundance did not. These results suggest that different species may habituate to the presence of wind turbines at different rates (Kerlinger & Guarnaccia, 2009).
Waterbirds
The potential impacts of the Project on migrating or foraging waterfowl should not be significant, even though migrating geese can be expected to forage in nearby farm fields, sometimes in substantial numbers. This conclusion is based on the results of a study conducted by the Iowa Cooperative Fish and Wildlife Research Unit at the Top of Iowa Wind Farm located in Worth County, Iowa. Due to its proximity to three state-owned wildlife management areas, the Top of Iowa Wind Farm experiences very high use by waterfowl (over 1.5 million duck and goose use-days per year). Observations at that site revealed that wind turbines did not affect the use of the fields by Canada geese or other species of waterfowl. In addition, over the two-year course of the study, no turbine-related waterfowl or shorebird mortality was documented (Koford et. al., 2005). Based on these study results, and observations at other wind power projects, the proposed Project is not anticipated to have a significant, long-term displacement or mortality effect on resident or migrating waterfowl.

Raptors
Raptors may experience some displacement due to the loss and fragmentation of habitat from the construction of the facility. Based on studies from the Midwest, local breeding raptors may decrease in density within the Project area after construction, but will most likely acclimate to the turbines with time (Garvin et al., 2011).

Game Species
While habituation to the presence of the turbines may not be immediate, game species such as deer and wild turkey generally adapt quickly to the presence of man-made features in their habitat (as evidenced by the abundance of these species in suburban settings). Significant displacement of game species from a wind power site is not expected to be an issue; edr has witnessed substantial numbers of deer and turkey foraging in open fields directly adjacent to and beneath operating wind turbines at several New York wind power sites.

Bird Collision Risk
Avian fatalities at wind plants can result from collisions with turbine rotors, guy wires of on-site met towers, and perhaps wind turbine towers. In 2003, an estimated 20,000 - 37,000 birds were killed at about 17,500 wind turbines in the United States (Erickson et. al., 2005). Fatalities ranged from zero to about 9 birds per turbine per year, yielding an average of 2.19 birds per turbine per year. Recent studies in the Western and Midwestern United States have confirmed the fatality levels at the lower end of the range, while studies from the Eastern United States reveal fatality levels slightly higher than the national average. For example, a study conducted in 2003 at the Mountaineer Wind Energy Center in West Virginia found an average mortality rate of about 4 birds per turbine per year (Kerns & Kerlinger, 2004), and approximately 7 birds per turbine per year were reported killed at a small project in eastern
Tennessee (Nicholson, 2003). Nationwide, night migrating songbirds incur the majority of collision fatalities, with other avian species experiencing many fewer collisions.

Although collision risk is likely to be low, data on resident and migrating birds and bats at the Project area were collected to determine if site-specific characteristics might suggest an elevated level of risk relative to other sites. The overall level of activity and species composition documented during those surveys is within the range documented by similar surveys that have been conducted at other proposed wind power projects in New York State. Consequently, the Project area is not believed to be a particularly important avian corridor or an area of concentrated migration activity. A more thorough assessment of collision risk is presented below by species groups.

*Migratory Songbirds*

Based on post-construction fatality studies at operating wind projects, it is likely that nocturnal migrant passerines (songbirds) will make up the majority of bird kills due to collision with the turbines. However, there are no geographical or topographical features on or adjacent to the Project area that are likely to attract or concentrate nocturnal migrant passerines, and the Project area is not immediately proximate to any large water bodies where nocturnal migrants tend to concentrate at stopover areas. Outside of such concentration areas, passerine migration is typically diffused over a broad front. Therefore, the Project is anticipated to have a fatality rate that will be within the range of fatality rates observed elsewhere in New York; (see Table 9 for a summary of the calculated bird fatality rates at New York wind energy facilities). There are no indicators of potential elevated risk to passerines, and thus no biologically significant adverse impacts are anticipated for any passerine species.

*Waterbirds*

Due to the lack of open water habitats in the area, the Project area does not support a large number of water birds. In addition, post-construction studies at existing wind energy facilities have shown that waterfowl are less susceptible to collision than other species groups (Erickson et al., 2002; Langston & Pullan 2003; NWCC, 2010). Risk of collision to waterfowl and other waterbirds during migration is also likely to be minimal because these birds typically migrate at high altitudes (Kerlinger & Moore, 1989; Bellrose, 1976), and because this group of birds has not demonstrated a propensity to collide with tall structures such as other wind energy projects, communication towers, tall buildings etc.

*Raptors*

Raptor mortality from collision with turbines has been low at most operating wind power projects outside of California and some sites in Europe, which are now generally considered to have been poorly sited. Based on comparative studies of avian mortality rates at wind farms in New York State and raptor passage rate through wind farm sites, the overall raptor fatality rate at the Project is expected to be low. Post-construction ground searches conducted at
several operating wind power projects in Wyoming County, New York have consistently documented low raptor mortality. At the Noble Bliss Windpark, surveys documented seven raptor carcasses: three red-tailed hawks (one during standardized surveys and two incidental reports) and a sharp-shinned hawk during the 2008 survey (Jain et al., 2009e), and three red-tailed hawks (one during standardized surveys and two incidental reports) during the 2009 survey (Jain et al., 2010c). Post-construction ground searches conducted at the Noble Wethersfield Windpark in 2010 found two raptor carcasses; one red-tailed hawk and one sharp-shinned hawk (Jain et al., 2011a). At the High Sheldon Wind Farm, mortality of only three raptors (a sharp-shinned hawk and two turkey vultures) was documented during two years of post-construction studies (Tidhar et al., 2011b). These recent results are similar to those of other studies conducted in New York, and reflect the fact that raptor migration is typically diffuse in the region.

Even where concentrated hawk migration does occur around wind energy sites, evidence to date shows that risk to migrating raptors is not great and not likely to be biologically significant. At the Mountaineer Wind Energy Facility on Backbone Mountain (a long, linear ridge) in West Virginia, a study by Kerns and Kerlinger (2004) found that only one raptor, a red-tailed hawk, was killed during a year of study. Reports from Tarifa, Spain, where raptor migration is highly concentrated, strongly suggest that migrating raptors rarely collide with turbines (DeLucas et. al., 2004). Several studies have documented raptor collision avoidance behaviors at wind facilities (Whitfield & Madders, 2006; Chamberlain et. al., 2006). Although the mechanism of turbine avoidance is unknown, most raptors are diurnal and have good eyesight, suggesting they may be able to detect turbines visually as well as acoustically.

There are no geographical or topographic features (e.g., mountain ridgelines, river valleys, or coastlines) in the vicinity of the Project area that would attract or concentrate migrant raptors in large numbers. Surveys of the Project area did not identify any concentrated flight paths in either spring or fall. The 2012 raptor study recorded a migratory passage rate of 0.492 raptors/hour in the spring, compared to an average passage rate of 10.2 raptors/hour at the three other sites in the region with available spring data, and a passage rate of 0.069 raptors/hour in the fall, compared to an average passage rate of 8.07 at the three other sites in the region with fall data (Sanders, 2013a). These passage rates are extremely low relative to what is seen at hawk watches and other raptor concentration areas. Consequently, the impacts to migrating raptors from the development and operation of the Project are anticipated to be low. Based on the general lack of elevated risk factors and the results of fatality monitoring at other New York wind projects, no biologically significant adverse impacts on raptors are anticipated from operation of the Project.

In summary, studies conducted at other sites outside of California have shown avian fatalities to be relatively infrequent events at wind farms. In the Midwestern and Eastern United States, night migrating songbirds have accounted for a majority of the fatalities at wind turbines. In general, the documented level of fatalities has not been
large in comparison with the source populations of these species, nor have the fatalities been suggestive of biologically significant impacts to the affected species. The observed level of mortality is also minor when compared to other potential sources of avian mortality (Erickson et al., 2001).

**Bird Fatality Approximations**

There currently is no predictive model available that has been demonstrated to accurately predict avian collision mortality as a result of wind power project operation. Therefore, risk assessments must be based on pre-construction indices and indicators of risk (e.g., site-specific survey data), along with empirical data from operating projects. Bird fatality rates have varied between 0.66 and 9.59 birds/turbine/study period and between 0.44 and 5.81 birds/MW/study period at New York sites where recent, rigorous post-construction mortality monitoring has been conducted (see Table 9). Avian fatality rates at the Project are anticipated to be similar to those recorded elsewhere within New York State. This prediction is based on the results of on-site bird studies and literature review, which did not identify any indicators of elevated risk at the Project area. There are no species or habitats on site that would suggest elevated risk to breeding birds, and there are no features in the area that would attract or concentrate large numbers of migrating birds.

It is anticipated that the bird fatality rates for the Copenhagen Wind Farm will be within the range of bird fatality rates documented in the studies summarized below in Table 9. A lower bound estimate of 41 avian fatalities per year is based on the results of the 2008 survey results from the Noble Bliss Wind Project (Jain et al., 2009e). An upper bound estimate of 595 avian fatalities per year is based on the results of 2006 surveys conducted at the Maple Ridge Wind Project (Jain et al., 2007). An average fatality rate of 152 birds per year at the Copenhagen Wind Farm was calculated based on the weekly bird/MW/study period rates documented in other studies. These estimations represent the full range of estimated mortality, which may be biased high or low depending on survey methods. Such comparisons can be misleading due to differences in the attention paid to avoidance measures during project design, the differences in habitat and avian abundance at the different projects, and other factors that would influence bird impacts. The number of bird fatalities at a given project can really only be determined through post-construction mortality study. However, using actual mortality rates documented at operating wind projects in comparable settings is the best available (and widely accepted) means of predicting collision mortality, and the range and average of predicted collision mortality presented above represents a reasonable estimate of the Project’s potential impacts.

Although these numbers may appear large, they are a tiny fraction of the population that migrates through the area, and are not considered biologically significant impacts, since the numbers are not sufficient to impact the overall population. As indicated above, this predicted level of fatalities is quite minor when compared to other sources of mortality. Other sources of avian mortality that each greatly exceed that caused by wind turbines include collision
with buildings/windows, predation by housecats, use of agricultural pesticides, collision with communication towers, collision with power lines, and collision with vehicles (Erickson et al., 2001; Klem, 1991; Coleman & Temple, 1993; Pimental et al., 1992).
Table 9. Bird Fatality Rates from Post-Construction Studies at New York State Wind Energy Facilities

<table>
<thead>
<tr>
<th>Wind Project and Location</th>
<th>Monitoring Start/End Date</th>
<th>Year</th>
<th>Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal)</th>
<th>Reference</th>
</tr>
</thead>
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<td></td>
<td></td>
<td></td>
<td>Bird Fatalities/Turbine</td>
<td>Bird Fatalities/MW/Period</td>
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<td>1.91</td>
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<td>1.43</td>
<td>0.96</td>
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<td>3-day surveys</td>
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<td>2.48</td>
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<td>Weekly surveys</td>
<td>4/15 – 11/15</td>
<td>2009</td>
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<td>1.17</td>
</tr>
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<tr>
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<td><strong>Noble Wethersfield, Wyoming County, New York – Mixed (agriculture and forest)</strong></td>
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<td>Weekly surveys</td>
<td>4/26 – 10/15</td>
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<td>Weekly surveys</td>
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<td>1.65</td>
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<td><strong>High Sheldon, Wyoming County, New York – Mixed (agriculture and forest)</strong></td>
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<td>4/15 – 11/15</td>
<td>2010</td>
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<td>1.76</td>
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<td>Daily and weekly surveys</td>
<td>5/15 – 11/15</td>
<td>2011</td>
<td>2.36</td>
<td>1.57</td>
</tr>
</tbody>
</table>
Bat Collision Risk

Fatality monitoring studies at operating wind power projects in the Northeast suggest that collision mortality for bats can be substantially greater than that seen for birds. Migratory tree-roosting bat species (hoary bat, eastern red bat, and silver-haired bat) appear to be especially susceptible to colliding with the operating wind turbines. Results of fatality studies at wind energy facilities in the eastern United States as well as several western sites (U.S. and Canada) seem to indicate that these species are more susceptible to collisions with wind turbines than resident bat species (NWCC, 2010; Kunz et al., 2007; Arnett et al., 2008). For example, during the post-construction surveys at the Maple Ridge Wind Farm in Lewis County, New York, 151 of 203 total dead bats found during the 2007 surveys and 106 of 140 total dead bats found during 2008 surveys were the three tree-roosting bat species mentioned above (Jain et al., 2009a, 2009b). Similarly, during the post-construction surveys at the Noble Bliss Windpark, 43 of the 74 total dead bats found during 2008 surveys, and 27 of the 36 total dead bats found during the 2009 surveys were hoary, eastern red, or silver-haired bats (Jain et al., 2009e, 2010c).

As the population sizes, trends, and migratory patterns of most bats in New York State are unknown, it is uncertain what level of impact wind projects have, especially in light of the even greater mortality risk presented by WNS (NYSDEC, 2010).

Bat Fatality Approximations

Available data from operating wind projects suggest that the risk of collision mortality will generally be higher for bats than that for birds. Johnson and Strickland (2004) found bat mortality rates of 46.2 fatalities per turbine per year at wind projects sited along forested ridgelines in the Appalachians. This differs from the much lower mortality rates documented at mid-west and western sites located in open and mixed landscapes, ranging from 0.07 to 2.32 fatalities per turbine per year (Erickson et al., 2002). Mortality rates at the Maple Ridge facility in the Tug Hill region of northern New York State are lower than those reported from studies at Appalachian ridges, but greater than those reported in Midwestern studies. Estimates ranged from 15.2 to 24.5 bats per turbine per year during the first year of post-construction monitoring (Jain et. al., 2007), and from 15.4 to 18.4 bats per turbine per year during the second year of post-construction monitoring (Jain et. al., 2009a).

Bat fatality rates have varied between 0.7 and 24.53 bats/turbine/study period and between 0.46 and 16.3 bats/MW/study period at New York sites where recent, rigorous post-construction mortality monitoring has been conducted (see Table 10). Bat fatality rates at the Project are anticipated to be similar to those documented elsewhere in New York State. This prediction is based on the results of the habitat surveys, acoustical monitoring studies, and literature review which did not identify any elevated indicators of risk to bats at the Copenhagen Wind Farm site (e.g., there is no evidence of large roost, hibernacula or elevated bat activity in the area).
It is anticipated that the bat fatality rates for the Project will be within the wide range of bat fatality rates documented in the New York studies summarized in Table 10. A lower bound estimate of 44 bat fatalities per year is based on the results of the 2008 survey results from the Munnsville Wind Project in Madison and Oneida Counties, New York (Stantec, 2008). An upper bound of 1,521 bat fatalities per year is based on the results of 2006 surveys conducted at the Maple Ridge Wind Project (Jain et al., 2007). An average fatality rate of 406 bats per year at the Copenhagen Wind Farm was also calculated based on the weekly bat/MW/study period rates provided in Table 10. It should be noted that these estimates may be somewhat higher than what may occur at the Project, given the reduction of resident cave bat populations since the onset of WNS in winter 2006.

As with estimates of avian collision morality, such comparisons can be misleading. The National Wind Coordinating Collaborative (NWCC), a partnership of experts and interested parties that identifies and addresses issues that affect the use of wind power, warns that caution must be used when comparing fatality rates across studies due to the use of different estimators and varying search intensities, study lengths, timing, size of search areas, and biases from unaccounted crippling losses (Strickland et al., 2011). Research regarding impacts to bats from wind developments has been more limited until recent years; therefore, there are fewer studies with bat fatality data than bird fatality data. For many bat species, an understanding of their natural history, especially migration and foraging movements, remains incomplete (Miller, 2008). The effect of bat fatalities due to wind turbines on populations as a whole is not well understood and current research is addressing this issue. The Bats and Wind Energy Cooperative (BWEC), an alliance of state and federal agencies, the wind industry, academic institutions, and non-governmental organizations, is currently researching the interactions of bats and wind turbines with the intent to develop solutions for wind farm siting and mitigation that will minimize or prevent bat mortality from wind turbines. To date, there has been no confirmed correlation between habitat availability and specific atmospheric or seasonal conditions that result in increased mortality. However, most collision mortality of migratory tree bats occurs during the fall migration season (August to September), and preliminary data seem to indicate increased mortality rates during periods of lower wind speed.
Table 10. Bat Fatality Rates from Post-Construction Studies in New York State Wind Energy Facilities

<table>
<thead>
<tr>
<th>Wind Project and Location</th>
<th>Monitoring Start/End Date</th>
<th>Year</th>
<th>Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal)</th>
<th>Reference</th>
</tr>
</thead>
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<td></td>
<td></td>
<td></td>
<td>Bat Fatalities/Turbine</td>
<td>Bat Fatalities/MW/Period</td>
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<td>Maple Ridge, Lewis County, New York – Mixed (agriculture and forest)</td>
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<td>Daily surveys</td>
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</tr>
</tbody>
</table>
3.3.2.2.3 Threatened and Endangered Species

Because limited use of the Project area by endangered, threatened, and special concern species is anticipated, no significant adverse impact on these species is expected during Project operation. The potential impacts on listed threatened and endangered species documented in the area are discussed in detail below.

A single migratory bald eagle was observed by Sanders (2013a) in the Project area during the on-site raptor surveys in 2012. In addition, correspondence from the NYNHP indicates the presence of this species within 10 miles of the Project area, and it was recorded in low numbers (1-3 birds per year) during six of the last ten Watertown Christmas Bird Counts (National Audubon Society, 2013). Habitat within the Project area is not suitable for breeding bald eagles, and foraging opportunities for this species are also limited due to the absence of any large bodies of water in the area. There are no activities pertinent to the life cycle of the bald eagle that would regularly bring it to the area, except as a migrant or a transient, and the number of bald eagles documented in the area was low. In addition, mortality studies at operating wind power projects have documented that bald eagles are not particularly susceptible to collision mortality. Consequently, the potential for direct mortality or injury to bald eagles from colliding with wind turbines is low. Similarly, the potential for disturbance, displacement, or habitat impacts that would affect this species are also low. Therefore, potential adverse impacts to bald eagle are considered unlikely.

A total of three northern harriers were observed in the Project area during the on-site raptor surveys, with behavior suggesting the birds were local residents and not migrants (Sanders, 2013a). Correspondence from the NYNHP and data from the BBS and BBA also indicate that it is a confirmed or suspected breeder in the area. Although foraging and courtship behavior by this species suggests the possibility of elevated collision risk, very low northern harrier mortality has been documented from wind turbines, even at sites that have relatively high use by this species (Erickson et al., 2002; Howe et al., 2002; Stantec, 2011b). The risk of northern harrier collision, disturbance, displacement, or habitat loss as a result of operation of the Project is considered low-to-moderate based on the species’ frequency of occurrence in the area.

Although upland sandpipers were not observed during any of Sanders field surveys, correspondence from the NYNHP indicates that this species breeds on-site, and data from the BBS and BBA also indicate that it breeds in the area. Very little data is available specific to the impacts of wind turbines on upland sandpiper. With regard to displacement, a post-construction study in Ontario found little change in breeding density between 0-200 meters from the turbine base, but a decrease at 200-300 meters (Stantec, 2011b). Courtship display flights can be within rotor swept zones (Illinois DNR, 2007), suggesting potentially elevated collision risk. However, in a post-construction mortality study in northeastern Wisconsin where upland sandpiper was “widespread and fairly common”, and often
observed “very close to the wind turbines”, no fatalities to the species were recorded (Howe et al., 2002), suggesting possible turbine avoidance behavior. The Ontario study likewise recorded no upland sandpiper fatalities (Stantec, 2011b). The risk of upland sandpiper collision, disturbance, displacement, or habitat loss as a result of operation of the Project is considered low-to-moderate based on the species’ frequency of occurrence in the area.

The federally and state-listed endangered Indiana bat and the state-listed species of special concern eastern small-footed bat are the only two protected bat species that were identified as having the potential to occur in Jefferson and Lewis Counties. Because acoustical monitoring cannot distinguish to the species level for the genus *Myotis*, there is the potential that these species could be present in the area. The Project area provides suitable roosting and foraging habitat for these species, and is within the range of the nearest hibernaculum, approximately 25 miles away. However, as indicated above, radio-tracked Indiana bats emerging from the Glen Park hibernaculum generally fly west, away from the Project area. Overall, the risk to these species is considered low, based on the results of fatality surveys at other wind projects and because of the inherent rarity of these species in New York State. In addition, WNS has likely largely decimated populations of cave-dwelling bats in the region. With decreases to already small populations, there is even less likelihood of these species being at the Project area, and thus exposed to collision risk.

Additional listed species documented in the area are listed in Table 7. All of these species were detected in very low numbers, and many were not actually observed on site. Therefore the potential risks of collision, disturbance, and displacement of listed species at the Copenhagen Wind Farm are considered remote.

### 3.3.3 Proposed Mitigation

The development of wind power projects can legitimately be considered a form of mitigation, in that power generated from the wind can satisfy demand that would otherwise utilize power generated by other means. All electric generating facilities impact ecological resources (fish, wildlife, natural communities). However, as indicated in Table 11, environmental impacts that result from more traditional power generating facilities such as fossil fuel, hydroelectric, and nuclear are much more significant than the impacts caused by wind power projects.
Table 11. Environmental Impacts of Electricity Sources

<table>
<thead>
<tr>
<th></th>
<th>Wind</th>
<th>Hydro</th>
<th>Nuclear</th>
<th>Coal</th>
<th>Natural Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Warming Pollution</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Air Pollution</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
<td>Limited</td>
</tr>
<tr>
<td>Mercury</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Mining/Extraction</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Waste</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Water Use</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Habitat Impacts</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(AWEA, 2008a).

These impacts include a larger project footprint, which results in direct habitat loss; the use of surface waters for generation and/or thermal regulation, which results in thermal discharge, fish entrainment, and impingement; the extraction and transportation of raw materials, which results in habitat disturbance and air pollution; waste disposal, which increases the effective footprint of a project and presents pollution/contamination concerns; air pollution, which results in acid precipitation and the subsequent effects on ecological resources; and/or continued contribution to global warming, which is perhaps the greatest potential impact to ecological (and human/cultural) resources worldwide.

3.3.3.1 Vegetation

Mitigation of impacts to vegetation will be accomplished primarily through careful site planning. Large areas of forest and wetland are being avoided to the extent practicable. Therefore, the most ecologically significant communities within the Project area will be largely protected from disturbance. Project access roads will be sited on existing farm lanes and forest roads wherever possible, and areas of disturbance will be confined to the smallest area possible. In addition, a comprehensive sediment and erosion control plan will be developed and implemented prior to Project construction to protect adjacent undisturbed vegetation and other ecological resources (see Section 3.2 Water Resources for further details).

Mitigation measures to avoid or minimize impacts to vegetation will also include pre-construction surveys for rare plant species, delineating sensitive areas (such as wetlands) where no disturbance or vehicular activities are allowed, educating the construction workforce on respecting and adhering to the physical boundaries of off-limit areas, complying with guidance provided by Environmental Monitors, employing best management practices during construction, and maintaining a clean work area within the designated construction sites. Following construction
activities, temporarily disturbed areas will be seeded (and stabilized with mulch and/or straw if necessary) to reestablish vegetative cover in these areas. Other than in active agricultural fields, native species will be allowed to revegetate these areas.

Controlling the introduction and spread of the target species will be achieved through the implementation of an Invasive Species Control Plan, which is attached hereto as Appendix I. The purpose of the ISCP is to facilitate the identification, control, and monitoring of invasive plants within sensitive environmental areas, such as streams and wetlands. A central theme of the ISCP will be educating construction workers about invasive species and how to prevent their spread. The goal of the ISCP is to prevent expansion of invasive species. Invasive plant control will be considered successful when 0% net increase in the aerial coverage of invasive species (compared to a baseline survey of the target area) is realized. The ISCP is proposed to consist of the following control measures, each of which is summarized briefly below:

1) Construction Materials Inspection – Construction material such as seed mixes, mulch, topsoil, sand, gravel, crushed stone, and rock brought to the Project area from an outside source will be free of invasive plant materials.

2) Target Species Treatment and Removal – If unavoidable areas containing target invasive species are encountered within regulated wetlands/streams, then appropriate treatment and removal methods will be conducted.

3) Construction Equipment Sanitation – The introduction of non-native invasive plant species will be controlled by assuring that all construction equipment is clean upon arrival on site, and that equipment utilized in areas with an abundance of invasive species will be cleaned prior to moving to another site.

4) Restoration – Regulated wetland and stream areas that are temporarily impacted during construction will be stabilized and restored in accordance with the Project-specific SWPPP.

Monitoring of the control of invasive species for the Copenhagen Wind Farm is proposed to have two phases: 1) monitoring the implementation of the ISCP during construction and 2) monitoring the success of the ISCP for a two-year period to coincide with the monitoring of other project restoration activities (i.e., NYSDAM Guidelines). For additional detail, see Appendix I.

3.3.3.2 Fish and Wildlife

As previously discussed, construction-related impacts to fish and wildlife should be limited to incidental injury and mortality due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth moving activities, and displacement
due to increased noise and human activities. Mitigation of impacts related to construction activity will be accomplished through careful site design (e.g., utilizing existing roads, avoiding sensitive habitat, and minimizing disturbance to the extent practicable), adherence to designated construction limits, and avoidance of off-limit sensitive areas.

To avoid and minimize impacts to aquatic resources resulting from construction-related siltation and sedimentation, an approved sediment and erosion control plan and SWPPP will be implemented. The sediment and erosion control plan and SWPPP were previously described in Section 3.2 (Water Resources). Proper implementation of these plans will assure compliance with NYSDEC SPDES regulations and New York State Water Quality Standards. In addition, a Spill Prevention, Containment and Counter Measures (SPCC) Plan will be developed and implemented to minimize the potential for unintended releases of petroleum and other hazardous chemicals during Project construction and operation.

Mitigation for impacts related to permanent habitat loss and forest fragmentation will be accomplished through careful site design (i.e., minimizing the permanent footprint of Project components to the extent practicable) and restoration of all temporarily disturbed areas. In addition, cleared forest land along Project access roads and at the periphery of turbine sites will be allowed to grow back and reestablish forest habitat in these areas.

With respect to impacts to wildlife in general, as previously stated, the relative risk levels for wind powered electricity ranged from “lowest” to “moderate” in comparison to other electricity generation types (coal, oil, natural gas, hydro, nuclear). In contrast, each of the other five electricity generation types had at least one phase with a risk level of “higher” or “highest” (Newman et al., 2009). With respect to avian impacts, a recent peer-reviewed article presented initial estimates that suggest wind farms and nuclear power stations are responsible each for between 0.3 and 0.4 avian fatalities per GWh of electricity, while fossil-fueled power stations are responsible for approximately 5.2 avian fatalities per GWh (Sovacool, 2009). Therefore, because wind powered electricity offsets electricity generated by fossil-fueled power plants, implementation of the Project can be considered mitigation for the impacts caused by coal, oil, etc.

The Project has been designed to minimize bird and bat collision mortality. The turbines will be placed much further apart than in older wind farms where avian mortality has been documented, such as those in northern California. They will also be mounted on tubular towers (rather than lattice), which prevent perching by birds. In an effort to reduce avian and bat impacts, electrical collection lines between the turbines will generally be buried. Lighting of the turbines (and other infrastructure) will be minimized to the extent allowed by the FAA, and will follow specific design guidelines to reduce collision risk (e.g., using blinking lights with the longest permissible off cycle).
Specific to the proposed Project, and based on the extensive expert study and analysis provided in the DEIS, the Project is not anticipated to have an undue adverse impact on birds or bats, and therefore no mitigation is required. However, the NYSDEC is requesting post-construction fatality monitoring studies at all wind power projects in New York State, and the Project Sponsor has volunteered to participate in this program in order to further the State’s understanding of bird/bat interactions with wind turbines. This study is anticipated to follow the protocols outlined in the NYSDEC’s 2009 Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects. Specifics of the study will be developed in consultation with state and federal agencies, including details such as study duration, search frequency, search areas, number and location of turbines to be searched, concurrent data collection and analysis, carcass collection for further study, and mitigation strategies that may be implemented if post-construction monitoring reveals operational impacts in excess of that which is anticipated or otherwise considered significant. In addition, a work plan for a post-construction habitat displacement study will be submitted to the NYSDEC for review prior to Project implementation.

3.4 CLIMATE AND AIR QUALITY

3.4.1 Existing Conditions

Existing climatic conditions and regional air quality are discussed below.

3.4.1.1 Climatic Conditions

The Natural Resources Conservation Service (NRCS) maintains and monitors National Water and Climate Centers (NWCC) in numerous locations throughout the United States, including one in Lowville, New York. This NWCC station has collected temperature and precipitation data from 1926 until present. Based upon the 30-year averages compiled from 1971 to 2000, the average daily maximum temperature in Lowville is 53.3 degrees Fahrenheit (°F), and the average daily minimum is 33.2°F. Historically, January is the coldest month with an average daily temperature of 16.4°F, and July is the warmest with an average daily temperature of 67.5°F. Temperature extremes range from a high of 97°F to a low of -35°F (NRCS, 2012b).

The 30-year annual average precipitation recorded in Lowville is 41.35 inches. November, with an average monthly precipitation of 4.07 inches, is historically the wettest month of the year, and February, with an average monthly precipitation of 2.53 inches, is the driest. The 30-year average annual snowfall recorded in Lowville is 122.9 inches. December and January are historically the snowiest months of the year with monthly averages of 29.8 inches and 36.2 inches, respectively (NRCS, 2102b).
3.4.1.2 Air Quality

The NYSDEC Division of Air Resources publishes air quality data for New York State annually. The most recent summary of air quality data available for the state is the New York State Air Quality Report for 2011 (NYSDEC, 2012c). Included in this report are the most recent ambient air quality data, as well as long-term air quality trends derived from data that have been collected and compiled from numerous state and private (e.g., industrial, utility) monitoring stations across the state. These trends are assessed and reported by NYSDEC regions and the Project area is located in NYSDEC Region 6, which encompasses Oneida, Herkimer, Jefferson, Lewis, and St. Lawrence Counties. There are four monitoring stations in Region 6: Nicks Lake in Herkimer County monitors ozone and sulfur dioxide, Perch River in St. Lawrence County measures ozone, Utica in Oneida County measures inhalable particulates, and Camden in Oneida County measures ozone.

The Clean Air Act requires the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. In 2011, all Region 6 sampling points were within the acceptable levels established by the NAAQS for all tested parameters, which include sulfur dioxide, inhalable particulates, and ozone (NYSDEC, 2012c).

The largest source of air emissions in the vicinity of the proposed Project is the US Army installation in Fort Drum. In 2011, the Fort Drum facility was ranked 26th among all facilities in New York State for total on- and off-site releases of all chemicals (EPA, 2012b).

Air emissions in the general area are related primarily to manufacturing, vehicular travel, and farm operations, although these sources are not prevalent on the generating site. Vehicles traveling area roads produce exhaust emissions along with dust from unpaved road surfaces. Routine odors are associated with certain farming practices (e.g., manure-spreading). Although at times an annoyance, none of these have a significant adverse effect on local air quality.

Federally mandated air-emissions standards and regulations (e.g., the Clean Air Act Amendments of 1990) have been enacted in an attempt to reduce air emissions from coal-burning power plants, which are seen as primary acid-rain sources. A number of reports have noted the effects of acid rain deposition in the Northeast, in particular the Adirondack Mountains and surrounding areas (N.Y. Times, 2001). Several programs monitor and track acid rain deposition, including the EPA’s Emissions Tracking System (ETS) and its Emissions & Generation Resource Integrated Database (E-GRID), which provides information on air emissions related to electric power generation.
The Tug Hill receives among the greatest levels of acidic deposition ("acid rain") and nitrogen deposition of any location in the United States. High pollutant concentrations in precipitation, along with high annual precipitation rates on the Tug Hill, result in extremely high annual deposition rates of these pollutants. In comparison with other regions of New York, such as the Adirondacks, Catskills, and the Allegheny Plateau, Tug Hill has the highest long-term (1980-2002) average annual deposition rates for ammonium (NH₄⁺), nitrate (NO₃⁻), total inorganic N, sulfate (SO₄²⁻), and hydrogen (i.e., H⁺, affecting pH). For example, Tug Hill is subject to inputs of N and H⁺ that are, respectively, 1.9 and 1.5 times greater than in the central Adirondacks. In addition, because the Tug Hill forests are similar to those of the Adirondacks and northern New England, and much of the region has strongly acidic soils, it is likely that Tug Hill is affected by N saturation and acidification (Mitchell et al, 2005).

No local air monitoring data is available to further characterize air quality in the immediate vicinity of the proposed Project.

### 3.4.2 Potential Impacts

#### 3.4.2.1 Construction

During the site preparation and construction phases of the Project, minor, temporary adverse impacts to air quality could result from the operation of construction equipment and vehicles. Such impacts could occur as a result of emissions from engine exhaust and from the generation of fugitive dust during earth moving activities and travel on unpaved roads. The increased dust and emissions will not be of a magnitude or duration that would significantly impact local air quality. Any impacts from fugitive dust emissions from travel on unpaved roads are anticipated to be short-term and localized and will be avoided or corrected quickly, as discussed below.

#### 3.4.2.2 Operation

The operation of this Project is anticipated to have a positive impact on air quality by annually producing 244,973 MWh of electricity with zero emissions (assuming 49 turbines, each with a nameplate capacity of 1.62 MW, operating at 35% annually), except very small emissions from vehicles servicing the facilities. Power delivered to the grid from this Project can off-set the generation of energy at existing conventional power plants, as referred in Section 2.2. Based on emissions rates for the average fuel mix in the Upstate New York Region (EPA, 2012c), this 244,973 MWh wind farm is estimated to annually displace:

- 97,352 pounds (48.7 tons) of NOₓ
- 238,511 pounds (119.3 tons) of SO₂
- 121,202,742 pounds (60,601.4 tons) of CO₂
The operation of this Project is not anticipated to have any measurable effect on climate. Some recent studies have suggested that there may be minor impacts to microclimates within 0.5 mile of wind turbines. Modeling conducted by Baidya Roy et al. (2004) suggests that large-scale wind turbine installations (i.e., 10,000 turbines) may have a warming effect on the local climate. During the environmental review process for a wind farm in Chautauqua, NY, a study group analyzed the impacts of wind turbines on vineyard microclimates (DeGaetano et al., 2004). This study group determined that a wind turbine could influence the ground level air temperature by no more than one degree Celsius (°C) and concluded that significant positive or negative impacts to area vineyards as a result of this potential change in microclimate were unlikely. Preliminary findings from a study conducted in Iowa, found that wind turbines produce measurable effects on the microclimate near crops due to the turbines pushing air downwards, which increases air flow below the turbines (The Ames Laboratory, 2010). However, on a larger scale, the Project represents a legitimate effort to mitigate the well-established causes of global climate change by generating up to 79.9 MW of electricity without the production of “greenhouse” gases.

3.4.3 Proposed Mitigation

Except for minor, short-term impacts from construction vehicles, the Project will have no adverse impacts on air quality. Dust control procedures will be implemented to minimize the amount of dust generated by construction activities, in a manner consistent with the Standards and Specifications for Dust Control, as outlined in the New York State Standards and Specifications for Erosion and Sediment Controls (NYSDEC, 2005). In accordance with these procedures, the extent of exposed/disturbed areas on the site at any one time will be minimized and restored/stabilized as soon as possible. The Environmental Monitor will identify dust problems and report them to the construction manager and the contractor. Water will be used to wet down dusty roads (public roads as well as Project access roads) as needed throughout the duration of construction activities. In more severe cases, temporary paving (e.g. oil and stone) could be used to stabilize dusty road surfaces in certain locations. In addition, the Project Sponsor will implement a Complaint Resolution Plan to establish an efficient process by which to report and resolve any construction or operational impacts (see Section 4.2 and Appendix G of this DEIS for additional information).

The development of wind power projects can legitimately be considered a form of mitigation, in that power generated from the wind can satisfy demand that would otherwise utilize power generated by other means. The United States currently obtains approximately 68 percent of its electricity from fossil fuels, with 42 percent coming from coal, the fossil fuel with the highest carbon dioxide content per unit of electricity produced (EIA, 2012a). Annual energy-related carbon dioxide emissions in the United States total approximately 5.6 billion metric tons; these emissions are projected to rise to 5.8 billion metric tons annually by 2035 (EIA, 2012c). Every 10,000 MW of wind installed can reduce carbon dioxide emissions by approximately 29 million tons annually if it replaces coal-fired generating
capacity (EPA, 2012d), or 18 million tons if it replaces generation from the United States average fuel mix (USDOE, 2008a). Table 12 compares the average air pollutant emission rate of the proposed Copenhagen Wind Farm to equivalently-sized natural gas, coal, and oil generating facilities.

Table 12. Comparison of Air Pollutant Emissions Between Electricity Sources

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Carbon Dioxide</th>
<th>Sulfur Dioxide</th>
<th>Nitrogen Oxides</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average emission rate (lbs/MWh)</td>
<td>Annual emissions for 306,600 MWh facility (tons/MWh)</td>
<td>Average emission rate (lbs/MWh)</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1,135</td>
<td>173,995.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Coal</td>
<td>2,249</td>
<td>344,771.7</td>
<td>13</td>
</tr>
<tr>
<td>Oil</td>
<td>1,672</td>
<td>256,317.6</td>
<td>12</td>
</tr>
<tr>
<td>Wind</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


According to the National Renewable Energy Laboratory (NREL), the contiguous United States has the potential for 10,957 GW of onshore wind power and an additional 4,150 GW of offshore wind power, for a total of 15,107 GW (USDOE, 2012). This potential additional wind power represents an amount more than nine times greater than current total U.S. electricity consumption (including Alaska and Hawaii) (EIA, 2012a). Switching from fossil fuel energy generation to wind power generations contributes to cleaner and healthier air, since wind power generation has zero emissions and is not a direct source of regulated pollutants such as nitrogen oxides, sulfur dioxide, and mercury. If the United States obtained 20% of its electricity from wind energy by 2030, the country could avoid putting 825 MMT of CO₂ annually into the atmosphere, or a cumulative total of 7.6 billion metric tons by 2030 (USDOE, 2008a).

Thus, by contributing to this effort, the Project will have an incremental and long-term beneficial impact on climate and air quality. This benefit should be viewed as mitigation for other environmental impacts associated with the Project.

3.5 VISUAL AND AESTHETIC RESOURCES

3.5.1 Existing Conditions

The visual study area for the Project includes two components: the area within a five-mile radius of each of the proposed turbines and the area within a one-mile radius of the proposed transmission line. A five-mile radius study area for assessment of turbine visibility was adopted based on established state agency guidance (e.g. NYSDEC, 2000; NYSOPRHP, 2006). Although no formal guidance is available regarding an appropriate study area for
assessment of transmission line visibility, a one-mile study area was adopted as it is typically used as an industry standard for visual assessments of small projects such as electrical utility lines, buildings, and/or communication towers. The visual study area covers approximately 190 square miles and, within Lewis County, includes all or portions of the Villages of Copenhagen and Castorland, and the Towns of Denmark, Croghan, New Bremen, Lowville, Harrisburg, and Pinckney. Within Jefferson County, the visual study area includes all or portions of the Villages of West Carthage and Carthage, and the Towns of Champion, Rutland, Watertown, and Wilna (see Appendix J, Figure 4). The existing Maple Ridge Wind Farm, constructed in 2006 in the southeastern portion of the visual study area, is a notable and prominent commercial land use in the study area.

Existing visual and aesthetic resources within the visual study area were identified as part of a Visual Impact Assessment (VIA) conducted by edr (2013a, attached hereto as Appendix J. The VIA was prepared in accordance with the NYSDEC Program Policy DEP-00-2 Assessing and Mitigating Visual Impacts (NYSDEC, 2000), and included a review of existing data and field reconnaissance to identify landscape similarity zones, viewer groups, and sensitive visual resources within the area. These existing visual/aesthetic components of the study area are described below.

3.5.1.1 Landscape Similarity Zones

Within the visual study area, four distinct landscape similarity zones (LSZ) were defined. The approximate location of these zones is illustrated in Appendix J: Figure 5, along with representative photos of each. Their general landscape character, use, and potential views to the proposed Project are described below.

3.5.1.1.1 Zone 1: Rural Uplands

The Rural Uplands LSZ makes up the majority of the visual study area, and is characterized by open agricultural land on elevated level areas, rolling hills and slopes, with widely dispersed farms and rural residences along a network of county and local roads. Active agricultural fields (corn, hay, pasture, etc.), bordered by hedgerows and scattered deciduous woodlots, dominate the landscape. Topography is generally level or undulating throughout this zone. Views in the Rural Uplands are generally open, at times expansive on hilltops, and include a patchwork of fields, fenced pastures, and woodlots, punctuated by barns and silos. Livestock and working farm equipment are often seen in the fields. The existing Maple Ridge Wind Farm is a prominent commercial land use in the southeastern part of the study area. Due to the elevation and the abundance of open fields in this LSZ, foreground (<0.5 mile), mid-ground (0.5-3.5 miles), and background (>3.5 miles) views of the proposed Project will be available from many areas within the Rural Uplands LSZ.
3.5.1.1.2 Zone 2: Rural Valleys

This LSZ is located in the level, broad, more low-lying area within the Black River Valley. Some larger sized farms and broader flatter fields occur within this zone. The Rural Valley zone includes pastureland for livestock, hay and other feed crops, idle areas, river/stream channels with numerous turns and oxbows, and floodplain wetlands. Views in this zone generally include a relatively level and open foreground backed by hillsides that feature a patchwork of fields and woodlots, and an upward orientation. Under these viewer circumstances, structures and forest vegetation will generally not provide significant screening. However, hedgerows and small patches of vegetation frequently break up the agricultural fields, and may block or screen some longer-range views from within this zone. Typical views in this LSZ can be experienced along NYS Routes 126 and 410.

3.5.1.1.3 Zone 3: Forest Land

Forest land is another significant LSZ within the visual study area. It is characterized by the dominance of forest vegetation (mixed deciduous and coniferous tree species), and occurs on hillsides and in narrow ravines throughout the study area, and in larger blocks in the southern portion of the study area. Views in the Forest Land zone are typically limited due to the screening provided by overstory trees. Views are generally restricted to areas where small clearings and road cuts provide breaks in the tree canopy. Where long distance views are available within this zone, they are typically of short duration, limited distance, and/or framed by trees. Land use in this zone includes forestry, low-density residential development, and recreational use (hunting, snowmobiling, etc.). The largest areas of contiguous forest occur in the southern portion of the study area and include Cobb Creek, Lookout, and Pinckney State Forests.

3.5.1.1.4 Zone 4: Village/Hamlet

This LSZ includes the Villages of Copenhagen, Castorland, and West Carthage, along with the hamlets of Champion, Deer River, and South Rutland. This zone is characterized by low to moderate-density residential (and limited commercial retail) development, generally oriented along a primary road (typically a state highway). Vegetation and landform contribute to visual character in the village and hamlet areas, but within the majority of this zone, buildings (typically 1-2 stories tall) and other man-made features dominate the landscape. Structures are variable in their size and arrangement, but tend to be of an older/traditional architectural style in the village core, and of a more modern, commercial character on the peripheries of village/hamlet areas. Activities within this zone are primarily associated with residential use, small commercial businesses, and local travel. Views within this zone are typically focused on the roadways and adjacent structures, although outward views across yards and adjacent fields are also available. Open views are most likely from open road corridors and the edges of the Village/Hamlet zone, where housing and vegetation density decrease and therefore screening is reduced.
3.5.1.2 Viewer/User Groups

Three categories of viewer/user groups were identified within the visual study area. These include the following:

3.5.1.2.1 Local Residents

Local residents include those who live and work within the visual study area. They generally view the landscape from their yards, homes, local roads, schools, and places of employment. Residents are concentrated in and around the Village of Copenhagen and various hamlets, but occur in relatively low density throughout the visual study area. Except when involved in local travel, residents are likely to be stationary, and have frequent or prolonged views of the landscape. Local residents may view the landscape from ground level or elevated viewpoints (typically upper floors/stories of homes). Residents’ sensitivity to visual quality is variable. However, it is assumed that residents may be very sensitive to changes in views from their homes and yards.

3.5.1.2.2 Through-Travelers/Commuters

Commuters and travelers passing through the area view the landscape from motor vehicles on their way to work or other destinations. Commuters and through-travelers are typically moving, have a relatively narrow field of view, and are destination oriented. Drivers on major roads in the area (e.g., NYS Routes 12, 26, 126, 177, and 410) will generally be focused on the road and traffic conditions, but do have the opportunity to observe roadside scenery. Passengers in moving vehicles will have greater opportunities for prolonged off-road views than will drivers, and accordingly, may have greater perception of changes in the visual environment.

3.5.1.2.3 Tourists/Recreational Users

Recreational users and tourists include local residents and out-of-town visitors involved in cultural and recreational activities at parks and historic sites, water bodies, and in undeveloped natural settings such as state forests. These viewers are concentrated on the major roadways and in the recreational facilities/cultural sites located within the visual study area, including Pleasant Lake, the Black River, various historic sites, and several state forests. Members of this group may view the landscape from area highways while on their way to these destinations, or from the sites themselves. This group includes snowmobilers, bicyclists, recreational boaters, hunters, fishermen, and those involved in more passive recreational activities (e.g., family vacations, picnicking, sightseeing, or walking). Visual quality may or may not be an important part of the recreational experience for these viewers. However, for some, scenery will be a very important part of their experience and in almost all cases enhances the quality of recreational experiences. Recreational users and tourists will often have continuous views of landscape features.
over relatively long periods of time. However, most recreational viewers and tourists will only view the surrounding landscape from ground-level or water-level vantage points.

3.5.1.3 Visually Sensitive Resources

The Project’s visual study area includes 54 sites (almost exclusively historic sites) that NYSDEC Program Policy DEP-00-2 Assessing and Mitigating Visual Impacts (NYSDEC, 2000) considers aesthetic resources of statewide significance. These include one property (the Hiram Hubbard House) listed on the National Register of Historic Places (NRHP), four historic districts (that include a total of 36 contributing properties) and 12 individual properties that have formally been determined to be by the New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) to be NRHP-Eligible. Identified NRHP-eligible properties include residences, cemeteries, farms, bridges, parks, and various other structures that are scattered throughout the study area, but are most heavily concentrated in the Village of Copenhagen and the Hamlet of Burrville. In addition, although no formally designated wild, scenic or recreational rivers are located within the visual study area (National Wild and Scenic Rivers, 2012; NYSDEC, 2012e), the portion of the Black River that flows through the study area has been identified by the NPS as having high recreational, geological, historic, and hydrological values. As a result, the 35-mile portion of the Black River between Carthage and Lyons Falls is listed on the Nationwide Rivers Inventory (NRI) and is therefore considered potentially eligible for listing as a Wild, Scenic, or Recreational River.

In addition to the scenic resources of statewide significance listed above, the visual study area also includes areas that are regionally or locally significant, sensitive to visual impacts, and/or receive significant public/recreational use. These include local parks and recreation facilities, public open space, population centers, and heavily used transportation corridors. Areas of intensive land use and higher population density include the Village of Copenhagen and portions of the Village of Carthage. Hamlets within the visual study area include Deer River, Denmark, Champion, South Rutland, and Burrville. The visual study area also includes several highways that could be considered visually sensitive due to the number of drivers that travel these roads on a daily basis, including New York State Routes 12, 26, 126, 177, and 410. Identified recreational areas within the visual study area include water resources such as Beaver River, Deer River, Black River and Rutland Lake; approximately 51 miles of snowmobile trails; NYSDEC-owned land including six state forests (covering 8,400 acres) and Black River Waterway Access and Fishing Access points; Carlowden Country Club and Cedars Golf Course. Two waterfalls, Kings Falls and High Falls, also occur on Deer River within the visual study area. Public schools within the visual study area include Copenhagen Central School, West Carthage Elementary School, and Carthage Middle School.

The locations of visually sensitive resources within the study area are shown in Appendix A in the VIA (see Appendix J of the DEIS).
3.5.2 Potential Impacts

3.5.2.1 Construction

Visual impacts during construction will include the addition of construction material and working construction vehicles and equipment to the local roads. In addition, construction activity/site disturbance, such as tree clearing, earth moving, soil stockpiling and road building, all of which will alter the character of the landscape, at least on a temporary basis, may be visible from some public vantage points. Dust generated by the movement of these vehicles could also potentially have an adverse impact on aesthetic resources. However, all of these activities will be relatively short term (i.e., generally restricted to the construction season), and at any one site, will generally occur on only a few days during the course of Project construction. In addition, the most significant earth moving, tree clearing, and general construction activity will occur at turbine sites, which are typically well removed and/or screened from public vantage points. However, ROW clearing and construction of the proposed transmission line does have the potential to be visible from public roads. Once construction activity ceases and site restoration activities are complete, construction-related visual impacts will no longer occur.

3.5.2.2 Operation

Impacts to visual resources resulting from Project operation were evaluated primarily through the VIA prepared by edr Companies (see Appendix J). Potential turbine visibility was evaluated using viewshed mapping and field verification (ballooning). Visual impact was evaluated by preparing computer-assisted visual simulations of the turbines from representatives/sensitive viewpoints from throughout the five-mile-radius study area. The potential visual impact of the turbines was evaluated by a registered landscape architect with experience in VIA. Results of these analyses are presented below.

3.5.2.2.1 Viewshed Analysis

Viewshed maps were generated for the area located within a five-mile-radius of the proposed turbines\(^1\) to determine the extent of potential Project visibility based on existing topography and vegetation, and the location and height of the proposed wind turbines. Viewshed analysis of the overhead transmission line was not conducted, as the final height and location of the poles are not known yet. Topographic viewshed maps for the Project were prepared using 10-meter resolution USGS digital elevation model (DEM) data (7.5-minute series) for the visual study area, the location and height of all proposed turbines, an assumed viewer height of 1.7 meters, and ESRI ArcGIS® software.

\(^1\) Note that viewshed analyses only take into account potential visibility of the proposed wind turbines. Other Project components (such as the proposed transmission line or substation) were not included in the viewshed analyses.
with the Spatial Analyst extension. Two five-mile radius topographic viewsheds were mapped, one to illustrate "worst case" daytime visibility (based on a maximum blade tip height of 492 feet, or 150 meters, above existing grade) and the other to illustrate potential visibility of turbine lights (based on an assumed height for the lights on top of the nacelle of 338 feet, or 103 meters, above existing grade).

A vegetation viewshed was also prepared to illustrate the potential screening provided by forest vegetation. The vegetation viewshed was prepared in the same manner as the topographic viewshed, except that a base vegetation layer was created using the 2006 USGS National Land Cover Dataset (NLCD) to identify the mapped location of forest land (including the Deciduous Forest, Evergreen Forest, and Mixed Forest NLCD classifications) within the visual study area. Based on standard visual assessment practice, the mapped locations of the forest land were assigned an assumed height of 40 feet and added to the DEM. The viewshed analysis was then re-run, as described above. Once the initial vegetation viewshed analysis was completed, a Spatial Analyst conditional statement was used to assign zero visibility to all areas of mapped forest, resulting in the final vegetation viewshed. Because it accounts for the screening provided by mapped forest stands, the vegetation viewshed is a much more accurate representation of turbine Project visibility. However, it is important to note that because screening provided by buildings and street/yard trees, as well as characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.), are not taken consideration in the viewshed analyses, being within the viewshed does not necessarily equate to actual Project visibility.

In addition, it is worth noting that the viewshed model results presented in the VIA (see Appendix J) represent a worst-case scenario, particularly considering the Project Sponsor will only construct and operate 49 wind turbines of the overall evaluated 62 turbine site. Therefore, it is anticipated that the potential visibility of the Project will be less than modeled. The discussion provided herein is analysis of the potential visibility of all 62 proposed wind turbines, and does not take into account that only 49 will be constructed.

Potential turbine visibility, as indicated by the viewshed analyses, is illustrated in VIA Figure 8 (see Appendix J) and summarized in Table 13, below. As indicated by blade tip viewshed analysis based only on topography, some portion of the proposed Project could potentially be visible in approximately 90.1% of the five-mile study area. This "worst case" assessment of potential visibility indicates the area where any portion of any turbine could potentially be seen, without considering the screening effect of existing vegetation and structures. Areas where there is no possibility of seeing the Project include locations in narrow ravines and on hillsides oriented away from the Project site. These are concentrated in the outer portions of the study area, such as along the Deer River to the south of the Project and the slopes of the Tug Hill Plateau in the western and northwestern portions of the study area. Based solely on the results of topographic viewshed analysis, potentially visible areas are found throughout the five-mile
study area, and more than half of the proposed turbines will be visible in the majority of areas where any portion of the Project will be visible. Of the 17 identified aesthetic resources of statewide significance within the five-mile study area, 13 are indicated as having potential views of some portion of the Project (based on maximum blade tip height and screening provided by topography alone). Aesthetic resources of statewide significance within the study area that will be screened from view of the Project by topography include the NRHP-listed Hiram Hubbard House and three of the identified NRHP-eligible sites.

Table 13. Summary of Viewshed Results for Five-Mile Study Area

<table>
<thead>
<tr>
<th>Number of Turbines Visible</th>
<th>Five-Mile-Radius Study Area</th>
<th>Viewshed Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blade Tip Topography Only</td>
<td>FAA/Nacelle Topography Only</td>
</tr>
<tr>
<td></td>
<td>Blade Tip Topography and Vegetation</td>
<td>FAA/Nacelle Topography and Vegetation</td>
</tr>
<tr>
<td></td>
<td>Square Miles</td>
<td>% of Study Area</td>
</tr>
<tr>
<td>0</td>
<td>18.2</td>
<td>9.9</td>
</tr>
<tr>
<td>1-12</td>
<td>18.1</td>
<td>9.8</td>
</tr>
<tr>
<td>13-24</td>
<td>20.1</td>
<td>10.9</td>
</tr>
<tr>
<td>25-36</td>
<td>15.8</td>
<td>8.6</td>
</tr>
<tr>
<td>37-48</td>
<td>18.0</td>
<td>9.8</td>
</tr>
<tr>
<td>49-62</td>
<td>94.2</td>
<td>51.1</td>
</tr>
<tr>
<td>Total Visible</td>
<td>166.2</td>
<td>90.1</td>
</tr>
</tbody>
</table>

Areas of potential nighttime visibility, as indicated by the FAA topographic viewshed analysis (VIA Figure 8, Sheet 2; see Appendix J) include approximately 86.6% of the five-mile radius study area. This analysis indicates that the potential visibility of FAA warning lights at a height of 338 feet (103 meters) will generally be concentrated in the same areas where daytime blade-tip height visibility was indicated. As stated above, this topographic analysis presents a "worst case" assessment of potential nighttime visibility that does not take into account the screening effect of existing vegetation and structures, and is based on the conservative assumption that all turbines could be equipped with FAA warning lights (a more realistic assumption is that approximately half of the turbines will be lighted).

Factoring vegetation into the viewshed analysis significantly reduces potential Project visibility (VIA Figure 8, Sheets 3 and 4; see Appendix J). Within the five-mile study area, vegetation, in combination with topography, will serve to block daytime views of the turbines from approximately 58.6% of the area (i.e., 41.4% of the study area is indicated as having potential Project visibility). Areas of potential nighttime visibility, as indicated by FAA vegetation viewshed
analysis, are limited to approximately 38.4% of the five-mile radius study area. Based on the results of the viewshed analysis, visibility will generally be most available in open agricultural areas and along significant portions of NYS Routes 12, 26, 126, and 410 within the study area. Visibility is also indicated in most portions of the Village of Copenhagen, however buildings and street trees, which are not accounted for in this analysis, will likely screen many of those views. State forests and other forested areas in the southern portion of the study area fall outside the vegetation viewshed, as do wooded slopes and the backsides of hills throughout the study area. Factoring vegetation in the viewshed analysis substantially reduces the area of potential Project visibility throughout the study area. However, because they are primarily located in agricultural or village settings, factoring mapped forest vegetation into the viewshed analysis does not indicate reduced Project visibility at many of the aesthetic resources of statewide significance within the study area (see Appendix J).

Neither the topographic viewshed, nor the vegetation viewshed represent seasonal visibility conditions. The topographic analysis assumes no trees exist, and therefore overestimates potential visibility, even during the “leaf-off” season. The vegetation analysis assumes complete screening by mapped forest vegetation, and therefore could be considered more representative of summer than winter conditions. However, as mentioned previously, this analysis excludes the screening effects of isolated trees, hedgerows, and structures. It is also based on a conservative assumed tree height of 40 feet. Thus even though the areas of mapped forest considered in this analysis are assumed to provide complete screening, many areas indicated as potentially visible will actually be screened by vegetation or structures not considered in this analysis.

Although in reality, the Project could be visible through the bare branches of trees during the winter, the viewshed program cannot evaluate partial visibility. From every location within the study area there is either a direct line of sight to one (or more) of the proposed turbines, or views to the turbines are interrupted by intervening vegetation or topography. Except when directly adjacent to the turbines, views through trees will generally be through large blocks of vegetation, and include numerous trunks and crowns. It is commonly accepted that views through over 200 feet of bare deciduous trees are essentially fully screened. Since this is the norm in the vast majority of the forested portions of the study area, the vegetation viewshed is probably a reasonable prediction of both winter and summer visibility.

Areas of actual visibility are anticipated to be more limited than indicated by the vegetation viewshed analysis, due to the slender profile of the turbines (especially the blade, which make up the top 160 feet of the turbine), the effects of distance, and screening from hedgerows, street trees and structures, which are not considered in the analysis.
3.5.2.2.2  Field Review

Visibility of the proposed Project was evaluated in the field on October 18, 2012. Three large (15-foot by 6-foot), blimp-shaped helium-filled balloons were raised to a height of 492 feet above ground level (based on a maximum blade tip height at the 12 o’clock position) at the approximate locations of proposed Turbines 11, 32, and 37. The purpose of this exercise was to verify visibility of the Project, and provide locational and scale references in photographs for subsequent use in the development of visual simulations. No balloons were raised along the proposed transmission line route, as the final height and location of the poles are not yet known. Weather conditions (relative to visibility) throughout the day were generally favorable. Clear skies in the morning gave way to partially cloudy skies in the afternoon, which resulted in good visibility and a representative variety of sky conditions. However, strong winds affected the height and position of the balloons throughout the day\(^2\).

While the balloons were in the air, field crews drove public roads and visited public vantage points within (and beyond) the five-mile radius turbine study area and the one-mile transmission line study area to document points from which the Project would be visible. Photos were taken from 230 representative viewpoints within the study area. Viewpoint locations were determined using hand-held global positioning system (GPS) units and high resolution aerial photographs (digital ortho quarter quadrangles). The time and location of each photo were documented on all electronic equipment (cameras, GPS units, etc.) and noted on field maps and data sheets. Viewpoints photographed during field review generally represented the most open, unobstructed available views toward the Project.

Field review confirmed that actual turbine visibility is likely to be more limited than suggested by viewshed mapping (VIA Figure 8; see Appendix J). This is due to the fact that trees within the study area provide more extensive and effective screening than assumed in these analyses (e.g., vegetation is more extensive than indicated on the USGS NLCD, and often taller than 40 feet in height), and screening provided by buildings is significant within more developed areas (e.g., the villages and hamlets). The result is that certain sites/areas where “potential” visibility was indicated by viewshed mapping were actually well screened from views of the proposed turbines. For instance, although viewshed analysis indicates potential visibility of the Project from throughout most portions of the Village of Copenhagen, the helium-filled balloons were screened by buildings and trees from many vantage points.

Field review also confirmed a lack of visibility (due to the screening effects of adjacent buildings and/or vegetation) from areas that were heavily forested, from some locations within village and hamlet centers (including portions of the

\(^2\) At around 10:15 a.m., a strong gust of wind pushed the mooring ropes of one of the balloons (balloon #3, at the proposed location of Turbine 32) into adjacent trees. While \textit{edr} personnel were attempting to disentangle the rope from the trees, the mooring rope snapped and the balloon was released. A replacement balloon was not erected at this location and for the remainder of the field review only two balloons (at the locations of Turbines 11 and 37) remained available to field crews for reference. However, existing communication towers located in the vicinity of Turbine 32 served as a viable proxy to evaluate potential visibility of this portion of the Project.
Villages of Copenhagen, Castorland, and West Carthage, along with portions of the hamlets of Deer River and Champion), and from locations where hedgerows, yard vegetation, street trees, or other structures blocked views of the project. Sites of statewide significance where field review confirmed lack of visibility (due the screening effects of adjacent buildings and/or vegetation) included the NRHP-listed Hiram Hubbard House and NRHP-eligible Battle Cemetery, 30497 NYS Route 12, and Louis J. Waite Farm. Existing buildings and vegetation will also screen most of the Project from many locations within the Copenhagen Village Historic Districts (North and South, see viewpoints listed above), although occasional, partial views of turbines (or turbine blades) will be available in gaps between buildings and trees. The Black River corridor is generally enclosed by vegetation that will screen views of the Project form many areas along this potentially eligible wild, scenic, or recreational river. However, partial or occasional views of the Project will be available through gaps in the vegetation.

The area with greatest Project visibility occurs in open agricultural areas, hilltops and slopes within the study area, including portions of NYS Routes 12 and 26. More distant views were available from the elevated open fields to the north, east, and southeast of the Project site. Views will also be available from open areas within the Black River Valley, including portions of NYS Route 126. However, throughout the study area, agricultural buildings, residences, hedgerows and trees not indicated on the USGS maps blocked/interrupted views toward the proposed turbines in many areas.

3.5.2.2.3 Visual Simulations

From the photo documentation conducted during field verification, a total of 10 viewpoints were selected for development of visual simulations of the proposed turbines. The simulations are included in VIA Appendix A (see DEIS Appendix J). These viewpoints were selected based upon the following criteria:

1. They provide open views of proposed turbines, as indicated by field verification (i.e., balloon visibility).
2. They illustrate Project visibility from sensitive resources with the visual study area.
3. They illustrate typical views from landscape similarity zones where views of the Project will be available.
4. They illustrate typical views of the proposed Project that will be available to representative viewer/user groups within the visual study area.
5. They illustrate typical views of different numbers of turbines, from a variety of viewer distances, and under different lighting conditions, to illustrate the range of visual change that will occur with the Project in place.
6. The photos obtained from the viewpoints display good composition, lighting, and exposure.
Locational details and the criteria for selection of each simulation viewpoint are summarized in Table 14, below:

**Table 14 Viewpoints Selected for Simulation**

<table>
<thead>
<tr>
<th>Viewpoint Number</th>
<th>Location and/or Visually Sensitive Resource</th>
<th>LSZ Represented</th>
<th>Viewer Group Represented</th>
<th>Viewing Distance</th>
<th>View Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Fuller Road, Town of Denmark</td>
<td>Rural Uplands</td>
<td>Residents</td>
<td>0.7</td>
<td>SW</td>
</tr>
<tr>
<td>17</td>
<td>Copenhagen Central School, Village of Copenhagen</td>
<td>Village/Hamlet</td>
<td>Residents, Travelers</td>
<td>1.7</td>
<td>NE</td>
</tr>
<tr>
<td>49</td>
<td>Pleasant Lake, Town of Champion</td>
<td>Rural Uplands, Forestland</td>
<td>Residents, Tourists</td>
<td>1.4</td>
<td>SE</td>
</tr>
<tr>
<td>63</td>
<td>County Road 194, Town of Denmark</td>
<td>Rural Uplands</td>
<td>Residents</td>
<td>2.1</td>
<td>NE</td>
</tr>
<tr>
<td>86</td>
<td>NYS Route 12, Village of Copenhagen</td>
<td>Rural Uplands</td>
<td>Residents, Travelers</td>
<td>1.9</td>
<td>W</td>
</tr>
<tr>
<td>95</td>
<td>Maple Ridge Wind Farm, Porter Road, Town of Harrisburg</td>
<td>Rural Uplands</td>
<td>Residents, Tourists</td>
<td>4.8</td>
<td>N</td>
</tr>
<tr>
<td>125</td>
<td>Cook Road, Town of Rutland</td>
<td>Rural Uplands</td>
<td>Residents</td>
<td>4.1</td>
<td>E</td>
</tr>
<tr>
<td>155</td>
<td>Mud Street, Town of Denmark</td>
<td>Rural Uplands</td>
<td>Residents</td>
<td>0.3</td>
<td>NE</td>
</tr>
<tr>
<td>159</td>
<td>NYS Route 26, Town of Denmark</td>
<td>Rural Uplands</td>
<td>Residents, Travelers</td>
<td>0.8</td>
<td>SW</td>
</tr>
<tr>
<td>200</td>
<td>NYS Route 126, Town of Croghan</td>
<td>Rural Valley</td>
<td>Residents, Travelers</td>
<td>3.8</td>
<td>SW</td>
</tr>
</tbody>
</table>

1. Distance from viewpoint to nearest visible turbine (in miles)
2. N = North, S = South, E = East, W = West

To show anticipated visual changes associated with the proposed Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the completed turbines from each of the 10 selected viewpoints. The photographic simulations were developed by constructing a three-dimensional (3D) computer model of the proposed turbines and turbine layout based on turbine specifications and survey coordinates provided by the Project developer. For the purposes of this analysis, it was assumed that all turbines would be GE 1.6-100 machines. The Project model used in the simulations presents a worst-case scenario that assumes all 62 proposed wind turbines will be constructed, when in fact only 49 will be constructed. Therefore, in some instances the simulations may overstate the potential visual impact of the Project. The next step in this process involved utilizing aerial photographs and GPS data collected in the field to create an AutoCAD Civil 3D 2013® drawing. The two dimensional AutoCAD data was then imported into AutoDesk 3ds MAX 2013® and three-dimensional components (cameras, modeled turbines, etc.) were added.

These data were superimposed over photographs from each of the viewpoints, and minor camera changes (height, roll, precise lens setting) made to align all known reference points (balloons, buildings, transmission line structures, etc.) within the view. This process ensures that Project elements are shown in proportion, perspective, and proper relation to the existing landscape elements in the view. Consequently, the alignment, elevations, dimensions and locations of the proposed structures will be accurate and true in their relationship to other landscape features in the
photo. At this point, a “wire frame” model of the facility and known reference points is shown on each of the photographs. The proposed exterior color/finish of the turbines is then added to the model and the appropriate sun angle is simulated based on the specific date, time and location (latitude and longitude) at which each photo was taken. This information allows the computer to accurately illustrate highlights, shading and shadows for each individual turbine shown in the view. All simulations show the turbines with rotors oriented toward the west-northwest, which is generally the prevailing wind direction in the area.

Because the design of the proposed overhead transmission line is still preliminary, simulations of the line were not prepared as part of the VIA. However, photo renderings of the line were subsequently prepared based on preliminary design information provided by the Project electrical engineers (C.G. Power Solutions USA, Inc.). A 3D computer model and pole coordinates provided by the electrical engineers were used to add the line to photos from six viewpoints documented during field review (Viewpoints 55, 134, 140, 141, 144 and 149). These viewpoints were selected because:

1. They provided open views of the proposed line.
2. They provided views of the line from a variety of distances and directions.
3. They include views from the Towns of Champion and Rutland, including one (Viewpoint 149) near the Rutland-Watertown town line (no open view of the line was dominated from Watertown during field review).

Photo renderings of the transmission line from these viewpoints were prepared following the methodology described above for the turbine simulations. The computer model used to prepare the renderings, and the renderings themselves, are included as part of Appendix A and J, respectively.

3.5.2.2.4 Potential Visual Impact Evaluation

As part of the Project VIA, visual impact was formally evaluated at the 10 viewpoints that were selected for development of visual simulations of the proposed turbines. The formal evaluation involved a registered landscape architect quantifying the effect of the proposed Project in terms of its contrast with existing components of the landscape (landform, vegetation, land use, water, sky, and viewer activity) in each view using visual contrast ratings on a scale of 0 (insignificant) to 4 (strong). The average score of the landscape components for each viewpoint provides the composite score for that viewpoint. The results of this process are summarized below in Table 15 below.
Table 15. Summary of Results of Contrast Rating Panel Review of Simulations

<table>
<thead>
<tr>
<th>Viewpoint #</th>
<th>Distance (Nearest Turbine in View)</th>
<th>Landscape Similarity Zone (LSZ)</th>
<th>Contrast Rating</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Landform</td>
<td>Vegetation</td>
<td>Land Use</td>
<td>Water</td>
</tr>
<tr>
<td>2</td>
<td>0.7 mile</td>
<td>Rural Uplands</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>1.7 miles</td>
<td>Village/Hamlet</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>49</td>
<td>1.4 miles</td>
<td>Rural Uplands, Forestland</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>63</td>
<td>2.1 miles</td>
<td>Rural Uplands</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>86</td>
<td>1.9 miles</td>
<td>Rural Uplands</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>95</td>
<td>0.8 miles</td>
<td>Rural Uplands</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>125</td>
<td>4.1 miles</td>
<td>Rural Uplands</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>155</td>
<td>0.3 mile</td>
<td>Rural Uplands</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>159</td>
<td>0.8 mile</td>
<td>Rural Uplands</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>200</td>
<td>3.8 miles</td>
<td>Rural Valley</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td><strong>1.6</strong></td>
<td><strong>1.65</strong></td>
</tr>
</tbody>
</table>

1 Contrast Rating Scale: 0 (insignificant contrast), 1 (minimal contrast), 2 (moderate contrast), 3 (appreciable contrast), 4 (strong contrast).

As Table 15 indicates, overall composite contrast ratings for the 10 selected viewpoints ranged from 0 (insignificant) to 2.0 (moderate). Six viewpoints received average scores in the range of 1.2 to 2.0 on the scale of zero to four, which indicates a minimal to moderate level of visual contrast. Four viewpoints received average scores of 1.0 or less, indicating insignificant to minimal visual contrast. Based on the contrast rating scores and comments, greater levels of contrast can be anticipated where foreground views of turbines (i.e., under 1.0 mile) are available from residences or areas of relatively higher overall scenic quality. Conversely, contrast is reduced when turbines are partially screened, viewed at greater distances, seen in the context of a working agricultural landscape, or viewed in a setting with existing visual clutter. Based on experience with currently operating wind power projects elsewhere, public reaction to the Project is likely to be generally positive, but highly variable based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power. Although at times offering appreciable contrast with elements of the landscape, the proposed Project will not necessarily be perceived by viewers as having an adverse visual impact. The nearby Maple Ridge Wind Farm, in operation since 2006 has generally received a positive public reaction following their construction and are an accepted part of local landscape. This observation is supported by recent annual surveys conducted by Jefferson County Community College (JCCS), which revealed strong community support for wind power (JCCS, 2008, 2010, 2011, 2012). A significant majority (approximately 90%) of Lewis County residents who participated in these surveys expressed support for the development of additional wind energy projects (JCCS, 2010, 2011, 2012). Approximately 70% of respondents have consistently indicated that wind farms have had a positive impact on Lewis County (JCCS, 2008, 2010, 2012). The 2008 survey further characterized the individuals that were able to see and/or hear turbines from their homes to reveal that 77.1% of these individuals indicated that the wind farms have had a positive impact on Lewis County.
Additionally, only 7.5% of participants who live within one mile of the nearest wind turbine felt that wind farms have had a negative impact (JCCS, 2008).

Although not formally evaluated as part of the VIA, electrical infrastructure and FAA warning lights associated with the proposed Project also will result in some level of visual impact. Above-ground electrical infrastructure includes a collection substation, transmission line, and POI substation. These components of the Project will present contrast with the largely undeveloped/agricultural character of the Project area and add visual clutter to the landscape. However, this effect will be limited due to the distance of these facilities from public vantage points, their relatively modest height, and screening provided by native vegetation. Photo renderings of the proposed transmission line from six representative viewpoints within the study area indicate that the visibility and visual impact of the line will be variable based on the distance and position of the viewer relative to the line. When viewed at close distance (e.g., near proposed road crossings) the line will appear fairly prominent, especially when viewed against the sky. At greater distances the line generally presents limited contrast and blends well with the surrounding landscape. The narrow profile of the single wood poles limits their visual weight, and their natural color generally blends well with background vegetation. The preliminary design of the line (single pole, Davit arm structures, 65-80 feet tall with 400 foot average spans) limits the number of poles required and width of ROW that would need to be cleared. It is also consistent in line, character and scale with other existing utility structures in the landscape, including roadside distribution lines, communication towers, and transmission lines.

The contrast of the proposed aviation warning lights with the night sky could be appreciable in dark, rural settings, and their presence will suggest a more commercial/industrial land use. Viewer attention will be drawn by the flashing of the lights, and any positive reaction that wind turbines engender (due to their graceful form, association with clean energy, etc.) is lost at night. While generally not an issue from roads and public resources visited almost exclusively during the day (parks, trails, historic sites, etc.), turbine lighting could be perceived negatively by area residents who may be able to view these lights from their homes and yards. However, this impact will be limited in areas of more concentrated human settlement, where existing light sources will limit the visibility and contrast of the aviation warning lights. In addition, because the Maple Ridge Wind Farm has been in operation since 2006, the appearance and effect of FAA warning lights are familiar to residents within the visual study area for the Copenhagen Wind Farm.

3.5.2.2.5 Assessment of Shadow Flicker

In addition to the VIA, a separate assessment of the phenomenon known as “shadow flicker” was conducted by edr (see Appendix K). Shadow flicker is the alternating change in light intensity or shadows created by the moving turbine blades when back-lit by the sun. These flickering shadows may be perceived by some as annoying when
cast on nearby residences; however, due to the turbines’ low blade pass frequency, shadow flicker is not anticipated to have any adverse health effects (e.g., trigger epileptic seizures). Shadow flicker is most pronounced in northern latitudes during winter months because of the lower angle of the sun in the winter sky. However, it is possible to encounter shadow flicker anywhere for brief periods before sunset and after sunrise (U.S. Department of the Interior, 2005). Shadow flicker does not occur when fog or clouds obscure the sun, or when turbines are not operating.

No consistent national, state, county, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines at the proposed Project site. In general, quantified limits on shadow flicker are uncommon in the United States because studies have not shown it to be a significant issue (USDOE, 2008, 2012; NRC, 2007). However, standards developed by some states and countries provide guidance in this regard. The Ohio Power Siting Board also uses 30 annual hours of shadow flicker as a threshold of acceptability in reviewing commercial wind power projects (OPSB, 2008, 2009a, 2009b, 2009c, 2009d). Additionally, international guidelines from Europe and Australia have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance (NRC, 2007; DECC, 2011; DPCD, 2012). A conservative threshold of 25 shadow flicker hours per year was applied to the analysis of the proposed Project to identify any potentially significant impacts on area residences.

The shadow flicker analysis for the proposed Project used WindPRO 2.8.543 software and associated Shadow module, which is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Project include:

- Latitude and longitude coordinates of 62 proposed wind turbine sites (provided by the Applicant). It is worth noting that only 49 turbines will be constructed. Therefore, the results of the shadow flicker analysis overstate the potential effect of the Project.
- Latitude and longitude coordinates for 123 residential structures located within approximately 1,000 meters of a proposed turbine (provided by the Applicant).
- USGS 1:24,000 topographic mapping and USGS digital elevation model (DEM) data.
- The rotor diameter (100 meters) and hub height (96 meters) for the GE 1.6-100 turbine.
- Annual wind rose data (provided by the Applicant), which is depicted in Table A1 of Attachment A (to determine the approximate directional frequency of rotor orientation throughout the year).
- The average monthly percent of available sunshine for the nearest NOAA weather station in Syracuse, NY. Obtained from NOAA “Comparative Climatic Data for the United States through 2011” (see Table A2 of Attachment A) (http://www.ncdc.noaa.gov).
• No allowance was made for wind being below or above generation speeds. Blades are assumed to be moving during all daylight hours when the sun’s elevation is more than 3 degrees above the horizon (due to the scattering effect of the atmosphere on low angle sunlight).
• The possible screening effect of trees and buildings adjacent to the receptors was not taken into consideration in the analysis. In addition, the number and/or orientation of windows in residential structures were not taken into consideration in the analysis.

A summary of the projected shadow flicker at each of the 123 receptors located within approximately 1,000 meters of a proposed turbine site is presented below. The modeled results represent a worst-case scenario, particularly considering the Project Sponsor will only construct and operate 49 wind turbines of the overall evaluated 62 turbines. Therefore, it is anticipated that the number of hours per year that some receptors will experience shadow flicker will be less than modeled:

• 45 (37%) are not expected to experience any shadow flicker,
• 1 (1%) may be affected 0-1 hour/year,
• 39 (30%) may be affected 1-10 hours/year,
• 35 (29%) may be affected 10-25 hours/year,
• 2 (2%) may be affected 25-40 hours/year,
• 1 (1%) may be affected for more than 40 hours/year.

The model results indicate that a total of three receptors are predicted to exceed the 25-hour threshold. The details regarding anticipated shadow flicker at each of these structures are summarized below in Table 16. Two of these receptors are Project participants. Therefore, only one non-participating residential receptor (Receptor 70) is predicted to exceed the 25-hour per year threshold. Shadow flicker effects will be experienced at Receptor 70 a maximum of 202 days per year. The maximum amount of shadow flicker modeled for a single day at Receptor 70 is 47 minutes per day.
Although shadow flicker at these receptors exceeds the 25-hour per year threshold, these calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing site-specific conditions and obstacles such as vegetation and/or buildings. Based on aerial photo interpretation, it appears that tall vegetation and/or buildings located between the affecting turbines and these receptors may reduce the amount of shadow flicker experienced at these receptors. Further, this analysis assumes the turbine rotor is continuously in motion. Given these conservative assumptions, the predicted shadow-flicker frequency represents a conservative scenario. In addition, many of the modeled shadow flicker hours are expected to be of low intensity, as they would occur during the early morning or late afternoon hours when the sun is low in the sky. As the sun sinks below the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and therefore reducing its ability to cast dark shadows. It is also worth noting that because the results of the shadow flicker analysis are based on 62 turbines, but only 49 will be constructed and operated, the number of receptors experiencing more than 25 hours of shadow flicker per year may be less than modeled.

Further study may be completed to fully assess the specific characteristics of the non-participating receptor predicted to receive more than 25 hours per year of shadow flicker, with particular focus on any windows facing the anticipated affected zone. For example, it may be that the wall presumed to be affected by shadow flicker contains no windows, or is not exposed to the sun due to shading by a barn, trees, garage or other outbuildings. To more accurately calculate the amount of shadow flicker likely to occur at this receptor, field review and additional data collection could be conducted to identify obstacles that could fully or partially block shadows at this receptor site. These data would then be incorporated into the shadow-flicker model and the analysis of predicted shadow-flicker impacts re-run. This further detailed analysis of receptor characteristics would be more accurate, and could reduce the number of predicted hours the receptor would affected by shadow flicker (edr, 2013b).
Although shadow flicker has been alleged to cause or contribute to health effects, as indicated above, blade pass frequencies for modern commercial scale wind turbines are so low that the resulting flicker effect is not likely to trigger seizures. According to the Epilepsy Society (2012), approximately five percent of individuals with epilepsy have sensitivity to light. Most people with photosensitive epilepsy are sensitive to flickering around 16-25 Hz, although some people may be sensitive to rates as low as 3 Hz and as high as 60 Hz. Blades on commercial wind turbines rotate at a frequency of 1 Hz or less, and there is no evidence that wind turbines can trigger seizures (British Epilepsy Association, 2007; Ellenbogen et al., 2012; Parsons Brinckerhoff, 2011; NHMRC, 2010b).

The primary concern with shadow flicker is the annoyance it can cause for adjacent homeowners. Annoyance can trigger physiological reactions of the autonomic nervous and/or endocrine systems that increase the risk of cardiovascular disorders. However, it is important to note that annoyance is not a disease or physical illness in of itself; rather it is a variable and subjective response to stimuli that can include many other things besides shadow flicker. Pierpont (2009) postulates that shadow flicker, in association with low frequency noise can result in “wind turbine syndrome”, consisting of a wide variety of symptoms including headache, tinnitus, ear pressure, vertigo, nausea, visual blurring, tachycardia, irritability, cognitive problems, and panic episodes. The proposed mechanism for these effects is disturbance of balance due to “discordant” stimulation of the vestibular system, along with visceral sensations, sensations of vibration in the chest and other locations in the body, and stimulation of the visual system by moving shadows, with sleep disturbances and headache as the most commonly reported symptoms. However, Pierpont’s conclusions are based on phone interviews with 23 people in 10 families who live between 1,000 feet and 1 mile from wind turbines. Study participants were selected based on self-reported health issues; participants living in similar areas without health problems were excluded from the study. The scientific rigor of Pierpont’s investigation and the validity of her conclusions have been widely criticized (e.g., Roberts, 2009; Leventhall, 2009; NHMRC, 2010b; Ellenbogen et al., 2012), and no peer-reviewed studies have supported the existence of “wind turbine syndrome”.

In summary, adverse shadow flicker impacts are not anticipated. Of the three receptors predicted to exceed the 25-hour threshold, two are Project participants. Therefore, only one non-participating residential receptor is predicted to exceed the 25-hour per year threshold. Mitigation measures to reduce the impact of shadow flicker on sensitive receptors are discussed below in Section 3.5.3 of this DEIS.
3.5.3 Mitigation

Construction-related visual impacts will be avoided, minimized, and mitigated through 1) careful site planning/project layout, 2) development and implementation of various construction plans, and 3) a comprehensive site restoration process following completion of construction.

Site planning has already been utilized to locate turbines away from visually sensitive resources/receptors and minimize site disturbance, including tree clearing and grading. Prior to finalization of the Project design, opportunities for additional micro-siting or realignment of facilities that could reduce potential visual impacts will be explored (e.g., alignments of the transmission line that reduce visibility of the cleared ROW).

During construction, visual impacts associated with working construction equipment will be minimized through adherence to a construction routing and sequencing plan that minimizes impacts on local roads and residences. A dust control plan and a sediment and erosion control plan will be developed and implemented as described in Sections 3.4.3 and 2.6 respectively, to minimize off-site visual impacts associated with construction activities. As described in the impacts discussion, any unavoidable construction-related visual impacts will be short term.

Following completion of construction, site restoration activities will occur. As described in Section 2.0, restoration will include removal of excess road material from Project access roads (i.e., going from 40 feet to 20 feet in width), restoration of agricultural fields (including soil decompaction, rock removal, and topsoil spreading), and revegetating/restoring disturbed sites through seeding and mulching. These actions will assure that, as much as possible, the site is returned to its preconstruction condition and that long-term visual impacts are minimized.

Mitigation options for the operating Project are limited, given the nature of the Project and its siting criteria (very tall structures typically located in open fields at the highest locally available elevations). It is also worth noting that for many individuals, views of wind power projects are not necessarily considered an adverse impact that requires mitigation (Warren, et al., 2005). However, in accordance with NYSDEC Program Policy (NYSDEC, 2000), various mitigation measures were considered. These included the following:

Professional Design. All turbines will have uniform design, speed, color, height and rotor diameter. Turbines will be mounted on conical steel towers that include no exterior ladders or catwalks. The placement of any advertising devices (including commercial advertising, conspicuous lettering, or logos identifying the Project owner or turbine manufacturer) on the turbines will be prohibited. Although the design is still preliminary, it is
anticipated that the transmission line will primarily utilize single pole Davit arm structures to minimize structure bulk and required ROW clearing.

**Screening.** Due do the height of individual turbines and the geographic extent of the proposed Project, screening of individual turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing Project visibility or visual impact. However, if adequate natural screening is lacking at the proposed substation site, a planting plan would be developed and implemented to minimize the visibility of this facility.

**Relocation.** Because of the limited number of suitable locations for turbines within the Project site, and the variety of viewpoints from which the Project can be seen, turbine relocation will generally not significantly alter visual impact. Moving individual turbines to less windy sites would not necessarily reduce impacts but could affect the productivity and viability of the Project. Where visible from sensitive resources within the study area, generally more than half of the proposed turbines will be visible, and relocation of individual machines would have little effect on overall visual impact. Additionally, throughout the study area, views of the Project are highly variable and include different turbines at different vantage points. Therefore, turbine relocation would generally not be effective in mitigating visual impacts. Additionally, the Project layout has been designed to accommodate set-backs from roads and residences. Options for relocation of individual Project components are constrained by compliance with these various setbacks. The route of the proposed transmission line has been selected to avoid nearby residences and minimize road crossings to the extent practicable. In general, the proposed line traverses undeveloped forest and agricultural fields and is well removed from visual receptors. Alternate routing that more closely paralleled existing road ROW would increase the visibility of the transmission line.

**Camouflage.** The white/off white color of wind turbines (as mandated by the FAA) generally minimizes contrast with the sky under most conditions. This is demonstrated by simulations prepared under a variety of sky conditions. Consequently it is recommended that this color be utilized on the Copenhagen Wind Project. The size and movement of the turbines prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else). Nielsen (1996) notes that efforts to camouflage or hide wind farms generally fail, while Stanton (1996) feels that such efforts are inappropriate. She believes that wind turbine siting “is about honestly portraying a form in direct relation to its function and our culture; by compromising this relationship, a negative image of attempted camouflage can occur.” Other components of the Project will be designed to minimize contrast with the existing agricultural character in the Project area. For instance, new road construction will be minimized by utilizing existing farm lanes wherever possible, in almost all cases, electrical collection lines will be buried, and the overhead transmission line will utilize wooden poles that
minimize contrast with surrounding vegetation and are consistent in appearance with existing roadside utility lines.

**Low Profile.** A significant reduction in turbine height is not possible without significantly decreasing power generation. Less generating capacity (resulting from smaller turbines) could threaten the Project’s economic feasibility. To avoid generation losses, use of smaller turbines would require that additional turbines be constructed. Several studies have concluded that people tend to prefer fewer larger turbines to a greater number of smaller ones (Thayer and Freeman, 1987; van de Wardt and Staats, 1988). The transmission line is anticipated to utilize poles that range in height from 65 to 80 feet, which is not significantly taller than adjacent forest vegetation. The use of shorter poles is constrained by line clearance/safety requirements. There will be minimal visual impact from the electrical collection system because the majority of the collection system will be installed underground.

**Downsizing.** The analysis of potential Project visibility and visual impact presented herein is based on the conservative assumption that 62 proposed turbines would be constructed, when in fact only 49 turbines will be constructed and operated. The potential effect of the Project is therefore overstated. Further reducing the number of turbines could reduce visual impact from certain viewpoints, but from most locations within the study area where more than one turbine is visible, the visual impact of the Project would change only marginally. Additionally, the elimination of turbines could significantly reduce the socioeconomic benefits of the Project and reduce the Project’s ability to assist the State in meeting its energy policy objectives and goals.

**Alternate Technologies.** Alternate technologies for power generation, such as gas-fired generation, would have different, and perhaps more significant, visual impacts than wind power. Viable alternative wind power technologies (e.g., vertical axis turbines), that could reduce visual impacts, do not currently exist in a form that could be used on a commercial/utility-scale project. Visual impact of the proposed transmission line could be minimized by installing it underground. However, such an installation presents reliability and maintenance difficulties and would increase the cost of the line by five times the cost of an overhead line. Use of this alternate technology is not warranted given the limited visual impact of the proposed transmission line.

**Non-specular Materials.** Non-specular conductors will be used on the proposed transmission line, but will not be necessary for the underground electrical collection lines, because they will be buried. Non-reflective paints and finishes will be used on the wind turbines to minimize reflected glare.
Lighting. Turbine lighting will be kept to the minimum allowable by the FAA and is anticipated to include approximately half of the proposed turbines. Medium intensity red strobes will be used at night, rather than white strobes or steady burning red lights. Fixtures with a narrow beam path will be considered as a means of minimizing the visibility/intensity of FAA warning lights at ground-level vantage points. Lighting at the substation will be kept to a minimum, and turned on only as needed, either by switch or motion detector. Full cut-off fixtures will be utilized to the extent practicable (consistent with safety and security requirements).

Maintenance. The turbines and turbine sites will be maintained to ensure that they are clean, attractive, and operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Pasqualetti et al., 2002; Stanton, 1996). In addition, the Project developer will establish a decommissioning fund to ensure that if the Project goes out of service and is not repowered/redeveloped, all visible above-ground components will be removed.

Offsets. Correction of an existing aesthetic problem within the viewshed is a viable mitigation strategy for wind power projects that result in significant adverse visual impact. Historic structure restoration/maintenance activities could be undertaken to off-set potential visual impacts on cultural resources.

Shadow Flicker Mitigation
As described above, the current shadow flicker analysis is considered to present a worst case scenario, particularly considering the Project Sponsor will only construct and operate 49 wind turbines of the overall evaluated 62 turbines. Therefore, it is anticipated that the number of hours per year that some receptors will experience shadow flicker will be less than modeled. Depending upon which turbines are ultimately constructed and the outcome of additional more specific study (to be conducted by the Project Sponsor prior to FEIS) shadow flicker effects may need to be mitigated at up to three receptors. Two of these receptors are Project participants. Therefore, only one non-participating residential receptor (Receptor 70) is predicted to exceed the 25-hour per year threshold. Shadow flicker effects will be experienced at Receptor 70 a maximum of 202 days per year. The maximum amount of shadow flicker modeled for a single day at Receptor 70 is 47 minutes per day.

Prior to finalization of the FEIS, the Project Sponsor will evaluate what opportunities exist for mitigating those residences exposed to more than 25 hours per annum. Possible mitigations could include: screen plantings, installation of blinds or curtains at the impacted windows, or scheduled curtailment of turbines at sensitive times of day during the summer months to reduce the exposure to below 25 hours.
3.6 HISTORIC, CULTURAL, AND ARCHEOLOGICAL RESOURCES

3.6.1 Existing Conditions

A Phase 1A cultural resources survey was prepared for the Project (edr, 2013c; see Appendix L). The purpose of the Phase 1A survey was to determine whether previously identified cultural resources are located in the areas that may be affected by the proposed Project, and to evaluate the potential for previously unidentified cultural resources to be located in the area of potential effect (APE). These resources include archeological sites (prehistoric and historic) and standing structures or other aboveground features.

The Phase 1A Cultural Resources survey for the Project consisted of a background/literature search, a site file check, and a field inspection of the Project area. Archeological and historic site files at the NYSOPRHP were reviewed as an initial step to determine the presence of known archeological sites within a one-mile radius of the APE. These files include data recorded at both the NYSOPRHP and the New York State Museum (NYSM). Additional research concerning cultural resources in the study area was conducted at the Lewis County Historical Society, and using on-line resources (see Appendix L for additional detail).

To initiate consultation with the State Historic Preservation Office (SHPO) concerning the Project, the Phase 1A Cultural Resources Survey for the Project (edr, 2013c; see Appendix L) was provided to NYSOPRHP (which serves as the SHPO in New York) on March 6, 2013 for their review and comment (see Appendix P).

3.6.1.1 Previously Recorded Cultural Resources

3.6.1.1.1 Archeological Resources

The review of archeological site files at the NYSOPRHP and the NYSM included in the Phase 1A Cultural Resources Survey (edr, 2013c) identified five archeological sites are located within the Project site, and 26 additional sites located within one mile of the Project site (Table 17; see Figure 5 in Appendix L).

<table>
<thead>
<tr>
<th>NYSOPRHP Site Identifier</th>
<th>Additional Site Name</th>
<th>Time Period</th>
<th>Description</th>
<th>Distance from Project site</th>
</tr>
</thead>
<tbody>
<tr>
<td>045.18.0016</td>
<td>J. Sidmore Farmstead</td>
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<td>Map-documented site; various material remains found</td>
<td>Within Project site</td>
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<td>Prehistoric</td>
<td>Evidence of a camp</td>
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<td>U.A. Twitchel</td>
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<td>Earthwork and Artifacts</td>
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</tbody>
</table>

There are no previously reported archeological sites located within the proposed wind generating portion of the Project site. NYSM Sites 3465, 3538, and 3539 are located within the portion of the proposed Transmission Line Corridor located north of New York State Route 12 and south of Middle Road (County Route 160) in Jefferson County. These sites are described as “traces of occupation” reported in the *Archaeological History of New York State* (Parker, 1922), which implies a general area from which Native American artifacts have been recovered or reported. This site description usually indicates the presence of small camp sites and/or lithic scatters. The other sites within the Transmission Line Corridor (NYSOPRHP Sites 045.18.0016 and 045.18.0017; see Table 17) were identified during archeology survey conducted in association with the planning and construction of County Route 162 reconstruction (Abel, 2004). These are historic-period archeological sites that represent remains associated with farmstead sites depicted on historic maps of the area. In addition, there are 14 historic-period and 12 prehistoric sites located within one mile of the Project. These sites are generally located within one-mile of the westernmost...
portion of the Transmission Line, in Jefferson County. The historic-period sites are for the most part farm or other structure sites depicted on historic maps.

3.6.1.1.2 Historic and Architectural Resources

Historically significant properties include buildings, districts, objects, structures and/or sites listed, or that NYSOPRHP has formally determined are eligible for listing, on the State and NRHP. Criteria set forth by the National Park Service for evaluating historic properties (36 CFR 60.4) state that a historic building, district, object, structure or site is significant (i.e., eligible for listing on the NRHP) if the property conveys: “The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (d) that have yielded, or may be likely to yield, information important in prehistory or history” (CFR 2004a; NPS 1990).

**edr** reviewed the State Preservation Historical Information Network Exchange (SPHINX) database maintained by NYSOPRHP to identify significant historic buildings and/or districts located within five miles of the Project. Per the **SHPO Wind Guidelines**, the APE for visual impacts on historic properties for wind projects is defined as those areas within five miles of a project which are within the potential viewshed (based on topography) of the project (NYSOPRHP, 2006). The analysis included herein provides a conservative presentation and includes all historic resources located within five miles of the Project (i.e., not only the resources within the Project’s viewshed), and identifies which resources have potential views of the proposed project.

One NRHP-listed property, four potential historic districts, and 48 properties that have been formally determined eligible for listing on the NRHP are located within five miles of the Project (Table 18; see Figure 6 in Appendix L.
<table>
<thead>
<tr>
<th>Site Identifier</th>
<th>Property Name, Address, and/or Description</th>
<th>Turbine Visibility</th>
<th>Determination</th>
<th>Distance from Nearest Turbine (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>049.02.0036</td>
<td>Structure D</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.8</td>
</tr>
<tr>
<td>049.43.0080</td>
<td>Copenhagen Village Historic District South</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.8</td>
</tr>
<tr>
<td>049.43.0051</td>
<td>Structure U</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0052</td>
<td>Structure V</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0053</td>
<td>Structure W</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0054</td>
<td>Monument Park</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0055</td>
<td>Structure X</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0056</td>
<td>Structure T3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0058</td>
<td>Structure Y2</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0059</td>
<td>Structure Z2</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0060</td>
<td>Structure A3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0061</td>
<td>Structure B3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0062</td>
<td>Structure C3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0063</td>
<td>Structure E3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0065</td>
<td>Structure F3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0066</td>
<td>Structure G3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0067</td>
<td>Structure H3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0068</td>
<td>Structure I3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0069</td>
<td>Structure J3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0070</td>
<td>Structure K3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0071</td>
<td>Structure L3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0072</td>
<td>Structure M3</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0074</td>
<td>United Church of Copenhagen</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0075</td>
<td>Structure K2</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0076</td>
<td>Structure L2</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0079</td>
<td>Copenhagen Village Historic District North</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>0.9</td>
</tr>
<tr>
<td>049.43.0042</td>
<td>Structure L</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
<tr>
<td>049.43.0043</td>
<td>Structure M</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
<tr>
<td>049.43.0044</td>
<td>110 High Street</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
<tr>
<td>049.43.0045</td>
<td>Structure O</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
<tr>
<td>049.43.0046</td>
<td>Structure P</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
<tr>
<td>049.43.0047</td>
<td>116 High Street</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
<tr>
<td>049.43.0048</td>
<td>Structure R</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
<tr>
<td>049.43.0049</td>
<td>Structure S</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
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<tr>
<td>049.43.0050</td>
<td>122 High Street</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
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</tr>
<tr>
<td>049.43.0057</td>
<td>Structure X2</td>
<td>Visible</td>
<td>NRHP-Eligible</td>
<td>1.0</td>
</tr>
</tbody>
</table>

3Potential visibility of the Project based on topography only; the potential screening effects of structures and vegetation are not taken into account. The topography-only viewshed analysis therefore overstates the potential visibility of the Project.

4 Potential visibility of the Project taking into account the potential screening effect of forest vegetation (with an assumed height of 40 feet), which reduces the amount of area from which the Project will be potentially visible.
<table>
<thead>
<tr>
<th>Site Identifier</th>
<th>Property Name, Address, and/or Description</th>
<th>Turbine Visibility</th>
<th>Distance from Nearest Turbine (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>049.05.0040</td>
<td>2952 Alexander Road</td>
<td>Visible</td>
<td>1.2</td>
</tr>
<tr>
<td>049.05.0038</td>
<td>Gallup Cemetery</td>
<td>Visible</td>
<td>1.4</td>
</tr>
<tr>
<td>--</td>
<td>Number Three Road Historic District</td>
<td>Visible</td>
<td>1.7</td>
</tr>
<tr>
<td>049.05.0040</td>
<td>Harrisburg Historic District</td>
<td>Visible</td>
<td>1.7</td>
</tr>
<tr>
<td>049.05.0034</td>
<td>Fairview Cemetery</td>
<td>Visible</td>
<td>1.9</td>
</tr>
<tr>
<td>049.05.0033</td>
<td>House in Harrisburg Historic District</td>
<td>Visible</td>
<td>2.0</td>
</tr>
<tr>
<td>049.05.0035</td>
<td>House in Harrisburg Historic District</td>
<td>Visible</td>
<td>2.1</td>
</tr>
<tr>
<td>049.05.0036</td>
<td>Battle Cemetery</td>
<td>Visible</td>
<td>2.2</td>
</tr>
<tr>
<td>045.18.0035</td>
<td>30497 NY 12</td>
<td>Visible</td>
<td>2.4</td>
</tr>
<tr>
<td>08NR05893</td>
<td>Hiram Hubbard House</td>
<td>Visible</td>
<td>2.6</td>
</tr>
<tr>
<td>045.06.0050</td>
<td>Louis J. Waite Farm</td>
<td>Not Visible</td>
<td>2.7</td>
</tr>
<tr>
<td>049.09.0023</td>
<td>8049 Number 3 Road</td>
<td>Visible</td>
<td>3.4</td>
</tr>
<tr>
<td>049.41.0004</td>
<td>Railroad Depot</td>
<td>Visible</td>
<td>3.4</td>
</tr>
<tr>
<td>049.09.0030</td>
<td>8205 NYS Route 12</td>
<td>Visible</td>
<td>3.5</td>
</tr>
<tr>
<td>049.09.0024</td>
<td>7477 Rice Road</td>
<td>Visible</td>
<td>3.7</td>
</tr>
<tr>
<td>049.13.0081</td>
<td>BIN 3339920 Steel Truss Bridge CR33</td>
<td>Visible</td>
<td>4.5</td>
</tr>
<tr>
<td>045.20.0038</td>
<td>24992 NY 12</td>
<td>N/A</td>
<td>8.0(^\text{5})</td>
</tr>
</tbody>
</table>

The only property listed on the NRHP within five miles of the Project is the Hiram Hubbard House, which is located approximately 2.5 miles north of the proposed Project. This property is a residential dwelling constructed in 1820 just east of the intersection of NYS Route 26 and County Route 47. The house is associated with Noadiah Hubbard who was one of the early settlers of the Town of Champion (Thornton and Zando, 2012).

Historic resources within five miles of the Project that NYSOPRHP has formally determined eligible for listing on the NRHP (Table 18; see Figure 6 in Appendix L) include residences, cemeteries, farms, bridges, parks, and various other structures. In addition, there are numerous nineteenth-century structures, primarily residences and farmsteads, which have not been previously evaluated by NYSOPRHP to determine if they are NRHP-eligible. These types of resources are typically determined NRHP-eligible under NRHP Criterion C (i.e., they "embody the distinctive characteristics of a type, period, or method of construction" [CFR 2004a]), and often derive their significance from being representative examples of vernacular nineteenth-century architectural styles that retain their overall integrity of design and materials. Within the Tug Hill Plateau, many nineteenth-century farmhouses were originally Folk, Georgian or Federal-inspired vernacular houses with modest details. The architectural integrity of historic resources throughout the five-mile radius study area is highly variable, with many showing noticeable alteration.

\(^{5}\) Although 24992 NY Route 12 is located more than five miles from a proposed turbine, the property is located within one mile of the Project’s proposed transmission line, so it is included within the study area.
An architectural survey for Phase 1 of the Maple Ridge (formerly Flat Rock) Wind Power Project in the Towns of Martinsburg, Harrisburg and Lowville was conducted in October 2002, and another for Phase 2 on August 2003. As a result of these surveys, 89 properties of interest were identified by NYSOPRHP. Of these 89 properties, NYSOPRHP determined 19 were individually NRHP-eligible, 49 were NRHP-eligible as contributing to 5 potential historic districts, 8 were not eligible, and 13 were not formally evaluated for National Register eligibility (JMA, 2004a; edr, 2004). Of the 48 previously identified historic sites in the study area, all but five (and all four of the proposed historic districts) were documented and evaluated during the historic resources survey for the Maple Ridge project.

3.6.1.2 Archeological Sensitivity for Prehistoric Native American Sites

There are relatively few previously reported Native American archeological sites located on the Tug Hill Plateau (Einhorn, 1969). To some extent this may reflect that relatively little previous archeological research has been undertaken on Tug Hill (JMA, 2004b, 2007). Large Phase 1 archeological surveys were recently undertaken as part of environmental compliance review for the Maple Ridge (formerly Flat Rock) Wind Farm (constructed 2005-2006) and the proposed Roaring Brook Wind Farm (JMA, 2004b, 2009), both of which are located south of the Project site on Tug Hill. No Native American artifacts or archeological sites were identified as a result of either of these previous surveys. Native American archeological sites that have been identified on Tug Hill typically consist of only one or a few artifacts resulting in small and ephemeral archeological sites, which appear to represent short term hunting or foraging (Einhorn, 1969). In general, the wind generating facility Project site can be considered to have relatively low potential for Native American archeological sites to be present.

As described in Section 3.6.1.1.1, NYSM Sites 3465, 3538, and 3539 are located within or adjacent to the proposed Transmission Line Corridor. These sites are described as “traces of occupation” reported in the Archaeological History of New York State (Parker, 1922), which implies a general area from which Native American artifacts have been recovered or reported, and are located at or around the locations where the proposed Transmission Line Corridor crosses the headwaters of Boynton, Jacob, and Sandy Creeks. Based on the locations of these sites, those portions of the proposed Transmission Line Corridor located in the vicinity (i.e., within approximately 200 feet) of stream crossings and/or associated wetlands should be considered as having a moderate to high potential for Native American archeological sites to be present. Other portions of the proposed Transmission Line Corridor (i.e., those located away from streams and wetlands) should be considered as having a low to moderate potential for Native American archeological sites to be present.
3.6.1.3 Archeological Sensitivity for Historic Period Sites

Historic-period archeological sites located in the vicinity of the Project site could include settlements, farms, or early industrial sites (e.g., mills) dating from the nineteenth and early-twentieth centuries. The locations of nineteenth-century structures within and near the Project site and Transmission Line Corridor are shown on historic maps and atlases that depict the Project area (see Historic Maps included in Appendix L). Map-documented structures (MDS) within the Project site are generally located adjacent to existing roadways. In some instances, MDS represent existing buildings and/or farms. In other instances, the MDS are abandoned structures that now may be represented only by archeological remains. Potential archeological resources associated with these MDS could include abandoned farmstead sites, wherein the complete residential and agricultural complex consisting of foundations, structural remains, artifact scatters, and other features, would constitute an archeological site. In other locations, more limited remains of these complexes, perhaps represented by only a foundation or an artifact scatter, may be extant. Areas located in the immediate vicinity (within approximately 200 feet) of MDS locations should be considered as having a high potential for the presence of historic-period archeological resources. The remaining portions of the Project site exhibit minimal (if any) likelihood for significant historic period archeological sites to be present.

3.6.2 Potential Impacts

3.6.2.1 Construction

3.6.2.1.1 Archeological Resources

Proposed construction of the Project will include ground disturbing activities that have the potential to impact archaeological resources. The APE for archeological resources includes all areas within the limits of disturbance for proposed construction activities. In general, there is relatively little likelihood that most portions of the Project site contain archeologically sensitive sites. Archeologically sensitive areas are identified based on the following criteria: undisturbed areas that are environmentally sensitive with relatively level well-drained soils or in the vicinity of potable water such as springs, streams or creeks (these characteristics typify known site locations in the region); proximity to known (i.e., previously reported) prehistoric or historic site locations within or adjacent to the Project site; and proximity to structures depicted on historic maps located within or immediately adjacent to the Project site.

3.6.2.1.2 Historic and Architectural Resources

As the construction of the access roads and wind turbines will not require demolition or other adverse impacts to historic and architectural resources, there will be no direct impact on architectural resources.
3.6.2.2 Operation

3.6.2.2.1 Archeological Resources

Once the proposed Copenhagen Wind Farm has been constructed, no significant earth-disturbing activities associated with operation and maintenance of the Project will occur. Therefore, Project operation will not have an adverse effect on archeological resources.

3.6.2.2.2 Historic and Architectural Resources

The Project’s potential effect on a given historic property would be a change (resulting from the introduction of wind turbines) in the property’s visual setting, if turbines are visible when the historic property is viewed from a publicly accessible vantage point. The Federal Regulations entitled “Protection of Historic Resources” (36 CFR 800) include in Section 800.5(2) a discussion of potential adverse effects on historic resources. The following types of effects apply to wind energy projects include:

“Adverse effects on historic properties include, but are not limited to: [items i-iii do not apply]; (iv) Change of the character of the property’s use or of physical features within the property’s setting that contribute to its historic significance; (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property’s significant historic features; [items vi-vii do not apply]” (CFR, 2004b).

As it pertains to historic properties, setting is defined as “the physical environment of a historic property” and is one of seven aspects of a property’s integrity, which refers to the “ability of a property to convey its significance” (NPS, 1990:44-45). The other aspects of integrity include location, design, materials, workmanship, feeling, and association.

The potential effect resulting from the introduction of wind turbines into the visual setting for any historic or architecturally significant property is dependent on a number of factors including the number of visible turbines, distance, visual dominance, orientation of views, viewer context and activity, and the types and density of modern features in the existing view (such as buildings/residences, overhead electrical transmission lines, cellular towers, billboards, highways, and silos). It is also worth noting that visual setting may or may not be an important factor contributing to a given property’s historical significance. Scenic views and/or association with the landscape are not specifically identified as contributing to the significance of any of the historic resources in the study area.
The potential visibility and visual impact of the proposed Project is evaluated in the VIA for the Project (edr, 2013a; see Appendix J). The VIA includes an evaluation of the potential visibility of the Project based on viewshed analysis (including the screening effects of vegetation and FAA warning light visibility), field confirmation of visibility utilizing helium-filled balloons raised to the maximum blade-tip height of the proposed turbines, preparation of representative visual simulations, and evaluation of visual simulations by a Registered Landscape Architect.

Visibility of a project does not necessarily indicate that an adverse effect will occur. The NYSDEC guidance concerning visual impacts on aesthetic resources of statewide significance (which include NRHP-listed and NRHP-eligible structures) defines significant aesthetic impacts as those “that may cause a diminishment of the public enjoyment and appreciation of an inventoried resources, or one that impairs the character or quality of such a place... Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision making. Instead a project, by virtue of its visibility, must clearly interfere with or reduce the public's enjoyment and/or appreciation of the appearance of an inventoried resource” (NYSDEC, 2000:5).

Most of the historic resources previously identified within the study area were recommended NRHP-eligible under Criterion C (i.e., they "embody the distinctive characteristics of a type, period, or method of construction" [CFR, 2004a]). These properties are typically determined NRHP-eligible because they are representative examples of vernacular nineteenth-century architectural styles that retain their overall integrity of design and materials, or are associated with broad themes such as the agricultural development of the region. These properties would retain the characteristics that caused them to be recommended eligible after the introduction of wind turbines into their visual settings. For these types of resources, the potential change in the setting resulting from the Project will not necessarily result in diminished public enjoyment and appreciation of a given historic property, or impair its character or quality (per NYSDEC, 2000, see above).

A summary of potential Project visibility from all of the identified historic resources within the study area is provided in Table 18. Of the 52 historic sites (including four proposed historic districts) all but one will have potential views of the project (based on viewshed analysis that considers only the screening effects of topography). When the screening effects of forest vegetation are included in the viewshed analysis, the Project will be screened from three additional historic resources (i.e., the Project will potentially be visible from 48 properties). It is important to note that this assessment of potential visibility assumes that 62 turbines will be built (when in fact only 49 turbines will ultimately be built) and does not take into account screening that would be provided by buildings, street trees, yard vegetation, or other factors that may reduce actual Project visibility. Of the 51 historic resources with potential visibility of the Project, none are located within 0.5-mile of the proposed turbines (i.e., where the Project would be a feature in the foreground), 48 resources are located between 0.5 and 3.5 miles from the Project (i.e., where the Project would be a
feature in the mid-ground), and three resources are located more than 3.5 miles from the Project (i.e., resources where the Project would be a feature in the background). Most of the historic resources within the study area are located within the Village of Copenhagen. Existing buildings and vegetation will screen most of the Project from many locations within the Copenhagen Village Historic Districts (North and South), although occasional, partial views of turbines (or turbine blades) will be available in gaps between buildings and trees.

It is important to note that because screening provided by buildings and street/yard trees, as well as characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.), are not taken into consideration in the viewshed analyses, being within the viewshed does not necessarily equate to actual Project visibility. Field review of potential Project visibility conducted as part of the VIA for the Project verified that visual screening provided by existing buildings, yard trees, and other objects limit views of the Project from some areas where viewshed mapping suggests the Project is potentially visible, especially within village and hamlet settings (edr, 2013a). Therefore, the viewshed data presented in Table 18 overstates the potential visibility of the Project from historic resources within the study area.

As described in the VIA for the Project (edr, 2013a), the Project will result in generally greater visual contrast from vantage points located close to the turbines, where the turbines appear larger, and that provide relatively open views that feature multiple turbines. Therefore, the potential visual effect of the Project on the visual setting associated with historic resources will generally be greater for resources where the Project is featured in the foreground and/or near mid-ground (i.e., within approximately 1.5 miles) of the view.

Most (38) of the historic resources within the study area are located within the Village of Copenhagen, within either the Village of Copenhagen North or Village of Copenhagen South NRHP-eligible historic districts. These resources are located within approximately 0.8 to 1.0-mile from the nearest turbines (i.e., near mid-ground views of the Project may be available). Within the village, existing buildings and street/yard trees will screen views of the turbines from many vantage points. Where turbines are visible, they will typically be occasional, partial views of the Project in the gaps between existing vegetation and buildings. More open views of the Project will be available from higher elevation areas on the outskirts of the village. The visual simulation from Viewpoint 17 (see Appendix A [Visual Simulations] in the VIA, DEIS Appendix J) demonstrates both the visibility and partial screening by buildings and vegetation of the turbines from an elevated vantage point located on the southern outskirts of the village (from the Copenhagen Central School District). However, from within the village, including from within the NRHP-eligible historic districts, only occasional, partially screened views of the Project are expected. From other vantage points in the village, the Project will be completely screened by existing buildings or trees. Because views of the Project will be partially or fully screened from most areas within the village, the Project is not expected to have a significant effect
on the visual setting or character of historic resources located within the Village of Copenhagen. The simulations from Viewpoint 86 (see Appendix A [Visual Simulations] in the VIA, DEIS Appendix J) provide a representative view of an open (not screened) view of wind turbines located in the near mid-ground of the view from rural areas.

More distant mid-ground views (i.e., between 1.5-3.5 miles) and background views (i.e., greater than 3.5 miles) of the Project will be potentially available from 14 historic resources, all of which are located in the rural areas surrounding the Project. As shown in the simulations from Viewpoints 96, 125, and 200 (see Appendix A [Visual Simulations] in the VIA, DEIS Appendix J), at these distances the proposed turbines (although readily apparent) will not necessarily be prominent features in the view. The potential effect of the Project on the visual setting associated with these resources will generally be less than for resources located closer to the Project. As described in the VIA for the Project (edr, 2013a), the effect on the view from vantage points where the Project will be featured in the distant mid-ground is dependent on many factors including the openness of the view, the number of visible turbines, the extent to which the Project is screened or partially screened by buildings, trees, or other objects, and the amount of existing visual clutter and/or modern intrusions in the view. From vantage points where the Project will be featured in the background, the proposed turbines will not be prominent features in the view from these areas and will not significantly affect the visual setting associated with historic resources. The simulations also show that the turbines' narrow profile and white color can significantly reduce their visibility and visual impact, especially at background distances.

3.6.3 Proposed Mitigation

As described in Section 3.2.3, it is anticipated that the Project will require a wetlands permit from the USACE because of potential impacts to surface waters protected under Section 404 of the Clean Water Act. The Project may also require a permit from the NYSDEC under the NYS Environmental Conservation Law, Article 15 (Protection of Waters), in which case a Joint Application for Permit will need to be filed. As part of the wetland permit review, USACE (and NYSDEC, if applicable) would be required to consult with the New York SHPO under Section 106 of the National Historic Preservation Act (and Section 14.09 of the New York State Parks, Recreation, and Historic Preservation Law, if applicable) regarding the potential effect of the Project on archeological and/or historic resources listed on or eligible for listing on the NRHP. As described in Section 3.6.1, the Phase 1A Cultural Resources Survey for the Project site (edr, 2013c; see Appendix L) was provided to the NYSOPRHP on March 6, 2013 for their review and comment (see Appendix P) to initiate SHPO consultation for this Project. It is anticipated that any mitigation measures related to impacts on cultural resources that may be required for the Project will be determined by the Lead Agency in consultation with the SHPO/NYSOPRHP.
3.6.3.1 Archeological Resources

To avoid any impacts to any archeological resources that may be located within the Project site, a Phase 1B archeological survey will be conducted prior to construction of the Project. The Phase 1B archeological survey will be conducted in accordance with the New York State Historic Preservation Office Guidelines for Wind Farm Development Cultural Resources Survey Work (the SHPO Wind Guidelines) issued by the NYSOPRHP in 2006. The SHPO Wind Guidelines (NYSOPRHP, 2006) request that archeological surveys for wind projects be conducted in accordance with a specialized methodology, which includes:

1. Conducting a landscape classification analysis for the Project area following the criteria presented in the Archeological Investigations in the Upper Susquehanna Valley, New York State (Funk, 1993);
2. Preparing an archeological sampling protocol that provides for intensive sampling of environmental zones identified in the landscape classification analysis;
3. Providing the archeological sampling protocol (in the form of a work plan) to NYSOPRHP staff for comment prior to conducting fieldwork; and,
4. Conducting a Phase 1B archeological field survey in accordance with the approved work plan, and submitting a Phase 1B archeological survey report to NYSOPRHP for review.

The Phase 1B archeological survey will take into account any further consultation with the NYSOPRHP (e.g., comments received on the Phase 1A report and the recommendations contained therein), and will include a pedestrian surface survey in previously cultivated areas, the excavation of shovel tests, and examination of the locations of map-documented structures. Any archeological sites identified within the Project site will be avoided during Project construction. All archeological sites identified within the APE for the Project will be avoided through relatively minor modifications to the Project layout. The mapped locations of identified archeological sites will be included on Project construction maps surrounded by a 100-foot (minimum) buffer, identified as “Environmentally Sensitive Areas” or similar, and marked in the field by construction fencing with signs that restrict access. These measures should be adequate to insure that impacts to archeological resources are avoided. In the event that unanticipated archeological resources are encountered during construction, the environmental monitoring plan will include provisions to stop all work in the vicinity of the archeological finds until those resources can be evaluated and documented by a Registered Professional Archeologist.

3.6.3.2 Historic and Architectural Resources

The SHPO Wind Guidelines (NYSOPRHP, 2006) request that cultural resources surveys for wind projects include a historic-architectural resources survey to assess all buildings greater than 50 years old within a five-mile-radius study.
area (as defined by topographic viewshed analysis) to evaluate potential NRHP-eligibility of previously undocumented resources. It is likely that additional NRHP-eligible properties (i.e., that have not been previously identified or formally evaluated) are located within five miles of the Project. The identification and enumeration of these properties will allow for a more thorough evaluation of the Project’s potential effect on the visual setting associated with historic resources located within five miles of the Project. The results of the historic-architectural resources survey will be presented in the FEIS. It is worth noting that a significant portion of the five-mile-radius study area for the Project was recently (2003-2004) surveyed for historic resources for the Maple Ridge Wind Farm project (JMA, 2004a; see Figure 6 in Appendix L). No additional historic-architectural resources survey should be necessary within this recently surveyed area.

Mitigation options are limited, given the nature of the Project and its siting criteria (very tall structures typically located in open fields at the highest locally available elevations). To address any community concerns regarding potential visual effects on any historic structures or sites within the study area, the Applicant/owner/developer will work with the SHPO and the Lead Agency to identify a worthwhile cultural resources project (or projects) within the study area. Local stakeholders, such as historic societies or local historians, will be consulted as appropriate as part of this process. Typical cultural resources mitigation projects that have been proposed for other wind energy projects in New York State have included activities such as additional historic resources surveys, NRHP nominations, monetary contributions to historic property restoration causes, development of heritage tourism promotional materials, development of educational materials and lesson plans, and development of public history materials, such as roadside markers.

3.7 SOUND

The sound or noise produced during construction and operation of wind power projects can be a significant concern to local residents. Noise is defined as any loud, discordant or disagreeable sound or sounds. More commonly, in an environmental context, noise is defined simply as unwanted sound. Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise. The sound generated by proposed or existing facilities may become noise due to land use surrounding the facility, if these lands contain residential, commercial, institutional, or recreational uses, and the sound is perceived as noise by the users of the adjacent lands (NYSDEC, 2001).

Acoustical terms used in this section are defined as follows:

- **Ambient noise level**: The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
• **Decibel (dB):** A unit describing the amplitude of sound.

• **A-weighted sound pressure level (dBA):** The sound pressure level in decibels as measured on a level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.

• **Equivalent Sound Level (L_{eq}):** The L_{eq} integrates fluctuating sound levels over a period of time to express them as a steady-state sound level. Equivalent Sound Level is considered to be related directly to the effects of sound on people since it expresses the equivalent magnitude of the sound as a function of frequency of occurrence and time.

In order to provide a frame of reference for noise levels presented in the following discussion, Table 19 lists examples of common noise sources and their respective dBA levels.

<table>
<thead>
<tr>
<th>Source/Activity</th>
<th>Indicative noise level (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold of hearing</td>
<td>0</td>
</tr>
<tr>
<td>Rural night-time background</td>
<td>20-40</td>
</tr>
<tr>
<td>Quiet bedroom</td>
<td>35</td>
</tr>
<tr>
<td>Wind farm at 350m</td>
<td>35-45</td>
</tr>
<tr>
<td>Car at 40 mph at 100m</td>
<td>55</td>
</tr>
<tr>
<td>Busy general office</td>
<td>60</td>
</tr>
<tr>
<td>Truck at 30 mph at 100m</td>
<td>65</td>
</tr>
<tr>
<td>Pneumatic drill at 7m</td>
<td>95</td>
</tr>
<tr>
<td>Jet aircraft at 250m</td>
<td>105</td>
</tr>
<tr>
<td>Threshold of pain</td>
<td>140</td>
</tr>
</tbody>
</table>


To obtain background sound levels and evaluate potential sound impacts from the Project, Hessler Associates, Inc. (Hessler) prepared an *Environmental Sound Survey and Noise Impact Assessment* (Hessler Associates, Inc., 2012). This document is included in Appendix M. Conservatively, Hessler Associates evaluated all potential 62-turbine site locations, although only a maximum of 49 turbines will be constructed and operated. The two primary phases of the study included an ambient sound level survey to characterize the existing acoustical environment and a computer modeling analysis of future Project operation sound levels, which were compared to the noise thresholds set forth in the local ordinance and NYSDEC guidelines.
3.7.1 Existing Conditions

Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise (i.e., unwanted sound). Some properties of sound typically measured include:

1. Frequency: Frequency is the rate at which a source produces sound waves (i.e., complete cycles of high and low pressure regions). In other words, frequency is the number of times per second that a vibrating body completes one cycle of motion. The unit for frequency is the hertz (Hz = 1 cycle per second). Low pitched or bass sounds have low frequencies, while high-pitched or treble sounds have high frequencies. The sensitivity of the human ear to sound depends on the frequency or pitch of the sound. The human ear hears some frequencies better than others and this varies among individuals.

2. Sound Pressure: Sound pressure level (SPL) is the amount of air pressure fluctuation that a sound source creates. We "hear" or perceive sound pressure as loudness. Sound pressure is usually expressed in units called pascals (Pa). The common sounds we hear have sound pressure levels over a very wide range (0.00002 Pa - 20 Pa). It is difficult to work with such a broad range of sound pressures. To overcome this difficulty, a unit of decibel (dB) is used which compresses the scale of numbers into a manageable range. SPL can be statistically summarized as the residual, or L90, sound level. The L90 is the sound level exceeded during 90% of a measurement interval. It excludes sporadic, short-duration sound events, thereby characterizing the more quiet lulls between such events. It is this consistently present "background" level that forms a conservative basis for evaluating the audibility of a new sound source.

3. Sound Power: The sound power is the sound energy transferred per second from the sound source to the air. A sound source has a given, constant sound power that does not change if the source is placed in a different environment. Sound power is expressed in units called watts (W). An average whisper generates a sound power of 0.0000001 W, a truck horn 0.1 W, and a turbo jet engine 100,000 W. Like sound pressure, sound power (in W) is usually expressed as sound power levels in dB. Sound measurement readings can be adjusted to correspond to human hearing with an "A-weighting filter" which de-emphasizes frequencies or pitches that are outside the normal range of human hearing. Decibels measured using this filter are A-weighted and are called dBA.

4. Time Distribution: Sound can be continuous, variable, intermittent, or impulsive depending on how it changes over time. Continuous sound remains constant and stable over a given time period.
The Generating Site, or the portion of the Project area where the wind turbines will be located, can generally be described as rural and sparsely populated with residences and farms. Environmental variables that are expected to affect existing noise levels include the rustling of trees, wind blowing over fields of corn or grass, vehicle use on local roads, tractor/farming activity, and inclement weather (rainstorms and thunder). Aside from area residences, no other high-occupancy or sensitive receptors such as schools, hospitals, or institutions are located within the Project area, or within 0.5 mile of a proposed wind turbine. The Carlowden Country Club is located adjacent to the northeastern portion of the generating portion of the Project area and within 0.5 miles of a proposed wind turbine.

To evaluate background sound levels, Hessler selected 11 measurement positions, which were selected to represent the acoustic environments experienced at residences nearest to turbines and to cover the Project area in a uniform manner. Each monitoring location was near a typical home or farm and, in most cases, the monitor was placed in the rear yard, away from exposure to local road traffic or other significant sources of noise. Appendix M includes descriptions and photographs of each measurement position as well as a map depicting their respective locations.

Rion Model NL-31 and NL-21, ANSI Type 1 and 2, respectively, integrating sound level meters were used for the survey, set to continuously record a number of statistical parameters in 10 minute increments including the average (Leq), minimum, maximum, and residual (L90) sound levels. Each instrument was enclosed in a weatherproof case and paired with a microphone (either mounted on a 12-inch boom or on a temporary post) and a seven-inch diameter oversized windscreen (ACO Type WS7-80T). All microphones were located approximately one meter above ground level and positioned away from the instrument box and other significant reflective surfaces. All instruments were field calibrated with a Bruel and Kjaer Type 4230 calibrator at the beginning and end of the survey. The observed calibration drift averaged +0.4 dB and ranged from +0.1 to +0.7 dB. Each of these instruments is designed for services as a long-term environmental sound level data logger measuring the A-weighted sound level.

The background sound level survey lasted 18 days, from March 7 to March 25, 2012. At this time of year, contaminating natural sounds from nocturnal insects, leaf rustle, birds, human activity, etc. are generally at annual minimum, providing a conservative measure of the local year-round noise conditions. Weather conditions during the survey period were generally fair, with only a few instances of light snow or very light rain. Wind speed was measured one meter above the ground surface at two of the monitoring locations and at a height of 58 meters by a meteorological tower located in the southeastern portion of the Project area. Hessler normalized wind speed

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6 The closest school to the proposed Project is Copenhagen Central School, located on Mechanic Street in the Village of Copenhagen, approximately 1 mile from the nearest turbine.
recorded at the meteorological tower to a height of 10 meters for further use because wind turbine sound power levels are provided relative to wind speed at this elevation, as described in Appendix M.

Review of the L90 sound levels recorded during the survey period for all 11 monitoring locations revealed that the levels measured at monitoring locations 3 and 8 were subtly affected by the sound of distant water flow (from a waterfall and a small creek, respectively) and the data from these two positions was consequently disregarded from further use or analysis. A small correction for wind-induced microphone noise was applied to the results from the remaining nine monitoring locations, as described in Appendix M. When compared with recorded wind speed, the monitoring results clearly indicate that natural wind-induced sounds in the environment were the principal cause of fluctuations in background sound level within the Project area during the sampling period. Environmental sound levels were low during times of low wind speed and increased substantially during windy conditions. Because the potential for noise impacts is normally greater at night, the nighttime only L90 residual sound levels were used as the design basis for the assessment of potential impacts. This value ranges from 31 to 45 dBA as wind speed increases from 3 to 10 meters per second, as shown in Table 2.6.1 of Appendix M. The critical wind speed to evaluate for this Project is 7 meters per second, when the proposed wind turbines would be generating a sound power level that is a worst-case situation. During this situation, the project noise would be more audible than the ambient noise condition. At 7 meters per second, the ambient noise condition is 35 dBA.

3.7.2 Potential Impacts

Virtually everything that has moving parts will make some sound, including wind turbines. While there are universal standards for quantitative sound level measurement methodologies, there are no universally accepted methods to measure the subjective effects of noise, or to measure the corresponding reactions of human annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person’s subjective reaction to a new noise is by comparing it to the existing or “ambient” environment to which that person has adapted. It is a well-established fact for a new broadband, atonal noise source with a frequency spectrum similar to that of the background, that a cumulative increase in the total sound level of about 5 or 6 dBA at a given receptor is required before the new sound begins to be clearly perceptible or noticeable to most people. Cumulative increases of between 3 and 5 dBA are generally regarded as negligible or hardly audible. Lower sound levels from the new source are “buried” in the existing background sound level and become progressively less.

The NYSDEC Program Policy Memorandum, “Assessing and Mitigating Noise Impacts,” suggests that new noise level increases that exceed 6 dBA above ambient may result in complaints in sensitive locations or may require
additional analysis. The specific language relating to these perceptibility thresholds in the NYSDEC program policy (Section V B(7)c) is as follows:

- Increases ranging from 0-3 dB should have no appreciable effect on receptors.
- Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive receptors are present.
- Sound pressure increases of more than 6 dB may require closer analysis of impact potential depending on existing SPL’s [sound pressure levels] and the character of surrounding land use and receptors.

What this essentially says is that cumulative increases in the total ambient sound level of 6 dBA or less are unlikely to constitute an adverse community impact. From a practical standpoint, because decibels add logarithmically, this threshold means that noise from the project is likely to be considered largely acceptable so long as it does not exceed the existing background level by more than 5 dBA. For example, a background level of 40 dBA plus a project-only sound level of 45 dBA would equal a total cumulative level of 46 dBA – or 6 dBA above the original level. As noted above, the guidelines suggest further evaluation for increases beyond 6 dBA. The guidelines go on to say that “in non-industrial settings the SPL [sound pressure level] should probably not exceed ambient noise by more than 6 dBA at the receptor” but also notes that “there may be occasions where an increase in SPL’s of greater than 6 dBA might be acceptable. The addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dBA”

The Town of Denmark’s Wind Energy Ordinance requires that the Project operate so that the maximum noise generated shall not exceed 45 dBA, as measured 1,250 feet from wind turbines, except as allowed by waiver.

The potential sound-related impacts resulting from the construction and operation of the Project are described below.

3.7.2.1 Construction

Construction of wind power projects requires the operation of heavy equipment and construction vehicles for various activities including construction of access roads, excavation and pouring of foundations, the installation of buried and above ground electrical interconnects, and the erection of turbine components. These activities, although temporary, will produce the following types and levels of noise:

Truck traffic and heavy equipment operation: Heavy equipment, gravel, concrete and the wind turbine components must be delivered to the site by large trucks (including dump trucks, cement mixers, and tractor-trailers). Heavy equipment utilized on a wind power project includes bulldozers and rollers during site preparation and road construction, backhoes, hoe rams, and pneumatic jacks during foundation excavation, and cable plows, trenchers,
and backhoes during electrical cable installation. A large erection crane is used to install the nacelle and rotor atop the turbine tower. Sound generated by truck traffic and heavy equipment ranges from 83 to 91 dBA at a distance of 50 feet (USEPA, 1971).

**Blasting:** Although not anticipated on this Project, blasting may occasionally be required if the turbines are being installed in areas where bedrock is close to the surface and cannot be broken up by other means. More frequently, foundation holes are excavated using backhoes or a pneumatic jack to break up subsoil bedrock. However, if blasting is required, the level of noise generated will be dependent upon technical specifications (size and depth of drilled holes, type and amount of explosive), atmospheric conditions (wind direction, temperature, humidity), and geologic conditions (soil type, bedrock type) (APAO website). In addition, any blasting-related noise will be temporary and infrequent.

Table 20 below shows the total composite noise level at a reference distance of 50 feet, based on the pieces of equipment operating for each construction phase and the typical usage factor for each piece. The noise level at 1,500 feet is also shown.

<table>
<thead>
<tr>
<th>Construction Phase</th>
<th>Composite Equipment Noise Level at 50 feet, dBA</th>
<th>Composite Equipment Noise Level at 1,500 feet, dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearing</td>
<td>88</td>
<td>58</td>
</tr>
<tr>
<td>Excavation</td>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>Foundation</td>
<td>89</td>
<td>59</td>
</tr>
<tr>
<td>Erection</td>
<td>84</td>
<td>54</td>
</tr>
<tr>
<td>Finishing</td>
<td>89</td>
<td>59</td>
</tr>
</tbody>
</table>

Noise from construction-related activities may cause some temporary annoyance at residences within and adjacent to the Project site. In some places these activities will occur relatively close to existing residences and, at distance of 1,500 feet, a total sound level ranging from 54 to 60 dBA might occur over several working days. Such levels would generally be unacceptable if they were occurring on a permanent basis or outside of normal daytime working hours. However, as a temporary, daytime occurrence, construction sound of this magnitude may well go unnoticed by many residents in the Project site as construction-related noise will not be significantly louder than everyday noise sources such as farm equipment and vehicles passing on the road.
3.7.2.2 Operation

According to Rogers et al. (2006), the sources of sounds emitted from operating wind turbines can be divided into two categories: 1) mechanical sounds, from the interaction of turbine components, and 2) aerodynamic sounds, produced by the flow of air over the blades. Mechanical sounds originate from the relative motion of mechanical components and the dynamic response among them. Since the emitted sound is associated with the rotation of mechanical and electrical equipment, it tends to be tonal (of a common frequency), although it may have a broadband component. Aerodynamic broadband sound is typically the largest component of wind turbine acoustic emissions, and is generally characterized as a “swishing” or “whooshing” sound. It originates from the flow of air around the blades, and generally increases with rotor speed.

In order to quantitatively look at potential impacts in absolute terms, a modeling study of worst-case Project sound levels was carried out to determine what specific sound levels could be expected at the nearest receptors. Using the design sound power level spectrum for the GE 1.6-100 turbine, worst-case Project sound levels were calculated using the Cadna/A®, noise modeling program developed by DataKustik, GmbH (Munich). This software enables the Project area and its surroundings, including terrain features, to be realistically modeled in three-dimensions. The program calculates sound levels in strict accordance with ISO 9613-2 Acoustics – Attenuation of Sound during Propagation Outdoors, which is the primary worldwide standard for sound predictions and modeling.

The overall A-weighted sound power level for the GE 1.6-100, tested in accordance with IEC 61400-11, was obtained from General Electric in the form of a 2012 technical specification document (General Electric Co., 2012). These data show that turbine sound level varies with wind speed, increasing with wind speed until it plateaus at a fixed maximum. As previously mentioned, the field survey determined that the nighttime background sound level also varies with wind speed. Therefore, the background and turbine sound levels must be compared under the same wind conditions. For example, it would be incorrect and meaningless to compare the maximum turbine sound level, which requires high winds for it to occur, to the background sound level on a calm, quiet night. In terms of potential noise impacts, the worst-case combination of background and turbine sound levels would occur at the wind speed where the background level is lowest relative to the turbine sound level (in other words, where the differential between the background level and turbine sound power level is greatest). This worst-case situation occurs at a wind speed of 7 m/s, when the turbine first reaches the point of maximum sound emissions. At higher wind speeds the background level continues to increase while the turbine sound level remains constant.
The following conservative assumptions have been applied to the model:

- **Observer Outside** – The plotted sound levels occur outside; sound levels inside of any dwelling will be 15 to 20 dBA, or more, lower.

- **Maximum Turbine Sound Level** – The maximum turbine sound level was used.

- **Critical Wind Speed** – A 7 m/s wind represents the point where the least amount of masking noise is likely to be present relative to the turbine sound level.

- **Cool Season Background Levels** – The background survey was carried out during late winter conditions when environmental sound levels are generally at annual minimum. Based on other surveys of seasonal variation, it is quite possible that the background level during the warmer months would be significantly higher.

- **Conservative Nighttime L90 Background Level** – The critical design wind condition of 7 m/s is based on the nighttime L90 background sound level that represents the near-minimum sound level. By definition, a higher background sound level will actually exist most of the time (90% of the time).

- **Low Ground Porosity** – Open fields would normally be considered somewhat more acoustically absorptive than assumed in the model.

- **Downwind Sound Level** – The downwind sound level measured per IEC 61400-11 is assumed to exist in all directions from every unit; a hypothetical situation where wind is blowing from all directions at the same time.

The Project's potential noise impact can be evaluated in terms of the noise guidelines published by the NYSDEC (2001) and the observed reaction to other comparable wind power projects. As previously described, the method suggested in these guidelines is fundamentally based on the perceptibility of the new source above the existing background sound level. Potential noise impact may also be evaluated in terms of its absolute level at potentially sensitive receptors. Peer-reviewed research based on sound testing at a number of newly completed wind projects comparable to the Copenhagen Wind Farm suggests that complaints about noise become very rare when the mean project sound level is below approximately 40dBA, essentially irrespective of the background noise level (Hessler & Hessler, 2011). According to this research, project sound levels in the range of 40 to 45dBA correlate to noise complaints from approximately two percent of the population living within 2000 feet of a turbine and project sound levels in the range of 45 to 50dBA correlate to complaints from approximately four to six percent of the population.

Therefore, the thresholds used to evaluate noise impacts for this Project include:

- A relative increase of 5dBA above the background level (per NYSDEC guidelines).
- An absolute level of 40dBA (the point at which complaints are possible but generally rare and unlikely).
- An absolute level of 45dBA (the point at which complaints are generated by four to six percent of population).
The model results evaluating all potential 62 turbine sites are depicted in Plot 1 of Appendix M. These results conservatively indicate that if all potential 62 turbine sites were constructed and operated, 67 residences located nearest to proposed turbines are predicted to experience Project sound levels in the range of 40 to 45 dBA. In absolute terms, a sound level of 40-45 dBA is characterized as “quiet to very quiet” in the DEC guidelines. However, in this range, the Project is likely to be clearly perceptible outside of these residences much of the time when it is operating. Consequently, some potential exists for annoyance and sporadic complaints in this area, although experience from comparable projects suggests that complaints would be few in number (on the order of two percent).

Additionally, the model results indicate that if all potential 62 turbine sites were constructed and operating, seven residences will experience Project sound levels just over 45dBA (see Plot 1 of Appendix M). However, each of these residences belongs to landowners participating in the Project and, typically, noise issues are much less common with participants than non-participants. Regardless, there should be awareness that sound emissions from the turbines may be quite prominent and noticeable much of the time as a churning or swishing sound, particularly at night in these areas.

The majority of the residences in the Project area are anticipated to experience sound levels when the project is operating, that are less than 40 dBA. It is important to note that the 40 dBA contour illustrated in the sound contour map (Plot 1 of Appendix M) is not necessarily the threshold of audibility and the turbines will probably be audible from time to time, depending on wind and weather conditions, for quite some distance beyond this contour line. Because they are entirely dependent on constantly changing wind and atmospheric conditions, wind turbine sound emissions are highly variable with time and will routinely fluctuate above and below the predicted mean level, usually within +/- 5 dBA, but by greater amounts on occasion.

The modeled results presented by Hessler represent a worst-case scenario, particularly considering the Project Sponsor will only construct and operate 49 wind turbines of the overall evaluated 62 turbine site. Therefore, it is anticipated that the number of residences experiencing sound levels in the range of 40 to 45 dBA or greater than 45 dBA will be less than modeled.

3.7.1.1 Low Frequency Noise Concerns

Although concerns are often raised with respect to low frequency or infrasonic noise emissions from wind turbines, modern pitch-regulated wind turbines of the type proposed for this Project do not generate low frequency noise to any significant extent. No impact of any kind, whether related to annoyance or health, is expected from Project-related low frequency noise. Early wind turbines (designed with the blades downwind of the support tower) were
prone to producing a periodic thumping noise each time a blade passed the tower, and the widespread belief that wind turbines generate excessive or even harmful amounts of low frequency noise likely originated with this phenomena. While modern wind turbines have been re-configured with blades arranged upwind of the tower, and therefore no longer produce the same magnitude of thumping noises, the myth of excessive low-frequency noise may have perpetuated due to confusion of low frequency sound with the amplitude modulation typical of wind turbines (i.e., the periodic swishing sound with a frequency of about 1 Hz). However, numerous studies show that the low frequency content in the sound spectrum of a typical modern wind turbine – like those proposed for this Project – is no higher than that of the natural background sound level in rural areas (Sondergaard & Hoffmeyer, 2007; Hessler et al., 2008).

In addition, in response to concerns that sounds emitted from wind turbines cause adverse health consequences, AWEA and CanWEA established a scientific advisory panel to conduct a review of current literature pertaining to the perceived health effects of wind turbines (Colby et al., 2009). The multidisciplinary panel was comprised of medical doctors, audiologists, and acoustical professionals from the United States, Canada, Denmark, and the United Kingdom. The objective of the panel was to provide an authoritative reference document for legislators, regulators, and anyone who wants to make sense of the conflicting information pertaining to wind turbine sound. The panel evaluated peer-reviewed literature on sound and health effects, as well as sound produced by wind turbines. The panel concluded that there is no evidence that the audible or sub-audible sounds produced by operating wind turbines have any direct adverse physiological effects and the ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans. In addition, based on the levels and frequencies of the sounds produced by operating wind turbines and the panel’s experience with sound exposures in occupational settings, the sounds produced from operating wind turbines are not unique and therefore do not likely cause direct adverse health consequences (Colby et al., 2009).

The Chief Medical Officer of Health (CMOH) of Ontario also reviewed existing scientific evidence on the potential health impact of noise generated by wind turbines. The report concluded, “…the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects. The sound level from wind turbines at common residential setbacks is not sufficient to cause hearing impairment or other direct health effects, although some people may find it annoying” (CMOH of Ontario, 2010).

In addition, the Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Department of Public Health (MDPH) assembled a team of independent experts to identify any documented or potential health impacts or risks that may be associated with exposure to wind turbines and discuss public health effects relating to wind turbines, based on scientific findings. To do this, the independent, expert panel conducted a literature review,
including peer-reviewed scientific studies, other reports, and popular media, as well as reviewed public comments received by the MassDEP and/or MDPH. According to the report, there is insufficient evidence that the noise from wind turbines is directly causing health problems or disease (Ellenbogen et al., 2012).

### 3.7.3 Proposed Mitigation

Although impacts related to construction noise will be temporary, and are not anticipated to be significant, measures employed to minimize and mitigate temporary construction noise shall include:

- Implementing best management practices for sound abatement during construction, including use of appropriate mufflers and limiting hours of construction.
- Notifying landowners of certain construction sound impacts in advance (e.g., if blasting becomes necessary).
- Implementing a complaint resolution procedure to assure that any complaints regarding construction sound are adequately investigated and resolved (see Section 4.1 of this DEIS for additional information).

The model results indicate that sound levels ranging from 40-45dBA will result in some portions of the Project area from the operating project during some wind and atmospheric conditions, although the majority of the Project area includes residences within that areas that will total sound levels will occur below 40 dBA. Residences located within the 45dBA sound contour including five participating landowners. According to Hessler, sound levels in this range will be perceptible, and in a small percentage of the population sporadic complaints.

Although impacts related to operational noise are not anticipated to be significant, measures employed to minimize and mitigate operational related noise shall include:

- Relocating or eliminating turbines during the design phase that contribute to modeled operational noise effects on nearby residences.
- Implementing a complaint resolution procedure to assure that any complaints regarding operational sound are adequately investigated and resolved (see Section 4.1 of this DEIS for additional information).
- Creating a telephone/email hotline to receive and formally document all noise complaints, which will then be investigated by O&M staff.
- Limit the cutting/clearing of vegetation surrounding the proposed substation.
- Keeping turbines in good working order throughout the operational life of the project.
- Siting turbines at least 1,500 feet from any residences not receiving direct benefits from the Project.
3.8 TRAFFIC AND TRANSPORTATION

Wind power generating projects have the potential to create transportation impacts as a result of short-term construction activities (temporary impacts) and as a result of long-term operation and maintenance of the Project (permanent impacts). To evaluate the potential temporary and permanent impacts resulting from the proposed Project, Fisher Associates, P.E., L.S., P.C. (Fisher) conducted a Traffic and Transportation Study. The purpose of this evaluation is to serve as an initial assessment of the road impacts and modifications required to construct the Project. The Project area roadways were reviewed for traffic & safety conditions, width, physical conditions, and surface type and each bridge and/or culvert found in the field was reviewed for condition, size, type, and cover. Locations that may require improvements prior to construction were noted in the study. The improvement areas will require detailed engineering design prior to construction of the Project. Each intersection along the construction and delivery routes was reviewed to determine what improvements, if any, would be required to accommodate delivery and construction traffic. The Traffic and Transportation Study is included as Appendix N of this DEIS.

3.8.1 Existing Conditions

The Project area is served by a network of State, County, and local roadways. Existing roads in the vicinity of the Project area range from two-lane highways with paved shoulders to seasonally maintained, dirt/gravel roads. Fisher conducted a desktop assessment to identify the best delivery routes to each proposed wind turbine location and for access to the transmission site, and to locate junctions and areas of the route that would require more detailed study. The desktop analysis was followed-up by a field-based study. Each delivery route was driven, roads were measured, and road conditions were surveyed by Fisher engineers and site surveyors to identify any areas of concern, as well as bridges, culverts, and areas of poor road conditions. Then, a further technical analysis was conducted by Fisher to identify additional areas of concern, and to predict the path of the vehicles and assess the suitability of the delivery route for delivery of oversize components used in wind farm construction (see the Traffic and Transportation Study in Appendix N).

3.8.2 Potential Impacts

3.8.2.1 Construction

Some temporary impacts to transportation in-route (mobilizing to the Project area), as well as in and around the Project area will result from the movement of vehicles involved in Project construction. These vehicles and their role in the Project are described below. The exact construction vehicles have not yet been determined, however, it is known that transportation of turbine components and associated construction material involves numerous conventional and specialized transportation vehicles, including:
Wind Turbine Equipment

- Blade Sections – Wind turbines blades (three per turbine) are transported on trailers, with one blade per vehicle. Blades typically control the length of the design vehicle, and the radius of the curves along the travel route to the site. Specialized transport vehicles are designed with articulating (manual or self-steering) rear axles to allow maneuverability through curves.
- Tower Sections – Towers consist of four sections and are transported with one section per truck. Towers generally can control the height and width of the design vehicle dimensions.
- Nacelle – The turbine and related elements are typically the heaviest component transported.
- Hub and Nose Cone – Typically transported with one or more of the same element on a vehicle, for a total of three truck trips per tower. These elements are not critical elements related to design vehicle dimensions.
- Escort Vehicles.

Construction Equipment and Materials

- Construction of Site Roads – Conventional trucks carrying stone, gravel, and miscellaneous construction equipment.
- Crane – For assembly of the wind towers, cranes are transported in sections over numerous trips to the site. Assembled cranes may be crawled between tower sites.
- Concrete trucks for tower foundations.
- Variety of conventional semi-trailers for delivery of substation and O&M facility components and materials.
- Construction staff and other incidental truck trips.

As described in Appendix N, during construction the Project will generate both standard truck and oversized/overweight (OS/OW) vehicular traffic. There will be approximately 10 OS/OW truck type per turbine in addition to approximately 40 loaded concrete trucks per foundation, two conventional semi-trailers of reinforcing steel per turbine, and 20 truckloads for small substation component material. Additional vehicle use will include gravel trucks, pick-up trucks for equipment and tools and trucks and cars for transporting personnel.

The circulation of OS/OW vehicles along Project area and delivery route roadways will result in minor delays for flagman and temporary traffic signals. Roadways should not be significantly adversely impacted by construction traffic as existing traffic volumes are so low.
Based upon an assessment of the existing conditions, Fisher identified two main delivery routes from Interstate 81 to each of the proposed wind tower access roads (see Appendix N). One route from exit 47 in Watertown on Routes 11 and 12 to local county roads and one route from exit 42 near Adams Center on County Route 177. It is assumed that the wind components will typically be delivered directly to the tower sites and that the laydown area will be used primarily to store spools of cable, set up the construction trailers, and park vehicles and dozers. It should be noted that while construction may begin in the spring, turbine component delivery is not anticipated to occur until early-mid summer, after access roads and turbine foundations have been prepared. Therefore, potential winter weather will not affect and/or delay oversized vehicles. However, if bad weather (e.g., thunder storms) occurs while oversized vehicles are in route, such vehicles will likely be required to delay travel in accordance with NYSDOT permit conditions (e.g., pull into a rest stop).

Both of the routes described above and shown in the Traffic and Transportation Study (Appendix N of this DEIS) have a number of potentially constraining features, particularly intersection turning radii. Fisher used engineering software to track a delivery vehicle path, which is overlaid onto orthoimagery. The resulting analysis produces an image of the vehicle movement and identifies any road upgrades that will be required to allow safe passage of the delivery vehicle (including those that may occur on private property). As described in Appendix N, Fisher identified up to 29 intersections along the delivery routes which would require improvements to accommodate vehicles. Appendix E - Exhibits 1 through 29 of the Traffic and Transportation Study (Appendix N of this DEIS) show potential improvement areas for each of the constraints along the proposed delivery routes. The final limit of improvements may be a combination of widening on the inside and the outside of the curve.

The extent of the roadway segment improvements will be verified with the turbine supplier/contractor prior to Project construction, and coordinated with State, County, and local highway departments (at no expense to these departments) prior to the arrival of oversize/overweight vehicle on-site. The following construction activities will likely be required at the locations of road width and turning radii improvements:

- Clearing and grubbing of existing vegetation.
- Relocating traffic signs, fences, and utility poles.
- Grading of the terrain to accommodate the improvement.
- Extension of existing drainage pipes and/or culverts.
- Re-establishment of ditch line (if necessary).
- Construction of a suitable roadway surface to carry the construction traffic (based on the existing geotechnical conditions).
Any cut and fill required for road improvements would comply with the measures set forth in the SWPPP developed during the engineering phase of Project design.

3.8.2.2 Operation

Once the Project is commissioned and construction activities are officially concluded, traffic will likely be concentrated around the O&M facility resulting from Project employees traveling to and from the O&M building. Some of these personnel will need to visit each turbine location and return to this facility. Each turbine typically requires routine maintenance visits once every three months, but certain turbines or other Project improvements could require periods of more frequent service visits. Such service visits typically involve one to two pick-up trucks. However, because all turbines and associated access road are located on (and accessed from) leased land, public road use due to routine maintenance activities will be relatively limited. The Project owner is responsible for the maintenance of all private access roads leading to the turbine sites.

Project personnel (or National Grid personnel) may also need to service the Project substation and POI station. Routine servicing would likely be carried out on a similar quarterly basis and it is anticipated this would involve a similar number of maintenance vehicles.

3.8.3 Proposed Mitigation

Prior to construction, the Applicant and/or contractor will obtain all necessary permits from the Towns and County highway departments and the NYSDOT, for activities including new access roads, improving existing roadways, crossing highways with buried electrical interconnects, and operating oversized vehicles on the highways. The final transportation routing documentation will be provided prior to construction, and will specify the local, County, and State roads to be used as delivery routes (both within and outside of the Project area) by construction/transportation vehicles. All public road upgrades that may be required to accommodate construction vehicles will be identified, including shoring up bridge abutments, adding steel plates or gravel to road surfaces, widening roadways, reconfiguring intersection geometry to accommodate the turning radius of large construction vehicles, and identifying the bridges, pipes, and culverts that will not accommodate the construction related traffic.

Special hauling permits are required for loads that exceed legal dimensions or weights. Thus, transport of the blades, nacelles, tower sections and cranes will require a variety of special hauling permits. Actual loads will depend on the specific turbine supplier, crane equipment chosen, and degree of disassembly of the crane.
A construction routing plan will be developed to assure that to the extent practical, construction vehicles avoid areas where public safety could be a concern (schools, clusters of homes, etc.). To minimize safety risks to the general public, over-sized vehicles will be accompanied by an escort vehicle and/or flagman to assure safe passage of vehicles on public roads. In addition, construction operations will be conducted so that the traveling public is subjected to a minimum delay and hazard. Deliveries will be made during off peak hours for road use (typically 9:30 a.m. to 3:00 p.m. and 6:00 p.m. to 6:00 a.m.) at the discretion of the New York State Department of Transportation (NYSDOT), County and Town Highway Departments, along with New York State Police. The contractor shall provide reflective warning signs, barricades, lighting and flags as necessary to protect traffic.

In accordance with the anticipated County and Towns’ Road Use Agreements, directly prior to construction, a survey of the agreed delivery route will be carried out by appropriately qualified engineers (and NYSDOT, County Highway, and Town Highway Departments as available) to assess and document current existing road conditions. Any extraordinary damage or over-run caused by vehicles during the construction period is to be repaired to agreeable standards under a Road Use Agreement with the relevant authority (State, County, or Town). The Applicant will repair damage done to roads affected by construction within the approved delivery route, thereby restoring the affected roads to a condition equal to or better than documented by the pre-construction survey. Roads will also be maintained in good working order during construction. The Project Sponsor will establish a road use reparation fund or purchase a reparation bond as financial assurance that the roads damaged by the activities of the Project’s construction will be repaired to the standards required by the Road Use Agreement.

Delivery routes may change during the design and construction preparation process; however, the municipalities will be notified of the changes throughout the continued development of the Project. Additionally, design plans will be completed for all public road improvements, and will be made available for the affected local Towns (and to the owner/operator of the respective road) to review prior to construction activities. Once the delivery routes are finalized, the Applicant will enter into a road-use agreement with applicable Towns and Counties, which is anticipated to include a method for post-construction inspections to assure local roads were restored to a condition equal to or better than documented by the pre-construction survey.

Following the examination of the proposed delivery routes, the following mitigation measures are proposed for a suitable traffic management system, which will be put in place prior to any construction taking place:

- In accordance with the County and Towns’ Road Use Agreements, directly prior to construction, a survey of the agreed delivery route will be carried out by appropriately qualified engineers and NYSDOT, County Highway, and Town Highway Departments to assess current existing road conditions. As discussed in the Traffic and Transportation Plan (see Appendix N), video documentation can be used as part of this survey.
Any extraordinary damage or over-run caused by vehicles during the construction period is to be repaired to agreeable standards under a Road Use Agreement with the relevant authority (State, County, or Town).

• The existing surface conditions of roads in the Project area appear adequate to accommodate construction activities. However, there will likely be damage to the surface condition of some roadways. The Applicant will repair the roadways in consultation with the highway departments using the appropriate treatment (i.e., oil and stone, hot or cold mix asphalt, etc.) to re-establish the pre-construction surface conditions.

• According to the Traffic and Transportation Plan (Appendix N of this DEIS), the majority of the roads within the Project area are of sufficient width to accommodate the proposed construction activities. However, Boni Road Spur and Hayes Road may need widening if used for construction. If necessary, roadways would be widened or pull-off areas would be established to allow two-way traffic. Coordination with municipalities and highway departments will then occur to determine which improvements will be maintained after construction.

• As discussed in the Traffic and Transportation Plan, there are multiple intersections that will require temporary improvements (i.e., turning radius widening) if used for construction activities (see Appendix N). Each such intersection will require a detailed engineering plan to quantify and address all impacts. The Traffic and Transportation Plan provides preliminary engineering to accommodate the OS/OW vehicles. After construction of the Project, the Applicant will coordinate with the NYSDOT, County, and Local highway departments to determine if the radii/intersection improvements will be returned to pre-construction conditions or left in place for future use by the Towns and County.

• The Traffic and Transportation Plan identifies potential impacts associated with the weight of construction vehicles. Murrock Road is the only road within the Project area that has a posted weight limit (5 Ton Axle Weight Limit). All other roads are adequate for construction vehicles and traffic. If Murrock Road is used for construction, it will need to be evaluated further to determine the necessary improvements. Drainage structures (i.e., culverts) will also be reviewed during the detailed design process to determine if improvements are necessary to accommodate construction traffic. Typical improvements to these structures that may be necessary are listed in the Traffic and Transportation Plan (see Appendix N).

• The bridges on the proposed transportation routes are outlined in the Traffic and Transportation Plan, and appear to be safe for legal loads and do not have posted weight restrictions. Nonetheless, each bridge will be reviewed during final engineering design and/or the Special Hauling Permit process to determine if additional measures may be required for delivery of Project components.

• According to the Traffic and Transportation Plan (Appendix N), the vertical curvature/slope of roads within the Project area appears to accommodate the requirements of the component delivery vehicles. Despite this, each vertical curve will be analysed during final design to determine if the OS/OW vehicles will be able to
traverse existing roadways. See Appendix N for a list of mitigation measures that may be used if it is determined that the vertical curves are too great for construction traffic.

- If necessary, the Applicant will coordinate with local utility, telephone, and cable companies and the NYSDOT to obtain necessary permits to raise wires and traffic signals. This could include permanently raising wires/traffic signals, temporarily raising wires/traffic signals for the duration of construction, or temporarily raising wires/traffic signal as a construction vehicle passes underneath. The component delivery company selected for the Project will coordinate with the NYSDOT for the Special Hauling Permit into the Project area.

- New York State Police and the Lewis and Jefferson County Sheriffs will be notified of the movement of long and abnormal vehicles and applications for the use of police or state licensed escorts will be made if deemed necessary. Escort vehicles and traffic control will be used in accordance with all applicable permits and regulations.

### 3.9 SOcioECONOMICS

This section presents specific information regarding the labor force, including population and housing; the economy, in particular employment rates and opportunities; and municipal budgets and taxes, including the local school budgets and taxes. The potential impacts of the Copenhagen Wind Farm on these existing socioeconomic conditions, during both construction and operation, are then evaluated.

#### 3.9.1 Existing Conditions

Jefferson and Lewis Counties lie in the Northern New York Region east of Lake Ontario and west of the Adirondacks. A portrait of the existing socioeconomic conditions throughout the area serves as a baseline comparison for the potential impact of the proposed Project on local population, the housing market, employment, and municipal services.

##### 3.9.1.1 Population, Housing, and Schools

As shown in Table 21, Jefferson and Lewis Counties have experienced varying rates of population growth, decline, and stagnation over the past 30 years. Meanwhile, the Towns of Denmark, Champion, Rutland, and Watertown, as well as the Village of Copenhagen, have seen varying trends and rates of either growth or decline, as shown in Table 21. Tables 22 and 23 illustrate age distribution and educational attainment levels throughout the area.
## Table 21. Population, 1980-2010

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis County</td>
<td>27,087</td>
<td>0.5%</td>
<td>26,944</td>
<td>0.6%</td>
<td>26,796</td>
<td>7.0%</td>
<td>25,035</td>
</tr>
<tr>
<td>Town of Denmark</td>
<td>2,860</td>
<td>4.1%</td>
<td>2,747</td>
<td>1.1%</td>
<td>2,718</td>
<td>11.0%</td>
<td>2,448</td>
</tr>
<tr>
<td>Village of Copenhagen</td>
<td>801</td>
<td>-7.4%</td>
<td>865</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Jefferson County</td>
<td>116,229</td>
<td>4.0%</td>
<td>111,738</td>
<td>0.7%</td>
<td>110,943</td>
<td>25.9%</td>
<td>88,151</td>
</tr>
<tr>
<td>Town of Champion</td>
<td>4,494</td>
<td>2.1%</td>
<td>4,400</td>
<td>-3.8%</td>
<td>4,574</td>
<td>12.8%</td>
<td>4,056</td>
</tr>
<tr>
<td>Town of Rutland</td>
<td>3,060</td>
<td>4.2%</td>
<td>2,938</td>
<td>-2.8%</td>
<td>3,023</td>
<td>12.6%</td>
<td>2,685</td>
</tr>
<tr>
<td>Town of Watertown</td>
<td>4,470</td>
<td>-2.7%</td>
<td>4,596</td>
<td>5.9%</td>
<td>4,341</td>
<td>40.1%</td>
<td>3,098</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2012

## Table 22. Age Groups, 2010

<table>
<thead>
<tr>
<th></th>
<th>&lt;15 Years</th>
<th>% of Total Pop.</th>
<th>15-44 Years</th>
<th>% of Total Pop.</th>
<th>45-64 Years</th>
<th>% of Total Pop.</th>
<th>65+ Years</th>
<th>% of Total Pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis County</td>
<td>5,459</td>
<td>20.2%</td>
<td>9,692</td>
<td>35.8%</td>
<td>7,860</td>
<td>29.0%</td>
<td>4,076</td>
<td>15.0%</td>
</tr>
<tr>
<td>Town of Denmark</td>
<td>633</td>
<td>22.1%</td>
<td>1,149</td>
<td>40.2%</td>
<td>733</td>
<td>25.6%</td>
<td>345</td>
<td>12.1%</td>
</tr>
<tr>
<td>Village of Copenhagen</td>
<td>165</td>
<td>20.6%</td>
<td>370</td>
<td>46.2%</td>
<td>179</td>
<td>22.3%</td>
<td>87</td>
<td>10.9%</td>
</tr>
<tr>
<td>Jefferson County</td>
<td>25,047</td>
<td>21.5%</td>
<td>51,285</td>
<td>44.1%</td>
<td>26,916</td>
<td>23.2%</td>
<td>12,981</td>
<td>11.2%</td>
</tr>
<tr>
<td>Town of Champion</td>
<td>984</td>
<td>21.9%</td>
<td>1,874</td>
<td>41.7%</td>
<td>1,103</td>
<td>24.5%</td>
<td>533</td>
<td>11.9%</td>
</tr>
<tr>
<td>Town of Rutland</td>
<td>570</td>
<td>18.6%</td>
<td>1,253</td>
<td>40.9%</td>
<td>900</td>
<td>29.4%</td>
<td>337</td>
<td>11.0%</td>
</tr>
<tr>
<td>Town of Watertown</td>
<td>733</td>
<td>16.4%</td>
<td>1,813</td>
<td>40.6%</td>
<td>1,365</td>
<td>30.5%</td>
<td>559</td>
<td>12.5%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2012

## Table 23. Educational Attainment, 2010

<table>
<thead>
<tr>
<th></th>
<th>% High School Degree or Other</th>
<th>2000-2010 Change</th>
<th>% Bachelor's Degree or Higher</th>
<th>2000-2010 Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis County</td>
<td>86.0%</td>
<td>+5.0%</td>
<td>14.4%</td>
<td>+2.7%</td>
</tr>
<tr>
<td>Town of Denmark</td>
<td>83.2%</td>
<td>-1.6%</td>
<td>18.2%</td>
<td>+6.1%</td>
</tr>
<tr>
<td>Village of Copenhagen</td>
<td>91.6%</td>
<td>+7.5%</td>
<td>13.8%</td>
<td>+4.1%</td>
</tr>
<tr>
<td>Jefferson County</td>
<td>87.0%</td>
<td>+4.1%</td>
<td>20.2%</td>
<td>+4.2%</td>
</tr>
<tr>
<td>Town of Champion</td>
<td>87.0%</td>
<td>+2.5%</td>
<td>19.0%</td>
<td>+4.5%</td>
</tr>
<tr>
<td>Town of Rutland</td>
<td>88.2%</td>
<td>+4.1%</td>
<td>16.3%</td>
<td>+5.8</td>
</tr>
<tr>
<td>Town of Watertown</td>
<td>85.5%</td>
<td>+13.5%</td>
<td>20.9%</td>
<td>+3.5%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2012
Housing availability throughout the four towns is variable, with the lowest value seen in Watertown. Homeownership and median housing value follow a similar pattern varying from under $100,000 in Copenhagen, to over $140,000 in Watertown (see Table 24). Poverty rates within each town are lower than that of the County they are located in except for Denmark, which (at 15.4%) is higher than the statewide rate of 14.2% (see Table 25).

Table 24. Housing, 2010

<table>
<thead>
<tr>
<th></th>
<th>Housing Occupancy Rate</th>
<th>Owner-Occupied Rate</th>
<th>Median Housing Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis County</td>
<td>70.7%</td>
<td>77.8%</td>
<td>$100,700</td>
</tr>
<tr>
<td>Town of Denmark</td>
<td>86.0%</td>
<td>71.3%</td>
<td>$121,600</td>
</tr>
<tr>
<td>Village of Copenhagen</td>
<td>80.1%</td>
<td>53.9%</td>
<td>$95,700</td>
</tr>
<tr>
<td>Jefferson County</td>
<td>77.2%</td>
<td>57.2%</td>
<td>$116,800</td>
</tr>
<tr>
<td>Town of Champion</td>
<td>89.5%</td>
<td>64.8%</td>
<td>$110,000</td>
</tr>
<tr>
<td>Town of Rutland</td>
<td>91.6%</td>
<td>74.7%</td>
<td>$108,200</td>
</tr>
<tr>
<td>Town of Watertown</td>
<td>92.5%</td>
<td>85.8%</td>
<td>$144,200</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2012

Table 25. Household Income and Population Below Poverty, 2010

<table>
<thead>
<tr>
<th></th>
<th>Median Household Income</th>
<th>% of Population Below Poverty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewis County</td>
<td>$42,846</td>
<td>14.6%</td>
</tr>
<tr>
<td>Town of Denmark</td>
<td>$45,417</td>
<td>15.4%</td>
</tr>
<tr>
<td>Village of Copenhagen</td>
<td>$43,977</td>
<td>9.7%</td>
</tr>
<tr>
<td>Jefferson County</td>
<td>$43,410</td>
<td>14.4%</td>
</tr>
<tr>
<td>Town of Champion</td>
<td>$45,511</td>
<td>9.5%</td>
</tr>
<tr>
<td>Town of Rutland</td>
<td>$53,817</td>
<td>8.1%</td>
</tr>
<tr>
<td>Town of Watertown</td>
<td>$66,331</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 2012

The Copenhagen Wind Farm Project area contains portions of three school districts. The numbers of schools and enrollment level of these districts are outlines below in Table 26.
Table 26. School Districts within the Project area Enrollment Data, 2010-2011

<table>
<thead>
<tr>
<th>School District</th>
<th>Number of Schools</th>
<th>2010-2011 Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copenhagen</td>
<td>1</td>
<td>479</td>
</tr>
<tr>
<td>Lowville</td>
<td>3</td>
<td>1,421</td>
</tr>
<tr>
<td>Watertown</td>
<td>8</td>
<td>4,267</td>
</tr>
</tbody>
</table>

Source: NYS Education Department, 2012

3.9.1.2 Economy and Employment

As shown in Table 27, according to the New York State Department of Labor (NYSDOL) the five dominant employment sectors in Jefferson County (in decreasing order of total employment) are 1) Government, 2) Retail Trade, 3) Health Care and Social Assistance, 4) Accommodation and Food Services and 5) Manufacturing. Likewise, for Lewis County, the order is 1) Government, 2) Manufacturing, 3) Retail Trade, 4) Accommodation and Food Services, and 5) Health Care and Social Assistance. Once a significant contributor to the local employment base, on-farm employment now represents a much smaller share of countywide employment, although it remains a substantial economic generator throughout the region by several other measures. Although unemployment across all industries within the county is currently higher than the longer-term average, recent (slow) growth has begun to bring the unemployment rate down.

Table 27. Total Employment in Jefferson County

<table>
<thead>
<tr>
<th>Employment Sector</th>
<th>Total full-time and part-time employment by NAICS industry Jefferson County, New York (number of jobs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishing Hunting</td>
<td>325</td>
</tr>
<tr>
<td>Mining</td>
<td>75</td>
</tr>
<tr>
<td>Utilities</td>
<td>232</td>
</tr>
<tr>
<td>Construction</td>
<td>2,067</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2,706</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>1,003</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>6,726</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>1,318</td>
</tr>
<tr>
<td>Information</td>
<td>718</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>829</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>578</td>
</tr>
<tr>
<td>Professional and Technical Services</td>
<td>740</td>
</tr>
</tbody>
</table>
### Employment Sector

<table>
<thead>
<tr>
<th>Employment Sector</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of Companies and Enterprises</td>
<td>249</td>
<td>257</td>
<td>220</td>
<td>256</td>
</tr>
<tr>
<td>Administrative and Waste Services</td>
<td>1,511</td>
<td>1,270</td>
<td>1,245</td>
<td>1,002</td>
</tr>
<tr>
<td>Educational Services</td>
<td>159</td>
<td>156</td>
<td>154</td>
<td>155</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>5,621</td>
<td>5,774</td>
<td>5,950</td>
<td>5,970</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>447</td>
<td>441</td>
<td>421</td>
<td>426</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>3,754</td>
<td>3,732</td>
<td>3,880</td>
<td>4,125</td>
</tr>
<tr>
<td>Other Services</td>
<td>1,369</td>
<td>1,315</td>
<td>1,413</td>
<td>1,528</td>
</tr>
<tr>
<td>Government</td>
<td>11,506</td>
<td>11,686</td>
<td>11,933</td>
<td>11,784</td>
</tr>
<tr>
<td>Unclassified</td>
<td>13</td>
<td>25</td>
<td>34</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41,946</strong></td>
<td><strong>41,556</strong></td>
<td><strong>42,303</strong></td>
<td><strong>41,759</strong></td>
</tr>
</tbody>
</table>


### Table 28. Total Employment in Lewis County

<table>
<thead>
<tr>
<th>Employment Sector</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry, Fishing Hunting</td>
<td>235</td>
<td>233</td>
<td>255</td>
<td>268</td>
</tr>
<tr>
<td>Utilities</td>
<td>40</td>
<td>41</td>
<td>63</td>
<td>47</td>
</tr>
<tr>
<td>Construction</td>
<td>268</td>
<td>322</td>
<td>297</td>
<td>262</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1281</td>
<td>1,213</td>
<td>1,192</td>
<td>1,209</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>124</td>
<td>93</td>
<td>102</td>
<td>98</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>710</td>
<td>704</td>
<td>709</td>
<td>714</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>94</td>
<td>95</td>
<td>91</td>
<td>98</td>
</tr>
<tr>
<td>Information</td>
<td>61</td>
<td>49</td>
<td>46</td>
<td>41</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>91</td>
<td>91</td>
<td>85</td>
<td>86</td>
</tr>
<tr>
<td>Real Estate and Rental and Leasing</td>
<td>40</td>
<td>40</td>
<td>43</td>
<td>42</td>
</tr>
<tr>
<td>Professional and Technical Services</td>
<td>93</td>
<td>81</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>Administrative and Waste Services</td>
<td>70</td>
<td>59</td>
<td>60</td>
<td>62</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>355</td>
<td>375</td>
<td>427</td>
<td>427</td>
</tr>
<tr>
<td>Arts, Entertainment, and Recreation</td>
<td>N/A</td>
<td>N/A</td>
<td>51</td>
<td>53</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>464</td>
<td>479</td>
<td>543</td>
<td>513</td>
</tr>
<tr>
<td>Other Services</td>
<td>173</td>
<td>163</td>
<td>159</td>
<td>154</td>
</tr>
<tr>
<td>Government</td>
<td>2428</td>
<td>2,423</td>
<td>2,397</td>
<td>2,311</td>
</tr>
</tbody>
</table>

Draft Environmental Impact Statement
Copenhagen Wind Farm
### Total full-time and part-time employment by NAICS industry Lewis County, New York (number of jobs)

<table>
<thead>
<tr>
<th>Employment Sector</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unclassified</td>
<td>78</td>
<td>80</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>6605</td>
<td>6541</td>
<td>6618</td>
<td>6496</td>
</tr>
</tbody>
</table>

3.9.1.3 Municipal Budgets and Taxes

Table 29 illustrates the municipal budgets for Jefferson and Lewis Counties and the Towns of Denmark, Champion, Rutland, and Watertown, as well as the Village of Copenhagen. Local municipal budgets vary substantially between one another, and in some cases from one year to the next. Lewis and Jefferson Counties both increased expenditures by 6% from 2009 to 2010. Other changes were more dramatic, including the Town of Rutland and the Village of Copenhagen.

### Table 29. Municipal Budgets

<table>
<thead>
<tr>
<th>Entity</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lewis County</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Revenues &amp; other sources</td>
<td>$122,679,987</td>
<td>$115,118,625</td>
</tr>
<tr>
<td>Total Expenditures &amp; other sources</td>
<td>$125,899,790</td>
<td>$118,764,727</td>
</tr>
<tr>
<td>Total Indebtedness</td>
<td>$18,387,115</td>
<td>$14,215,000</td>
</tr>
<tr>
<td><strong>Town of Denmark</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Revenues &amp; other sources</td>
<td>$1,110,346</td>
<td>$1,307,136</td>
</tr>
<tr>
<td>Total Expenditures &amp; other sources</td>
<td>$1,129,884</td>
<td>$1,289,989</td>
</tr>
<tr>
<td>Total Indebtedness</td>
<td>$730,000</td>
<td>$765,000</td>
</tr>
<tr>
<td><strong>Village of Copenhagen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Revenues &amp; other sources</td>
<td>$682,921</td>
<td>$1,772,407</td>
</tr>
<tr>
<td>Total Expenditures &amp; other sources</td>
<td>$798,519</td>
<td>$2,011,006</td>
</tr>
<tr>
<td>Total Indebtedness</td>
<td>$2,263,335</td>
<td>$2,299,053</td>
</tr>
<tr>
<td><strong>Jefferson County</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Revenues &amp; other sources</td>
<td>$216,902,054</td>
<td>$209,795,100</td>
</tr>
<tr>
<td>Total Expenditures &amp; other sources</td>
<td>$217,608,935</td>
<td>$204,415,072</td>
</tr>
<tr>
<td>Total Indebtedness</td>
<td>$20,560,000</td>
<td>$23,003,627</td>
</tr>
<tr>
<td><strong>Town of Champion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Revenues &amp; other sources</td>
<td>$2,515,652</td>
<td>$2,673,617</td>
</tr>
<tr>
<td>Total Expenditures &amp; other sources</td>
<td>$3,285,390</td>
<td>$3,177,434</td>
</tr>
<tr>
<td>Total Indebtedness</td>
<td>$2,357,170</td>
<td>$3,523,556</td>
</tr>
</tbody>
</table>
Property taxes are the single largest revenue source for local municipalities in the area. Annual municipal expenditures are recovered through each municipality’s tax levy, which is borne by taxable properties according to their respective assessed value. Many factors influence the assessed value of land, including the type of land use on that property. Real property taxes are determined by the each property’s assessed value, multiplied by the tax rate established by each municipality. Tables 30, 31 and, 32 summarize the most recent data available for municipal and county property tax levies and rates.

Table 30. Property Tax Levy and Municipal Tax Rate (2011, 2010)

<table>
<thead>
<tr>
<th>County</th>
<th>Levy Year 2011 (roll year 2010)</th>
<th>Levy year 2010 (roll year 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>County Tax Levy*</td>
<td>County Tax LevY</td>
</tr>
<tr>
<td>Lewis County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Town of Denmark</td>
<td>$914,439</td>
<td>6.78</td>
</tr>
<tr>
<td>Village of Copenhagen</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Jefferson County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Town of Champion</td>
<td>$1,639,887</td>
<td>6.37</td>
</tr>
<tr>
<td>Town of Rutland</td>
<td>$1,120,132</td>
<td>9.52</td>
</tr>
<tr>
<td>Town of Watertown</td>
<td>$2,738,414</td>
<td>9.36</td>
</tr>
</tbody>
</table>

Source: NYSORPTS, 2012

*Property tax levy reflects the amount of revenue required by the municipality through the property tax base, and is equal to total municipal spending minus aid and other revenues. Tax base is equal to the sum of taxable parcel values. Municipal tax rate is determined by dividing the levy by the tax base, such that each taxable parcel produces that amount of property tax per $1,000 assessed value. For a $100,000 property in the Town of Denmark, county tax liability = (6.78 / 1000) * 100,000, or $678. Equalization (Eq.) rate is the state’s measurement of a municipality’s level of assessment (LOA). An equalization rate of 100 means that the municipality is assessing property at 100 percent of market value. An equalization rate lower than 100 means that the municipality’s total market value is greater than its assessed value.
Table 31. Property Tax Levy and Municipal Tax Rate (2011, 2010)

<table>
<thead>
<tr>
<th>County</th>
<th>Town or Village</th>
<th>Levy Year 2011 (roll year 2010)</th>
<th>Levy Year 2010 (roll year 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Municipal Tax Levy*</td>
<td>Municipal Tax Rate</td>
<td>Eq. Rate</td>
</tr>
<tr>
<td>Lewis County</td>
<td>Town of Denmark</td>
<td>$861,170</td>
<td>7.25</td>
</tr>
<tr>
<td></td>
<td>Village of Copenhagen</td>
<td>$178,156</td>
<td>7.4</td>
</tr>
<tr>
<td>Jefferson County</td>
<td>Town of Champion</td>
<td>$534,631</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>Town of Rutland</td>
<td>$287,782</td>
<td>3.01</td>
</tr>
<tr>
<td></td>
<td>Town of Watertown</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: NYSORPTS, 2012

Table 32. Property Tax Levy and Municipal Tax Rate (2011, 2010)

<table>
<thead>
<tr>
<th>County</th>
<th>Town or Village</th>
<th>Levy Year 2011 (roll year 2010)</th>
<th>Levy Year 2010 (roll year 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Municipal Tax Levy*</td>
<td>Municipal Tax Rate</td>
<td>Eq. Rate</td>
</tr>
<tr>
<td>Town of Denmark</td>
<td>Carthage SD</td>
<td>$2,538,213</td>
<td>11.72</td>
</tr>
<tr>
<td></td>
<td>Copenhagen SD</td>
<td>$306,499</td>
<td>8.76</td>
</tr>
<tr>
<td></td>
<td>Lowville SD</td>
<td>$92,739</td>
<td>8.26</td>
</tr>
<tr>
<td>Town of Champion</td>
<td>Carthage SD</td>
<td>$2,603,335</td>
<td>11.72</td>
</tr>
<tr>
<td></td>
<td>Copenhagen SD</td>
<td>$154,188</td>
<td>8.76</td>
</tr>
<tr>
<td>Town of Rutland</td>
<td>Carthage SD</td>
<td>$1,226,316</td>
<td>17.49</td>
</tr>
<tr>
<td></td>
<td>Copenhagen SD</td>
<td>$490,048</td>
<td>13.08</td>
</tr>
<tr>
<td></td>
<td>South Jefferson SD</td>
<td>$52,847</td>
<td>16.24</td>
</tr>
<tr>
<td></td>
<td>Watertown SD</td>
<td>$48,300</td>
<td>13.64</td>
</tr>
<tr>
<td>Town of Watertown</td>
<td>Copenhagen SD</td>
<td>$1,619</td>
<td>12.89</td>
</tr>
<tr>
<td></td>
<td>General Brown SD</td>
<td>$362,975</td>
<td>12.64</td>
</tr>
<tr>
<td></td>
<td>South Jefferson SD</td>
<td>$1,073,796</td>
<td>16.00</td>
</tr>
<tr>
<td></td>
<td>Watertown SD</td>
<td>$2,795,378</td>
<td>13.44</td>
</tr>
</tbody>
</table>

Source: NYSORPTS, 2012
3.9.1.4 Property Values

Local residents often inquire about the potential for property values to depreciate as a result of a proposed wind power project. This issue has come up during the siting and review of other wind power projects in New York and throughout the United States. In order to address this concern, Renewable Energy Policy Project (REPP) conducted a quantitative study in 2003 titled, Effect of Wind Development on Local Property Values. REPP assembled a database of real estate transactions adjacent to every wind power project in the United States (10 MW or greater) that became operational between 1998 and 2001 (a total of 10 projects, including the Madison and Fenner projects in Madison County, New York). For this study, data was gathered within 5 miles of the wind projects, as this was determined by REPP to be the potential area of visual impact (viewshed). For each of the 10 projects, similar data was also gathered for a comparable community that was located outside of the project viewshed (comparable communities were based on interviews with local assessors as well as analysis of U.S. Census Bureau demographic data). The goal of the data collection was to obtain real estate transaction records for a time period covering roughly six years (three years pre-construction and three years post-construction), and for data based on actual sales values, and not necessarily assessed values. The data was then analyzed in three different ways: Case 1 examined the price changes in the viewshed and the comparable community for the entire period of the study; Case 2 examined how property values changed in the viewshed before and after the project became operational; and Case 3 examined how property values changed in the viewshed and the comparable community after the project became operational.

The results of these analyses showed no negative affect on property value from existing wind facilities. Of the 10 projects examined in the Case 1 analysis, property values actually increased faster within the wind power project viewshed in eight of the 10 projects. The Case 2 analysis revealed that the property values also increased faster after the wind facilities became operational in nine of the 10 projects examined. In the Case 3 analysis, property values increased faster in the wind power project viewshed than in the comparable community in nine of the 10 projects (Sterzinger et al. 2003, p. 2).

It should be noted that the REPP study has been criticized because it assumes that all properties within the study area have a view of the respective wind facility, does not account for property distance to the wind facility, uses an unconventional statistical analysis, and includes transactions that are perceived to be inappropriate (e.g., estate sales, sales between family members, sales due to divorce, etc.). In addition, at least two property value studies (Haughton et al. 2004, p. 8; Heintzelman & Tuttle 2011, p. 21) have predicted a negative effect from the proposed development of a wind power project. To present a clearer understanding of the actual effects of existing wind facilities on property values, a Master of Science thesis was prepared by Ben Hoen (2006, p. 37). The purpose of
this study was to analyze whether the transaction value of homes within 5 miles of the existing Fenner Wind Farm (total turbine blade tip height 328 feet), was significantly affected by views of the wind facility. “View” is defined using a continuous variable from 0 (no view) to 60 (a full view of all 20 turbines). The study additionally investigates how effects may vary with distance (spatially), time (temporally), and house value. Lastly, the effect and degree of the PILOT payment to Fenner Township was investigated. The study utilized the hedonic pricing model, which, given enough data, is sensitive enough to allow sales to be grouped temporally (e.g., by year), spatially (e.g., by distance), and economically (by the value of the home).

The data concerning transaction values and assessor information was collected from the Madison County Real Property Tax Office. From January 1, 1996 through June 1, 2005, 452 sales took place that were coded “arms-length” transactions by county assessors, and were within 5 miles of Fenner Wind Farm. Of these, 167 were removed as land-only sales (i.e., sale of parcel that did not contain a house), and five were removed as non arms-length sales, resulting in a total of 280 sales. Of these, 140 occurred after construction of the Fenner Wind Farm began (2001). A field analysis was conducted on October 30 and 31, 2005 to ensure complete accuracy of the "view" variables used in the model. Visits were made to those homes sold after January 1, 2001 (138 homes visited) to assess the degree to which the home has a view of the wind facility. By standing at or near the house a rating of 1 to 60 was established for each home. This rating was based on the degree to which viewers could see each of the 20 windmills in the Fenner Wind Farm. A total of 3 points per turbine were possible (one point if only the blade above the nacelle was visible, two points if the nacelle was also visible, and three points if the tower below the rotor swept area was also visible), for a cumulative maximum of 60 points.

Computer modeling analysis of the 280 home sales within 5 miles of the Fenner Wind Farm did not reveal a statistically significant relationship between the sale price of homes and either proximity to, or visibility of, the wind facility. Additionally, the analysis did not demonstrate a relationship even when concentrating on homes within one mile of the wind facility that sold immediately following the announcement and construction of the Project. This study therefore concluded that in Fenner, a view of the wind facility does not produce either a universal or localized effect, adverse or otherwise. To the degree that other communities, like the current Project area resemble the Fenner rural farming community, similar conclusions are anticipated (Hoen, 2006).

A more recent study sponsored by the Lawrence Berkeley National Laboratory focused specifically on impacts of wind facility projects on residential property values. The report The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis, released in December 2009 explains the study and the conclusions drawn from the study (Hoen et al., 2009). A more broad approach to assessing potential impacts on property values of residences near wind facility projects was undertaken for this study and consequently it
is the “most comprehensive and data-rich analysis to date in the U.S. or abroad on the impacts of wind projects on nearby property values” (Hoen et al., 2009). This study’s analysis is based on information from 10 communities surrounding 24 existing wind power facilities spread across nine states. The study included the Fenner Wind Farm and Waymart Wind Farm (total turbine blade tip height 328 feet) in Wayne County, Pennsylvania, two facilities that are comparable in terms of land use and rural condition to the Copenhagen Wind Farm. While the Fenner Wind Farm is a considerably smaller Project, the study area is similar in composition and land use. Homes included in the study were located from 800 feet to over five miles from the nearest wind energy facility. This study used a methodology based on the hedonic pricing model to identify the marginal impacts of different housing and community characteristics on residential property values. Analysis of possible impacts on property values was undertaken by dividing the impacts into three non-mutually exclusive categories, area stigma, scenic vista stigma, and nuisance stigma. An explanation of each identified stigma, as used in this study is: Area stigma may occur regardless of whether the wind facility is within view of the home. The mere fact that a wind facility is generally nearby may adversely affect a home’s value. Scenic vista stigma is based on the concern that a home may be devalued because a wind facility is within view and/or interrupts an existing scenic vista. A nuisance stigma can occur because of the potential for extenuating factors from a nearby wind facility, such as noise or shadow flicker (regardless of whether they actually occur). Exploration of the effects of all three stigmas resulted in finding no persuasive evidence that neither the view of the wind facilities nor the distance of the home to the facilities is found to have any significant effect on home sales prices. The study recognizes the possibility that the value of an individual home (or small numbers of homes) has been or could be negatively impacted by a nearby wind facility (Hoen et al., 2009). However, even if such occurrences do exist “they are either too small or too infrequent to result in any widespread, statistically observable impact” (Hoen et al., 2009).

As previously mentioned, Hoen et al. (Hoen et al., 2009) categorized three types of wind turbine stigmas that could affect property values. In a site-specific study conducted in Ford and McLean County, Illinois, Hinman (Hinman, 2010) formalized a fourth stigma, wind farm anticipation stigma. This stigma decreases property values due to the uncertainty surrounding where turbines will be placed and what effect the wind facility will have on area residents when the development is initially proposed. The study examined 3,851 residential property transactions from 2001 through 2009 (Hinman, 2010). The study found that when the 240-turbine wind facility was initially announced, property values near the prospective wind facility decreased compared to elsewhere in the county. However, after the wind facility entered the operational stage, property values near the wind facility increased faster than those located elsewhere in the county. The turbines considered in this study are 398 feet from base to blade tip.

A property value study in the vicinity of Mendota Hills Wind Farm (62 wind turbines, turbine height to blade tip 297 feet), GSG 1 Wind Farm (40 wind turbines, approximately 399 feet to blade tip), and Lee-Dekalb Wind Center (145
wind turbines, turbine height to blade tip 388 feet) within Lee County, Illinois also examined the wind farm anticipation stigma (Carter, 2011). The study examined 1,298 real estate transactions from 1998 to 2010. The study suggests that following announcement of the wind project, property values near the proposed wind facility initially decline. However the analysis indicates that residential properties located near wind turbines in Lee County have not in fact been negatively affected by the installation of a wind energy facility. Assuming the wind facility is appropriately sited using modern, industry standard setbacks, and that it minimizes impacts to nearby residences, property values eventually rebound once the uncertainty surrounding how homeowners are affected by the development disappears. The study acknowledges one shortcoming of property value studies, which is that the results presented are not able to state anything about whether being in close proximity to a wind facility affects the ease of selling a home. It could be that homes near wind turbines are not for sale or selling and consequently would not be included in the studies evaluating real estate transaction data (Carter, 2011). However, the Hoen et al. (Hoen et al., 2009) study estimated a sales volume model and concluded that sales volumes did not decrease with wind energy development.

Heintzelman and Tuttle (2011) examined 11,331 property transactions (including agricultural property) over nine years in Northern New York to explore the effects of new wind facilities on property values. These properties are within Lewis, Franklin, and Clinton Counties. However, only 461 transactions occur within three miles of a wind turbine. The study examined 194 turbines (height to blade tip 395 feet) in Lewis County, which occur on top of a large plateau, as well as 85 turbines in Franklin County and 186 turbines in Clinton County (turbine height to blade tip 390 feet), which occur within a broad river valley with small hills. Similar to the Hoen (2006), Hoen et al. (2009), Hinman (2010), and Carter (2011), the study found that in Lewis County turbines appear to have had little effect, or in some instances a positive effect. In contrast, property values in Clinton and Franklin Counties were negatively impacted by nearby wind energy facilities, with the magnitude of this effect dependent on the distance between homes and the nearest turbine. For Franklin and Clinton Counties, properties within 0.5 mile experienced an 8.8% to 15.8% decline. At a range of three miles the decline is between 2% and 8%. The study states that in Lewis County, landowners appear to be receiving sufficient compensation to prevent a decline in property values. In addition, the Clinton and Franklin County projects became operational in 2008 and 2009, at the very end of the nine year study period, while the Lewis County project became operational in 2006, resulting in a much larger set of property sales and thus, more robust analysis (Heintzelman & Tuttle, 2011).

Public opinion and perception seem to indicate that the presence of wind turbines diminish property values. However, numerous property value studies based on statistical analysis of real estate transactions have found that wind facilities have no significant impact on property values (Sterzinger et al. 2003; Hoen 2006; Hoen et al. 2009; Hinman 2010; Carter 2011).
3.9.2 Potential Impacts

This section examines the jobs, earnings, and associated economic output that could be generated throughout the local and statewide economy by the construction and operation of a 79.9 MW facility with 49 turbines sized at 1.6 MW. The analysis incorporates the National Renewable Energy Laboratory’s Job and Economic Development Impact (JEDI) model to calculate these impacts, and assumes a 9-month construction schedule starting in 2014. Table 33 outlines the projected labor and economic impacts of the proposed project as calculated using the JEDI model, which are elaborated upon in this section.

<table>
<thead>
<tr>
<th>Table 33. Projected Economic Impacts</th>
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<tbody>
<tr>
<td><strong>During construction period</strong></td>
</tr>
<tr>
<td>Project Development and Onsite Labor Impacts</td>
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<tr>
<td>Construction and Interconnection Labor</td>
</tr>
<tr>
<td>Construction Related Services</td>
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<tr>
<td>Turbine and Supply Chain Impacts</td>
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<tr>
<td>Induced Impacts</td>
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<tr>
<td><strong>Total Impacts</strong></td>
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<tr>
<td><strong>During operating years (annual)</strong></td>
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<tr>
<td>Onsite Labor Impacts</td>
</tr>
<tr>
<td>Local Revenue and Supply Chain Impacts</td>
</tr>
<tr>
<td>Induced Impacts</td>
</tr>
<tr>
<td><strong>Total Impacts</strong></td>
</tr>
</tbody>
</table>

Source: National Renewable Energy Laboratory Jobs and Economic Development (JEDI) Model Version W1.10.02
Earnings and Output figures are in millions of dollars. Results are based on model default parameters. Figures may not add up due to independent rounding.

3.9.2.1 Construction

3.9.2.1.1 Population and Housing

Construction of the proposed facility would likely increase local employment demand. During facility construction (expected to last approximately nine months), the Project could employ an estimated 62 workers on-site (based on JEDI model, which is conservative estimate). At this stage, it is unknown what portion of these workers will come from the existing labor force within the county. Those that come from the existing local labor force will not represent an increase in local population, and are thus not expected to generate any increased demand in housing. Those that come from outside of the local labor force may precipitate a marginal, short-term increase in housing demand; some
may move into the area on a permanent basis. It is anticipated that the local housing market can accommodate this increased demand.

3.9.2.2 Economy and Employment

The Socioeconomic Report also describes increased employment demand that could occur throughout the industrial supply chain. In addition to the 62 on-site construction jobs, the off-site industries within New York State that supply goods and services for the construction of the facility could experience increased employment demand of a projected 194 workers. Furthermore, the increased household income associated with both on- and off-site employment could induce demand for more than 55 jobs, as construction and supply chain workers spend their earnings on everyday household goods and services. In sum, it is estimated that the on-site, supply chain and induced jobs could generate $21.3 million in earnings over the course of facility construction.

In addition to jobs and earnings, the construction of the proposed Project could result in an increase in economic output for the businesses employing these workers. Output is measured by the value of industry production in the state or local economy. For the manufacturing sector, output is calculated by total sales plus or minus changes in inventory. For the retail sector, output is equal to gross profit margin. For the service sector, it is equal to sales volume. It is estimated that Project construction could result in an economic output of approximately $49 million, between on-site construction, supply chain impacts, and increased household spending.

3.9.2.3 Municipal Budgets and Taxes

The construction of the proposed Project may have a marginal positive impact on municipal budgets through sales taxes generated by construction-related expenditures and those generated by construction workers’ local spending. The construction process is not anticipated to result in any municipal revenues from increased property taxes (see Section 3.9.2.2, below). The number of on-site workers associated with Project construction is not expected to require additional municipal services (e.g. snowplowing, solid waste pick-up, emergency services).

Although the construction of the Project may impact the condition of local roads, the cost of repair will not be borne by local municipalities. Such repairs are subject to a Road Use Agreement negotiated between the Project Sponsor and each municipality; the Project Sponsor will be responsible for any such financial obligation.
3.9.2.4 Property Values

Little data exists with regard to the specific impacts of wind energy facility construction on nearby property values. As described above, a study conducted in Ford and McLean County, Illinois identified a “wind farm anticipation stigma.” This stigma decreases property values when the development is initially proposed, due to uncertainty about where turbines will be placed and what effect the wind facility will have on area residents. The study found that when the 240-turbine wind facility was initially announced, property values near the prospective wind facility decreased compared to elsewhere in the county. However, after the wind facility entered the operational stage, property values near the wind facility increased faster than those located elsewhere in the county (Hinman, 2010). If a similar anticipation stigma were to occur in the vicinity of the proposed Copenhagen Wind Farm, such impacts would be expected to be similarly short-lived.

3.9.2.5 Operation

3.9.2.5.1 Population and Housing

The operation and maintenance of the proposed facility could increase local employment demand by an estimated five workers on-site. This estimation is based on the JEDI model, however the Project Sponsor estimates the full time workers will be seven to ten. It is anticipated that these workers will either come from within the local labor force or move into the local labor force on a permanent (or semi-permanent) basis. It is also anticipated that the local housing market can accommodate whatever increased demand may result from these long-term positions.

3.9.2.5.2 Economy and Employment

The operation and maintenance of the proposed facility is estimated to generate five (based on JEDI model) full-time jobs with estimated annual earnings of approximately $360,000. These jobs will be most likely be comprised of a Project Manager, Wind Technicians, and administrative personnel. Projected wage rates are consistent with statewide averages, and are estimated to range from around $16 to $25 per hour for administrative and technical personnel, to around $40 per hour for facility management. The full time local jobs generated by the wind energy facility comprise the Project’s direct long-term employment impact.

In addition to the on-site workforce described above, the operation and maintenance of the proposed facility will also generate employment through the industrial supply chain and the spending of landowner lease revenues and workers’ earnings. It is estimated that supply chain and lease revenues could support four jobs as a result of Project operations and maintenance. The combined household spending of these employees, along with that of the on-site operations and maintenance workforce, could support an additional four jobs. In sum, it is estimated that the direct,
indirect, and induced employment generated by facility operation and maintenance could be associated with $1,000,000 in total annual earnings. In addition, Project operation and maintenance could result in an economic output of approximately $2.6 million, between on-site labor, supply chain impacts, and increased household spending.

According to the Australian Wind Energy Association (AusWEA), initial concerns that wind turbines would negatively impact tourism in that country have proven unfounded (AusWEA, 2003). Similarly, a recent survey of visitors to Vermont's Northeast Kingdom found that 95% would not be deterred from further visits by the existence of a proposed wind farm (Institute for Integrated Rural Tourism, 2003). A 2002 study conducted in the Argyll Region of Scotland, involving interviews with over 300 tourists, found that 91% said the presence of wind farms in the area would not influence their decision about whether to return to the area (MORI Scotland, 2002). Almost half (48%) of the tourists interviewed were visiting the area because of the ‘beautiful scenery and views’. Of those who had actually seen wind farms, 55% indicated that their effect was "generally or completely positive", 32% were ambivalent, and 8% felt that the wind farms had a negative effect. Similar positive effects have been reported from various wind farm locations in Australia. Some tourism industry providers have begun marketing wind farms as a tourist attraction, even in rural portions of New York State (Puit, 2011; AusWEA, 2003).

3.9.2.5.3 Municipal Budgets and Taxes

The operation and maintenance of the proposed facility is anticipated to have a positive impact on municipal budgets through the provision of payments in lieu of taxes (PILOT). Although the structure of such payments has not yet been formalized by the Project Sponsor and local taxing jurisdictions, it is estimated that the PILOT will be approximately $640,000 for year one with an estimated 20 year total of $15,500,000. This annual revenue stream will be distributed among the relevant taxing jurisdictions according to their share as determined by the local combined tax rates and pursuant to the terms of the PILOT Agreement. Table 34 illustrates the potential distribution of PILOT revenues if this distribution were to follow recent local averages7. Once the PILOT agreement expires, the property (in this case, the installed infrastructure) is fully taxable.

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7 Table 34 summarizes the projected annual PILOT payments based on the average distribution of property taxes. Within the Town of Denmark in 2011, municipal property taxes constituted an average of 34% of each residential property’s total tax obligation. County taxes constituted an average of 32%, and school taxes claimed the remaining 34%. Distribution of property taxes based on average distribution as determined published 2011 tax levies (NYSORPTS, 2012). Payment amounts based on 79.9 MW facility, with a base payment of $8,000 per MW installed and annual increases of 2%.
Table 34. Potential Distribution of PILOT Payments

<table>
<thead>
<tr>
<th>Year 1 PILOT payment</th>
<th>Estimated Year 1 distribution</th>
<th>20-yr total PILOT payments</th>
<th>Estimated total distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Municipalities</td>
<td>County</td>
<td>School Districts</td>
</tr>
<tr>
<td>$639,200</td>
<td>$217,328</td>
<td>$204,554</td>
<td>$217,328</td>
</tr>
</tbody>
</table>

The operation and maintenance of the proposed facility could bring some positive impact to municipal budgets through the sales taxes associated with facility-related expenditures. Beyond sales taxes and the positive impacts stemming from the Project PILOT (as well as the eventual full taxation of Project infrastructure), the operation of the proposed facility is not expected to have any direct impact on the municipal tax bases in the area. This expectation is based on multiple studies across the country (including examples from upstate New York) that have found no persuasive evidence of any significant relationship between the presence of wind energy facilities and the sale prices of adjacent or nearby properties (Sterzinger et. al., 2003; Hoen, 2006; Hoen et. al. 2009; Wiser et al., 2009).

3.9.2.5.4 Property Values

Although the presence of wind turbines will increase the value of the properties on which they are located and generate income for the participating landowners, due to the allowed tax exemption pursuant to New York State Real Property Tax Law, Article 4, §487, the landowners of these properties will not be assessed a higher value to reflect these improvements. In addition, studies of wind power impact on property values have indicated that these projects typically do not have an adverse effect on assessed property value (REPP, 2003; Hoen, 2006; Hoen et al., 2009; Hinman, 2010; Carter, 2011). Therefore, the Project should have no effect on future real property tax obligations for each participating landowner.

3.9.3 Mitigation

3.9.3.1 Construction

3.9.3.1.1 Population and Housing

Project construction is not expected to have any adverse impacts on population or housing availability in the Towns of Champion, Denmark, Rutland, or Watertown, or the surrounding communities, nor is it expected to depress local property values. Mitigation measures to address population and housing impacts are not necessary.
3.9.3.1.2 Economy and Employment

The construction of the Project is expected to have a positive impact on the local economy and employment, in that additional jobs will be created and additional local expenditures made (lease payments to participating landowners, as well as local purchase of goods and services). Mitigation measures to address economy and employment are not necessary.

3.9.3.1.3 Municipal Budgets and Taxes

Construction of the proposed Project will not create a significant demand for additional municipal facilities or services. Because it will not directly increase local municipal expenses, it will have no adverse impact on municipal budgets. Beyond the Road Use Agreement, no additional mitigation measures are necessary.

3.9.3.1.4 Property Values

The construction of the Project is not expected to have a significant impact on the local property values. Therefore, mitigation measures to address property values are not necessary.

3.9.3.2 Operation

3.9.3.2.1 Population and Housing

The operation and maintenance of the Project is not anticipated to adversely affect population or housing availability in the Towns of Champion, Denmark, Rutland, Watertown, or the surrounding communities, nor is it expected to depress local property values. Therefore, mitigation measures to address population and housing impacts are not necessary.

3.9.3.2.2 Economy and Employment

The operation and maintenance of the Project is expected to have a positive impact on the local economy and employment, in that additional jobs will be created and additional local expenditures made (lease payments to participating landowners, as well as local purchase of goods and services). Mitigation measures to address economy and employment are not necessary.
3.9.3.2.3 Municipal Budgets and Taxes

Neither operation nor maintenance of the proposed Project will create a significant demand for additional municipal facilities or services. Because it will not directly increase local municipal expenses, it will have no adverse impact on municipal budgets. Beyond the Road Use Agreement and PILOT agreement, no additional mitigation measures are necessary.

3.9.3.2.4 Property Values

As previously discussed, the operating Project is not expected to have a depressing effect on local property values. Property owners within the viewshed of proposed wind power projects often inquire about the possibility that these projects could at some point be abandoned, and that the abandoned facilities may affect local property values. To address this issue, the Project developer will establish a decommissioning fund or purchase a decommissioning bond in an amount sufficient to secure the cost of removing turbine site improvements as required under its leases with participating landowners. This fund will assure that the proposed wind power facility will be dismantled and removed in accordance with a Project Decommissioning Plan in the event that it reaches the end of its operational life span or its operation is otherwise abandoned. For more detail on the Project Decommissioning Plan, see Section 2.8.

3.10 PUBLIC SAFETY

This section addresses potential public safety concerns related to the proposed Project. Background information on public health and safety issues associated with wind energy projects is presented first, followed by a discussion of potential impacts associated with the Project, and proposed mitigation measures.

3.10.1 Background Information

Public safety concerns associated with the construction of a wind power project are categorized primarily by fairly standard construction-related concerns. These include the potential for injuries to workers and the general public from 1) the movement of construction vehicles, equipment and materials, 2) falling overhead objects, 3) falls into open excavations, and 4) electrocution. These types of incidents are well understood, and do not require extensive background information. In addition, because the generating portion of the Project is contained within a remote parcels private land, these safety concerns do not present risk to the general public.

Public safety concerns associated with the operation of a wind power project are somewhat more unique, and are the focus of this section. In many ways, wind energy facilities are safer than other forms of energy production, since significant use and storage of combustible fuels are not required and there are no emissions associated with wind
energy production. In addition, use and/or generation of toxic or hazardous materials are minor when compared to other types of generating facilities. However, potential risks to public health and safety can be associated with the operation of wind generation facilities. Examples of such safety concerns include ice shedding, tower collapse/blade throw, stray voltage, fire, lighting strikes, electrocution, and electro-magnetic fields. Each of these concerns is discussed individually in the sections below. Potentially significant adverse impacts associated with low frequency noise and shadow flicker are discussed in Sections 2.6 and 3.7, respectively.

Additionally, one gas transmission pipeline crosses the proposed transmission line corridor (see Figure 3B). However, this line will only be crossed by the overhead 115 kV line and will be carefully avoided in the siting of transmission poles and their associated access routes. The Project Sponsor will coordinate with the gas pipeline company during the engineering design of the proposed transmission line. Therefore, no impacts or safety concerns associated with this gas transmission line are anticipated to result from Project construction or operation.

3.10.1.1 Ice Shedding

Ice shedding and ice throw refer to the phenomena that can occur when ice accumulates on rotor blades and subsequently breaks free and falls to the ground. Although a potential safety concern, no serious accidents caused by ice being “thrown” from an operating wind turbine have been reported (IEA Wind, 2012). However, ice shedding and ice throw do occur, and could represent a potential safety concern.

Under certain weather conditions, ice may build up on the rotor blades and/or sensors, slowing the rotational speed, and potentially creating an imbalance in the weights of the individual blades. Such effects of ice accumulation can be sensed by the turbine’s computer controls and would typically result in the turbine being shut down until the ice melts. Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and the ice on the rotor blades begins to thaw. Therefore, the tendency is for ice fragments to drop off the rotors and land near the base of the turbine (Morgan et al., 1998; Ellenbogen, et al., 2012). Ice can potentially be “thrown” when ice begins to melt and stationary turbine blades begin to rotate again; if ice falls from a stationary turbine during very high wind conditions that are strong enough to carry the ice some distance; or in the event of a failure of the turbine’s control system.

The distance traveled by a piece of ice depends on a number of factors, including: the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational speed of the blade, the shape of the ice that is shed (e.g., spherical, flat, smooth), and the prevailing wind speed. Data gathered at existing wind farms have documented ice fragments on the ground at a distance of 50 to 328 feet from the base of the tower. These fragments were in the range of 0.2 to 2.2 pounds in mass (Morgan et al., 1998). Ice throw observations are
also available from a wind turbine near Kincardine, Ontario, where the operator conducted 1,000 inspections between December 1995 and March 2001. Only 13 of the 1,000 inspections noted ice fragments, which were documented on the ground at a distance up to 328 feet (100 meters) from the base of the turbine, with most found within 164 feet (50 meters) (Garrad Hassan America, Inc., 2007). While the height of wind turbines is also a factor to be considered, the “Wind Turbine Health Impact Study” prepared by an independent expert panel for the Massachusetts Department of Public Health concluded that, “ice is unlikely to land farther from the turbine than its maximum vertical extent” (Ellenbogen, 2012).

3.10.1.2 Tower Collapse/Blade Throw

Another potential public safety concern is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. While extremely rare, such incidents do occur. For example, a tower collapsed at the Klondike III Wind Farm in Oregon in August 2007, resulting in the death of one worker and injury to another. In addition, a wind turbine collapse occurred at the Altona Windpark in Clinton County, New York in March 2009. According to Noble Environmental Power (the project owner) and General Electric (the turbine manufacturer), the collapse was caused by a “wiring anomaly” which prevented the turbine from shutting down as designed during a power outage (Albany Times Herald, 2009). According to Noble Environmental Power, the turbine collapse caused a small fire and scattered debris up to 345 feet from the base of the turbine (The Press Republican, 2009). No one was injured as a result of the incident and local setbacks proved sufficient to protect area homes and public roads.

Such incidents can introduce safety risks for project personnel, and for the general public, as well. The reasons for a turbine collapse or blade throw vary depending on conditions and tower type. The main causes of blade and tower failure are a control system failure leading to an over speed situation, a lightning strike, or a manufacturing defect in the blade (Garrad Hassan America, Inc., 2010). Most instances of blade throw and turbine collapse were reported during the early years of the operation of a wind project.

3.10.1.3 Stray Voltage

Stray voltage is a phenomenon that has been studied and debated since at least the 1960’s. It is an effect that is primarily a concern of farmers whose livestock can receive electrical shocks, although occurrences of stray voltage have also occurred in residential urban areas. Stray voltage can be defined as a “low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system” (Schmidt, 2000), arising from the electrical resistance to earth being below those required by design and construction codes. The term stray voltage can be further defined as a “continuous voltage sources of less than 10 volts between two objects that are likely to be contacted simultaneously by livestock or domestic pets”. Stray voltage is not something unique to wind project
According to the Canadian Wind Energy Association (CANWEA, 2012), “There has been much confusion on the topic of stray voltage, and wind turbines have at times been inappropriately linked as direct sources of stray voltage. Stray voltage is a potential symptom in any system of electrical distribution, regardless of source and is especially prevalent on working farms. Wind turbines are often located in agricultural areas, connecting to the provincial electricity grid with farm operators leasing the land on which the turbines sit. Through improved regulation and electrical code enforcement, incidences of stray voltage will be increasingly detected and eliminated.”

When designed, built, and operated to appropriate electrical safety standards, wind power projects and other electrical facilities do not create any stray voltage issues. Should issues or complaints regarding stray voltage arise, these would typically be investigated by the local utility operator who will investigate the problem and isolate the source of the problem. In the unlikely event of any stray voltage issues, the Project Sponsor will co-operate and liaise with local utilities where necessary to help identify the source of the problem.

3.10.1.4 Fire

Wind turbines, due to their height, physical dimensions, and complexity, have the potential to present response difficulties to local emergency service providers and fire departments. Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic) does create the potential for fire or a medical emergency within the tower or the nacelle. This, in combination with the elevated location of the nacelle and the enclosed space of the tower interior, makes response to a fire or other emergency difficult, and beyond the capabilities of most local fire departments and emergency service providers who have not been adequately trained and equipped.

Other Project components create the potential for a fire or medical emergency due to the storage and use of diesel fuels, lubricating oils, and hydraulic fluids. Storage and use of these substances may occur at the substations, in electrical transmission structures, staging area(s), and the O&M building/facility. The presence of high voltage electrical equipment also presents potential safety risks to local responders.
3.10.1.5 Lightning Strikes

Due to their height and metal/carbon components, as well as generally being located in exposed areas, such as open
land, coastal areas, ridges, plateaus, and offshore, wind turbines are susceptible to lightning strikes. Statistics on
lightning strikes to wind turbines are not readily available, but it is reported that lightning causes four to eight faults
per 100 turbine-years in northern Europe, and up to 14 faults per 100 turbine-years in southern Germany (Korsgaard
& Mortensen, 2006). Most lightning strikes hit the rotor, and their effect is highly variable, ranging from minor surface
damage to complete blade failure. All modern wind turbines include lightning protection systems, which generally
prevent catastrophic blade failure.

3.10.1.6 Electrocution

Due to the generation and transmission of electricity, a wind power project poses the hazard of electrocution.
Because power generation and transmission does not generally occur until after the wind project has been
constructed, this concern is primarily associated with an operating wind power project. The electricity generated by
each turbine will initially be transmitted through buried 34.5 kV electric lines to a collection and transforming
substation, and then delivered to an interconnection substation through an overhead transmission line not to exceed
115 kV. Buried lines will be placed at least 3 feet below grade; therefore, any earthwork conducted at or below these
depths (and in the immediate proximity of the buried lines) will introduce the risk of electrocution by accidental
contact. The overhead electrical transmission line will be centered within a 100-foot ROW. The Project Sponsor is in
the process of securing easements for this ROW.

3.10.1.7 Electro-magnetic Fields

Electric and magnetic fields are sometimes jointly referred to as electro-magnetic fields, or EMF. EMF is found
wherever there is electricity, whether it is wiring, appliances, computers or power lines. Electric power transmission
and collector lines create EMF because they carry electric currents at relatively high voltages. EMFs decrease in
size as the distance from the source increases. For an electric transmission/collector line, EMF levels are highest
next to the lines (typically near the center of the transmission line ROW) and decrease as the distance from the
transmission/collector corridor increases. Electric fields are attenuated by objects such as trees and the walls of
structures, and are completely shielded by materials such as metal and the earth.

The proposed 115 kV transmission line connecting the Project substation to existing National Grid facilities will be
pole mounted. Additionally, in situations where installation of underground cabling is not feasible due to construction
constraints (e.g. bedrock, steep slopes), small portions of the 34.5 kV electrical collection lines for this Project will be
constructed overhead. The proposed 115 kV line is approximately nine mile in length and is located entirely on
private leased lands. Public access to this line would be limited given the selected routing, and it would connect to an existing 115 kV line owned by National Grid. It should be noted that the voltages for both the transmission and collector lines are typical of existing grid infrastructure across the Project area.

Humans are exposed to a wide variety of natural and man-made EMFs, both in the outdoor environment and in homes, schools, and businesses. The EMFs produced by electric transmission lines are well within the range of EMF exposures from such other sources. This is a view supported by the Federal-Provincial-Territorial Radiation Protection Committee of Canada (2008): "Public concerns appear to arise from periodic media reports and from dubious Internet websites which contain inaccurate, unsubstantiated, controversial or contradictory statements regarding EMF-health issues. Concerns may result in public opposition to the proposed construction of new high-voltage power lines or upgrades of existing ones. Opposition to such proposals is often influenced by factors other than health issues (e.g., aesthetics). In addition, some individuals and organizations are promoting precaution by advising the public to limit their time spent near power lines or to avoid being near lines. Like household electrical appliances, power lines emit power-frequency EMFs. The intensity of the EMFs from such lines depends on wiring and tower configurations, as well as the line voltage, the current being carried and distance from the lines. EMFs from power lines and electrical appliances diminish rapidly with increasing distance. For magnetic fields, the contribution from power lines to the levels in most homes and other buildings is very small to negligible when compared to the fields in close proximity to operating electrical appliances and building wiring."

Numerous public health review groups, including the National Institute of Environmental Health Sciences, the National Institutes of Health, and the U.S. Department of Energy, have examined the public’s exposure to EMFs produced by power lines. The consistent overall conclusion of these groups is that available data do not support a cause and effect relationship between exposure to environmental levels of EMF and elevated risk of disease. In a fact sheet released in April 2004, Health Canada concluded that, "Research has shown that EMFs from electrical devices and power lines can induce weak electric currents to flow through the human body. However, these currents are much smaller than those produced naturally by your brain, nerves and heart, and are not associated with any known health risks."

**3.10.2 Potential Impacts**

**3.10.2.1 Construction**

As mentioned in the background information section, public safety concerns associated with Project construction include 1) the movement of large construction vehicles, equipment, and materials, 2) falling overhead objects, 3) falls into open excavations, and 4) electrocution. These hazards are most relevant to construction personnel who will be
working in close proximity to construction equipment and materials, and will be exposed to construction related
hazards on a daily basis. However, the risk of construction-related injury will be minimized through safety conscious
design, pre-qualification and appointment of competent and experienced contractors, regular safety training, use of
appropriate safety equipment, use of certified equipment plant, implementation of suitable safety procedures and
regular site auditing, effective testing, and commissioning.

The general public could also be exposed to construction-related hazards due to the passage of large construction
equipment on area roads and unauthorized access to the work site (on foot, by motor vehicle, ATV, snowmobile,
hunting, or other outdoor recreation activities). The latter could result in collision with stockpiled materials (soil, rebar,
turbine/tower components), as well as falls into open excavations. Because construction activities will adhere to
industry safety standards and will occur primarily on private land well removed from adjacent roads and residences,
exposure of the general public to construction-related risks/hazard is expected to be very limited as long as
appropriate controls are put in place regarding restricting access to the active construction sites and appropriate
signage, guard rails and fencing.

3.10.2.2 Operation

3.10.2.2.1 Ice Shedding

As stated previously, while turbine icing certainly will occur at times, any ice that accumulates on the rotor blades will
likely cause an imbalance, or otherwise alert sensors, and result in turbine shut-down. As the ice begins to thaw, it
will typically drop straight to the ground. Any ice that remains attached to the blades as they begin to rotate could be
thrown some distance from the tower. However, such a throw will usually result in the ice breaking into small pieces
and falling within 328 feet of the tower base (Morgan et al., 1998; Garrad Hassan America, Inc., 2007) or within a
distance equal to the maximum turbine height of 492 feet (Ellenbogen et al., 2012). The Project layout was designed
in accordance with minimum setback distances of 674 feet between proposed turbines and the centerline of public
roads, and 1,500 feet between the proposed turbines and non-participating permanent residences. These setbacks
exceed the area around turbines where studies have documented the potential for ice shedding/ice throw may occur,
which should adequately protect nearby residents, motorists and recreational users of nearby lands (such as
snowmobilers, snowshoers, cross country skiing, hunting or other outdoor winter recreational activities) from falling
ice of any significant size. The Project setbacks from occupied structures also exceed those recommended by GE,
the manufacturer of the GE 1.6-100 turbine model proposed for the Project Site. For “ice-prone project locations”,
GE recommends a setback of 1.5 x (hub height + rotor diameter), or 984 feet for the GE 1.6-100 turbine (GE, 2006).
In addition, unauthorized public access to the site will be limited by posting signs to alert the public and maintenance workers of potential ice shedding risks. Based upon the results of studies/field observations at other wind power projects, the Project's siting criteria, and the proposed control of public access to the turbine sites, it is not anticipated that the Project will result in any measurable risks to the health or safety of the general public (including those participating in outdoor recreation activities such as snowmobiling, snowshoeing, cross country skiing, etc.) due to ice shedding.

3.10.2.2.2 Tower Collapse/Blade Throw

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (AWEA, 2008). The engineering standards of the wind turbines proposed for this Project are of the highest level and meet all federal, state, and local codes. In the design phase, state and local laws require that licensed professional engineers review and approve the structural elements of the turbines. State of the art braking systems, pitch controls, sensors, 24/7 monitoring and speed controls on wind turbines have greatly reduced the risk of tower collapse and blade throw. The wind turbines proposed for the Project will be equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. In addition to the ability for the blades to be feathered to spill the wind and the nacelles to be rotated out of the wind, the turbines will automatically shut down at wind speeds over the manufacturer's threshold (55.9 mph (25 m/s) for the GE 1.6 – 100 model). They will also cease operation if significant vibrations or rotor blade stress is sensed by the turbines' blade monitoring systems. A re-start protocol has to be complied with after any such wind turbine shutdown. Because of these reasons, the risk of catastrophic tower collapse or blade failure is minimal.

Prior to final Project design, a subsurface investigation will be performed at each proposed turbine location to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. See Section 3.1.3 for additional information on the subsurface investigations to be performed before final foundation design. Based upon the Project's siting criteria, and the proposed control of public access to the turbine sites, it is not anticipated that the Project will result in any measurable risks to the health or safety of the general public (including those participating in outdoor recreation activities such as snowmobiling, snowshoeing, cross country skiing, hiking, bird watching etc.) due to tower collapse or blade throw.

3.10.2.2.3 Stray Voltage

While the concerns surrounding stray voltage are legitimate, it is important to note that stray voltage is preventable with proper design, specifications, electrical installation, grounding practices, testing and commissioning. The
Project’s power collection system (34.5 kV and 115 kV) will be properly grounded, and will be electrically isolated (in accordance with required electricity regulations) from the local electrical distribution lines that provide electrical service to on-site structures or off-site buildings and homes. It will be physically and electrically isolated from all of the buildings in and adjacent to the Project area. Additionally, the wind farm’s buried electrical collection lines will be located a minimum of three feet below ground, and will use shielded cables with multiple ground points. This design eliminates the potential for stray voltage (J. Barrett, pers. comm.).

3.10.2.2.4 Fire

All turbines and electrical equipment will be inspected and tested by the Project Sponsor and the connecting utility (for grid and system safety) prior to being commissioned and brought on line. This, along with implementation of built-in safety systems, minimizes the chance of fire occurring in the turbines or electrical stations. However, fire at these facilities could result from a lightning strike, short circuit or mechanical failure/malfunction. Any of these occurrences at a turbine would be sensed by the System Control and Data Acquisition system and reported to the Project control center. Under these conditions, the turbines would automatically shut down and Project maintenance personnel would respond as appropriate.

In the event that a wind turbine catches fire, it is typically allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. Power from the circuit of the Project with the turbine fire is also disconnected; however, the other circuits remain connected and operational. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air (Global Energy Concepts, 2005). However, since the public does not have access to the private land on which the turbines are located, risk to public safety during a fire event is essentially very low. The turbine nacelles and transformers at the substation will be equipped with fire suppression systems. These systems should inhibit and extinguish any fires that occur within the nacelle or at the Project collection station and shut down power to the station.

Generally, any emergency/fire situations at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the Project owner/operator. Construction and maintenance personnel (and properly trained and equipped regional responders) will be trained and will have the equipment to deal with emergency situations that may occur at the Project site (e.g., tower rescue, working in confined spaces, high voltage, etc.). Consequently, such an incident would generally not expose local emergency service providers or the general public to any public health or safety risk. The Project Sponsor will provide and maintain relevant training and equipment to local emergency response services.

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3.10.2.2.5  Lightning Strikes

Lightning protection systems were first added to rotor blades in the mid-1990s, and are now a standard component of modern turbines (Korsgaard & Mortensen, 2006). These systems rely on lightning receptors and diverter strips in the blades that provide a path for the lightning strike to follow to the grounded tower. Lightning is effectively and safely intercepted at several receptor points including the outermost blade tip and the blade root surface, and transmitted to the wind turbine’s lightning conductive system. The turbines’ blade monitoring system provides documentation of all critical lightning events. If a problem is detected, the turbine will shut down automatically, or at a minimum, be inspected to assure that damage has not occurred.

3.10.2.2.6  Electrocution

As previously mentioned, most electrical collection lines will be buried or sited in remote locations on private land parcels, and therefore, the general public will not be exposed to risk from electrocution. Underground collector cabling will be buried at a depth that will not interfere with normal agricultural practices. In addition, all underground cabling within private lands will be mapped and all land owners will be provided with detail of the cable locations.

The 115 kV transmission line will be located overhead on standard poles, up to 70 feet in height, on private leased lands (with limited or no public access), thus minimizing the potential for electrocution. This line will also be marked with appropriate signage warning of high voltage. Appropriate, standard, high voltage warning signage and fencing will also be used for the interconnection substation and the collection substation to minimize risks to the public.

3.10.2.2.7  Electro-magnetic Fields

As described in Section 3.10.1.7, EMFs are a combination of electric and magnetic fields generated by the operation of various Project components, including the turbine generator, electrical collection lines, interconnection lines, and transformers. The strength of an EMF is inversely proportional to the distance a sensor is from the Project component, so that the electric and magnetic field strengths decline as the distance from the component increases. The height of the turbine generator (over 300 feet) above the ground, the location of electrical collection cables underground, and the location of substation transformers and other electrical equipment inside a fenced yard provide separation of these components from the general public to limit EMF exposure.

New York is one of few states that have established standards for electric and magnetic fields produced by electric power lines. All Project components will comply with applicable standards. Table 35 summarizes EMF guidelines that have been adopted by various states.
### Table 35. State EMF Standards and Guidelines for Transmission Lines

<table>
<thead>
<tr>
<th>State/Line Voltage</th>
<th>Electric Field</th>
<th>Magnetic Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida a</td>
<td>69-230 kV</td>
<td>150 mG</td>
</tr>
<tr>
<td>500 kV</td>
<td>10.0 kV/m</td>
<td>200 mG/250 mG c</td>
</tr>
<tr>
<td></td>
<td>2.0 kV/m b</td>
<td></td>
</tr>
<tr>
<td>Massachusetts</td>
<td>-</td>
<td>85 mG</td>
</tr>
<tr>
<td>Minnesota</td>
<td>8.0 kV/m</td>
<td>-</td>
</tr>
<tr>
<td>Montana</td>
<td>7.0 kV/m d</td>
<td>-</td>
</tr>
<tr>
<td>New Jersey</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>New York f</td>
<td>11.8 kV/m</td>
<td>200 mG</td>
</tr>
<tr>
<td></td>
<td>11.0 kV/m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.6 kV</td>
<td></td>
</tr>
<tr>
<td>Oregon</td>
<td>9.0 kV/m</td>
<td>-</td>
</tr>
</tbody>
</table>

(NIEHS, 2002)

**ROW** = right of way; mG = milliGauss; kV/m = kilovolts per meter

Notes:
- a Magnetic fields for winter-normal, maximum line load capacity
- b Includes the property boundary of a substation
- c 250 mG standard applies only to certain 500 kV double-circuit lines built on existing ROWs
- d Maximum for highway crossings
- e May be waived by the landowner
- f Magnetic fields for winter-normal, maximum line load capacity
- g Maximum for private road crossings

**Electric Fields**

Electric fields around power lines are produced by electrical charges, measured as voltage, on the energized conductor. Electric field strength is directly proportional to the line’s voltage; that is, increased voltage produces a stronger electric field. The electric field is inversely proportional to the distance a sensor is from the conductors. The strength of the electric field is measured in units of kilovolts per meter (kV/m). The voltage, and therefore the electric field, around a power line remains practically steady and is not affected by the common daily and seasonal fluctuations in production of electricity by the Project.

**Magnetic Fields**

Magnetic fields around power lines are produced by the electrical load or the amount of current flow, measured in terms of amperage, through the conductors. The magnetic field strength is directly proportional to the amperage; that is, increased amperage produces a stronger magnetic field. The magnetic field is inversely proportional to the sensor’s distance from the conductors. Magnetic fields are expressed in units of milligauss (mG). However, unlike voltage, the amperage and therefore the magnetic field around a power line, fluctuate hourly and daily as the amount of current flow varies. The strength of the magnetic field depends on the current in the conductor, the geometry of the construction, the degree of cancellation from other conductors, and the distance from the conductors or cables.
Overhead Transmission Lines

For the overhead 115 kV electric transmission line, the electric field will be designed in accordance with the New York State EMF Standards and Guidelines for Transmission Lines referenced in Table 35 above. It is anticipated that the location of the 115 kV transmission line on private land and within the ROW leased by the Project Sponsor will provide separation of these components from the general public that is sufficient to limit EMF exposure.

Underground Lines

For underground 34.5 kV circuits, the electric field is totally contained within the insulation of the cable, although the magnetic field is not. Because the electric field is contained within the buried cables, no electric field is measurable at the surface of the ground. Magnetic fields are assessed on the basis of 3 parallel conductors, bundled together, and placed 3 feet below grade. The conservative peak line loading value assumed for assessment of each underground circuit is approximately 50% higher than expected peak loading levels. The net magnetic field of buried cables is measurable 1 meter above the surface of the ground over the cables.

The strength of EMF’s produced by Project components will not be significant at any receptor location. The height of the turbine generator (over 300 feet) above the ground; the location of electrical collection cables underground; and the location of substation transformers and other electrical equipment inside a fenced yard and suitably setback from any residents, should adequately separate these components from any human receptors. Employees working at the Project will be adequately trained and medically checked to mitigate against any pre-existing conditions (such as heart pacemakers etc.) that could impacted by close proximity to electrical equipment.

3.10.3 Proposed Mitigation

3.10.3.1 Construction

Contractors will comply with Occupational Safety and Health Administration (OSHA) regulations, in addition to state worker safety regulations, regarding electricity, climbing of structures, and other hazards, during construction of the Project. To minimize safety risks to construction personnel, all workers will be required to adhere to a safety compliance program. The safety compliance program will address appropriate health and safety related issues including:

- minimum training and qualifications based on the tasks to be undertaken
- personal protective equipment such as hardhats, safety glasses, orange vest, and steel-toed boots
- job safety meetings and attendance requirements
- fall prevention
• construction equipment operation
• maintenance and protection of traffic
• hand and power tool use
• open hole and excavation area safety
• parking
• general first aid
• petroleum and hazardous material storage, use, containment and spill prevention
• posting of health and safety requirements
• visitors to the job site
• local emergency resources and contact information
• incident reporting requirements

As mentioned in Section 3.8, a construction routing plan will be developed to assure that construction vehicles avoid areas where public safety could be a concern (schools, clusters of homes, etc.). To minimize safety risks to the general public, over-sized construction vehicles will be accompanied by an escort vehicle or flagman, as necessary to assure safe passage of vehicles on public roads. The general public will not be allowed on the construction site. After hours, vehicular access to such sites may be blocked by parked equipment, and temporary construction fencing or other visible barriers and suitable protection will be placed around excavations that remain open during off hours. The contractor will coordinate with local fire and emergency personnel to assure that they are aware of where various construction activities are occurring, and avoid potential conflicts between construction activity and the provision of emergency services (e.g., road blockages, etc.).

3.10.3.2 Operation

3.10.3.2.1 Ice Shedding

As stated previously, compliance with required set-backs from sensitive receptors (residences and public roads) and measures to control public access (gates, warning signs, etc.) should minimize any public safety risk associated with ice shedding. The Project Sponsor will also meet with local landowners and snowmobile clubs to explain the risks of ice shedding and proper safety precautions. Additionally, icing of the sensors on the wind turbines will result in automatic turbine shut-down, requiring a re-start protocol to be complied with before recommencing operation.

3.10.3.2.2 Tower Collapse/Blade Throw

The setbacks should assure that a tower failure would not endanger adjacent properties, roadways, or utilities. In addition, members of the public do not have access to the private land on which the turbines are located, and as
previously stated, distance to the nearest public road/residences essentially eliminates risk to the public due to tower collapse/blade throw. Therefore, mitigation is not proposed.

3.10.3.2.3  **Stray Voltage**

Stray voltage will be prevented through proper design and grounding of the Project's electrical system, supplemented by appropriate testing and commissioning. Although not anticipated, any reported stray voltage problems will be addressed through the Project's Complaint Resolution Procedure, described in Appendix G. Beyond this, additional mitigation is not proposed.

3.10.3.2.4  **Fire**

An employee safety manual will be incorporated into the overall operating and maintenance policies and procedures for the Project. Included in that manual will be specific requirements for a fire prevention program. In addition, a Fire Protection and Emergency Response Plan will be developed for the Project, and will include the following components:

- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.
- Regular inspection of all substation components.
- Regular inspection of fire extinguishers at all facility locations where they are installed.
- All Project vehicles will be equipped with firefighting equipment (fire extinguishers and shovels) as well as communications equipment for contacting the appropriate emergency response teams.
- The MSDS for all hazardous materials on the Project site will be on file in the construction trailers (during construction) and the O&M building (during operation), and provided to local fire departments and emergency service providers.
- All wind turbine nacelles will be fitted with suitable fire suppressant equipment.
- The facility Safety Coordinator shall notify the local fire department of any situation or incident where there is any question about fire safety, and will invite an officer of the fire department to visit the workplace and answer any questions to help implement a safe operating plan. The Project Sponsor will provide and maintain appropriate equipment and provide the required level of training to the local fire department.

Development and implementation of this plan will assure that Project construction and operation will not have a significant adverse impact on public safety, or the personnel and equipment of local emergency service providers.
3.10.3.2.5  Lightning Strikes

Beyond the turbines’ lightning protection system, and the fire/emergency response plan described previously, no additional measures to mitigate the effects of lightning strikes are proposed.

3.10.3.2.6  Electrocution

Apart from the 115 kV overhead transmission line and small portions of the 34.5 electrical collection lines, the Project Sponsor has committed to burying all electric lines a minimum of 36 inches (48 inches in agricultural land). The 115 kV transmission line will be designed in accordance with National Grid safety specifications and will be located on private land within a ROW leased by the Project Sponsor. The Project Sponsor will also coordinate with Dig Safely New York prior to the commencement of any construction activities. Beyond these activities, no additional measures to mitigate the potential for electrocution are proposed.

3.10.3.2.7  Electro-magnetic Fields

Because no significant impacts from EMF are expected, no mitigation is necessary. As previously indicated, all proposed electrical collection lines are expected to operate well below the state established standard for magnetic fields. The Project Sponsor will voluntarily adhere to the magnetic field strength interim standards established in the New York State PSC’s Interim Policy Statement on Magnetic Fields, issued September 11, 1990. The Interim Policy establishes a magnetic field strength interim standard of 200 mG, measured at one meter above grade, at the edge of the ROW, at the point of lowest conductor sag.

3.11  COMMUNITY FACILITIES AND SERVICES

The level of community facilities and services provided to the Project area was determined through e-mail and telephone communications with state and county personnel, including the New York State Police Department and Jefferson and Lewis County Sheriff’s Department. In addition, online research was conducted for fire departments and schools. These facilities include public utilities, police and fire protection services, emergency medical services (EMS), education facilities, and recreational facilities.

3.11.1  Existing Conditions

Public Utilities and Infrastructure

Public utilities and infrastructure in the Project area include various overhead and underground facilities. Above ground components include electric distribution and telephone lines along most of the public roads within the Project
area. Cable television and data lines and communications towers also occur in and around the Project area. Underground utilities include telephone, cable television and data, and natural gas pipelines. In addition, one high-pressure gas transmission pipeline is located within the Project area. Specifically, the pipeline is located near the existing substation in the Town of Watertown (and the proposed POI station), and crosses underneath the proposed transmission line between Gotham Road and County Road 160 (Middle Road) (see Figure 3A).

**Police Protection**

The Project resides within two counties, each with their own dispatch center. The Jefferson County 911 Dispatch Center in Watertown dispatches all police, emergency and fire calls within Jefferson County. Similarly, the Lewis County 911 Dispatch Center is located in Lowville and dispatches all police, emergency and fire calls within Lewis County.

Police service to the Village of Copenhagen and Lewis County is provided by the New York State Police and the Lewis County Sheriff's department, located at 5252 Outer Stowe Street in the Village of Lowville. The Lewis County Sheriff's department is composed of 16 officers who respond to about 10,000 calls annually (Lewis County, 2012).

Police service in Jefferson County is provided by the New York State Police and the Jefferson County Sheriff's Department, with its main office located at 753 Waterman Drive in the City of Watertown and with its satellite office located at 23 Franklin Street in the Village of West Carthage. The Jefferson County Sheriff's Department is composed of 26 Deputy Sheriffs, five sergeants, and nine detectives (Jefferson County, 2012).

New York State Police Troop D provides additional service to the area. The closest stations reside in the Village of Carthage, Village of Lowville, and the City of Watertown (NYSP, 2012).

**Fire Protection and Emergency Response**

The Project area is serviced by the Copenhagen Fire Department and the Tylerville Fire Department. Both stations are staffed by volunteers and provide fire protection, rescue, and emergency medical services. The Tylerville Fire Department is located at 28467 County Route 69 in the Village of Copenhagen. The Copenhagen Fire Department is located at 9950 New York State Route 12, in the Village of Copenhagen. The Copenhagen Fire Department consists of 40 volunteer members, two engines, one tanker, and one mini-pumper (CFD, 2012).

**Health Care Facilities**

There are three hospitals within 20 minutes of the Project, and proximity to each varies upon the location within the Project area. As such, distances to each hospital were measured from the center of the Project area.
Lewis County General Hospital and Residential Health Care Facility is located at 7785 North State Street in the Town of Lowville, approximately 13 miles southeast of the Project area. Lewis County General Hospital provides both acute and long term care, with 54 and 160 beds, respectively. Approximately 23 physicians provide the community with emergency, intensive care, pharmacy, and a range of diagnostic and rehabilitative services.

Carthage Area Hospital is located at 1001 West St. Rd. in the Town of Carthage, approximately 8 miles northeast of the Project area. Carthage Area Hospital provides acute care, with a total of 78 beds. The facility provides services in emergency, intensive care, cardiology, vascular and many others including a range of diagnostic and rehabilitative services.

Samaritan Medical Center is located at 830 Washington St. in the City of Watertown, approximately 14 miles west of the Project area. Samaritan Medical Center provides both acute and long term care with a total of 294 beds. The facility provides a wide array of services including emergency, urgent care, imaging, surgical care, and infectious diseases.

**Educational Facilities**

There are three school districts that intersect the Project site. These include the Copenhagen Central School District, the Lowville Academy and Central School District, and the Watertown City School District.

The Copenhagen Central School is located at 3020 Mechanic Street in the Village of Copenhagen and provides public education services to approximately 500 youth in the area, with one building that serves Pre-K through 12 (Copenhagen Central School, 2012; NYSED, 2012).

Lowville Academy and Central School District is housed in one building located at 7668 State Street in the Town of Lowville (approximately 13 miles southeast of the Project area), and provides public education services to 1,440 youth in grades K through 12 (Lowville Academy and Central School District, 2012; NYSED, 2012).

Watertown School District provides public education services to approximately 4,267 youth in the area, with 5 elementary schools serving grades K through 4, one intermediate school serving grades 5-6, one middle school serving grades 7 through 8, and one high school serving grades 9 through 12. Starbuck Elementary School is located at 430 East Hoard Street in the City of Watertown, and serves 134 students in grades K through 4. Sherman Elementary is located at 836 Sherman Street in the City of Watertown, and serves 346 students in grades K through 4. Ohio Elementary School is located on 1537 Ohio Street in the City of Watertown, and serves 338 students in grades K through 4.
grades K through 4. North Elementary School is located at 171 Hoard Street in the City of Watertown and serves 546 students in grades K through 4. Knickerbocker Elementary School is located at 739 Knickerbocker Drive in the City of Watertown, and serves 425 students in grades K through 4. H.T. Wiley Intermediate School is located at 1351 Washington Street in the City of Watertown, and serves 660 students in grades 5 to 6. Case Middle School is located at 1237 Washington Street in the City of Watertown, and serves 592 students in grades 7 to 8. Watertown High School is located at 1335 Washington Street in the City of Watertown, and serves 1,226 students in grades 9 through 12 (Watertown City School District, 2012; NYSED, 2012).

Three private schools also reside within the Watertown School District boundaries. Immaculate Heart Elementary School is located at 122 Winthrop Street in the City of Watertown, and serves 295 students in grades PK through 6. Immaculate Heart Central Junior High School is located at 1316 Ives Street in the City of Watertown, and serves 315 students in grades 7 through 12. Faith Fellowship Christian School is located at 131 Moore Avenue in the City of Watertown, and serves 85 students in grades PK through 12 (Education, 2012).

Augustinian Academy is a private school located approximately 4.5 miles northeast of the Project area, at 317 West Street in the Village of Carthage, and serves approximately 130 youth in the area in grades Pre-K through 8 (Augustinian Academy, 2012).

Hope Mennonite School is a private school located approximately six miles southeast of the Project area, at 9924 East Road in Lowville and serves 22 students in grades 1 through 9 (Education, 2012).

**Solid Waste Disposal**
Neither the Town of Copenhagen or Lewis County provides a waste collection service for the Project area, but residents can hire private waste removal companies. The Village of Copenhagen does provide a weekly waste removal service for residents. Lewis County collects recyclables from 20 locations around the county, providing service to 21 of the 22 towns. In addition, the transfer station for Jefferson County is located at 27138 NYS Route 12 in the City of Watertown and accepts residential and construction debris at $120 per ton. Waste at this station is transferred to the Development Authority of the North Country's Landfill in the Town of Rodman (Jefferson County, 2012).

**Parks and Recreation**
There are six state forests located outside of the Project area, but within ten miles, all of which are located to the southwest. They include Pinckney State Forest, Granger State Forest, Lookout State Forest, Tug Hill State Forest, Cobb Creek State Forest, and Grant Powell Memorial State Forest.
Pinckney State Forest is the closest state forest to the Project, located approximately 1.5 miles from the nearest turbine. It encompasses 2,091 acres in the Town of Pinckney, where recreational activities include trout fishing, hunting, hiking, biking, snowmobiling, cross-country skiing, and snowshoeing (NYSDEC, 2012d).

Lookout State Forest is located approximately 1.7 miles from the nearest turbine, and encompasses 3,915 acres in the Town of Pinckney. Recreational activities include hunting, fishing, hiking, biking, snowmobiling, snowshoeing, and cross-country skiing (NYSDEC, 2012d).

Cobb Creek State Forest is located approximately two miles from the nearest turbine, and encompasses 2,185 acres in the Town of Harrisburg. Opportunities for recreational activities include hiking and snowshoeing (NYSDEC, 2012d).

Granger State Forest is located approximately 4.6 miles from the nearest turbine, and encompasses 734 acres of land in the Town of Pinckney. Recreational activities include small and big game hunting, hiking, cross-country skiing, and snowmobiling (NYSDEC, 2012d).

Grant Powell Memorial State Forest is located approximately five miles from the nearest turbine, and encompasses 8,077 acres in the Towns of Montague, Harrisburg, and Pinckney. Recreational activities offered at the Forest include snowmobiling, cross-country skiing, snowshoeing, hiking, hunting, and fishing (NYSDEC, 2012d).

Tug Hill State Forest is located approximately six miles from the nearest turbine, and encompasses 12,242 acres in the Towns of Rodman and Pinckney. Recreational activities include snowmobiling, snowshoeing, dogsledding, cross-country skiing, hunting, hiking, biking, and trout fishing (NYSDEC, 2012d).

The Deer River runs through the middle of the Generating Site, while the Black River is located both northeast of the Generating Site and northwest of the Transmission Site, approximately 2.7 and 2.5 miles, respectively. There are two NYSDEC-designated public fishing rights access areas on the Black River. They are located approximately 3.5 miles northeast of the Project area and four miles east of the Project area (NYSDEC, 2012e).

Several snowmobile trails converge into a single loop system that is located near the center of the Project area. These trails then radiate out from the Project area in all directions. The trails are maintained by the Barnes Corners Sno-Pals and the Valley Snow Travelers (NYSOPRHP, 2012).
There are two golf courses located near the Project. Carlowden Country Club is located at 4105 Carlowden Road, in the Town of Denmark, immediately adjacent to the Project area and less than a mile east of turbines 5 and 50 (Carlowden Country Club, 2012). The Cedars Golf Course is located at 9368 East Road in the Town of Lowville, approximately 3.5 miles from the Project area (Cedars Golf Course, 2012).

3.11.2 Potential Impacts

3.11.2.1 Construction

The Project will not result in significant increase in the demand for utilities such as telephone, natural gas, electric, water, sanitary sewer, etc. Due to their relatively temporary nature, construction workers will not generate a significant long term demand on local recreational facilities, school district services/facilities, or other community services/facilities.

Short term and minor impacts to existing electric distribution facilities may occur during the construction phase of the Project. National Grid manages the local overhead distribution poles and lines. Prior to construction, the Project Sponsor will review the Project layout with National Grid representatives in order to determine potential areas of conflict between existing utility lines and construction activities. The Project Sponsor will then contract a detailed survey (pole locations, line height, etc.) of all lines identified to have potential conflict with construction activities. If conflicts cannot be avoided through minor shifts in access road alignment or the delivery route, National Grid will temporarily raise a line(s), drop a line(s), or relocate a line(s). None of these activities will require new utility easements/right of ways.

The Project Sponsor will consult with the high-pressure gas transmission pipeline operator to avoid potential adverse impacts. It is expected that the Project Sponsor has been provided with documentation that outlines the guidelines for construction activities on (and in the vicinity of) the gas transmission pipeline rights-of-way. This documentation will likely include notification requirements, drawing requirements, and requirements associated with crossing pipelines with heavy equipment and excavation, cuts or fill in the vicinity of the gas pipelines.

During construction, some public roadways may be temporarily blocked due to oversized delivery vehicles. Impacts of this nature will be addressed through a road use agreement to be executed with the County and Towns. In addition, damage may occur to the roadways anticipated to be used by oversized/heavy equipment, which has the potential to reduce the response time of emergency personnel. However, the police, fire, and emergency response departments have adequate personnel and equipment to respond to basic emergency needs during the construction and operation of the Project. If any roadways are deemed impassable during the construction period, Emergency
Services will be notified of any impassable routes. The construction site could also experience vandalism/trespass problems that would require involvement of local police. Based on experience with other wind power projects in New York, this is not anticipated to be a significant impact.

Project construction will generate some solid waste, primarily plastic, wood, cardboard and metal packing/packaging materials, construction scrap, and general refuse. This material will be collected from turbine sites and other Project work areas, and disposed of in dumpsters located at the construction staging area(s). A private contractor will empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid waste disposal facility.

During construction, the Project will not adversely impact the local school districts, beyond the possible delay of school bus pick-ups and drop-offs at homes within the Project area due to temporary construction traffic/activity. In addition, Project construction will not impact facilities of local interest as no physical disturbance will occur to lands owned by these facilities.

3.11.2.2 Operation

The Project will not result in any significant adverse long-term impacts to local utilities and energy resources. Long-term energy use will increase slightly as a result of facility maintenance and the operation of the O&M facility. However, this impact will be minor because the amount of required electricity and fuel is small, and local fuel suppliers and utilities have sufficient capacity available to serve the Project's needs. As a result, no improvements to the existing energy supply system will be necessary. In addition, the Copenhagen Wind Farm will generate up to 79.9 MW of electric power using a renewable resource (wind), which will be available to the people of Jefferson and Lewis County and other areas of New York State.

No significant problems that would require response by local police, fire, and emergency service personnel are anticipated to result from Project operation. The Project's siting criteria specifies that wind turbines are located at least 642 feet from property lines and non-seasonal public roads, and no permanent residential structures occur within 1,500 feet of a wind turbine, except by waiver. This is well outside of any area that could be affected in the unlikely event of a tower fall or catastrophic blade failure. To the extent Project personnel require emergency assistance, it is anticipated that local providers have experience in responding to fire and accidents in rural locations.

The local fire departments do not have the specialized equipment necessary to respond to a fire should one occur in the nacelle of a Project turbine. Generally, any emergency/fire situations at a wind turbine site or substation will be the responsibility of the Project owner/operator and/or the substation owner/operator. Construction and maintenance
personnel will be trained and will have the equipment to deal with emergency situations that may occur at the Project area (e.g., tower rescue, working in confined spaces, high voltage, etc.).

The Project is not anticipated to result in a significant increase in the demand on educational facilities. The operating Project is anticipated to require approximately seven to ten full-time employees and the existing educational facilities should have sufficient capacity to accommodate the addition of these families to the area (if it is necessary to hire these employees from outside the area).

3.11.3 Mitigation

The impacts to the local economy, population, and community services resulting from the proposed Project are not of the type or magnitude that will require mitigation. In fact, development of the proposed Project will have minimal impact on population, and place little demand on community services, while at the same time providing significant income and tax revenue to the town, county, and school districts. The income anticipated from the proposed Project will more than offset any incurred costs, and can assist with the financing of community services that benefit all residents of the towns and county.

To mitigate any potential concerns regarding Project construction, the Project Sponsor will meet with the local emergency service personnel (fire, police, and EMS) to review and discuss the planned construction process. During this meeting, unique construction equipment, the overall construction process, and schedule/phasing will be addressed. Prior to construction, the Project Sponsor will implement an emergency response plan, which will be developed in consultation with local emergency service personnel. The distance and response time of some of the emergency response personnel will be taken into account when initially developing the coordinated emergency response plan, along with identifying where various construction activities will be concentrated, the provision of maps and other related materials requested by emergency responders, and the development of alternate response routes in the event that the primary route is blocked by construction activities. At a minimum, the following measures will be implemented to assure adequate levels of protection related to local fire, police, and other emergency services.

- Coordinating with local police/EMS personnel during Project component delivery.
- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.
- Regular inspection of all substation components.
- Regular inspection of fire extinguishers and fire suppression systems at all facility locations where they are installed.
• All Project vehicles will be equipped with firefighting equipment (fire extinguishers and shovels) as well as communications equipment for contacting the appropriate emergency response teams.

• The MSDS for all hazardous materials on the Project will be on file in the construction trailers (during construction) and the O&M building (during operation).

• Site maps showing turbine locations and access routes will be provided to local emergency service personnel.

• The facility Safety Coordinator shall notify the local fire department of any situation or incident where there is any question about fire safety, and will invite an officer of the fire department to visit the workplace and answer any questions to help implement a safe operating plan.

The Project Sponsor shall coordinate with the local fire departments and emergency service agencies with regard to training, practice drills, and documentation of appropriate actions in case of emergency circumstances at the Project. Such documentation shall include the locations of all emergency shutdown controls, location of any potentially hazardous materials, and site maps showing turbine locations and access routes. In addition, the Project Sponsor will work with local emergency service providers to assure that the Project area can be adequately accessed during the winter months.

As described in Section 3.10, in the event that a wind turbine catches fire, the fire is typically allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. Power to the circuit of the Project with the turbine fire is also disconnected. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air (Global Energy Concepts, 2005). In order to further safeguard against fire in the nacelle of the turbines, the nacelle of each machine will be fitted with a fire suppression system that will be automatically deployed should fire occur.

To minimize safety risks to school children (including children at school bus stops on local roads), prior to initiating construction activities, the Project Sponsor and/or contractor shall coordinate with appropriate school district personnel (i.e., director of transportation) to determine if the proposed delivery or construction routes pose any safety risks. If necessary, mitigation measures will be determined through consultation with school district personnel, and will address school bus and construction activity schedules, appropriate safety measures such as regularly scheduled communication between the Project Sponsor and/or contractor and school district personnel, avoidance scheduling, and alerts.
Generally, any emergency/fire situations at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the Project owner/operator. Construction and maintenance personnel (and properly trained and equipped regional responders) will be trained and will have the equipment to deal with emergency situations that may occur at the Project area (e.g., tower rescue, working in confined spaces, high voltage, etc.).

### 3.12 COMMUNICATION FACILITIES

To evaluate the potential for the Project to impact existing telecommunication signals, Comsearch was contracted to conduct a Licensed Microwave Search, an Off-Air Television Reception Analysis, an AM/FM Radio Broadcast Analysis, a Mobile Phone Services Analysis, and a Land Mobile Radio (LMR) and Emergency Services Search in the vicinity of the proposed Project area (see reports in Appendix O). In addition, the Project Sponsor provided written notification of the proposed Project to the National Telecommunications and Information Administration (NTIA) and has initiated correspondence with Fort Drum, a US Army base located approximately seven miles directly north of the Project (see Figure 2). See Appendix P for agency correspondence, including correspondence with the NTIA.

#### 3.12.1 Existing Conditions

##### 3.12.1.1 Microwave Analysis

Microwave telecommunication systems are wireless point-to-point links that communicate between two sites (antennas) and require clear line-of-sight conditions between each antenna. Comsearch (2012) identified twelve microwave paths that intersect the Project area (see Figure 2 in the Licensed Microwave Report in Appendix O).

##### 3.12.1.2 Off-Air Television Analysis

The television reception analysis identified all off-air television stations within a 150-kilometer radius of the proposed Project, as measured from the approximate center of the Project area. Off-air television stations transmit broadcast signals from terrestrially located facilities that can be received directly by a television receiver or house-mounted antenna (Comsearch, 2013a). The results of the study indicate that there are ninety (90) off-air television stations within 150 kilometers of the Project area (see Off-Air TV Analysis in Appendix O).

The stations most likely to provide off-air coverage to the Project area are those within a distance of 65 kilometers or less. Comsearch (2013a) identified twelve (12) stations within 65 kilometers of the Project area, of which eight (8) are operational TV stations. Four (4) of the operational stations within 65 kilometers are translators or low power operations with limited range and limited programming, while the remaining stations are full-power digital or very high frequency (VHF) TV stations. Two of the full power stations, WWTI and WPBS-DT are located within the Project area.
and are located at a distance of 0.6 and 2.36 kilometers from the closest turbine, respectively. According to Comsearch (2013a), most residents in the area likely view television programming through the use of cable or a satellite dish.

3.12.1.3 AM and FM Broadcast Analysis

The radio reception analysis identified all AM and FM broadcast stations within a 30-kilometer radius of the proposed Project, as measured from the approximate center of the Project area. Comsearch (2013b) identified three (3) AM stations and twenty-one (21) FM stations within this search area (see AM and FM Radio Report in Appendix O). Two of the AM stations, WNER and WTNY, are licensed separately for daytime and nighttime operations. The AM station antennas are located between 18.76 and 19.56 kilometers away from the Project. Of the 21 identified FM stations, 20 are licensed and operational, with 8 designated as lower power stations with limited range. These FM station antennas are located between 0.5 and 29.49 kilometers away from the Project.

3.12.1.4 Mobile Phone Services Analysis

Advanced Wireless Service (AWS), Cellular, and Personal Communication System (PCS) services are available within the Project area. Comsearch (2013c) determined that there are six AWS telephone operators, two Cellular telephone operators, and nine PCS telephone operators in Lewis and Jefferson County (see Mobile Phone Carrier Report in Appendix O). The band of operation for each mobile telephone operator is presented below in Table 36.

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<thead>
<tr>
<th>Operator</th>
<th>Type of System</th>
<th>Band of Operation</th>
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<td>Verizon</td>
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<td>MetroPCS</td>
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Table 36. Mobile Telephone Operators in Jefferson and Lewis County, NY
<table>
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<tr>
<th>Operator</th>
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<th>Band of Operation</th>
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<td>MCG PCS</td>
<td>PCS</td>
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3.12.1.5 Land Mobile and Emergency Services Radio Coverage

Comsearch (2013d) identified the registered site-based frequencies for first responder entities, such as police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county, and municipal agencies. In addition, Comsearch identified all regional licenses for industrial and business LMR systems, and commercial E911 operators within the proposed Project area. LMR systems are wireless communications used by terrestrial users in vehicles or on foot. Such systems are often used by emergency first responder organizations, public works organizations, and companies with large vehicle fleets or numerous field staff. LMR coverage is the result of the placement of tower-mounted repeaters. Comsearch (2013d) determined that there are twenty-two (22) site-based licenses, twenty-six (26) regional licenses, and six (7) mobile phone carriers with E911 service registered within the area of interest, depicted in Figure 1 of the Land Mobile and Emergency Services Report (Appendix O). The majority of these LMR systems are licensed to governmental bodies including the State of New York, Lewis County, and local municipalities.

3.12.1.6 FAA and NTIA Notification

The Project Sponsor sent a written notification of the proposed Project to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. Upon receipt of notification, the NTIA provides plans for the proposed Project to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC), which include the Department of Defense (DOD), Department of Education (DOE), Department of Justice (DOJ), and the FAA. The NTIA then identifies any Project-related concerns during a 45-day review period. The NTIA notification letter is provided in Appendix P.

3.12.1.7 Fort Drum Communication Systems

To evaluate the potential for the Project to impact airspace and communication systems and nearby Fort Drum, the Project Sponsor is working with the appropriate personnel at the base as well as the pertinent federal agencies. The Project Sponsor has had extensive correspondence with Fort Drum, beginning in 2011. This correspondence is outlined in detail below:
• On February 4, 2011, Project Sponsors met with the energy manager at Fort Drum, as well as procurement and legal representatives, to discuss the idea of partnering with Fort Drum on the Project and possibly arranging a PPA. At this meeting, Project Sponsors indicated their understanding of past discussions held between Maple Ridge Wind Farm and Fort Drum and that they would not move forward with the project if we did not receive the proper clearance from the FAA.

• On December 22, 2011, the Town of Denmark received a letter from the Office of the Garrison commander at Fort Drum. The letter outlines Fort Drum’s concerns over potential impacts to air traffic control capabilities, particularly to Airport Surveillance Radar (ASR).

• On March 20, 2012, Project Sponsors spoke with Fred Tomaselli, an Airspace Manager at Fort Drum, about the project and followed up with an email that included the turbine layout and a report from Aviation Systems.

• On June 20, 2012, Project Sponsors met with Fort Drum officials Michael Richardson and Joe White at the base to discuss potential impacts to aviation operations from the existing and planned wind farms in the vicinity of the base and explore technical solutions to potential impacts to the ASR.

• On August 28, 2012, Project Sponsors sent a letter to Mr. Richardson and Mr. White, stating that they looked forward to working together to identify solutions to minimize or mitigate perceived aviation or radar risks.

• On January 4, 2013, Project Sponsors emailed Mr. Richardson inquiring whether Fort Drum had made any progress on determining a viable technical solution to the wind turbine/radar issues, specifically with regard to improvements to the ASR, which were discussed at the June 20, 2012 meeting.

• On February 13, 2013, Mr. Richardson responded to Project Sponsors. He is still waiting for word from high command on the viability of the technical fix for the ASR.

• On February 19, 2013, Project Sponsors informed Mr. Richardson that the Project would extend their FAA permits and asked for additional detail about Fort Drum’s concerns over the Project requesting increases to the MVAs for several of the turbines in the Project.

3.12.2 Potential Impacts

3.12.2.1 Construction

There is very limited potential for temporary communication interference as a result of Project construction. Cranes used during construction activities (and the individual turbine components being raised by the cranes) can cause temporary obstruction of microwave links, as well as some degradation to television and radio signals. However, because individual turbines have been sited to avoid interference with microwave paths that cross the Project, the
The potential for microwave interference by equipment assembling and erecting these turbines is minimal. Any impact on television or radio reception caused by construction equipment would be temporary, as turbine assembly and erection at each turbine site is typically completed within 1 to 3 days.

3.12.2.2 Operation

The following subsections evaluate the potential for the Project to impact existing telecommunication signals.

3.12.2.2.1 Microwave Communication Systems

To assure an uninterrupted line of communications, a microwave link should be clear, not only along the axis between the center point of each microwave dish, but also within a formulaically calculated distance around the center axis of the radio beam, known as the Fresnel Zone. Using coordinates provided to Comsearch, by the Federal Communications Commission (FCC), a Worse Case Fresnel Zone (WCFZ) was calculated for the microwave paths identified within the Project area. Based upon the calculated WCFZ, it was determined that the Project, as studied, would have an adverse impact on microwave communications systems. (see Licensed Microwave Report in Appendix O). Five turbines were revealed to have a potential conflict with three microwave paths. Turbines 5, 50, and 51 will likely affect microwave link 9, while turbines 21 and 41 will affect microwave paths 6 and 2, respectively.

3.12.2.2.2 Television Systems

As described in Section 3.12.1.2, Comsearch (2013a) assessed the coverage of off-air television stations within a 150-kilometer radius of the Project area and the potential for degraded television reception as a result of the Project. The stations most likely to produce off-air coverage to the Project area are those within a distance of 65 kilometers or less. The off-air television available to the local communities is provided by a mix of translator stations, low power stations, and full power digital stations. The eight operational stations within 65 kilometers of the Project may have their reception disrupted in and around the turbines, or in locations on the opposite side of the Project area relative to the station antennas.

Although the potential for wind turbines to disturb some of the available channels at some reception points in the area is a possibility, Comsearch indicates that cable and satellite are more likely the dominant mode of service delivery to the immediate area. In addition, high-power television broadcast stations ceased analog operations in June 2009 and began broadcasting exclusively in digital format. Low-power TV broadcasters and translators were exempt from the FCC’s digital requirement, and may still broadcast analog signals. Since translator stations rebroadcast high-power stations to a limited local audience, their programming is typically in digital format as well. Analog television broadcast signals are subject to variations in signal level by the motion of wind turbine blades, which may result in
distortions in the contrast, brightness, and clarity of the video. In addition, changing reflections produced by the
motion of wind turbine blades may cause ghosting. Digital television signals are also subject to level variations and
reflections, but as long as the signal remains above the operational threshold of the receiver, the video produced is
unaffected. Wind turbines can cause signal attenuation in both analog and digital signals. However, because they
require a much lower signal level to produce excellent video, digital signals can withstand the attenuation effect to a
greater extent. For analog television, as the signal is degraded by external effects, video quality is reduced in a
sliding scale of performance. For digital television, as the signal is degraded, the video quality remains excellent until
the signal level falls below the operational threshold of the receiver. Since the conversion to digital broadcast, there
has been an improvement in television reception in the vicinity of wind energy facilities (Polisky, 2011).

In addition, recent surveys of TV reception in the U.S. found that only ten percent of households now rely solely on
off-air television, while cable service and satellite are more likely the dominant modes of television service delivery.
Specific impacts to TV reception would most likely include noise generation at low VHF channels within 0.5 mile of
turbines, reduced picture quality (e.g., ghosting or shimmering), and signal interruption (NWCC, 2005). Lastly,
Comsearch examined the antenna heights of the two stations located within the Project area and compared them to
the height of the highest wind turbine. The results showed that the antennas height was well above that of the highest
turbine and therefore the transmitted signal of the stations should be unaffected.

3.12.2.2.3 AM and FM Broadcast

According to Comsearch (2013b), potential interference with AM broadcast coverage would only occur if turbines
were located within 3.2 kilometers of AM broadcast stations with directive antennas, or within 0.8 kilometers of
broadcast stations with non-directive antennas. Therefore, since all AM broadcast stations are located more than
18.7 kilometers from the Project, no degradation of AM broadcast signals is anticipated.

According to Comsearch (2013b), potential interference with FM broadcast coverage would only occur if turbines
were located within 4.0 kilometers of FM broadcast stations. Four stations are located within 4.0 kilometers of the
nearest wind turbine. Twenty-one turbines could potentially obstruct WJNY, WRVJ, and DW240AN. Of those
turbines, WJNY, WRVJ, and DW240AN could be obstructed by 11, 13, and 10 turbines, respectively. However,
station WBDR was determined to have sufficient height and clearance not to be obstructed.

3.12.2.2.4 Mobile Phone Services

Telephone mobile communications in the AWS, Cellular, and PCS frequency bands should be only minimally
affected by the presence of the wind turbines, if at all. This applies to operations both within and outside of the
Project area. Signal blockage caused by wind turbines is not very destructive to the propagation of signals in these frequency bands. In addition, these systems are designed so that if the signal from (or to) a mobile unit cannot reach one cell, it will be able to reach one or more other cells in the network. Therefore, local obstacles are not normally a problem for these systems, whether they are installed in urban areas near large structures and buildings, or in rural areas near wind energy facilities.

3.12.2.2.5 LMR and Emergency Services Coverage

Considering the frequencies at which these systems operate, and the fact that the channels are used exclusively for audio communications, coverage should not be a problem when the turbines are installed. In addition, all of the licensed land mobile stations in the Copenhagen Wind Farm Project area are located more than 77.5 meters from the turbines. Thus the turbines meet the setback distance criteria for FCC interference emissions in the land mobile bands. No impacts are anticipated to LMR and emergency services coverage.

3.12.2.2.6 FAA and NTIA Notification

The Project Sponsor awaits a reply from NTIA regarding any potential agency concerns. Based upon preliminary screening with the FAA, the Project Sponsor does not anticipate any IRAC agency concerns. However, the response to the NTIA notification letter will be provided to the Town prior to the conclusion of SEQRA review. Additionally, the Project sponsor will receive a No Hazard Determination letter from FAA based upon the final site selection of 49 turbines out of the evaluated 62 turbine sites.

3.12.2.2.7 Fort Drum Communication Systems

The appropriate federal studies are currently underway for the proposed Project and consultation with Fort Drum is ongoing. Fort Drum representatives have indicated in correspondence with the Project Sponsor that it is possible the Project has the potential to interfere with radar utilized by the base. The Fort Drum representatives indicated that the radar system could at times identify wind turbines associated with the Project as oncoming air traffic. If interference to airspace (or their radar) is identified during these studies, the Project Sponsor will work with the FAA and/or Fort Drum to adequately resolve any identified potential interference.
3.12.3 Proposed Mitigation

3.12.3.1 Construction

If disruptions to existing communication systems occur as a result of Project construction, they will be temporary, and will only occur during the erection of a limited number of turbines. Because turbine installation/crane activity will occur at different locations and at different times during the construction period, any degradation/disruption to existing communications will not represent a constant interference to a given television/radio reception area or microwave signal. In addition, turbine erection will be performed as efficiently as possible (under favorable conditions, one turbine can be erected in one day). Therefore, mitigation is not necessary.

3.12.3.2 Operation

3.12.3.2.1 Microwave Communication Systems

The Project, as currently proposed, will not impact existing microwave communications. Comsearch (2012) identified three microwave paths that were interfered by five turbines (5, 21, 41, 50, and 51). The Project Sponsor has since moved the location of these turbines slightly to avoid interference with the microwave paths. If future turbine layout revisions are necessary, the new layout will be designed so as not to interfere with existing microwave paths. Beyond this, additional mitigation is not necessary and is therefore not proposed.

3.12.3.2.2 Television Systems

The Comsearch (2013a) report indicates that impacts to existing off-air television coverage are possible. If Project operation results in any impacts to existing off-air television reception, the Project Sponsor will address and resolve each individual problem as necessary. The Project Sponsor will prepare a Complaint Resolution Plan, which sets forth the general parameters to be used to resolve any complaints that may arise during project construction or operation. Mitigation actions, should they be needed for verified issues of signal degradation for households that currently only receive over the air television, can take many forms and shall be resolved on an individual basis. Mitigation actions could include adjusting existing receiving antennas, upgrading an antenna, or providing cable or satellite systems to the affected households.

3.12.3.2.3 AM and FM Broadcast

The Comsearch (2013b) report indicates that impacts to existing FM stations coverage are possible. If Project operation results in any impacts to existing AM / FM broadcast signals, the Project Sponsor will address and resolve each stations problem. However, due to its geographic location relative to existing AM broadcast stations, no impacts are expected to AM stations. Yet three FM stations could have degraded coverage as a result of the planned wind
turbines: DW240AN, WJNY, and WRVJ. The Project Sponsor has several options for mitigation. Degradation could be avoided by removing or relocating the turbines causing the obstruction. Another option would be to notify the FM station owners and alert them to the fact that their station’s coverage could be reduced once the wind turbines are installed. Stations could try and prevent the loss of coverage by relocating to a new tower or by simply moving the transmitter antenna higher on the existing tower to allow for clearance the wind turbines. Alternatively, an auxiliary antenna in the at risk area could be installed to re-establish lost coverage.

3.12.3.2.4 Mobile Phone Services

If an AWS, Cellular, or PCS company were to claim that their coverage had been compromised by the presence of the proposed Project, coverage could be restored by installing an additional cell or an additional sector antenna on an existing cell for the affected area. Utility, meteorology, and/or the turbine towers within the Project area could serve as the structure platforms for the additional AWS, Cellular, or PCS base station or sector antennas. Although no impact is anticipated, if there is a report of interference with an AWS, Cellular, or PCS system in the area, the complaint resolutions plan set forth in Appendix G may be invoked.

3.12.3.2.5 LMR and Emergency Services Coverage

If there is a reported change in LMR or Emergency Services coverage in the area, it can be easily corrected. This could be accomplished by adding or positioning the repeaters at locations within the Project area. Repeater antennas could be installed on utility, meteorological, or turbine towers within the Project area as needed.

3.12.3.2.6 FAA and NTIA Notification

Currently, there are no anticipated impacts from the proposed Project on federal facilities. Therefore, no mitigation is currently proposed. However, the Project Sponsor will evaluate the need for mitigation upon receipt of response from the NTIA notification letter.

3.12.3.2.7 Fort Drum Communication Systems

Consultation with Fort Drum representatives is ongoing. Fort Drum representatives have expressed there may be an upgrade or new technology available which would mitigate the amount of interference caused by the Project as it relates to the radar system used by the base. Fort Drum is currently investigating the possibility of implementing the new software/radar technology at the base, and is corresponding with the Project Sponsor regularly to keep them apprised of the status of this potential mitigation. Correspondence between Ft. Drum and the Project Sponsor is included in Appendix P.
3.13 LAND USE AND ZONING

Land use and zoning in the Project area was determined through review of local town zoning ordinances and zoning district maps, tax parcel maps, aerial photographs, and field review conducted in the summer and fall of 2012. Land use and zoning are discussed in terms of regional land use patterns, on-site classifications, and future land use.

3.13.1 Existing Conditions

3.13.1.1 Regional Land Use Patterns

The proposed Project is located in the Town of Denmark, Lewis County, and the Towns of Rutland, Champion, and Watertown, Jefferson County, New York. Lewis and Jefferson Counties are located in north-central New York within the North Country region. They border St. Lawrence County to the north, Herkimer County to the east, Oswego and Oneida Counties to the south, and Lake Ontario to the west.

The Project area is located on the edge of the Tug Hill Plateau physiographic province, near its descent to the Black River Valley. The Tug Hill Plateau is known for its substantial winter snowfall and outdoor recreational opportunities. Much of Lewis County is forested, providing for timber and maple syrup production, while Jefferson County is predominantly agricultural. In 2007, there were 616 working farms in Lewis County (occupying 167,249 acres or 20% of the County) and 885 in Jefferson (262,331 acres or 32% of the County). Dairy farming is the primary agricultural activity in the counties and corn for silage or greenchop is the major field crop planted in both counties (USDA, 2009). Agricultural land, New York State forestland, rural residential properties, and private seasonal homes are scattered throughout the counties. There are several state forests within approximately five miles of the Project (as measured to the nearest turbine), including Pinckney State Forest (0.9 mile), Lookout State Forest (1.6 miles), Cobb Creek State Forest (1.8 miles), and Granger State Forest (4.4 miles). There are no state parks, state forest preserve lands, or state wildlife management areas in the vicinity of the Project area.

The land use patterns in the Towns of Denmark, Rutland, Champion and Watertown are similar to those of the greater region. Apart from small hamlets and villages, the towns are rural in nature and generally characterized by agricultural and vacant (mostly forested) land. Agricultural land uses are predominantly row crops, tall grasses, and pasture, though the area also features a substantial amount of scrub/shrub land interspersed between the acreage in production. Parcels classified as vacant land are generally forested or scrub/shrub cover, with agricultural woodlots and hedgerows forming a substantially fragmented forest pattern. The villages and hamlets within the Project area
include Copenhagen, Denmark, Burrville, and Tylersville. Interstate 81 serves as the nearest major transportation corridor; additional transportation routes through the Project area include New York State Routes (NYS) 12 and 126.

Land use is also classified by the New York State Office of Real Property Tax Services (NYSORPTS). Table 37 shows the distribution of parcels by broad land use category throughout the entire Town of Denmark, as determined by the NYSORPTS. Many of the parcels classified as residential also feature agricultural uses, and many also feature substantial amounts of forest cover. A number of non-agricultural residential properties are found within the Project area as well, most of which have been developed as frontage lots along public roadways. Based on site visits and aerial imagery of the town, the majority of residential structures within the generating Project area appear to be single-family units.

**Table 37. 2011 Parcel Land Use Classification within the Generation Project area (Town of Denmark)**

<table>
<thead>
<tr>
<th>Broad Use Category</th>
<th>Description</th>
<th>Parcel Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Agricultural Properties</td>
<td>278</td>
</tr>
<tr>
<td>200</td>
<td>Residential Properties</td>
<td>803</td>
</tr>
<tr>
<td>300</td>
<td>Vacant Land</td>
<td>310</td>
</tr>
<tr>
<td>400</td>
<td>Commercial Properties</td>
<td>46</td>
</tr>
<tr>
<td>500</td>
<td>Recreation and Entertainment Properties</td>
<td>9</td>
</tr>
<tr>
<td>600</td>
<td>Community Service Properties</td>
<td>34</td>
</tr>
<tr>
<td>700</td>
<td>Industrial Properties</td>
<td>6</td>
</tr>
<tr>
<td>800</td>
<td>Public Service Properties</td>
<td>66</td>
</tr>
<tr>
<td>900</td>
<td>Public Parks, Wild, Forested and Conservation Properties</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total Parcels in All Broad Use Categories</td>
<td>1,562</td>
</tr>
</tbody>
</table>

Source: NYSORPTS, 2012

A similar general land use pattern is exhibited throughout the transmission Project area, through the Towns of Champion, Rutland, and Watertown, as shown in Figure 8. The dominant land use pattern shifts in the western portion of the transmission Project area, where residential frontage lots are more densely located in the Town of Watertown, outside of the City of Watertown’s municipal limits. A number of mineral and/or sand and gravel extraction uses are noted in this area as well, straddling both sides of NYS Route 12.
Table 38 shows the distribution of parcels by broad land use category throughout the transmission Project area. As in the Town of Denmark, most properties throughout these three towns appear to feature agricultural or forestry land uses, although the majority are classified as residential uses.

### Table 38. 2011 Parcel Land Use Classification within the Transmission Project area

<table>
<thead>
<tr>
<th>Town</th>
<th>Broad Use Category</th>
<th>Description</th>
<th>Parcel Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Champion</td>
<td>100</td>
<td>Agricultural Properties</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>Residential Properties</td>
<td>1,409</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>Vacant Land</td>
<td>420</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>Commercial Properties</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>Recreation and Entertainment Properties</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>Community Service Properties</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>Industrial Properties</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>Public Service Properties</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>900</td>
<td>Public Parks, Wild, Forested and Conservation Properties</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Town of Champion Parcel Subtotal</strong></td>
<td></td>
<td><strong>2,133</strong></td>
</tr>
<tr>
<td>Rutland</td>
<td>100</td>
<td>Agricultural Properties</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>Residential Properties</td>
<td>951</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>Vacant Land</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>Commercial Properties</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>Recreation and Entertainment Properties</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>Community Service Properties</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>700</td>
<td>Industrial Properties</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>Public Service Properties</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>900</td>
<td>Public Parks, Wild, Forested and Conservation Properties</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Town of Rutland Parcel Subtotal</strong></td>
<td></td>
<td><strong>1,563</strong></td>
</tr>
<tr>
<td>Watertown</td>
<td>100</td>
<td>Agricultural Properties</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>Residential Properties</td>
<td>1,250</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>Vacant Land</td>
<td>432</td>
</tr>
</tbody>
</table>
### Town of Watertown Parcel Subtotal

<table>
<thead>
<tr>
<th>Town</th>
<th>Broad Use Category</th>
<th>Description</th>
<th>Parcel Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Commercial Properties</td>
<td></td>
<td>196</td>
</tr>
<tr>
<td>500</td>
<td>Recreation and Entertainment Properties</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>600</td>
<td>Community Service Properties</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>700</td>
<td>Industrial Properties</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>800</td>
<td>Public Service Properties</td>
<td></td>
<td>73</td>
</tr>
<tr>
<td>900</td>
<td>Public Parks, Wild, Forested and Conservation Properties</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Transmission Project area Parcel Subtotal: 2,088

Source: NYSORPTS, 2012

### 3.13.1.2 Project Area Zoning

Zoning regulations within the generation Project area are described within the Town of Denmark Zoning Law, adopted by the Town Board in 1987 (Town of Denmark, 1987). The turbine locations within the generation Project area are located within three Agricultural Residential districts, AR-1, AR-2, and AR-2a, all three of which allow for the construction of wind energy generation facilities by special permit. With respect to other permitted uses, only small differences exist between these districts.

The generation Project is subject to local regulation with regard to facility setbacks as defined in Article X of the Town of Denmark Zoning Law. Section 1025 of this law requires a setback distance equal to the height of the highest portion of the nacelle plus twice the length of one rotating blade (a total distance of 642 feet, in this case) from the centerline of the nearest road, and 1,500 feet from any residence, public building, campground, church, business, or school property line (with exceptions) (Town of Denmark, 2003). However, the Town of Denmark is currently in the process of amending this law. Draft setback regulations within the proposed amendment include the following (emphasis added):

- From adjacent road centerlines, facilities must be set back to the highest portion of the nacelle, plus twice the length of one rotating blade. (Note: the substance of this portion of the setback regulations is unchanged from the original.)
- From any residence, public building, campground, church or business, facilities must be set back 1,500 feet from such structures. In addition, from any school property line, facilities must be set back 1,500 feet. Owner occupants of residential structures may consent in writing to vary this distance, subject to
the provision of adequate property access in the event of facility collapse. In this case, the facility may not be closer than the highest portion of the nacelle plus twice the length of one rotating blade from the residence.

- From the side and rear lot lines of bordering parcels, facilities must be set back to the highest portion of the nacelle, plus twice the length of one rotating blade. Adjacent property owners may waive this requirement, subject to the provision of adequate property access in the event of facility collapse (Town of Denmark, 2013).

As proposed, generation Project facilities will comply with setback requirements as outlined in both the existing local zoning law and the draft amendment. The facilities will maintain minimum setback of 642 feet from the centerline of non-seasonal public roads, and from the property lines of all adjacent parcels owned by non-participating neighbors except by way of waiver. In addition, except by way of waiver, the turbine locations will maintain a minimum setback of at least 1,500 feet between the tower location and adjacent residential, public, campground, church, or business structures, and at least 1,500 feet from school property lines. Should final design of the generation Project facilities alter setback distances, the Project Sponsor will seek the appropriate waivers and/or variances as required by the zoning law.

Because some proposed generation Project facilities are located within 500 feet of neighboring towns (in this case, the Towns of Lowville and Harrisburg), the Lewis County Planning Board will be required to assess the special permit application for its potential inter-municipal impacts per §239-m of New York State General Municipal Law. The County Planning Board will review the proposed site plan according to a number of criteria, including, but not limited to, the proximity of turbine locations to non-participating properties, and will make recommendations to the Town of Denmark as to whether or not the proposal adequately addresses the concerns of neighboring jurisdictions.

As defined in Article VII of the Town of Denmark Zoning Law, an electrical substation such as that which is proposed as part of this Project is considered an “essential facility”, and is thus subject to special permit requirements in all zoning districts (Town of Denmark, 1987). As shown in Figure 3, the proposed collection substation will be sited north of Route 12 in an upland agricultural field, and will be located in the AR-1 district. The substation will be located at least 525 feet from the nearest residence, and will be screened from adjacent public roads. Article VII of the zoning law requires that essential facilities meet the following requirements:

- Location: The proposed installation in a specific location must be demonstrated to be necessary and convenient for the efficiency of the essential services or the satisfactory and convenient provision of service to the area in which the particular use is located.
• Buildings: The design of any building or structure in connection with such facility shall conform to the
genral character of the area and shall not adversely affect the safe and comfortable enjoyment of
property rights in the district in which it is to be located.
• Landscaping: Adequate landscaping shall be provided to create a visual and sound buffer between
such facilities and adjacent property.
• Access: All points of necessary access, or transformers, shall be placed in secure structures at ground
level.
• Fencing: All major electrical facilities or substations, if above ground, shall be secured by a fence.
Also, no transformer or associated switches shall be closer than one hundred (100) feet from any lot
line.

In addition, Article IX of the zoning law requires the applicant and the Town of Denmark to agree upon the placement
of the substation and its associated fencing and screening, as well as a protocol for limiting environmental pollution
as a result of transformer leakage. The final design and construction of the proposed substation will be compliant
with all applicable local regulations.

The Project also includes electrical collection lines from each turbine to the collection substation, which are required
to be buried per Article IX of the local zoning law, except where an overhead crossing is allowed by variance/waiver.
These lines will cross the RFC-2 River Front Conservation (RFC-2), and Highway/Mixed Use (H-1) zoning districts.

Lewis and Jefferson Counties have designated Agricultural Districts established pursuant to the New York State
Agriculture and Markets (NYSA&M) Law. The entire generation site occurs within Lewis County Agricultural District
6, and portions of the transmission line occur within Jefferson County Agricultural District 1 (Figure 7).

Zoning regulations within the transmission Project area include those adopted by the towns of Champion, Rutland,
and Watertown. The proposed transmission line will be located over 450 feet from the nearest residence; although
transmission line design is currently preliminary, it is anticipated that the line will be carried on steel or treated wood
pole structures that range in height from 65 to 80 feet above ground level, which is consistent with the height of the
structures associated with the existing National Grid 115 kV line. The compatibility of the transmission Project with
these regulations is detailed below:
• Town of Champion: The proposed route of the transmission Project transects the southern portion of the
Agricultural Resource (AR) zoning district within the Town of Champion. As per Local Law #6 of 2012,
power transmission and distribution facilities are permitted within the AR district subject to special permits as
Local Law #6 outlines the following site plan criteria for essential facilities (Town of Champion, 2012):

- **Location:** The proposed installation in a specific location is necessary and convenient for the efficiency of the essential facility or the satisfactory and convenient provision of service to the area in which the particular use is located. Where electrical or gas transmission lines run through residential neighborhoods, they shall be required to be located underground. Transmission lines shall be a minimum of 1000 feet from any residential structure. All electrical and gas transmission lines shall use existing right-of-ways.

- **Buildings:** The design of any building or structure in connection with such facility shall conform to the general character of the area and will not adversely affect the safe and comfortable enjoyment of property rights in the district in which it is to be located.

- **Landscaping:** Adequate landscaping will be provided to create a visual and sound buffer between such facilities and adjacent property.

- **Access:** All points of necessary access, or transformers, shall be placed in secure structures at ground level.

- **Fencing:** All major electrical transformer facilities or substations, if above ground, shall be secured by a fence. Also no transformer or associated switches shall be closer than one hundred (100) feet from any lot line.

- **Noise:** Electrical or gas substations; electrical or gas transmission lines; water treatment storage and transmission facilities, pumping stations; and similar facilities shall be located with relation to property lines so that the level of noise produced by any of the listed facilities shall not exceed 55 decibels, measured at the boundaries of all the closest parcels.

**Bulk requirements within the AR district include the following:**

- Minimum lot area: 1.5 acres

- Minimum lot width: 200 ft.

- Minimum front, rear, and side yards: 30 ft. (along state roadways, front yard setback is either 60 ft. from the center of the road or 10 ft. from the road right of way, whichever is greater)

- Maximum height: 35 ft.

Most of the bulk requirements are not applicable to the transmission line. Where compliance cannot be achieved due to particular requirements of the transmission facility (e.g. residential setback distances or the use of existing rights of way), the Applicant anticipates that waivers or variances will be negotiated with the local Planning Board. Section 525(B) of the Town of Champion zoning code notes that “The planning board
is empowered to waive, when reasonable, any application requirements for the approval, approval with modifications or disapproval of site plans or special use permits submitted for approval. Such waiver may be exercised in the event requirements are found not to be requisite in the interest of the public health, safety or general welfare and inappropriate to a particular site plan or special use permit” (Town of Champion, 1997).

- **Town of Rutland**: The proposed route of the transmission Project transects the Agricultural and Rural Residential (ARR) and Hamlet (H) zoning districts within the Town of Rutland. Chapter 130 of the town’s code of ordinances defines “essential service” facilities as the “erection, construction, alteration, operation or maintenance by municipal agencies or public utilities of telephone dial equipment centers, electrical or gas substations, water treatment or storage facilities, pumping stations, hydroelectric power plants and similar facilities” (Town of Rutland, 2010). The proposed transmission Project is assumed to fall within this designation. Essential services are a special permitted use within both the ARR and H zones. Specially permitted uses within the ARR district are subject to the following bulk requirements:
  - Minimum lot frontage: 300 ft.
  - Minimum front, side, and rear yards: 75, 50, and 50 ft., respectively.

Specially permitted uses within the H district are subject to the following bulk requirements:
  - Minimum lot frontage: 200 ft.
  - Minimum front, side, and rear yards: 75, 50, and 50 ft., respectively.

In addition to these requirements, the special use permitting process includes the review and approval of site plan elements such as location, building design, landscaping, access, and fencing. Within the Town of Rutland, the proposed transmission Project does not include building elements that would be reviewed under such criteria. To the extent that the proposed Project must satisfy special permit requirements as identified in the town’s zoning ordinance, it is expected to do so. If compliance cannot be achieved due to particular requirements of the transmission facility, the Applicant anticipates that waivers or variances will be negotiated with the local Planning Board.

- **Town of Watertown**: The proposed route of the transmission Project is wholly within the R-1 residential zoning district in the Town of Watertown. Public utility facilities are a permitted use within the R-1 district, subject to site plan review by the local planning board. Per Chapter 107 Attachment 1 of the town code, bulk requirements for properties within the R-1 district include the following:
  - Minimum lot size: 40,000 sq. ft.
• Minimum lot frontage: 150 ft.
• Maximum lot coverage: 20%
• Minimum floor area: 900 sq. ft.
• Maximum building height: 35 ft.
• Minimum front, side, and rear yards: 30, 30, and 40 ft., respectively

The Applicant anticipates that the proposed Project will comply with local zoning ordinance requirements. Where compliance cannot be achieved due to particular requirements of the transmission facility, the Applicant anticipates that waivers or variances will be negotiated with the local Planning Board.

3.13.1.3 Future Land Use

The Lewis County Comprehensive Plan, adopted by the Lewis County Board of Legislators in October of 2009, describes a series of future “character areas” throughout the Town of Denmark in an effort to guide future growth and development patterns. The majority of the generation Project area is identified within the plan as a “farmland” character area, with a smaller inclusion of “rural living” character area in the northern portion of the town (Bergmann Associates, 2009). These future land uses are consistent with the existing land use patterns in the area and compatible with the Project.

Although Jefferson County has not adopted a comprehensive land use plan to recommend any particular future land uses for the transmission Project area, it has adopted a Comprehensive Economic Development Strategy. The proposed transmission Project is compatible with the general intent of that strategy, and with specific objectives related to the development of appropriate alternative energy sources (Jefferson County, 2012).

In addition to these county-wide plans, the Town of Champion adopted a comprehensive plan in March, 2009. This plan recommends an “agricultural zone” within the area of the town where transmission facilities would cross (Town of Champion, 2009). The description of the recommended agricultural zone does not represent a substantial change in the existing land use pattern and would support these land uses.

It is also noted that state-certified Agricultural Districts cover a majority of land within the Town of Denmark, a large portion of the Towns of Rutland and Champion, and a small portion of the Town of Watertown. Although this does not altogether restrict substantial changes in land uses, it suggests that such changes are unlikely to occur in the near future. Numerous wind farms have been built within state-certified Agricultural Districts in New York State, and when appropriately designed and built, such projects are consistent and supportive of agricultural land uses and districts.
3.13.2 Potential Impacts

The Project will be compatible with land uses that dominate the Project area. However, there will be temporary, construction-related impacts, as well as permanent impacts (operation related) to land uses within the Project area and the larger community. Anticipated land use and zoning impacts are described below.

3.13.2.1 Construction

Land use impacts anticipated to result from Project construction can be quantified in terms of ground disturbance to NYSORPTS land use classifications. These impacts are summarized below in Table 39. Both temporary impacts, and conversion to built facilities (permanent impacts), as calculated below, include those for both the generation Project and transmission Project.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Temporary Impact (Acres)</th>
<th>Converted to Built Facilities (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NYSORPTS Classification</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural</td>
<td>434</td>
<td>46</td>
</tr>
<tr>
<td>Residential</td>
<td>58</td>
<td>7.5</td>
</tr>
<tr>
<td>Vacant</td>
<td>38</td>
<td>4</td>
</tr>
<tr>
<td>Recreation &amp; Entertainment</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Public Services</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>532</td>
<td>58</td>
</tr>
</tbody>
</table>

Temporary construction-related disturbance to agricultural lands, as categorized by NYSORPTS, will total approximately 434 acres. Along with this direct impact to agricultural land, movement of equipment and material could result in damage to growing crops, damage to fences and gates, damage to subsurface drainage systems (tile lines), and temporary blockage of farmers’ access to agricultural fields. However, wind turbines and associated facilities have been located to minimize loss of active agricultural land and interference with agricultural operations, and construction activities will be in accordance with the NYSA&M agricultural protection guidelines included in Appendix E. Landowners will be compensated for any permanent crop damage caused by the construction activities at fair market value.

In addition, construction will result in the temporary disturbance of approximately 58 acres of land categorized as residential, 38 acres of vacant lands, 1 acre of recreation and entertainment land, and 1 acre of public service lands. Impacts to residential lands are confined to the properties of participating landowners.
3.13.2.2 Operation

The generating Project as proposed is compatible with the existing local laws, zoning, and land use patterns within the Towns of Denmark, Champion, Rutland, and Watertown. The transmission Project is largely compatible with these as well, with the potential exception of the siting requirements described in the Town of Champion’s Local Law #6 of 2012, for which variances will be sought if necessary. The generating portion of the Project will occur entirely on leased land in areas dominated agricultural land uses. Only very minor changes in existing land uses within the Project area are anticipated as a result of Project implementation. As shown in Table 39, the Project represents a cumulative conversion of approximately 58 acres of land from its current use to built facilities. Of these, approximately 46 acres are categorized as agricultural, 7.5 acres are categorized as residential, 4 acres are categorized as vacant land, and 0.5 acres are categorized as public services by the NYSORPTS.

During Project operation, additional impacts on land use should be infrequent and minimal. Other than occasional maintenance and repair activities, the Project should not interfere with on-going land use (e.g., agriculture activities, timber management). However, based on edr’s experience with existing wind power projects (e.g., Fenner, Maple Ridge, and Howard), the Project may cause a perceived change in land use. As discussed in Section 3.5, the visibility and visual impact of the wind turbines will be highly variable based upon distance, number of turbines in the view, weather conditions, sun angle, the extent of visual screening, scenic quality, viewer sensitivity and/or existing land uses. Where a significant number of the proposed turbines can be seen at the same time, or where the turbines can be viewed from near mid-ground distances (e.g., 0.5 to 1.0 mile), a viewer may perceive a change in the rural characteristics of the area, even though the existing land uses remain substantially unchanged. Such viewing conditions may occur along roads adjacent to the Project.

In addition, as indicated in the VIA included as Appendix J, the landscape surrounding this Project will retain its open space character and overall spatial organization once the Project is in place. Although there are some new and distinctive built features added to the landscape within the Project area, the surrounding landscape retains much of its rural landscape character because the open sky, topography, and existing patterns of land use will remain dominant.

When in operation, the Project will be another land use in the area that compatibly coexists with the other historically dominant land uses. Additional discussion of potential impacts of Project operation on residential development is provided in Section 3.9, Socioeconomics.
3.13.3 Proposed Mitigation

The Project is compatible with the agricultural land use within the Project area. However, the Project will impact agricultural activities (at least temporarily) and although the overall perception of the landscape will remain rural in character, the Project may result in a slight change to the area's landscape character or its perceived land use throughout the area.

To minimize and/or mitigate impacts to active agricultural land and farming operations, Project siting and construction will fully comply with NYSA&M agricultural protection guidelines (see Appendix E). These mitigation measures include:

- Limiting permanent road widths to a maximum of 16 feet or less, and where possible, following hedgerows and field edges to minimize loss of agricultural land.
- Having roads that must cross agricultural fields stay, where feasible, on ridge tops and other high ground to minimize cut and fill as well as potential drainage problems.
- Avoiding disturbance of surface and subsurface drainage features (ditches, diversions, tile lines, etc.).
- Prohibiting vehicular access to turbine sites until topsoil has been stripped and permanent access roads have been constructed.
- Limiting vehicular access to construction roads only.
- Limiting vehicle and equipment traffic and parking to the access road and/or designated work areas such as tower sites and laydown areas. No vehicles or equipment will be allowed outside the work area without prior approval from the landowner and, when applicable, the Environmental Monitor.
- Stripping all topsoil from agricultural areas used for vehicle and equipment traffic and parking.
- Prohibiting stripping of topsoil or passage of cranes across agricultural fields during saturated conditions when such actions would damage agricultural soils.
- Avoiding blocking of surface water drainage due to road or installation or stockpiled topsoil.
- Maintaining access roads throughout construction so as to allow continued use/crossing by farmers and farm machinery.
- Temporarily fencing work areas in active pastureland to protect livestock, consistent with landowner agreements.
- Disposing of excess concrete offsite (unless otherwise approved by the Environmental Monitor and the landowner). Under no circumstances shall excess concrete be buried or left on the surface in active agricultural areas.
• Washing of concrete trucks, if necessary, outside of active agricultural areas in locations approved by the Environmental Monitor.
• Restricting crane set-up, erection, and breakdown activities to designated access roads and work pads at the turbine sites.
• Stabilizing restored agricultural areas with seed and/or mulch.
• Removing and disposing of all construction debris offsite at the completion of restoration.
• Removing all excess subsoil and rock from the site. On site disposal of such material may be allowed if approved by the landowner and the Environmental Monitor, with appropriate consideration given to any possible agricultural or environmental impacts.
• Repairing any surface or subsurface drainage structures damaged during construction to as close to preconstruction conditions as possible, unless said structures are to be removed as part of the Project design.
• Re-grading all access roads to allow for farm equipment crossing, and to restore original surface drainage patterns or other drainage pattern incorporated into the design.
• Compensation for damaged/lost crops.

Following construction, all disturbed agricultural areas will be decompacted to a depth of 18 inches with a deep ripper or heavy-duty chisel plow. In areas where the topsoil was stripped, soil decompaction shall be conducted prior to topsoil replacement. Following decompaction, all rocks 4 inches and larger in size will be removed from the surface of the subsoil prior to replacement of the topsoil. The topsoil will be replaced to original depth and the original contours will be reestablished where possible. All rocks 4 inches and larger shall be removed from the surface of the topsoil. Subsoil decompaction and topsoil replacement should be avoided after October 1, unless approved on a site-specific basis by the landowner in consultation with the Environmental Monitor and NYSA&M. All parties involved should be cognizant that areas restored after October 1 may not obtain sufficient growth to prevent erosion over the winter months. If areas are to be restored after October 1, necessary provision should be made to restore any eroded areas in the springtime to establish proper growth.

Beyond reducing impacts to agricultural land, other mitigation measures that will be undertaken to reduce the impact of the Project on land uses are listed below. These include:

• Lighting towers only to the extent necessary to comply with FAA requirements. Lighting for the substation and other ground level facilities will be kept to a minimum and generally operated by switch or motion detector.
• Utilizing tubular towers and finishing structures with a single, non-reflective matte off-white finish.
• Installing turbines in locations where proximity to existing fixed broadcast, retransmission, or reception antenna for radio, television, or wireless phone or other personal communications systems will not produce electromagnetic interference with signal transmission or reception.
• Designing all Project components in a way that minimizes the impacts of land clearing and the loss of forest land and open space.
• Locating Project components so as to minimize impacts on state and federal jurisdictional wetlands.
• Managing storm water run-off and erosion control in a manner consistent with all applicable state and federal laws and regulations.
• Removing all solid waste, hazardous materials, and construction debris from the site and managing its disposal in a manner consistent with all appropriate rules and regulations.
• Utilization of appropriate setbacks from sensitive receptors and features (residences, roads, non-participating property lines, overhead power lines, microwave links, etc.).

These actions will assure that adverse impacts on land use, agricultural districts, and zoning are minimized or mitigated to the extent practicable.
4.0 UNAVOIDABLE ADVERSE IMPACTS

The proposed Project will result in significant long-term economic benefits to participating landowners, as well as to the Towns of Denmark, Champion, Rutland, Watertown, the local school districts, and Lewis and Jefferson Counties (see Section 3.9). When fully operational, the Project will provide up to up to 79.9 MW of electric power generation with no emissions of pollutants or greenhouse gases to the atmosphere. The development of the site is consistent with surrounding land uses may function to keep land within the generating portion of the Project site in agricultural use, thus protecting open space and existing land use patterns.

Despite the positive effects anticipated as a result of the Project, its construction and operation will necessarily result in certain unavoidable impacts to the environment. The majority of these environmental impacts will be temporary, and will result from construction activities. However, long-term unavoidable impacts associated with operation and maintenance of the Project includes turbine visibility from some locations within the area. While the presence of the turbines will result in a change in perceived land use from some viewpoints, their overall contrast with the landscape, as determined through evaluation by registered landscape architects, is moderate in most locations. Project development will also result in an increased level of sound at some receptor locations (residences) within the study area (Project sound levels are not expected to exceed 45 dBA at any non-participating residences), a minor loss of forest land, wildlife habitat changes, and some level of avian and/or bat mortality associated with bird/bat collisions with the turbines. As evaluated through site-specific expert analyses, which are presented in Section 3.0 of the DEIS, these impacts are not considered significant, and are outweighed by the benefits of providing a source of clean, renewable energy and displacing some of the energy (and emitted pollutants) created by fossil fuel generators, which result in significant environmental impacts (Driscoll et. al., 2007) and (NYSDEC, 2010b).

Although adverse environmental impacts will occur, they will be minimized through the use of various general avoidance and minimization measures, as well as site-specific mitigation measures. With the implementation of these measures, the Project is expected to result in positive, long-term overall impacts that will offset the adverse effects that cannot otherwise be avoided. Should avoidance mitigation measures fail and adverse impacts occur, the Project Sponsor will evaluate the need for turbine specific scheduled curtailment of operations when it is deemed necessary to operate the project in a socially responsible manner.

The following subsections summarize general avoidance and minimization measures, which have been incorporated into the Project design, and specific mitigation measures proposed to offset adverse impacts to specific resources.
4.1 GENERAL MINIMIZATION AND AVOIDANCE MEASURES

General mitigation measures include compliance with the conditions of various local, state and federal regulations that govern Project development.

SEQRA regulations require public input into the environmental review of proposed development projects so that potential adverse impacts can be identified prior to Project implementation and avoided or mitigated to the greatest extent practicable. This DEIS was prepared in accordance with these regulations, and provides a primary means by which the potential costs and benefits of the Project are described and weighed in a public forum. Compliance with SEQRA regulations will assure that public and agency comments are solicited and appropriately addressed, Project alternatives are evaluated, and potential adverse impacts are identified and mitigated to the greatest extent practicable. Response to comments and preparation of the DEIS and FEIS will provide the information necessary for the lead agency and other involved agencies to draw conclusions (Findings Statement) regarding the Project's overall environmental impacts, and impose conditions on SEQRA approval, if necessary and where relevant.

Compliance with the other various federal, state, and local regulations governing the development, design, construction and operation of the proposed Project also will serve to minimize adverse impacts. Construction activities and Project engineering will be in compliance with applicable state and local building codes and federal OSHA guidelines to protect the safety of workers and the public. Federal and state permitting required by the USACE and/or the NYSDEC will serve to protect water resources, along with implementation of a state-approved SPDES permit. Highway permitting at the local, county, and state level will assure that safety, congestion, and damage to highways in the area is avoided or minimized.

The final Project layout will be in accordance with various siting criteria, guidelines, and design standards that serve to avoid or minimize adverse environmental impacts. These include:

- Siting the Project away from population centers and areas of residential development.
- Siting turbines in compliance with all local set-back requirements to minimize noise, shadow flicker, and public safety concerns.
- Using existing farm roads for turbine access whenever possible, to minimize impacts to soil, ecological, and agricultural resources.
- Minimizing the number of stream and wetland crossings.
- Designing all electrical lines in a manner that denies any possibility of stray voltage.
- Siting turbines primarily in open field areas to minimize forest clearing and impacts to habitat.
- Minimizing overhead transmission lines and designing any overhead transmission line in accordance with Avian Power Line Interaction Committee (APLIC) guidelines to minimize impacts on birds.
- Limiting turbine lighting to the minimum allowed by the FAA to reduce nighttime visual impacts, and following lighting guidelines to reduce the potential for bird collisions.
- Construction procedures will follow Best Management Practices for sediment and erosion control.
- Designing, engineering, and constructing the Project in compliance with various codes and industry standards to assure safety and reliability.
- Following construction procedures in accordance with Best Management Practices for sediment and erosion control.
- Installing turbines with appropriate grounding and automatic shutdown/braking capabilities to minimize public safety concerns.
- Complying with the NYSA&M guidelines in order to minimize impacts on agricultural ground and farming practices.

4.2 SPECIFIC MITIGATION MEASURES

Project development and operation will also include specific measures to mitigate potential impacts to specific resources. These were described in detail in Section 3.0, but generally include the following:

- Developing and implementing various plans during to minimize adverse impacts to air, soil, and water resources, including a dust control plan, sediment and erosion control plan, and Spill Prevention, Control, and Countermeasure (SPCC) plan.
- Documenting existing road conditions, and undertaking public road improvement/repair as required to mitigate impacts to local roadways.
- Employing an environmental monitor/inspector to evaluate best practices to be employed at sensitive areas such as stream and wetland crossings.
- Implementing an Invasive Species Control Plan.
- Implementing a Blasting Plan, as required.
- Developing and implementing a complaint resolution procedure to address landowner concerns throughout Project construction and operation.
- Preparing a historic resource mitigation program to be developed in consultation with the SHPO.
- Preparing a compensatory wetland mitigation plan, as required to mitigate impacts to streams and wetlands.
• Entering into a PILOT agreement with the local taxing jurisdictions to provide a significant predictable level of funding for the towns, county, and school districts.
• Developing of an emergency response plan with local first responders.

If additional, unanticipated mitigation is necessary as a result of unforeseen operational impacts, the Project Sponsor will work with the Towns and Counties to develop an acceptable remedial plan to address any such impacts, with a timeline for implementation.

4.3 ENVIRONMENTAL COMPLIANCE AND MONITORING PROGRAM

The Project Sponsor is committed to develop and operate its projects in a safe and environmentally responsible manner. In addition to the mitigation measures described above, the Copenhagen Wind Farm will develop an environmental compliance program and the Project Sponsor will provide funding for an independent, third party environmental monitor to oversee compliance with environmental commitments and permit requirements. The environmental compliance program will include the following components:

1. Planning – Prior to the start of construction, the environmental monitors will review all environmental permits and, based upon the conditions/requirements of the permits, prepare an environmental management document (Environmental Compliance Manual) that will be utilized for the duration of the construction and operation of the Project. This document will distill and clearly present all environmental requirements for construction and restoration included in all Project permits and approvals, and will be designed to aid in the management of environmental issues and concerns that may arise during construction of the Project. The Environmental Compliance Manual will include 1) copies of all issued environmental permits and approvals, 2) a compliance matrix that summarizes all relevant permit requirements and identifies the responsible party and time frame (if applicable), and 3) a Project contact list and organizational chart.

2. Training – The environmental monitors will hold environmental training sessions that will be mandatory for all contractors and subcontractors before they begin working on the site. The purpose of the training sessions will be to distribute the Environmental Compliance Manual, explain the environmental compliance program in detail, prior to the start of construction, and to assure that all personnel on site are aware of the permitting requirements for construction of the Project.

3. Preconstruction Coordination – Prior to construction, the contractor(s) and the environmental monitors will conduct a walkover of areas to be affected by construction activities. The limits of work areas, especially in and adjacent to sensitive resource areas such as wetlands, will be defined by flagging, staking or fencing prior to
construction, as needed. This walkover will identify landowner concerns, sensitive resources, limits of clearing, proposed stream or wetland crossings, and placement of sediment and erosion control features. Specific construction procedures will be discussed amongst the group, and updated to become part of the Project layout and construction sequence, as needed. The pre-construction site review will serve as a critical means of identifying any required changes in the construction of the Project early enough in the process to avoid potential delays once construction has begun. Proposed changes to the construction plan will be identified as soon as possible, as changes may require an agency notification period and take time for approval to be received.

4. Construction and Restoration Inspection – The monitoring program will include daily inspection of construction work sites by the environmental monitor. The environmental monitor is the primary individual(s) responsible for overseeing and documenting compliance with environmental permit conditions on the Project. The environmental monitor will conduct inspections of all areas requiring environmental compliance during construction activities, with an emphasis on those activities that are occurring within jurisdictional/sensitive areas, including cultural resource areas, wetland and stream crossings, and active agricultural lands. When on site, the environmental monitor’s schedule will include participation in a daily Plan of Day (POD) meeting with the contractors to obtain schedule updates, identify in-field monitoring priorities, and address any observed or anticipated compliance issues. During the course of each visit, multiple operations are likely to be occurring throughout the Project area, and will need to be monitored by the environmental monitor. Activities with the potential to impact jurisdictional/sensitive resources, or with greater potential for environmental impact, will receive priority attention from the environmental monitor. For instance, installation of an access road across a protected stream would likely receive greater attention than installation of buried electrical collection lines across a successional old field. However, some level of field inspection by the environmental monitor will occur at all earth-disturbing work sites during each site visit. The monitor will keep a log of daily construction activities, and will issue periodic/regular (typically weekly) reporting and compliance audits. Additionally, when construction is nearing completion in certain portions of the Project area, the monitor will work with the contractors to create a punch list of areas in need of restoration in accordance with all issued permits.

Specific to agricultural land impacted by the Project, the Project Sponsor will provide a monitoring and remediation period of no less than two years immediately following the completion of initial restoration (see Appendix E). The two year period will allow for the effects of climatic cycles such as frost action, precipitation, and growing seasons to occur, from which various monitoring determinations can be made. The monitoring and remediation phase will be used to identify any remaining agricultural impacts associated with construction that are in need of mitigation and to implement the follow-up restoration. General conditions to be monitored include topsoil thickness, relative content of rock and large stones, trench settling, crop production, drainage, and repair of severed fences. Impacts will be
identified by the environmental monitor through on site monitoring of all agricultural areas impacted by construction and through contact with respective farmland operators and NYSA&M.
5.0 ALTERNATIVES ANALYSIS

SEQRA (6 NYCRR Part 617) requires that an EIS evaluate a range of reasonable project alternatives. In determining the scope of alternatives to be considered, the emphasis is on what is “reasonable”. As described in §617.9 (b)(5)(v), an EIS must contain “a description and evaluation of the range of reasonable alternatives to the action that are feasible, considering the objectives and capabilities of the Project Sponsor”. As stated in Section 2.2, the objective of the proposed action is to take advantage of the available wind resource and New York bulk power transmission system availability in order to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid. The Applicant has a 79.9 MW interconnection request with the NYISO, therefore the preferred alternative is to construct a facility that can produce at least 79.9 MW of renewable energy. The Project is currently proposed as an up to 49 wind turbine facility and is planned to generate up to 79.9 MW and have a total net annual generation of approximately 244 GWh, delivered to National Grid’s existing 115 kV line, or enough electricity to meet the average annual consumption of approximately 31,000 average NYS households.

Additionally, §617.9 (b)(5)(v) indicates the description and evaluation of each alternative should be at a level of detail sufficient to permit a comparative assessment of the alternatives discussed. It is well-established law under SEQRA that “the degree of detail with which each alternative must be discussed will vary with the circumstances and nature of each proposal.” (King v Saratoga County Bd. of Sup’rs, 223 AD2d 894 [3d Dept. 1996], affd 89 NY2d 341 [1996]; Impact Review, § 5.14 [3].) The range of alternatives must include the no action alternative. The no action alternative discussion should evaluate the adverse or beneficial site changes that are likely to occur in the reasonably foreseeable future, in the absence of the proposed action. The range of alternatives may also include, as appropriate, alternative:

(a) sites;
(b) technology;
(c) scale or magnitude;
(d) design;
(e) timing;
(f) use; and
(g) types of action.

For private Project Sponsors, any alternative for which no discretionary approvals are needed may be described. Site alternatives may be limited to parcels owned by, or under option to, a private Project Sponsor;
It is appropriate to focus on those alternatives that could potentially address specific environmental impacts (as identified during the SEQRA review process) associated with the proposed action. For example, if neighbor impacts (noise, shadow flicker) are addressed as the primary concern with the proposed project, alternatives under consideration should be those that specifically address those sorts of impacts.

The following alternatives to the proposed action are described and evaluated: alternative Project area/Project sites, alternative project design/layout, alternate project size, alternative technologies and no action. These alternatives offer a potential range and scope of development for comparative analysis and consideration.

5.1 ALTERNATIVE PROJECT AREA/PROJECT SITES

Under 6 NYCRR § 617.9(b)(5)(v)(g), site alternatives addressed in an EIS may be limited to parcels owned by, or under option to, a private Project Sponsor. OwnEnergy does not own, or have under option, any contiguous parcels in Lewis or Jefferson Counties other than the ones that constitute the Project site. Therefore, there is no requirement to evaluate any alternative Project areas. Nonetheless, this section provides background information on the selection of the Project site to facilitate understanding of the criteria that the Applicant employed.

The preliminary selection of wind turbine locations on a regional or statewide basis is constrained by several factors that are essential for the Project to operate in a technically and economically viable manner. These factors include the following:

- adequate wind resource
- adequate access to the bulk power transmission system, from the standpoints of proximity and ability of the system to accommodate the interconnection and accept and transmit the power from the Project
- contiguous areas of available land
- compatible land use
- willing land lease participants and host communities
- limited population/residential development

In selecting a specific Project area, several design factors greatly favor rural areas for commercial wind development, particularly turbine spacing and setback requirements. Generally, approximately 60 acres of land is required per MW-scale wind turbine for the turbine to perform properly under New York state wind conditions. Although the actual footprint of the wind turbine is much smaller, this amount of airspace is required to minimize effects turbines have on one another when sited down wind. In sum, a dense array of wind turbines may result in reduced wind capture and
impose unacceptable stresses on operating wind turbine components. These larger land requirements also favor other design considerations including acceptable setback distances from residential areas.

Several areas of the northern tier of New York have the desired combination of these attributes that make them more suitable for commercial wind development such as rural settings, proximity to high-voltage power lines, and higher elevations and proximity to lake-effect weather. The Project Sponsor has researched other potentially suitable sites in New York, including areas in the vicinity of Madison, Clinton, and Cortland Counties and evaluated the sites to include the above referenced essential factors to operate a viable wind power facility. During this site search, the Project Sponsor identified the current Project site as the most viable compared to other available sites due its desirable wind resource and supportive community. In addition, the Project Sponsor was able to acquire the Project’s development assets at a competitive price, which gives the Project a significant economic advantage.

The Project Sponsors initiated contact with willing landowners by telephone and mail. Approximately 90 residents of the Town of Denmark attended and participated in a dinner and meeting at the Copenhagen Fire House on February 7, 2012. At the meeting, Project Sponsors briefed landowners on key aspects of the Project and the proposed timeline for development and discussed the initial Project layout. Since then, Project Sponsors have had ongoing dialogue with each of the landowners who are part of the Project, amending various parts of the turbine layout, access road and collection line routes according to their input. In addition to the landowner’s support Copenhagen Wind, LLC selected the proposed Project site for the following reasons:

- It is proximate to the National Grid East Watertown Substation; a suitable 115 kV interconnection transmission facility, which has available capacity to transmit power from the Project to the New York State grid;
- The site is relatively rural, and the area within the vicinity of the proposed Project generating site is of low population and residential density. Therefore turbines on the this site will generally meet setback requirements as set forth in the Town's Zoning Ordinance, except by waiver.
- The Project area consists of an abundance of existing farm lanes within the generating site that can be upgraded and will minimize new access roads.

5.2 ALTERNATIVE PROJECT DESIGN/LAYOUT

5.2.1 Wind Turbine Selection

Several factors drive the selection of wind turbines for the Project, including market competition, market (supply) availability, industry trends, and importantly, site and wind resource suitability. As discussed in Section 2.5.2, the type
of wind turbine generator proposed for the Project is a 1.62 MW, three-bladed, upwind turbine design with 96-meter hub height and 100-meter rotor diameter. Most modern commercial scale wind turbines are three-bladed designs with the rotor position maintained upwind (on the windy side of the tower) using electrical motors in their yaw mechanism (mechanism used to turn the wind turbine rotor against the wind). The vast majority of commercial scale turbines sold in world markets have this design.

Wind power projects in New York (both proposed and operational) include turbines that range in size from 660 kW to 3 MW. Driven by both economics and technical change, the national and international trend in the industry is towards larger turbines, in the form of taller towers, larger rotor diameters. Typical proposed turbines have 80 to 100 meter tall hub heights and 80 to 112 meter diameter rotors. Higher hub heights generally equate to higher wind speeds while larger rotor diameters capture more of the available wind energy. The site specific wind resource characteristics are the drivers in selecting the optimal hub height, rotor diameter, as well as the turbine design to maximize wind energy capture and electricity generation. Wind turbines are designed for various wind speed profiles from very energetic Class I regimes (average wind speeds greater than 8.5 m/s) to lower Class III regimes (< 7.5 m/s). These lower Class III wind conditions are typical to New York, and the use of Class III turbines here is consistent with the stated objectives of the Project Sponsor and current industry practices.

Fewer small turbines types are available in the US market for low wind regimes. However, if the Project specified the use of smaller (lower hub height/smaller rotor diameter/smaller rated capacity) the number of turbines required to meet the Project’s stated purpose, need and benefits would have to increase. Currently, the Project Sponsor is evaluating up to 62 turbine sites to ultimately construct 49 turbines. The current generating site boundary cannot accommodate a project of greater than the proposed 49 turbines, due to landowner participation, site constraints including turbine spacing requirements, wind optimization, required setbacks, and minimization of noise and shadow flicker impacts. The use of a greater number of smaller turbines (lower hub height and/or smaller rotor diameter) may have the effect of minimizing visibility (See section 3.6 for a discussion of visual impacts of the proposed turbines), but would be limited given the open plateau nature of the generating site. Temporary and permanent impacts to streams, wetlands, soils, and vegetation and neighbor impacts (noise and shadow flicker) associated with constructing more than 49 turbines and associated infrastructure (gathering lines, staging areas and roads) would significantly outweigh any reduction in visibility associated with smaller turbines.

For example, if the project chose to use a Gamesa 850 (850kW) wind turbine (a wind turbine available in the US in low wind regimes), the overall height of the turbine could be reduced to 74 meters, but require 94 wind turbines to reach up to 79.9 MW. Development of 94 turbines is an approximately 52% increase in site development footprint. It is reasonable to assume there would be a nearly proportional increase in length of new access roads, electrical
interconnection lines, and staging area size. It can also be assumed that the existing substation size, meteorological towers, and transmission line can remain similar in size to a 49 turbine project and not need to proportionally increase. Using these assumptions, it is estimated that the overall impacts to vegetation, streams, wetlands and soils will also increase by approximately 52%. For example, the overall permanent loss or conversion of successional land as a result of constructing 94 turbines would be approximately 14 acres, versus 9 acres for the proposed Project.

The Applicant has also considered alternative turbine layouts that utilize larger rotors and generators, including the Vestas 3 MW V112 and the Nordex 2.5 MW N117. Although such layouts have fewer turbines and associated access roads and therefore, lower environmental impacts and construction costs, the Applicant must evaluate project layouts in terms of their overall cost/MWh of production. At present, the Applicant’s production estimates and indicative unit pricing for larger turbines do not compare favorably with the preferred alternative. Given the intense competition to secure off-take contracts for long term power and renewable energy credits, the inferior economics of the larger-unit layouts makes them non-viable.

5.2.2 Alternate Turbine Layouts

The process of determining Project design and layout involves continuous evaluation of alternatives. This process resulted in a number of interim layouts since its inception in early 2011. The evolution of turbine layouts provides additional basis for this alternatives analysis. The number of turbines has remained relatively consistent (approximately 49 turbines to be constructed from a potential of 62 site alternatives) throughout the Project design/layout process so the differences among the evolving layout alternatives are the result of shifts in turbine locations and associated infrastructure. These shifts have occurred primarily as a result of wetland impact minimization, wind resource optimization, construction constraints, neighbor related impact avoidance and increased landowner participation.

The steps involved in determining the final location of project components (wind turbines, electrical lines, access roads, O&M building, and substation) generally include:

1. Measure site-specific wind resource patterns and quantities.
2. Obtain substantial volunteer landowner and neighbor agreements.
3. Perform a site constraint analysis.
4. Develop a preliminary turbine layout.
5. Develop a preliminary access road and electrical layout.
6. Perform site specific studies and data collection.
7. Minimize impacts to identified constraints; revise layout as required.
8. Review layout changes with participating landowners, revise layout as required.

Once the overall Project area was evaluated for initial siting criteria, the Project Sponsor installed wind measurement/meteorological towers to collect site specific data to develop a turbine array design. During the array development, the Project Sponsor developed voluntary agreements with willing landowners and neighbors that would allow for the construction and operation of all Project components including turbines, buried electrical lines, access roads, and the substation. A substantial participation effort on the part of the landowners and neighbors was obtained prior to development of a preliminary site layout.

After landowners had substantially participated in the layout review process, a site constraint analysis was performed to identify suitable preliminary locations for wind turbines only. Site constraints include, but are not limited to, mapped wetlands and streams, local law setback requirements to property lines/roads, proximity to non-participating permanent residential structures, microwave paths (Fresnel zones), noise levels, agricultural land and steep slopes. The Project Sponsor specifically avoided siting turbines or turbine workspaces directly in wetlands. Preliminary turbine siting is intended to maximize/optimize wind resource and landowner participation, while avoiding site constraints and impacts to the maximum extent practicable.

Once a preliminary turbine layout is identified through the constraint analysis and optimization process, access roads and electrical collection lines are defined. The Project Sponsor has several engineering criteria required in initial access road and electrical line layout, including designing the alignments to minimize installation/material costs (shortest sections of road and electrical lines possible). After this initial access road and electrical line layout, the Project Sponsor will make modifications to avoid or minimize impacts to the identified site resources and to meet landowner requirements for individual siting on private land. Additionally, site modifications will be made to minimize impacts including co-locating electrical lines with access roads (where feasible), minimizing new wetland crossings, and re-using the substantial existing network of farm lanes for proposed Project access roads. All preliminary layout efforts were reviewed on site with the landowners, Project engineering and environmental consultants, to minimize impacts to identified site resources and meet landowner requirements.

Through an analysis of site develop-ability, wind resource assessment, environmental resource factors, and review of the site’s zoning constraints, a proposed project layout was developed by the Project Sponsor. The layout of 49 turbine sites as proposed is satisfactory to the participating landowners and results in a carefully achieved balance of energy production and environmental protection. Significant relocation of any of the turbines to a site other than one of the identified 49 sites would have a ripple effect, in that the location of other turbines would have to be reexamined and possibly changed to maintain an efficient/workable Project design. Therefore, reduction of environmental
impacts in one location could result in increased impact in another location and/or reduced power generation. In the case of visual impact, removal or relocation of one or two individual turbines from a 49-turbine array is unlikely to result in a significant change in Project visibility and visual impact from most locations.

5.2.3 Electrical Collection Lines

As a matter of general economical design preference, the Project Sponsor would prefer to build all electrical lines in the shortest, most direct alignment between turbines. However, on the generating site, the Project's electrical gathering system will be primarily buried along existing and proposed access roads (unless site features prohibit burial, such as the Deer River crossing) to significantly consolidate and minimize crossing impacts to onsite vegetative communities and wetland/stream systems. Other potential alternatives including significant sections of overhead gathering lines, or gathering lines that were not substantially adjacent to access roads were not considered, as they provided significant impacts over the Project proposal.

5.2.4 Electrical Transmission Line

OwnEnergy evaluated several potential routes for the electrical transmission line that will connect the project to the National Grid East Watertown Substation. Potential routes were of essentially the same distance (between 7 and 10 miles in length), crossed agricultural and forested private land parcels, and were sited away from public rights of way, limiting visibility of the line. However, the preferred alternative was selected due to willingness of the local landowners to enter into easement agreements. Each of the two other routes had landowners that were not willing participants, and without their participation, resulted in a non-contiguous easement between the generating site and the POI station. As currently proposed, the approximately nine miles of transmission line is overhead and will likely be mounted on wood or steel poles. OwnEnergy explored alternatives to an overhead line arrangement including burying all nine miles of the transmission line, however it was determined to be economically cost prohibitive.

5.2.5 Collection Substation

The location of the substation has been selected for its proximity to other Project components along with electrical collection systems. In addition, the site was selected from a broader area based upon existing grades, avoidance of wetlands and other ecological resource impacts, and landowner requests/concerns. The proposed location consists of open agricultural land, thus eliminating the need for significant tree removal/clearing.
5.2.6 Access Roads

Permanent access road widths will be the minimum necessary to operate and maintain the Project. Approximately four miles of roadways will be coincident with existing farm drives to reduce the impacts of constructing new roadways in undisturbed land conditions. Access will be reduced from a construction width of 40 feet to an operation/maintenance width of 16 feet (unless determined otherwise through landowner requests and/or negotiations). Shorter, more direct routes are a more desirable alternative from a project development/cost perspective. However, by following siting guidelines such as utilizing existing farm roads and avoiding significant wetland crossings, this alternative is essentially rejected.

5.3 ALTERNATIVE PROJECT SIZE

Copenhagen Wind Farm has a 79.9 MW interconnection request with the NYISO, therefore the preferred alternative is to construct a facility that has the ability to produce at least 79.9 MW. A project of significantly more, or fewer, turbines would pose challenges to the technical or economic feasibility of the Project, and would not meet the stated objectives of the Project.

If the proposed number of turbines were significantly reduced, the maximum benefit of the available wind resource would not be realized. If the turbine number were even moderately reduced, the Project would cease to be economically viable due to the high fixed cost of interconnection with the power grid. As with most land disturbance based environmental impacts, economic benefits would also be reduced proportionately with a smaller project. PILOT payments to local taxing jurisdictions (which are typically developed on a per MW or per turbine basis), as well as construction expenditures, would be greatly reduced.

If the proposed number of turbines were significantly increased above 49, the Project Sponsor would need to obtain more leased land area to operate efficiently and to meet the criteria for siting. The Project Sponsor does not currently have the additional land control to increase the Project Site. Additionally, the current National Grid 115 kV Watertown substation – Black River to Lighthouse Hill 115 kV transmission line does have the capacity to accept a 79.9 MW project and may accept a project of up to 79.9 MW without significant project upgrades.

As mentioned previously, various siting constraints dictate the size and layout of a wind power project. These constraints make a significantly larger number of turbines within the Project site highly unlikely. A larger project would result in location of wind turbine towers in areas that do not have ideal wind resources, and which may not have willing landowner participants. This alternative would also require installation of more turbines in areas with more sensitive resources and/or higher population density. Although a larger facility might theoretically have more
economic value, the greater environmental impacts would not justify the marginally increased power generation potential of the Project.

5.4 ALTERNATIVE TECHNOLOGIES

The turbines proposed for the Project will utilize the latest in wind power generation technology to enhance Project efficiency and safety, and minimize impacts such as noise. The Project Sponsor is proposing to develop up to 79.9 MW of renewable energy. Alternative power generation technologies, such as fossil-fuel and biomass combustion, would not meet the goals of the Project, are not the area of expertise of the Project Sponsor, and would pose more significant adverse environmental impacts, particularly on air quality but also on land use, aesthetics, and water resources. Most fossil fuel-fired generating facilities would require significant amounts of water to operate, the use of which may pose impacts to surface water or groundwater resources as well as fish and other aquatic organisms. Nuclear power plants have not been constructed in the U.S. for over 25 years, due primarily to public opposition, high cost, and concerns over the safe storage and disposal of nuclear waste. These plants also present potential public safety and security/terrorism concerns. Conventional power plants also would not advance the RPS goal of generating 30% of the state’s power by 2015.

In regard to other renewable sources of generation, hydroelectric plants have significant impacts on terrestrial and aquatic ecological resources, land use, and aesthetics. They can also only be developed in places with appropriate water volumes and topographic conditions (which do not exist within the Project site). Other renewable energy technologies, such as solar power and hydrogen, are still either cost-prohibitive or in development. Aside from cost constraints, utility-scale solar power is not feasible in an area such as upstate New York, where available sunshine is limited. Currently, wind is the only renewable energy source that can help meet energy needs in a technologically and economically efficient manner. It can also do this without the emission of greenhouse gases and other environmental impacts that alternative power generation technologies would create.

5.5 ALTERNATIVE CONSTRUCTION PHASING

OwnEnergy proposes to construct the Project in a single phase during a single construction season. Single phase construction will result in a more efficient construction process, with a shorter duration of construction-related impacts, than a multiple phase construction approach, and will allow resources, such as soils, wildlife, and vegetation, that are temporarily impacted by construction, to begin to recover and/or habituate sooner. In contrast, a multiple phase construction process would result in a longer period of construction disturbance, and would be less economically efficient for both the sponsor and the local beneficiaries of the direct and indirect economic benefits of the Project.
5.6 NO ACTION

The no action alternative assumes that the Project site would continue to exist as agricultural, forested, successional and rural residential land. This no action alternative would not affect on-site ambient noise conditions, construction traffic or public road conditions, wildlife or wildlife habitat, wetlands and streams, or television/communication systems, and would maintain community character, economic and energy-generating conditions as they currently exist.

Under this alternative, no wind turbines or infrastructure (e.g., roads, buried or above ground electrical interconnects, and substations) would be developed on the site. Consequently, none of the environmental impacts associated with Project construction and operation would occur. In addition, no economic benefits would accrue to the area. These unrealized economic benefits would include income from construction jobs, lease payments to the landowners, and annual PILOT payments to the affected town, school district, and county. Annual revenues to the town of Denmark, Lewis County, and the school district remain to be negotiated in the final terms of a PILOT agreement, but are anticipated to be approximately $8,000 per MW for the first year the Project is operational. Under the no action alternative, multiplier effects from these economic benefits would also not be realized. Furthermore, the benefits of adding up to 79.9 MW of clean, renewable electric energy to the power grid would be lost, and reliance on fossil-fuel-fired generators, which contribute to emissions of sulfur dioxide (a precursor of acid rain), nitrogen oxide (a smog precursor), and carbon dioxide (a greenhouse gas) would continue unabated. Given the short-term nature of anticipated construction impacts and the generally minor long-term impacts of Project operation, as compared to the significant economic, policy and environmental benefits that the Project would generate, the no action alternative is not considered a preferred alternative.

5.7 ALTERNATIVES THAT AVOID SIGNIFICANT IMPACTS

Unavoidable adverse impacts resulting from Project construction and operation are described in Section 4.0. Temporary, short-term construction related impacts as well as long term operational related impacts are discussed. As described in Section 4.0, the majority of impacts to soils/topography, streams and wetlands, terrestrial ecological communities/wildlife habitat, air quality, and transportation and travel will be temporary and localized and no significant loss of these resources is anticipated. The permanent displacement, conversion or loss of habitat, as well as stream and wetland acreage has been minimized due to significant siting avoidance measures (See Section 3.2 Water Resources and 3.3 Biological Resources).

Operational-related impacts will result from the Project due to its location near rural residential areas and surrounding hamlets and villages (e.g. sound, shadow flicker, visual impact). Relative to other Project impacts, operational
impacts may be more significant. The preferred alternative largely avoids these impacts to the maximum extent practicable, through the adherence to local setbacks or waivers as applicable.
6.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed Project will require the irreversible and irretrievable commitment of certain human, material, environmental, and financial resources, as described below. For the most part, the commitment of these resources will be offset by the benefits that will result from implementation of the Project.

Human and financial resources have already been expended by the Project Sponsor, the State of New York (i.e., various state agencies), Lewis and Jefferson Counties, and the Towns of Denmark, Champion, Rutland and Watertown for the planning and review of the Project. The expenditure of funds and human resources will continue to be required throughout the permitting and construction phases of the Project (e.g., for environmental reviews and permitting, site plan approval, building and construction inspections).

The Project also represents a commitment of land for the life of the Project, proposed to be 25 years. Specifically, the land to be developed for wind turbines, access roads, the O&M building, the overhead transmission line, collection substation and the point of interconnect facility, a total of 58 acres, will not be available for alternative purposes for the life of the Project. As a result of the implementation of the Project, there will be relatively minor impacts to environmental resources such as agricultural lands, soils, wildlife habitat, wetlands and streams (see Section 3.0 for additional detail). However, because the turbines/towers are proposed to be removed, and the land reclaimed for alternative uses upon Project decommissioning (see Decommissioning in Section 2.8), the commitment of this land to the Project is neither irreversible nor irretrievable.

Various types of manufacturing and construction materials and building supplies will be committed to the Project. The use of these materials, such as gravel, concrete, reinforcement steel, cables etc., will represent a long-term commitment of these resources, which will not be available for other projects. However, some of these materials (e.g., steel, gravel, cables) will be retrievable following the operational life of the Project, and will likely be retrieved in accordance with Project decommissioning.

Energy resources will be irretrievably committed to the Project, during both the construction and operation of the Project. Fuel, lubricants, and electricity will be required during turbine fabrication and activities associated with the manufacture of turbines and components of the electric collection/interconnect system, as well as operation of various types of construction equipment and vehicles on-site, and for the transportation of workers and materials to the Project area. However, the energy resources utilized to construct and operate the Project will be minor compared to the energy generated by the Project (244,973 MWh) and made available to the state power grid.
7.0 GROWTH INDUCING IMPACTS

Certain proposed actions reviewed under the SEQRA process have the potential to trigger further development by either attracting a significant local population, inviting commercial or industrial growth, or by inducing the development of similar projects adjacent to the built facility. The proposed Project does not require a work force greater than approximately seven to ten employees during operations, and therefore will not lead to significant growth in local population or housing. Although it is anticipated that the period of construction of the facility will enhance the local economy through the purchase of goods and services, both by the Project Sponsor (construction materials and services) and by temporary construction workforce (hotel nights, catering, etc.) the type and level of expenditures are not of the sort that would generate significant sustained growth of businesses that serve the proposed facility. Lease payments to landowners have the potential to induce growth of local agriculture by providing more capital for landowners to invest in their businesses, if desired. However, secondary/indirect impacts resulting in local growth are not anticipated to occur as a result of the proposed action. The PILOT that ultimately will be executed for the generation Project to bring in tax revenue to local taxing jurisdictions has the potential to lower taxes or to improve community facilities for area residents and this may provide some incentive for businesses and residences to locate there, but any associated growth inducing impact is expected to be minimal.

The Copenhagen Wind Farm is proposed, in part, because of the presence of existing resources and facilities that allow the Project to be economically viable. Specifically, the availability of adequate wind, availability of suitable land resources, the proximity to an existing transmission line, and the market demand supported by the New York RPS allow for generation and transmission of the Project's electric output to the state power grid. The occurrence of these resources/facilities might suggest that other wind power projects could be proposed on adjacent lands. However, this would be the case with or without the proposed Project. Its presence alone will not encourage the development of additional wind power projects in the area. In fact, because the existing capacity of transmission facilities will be reduced by the addition of electricity generated by the Copenhagen Wind Farm, future projects will be more difficult to develop if such development could only be accommodated by upgrading the existing transmission line. If this were the case, such upgrades would likely make future projects less economically viable due to the significant cost typically associated with such upgrades which would be borne by the developer.

Additional wind power projects in the adjacent areas may be limited by the following factors, which are all necessary for a viable wind power project in New York State:

- Adequate wind resource
- Proximity to existing transmission lines with available capacity, and the cost of connecting to these lines
- Willingness of landowners to participate
• Proximity to appropriate transportation corridors
• Land area that can accommodate industry standard setbacks
• Presence of significant environmental resources

Except by waiver, the Project layout was designed in accordance with minimum setback distances of 642 feet between proposed turbines non-participating property lines and the centerlines of non-seasonal public roads; all setbacks are consistent with the manufacturer’s recommended guideline distance for safety and have also been assessed by the Project Sponsor as being acceptable. The minimum setback distance between the proposed turbines and existing permanent residences is 1,500 feet (except by waiver). These setbacks exceed the area around turbines where studies have documented the potential for ice shedding/ice throw may occur, which will adequately protect nearby residents, recreational users (such as hikers, cross country skiers and snowmobilers) and motorists from falling ice of any significant size and protect neighboring land parcels from danger in the event of turbine collapse. Given the existing residential patterns (i.e., houses built primarily along roadsides), along with the limited nature of residential development in the vicinity of the Project area, it is expected that the implementation of the Project will not significantly impact the development potential of neighboring vacant parcels in the area.
8.0 CUMULATIVE IMPACTS

In accordance with 6 NYCRR § 617.9(b)(5)(iii)(a), SEQRA requires a discussion of cumulative impacts where such impacts are “applicable and significant.” Cumulative impacts are two or more individual environmental effects which, when taken together, are significant or that compound or increase other environmental effects. The individual effects may be effects resulting from a single project or from separate projects.

Where individual effects of the Project may interact with other effects of the Project, such potential cumulative impacts have been addressed in Section 3.

This section addresses the potential cumulative impacts that may arise from interactions between the impacts of the Project and the impacts of other projects. In general, cumulative impact analysis of external projects is required where the external projects have been specifically identified and either are part of a single plan or program, or there is a sufficient nexus of common or interactive impacts to warrant assessing such impacts together. Some cumulative impacts are the simple additive effect of the projects (i.e., each will disturb a certain amount of ground surface, wetlands, or natural communities). These additive impacts can be quantified by simply tallying the total impacts resulting from each project, to the extent that such information is known and has been publicly presented. Certain other cumulative impacts may not simply be additive and therefore need a certain level of further analysis. The subsections below discuss whether there are identified projects for which a cumulative impact analysis is required, and assess the extent to which the impacts of such projects will be cumulative with the impacts of the Copenhagen Wind Farm.

Across New York State, numerous wind-powered generating facilities are in the project planning and development phases. The review and approval status of these projects is highly variable, ranging from preliminary site investigations to those with completed system reliability impact studies (a requirement of the NYISO), detailed project plans, and landowner agreements.

The NYISO oversees the New York Transmission System (the “Grid”) and has in place a process for permitting the interconnection of new electric generating facilities with the Grid. Consequently, consideration of a project’s status in the NYISO review process is a helpful measure for determining whether a proposed project may or may not be built. The NYISO reviews projects in three main phases: submittal of an interconnection request, preparation of a feasibility study, and completion of a system reliability impact study. This review process separates projects, initially by feasibility to connect to the Grid through a selected transmission facility. Proposed projects in any phase of project review by the NYISO are identified on a comprehensive queue listing maintained by NYISO on their website.
http://www.nyiso.com. It is reasonable to assume that wind power projects with in-progress system reliability impact studies and with upcoming proposed operation dates may be considered ‘proposed’ or ‘future’ projects for the purposes of cumulative impact analysis.

There is one project listed in the NYISO queue located in proximity to the Copenhagen Wind Farm, the Roaring Brook Wind Farm (NYISO, queue updated January 31, 2013). The Roaring Brook Wind Farm is a planned 39 turbine, 78 MW wind energy facility proposed in a remote forested area of the Town of Martinsburg. The Roaring Brook Wind Farm has a completed system reliability impact study with the NYISO and had received all permits for construction. However the planned construction date is unknown. It is located 9.5 miles south/southwest of the proposed Copenhagen Wind Farm and therefore its operation is not anticipated to have a significant impact on the communities within the Copenhagen Wind Farm Project area.

The nearest existing operating project is the Maple Ridge Wind Farm, a 195 turbine, 321 MW wind energy facility located in the towns of Lowville, Martinsburg, and Harrisburg in Lewis County. This facility is located approximately 2.4 miles southeast of the Copenhagen Wind Farm Project site, and therefore its operation could have an impact on the communities within the Project area of the Copenhagen Wind Farm.

The three projects are depicted in Figure 10.

For the purposes of cumulative impact analysis, it is assumed that all three projects will eventually be operational. It is also assumed that the Copenhagen Wind Farm and the Roaring Brook Wind Farm would not be constructed simultaneously. Due to the distance between the projects and their different construction schedules, cumulative impacts associated with the operation of the Maple Ridge Wind Farm, the Roaring Brook Wind Power Project, and the Copenhagen Wind Farm are anticipated to be limited to visual, avian/bats, and socioeconomic resources.

A possible cumulative impact resulting from the construction of a new wind power project adjacent to an existing facility, and a proposed facility, would be the effects on visual/aesthetic resources and community character if all three were constructed and operating. To evaluate the potential cumulative visual impact of multiple wind power projects, cumulative viewshed analyses were prepared. To accomplish this, the 10-mile radius Copenhagen Wind Farm topographic and vegetation viewshed analyses (based on maximum blade tip height) were overlaid on the same viewshed analyses prepared for the existing Maple Ridge Wind Farm in the Towns of Martinsburg, Harrisburg and Lowville, and the proposed Roaring Brook Wind Farm in the Town of Martinsburg. Conservatively, for the Copenhagen Wind Farm, all 62 potential turbine sites were included in the viewshed analysis, although only 49 will be constructed. The viewsheds for the three projects were then plotted on a base map, and areas of viewshed
overlap identified. The cumulative viewshed analysis of the proposed Copenhagen Wind Farm, previously permitted Roaring Brook Wind Power Project, and the existing Maple Ridge Wind Farm is presented in Figure 10. Based on the screening effect of topography alone, it appears that areas with potential simultaneous views of these three projects are primarily available widely dispersed in an area roughly bounded by west State Route 12 on the east, Flat Rock Road (in Martinsburg) to the south, Route 194 (in Pinckney) to the west, and just south of the southern municipal limit of the Village of Copenhagen to the north. Many of the sensitive receptors (including portions of the Grant Powell Memorial, Cobb Creek, and Lookout State Forests, the Valley Snow Travelers snowmobile trail, and multiple NRHP-Eligible properties northwest of Lowville) could potentially have simultaneous views of all three projects.

Factoring vegetation into this cumulative viewshed analysis essentially eliminates wooded sites (and areas where views of the projects would be blocked by tall vegetation), from the area of potential cumulative project visibility. Areas indicated as having potential views of all three projects on the cumulative vegetation viewshed map are limited primarily to open field areas located adjacent to the Maple Ridge turbines, and some areas between State Routes 12 and 26 to the southeast of the proposed Copenhagen Wind Farm Project area. Such views could also be available in areas along roads such as portions of Number Three Road (northwest of Lowville), Delles Road, Griffith Road, Wilson Road, Austin Road (south of Copenhagen) Flat Rock Road (in Martinsburg), and State Route 177 (in Harrisburg). Areas of potential cumulative visibility in total amount to approximately 6.4% of the total area of overlap between the three 10-mile study areas (see Figure 10).

Cumulative avian impacts may also occur as a result of proximity of the three projects. As discussed in Section 3.3.2.2.2, Erickson et al. estimated 20,000 - 37,000 birds were killed at about 17,500 wind turbines in the United States in 2003 (Erickson et al. 2005). These fatalities ranged from zero to about 8 birds per turbine per year, yielding an average of 2.1 birds per turbine per year. In three years of study at Maple Ridge (2006, 2007, and 2008), the fatality rates ranged between 3.13 and 9.59 birds per turbine per study period (Jain et al., 2007, 2009a, 2009b). At sites across New York State where recent, rigorous post-construction mortality monitoring has been conducted, bird fatality rates have varied between 0.66 and 9.59 birds/turbine/study period (see Table 10). Using this range, cumulative avian mortality for the Maple Ridge Wind Farm, Roaring Brook, and Copenhagen Wind Farm projects is estimated to be between approximately 196 and 2,839 birds per year. These cumulative avian impacts are not anticipated to be biologically significant for any of the affected species.

While 196 to 2,839 potential avian fatalities per year may sound large, it is a tiny fraction of the population that migrates through and/or resides in this area. This range of potential avian fatalities is not considered biologically significant, especially in consideration of other sources of bird mortality. On a national scale, the annual bird mortality
associated with wind energy facilities (20,000 to 37,000 birds per year [Erickson et al., 2005]) is slight compared to other sources of mortality. A recent National Research Council study concluded that wind energy generation in the United States is responsible for only 0.003% of anthropogenic avian mortality (NRC, 2007). Other such sources include vehicles (80 million birds per year [Banks, 1979; Hodson & Snow, 1965]), collisions with buildings (100 million to 1 billion birds per year [Klem, 1990, 2009]), power and transmission lines (130 to 174 million birds per year [Koops, 1987; Erickson et al., 2005]), communication towers (4 to 50 million birds per year [USFWS, 2002]), pesticides (67 million birds per year [Pimentel et al., 1992]), oil pits (1.5 to 2 million birds per year [USFWS, 2002]), and predation by domestic cats (100 million to 1 billion birds per year [Coleman & Temple, 1996; Dauphine & Cooper, 2009]).

Across New York State, bat fatality rates have varied between 0.7 and 24.53 bats/turbine/study period in rigorous post-construction mortality monitoring conducted between 2006 and 2011 (see Table 11). As described in Section 3.3.2.2.2, Jain et al. (2007, 2009a, 2009b) documented a mortality rates in the range of 8.18 - 24.53 bats per turbine per year at Maple Ridge during the first three years of post-construction monitoring. None of the bat carcasses retrieved during the study were threatened or endangered species. The proximity of this site and the presence of quality bat habitat (mix of forest, wetland and open areas) on site suggest that similar rates of collision mortality could be anticipated on the Copenhagen Wind Farm site.

Finally, cumulative economic impacts will be realized by Lewis County. Currently, Lewis County receives annual PILOT agreement distributions associated with Maple Ridge Wind. Although the exact percentage distribution to the Town, County and school districts from the Copenhagen Wind Farm cannot currently be known, based upon the assumptions outlined in Section 3.9.2.5.3, PILOT revenues associated with the Project are expected to total approximately $640,000 in the first year of payment. Payments over a 20-year PILOT agreement would yield approximately $15,500,000 in cumulative revenues for local taxing jurisdictions.
9.0 EFFECTS ON USE AND CONSERVATION OF ENERGY RESOURCES

In a policy titled *Guide for Assessing Energy Use and Greenhouse Gas Emissions in an Environmental Impact Statement* released on July 15, 2009, the NYSDEC Office of Air, Energy, and Climate states, “Global climate change is emerging as one of the most important environmental challenges of our time. There is scientific consensus that human activity is increasing the concentration of [greenhouse gas] in the atmosphere and that this, in turn, is leading to serious climate change. These climate changes will continue to affect the environment and natural resources of the State of New York” (NYSDEC, 2009). A subsequent policy titled *Climate Change and DEC Action* released by NYSDEC Commissioner Grannis on October 22, 2010 states, “Based on overwhelming scientific evidence, the New York State Department of Environmental Conservation recognizes that New York State’s air and water quality, forests, fish and wildlife habitats, and people and communities, are at risk from climate change. In order to perform its core mission of conserving, improving, and protecting the State’s natural resources and environment, DEC must incorporate climate change considerations into all aspects of its activities...” (NYSDEC, 2010b).

In addition, the NYSDEC has revised the Full Environmental Assessment Form (EAF), effective October 2012, which requires a more detailed analysis of a proposed action's potential impact on air quality. Specifically, the revised EAF requires a relative quantification of greenhouse gas emissions such as carbon dioxide and nitrous oxide. Clearly the NYSDEC, whose mission is “to conserve, improve and protect New York’s natural resources and environment, and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being”, is concerned about the negative effects of climate change and greenhouse gas emissions.

Electricity generated from zero-emission wind energy can displace the electricity generated from conventional power plants, thereby reducing the emissions of conventional air pollutants, such as sulfur and nitrogen oxides (acid rain precursors); mercury, and carbon dioxide (linked to global climate change). Displaced emissions occur because renewable electric generation sources have low marginal operating costs (i.e., fuel). Therefore, renewable energy sources become “must run” sources, displacing generation at fossil fuel plants that have higher marginal operating costs.

The proposed Project will have significant, long-term beneficial effects on the use and conservation of energy resources. The operating Project will contribute up to 79.9 MW of electrical generating capacity without consuming cooling water or emitting pollutants. Assuming that the average house in New York uses approximately 7.3-megawatt hours (MWh) of electric power per year and that the average house in the United States uses approximately 11.5 MWh of electric power per year (EIA, 2012a), and assuming the Project generates approximately
35% of its nameplate generating capacity, this is enough power to support between approximately 21,000 and 33,500 average homes in New York State (based on the New York and national averages).

The Project will add to and diversify the state's sources of power generation, accommodate future growth in power demand through the use of a renewable resource (wind), and over the long term will displace some of the state's older, less efficient, and dirtier sources of power. Wind energy generation results in reductions in air emissions because of the way the electric power system works. Generally, the most expensive power sources will be "backed down" when there is a sufficient source of wind energy available. Given the mechanism that governs the operation of the New York electricity markets, wind energy is a preferred power source, on the day ahead markets, on an economic basis because the operating costs to run the turbines are low and there are no fuel costs. Therefore, wind turbines produce power that reduces the need for generation from individual fossil fuel-fired power plants or units, thereby reducing fuel consumption and the resulting air emissions that would have otherwise occurred (Jacobson and High, 2008).

The specific types of fossil fuel-fired power units and associated emissions that will be displaced by wind energy generation vary significantly among states and regions of the country. The displaced emissions of CO₂, NOₓ, SO₂, and mercury generally will be greater in regions with large amounts of coal-fired generation and lower in areas where natural gas is the primary fuel (such as New England). However, even in New England, where natural gas is a major source of generation, wind energy backs down some generating units fired by coal and residual oil at certain times (GE Energy, 2005).

In June 2007, former Governor Spitzer and Lieutenant Governor Paterson formed the NYS Renewable Energy Task Force to investigate the implementation of increased renewable energy sources in the State. The Task Force published a report in February of 2008 that is intended to serve as a policy "road map" to address the many challenges we face in reducing our dependence on fossil fuels, stimulating investment in clean energy alternatives, and moving toward a Clean Energy Economy in New York State. In the conclusion of their report, the Task Force provides the following message:

"New York faces compelling reasons to put renewable technologies to use in large scale… New York has significant opportunities to advance these technologies, which will in turn improve our energy security, the reliability of our current energy infrastructure, and create new business opportunities and green collar jobs of every level. If our society is to begin addressing these critical challenges we face, New York must begin transitioning away from relying on conventional energy sources. Rather, we need to adequately educate our citizens to use and accept renewable resources as an integral part of the solution" (Renewable Energy Task Force, 2008).
In addition, in December 2012 the New York Energy Highway Task Force issued the “New York Energy Highway Blueprint,” on behalf of Governor Andrew Cuomo. Regarding the importance of renewable energy in New York State, the Blueprint states that “modernizing our generation assets promotes environmental and efficiency goals and preparing well in advance for the potential closure of power plants is critical to safeguarding system reliability and protecting consumers.” The Blueprint also contends that new renewable energy projects provide sustained environmental benefits through reduced local and state air emissions, and can also generate short- and long-term economic development through construction, operation, and maintenance jobs, expenditures for supplies and materials, and tax payments to local communities (NY Energy Highway Task Force, 2012).

The authors of these reports recognize the need for, and benefits of, a rapid transition toward the large-scale development of renewable energy sources such as the proposed Copenhagen Wind Farm.

In summary, this Project is proposed at a time of significant energy uncertainty, at both the state and national levels. At 79.9 MW of generation capacity, the Project will generate enough energy annually to serve between approximately 21,000 and 33,500 homes.
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