Biological Fact Sheet - Cooling Water Intake Structure

Bureau of Habitat, Steam Electric Unit

Name of Facility: Port Jefferson Power Station
Owner/Operator: National Grid
SPDES #: NY-0005932
Location: Suffolk County, New York
Town of Brookhaven
Port Jefferson Harbor, Long Island Sound

1. Description of Facility

The Port Jefferson Power Station (PJS), owned by National Grid, is located in Port Jefferson, Suffolk County, NY. The station is situated on the southwestern shore of Port Jefferson Harbor. This facility has two active natural gas/oil fired steam-electric generating units, Units 3 and 4. These units were built in 1948 and 1950 respectively. Units 1 and 2 have been in permanent cold standby since 1992. Net generation for this facility is 362 MW of electricity.

PJS employs a once-through cooling system that withdraws water from Port Jefferson Harbor using a shoreline intake structure. The intake structure consists of four separate screenbays, each with a skimmer wall, trash rack and 3/8" traveling screen. Fish and debris washed from the traveling screens are returned to Port Jefferson Harbor via a 24" diameter return pipe. Each unit has two circulating water pumps rated for a total water withdrawal capacity of 294 MGD. The heated cooling water is finally discharged back into the harbor via a submerged discharge opening approximately 127 feet east of the intake. The thermal discharge limits include a maximum discharge temperature of 110°F and a change in temperature (delta T) of not more than 30°F compared to the intake temperature.

2. Ecological Resource

Port Jefferson Harbor is classified as SA waters, with the best usages of Class SA waters being shellfishing for market purposes, primary and secondary contact recreation, and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.

The fish and wildlife habitat in and around the harbor consists of open water, tidal flats, salt marshes and barrier beaches. Water depths in Port Jefferson Harbor range from about 6 to 30 feet, with maximum depths of over 50 feet and a tidal range of approximately 7 feet. The landscape surrounding the harbor is varied with residential and commercial developments bordering the harbor.

Port Jefferson Harbor provides important habitat for several species of marine fish, including but not limited to scup, bluefish, Atlantic silversides, Atlantic menhaden, northern puffer, striped bass, blackfish and winter flounder. The harbor is also an important shellfish producing area, with much of the area open seasonally or conditionally for recreational or commercial harvest of shellfish, including American oyster and hard clam. In addition to finfish and shellfish habitat,

the harbor and parts of Long Island Sound may be important habitat for juvenile Atlantic Ridley turtles.

Impingement and entrainment studies were conducted at PJS during 2003-2004 and 2008-2009. The estimated number of fish impinged during these two study years ranged from 10,689 to 150,000 fish. The range in number of eggs, larvae and juveniles estimated to be entrained during the study years was between 290 million to 1.1 billion organisms. The range in numbers of fish impinged and entrained is likely due to interannual variability (ASA July 2009). The species of fish most commonly impinged during the study years were Atlantic menhaden, Atlantic silverside, striped killifish, cunner, butterfish, winter flounder, sea robins and three spine stickleback. The majority of species entrained were Atlantic menhaden, bay anchovy, cunner, tautog, fourbeard rockling, Atlantic silverside and gobies.

3. Alternatives Evaluated

The following possible technologies were evaluated at this facility:

1. Closed-Cycle Cooling: full and partial retrofit
2. Continuous operation of existing intake traveling screens
3. Coarse-mesh and fine-mesh traveling screens with fish protection features
4. Wide-slot and narrow-slot cylindrical wedgewire screens
5. Impingement Barrier Net (IBN)
6. Variable Speed Pumps (VSP)

With the exception of closed-cycle cooling, the analyses of these technologies or operational measures include reduction benefits from planned outages and continuous traveling screen operation.

4. Discussion of Best Technology Available

According to 6NYCRR Part 704.5 - *Intake structures* and Section 316(b) of the federal Clean Water Act, the location, design, construction, and capacity of cooling water intake structures must reflect the "best technology available" (BTA) for minimizing adverse environmental impact.

Feasibility of Closed Cycle Cooling

Location: PJS has a shoreline, surface intake situated parallel to the shore. The location of this intake structure would not change to accommodate the installation of cooling towers.

Design: The current intake structure would be modified to create a forebay to isolate the recirculated water from the Harbor. The discharged water would be circulated to the cooling towers and then to the existing screenhouse. Smaller circulating pumps would be installed in the forebay, to supply makeup water to the cooling system.

Construction: Construction activities associated with cooling towers would include installing the sheetpile walls at the intake to create the forebay, and the actual construction of the cooling towers themselves. However, due to a physical lack of available space at the site, the proximity to residential areas and an existing conservation easement, retrofitting PJS with closed-cycle cooling is not considered feasible.

Capacity: Closed-cycle cooling would reduce the amount of water used by approximately 95%, which would provide the greatest benefit in entrainment reductions. However, this technology has already been determined to not be available due to lack of space to install the towers.

Alternative technologies other than Closed Cycle Cooling

Location: As stated previously, PJS has a shoreline, surface intake situated parallel to the shore. No information was presented by National Grid to suggest that relocation of the intake structure would minimize adverse environmental impact.

Design: Alternatives such as Ristroph screens (coarse and fine-mesh), cylindrical wedgewire screens, and an impingement barrier net would change the intake structure design by providing a physical barrier to reduce entrainment and/or to reduce impingement mortality. Variable Speed Pumps (VSP) would use the same intake pipe, but the design would be altered by the change in pump motors. Continuous operation of the existing traveling screens would not change the design of the existing intake structure.

Construction: Installation of the coarse-mesh Ristroph screens would not require major construction activities, only modifications to current mechanisms. Implementation of the fine-mesh screen system would require the construction of a new screenhouse, the construction and removal of a cofferdam and the construction of sheet pile isolation walls with an access deck. Four (4) new screen bays would be constructed to house four (4) new fourteen-foot wide fine-mesh Ristroph traveling screens. Installation of the wide-slot wedgewire screens would require the construction of a bulkhead to attach 4“T” heads. Each “T” head would be 23 feet long by 7 feet in diameter. The narrow-slot wedgewire screens would require 16 “T” heads to meet flow demands. Both wide-slot and narrow-slot wedgewire screens would require some dredging and, with narrow-slot screens, the construction of an access road along the catwalk. The wedgewire screens were not considered further due to the lack of demonstrated effectiveness in a marine environment, the potential for biofouling (which would make the screen system ineffective), and the lack of tidal action in between the bulkheads which would diminish the effectiveness of the air burst wash system. The VSPs would have no aquatic construction effects, but would require an enclosed structure to protect electrical equipment. Installation of the Impingement Barrier Net (IBN) would have minimal construction impacts, as the net would be attached to existing support structures.

Capacity: In addition to closed-cycle cooling discussed above, VSPs are the only remaining technology that would reduce the amount of cooling water used. VSPs are considered feasible at this facility, and in combination with fine-mesh Ristroph screens and the Impingement Barrier Net, have the potential to reduce impingement mortality and entrainment by 94 and 68 percent, respectively.

5. Determination of Best Technology Available

After evaluating all of the available alternatives, the New York State Department of Environmental Conservation (NYSDEC) has determined that, in combination, the following technologies represent the best technology available for minimizing adverse environmental impacts from the cooling water intake structure.

1. Continuous operation of traveling screens;
2. Employ pump shutdown procedures;
3. Replacement of existing traveling screens with coarse-mesh Ristroph-type screens;
4. Installation of Variable Speed Pumps on Units 3 and 4; and
5. Operate the facility so that by the expiration of the permit, the facility will have operated at or below a 15 percent generating capacity, averaged over the 5 year permit term.

In keeping with the Department's established, environmentally-protective BTA requirements for existing facilities with cooling water intake structures, a 95 percent reduction in impingement mortality and a 80 percent reduction in entrainment, including through-plant survival, from calculation baseline level, are the impact reductions feasible from implementation of these technologies and operational measures.

Although the following technologies may represent the Best Technology Available at another facility, these alternatives were not considered as BTA for PJS, for the following reasons. Closed-cycle cooling, although the most protective technology, is not available due to the lack of vacant space on the facility property. Wedgewire screens were not considered available for several reasons. Removing or reconfiguring the sheet pile bulkheads to accommodate the wedgewire screens could cause erosion of neighboring beaches, and deposition of sand in the intake area. Additionally, wedgewire screens are not a demonstrated technology in a marine environment for a facility of this size. Finally, fine-mesh ristroph screens would not decrease impingement mortality over the selected coarse-mesh traveling screens and would require extensive testing at this site. There is also no assurance that the fish eggs and larvae entrained through the cooling system would survive the impingement stress on the fine-mesh screens.

6. Monitoring Requirements

In accordance with Biological Monitoring Requirement 4 of the attached permit, the permittee must submit to the NYS DEC Steam Electric Unit, for Department approval, a *Verification Monitoring Plan*. This plan is designed to confirm that the reductions in impingement mortality and entrainment required by this permit are being achieved. At a minimum, the plan must include two years of monitoring to verify full-scale performance of BTA measures. These studies must quantify by species the numbers of fish impinged and the number of fish entrained

at the facility under both estimated calculation baseline conditions and actual operating conditions during the two year study period. The studies must also evaluate the effectiveness of technologies and operational measures implemented to reduce fish mortality.

As part of the Verification Monitoring, National Grid will also study through-plant entrainment survival. Entrainment survival has been observed at other steam electric facilities in New York, including Port Jefferson (EPRI 2000).

7. Legal Requirements

The requirements for the cooling water intake structure in this State Pollutant Discharge Elimination System permit are consistent with the policies and requirements embodied in the New York State Environmental Conservation Law, in particular - Sec.1-0101.1.; 1-0101.2.; 1-0101.3.b., c.; 1-0303.19.; 3-0301.1.b., c., i., s. and t.; 11-0107.1; 11-0303.; 11-0535.2; 11-1301.; 11-1321.1.; 17-0105.17.; 17-0303.2., 4.g.; 17-0701.2. and the rules thereunder, specifically 6NYCRR Part 704.5. Additionally, the requirements are consistent with the Clean Water Act, in particular Section 316(b).

8. Summary of Proposed Permit Changes

Table 1. Deletions

Permit condition	Reason for Deletion
Biological Requirement B1-B3, B8, B11	Permit conditions have been satisfied.
Biological Requirement B4-B6, B9	Conditions require rewriting based on the Department's BTA determination, the remanding of the Phase II Rule [40 CFR 125 Subpart J] and the Department's sequential permitting process.

Table 2. Additions/Changes

Permit Condition	Requirements
Biological Requirement B1	Requires continuous operation of existing traveling screens and limit generation to less than 15% capacity.
Biological Requirement B2	Requires submission of *Technology Installation and Operation Plan* required to implement BTA.
Biological Requirement B3	Requires installation of Variable Speed Drive pumps and Ristroph-type screens on Units 3 and 4.
Biological Requirement B4	Requires submission of *Verification Monitoring Plan*
Biological Requirement B5	Requires submission of a report that demonstrates compliance with 6NYCRR part 704.5 for reductions in impingement mortality and entrainment of fish.
Biological Requirement B6	Requires implementation of BTA according to the *TIOP*.
Biological Requirement B7	Requires a contingency plan if BTA do not meet impingement mortality/entrainment reduction requirements.
Biological Requirement B8	Requires maintenance of records for a minimum of 10 years from EDP.

Biological Requirement B9	Requires submission of status reports.
Biological Requirement B10	Requires submission of a monthly report documenting MWh generation and cooling water use.
Biological Requirement B11	Requires submission of a report on cumulative reductions in impingement and entrainment mortality and analysis of technologies.
Biological Requirement B12	Requires no modifications made to the intake structure without prior Department approval.

9. References

NYSDOS Coastal Fish and Wildlife Habitat Assessment Form October 15, 2005

6 NYCRR Part 701 Classification of waters www.dec.ny.gov

6 NYCRR Part 704.5 Intake structures www.dec.ny.gov

Section 316(b) Clean Water Act

ASA Analysis & Communication, Inc. 2005. Impingement and Entrainment Monitoring for Port Jefferson Power Station March 2003- February 2004. Prepared for KeySpan Corporation by ASA Analysis & Communication.

ASA Analysis & Communication, Inc. 2007. Design and Construction Technology Review for Port Jefferson Power Station. Prepared for KeySpan Corporation by ASA Analysis & Communication.

National Grid. 2008. Proposed Suite of Technologies and Operational Measures for Port Jefferson Power Station.

ASA Analysis & Communication, Inc. 2009. Impingement and Entrainment Monitoring for Port Jefferson Power Station March 2008- March 2009. Prepared for National Grid by ASA Analysis & Communication.

Review of Entrainment Survival Studies: 1970–2000, EPRI, Palo Alto, CA: 2000. 1000757.

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