

**STATE OF VERMONT
PUBLIC SERVICE BOARD**

Petition of Entergy Nuclear Vermont Yankee, LLC)
and Entergy Nuclear Operations, Inc. for)
amendment of their Certificate of Public Good and)
other approvals required under 10 V.S.A. §§ 6501-) Docket No. 7862
6504 and 30 V.S.A. §§ 231(a), 248 & 254, for)
authority to continue after March 21, 2012,)
operation of the Vermont Yankee Nuclear Power)
Station including storage of spent nuclear fuel)

**REPLY BRIEF
OF THE VERMONT NATURAL RESOURCES COUNCIL
AND THE CONNECTICUT RIVER WATERSHED COUNCIL**

The Vermont Natural Resources Council (“VNRC”) and the Connecticut River Watershed Council (“CRWC”), by and through attorney Jamey D. Fidel, Esq., hereby submit this Reply Brief in the above-captioned matter. Notwithstanding that Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc. (“Entergy”) now seek a certificate of public good (“CPG”) only through December 31, 2014, VNRC and CRWC respectfully rely on its Post Hearing Memorandum of Law and Proposed Findings of Fact and Conclusions of Law (hereinafter “Initial Brief”) and submit that the Public Service Board (“Board”) should review the record presently before it, and conclude that Entergy has failed to meet its burden of proving that the continued operation of the Vermont Yankee Nuclear Power Station (“VYNPS”) will not have an undue adverse effect on the water purity and the natural environment of the Connecticut River.

VNRC and CRWC (hereinafter “VNRC/CRWC”) reply herein to certain proposed facts and arguments by Entergy in its initial post-hearing pleadings. Entergy’s proposed facts and arguments continue to misrepresent the record in this case, and further demonstrate why the Board should find that Entergy has not met its burden of proof under Section 248(b)(5).

I. Introduction

In its initial post-hearing pleadings, Entergy improperly characterizes the burden of proof under Section 248(b)(5), and continues its pattern of misrepresenting the record and the reliability of Equation 1.1. Entergy's Proposal for Decision ("Entergy's Proposal") includes citations to the transcript that are not complete, and in many cases when entire quotes are considered, it shows that witness testimony contradicts Entergy's proposed facts. Many of the incomplete quotes relied upon by Entergy are from the testimony of Dr. Peter Shanahan (and are corrected or clarified herein). Moreover, all of the quotes from the testimony of Dr. Craig Swanson, and relied upon by Entergy, overlook a key admission by Dr. Swanson during his cross-examination; that is the when river flow is below about 17,500 cubic feet per second ("cfs) and only flows through the turbines of Vernon Dam, the water passing through the turbines - and therefore the water that is being mixed - is drawn primarily from the VYNPS thermal plume. Thus, Dr. Swanson acknowledged that the VYNPS thermal plume is not completely mixed with the entire cross section of the River flow above Vernon Dam. The existence of the plume above the dam is a significant fact, because it shows that the waters mixing at Station 3 do not consist of the VYNPS thermal discharge mixed with the entire cross section of the River as assumed by Equation 1.1. Instead, the thermal plume flows through the Vernon Dam turbines with very little water from the east side of the River mixed in. Notwithstanding these facts, Entergy continues to make misleading assertions that Equation 1.1's assumption of complete mixing is satisfied by actual conditions, and that Equation 1.1 is an appropriate method for estimating temperature in the Connecticut River. Finally, Entergy makes several other misleading assertions and arguments in its initial post-hearing pleadings, which are described and clarified herein.

II. Entergy mischaracterizes the test for rebutting a presumption of compliance with Section 248(b)(5).

In its Proposal for Decision, Entergy seemingly creates its own test for rebutting a presumption of compliance with Section 248(b)(5). Entergy creates the novel position that those seeking to rebut the presumption created by Entergy VY's NPDES permit "must advance specific, credible evidence that: (1) the VY Station operates in material non-compliance with its permit, or (2) there is material ("undue") harm to the aquatic ecosystem despite ANR's involvement." Entergy Initial Brief at 53. Entergy cites several Board decisions to bolster its position, but a close examination of both cases indicate that there is no support for Entergy's test, which it characterizes as a "heavy burden." *Id.*

The first case Entergy cites, Docket 7887, *Pet. of Cent. VT. Pub. Serv. Corp.*, Order of 9/13/12 at 15, simply states that environmental permits issued by other agencies create a rebuttable presumption of compliance with Section 248(b)(5), and a certificate of public good cannot be issued until the permits are filed and parties have an opportunity to rebut the presumption.¹ Docket 7887, *Pet. of Cent. VT. Pub. Serv. Corp.*, Order of 9/13/12 at 14. The second case Entergy cites for its test is the 2004 Entergy "Uprate" case. It is ironic that Entergy would cite the Uprate case, being that the Board ruled that CRWC, by bringing information into the record, had "adduced evidence sufficient to support a finding contrary to the effect of the presumption." Docket 6812, *Petition of Entergy Nuclear Vermont Yankee, LLC and Entergy Nuclear Operations, Inc., for a certificate of public good to modify certain generation facilities at the Vermont Yankee Nuclear Power Station in order to increase the Station's generation*

¹ In *Pet. of Cent. VT. Pub. Serv. Corp.* no party filed any comments in opposition to the terms and conditions of the permits, and the Board found the process had been satisfied. *Id.* at 15.

output, Order of 3/15/2004 at 80. As the Board explained, “Once such evidence is introduced, the presumption entirely disappears and has no further effect.” Neither of the cases Entergy cites for its rebuttable presumption test includes the proposition that a party must prove non-compliance with a permit, or that Entergy is causing material harm to the aquatic ecosystem.² As the Board instructed, once a party brings sufficient evidence into the record to question the validity of a NPDES permit, the presumption disappears and it has no further effect. *Id.* at 81. VNRC/CRWC and other parties have provided sufficient evidence to question and undermine the validity and underlying methodology of Entergy’s stale and outdated NPDES permit; therefore, the burden of proof squarely sits on Entergy to demonstrate that the continued operation of the VY Facility will not have an undue adverse effect on the Connecticut River.

III. Entergy has misrepresented facts about Equation 1.1 to the Board by presenting testimony and evidence out of context or by omitting additional relevant information.

Of the many misleading proposed facts in Entergy’s Proposal for Decision, Entergy’s assertion that there is complete mixing of the thermal discharge and the River water at Station 3 is one of the more egregious. Entergy Proposal at ¶ 367. There is not, as Entergy would have the Board believe, complete mixing of the thermal plume with the entire cross section of the River. A more careful examination of the record, set forth below, refutes Entergy’s assertions.

² Entergy also relies on *State v. Pluta*, 157 Vt. 451, 454-55 (1991) for the proposition that “specific evidence is required to show that the presumed fact is not true in the particular case.” Entergy’s reliance on *State v. Pluta* is misplaced being that that case involved a discussion on the test for a defendant to overcome the *statutory* presumption that a person is intoxicated if, at the time of operation, they have reached a .10 percent blood alcohol content. The Board should follow its own guidance on the test for overcoming a rebuttable presumption, rather than case law related a statutory presumption in drunk driving statutes.

A. The VYNPS thermal discharge does not completely mix with the full flow of the River.

The evidence is clear that the VYNPS thermal plume typically remains as a distinct plume on the western side of the River, and that for the majority of the year, River water flows only through the turbines, which draw primarily from the plume on the western side of the River. Swanson, tr. 06/24/13 at 57:25-58:6; 61:3-11; EN-CS-317; EN-Cross-1 at 2-31. Nevertheless, Entergy attempts to minimize this fact by asserting that the Dam's turbines draw water "from the majority of the water column in Vernon Pool," (Entergy Proposal, ¶ 323), but Entergy omits several key facts. First, the turbines are located on the western side of the Dam, so the "water column" that is the source of water flowing through the turbines, does not extend across Vernon Pool, but instead, is limited to the western side of the River. Swanson, tr. 06/24/13 at 56:13-16. Indeed, when pressed on the vertical and horizontal extent of the VYNPS thermal plume, Entergy's hydrothermal expert acknowledged that his own modeling shows elevated temperatures of the plume extending to the bottom of Vernon Pool, and he admitted that when water flows only through the Vernon Dam turbines water is drawn primarily from the VYNPS thermal plume. *Id.* at 57:25-58:6; 61:3-11.

These basic facts pose a problem for Entergy, because Dr. Shanahan credibly testified that Equation 1.1 *assumes* that the VYNPS thermal discharge "is diluted in the full flow of the river at the exact time the heat is discharged[.]" and "that the thermal discharge and river flow are completely contemporaneous[.]" Shanahan surr. pf. at 17:1-3, 9-10. *See also*, Shanahan, tr. 06/26/13 at 89:21-24 ("Equation 1.1 presumes that these two streams of water [the thermal discharge and the River] will completely mix in a more or less continuous way"). Moreover, at the technical hearing, Dr. Swanson agreed that complete mixing is one of the "fundamental

assumptions” necessary for Equation 1.1 to apply to Station 3. Swanson, tr. at 12:23-13:1. *See also* Swanson, reb. pf. at 17:14-15 (Equation 1.1 implicitly assumes complete mixing at Station 3).

Faced with the impossible task of having to show that Equation 1.1’s assumption of complete mixing with the entire river flow is reflected by actual flow conditions, Entergy attempts to build on the carefully worded reference to the “majority of the water column in Vernon Pool,” with its suggestion that “[t]he River and thermal discharge are completely mixed at Station 3.” Entergy Proposal for Decision, ¶ 367. Incredibly, Entergy also suggests “[t]hat the thermal discharge is completely mixed with the River below Vernon Dam and at Station 3 is therefore uncontested by any evidence[.]” Entergy Initial Brief at 59. In doing so, Entergy ignores testimony from Dr. Swanson and Dr. Shanahan that provides persuasive and credible evidence that the VYNPS thermal discharge does not mix with “the River,” because it does not mix with the entire cross section of the River above Vernon Dam.

Furthermore, Dr. Shanahan has never testified that “the River and thermal discharge are completely mixed at Station 3” as Entergy suggests. Instead, Dr. Shanahan repeatedly and carefully explained that with respect to the mixing of waters flowing through Vernon Dam, the most important consideration is *what* water is flowing through the turbines. Dr. Shanahan testified only that “water that passes through the dam will be well mixed in the process of going through the dam.” Shanahan, tr. 6/26/13 at 27:9-11 (emphasis added). Dr. Shanahan is clearly not saying that the thermal discharge completely mixes with the entire cross section of the River

– instead, he’s saying only that the water flowing through the turbines, on the western side of the river, is well mixed.³

Entergy also ignores other testimony from Dr. Shanahan where he clearly explains what water is mixed by the turbines. He emphasized that the appropriateness of Equation 1.1 depends on “*what it is* that is being mixed passing through the dam.” Shanahan, tr. 6/26/13 at 25:17-18; Shanahan pf. at 15:16-18. The water passing through the Dam’s turbines is water from Vernon Pool that is not mixed, but exhibits both vertical stratification and horizontal variability in temperature. Shanahan, tr. 6/26/13 at 66:7-21. Thus, when describing why mixing of the thermal discharge and the River is not complete, Dr. Shanahan explained, “it’s really what’s happening above the dam that affects that aspect of mixing.” *Id.* at 90:9-10. He continued, “[s]o there’s really kind of two parts to this mixing process, if you like. These two streams of water have to come together more or less continuously and smoothly, and then they get mixed together. The second step is fine. The first step is not.” *Id.* at 90:11-16. Dr. Shanahan concluded that “as far as mixing of the waters of concern here, if you like, that is not complete and that’s not happening as Equation 1.1 anticipates.” *See also id.* at 67:15-18 (“the water that is going through the dam is not necessarily kind of a, if you like, a continuous smooth flow of river water mixed with the thermal effluent from the power station.”); *Id.* at 90:5-8 (“as far as the mixing of those two streams of water that Equation 1.1 anticipates[,] that mixing is not complete”).

In addition Dr. Shanahan explained that the cycling of the VYNPS’s discharge of heated water further undermines the assumption of complete mixing of the thermal discharge and with

³ It is significant therefore, that River flows exceed the Vernon Dam turbines’ capacity about 20 percent of the year, and water flows only through the turbines the remainder of the year. EN-Cross at 2-31.

the full cross section of the River. Dr. Shanahan testified, “[T]here’s a lag in the discharge of the heat by the power station and it reaching the dam. So you’re really looking at flow at the dam, and looking at that is what controls how much heat you can reject, but when you consider that there’s a lag in the flow, the time it takes for the heat to get down to the dam, those are effectively asynchronous by the time it gets over the dam.” Shanahan, tr. 06/26/13 at 76:9-12. He went on to describe how these asynchronous conditions occur, explaining, “[w]hen you think about the heat rejection it's really being cut by a factor -- or increased by a factor of four during these flow transitions, and so particularly when the flow drops down you have quite a slug of hot water left over from the high heat rejection sitting there that's not actually, you know, meeting the river flow that was anticipated when it was discharged.” *Id.* at 109:23-110:6.

Thus, as the foregoing testimony demonstrates, the complete evidentiary record refutes Entergy’s assertion that there is complete mixing of the thermal discharge and River water at Station 3. And as complete mixing at Station 3 is a “fundamental assumption” for the use of Equation 1.1 to estimate temperature increases in the River, Equation 1.1 often is not a valid or accurate method for regulating the VYNPS thermal discharge. See Shanahan, tr. 06/26/13 at 96:15-20 (“using the equation [1.1] and assuming that these two streams of water mixed together is not a very effective way to regulate. I think measuring the temperature, having a better measurement system would be the way to do it and see what's actually going on.”). Therefore, Dr. Swanson’s opinion, that Equation 1.1 provides a conservative estimate of the VYNPS’s contribution to increased water temperatures at Station 3, has no basis in fact.⁴

⁴ It is troubling that as a fall back strategy to addressing substantive issues in the case, Entergy attempts to portray Dr. Shanahan as an expert witness who has had his testimony “disallowed or not credited with disturbing frequency...”. Initial Brief at 57, n. 23. Entergy cites a few cases,

B. Equation 1.1 has not been validated for all flow conditions in the Connecticut River.

In proposed Finding of Fact 346, Entergy ignores unambiguous evidence and the testimony of Dr. Swanson and Dr. Shanahan when it suggests that Equation 1.1 “has been validated in all hydrological conditions known to exist in the River in the vicinity of the VY Station[.]” Entergy Proposal, ¶ 346. Entergy even attempts to give the impression that Dr. Shanahan agrees with this proposed fact, in a carefully worded assertion that Dr. Shanahan acknowledged that the Phase V study “*looked at rapidly varying flow conditions*” and “*evaluated Equation 1.1 during cycling flow.*” Entergy Proposal at 76, ¶ 348 (emphasis added); Entergy Initial Brief at 57. In fact, Dr. Shanahan does not agree, and Entergy omitted any reference to his testimony to that effect. When asked if the Phase V study looked at flow conditions fluctuating between 2,000 and 8,000 cubic feet per second (“cfs”), Dr. Shanahan correctly pointed out that study looked at periods of cycling flow, but the actual analysis used an assumed minimum flow of 1,200 cfs. Shanahan, tr. 6/26/13 at 53:12-20. Moreover, when asked if he understood that the study of Equation 1.1 “looked at rapidly varying flow conditions,” he responded, “[i]t looked at them, but *did not specifically account for them*. It used the low flow. It used the minimum daily flow.” Finally, even Dr. Swanson acknowledged that “Equation 1.1 has not been validated for river flows between June 11th and September 8th,” and that in the Phase V study, validation of Equation 1.1 by comparing predicted temperature increases with actual measurements was only conducted for January, February and March of 1977 and 1978.

but fails to mention that Dr. Shanahan has testified as an expert witness in about sixty cases. Shanahan, tr. 6/26/13 at 64:25-65:15. The Board should ignore Entergy’s tactics, especially when the overwhelming majority of cases in which Dr. Shanahan was an expert witness are left unaddressed by Entergy, presumably because they do not support Entergy’s attempt to discredit Dr. Shanahan.

Swanson, tr. 6/24/13 at 15:20-23; 89:4-90:4. In fact, during the discussion of these validation periods, Dr. Swanson admitted, “I don't know when these conditions -- measurements occurred other than the winter period of '77/78.” *Id.* at 88:21-22.

The testimony of Dr. Shanahan and Dr. Swanson shows that Equation 1.1 was not validated for rapidly varying flow conditions, and it was not validated during summer months. By definition then, Equation 1.1 was not validated for Connecticut River flow conditions during summer months, rapidly varying or otherwise. Accordingly, Entergy's suggestion that Equation 1.1 has been validated for all known flow conditions simply is not true.

C. Equation 1.1 does not provide a conservative estimate of water temperature increases in the Connecticut River.

Another example of Entergy providing the Board with less than sufficient evidence can be found in Entergy's proposed Finding of Fact 334, in which Entergy asserts that “Equation 1.1 *is intended* to conservatively estimate (i.e., by overestimating) the amount by which the VY Station's thermal discharge alone...may be expected to increase Connecticut River water temperature at downstream Station 3.” Entergy Proposal for Decision at 72, ¶ 334 (emphasis added). First, Entergy does not assert that Equation 1.1 *actually provides* a conservative estimate of temperature increases at Station 3. Entergy carefully states that it is only *intended* to do so. Second, Entergy has not quantified for the Board how Equation 1.1 might overestimate water temperature increases. Third, the record shows the formula referenced by Entergy as Equation 1.1 in its filings is not in the same form as the one it uses in its Operations Manual. Specifically, Entergy references Equation 1.1 as follows.

$$\Delta T_r = H/\rho C_p Q_r$$

However, in its own manual, Entergy presents Equation 1.1 as follows.

$$\Delta Tr = \frac{15.193 * (\text{MWt rejected})}{(\text{River flow in cfs})}$$

Deen surr. pf. at 13:8-14, Ex Reb-DLD-2 at 20. Significantly, the Operations Manual includes a note stating “This calculation is only valid when the plant is in open cycle.” *Id.* Furthermore, the Manual states that the formula may be used for determining compliance with the NPDES permit “provided the plant is at steady state operation.” *Id.* Entergy has not provided any evidence to the Board, nor does the Operations Manual explain, that Equation 1.1 is valid when the VYNPS is operated in, or transitioned to hybrid cycle, or how it determines compliance with the NPDES permit during or transitioning to hybrid cycle operations. It is significant then, that Exhibits PS-5 and PS-6, which plot heat rejection data recently produced by Entergy, show that the VYNPS operates in hybrid cycle when varying the heat rejection rate to the river.

Furthermore, Exhibit PS-6 provides a helpful reference to ground truth other assertions made by Entergy in its Proposal for Decision, including the allegation that water temperatures in the fish ladder *never* exceeded the defined spawning range maximum of 78.8 degrees F from 2006 to 2010 during the period when adult shad are present. Entergy Proposal for Decision at 96, ¶ 440. Exhibit PS-6 highlights that this is simply not true; temperatures at the fishway climbed over the defined spawning range maximum of 78.8 degrees on multiple occasions. Additional plotting of heat rejection data could have highlighted many more problematic temperature readings, but Entergy delayed the production of data that would have allowed for a more thorough analysis.

IV. Entergy misrepresents the facts of the discovery dispute over heat rejection and water temperature data.

Entergy erroneously suggests that VNRC/CRWC somehow bears some responsibility for Entergy's failure to produce requested heat rejection and water temperature data. Under Entergy's logic, after VNRC requested Entergy's data in Excel spreadsheets in September of 2012, in March of 2013, and again in a meet-and-confer process in April of 2013, VNRC only had to request the data a fourth time, and Entergy would have produced them without objection, and without the need for a motion to compel. Entergy Initial Brief at 117-118. Entergy's argument is absurd on its face and the Board should disregard it.

Moreover, Entergy's delay in production assuredly affected the evidence that is available for the Board's consideration. While Dr. Shanahan testified that the data in .csv format would likely not have changed the opinions he formed for his surrebuttal testimony (Shanahan, tr. 6/26/13 at 94:25-96:2), he clearly could have formed opinion for other time periods that would have provided relevant evidence for the Board, including evidence of water temperatures that exceeded certain tolerances for various phases of fish life cycles. *Id.* at 115:7-20.⁵

V. The Board should disregard testimony-based charts and graphs produced by Dr. Swanson that were not admitted into the record.

At the June technical hearing, Entergy asked Dr. Shanahan about a number of graphs produced by Dr. Swanson, but at the close of his testimony Entergy did not move them into the record. Despite this failure, Entergy then proceeds to rely heavily on Dr. Shanahan's testimony about those graphs. As they were never admitted into the record, the Board should disregard the

⁵ Entergy claims that VNRC/CRWC turned down Entergy VY's offer to produce the data in the requested native .csv format (Initial Brief at 119), but Entergy only offered the data in .csv format with onerous conditions. VNRC/CRWC's Motion to Compel explains the entire sequence of events regarding this discovery dispute.

questions and responses of Dr. Shanahan. First, Dr. Shanahan raised questions about how the data was processed to produce the graphs, and testified that he would need more information to properly interpret them. Shanahan, tr. 6/26/13 at 112:23-113:25. Second, Dr. Shanahan described the graphs as “meaningless” and having a lot of unexplained aspects. *Id.* Dr. Shanahan’s testimony about the graphs does not provide the Board with any relevant evidence, and the graphs themselves are not available to refer to when reviewing the testimony. The Board should confine its review of this case to the evidence adduced at the hearings. See, *Hoover v. Hoover*, 764 A.2d 1192, 171 Vt. 256, 258 (2000). Accordingly, the Board should disregard Entergy’s proposed facts and argument relying on those graphs.⁶

VI. Conclusion

For the foregoing reasons and those articulated in VNRC/CRWC’s Initial Brief, the Board should find that Entergy has not met its burden in demonstrating that the continued operation of the VY facility will not have an undue adverse effect on the water purity and natural environment of the Connecticut River in accordance with 30 VSA § 248(b)(5). In regards to the Board's ultimate decision on whether to grant a CPG for the continued operation of the VY facility, VNRC and CRWC rest on the arguments presented in its Initial Brief.

⁶ VNRC/CRWC respectfully submit that the Board should disregard ¶¶ 391-92 of Entergy’s Proposal, and footnotes 29 and 30 and the text related to those footnotes on page 60 of Entergy’s Initial Brief.

Dated at Montpelier, Vermont

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Respectfully submitted,

Jamey D. Fidel, Esq.
jfidel@vnrc.org

Counsel for VNRC and CRWC
Vermont Natural Resources Council
9 Bailey Avenue
Montpelier, VT 05602
(802) 223-2328
(802) 223-0287 (fax)