UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

April 21, 2000

Mr. Norm Cowden
Southern Energy Canal II, L.L.C.
9 Freezer Road
P.O. Box 840
Sandwich, MA 02563

Subject: Section 316 Demonstration Study Requirements for NPDES Permit MA0004928

Dear Mr. Cowden:

As you are aware from discussions on the Canal Redevelopment Project and our March 24, 2000 comments on the Final Environmental Impact Report (FEIR) for the Canal Redevelopment Project, EPA-New England (EPA-NE) requires the following information to make a determination on the reissuance of the proposed National Pollutant Discharge Elimination System (NPDES) Permit (No. MA0004928) for the Southern Electric Company to discharge heated effluent (non-contact cooling water) to Cape Cod Canal:

EPA - NPDES Permit Form 1,
EPA - NPDES Permit Form 2C,
EPA - NPDES Permit Form 2F,
Section 316 Demonstration Study and Other Related Information, and
Other Tentative Findings and Determinations.

The issuance /reissuance process for NPDES permits authorizing the discharge of effluent(s) with a thermal component to marine waters also cues a number of other statutes, such as:

Massachusetts State Certification;

The Endangered Species Act consultation requirements with the National Marine Fisheries Service (NMFS);

Essential Fish Habitat consultation requirement under the Fishery Conservation Act with the National Marine Fisheries Service; and

Certification from Massachusetts Coastal Zone Management per the Coastal Zone

Management Act .

Per your request, this letter describes the types of information in more detail which will be required for EPA and the State to evaluate the applicant's application for reissuance of its NPDES permit, the applicant's eligibility for a continuance of its Section 316(a) variance, and the adequacy of the proposed cooling water intake structure (CWIS) technology in accordance with Section 316(b) of the CWA that the location, design, construction, and capacity of the cooling water intake structure(s) reflects the best technology available (BTA) for minimizing adverse environmental impact(s).

Section 316(a) of the Clean Water Act

According to the CWA Section 316(a) as codified at 40 CFR 125 subpart H, thermal discharge effluent limitations in NPDES permits may be less stringent than those required by applicable standards and limitations if the discharger demonstrates 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 in and on the body of water into which the discharge is made. This demonstration must show that the alternative effluent limitation desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of a balanced indigenous community of shellfish, fish and wildlife in and on the body of water.

The State of Massachusetts has classified the waters of Cape Cod Canal as SA. The thermal water quality standards for SA waters are: the temperature of the water body shall not exceed 85° F nor reach a maximum daily mean temperature of 80° F. In addition, the rise in temperature due to a discharge shall not exceed 1.5° F. Southern Energy Canal's thermal discharge exceeds State thermal water quality standards. The existing/current permit has a Section 316(a) variance. For permit renewal, Southern Energy should include thermal data and information to support continuation of this variance from State water quality standards. Southern Energy should also submit any hydrothermal modeling results and/or other pertinent information to better characterize isothermal components of the thermal plume. The thermal plume should be delineated into finite, whole number isotherms to the 1° C isotherm above ambient.

Section 316(b) of the Clean Water Act

In order to reissue the NPDES permit for Canal Station, Section 316(b) of the Act requires that EPA-NE must make a determination that the location, design, construction, and capacity of the existing and proposed cooling water intake structures (CWIS) reflect the best technology available (BTA) for minimizing adverse environmental impact(s). For EPA to make this determination, the permittee should perform a technology assessment which reviews alternative methods for reducing entrainment and impingement at the cooling water intake. The evaluation criteria should include engineering and biological factors. The engineering factors should include effectiveness, technical feasibility and reliability, potential for other adverse effects, safety, and cost. Total cost should consist of the capital cost which includes the purchase and installation of new equipment or the retrofit of existing equipment. The cost of lost generation during construction of the alternative should be included in the capital cost. Annual operation and maintenance costs (O&M) should also be evaluated. The biological measures should include thermal conditional mortality, conditional entrainment mortality, conditional impingement mortality, total conditional mortality, anthropogenic non-plant related mortality (e.g.,conditional fishing mortality), migratory effects, and other aquatic effects. In assessing ecological benefit (or conversely harm to the ecosystem), for the purpose of this BTA determination, EPA-NE will focus on comparisons of estimated fish and wildlife mortalities among alternatives.

BTA proposals to support reductions in predicted entrainment and impingement conditional mortalities are required so that EPA-NE may make an assessment of impacts to marine resources by the intake of non-contact cooling water. In its NPDES application, Southern Energy will need to commit to the use of BTA designs for the CWISs.

The major problems associated with the withdrawal of large volumetric rates of cooling water include entrainment and impingement of aquatic life. These concerns can essentially be eliminated through the use of air-cooled condensers and to a large extent (up to 75%) eliminated with wet-cooling towers. Since losses by entrainment are directly proportional to the volumetric flow rate requirements for cooling water, Southern Energy should also investigate "trading off" larger delta-Ts across the condenser to achieve lower volumetric flow rates of non-contact cooling water. This scenario, however, will have to stand up to a favorable §316(a) variance demonstration.

For once-through cooling water systems, other BTA considerations for cooling water intake structure which should be assessed by the applicant include:

- non-continuous operation of Unit 1;

- variable speed pumps, which would reduce impingement and entrainment impacts during periods of lower cooling water demand;

- low approach/superficial velocities of less than 0.5 feet per second (fps);

- the use of dual flow screens to allow for lower approach/superficial velocities;

- the use of angled screens;

- the use of wedgewire screens;

- the use of dual spray systems for organism and debris removal from the traveling screens [low pressure for organism removal and high pressure for debris removal (to a separate collection system)];

- the use of fish buckets (or water-filled troughs at the bottom of each screen panel);

- fine mesh screens (as small as 0.5 mm) to reduce entrainment (at the expense of impingement);

- return mechanisms for impinged organisms on both the existing and proposed intakes, including a means and a means of returning fish on either side of the intake structure(s) depending on tidal conditions; and

- continuous operation of the traveling screens to minimize residence time of impinged aquatic life.

In order to verify predicted impingement rates, as well as quantify the loss of adult equivalents from impingement and entrainment, Southern Energy Canal should institute a post-operational (to Canal Redevelopment Project) monitoring program. This information would assist both Canal Station and the regulatory agencies in determining appropriate mitigation, if necessary.

As a way of organizing this information we have created a matrix (or Table) as well as a list of backup-informational requirements for the Table. These are included as Attachment A. Because similar information is required by both CWA Sections 316(a) and 316(b), the Table combines the informational needs of both. As part of your permit renewal application, EPA requires that you complete this Table, with supporting information for each critical aquatic organism (CAO) and representative important species (RIS). This Table will also help you and EPA identify specific information needs, and help with the design of your Sections 316(a) and 316(b) demonstration studies.

Each entry into the Table needs to be supported with text. In the text, provide the rationale, data, calculations, and assumptions made, as well as the uncertainty of the estimates and information such as technical feasibility, special cost concerns, and environmental impacts not related to water quality such as: noise, fuel use, land use, and visual impacts. Take for example the evaluation of retrofitting the current Unit 1 with variable speed pumps(s). In addition to generating cost and benefit information, germane information would include resulting effects such as: an increase in temperature of the once-through water (across condenser or from intake to discharge), higher condenser back pressure, and/or other process variables.

In the text supporting the Table describe any pre-selections or omissions from the Table. For example, include a wet-cooling tower as a control alternative in the Table and provide in the text the selection rational for that particular cooling tower option in terms of water sources (e.g., Cape Cod Canal, treated municipal wastewater, new wells, or other sources) and of cooling tower type (mechanical draft, natural draft, plume abatement, and drift eliminators).

Your framework for considerations should be broad and include alternatives such as the timing of scheduled maintenance shutdowns. For example, you may find, based on retrieved biological information, that you can greatly decrease the annual conditional entrainment mortality by scheduling plant shut downs around periods when high concentrations of larvae and/or fish eggs exist in the zone of influence on aquatic organisms around the Station's intake(s).

Based largely on your response to this letter, EPA-NE will decide with you the scope and timing for future Section 316(a) and 316(b) demonstration studies, if necessary. EPA may require that the demonstration studies be partially or fully completed prior to permit reissuance, or alternatively, the demonstrations may become a permit requirement.

The NPDES permit will be conditioned according to results from the Sections 316(a) and (b) demonstration studies. Moreover, EPA may require modifications to existing operating procedures, additional facility construction, reduced thermal discharge and/or reduced intake flow if necessary to ensure that the NPDES permit complies with Section 316(a) or State water quality standards and with Section 316(b) of the CWA.

In addition, Southern Energy is encouraged to propose mitigation and/or conservation measures, such as habitat restoration; measures which are designed to enhance or expand the biotic resources subject to power plant stresses and provide other environmental benefits.

In the FEIR, Southern Energy Canal identified a malfunction of the Unit 1 chlorination system as the probable cause of high impingement rates of cunner and pollock in June, 1999. The FEIR suggests that a new chlorination system will be installed at the facility, but did not provide any specifics on the proposed system. As part of the NPDES permit reissuance process, EPA-NE is requiring a written description and explanation of the proposed chlorination system. Since chlorine toxicity can cause fish kills, EPA-NE is requesting Southern Energy Canal to explore options other than chlorination which would reduce the exposure of aquatic organisms to this toxin. For example, Brayton Point Power Station is considering a system for controlling biological growth on condenser tubes that will eliminate the use of sodium hypochlorite. This system has been successfully used by Florida Power Corporation at their Crystal River Power Plant for several years. EPA encourages Southern Energy Canal to contact them for more information on this non-biocide option.

Arranged below is a summary of the information requested for the NPDES permit renewal process:

- Complete EPA-NPDES Permit Forms 1, 2C, & 2F.

- For both the facility's existing design (Unit 1) and the proposed design in the Canal Redevelopment Project (Unit 2), submit information to support alternative effluent limitations of the thermal component under Section 316(a) of the CWA. Also submit information which will demonstrate minimization of environmental impacts from the cooling water intake as required by Section 316(b) of the CWA for the Southern Energy Canal Power

Plant, Units 1 and 2.

- Complete the Section 316(a) and 316(b) summary information Table as provided in Attachment A with supporting text and ancillary Tables. As part of this text include your recommendations regarding: potential BTA for your cooling water intake structure/cooling system operation; what alternatives need further analysis, and any data gaps that exist relevant to the Section 316(a) and 316(b) of the CWA determinations.

- A written description of the facility's proposed chlorination system, for both Units 1 & 2.

- A description of the life histories of Essential Fish Habitat Species which may occur in the vicinity of Southern Energy Canal Station.

Please send the above requested information to me at the following address:

Nicholas Prodany
U.S. EPA Region I (CMA)
One Congress Street, Suite 1100
Boston, MA 02114-2023

Please call me at (617) 918-1691 if you have any questions regarding your application or if you need additional forms.

Sincerely,

N. W. Prodany

Nicholas Prodany
Office of Ecosystem Protection
Massachusetts State Program Office

cc: Charles Cooper, TRC Environmental Corp.
Olga Vergara, EPA
Eric P. Nelson, EPA
David Webster, EPA
Todd Callaghan, MA CZM
Bob Lawton, MA DMF
Paul Hogan, MA DEP
Gerry Szal, MA DEP
Eric Hutchins, NMFS

Enclosures

ATTACHMENT A: CWA §§ 316(a) and 316(b) Information Tabl

Control Alternative	Capitol Cost[1] ($)	Incremental Operating and Mainten-ance Cost[2] ($/year)	Max. Intake Velocity[3](ft/sec)	Max. Intake Flow Rate (MGD)	Fraction of 7Q10[4a] or Fraction Passed Thru Plant[4b] (%)	Max Thermal Dis-charge Rate (BTU/hr)	Flow Rate generated per period of operation	REPEAT FOR EACH SPECIES				
								Thermal Conditional Mortality [7, 8] (%)	Entrainment Conditional Mortality[8] (%)	Impingement Conditional Mortality[8] (%)	Total Conditional Mortality due to Plant[8,9] (%)	Anthropogenic Non-plant Relate conditional Mortali (e.g., fishing) [8, 10] (
existing conditions												
FEIR Design condtions												
Non continuous operation of Unit 1												
variable speed pump(s) Unit 1												
variable speed pumps Unit 2												
other flow modification scenarios												
continuous operation traveling screens												
alternative screening - angled												
alternative screening - wedgewire												
dual flow screens												
fine mesh screens												
other alternative screening												
intake structure with lower intake velocity												
dual spray systems												
other flow modification scenario(s)												

Control Alternative	Capitol Cost[1] ($)	Incremental Operating and Mainten-ance Cost[2] ($/year)	Max. Intake Velocity[3](ft/sec)	Max. Intake Flow Rate (MGD)	Fraction of 7Q10[4a] or Fraction Passed Thru Plant[4b] (%)	Max Thermal Dis-charge Rate (BTU/hr)	Flow Rate generated per period of operation	REPEAT FOR EACH SPECIES							
								Thermal Conditional Mortality [7, 8] (%)	Entrainment Conditional Mortality[8] (%)	Impingement Conditional Mortality[8] (%)	Total Conditional Mortality due to Plant[8,9] (%)	Anthropogenic Non-plant Related conditional Mortality (e.g., fishing) [8, 10] (%)	Migratory Effects (List)	Other aquatic effects (positive and negative) (% Mortality)	Other effects (positive and negative) (quantify)
fish return systems - buckets															
fish return troughs															
fish return other															
alternative discharge location															
modified discharge structure/ diffuser															
habitat mitigation plan															
other alternatives															

Notes from 316 (a) and (b) Information Table:

1. The cost to purchase and install new equipment or retrofit existing equipment (in current dollars). Include lost generation during construction of alternative.

2. The additional operation and maintenance costs, incremental to the existing cooling water system, assuming operation at capacity factor projected for next year. Include lost generation due to decreased thermal efficiency.

3. Intake velocity is flow rate divided by surface area of intake (do not subtract area taken up by screens).

4. a. For rivers divide maximum intake flow rate by 7Q10 of river and express as percent.
   b. For estuarine or lake systems determine the percent of water that would cycle through the plant based on average residence time in the local ecosystem and maximum flow rate (may be greater than 100 percent).

5. Estimate acute and chronic lethal effects from the thermal plume on all life stages. Additionally, identify and quantify to best extent practicable, the potential sub-lethal effects, as well as the thermal plume's potential to prevent or impede the passage of migratory fish or shellfish. For tidally influenced areas, this evaluation should consider each representative stage of the tide (e.g. slack low and high water, mid/peak- ebb and flood).

6. Conditional mortality is the estimated mortalities due to a particular condition as a percentage of absolute abundance. For conditional mortalities, a range that estimate approximately the $p=.01$ level of confidence may be presented along with best value estimates.

7. Includes but not limited to the sum of other conditional mortalities, salinity effects and synergistic effects.

8. This need not be estimated for species if the anthropogenic non-plant related impacts are insignificant or if the comparison of this impact to plant-related conditional mortalities is irrelevant to assessing impacts on a species population.

Backup Information Requirements for 316 (a) and (b) Information Table

A. The Environment

Delineate an area as the "local ecosystem" for the purpose of evaluating the potential impacts on indigenous animal populations attributed to thermal, impingement, or entrainment effects of the power plant. The boundaries of a local ecosystem should be defined by geomorphic features (e.g. estuaries), structural barriers (e.g. dams), salinity zones, tidal influence, or any combination thereof.

Describe the hydrodynamic conditions in the local ecosystem and in close proximity to the plant's intake and discharge (e.g. stagnant lake, unidirectional river, tidally influenced river or water body). This description should include range of water depth and tide, current direction and velocity, and salinity, as applicable. Diurnal and seasonal variations in salinity concentrations should be described. For river ecosystems, 7Q10 flows should also be calculated.

The designated local ecosystem will often be more spatially limited than the range requirements of a particular species throughout its entire life cycle. Describe the conspicuous ecological attributes of the local ecosystem to indigenous animals, and their significance to adjacent ecosystems (e.g. The area provides protected habitat for many species of finfish in their juvenile life stage, which later migrate offshore).

For tidally influenced areas, calculate the surface area and volume of the defined local ecosystem. The volume will be used to calculate the average residence time in the local ecosystem between pass-through (volume/flow rate= residence time). Additionally, it will be used to calculate population estimates and conditional mortality for certain species susceptible to plant impacts.

B. Indigenous Species

For the following categories, list all species known to currently exist in the local ecosystem, or did exist prior to plant construction, during any life stage, and for any period of time: Fish, mollusk, crustacean, reptile, and marine mammal. Also, list all invertebrates that are major forage species, and list and delineate on a map all sub-aquatic vegetation. Site-specific information may be obtained from federal, state, or municipal resource agencies, as well as local universities. Information gathered during prior 316 demonstrations or other permit requirements may also be useful.

For each species identified above, provide the following information, and its source. Illustrate in table format, where appropriate.

1. Select the appropriate classification(s): resident / seasonal / diadromous

2. The species has commercial / recreational / significant forage value / not applicable

3. Is the species Federally managed? Yes No

4. If yes, is the local ecosystem designated as essential fish habitat (EFH)?

5. Is the species listed as threatened or endangered, or otherwise protected under state or federal law?

6. Life stage(s) of species when present in local ecosystem? (Circle all that apply)
egg - larva - juvenile - adult - none

7. Life stage(s) vulnerable to entrainment, impingement, thermal impacts of the plant
egg - larva - juvenile - adult - none

A species is considered vulnerable if it is susceptible to:

- entrainment as an egg, larva, or juvenile;
- impingement at any life stage, lethal or sub-lethal effects;
- thermal shock or stress at any life stage;
- impedance along migratory route to or from spawning grounds;
- habitat loss or avoidance due to intolerable conditions;
- loss of forage due to vulnerabilities of major prey species.

For those species determined to be vulnerable at some life stage, provide the information requested below. For species that are not considered to be vulnerable, but are listed as Federally managed (i.e. those for which the local ecosystem is designated essential fish habitat), diadromous, or having commercial, recreational, or forage value, provide the information requested below as a rationale for this determination.

Species:
Common name:

Eggs

- Does this species spawn in the local ecosystem? Yes No
- Are eggs present in the local ecosystem? Yes No
- If yes, what months are eggs present? Most abundant?
- Are they vulnerable to entrainment? Yes No
- If no, why not?

Larvae

- Are larvae present in the local ecosystem? Yes No
- If yes, what months are larvae present? Most abundant?

- Are they vulnerable to entrainment? Yes No
- If no, why not?

Juveniles

- Are juveniles present in the local ecosystem? Yes No
- If yes, what months are juveniles present? Most abundant?
- Are they vulnerable to entrainment or impingement? Yes No
- If no, why not?
- Are any of their major forage species vulnerable to entrainment or impingement? Yes No
- If yes, which species?
- Is the subject species migrating through this area from spawning or nursery habitat ? Yes No
- If yes, does the local ecosystem represent the only avenue of egress from this habitat? Yes No

Adults

- Are adults present in the local ecosystem? Yes No
- If yes, what months are adults present? Most abundant?
- Are they vulnerable to impingement? Yes No
- If no, why not?
- Are any of their major forage species vulnerable to entrainment or impingement? Yes No
- If yes, which species?
- Are the subject species migrating through this area to or from spawning habitat ? Yes No
- If yes, does the local ecosystem represent the only access to and from this habitat? Yes No

Based on the information gathered, develop a list of species that are highly vulnerable to impacts from the plant, as well as those that have commercial, recreational, or significant forage value. The following considerations should be made in developing this list:

- The absolute abundance of the species in the local ecosystem during vulnerable life stages (provide population estimates);
- The relative abundance of the species in the local ecosystem during vulnerable life stages;
- The estimated impact to species from the plant. This should be considered in terms of the number of individuals lost from each life stage, the total number of adult equivalents, and as a percentage of the available population;
- The status and trend of local stocks. Compare this to the status and trend of the population on a regional scale;
- The significance of the local ecosystem as spawning, refuge, and/or forage habitat;
- The significance of the local ecosystem as a conduit between spawning or nursery habitat

and other required habitat.

The resulting list reflects those species that will be designated as either representative important species (RIS) due to their vulnerability to thermal effects of the plant , or critical aquatic organisms (CAO) due to their vulnerability to impingement or entrainment, or both. Those species that are not directly affected by the plant, but are indirectly affected by habitat loss or loss of forage, should be identified according to the type of impact(s) to the resources on which they rely.

Provide the rationale used to select RIS and CAO, and the specific bases for not selecting Federally managed species, or other commercial, recreational, or forage species.

For each of the species listed above as RIS or CAO, make the necessary calculations to complete the 316 (a) and (b) Information Table. Supporting information, including, but not limited to, thermal plume predictions, thermal preferences and critical thermal tolerances for specific species, actual impingement or entrainment data collected, and other sampling data collected, should be provided in supporting text.

For RIS provide the temperature (hourly, daily, weekly, monthly, and annual average) which would cause the protection and propagation of a balanced, indigenous population of this species in the local ecosystem not to be assured.

For CAO provide the measurable indicators (e.g., impingement rate, relative abundance) and threshold values of these indicators that reflect an unacceptable adverse environmental impact on this species due to entrainment and impingement.