VERMONT LAW SCHOOL

Environmental and Natural Resources Law Clinic
Vermont Law School, PO Box 96, Chelsea Street
South Royalton, VT 05068
802-831-1630 (phone) • 802-831-1631 (fax)

COMMENTS OF CONNECTICUT RIVER WATERSHED COUNCIL AND VERMONT NATURAL RESOURCES COUNCIL ON DRAFT DISCHARGE PERMIT # 3-1199

On behalf of Connecticut River Watershed Council and the Vermont Natural Resources Council, the Environmental and Natural Resources Law Clinic at Vermont Law School submits these comments on Draft Discharge Permit # 3-1199, issued for public comment by Vermont's Department of Environmental Conservation (DEC) on July 2, 2014. The permit is for discharges of effluent from the Entergy Nuclear Vermont Yankee nuclear power facility into the Connecticut River. Entergy's current permit expired more than eight years ago.

Connecticut River Watershed Council (CRWC) and Vermont Natural Resources Council (VNRC) (collectively, "CRWC") appreciate the opportunity to comment on the Draft Permit. CRWC supports long-overdue improvements to the permit that have made it more protective of aquatic species in the River. The recognition that Equation 1.1 is inappropriate for measuring compliance with permit limits, the adjustments to time periods within the permit to more closely match migratory patterns, and the addition of ambient caps for some seasons are all steps in the right direction. However, CRWC remains concerned that the Draft Permit falls short of the Clean Water Act's mandate to assure the protection and propagation of a balanced indigenous population of fish and wildlife in the River. For instance, given that Entergy has not met its burden to show that it qualifies for a variance from applicable temperature limits, DEC has not explained how Vermont Yankee's continued use of Equation 1.1, the unchanged Winter limits, or the new ambient cap regime are sufficient to meet the Clean Water Act standard.

Therefore, CRWC recommends that DEC revise this Draft Permit in order to adequately protect the Connecticut River's aquatic species, either through significantly more stringent and additional temporal and geographic ambient caps, or through the requirement that Vermont Yankee meet the Vermont Water Quality Standard for temperature—1.0ºF above ambient—and utilize its closed-cycle cooling towers as unequivocally recommended by the Environmental Advisory Committee. CRWC also recommends that DEC build upon the strides it has made with this permit by formally implementing a new approach to developing biologically based temperature criteria and permit conditions for thermal discharges in the State that ensure effluent limits and ambient conditions be actually attained. DEC should adopt this new approach to thermal discharges in its triennial review of Vermont's Water Quality Standards.

TABLE OF CONTENTS

I. The Vermont Department of Environmental Conservation has the authority and responsibility to issue a permit that assures compliance with the Clean Water Act.

As described below, Vermont DEC has the authority and responsibility to revise Vermont Yankee's existing, expired permit in order to be adequately protective of the Connecticut River. The law fully supports steps that DEC has taken in that direction.

A. The Clean Water Act requires review and revision of NPDES permits to protect water quality and the permit applicant has the burden to prove that any variance for a thermal discharge will assure protection of aquatic species.

The Clean Water Act (CWA or Act) requires National Pollutant Discharge Elimination System (NPDES) permits to contain effluent limitations sufficient to ensure compliance with water quality standards.[1] The Connecticut River near the Vermont Yankee facility is designated as "cold water fish habitat" under the Vermont Water Quality Standards (VWQS), which means that the "total increase from the ambient temperature due to all discharges and activities shall not exceed 1.0°F," unless a discharger qualifies for a variance.[2] In order to qualify for a variance, a permit applicant must demonstrate, among other things, that a proposed effluent limitation will be more stringent than necessary to assure the protection and propagation of a balanced and indigenous fish population [BIP] and that an alternative, less stringent limitation will nevertheless assure such protection and propagation.[3] As stated by the United States Environmental Protection Agency's (EPA's) Environmental Appeals Board: "[T]he statute and the regulations clearly impose the burden of proving that the section 301 thermal effluent limitations are too stringent on the discharger seeking the variance, not on the Agency. The discharger likewise has the burden of demonstrating that its proposed alternate effluent limitations are sufficient to ensure protection and propagation of the BIP."[4]

Therefore, DEC cannot authorize any discharge in excess of the 1.0°F VWQS unless Entergy has demonstrated that less stringent limitations will protect aquatic species in the River. Further, DEC is not obligated to grant any variance; rather, DEC has the discretion to do so if the specified minimum requirement is satisfied.[5] As with other provisions of the CWA, the requirements of § 316(a) provide a floor that state agencies must meet, and States remain free to implement requirements more stringent than or in addition to those provided in the CWA:

> Except as expressly provided in this chapter, nothing in this chapter shall . . . preclude or deny the right of any State or political subdivision thereof or interstate agency to adopt or enforce . . . any standard or limitation regarding discharges of pollutants . . . except that . . . such State or political subdivision or interstate

[1] 33 U.S.C. § 1311(b)(1)(C); 40 C.F.R. §§ 122.4, 122.44(d).
[2] Vermont Natural Resources Board/Water Resources Panel, Vermont Water Quality Standards (VWQS), § 3-01 B.1.b, d, App. A (eff. Dec. 30, 2011).
[3] *Id.*; § 316(a), 33 U.S.C. § 1326(a); *In re Entergy Nuclear Vermont Yankee Discharge Permit 3-1199*, 989 A.2d 563, 583 ¶ 50 (Vt. 2009).
[4] *In re Dominion Energy Brayton Point, L.L.C.*, 12 E.A.D. 490, 2006 WL 3361084, at *45 (EAB 2006).
[5] *See* § 316(a) ("the Administrator *may* impose") (emphasis added).

> agency may not adopt or enforce any effluent limitation, or other limitation, effluent standard, prohibition, pretreatment standard, or standard of performance which is less stringent than . . . this chapter.[6]

Additionally, when deciding whether a permit applicant has met its burden for a variance, EPA has stated that an agency "should take a rigorous and conservative approach to granting and reissuing variances in order to meet the standard of assuring the protection and propagation of the BIP."[7] EPA continued: "Such an approach is appropriate in light of the fact that the applicant for a § 316(a) variance is seeking to be excused from otherwise applicable limitations, and given the CWA's overarching goal of restoring and maintaining the 'biological integrity of the Nation's waters,' 33 U.S.C. § 1251(a), and attaining 'water quality which provides for the protection and propagation of fish, shellfish and wildlife.' 33 U.S.C. § 1251(a)(2)."[8] Senator Muskie, the primary Senate sponsor of the Clean Water Act, confirmed decades earlier: "Congress intended that there be a *very limited waiver* for those major sources of thermal effluents which could establish beyond any question the lack of relationship between federally established effluent limitations and that water quality which assures . . . the protection and propagation of [the BIP]."[9]

DEC also has the authority and responsibility to conduct a thorough review with each re-issuance of a permit and to revise existing permit conditions whenever appropriate. The Clean Water Act prescribes that states issue NPDES permits for "fixed terms not exceeding five years."[10] This is to ensure that permits, if granted, evolve as necessary to protect water quality. As explained by Vermont's Environmental Court, "it is important to keep in mind that NPDES permits 'were to be issued for just five-year terms, and businesses were to adopt new technology in the transition time *to eliminate their discharges*' in that five-year period."[11] Relatedly, DEC must actually review and analyze NPDES permit limitations; they do not exist in perpetuity.[12] Vermont's Environmental Court has noted the impropriety of limiting an agency's permitting responsibilities to a "ministerial act, to be completed every five years when a permit came up for renewal, whereby [DEC] would issue each successive permit with the exact same effluent limitations as the previous permit."[13]

State and federal regulations echo these requirements. Federal regulations provide that each permit issuance requires an analysis and explanation of how proposed terms will comply with the

---

[6] 33 U.S.C. § 1370.
[7] EPA-New England, *Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Mirant Kendall Station in Cambridge, MA* 34 (June 8, 2004).
[8] *Id.*
[9] S. Rep No. 95-370, at 642 (1977) (Conf. Rep.) (emphasis added).
[10] 33 U.S.C. § 1342(b)(1)(B); *also* 40 C.F.R. § 122.46(a) ("NPDES permits shall be effective for a fixed term not to exceed five years.").
[11] *In re Montpelier WWTF Discharge Permit*, No. 22-2-08, at 9-10 (Vt. Env. Ct., June 30, 2009), *citing* Mary Christina Wood, *Nature's Trust: Reclaiming an Environmental Discourse*, 25 Va. Envtl. L.J. 243, 253 (2007) (emphasis added) (internal citation omitted).
[12] *See In re Montpelier,* Vt. Envt'l Ct. (June 30, 2009), at 13.
[13] *Id.*

CWA.[14] Vermont's regulations require the "scope and manner of any review of an application for reissuance of a permit [to] insure at least" that the discharge is "consistent with applicable effluent standards and limitations" and "water quality standards."[15] Vermont law also provides that: "A renewal permit shall be issued following all determinations and procedures required for initial permit application."[16]

Additionally, the EPA's NPDES Permit Writers' Manual explicitly states that "[o]nce a variance is granted, the discharger must still reapply for the variance each permit term."[17] Likewise, the Preamble to § 316(a) regulatory revisions confirmed that an agency could indeed "require a full demonstration for a renewal in cases where [it] has reason to believe that circumstances have changed, that the initial variance may have been improperly granted, or that some adjustment in the terms of the initial variance may be warranted."[18]

Further, a permitting agency need not wait until a permit's five-year term is expired in order to make improvements to the permit or to terminate it; and the agency has the authority to deny a renewal permit. The regulations cite numerous grounds for modification, revocation and reissuance, or termination of NPDES permits, and denial of renewal permits.[19] Along those lines, each NPDES permit issued in Vermont must contain conditions sufficient to ensure that the permit "may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to," various causes.[20] Coupled with this flexibility is the agency's authority to require more information from the permittee whenever necessary to make relevant determinations. Federal law provides: "The permittee shall furnish to the [agency], within a reasonable time, any information which the [agency] may request to determine whether cause exists for modifying, revoking and reissuing, or terminating th[e] permit or to determine compliance with th[e] permit. The permittee shall also furnish to the [agency] upon request, copies of records required to be kept by th[e] permit."[21] As such, both state and federal law recognize that permits must be adaptable to new information and changing circumstances if they are to be effective in protecting water quality.

In the context of Vermont Yankee specifically, both the Environmental Court and Vermont's Agency of Natural Resources (ANR) have recognized the requirement to conduct a thorough review and issue a protective permit with each permit issuance. In a recent letter responding to one of Entergy's many assertions that its permit should remain unchanged, ANR's General Counsel explained that "ANR has the legal obligation to review the proposed discharge for

[14] *See, e.g.,* 40 C.F.R. §§ 122.44, 124.7, 124.8.
[15] Vt. Water Pollution Control Permit Regulations § 13.5(b)(2)(c).
[16] 10 V.S.A. § 1263(e).
[17] EPA, *NPDES Permit Writers' Manual (NPDES Manual)* 5-43 (2010).
[18] NPDES Revision of Regulations, 44 Fed. Reg. 32,854, 32,894 (June 7, 1979).
[19] 40 C.F.R. §§ 122.62-.64.
[20] Vt. Water Pollution Control Permit Regulations § 13.4(e)(2); *see also id.* § 13.8 ("any permit issued hereunder can be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to," various causes).
[21] 40 C.F.R. § 122.41(h); Vt. Water Pollution Control Regulations §§ 13.4(e)(3), 13.6(c)-(d) (similar).

compliance with the applicable law every five years as part of the NPDES renewal process."[22] The Environmental Court made similar observations more than once in its earlier decision on the Vermont Yankee case, explicitly referencing the then-upcoming renewal process:

> [I]n 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 . . . .
>
> The renewal permit proceeding takes account of whether the proposed or continued operation of the discharging source will comply with all applicable standards and requirements, including any changes to those requirements that had been put in place during the term of the prior expiring permit. Vermont Water Pollution Control Permit Regulations, §13.5(b)(2)(c). . . .
>
> [I]t is beyond the scope of the present proceeding for the Court to consider any amendment of the summer thermal discharge already allowed to be discharged by the unappealed existing expired permit, or whether any other aspects of the Vermont Yankee thermal regime are working well or should be changed—such issues will be for the ANR to consider in the first instance in its work on the pending renewal permit application.[23]

In sum, DEC has ample legal authority to revise Vermont Yankee's NPDES permit limits in order to protect the Connecticut River where, as here, Entergy has not shown that its existing limitations will do so.

B. Many years' worth of materials support DEC's conclusion that Vermont Yankee's existing, expired permit is insufficient to protect aquatic populations in the Connecticut River.

In addition to the legal authorities described above, numerous scientific authorities have raised serious concerns with Vermont Yankee's hot-water discharges over the years. The concerns date back to the plant's inception, when Vermont Yankee was required to build and operate closed-cycle cooling towers during its first two years of operation.[24] Many years and many variances later, those concerns remain. Below we provide selected examples of agency statements, expert reports, and other documents demonstrating that Vermont Yankee's existing, expired permit is not protective of aquatic species, and that it needs to change. **In other words, Entergy has not met its burden to show that it qualifies for a variance.**

[22] Letter from Jon Groveman, ANR General Counsel, to Kelli M. Dowell, Entergy Assistant General Counsel, at 3 (Apr. 8, 2014).
[23] *In re Entergy Nuclear/Vermont Yankee Thermal Discharge Permit Amendment*, No. 89-4-06, at 4, 6 (Vt. Env. Ct., May 22, 2008).
[24] *See* Vermont Yankee Nuclear Power Corporation, *316 Demonstration* 1-1 – 1-2 (Mar. 1978).

1. The USGS Conte Lab letter identified numerous studies that Entergy would need to conduct before there could be any determination that Vermont Yankee was not harming fish populations.

In a July 2007 letter, approximately one year after Vermont Yankee's last thermal variance was granted, Drs. Theodore Castro-Santos and Alexander Haro of the United States Geological Survey (USGS) concluded that there was a "need for further studies to determine whether or not Vermont Yankee's thermal discharge is having an effect on shad passage at Turner's Falls Dam."[25] The letter had explained that there was a decline in shad passage at Turners Falls Dam between 1990 and 2006, which was not likely attributable to either decreased passage at a downstream dam or striped bass predation.[26] The authors referred to data suggesting that shad "may abandon their migration without spawning" if appropriate temperature conditions were not present, and stated that they knew of "no data that could support or refute" whether Vermont Yankee's thermal discharge was a possible factor in the Turners Falls decline.[27] They made specific recommendations on studies that would help determine how Vermont Yankee's discharge actually affects shad passage at Turners:

> The most important information with which to address thermal effects on any of the Connecticut River flora or fauna is the extent of the thermal influence of the plant. The further downstream this influence extends, the more opportunities to affect the river's ecology. For example, the energetic requirements of migratory fish could be affected, even if the river is warmed even slightly. The magnitude of this effect depends on exposure, duration, timing, and swim speed. To reasonably assess whether there is any influence, therefore, it would be necessary to collect data on swim speeds, location, migratory timing, and delays to upstream and downstream migration under both elevated and unaltered river temperature conditions. No such studies have been performed. More information is also needed to better characterize the relationship between temperature and swimming energetics over a range of swim speeds.
>
> Similarly, studies on the effects of thermal alterations on juvenile development would help determine whether any influence exists. Again, this would require controlled studies over a range of flow conditions (and presumably years) with and without thermal alteration. Influences on juvenile development are important because any reduced viability among the offspring of shad spawning upstream of the dam would probably cause a reduction in the proportion passing Turners Falls.
>
> Finally effects of thermal alterations on passage at Vernon Dam, both for adult upstream migrants, and for both adult and juvenile downstream migrants would provide valuable information. Differential survival between the Turners-Vernon

[25] Letter from Stephen P. Garabedian, United States Geological Survey, to David L. Deen, Connecticut River Watershed Council, at Q. 11 (July 2, 2007).
[26] *Id.* at Qs 3, 4.
[27] *Id.* at Qs 7, 10.

reach and the river upstream of Vernon could affect passage behavior of subsequent generations.[28]

To date, none of these studies have been conducted.

2. Agency correspondence reveals concerns about decreasing trends in fish species.

In a 2008 communication, a biologist with the United States Fish and Wildlife Service noted that Vermont Yankee's biological data had shown "negative trends for 2-3 species." The email also cast doubt upon Vermont Yankee's attempt to explain away any statistically significant trends as resulting from too much data.[29]

Notes on the "Ecological Studies Presentation" for a spring 2009 Environmental Advisory Committee (EAC) meeting reported on macroinvertebrate monitoring results. The trend analysis showed, "as usual, oligochaetes decreasing" and a "[n]ew trend showing a significant decreasing result in 'all others.'"[30]

Notes from a 2010 EAC meeting conveyed Ken Cox's concern that "2 of the RIS are showing decreasing trends" and, specifically, that walleye showed decreasing trends upstream and downstream of Vernon Dam and that Vermont Yankee's explanation for the decrease was "weak."[31]

Notes from a 2011 meeting showed that the Committee was considering adding white perch and tessellated darter to the RIS. The white perch population had not been monitored recently and "appear[ed] to have plummeted."[32]

3. A 2010 Castro-Santos paper identified thermal influence as an important habitat characteristic.

Another USGS paper, also co-authored by Castro-Santos, presented a simulation model to assess the effects of migratory distance and dams on the spawning success and survival of American shad in the Connecticut.[33] It found that the "thermal environment" was "one habitat characteristic that affected all three performance variables [migratory distance, fecundity, survival]."[34] Specifically, the model suggested a "potential mismatch between arrival timing and riverine environment" because fish that arrived earlier (when water temperatures were cooler)

---

[28] *Id.* at Q. 12.
[29] Email from Melissa Grader, Biologist, United States Fish and Wildlife Service, to Todd Richardson, Massachusetts (June 9, 2008) (cc: Ralph Abele, Ken Cox, Gabriel Gries, Caleb Slater).
[30] *Draft – Vermont Yankee Environmental Advisory Committee (EAC) Meeting* 1 (Apr. 29, 2009).
[31] *May 27 2010 Minutes of the NPDES Environmental Advisory Committee Meeting* 4 (May 27, 2010).
[32] *Notes and Comments of Environmental Advisory Committee at September 9, 2011 Meeting at Keene Regional Office of New Hampshire Fish & Game Department* 1 (Sept. 9, 2011).
[33] Theodore Castro-Santos & Benjamin H. Letcher, *Modeling Migratory Energetics of Connecticut River American shad (Alosa sapidissima): Implications for the Conservation of an Iteroparous Anadromous Fish,* 67 Can. J. Fish. Aquat. Sci. 806 (2010).
[34] *Id.* at 824.

tended to perform better.[35] The paper concluded, among other things, that "[t]hermal influences on energetics . . . need further study."[36]

4. A 2010 letter from ANR to Entergy identified problem areas and called for needed studies.

This letter expressed many concerns regarding Vermont Yankee's ecological monitoring and results, and reiterated the need for additional studies. Among other things, the letter explained that "walleye and white sucker trends raise red flags" and that "given concerns VY has raised regarding [current testing methods], perhaps it is premature to reach conclusions of 'no prior appreciable harm' for the other seven RIS."[37] The letter also emphasized the need for long-needed studies to determine Vermont Yankee's effect on salmon smolts: "Nearly five years have passed since the EAC's concerns regarding thermal effects on smolt behavior and physiology and the need for VY to undertake studies was raised in Carol Carpenter's September 21, 2005 letter to you. To date, unfortunately, little headway has been made to implement this important work."[38]

To date, the salmon smolt study has not been conducted.

5. A 2011 letter from DEC to Entergy again called for needed studies.

In this letter, DEC's Deputy Commissioner asserted that outstanding studies on salmon smolts and the thermal plume from the Vermont Yankee facility were "critical to assessing whether [Entergy] meets the applicable state and federal requirements relating to its NPDES permit."[39] The letter also identified the need for a juvenile shad outmigration study and noted that concerns about juvenile shad outmigration had been raised since 2004.[40]

To date, none of these studies has been conducted by Entergy.

6. The February 2012 HydroAnalysis Report concluded that Entergy's 2006 variance was "significantly flawed."

This Report, commissioned by CRWC, was developed by HydroAnalysis, Inc., an environmental consulting firm in Massachusetts. Among other things, the firm has extensive expertise in water quality and hydrologic data collection and analysis, and modeling of rivers, estuaries, and lakes. The Report determined that the 2004 hydrothermal model upon which Entergy relied to support its 2006 variance was "incapable of supporting 316(a) demonstration requirements."[41] In other

[35] *Id.*
[36] *Id.* at 826.
[37] Letter from Kenneth M. Cox, ANR, to Lynn DeWald, Entergy 2 (June 7, 2010).
[38] *Id.*
[39] Letter from Justin Johnson, ANR, to Lynn DeWald, Entergy 1 (April 26, 2011).
[40] *Id.*
[41] Ken Hickey et al., *Review of Vermont Yankee Thermal Discharge Modeling* 23 (HydroAnalysis 2012) (*Thermal Review*).

words, Entergy had not accurately assessed the thermal plume's impact on the aquatic species in the River. In coming to this conclusion, HydroAnalysis identified four fundamental failings of Entergy's modeling evaluation.

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).[42]

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.[43]

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

Vermont Yankee's previous demonstrations, while incomplete, nonetheless accurately showed that the plant's thermal plume extended 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, covered only Vernon Pool and "d[id] 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.[44]

3) The evaluation applied inappropriate model scenarios.

The model scenarios that Entergy 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, Entergy's evaluation was limited to a set of steady-state scenarios that provided "snapshots" of river conditions under constant conditions. The constant conditions presented 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, Entergy's modeling application was based upon a relatively small data set representing only 16% of the data actually collected

[42] 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, supra* note 41, at 12-14.
[43] *Id.* at 5-14, 23-24.
[44] *Id.* at 17-18, 24-25.

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. In contrast, EPA guidance requires models to account for varying conditions including 7-day 10-year low flows. The steady-state mode that Entergy employed was incapable of predicting worst-case conditions as required by a 316(a) demonstration.[45]

4) The evaluation failed to provide sufficient data to support an analysis of the discharge's effects on aquatic species.

In addition to the deficiencies described above showing that the Entergy model was insufficient to support a BIP determination, other fisheries analyses relative to the model were 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.[46] This is especially problematic given that, as a later HydroAnalysis report found, temperatures in the fishway are routinely much higher than downstream at Station 3. (See Part III.C.1.)

7. The February 2012 Midwest Biodiversity Institute Report concluded that the existing Representative Important Species (RIS) list should be expanded.

This Report, commissioned by CRWC, concluded that additional species should be added to the existing RIS.[47] Chris O. Yoder of the Midwest Biodiversity Institute (MBI), which provides expertise in biological assessment, monitoring, and technical evaluation, developed the Report.

In its 2004 Demonstration, Entergy presented a nine-species RIS list.[48] A RIS may be used to "represent" the BIP.[49] 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."[50] It may include introduced species but not species whose "presence or abundance is attributable to [thermal variance discharges]."[51] 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.

---

[45] *Id.* at 3-4, 25-26; Ken Hickey et al., *Review of Vermont Yankee Thermal Discharge Modeling* 23 (HydroAnalysis 2012) (Feb.6, 2012 revised version corrected to state that only 39 of 240 days, not 41 of 240 days, were chosen for data set).
[46] *Thermal Review, supra* note 41, at 23-27.
[47] Chris O. Yoder, *Selection of Representative Important Species for the Connecticut River in the Vicinity of the Vermont Yankee Electric Generating Facility* 1 (MBI 2012) (*RIS Selection*).
[48] 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* § 5.2 (April 2004).
[49] 40 C.F.R. § 125.71(b); *In re: Entergy Nuclear,* Vt. Envt'l Ct. (May 22, 2008), at 22-24.
[50] 40 C.F.R. § 125.71(c).
[51] *Id.*

The Midwest Biodiversity Institute's RIS analysis used fish assemblage relative abundance data collected in an EPA-funded electrofishing survey of the Connecticut River in 2008 and 2009.[52] Principal Investigator Chris O. Yoder provided updated RIS options for several different river reaches, which 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.[53]

In its analysis, MBI used 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 shared many fundamental concepts, the 1977 Guidance offered a suggested "limit" on the number of species that should comprise a RIS (e.g., 2-15).[54] However, as MBI explained, modern science suggested 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, suggested that the more modern criteria could more fully support protection of the BIP.[55]

To demonstrate that a RIS with a larger number of species was technically feasible to evaluate, MBI also offered 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.[56] As discussed in Part V, CRWC recommends that DEC formally adopt this type of process—or something similar—for thermal discharges going forward.

8. The August 2012 HydroAnalysis Report identified fatal flaws with the compliance equation in Entergy's permit.

This Report, also commissioned by CRWC, had two major findings. First, the Report found that the equation used to calculate compliance with the temperature limits in Vermont Yankee's existing NPDES permit (Equation 1.1) was inappropriate because it improperly assumed complete mixing of the thermal discharge in the Connecticut River.[57] Second, actual ambient temperatures in the fishway and at the downstream monitoring station were routinely several degrees higher than the NPDES-permitted temperatures, with temperature rise extending at least

[52] 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).
[53] *RIS Selection* at 1, 8-13.
[54] *Interagency 316(a) Technical Guidance Manual* § 3.5.2.1 (1977).
[55] *RIS Selection, supra* note 47, at 4-5, 9-10, 12-13.
[56] *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).
[57] Ken Hickey & Peter Shanahan, *Review of Vermont Yankee Thermal Discharge Permit Requirements & Analysis of Connecticut River Water Temperature & Flow (Vermont Yankee Analysis)* 1 (HydroAnalysis 2012).

22.5 miles downstream.[58] HydroAnalysis looked at temperature and flow data from May – September for the years 2006 – 2010 and found, among other things, that actual temperature rise as Station 3 "exceeded Station 3 permitted temperature rise on 58% of days during the study period and during 74% of June days."[59] It also found that: "Actual temperature rise at the fishway exceeded permitted temperature rise on 73% of days during the study period and 96% of days in 2008."[60] Two key recommendations were to:

> 1. Replace Equation 1.1 with a more appropriate, accurate, and protective approach.
> 2. Conduct a fisheries review of the water temperature measurements in the fishway and throughout the entire thermal plume, extending beyond 22.5 miles below Vernon Dam, to evaluate the potential for harm to fish and likelihood of avoidance due to elevated water temperatures.[61]

9. A 2012 United States Fish & Wildlife Service letter to ANR documented numerous concerns and uncertainties regarding Vermont Yankee's thermal discharge.

Kenneth Sprankle, the Connecticut River Coordinator for the United States Fish and Wildlife Service (USFWS), documented numerous concerns and uncertainties regarding Vermont Yankee's thermal discharge in a March 2012 letter to ANR.[62]

The letter referenced several recent studies coming to the well-known conclusion that "[r]iver water temperature is one of the single greatest cues and physical variables to influence fish behavior, physiology, migration, movement, feeding, growth, maturation, spawning, egg and larval development, resilience to pathogens (stress), and survival."[63] It then raised concerns with the migratory windows in Vermont Yankee's current expired permit. For example, the plant was allowed to discharge excess heat during the annual smolt run (when salmon smolts migrate downstream), from April 1 until the plant reduces its heated discharge on May 16, which may negatively impact survival rates.[64] Though the Environmental Advisory Committee had been requesting smolt studies for more than five years, Vermont Yankee's delay had been "ongoing," and USFWS advised: "Until results on an agency approved study(ies) are completed, the 13.4^{o} F increase should not be permitted during the smolt passage period as it leaves many important unanswered questions . . . ."[65] Juvenile shad and herring face similar challenges, with Entergy discharging high heat during a good portion of the outmigration season.[66] Of this, USFWS stated that "[t]he Service has seen no evaluations of how juvenile shad and blueback herring

[58] *Id.* at 1, 11.
[59] *Id.* at 13.
[60] *Id.*
[61] *Id.* at 14.
[62] Letter from Kenneth Sprankle, USFWS, to Deborah Markowitz, Secretary, Vermont ANR (USFWS Letter) (March 16, 2012).
[63] *See id.* at 1 (citations omitted).
[64] *Id.* at 2.
[65] *Id.*
[66] *Id.* at 6.

outmigration may be impacted in the immediate vicinity of the heated discharge as well as downstream in the artificially warmed river."[67] Additionally, high temperatures at the tailrace (base of Vernon Dam) raised serious negative implications for adult upstream migration.[68]

Mr. Sprankle also discussed telling data from a 2011 Shad Movement Study (Sprankle & Castro-Santos) in which 40 radio-tagged shad passed Turners Falls but none passed Vernon; 36 of these fish had come within at least .4 mile of Vernon Dam and many had spent more than a week there.[69] USFWS temperature data for the same time period showed elevated temperatures in Vernon Pool.[70]

The letter also explained that a comparison of USFWS temperature readers while Vermont Yankee was offline and online showed that there was "no appreciable increase to water temperature" between the upstream reference site and Vernon Dam during the offline period (indicating that the sun is not responsible for heating within Vernon Pool).[71] It went on to raise concerns about the actual temperature of Vermont Yankee's discharge (which Vermont Yankee has said it does not monitor) in relation to the River and the risks of "heat shock."[72]

Then, it highlighted the need to consider population resilience when so many diadromous fishes are suffering dramatic declines "with identified threats including warm water discharges and climate change."[73] Of particular concern are the endangered or troubled species of the Connecticut, including American shad, blueback herring, American eel, Atlantic salmon, and shortnose sturgeon.[74] Finally, in light of these stressors and the threat of climate change, USFWS suggested "closed cycle cooling" as a "measure that would help buffer the anticipated increase in Connecticut River water temperatures due to climate change."[75]

In essence, this letter raised serious unanswered questions about Vermont Yankee's thermal discharge during each period of plant operation—smolt outmigration, adult shad up migration, juvenile shad outmigration, and "winter." It also described a study in which Vermont Yankee's discharge was a potential cause of failed adult shad passage at Vernon Dam.

To date, no studies have been done to address the information gaps and concerns identified in this letter.

---

[67] *Id.*
[68] *Id.* at 3.
[69] *Id.* at 3-4.
[70] *Id.* at 4.
[71] *Id.* at 5.
[72] *Id.*
[73] *Id.* at 7 (citation omitted).
[74] *Id.*
[75] *Id.*

10. Testimony in the Public Service Board proceeding identified serious gaps in the information needed for a thermal variance and raised concerns about Vermont Yankee's effects on fish populations.

Several witnesses who testified before the Public Service Board in Vermont Yankee's Certificate of Public Good proceeding added to the chorus of concern regarding Vermont Yankee's hot-water discharges. Summaries of some of the pre-filed testimony are provided below.

Kenneth M. Cox (ANR witness)

Ken Cox, an ANR Fisheries Biologist working on Vermont Yankee's permit, sponsored Mr. Sprankle's letter (described above) and testified that it was "a good summary of the concerns related to fisheries."[76] He stated that he agreed with "the concerns that Mr. Sprankle has raised regarding the impacts of temperature on the behavior and physiology of fish."[77] He continued:

> The letter identifies important gaps in information regarding the impacts of [Vermont Yankee's] thermal discharge. I share the concerns of Mr. Sprankle and other members of the EAC [Environmental Advisory Committee] regarding the lack of information defining the full extent and characteristics of [Vermont Yankee's] thermal plume and the potential impacts of the thermal plume on Atlantic salmon smolts . . . and adult and juvenile American shad.[78]

Mr. Cox explained the bases for his concerns as including uncertainty about the mixing and extent of the plume and its particular effects on sensitive life stages of diadromous species, "set[ting] the stage for significant impacts on the biological needs of fish."[79] He explained that the extent of the thermal plume was troubling because two previous assessments had "indicate[d] temperature increases ha[d] been observed as far as 58 miles downstream in the vicinity of Holyoke Dam under certain river flows and [Vermont Yankee] operating conditions."[80] He stated that "winter period" discharges (13.4°F increase) may "compromise survival" because they overlap with migration periods of both shad and salmon, and may also affect blueback herring.[81] He also noted habitat degradation concerns regarding the federally endangered shortnose sturgeon.[82] Finally, he testified that there could be "potentially significant impacts" associated with Vermont Yankee's cooling water intake structure.[83]

Mr. Cox also identified numerous instances where Entergy delayed—and continues to delay—providing information to ANR:

---

[76] Prefiled Testimony of Kenneth M. Cox, Docket No. 7862, at 3 (Vt. Pub. Serv. Bd. Oct. 22, 2012).
[77] *Id.*
[78] *Id.* at 3-4.
[79] *Id.* at 6.
[80] *Id.* at 7.
[81] *Id.* at 9-12.
[82] *Id.* at 13.
[83] *Id.* at 14.

> The Agency and the EAC have raised these concerns to [Vermont Yankee] going back a[t] least as far as 2004, and the Agency has requested [Vermont Yankee] conduct studies to assess thermal impacts on salmon smolts and shad adults and juveniles. Additionally, the Agency requested that [Vermont Yankee] determine the full extent and character of its thermal plume. To date no substantive data or results have been provided to the Agency pertaining to any of these requests.[84]

Marcia Greenblatt (Department of Public Service witness)

Marcia Greenblatt, a Water Resources Engineer with the group Integral Consulting, Inc. also sponsored Mr. Sprankle's letter, as well as the two HydroAnalysis reports commissioned by CRWC.[85] She testified that there was insufficient evidence to conclude that Vermont Yankee was not adversely affecting the Connecticut River.[86] She stated: "There is substantial uncertainty surrounding the impacts of thermal discharge from [Vermont Yankee]. My evaluation identifies concerns with the applicability and the protectiveness of the thermal discharge limits currently regulating [Vermont Yankee]."[87]

In particular, Dr. Greenblatt testified to the limitations of Equation 1.1 and stated that the "actual contributions of the thermal discharges from [Vermont Yankee] may be greater than the values calculated by Equation 1.1."[88] For example, she noted that the USFWS temperature data referenced in Mr. Sprankle's letter showed that "temperatures were generally higher after passing through the Vernon Dam and [Vermont Yankee] while [Vermont Yankee] was in operation."[89] Further, because Entergy's 2004 hydrothermal model did not extend to the downstream monitoring station, the model did not "show compliance with the NPDES permit."[90]

Dr. Greenblatt also explained, as HydroAnalysis had, that Entergy's 2004 hydrothermal model suffered from important flaws, including a failure to apply time-varying scenarios, a failure to assess the extent of the plume, and a failure to assess any temperature increase in combination with prior increases.[91] She continued: "Without [an evaluation of downstream impacts], it cannot be determined if the increased limits in the existing permit are protective of the communities downstream."[92] She concluded that the evidence she had reviewed did not convince her that Vermont Yankee's discharges were not adversely affecting the aquatic ecosystem, and noted as particularly concerning elevated temperatures at the downstream monitoring station and in the fish ladder.[93]

---

[84] *Id.* at 6-7. *See also id.* at 8 (referencing delay in implementation of 2008 study plan to assess thermal plume) and 13 (noting that concerns about juvenile shad outmigration had not been addressed by Connecticut River studies).
[85] Prefiled Testimony of Marcia Greenblatt, Docket No. 7862 (Vt. Pub. Serv. Bd. Oct. 22, 2012).
[86] *Id.* at 16-17.
[87] *Id.* at 17.
[88] *Id.* at 6-8.
[89] *Id.* at 9-10 (also noting that "a graphical review of these data during this time period suggests they behave reasonably and as expected").
[90] *Id.* at 11.
[91] *Id.* at 12-15.
[92] *Id.* at 15.
[93] *Id.* at 15-16.

John Samuelian (Department of Public Service witness)

John Samuelian, Senior Managing Scientist at Integral Consulting, Inc. sponsored Mr. Sprankle's letter, the Midwest Biodiversity Institute report commissioned by CRWC, and several scientific studies on American shad and anadromous species.[94] Dr. Samuelian summarized the concerns raised in Mr. Sprankle's letter and the conclusions of the scientific studies.[95] He recommended: examining Vermont Yankee's plume during spawning and migration periods to determine whether the plume is adversely affecting fish, including adverse, compounded effects that may reduce iteroparity (multiple spawning over the course a lifetime); considering the Castro-Santos and Letcher (2010) model to help assess impacts on shad, including additional model scenarios or refinements, and; examining the thermal gradient of Vermont Yankee's plume to assess impacts on shad during sensitive life stages.[96] He also noted that MBI's thermal tolerance metrics should be used to help assess impacts to fish species.[97]

In sum, he found that the information he reviewed was insufficient to support a conclusion that Vermont Yankee would not adversely affect the River:

> [B]ased on the concerns raised by the USFWS, there are too many unknowns to conclude that thermal discharges are not negatively affecting fish in the Connecticut River. Recent studies and peer-reviewed articles raise serious questions concerning whether the heated effluent discharged from [Vermont Yankee] is causing adverse impacts on species in the Connecticut River. In particular, there are substantial concerns about thermal discharges that coincide with sensitive life stages (e.g., spawning runs, egg hatching, larval development) of representative species. Moreover, there is a lack of scientific information on winter ecology applicable to this reach of the Connecticut River and additional concern about the compounding effect of climate change. In summary, there is significant uncertainty surrounding the impacts of [Vermont Yankee's] thermal discharge on fish species, and Entergy has not provided sufficient information or data analyses to allow me to conclude that [Vermont Yankee] is not adversely affecting fish species in the Connecticut River.[98]

Peter Shanahan (CRWC & Vermont Natural Resources Council witness)

This testimony built upon the August 2012 report by HydroAnalysis, explaining in detail why the use of Equation 1.1 to measure compliance with temperature limits was inappropriate. In sum, variations in river flow and in the heat rejection rate from the Vermont Yankee plant violate

[94] Prefiled Testimony of John Samuelian, Docket No. 7862 (Vt. Pub. Serv. Bd. Oct. 22, 2012).
[95] *Id.* at 4-11.
[96] *Id.* at 9-11.
[97] *Id.* at 11-12.
[98] *Id.* at 12.

the assumptions underlying the Equation, with the result that "actual river temperatures are being increased above the amount anticipated by Equation 1.1."[99]

11. A 2012 ANR letter to Entergy reaffirmed the need for more studies and the lack of existing information adequate to support Vermont Yankee's variance.

In an October 19, 2012 letter to Entergy, ANR requested numerous pieces of extensive information from Entergy in relation to both 316(a) and 316(b) analyses.[100] Relative to 316(a), the agency requested: a study proposal for American shad (which studies were requested in 2006), supplemental materials related to a salmon smolt study, the complete raw time series temperature data set collected for Entergy's 2004 hydrothermal model, and all raw temperature data collected by Vermont Yankee from 1967 to present.[101]

The agency stated that "[t]he effects of the Entergy thermal discharge on American shad migrations and seasonal residency in vicinity of Vernon dam and downstream have not been adequately investigated."[102] The agency also stated that, in order to "fully evaluate the renewal permit application," it would need to "reexamine[e] Entergy's hydrothermal model and the calculations for determining compliance with the thermal discharge permit."[103]

12. The Report of the multi-agency Environmental Advisory Committee for Vermont Yankee's NPDES permit unequivocally recommended that the plant operate in closed-cycle mode for the remainder of its operation.

On November 12, 2013, the Vermont Yankee Environmental Advisory Committee submitted a formal recommendation to ANR regarding Vermont Yankee's NPDES permit. The EAC unequivocally recommended:

> In consideration of the VANR issuing a new/amended NPDES permit for the VY project, the EAC recommends Entergy be required to operate the project in closed-cycle mode year-round (i.e., reversion to the use of cooling towers) at least until the outstanding concerns regarding the effects of VY's thermal discharge on biota of the River, discussed below, have been satisfactorily assessed and accepted by the VANR and other state and federal fishery agencies with interests in and responsibilities for the wellbeing of resident and anadromous fish populations in the River.[104]

The 25-page Report identified numerous deficiencies and concerns with Vermont Yankee's existing, expired permit. First, the Report recommended adjustments to the seasons in the permit

---

[99] Prefiled Surrebuttal Testimony of Peter Shanahan, Ph.D., P.E., Docket No. 7862 5, 12 (Shanahan PSB Testimony) (Vt. Pub. Serv. Bd. May 6, 2013).
[100] Letter from Justin Johnson, ANR, to Lynn DeWald, Entergy (Oct. 19, 2012).
[101] *Id.* at 3-5.
[102] *Id.* at 3-4.
[103] *Id.* at 5.
[104] *Vermont Yankee Environmental Advisory Committee Recommendations to Vermont Agency of Natural Resources on Upcoming Vermont Yankee NPDES Permit Renewal* (EAC Report) 6 (Nov. 12, 2013) (emphasis in original).

because "[t]he thermal discharge periods/seasons under which VY currently operates do not correspond with the migration and spawning schedules of anadromous fish species."[105] Second, the Report noted that changes to the River over the years had made it very difficult to assess the health of Representative Important Species and recommended the plant operate in closed-cycle for a period of years in order to establish a new baseline.[106] Relatedly, the Report identified the need for a better ecological monitoring program based upon a new baseline, rather than upon data from 1991—which Entergy had refused to implement.[107] It also recommended monitoring different age and size classes within species and finding an adequate control site, and generally reviewing the program in order to ensure proper field procedures, data analyses, and products.[108]

Third, the Report explained that "[t]he full extent of VY's thermal effect on the River from the point of discharge and downstream is not currently known or understood."[109] Specifically, and consistent with CRWC's previous expert reports, the EAC Report noted:

> Binkerd et al. (1978) and Luxenberg (1985) determined downstream thermal effects attributed to VY's discharge may extend as far as the Holyoke Dam. Entergy contends its influence on the River is much shorter; however, no irrefutable data have been provided to support this.[110]

As a result, the EAC firmly recommended that "Entergy undertake field studies employing the best technologies available to ascertain the maximum downstream effect range of its thermal influence on the River."[111] Later, the Report also identified concerns that the River's thermal regime had increased over the decades and that Vermont Yankee had contributed to that increase, thereby affecting shad populations.[112]

The bulk of the Report was focused on a series of recent research documenting "negative thermal impacts to anadromous fishes," specifically adult American shad, juvenile American shad, shortnose sturgeon, and also diadromous species.[113] The Report explained that the "significant decrease" in shad passing from Turners Falls Pool into Lower Vernon Pool "continue[d] to be of concern" to the EAC, and noted several possible causes that included temperature influences from Vermont Yankee's discharge.[114] Shad might detect a temperature differential approaching Vernon ladder; they might be bioenergetically stressed from upward migration and temperature increases near Vermont Yankee; they might spawn prematurely and halt upward migration because of higher temperatures caused by Vermont Yankee, and; there might be structural issues with Vernon ladder or any combination of these factors.[115]

---

[105] *Id.*
[106] *Id.* at 9.
[107] *Id.* at 10.
[108] *Id.* at 11.
[109] *Id.* at 9.
[110] *Id.*
[111] *Id.* at 10 (emphasis in original).
[112] *Id.* at 21-22.
[113] *Id.* at 11-19.
[114] *Id.* at 13.
[115] *Id.*

The Report also raised concerns about entrainment and impingement, explained below. (See Part III.D.)

Finally, the EAC emphasized that "closed-cycle operation should be implemented as soon as possible including 2014."[116]

II. CRWC supports provisions in the Draft Permit that make it more protective of the Connecticut River than the current, expired permit.

Given the refrain of concerns raised above—showing that there is *no* assurance whatsoever that Entergy's current permit meets CWA standards—and DEC's legal obligation to write an adequate permit, CRWC fully supports revisions to Vermont Yankee's permit to the extent that they provide some long-overdue, much-needed protections for fish populations in the River.

A. DEC's rejection of Equation 1.1 is proper.

CRWC supports the agency's conclusion that Equation 1.1 "is not an adequate method of determining the increase in river temperature above ambient."[117] As explained at length in the August 2012 HydroAnalysis Report and Dr. Shanahan's Public Service Board testimony, the Equation does not adequately measure actual temperature rise in the River.

CRWC also agrees that the Clean Water Act does not give industry a "sun allowance" when it heats a water body over natural temperatures. The Draft Fact Sheet stated: "The Agency does not agree that an applicant for a variance from thermal limitations must only address its contribution."[118] Instead, the Act is very clear: an industry must prove that its discharge will assure the protection and propagation of aquatic species and it must take into account "all other significant impacts on the species affected."[119] One such "significant impact" could be global climate change, and the NPDES Permit Writers' Manual specifically calls for its consideration in the evaluation of 316(a) variances:

> **Climate Change Considerations**
> Evaluation of requests for variances under CWA section 316(a) requires consideration of the change to the ambient water temperature because of an effluent discharge. The studies provided by applicants to support their requests frequently include historical thermal data for the receiving water. Permitting authorities should be aware that the effects of global climate change could alter the thermal profile of some receiving waters making the historical record of thermal conditions less representative of future conditions. Where appropriate, water quality models should take these potential changes into account.[120]

[116] *Id.* at 22.
[117] Draft Fact Sheet at 6.
[118] *Id.*
[119] *See* 33 U.S.C. § 1326(a); 40 C.F.R. § 127.73(a).
[120] *NPDES Manual, supra* note 17, at 5-43.

B. DEC's decision to take into account sensitive life stages of migratory fishes is proper.

The best option for protecting fish species in the River is to require Vermont Yankee to use its existing cooling towers year-round, as recommended by the EAC. However, DEC's decision to modify the seasons for which there are different permit limits in the Draft Permit is an improvement over the existing, expired permit. The new Spring Period (April 1 – June 30) appears to cover the downstream passage window for Atlantic salmon smolts as well as a portion of adult herring, shad, and salmon up migration and adult shad downstream passage.[121] The new Fall Period I (September 16 – October 15) appears to cover some juvenile shad downstream passage and adult salmon up migration.[122] The new Fall Period II (October 16 – November 15) appears to cover some adult salmon upstream and downstream migration, and some juvenile shad outmigration.[123] To the extent that these new seasonal categories provide more protection for sensitive life stages of fishes in the River, they are valid revisions under the Clean Water Act. However, as explained more fully below, DEC has failed to explain how these particular time periods with their particular ambient caps are sufficient to meet the standard of protection required under the CWA. In addition, we have concerns that the ambient caps and associated monitoring are not sufficient to protect the River's aquatic species.

III. DEC should require closed-cycle cooling in this permit.

ANR, experts, and other agency officials have been requesting studies from Entergy for years. They have stated that there is inadequate information to support Entergy's variance. Today, none of the recommended studies has been conducted and there is still inadequate information to support Entergy's variance. DEC should require the plant to meet the VWQS for temperature—1.0ºF above ambient—and operate in closed-cycle mode, as recommended by the EAC after many, many months of careful deliberation and thorough review. In the absence of requiring Vermont Yankee to operate in closed-cycle, DEC should, at a minimum, explain how the ambient cap limits are sufficiently stringent to assure the protection and propagation of a balanced, indigenous population of fish in the River as required by the CWA, or change those limits.

A. DEC has not explained how Vermont Yankee's continued use of Equation 1.1 will assure protection of the BIP.

It is not clear how, in practice, Vermont Yankee's continued use of Equation 1.1 will not lead to the same problems that use of the Equation has led to over the past many years, especially given multiple concerns with the ambient cap regime, discussed below.

---

[121] *See* USFWS Letter, *supra* note 62, at 2 (identifying smolt period as April 1 – June 15); EAC Report, *supra* note 104, at 8.
[122] *See* EAC Report, *supra* note 104, at 8 (identifying operation dates of upstream and downstream passages at Vernon).
[123] *See id.*

In addition, Vermont Yankee's "ability to make operational changes"[124] is not a sufficient reason to allow the plant to continue using a compliance formula that does not satisfy VWQS or § 316(a)'s mandate to assure protection and propagation of the BIP. The Clean Water Act is clear that, absent limited flexibilities not applicable here, costs are not to be considered when setting water quality-base effluent limitations in permits. As put in a recent Environmental Appeals Board decision: "[T]he legal standard is that cost and technological considerations are not factors in setting water quality-based effluent limits. Rather, section 301(b)(1)(C) of the CWA requires unequivocal compliance with applicable water quality standards, and does not recognize an exception for cost or technological infeasibility."[125]

In order to solve this problem, to protect the BIP and to ensure that the plant does not continue to utilize an invalid compliance formula, DEC should require Vermont Yankee to operate in closed-cycle cooling mode.

B. DEC has not explained how the permit's unchanged Winter limits are sufficient to protect fish species.

Though the Winter period is shorter in the Draft Permit than in Entergy's existing, expired permit, the temperature limits are unchanged. In particular, the Draft Permit still allows Vermont Yankee to increase river temperature 13.4ºF above ambient as measured by Equation 1.1 at Station 3. DEC has not explained how allowing this temperature increase will protect fish against the risks of thermal shock, especially given that temperatures in Vernon Pool are likely to be significantly higher than temperatures at Station 3, which is almost a mile and a half downstream from the discharge point. Though Vermont Yankee does not monitor, and is not required to monitor, the temperature of its discharge, we do know that it can approach 100 ºF.[126]

With good reason, USFWS expressed concern about "heat shock" in its March 2012 letter.[127] Various scientific studies have explained that thermal shock (cold shock or heat shock) can be dangerous for fish and should be taken into account when setting temperature limits. For instance, a study from Ohio evaluated some of the effects of thermal discharge on Lake Erie fish. It found that the fish were at risk of negative impacts from cold-shock, particularly during winter months when the fish were drawn to thermal plumes.[128] A 1977 EPA paper found that determining species-specific temperature criteria is important for ensuring the protection and propagation of a biological indigenous population. In particular, the paper recommended establishing winter temperatures that protect against harm from temperature fluctuations or elevated acclimation temperatures.[129] Another paper illustrated how rapidly maximum

[124] Draft Fact Sheet at 6.
[125] *In re City of Attleboro, MA Wastewater Treatment Plant,* 2009 WL 5326324, NPDES Appeal No. 08-08 (Envtl. App. Bd. Sept. 2009).
[126] Email from Lynn DeWald, Entergy, to Ken Sprankle, USFWS (Feb. 21, 2012).
[127] USFWS Letter, *supra* note 62, at 5.
[128] Jeffrey M. Reutter & Charles E. Herdendorf, *Thermal Discharge from a Nuclear Power Plant: Predicted Effects on Lake Erie Fish*, 76 Oh. J. Sci. 39 (1976).
[129] William A. Brungs & Bernard R. Jones, U.S. EPA, *Temperature Criteria for Freshwater Fish: Protocol and Procedures* 160 (May 1977).

temperatures decrease after an abrupt shutdown, and the resulting impact on fish from this rapid decrease.[130] Another article, though not focused on winter discharges, discussed some of the negative impacts of cold and heat shock on fish and described some steps that the Oyster Creek facility in New Jersey took to reduce those impacts.[131]

DEC has also not explained how the Winter limits will ensure adequate habitat for yellow perch and walleye, with yellow perch already suffering a high rate of impingement and entrainment.[132] This has been a subject of discussion amongst EAC members in which the protective winter chill requirements of the Mirant Kendall permit (for a power plant in Cambridge, Massachusetts), as well as yellow perch temperature papers, were offered for consideration.[133] In The Draft Permit for Merrimack Station in New Hampshire, EPA concluded that "thermal conditions within the discharge canal are not protective of yellow perch during their winter period of gonadal development or their spring spawning period, nor are they protective of yellow perch eggs and larvae should spawning take place in the canal."[134]

C. DEC has not explained how the new ambient cap regime is sufficient to protect fish species.

CRWC supports DEC's determination that "actual temperature measurements should be utilized to measure compliance with thermal limits."[135] However, we have serious concerns that the caps in the Draft Permit are geographically and spatially insufficient, are triggered by insufficient sampling data in terms of the time scale (hourly versus real time fluctuations), and are too high to protect fish in the River.

1. There should be temperature probes and ambient cap limits in Vernon Pool, the fish passages, and downstream at least as far as Station 3.

Station 3 is almost a mile and a half downstream from Vermont Yankee's discharge point. It should not be the sole point at which temperatures are monitored in order to determine compliance with Vermont Yankee's NPDES permit. As mentioned above, the discharge point in

---

[130] David A. Pilati, *Cold Shock: Biological Implications and a Method for Approximating Transient Environmental Temperatures in the Near-field Region of a Thermal Discharge,* 6 Sci. Total Env't 227 (1976).

[131] Michael J. Kennish et al., *Anthropogenic Effects on Aquatic Communities*, *in* Lecture Notes on Coastal and Estuarine Studies: Ecology of Barnegat Bay, New Jersey 318 (1984). *See also* U.S. E.P.A., *Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* 33 (2003) (discussing thermal shock and related concerns).

[132] *See* EAC Report *, supra* note 104, at 20.

[133] Email chain re: Winter Chill Period for Yellow Perch in the Lower Charles (Mar. 26, 2012) (Gabriel Gries, Gerald Szal, Caleb Slater, Carol Carpenter, David Neils, Ken Cox, Will Lael, Melissa Grader, Rich Langdon, Ken Sprankle).

[134] U.S. E.P.A., *Merrimack Station Draft Permit Fact Sheet Attachment D: 8.3.1.8 - Thermal Effects in the Discharge Canal* (2011). *See also* Kenneth E.F. Hokanson, *Temperature Requirements of Some Percids and Adaptations to the Seasonal Temperature Cycle*, 34 J. Fish. Res. Board Can. 1524 (1977) (discussing minimum winter temperatures necessary for successful yellow perch and walleye reproduction) (utilized by EPA in developing draft permit for Merrimack Station in New Hampshire).

[135] Draft Fact Sheet at 6.

Vernon Pool approaches 100 ºF, though we do not know how often, for how long, in what amount, whether it goes higher, or how long the plant discharges at other temperatures. DEC should require monitoring of this temperature and potential temperature fluctuations. As explained in a USFWS email: "[Vermont Yankee] should have temperature probes in the discharge for what is going into the river for discharge. That has implications for organisms that encounter that plume of water in whichever direction they are heading in that reach either on their own power, drifting, or some combination of the two."[136]

Water from the Vernon Pool takes from three to twelve hours to travel to Station 3.[137] Entergy's previous hydrothermal model has been discredited or, at the least, recognized as inadequate.[138] Therefore, setting an ambient cap at Station 3 is going to do little, if anything, to protect fishes between the discharge point and Station 3, especially when, for example, even the upper lethal thermal tolerance level for American shad does not approach 100 ºF (approximately 37.8ºC).[139] In effect, this gives Vermont Yankee a huge mixing zone in which to harm fish species and in which the § 316(a) standards are not met, especially given that the EAC has expressed concern that "[t]emperatures in the Vernon Tailwater and LVP [Lower Vernon Pool] could also be physiologically disadvantageous to adult shad."[140] Further, there is no indication that Vermont's mixing zone criteria would be met even if Vernon Pool and downstream were intended as a mixing zone; those criteria provide that mixing zones must "[n]ot constitute a barrier to the passage or movement of fish" or prevent the full support of uses outside the zone, must "[n]ot kill organisms passing through the mixing zone," and must "[p]rotect and maintain the existing uses of the waters."[141]

Additionally, temperatures in the fishway are routinely much higher than at Station 3. As explained in the August 2012 HydroAnalysis Report, and using Vermont Yankee's data: "Actual peak temperature rises at the fishway were typically more than 2°F higher than the permitted rise and were sometimes more than twice the permitted temperature rise. Maximum actual peak temperature rise at the fishway exceeded 10°F when the permitted temperature rise was 3°F."[142] The Report continued: "Actual temperature rise at the fishway exceeded permitted temperature rise on 73% of days during the study period and 96% of days in 2008."[143] The earlier HydroAnalysis Report had noted "a need for thermal conditions of the Vernon Dam Fishway to be more thoroughly characterized."[144] In 2008, the Environmental Court was so concerned about adult shad outmigration in the fishway that it attempted to add a condition to

---

[136] Email from Ken Sprankle, USFWS, to Lynn DeWald, Entergy (USFWS Email) (Feb. 21, 2012).
[137] Shanahan PSB Testimony, *supra* note 99, at 13-15 (referring to testimony from Vermont Yankee witness).
[138] *See, e.g.,* Justin Johnson Letter, *supra* note 39 (April 26, 2011; *Thermal Review, supra* note 41; Cox PSB Testimony, *supra* note 76; Greenblatt PSB Testimony, *supra* note 85; Justin Johnson Letter, *supra* note 100 (Oct. 19, 2012).
[139] *See* Chris O. Yoder, *Development of a Database for Upper Thermal Tolerances for New England Freshwater Fish Species (Thermal Tolerances)* A-5 – A-6 (MBI 2012).
[140] EAC Report, *supra* note 104, at 14.
[141] VWQS § 2-04.a.2.
[142] *Vermont Yankee Analysis, supra* note 57, at 13.
[143] *Id.*
[144] *Thermal Review, supra* note 41, at 27.

Vermont Yankee's permit.[145] In fact, existing literature shows that the physiological optimum temperature for juvenile American shad, depending on relevant factors, is around 59-77°F, and that the upper lethal temperature is around 93-95°F.[146] Fishway temperatures have exceeded optimum range too often, with the August 2012 HydroAnalysis Report showing exceedances for the May-September periods in 4 of 5 years and temperatures climbing over 80°F in 2008 and 2010.[147] Given that the fishway is about one half mile downstream from the plant, juvenile shad would need to travel through even hotter temperatures to reach the fishway.

Finally, any ambient cap at Station 3 itself should be sufficiently conservative to account for the facts that the nature and extent of Vermont Yankee's plume have not been established (and may well extend 55 miles downstream), and that the temperatures downstream of the dam do not represent a completely mixed River.[148]

2. The temporal unit of measure for the ambient caps should be more frequent than an hourly average.

Temperature in the Connecticut River near the Vermont Yankee facility fluctuates widely and frequently. Therefore, during periods of fluctuation, an hourly average ambient cap measurement may not be protective of fish species, and DEC has failed to explain how its decision to use an hourly average is sufficient to protect fish species.

As Dr. Shanahan explained in his testimony before the Public Service Board when referring to temperature data from June 2007 and June 2010:

> The minute-to-minute measurements at Station 7 are shown with a brown line and match the hourly measurements fairly closely. However, the minute-to-minute measurements at Station 3 vary continuously over time with the result that those data appear as a light-green band behind the red line showing the hourly data. What this shows is that *temperature downstream of the Vermont Yankee thermal discharge is constantly fluctuating from minute-to-minute*. . . . The extent of fluctuation varies over time, but is more than 1 degree on many occasions punctuated with occasional upward "spikes" that create a total fluctuation of nearly 2 degrees. Exhibit 3 shows a 12-hour portion of the record from Exhibit 3 in detail and *the temperature fluctuations in the minute-to-minute measurements are readily apparent. There are continuous ups and downs in the temperature, including, for example, a roughly two degree temperature spike at around 7:40pm.* Exhibit 4 shows a graph for June 22 through 28, 2010, a period of time that shows the same characteristic low-flow pattern as the June 23- 29, 2007 period. During the June 2010 time period shown in Exhibit 4 . . . upstream Station

[145] *See In Re Entergy Nuclear,* Vt. Envt'l Ct. (May 22, 2008), at 34.
[146] *Thermal Tolerances, supra* note 139, at A-6.
[147] *Vermont Yankee Analysis, supra* note 57, Figures 1-29.
[148] *See, e.g.,* Justin Johnson Letter, *supra* note 39 (April 26, 2011) (plume not assessed); Shanahan PSB Testimony, *supra* note 99, at 16 (not completely mixed); *Thermal Review, supra* note 41, at 5-10 (thermal influence extends to Holyoke).

> 7 does not show significant temperature fluctuations in the minute-to-minute data. In contrast, *the minute-to-minute record for Station 3 shows a pattern of constant temperature fluctuation* similar to that seen in the June 2007 record for Station 3.[149]

In describing the temperature increases between Station 7 and Station 3, Dr. Shanahan continued:

> The minute-to-minute data show that those temperature increases are frequently even greater than revealed by our prior analysis of the hourly data. Moreover, *the data show that any aquatic life in the river near Station 3 experience a regime of constantly fluctuating temperature*, which, as demonstrated by the data for Station 7, is not present upstream of the [the plant] where river waters are not affected by the plant's thermal discharge.[150]

The USFWS has also expressed the importance of using "fine time scale data."[151] The USFWS requested this data from Entergy so as "not to lose the high values that are potentially dampened by the lows with whatever variability occurs."[152] Mr. Sprankle explained: "Different species and life stages have different responses to exposures and how rapidly they occur, I want to better understand the scenarios with all the dynamic components."[153]

Given the minute-to-minute variable, fluctuating temperatures downstream of Vermont Yankee's discharge and the potential for impacts to fish species under these dynamic conditions, DEC should have established ambient caps for a more frequent unit of time. The unit of measure should ensure protection of the BIP taking into account various thermal tolerance thresholds.[154]

3. The ambient caps should be set at levels that actually ensure the protection and propagation of fish species in the River.

In addition to our points above regarding the need for ambient cap limits in Vernon Pool, the fish passages, and downstream to at least Station 3, CRWC is concerned that the existing limits at Station 3 are not protective of aquatic species.

For the Winter Period, DEC has not explained how the ambient cap at Station 3 (65ºF) is sufficient to assure that resident fishes have sufficient habitat. For the Spring Period, DEC has not explained how the ambient cap at Station 3 (71ºF) is sufficient to protect, for instance, shad up migration and spawning, juvenile shad rearing, salmon smolt outmigration, and adult salmon up migration and spawning. Seventy-one degrees Fahrenheit is above the commonly accepted

[149] Shanahan PSB Testimony, *supra* note 99, at 8-9 (emphasis added).
[150] *Id.* at 10 (emphasis added).
[151] USFWS Email, *supra* note 136 (Feb. 21, 2012).
[152] *Id.*
[153] *Id.*
[154] *See, e.g., Thermal Tolerances, supra* note 139, at 4-5.

spawning temperature for shad, meaning that if the temperature at Station 3 is 71ºF, shad are likely to stop their up migration and spawn without attempting to go further:

> In spring, sexually mature shad begin to enter their home rivers when the water temperature rises through six degrees Celsius, and they spawn when the temperature is between sixteen and twenty-two (sixty to seventy Fahrenheit). So, in effect, they have brackets around them. . . . "It is fairly well established that when water temperature gets to twenty-one they slow down, and by twenty-two they stop. They look for a suitable place to spawn. It's a race against time. If you're a shad, you take every opportunity to get as far upstream as you can, past every obstacle, before the water temperature reaches twenty-one degrees."[155]

The EAC has also recognized this issue, finding that "any thermal impacts in [lower Vernon Pool] may not be limited to acting directly on rearing juveniles, but also acting on them indirectly by decreasing adult spawning success and/or recruitment to the post-metamorphosed life stage."[156]

For the Summer Period, DEC has left the ambient cap at Station 3 at 85ºF. During the Summer Period, Vernon fish passage remains operational until July 15th because shad may still be migrating upstream,[157] and 85ºF is far above the optimum spawning temperature range. This Period also covers juvenile shad and blueback herring rearing and early outmigration.[158] Available literature shows that the physiological optimum for juvenile shad, depending on relevant factors, is about 59-77ºF and the upper lethal is 93.2--95ºF.[159] Eighty-five degrees far exceeds optimum rearing temperatures for juvenile shad, especially considering that if the temperature at Station 3 is 85ºF, temperatures are higher upstream and in Vernon Pool. Eighty-five degrees also exceeds the outmigration cue for juvenile shad, which is around 61ºF, and thus may delay outmigration for shad that would begin outmigration within this season. Delayed outmigration can have "important negative repercussions on juvenile shad survival as late migrant fish face greater physiological challenges relative to 'early' fish, both during freshwater residence and during seawater entry."[160]

The Fall Periods suffer some of the same deficiencies, though their caps appear to fall within the physiological optimum range for juvenile shad. These periods also serve as rearing and outmigration time for juvenile shad and blueback herring, yet the ambient caps (69ºF and 69ºF) exceed the outmigration cue for juvenile shad.

In sum, there appears to be a serious mismatch between thermal tolerance levels of BIP species and the ambient caps proposed in the Draft Permit, especially given that the ambient caps do not

---

[155] *See, e.g.,* John McPhee, *The Founding Fish* 37-38 (2002) (quoting Boyd Kynard, a fisheries researcher with over 30 years of experience at USGS, USFWS, and the University of Massachusetts – Amherst).
[156] EAC Report, *supra* note 104, at 15.
[157] *Id.* at 8.
[158] *Id.* at 7-8.
[159] *See Thermal Tolerances, supra* note 139, at A-6.
[160] EAC Report, *supra* note 104, at 16 (citing Zydlewski et al. 2003).

even apply to the first mile and a half of thermal discharge in the River. As such, DEC has not explained how the proposed ambient caps are sufficient to protect fish species in the River.

In addition, DEC has not explained how the time that it takes for the Vermont Yankee plant to "reduce the thermal output of the discharge" as necessary to comply with the ambient caps will not harm the BIP. Though the plant is required to reduce thermal output "as soon as possible," the Draft Permit provides no indication of how long this takes in any given scenario. The lag time between exceedance of the ambient cap and reduction of thermal discharge means that harm to fishes can occur while the plant is adjusting to reach temperatures, especially given that the ambient caps themselves are generally not protective and compliance is measured on an hourly average basis.

Further, DEC has not considered the effects that climate change may have on the outmigration timing for fish in the River. DEC should consider these and any other effects climate change may have when setting ambient caps. As explained in the NPDES Permit Writer's Manual, climate change can alter the thermal profile of a River and water quality models should take this into account.[161] Where, as here, the permit applicant has failed to provide sufficient water quality modeling, the agency should be especially diligent in setting ambient caps as low as necessary to assure the protection and propagation of aquatic species.

D. DEC has not explained how anything less than closed-cycle cooling is appropriate under § 316(b).

Section 316(b) of the Clean Water Act requires that permits issued to facilities with cooling water intake structures (CWIS)—such as Vermont Yankee—reflect the "best technology available [BTA] for minimizing adverse environmental impact."[162] The primary "adverse environmental impact[s]" associated with CWIS are mortalities and injuries of fish and other aquatic organisms caused by impingement and entrainment.[163] While EPA estimates that over 3.4 billion fish and shellfish are killed from impingement and entrainment at existing facilities annually, closed-cycle cooling systems can reduce mortality by up to 98 percent as compared to conventional once-through systems.[164]

EPA's new § 316(b) regulations provide seven different technologies as options to satisfy the best technology available standard, including closed-cycle cooling.[165] DEC also has independent authority to require closed-cycle cooling under § 316(b). As noted above, states may have more stringent requirements than those mandated by the CWA.[166] Thus, like the CWA itself, the

---

[161] *NPDES Manual, supra* note 17, at 5-43.
[162] § 316(b), 33 U.S.C. § 1326(b).
[163] Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities (Phase II Rule), 69 Fed. Reg. 41,576, 41,586 (July 9, 2004).
[164] *Id.* at 41,586, 41,601.
[165] U.S. E.P.A., *National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities* 4, 89-90 (Federal Register Notice, Pre-Publication, May 19, 2014) (Pre-Publication Notice).
[166] 33 U.S.C. §§ 1311(b)(1)(C) ("any more stringent limitation"), 1370.

standards developed by EPA pursuant to section 316(b)'s "best technology available" requirement function as a floor, not a ceiling, for minimizing the harmful environmental effects of CWIS.[167]

DEC has not explained how the Draft Permit meets the Clean Water Act's baseline requirement that facilities use the best technology available to reduce impingement and entrainment. Instead, it summarily "finds" that compliance with § 316(a) will equal compliance with § 316(b), presumably because studies to assess "the effects of the cooling water intake structures on the aquatic ecosystem would take longer than" Vermont Yankee's remaining term of operation.[168] However, the Clean Water Act provides no exception to the BTA requirement based on a desire for more studies or length of operation.

Further, agency officials have already concluded that Vermont Yankee should use its cooling towers year-round. The EAC explained that, in some years, the number of juvenile shad impinged on Vermont Yankee's intake structure was a "substantial proportion" of the standing crop index for juvenile shad.[169] In 2005, the number of juvenile shad impinged was 21% of the estimated standing crop; in 2010, it was 12%.[170] There were also concerns about impacts to larval fishes from Vermont Yankee's cooling water intake structure.[171] The EAC Report noted that two RIS species, walleye and white sucker, had been entrained disproportionately to their near-field populations and had also shown declining trends around Vernon Pool since 2008.[172] Further, the fact that "tens of millions of larval fishes" were being entrained each year meant that they were not available for trophic food webs.[173] Therefore, as CRWC has, the EAC took the position that Vermont Yankee's existing cooling towers were the best technology available for reducing entrainment impacts and should be utilized to meet the CWA's § 316(b) standard.[174]

ANR had previously noted, in comments on one of Vermont Yankee's annual ecological reports, that the "2,076 fish recovered from the [CWIS] represents a small fraction of the total number likely impinged and killed."[175] It also noted that "the level of impact on resident species is largely unknown and may be a significant enough factor to not be overlooked in explaining population trends" and that "impingement during periods other than the summer (i.e., the winter period) is . . . poorly understood and should be examined" because it was "possible resident fishes are attracted to warmer water associated with the discharge and are subjected to increased entrainment."[176]

---

[167] *See, e.g., U.S. Steel Corp. v. Train,* 556 F.2d 822, 838-39 (7th Cir. 1977), *abandoned on other grounds by City of West Chicago, Ill. v. U.S. Nuclear Regulatory Comm'n,* 701 F.2d 632, 644 (7th Cir. 1983).
[168] Draft Fact Sheet at 3.
[169] EAC Report, *supra* note 104, at 15.
[170] *Id.*
[171] *Id.* at 19-21.
[172] *Id.* at 20.
[173] *Id.* at 21.
[174] *Id.*
[175] ANR Memorandum from Kenneth Cox, Fisheries Biologist, to Carol Carpenter, Environmental Analyst re: ENVY's "Ecological Studies of the Connecticut River Vernon, Vermont Report 35 January-December 2005" (draft dated May 2006) 1 (Mar. 26, 2007).
[176] *Id.*

Unless and until DEC is able to determine that technology other than closed-cycle cooling is the best available for minimizing adverse environmental impact, DEC should require Vermont Yankee to operate its already existing closed-cycle cooling towers. Anything less does not satisfy the CWA standard.

E. DEC should not eliminate the EAC for purposes of reviewing monitoring studies and making recommendations.

The Draft Permit eliminates the EAC and Part IV provides that Vermont Yankee must submit its annual reports on environmental monitoring and studies to the Secretary (ANR). CRWC is concerned that this will weaken the rigor, resources, and expertise that the EAC should provide in making recommendations regarding Vermont Yankee's discharge. The EAC is comprised of biologists and other agency officials from multiple states and the federal government. It helps to provide interstate perspectives on managing an interstate resource, and helps to ensure that governmental agencies retain some control over the studies and monitoring that Vermont Yankee—the regulated industry—proposes. Eliminating it could have negative consequences for the health of the River especially if, as in this case, Vermont's own environmental agency is more inclined to take a less protective path.

CRWC supports continuing the EAC through final operation, shutdown, and any continued studies on the River. The EAC should:

- Expand its membership to include some or all of the following: specifically interested non-governmental organizations such as CRWC, the United States Geological Survey Conte Lab in Turner Falls, and university scientists with expertise relevant to American shad, other species, and riverine ecosystems.

- Solicit discussion and suggestions from interested or knowledgeable parties who could inform the EAC, review study or monitoring proposals and results, etc.

- Convene stakeholder meetings outside regularly scheduled meetings for input on studies, study parameters, and discussion of study results, Vermont Yankee annual reports, environmental monitoring, and the like.

IV. Additional Comments - Monitoring Procedures

A. Temperature Monitoring

CRWC supports the requirement that Vermont Yankee's temperature monitoring be provided in usable digital format.

However, temperature data should be reported as instantaneous time measurements at a fine time-scale level (e.g., every three minutes), and/or such other instantaneous fine time-scale data as Vermont Yankee collects, in addition to hourly, daily, and monthly means. This will help to

ensure that actual temperatures and temperature ranges—not just hourly or other averages—are reported and observed. (See also Part III.C.2, above.)

B. Larval Fish Monitoring

CRWC is concerned that the time period for larval fish monitoring (May – July 15) may not be sufficient to cover the larval stages of all fishes in the vicinity of the plant, especially given that entrainment of larval fishes was specifically raised as a concern in the EAC Report.[177] The monitoring period is unchanged from the existing, expired permit.

C. Impingement Monitoring

CRWC supports requiring fish impingement monitoring for all months, not just a few months as in the existing, expired permit.

D. Standard Operating Procedures

The Standard Operating Procedures for field sampling, referred to in Part IV of the Draft Permit, are part of Vermont Yankee's NPDES permit and, as such, should be made available for public notice and comment prior to their approval.[178]

V. Recommendations

CRWC recommends that DEC revise the Draft Permit in order to adequately protect the Connecticut River's aquatic species, either through more stringent and additional temporal and geographic ambient caps, or through the requirement that Vermont Yankee meet the VWQS for temperature—1.0ºF above ambient— and utilize its closed-cycle cooling towers as unequivocally recommended by the Environmental Advisory Committee. CRWC also recommends that DEC build upon the strides it has made with this permit by adopting an improved approach to temperature standards and permitting going forward.

Specifically, we recommend that DEC and ANR in coordination with New Hampshire, Massachusetts, and Connecticut water quality and fisheries agencies; USFWS; U.S. EPA.; and the New England Interstate Water Pollution Control Commission, engage in a rule-making or other formal process in order to develop temperature criteria for Vermont's waters as well as a means to effectively implement the criteria into permit conditions. DEC should incorporate

[177] EAC Report, *supra* note 104, at 19-21.

[178] *See* 33 U.S.C. § 1251(e) ("Public participation in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan, or program established by the Administrator or any State under this chapter shall be provided for, encouraged, and assisted by the Administrator and the States.); *Waterkeeper Alliance, Inc. v. U.S. E.P.A.,* 399 F.3d 486, 503-04 (2d Cir. 2005) (holding, among other things, that EPA rule for concentrated animal feeding operations violated CWA because it did not provide for public participation in development and enforcement of nutrient management plans in permits).

these criteria into its triennial adoption of Vermont's Water Quality Standards. We recommend the following sources as helpful:

- *Selection of Representative Important Species for the Connecticut River in the Vicinity of the Vermont Yankee Electric Generating Facility* and *Development of a Database for Upper Thermal Tolerances for New England Freshwater Fish Specie* by Chris O. Yoder (MBI 2012). These reports provide an overview of the first few steps in developing temperature criteria utilizing the Fish Temperature Model developed by Mr. Yoder.
- Dale A. McCullough, *Are Coldwater Fish Populations of the United States Actually Being Protected by Temperature Standards?,* 3 Freshwater Revs. 147 (2010). This article emphasizes the importance of establishing temperature standards and controls that protect all life stages and account for sublethal thermal impacts as well as optimum growth conditions. It offers several recommendations for improved practices, including those from EPA Region 10's 2003 temperature guidance.
- EPA Region 10 Water Temperature Guidance, http://yosemite.epa.gov/r10/water.nsf/1887fc8b0c8f2aee8825648f00528583/ce95a3704aeb5715882568c400784499. These materials describe an approach for developing temperature criteria designed to protect coldwater salmonids as a temperature-sensitive species. It incorporates considerations of thermal tolerances including physiological optimums, different times of year, and different locations.

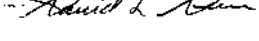
We also recommend that ANR develop revised agency policies, through either a guidance document or rule, demonstrating how the agency will evaluate thermal discharges and associated water quality models, fisheries studies, peer-reviewed literature, and the like. Additionally, we recommend that the agency convene a working group to establish best practices for implementing the Clean Water Act's § 316(b) requirements. The working group should include officials from other states who have expertise in § 316(b) evaluations, including from EPA Region 1 and New York.

Thank you for your consideration of these comments.

Laura Murphy
Associate Director & Assistant Professor, Environmental & Natural Resources Law Clinic
Counsel for Connecticut River Watershed Council & Vermont Natural Resources Council

Andrew Fisk, Ph.D.
Executive Director
Connecticut River Watershed Council

Brian Shupe
Executive Director
Vermont Natural Resources Council



David Deen
Upper Valley River Steward
Connecticut River Watershed Council

Jamey Fidel
General Counsel & Forest & Wildlife Program Director
Vermont Natural Resources Council