

AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
ONE NATIONAL LIFE DRIVE, MAIN-2
MONTPELIER, VT 05620-3522

FACT SHEET
(October 2014)

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE UNITED STATES

PERMIT NO: 3-1199
PIN: NS75-0006
NPDES NO: VT0000264

NAME AND ADDRESS OF APPLICANT:

Entergy Nuclear Vermont Yankee, LLC
320 Governor Hunt Road
Vernon, Vermont 05354

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Vermont Yankee Nuclear Power Station
320 Governor Hunt Road
Vernon, Vermont 05354

RECEIVING WATER: Connecticut River

CLASSIFICATION: Class B. Class B waters are suitable for bathing and recreation, irrigation and agricultural uses; good fish habitat; good aesthetic value; acceptable for public water supply with filtration and disinfection.

I. Action, Type of Facility, and Discharge Location

The Vermont Agency of Natural Resources (hereafter referred to as "Agency") received a renewal application for the permit to discharge into the designated receiving water from the above named applicant on September 30, 2005. Entergy Nuclear Vermont Yankee, LLC (ENVY) is engaged in the operation of Vermont Yankee Nuclear Power Station ("Facility"), a nuclear electrical generating station. The discharge is combined effluent from circulating water and service water, boiler blowdown, water treatment process and carbon filter backwash, demineralized trailer rinsedown water, and strainer/traveling screen backwash. The Agency has made a decision to renew the discharge permit.

It is important to note that this permit reflects the fact that on August 27, 2013, ENVY announced its intention to close the Facility by the end of 2014. Closure of the Facility and cessation of

power production will drastically reduce the thermal discharge. While ENVY has not indicated what the post-closure operation regime will be in terms of the thermal discharge, a Clean Water Act (CWA) Section 316(a) (33 U.S.C. §1326(a)) variance may not be required. The permit is for a term ending December 31, 2015 to allow ENVY the opportunity to submit post-closure information to the Agency as soon as it is available; the Agency can then issue a new permit that reflects the post-closure thermal discharge.

II. Description of Discharge

A quantitative description of the discharge in terms of significant effluent parameters is based on state and federal laws and regulations, the discharge permit application, and the recent self-monitoring data.

III. Limitations and Conditions

The effluent limitations of the permit, the monitoring requirements may be found on the following pages of the permit:

Effluent Limitations:	Pages 2 - 8 of 30
Monitoring Requirements:	Pages 2 - 9, 23 - 30 of 30

IV. Permit Basis and Explanation of Effluent Limitation Derivation

Facility Description and Background:

ENVY owns and operates the Facility, a nuclear power station in Vernon, Vermont. The Facility is located on the west shore of Vernon Pool, an impoundment of the Connecticut River created by Vernon Dam. The dam and Vernon Station, a hydroelectric facility, are located approximately 0.75 miles downstream from the Facility. The Facility, which began operation in 1972 under the ownership of Vermont Yankee Nuclear Power Corporation (VYNPC), is classified as a Boiling Water Reactor with a rated core thermal power level of 1912 MW (upgraded in 2006 from the original 1593 MW), providing a gross electrical output of 620 MW. The remainder of the energy, 1292 MW, is removed as heat by circulating water as it passes by the condenser: the heated circulating water is discharged to the Connecticut River (outfall S/N 001), or to the mechanical draft cooling towers to dissipate the heat to the atmosphere. There are several other activities associated with the eletro-generation and facility operations, which may result in a discharge. Typically these discharges are not continuous and may occur infrequently. These include: cooling water from service water pumps (included in S/N 001); plant heating boiler blowdown (S/N 003); water treatment carbon filter backwash (S/N 004); demineralized trailer rinse down water (S/N 006); and strainer and traveling screen backwash water (S/N 009). All these discharges enter the Connecticut River via the discharge structure with the exception of S/N 006 which discharges via the stormdrain system to the north of the Facility's intake structure and S/N 009 which discharges at the intake structure.

Cooling Water Intake Structure – The cooling water intake structure (CWIS) is located in a reinforced concrete bulkhead north of the Facility, drawing water from the Vernon Pool. The CWIS is shared by the Circulating Water (CW) and Service Water (SW) systems, each within separate forebays. The CWIS extend downward about thirty feet below normal river surface elevation. There are two sets of fixed screens (bar racks); one for the CW intake and one for the

SW intake. The design water velocity through the CW screens is about 1.0 fps and the actual velocity through each screen is between 0.0 fps (closed cycle cooling) to 1.0 fps (open cycle cooling). The design water velocity through each SW screen is about 0.1 fps during maximum (i.e. summertime) flow operations. The screen openings for both the CW and SW are 3" by 3/8" rectangular vertical bars.

The CWIS also contains five traveling screens which provide a basic fish and debris handling system. Each of the screens consists of 54 fiberglass basket elements that are chain driven in a continuous loop. Each basket is formed from 0.080" diameter stainless steel wire cloth with 3/8" openings. The maximum cooling water intake flow for the CW system is 360,000 gpm and maximum for the SW system is 13,400 gpm.

CWA Section 316(b) (33 U.S.C. §1326(b)) requires that "the location, design, construction, and capacity of CWIS reflect the best technology available for minimizing adverse environmental impact." Studies to examine the effects of the cooling water intake structures on the aquatic ecosystem would take longer than ENVY's anticipated term of operation. However, the Facility has cooling water infrastructure in place, and the capacity to operate in closed cycle cooling. Accordingly, the Agency finds that to the extent ENVY is required to take action to reduce its thermal discharge to meet effluent limitations during the term of this permit, the use of the existing cooling water infrastructure is the best technology available.

S/N 001 Circulating Water and Service Water Discharge – This discharge is made up of CW and SW. The circulating water removes unused heat energy from the Main Condenser; as a 'non-contact cooling system', plant-related radioactive liquid is not released. In the permit, a minor waste stream from cooling four Residual Heat Removal Service Water Pump (RHRSWP) motors has been incorporated into this discharge. In the previous permit, effluent from cooling the RHRSWP motors was considered a separate outfall (S/N 005); however, this cooling water is supplied by the SW system, and ultimately combines with S/N 001 before being discharged to the river, thereby neither increasing the SW intake, nor total discharge from S/N 001 as modified. No additional effluent limits or monitoring is required for this modification.

The Facility has a cooling water infrastructure which can be operated as open cycle, closed cycle, or a "hybrid" cycle which combines, to various levels, features of the closed and open cycle systems. The cycle of operation determines the volume of water and amount of heat discharged to the river. In order to comply with the thermal criteria for discharge described in Section I.A.7 of the permit, water may be discharged directly to the Connecticut River (i.e., open cycle – or "once through"), or may be directed to the mechanical draft cooling towers; water that is directed to the cooling towers may wholly, or in part, be returned to the river and/or the plant's circulating water system ("hybrid" or closed cycle).

Open/Hybrid cycle flow is permitted at 543 MGD, daily maximum, and closed cycle flow is permitted at 12.1 MGD, daily maximum. These limits, calculated values, are unchanged from the previous permit. The chlorine and oxidant limits as well as pH are unchanged from the previous permit and comply with Vermont Water Quality Standards (VWQS).

As part of the application for a discharge permit, ENVY applied for a variance from the VWQS pursuant to CWA Section 316(a).

Thermal Component: Historical Overview. Under the 1973 Atomic Energy Commission operating license, the Facility was required to use a closed cycle cooling system unless determinations could be made concerning the possible environmental impact from the thermal discharge. Under the provisions of both CWA Section 316(a) and the VWQS, alternative thermal limits may be granted where a demonstration can be made that such alternative limits will be more stringent than necessary to protect a balanced indigenous population of aquatic organisms and wildlife in the receiving waterbody. In order to make this determination, the Facility was allowed to discharge heat in compliance with the VWQS of that time, concurrent with an intensive biological and hydrological study program (so-called “phased studies”). The study program was developed under the direction of the Technical Advisory Committee (later the Environmental Advisory Committee (EAC)) and approved by the Agency.

In 1978, a 316 Demonstration was submitted and then approved by the Agency which allowed a temperature increase during the winter months (October 15 – May 15) beginning with the 1978 permit.

Using the “phased studies” and other pre-operational studies as a basis, a program and study plan were then proposed to make this demonstration during the summer months. The goal of the program (called “Project SAVE”) was to investigate if plant operations could be optimized during the period of May 16 through October 14 without adverse environmental impact. The studies included intensive fish and hydrological investigations while the plant operated under alternative (experimental) thermal limits. These studies began in 1982 and were allowed to continue through the life of the 1985 permit.

In 1990, VYNPC submitted 316 Demonstration: Biological, Hydrological & Engineering Information and Environmental Impact Assessment (For the Period May 16 to October 14). The Agency determined that the operations had not altered the distribution, abundance, or diversity of the aquatic biota, including resident and anadromous fish, in the Connecticut River and therefore approved VYNPC’s request for eased thermal discharge limits. The approved temperature limitations allowed the Facility to operate in open/hybrid cycle the majority of the time. In order to assess compliance with the effluent limits, an extensive monitoring program was included in the permit (Section IV – Environmental Monitoring Studies, Connecticut River).

In 2003, ENVY – the owner of the Facility as of July 2002 – submitted an amendment application requesting a change to the 2001 permit temperature limitations for the thermal component of their discharge. ENVY requested a one degree increase in the thermal discharge from the Facility, as measured by the increase in the temperature of the Connecticut River above ambient during the summer period of May 16 – October 14. The Agency approved this requested amendment only for the period of June 16 through October 14.

Following issuance of this amended permit, the permit was appealed to the Environmental Court (2008 decision) and then to the Vermont Supreme Court. In December 2009, the 1° increase during the period of June 16 – October 14 was upheld by the Supreme Court.

Thermal Component: Legal and Regulatory Basis for ANR's 2014 Review. The Agency's review of thermal discharges is governed by Section 316(a) of the Clean Water Act and relevant portions of the Vermont Water Quality Standards. CWA Section 316(a) provides for the establishment of alternative thermal effluent limitations. The Environmental Protection Agency (EPA) has adopted regulations pursuant to Section 316(a) at 40 CFR §125.70 through 125.73. 40 CFR §125.73 includes the "Criteria and standards for the determination of alternative effluent limitations under 316(a)" and states that:

"Thermal discharge effluent limitations or standards established in permits may be less stringent than those required by applicable standards and limitations if the discharger demonstrates to the satisfaction of the director that such effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife on the body of water into which the discharge is made."

Accordingly, the Permittee is required to demonstrate that the otherwise applicable thermal discharge effluent limit is more stringent than necessary to assure the protection and propagation of the waterbody's balanced, indigenous population of shellfish, fish and wildlife.

Section 3-01 B.1. of the VWQS establishes temperature criteria for all state waters and establishes conditions for the assimilation of thermal wastes. The VWQS also allow that alternative thermal limits may be granted; specifically, Section 3-01 B.1.d. Assimilation of Thermal Wastes states:

"The Secretary may, by permit condition, specify temperature limits that exceed the values specified above in order to authorize discharges of thermal wastes when it is shown that:

- (1) The discharge will comply with all other applicable provisions of these rules;
- (2) A mixing zone of 200 feet in length is not adequate to provide for assimilation of thermal waste; and
- (3) After taking into account the interaction of thermal effects and other wastes, that the change or rate of change in temperature will not result in thermal shock or prevent the full support of uses or the receiving waters."

Thermal Component: Findings of ANR's Review Process -- The changes to the thermal effluent limitations reflected in the permit are based on the September 30, 2005 application, annual and analytical reports, literature reviews, and information garnered from conversations and technical discussions with Agency staff, the EAC¹, and ENVY and their consultants.

¹ The 2001 discharge permit issued to ENVY, which is in effect today as amended by the Agency in 2006, established an Environmental Advisory Committee (EAC), comprised of representatives of the Vermont, New Hampshire, and Massachusetts environmental and fisheries programs, plus the coordinator of the United States Fish and Wildlife Service's Connecticut River Anadromous Fish Program. The 2001 permit states that the EAC is "advisory in function" and requires the Permittee to meet with the EAC "as often as necessary, but at least annually, to review and evaluate the aquatic environmental monitoring and studies program" established in Part IV of the permit.

In this permit, the Agency has supplemented the temperature limitations as determined by an equation (Equation 1.1), with temperature limits as measured downstream of the Facility. The Agency has concluded that these temperature “caps” are necessary to assure the protection and propagation of aquatic biota, and compliance with the VWQS. The temperature caps were determined based on the life history of species in the Connecticut River and are consistent with peer-reviewed studies and literature.

Equation 1.1 (Eq. 1.1) is a mass-balanced calculation used by the Facility to assess the discharge-induced increase in river temperature; the equation contains a number of factors: including the heat rejection rate of the Facility, water density, the flows of the Connecticut River at the Vernon Dam, and the specific heat of the river. Eq. 1.1 is defined on page 1-8 of Vermont Yankee’s 316 Demonstration: Engineering, Hydrological and Biological Information and Environmental Impact Assessment (March 1978).

The Agency has concluded that Eq. 1.1 is not an adequate method of determining the increase in river temperature above ambient. The use of Eq. 1.1 raises a number of concerns including:

- The model was developed in the 1970’s and has not been adjusted or recalibrated to reflect current conditions;
- The model only accounts for the Facility’s thermal contribution to the river. The Agency does not agree that an applicant for a variance from thermal limitations must only address its contribution, but rather, whether a thermal discharge will add heat to the water that will have an adverse effect on the waterbody’s balanced, indigenous population of shellfish, fish and wildlife.
- A model is not necessary to measure the temperature of the river. Once a determination is made about the thermal tolerances of the waterbody’s balanced, indigenous population of shellfish, fish and wildlife, actual temperature measurements should be utilized to measure compliance with thermal limits.

In light of the short-term nature of the permit, however, the Agency has considered ENVY’s ability to make operational changes to implement a new thermal discharge regime for the remaining months that the Facility will be in full operation. In particular, ENVY has indicated that the Facility operations are specified for the use of Eq. 1.1 to determine the increase in river temperature above ambient as a result of cooling water discharge, and to trigger actions to ensure compliance with the discharge permit. For this reason, the Agency has decided to allow the use of Eq. 1.1 in the permit in determination of the increase in temperature above ambient at Station 3 relative to Station 7.

On November 12, 2013, the EAC issued a final recommendation to the Agency on ENVY’s request for a thermal variance. In sum, the EAC concluded: “[I]n 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.”

To address these concerns while allowing the Facility to utilize Eq. 1.1 for the operational reasons set forth herein, the permit also utilizes a hybrid approach. It maintains the use of Eq. 1.1 while also imposing temperature caps as concurrent compliance triggers. Compliance with the temperature caps assures that the Facility's thermal discharge will maintain the waterbody's balanced, indigenous population of shellfish, fish and wildlife.

Modified Seasons. The Agency's review found data suggesting the seasonal periods specified under the previous permit had no relevance to the life history stages of the fish of the Connecticut River (including but not limited to American Shad). The previous permit defined three seasons: "winter" (October 15 – May 15), "spring" (May 16 – June 15), and "summer" (June 16 – October 14). The permit contains revised seasonal periods that will support the biological/life history requirements of anadromous and resident fishes inhabiting and/or migrating through portions of the Connecticut River affected by the Facility's thermal discharge. Specifically, the revisions will lengthen the Spring Period (to April 1 – June 30), shorten the Summer Period (to July 1 – September 15), and introduce two Fall Periods (September 16 – October 15 and October 16 – November 15).

Thermal Limitations.

The thermal limitations of the Winter Period remain unchanged from the previous permit.

The Spring Period retains from the previous permit the "spring" period set of temperature criteria that limit the increase of river temperature above ambient temperature (Table 7.b in permit); these limits are specified in Section 3.01 B.1, VWQS. The permit establishes a temperature cap of 71° F – measured temperature at Station 3 – for the Spring Period, beyond which the Facility shall, as soon as possible, reduce the thermal output of the discharge to the extent that a measured average hourly temperature does not exceed 71° F.

The Summer Period retains from the previous permit the June 16 – October 14 temperature criteria that limit the temperature increase above ambient temperature (Table 7.c), as well as the 85° F temperature cap. These variance-based thermal discharge limits for the period of June 16 through October 14 were established in the previous permit, when amended in 2006.

The new Fall Period I is also limited by the variance-based thermal discharge limits for the period of June 16 – October 14 established in the previous permit; these temperature criteria limit the increase above ambient temperature (Table 7.d). Additionally, the permit establishes a temperature cap of 69° F for Fall Period I.

The new Fall Period II has a set of temperature criteria that limit the increase above ambient temperature (Table 7.e), as specified in Section 3.01 B.1, VWQS; Fall Period II is also limited by a temperature cap of 65° F.

S/N 002 Radioactive Liquid – The CWA and its implementing regulations do not apply to radioactive materials that are regulated under the Atomic Energy Act of 1954. Thus, this discharge is subject to NRC regulation and has been deleted from the permit.

S/N 003 Plant Heating Boiler Blowdown – Plant heating boilers discharge relatively small

volumes of blowdown once or twice a day during the heating season. The boilers are treated daily with an oxygen scavenger and pH control agent. This wastestream discharges through the main outlet structure. The flow of 0.0010 MGD and requirement for estimating the daily discharge are unchanged from the previous permit.

S/N 004 Water Filter Carbon Filter Backwash – This system is part of the potable and river water purification system. As in the previous permit, this permit establishes a flow limit of 0.010 MGD and a total suspended solids pounds limit of 8.3 lbs (based on a concentration limit of 100 mg/l for a ‘low volume waste source’ - 40 CFR §423.12). Also, as in the previous permit, no monitoring is required because past monitoring results indicated that the discharge was consistently well below this limit. The requirement for estimating the discharge is unchanged from the previous permit. This intermittent wastestream (occurring every three to six weeks) discharges through the main outlet structure. This is unchanged from the previous permit.

S/N 005 Cooling Water from the RHR Service Water Pumps – This minor cooling water supply that cools four Residual Heat Removal Service Water Pump motors has been removed as an independent discharge, and incorporated into S/N 001 in the permit.

S/N 006 Demineralized Trailer Rinse Down Water – The Facility is not currently utilizing this system. However, ENVY has requested that this provision remain in the permit in case of need. The trailer would consist of a potable water processing facility. Potable water would enter the trailer, be purified by sand/carbon filters followed by reverse osmosis, and that water would ultimately be sent to the facility’s demineralized water storage tank. The discharge would be the backwash as a result of washing down the sand and/or carbon filters. This minor discharge would enter the S/N 006 Storm Drain System located to the north of the intake structure. As in the previous permit, the flow limit is 10,000 gpd and there are no effluent limitations or monitoring requirements. Stormwater discharges from S/N 006, 007, 008, 010, and 011 are covered under Multi-Sector General Permit 3-9003 (NOI 3653-9003) and have been deleted from the permit; stormwater discharges from S/N 006, 007, and 010 are covered under General Permit 3-9015 and have been deleted from the permit.

S/N 009 Strainer and Traveling Screen Backwash – River water is utilized to backwash the service water screens and the circulating water traveling screens on the cooling water intake structure. As in the previous permit, the backwash limit is 0.050 MGD and monitoring is required when backwashing occurs (more frequent during high river flows). A small amount of penetrant/biodispersant may be in the discharge as a result of use to reduce biofouling of the facility’s piping. Any debris collected as a result of the backwashing is disposed of according to state and federal regulations (i.e. not discharged back into the river).

Other Provisions

The Environmental Advisory Committee. The 2001 NPDES permit issued to ENVY, which is in effect today as amended by the Agency in 2006, established the EAC, comprised of representatives of the Vermont, New Hampshire, and Massachusetts environmental and fisheries programs, plus the coordinator of the United States Fish and Wildlife Service's Connecticut River Anadromous Fish Program. The EAC is "advisory in function" and requires ENVY to meet with the EAC "as often as necessary, but at least annually, to review and evaluate the aquatic environmental monitoring and studies program" established in Part IV of the permit. ENVY's intention to close the facility means that thermal discharge will be greatly diminished in 2015, thereby reducing the necessity of such a committee. While the Agency retains the right to consult with these organizations on matters concerning Facility operations, the EAC condition has been deleted from the permit.

Approved Chemicals. All chemicals have been reviewed by the Agency for negative environmental effects. The approved chemical list in the permit includes several new chemicals:

Conquor CNQR 3588 has a lower toxicity than Cortrol OS7700 and will be used preferentially. Discharges are limited to 30 ppm Diethyl-Hydroxyl-Amine. The Facility will retain use of Cortrol OS7700 as a backup.

Nalco CL-50, Nalco CL103, and Nalco PCL-401 will be used in the Service Water System, and are non-toxic for aquatic ecological effects.

Nalco H-130 will be used at a maximum concentration of 2 ppm before dilution, well below thresholds for adverse ecological effects.

Prosan 24 is a fungicide used annually in the spring to treat the wooden portions of the cooling towers to inhibit fungal growth. There is no discharge of this product to surface waters.

The chemical Bulab 7034 has been removed, and Depositrol BL5303 has been renamed Scaletrol PDC 9329 (industry change).

Environmental Monitoring Studies. The permit includes a new requirement that the Permittee shall submit all data collected in Part IV –Environmental Monitoring Studies, Connecticut River in a usable digital format (e.g., Excel). This data shall be submitted annually, by May 31, or earlier if requested by the Agency in writing.

V. Procedures for Formulation of Final Determinations

*The public comment period for receiving comments on the draft permit was from **July 7 through August 27, 2014.***