PSNH PUBLIC SERVICE
Company of New Hampshire

SEABROOK STATION
Engineering Office:
1671 Worcester Road
Framingham, Massachusetts 01701
(617) - 872 - 8100

December 2, 1982

SBN-400
T.F. B7.1.2

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing

References: (a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444
(b) USNRC Memorandum, dated October 14, 1982, "Notice of Meeting Regarding Open Items in the Safety Review," L. L. Wheeler to J. D. Kerrigan

Subject: Response to Open Items (SRP Sections 10.3.5 and 10.4.8; Chemical Engineering Branch)

Dear Sir:

As a result of a recent meeting with the NRC Staff [Reference (b)], we offer the following responses to the subject open items.

Item (SRP Section 10.3.5):

Additional information is needed on the following secondary water chemistry items:

(a) Sample locations,

(b) Frequency of sampling for critical parameters,

(c) Methods of recording and management of data, and

(d) Program element defining corrective action for off control point chemistry parameters.

Response:

Public Service Company of New Hampshire (PSNH) responded to these particular subjects in answering RAI 282.2. Subsequent discussions with the NRC reviewer (Mr. B. Turovlin) determined that a comparison of the Seabrook Secondary Side Water Chemistry Program to the recommendations of Branch Technical Position MTEB 5-3 ("Monitoring of Secondary Side Water Chemistry in PWR Steam Generators") would be useful in providing the level of detail necessary to complete the review of this item.

B001

Accordingly, the response that follows is an itemized identification of the Seabrook design and program commitments that pertain to the individual subsections of Part II of BTP MTEB 5-3.

BTP Subsection 1 - first subparagraph:

"Crevices between the tubing and the tube sheets or tubing supports should be minimized to prevent concentration of impurities of solids in these areas. To achieve this goal the tubes at the tube/tube sheet interface should be expanded for the full depth of the tube sheet."

Response:

See FSAR section 5.4.2.4.a.

BTP Subsection 1 - second subparagraph:

"To minimize the deposition of corrosion products and sludge between the tubes and the supporting structure, the tube/tube support interface should be designed to promote high velocity water flow at the interface. This would improve the "washing" of this area."

Response:

See FSAR section 5.4.2.4.b and Figure 5.4-3.

BTP Subsection 2:

"Regulatory Guide 1.37 endorses ANSI N45.2.1 and states in part, "The surface (of components) shall appear metal clear. Scattered areas of rust are permissible provided the aggregate area of rust does not exceed two square inches in any one square foot area." Experimental work has shown that a porous packing of oxide in the tube support annulus is one of the conditions resulting in the concentration of contaminants which leads to runaway corrosion of the tube support plate. Nuclear plant operators should start up the steam generators with "metal clean" surfaces. A method of confirmation such as photographing the inside of the steam generator should be undertaken after hot functional testing to confirm the "metal clean" condition."

Response:

Upon completion of hot functional testing, PSNH will confirm that the secondary side of the steam generators satisfies the class C cleanliness requirements of Regulatory Guide 1.37 and ANSI N45.2.1 - 1973. The exact technique for accomplishing this confirmation has not yet been selected, nor have procedures yet been written. The selection of technique and preparation of procedures will be completed on a timely basis that is coordinated with the test program schedule and will provide sufficient time for necessary training and practice prior to the actual use.

BTP Subsection 3.a. - first subparagraph, first sentence:

"In the FSAR, the applicant should describe implementation of a secondary water chemistry and monitoring program (in accordance with reference nuclear steam system supplier's recommended procedure) to inhibit steam generator corrosion and tube degradation."

Response:

The components and plant systems that are included in the secondary water chemistry and monitoring program are described in FSAR Section 9.3.2, Tables 9.3-1 and 9.3-2, Figure 9.3-5b, Figure 9.3-6, and FSAR Sections 10.3.5 and 10.4. The attached copy of Figure 9.3-6 has been marked up to display the steam generator blowdown sampling system and the sampling it performs on each steam generator individually.

The procedures that implement this program are, as stated in the PSNH responses to RAI 282.2 and RAI 282.3, now being developed and will be in use by three months prior to fuel load. These procedures will embody the guidance and recommendations of the generic NSSS (Westinghouse) "Steam Side Water Chemistry Control Specifications" (Westinghouse Standard Information Package 5-4) (SIP 5-4) with modifications necessary to adapt to the Seabrook specific systems, components and chemical analysis equipment.

A meaningful discussion of this All Volatile Treatment (AVT) chemistry program is proprietary Westinghouse information. It is presented in the SIP 5-4 documentation which is available for NRC review.

The secondary side water chemistry program procedures will also use as reference material and guidance other professional and technical publications such as:

- Westinghouse Standard Information Package 5-2, Chemical Analysis Procedures.
- American Public Health Association, Standard Methods for Examination of Water and Wastewater.
- American Society for Testing Materials, Part 31 Water.

These procedures will also include the requirements of Section 10 of Appendix A to Regulatory Guide 1.33 (Rev. 2, 2/78) and Section 6.8.5(c) of the Technical Specifications and will give specific instructions regarding such matters as frequency and schedule of sampling, the techniques to be used for drawing samples and for performing the analysis using each type of analysis equipment. Alternate methods of analysis, for example by use of grab samples and back-up analysis equipment, will also be presented. These procedures also will provide for recording, plotting and performing trend analysis and reporting the results of specific samples and trends to operational shift supervisors, to chemistry supervisors, and, when circumstances warrant, to station upper management. Also to be covered in these procedures will be the timing of and means by which corrective action will be undertaken when various parameters are trending toward an out-of-specification condition or are found to actually be past the established limits. Included also will be the techniques to confirm or verify the accuracy of results. Procedures will also ensure proper calibration and maintenance of analytical instrumentation and equipment.

BTP Subsection 3.a. - first subparagraph - second sentence:

"This program should cover the following operational modes: (1) power operation (normal), (2) startup, (3) hot standby, (4) hot shutdown, and (5) cold shutdown/cold wet layup."

Response:

The critical parameters and specifications for each of the listed operational modes are presented on Table 282.2-1 which was submitted with the PSNH response to RAI 282.2. A copy of Table 282.2-1 is attached. It has been revised to present the information in modes that now match the BTP request.

BTP Subsection 3.a. - second subparagraph:

"Each of the above modes should be defined with regards to percent rated thermal power and approximate temperature range, ^{O}F."

Response:

A copy of Table 282.2-1 (noted above) is attached. It has been revised to provide the thermal power and temperature information requested. This revised Table 282.2-1 will be made part of the next available FSAR Ammendment.

BTP Subsection 3.b:

"The secondary water chemistry monitoring and control program should include the following:

Subsection (1) (first sentence):

"Identification of a sampling schedule for critical parameters during each mode of operation and of acceptance control criteria for these parameters."

Response:

As stated in the PSNH response to RAI 282.2 and as noted above in the response to Subsection 3.a, the sampling schedule and the acceptance control criteria for the various parameters will closely follow the AVT chemistry program presented in the proprietary Westinghouse SIP 5-4 documentation. The attached revised Table 282.2-1 presents much of this information. The remainder is briefly outlined in FSAR Sections 9.3.2.1, 9.3.2.2 and 9.3.2.5 and will be embodied in detail in the Seabrook specific chemistry procedures that will be completed and in use by three months prior to fuel load.

BTP Subsection 3.b. - Subsection (1) (second and third sentences):

"The program should include as a minimum the control of pH, cation conductivity, free sodium, and dissolved oxygen. However, other parameters such as specific conductivity, chlorine, fluorine, suspended solids, silica, total iron, copper, ammonia, and residual hydrazine merit consideration."

Response:

The minimum control parameters are included in the program as shown on the attached Table 282.2-1. In addition it should be noted that "free sodium" will be separately monitored, but that the related parameter that is controlled is free hydroxide.

Of the "other parameters" that "merit consideration," two are itemized in Table 282.2-1 and the others, which have been carefully considered, will be sampled and controlled as plant circumstances require during the conduct of operations.

BTP Subsection 3.b. - Subsection (1) (fourth sentence):

"In plants having more than one steam generator, additives to each steam generator should be controlled separately."

Response:

As shown on the attached copy of revised FSAR Figure 9.3-6 the normal control of the AVT program chemistry parameters, while conducting normal power operations, is performed on all steam generators in parallel. The blowdown from each generator, however, is sampled individually and the chemical addition system provides the capability to adjust the chemistry of any individual steam generator, should such a need arise.

BTP Subsection 3.c. - first subparagraph, first and second sentence:

"The Nuclear Regulatory Commission will review the secondary water chemistry control and monitoring program of each individual plant. The applicant should incorporate the technical recommendations of the steam generator supplier."

Response:

The technical recommendations of the steam generator supplier (Westinghouse) are being incorporated as has been noted in the PSNH responses to RAI 282.2, RAI 282.3 and subsection 3.a above.

BTP Subsection 3.c. - first subparagraph, third sentence:

"Any significant deviation from the supplier's recommendations should be noted and justified technically."

Response:

As stated in the PSNH response to RAI 282.2, RAI 282.3 and as noted in subsections 3.a. and 3.b. above, no significant deviations from the NSSS suppliers' recommendations are necessary at this time. Should such deviations become advisable in the future, they will be noted as appropriate revisions to documents concerned and technically justified.

BTP Subsection 3.c. - second subparagraph:

"Records should be made of the monitored item values, and in accordance with 10 CFR Part 50, §50.71(a) they shall be made available for audit and inspection when deemed necessary."

Response:

As stated in response to RAI 282.2, as noted in the response to subparagraph 3.a (above) and as required by Sections 6.8.5 and 6.10.2 of the Technial Specifications, appropriate records will be prepared and

maintained in accordance with approved procedures that will stipulate the methods of recording and managing chemistry data. Such records shall be available for audit and inspection in accordance with 10CFR 50.71(a).

BTP Subsection 3.c. - third subparagraph:

"Each licensee as part of his annual operating report should include an evaluation of the secondary side water chemistry program with an evaluation of the trends and a summary of the total time during the reporting period the various chemistry parameters were out-of-specification."

Response:

PSNH will submit annual reports as required by Regulatory Guides 1.16 (Rev. 4, 8/75) and 10.1 (Rev. 4, 10/81) and by Technical Specifications Section 6.9.1.5.

BTP Subsection 3.d. - subparagraph (1) - first sentence:

"For plants utilizing volatile chemistry:

(1) The composition, quantities, and added rates of additives should be recorded."

Response:

The recording of composition, quantities and addition rates of chemical additives is a normal part of the Seabrook Station chemistry records. The specifics of these records and of the procedures involved are, as stated in the PSNH response to RAI 282.2, RAI 282.3 and subsection 3.a. (above), now in preparation. They will be completed and in use three months prior to fuel load.

BTP Subsection 3.d - subparagraph (1) - second sentence:

"Routine changes in these items should be reported under biannual FSAR update as required by 10 CFR Part 50, §50.71."

Response:

As noted above, the chemistry program will embody the guidance and recommendations of the Westinghouse SIP 5-4 without signficant deviations. Routine changes that may occur in the future will be reflected by revisions to existing FSAR information in the annual update required by 10 CFR 50.71.

BTP Subsection 3.d. - subparagraph (1) - third sentence:

"However, nonconservative changes, i.e., relaxation in sample frequency, or change in impurity limits shall be submitted to NRC for approval before the change is implemented."

Response:

As noted above, the chemistry program will embody the guidance and recommendations of the Westinghouse SIP 5-4 without signficant deviation. Changes to safety related chemistry procedures are subjected to the same degree of review and approval as other station procedures of that category. The review will consider whether such changes are "non-conservative" and whether they involve an unreviewed safety question. Station administrative procedures provide for the routing and disposition of changes of this type, which includes submission to the NRC for review and approval in appropriate cases.

BTP Subsection 3.d. - subparagraph (2) - first sentence:

"(2) The electrical conductivity and the pH of the bulk steam generator water and feedwater should be measured continuously."

PSNH Response:

The electrical conductivity and pH of the bulk steam generator water (blowdown) and feedwater is measured continuously as outlined in FSAR Sections 9.3.2.2 and 9.3.2.5 and FSAR Table 9.3-1 and as shown on the attached copy of revised FSAR Figure 9.3-6.

BTP Subsection 3.d. - subparagraph (2) - second sentence:

"Assurance should be provided that the sample taken at the blowdown is typical of the bulk steam generator water and that there is a minimum bypass between the feedwater inlet and the blowdown sampling point."

Response:

Information which documents the assurance of these two factors will be provided in the near future.

BTP Subsection 3.d. - subparagraph (3):

"(3) For once-through steam generators, the pH and electrical conductivity at the coolant inlet should be measured continuously."

Response:

Not applicable. Seabrook does not have once-through steam generators.

BTP Subsection 3.d. - subparagraph (4):

"(4) Free hydroxide concentration and impurities (particularly chloride, ammonia and silica) in the steam generator water should be measured at least three times per week."

Response:

Chloride, ammonia and silica will be monitored at least three times per week. Free hydroxide will be monitored at least once per week since sea water cannot produce free hydroxide in the steam generators and since the separate monitoring of sodium (see FSAR 9.3-6) is used to cross-check free hydroxide.

BTP Subsection 3.e.:

"For plants utilizing phosphate treatment . . . "

Response:

Not applicable. Seabrook will use AVT.

BTP Subsection 3.f. - subparagraph (1)(a):

For all PWR Plants

(1) Condenser cooling water in-leakage to the condensate has been identified as the major source of impurity ingress in the PWR secondary feedwater. The combination of impurity ingress with corrosion of copper containing alloys and corrosion product transport (Fe_3O_4, NiO_2, etc.) in the secondary water system produces sludge that is difficult to remove and is reactive to steam generator materials.

In reporting the program the following guidelines should be observed:

(a) Monitor the condensate water quality at the condensate pump discharge as a minimum. Supplement as necessary by samples from the condenser hot well and condenser discharge."

Response:

Such monitoring is accomplished as noted above, in the response to RAI 282.2 and as shown on revised Figure 9.3-6 (attached).

BTP Subsection 3.f. - subparagraph (1)(b):

"(b) Measure the cation conductivity and oxygen."

Response:

Cation conductivity and oxygen are measured as discussed above, in the response to RAI 282.2 and as shown on revised Table 282.2-1 (attached) and revised Figure 9.3-6 (attached).

BTP Subsection 3.f. - subparagraph (1)(c):

"(c) Maintain condensate impurity level at 0.1 ppm $\pm$ 0.05 ppm, oxygen at $\leq$ 5 ppb."

Response:

As provided in SIP 5-4, and as discussed above, in the response to RAI 282.2 and as shown on revised Table 282.2-1 (attached), revised Figure 9.3-6 (attached) and Figure 10.3-2, impurities will be observed by monitoring conductivity, iron and copper.

BTP Subsection 3.f. - subparagraph (1)(d) and (1)(e):

"(d) A cation conductivity increase of 0.05 to 0.10 umho/cm justifies on-line investigation of possible contamination."

"(e) An increase of 0.10 to 0.20 umho/cm is considered an indication of condenser leakage."

Response:

The cause or source of increases in cation conductivity, such as those given in the BTP, will be investigated. It should be noted, however, that although they are not necessarily in the condenser, the Seabrook condenser design has special provisions to aid in prompt and positive indications of condenser tube sheet leakage as shown on revised Figure 9.3-6 (attached) and as discussed in the PSNH response to RAI 282.2(5), and FSAR Section 10.4.1.5.

BTP Subsection 3.f. - subparagraph (1)(f):

"(f) When a condenser leak is confirmed, the leak should be repaired or plugged within 96 hours, or before the total integrated conductivity increase reaches 20 umhos/cm hrs. The staff will consider other impurity-time limit proposals for limiting the quantity of impurities entering the steam generator."

Response:

Corrective action to repair a verified condenser leakage of seawater that is in excess of the SIP 5-4 parameters will be accomplished within 96 hours as discussed in the PSNH response to RAI 282.2(5).

BTP Subsection 3.f. - subparagraph (2):

"(1) Identify the procedures used to measure the value of each of the critical parameters. Provide the procedure title, the applicant/licensee's procedure number, and the basis (i.e., ASTM No.)."

Response:

As noted above and as discussed in the PSNH responses to RAI 282.2 and RAI 282.3, the chemistry procedures are now being developed and will be completed by three months prior to fuel load. These procedures will embody the guidance and recommendations of the SIP 5-4 (and the listed professional and technical publications) with modifications necessary to adapt to the Seabrook specific systems, components and analysis equipment.

BTP Subsection 3.f. - subparagraph (3):

"(3) Identify sampling points. The program should consider sampling the steam generator blowdown, the hot well discharge, the feedwater, and demineralizer effluent as a minimum of sampling points."

Response:

The sampling points include those given in the BTP and are as discussed in FSAR sections 9.3.2 and 10.3.5., the PSNH response to RAI 282.2, FSAR Table 9.3-1 and revised FSAR Figure 9.3-6 (attached). The demineralizer effluent is also sampled even though it is not specifically noted or shown in the referenced material.

BTP Subsection 3.f. - subparagraph (4) & (5):

"(4) State the procedure for recording and management of data."

"(5) State the procedures defining corrective action for various out-of-specification parameters. The procedures should define the allowable time for correction of out-of-specification chemistry."

Response:

As stated in the PSNH response to subsection 3.a., 3.c. and 3.f. above and to RAI 282.2, the appropriate procedures are now in preparation. They will include detailed methods for recording data and for its short term and long term management. Also included will be complete and specific directions regarding corrective action to be taken for the various types of out-of-specification conditions that could be found for the chemistry parameters, particularly including the time allowance for correcting such conditions.

BTP Subsection 3.f. - subparagraph (6):

"(6) Identify (a) the authority responsible for the interpretation of the data, and (b) the sequence and timing of administrative events required to initiate correction action."

Response:

There will be a suitably qualified chemistry technician assigned to each operating shift. He will have the capability, authority and responsibility to interpret chemistry analyses and data. He will report the results to the Unit Shift Supervisor of the unit concerned. As outlined in the response to 3.a. above, when the results of a chemistry analysis indicate corrective action is necessary, the appropriate procedures will require that the shift chemistry technician will also promptly inform the Unit Shift Supervisor of the required corrective action and the timing, sequence and specifics of the action to be taken. When the Unit Shift Supervisor concurs in the corrective action and has placed the unit in an operational condition that is compatible with the corrective chemistry action, he will direct the chemist to proceed with such corrective action.

The procedures will also stipulate the steps to be followed if the chemist and the Unit Shift Supervisor disagree on the action to be taken and more senior chemistry and operational management must be brought into the decision process.

BTP Subsection 3.f. - subparagraph (7):

"(7) Identify major components of the secondary water system and materials in contact with secondary water coolant."

PSNH Response:

The major components of the secondary water systems are shown in revised Figure 9.3-6 (attached). The materials within these components and the interconnecting piping of the condensate, feedwater and main steam systems will be identified and submitted to the NRC in the near future.

Item (SRP Section 10.4.8):

Provide information regarding effects of steam generator blowdown on secondary water chemistry.

Response:

FSAR sections 9.3.2, 10.3.5 and 10.4.8 present a discussion of the effects of steam generator blowdown. Also pertinent, but not extracted here, is the discussion given in the NSSS (Westinghouse) "Steam Side Water Chemistry Control Specifications" (Westinghouse Standard Information Package 5-4) (SIP 5-4) which contains proprietary Westinghouse information but is available for NRC review.

Very truly yours,
YANKEE ATOMIC ELECTRIC COMPANY

John DeVincentis
Project Manager

cc: Atomic Safety and Licensing Board

ASLB SERVICE LIST

Philip Ahrens, Esquire
Assistant Attorney General
Department of the Attorney
General
Augusta, ME 04333

Representative Beverly Hollingworth
Coastal Chamber of Commerce
209 Winnacunnet Road
Hampton, NH 03842

William S. Jordan, III, Esquire
Harmon & Weiss
1725 I Street, N.W.
Suite 506
Washington, DC 20006

E. Tupper Kinder, Esquire
Assistant Attorney General
Office of the Attorney General
208 State House Annex
Concord, NH 03301

Robert A. Backus, Esquire
116 Lowell Street
P.O. Box 516
Manchester, NH 03105

Edward J. McDermott, Esquire
Sanders and McDermott
Professional Association
408 Lafayette Road
Hampton, NH 03842

Jo Ann Shotwell, Esquire
Assistant Attorney General
Environmental Protection Bureau
Department of the Attorney General
One Ashburton Place, 19th Floor
Boston, MA 02108

TABLE 282.2-1

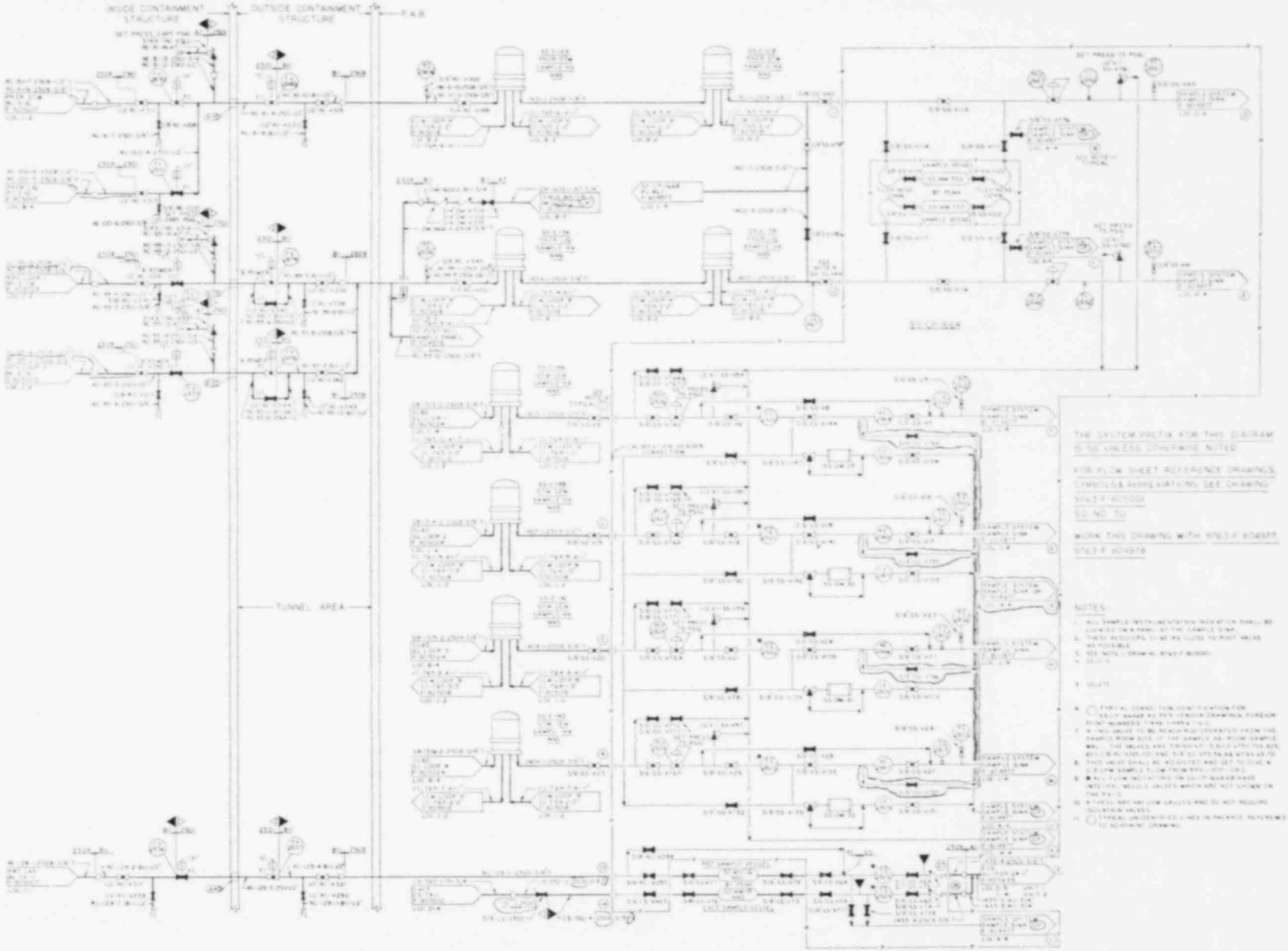
CRITICAL PARAMETERS AND SPECIFICATIONS FOR EACH MODE OF OPERATIONS

Operational mode:	Refueling & Wet Lay-Up	Cold Shutdown	Hot Standby Hot Shutdown	Hot Start-Up		Normal Power Operation	
Thermal Power (%):	0	0	0	0 ----> 5%		5 ----> 100%	
Sample Source:	Blowdown	Blowdown	Blowdown	Feedwater	Blowdown	Feedwater	Blowdown
Temperature Range (°F): (before sample cooler)	70 - 140	70 - 200	350 - 557 200 - 350	40 - 350	350 - 557	40 - 445	557 - 588
Parameter							
ph, 25°C	10.0-10.5	8.5-10.00	8.8-10.0	8.8-10.0	8.5-10.0	8.8-9.2	8.5-9.0
Free Hydroxide as ppm $CaCO_3$	N/A	N/A	.15 max	N/A	.15 max.	N/A	.15 max.
Cation Conductivity, umhos/cm, 25°C	N/A	7 max.	2.0 max.	N/A	7 max.	N/A	2 max.
Chloride, ppm	.5 max.	.5 max.	N/A	N/A	N/A	N/A	.15 max.
Hydrazine, ppm	75-150	N/A	N/A	$[O_2]$ + .005	N/A	$[O_2]$ + .005	N/A
Dissolved Oxygen, ppb	100 max.	N/A	N/A	100 max.	N/A	5 max.	N/A

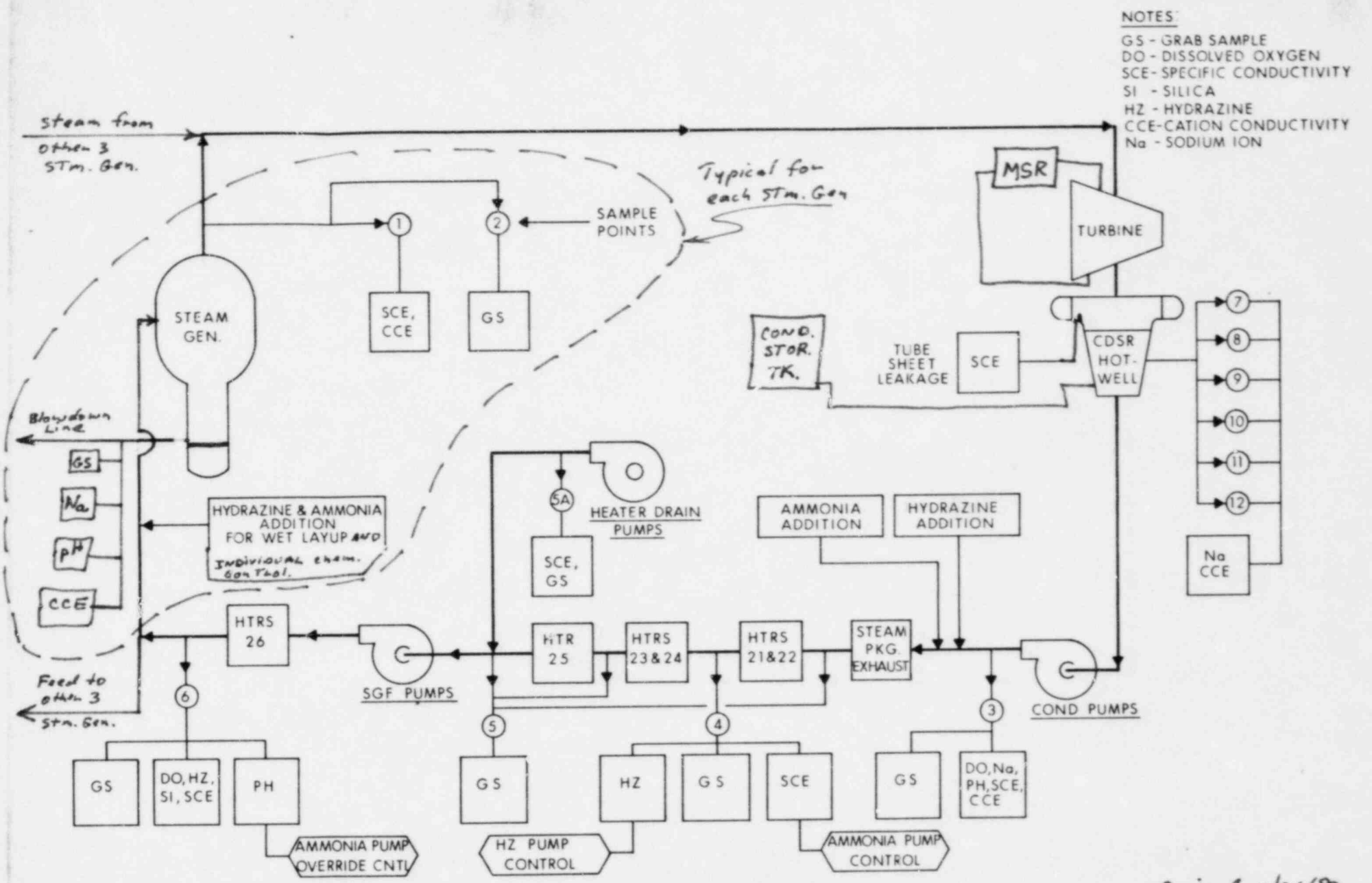
NOTES:
1. "N/A" indicates that the parameter is continuously monitored but control limits are not specified by Westinghouse SIP 5-4.
2. See FSAR Tables 10.3-1, 10.3-2 and 10.4-2 for other parameters that are monitored but which have no specific control points established.

SB 1&2
FSAR

Amendment 45
June, 1982
(Revised 11/22/82)



PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE SEABROOK STATION - UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	SAMPLE SYSTEM NUCLEAR P&I DIAGRAM SHEET 1	
		FIGURE 9.3-5b



Revised 11/26/82

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE SEABROOK STATION - UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	SECONDARY STEAM AND WATER SAMPLING SUBSYSTEM SCHEMATIC FIGURE 9.3-6