United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 Westgate Center Drive
Hadley, MA 01035-9589

**Memorandum**

To: Assistant Regional Director, Region 5

From: Regional Habitat Conservation Plan Coordinator, Ecological Services, Region 5

Subject: Findings and Recommendation on Issuance of an Incidental Take Permit to Beech Ridge Energy LLC and Beech Ridge Energy II LLC for the Beech Ridge Wind Energy Project Habitat Conservation Plan in Greenbrier and Nicholas Counties, West Virginia

Pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (16 U.S.C. Section 1531 et seq.) (ESA), the U.S. Fish and Wildlife Service (Service) proposes to issue an incidental take permit (ITP) to Beech Ridge LLC and Beech Ridge II LCC (referred to collectively as BRE) for incidental take[1] of the federally endangered Indiana bat (*Myotis sodalis*) and Virginia big-eared bat (*Corynorhinus townsendii virginianus*) for the Beech Ridge Wind Energy Project. In support of their ITP application, BRE developed a habitat conservation plan (HCP). The Service finds that BRE's application for an ITP meets permit issuance criteria outlined in section 10(a)(2)(B) of the ESA and in 50 CFR 17.22(b)(2) as explained by the following analysis and rationale. The resulting permit will authorize the take of up to 53 Indiana bats and 14 Virginia big-eared bats over a 25-year permit term.

Documents used in the preparation of these findings and recommendation include but are not limited to: draft habitat conservation plan (DHCP) and draft implementing agreement (BRE 2012), final habitat conservation plan (FHCP) and final implementing agreement (IA; BRE 2013), an addendum to the FHCP (errata sheet), draft environmental impact statement (DEIS) (USFWS 2012a), final environmental impact statement (FEIS) (USFWS 2013a), section 7 biological opinion (BO) (USFWS 2013b), and responses to comments on the DHCP and DEIS (USFWS 2013c). The FHCP, errata sheet, IA, FEIS and BO are incorporated by reference. This document provides the rationale for issuing the permit and in doing so summarizes key aspects of the proposed project and its impacts. The FHCP provides the applicants' final plan, including full project description and conservation measures. The FEIS and BO provide the Service's analyses of the environmental impacts, and the impacts from the project on the listed bats species, respectively.

## I. Project Description

BRE's ITP permit application seeks a 25-year authorization for incidental take of Indiana and Virginia big-eared bats associated with the Beech Ridge Wind Energy Project. Beech Ridge Energy LLC owns and operates phase I of the project: 67 existing 1.5-megawatt (MW) turbines and associated infrastructure. A separate business entity, Beech Ridge Energy II LLC, will construct and operate phase II of the project: up to 33 additional turbines, each with a rated capacity of 1.62 MW but not to exceed 2.5 MW, plus associated infrastructure. The companies are jointly referred to as BRE in the HCP and this document. Both companies are wholly-owned subsidiaries of Invenergy Wind, and are separate companies with management control over their respective phases of the project. Beech Ridge Energy LLC and Beech

[1] Take is defined in section 3 of the ESA as, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Here, the turbine operations of the facilities would cause take of listed bats through collision or barotrauma.

Energy II LLC are applying as co-permittees for an ITP for the project. Together the companies will be jointly responsible for implementing the terms and conditions of the HCP, ITP, and the IA. If either company fails to implement the terms and conditions, then the permit will be considered to be in violation for both entities. For example, the mitigation is a joint responsibility of both companies and failure to adequately implement the mitigation will be considered a permit violation for both companies. The companies will coordinate over administrative and operational issues related to the HCP to ensure efficient operation of the project.

BRE applied for an ITP as part of a court approved settlement agreement between the company and several plaintiffs concerning the effects of the project to Indiana bats. Under the terms of the agreement, BRE agreed to limit the operation of wind turbines at the project that had already been constructed and forego construction and operation of additional wind turbines pending receipt of an ITP from the Service. The purposes of the HCP are to avoid, minimize, and mitigate for potential adverse effects from the covered activities on the covered species and to provide the basis for take authorization via a Service issued ITP, pursuant to the ESA.

<u>Project Location; Covered Lands; Covered Activities; Permit Term</u>

The project is located along Beech Ridge in Greenbrier and Nicholas counties, West Virginia, approximately 5 miles [8 kilometers, (km)] northwest of the town of Trout, approximately 7 miles (11 km) north-northwest of Williamsburg, and approximately 9 miles (14 km) northeast of downtown Rupert, West Virginia. The project is located on a 63,000-acre tract owned by an industrial timber management company. BRE leased approximately 30,600 acres from this landowner to plan for, develop, operate, and maintain the project and all associated infrastructure, including road right-of-ways. In addition, BRE has an agreement with a power company for access to the right-of-way of the existing 14-mile (23 km) and future 1.6-mile (2.6-km) long supplemental transmission line. Within this large planning area, the ground disturbance footprint for the total project is approximately 521 acres distributed linearly over 30 miles of ridgeline. And within these 521 acres, it is anticipated that the area of direct land use occupied by the 100 turbines, access roads, substation, and the operations and maintenance facility for the duration of the ITP will be approximately 71 acres.

Within the context of this large planning area, the covered lands encompass 6,022 acres as described in section 1.4 of the FHCP. These lands correspond to the geographic area in which covered activities will occur, and in which take authorized by the permit is reasonably likely to occur. The covered lands include the following project components as depicted n Figure A-1 of the FHCP:

- Locations for all the turbines that have been constructed (67 turbines) or will be constructed (additional 33 turbines);
- All associated project facilities including roads, collection lines, the substation, the operation and maintenance (O&M) facility, and meteorological towers;
- A 492-foot (150-meter) buffer around all installed structures (exclusive of the transmission line);
- A 50-foot-wide (15-meter) permanent right-of-way associated with the existing 14-mile-long and future 1.6-mile-long supplemental transmission lines under the West Virginia Public Service Commission (WVPSC) siting regulations.

The applicant developed an HCP which includes the following activities for which BRE requested ITP coverage:

1) Operation of the existing 67 turbines (phase 1);
2) Construction of up to 33 additional turbines (phase II) and associated infrastructure, including construction of turbine assembly pads, construction of new access roads and improvement of

existing access roads, use of an existing staging area and concrete batch plant, construction of underground electrical and communication cables, construction of 2 self-supporting unguyed meteorological towers, and construction of a supplemental 1.6-mile-long overhead transmission line;

3) Operation of the 33 (phase II) turbines;
4) Maintenance of each phase of the project, including turbine maintenance, maintenance of underground cable and communication lines, mowing of turbine plots and use of herbicides to control noxious weeds near turbines, and cutting of hazard trees in the transmission line and other project areas for safety reasons; and
5) Decommissioning of the entire 100-turbine project and associated facilities including, but not limited to, dismantling and removal of the turbines, foundations, and transformers; substation and transmission line; four meteorological towers; and an operation and maintenance (O&M) building, followed by site grading and restoration. Disturbed areas and access roads will be left in place or graded and returned to the original contour per the request of the landowner.

Of these activities, we determined in our BO (USFWS 2013b) that only turbine operations are reasonably likely to cause take over the duration of the ITP, and thus the permit we issue will only authorize take associated with turbine operations. The permit will authorize cumulative take over the duration of the ITP of up to 53 Indiana bats and 14 Virginia big-eared bats.

The permit duration is 25 years from the effective date of the permit. Therefore, the authorized incidental take stemming from turbine operations will be a maximum of 25 years. But the two phases may operate for fewer years depending on how long it takes to construct phase II, and the permittees' decisions regarding decommissioning and its timing. The minimum functional life of the turbines is 20 years, but the useful life of a particular turbine may vary. After 20 years of operation, BRE will evaluate whether to continue turbine operations, decommission the Project, or retrofit the project with new turbines. The latter would require permit amendment and renewal.

We note that construction of phase I of the project occurred prior to the initiation of the ITP process; hence, it is not a covered activity. Phase I construction included construction of 67 turbines, associated infrastructure such as roads, staging area, concrete batch plant, underground and aboveground electrical collector system, a 14.0-mile-long overhead transmission line, a substation for connection of the wind turbines to the local transmission system, and an O&M building. Project facilities and infrastructure for both phases have been or will be placed on private land via long-term lease agreements between BRE and the respective landowner.

Minimization and Mitigation Measures

Chapter 5 of the FHCP and section II of the BO identify the full suite of minimization measures. But the key minimization measure to address incidental take is a turbine curtailment strategy designed to achieve a 60 percent reduction in *Myotis* bat fatalities and 50 percent reduction in Virginia big-eared bat and other bat fatalities. Initially BRE will evaluate whether this can be achieved by feathering turbine blades such that they are not turning below wind speeds of less than 4.8 meters per second (m/s) for five hours per night during the fall bat migration season.

BRE will also implement a Research, Monitoring, and Adaptive Management Plan (RMAMP) as an adaptive management strategy to assess whether the turbine curtailment strategy is effective in achieving the 60% annual reduction in *Myotis* fatalities and a 50% annual reduction in other bat fatalities. If the strategy proves to be ineffective in achieving the biological goals, BRE will increase the cut-in speed levels, the nightly duration of applying the cut-in speeds, and/or extending the season of applying the curtailment measures until such point as the goals and objectives are achieved.

To mitigate for the incidental take of Indiana and Virginia big-eared bats, within 2 years of ITP issuance, BRE will implement off-site conservation projects that meet specific criteria identified in the FHCP (section 5.3). For Indiana bats, BRE will fund implementation of a hibernaculum gating project that protect at least 53 Indiana bats from human disturbance; or purchase priority winter hibernacula that support at least 53 Indiana bats or summer maternity areas through fee simple acquisition, lease, or conservation easement, and will transfer ownership rights to a Service-approved land manager who agrees to protect and manage the site in perpetuity. For Virginia big-eared bat, BRE will fund implementation of a gating project at a known hibernaculum supporting at least 14 Virginia big-eared bats that is threatened by human activity. Specific criteria for these projects are more fully outlined in the HCP. The mitigation projects are intended to eliminate threats, increase the survival probability of the Indiana and Virginia big-eared bats that overwinter in hibernacula, and maintain and in some cases improve reproductive success at the mitigation sites. Section 5.0 of the FHCP provides further details about these minimization and mitigation measures. Later in this document, the Service explains how these measures satisfy the "maximum extent practicable" issuance criteria.

Monitoring and Reporting

HCP compliance and effectiveness monitoring is discussed in the RMAMP in appendix C of the FHCP. BRE has two levels of monitoring as part of its overall monitoring strategy: 1) intensive monitoring for Indiana bats during years 1-3 of the ITP to confirm mortality estimates and evaluate effectiveness of minimization measures, and; 2) annual monitoring during all years of the ITP to confirm mortality estimates for all bats and to verify that minimization measures remain effective. The intensive monitoring conducted in the first three years is designed to detect fatalities of Indiana bats and to allow estimates of Indiana bat take to determine success at meeting the HCP goals. The intensive monitoring study design consists of standardized carcass searches, searcher efficiency trials, and carcass removal trials. The number of bat fatalities will be based on the number of bat carcasses found in search plots. Total number of bat carcasses will be estimated by adjusting for removal bias (e.g., scavenging), searcher efficiency bias, and casualty distribution (e.g., adjusting for carcasses potentially falling in non-searched areas within the search plot). Annual monitoring will be conducted in parallel with intensive monitoring and in all other years (years 4-25) to track take, to estimate all-bat fatality rates, to confirm the accuracy of annual monitoring, and to determine the need for more intensive monitoring for covered species.

Reporting is discussed in section 4.2 of appendix C of the FHCP. BRE will prepare and submit annual reports to the Service no later than February 15 of each year to track take levels occurring under the permit and to ensure the conservation program is being properly implemented. The annual report will include four components:

a. Scientific report, including biological goals and objectives of the HCP; objectives for the research and monitoring programs; methods; effects on covered species or habitat and all bats; evaluation of progress toward achieving measurable biological goals and objectives; and recommendations/proposed adaptive management.[2]

[2] In the errata sheet to the HCP, BRE clarified the scientific report will include, at minimum, the following additional information: 1) quantity and species composition of bat carcasses, 2) estimates of bat fatality, with 95% confidence intervals, for covered species, *Myotis* bats, and all bats corrected for biases, 3) probability of detecting carcasses of covered species, 4) cumulative estimated covered species take, 5) circumstances for each covered species carcass, 6) weather conditions preceding and during carcass searches, 7) adaptive management measures implemented, 8) raw data of bat carcasses in spreadsheet format, 9) summary of carcass search dates, location, and time, 10) injured bat reporting forms and rehabilitator reports, 11) subsequent year's research and monitoring plan and adaptive management measures to be implemented; and 12) subsequent year's monitoring cost estimate.

b. Facilities report, including a summary of project activities that are covered activities, including construction, operations, maintenance, and decommissioning activities; acres disturbed; and turbine operations reports.
c. Off-site conservation report, including funding expenditures for off-site conservation, balance and accrual, and status and condition of off-site conservation area(s).
d. Changes report, including a description of any minor or major amendment, changed circumstances, and actions taken.

Changed Circumstances and Adaptive Management

Chapter 5 of the FHCP describes changed circumstances and other aspects of the adaptive management plan. Five specific circumstances are identified that, if triggered, will result in changes to the conservation plan, summarized as follows:

- Impacts of White-Nose Syndrome (WNS) on Covered Species: The FHCP and other Service documents (e.g., BO) assume that WNS is affecting Indiana bats and their population in the Appalachian Mountain Recovery Unit (AMRU) will experience a 70% reduction over time, as has been seen in the Northeast Recovery Unit. The purpose of this changed circumstance is allow a re-analysis of the impact of take and change the conservation measures, as necessary, if this assumption becomes invalidated by more severe population estimates during the permit term. The trigger will be a 70% or greater reduction in the Indiana bat AMRU population from the 2011 estimates (pre-WNS), based on biennial USFWS estimates. The response will be for BRE to conduct an analysis to determine whether the level of Indiana bat take at the project is having a material negative effect to the remaining Indiana bat populations in the recovery unit. If the analysis demonstrates that a 60% take reduction is no longer sufficient to prevent material negative effects with the declining population, BRE will implement additional operational restrictions or minimization measures. WNS has not yet been detected in Virginia big-eared bats. Therefore, the trigger for this species is documentation of the occurrence of WNS in the West Virginia population that is having a negative effect. The response will be a similar analysis and change in operational restrictions or minimization measures as will occur for Indiana bats.
- Elevated Annual Take Due to Changing Environmental Conditions: The purpose of this changed circumstance is to adjust the conservation strategy in the event that the Indiana bat range expands, the local population size increases, habitat use at the project site increases, or the distribution and occurrence of Indiana bat in or near the project increases during the permit term. The trigger will be annual take exceeding 4.5 Indiana bats per year. The response will be a change to the operational restrictions or minimization measures to ensure that the authorized level of take will not exceeded despite a change in the distribution and occurrence of Indiana bats in or near the project.
- Listing of New Species: The purpose of this changed circumstance is to identify a process for adding new covered species to the HCP in the event of future listing actions involving species potentially affected by the project. The trigger will be any future listing of bats or other species as threatened, endangered, or candidates. The response will be that BRE will confer with the Service as to the need for an HCP amendment to include these as covered species and incorporate appropriate conservation measures.
- Changed Technology/Techniques: The purpose of this changed circumstance is to identify a process for incorporating wind turbine technology advances and techniques that will better avoid or minimize the mortality of bats during the permit term. The trigger will be if BRE determines that new techniques or technology are available that are cost-effective, feasible to implement, and meet the HCP biological objectives. The response will be implementation of such measures if they have been demonstrated to be effective in a scientifically-based study, are approved by the

Service as the best available science, are compliant with HCP biological goals and objectives, and will not increase the authorized level of incidental take.

- Development of an Indiana Bat Maternity Colony in or Within 2.5 Miles of the Project Area: The FHCP and other Service documents (e.g., BO) assume that there are no Indiana bat maternity colonies occurring at the project site. Therefore, the primary impacts of the operating wind turbines will be to bats during the migration period. If that assumption is incorrect, project operations could result in very different impacts than were analyzed or accounted for by the conservation strategy. Therefore, the purpose of this changed circumstance is adjust the conservation strategy if new information suggests an Indiana bat maternity colonies could be present at the project site. The trigger will be a maternity take event, meaning the discovery of a reproductive female or young-of-the-year juvenile Indiana bat fatality during the maternity season (May 15 to August 15). The response will be immediately raising turbine cut-in speeds to 6.9 m/s during the maternity season at all turbines within 5 miles (8 km) of the turbine where the maternity take event occurred from sunset to sunrise. Thereafter, BRE will conduct further surveys and develop and implement operational adjustments during the maternity season known to be effective in avoiding Indiana bat mortality.

In addition to the changed circumstances, the FHCP incorporates the RMAMP as an adaptive management plan to adjust the turbine operations in order to ensure the HCP biological goals and objectives are achieved.

## II. Incidental Take Permit Issuance Criteria – Analysis and Findings

### A. Permit Issuance Criteria

Sections 10(a)(2) of the ESA specifies the requirements for permit issuance. This provision is broken into two component parts, one directed to applicants and the other to the Service. Section 10(a)(2)(A) sets forth the required components of an application from which the Service can judge whether an applicant's submission is complete. Section 10(a)(2)(B) provides the criteria by which the Service must evaluate and approve an application package once it has determined the submission is complete. As described below, the requirements, although necessarily similar, are not identical, and are not interchangeable standards.

Section 10(a)(2)(A) of the ESA specifically mandates that "no permit may be issued by the Secretary authorizing any taking referred to in paragraph (1)(B) unless the applicant submits to the Secretary a conservation plan that specifies: (i) the impact which will likely result from such taking; (ii) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps; (iii) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and (iv) such other measures as the Secretary may require as being necessary or appropriate for the purposes of the plan." The Service evaluated BRE's HCP and considered it to be complete prior to initiating the public comment process.

Section 10(a)(2)(B) of the ESA mandates that the Secretary shall issue a permit, "if the Secretary finds, after opportunity for public comment, with respect to a permit application and the related conservation plan that: (i) the taking will be incidental; (ii) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; (iii) the applicant will assure that adequate funding for the plan will be provided; (iv) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and (v) the measures, if any, required under subparagraph (A)(iv) will be met; and he has received such other assurances as he may require that the plan will be implemented."

### B. Anticipated Take

The issuance criteria of ESA section 10(a)(2)(B) focuses largely on the take that is anticipated to occur as a result of the proposed project and the obligations of BRE, as the permittee, to reduce or compensate for the impact of the taking. To provide context for that discussion, we summarize what is known about the bat species in the project area, and the take we project to occur when accounting for BRE's minimization strategy.[3]

Indiana bats

Acoustic data collected within the action area suggest that Indiana bats may incidentally occur within the action area between April and November. While there is currently no evidence of summer maternity or bachelor colonies in the action area, habitat conditions are conducive and the acoustic data suggests some potential of Indiana bat activity during the summer. There are no known hibernacula to support wintering populations. Therefore, we assume that Indiana bats may move through the action area during spring and fall as they migrate between winter and summer habitat. In addition, there may be incidental Indiana bat occurrences during the summer period. A more complete description of Indiana bat use of the action area, as well as status at the species, regional and local level is provided in the Service's BO (USFWS 2013b).

Virginia big-eared bats

Virginia big-eared bats are not currently known to occur within the action area and there are no records of this species occurring within the surrounding Greenbrier and Nicholas counties. No Virginia big-eared bats were captured during mist-net surveys in 2005, 2006, and 2010 (BHE 2005, BHE 2006, Young and Gruver 2011) at the project site. However, consistent with Service recommendations, BRE included Virginia big-eared bats in the HCP because the project is on the edge of the species range and there is potential for Virginia big-eared bats to pass through the project area due to proximity to known range. That potential may increase over time with an expanding population and any range shifts caused by human disturbance and vandalism of caves or a changing climate. A more complete description of Virginia big-eared bat use of the action area, as well as status at the species, regional and local level, is provided in the Service's BO (USFWS 2013b).

Anticipated Take from Collision and Barotrauma

Impacts associated with operating wind turbines are the only component of the project likely to result in take. It is well documented that wind turbines kill bats of several different species through collision with turbine blades and barotrauma (Arnett et al 2008, Taucher et al. 2012). Barotrauma is internal hemorrhaging due to an over-expansion of hollow respiratory structures and is caused by a sudden drop in air pressure near wind turbine blades.

The species most commonly found as fatalities from wind projects are the long-distance migratory tree bats, such as red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), and silver haired bats (*Lasionycteris noctivagans*). These three species comprise 50 to 75% of bat mortality at all of the wind projects across the eastern and midwestern United States (Arnett et al. 2008, Kunz et al. 2007, Taucher et al 2012). Migratory tree bats do not winter in caves but migrate to warmer southern areas during the

[3] In the BO, we determined that several other components of the wind project are not likely to adversely affect the Indiana bats and Virginia big-eared bats in the action area. These components are: (1) vehicle collisions, (2) light emission, (3) water contamination, (4) water use, (5) weed control, (6) turbine operation noise disturbance, (7) construction, maintenance, and decommissioning noise, and (8) habitat removal.

winter roosting in hollow trees, leaf litter or other protected areas.

Cave dwelling species of bats, like Indiana bats, are also killed at wind turbines but in smaller numbers and there appear to be species specific vulnerabilities. For example, the bat community in West Virginia can be described from the 330 summer mist-net surveys conducted across the state from 2005 to 2009, which captured a total of 17,440 bats (compiled by C. Stihler, WVDNR, 2011). In this sample, the long-eared bat (*Myotis septentrionalis*) is the most common species in mist-net surveys in West Virginia, but this species is rarely found in wind turbine mortality monitoring in vicinity of the project (see BO Figure 10, USFWS 2013b). Conversely, the tri-colored bat (*Pipistrellus subflavus*) is frequently found in wind turbine fatalities but less commonly found in mist-net surveys. These differences may reflect the height at which species typically fly and whether they fly high enough to be within the rotor swept area or mist-net area. For example, the long-eared bat may commonly fly low and within the heights of mist-nets, but not within the much higher rotor swept areas. The species-specific vulnerabilities of Indiana bats and Virginia big-eared bats are not known. Indiana bats are described as typically foraging at the canopy level or lower, which would place them below the rotor swept area, however, the height at which they migrate might be different than when foraging. Virginia big-eared bats also fly at tree height and lower. While flying over open areas, Virginia big-eared bats exhibit horizontal sweeps of up to 20 feet (6 meters), with vertical flights approximately 2 to 3 feet (0.6 to 1.0 meters above the surface of vegetation. This behavior is often interrupted with deeper vertical drops of 7 to 98 feet (2 to 30 meters) as bats shift back and forth between the surface of clearings and the edge of forest canopies (Lacki and Dodd 2011).

Currently, there have been no Virginia big-eared bat fatalities and five Indiana bat fatalities documented at wind turbines across the country. Of the Indiana bat fatalities, most of these are female bats that have been killed in late September or early October, however, one male was killed in West Virginia in early July (see BO Table 3, USFWS 2013b). And since two of the fatalities are from the AMRU, Indiana bats clearly have some vulnerable to wind turbines in the recovery unit. It is likely that additional Indiana bat mortality has occurred at wind farms across the country, but has not been documented due to lack of post-construction monitoring, inaccurate identifications, or the difficulty of detecting rare species. It is possible that Virginia big-eared bat fatality also has gone undetected, although fewer turbines have been built within their range than Indiana bats. Variables such as searcher efficiency and carcass persistence are measured and addressed in post-construction surveys and incorporated into the estimates of total bats killed, but cannot change the difficulty in detecting rare species. Thus, the five Indiana bat carcasses found represent a larger number of estimated fatalities if adjusted for these variables.

Bat activity is highest at wind turbines on warm nights with low winds as these conditions are best for foraging bats. The effect of wind speed may be even greater on smaller bats like the Indiana bat. Multiple studies have considered different cut-in speeds to date, and evidence demonstrates that use of feathering and a variety of different raised cut-in speeds can significantly reduce all bat mortality compared to wind turbines that are not operating with feathering and cut-in speeds (see BO Table 4, USFWS 2013b). These studies are summarized in section 4.1.5.2 in the HCP, section 2.1 in the final RMAMP, and sections 3.2.3.1, 5.8.2.2, and 5.8.2.3 in the FEIS. Though there are differences in how these studies were conducted, generally we conclude that feathering turbine blades all night so that they do not rotate at greater than 2 rpm when wind speeds are at or below 6.5 and 6.9 m/s can reduce total bat fatalities on average by roughly 73 and 93%, respectively. In contrast, feathering turbine blades all night so that they do not rotate at greater than 2 rpm when wind speeds are 5.0 m/s or less can reduce total bat fatalities by an average of 60%; however, there is much variation among the studies testing 5.0 m/s cut-in speeds, with bat fatality reduction ranging from 35 to 87% reduction (see BO Table 4, USFWS 2013b). Whereas existing available information from testing different cut-in speeds is inconsistent in terms of terminology, methods, and ultimately results and interpretations, the one thing that does seem to be clear is that feathering turbines below raised cut-in speeds at night during the seasons of greatest bat exposure at wind projects can significantly reduce bat fatalities.

Because of the large variation among studies, there is uncertainty as to the actual results that can be achieved at the Beech Ridge Project through particular cut-in speed adjustments. Such results are likely to be influenced by site-specific variables such as blade feathering, local bat population use, habitat conditions, wind speeds, and temperatures. Rather than relying on results from any particular studies, BRE's plan relies on the RMAMP process to evaluate whether the initial curtailment plan will achieve the stated biological goals and objectives.

As a minimization measure in the HCP, BRE will be evaluating the effectiveness of a curtailment strategy to achieve the objective of reducing annual *Myotis* fatality (and by extension Indiana bat fatality) by 60%, and reducing annual Virginia big-eared bat fatality by 50% as detailed in BRE's RMAMP (BRE 2013a, appendix C to HCP). BRE initially will study treatment turbines that compare feathering blades at wind speeds below 4.8 m/s for half the night versus all night from July 15 through October 15. If these minimization measures prove to be ineffective in achieving 60% annual reduction in *Myotis* fatality and 50% annual reduction in all other bat fatality, BRE has committed through the RMAMP process to increase the cut-in speed levels, the nightly duration of applying the cut-in speeds, and/or extending the season of applying the curtailment measures until such point as the HCP biological goals and objectives are achieved. Once the objectives are achieved, BRE may further refine the curtailment strategy to allow for increased operation but only so long as the objectives continue to be met and only with written agreement of the Service. While the Service believes higher cut-in speeds for longer durations of the night and/or season are more likely to achieve the objectives, we are confident the RMAMP process will be equally effective in achieving the fatality reduction objectives for Indiana and Virginia big-eared bats, as well as greatly minimize the fatality of all bats.

For example, during fall 2010 bat fatality was reduced by 50% at the Fowler Ridge Wind Farm in Indiana when cut-in speeds were raised to 5 m/s, applied all night <u>without</u> turbine feathering (Good et al. 2011). Similarly, during fall 2011 bat fatality was reduced by 58% at the Fowler Ridge Wind Farm by <u>fully</u> feathering blades all night below a 4.5 m/s cut-in speed (Good et al. 2012). These fall season bat reduction estimates are higher than would be anticipated when considered across the entire year, but demonstrate that significant bat fatality reductions can result from the right combination of raised cut-in speeds and turbine feathering. BRE's biological goals and objectives, to produce a 60% annual reduction in *Myotis* fatalities and 50% annual reduction in other bat fatalities, is achievable and is within the range demonstrated by other similar projects.

However, we recognize that this curtailment regime does not entirely eliminate risk to Indiana bats from operating turbines. For example, the second Indiana bat fatality at Fowler Ridge occurred at a turbine that was programmed to cut-in at wind speeds below 5.0 m/s. The night that the bat was killed, wind speeds were often higher than 5.0 m/s (Figure 17, Good et al. 2011) and it is likely that the bat was killed when the turbine was operating at higher wind speeds. Therefore, we anticipate that curtailing wind turbines at wind speeds below 5.0 m/s will minimize, but not fully avoid, take of Indiana bats.

Impacts of wind turbines on Virginia big-eared bats are less certain because there have been no fatalities to date and wind projects have largely been constructed outside of the 6-mile[4] foraging activity radii applied to occupied caves (see BO Figure 8, USFWS 2013b). However, we assume that to the extent that the species occurs in the action area and thus is exposed to operating wind turbines, they will have similar vulnerabilities as the other bat species that have been evaluated. Therefore, we similarly assume that the effectiveness of turbine curtailment for the bat species that have been evaluated will also extend to Virginia big-eared bats.

[4] Based on radio-telemetry data, Virginia big-eared bats typically forage within 6 miles of their hibernacula (Stihler 2010, and C. Stihler, WVDNR. pers. communication).

With implementation of the turbine curtailment strategy in the HCP, we assume that fatality of Indiana and Virginia big-eared bats will be minimized, but not fully avoided. Therefore, adverse effects to both species are anticipated from turbine operations. Incidental take from this component of the project would be authorized through the ITP.

Quantifying Take of Individual Bats by Collision or Barotrauma

Fatality-related impacts to individual Indiana and Virginia big-eared bats will occur in the action area due to collision and barotrauma during turbine operations. As previously analyzed, there are potentially other effects from the project (vehicle collisions, light emission, water contamination, water use, weed control, noise disturbance, and habitat removal) but with implementation of the HCP conservation measures they are not anticipated to result in take of Indiana or Virginia big-eared bats in the action area.

With respect to fatalities of individual Indiana bats from turbine operations, the Service and BRE worked together to develop a model (BRE 2013a; section 4.1.3) to estimate take of Indiana bats based on surrogate variables that include the mortality of a more common species, the little brown bat. Following the public comment period on the DHCP and DEIS the Service independently revised the take estimate using the best available regional post-WNS data (Service 2013f, Appendix F, Report F-5 in FEIS), and BRE subsequently incorporated the results into their HCP. We felt it was important to revise the take estimate using post-WNS data as the composition of bats on the landscape is changing due to WNS. As bat populations decline due to WNS, we expect reduced total numbers of bats killed because fewer bats are flying in the air-space and potentially interacting with turbine blades.

As explained in the Service's FEIS (USFWS 2013g, Appendix F-5 in the FEIS), the surrogate model used to estimate take of Indiana bats is based on the following formula:

**(Estimate of total annual bat fatality for the project) x (Percent of fatalities that are little brown bats at other projects) x (Percent of Indiana bats to little brown bats in the population) x (100 turbines) x (Number of years of operation)**

The take model is sensitive to total annual bat mortality rates and to the ratio of Indiana bats to the surrogate species. Therefore, we carefully considered which data sets would give the most unbiased estimates. With regard to annual bat fatality rates, post-WNS bat fatality rates at four projects within the 200-mile[5] migration distance of the Beech Ridge project vary from 15 to 96 bats per turbine per year and average 43 bats per turbine. These post-WNS rates are higher than pre-WNS rates averaging 32 bats per turbine per year and ranging from 24 to 48 bats per turbine for other projects within 200 miles of Beech Ridge. We used the average rate as it is not reasonable to assume the extreme values (the low end or high end estimates) would occur consistently every year at Beech Ridge. While the sample size of post-WNS studies is small (n = 4), these studies reflect the best current bat species fatality rates in the regional landscape.

The proportion of little brown bats to all bat fatalities at these four projects is currently in the range of 0 to 4.4%, compared to 3.0 to 2.9% pre-WNS. To account for uncertainty and err on the side of the species (which may overestimate take), the Service decided to use 4.4% in the surrogate take model as the proportion of all bat fatalities that are little brown bats.

To determine the ratio of Indiana to little brown bats in the natural population, we used a robust long-term summer mist-net survey data set from West Virginia. We excluded mist-net surveys that occurred in

[5] The HCP and our memorandum (USFWS 2013g) refer to projects within 200 miles, however, as it turns out, all projects with post-WNS data cited are located within the 100-mile migration distance of the Beech Ridge project.

areas of known Indiana bat use so as to reflect an unbiased representative sample of bat populations and not skew the dataset in favor of higher Indiana bat concentrations. The ratio of Indiana bats to little brown bats was 2.38% in 2012 (the most current available dataset), and averaged 2.38 percent for the post-WNS period from 2009 to 2012, versus an average of 0.81% for the pre-WNS period from 2003 to 2008. We therefore used 2.38% as the ratio of Indiana to little brown bats in the surrogate take model because it best reflects current conditions.

The Service considered hibernacula survey data as a potential alternative to the summer mist-net data for determining the ratio of Indiana to little brown bats in the surrogate model. However, we believe the cave dataset inflates the ratio because the data is collected from caves with the largest known Indiana bat populations. Caves with only small bat populations or without listed bats are typically not included in the hibernacula surveys, which means the dataset may be skewed towards higher Indiana bat estimates. In addition, cave surveys sometimes do not count all bats, but focus instead on the inventorying only the listed bat species in the cave. Finally, in recent years (starting in 2009/2010), fewer caves than normal were surveyed due to concerns about WNS. To the extent that larger caves were not surveyed (e.g., Hellhole), many bats may have been missed by the survey efforts. For these reasons, the Service concludes that the mist-net data are more representative of bat species compositions on the landscape than winter hibernacula counts.

Applying these variables to the surrogate model resulted in a cumulative 25-year estimated take from turbine operations of up to 112 Indiana bats prior to curtailment and up to 53 bats after curtailment is applied. The calculation based on turbine curtailment assumes that take is higher during the first three years of curtailment trials (4.5 bats per year for 100 turbines), and is reduced by 60% (1.8 bats per year for 100 turbines) for years 4 through 25. We believe it overestimates take during the first three years because it assumes no reduction in bat fatality during the trials. However, this overestimate allows for the uncertainty of how much fatality reduction will occur during these three calibration years and errs on the side of the species in assuming a worst case scenario.

Finally, in addition to the surrogate model approach, the Service independently estimated take of Indiana bats for the Beech Ridge project using an alternate method that relies on actual Indiana bat fatality data at those projects where carcasses have been found rangewide. (Note: we applied this same alternate method to estimate an annual rate of ongoing take of Indiana bats from wind energy projects in the AMRU earlier in section IV of this BO). This is a more simple formula with fewer variables than the surrogate method:

**(Average annual bat fatality rate per turbine) x (100 turbines) x (Proportion of all bat carcasses found that are Indiana bats)**

Using this method, we assumed that all wind turbines within the AMRU will kill an average of 25.98[6] bats per turbine per year, consistent with the analysis in our FEIS (Table 5.20). This is a lower average fatality rate than the 43 bats per turbine used in the surrogate model, because our FEIS used a much larger data set of 17 studies, irrespective of the onset of WNS, and applied certain criteria to the studies which were included (e.g. only studies for the full bat active season were included). Using a large regional data set that includes both pre- and post-WNS studies makes sense for this formula because the Indiana bat fatalities occurred at locations throughout the range in multiple recovery units at a time when the full brunt of WNS had not yet manifested.

Using actual Indiana bat fatalities rangewide, and using the larger regional data set as in the FEIS, and therefore applying an average rate of 25.98 bats per turbine per year to the 100 turbine Beech Ridge

[6] We are using average bat fatality rates from other projects (where turbines were not curtailed) because this information is not available for the Beech Ridge project.

project yields approximately 2,598 bats killed annually without curtailment measures in place. The Indiana bat mortality rate is calculated to be 0.2% of the annual bat fatalities, or 5.2 per year before curtailment. The Indiana bat proportion (i.e., 0.2%) is based on a weighted average of the total number of Indiana bat carcasses found to all bat carcasses found at the four facilities where Indiana bat fatality have been documented to date (see Table 4.1 in Service 2013g). With curtailment in place, mortality would be reduced by 60% to 2.1 Indiana bats per year. Assuming curtailment averages 2.1 bats per year for 25 years yields an estimated fatality rate of 53 Indiana bats cumulatively over the duration of the ITP. This is the same estimated take as derived from the surrogate model method, which included the assumption of higher bat fatality during the first 3 years when curtailment is being tested.

If one assumes no reduction in bat fatality during the first 3 years, followed by 60% reduction in years 4 through 25, this alternate take calculation method yields an estimate of 62 Indiana bats for the duration of the ITP. This likely overestimates take during the first 3 years because it assumes no reduction in bat fatality during the trials.

In summary, the Service independently evaluated alternate methods, datasets, and assumptions for estimating Indiana bat take. The estimates ranged from 45 to 62 Indiana bats, but when the most reasonable assumptions are considered both estimation methods suggest there will be take of 53 Indiana bats after curtailment is applied. Therefore, we believe 53 is a reasonable estimated take for the project.

We are not aware of appropriate surrogates for Virginia big-eared bats and no carcasses of this species have been detected at wind projects to date. Because the project is on the edge of the range of the Virginia big-eared bat, and risk of take is low, we assumed take of up to 1 bat per year during years 1 through 3 and take of 0.5 bats per year during years 4 through 25 when the objective of reducing fatality by 50% is achieved. This yields an estimated 14 Virginia big-eared bats for the life of the project, or 0.56 per year on average. This rate of annual mortality is so low that it may not be detectable during monitoring. For such a rare event, finding just one carcass in 25 years may translate to 10 or more estimated fatalities given bias correction factors for searcher efficiency and scavenger removals.

The amount of take authorized by the permit is the amount not to be exceeded and could be modified over time in response to new information. Our take estimates are based on the best available information. The baseline bat fatality rate (without curtailment) will be determined during years 1 through 3 of the permit. It may be higher or lower than initially estimated. The 60% fatality reduction of Indiana bats and 50% fatality reduction of Virginia big-eared bats is then applied to the average baseline fatality for year 1 through 3. If baseline fatality levels are low, the estimated future take will be lower than currently predicted. If necessary, and consistent with the HCP No Surprises policy, the Service could amend the permitted take consistent with 50 CFR 13.23(b). If baseline fatality levels are high, the estimated future take will be higher than currently anticipated, which could trigger the need for a permit amendment.

Although take of individual Indiana and Virginia big-eared bats from turbine operations will occur within the action area, it is the impact from the loss of those individuals to their associated maternity colonies or hibernacula that will determine the impact of the take to the broader populations. This will be further assessed in the jeopardy analysis section IX of this BO.

It is against these calculations that we evaluate the impacts of the taking, in the context of the permit issuance criteria.

### C. Findings

#### 1. The taking will be incidental

Incidental take is defined in 50 CFR 17.3 as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." The first part of the definition addresses whether take of Indiana and Virginia big-eared bats is the purpose of activities in the HCP. As discussed above, the purpose of the covered activities in the HCP are to construct, operate, maintain, and decommission (at the end of the project) a 100-turbine wind energy facility over a 25-year period. In the course of implementing these activities, BRE anticipates the unavoidable take of Indiana and Virginia big-eared bats. For that reason, BRE developed the HCP which describes the avoidance, minimization, and mitigation measures they will implement to address potential impacts from the project. Thus take of listed species is not the purpose of the wind energy project and will occur incidental to BRE's efforts to implement the covered activities.

The second part of the definition addresses whether BRE is conducting otherwise lawful activities. BRE previously secured all necessary approvals for construction, operation, and decommissioning of phase I of the project. Section 1.5 of the FEIS developed for the HCP includes a discussion of the various review processes BRE has and continues to undertake for construction, operation, and decommissioning of phase II of the project (USFWS 2013a). On November 13, 2013, BRE provided the Service a status update on securing these approvals (K. Coppinger, BRE, pers. communication). Of the eight potential other approvals, the most essential piece is the siting certificate for the phase II expansion area, which was issued to BRE II by the West Virginia Public Service Commission on June 19, 2013. But for this certificate, the second phase of the project could not be built and all other State, Federal, and local approvals would not be necessary. BRE also secured an Aviation Hazard Determination (i.e. an approval letter) for the phase II project from the FAA on March 29, 2013. For phase II of the project BRE continues to pursue a National Pollutant Discharge Elimination System permit, associated approval of a Stormwater Pollution Prevention Plan, and an air quality permit for the cement batch plant from the West Virginia Department of Environmental Protection (WVDEP); road upgrade and building permits from the county; and Clean Water Act section 404 wetland fill and stream activity permits from the Corps of Engineers (if required). BRE predicts these other approvals will be secured by September 1, 2014. While it is not necessary for the Service to demonstrate that BRE has complied with all other laws prior to ITP issuance, we do as a standard practice include a permit term and condition on every ITP issued which says: "The validity of this permit is conditioned upon strict observance of all applicable foreign, State, local, tribal, or other Federal law." Moreover, because the only take being authorized will result from turbine operations, presumably all construction approvals will have been granted before phase II turbines are operational.

With regard to laws the Service is responsible for, we note that during implementation of this wind project, BRE developed and has begun implementing an Avian Protection Plan (APP)[7, 8] as recommended by the Service's Land-Based Wind Energy Guidelines (USFWS 2012b). These guidelines serve as the primary tool to facilitate compliance with the Migratory Bird Treaty Act for terrestrial wind energy facilities. The Service has advised BRE of the risk of take to eagles throughout the HCP process, the availability of Bald and Golden Eagle Act (BGEPA) permits for bald eagles, and options for addressing golden eagles. BRE incorporated measures to avoid and minimize the likelihood of take of bald and golden eagles into the APP. With implementation of these measures, the risk of take of bald eagles is low: likely reduced to fewer than 0.03 bald eagles per year (or fewer than 1 eagle every 33 to 35 years on

[7] Multiple drafts of the APP were prepared over the course of developing the HCP. The Service understands the most recent version to be dated August 2013, which was amended through addition of an appendix on October 27, 2013. Earlier drafts were provided on June 26, 2011; December 27, 2011; January 3, 2012; May 2012 (public review draft); January 4, 2013; and February 15, 2013.

[8] In the final version of the Wind Energy Guidelines, published in March 2012, these plans are now called Bird and Bat Conservation Strategies (BBCS). We note that we provided technical assistance to BRE on its APP based on these guidelines, not the Service's 2003 Wind Guidelines referenced in the application materials.

average, which is longer than the ITP and the functional life of the turbines (see discussion of the Service's eagle collision model in the FEIS section 5.7.2.2). Thus with implementation of the APP take of bald eagles is not likely during the permit term. However, risk of take of golden eagles is higher and it is uncertain how much this risk of take can be reduced through APP minimization measures; hence, some likelihood of take may remain (0.34 golden eagles or fewer per year, which equates to 1 or fewer golden eagles every 3 to 4 years on average). The Service is not currently issuing permits for take of golden eagles east of the 100th Meridian; hence a golden eagle take permit is not currently an option for BRE. Per the Service's Eagle Conservation Plan guidelines, the Service will notify BRE in writing of the potential risk of golden eagle take and that such take may result in ITP suspension or revocation. However, BRE's purpose in implementing APP measures aimed at avoiding and minimizing the potential for take of eagles is to be compliant with BGEPA and therefore avoid the need for a permit.

To comply with the National Historic Preservation Act, BRE entered into a memorandum of agreement (MOA) with the West Virginia Division of Culture and History State Historic Preservation Office (SHPO) for the initial 67-turbine phase of the project. In addition, BRE recently developed another MOA between the Service, BRE, SHPO, and the Catawba Indian Nation to address potential adverse effects to historic properties and archaeological resources during siting and construction of the additional 33-turbine phase II of the project. BRE will implement and complete all necessary archeological field studies and implement avoidance measures prior to construction of the 33-turbine phase. BRE will mitigate the adverse visual effect to above-ground historic resources associated with the phase II turbines per the requirements of the MOA, which include preparation of a historic context and photographic records focused on western Greenbrier County, addressing the development of the region from earliest settlement to the present day. All impacts to cultural resources will be avoided and or mitigated in compliance with the terms of the MOA.

In conclusion, the Service finds that the activities proposed in the HCP will not be conducted for the purpose of causing take of Indiana or Virginia big-eared bats and are anticipated to be otherwise lawful; therefore, the Service concludes that the anticipated take associated with the project will be incidental to otherwise lawful activities.

**2. The HCP will, to the maximum extent practicable, minimize and mitigate the impacts of such taking**

In order to issue an incidental take permit, the Service must find that "the applicant will, to the maximum extent practicable, minimize, and mitigate the impacts of the taking." 16 U.S.C. 1539(a)(1)(B)(ii); 50 C.F.R. 17.22(b)(2)(B) & 17.32(b)(2)(B).

The Service's HCP Guidance (USFWS 2000) states that:

> [t]he applicant decides during the HCP development phase what measures to include in the HCP (though, obviously, the applicant does so in light of discussions with and recommendations from FWS or NMFS). However, the Services ultimately decide, at the conclusion of the permit application processing phase, whether the mitigation program proposed by the applicant has satisfied this statutory issuance criterion.

To do so, the Service must examine and predict the adequacy and efficiency of the applicants' proposed minimization and mitigation measures. It is important to understand that in doing so, the Service is focused solely on measures to be undertaken to reduce the likelihood and extent of the take resulting from the project as proposed, as well as appropriate compensatory measures. It is the Service's position that the impacts of the proposed project that were not *eliminated* through the HCP process, must be minimized to the maximum extent practicable, and then those remaining impacts that cannot be further minimized must be mitigated commensurate with level of take. These standards are based in a *biological determination* of the impacts of the project as proposed, what would further minimize those impacts, and then what would biologically mitigate, or compensate for those remaining impacts.

If an applicant commits to implement minimization and mitigation measures that are fully commensurate with the level of impacts, or are consistent with what current science demonstrates to be effective, it has minimized and mitigated to the maximum extent practicable. See, e.g., National Wildlife Federation v. Norton, 306 F. Supp. 2d 920 (E.D. Cal. 2004) (finding that the level of mitigation provided must be "rationally related to the level of take under the plan" and that where mitigation "more than compensates" for the impacts of take, it did not need to demonstrate that more mitigation would be infeasible").[9] National Wildlife Fed'n v. Babbit, 306 F. Supp. 2d 920, (E.D. Cal. 2005). Thus, it is only where certain constraints may preclude attaining these proven measures or thresholds that the "practicability" issue needs to be addressed more thoroughly.

In those circumstances where the applicant cannot fully achieve the minimization and mitigation standards, the Service must evaluate whether the applicant has still minimized and mitigated "to the maximum extent practicable." The court in National Wildlife Fed'n v. Babbit (2005) noted that the "practicable" as used in the ESA does not simply mean "possible" but means "reasonably capable of being accomplished." It also corroborated that "there are two components to the mitigation finding: (1) the adequacy of the mitigation program in proportion to the level of take that will result, and (2) whether the mitigation is the maximum that can be practically implemented by the applicant." Id. Factors to be considered in the practicability analysis may include constraints based on the site itself, availability of mitigation habitat, timing and nature of the project, the financial means of the applicant, cost and time associated with redesign, and going through local and state permitting and zoning processes. In these instances, the Service must evaluate whether the applicant has provided reasonable explanations concerning its constraints or infeasibility. The Service must also independently review the record evidence supporting the applicant's assertions. The practicability evaluation is necessarily project specific, and may properly yield different determinations in different situations. The analysis is a limited, although substantial examination. But the Service need not examine practicability where the applicant has already committed to implement minimization and mitigation measures commensurate with the impacts of the taking. In those circumstances, no more is required of the applicant.

BRE incorporated a number of measures during initial project siting and planning that either purposefully or incidentally avoided or reduced some of the potential impacts to Indiana and Virginia big-eared bats (FHCP section 1.5). These measures include:

- The total number of wind turbines was reduced from 124 turbines to 100 turbines, which will result in less habitat clearing and less potential for incidental take (FHCP section 5.2);
- Wind turbines were sited further from known hibernacula, also reducing the potential for incidental take (FHCP section 5.2);
- To comply with the Clean Water Act, BRE avoided impacts to regulatory wetlands during phase I construction, and plans to do the same during phase II construction, thus minimizing potential impacts to water sources that could be used by listed bats;

[9] In deferring to the Service's interpretation of the term, the Court also explained that "[t]he words "maximum extent practicable' signify that the applicant may do something less than fully minimize and mitigate the impacts of the take where to do more would not be practicable. Moreover, the statutory language does not suggest that an applicant must ever do more than mitigate the effect of its take of species"

- The facility was constructed at high elevation where the potential for suitable Indiana bat maternity habitat to be present is minimized by cool temperatures.

Minimization Measures (FHCP section 5.0)

The FHCP describes the impacts of take associated with BRE's covered activities and includes measures to avoid, minimize, and mitigate the impacts of incidental take of Indiana and Virginia big-eared bats (FHCP section 5.0 and appendix C). While there are a number of HCP commitments, the primary impact of the project to covered species is from wind turbine related fatalities. Therefore, the key minimization measure is a turbine curtailment strategy designed to achieve a 60 percent reduction in *Myotis* bat fatalities and 50 percent reduction in Virginia big-eared bat and other bat fatalities. Initially BRE will evaluate whether this can be achieved by feathering turbine blades such that they are not turning below wind speeds of less than 4.8 meters per second (m/s) for five hours per night during the fall bat migration season.

BRE will also implement the RMAMP as an adaptive management strategy to assess whether the turbine curtailment strategy is effective in achieving the 60% annual reduction in *Myotis* fatalities and a 50% annual reduction in other bat fatalities. If the strategy proves to be ineffective in achieving the biological goals, BRE will increase the cut-in speed levels, the nightly duration of applying the cut-in speeds, and/or extending the season of applying the curtailment measures until such point as the goals and objectives are achieved.

If BRE's curtailment strategy successfully meets the biological objectives described above, BRE may evaluate and implement less restrictive operational protocols, developed through implementation of the RMAMP, that achieve the same measurable objectives. Any changes to the curtailment strategy may be followed by intensive monitoring during the following year in the season(s) in which the adjustment is implemented. However, BRE's curtailment strategy will only be modified with the written agreement of the Service and according to procedures identified in this HCP as well as the permit and IA (FHCP appendix C section 5.2). Thus this exception is not of particular concern, given the overriding commitment to achieve the measurable objectives.

The Service has independently evaluated the fatality reduction goals and determined they are biologically sufficient to reduce incidental take to a level that it will not have additive effects to the existing Indiana bat population at local and regional levels. The Service used a demographic model developed by Thogmartin et al. (2013) to compare the Indiana bat population trajectories with and without various levels of incidental take from the project. The model demonstrated that the level of incidental take associated with a 60% reduction in Indiana bat fatalities will result in a population trajectory (at both local and regional levels) that is nearly indistinguishable from the trajectory that will occur without the project impacts (USFWS 2013b). A similar modeling approach cannot be conducted to evaluate the 50% reduction objective for Virginia big-eared and other bat fatalities. This is primarily due to a lack of population-level data for most bat species required to run demographic models. However, most bat populations are thought to be much larger than Indiana bats and are expected to be able to absorb the level of take anticipated by this project without demographic consequences. The Service does not have a population model for Virginia big-eared bats. However, both the risk and the level of take anticipated by the project for Virginia big-eared bats is small, and the Service does not anticipate take at a level that would have measurable demographic consequences. Virginia big-eared bat populations are generally thought to be stable or increasing over much of their limited range, as more fully described in the Service's BO (USFWS 2013b).

Based on the existing science and best available information, the most effective minimization measure for reducing bat fatalities at wind projects is to curtail turbines (i.e., restrict turbine rotations) at lower wind speeds during the times of the year that bats are anticipated at the site. Research suggests that more bat fatalities occur during low wind periods in summer and fall months (Arnett et al. 2008). Bats restrict their flight activity during periods of rain, low temperatures, and strong winds (Eckert 1982; Erickson and West 2002). On a local scale, strong winds can influence the abundance and activity of insects, which may influence the activity of insectivorous bats. The variables that are often adjusted to achieve lesser or greater fatality reductions from turbine operations include, feathering turbine blades below turbine cut-in speeds (i.e., the wind speeds at which blades turn such that the generators can begin creating energy); how many hours per night the curtailment is applied; and the season during which turbine curtailment is applied. However, these adjustments may represent a trade-off between reductions in bat fatality and reduction in power generation (i.e., lost revenue).

Multiple studies have evaluated the bat fatality reductions associated with a variety of different turbine cut-in speeds compared to wind turbines that are not implementing turbine feathering below cut-in speeds. These studies are summarized in section 4.1.5.2 of the FHCP, section 2.1 of the RMAMP, and sections 3.2.3.1, 5.8.2.2, and 5.8.2.3 in the FEIS. These include the best available scientific information on curtailment studies including those most recently conducted at Fowler Ridge[10] (Good et al. 2012), Criterion (Young et al. 2013), Mount Storm (Young et al. 2011a, 2012), Pinnacle (Hein et al. 2013), Laurel Mountain (Stantec 2013a, b), Beech Ridge (Tidhar et al. 2013), and North Allegheny (Shoener Environmental 2013) wind projects.

Based on this comprehensive review of existing information, the Service concludes that BRE's turbine curtailment strategy (i.e., feathering turbine blades below wind speeds of 4.8 m/s beginning at sunset for a period of five hours from July 15 to October 15), especially in light of their commitment to adjust the strategy via the RMAMP as necessary, will achieve the biological goals identified in the FHCP. The studies show that feathering turbine blades below cut-in speeds of 5.0 m/s all night have achieved an average reduction in bat fatalities of 60% for the season study period, ranging from 35 and 87% (Arnett et al. 2010, Good et al. 2011, Young et al. 2013, Hein et al. 2013). This range differs somewhat from the 44 to 93% range cited in BRE's HCP, which is based on curtailment trials at the Casselman wind energy project in 2008 and 2009 (Arnett et al. 2010). That study reports a 43 to 93% nightly fatality reduction (i.e., the variation at the site from night to night), rather than the total fatality reduction across the full study season, which was 68% in 2009 and 87% in 2008.

The turbine curtailment studies recently conducted at the Fowler Ridge project (Good et al. 2011, 2012) serve as good examples of the level of effectiveness that could be achieved at BRE's project. In 2010, wind turbine blades that were not feathered (i.e., allowed to rotate freely or freewheel) below 5.0 m/s turbine cut-in speeds had bat mortality approximately 50% less than that of normally operating turbines (i.e., cut-in speeds generally around 3.5 m/s). In 2011, wind turbines were feathered below various cut-in speeds and the results suggested that blades feathered below a 4.5 m/s turbine cut-in speed had approximately 57% less bat mortality than normally operating turbines - an even higher reduction at a lower cut-in wind speed. Based on these results, the Service believes that feathering turbine blades below a 4.8 m/s cut-in speed potentially can achieve greater than a 60% reduction in bat mortality.[11]

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[10] A curtailment study conducted in 2010 at Fowler Ridge Wind Farm in northwestern Indiana showed that turbines with raised cut-in speeds of 5.0 m/s and 6.5 m/s all night killed fewer bats (57.5% and 78.0%, respectively) than normally operating turbines over the course of the fall migration season (Good et al. 2011). The turbine blades in this study were not feathered below the cut-in speeds, meaning they were rotating freely below cut-in speeds. The fall 2011 study at Fowler Ridge Wind Farm tested the effect of fully feathering turbine blades all night and demonstrated reduced bat fatality for the fall season by 36%, 57%, and 73%, respectively, at cut-in speeds of 3.5, 4.5, and 5.5 m/s compared to normally operating turbines (Good et al. 2012).

[11] The take calculation presented in section 4.1 of the FHCP is largely premised on a model incorporating data from wind projects within 200 miles of the BRE project site. However, in considering the effectiveness of curtailment strategies, we find it appropriate to consider the results from Fowler, which is outside the 200 mile distance, because

While a 4.8 m/s cut-in speed has not been evaluated in any studies conducted to date, BRE's HCP suggests that it will be equally effective as a cut-in speed of 5.0 m/s in reducing all bat mortality and will likely achieve a 60% or greater reduction in take of Indiana bats and other *Myotis* bats. Because of the large variation among studies, there is uncertainty as to the actual results that can be achieved at Beech Ridge through particular cut-in speed adjustments. Such results are likely to be influenced by site specific variables such as blade feathering, local bat population use, habitat conditions, wind speeds, and temperatures. Rather than relying on results from any particular study, BRE's plan relies on the RMAMP process to evaluate whether the initial curtailment plan will achieve the identified biological goals and objectives. If the RMAMP process demonstrates such objectives are not being met, BRE will implement additional changes to the curtailment plan (including the potential to raise cut-in speeds) to achieve the objectives.

The Service did acknowledge in the FEIS that higher cut-in speeds have been associated with higher bat fatality reductions. We also included alternative 3 in the DEIS and FEIS to analyze the potential impacts of a curtailment strategy that includes feathering turbines below a cut-in speed of 6.5 m/s. While there is uncertainty in terms of the amount of fatality reductions associated with any given turbine cut-in speed, we noted in the DEIS and FEIS that the best available information suggests that a raised cut-in speed of 6.5 m/s for the entire nightly active period could further minimize take of covered bats by 26% over the 50% reduction proposed in the DHCP. However, the Service believes that the FHCP curtailment strategy will be sufficient to achieve BRE's biological goals.

In terms of the hours per night the curtailment strategy is applied, BRE will initially evaluate whether implementing the curtailment beginning at sunset for a period of five hours during the fall season will achieve the biological goal and objective of a 60% annual reduction in *Myotis* fatalities and 50% annual reduction for Virginia big-eared bats and all other bat species. Nightly activity patterns of bats are variable, but activity is typically highest in the first few hours after sunset and tapers off during the remainder of the night (Hayes 1997; Arnett et al. 2005; Kunz 2004; Kunz and Lumsden 2003). However, the Arnett et al. (2005) study showed five bat strikes (62%) with turbines in the first five hours and three strikes (32%) the remainder of the night, which the Service considers to be a biologically meaningful level of bat mortality the second half of the night.

The Service acknowledges that information on the nightly duration of curtailment is largely based on studies that implemented curtailment strategies during the full nighttime period. To date, one study of partial night curtailment has not been as effective in reducing bat fatality as full night curtailment: 7% vs. 35% respectively at the Pinnacle Wind Power Project (Hein et al. 2013). Another study conducted at the Mount Storm Wind Project found a 47% reduction in bat fatality for the first half of the night and a 22% reduction for the second half of the night, perhaps suggesting up to a 69% reduction for the full night (Young et al. 2011). We note that the Mount Storm study did not have a treatment for all night and therefore our interpretation is somewhat speculative. However, for these reasons we believe that full night curtailment is more likely to achieve BRE's biological goals and objectives than half-night curtailment. Therefore, the Service is relying on the RMAMP process to demonstrate the effectiveness of BRE's initial strategy in meeting the HCP's biological goals. Through that adaptive management strategy, BRE will implement additional changes to the curtailment strategy (including the potential to implement full night curtailment) if additional fatality reductions prove necessary.

In terms of the season during which the turbine curtailment strategy is applied, BRE will implement turbine feathering from July 15 to October 15 annually. Available scientific information indicates that reductions in bat mortality can be achieved by implementing turbine cut-in speed adjustments during the late summer and fall (Arnett et al. 2010; Baerwald et al. 2009; Good et al. 2011, 2012, Taucher et al.

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they evaluated a turbine curtailment strategy similar to that proposed by BRE.

2012; Young et al. 2011, 2012). The average number of bat fatalities measured per turbine search at Mount Storm wind project was between approximately 7 and 14 times higher in the months of August and September than in the months of April and May (see table 4.8 in FHCP). A recent summary of 12 full season surveys at Pennsylvania wind farms shows 79% of bat mortality occurred between July 15 and October 15 (Taucher et al. 2012). Further, results from the first and second year of post-construction monitoring data at the Criterion wind project in Maryland show that 72% of the bat fatalities occurred from July 15 through October 15. Most of the fatalities that occurred at Criterion (Young et al. 2011 and 2012) were migratory tree bats and none of the fatalities outside of the fall period were *Myotis* species.

Seasonality of curtailment is also based on site specific factors. Site specific factors at BRE's project suggest that the primary times that Indiana bats may be present are during spring and late summer/fall when bat migration occurs. During those periods Indiana bats may occasionally pass through the project as they migrate from their winter to summer habitat. Based on our current understanding of Indiana bat migration, female Indiana bats move quickly from winter to summer habitat (i.e., during spring migration) due to their limited fat reserves and food availability upon emergence, therefore, there would be a short duration of exposure at the project site during spring migration. Male Indiana bats tend to remain close to the hibernaculum during the summer (USFWS 2007), the closest of which is Snedegar's cave located 9.3 miles away from the project site. As a result, we assume that there could be some elevated risk of exposure to individual male Indiana bats during the summer seasons. However, fall migration is somewhat more protracted with individuals arriving at a hibernaculum over the course of two to three months in order to mate and increase body mass prior to hibernation (USFWS 2007). During this time bats swarm near the entrance to the cave but also forage up to 10 miles (or more) away. Due to the increased time Indiana bats may spend swarming, foraging, and migrating through the project area during this fall migration period, there is an increased exposure risk. Therefore, the Service assumes the period of greatest fatality risk to Indiana bats at the project is during this fall migration period. In the northern United States, including the Indiana bat's AMRU, the Service generally considers the fall migration period to occur in the 12-week period between July 15 and October 15, which includes the peak of the fall swarming period (USFWS 2007). For that reason, BRE's curtailment strategy targets bat fatality reductions during this period.

The Service does not ignore the potential for Indiana bat fatalities to occur during the spring migration period or summer, but we anticipate that the greatest risk to Indiana bats will be during the fall migration period. Extending turbine curtailment beyond the fall season comes with a cost in terms of reduced power generation. Based on the available information regarding how Indiana bats use the project site, timing of known Indiana bat fatalities from other projects (i.e., generally during the late summer/fall migration period as summarized in the Service's BO, USFWWS 2013b), and overall bat fatality patterns in the region, the Service believes that BRE's curtailment strategy period (July 15 through October 15) is sufficient to minimize the risk of take. Nevertheless, to validate this assumption, BRE has committed to conduct weekly searches at a subset of turbines for the 25-year duration of the ITP from April 1 to November 15 (appendix C to HCP, Table 1.1). The adaptive management annual take thresholds in the HCP (section 5.1) further ensure that should the amount of take be greater than expected (e.g., more take occurs during spring than anticipated), mid-course corrections will be implemented (such as longer seasons of curtailment) to keep cumulative levels of take on track with the overall take ITP take limit.

With respect to Virginia big-eared bats, they are active beginning as early as mid-March (if there are warm days) and extending through November 15 (C. Stihler, WVDNR, pers. communication). It is anticipated that risk of take of Virginia big-ears bat is currently low because the project is on the edge of the species known range, but this risk could increase as the increasing local population colonizes new caves, or as the species range shifts in the future in response to climate change or other factors. Any take of Virginia big-ear bats would likely occur during the summer or fall when bats leave their maternity colonies or hibernacula to forage at night, or during spring and fall when bats move at night between summer colonies and winter hibernacula. Impacts of wind turbines on Virginia big-eared bats are less certain than for Indiana bats, however, we assume that to the extent that this species occurs in the action area and thus is exposed to operating wind turbines, they will have similar vulnerabilities as the other bat species that have been evaluated. Therefore, we similarly assume that the effectiveness of turbine curtailment for all bat species that have been evaluated will also extend to Virginia big-eared bats, and BRE's curtailment strategy period (July 15 through October 15), the adaptive management annual take thresholds, and annual monitoring from April 1 to November 15 is sufficient to minimize the low risk of take.

The Service's analysis of the adequacy of the turbine curtailment strategy to effectively minimize the potential for take is in part based on the assumption that there are no Indiana bat maternity colonies at BRE's project site. That assumption is supported in part by the existing data collected at the site. Discovery of a reproductive female or young-of-the year juvenile Indiana bat fatality during the maternity season (May 15 to August 15) could indicate the presence of a maternity colony on or near covered lands. Therefore, BRE has considered this potential as a changed circumstance in the FHCP (section 8.2), which would then require additional avoidance and minimization measures. To avoid the likelihood of additional take, BRE would immediately raise turbine cut-in speeds to 6.9 m/s from sunset to sunrise during the maternity season (May 15 to August 15) at all turbines within 5 miles (8 km) of the turbine where the maternity fatality event occurred. This higher level of curtailment would need to be maintained unless and until BRE applied for a major ITP amendment to authorize additional take during the maternity season.

The Service believes BRE's turbine curtailment strategy can achieve the HCP's fatality reduction objectives, and as stated previously, those objectives are biologically sufficient to reduce incidental take to a level that it will not have additive effects on Indiana or Virginia big-eared bat populations. Therefore, additional measures (e.g., higher cut-in speeds, more hours of curtailment, or longer curtailment season) are not necessary unless anticipated reductions in estimated take cannot be achieved. BRE's RMAMP will ensure that the curtailment strategy is effective and serve as an adaptive management strategy should additional measures become necessary.

In addition to the turbine curtailment strategy, the FHCP describes the following additional minimization measures that address potential impacts that may occur during construction, maintenance, and decommissioning activities. As detailed in the Service's BO, we believe implementation of these minimization measures will reduce impacts to a level that avoids the potential for adverse effects to Indiana and Virginia big-eared bats (USFWS 2013b). Therefore, the Service believes the minimization measures related to construction, maintenance, and decommissioning activities will be effective in reducing impacts to a level that is not likely to adversely affect either species, and therefore not cause take.

- BRE committed will work with the Service during micro-siting of phase II turbines to adjust, where feasible, the location of turbines to minimize impacts to covered species and their habitat.

- BRE will minimize land use disturbance associated with upgrading and constructing new access roads for the phase II expansion area, where possible, by using previously disturbed timber/mining haul roads, as well as historic timber skid trails that were used for previous timbering operations.

- To avoid direct mortality of Indiana bats during clearing of 148 acres of trees in the phase II expansion area, BRE will limit tree clearing to the period between November 15 and March 31 when bats are in hibernation, with one exception. Should weather (e.g., deep snow or ice) prevent clearing or create safety issues for construction workers, BRE may clear up to 15 acres between April 1 and May 15 or between October 15 and November 14. If tree clearing is necessary during either of these periods, BRE will retain a qualified wildlife biologist to conduct a survey for potential roost trees prior to clearing and confirm that potential roost are not occupied by roosting Indiana bats. If trees are found to be occupied, BRE will mark the occupied trees and delay removal until such time as the trees are unoccupied.

- In the event that hazard trees have to be trimmed or removed during maintenance of approximately 15.6 total miles of transmission line, or in other portions of the facility, BRE will trim or cut the hazard trees between November 15 and March 31, except in an emergency where there is risk to public safety and/or the transmission line.

- To minimize impacts to streams and ponds that may be used for drinking by listed bats, BRE will use water from an existing well to serve the requirements of the existing batch plant that will be used to make concrete during phase II construction. In addition, water used for dust suppression during phase II construction and during decommissioning of the entire project will be withdrawn from local perennial creeks/ponds within the project area, thus minimizing impacts to intermittent and ephemeral headwater streams. To avoid dewatering streams, BRE also will follow West Virginia Department of Environmental Protection (WVDEP) water withdrawal guidance, and use an on-line mapping tool and standard practices to judge when it is appropriate to remove water from streams.

- To minimize soil erosion and stream siltation during and after construction of the phase II expansion area, BRE will prepare and implement a Storm Water Pollution Prevention Plan (SWPP), including standard measures such as silt fences, straw bales, netting, soil stabilizers, and check dams. Areas disturbed during construction of the phase II expansion area will be stabilized and reclaimed using appropriate erosion control measures including site-specific contouring and reseeding, designed and implemented in compliance with the SWPP.

- To minimize toxic substance release, BRE will implement a Hazardous Spill Prevention Plan, Control, and Countermeasure Plan. Diesel fuel, gasoline, coolant, and lubricants will not be stored within 100 feet of any stream, nor will vehicle refueling or routine maintenance occur within 100 feet of streams.

- To minimize the potential for animal/vehicle collisions on the project site, BRE will post 25 mile-per-hour speed limit signs along roads, as necessary, identifying speed limits.

- To minimize wildlife harvest[12], BRE will prohibit hunting, fishing, dogs, and possession of firearms in the project area by its employees and contractors during construction, operation, and maintenance, and will conduct employee/contractor education regarding wildlife laws. Violations will be referred to the West Virginia Division of Natural Resources (WVDNR) for prosecution and offending employees or contractors may be disciplined and dismissed by BRE.

The Service believes the minimization measures in BRE's conservation plan adequately reduce the likelihood and extent of the take of Indiana and Virginia big-eared bats from the project. The minimization measures related to construction, maintenance, and decommissioning activities are anticipated to reduce impacts to a level that avoids the potential for take (see USFWS 2013b). The minimization measures related to turbine operations are anticipated to achieve the HCP's fatality reduction objectives, and as stated previously, those objectives are biologically sufficient to reduce

[12] Historically, recreational shooting of bats was common in West Virginia, although less so today.

incidental take to a level that it will not have additive effects on Indiana or Virginia big-eared bat populations. Therefore, the Service concludes that the minimization plan meets the maximum extent practicable criteria.

Mitigation Measures (FHCP section 5.3)

To mitigate for the incidental take of Indiana and Virginia big-eared bats, within two years of ITP issuance, BRE will implement off-site conservation projects that meet specific criteria identified in the FHCP (section 5.3). For Indiana bats, BRE will fund implementation of a hibernaculum gating project that protect at least 53 Indiana bats from human disturbance; or purchase priority winter hibernacula that support at least 53 Indiana bats or summer maternity areas through fee simple acquisition, lease, or conservation easement, and will transfer ownership rights to a Service-approved land manager who agrees to protect and manage the site in perpetuity. For Virginia big-eared bats, BRE will fund implementation of a gating project at a known hibernaculum supporting at least 14 Virginia big-eared bats that is threatened by human activity. In response to concerns expressed by the Service, BRE amended sections 5.3 and 5.31 of the FHCP to clarify that hibernacula, maternity habitat, and cave gating projects would be conducted at times when listed bats would not be present, thereby eliminating any adverse effects or incidental take.[13]

The FHCP identifies three options for Indiana bat mitigation. Under option 1, BRE may fund the protection (through fee-title acquisition or conservation easement) of an Indiana bat hibernaculum in the AMRU from ongoing and future adverse threats and land management activities in perpetuity. By protecting a Priority 1, 2, 3, or 4 hibernaculum that supports Indiana bats and removing threats that affect survivorship, the long-term survival of the population in the cave remains stable or increases. Protection of such caves in perpetuity would thus not only increase the likelihood that bats in the cave survive over time and continue contributing to the local population; it would also help to offset the impacts of the potential take of the bats during the operation of the wind farm. The Service notes that hibernating populations of Indiana bats are declining due to WNS impacts. However, by protecting a known hibernaculum in perpetuity, the Service believes it will continue to serve as important refugia for surviving Indiana bats and when Indiana bats rebound in the future. Further, the role of smaller hibernacula (e.g., Priority 3 and 4) may increase over time as WNS continues to influence populations.

BRE has worked with the Service and WVDNR to identify specific conservation projects that could be undertaken, and identified maternity areas and hibernacula on private lands ranging in size between 60 and 450 acres. These key areas currently produce between 12 and 12,000 bats annually. For example, a potential Indiana bat mitigation project was identified by the Service that may meet the goals, objectives and criteria identified for option 1 mitigation in the HCP. This particular parcel contains high quality intact forest, a small hibernaculum occupied by Indiana bats, and possibly multiple caves. These other caves may be used by Indiana bats and several other species (including little brown bat and northern long-eared bat). BRE is currently working with the landowner to develop an agreement to purchase the parcel by fee title or conservation easement, including the cave and a 300-acre forest buffer.

Under option 2, BRE would fund the acquisition or purchase of a conservation easement to protect Indiana bat maternity areas in perpetuity, including roosting or foraging habitat; implementing silvicultural measures to create corridors between known roosting habitats; improve known foraging areas; or reforesting woodlots (blocks of habitat). This option would only be pursued in the event that option 1 cannot be achieved and BRE will have the burden of proof that option 1 cannot be completed within the 24-month time period. The average maternity colony size for Indiana bat is 60 reproductive

[13] See FHCP Errata at p. 1

females[14] (Kurta 2005). By protecting a known Indiana bat maternity colony and removing threats that affect survivorship, the long-term survival of the population in the maternity colony remains stable or increases. Protection of such maternity colonies in perpetuity would thus not only increase the likelihood that bats in the maternity colony survive over time and continue contributing to the local population; it would also help to offset the impacts of potential take of the bats during the operation of the wind farm.

Finally, under option 3, BRE would fund implementation of a hibernaculum gating project that protects Indiana bats from human disturbance in perpetuity. Similar to option 2, this option would only be pursued in the event that option 1 cannot be achieved and BRE will have the burden of proof that option 1 cannot be completed within the 24-month time period. The objective of the hibernacula gating project would be to protect a cave that supports multiple bat species, and at least 53 Indiana bats, by removing or minimizing threats to bats in the cave, such as winter time human disturbance. These types of cave protection measures have been shown to result in increases in winter bat populations presumably due to reduced impacts and improved survivorship of bats in the cave. Gating as a means of protecting bats during the critical and vulnerable hibernation period has been used since at least the early 1970's (MacGregor 1993). A lack of understanding of bat behavior and of airflow and temperature regimes in caves resulted in early cave gate designs that yielded effects opposite of those intended, by restricting ingress and egress (Ludlow and Gore 2000; Pugh and Altringham 2005; Spanjer and Fenton 2005) and/or by altering airflow and temperature regimes inside the cave (Richter et al., 1993) and resulted in declining cave populations in some cases (MacGregor 1993). However, with better understanding of the effects on gates on bat behavior and the importance of airflow, gate designs improved and this measure has been effective in increasing wintering bat populations presumably due to removal of deleterious impacts and increased over-winter survival (Laval and Laval 1980; MacGregor 1993; Richter et al. 1993; Elliot 2003; Martin et al. 2003; Kennedy and Powers 2005; Martin et al. 2006; TNC 2012). For caves suffering chronic disturbances due to human entry during the season(s) of use, a well designed and installed gate to minimize changes in internal conditions and bat behavior is likely to result in population level benefits.

The Service believes that by removing disturbance related impacts (e.g., lethal mortality events and disturbance events) to a wintering concentration of Indiana bats, over time a greater number of Indiana bats will be benefitted than will be impacted by the take of the project. In addition, the impact of take from the project will likely be distributed across several local population concentrations (i.e., maternity colonies and hibernacula) such that no one local population is affected by the loss of such few individuals. However, by gating a known hibernaculum, supporting a sufficient population size, the local hibernacula population will be permanently protected and is anticipated to have greater overwinter survivorship and higher reproductive capacity into the future. While it is difficult to quantify *a priori* the population benefit (i.e., the additional number of bats produced) by the hibernaculum gating, the Service will be able to quantify that benefit over time via the Service sponsored semi-annual hibernacula bat counts the West Virginia Division of Natural Resources conducts. At a minimum the project will benefit the 53 Indiana bats that utilize the hibernaculum.

[14] The mean maximum emergence count after young began to fly (measured in 12 studies rangewide) was 119 bats (Kurta 2005), suggesting that 60 adult females were present (assuming that most adult females successfully raise one pup to flight stage). We note that the HCP cites a range of 60 to 80 adult females, citing the Indiana bat recovery plan (Service 2007) which cites Kurta (2005) but also mentions the average maternity colony size in Indiana was 80 adult females. We choose to use 60 females as the average size because it is based on studies across the range, and using 60 (a smaller number in our population modeling as described in our biological opinion, USFWS 2013b), errs conservatively on the side of the species.

For Virginia big-eared bats, BRE will fund implementation of a gating project at a known occupied hibernaculum threatened by human disturbance that protects Virginia big-eared bats from disturbance in perpetuity. By protecting a Priority 1, 2, 3, or 4 hibernaculum that supports at least 14 Virginia big-eared bats and removing threats that affect survivorship, the long-term survival of the population in the cave remains stable or increases. Protection of such caves in perpetuity would thus not only increase the likelihood that bats in the cave survive over time and continue contributing to the local population; it would also help to offset impacts of the potential take of the bats during the operation of the wind farm. On June 15, 2011, the Service identified high priority mine portal gating needs at the New River Gorge National River. These gating projects will benefit the Virginia big-eared bat local population most likely to be adversely affected by the project's turbine operations, by removing threats of cave vandalism and human disturbance in an area of the New River Gorge National River frequented by recreationists. 2010). The Service believes that providing funding for the two gates would adequately mitigate take of Virginia big-eared bats associated with this HCP.

In the event that acceptable conservation projects have not been identified and cannot be implemented upon ITP issuance, BRE will establish a trust fund in the amount of $785,500. Those funds would be used to fully implement the projects within two years of permit issuance. If a fund is established, BRE will select a fund administrator identified in consultation with the Service to manage and administer the conservation fund in a segregated account for the benefit of the covered species. More specific details of the conservation trust fund are contained in section 5.3.4 of the FHCP.

The Service finds that mitigation measures in BRE's conservation plan adequately compensate for the impact of the taking of 53 Indiana bats and 14 Virginia big-eared bats over the permit term. While BRE has been working with the Service to develop a specific Indiana bat mitigation project that will meet the criteria for option 1 (i.e., protection through fee-title acquisition or conservation easement of an Indiana bat hibernaculum in perpetuity), that project is still under development. To comply with the permit, BRE must complete all of the mitigation within 24-months from permit issuance. This will ensure that the benefits of mitigation will be achieved and accrue over the permit term in advance of most of the anticipated incidental take occurring. There is potential for some incidental take to occur prior to implementation of the mitigation, however, the funding for the mitigation projects will be secured in advance of any take and the impacts from the limited amount of potential take are anticipated to be small. If no option 1 projects for Indiana bats can be implemented within the 24-month period, BRE can implement option 2 and 3 projects. However, all three options have strict criteria that will allow the Service to evaluate each project's value and the criteria include parameters to ensure the projects are at least commensurate with the level of anticipated take. Finally, BRE incorporated the Service's preferred biological and legal restrictions to be included in any conservation easement or deeds to ensure the longevity, purpose and benefit of real property acquisitions. Thus, the Service is confident that such instruments will provide the intended conservation benefits. Therefore, the Service concludes that the mitigation projects for both Indiana and Virginia big-eared bats are commensurate with the anticipated incidental take and meets the maximum extent practicable criteria.

In conclusion, the above minimization and mitigations measures satisfy the maximum extent practicable standard. The minimization measures adequately reduce the likelihood and extent of incidental take of Indiana and Virginia big-eared bats, while the mitigation is commensurate with the level of take anticipated by the project.

3. **The applicant will ensure adequate funding for the HCP, and procedures to deal with unforeseen circumstances will be provided.**

Funding

The Service finds that BRE has ensured adequate funding for implementation of the HCP. Section 6.0 of the HCP describes the costs associated with plan implementation. For the most part, the avoidance and minimization plans do not require additional funding. Rather, they are part of BRE's operational budget. Therefore, the primary costs for implementing the HCP include compliance monitoring, reporting, implementation of the mitigation projects, responses to changed circumstances, and adaptive management (i.e., the RMAMP). BRE has incorporated several mechanisms to ensure adequate funding for plan implementation.

First, concurrent with permit issuance, BRE will provide the Service with evidence that it has signed a contract for the first year of monitoring and reporting. This is important since implementation of the RMAMP is critical for ensuring the HCP is achieving the biological goals.

Second, within one year of ITP issuance, BRE will provide one or more irrevocable, non-transferable standby letters of credit issued by (i) a United States commercial bank or (ii) a United States branch of a foreign commercial bank with sufficient assets in the United States, as determined by the Service, with either such bank having a credit rating of at least A- from S&P or A3 from Moody's in the amount of $1,580,400. BRE will maintain this financial assurance for the duration of the ITP and provide the Service evidence of its establishment. The amount of financial assurance is based on the estimated RMAMP implementation costs for years 1 through 3 of the ITP (the most expensive annual recurring costs), including the intensive monitoring effort, mowing, and reporting (HCP table 6.1). Costs for plan implementation reduce over time and therefore, the financial assurances provided by the letter of credit will ensure that BRE has adequate finances over the 25-year permit duration to implement the HCP commitments.

Finally, implementation of the Indiana and Virginia big-eared bat mitigation projects represents a significant financial commitment. The projects will be identified, implemented, and completed within 24 months following permit issuance. To ensure adequate funding, BRE will establish a trust fund in the amount of $785,500 within 90 days following permit issuance (as detailed in HCP section 6.0). The Service requested, and BRE agreed to limit the structure of the trust fund to eliminate the potential for the funds to be misused: fund administration will be by a Service-approved escrow agent or qualified conservation organization; fees associated with fund administration will be paid separately by BRE and will not materially diminish the amount of the mitigation fund; funds may not be co-mingled with other funds or accounts; funds may not be placed in an investment or portfolio-based account; funds may be interest-bearing with the interest paid to cover administrative fees or rolled into the corpus of the mitigation monies.

The Service finds the amount of funds to be placed into the trust fund to be adequate. BRE has worked with the Service and WVDNR to identify conservation areas (known maternity habitat and hibernacula on private lands) that range in size from 60 to 450 acres. Using acreages associated with these specific conservation areas, BRE estimates that it can protect a key maternity area or hibernacula on private land within the AMRU by acquiring approximately 200 to 300 acres at a cost of about $2,000 per acre or less. BRE estimates that the transaction costs associated with such an acquisition will be approximately $70,500, including a property survey, recording, phase I environmental assessment and title insurance. BRE will seek to transfer ownership and management for the property to a state or government agency or a qualified conservation organization. Based on conversations with conservation organizations active in West Virginia, BRE estimates that if they must retain ownership of the property, the annual management costs for the property should be approximately 15% of the acquisition costs, or $90,000 over the life of the ITP. BRE will also provide $25,000 to fund additional Virginia big-eared bat projects in the event that the selected mitigation project does not also benefit Virginia big-eared bat. Section 7.0 of the IA also outlines BRE's commitment to assure mitigation and monitoring will be funded.

BRE will submit to the Service by April 30 of each year an annual report detailing expenditures made during the preceding calendar year, and the current balance of funds. These reports are intended to help the Service ensure that adequate funding will be provided to implement the HCP and that funding sources at the required annual levels are reliable and will meet the purposes of the HCP.

Changed Circumstances

Consistent with the issuance criteria, and the Service's five-point policy, BRE's FHCP includes procedures to address unforeseen circumstances, as described below. In addition, the FHCP (section 8.2) accounts for specific changed circumstances, which trigger procedures or changes in the conservation plan to adjust to new information or contingencies. Changed circumstances include:

- Elevated annual take of covered species due to changing environmental conditions;
- Population declines or catastrophic population failure due to WNS;
- Listing of additional bat species, such as eastern small-footed bat (*Myotis leibii*), northern long-eared bat (*M. septentrionalis*), and little brown bat (*M. lucifugus*) due to population declines;
- Changed technology/techniques developed to avoid or minimize bat mortality from wind turbines;
- Detection of an Indiana bat maternity colony in or within 2.5 miles of the project, or discovery during post-construction monitoring of a dead female Indiana bat or juvenile during the maternity season (May 15 to August15).

The Service negotiated these changed circumstances to include certain provisions it felt necessary in order to issue a permit. These concerned key assumptions or uncertainties associated with the modeling of anticipated take or the potential impact of that take on the species. For instance, WNS is a significant impact to Indiana bats and causing rapid declines in the population. The Service evaluated the impacts of incidental take from this project assuming population impacts from WNS in the AMRU are not worse than what has been found in the Northeast Recovery Unit. In the event that the population declines are worse, the Service felt it was imperative to re-assess the impacts of take from this project and potentially further reduce that level of take if it was having a larger than anticipated negative impact to the Indiana bat populations. The WNS changed circumstance allows such evaluation and changes if the triggers are met. As another example, the Service evaluated the potential for incidental take from this project assuming that Indiana bat maternity colonies do not occur on the project site. If that assumption is incorrect then the level and potential impact of incidental take will be different than was accounted for by the Service's analysis. Therefore, the Service felt it was important to incorporate a changed circumstance that allowed a change in the conservation strategy in the event that new information demonstrated presence of a maternity colony.

The HCP includes a changed circumstance that addresses the addition of covered species to the HCP and ITP. The HCP suggests the determination as to whether such additions will be treated as minor or major amendments will be made on a case-by-case basis. However, it should be noted that at this juncture the Service presumes that adding new species to the ITP would require a major amendment due to the need for analysis beyond which appears in the HCP or any of the Service's documents.

BRE, in coordination with the Service, will follow the procedures outlined in the FHCP (section 8.2) and will propose additional or alternative measures as the need arises to deal with changed circumstances.

Most of the responses to changed circumstances, in the event they are triggered, would result in modifications to the turbine curtailment strategy. As such those changes do not require additional funding assurances, but rather just reduce the amount of energy BRE would be able to generate. Some of the changed circumstances (e.g., maternity colony detection, new covered species) trigger permit amendments, in which case additional funding obligations would be incorporated into the amendment process. Finally, BRE will be required to provide an annual funding expenditure report that confirms adequate funding for implementation of the HCP for the ensuing year, which would include implementation of changed circumstances in the event they were triggered.

Unforeseen Circumstances

Unforeseen circumstances are defined as changes in circumstances affecting a species or geographic area covered by an HCP that could not reasonably have been anticipated by plan developers and the Service at the time of the development and negotiation of the plan and that result in substantial and adverse changes in the status of the covered species. They are those events that are completely unpredictable (e.g., an earthquake or the outbreak of a disease completely lethal to Indiana bat), or that exceed historical variability, and that result in a substantial and adverse change to the status of a covered species. The FHCP includes a section detailing the obligations of BRE and the Service in the event of unforeseen circumstances. These incorporate the assurances guaranteed by the Service's "No Surprises" regulations (50 CFR 17. 22(b)(5) and 17.32(b)(5)), provided the FHCP is being properly implemented, and only for species adequately covered by the FHCP.

In conclusion, the Service finds that BRE, through the FHCP and IA, has ensured adequate funding for the HCP and provided procedures to deal with unforeseen circumstances.

**4. The taking of Indiana bat will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.**

The ESA's legislative history indicates Congress intended this issuance criterion be based on a finding, among others, that the proposed action is not likely to jeopardize a listed species pursuant to section 7(a)(2) of the ESA or adversely modify critical habitat. As a result, the Service has reviewed the project pursuant to section 7 of the ESA. In the Service's BO, we concluded that issuance of the proposed ITP is not likely to jeopardize the continued existence of Indiana or Virginia big-eared bats. Below we provide a brief summary of the jeopardy analysis, but the complete analysis is provided in the BO (USFWS 2013b).

Jeopardy determinations for Indiana and Virginia big-eared bats are made at the scale of the listed entity, which is the rangewide distribution of the species (Federal Register 32[48]:4001). The jeopardy analysis described in the Service's BO (USFWS 2013b) follows an analytical approach that assesses the project impacts at several scales in a stepwise fashion. The analysis first examines the impacts of the take of individuals on the local populations (i.e., the closest hibernaculum and maternity colonies that may be within the distance bats migrate from the action area). If take of individual Indiana bats from the project will reduce the fitness (i.e., short or long-term persistence or reproductive potential) of these local populations, then the jeopardy analysis will need to further evaluate how reduced population fitness affects the likelihood of both survival and recovery of the species at the AMRU scale, in the case of Indiana bats, or at the rangewide scale, in the case of Virginia big-eared bats which have no recovery units. If, however, take of individual Indiana bats or Virginia big-eared bats from the project will not reduce the fitness of local populations, then there will not be impacts to survival and recovery of the species at broader population levels and no additional analysis is required. For Indiana bats, if project impacts may affect the likelihood of survival and recovery at the recovery unit scale, then the jeopardy analysis will need to take the final step of evaluating whether the species' rangewide reproduction, numbers, or distribution will be impacted in order to reach a jeopardy determination for the listed entity.

As described earlier (and as described in section VII of the BO and chapter 4 of the FHCP), we anticipate that effective implementation of the curtailment strategy will achieve the objectives of reducing *Myotis* fatality (and hence Indiana bat fatality) by 60% and all bat fatality (and hence Virginia big-eared bat fatality) by 50%, resulting in net cumulative take of up 53 Indiana bats and 14 Virginia big-eared bats in the action area over the 25-year period of the ITP. Further, we anticipate the Indiana bat take will largely occur during the fall migration period, thus bats that occur on site would be coming from a much larger area.

Impacts of Indiana bat take to local hibernacula

Given that Indiana bats can migrate up to 100 miles between summer and winter habitat, bats traveling through the project site could be going towards multiple hibernacula. The likelihood that a bat in the project vicinity is from any particular hibernacula is not known, but probably depends on the number of bats in each hibernacula and the distance from the project site to the hibernacula. We conducted a geographic information systems (GIS) analysis to estimate how many Indiana bats could be flying past the project during migration and which hibernacula they are likely to be going towards as follows. Further details of the analysis can be found in section IX the BO (USFWS 2013b).
There were 30 hibernacula that currently had at least one Indiana bat as of 2013 and that had 100-mile radii overlapping with the project site. If we assume migrating bats are evenly distributed within a 100-mile radius of each hibernaculum, there could be 4,324 Indiana bats flying within 100 miles of the project. However, it is important to note that 81% of these bats are from only six hibernacula; Hellhole (54%), Snedegar's (7%), Arbogast/Cave Hollow (7%), Martha's (7%), Fortlick (4%), and Big Springs (2%). The rest of the caves each represent $\leq$1% of the potentially affected population. While this is a simple analysis and assumes bats are evenly distributed across the landscape, it also underscores the likelihood of bats coming from more than one hibernaculum and that it is especially likely that some would come from Hellhole. Project mortality also is likely to include bats from the closest cave (Snedegar's), small hibernacula which comprises about 7% of the potentially affected population due to the recent large decline of the Indiana bat population in Hellhole. Most of the bats killed would likely originate from Hellhole and other caves simply because there are more bats likely to be entering the action area from the largest extent hibernacula. We looked closely at the potential effects to the population at Snedegar's Cave because it is the closest hibernacula and a conservation goal is to keep all hibernacula populations viable despite the take from wind projects. We examined the potential effects of take from this project with curtailment by attributing 50% of the cumulative take of 53 Indiana bats to bats that use Snedegar's Cave and 50% of the cumulative take to bats that use Hellhole, the largest hibernacula in the area. This represents a reasonable worst case scenario since the GIS analysis suggests that much smaller proportion of the take will be attributed to bats from Snedegar's Cave than from Hellhole. This skewing of the take toward Snedegar's Cave takes into account the fact a small portion of the project area (14 of 100 turbines) falls within the outer edge of the 10-mile swarming radius of Snedegar's Cave, and thus take of these bats during both fall swarming and migration is anticipated. This allocation of 50% of the take to the closest hibernacula and 50% to the largest hibernacula is more skewed (i.e., more take is attributed to the smaller, closest cave) than we anticipate in reality, but we want to err on the side of caution in considering population affects.

To examine the population-level effects of Indiana bat fatalities on both Snedegar's Cave and Hellhole from the project, we used the Thogmartin et al. (2013) model, and assumed the fatality reduction objectives for curtailment are achieved. In our demographic model runs we assumed that WNS was already affecting the population of interest and would continue to do so. The model uses Indiana bat specific assumptions about the response to WNS. For example, the model forecasts the trajectory of the WNS-affected population trend based on what we have observed in Indiana bat populations in the Northeast Recovery Unit, i.e. a 70% population decline from its peak within four years after the on-set of WNS. This is a conservative approach as the response to WNS in the AMRU has been somewhat delayed (a 46% decline from the 2011 peak within 5 years of the on-set of WNS) compared to the Northeast Recovery Unit. Nevertheless we wanted to be cautious and err on the side of the species. It is reasonable to expect the AMRU population will experience up to a 70% decline as has been seen in the Northeast Recovery Unit.

If, however, at any time, the AMRU population decreases by 70% or greater than the peak 2011 level, this will constitute a changed circumstance as a key assumption of the population model will have been violated (HCP section 8.2.1), triggering further analysis to determine whether the level of Indiana bat take at the project is having a material negative effect (after accounting for benefits of mitigation) to the remaining Indiana bat populations in the AMRU. If the analysis demonstrates that a 60% take reduction is no longer sufficient to prevent material negative effects to the declining population, BRE will, after consultation with the Service, implement additional operational restrictions or minimization measures by the next bat spring emergence season such as: changes in the turbine cut-in speed; changes in timing of turbine operating regimes (if timing of Indiana bat fatalities suggests a specific period when these species are at greatest risk); selected turbine curtailment (if evidence indicates specific turbines are causing significantly greater mortality of bats); making operational adjustments based in part on other environmental factors such as temperature; and deployment and testing of bat deterrent technology if suitable technology is available.

We ran 10,000 simulations for each model scenario. The intent of each scenario was to determine if the estimated take from the project would cause measurable impacts to the hibernacula population. As a general rule of thumb, we considered measurable impacts to be a 5% or more difference in metrics with the project take versus without the project take; i.e., meeting or exceeding this metric could be cause for concern necessitating the need look more closely at the results

Model results indicate that under the reasonable worst case scenario where 50% of the Indiana bat fatalities came from Snedegar's Cave (the closest cave) and 50% of the fatalities came from Hellhole (the largest cave), the difference in these two hibernacula population trajectories with and without the project is largely indistinguishable (Service 2013b, Appendix A). The model projections for Snedegar's Cave began with a population of 179 Indiana bats, which is the current estimate from 2011 after WNS had severely reduced the population in this small hibernacula. With or without the project related fatalities, the results of the population model for Snedegar's Cave are essentially the same. There is no difference in the Snedegar's median population sizes with or without the project at year 25 and 50, and in both cases the model predicts population growth. The Snedegar model projections also predict no change in median population growth rates. For those model runs that predicted extirpation of the Snedegar's population, the median time to extirpation is 15 years with the project and 20 years without the project; however, the formula to calculate median time to extirpation only includes runs that went to extirpation (< 1% of all runs), so the calculation gives the median time to extirpation for only a small subset of all model runs. Over 99% of all model runs predicted populations greater than zero at years 25 and 50, thus the risk of extirpation is low, without or without the project. Based on these modeling results, there is a discountable difference seen in the Snedegar's Cave population projections when adding the estimated take from the project.

The model projections for Hellhole began with a population of 2,540 Indiana bats, which is the current estimate from 2013 after WNS has severely reduced the population in this formerly large hibernacula. Similar to the results for Snedegar's Cave, with or without the project related fatalities at Hellhole, the results of the population model are essentially the same. These model projections predict no difference in the Hellhole median population size at years 25 and 50, and in fact, predict substantial population growth for this sized population. Because none of the model runs went to zero, the probability of the population being extirpated by year 25 or 50 is zero. There is no change in the median growth rate, with or without take from the project, at years 25 or 50. Overall, there is no difference seen in the population projections with and without the estimated take from the project, recovery of the population by year 25, and substantial growth to greater than pre-WNS numbers by year 50.

Therefore, we conclude that implementation of the project is not likely to impact the continued existence of Indiana bats at the scale of the local hibernacula population (USFWS 2013b).

Impacts of Indiana bat take to non-local maternity colonies

The incidental take anticipated at this project from turbine operations will result in loss of female Indiana bats that are important for maintaining maternity colony populations. Therefore, we also evaluated the potential effects to a theoretical maternity colony of 60 females. Sixty bats[15] is the average population estimate for known Indiana bat maternity colonies (Table 2 in Kurta 2005).

The location of the nearest maternity colony in the action area is unknown and it would be speculative to assume a colony occurs on the project site. Moreover, the HCP specifically includes a changed circumstance which limits the take of a reproductive female or her young to a one-time event. Thus repeated take (i.e. multiple years in a row) of females and their pups in the action area during summer is unlikely. In the event that this changed circumstance is triggered, the Service would likely reinitiate section 7 consultation to evaluate population-level effects from this one-time event, and BRE would immediately suspend or alter turbine operations to prevent additional summer take of females or young from re-occurring, until such time as they had completed a permit amendment to allow for summer take.

We therefore assumed it most likely that the take of most females would occur during fall migration rather than during the summer breeding season and these females would originate from maternity colonies located outside of the action area. We used the Thogmartin et al. (2013) demographic model and the same approach as described above for the local hibernacula impacts. Likewise, we assumed WNS had infected the colony and would continue to do so for the future. We also assumed that the fatalities from the project will include equal numbers of males and females, and thus we would expect 50% of the take with curtailment, or 26.5 females to be killed during fall spread across 25 years or 1.06 females per year. As explained above, we anticipate there may be up to 4,324 Indiana bats migrating within 100 miles of the project. With an average maternity size of 60 females, this suggests the potential for up to 72 maternity colonies in the vicinity of the project. Therefore we assume that the 1.06 female bats incidentally killed at the project annually will be coming from more than one colony, and most likely from multiple colonies.

For demographic modeling purposes we assumed a worst case scenario where all of the annual female take was attributed between only two maternity colonies. We anticipate in reality females will come from two or more colonies (and most likely from more than two), but there is no data currently available to evaluate precisely how take might be distributed. Thus, we evaluated the worst case scenario where all take results in the removal of females during fall originating from only two maternity colonies and WNS is present.

[15] The mean maximum emergence count after young began to fly (measured in 12 studies rangewide) was 119 bats (Kurta 2005), suggesting that 60 adult females were present (assuming that most adult females successfully raise one pup to flight stage). We note that the HCP cites a range of 60 to 80 adult females, citing the Indiana bat recovery plan (USFWS 2007) which cites Kurta (2005) but also mentions the average maternity colony size in Indiana was 80 adult females. We choose to use 60 females as the average size because it is based on studies across the range, and using 60 (a smaller number) in our population modeling as described in our BO (USFWS 2013b), errs conservatively on the side of the species.

Even under this worst case scenario, the model predictions of the viability of the maternity colony population are essentially the same with or without project related fatalities (see Appendix A in BO, USFWS 2013b). Under this model there was a predicted decrease in the maternity colony populations by year 25 (median population size decreased from 120 to 103 without the project take, and to 101 with the project take) but recovery of the maternity colonies back to the original size (120) was seen by year 50. These model projections predict little to no change in median population growth rates at years 25 and 50.

For those model runs where the population went to extirpation, the median time to extirpation was 13.5 years with the take from the project versus 18 years without the take from the project. The formula to calculate median time to extirpation only includes runs that predicted extirpation, so the calculation gives the median time to extirpation for only a subset of all model runs (< 2%). Over 98% of all model runs predicted populations greater than zero at years 25 and 50, thus the risk of extirpation is low, without or without the project.

Based on these modeling results, there is a discountable effect on the population projections predicted when adding the estimated take from the project. In both cases the model predicts that maternity colonies will still persist at year 25 and have recovered to their original size by year 50. Overall, there is no difference in the population predictions with and without the estimated project related fatalities. Again, we believe a more realistic scenario is that take of bats from the project will be distributed among more maternity colonies, which means the conclusions reached for the above worst case scenario are conservative. In either case, however, this analysis shows that implementation of the project is not likely to impact continued viability of Indiana bats at the scale of non-local maternity colonies. And the changed circumstances (one time "maternity event") provision of the HCP prevents the project from impacting the continued viability of Indiana bats at the scale of the local maternity colony (i.e., repeated takes of females and pups year after year at the same local colony are prevented).

Impacts of Indiana bat take at the AMRU scale

Given that take from this project is not likely to impact the fitness or viability of Indiana bats at the local population scale, we do not anticipate a reduction in the likelihood of survival and recovery of the species at the AMRU scale. An average annual loss of 2.1 Indiana bats per year (53 bats spread across 25 years) with the project take would represent 0.02% percent of the 2013 AMRU population of 17,584 individuals; and 0.29 to 0.34% of the AMRU population when added to estimated take of 50 to 58 Indiana bats per year from other existing wind energy projects in the AMRU. No additional analysis is necessary since the annual loss of individuals from the project is small and will not result in population level effects.

Impacts of Virginia big-eared bat take to local populations

It is anticipated that any take of Virginia big-ear bats would likely occur during the summer or fall when bats are in maternity colonies or moving between summer colonies and winter hibernacula. Take would likely originate from the closest local population to the south: a complex of mine portals and exposed rock cliff habitat in the New River Gorge National River of Fayette County. Few data are available for this population as the portal complex where the bats occur is unsafe to enter. Of 47 portals that provide suitable bat habitat, approximately half have been surveyed and Virginia big-eared bats have been confirmed at 15 portals since 2002 (Johnson et al. 2003, Varner 2008; C. Stihler , WVDNR, pers. communication). During the 2002 surveys, a total of three Virginia big-eared bats were captured during summer and 25 during fall harp trapping at mine entrances in the New River Gorge National River (Johnson et al. 2002). Since 2007, harp trapping at the entrances to these abandoned coal mines in the New River Gorge National River during the late summer and fall swarming period have captured small numbers of Virginia big-eared bats (usually 1 to a few bats per portal on a given night) (Varner 2008). Whereas no large colonies have been discovered in the area, the population is likely larger than 15 to 28 bats because portal entrance surveys underestimate bats. The relationship of these bats to other populations is unclear, although this population appears to be genetically distinct and most closely related to the Tazewell County population in Virginia which also has not been well surveyed (Piaggio et al. 2009, Stihler 2011).

In contrast to this southern population, the closest northern population to the project has been regularly surveyed during winter cave counts and has more reliable data. During the 2012 winter surveys, the hibernacula in the northern population in West Virginia was estimated to have 11,792 Virginia big-ear bats distributed among nine hibernacula. However, all of these caves in the northern population are over 70 miles away from the project and Virginia big-ear bats are unlikely to move this far between summer and winter caves; hence, bats originating from the northern population are not likely to be affected by Beech Ridge turbine operations.

As a worst case scenario, we assumed the incidental take of up to 14 Virginia big-eared bats would be distributed evenly throughout the 25-year permit duration such that we would anticipate an average of 0.56 fatalities per year with project curtailment. This take would most likely originate from the Fayette County population; thus the maximum potential impact to this local population is 2.0 to 3.7% loss annually, if the population is as small as the roughly 15 to 28 bats captured at the entrances to portals. Unlike Indiana bats, we currently do not have a demographic model to evaluate the impact of this level of annual take to these populations. However, qualitatively it appears to be a small proportion compared to the annual average 30-year growth rate of Virginia big-eared bat maternity colonies in West Virginia. Between 1983 and 2013, Virginia big-eared bat numbers in West Virginia increased by an average of 162 bats per year, which is far greater than the anticipated take of 0.56 bats per year from the Fayette County population. In addition, the annual reproductive capacity for this population may exceed this level of take, assuming this population is growing like others in the State (i.e. the maternity populations in West Virginia grew by an average of roughly 5% per year from 1983 to 2013, whereas the annual project take, at worst, represents 2.0 to 3.7% percent of the current estimated Fayette County population). In reality, the population is likely larger than the 15 to 28 Virginia big-eared bats captured at the entrances to the Fayette County portals.

Moreover, BRE has committed to funding two cave gating projects which will benefit the Fayette County population by removing threats of cave vandalism and human disturbance in an area frequented by recreationists. Cave vandalism and disturbance are the primary threats to the Virginia big-eared bat population rangewide. Unlike Indiana bat, WNS currently is not a threat to the Virginia big-eared bat. The gating projects will be implemented within two years of ITP issuance. Hence the benefits of gating a winter or summer mine portal (increased over winter survival or increased reproduction) will likely begin accruing before take actually occurs. In reality, little take is anticipated early in the life of the ITP given that the project is 27 miles from the closest population, and the farthest recorded distance moved by a Virginia big-eared bat is 20 miles. Take is more likely to occur in the future with an expanding population and possible range shifts from climate change.

Virginia big-eared bats are extremely sensitive to human disturbance. Even slight disturbances can cause adults to abandon caves, abandon young, and force bats to use valuable energy reserves needed to survive hibernation. Circumstantial evidence suggests that Virginia big-eared bat populations in West Virginia have increased over the past 30 years following cave gating, and have decreased in only a few caves which were not gated or had other site-specific problems (such as cat predation on bats at the entrance to one cave) (Stihler 2010).

Therefore, in consideration of the effects of the taking, and the effects of the mitigation, we conclude that the level of incidental take of Virginia big-eared bats will not reduce the fitness (i.e., short or long-term persistence or reproductive potential) of the local Fayette County population. Given that there is no reduction at the local population scale, we do not anticipate a reduction in the likelihood of survival and recovery of the species at the rangewide scale[16]. No additional analysis is necessary since the loss of individuals from the project will not result in population level effects.

Impacts of Indiana and Virginia big-eared bat take at the rangewide scale

As previously explained, implementation of this project is not likely to impact the continued existence of either the Virginia big-eared bat or the Indiana bats at the local population scale. For Indiana bats, this also means that the project is not likely to appreciably reduce the likelihood of survival and recovery of the Indiana bat populations within the AMRU. By extension, the Service concludes that this project will not appreciably reduce both the survival and recovery of either bat at their rangewide scales, which are the listed entity for these species.

- The risk of take of Virginia big-eared bats is low given the project is located on the edge of the species' known range.

- Because the overall population trend of Virginia big-eared bats is stable or increasing, the low level of take, should it occur, will most likely be spread over multiple maternity colonies and winter hibernacula.

- The maximum potential annual impact to the local Virginia big-eared bat population is low compared to the annual average growth rate and reproductive potential in the state.

- An average annual loss of 0.56 Virginia big-eared bats per year by the project represents only 0.005% of the 2013 rangewide population; and 0.03% of the rangewide population when added to estimated ongoing take of Virginia big-eared bats annually from other existing wind energy projects in the species range.

- The potential for take of Indiana bats from the project is greatest during the migratory period; hence the population impacts from the low level of annual take will most likely be spread over many maternity colonies and hibernacula over time.

- Our population modeling indicated that the low level of annual take of Indiana bat would not be additive to the effects of WNS, even under worst case scenarios for local hibernacula and non-local maternity populations. Results were virtually indistinguishable with the project take versus without.

- The AMRU is one of four recovery units comprising the rangewide distribution of Indiana bats (USFWS 2007). Further, it only represents 3% of the current rangewide population. An average annual loss of 2.1 Indiana bats per year by the project represents only 0.02% of the 2013 AMRU population; and less than 0.3% of the AMRU population when added to ongoing estimated take from other existing wind energy projects in the AMRU.

After reviewing the current status of the Indiana bat including a declining population associated with WNS, the current status of the Virginia big-eared bat including a stable or increasing population, the environmental baseline for the action area, the effects of the proposed action and BRE's implementation of the HCP, and the anticipated cumulative effects, the Service concluded in its BO that the actions as

[16] The rangewide distribution of the Virginia big-eared bat is considered a single recovery unit; thus we consider effects at the local and rangewide scales only.

proposed, are not likely to jeopardize the continued existence of either species (USFWS 2013b). This conclusion is based on the magnitude of the project effects (to reproduction, distribution, and abundance) in relation to the listed populations. Implementing regulations for section 7 (50 CFR 402) defines "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

No critical habitat for Indiana bats or Virginia big-eared bats is designated within the action area. Impacts from the proposed actions are anticipated to be localized and not likely to impact critical habitat at broader geographic scales. Therefore, we concluded in our BO that the actions as proposed, are not likely to destroy or adversely modify Indiana bat or Virginia big-eared bat critical habitat.

In conclusion, the Service finds that the level of authorized take will not significantly affect local Indiana or Virginia big-eared bat populations, will not have rangewide population effects, and will not appreciably reduce the likelihood of the survival and recovery of either of these species in the wild. The Service's biological opinion is that the action as proposed is not likely to jeopardize the continued existence of Indiana or Virginia big-eared bats.

### 5. Other measures, as required by the Director of the Service, have been met.

The HCP, minimization and mitigation measures, funding assurances, and all other aspects of the HCP incorporate all elements determined by the Service to be necessary for approval of the HCP and issuance of the permit. The IA and permit conditions include provisions to ensure that the HCP will be fully implemented. Therefore, the Service finds that other measures, as required by the Director of the Service, have been met.

## III. Public Comments

On August 24, 2012, the Service published a notice of availability and request for comments in the *Federal Register* for BRE's DHCP and the Service's DEIS (77 Federal Register 51554; Federal e-Rulemaking portal docket # FWS-R5-ES-2012-0059). The 60-day public comment period closed on October 23, 2012; the Service received 42 comment letters. Based on some of the comments we received, changes were made to the FEIS and the FHCP which clarified and strengthened the conservation measures. A description of these changes and responses to all substantive public comments are included as Volume III to the Service's FEIS. The Service's record of decision (ROD; USFWS 2013d) also summarizes the changes made in response to public comments.

On September 13, 2013, the Service published a notice of availability of the FEIS, FHCP, and responses to comment (78 Federal Register 56729). We solicited stakeholder review of the adequacy of our responses to comments during the minimum 30-day waiting period phase of the FEIS. The waiting period for an agency decision closed on October 16, 2013; thus the agency is now free to sign its ROD.

## IV. National Environmental Policy Act – Analysis and Findings

Pursuant to the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq.*), the Service prepared an EIS that analyzed four alternatives:

> Alternative 1 - the issuance of an ITP with implementation of the HCP (with curtailment at 4.8 m/s from sunset for 5 hours from July 15 to October 15), RMAMP, and APP (the proposed action);

Alternative 2 - a status quo (no action) alternative, with implementation of a RMAMP and APP; Alternative 3 - an alternative that included additional covered species in an HCP (with curtailment at 6.5 m/s from 30 minutes before sunset to 15 minutes after sunrise from April 1 to October 15), implementation of a RMAMP, and APP; and,

Alternative 4 -an alternative that would only include phase I of the project (67 turbines) in the HCP (with curtailment at 4.8 m/s from sunset for 5 hours from July 15 to October 15), implementation of a RMAMP, and APP.

The Service considered five other alternatives, which were eliminated from detailed analysis as they did not meet the purpose and need for the proposed action, had the potential for significant adverse impacts to air quality and climate, or had environmental impacts similar to the proposed action. Other alternatives could not be legally undertaken, or were found to be lacking in sufficient protection for the covered species or other wildlife resources, or included conservation measures that were not practicable given the magnitude of the potential effects. Those alternatives included full project build-out with unrestricted operations, and no ITP/HCP; an ITP with full implementation of the HCP with a reduced permit term (10-year period); an alternative project location; alternative energy sources for electricity generation; and an ITP with full implementation of the HCP and reduced number of turbines with larger capacity.

The Service concluded its NEPA review with a ROD (USFWS 2013d) that confirmed the adequacy of the NEPA analysis (40 CFR 1508.27). The ROD also identified the preferred alternative (alternative 2/proposed action) and the environmentally-preferred alternative (alternative 1/no action). In identifying the proposed action as the Service's preferred alternative, the ROD supported issuance of an ITP to Beech Ridge Energy LLC and Beech Ridge Energy II LLC for incidental take of Indiana and Virginia big-eared bats in conjunction with the Beech Ridge Wind Energy Project.

## V. General Criteria and Disqualifying Factors – Analysis and Findings

The Service currently has no evidence that would disqualify or make the applicants ineligible to receive a permit under our general permitting regulations in 50 CFR 13.21 (b through d), at this time.

## VI. Recommendation on Permit Issuance

Based on our findings with respect to the ITP application (including the FHCP, FHCP errata, IA) and supporting Service documents (including the FEIS, ROD, BO, and ITP conditions), I have determined that the application meets the issuance criteria found in section 10(a)(2)(B) of the ESA.

I therefore recommend issuance of the section 10(a)(1)(B) incidental take permit (number TE16692B-0) to BRE for incidental take of Indiana and Virginia big-eared bats that may occur during turbine operation at the Beech Ridge Wind Energy Project.

Approved by: Paul R. Phifer

Paul Phifer
Assistant Regional Director, Ecological Services
Northeast Region

12/5/13
Date

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