PSNH

SEABROOK STATION
Engineering Office

Public Service of New Hampshire

New Hampshire Yankee Division

January 17, 1986

SBN- 928
T.F. B7.1.2

United States Nuclear Regulatory Commission
Washington, DC 20555

Attention: Mr. Vincent S. Noonan, Project Director
PWR Project Directorate No. 5

References: (a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444

Subject: Revisions to FSAR Section 8.2 - Off-Site Power System

Dear Sir:

FSAR Section 8.2.1 states that the Seabrook to Newington and Seabrook to Tewksbury 345 kV transmission lines will be in service prior to Unit 1 core loading; the third line, Seabrook to Scobie Pond, will be in service prior to Unit 2 going on line.

However, regulatory appeals at the state level have delayed the completion of the Seabrook to Tewksbury line so that it will not be available for Unit 1 core loading. The Seabrook to Scobie Pond line has been completed and will be available to provide the second independent source of off-site power to Seabrook Unit 1.

In the FSAR we make reference to stability and power flow studies to support the requirements of GDC 17. However, these studies represent the transmission line configuration stated in FSAR Section 8.2.1. Additional power flow and stability studies were therefore performed to identify any additional system requirements and to demonstrate that Seabrook Unit 1 connected to the transmission grid by the Seabrook-Scobie Pond and Seabrook-Newington 345 kV transmission lines can meet all the applicable criteria.

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The results of the additional studies and the changes in the transmission line availability have been incorporated in the attached revised sections of the FSAR (Attachment 1). These will be incorporated into the FSAR by a future amendment.

Very truly yours,

John DeVincentis, Director
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Attachment

cc: Atomic Safety and Licensing Board Service List

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ATTACHMENT 1

Revised FSAR Section 8.2 Excerpts

Seabrook Station

8.2 OFFSITE POWER SYSTEM

8.2.1 Description

The transmission grid connections which provide offsite power for the two units at Seabrook Station consist of three 345 kV transmission lines, as shown in Figures 8.2-1, 8.2-2, and 8.2-3. These lines are designed and built to provide the electrical and structural independence necessary to insure continuity of offsite electrical power to the station.

At Seabrook Station, the three lines terminate at separate terminating structures. From the terminating structures each circuit is routed in metal-enclosed, SF_6 gas-insulated bus to a common switching station, as shown in Figures 8.2-7 and 8.2-8.

Insert I

Two of the three transmission lines (the Newington and Tewksbury lines) will be in service prior to Unit 1 core loading. The third line (to Scobie Pond) will be placed in service prior to Unit 2 going on line.

Insert II

8.2.1.1 Transmission Lines

The topography of the 345 kV transmission line rights-of-way is of reasonably flat areas or low rolling hills. One line runs in a northerly direction for approximately 18 miles and terminates at Newington Generating Station in Newington, New Hampshire. The second line runs in a westerly direction for approximately five miles and then veers south for approximately 35 miles, terminating at Tewksbury Substation in Tewksbury, Massachusetts. The third line runs in a westerly direction for approximately 28 miles and terminates at Scobie Pond Substation in Londonderry, New Hampshire.

The two 345 kV lines from Seabrook to Scobie Pond and from Seabrook to Tewksbury are on separate towers but share the same right-of-way for approximately five miles as shown in Figure 8.2-1. The balance of the Tewksbury line is shown in Figure 8.2-2.

Both the Scobie Pond and the Tewksbury transmission lines utilize wood or steel H-frame type structures, with two steel H-frame structures in parallel on the common portion of their rights-of-way. See detail B of Figure 8.2-4 for typical parallel 345 kV H-frame structures. The steel angle structures necessary for those portions of the lines are similar to that shown in detail C of Figure 8.2-4. As noted on Figure 8.2-1, the spacing of the structures on the parallel lines is 85 feet center-to-center. The combination of 85 foot separation and the safety factors in the design of the steel structures insures complete electrical and physical separation of the two transmission lines along the five mile section of common right-of-way.

The Newington line is on an entirely separate right-of-way, as shown in Figure 8.2-3. The transmission line from Seabrook to Newington Station uses single pole steel structures similar to that in detail A of Figure 8.2-4 and H-frame type structures similar to those shown in detail B of Figure 8.2-4.

Insert I

It has been anticipated that two of the three transmission lines (the Newington and Tewksbury lines) will be in service prior to Unit 1 core loading. The third line (to Scobie Pond), would have been placed in service prior to Unit 2 going on line. Appropriate power flow and stability studies were performed for this line configuration as shown in Section 8.2.2.3 of the FSAR. Subsequent to these studies and because of local regulatory difficulties, completion of the Seabrook-Tewksbury line has been delayed and, therefore, it will not be available for Unit 1 core loading. The Seabrook to Scobie Pond line has been completed and will be available to provide the second independent source of off-site power to the Seabrook Unit 1.

Additional power flow and stability studies were performed to identify any additional system requirements and to demonstrate that Unit 1 connected to the transmission grid by the Seabrook-Scobie Pond 345 kV line and Seabrook-Newington 345 kV line can meet all applicable criteria. The results of those additional studies are shown in Section 8.2.2.3.

Insert II

The topography of the 345 kV transmission line rights-of-way is of reasonably flat areas or low rolling hills. The Newington line runs in a northerly direction for approximately 18 miles and terminates at Newington Generating Station in Newington, New Hampshire. The Tewksbury line runs in a westerly direction for approximately five miles and then veers southerly for approximately 35 miles, terminating at Tewksbury Substation in Tewksbury, Massachusetts. The Scobie Pond line runs in a westerly direction for approximately 28 miles and terminates at Scobie Pond Substation in Londonderry, New Hampshire.

Insert III

8.2.2.3 Power Flow and Stability Studies

B. 1980 Studies for Unit 1 and Unit 2 Operation

Seabrook Station Units 1 and 2 Transient Stability and Power Flow Studies (References 6 and 7) have been performed to determine the effect of the Seabrook Station and its associated facilities on the reliability of the interconnected transmission system. The current studies for Unit 1 differ from previously performed studies, which were included in the Seabrook PSAR, due to the revised order in which the transmission lines are being built. The transmission lines associated directly with both Units 1 and 2 have not changed, but the interconnected transmission system representation has been updated as applicable.

The studies reported in References (6) and (7) update similar studies submitted to NEPOOL (New England Power Pool) in 1974 and serve to reconfirm the power transfer levels presented in those studies. Modifications were made to the load, generation and transmission representations based on the most up-to-date estimates for the study years. The studies were performed in accordance with the NEPOOL and NPCC (Northeast Power Coordinating Council) reliability criteria. System performance was evaluated at power transfer levels that could be reasonably expected. Transfer levels at or above those presented in the 1974 studies were investigated and system requirements necessary to achieve these transfer levels were determined.

a. System Representation and Methodology

The transient stability study was conducted using the Westinghouse Electric Corporation's Transient Stability and Power Flow Programs. A detailed network representation of Nova Scotia, New Brunswick, New England and New York was used. A less detailed network representation of Ontario Hydro, P.J.M. (Pennsylvania, New Jersey, Maryland) and systems to the west and south was utilized. Cases studied included consideration of delayed clearing of faults, inoperative circuit breakers, and unsuccessful attempts to reclose a circuit breaker subsequent to initial clearing of a fault. The need for dual high speed relaying systems and required modes of reclosing at individual terminals were also investigated.

The power flow study was conducted using the Philadelphia Electric Power Flow Program. A detailed network representation was utilized for New England and a simplified network representation was utilized for New York and New Brunswick.

A 45 and 95 percent winter peak load level was studied for both study years for both the transient stability and the power flow studies. The studies included cases stressing intra-pool power transfers. Cases simulating post fault power flow conditions were run for the majority of the stability cases studied. Figures 8.2-11 and 8.2-12 are switching diagrams of the portion of the 345 kV transmission system most closely tied to Seabrook for the two study years.

Insert III

A. 1985 Studies for Unit 1 Operation With Seabrook to Newington and Seabrook to Scobie Pond 345 kV Line Configuration

As mentioned under Section 8.2.1, the construction of the Seabrook to Tewksbury 345 kV transmission line has been delayed due to local regulatory difficulties, so this line will not be available for Unit 1 core loading as originally anticipated. The Seabrook to Scobie Pond line has been completed and will provide the second independent source of off-site power to the Unit as well as will provide a second path for Seabrook power to flow into the transmission grid.

The stability studies performed in 1980 (References 6 and 7) do not represent the line configuration that will be in existence for Unit 1 operation (i.e., Seabrook to Newington and Seabrook to Scobie Pond). Therefore, new studies (Reference 13) were performed to demonstrate that Seabrook Unit 1 connected to the transmission system by the Seabrook to Scobie Pond 345 kV line, and the Seabrook to Newington 345 kV line can meet all the applicable criteria and satisfies the requirements of GDC 17.

These new studies for Unit 1, supersede the applicable portions of the 1980 studies for Unit 1 operation.

These studies, reported in Reference 13, were performed in accordance with NEPOOL and NPCC reliability criteria.

a. System Representation and Methodology

The basic transmission network used for this study was developed by the Transmission and Stability Task Forces of the NEPOOL Planning Committee for stability studies. Changes were made to simulate the year 1986. A 45 percent and 75 percent summer peak load level was represented based on the "April 1985 NEPOOL Forecast Report of Capacity, Energy, Load and Transmission."

Insert III (continued)

A detailed network representation of Nova Scotia, New Brunswick, New England and New York was used. A less detailed network representation of Ontario Hydro, PJM (Pennsylvania, New Jersey, Maryland) and the Interconnected Systems Group was utilized. The study was performed by using the Westinghouse Electric Corporation "Westcat" Transient Stability and Power Flow Programs.

Thermal transfer limits as determined by NEPLAN were taken into consideration for this time period assuming the Seabrook-Tewksbury line is not in service. Stability testing was done at these transfer limits as discussed in Reference 13. Several different generation dispatches were tested to determine how these different dispatches effect system performance.

Figure 8.2-11A represents the switching diagram of the portion of the 345 kV transmission system most closely tied to Seabrook for this particular study.

b. Results and Conclusions

These studies have demonstrated that Seabrook Unit 1 connected to the transmission system by two 345 kV lines (Seabrook-Scobie Pond and Seabrook-Newington) can meet the NEPOOL "Reliability Standards for the New England Power Pool" and the NPCC "Basic Criteria for Design and Operation of Interconnected Power Systems."

With proper system operating procedures, stable operation of the interconnected power system can be maintained and availability of the off-site power supplies to the Seabrook Unit 1 will not be impaired.

Furthermore, load flow studies performed demonstrate the power system can be operated such that loss of the Seabrook to Scobie Pond line, Seabrook to Newington 345kV line or for other representative line contingencies, all voltages and line loadings can be within required limits.

It is expected that the Seabrook to Tewksbury line will be completed at some later date. Completion of this line will allow more economic operation of the generation system as well as allow significant flexibility in system operation.

As a result of the transient stability studies, it was determined that, in addition to the three 345 kV transmission lines terminating at Seabrook Station, an additional 345 kV circuit breaker will be required at Colburn Road Substation (Milford, New Hampshire) to assure system stability with both Seabrook units in operation.

C. General Conclusions

Studies conducted by NPCC (References 8 and 9) have demonstrated that the split of power on the New England to New York tie lines is relatively insensitive to the location of generation outages in New England. NEPOOL studies have demonstrated that New England can pick up the loss of the Millstone complex (2630 MW) from New York and that no reliability problems exist. Since Seabrook is a 2300 MW facility, the loss of Seabrook Station is a less severe disturbance than the loss of the Millstone complex. Prior to the loss of the two Seabrook units, the power flow from Northern New England to Southern New England would be on the order of 2000 MW. Upon loss of the two Seabrook units, there would be a decrease in the Northern New England to Southern New England power flow of approximately 2300 MW. As shown by the studies modeling the loss of Millstone, New England can make up this loss (without system reliability problems) by importing 2300 MW from New York. It is therefore concluded that loss of preferred power supply to the Seabrook nuclear units would not occur as a result of the loss of one or both Seabrook nuclear units.

Insert IV

NPCC has performed a study (Reference 10) to investigate the effect that the dropping of a large portion of load might have on the interconnected system. The load dropped (2600 MW), consisted of the Northfield Mountain Pumped Storage Plant (1000 MW), the Bear Swamp Pumped Storage Plant (600 MW) in Massachusetts, and Gilboa Pumped Storage Station (1000 MW) in New York, all operating in the pumping mode. The study, which was done on a large 1975 system representation, indicated no system break-up.

Frequency decay rates, in the event of a sudden generation/load imbalance, based on analysis and experience in the NPCC system (of which the New England 345 kV grid is part) are predicted to be less than the maximum credible frequency decay rates used by Westinghouse to determine loss of flow transients caused by frequency decay events. Although it is not possible to predict with certainty the boundaries of electrical islands, should they occur, computer studies for the NPCC system (Reference 11), taking into account the NPCC underfrequency load shedding program, have shown that the frequency decay does not exceed 4 Hz/second.

Based on the results of the studies performed, it is concluded that the generation at Seabrook Station with Unit 1, and with both Units 1 and 2, together with the facilities required to integrate this generation into and reinforce the transmission grid meet the NEPOOL "Reliability Standards for the New England Power

Insert IV

Since the completion of the 1980 studies, increased transfers of economic energy from the Midwest and Canada have heavily loaded the Transmission System in the Northeastern area of the United States. Currently, studies are in progress by several NPCC and PJM companies to assess the effect of loss of large amounts of generation in the New York and New England areas. Plans will be formulated to allow for continued reliable operation of the power system.

Pool" (Reference 3) and the NPCC "Basic Criteria for Design and Operation of Interconnected Power Systems" (Reference 2). As the system configuration warrants, NEPOOL periodically assesses the New England bulk power supply system on a near term basis with regard to disturbances associated with line out conditions in accordance with both NEPOOL and NPCC criteria. These studies determine any required remedial action to assure that system operation is in conformity with the criteria and form the basis of actual operating procedures.

8.2.3 References

1. "Bulk Power System Protection Philosophy", Northeast Power Coordinating Council.

2. "Basic Criteria for the Design and Operation of Interconnected Power Systems", Northeast Power Coordinating Council.

3. "Reliability Standards for the New England Power Pool", New England Power Pool.

4. ANSI C2, "National Electrical Safety Code.".

5. "Code for the Installation and Maintenance of Electrical Transmission Lines", Commonwealth of Massachusetts (applies within Massachusetts only).

6. Public Service Company of New Hampshire, Seabrook Station, Unit No. 1 and Unit No. 2 Transient Stability Study - January 1980.

7. Public Service Company of New Hampshire, Seabrook Station, Unit No. 1 and Unit No. 2 Power Flow Study - January 1980.

8. NPCC Report: "Analysis of the NPCC 1985 Transmission System" - June 1976; NPCC Working Group No. 17.

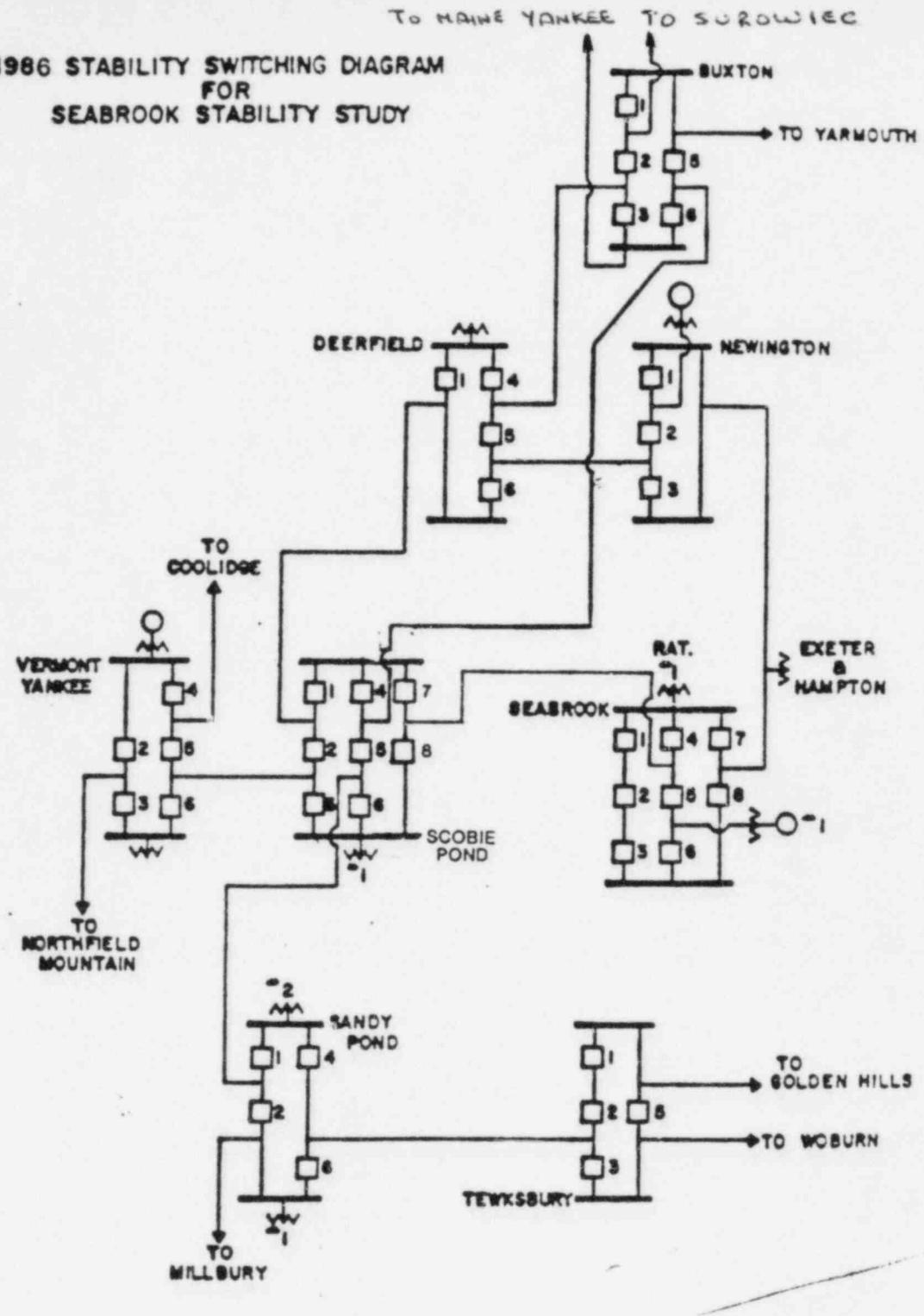
9. NPCC Report: "Analysis of the NPCC 1983 Summer and 1983/4 Winter Transmission System" - July 1979; NPCC Working Group No. 27.

10. NPCC Report: "Study of the Use of Pumped Storage Units for Load Shedding by NPCC Task Force on Systems Studies" - April 1974; NPCC Working Group No. 16.

11. NPCC II Joint Working Group Report - September 1970

12. Seabrook Generator Circuit breaker Qualification Test Reports and Analyses.

13. Public Service Company of New Hampshire, Seabrook Station, Unit No. 1 Load Flow and Transient Stability Study, December 1985 (analysis before completion of Seabrook to Tewksbury transmission line).



PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE
SEABROOK STATION - UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

SWITCHING DIAGRAM FOR
SEABROOK UNIT 1 TRANSIENT STABILITY
AND POWER FLOW STUDIES (1985)

FIGURE 8.2-11A