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Department of Nuclear Energy

November 15, 1983

Mr. E. Chelliah
Reliability and Risk Assessment Branch
Division of Safety Technology
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Chelliah:

Enclosed please find a letter report fulfilling the milestone for
Task 3 of FIN A-3725.

Sincerely yours,



I. A. Papazoglou, Group Leader

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LETTER REPORT ON THE

SELECTION OF SYSTEM COMBINATIONS FOR DETAILED
EVALUATION IN THE BNL SYSTEMS INTERACTIONS STUDY
OF THE INDIAN POINT-3

November 8, 1983

1. INTRODUCTION

The purpose of this letter report is to specify the combinations of front-line systems to be modelled in the Systems Interactions Study of Indian Point 3, to report on the documents so far received from NYPA and Ebasco, and to discuss the status of still-pending requests for further information. Task 3, in the Form-189 proposal for FIN A-3725, calls for the "select[ion] of the combinations of functionally coupled systems to be searched for SI", as well as a "report to the project manager [of] the lists of documents to be used in the analysis". This letter report, therefore, satisfies the Task 3 milestone.

Section 2 of the report describes the front-line systems given to BNL and LLNL at a meeting at NRC (Phillips Building) on September 14, 1983. Section 3 displays single systemic event trees, and relates them to event trees used in the IPPSS.¹ The sequences to be analyzed are put into correspondence with IPPSS sequences. Section 4 discusses the support systems. Section 5 discusses lists of documents to be used.

2. FRONT-LINE SYSTEMS

At a meeting between LLNL, BNL, and NRC, held on September 14, 1983, F. Coffman presented a list of front-line systems to be studied by both laboratories. This list is given in Table 1.

Table 1. Front-line Systems

1. High Pressure Injection (U_i) and Recirculation Systems (U_r)
2. Auxiliary Feedwater System (L)
3. Reactor Coolant Pump Seals (P)
4. Low Pressure Injection (D_i) and Recirculation Systems (D_r)
5. Pressurizer (PORV, Safety relief valves, block valves, etc.) (Q)
6. Main Feedwater System (M)

The list was promulgated by NRC with consideration given to previous suggestions of LLNL and BNL. It has been BNL's intention to emphasize correlations between initiating events and adverse effects on mitigating systems; this suggested to us that certain support system faults, which both cause initiations and affect mitigating systems, would be a relatively fruitful area of investigation. BNL had, therefore, proposed not to consider

the Low Pressure Injection System, which comes into play only after Medium or Large LOCAs. In accepting this list, BNL nevertheless implicitly agreed to examine the possibility of analyzing at least one medium or large LOCA.

Another important issue concerned with the selection of front-line systems is the inclusion of the recirculation phase of both the high and low pressure injection systems. For the following reasons, BNL questions the purpose of including the recirculation phase in the analysis. The basis of system selection has been established (by NRC) as involving systems whose failure leads to core damage and, in particular, to "early" core damage (plant damage state "E"). Given the above, containment safeguard systems were excluded, as well as combinations of systems failures that lead to "late" core damage. The successful operation of the recirculation phase of the injection systems depends (among other things) on the state of the containment systems (availability of containment fan coolers eliminates, for example, the need for RHR heat exchangers). The consideration of the recirculation systems therefore requires consideration of the containment systems, which are outside of the scope of this project. Moreover, the recirculation systems' failure causes only "late" core melt sequences, which were deemed less important and outside the scope of this project.

It is noteworthy that interactions between the recirculation phase of the injection systems and the containment systems are important in the sense that they affect the ex-plant consequences of "late" core melt accidents. However, these sequences have been excluded from the scope of this project. It is also noteworthy that failure of the injection phase and failure of the recirculation phase never appear on the same accident sequence since failure of either phase results in core damage. Therefore, interactions between the two phases are important only in the sense that they should be properly accounted for to avoid overestimation of the frequency of core damage, and not because they increase this frequency.

Based on the above thoughts and arguments, BNL considers that very substantial new justification would be necessary for inclusion of the recirculation phase in the analysis.

3. SYSTEMS COMBINATIONS: EVENT TREES

The following priorities are reflected in the systems combinations chosen:

1. Sequences leading to early core melt (labelled "E" in the IPPSS) are emphasized over those leading to late core melt.
2. The sequences chosen must include front-line systems in the list assigned by NRC (refer to Section 2 of this letter).
3. Special emphasis is given to transients and transient-induced LOCAs, which are believed to be more fertile areas of investigation than are medium and large LOCAs.

Figures 1-3 display simplified event trees for different initiating events, which BNL intends to analyze. All front-line systems which are within the scope of the study are included in the listing of "Front-line Systems" appearing across the top of each figure; of course, not all of them appear in any one sequence. Figures 1 through 3 span the following 7 generic accident sequences:

1. TML
2. $S_2(P)U_i$
3. $S_2(Q)U_i$
4. $S_2(P)ML$
5. $S_2(Q)ML$
6. S_1D_i
7. S_1U_i

where

- T: Stands for a generic transient initiator
- D_i : Low Pressure System (injection phase)
- L: Auxiliary Feedwater System and Secondary Side
- M: Main Feedwater System
- P: Reactor Coolant Pump Seal Failure
- Q: Pressurizer Overpressure Relief Valve (or Safety Relief Valve)
- S_1 : Medium LOCA

- U_i: High Pressure System (injection phase)
- S₂(P): Small Transient-Induced RCP LOCA
- S₂(Q): Small Transient-Induced Pressurizer LOCA

Figures 1-3 and Table 2 also establish the correspondence with IPPSS accident sequences; Figures 1 and 2 correspond to a particular event tree in Section 1.3 of the IPPSS, while Figure 3 corresponds to several transient event trees in the same section of the IPPSS. The numbers appearing in the far right column refer to sequence numbers on the designated IPPSS event tree.

The IPPSS displays on its event trees such functions as turbine trip, MSIV trip, Safety Injection Actuation Signal, etc. In our treatment, these events are put into the logic of those front-line systems whose operation is affected by them. Partly for this reason, we have only one transient event tree. Figure 3 illustrates this: following a "General Transient", one must protect the pressure boundary and remove decay heat.

Thus, the BNL study will cover sequences described by Figures 1, 2, and 3, where Figure 3 is understood to cover event trees No.7, 11a, 11b and 12 of the IPPSS. It is our intention to model the transient initiation insofar as it can potentially interact with the mitigating systems (e.g., via the support systems); this is covered in the next section on support systems. IPPSS transient sequences which are spanned by the above given list of sequences are given in Table 2.

4. SUPPORT SYSTEMS

It has been the position of all concerned parties that the support systems analyzed would be those necessary to the functioning of the front-line systems selected for study, which are listed in Table 1.

For the designated scope of the study, the support systems which so far present themselves are given in Table 3.

It is BNL's intention to model the initiating transients insofar as these are caused by systems appearing in Table 3 which support systems appearing in Table 1.

Table 2. IPPSS Sequences to be Included within BNL Sequences

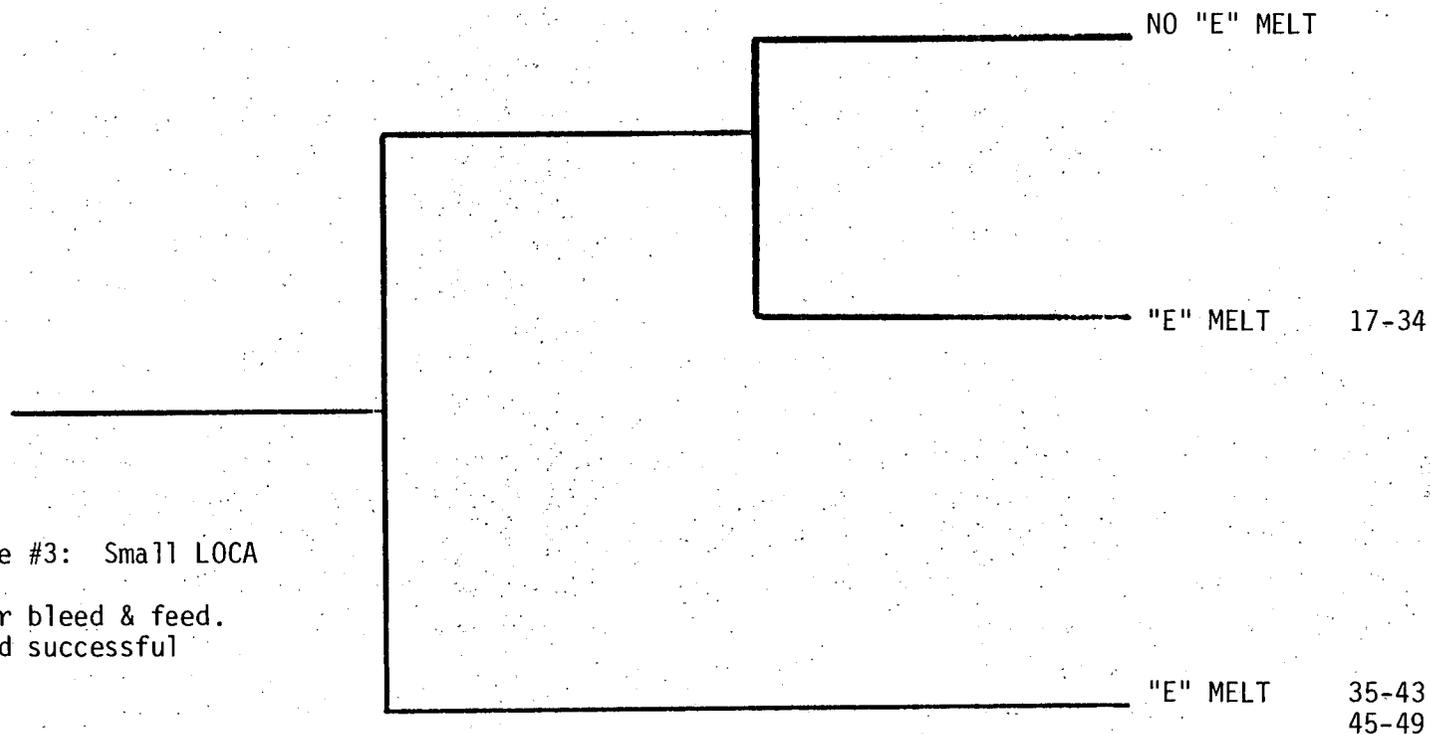
<u>IPPSS Event Tree</u>	<u>Sequence Numbers</u>
Medium LOCA - ET-2	13-72
Small LOCA - ET-3	17-34 35-43 45-49
Loss of Main Feedwater - ET-7	9-14 23-28 36-41
Turbine Trip - ET-11a	9-14
Turbine Trip/Loss of Offsite Power - ET-11b	9-14 29-40 41
Reactor Trip - ET-12	9-14 23-28 36-41

- Notes:
1. Reactor trip is assumed to be successful.
 2. Credit is not given for bleed-and-feed cooling, which is well beyond the licensing basis.
 3. This set of sequences substantially exhausts early melt sequences for the initiators shown.

Table 3. Support Systems

Electric Power
Component Cooling Water
Instrument Air
Heat Tracing
Service Air
Isolation Valve Seal Water
Containment Penetration
Safety Injection Actuation System
Reactor Protection System
Service Water
Chemical & Volume Control System
Nitrogen
Instrument Nitrogen
Turbine Bypass
Atmospheric Steam Dump
Condenser
Leakage Detection
Sample System
Reactor Water Storage Tank
Condensate Storage Tank
City Water
Fire Protection
Heating, Ventilation, Air Conditioning
Circulating Water
Auxiliary Steam
Reactor Control System: Turbine Bypass Control
Feedwater Control
Pressure Control
Main Steam
Turbine Generator
(Condensate and Feedwater considered part of MFWS)

EVENT	SMALL LOCA	HIGH-PRESSURE INJECTION	REMOVE DECAY HEAT	FINAL STATE	IPPSS SEQUENCES
FRONT-LINE SYSTEM		HPI	AFWS & SECONDARY SIDE		

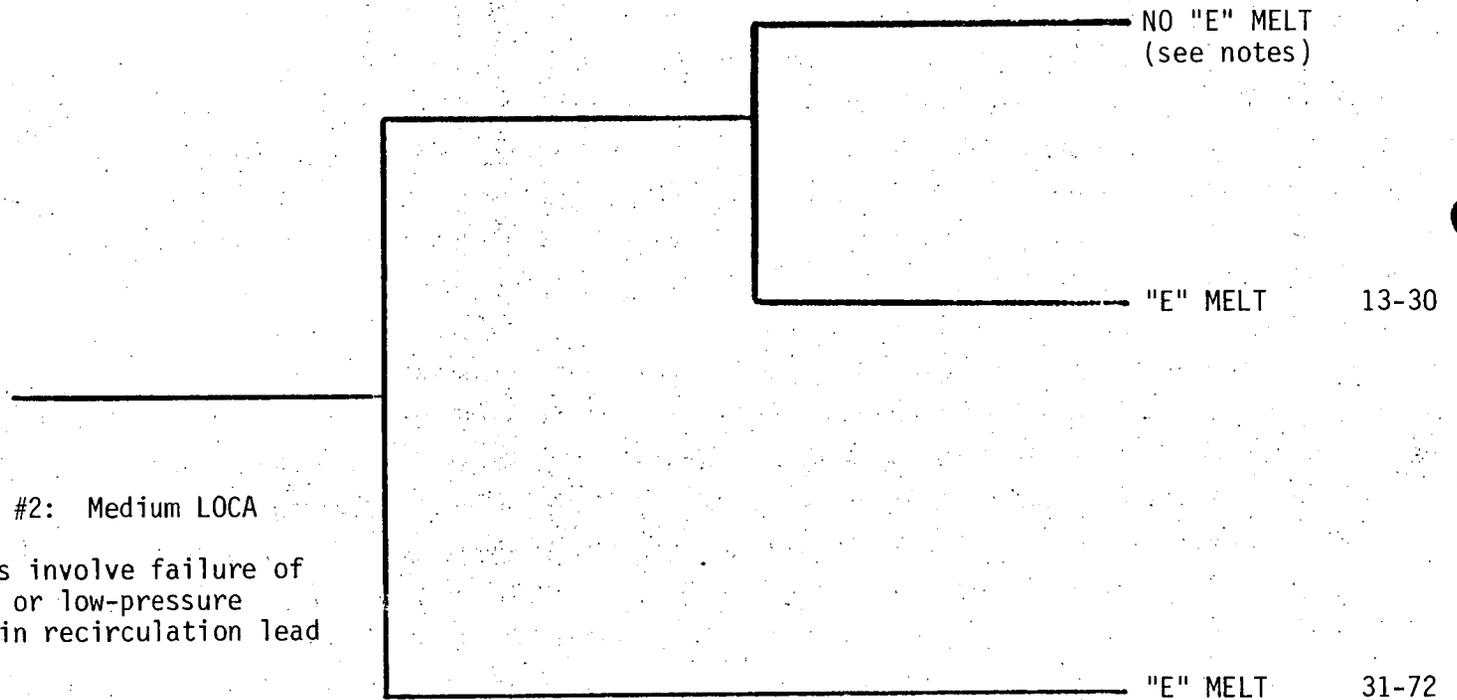


Reference: IPPSS Event Tree #3: Small LOCA

Notes: Credit not given for bleed & feed.
Reactor trip assumed successful

FIGURE 1. Small LOCA

EVENT	MEDIUM LOCA	LOW PRESSURE INJECTION	HIGH PRESSURE INJECTION	FINAL STATE	IPPSS SEQUENCES
FRONT-LINE SYSTEMS		LPI	HPI		



Reference: IPPSS event tree #2: Medium LOCA

Notes: All early ("E") melts involve failure of either high-pressure or low-pressure injection. Failures in recirculation lead to late ("L") melts.

FIGURE 2. Medium LOCA

EVENT	GENERAL TRANSIENT	PROTECT PRESSURE BOUNDARY	REMOVE DECAY HEAT	FINAL STATE
FRONT-LINE SYSTEMS	T	RCP SEALS, PZR	AFWS & SECONDARY SIDE	

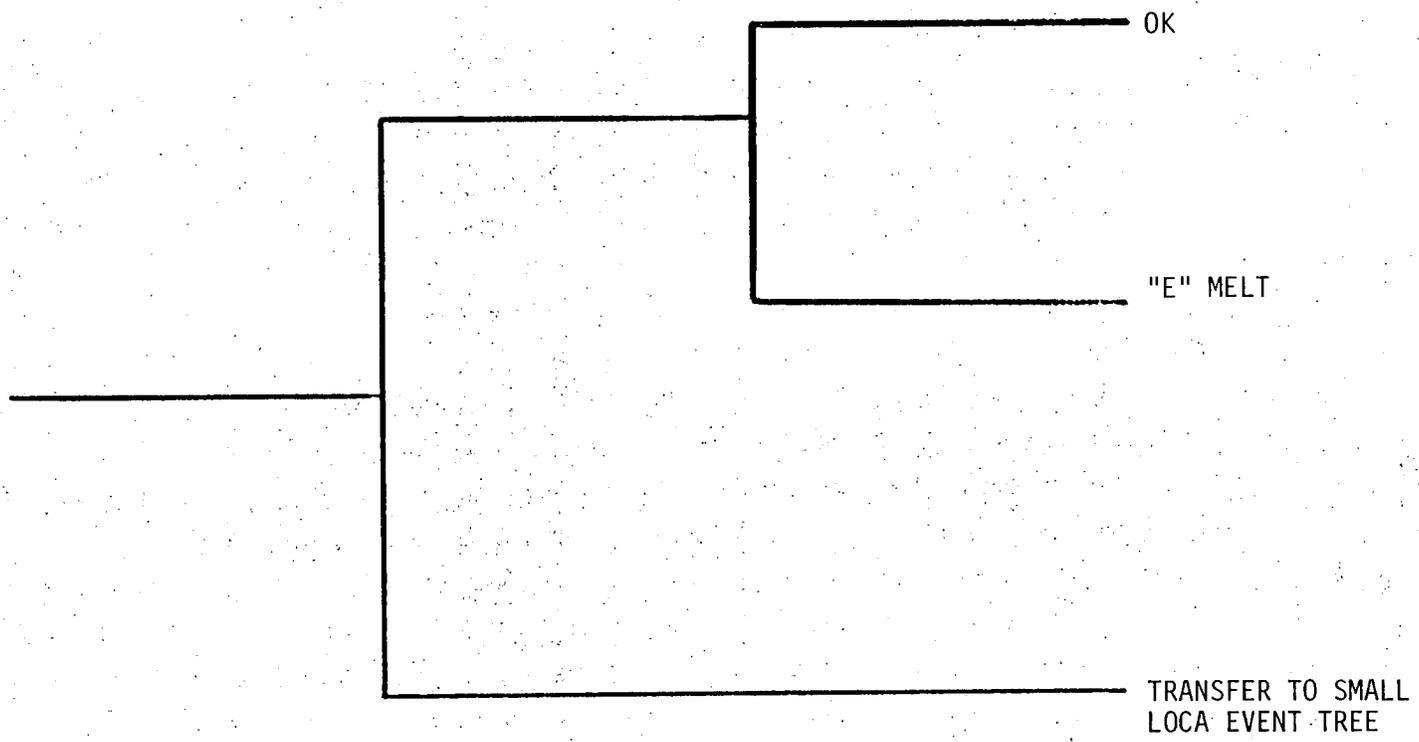


FIGURE 3. General Transient

5. DOCUMENTS TO BE USED IN THE ANALYSIS - OVERALL STATUS OF INFORMATION

The Statement of Work says the following about sources of information to be used in the study.

The sources of information about IP3 are generally the FSAR, the PRA, the Flow Diagrams, the plant arrangements drawings (elevations, plans, and sections), the Piping and Instrumentation Drawings, Control Systems logic diagrams, the systems descriptions, the emergency and normal operating procedures, the Electrical Line diagrams, the hangers, restraints, and snubbers sheets, and selected detail drawings. These sources of information were used by PASNY in their analysis of IP3, and will be provided by PASNY in coordination with the NRC project manager.

In addition, a very substantial list of documents (memo, Kishinevsky (Ebasco) to Conran (NRC), 6/28/82) was provided to BNL early in the study, with an indication that this material would be forthcoming.

To date, three shipments of documents have been received. Two of these have previously been reported to NRC.

The third is reported here in Section 5.1. Only a fraction of the above indicated information has arrived spontaneously.

Previously, BNL has also asked the technical monitor to provide an Equipment Qualification Status Report, a listing of safety-related components with their locations and environmental qualification. Such information almost certainly already exists, and if not provided to BNL, will have to be re-generated at substantial expense.

5.1 Documents Received at BNL

In addition to the documents previously reported to NRC, more have been received.

5.1.1 Systems Descriptions

BNL was asked to indicate what Systems Descriptions were desired. Table 4 shows BNL's request, along with an indicator of which ones have not been received. Items listed but not shown as "Not Received" have been received.

5.1.2 Procedures, Checklists, and Graphs

On September 14, at NRC, BNL was given a list of various procedures and checklists, and invited to submit requests for any of the items listed. Since then, in advance of making our own request, we have received some items from this list. Tables 5 through 13 tabulate items which are requested and items which have been received to date.

5.1.3 Replacement Drawings

On October 7, a letter was sent to J. R. Price of Ebasco, asking for legible copies of previously supplied (but illegible) sepias, or sepias which were on Ebasco's inventory but not actually received. Of the 25 drawings requested, the following 6 were recently received from NYPA:

20163	Flow Diagrams Symbols
20404	Flow Diagram Hydrogen and Carbon Dioxide
27213	Flow Diagram Air Cooling System for Hot Penetrations
27473	Flow Diagram Reactor Coolant System Sh 2
9321-F-30073	Three Line Diagram Low Voltage
9321-F-30113	Main Three Line Diagram

5.1.4 Other Drawings Received

Table 14 shows a list of drawings recently received from NYPA. Six of these are listed above in § 5.1.3 as corresponding to replacements of previously supplied, but illegible, drawings.

5.2 Summary of Current Information Requests Which Are Still Pending

1. Items listed in Tables 4-13 as being needed.
2. Items requested in the October 7 letter (see § 5.1.1) which have not been received.

3. Equipment Qualification Status Report (see § 5.0).
4. Vendor Manuals for: Reactor Coolant Pumps
Turbine Generator

5.3 Other Information to be Used in the Study

It is understood that BNL and LLNL have essentially equal access to IP3 documents, in that whatever is requested by either laboratory is sent to both laboratories. Both laboratories can expect to turn up new information needs as their studies progress, especially after site visits. It is BNL's understanding that we can expect the information promised in the Statement of Work, including the four site visits, and that reasonable requests which superficially go beyond the Statement of Work or the Kishinevsky memo will be honored to the extent practicable.

Table 4. System Descriptions Previously Requested by BNL

Description No.	Title	Status
1	Reactor Coolant System	NR
3	Chemical and Volume Control System	R
4	Auxiliary Coolant System	R
5	Waste Disposal System	NR
6	Primary Make-up Water System	NR
7	Steam, Generator Blowdown	R
8	Plant Chemistry	NR
9	Primary Sampling System	NR
10	Engineered Safeguards	R
10.1	Safety Injection System	R
10.2	Containment Spray	R
10.3	Containment Cooling and Filtration	R
10.4	Isolation Valve Seal Water System	NR
10.5	Weld Channel and Containment Penetration Pressurization System	NR
10.6	Vapor Containment Building	NR
10.7	Containment Isolation System	R
10.8	Hot Penetration Cooling System	NR
10.9	Post Accident Hydrogen Control System	NR
11	Ventilation Systems	R
13	Nuclear Instrumentation	NR
14	Incore Instrumentation	NR
16	Rod Control System	NR
18	Main and Reheat Steam Systems	NR
19	Extraction Steam, Heater, Reheater, Moisture Separator Drains and Vents	R
20	Condensate System	R
21	Feedwater System	R
22	Intake Structure	NR
23	Circulating Water System	NR
24	Service Water System	R
25	Secondary Sampling	NR
26	Main Turbine and Generator	R
27	Electrical Systems and Distribution	R
27.1	Electrical Systems	R
27.2	Exciter	R
27.3	Emergency Diesels	R
27.4	Service Buildings Electric Systems	NR

Table 4 (Cont.)

<u>Description No.</u>	<u>Title</u>	<u>Status</u>
28	Overall Unit Protection Systems	NR
29	Services	R
29.1	Auxiliary Steam	R
29.2	Instrument Air	R
29.3	Station Air	R
29.4	Chemical Feed	R
29.5	Flash Evaporator	R
29.6	Fire Protection	R
29.7	Nitrogen, Hydrogen, CO ₂ and Oxygen Supplies	R
29.8	Cranes and Monorails	R
29.9	City Water System	NR
30	Electrical Heat Trace	R

Note

NR = Not received
R = Received

Table 5. System Operating Procedures Needed

SOP-C-1	Condenser Air Removal System Operation
SOP-C-2	Condensate System Operation
SOP-C-4	Filling the Condensate Storage Tank
SOP-C-6	Condensate Vacuum Generator Operation
SOP-CB-5	Isolation Valve Seal Water System Operation
SOP-CC-1A	Component Cooling System Filling and Venting
SOP-CC-1B	Component Cooling System Operation
SOP-CC-2	Closed Cooling Water System Operation
SOP-CC-3	Component Cooling System Flow Balance
SOP-CVCS-1	CVCS Recycle System Operator
SOP-CVCS-2	Charging, Seal Water and Letdown Control
SOP-CVCS-3	Reactor Coolant System Boron Concentration Control
SOP-CVCS-6	Collapsing the Steam Bubble in the Pressurizer
SOP-EL-1	Emergency Diesel Generator Operation
SOP-EL-2	Instrument Bus Static Inverter Operation
SOP-EL-3	Battery Charger Operation
SOP-EL-5	Operation of On-site Power Sources
SOP-EL-7	Electrical Heat Training Systems Operation
SOP-EL-8	Bus Duct Cooling System Operation
SOP-EL-9	Filling Diesel Fuel Oil Storage Tanks
SOP-EL-10	Operation of the 138KV Pilot Wire Systems
SOP-EL-11	Operation of the Station and Unit Auxiliary Transformers
SOP-EL-12	Operation of the Alternate Electrical Feed System
SOP-FP-1	Fire Protection System Operation
SOP-FP-3	Fire Protection CO ₂ System Operation
SOP-FW-1	Main Feedwater and Steam Generator Water Level Control System Operation
SOP-FW-3	Filling the Feedwater and Condensate System
SOP-FW-4	Auxiliary Feedwater System Operation
SOP-GS-1	Nitrogen Systems Operation
SOP-HDS-1	Heater Drains System Operation
SOP-IA-1	Instrument Air System Operation
SOP-LO-1	Main Lube Oil System Operation
SOP-MS-1	Main and Reheat Steam Operation
SOP-MS-2	Auxiliary Steam System Operation
SOP-MS-3	Extraction Steam System Operation
SOP-PW-1	Primary Water System Operation
SOP-PW-2	Filling the Primary Water Storage Tank
SOP-RCS-1	Reactor Coolant Pump Operation
SOP-RCS-2	Pressurizer Pressure Control
SOP-RCS-3	Pressurizer Level Control

Table 5 (Cont.)

SOP-RCS-7	Pressurizer Relief Tank Operation
SOP-RCS-8	Low Pressure Operation Without a Steam Bubble
SOP-RCS-11	Startup of an Inactive LOOP with the Reactor at Power
SOP-RCS-12	Procedure for RCS Low Pressure Operation with a Nitrogen Bubble
SOP-RHR-1	Residual Heat Removal System Operation
SOP-RHR-2	Residual Heat Removal Via High Head Injection
SOP-RPC-1	Reactor Protection System Operation
SOP-RPC-8	Removal of Safety Related Equipment from Service
SOP-RW-1	Circulating Water System Operation
SOP-RW-4	De-Icing System Operation
SOP-RE-5	Service Water System Operation
SOP-SA-1	Station Air System Operation
SOP-SG-1	Steam Generator Blowdown System Operation
SOP-SI-1	Safety Injection System Operation
SOP-SI-2	Filling the RWST
SOP-SI-3	Recirculation and/or Purification of the RWST
SOP-SI-5	Cross Leak Checks of Safety Injection System Check Valves
SOP-V-1	Primary Auxiliary Building Heating and Ventilation System Operation
SOP-V-3	Diesel Generator Building Heating and Ventilation System Operation
SOP-V-4	Control Room Heating and Ventilation System Operation
SOP-V-5	Electrical Tunnel Heating and Ventilation System
SOP-V-6	Miscellaneous Heating and Ventilation System
SOP-WDS-10	Monitoring Leaks Within Containment Building

Table 6. Off-Normal Operating Procedures

<u>Received</u>	<u>Requested</u>	<u>Title</u>
*		ONOP-C-1 Loss of Condenser Vacuum
*		ONOP-CC-1 Loss of Component Cooling
*		ONOP-CC-2 Leakage Into the Component Cooling System
*		ONOP-CVCS-1 Loss of Charging or Letdown
*		ONOP-CVCS-2 Reactor Coolant Makeup Control System Malfunction
*		ONOP-EL-1 Failure of a Heat Tracing Circuit
*		ONOP-EL-2 Loss of 13.8 KV Power Source
*		ONOP-EL-3 Loss of an Instrument Bus
*		ONOP-ES-1 High Energy Line Breaks
*		ONOP-FP-1 Fire Protection
*		ONOP-IA-1 Loss of Instrument Air
*	*	ONOP-RC-1A Malfunctioning RPI
*		ONOP-RCS-1 Loss of Reactor Coolant Flow
*		ONOP-RCS-2 Malfunction of Pressurizer Pressure Control System
*		ONOP-RCS-3 Malfunction of Pressurizer Level Control System
*		ONOP-RCS-5 Reactor Coolant Pump Seal Malfunction
*		ONOP-RCS-6 Natural Circulation/Natural Circulation Cooldown
	*	ONOP-RPC-1 Instrument Failure
*		ONOP-RW-1 Service Water System Malfunction
*		ONOP-RW-2 Loss of a Circulating Water Pump
	*	ONOP-RW-3 Plant Flooding
	*	ONOP-SG-1 Steam Generator Tube Leak
	*	ONOP-TG-1 Excessive Load Increase or Decrease
	*	ONOP-WDS-1 Abnormal Containment Sump Levels

Table 7. Check Off Lists

<u>Received</u>	<u>Requested</u>	<u>Title</u>
*		COL-CC-1 Component Cooling
*		COL-CC-2 Closed Cooling Systems
*		COL-CC-3 Instrument Air Closed Cooling
*		COL-CVCS-1 Chemical & Volume Control System
*		COL-CW-1 City Water
*		COL-EL-1 6900 & 480 Volt Distribution
*		COL-EL-2 Lighting & Communications Systems
*		COL-EL-3 Instrument Bases & Distribution Panels
	*	COL-EL-4 Electrical Heat Tracing
	*	COL-EL-5 Diesel Generators
*		COL-FP-1 Fire Protection System
*		COL-FP-2 Fire Pump House
*		COL-FW-1 Main Feedwater Sytem
*		COL-FW-2 Auxiliary Feedwater System
	*	COL-GS-1 Nitrogen to Nuclear Equipment
	*	COL-GS-2 Hydrogen to Nuclear Equipment
	*	COL-IA-1 Instrument Air System
	*	COL-LV-1 Locked Valve Check List
	*	COL-MS-6 Auxiliary Steam Supply & Condensate Return
*		COL-RCS-1 Reactor Coolant System
*		COL-RHR-1 Residual Heat Removal System
	*	COL-RW-1 Circulating Water System
*		COL-RW-2 Service Water System
	*	COL-SA-1 Station Air System
	*	COL-SG-1 Steam Generator Blowdown
*		COL-SI-1 Safety Injection System

Table 8. Plant Emergency Procedures Needed

PEPCVCS-3	Emergency Boration
PEP-EL-1	Loss of Outside Power
PEP-ES-1	Emergency Core Cooling System Actuation
PEP-ES-1A	Loss of Coolant to Containment
PEP-ES-1B	Steam Generator Tube Rupture
PEP-ES-1C	Secondary Loss of Coolant
PEP-ES-1E	Recover From An Inadvertent SI
PEP-ES-1F	Resetting Phase A Isolation During LOCA Conditions
PEP-ES-1G	Recovery From Inadequate Core Cooling
PEP-ES-3	Passive Failures During An Engineered Safeguards Actuation
PEP-ES-7	Removal of a Non-Condensable Bubble in the RCS
PEP-FP-1	Safety-Related Equipment Incapacitated by Fire
PEP-FP-2	DG#31 & Safe Shutdown Instrumentation Fire Protection Isolation
PEP-FW-1	Loss of Feedwater
PEP-RHR-1	Loss of Residual Heat Removal Flow
PEP-RPC-1	Unit Trip
PEP-RPC-2	Control Room Inaccessibility
PEP-TG-2	Turbine Missile Generation

Table 9. Alarm Response Procedures

<u>Received</u>	<u>Requested</u>	<u>Section</u>	<u>Title</u>
	*	1	Turbine First Out Annunciator
	*	2	Reactor First Annunciator
*		3	Reactor Coolant System
*		4	Safeguards
*		5	Safeguards
*		6	Condensate and Feedwater
*		9	Chemical & Volume Control System
*		10	Auxiliary Coolant System
*		11	Electrical
*		12	Cooling Water & Air
*		15	Safety Injection
*		19	Diesel Generators
*		27	Fire Display Control Panel
*		29	TSC Emergency Diesel

Table 10. Plant Operating Procedures Needed

POP-2.1	Operation at Power
POP-3.1	Plant Shutdown from Full Power Operation to Zero Power Condition
POP-3.2	Plant Operation at Zero Power
POP-3.3	Plant Cooldown-Hot to Cold Shutdown

Table 11. Temporary Operating Procedures Needed

TOP-37	Operation of Component Cooling Heat Exchanger
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Table 12. Graphs Requested

RCS-1C	Minimum Pressure Necessary to Maintain NPSH on RCP
SP-6	Auxiliary Feedwater Flow vs. Valve Position

Table 13. Pump Curves Requested

Component Cooling Pumps
CVCS Charging Pumps
Safety Injection Pumps
Turbine Driver Auxiliary Feedwater Pump
Motor Driver Auxiliary Feedwater Pump
Service Water Pumps

Table 14. BNL List of Indiant Point Unit 3 Drawings
Received from NYPA with October 20, 1983
Transmittal Letter

Title	UEC No.	Con Ed No.	Rev.	Date
<u>A. Flow Diagrams (FD) - General</u>				
1. Flow Diagram-Symbols	C-20163-3	C-201815	3	11/17/75
2. FD-Reactor Coolant System-Sheet No.1	F-27383-14	A-202248	14	11/8/80
3. Same-Sheet No.2	F-27473-16	A-202275	16	4/17/81
* 4. (FD)-Reactor Coolant System Boundary Check Valve Testing Sheet No.1	F-28063-1	---	1	11/11/75
* 5. Same-Sheet Nos. 2,3,etc.	Not Included			
6. FD-Piping at Reactor Coolant Pumps	F-27343-9	A-202244	9	11/8/80
7. FD-Post Accident Containment Sampling System	C-26533-2	205666	2	3/11/81
8. FD-Chemical & Volume Control System-Sheet No.1	F-27363-17	---	17	5/10/83
9. Same-Sheet No.2	F-27373-15	A-202247	15	6/15/81
10. FD-Safety Injection System Sheet No.1 (Sheet No.2 previously received not included in this transmittal).	F-27358-14	A-202245	14	7/23/81
11. FD-Nitrogen to Nuclear Equipment	F-27233-13	A-202233	13	8/23/82
12. FD-Air Cooling System for Hot Penetrations	F-27213-7	A-202231	7	4/6/81
13. FD-Service Water System-Nuclear Steam Supply Plant	F-27223-21	A-202232	21	5/20/82
14. FD-Circulating Water	F-20263-10	A-201825	10	6/30/81
15. FD-Service & Cooling Water River Water & Fresh Water	F-20333-14	A-201832	14	6/5/82
16. FD-Gland Sealing for Valves and Pumps (Now have Rev.1 - 11/17/75)	F-20323-2	A-202819	2	5/3/83
17. FD-Condenser Air Removal & Water Box Priming	F-20253-15	A-201824	15	7/7/81
18. FD-Heater Drains & Vents (Now have Rev.7 - 11/18/76)	F-20223-8	A-201821	8	2/10/83
19. FD-Chlorination	F-20393-6	A-201838	6	11/17/75

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
20. FD-Hydrogen and CO ₂	F-20403-6	A-201839	6	10/21/81
21. FD-Fuel Oil to Diesel Generators	F-20303-7	A-201829	7	7/23/81
22. FD-Jacket Water to Diesel Generators	H-20283-8	B-201827	8	2/1/83

B. Flow Diagrams (FD) - Freeze Protection (FP)

1. FD-Jacket Water to Diesel Generators Electrical FP	H-22803-3	B-202058	3	3/8/82
2. FD-Fuel Oil to Diesel Generators Electrical FP (Now have Rev.2 - 2/3/76)	F-22783-3	A-202051	3	4/11/83
3. FD-Station Air Piping Electrical FP (Now have Rev.3 - 2/3/76)	F-22812-4	A-202064	4	5/3/83
4. FD-Service & Cooling Water River & Fresh Water Electrical FP (Now have Rev.2 - 2/8/76)	F-22723-3	A-202045	3	4/11/83
5. FD-Circulating Water Electrical FP	F-22743-4	A-202047	4	5/10/83
6. FD-Flash Evaporator Electrical FP (Now have Rev.2 - 2/3/76)	F-22753-3	A-202048	3	5/3/83
7. FD-Condensate & Boiler Feed Pump Suction Electrical FP (Now have Rev.3 - 2/3/76)	F-22703-4	A-202043	4	5/3/83
8. FD-Chlorination Electrical FP	F-22733-3	A-202046	3	2/3/76

C. Electrical Diagrams

* 1. Block Diagram-Three Line Diagram Low Voltage	F-33873-1	---	1	11/30/82
2. Main Three Line Diagram (Now have Rev.17 - 6/24/81)	F-30113-18	A-202289	18	11/30/82
3. Three Line Diagram Low Voltage	F-30073-12	A-202363	12	11/30/82
* 4. Cable Schematic - Main Power Generator, Transformers and Tie-Lines	F-30033-11	A-202457	11	11/30/82

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
D. Containment Building (CB)				
1) Piping, Supports & Restraints				
1. CB-Annulus-Small Piping Composite Sheet No.1 (S.E. Quadrant)	F-27803-6	A-205642	6	11/11/75
2. Same-Sheet Nos. 2,3,etc.	Not Included			
3. CB-Piping Composite Sections Sheet Nos. 1 and 2	Not Included			
4. Same-Sheet No.3	F-26273	A-202168	0	6/17/70
5. CB-Containment Spray System Plan South Half	F-26223-4	A-202163	4	11/11/75
6. CB-Cont.Spray System-Sections & Details-Sheet No.1	F-26243-3	A-202165	3	11/11/75
7. Same-Sheet No.2	F-26253-4	A-202166	4	11/11/75
8. CB-Safety Injection System Plan Sheet No.1	F-26143-14	A-202156	14	11/11/75
9. Same-Sheet No.2	F-26173-15	A-202158	15	11/11/75
10. CB-Safety Injection System Sections Sheet No.1	F-26153-15	A-202157	15	11/11/75
11. Same-Sheet No.2	F-26263-13	A-202167	13	11/11/75
12. CB-Safety Injection System Modifications	F-26063-3	A-205653	3	11/11/75
13. CB-Primary Coolant Pressurizer Safety Relief Valve Piping Sheet No.1	F-2543-11	A-202108	11	4/13/81
14. Same-Sheet No.2	F-25463-8	A-202109	8	4/17/81
15. CB-Pressurizer Safety Relief Valve Restraint Details	F-25483-6	A-202762	6	11/11/75
16. CB-Arrangement of Pipe Restraints Pressurizer Surge Line	F-27633-4	A-202263	4	11/11/75
17. CB-Arrangement of Pipe Restraints Main Steam & Boiler Feed South Half Sheet No.1	Not Included			
18. Same-Sheet No.2	F-27613-4	A-202262	4	11/11/75
19. (CB)-Pipe Whip Restraints Sheet No.1	F-26573-8	A-202754	8	11/11/75
20. Same-Sheet No.2	F-26583-7	A-202755	7	11/11/75

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
21. Same-Sheet No.3	F-26593-6	A-202756	6	11/11/75
22. Same-Sheet No.4	F-26603-5	A-202827	5	9/5/80
23. Same-Sheet No.5	F-26613-4	A-202828	4	11/11/75
24. Same-Sheet No.6	F-26623-4	A-202829	4	11/11/75
25. Same-Sheet No.7	F-26633-2	A-202635	2	11/11/75
26. Same-Sheet No.8	F-26643-4	A-202636	4	11/11/75
27. CB-Air Recirculation System Plan Above El.68'-0"	F-40253-6	A-202514	6	4/15/82
28. Same-Plan Above El.85'-0"	F-40243-4	A-202513	4	9/30/77
29. CB-Air Recirculation System Sections	F-40293-4	A-202518	4	11/1/75
30. Same-Section "A-A"	F-40273-3	A-202516	3	11/1/75
31. Same-Section "B-B"	F-40283-4	A-202517	4	11/1/75
32. CB-Air Recirculation System Hangers & Supports Sheet No.1	F-40303-3	A-202519	3	11/1/75
33. Same-Sheet No.2	F-40313-1	A-202520	2	11/1/75
34. CB-Location of Pipe Sleeves Plan	F-26033-10	A-202151	10	11/11/75
35. CB-RTD Piping for Primary Coolant System Sheet No.1	Not Included			
36. Same-Sheet No.2	F-25433-9	A-202115	9	4/14/81
37. Same-Sheet No.3	F-25443-8	A-202148	8	4/13/81
38. Same-Sheet No.4	F-25473-9	A-202185	9	4/15/81
39. CB-Demister & Cooling Coil Drain Piping Sheet No.1	F-26883-7	A-202200	7	11/11/75
40. Same-Sheet No.2	F-26893-7	A-202201	7	11/11/75
41. CB-Chemical & Volume Control System Sheet No.1	F-25813-14	A-202135	14	11/11/75
42. Same-Sheet No.2	F-25823-11	A-202136	11	11/11/75
43. Same-Sheet No.3	F-25833-7	A-202137	7	11/11/75
44. Same Sheet No.4	F-25843-6	A-202138	6	11/11/75
45. CB-Service Water Piping Sheet No.1	F-26903-10	A-202202	10	7/27/82
46. CB-Service Water Piping Sheet No.2	F-26913-8	A-202203	8	7/27/82
47. CB-Service Water Piping Sheet No.3	F-26923-6	A-202204	6	7/27/82
48. CB-Service Water Piping Sheet No.4	F-26933-6	A-202205	6	7/27/82
49. CB-Service Water Piping for Recirc.Fan Motor Coolers Sheet No.1	F-27483-5	A-202256	5	8/17/82

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
50. Same Sheet No.2	F-27493-5	A-202257	5	8/17/82
51. CB-Service Water Header Drains Sheet No.1	Not Included			
52. CB-Service Water Header Drains Sheet No.2	F-26513-4	A-202824	4	7/15/82
53. CB-Hydrogen Recombiner Piping	F-26983-13	A-202210	13	11/11/75
54. CB-Service Air, City Water Piping	F-26873-6	A-202199	6	1/19/77
55. CB-Post Accident Containment Air Sampling System	F-26863-6	A-202826	6	3/4/81
56. CB-Waste Disposal System North Half	F-265453-18	A-202177	18	9/21/78
57. CB-Waste Disposal System South Half	F-26463-10	A-202178	10	11/11/75
58. CB-Emergency Shower & Eyewash Piping	F-40323-1	A-202521	1	11/11/75
59. CB-In-Core Instrumentation Piping Supports General Arrangement	F-27063-3	A-202217	3	11/11/75
60. Same-Details	F-27073-3	A-202218	3	11/11/75

2) Instrumentation

1. CB-Piping Penetration Trench-Instrument Arrangement	F-70433-5	A-202582	5	7/29/77
2. CB-Instrument Arrangement Sheet No.1 Instrumentation	102-F-70633	A-202818	0	11/11/74
3. Same Sheet No.2	102-F-70643	A-202819	0	11/11/74
4. CB Test-Primary Senser Location-Instrumentation	F-70603-1	A-202815	1	12/12/75
5. CB-Instrumentation Arrangement Sheet No.1 Instrumentation	F-70273-8	A-202566	8	9/13/77
6. Same-Sheet No.2	F-80283-12	A-202567	12	2/8/78
7. Penetration & Liner Weld Joint Channel Pressurization Piping-Sheet No.1 Instrumentation	F-70333-7	A-202572	7	12/12/75
8. Same-Sheet No.2	F-70343-5	A-202573	5	12/12/75

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
9. Same-Sheet No.3	F-70353-5	A-202574	5	12/12/75
10. Same-Sheet No.4	F-70393-7	A-202578	7	12/12/75
11. Same-Sheet No.5	F-70523-4	A-202591	4	6/5/79
12. Same-Sheet No.6	F-70193-3	A-202558	3	12/12/75

E. General Instrumentation

1. Radiation Monitoring- Installation Details Instrumentation	F-70453-8	A-202584	7	12/12/75
2. Radiation Monitoring- Installation Details Iodine 131 Monitor-Instrumentation	F-70683-2	A-202823	2	12/12/75
3. Steam Generator Blowdown Sample Panel Instrumentation	F-70713-2	A-202826	2	12/12/75
4. Steam & Water Analysis System Sampling Diagram Instrumentation	F-70203-4	A-202559	4	12/12/75
5. Steam & Water Analysis System-Sample Piping Sheet No.1 Instrumentation	F-70213-2	A-202560	2	12/12/75
6. Same-Sheet No.2	F-70443-5	A-202583	5	12/12/75
7. Nuclear Plant Control Valve Hook-Up Details Instrumentation	F-70563-7	A-202595	7	2/16/81
8. Variable Weir Control Piping Arrangement Instrumentation	F-70473-2	A-202586	2	12/12/75
9. Extraction Steam Free Flow Reverse Current Valves Control System Instrumentation	F-70223-2	A-202561	2	12/12/75
10. Primary Plant Instrument Piping & Supports-Sheet No.1-Instrumentation	F-70253-6	A-202564	6	12/12/75
11. Same-Sheet No.2	F-70263-7	A-202565	7	12/12/75
12. Instrument Piping Schematics- Sheet No.1 Instrumentation	F-70103-4	A-202549	4	12/12/75
13. Same-Sheet No.2	F-70113-3	A-202550	3	12/12/75

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
14. Same-Sheet No.3	F-70123-7	A-202551	7	8/23/76
15. Same-Sheet No.4	F-70133-7	A-202552	7	12/12/75
16. Same-Sheet No.5	F-70143-8	A-202553	8	11/8/76
17. Same-Sheet No.6	F-70153-4	A-202554	4	12/12/75
18. Same-Sheet No.7	F-70483-3	A-202587	3	12/12/75
19. Transmitter Racks Piping Arrangement Sheet No.1 Instrumentation	F-70023-4	A-202541	4	12/12/75
20. Same-Sheet No.2	F-70033-8	A-202542	8	8/23/76
21. Same-Sheet No.3	F-70043-2	A-202543	2	12/12/75
22. Same-Sheet No.4	F-70513-4	A-202590	4	12/12/75
23. Same-Sheet No.5	F-70553-3	A-202594	3	12/12/75
24. Same-Sheet No.6	10-2F-70613-2	A-202816	2	8/23/76
25. Start-Up Feedwater By-Pass PTT Rack Instrumentation	102F-70623-1	A-202817	1	8/23/76
26. Cabled Tubing Schematic Instrumentation	F-70303-3	A-202569	3	12/12/75
27. Cabled Tubing Junction Box Arrangement Instrumentation	F-70073-2	A-202546	2	12/12/75
28. Cabled Tubing Arrangement Sheet No.1 Instrumentation	F-70053-7	A-202544	7	12/13/76
29. Same-Sheet No.2	F-70063-8	A-202545	8	12/12/75
30. Same-Sheet No.3	F-70163-4	A-202555	4	12/12/75
31. Instrument Air Supply- Sheet No.1 Instrumentation	F-70083-5	A-202547	5	4/24/78
32. Same-Sheet No.2	F-70093-4	A-202548	4	12/12/75
33. Level Control Piping- Sheet No.1 Instrumentation	F-70173-2	A-202556	2	12/12/75
34. Same-Sheet No.2	F-70183-5	A-202557	5	6/25/81
35. Same-Sheet No.3	F-70373-2	A-202576	2	12/12/75
36. Same-Sheet No.4	F-70383-6	A-202577	6	12/12/75
37. Same-Sheet No.5	F-70463-5	A-202585	5	12/13/76
38. Same-Sheet No.6	Not Included			
39. Same-Sheet No.7	F-70503-9	A-202589	9	12/12/75
40. Waste Hold-Up Pit & Nuclear Tank Farm Arrangement Instrumentation	F-70293-5	A-202568	5	12/12/75
41. Traveling Screens Differential Level Control System Instrumentation	F-70323-3	A-202571	3	12/12/75
42. Pressure Gage & Switch Details Instrumentation	F-70243-3	A-202563	3	12/12/75

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
43. Local Mounted Instrument Support Details Instrumentation	F-70233-4	A-202562	4	12/12/75
<u>F. Primary Auxiliary Building (PAB)</u>				
<u>1) Piping</u>				
1. PAB-Composite Piping Arrangement at El.73'-0" Sheets 1 to 4	Not Included			
2. Same-Sheet No.5	F-26363-12	A-202747	13	12/3/81
4. Same-Sheet No.6	F-26373-12	A-202748	12	12/3/81
5. PAB-Composite Piping Arrangement at El.15'-0" for Spent Resin, Chemical Drain & Sump Tanks	F-26683-9	A-202184	9	11/11/75
6. PAB-Composite Piping at Monitor Tank Pumps & Primary Water Pumps at El.41'-0"	F-26833-11	A-202198	11	12/4/81
7. PAB-Composite Piping Arrangement at Containment Spray Pumps & Additive Tank at El.41'-0"	F-26823-10	A-202197	10	6/15/81
8. PAB-Composite Piping Arrangement at SIS Pumps-Sheet No.1	F-26663-17	A-202182	17	11/11/75
9. Same-Sheet No.2	F-26673-10	A-202183	10	11/11/75
10. PAB-Service Air & City Water Piping Plans at El. 15'-0", El.32'-6", El.34'-0" & El.41'-0"	F-26843-6	A-202757	6	5/20/77
11. PAB-Service Air & City Water Piping Plans at El. 55'-0" & El.73'-0"	F-26853-7	A-202758	7	5/20/77
<u>2) Heating & Ventilation (H&V)</u>				
1. PAB-H&V-Plans El.15'-0", 34'-0" & 41'-0"	F-40363-5	A-202525	5	11/10/81

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
2. Same-55'-0" & 73'-0"	F-40373-5	A-202526	5	11/10/81
3. PAB-H&V-Sections- Sheet No.1	F-40383-4	A-202527	4	11/10/81
4. Same-Sheet No.2	F-40393-4	A-202528	4	11/1/75
5. Same-Sheet No.3	F-40403-2	A-202529	2	11/1/75

3) Instrumentation

1. PAB-General Arrangement Plan at El. 55'-0" Instrumentation	099-F-70693	A-202824	0	11/4/74
2. PAB-Instrument Arrangement Sheet No.1 Instrumentation	F-70403-7	A-202579	7	10/6/77
3. Same-Sheet No.2	F-70413-5	A-202580	5	12/12/75
4. Same-Sheet No.3	F-70423-3	A-202581	3	12/12/75
5. Same-Sheet No.4	F-70573-4	A-202596	4	6/7/77
6. Same-Sheet No.5	F-70583-6	A-202597	6	3/18/81

G. Auxiliary Feed Pump Building (AFPB) or Auxiliary Boiler Feed Pump Room.
(ABFPR)

1. AFPB-Additions to Chemical Feed	F-22543-3	A-202816	3	7/8/81
2. ABFPR-Instrument Piping Sheet No.1 Instrumentation	F-70313-7	A-202570	7	12/12/75
3. Same-Sheet No.2	F-70533-9	A-202592	9	6/3/82
4. Same-Sheet No.1	Not Included			
5. Same-Sheet No.2	102-F-70653	A-202820	0	11/11/74

H. Fuel Storage Building (FSB)

1. FSB-Service Air & City Water Piping Plant & Sections	F-26953-4	A-202207	4	8/20/82
2. FSB-General Arrangement Plant and Elevation Instrumentation	099-F-70703	A-202825	0	11/4/74

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
<u>I. Control Building (CTRLB)</u>				
1. CTRLB-Service & Cooling Water Piping Closed System Sheet Nos.1 to 3	Not Included			
2. Same-Sheet No.4	F-21053-7	A-201904	7	2/3/76
3. CTRLB-Air Conditioning Equipment Room Cooling Water, Steam & Cond. Piping Plans & Sections	F-40683-4	A-202617	4	11/1/75
4. Equipment Arrangement CTRLB-Sheet No.1 Instrumentation	F-70723	A-202827	0	11/4/74
5. CTRLB-E1.15'-0" & E1.33'-0" Heating & Ventilation Plans, Sections & Details	F-40653-2	A-202614	2	11/1/75
<u>J. Diesel Generator Building (DGB)</u>				
1. DGB-General Arrangement Plans	F-22503-4	A-202023	4	11/17/75
2. DGB-Fuel Oil & Jacket Water Piping Sheet No.1	F-22583-11	A-202031	11	7/20/81
3. Same-Sheet No.2	F-22593-6	A-202032	6	7/22/81
4. DGB-Service Water & Starting Air Piping	F-22573-8	A-202030	8	2/3/76
5. DGB-Exhaust System	F-22603-5	A-202033	5	2/3/76
<u>K. Turbine Building & Heater Bay (TBHB)</u>				
1. TBHB-H ₂ & CO ₂ Piping Sheet No.1	Not Included			
2. Same-Sheet No.2	F-20453-2	A-201844	2	10/21/81
3. TBHB-Service & Cooling Water Piping Closed System Sheet No.1	F-21023-8	A-201901	8	5/21/82
4. Same-Sheet No.2	F-21033-7	A-201902	7	5/15/82
5. TBHB-Service & Cooling Water Piping River Water System Sheet No.1	F-20973-8	A-201896	8	11/3/81

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
6. Same-Sheet No.2	F-20983-6	A-201897	6	11/13/81
7. Same-Sheet No.3	F-20993-10	A-201898	10	5/15/82
8. Same-Sheet No.4	F-21003-8	A-201899	8	11/15/81
<u>L. Intake Structure and Yard Area</u>				
1. Intake Structure-Service Water Piping River Water System-Sheet No.1	F-21063-12	A-201905	12	2/3/76
2. Same-Sheet No.2	F-21073-11	A-201906	11	2/3/76
3. Service Water Piping Back-Up Supply	F-27033-7	A-202759	7	11/11/75
4. Service Water Piping in Yard Area Plans-Sheet No.1	F-27003-8	A-202212	8	11/11/75
5. Same-Sheet No.2	F-27013-8	A-202213	8	5/28/82
6. Same-Sections	F-27023-10	A-202214	10	6/3/82
7. Modifications to Existing Yard Sanitary Lines-Plans, Profile & Details	F-40453-2	A-202534	2	11/1/75
8. Yard Area-H ₂ & CO ₂ Piping Sheet No.1	F-20443-6	A-201843	6	10/21/81
<u>M. Miscellaneous</u>				
1. Drains-PAB Exh., CB Purge & CB Pressure Relief Filter Systems Plans & Sections	F-40883-2	A-205670	2	11/1/75
2. Fan House-PAB Exh., & CB Purge Filter System-Sections & Details	F-40833-4	A-205697	4	11/1/75
3. Nuclear Tank Farm-General Arrangement-Plan	F-25223-3	A-202091	3	11/11/75
4. Nuclear Equipment-Hydrogen Piping	F-27053-3	A-202216	3	11/11/75
5. Arrangement of Enclosure Tank for Safety Injection System Sump Line Valve	F-26423-6	A-202750	6	11/11/75

Table 14 (Cont.)

Title	UEC No.	Con Ed No.	Rev.	Date
6. Holdup Tank Pit and Pipe Trench Floor & Hub Drains Plans & Sections	F-26493-6	A-202179	6	11/11/75
7. Valve Leak-Off Piping Sheet No.1	F-26473-5	A-202752	5	11/11/75
8. Same-Sheet No.2	F-26483-3	A-202753	3	11/11/75

NOTE: All of the above drawings were also submitted in the initial transmittal.
Only those designated by * are new submittals.