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CONNECTICUT RIVER WATERSHED COUNCIL

The River Connects Us

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To: Deborah Markowitz
Secretary, Vermont Agency of Natural Resources

From: Connecticut River Watershed Council
Environmental & Natural Resources Law Clinic at Vermont Law School
(Representing CRWC)

Date: February 7, 2012 (Revised 2.10.12)

Cc: Jon Groveman, General Counsel, ANR
Justin Johnson, Deputy Commissioner, DEC
Catherine Gjessing, Associate General Counsel, DEC
Elise N. Zoli, Goodwin Procter LLC

Re: Vermont Yankee's Renewal NPDES Permit & New Expert Reports

Connecticut River Watershed Council (CRWC) has long advocated for the health of the Connecticut River, which is a valuable habitat for fish and wildlife species including the coldwater species Atlantic salmon and the cool water species American shad. CRWC has been and remains particularly concerned about the effects of Vermont Yankee's thermal discharge on the River and on the species it supports. Because of this concern, and in advance of the Agency of Natural Resources' (ANR's) issuance of Vermont Yankee's renewal National Pollutant Discharge Elimination System (NPDES) permit, we have retained two experts to review two critical elements of the pending permit – the hydrothermal model and the representative important species list.

The consultants, HydroAnalysis, Inc. and the Midwest Biodiversity Institute, have determined that neither the hydrothermal model nor the list of representative important species are adequate to demonstrate that the temperature limits requested by Entergy are protective of aquatic life. Therefore, neither Entergy's model nor its RIS list should be relied upon by ANR in the permit renewal process. Further, given that these reviews cast significant doubt upon the adequacy of Entergy's current thermal limits, we respectfully request that ANR issue a renewal permit without a variance as soon as possible.

Statutory Overview

Under the Clean Water Act, an agency may grant a “variance” from otherwise applicable thermal limitations to a discharging facility if the alternative limits “will assure the protection and propagation of a balanced, indigenous population [BIP] of shellfish, fish, and wildlife in and on th[e] body of water [into which the discharge is to be made].” § 316(a), 33 U.S.C. § 1326(a). The burden rests squarely with the discharger to “demonstrate” that the desired variance limits will indeed assure protection of the BIP. *E.g.*, 40 C.F.R. § 125.73; *In re: Entergy Nuclear/Vermont Yankee Thermal Discharge Permit Amendment*, No. 89-4-06, at 4 (Vt. Env’t Ct., May 22, 2008) (“in each successive five-year renewal permit proceeding, the burden is on the applicant to show that the operation of the facility qualifies for the requested discharge, including, if applicable, the special analysis under § 316(a) to allow thermal discharges”). Two important elements of a demonstration are the selection of representative important species (RIS), and the analysis and mapping of the thermal plume. *See* 40 C.F.R. §§ 125.71, 125.73; U.S.E.P.A., *Interagency 316(a) Technical Guidance Manual* §§ 3.5-3.8 (1977) (“1977 Guidance”). If either of these is flawed, any subsequent conclusion assuring protection of the BIP is also flawed.

Summary of HydroAnalysis Findings

Report attached.

Entergy’s 2004 Demonstration, submitted in support of Entergy’s request for an additional summertime thermal variance, relied upon a hydrothermal model developed by Applied Science Associates (ASA). Entergy Nuclear Vermont Yankee, § 316(a) *Demonstration in Support of a Request for Increased Discharge Temperature Limits at Vermont Yankee Nuclear Power Station during May through October* §§ 4-5, Appendix 3 (April 2004) (“2004 Demonstration”). Based upon conclusions drawn from this model, Entergy determined that its requested permit conditions would assure protection of the BIP. *Id.* **After a careful review, HydroAnalysis has determined that the ASA study is in fact “incapable of supporting 316(a) demonstration requirements.”** Ken Hickey et al., *Review of Vermont Yankee Thermal Discharge Modeling* 23 (HydroAnalysis 2012) (“Thermal Review”).¹ In other words, Entergy has not accurately assessed the plume’s impact on the BIP.

The HydroAnalysis report identifies four fundamental failings of ASA’s hydrothermal modeling evaluation, summarized below.

¹ On October 25, 2011, HydroAnalysis and the Environmental & Natural Resources Law Clinic made a joint request to ASA, cc Elise Zoli of Goodwin Procter LLC, for various materials associated with the ASA model including an executable version of the model and the model’s verification report. By letter dated November 22, 2011, ASA informed us that we should make any such request to Ms. Zoli directly. On November 28, 2011, we submitted a near identical request directly to Ms. Zoli, cc ASA. We have not received a response to that request. Thus, HydroAnalysis’ review was limited to ASA’s report entitled *Hydrothermal Modeling of the Cooling Water Discharge from the Vermont Yankee Power Plant to the Connecticut River* (2004). However, as explained in HydroAnalysis’ review, the ASA report provided more than enough information for HydroAnalysis to determine that the ASA model is insufficient to support the 316(a) demonstration process.

1) The evaluation was based upon a false presumption of historic thermal characterization.

The 2004 modeling study was “not designed to evaluate the thermal conditions of the Connecticut River associated with the Vermont Yankee thermal discharge,” but rather to “evaluate the change in thermal conditions associated with a requested 1°F discharge temperature increase” – apparently “based on the assumption that only the proposed increase in thermal discharge needed to be evaluated.” HydroAnalysis explains that this assumption is incorrect, in large part through critiques of Vermont Yankee’s previous demonstrations (1978 and 1990).²

This “incremental” approach in 2004 also prevented Entergy from addressing other basic elements of a successful 316(a) demonstration. Entergy failed to include the entire thermal plume in the study area (see below), failed to include additive or synergistic effects associated with Vernon Dam, failed to create sufficient thermal plume maps, and failed to present sufficient data. *Id.* at 5-14, 23-24.

2) The evaluation excluded the majority of the study area.

Vermont Yankee’s previous demonstrations, while incomplete, showed that the plant’s thermal plume extends at least 55 miles downstream to Holyoke Dam and that “large-magnitude time-varying thermal plumes affect the river many miles below Vernon Dam.” The 2004 demonstration, on the other hand, covers only Vernon Pool and “does not include the vast majority of the river reach affected by the thermal discharge.” Because the downstream plume could have an “adverse impact on fisheries,” it should have been included. *Id.* at 17-18, 24-25.

3) The evaluation applied inappropriate model scenarios.

The model scenarios that ASA utilized provided only a “narrow window into the hydrothermal behavior of the Connecticut River.” Rather than predicting time-varying (i.e., dynamic) water temperature conditions, ASA’s evaluation was limited to a set of steady-state scenarios that provided “snapshots” of river conditions under constant conditions. The constant conditions presented by ASA were overly simplistic because they did not account for effects on Connecticut River water temperature (and the fishery) due to changes in the Vermont Yankee discharge, Vernon Dam operations, or other factors. In addition, the ASA modeling application was based upon a relatively small data set representing only 16% of the data actually collected for the model (39 of 240 days). The model lacked long-term time series water temperature predictions incorporating the dynamic effects of Vermont Yankee water temperature and flow, Vernon Dam operations, and weather measurements. The steady-state mode that ASA employed was incapable of predicting worse-case conditions as required by a 316(a) demonstration. *Id.* at 25-26.

² For example, the first demonstration, conducted in 1978, did not analyze long-term temperature conditions and did not identify average and worst-case conditions. The 1990 study also failed to analyze long-term and time-varying temperature data, and failed to adequately characterize the nature and extent of the thermal plume. *Thermal Review* at 12-14.

4) The evaluation failed to provide sufficient data to support a BIP analysis.

In addition to the deficiencies described above showing that the ASA model is insufficient to support a BIP determination, other fisheries analyses relative to the model are likewise lacking. For instance, the 2004 fisheries studies were limited to a small portion of the already small study area – lower Vernon Pool to downstream Station 3. Further, the model did not address low flow and elevated temperature events in the fishway as necessary to assure protection of the BIP. The model also did not characterize the dynamic or long-term effects of the hydroelectric facility on the River, including flows from the fishway. *Id.* at 23-27.

Summary of Midwest Biodiversity Institute (MBI) Findings

Report attached.

In its 2004 Demonstration, Entergy presented a nine-species RIS list. *2004 Demonstration* § 5.2. A RIS may be used to “represent” the BIP. 40 C.F.R. § 125.71(b); *In re: Entergy Nuclear, Vt. Env’tl Ct.* (May 22, 2008), at 22-24. The BIP, in turn, is “a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species.” 40 C.F.R. § 125.71(c). It may include introduced species but not species whose “presence or abundance is attributable to [thermal variance discharges].” *Id.* As such, the RIS is essential for evaluating thermal impacts and establishing a protective thermal regime. A RIS that is not representative of all species within the BIP will not accurately predict a thermal discharge’s impact.

MBI has conducted a RIS analysis using fish assemblage relative abundance data collected in an EPA-funded electrofishing survey of the Connecticut River in 2008 and 2009.³ In particular, Principal Investigator Chris O. Yoder provides updated RIS options for several different river reaches. Based on this data, **MBI recommends adding additional species to the existing RIS and extending the study area to a more geographically and ecologically relevant reach of river.** This would help to ensure not only that a sufficient number of species are considered, but also that the range of thermal and other sensitivities is appropriately broad, assuring that highly thermally intolerant species are afforded equal weight. Chris O. Yoder, *Selection of Representative Important Species for the Connecticut River in the Vicinity of the Vermont Yankee Electric Generating Facility* 1, 8-13 (MBI 2012) (“RIS Selection”).

In its analysis, MBI uses core concepts from EPA’s 1977 guidance as well as current scientific literature and professional practice to identify useful guidelines in selecting the RIS and protecting the BIP. For instance, the RIS should represent the full range of response and sensitivity to environmental stressors, should include recreationally or commercially valuable species, and should include any species listed as threatened or endangered. While EPA’s 1977 Guidance and the more modern RIS-selection criteria described by Yoder share many fundamental concepts, the 1977 Guidance offers a suggested “limit” on the number of species that should comprise a RIS (e.g., 2-15). *1977 Guidance* § 3.5.2.1. However, as MBI explains,

³ Many of the underlying data are presented in a report to U.S.E.P.A. Region 1: Yoder et al., *Fish Assemblage and Habitat Assessment of the Upper Connecticut River: A Preliminary Report and Presentation of Data* (MBI & Kleinschmidt, Jan. 2010).

modern science suggests that if the selection of the RIS is limited to a seemingly arbitrary number, there is a substantial risk of sensitive species being excluded. This, in turn, suggests that the more modern criteria can more fully support protection of the BIP. *RIS Selection* at 4-5, 9-10, 12-13.

To demonstrate that a RIS with a larger number of species is technically feasible to evaluate, MBI also offers some preliminary scientific guidance and methodology for developing protective temperature criteria in Vermont, following those developed for Ohio EPA's temperature criteria process and 316 guidelines. *Id.* at 5-8, 11-12; *see also generally* Yoder et al., *Re-evaluation of the Technical Justification for Existing Ohio River Mainstem Temperature Criteria: Report to the Ohio River Valley Water Sanitation Commission (ORSANCO) ad hoc Committee on Temperature Criteria Re-evaluation* (MBI 2006).⁴ This guidance may be useful to ANR not only in the NPDES context, but also in the 401 certification process or as a consideration during the triennial review of the Vermont Water Quality Standards.

Conclusions & Recommendations

The findings of HydroAnalysis, Inc. and Midwest Biodiversity Institute are unequivocal. They reveal that the information Entergy relied on, is currently relying on, and intends to continue to rely on to justify its thermal discharges, is flawed – so much so that the information cannot support a thermal variance. With these new reviews, Entergy's conclusions in support of its previous variances have been invalidated. In short, Entergy has not provided the statutorily required assurance that its thermal variance limitations will assure the protection of a balanced, indigenous population of fish and wildlife. Entergy has not met its burden.

We respectfully request that ANR act quickly to remedy this problem by issuing Vermont Yankee's renewal NPDES permit as soon as possible without a thermal variance.

We also provide the following general recommendations as suggested by HydroAnalysis, Inc. and Midwest Biodiversity Institute:

- If Entergy is to make a successful demonstration and receive a thermal variance, a comprehensive thermal modeling evaluation must be conducted. The evaluation should include two models linked together (Bellows to Vernon, Vernon to Holyoke). It should use, at minimum, a 10-year record of river flow and temperature, plant discharge flow and temperature, and meteorology. It should be applied dynamically including both summer and non-summertime conditions, and should simulate the 10-year period. Preferably, a public domain model that can be reviewed by agencies and third parties should be used.

CRWC recommends that ANR utilize its bill back authority under 3 V.S.A. § 2809 to hire an independent water quality modeler to conduct this analysis.

⁴ We are happy to provide the *ORSANCO* report to ANR if helpful.

- Normandeau's 2008 study plan for conducting a downstream field investigation and modeling evaluation, while likely appropriate in most respects, is majorly flawed because it calls for application in a steady-state mode. For the reasons explained above, a steady-state application is inappropriate for predicting impacts to the BIP in a dynamic river system. The proposed CE-QUAL-W2 model is designed for long-term dynamic simulation and should be utilized in that way.
- ANR should consider adding additional species to the existing RIS based on MBI's recent assemblage data and Vermont Yankee's 1978 plume characterization (showing a greater than 1°F temperature increase 55 miles downstream near Holyoke Dam).

And finally we want to restate our interest in seeing that the study recommendations on shad migration developed by the USGS Conte Lab are included in the Agency's deliberations on the pending permit. The recommendations continue to be very relevant as they note that energetic requirements of migratory fish can be affected by even slight river warming.

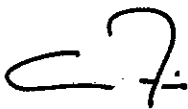
The Conte Lab's letter of July 2007 is attached.



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For Connecticut River Watershed Council

Respectfully submitted,

Student Clinicians
Cindy Hurt
Melissa Marks



Andrew Fisk
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Attachments (3):

Ken Hickey et al., *Review of Vermont Yankee Thermal Discharge Modeling* (HydroAnalysis 2012)

Chris O. Yoder, *Selection of Representative Important Species for the Connecticut River in the Vicinity of the Vermont Yankee Electric Generating Facility* (MBI 2012)

Letter from Stephen Garabedien, Ph.D., USGS Conte Lab to David Deen, CRWC (July 2007)