NMP1L 0426
Enclosure 5

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION UNIT 1

HAZARDS ANALYSIS OF REGULATORY GUIDE 1.97 CATEGORY 1 INSTRUMENTS

Report Date: July 28, 1989

FORWARD

This report documents information presented verbally to members of the NRC Staff during NRC Region I Inspection 89-12. It has been prepared in response to a specific NRC request for documentation (reference: Part b of Issue No. 8 in NRC letter to Niagara Mohawk dated April 21, 1989) and the associated Niagara Mohawk commitment contained in NMP1L 0401 to the NRC dated May 19, 1989.

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HAZARDS ANALYSIS

1.0 BACKGROUND:

The plant-specific parameters designated as "Category 1" for Nine Mile Point Unit 1 (NMP-1) and the associated display instruments that are subject to comparison against the Category 1 design criteria specified in Regulatory Guide 1.97 (Revision 2) are shown in Table 1 on the following two pages. The as-built features of these instruments fully conform with the plants design and licensing bases; however, some instruments do not conform with all of the referenced Regulatory Guide 1.97 design criteria.

Since the identified deviations from Regulatory Guide 1.97 Category 1 design criteria encompass a number of instruments, and since the deviations are mainly associated with potential single failure concerns (e.g., a lack of redundancy, Class 1E isolation devices, and/or cable separation), a detailed hazards analysis of the consequences of instrument failures was performed to demonstrate the safety of plant operations under these conditions and the continued ability to effectively carry out appropriate emergency response actions that may be required under post-accident conditions.

A general description of the process that was followed in conducting the analysis is presented in Section 2.

The results of the analysis are documented in Section 3.

TABLE 1

CATEGORY 1 PARAMETERS AND DISPLAY INSTRUMENTS

PARAMETER	DISPLAY INSTRUMENTS	
	Channel 11	Channel 12
Reactor Power (APRM)	APRM/IRM Recorders RI05A and RI05B (0 to 125%)	APRM/IRM Recorders RI05C and RI05D (0 to 125%)
RPV Water Level	Meter 36-09 (0 to 100 inches)	Meter 36-10 (0 to 100 inches)
	Meter IA13 (-1 to +27 ft)	None.
	Digital Display 1F51 Acurex System (-240 to +110 inches) Acurex Data Logger/Recorder System A Channel 108 (Fuel Zone) and Channel 088 (Lo Lo Lo)	Digital Display 1F52 Acurex System (-240 to +110 inches) Acurex Data Logger/Recorder System B Channel 108 (Fuel Zone) and Channel 088 (Lo Lo Lo)
RPV Pressure	Meter 36-31A (0 to 1600 psig)	Meter 36-32B (0 to 1600 psig)
	Recorder ID75 Black Pen (0 to 1600 psig)	
Drywell Pressure	Meter 201.2-105A (0 to 75 psig)	Meter 201.2-106A (0 to 75 psig)
	Meter 201.2-484A (-5 to +250 psig)	Meter 201.2-483A (-5 to +250 psig)
Drywell Temperature	None.	Meters 201-36B, 201-27B, and 201-33B (50 to 300°F)
Suppression Pool (Torus) Water Level	Meter 58-06A (1.25 to 14.75 ft) Recorder 201.2-307 (1.25 to 14.75 ft)	Meter 58-05A (1.25 to 14.75 ft) Recorder 201.2-308 (1.25 to 14.75 ft)

TABLE 1

CATEGORY 1 PARAMETERS AND DISPLAY INSTRUMENTS

(Continued)

PARAMETER	DISPLAY INSTRUMENTS	
	Channel 11	Channel 12
Suppression Pool (Torus) Water Temperature	Meter 201.2-519 (30 to 230°F) System 201.2-517 (Cabinet 1S69) Data Logger/Recorder Channel 023	Meter 201.2-520 (30 to 230°F) System 201.2-518 (Cabinet 1S10) Data Logger/Recorder Channel 023
Containment O_2	Recorder 201.2-451 Green Pen (0 to 100% Scale) (Range Switch) (Range 0 to 5%) (and 0 to 25% conc.)	Recorder 201.2-450 Green Pen (0 to 100% Scale) (Range Switch) (Range 0 to 5%) (and 0 to 25% conc.)
Containment H_2	Recorder 201.2-451 Red Pen (0 to 100% Scale) (Range Switch) (Range 0 to 5%) (and 0 to 20% conc.)	Recorder 201.2-450 Red Pen (0 to 100% Scale) (Range Switch) (Range 0 to 5%) (and 0 to 20% conc.)
Drywell Water Level	None.	Meter 80-100 (-30 to 0 ft)
IRM	APRM/IRM Recorders RI05A and RI05B (0 to 125 scale)	APRM/IRM Recorders RI05C and RI05D (0 to 125 scale)
SRM	Meters RG12A and RG12B (10^0 to 10^6 cps) Recorder RG05 Black Pen (SRM 11 or 12) (10^0 to 10^6 cps)	Meters RG12C and RG12D (10^0 to 10^6 cps) Recorder RG05 Red Pen (SRM 13 or 14) (10^0 to 10^6 cps)
Torus Airspace Pressure	None.	Meters 201.2-07B and 201.2-07C (0 to 4 psig)
Containment Area High Range Radiation	Meter 201.7-36 (0 to 10^8 R/hr) Recorder 201.7-36C Pen 1 (0 to 10^8 R/hr)	Meter 201.7-37 (0 to 10^8 R/hr) Recorder 201.7-36C Pen 2 (0 to 10^8 R/hr)

2.0 GENERAL DESCRIPTION OF THE ANALYSIS APPROACH

Each Regulatory Guide 1.97 Category 1 parameter having analog display indication was analyzed as follows:

a. Instrumentation that is subject to comparison with Regulatory Guide 1.97 (Revision 2) Category 1 design criteria was identified and deviations briefly described.

b. Alternate instruments and methods that could be used for determining the current status of the parameter were identified and briefly described.

c. For the instruments listed in Part a (above), applicable Technical Specification Limiting Conditions for Operation at power were identified, and the action required for out-of-specification conditions was described.

d. An inability to determine the current status of the parameter was assumed to occur and the effect of this condition on the continued safety of plant operations, considering execution of the actions specified in the Emergency Operating Procedures, was evaluated and described.* Conclusions concerning the accomplishment of primary plant safety functions under conditions associated with the postulated failure were also made, as appropriate.

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*Note: The EOP actions described herein are somewhat simplified and summarized for the purpose of these narations.

The analyses described above were performed on a symptomatic basis; that is, no particular cause was identified for the postulated failures. The effect, not the cause, of a failure was the condition of interest. Although the probability of occurrence for some of the presumed failures (e.g., a complete loss of the ability to determine the current status of a parameter) is extremely small and well beyond the design basis of the plant, the identified failures were analyzed to further demonstrate that current display instrumentation is fully adequate to assure the accomplishment of plant safety functions even under extremely degraded plant conditions.

3.0 DETAILED ANALYSES

3.1 Average Power Range Monitor

3.1.1 Category 1 Instruments

The principal (Category 1) display instrumentation for APRM reactor power consists of eight chart recorders. Detailed information on instrument loop components is shown in Part A of Attachment 1. Multiple separate and independent sensors, and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor reactor power under a wide spectrum of transient and accident conditions.

3.1.2 Alternate Instruments

Alternate display instruments and other methods that could be used for determining the current status of APRM reactor power are listed and described in Parts B through E of Attachment 1. In summary, these consist of:

- Meters on the respective APRM drawers.
- Separate High-High, High, and Downscale alarm/indicating lights located on the respective APRM drawers and on Console E for each APRM.
- Individual Local Power Range meters, one for each Local Power Range Monitor detector, located on the full core display.
- Computed numerical value information presented on the Safety Parameter Display System "Reactivity Control" and "Emergency Response Overview" screens.
- Computer alarm messages (high-high, high, and downscale flux).
- Annunciator alarms.

The sensors for the alternate display instruments are the same as those for the Category 1 display instruments (those listed in Part A of Attachment 1).

Other non-direct means of determining an approximate value of APRM reactor power, or of confirming that reactor power is below the APRM range, are listed in Part F of Attachment 1. In summary, these include:

- Indicated total steam flow, converted to equivalent percent reactor power.
- "All Rods In" indicated.
- IRMs or SRMs indicating on scale when the associated detectors are fully inserted.

3.1.3 Technical Specifications

Reactor operation at power requires a minimum of 3 operable APRM instrument channels in each of the two trip systems. With less than the minimum required number of APRM instrument channels operable, control rods must be inserted. (Reference: TS 3.6.2, "Protective Instrumentation," and Table 3.6.2a)

3.1.4 Execution of Emergency Operating Procedures

Actions specified in the Emergency Operating Procedures explicitly address the condition of not being able to determine reactor power; in simple terms, the "Failure to Scram" procedure (EOP-3) applies until it is determined (confirmed) that all control rods are inserted to or beyond position 02. The exact operator action required by EOP-3 if reactor power cannot be determined depends upon the current status of various other plant parameters including RPV water level, torus water temperature, and drywell pressure. In any case, the actions specified in EOP-3 for assuring safe shutdown when reactor power cannot be determined are clear and specific, and have been shown through EOP validation exercises conducted on the NMP-1 plant-specific simulator to adequately and effectively address accidents that extend well beyond the plant's design basis.

For design basis accidents a reactor scram occurs, control rods are verified to be inserted, and monitoring of APRMs is not required.

3.2 RPV Water Level

3.2.1 Category 1 Instruments

The principal (Category 1) display instrumentation for RPV water level consists of two narrow range meters that cover the normal RPV water level control band, two fuel zone meters that cover the core region and overlap the narrow range meters, and one wide range meter that overlaps the top end of the narrow range meters and extends up to approximately the height of the main steam lines. A meter for monitoring water level at the vessel flange is also provided. Recording of RPV water level is accomplished by the Acurex System. Detailed information on instrument loop components is provided in Part A of Attachment 2. The diversity of instrument sensors and channelization of Class 1E power supplies provides high assurance of the continued ability to effectively monitor RPV water level under a wide spectrum of transient and accident conditions.

Both of the fuel zone RPV water level transmitters (36-24A and 36-24B) are physically connected to the RPV through a common tap and sensing line. An evaluation of the operational significance of this design is currently being performed. (Reference: Niagara Mohawk letter NMP1L 0401 to the NRC dated May 19, 1988; response to NRC Issue No. 7.) The details of that analysis and results are beyond the scope of this report. They will be separately documented and then discussed with the NRC Staff at a time yet to be determined but prior to plant restart. Appropriate training will also be provided to control room operators as previously committed in the referenced letter.

3.2.2 Alternate Instruments

Alternate display instruments and other methods that could be used for determining the current status of RPV water level are described in Parts B through E of Attachment 2. In summary, these consist of:

- Meters on the Analog Trip System cabinets (Hi Lo, Lo Lo, and Lo Lo Lo indicating ranges).
- One meter on each Remote Shutdown Panel (0 to 100 inches indicating range).
- Four Narrow Range GEMAC meters and one Narrow Range GEMAC chart recorder in the main control room (0 to 100 inches indicating range).
- Computed numerical value information for Narrow Range and Wide Range instruments presented on the Safety Parameter Display System "Core Cooling" and "Emergency Response Overview" screens.
- Computer alarm messages (high and low RPV water level; RPS Channel 11/12 high and low RPV water level trips).
- Annunciator alarms.

The level transmitters for almost all of the alternate instruments are separate and independent from those of the Category 1 display instruments (those listed in Part A of Attachment 2), and are also Safety Related.

Because of the extremely wide diversity of alternate RPV water level instruments, no indirect methods for determining RPV water level were investigated in any detail; however, computing a head of water using RPV pressure values at different elevations (e.g., RPV dome pressure, and pressure in a line connecting to the recirculation loop piping or some other penetration in the lower region of the RPV) is one conceivable indirect method that could possibly be utilized.

3.2.3 Technical Specifications

For RPV water level instrumentation that performs an accident monitoring function, continued reactor operation at power requires:

- With less than two operable channels, restore the inoperable channel(s) to operable status within seven days or be in at least HOT SHUTDOWN within the next 12 hours.
- With less than one operable channel, restore the inoperable channel(s) to operable status within 48 hours or be in at least HOT SHUTDOWN within the next 12 hours.

(Reference: TS 3.6.11, "Accident Monitoring Instrumentation," Table 3.6.11-1., and Table 3.6.11-2)

3.2.4 Execution of Emergency Operating Procedures

Actions specified in the Emergency Operating Procedures explicitly address the condition of not being able to determine RPV water level; in simple terms, appropriate actions for controlling RPV parameters transfer to the "RPV Flooding" procedure (EOP-7) until RPV water level indication is restored. EOP-7 addresses both scrammed (all rods inserted to or beyond position 02) and scram failure conditions up to and including all control rods stuck at the 100% rod pattern position. Actions specified in EOP-7 direct that the RPV be depressurized (Electromatic Relief Valves opened) and that injection into the RPV be increased and controlled as necessary to maintain a specified RPV pressure (the specific value is determined by the number of open Electromatic Relief Valves). These actions assure the accomplishment of the adequate core cooling safety function when RPV water level cannot be determined, and have been shown through EOP validation exercises conducted on the NMP-1 plant-specific simulator to adequately and effectively address accident scenarios involving loss of RPV water level indication that extend well beyond the plant's design basis.

For the design basis loss of coolant accident, core reflood (and thus adequate core cooling) cannot be directly confirmed if all RPV water level indication is also assumed to fail concurrently with the break occurring. Thus the procedure and actions previously described would apply. If RPV pressure could not be increased and maintained as specified in EOP-7 because of the combination of break size and the limited availability of RPV injection (makeup) flow, a worst-case type of scenario, an exit from EOP-7 and entry to the "Drywell Flooding" procedure (EOP-10) would be required and is so specified; adequate core cooling would be accomplished by flooding the drywell in order to submerge the core. Drywell flooding up to at least an elevation equal to the top of the active fuel is a primary containment load that has been specifically analyzed and is so documented in the FSAR.

3.3 RPV Pressure

3.3.1 Category 1 Instruments

The principal (Category 1) display instrumentation for RPV pressure consists of two meters and one chart recorder. The signal to the recorder is selected by positioning a selector switch to PRESS #1 (Channel 11 instrument loop) or PRESS #2 (Channel 12 instrument loop). Detailed information on instrument loop components is provided in Part A of Attachment 3. Separate and redundant senors and channelized 1E power supplies provide high assurance of the continued ability to effectively monitor RPV pressure under a wide spectrum of transient and accident conditions.

3.3.2 Alternate Instruments

Alternate display instruments and other methods that could be used for determining the current status of RPV pressure are described in Parts B through E of Attachment 3. In summary, these consist of:

- Meters located in the west and east instrument rooms (0 to 1600 psig indicating range).
- Narrow (suppressed) range chart recorder located on Panel F (950 to 1050 psig indicating range).
- One meter on each Remote Shutdown Panel (0 to 1600 psig indicating range).
- Meters on the Analog Trip System cabinets.
- Computed numerical value information presented on the Safety Parameter Display System "Reactor Vessel Integrity" and "Emergency Response Overview" screens.
- Computer alarm messages (RPS trips for high and low RPV pressure).
- Annunciator alarms.

Sensors for the listed alternate display instruments are separate and independent from those of the Category 1 display instruments (those listed in Part A of Attachment 3), and most are also Safety Related. All are powered from channelized Class 1E circuits.

Several indirect methods that could be used to at least approximate the current status of RPV pressure are listed in Part F of Attachment 3. In summary, these include:

- Main turbine bypass valve position, considering the "pressure set" value.
- Pressure in the steam lines to the Emergency Condensers.
- Reactor coolant temperature, considering the saturation properties of water.
- The ability or inability of various pumps to inject into the RPV, considering the pump's shutoff head.

For the purpose of executing the Emergency Operating Procedures, as discussed below, some of these (or other) indirect indications would likely be more than adequate to accomplish the actions specified in the event that the principal display instruments are not operable.

3.3.3 Technical Specifications

None; RPV pressure is not included in the Technical Specification list of post-accident monitoring instruments, and the Category 1 instrument loops (those detailed in Part A of Attachment 3) do not actuate any automatic protective actions. Entry to the Emergency Operating Procedures is required, however, if RPV pressure exceeds 1080 psig (the high RPV pressure scram setpoint). Operability requirements for RPV pressure instrumentation that initiates reactor scram are detailed in Technical Specification 3.6.2.

3.3.4 Emergency Operating Procedures

The Emergency Operating Procedures specify two limits below which RPV pressure is directed to be maintained. These limits are:

- The Heat Capacity Temperature Limit (torus water temperature as a function of RPV pressure and torus water level).
- The Torus Load Limit (torus water level as a function of RPV pressure).

If it cannot be determined that plant conditions are and can be maintained below these limits, the action specified in the Emergency Operating Procedures is to perform an emergency RPV depressurization. This action entails opening three Electromatic Relief Valves (if not already open) to fully depressurize the RPV.

Similarly, specific values of RPV pressure are identified as action levels in the Emergency Operating Procedures. Examples include:

- WAIT until RPV pressure drops to 700 psig.
- Stabilize RPV pressure below 1080 psig with the main turbine bypass valves.
- Is RPV pressure above 300 psig?

If any doubt exists as to the status of RPV pressure relative to an action level, depressurizing the RPV by opening Electromatic Relief Valves as necessary preserves reactor coolant system integrity (i.e., prevents overpressurizing the RPV), and aids in assuring adequate core cooling by minimizing the head against which injection systems must pump. Such action is consistent with the intent of the Emergency Operating Procedures. For scram failure conditions, however, caution must be exercised to not induce a reactor power excursion since changes in RPV pressure will have an immediately observable effect on reactor power either directly (through the void coefficient of reactivity) or through a rapid increase in injection of cold water as RPV pressure decreases.

For the design basis loss of coolant accident, the break itself is the means through which the RPV is depressurized and further control of RPV pressure is not required.

3.4 Drywell Pressure

3.4.1 Category 1 Instruments

The principal (Category 1) display instrumentation for drywell pressure consists of two Narrow Range (0 to 75 psig) meters, two Wide Range (-5 to +250 psig) meters, and two Wide Range chart recorders. Detailed information on instrument loop components is provided in Part A of Attachment 4. Two sets of separate and independent sensors, and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor drywell pressure under a wide spectrum of transient and accident conditions.

3.4.2 Alternate Instruments

Alternate display instruments that could be used for determining the current status of drywell pressure are described in Parts B through E of Attachment 4. In summary, these consist of:

- Meters located on Panel L (0 to 4 psig and 0 to 250 psig).
- One meter on each Remote Shutdown Panel (0 to 4 psig).
- Meters on the Analog Trip System Cabinets.
- Computed numerical valve information presented on the Safety Parameter Display System "Emergency Response Overview," "Reactor Vessel Integrity," and "Primary Containment Integrity" screens.
- Computer alarm messages (High-High and High Pressure; RPS channel trips).
- Annunciator alarms.

Most of the sensors for the listed alternate instruments are separate and independent from those of the Category 1 display instruments (those listed in Part A of Attachment 4), and most are also Safety Related. All are powered from channelized Class 1E circuits.

Because of the extremely wide diversity of alternate drywell pressure instruments, no indirect methods for determining drywell pressure have been investigated in any detail. One option available, however, is to utilize the Integrated Leak Rate Monitoring System capabilities for monitoring drywell pressure, including the connection of a direct-reading guage, as is provided for in the associated instrument surveillance procedure.

3.4.3 Technical Specifications

For drywell pressure instrumentation that performs an accident monitoring function, continued reactor operation at power requires:

- With less than two operable channels, prepare and submit a Special Report to the Commission within 14 days following the event [instrument channel inoperability] outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the inoperable system (channel) to operable status.

- With less than one operable channel, initiate the pre-planned alternate method of monitoring drywell pressure within 72 hours, and:

  1) either restore the inoperable channel(s) to status within seven days of the event, or

  2) prepare and submit a Special Report to the Commission within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to system.

  If the pre-planned alternate method of monitoring drywell pressure is not available, either restore the inoperable channel(s) to operable status within seven days or be in at least HOT SHUTDOWN within the next 12 hours.

(Reference: TS 3.6.11, "Accident Monitoring Instrumentation," Table 3.6.11-1, and Table 3.6.11-2)

3.4.4 Emergency Operating Procedures

The Emergency Operating Procedures (EOP-4) specify several values and Limits below which drywell pressure is directed to be maintained and controlled. These values and Limits, and the corresponding operator actions that are required if the control instructions cannot be accomplished, are as follows:

1. <u>Value:</u> 3.5 psig; if exceeds ...

   <u>Action</u>: Vent the containment in accordance with EOP-8 as required to control drywell pressure (drywell temperature conditions permitting).

2. <u>Value:</u> 3.5 psig; if drops below ...

   <u>Action:</u> Terminate containment sprays if they hve been initiated.

3. <u>Value:</u> 18 psig; if exceeds ...

   <u>Action:</u> Initiate containment sprays (current values of drywell temperature and pressure permitting, (i.e., below the Containment Spray Initiation Limit).

4. <u>Limit:</u> Pressure Suppression Pressure, a plot of drywell pressure (range of 0 to 35 psig) vs torus water level (range of 5 to 15 feet); if cannot be maintained below ...

   <u>Action:</u> Depressurize the RPV in accordance with EOP-8 (essentially entails opening 3 Electromatic Relief Valves).

5. <u>Limit:</u> Drywell Pressure Limit (Primary Containment Pressure Limit), a plot of drywell pressure (range of 0 to 50 psig) vs primary containment [torus/drywell] water level (range from 5 feet indicated in the torus to 0 inches indicated in the drywell); if exceeds ...

<u>Action:</u> Vent the primary containment to atmosphere, irrespective of the radioctivity release rate, as necessary to restore and maintain drywell pressure below the Limit. (Venting the torus is preferred over venting the drywell. Defeating primary containment isolation interlocks may be required, and is authorized if necessary, to accomplish the specified action.)

The inability to determine (confirm though primary, alternate, or indirect means) that drywell pressure is below/above, as appropriate, any of the listed values or Limits would necessitate taking the respective action; with respect to the Containment Spray Initiation Limit, containment sprays could not be initiated for controlling pressure. In the extreme these actions would ultimately involve venting the primary containment to atmosphere, thereby assuring that the structural integrity of the primary containment is protected and maintained.

3.5 Drywell Temperature

3.5.1 Category 1 Instruments

The principal (Category 1) display instrumentation for drywell temperature consists of a meter for each of three different elevations in the drywell. These three instruments are considered to be a single system since the temperature at each elevation is of significance in determining a bulk average temperature value, and most of the actions in the Emergency Operating Procedures that are keyed to drywell temperature are based on bulk average values. Detailed information on instrument loop components is provided in Part A of Attachment 5.

3.5.2 Alternate Instruments

Alternate display instruments that could be used for determining the current status of drywell temperature are described in Parts B through E of Attachment 5. In summary, these consist of:

- One meter on each Remote Shutdown Panel (50 to 300°F); one temperature element is at elevation 330', the other temperature element is at elevation 237'. Each uses the "second" element of the corresponding sensor listed in Part A of Attachment 5.
- Computed numerical valve information presented on the Safety Parameter Display System "Primary Containment Integrity" screen.
- Computer alarm messages (high temperature).
- Annunciator alarm.

Sensors for the display instruments listed above are the same as those of the Category 1 display instruments (those listed in Part A of Attachment 5) except for the presentation on the Safety Parameter Display System (SPDS). Instruments used for the computed value of drywell temperature that is displayed on the SPDS are identified in Part C of Attachment 5.

Additionally, drywell temperature elements that input to the Integrated Leak Rate Monitoring System could be utilized as an alternate means for monitoring the status of this parameter.

3.5.3 Technical Specifications

Drywell temperature has no Technical Specification Limiting Condition for Operation (no maximum normal operating value is specified, nor is drywell temperature included in the list of post-accident monitoring instrumentation). Entry to the Emergency Operating Procedures is required, however, if drywell average temperature exceeds 150°F.

3.5.4 Emergency Operating Procedures

The Emergency Operating Procedures (EOP-4) specify several values below which drywell temperature is directed to be maintained and controlled. These values, and the corresponding operator actions that are required if the control instructions cannot be accomplished, are as follows:

1. Value: 150°F (average); if exceeds ...

   Action: Operate drywell cooling as required to maintain drywell average temperature below 150°F.

2. Value: 300°F; before reaching ...

   Action: Initiate containment sprays (current values of drywell temperature and pressure permitting, (i.e., below the Containment Spray Initiation Limit).

3. <u>Value:</u> 300°F; cannot be maintained below ...

<u>Action:</u> Scram (if not already initiated), enter EOP-2 (RPV Control), and depressurize the RPV in accordance with EOP-8 (essentially entails opening 3 Electromatic Relief Valves).

The inability to determine (confirm though primary, alternate, or indirect means) that drywell temperature is below any of the listed values would necessitate taking the respective action; with respect to the Containment Spray Initiation Limit, containment sprays could not be initiated for controlling pressure. In the extreme these actions would ultimately involve depressurizing the RPV to minimize any continued heat addition to the drywell, thereby assuring that the structural integrity of the primary containment is protected and maintained.

Additionally, the entire indicated range of drywell temperature is used to evaluate the reliability of RPV water level instruments as detailed in EOP-1 (General Instruction #6). If drywell temperature cannot be determined to be below the maximum values specified for use of RPV water level instruments, and it is subsequently concluded that RPV water level cannot be determined, then RPV flooding (EOP-7) would be required in order to assure adequate core cooling. Refer to the related discussion in Section 3.2.4.

3.6 Suppression Pool (Torus) Water Level

3.6.1 Category 1 Instruments

The principal (Category 1) display instrumentation for torus water level consists of two Wide Range (1.25 to 14.75 ft) meters and two Wide Range (1.25 to 14.75 ft) chart recorders. Detailed information on instrument loop components is provided in Part A of Attachment 6. Two completely separate and redundant instrument loops, each with completely independent components and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor torus water level under a wide spectrum of transient and accident conditions.

3.6.2 Alternate Instruments

Alternate display instruments that could be used for determining the current status of torus water level are described in Parts B through E of Attachment 6. In summary, these consist of:

- One Narrow Range (9 to 14.75 ft) meter located on Panel K.
- Computed numerical valve information presented on the Safety Parameter Display System "Primary Containment Integrity" screen.
- Computer alarm messages (high/low level).
- Annunciator alarms.

The sensors for the alternate display instruments are all Safety Related, and all are powered from channelized 1E circuits.

An indirect method of determining an approximate level of water in the torus would be to open vent and drain valves in lines that are open-ended inside the torus (and for which the high point elevation is known) to observe whether or not a constant stream of water is discharged. Proper radiological and radiation control procedures would have to be observed if this proposed indirect method were to be used.

3.6.3 Technical Specifications

For torus water level instrumentation that performs an accident monitoring function, continued reactor operation at power requires:

- With less than two operable channels, prepare and submit a Special Report to the Commission within 14 days following the event [instrument channel inoperability] outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the inoperable system (channel) to operable status.

- With less than one operable channel, initiate the pre-planned alternate method of monitoring torus water level within 72 hours, and:

    1) either restore the inoperable channel(s) to operable status within seven days of the event, or

    2) prepare and submit a Special Report to the Commission within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to system.

  If the pre-planned alternate method of monitoring torus water level is not available, either restore the inoperable channel(s) to operable status within seven days or be in at least HOT SHUTDOWN within the next 12 hours.

(Reference: TS 3.6.11, "Accident Monitoring Instrumentation," Table 3.6.11-1, and Table 3.6.11-2)

Reactor operation at power also requires that the interrelated parameters of pressure suppression system pressure and suppression chamber [torus] water temperature and level be maintained as directed in Technical Specification 3.3.2b (which references Technical Specification Figures 3.3.2a and 3.3.2b). At least once each day torus water level shall be checked and verified to be within the specified limits (Ref: TS 4.3.2a). If the limits of Technical Specification 3.3.2b are not met within 24 hours, the reactor shall be shut down using normal shutdown procedures (Ref: TS 3.3.2c).

3.6.4 Emergency Operating Procedures

The Emergency Operating Procedures (EOP-4) specify several values and Limits above/below which torus water level is directed to be maintained and controlled. These values and Limits, and the corresponding operator actions that are required if the control instructions cannot be accomplished, are as follows:

1. <u>Value:</u> 10.0 feet; if decreases below ...

   <u>Action</u>: Add water in accordance with OP-2.

2. <u>Value:</u> 10.0 feet; cannot be maintained above ...

   <u>Action:</u> Maintain torus water level above 7.0 feet

3. <u>Value:</u> 7.0 feet; if cannot be maintained above ...

   <u>Action:</u> Scram (if not already initiated), enter EOP-2 (RPV Control), and depressurize the RPV in accordance with EOP-8 (essentially entails opening 3 Electromatic Relief Valves).

4. Value: 5.8 feet; if drops below ...

Action: Close all Electromatic Relief Valves.

5. Value: 11.5 feet; if increases above ...

Action: Discharge water in accordance with OP-14.

6. Value: 11.5 feet; if cannot be maintained below ....

Action: Maintain torus water level below the Torus Load Limit (a plot of torus water Level vs RPV pressure).

7. Limit: Torus Load Limit, a plot of torus water level vs RPV pressure; if cannot be maintained below ...

Action: Maintain RPV pressure below the Limit irrespective of the resulting RPV cooldown rate.

8. Limit: Torus Load Limit; if torus water level and RPV pressure cannot be maintained below ...

Action: Continued assurance of adequate core cooling permitting, terminate all RPV injection except Core Spray, boron, and CRD.

Scram (if not already initiated), enter EOP-2 (RPV Control), and depressurize the RPV in accordance with EOP-8 (essentially entails opening 3 Electromatic Relief Valves).

9. <u>Value:</u> Drywell water level value of 0 inches; if reaches ...

<u>Action:</u> Irrespective of the resultant consequences associated with adequate core cooling, terminate all RPV injection from sources external to the primary containment.

The inability to determine (confirm though primary, alternate, or indirect means) that torus water level is below/above, as appropriate, any of the listed values or Limits would necessitate taking the respective action thereby assuring, to the maximum extent possible, that primary containment integrity is protected and maintained. In the extreme, this includes terminating injection into the RPV from sources external to the primary containment, irrespective of the consequent effects on the continued assurance of adequate core cooling, to preclude any further increases in torus/drywell water level. (Core Spray operation with suction from the suppression pool is not affected.)

3.7 Suppression Pool (Torus) Water Temperature

3.7.1 Category 1 Instruments

The principal (Category 1) display instrumentation for torus water temperature consists of two meters. The recording of torus water temperature is performed by the data logger on Acurex panels 1S69 and 1S10. Detailed information on instrument loop components is provided in Part A of Attachment 7. Two completely separate and redundant instrument loops, each with completely independent components and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor torus water temperature under a wide spectrum of transient and accident conditions.

3.7.2 Alternate Instruments

Alternate display instruments that could be used for determining the current status of torus water temperature are described in Parts B through E of Attachment 7. In summary, these consist of:

- One meter on each Remote Shutdown panel (30° to 230°F).
- Computed numerical valve information presented on the Safety Parameter Display System "Emergency Response Overview" and "Primary Containment Integrity" screens.
- Computer alarm messages.
- Annunciator alarms.

The sensors for the meters on the Remote Shutdown Panels are separate an independent from the sensors for the Category 1 display instruments (those listed in Part A of Attachment 7), are powered from channelized Class 1E circuits, and are also Safety Related.

The design of the Torus Temperature Monitoring System conforms with the redundancy, separation, and isolation single failure criteria specified in Regulatory Guide 1.97 for Category 1 instruments. Therefore, a detailed list of indirect methods for determining torus water temperature is not necessary. If both channels of the Torus Temperature Monitoring System should somehow fail, however, one viable alternate method of approximating torus water temperature would be to operate the Containment Spray pumps on minimum flow (or torus cooling mode) and monitor indicated water temperature at the pump discharge (heat exchanger inlet temperature). Relevant additional information is provided in Part F of Attachment 7.

3.7.3 Technical Specifications

For torus water temperature instrumentation that performs an accident monitoring function, continued reactor operation at power requires:

- With less than two operable channels, prepare and submit a Special Report to the Commission within 14 days following the event [instrument channel inoperability] outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the inoperable system (channel) to operable status.

- With less than one operable channel, initiate the pre-planned alternate method of monitoring torus water temperature within 72 hours, and:

  1) either restore the inoperable channel(s) to operable status within seven days of the event, or

  2) prepare and submit a Special Report to the Commission within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to system.

  If the pre-planned alternate method of monitoring torus water temperature is not available, either restore the inoperable channel(s) to operable status within seven days or be in at least HOT SHUTDOWN within the next 12 hours.

(Reference: TS 3.6.11, "Accident Monitoring Instrumentation," Table 3.6.11-1, and Table 3.6.11-2)

Reactor operation at power also requires that the interrelated parameters of pressure suppression system pressure and suppression chamber [torus] water temperature and level be maintained as directed in Technical Specification 3.3.2b (which references Technical Specification Figures 3.3.2a and 3.3.2b). At least once each day torus water temperature shall be checked and verified to be within the specified limits (Ref: TS 4.3.2a). If the limits of Technical Specification 3.3.2b are not met within 24 hours, the reactor shall be shut down using normal shutdown procedures (Ref: TS 3.3.2c).

Whenever heat from relief valve operation is being added to the water in the torus, torus water temperature shall be continually monitored and also observed and logged every five minutes until the heat addition is terminated. (Ref: TS 4.3.2c)

During testing of relief valves which add heat to the water in the torus, bulk torus water temperature shall not exceed 10°F above the limit specified in Technical Specification 3.3.2b (the maximum normal value for unrestricted operation at power). In conjunction with such testing, torus water temperature must be reduced within 24 hours to below the normal power torus water temperature Limiting Condition for Operation. (Ref: TS 3.3.2d)

The reactor shall be scrammed from any operating condition when torus water temperature (bulk) reaches 110°F. Operation shall not be resumed until torus water temperature is reduced to below the normal power torus water temperature Limiting Condition for Operation. (Ref: TS 3.3.2e)

3.7.4 Emergency Operating Procedures

The Emergency Operating Procedures (EOP-4) specify several values and Limits below which torus water temperature is directed to be maintained and controlled. These values and Limits, and the corresponding operator actions that are required if the control instructions cannot be accomplished, are as follows:

1. Value: 80°F (bulk average); if exceeds ...

   Action: Operate available torus cooling as required to maintain torus water temperature below 80°F.

2. Value: 110°F (bulk average); before reaching ...

   Action: Scram (if not already initiated).

3. Limit: Heat Capacity Temperature Limit, a plot of torus water temperature vs RPV pressure and torus water level; if cannot be maintained below ...

   Action: Scram (if not already initiated), enter EOP-2 (RPV Control), and irrespective of the resulting RPV cooldown rate maintain RPV pressure below the Limit

   If torus water temperature and RPV pressure cannot be restored and maintained below the Limit, depressurize the RPV in accordance with EOP-8 (this essentially entails opening 3 Electromatic Relief Valves).

The inability to determine (confirm though primary, alternate, or indirect means) that torus water temperature is below any of the listed values or Limits would necessitate taking the respective action. In the extreme this includes depressurizing the RPV to preclude the occurrence of conditions that could cause a loss of primary containment integrity (e.g., an RPV depressurization or loss of coolant accident from normal operating pressure with insufficient heat capacity in the suppression pool to fully condense the discharged steam).

3.8 Containment Oxygen Concentration

3.8.1 Category 1 Instruments

The principal (Category 1) display instrumentation for containment oxygen concentration consists of two chart recorders, each with a selectable indicating range of 0 to 5% or 0 to 25%. Detailed information on instrument loop components is provided in Part A of Attachment 8. Two completely separate and redundant instrument loops, each with completely independent components and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor containment oxygen concentration under a wide spectrum of transient and accident conditions.

3.8.2 Alternate Instruments

Alternate display instruments that could be used for determining the current status of containment oxygen concentration are described in Parts B through E of Attachment 8. In summary, these consist of:

- Two meters located on the Leak Rate Monitoring System Cabinet 1S67 (one 0 to 5% oxygen concentration and one 0 to 25% oxygen concentration).
- Computed numerical valve information presented on the Safety Parameter Display System "Emergency Response Overview" and "Primary Containment Integrity" screens.
- Annunciator alarms.

The indirect method for determining containment oxygen concentration is by analysis of a grab sample obtained from the containment via the Post Accident Sampling System.

3.8.3 Technical Specifications

To assure that in the event of a loss-of-coolant accident any hydrogen generation will not result in a combustible mixture within the primary containment system, the primary containment atmosphere shall be reduced to less than four percent oxygen with nitrogen gas whenever the reactor coolant pressure is greater than 110 psig and the reactor is in the power operating condition, except as specified below.

> Within the 24-hour period subsequent to the reactor being placed in the run mode for the power operating condition, the containment atmosphere oxygen concentration shall be reduced to less than four percent by weight, and maintained in this condition. Deinerting may commence 24 hours prior to a major refueling outage or other scheduled shutdown.

Reactor power operation requires that at least once each week oxygen concentration in the primary containment be determined. If the specifications detailed above are not met, reactor coolant system pressure shall be reduced to 110 psig or less within 10 hours.

(Ref: TS 3.3.1 and 4.3.1)

3.8.4 Execution of Emergency Operating Procedures

Actions specified in the Emergency Operating Procedures (EOP-4) for control of primary containment oxygen concentration are interrelated with those for primary containment hydrogen concentration. Refer to the discussion contained in Section 3.9.4 (execution of emergency operating procedures for containment hydrogen concentration).

3.9 Containment Hydrogen Concentration

3.9.1 Category 1 Instruments

The principal (Category 1) display instrumentation for containment hydrogen concentration consists of two chart recorders, each with a selectable indicating range of 0 to 5% or 0 to 20%. Detailed information on instrument loop components is provided in Part A of Attachment 9. Two completely separate and redundant instrument loops, each with completely independent components and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor containment hydrogen concentration under a wide spectrum of transient and accident conditions.

3.9.2 Alternate Instruments

Alternate display instruments that could be used for determining the current status of containment hydrogen concentration are described in Parts B through E of Attachment 9. In summary, these consist of:

- Annunciator alarms.

The sensors for the alarm units are the same as those for the Category 1 display instruments (those listed in Part A of Attachment 9).

The indirect method for determining containment hydrogen concentration is by analysis of a grab sample obtained from the containment via the Post Accident Sampling System.

3.9.3 Technical Specifications

For containment hydrogen concentration instrumentation that performs an accident monitoring function, continued reactor operation at power requires:

- With less than two operable channels, prepare and submit a Special Report to the Commission within 14 days following the event [instrument channel inoperability] outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the inoperable system (channel) to operable status.

- With less than one operable channel, initiate the pre-planned alternate method of monitoring drywell pressure within 72 hours, and:

  1) either restore the inoperable channel(s) to status within seven days of the event, or

  2) prepare and submit a Special Report to the Commission within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to system.

  If the pre-planned alternate method of monitoring containment hydrogen concentration is not available, either restore the inoperable channel(s) to operable status within seven days or be in at least HOT SHUTDOWN within the next 12 hours.

(Reference: TS 3.6.11, "Accident Monitoring Instrumentation," Table 3.6.11-1, and Table 3.6.11-2)

3.9.4 Emergency Operating Procedures

The inability to determine (confirm through direct, indirect, or alternate means) that containment hydrogen and oxygen concentrations are below 6% and 5%, respectively, is explicitly addressed in EOP-4. These values are the limiting conditions associated with creation of an explosive gasseous mixture. Thus the specified action is taken to assure (to the maximum extent possible) that primary containment integrity is protected and maintained. The required action is to vent and purge the primary containment, irrespective of the consequent radioactivity release rate, until either (1) drywell and torus hydrogen concentration can be determined to be below 6%, or (2) drywell and torus oxygen concentration can be determined to be below 5%. Specific instructions for performing the vent and purge operation are contained in EOP-4.

3.10 Drywell Water Level

3.10.1 Category 1 Instruments

The principal (Category 1) display instrumentation for drywell water level consists of a meter that monitors between elevations 267 ft and 305 ft 6 inches (elevation 290 ft is approximately equal to the top of active fuel). Detailed information on instrument loop components is provided in Part A of Attachment 10.

3.10.2 Alternate Instruments

Drywell water level has no alternate display device.

The principal indirect method for determining drywell water level entails computing a head of water equal to the difference in pressure sensed at two different drywell elevations. This method is further detailed in Part F of Attachment 10.

A "method of last resort" for determining an approximate value for drywell water level would be to open instrument line vent and drain valves that are open to the drywell atmosphere (and for which the high point elevation is known) to see whether or not a continuous discharge of water is obtained.

3.10.3 Technical Specifications

None.

3.10.4 Execution of Emergency Operating Procedures

Monitoring drywell water level is only required when RPV water level cannot be determined; thus, the alternate for drywell water level indication is a valid indication of reactor vessel water level at or above the top of the active fuel.

If Drywell Flooding (EOP-10) is being executed and it cannot be determined (confirmed through primary, alternate, or indirect means) that drywell water level is below 0 inches (referenced to drywell water level instrument zero), then the required action (EOP-4) is to terminate injection into the RPV from sources external to the primary containment irrespective of the consequent effects on the continued assurance of adequate core cooling. Refer to the discussion of torus water level control actions described in Section 3.6.4.

3.11 Intermediate Range Monitor

3.11.1 Category 1 Instruments

The principal (Category 1) display instrumentation for IRM reactor power consists of eight chart recorders. Detailed information on instrument loop components is shown in Part A of Attachment 11. Multiple separate and independent sensors, and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor reactor power under a wide spectrum of transient and accident conditions.

3.11.2 Alternate Instruments

Alternate display instruments and other methods that could be used for determining the current status of IRM reactor power are listed and described in Parts B through E of Attachment 11. In summary, these consist of:

- Meters on the respective IRM drawers.
- Separate High-High, High, and Downscale alarm/indicating lights located on the respective IRM drawers and on Console E for each IRM.
- Computed numerical value information presented on the Safety Parameter Display System "Reactivity Control" screen.
- Computer alarm messages (upscale trip, inop trip).
- Annunciator alarms.

The sensors for the alternate display instruments are the same as those for the Category 1 display instruments (those listed in Part A of Attachment 11).

Non-direct means of determining an approximate value of IRM reactor power, or of confirming that reactor power is below the IRM range include:

- Downscale indicated on the APRMs.
- "All Rods In" indicated.
- SRMs indicating on scale when the associated detectors are fully inserted.

3.11.3 Technical Specifications

Reactor operation at power requires a minimum of 3 operable IRM instrument channels in each of the two trip systems. With less than the minimum required number of IRM instrument channels operable, control rods must be inserted. (Reference: TS 3.6.2, "Protective Instrumentation," and Table 3.6.2a)

3.11.4 Execution of Emergency Operating Procedures

Actions specified in the Emergency Operating Procedures explicitly address the condition of not being able to determine reactor power; in simple terms, the "Failure to Scram" procedure (EOP-3) applies until it is determined (confirmed) that all control rods are inserted to or beyond position 02. The exact operator action required by EOP-3 if reactor power cannot be determined depends upon the current status of various other plant parameters including RPV water level, torus water temperature, and drywell pressure. In any case, the actions specified in EOP-3 for assuring safe shutdown when reactor power cannot be determined are clear and specific, and have been shown through EOP validation exercises conducted on the NMP-1 plant-specific simulator to adequately and effectively address accidents that extend well beyond the plant's design basis.

IRM reactor power is not an EOP Key Parameter, but the top end of the IRM range could serve as a backup indication of APRM reactor power above/below the APRM downscale value.

For design basis accidents a reactor scram occurs, control rods are verified to be inserted, and monitoring of IRMs is not required.

3.12 Source Range Monitor

3.12.1 Category 1 Instruments

The principal (Category 1) display instrumentation for SRM reactor power consists of four separate log count rate meters and one chart recorder. Detailed information on instrument loop components is shown in Part A of Attachment 12. Multiple separate and independent sensors, and channelized Class 1E power supplies, provide high assurance of the continued ability to effectively monitor reactor power under a wide spectrum of transient and accident conditions.

3.12.2 Alternate Instruments

Alternate display instruments and other methods that could be used for determining the current status of SRM reactor power are listed and described in Parts B through E of Attachment 12. In summary, these consist of:

- Log count rate meters on the respective SRM drawers.
- Separate High, Downscale, and short period alarm/indicating lights located on the respective SRM drawers and on Console E for each SRM.
- Computed numerical value information presented on the Safety Parameter Display System "Reactivity Control" screen.
- Computer alarm messages (short period).
- Annunciator alarms.

The sensors for the alternate display instruments are the same as those for the Category 1 display instruments (those listed in Part A of Attachment 12).

Non-direct means of determining an approximate value of SRM reactor power, or of confirming that reactor power is above the SRM range, include:

- "All Rods In" indicated.
- IRMs indicating on scale when the associated detectors are fully inserted.

3.12.3 Technical Specifications

Technical Specifications do not require that SRMs be operable for reactor operation at power.

3.12.4 Execution of Emergency Operating Procedures

Not applicable. Monitoring SRM reactor power level is not required for the execution of actions specified in the EOP. Confirmation of reactor shutdown is obtained by verifying that control rods are inserted.

For design basis accidents a reactor scram occurs, control rods are verified to be inserted, and monitoring of SRMs is not required.

3.13 Torus Airspace Pressure

3.13.1 Category 1 Instruments

The principal (Category 1) display instrumentation for torus airspace pressure consists of two meters. Detailed information on instrument loop components is provided in Part A of Attachment 13.

3.13.2 Alternate Instruments

Alternate display instruments that could be used for determining the current status of torus airspace pressure are described in Parts B through E of Attachment 13. In summary, these consist of:

- A meter on the N_2 Vaporizer Panel (0 to 4 psig).
- Computer alarm messages (high/low pressure).
- Annunciator alarms.

Since torus airspace pressure is not an EOP Key Parameter, no indirect method for determining the status of this parameter is required to be developed. The Integrated Leak Rate Monitoring System could, however, be used to determine and monitor torus airspace pressure if necessary.

Drywell pressure display instrumentation (Section 3.4) also provides an alternate indication of torus airspace pressure, as described below.

- As torus airspace pressure increases (or drywell pressure decreases), the vacuum breakers between the drywell and the suppression chamber open to limit the amount by which drywell pressure may go negative with respect to torus airspace pressure. Each valve is capable of opening on a differential pressure of 0.25 ± 0.10 psi. Technical Specification 3.3.6a details the vacuum breaker operability requirements that apply whenever primary containment integrity is required to be maintained (includes normal reactor operation at power); specifically, the valve shall be fully open with the applied force at all valve positions not exceeding that equivalent to 0.5 psi acting on the suppression chamber side of the disk.

- As drywell pressure increases, the design of the downcomers (vent pipes from the drywell to the torus) limits the amount by which drywell pressure may be higher than torus airspace pressure (under equilibrium conditions) to the pressure exerted by the head of water in the torus above the opening of the downcomers. With downcomer submergence maintained as specified in Technical Specification 3.3.2a (between 3.0 and 4.5 feet of water) this pressure difference is approximately 1.95 psi (maximum).

Thus, the overall design of the pressure suppression system (vacuum breakers and downcomers) assures that drywell pressure and torus airspace pressure differ by no more than several psi except during very short term transient conditions.

Additionally, the vacuum breakers between the suppression chamber and the reactor building are designed to limit the amount by which torus airspace pressure may go subatmospheric. Each valve is capable of opening on a differential pressure of 0.25 $\pm$ 0.10 psi. Technical Specification 3.3.6f(1) details the vacuum breaker operability requirements that apply whenever primary containment isolation is required to be maintained (includes normal reactor operation at power); specifically, the setpoint of the differential pressure instrumentation which actuates the vacuum breakers shall be no greater than 0.5 psi, and the self-actuating vacuum breakers shall be fully open when subjected to a force equivalent to or less than 0.5 psi acting on the valve disk.

3.13.3 Technical Specifications

Reactor operation at power requires that the interrelated paramaters of pressure suppression system pressure and suppression chamber [torus] water temperature and level be maintained as directed in Technical Specification 3.3.2b (which references Technical Specification Figures 3.3.2a and 3.3.2b). At least once each day the pressure suppression system pressure shall be checked and verified to be within the specified limits (Ref: TS 4.3.2a). If the limits of Technical Specification 3.3.2b are not met within 24 hours, the reactor shall be shut down using normal shutdown procedures (Ref: TS 3.3.2c).

3.13.4 Execution of Emergency Operating Procedures

Not applicable. Monitoring the status of torus airspace pressure is not explicitly required for execution of the actions specified in the Emergency Operating Procedures.

3.14 Containment Area High Range Radiation Level

3.14.1 Category 1 Instruments

The principal (Category 1) display instrumentation for containment area high range radiation level consists of two system monitor meters and two chart recorders. Detailed information on instrument loop components is provided in Part A of Attachment 14.

3.14.2 Alternate Instruments

An alternate display of containment area high radiation level is presented on the Safety Parameter Display System "Radioactivity Release Control" screen. The method for determining the displayed valve is described in Part C of Attachment 14.

Radiation Protection Surveillance Procedure No. N1-RSP-10C, "The Use and Routine Calibration of the General Atomic High-Range Gamma Radiation Monitoring System," details an alternate method of monitoring gamma radiation in the drywell for use when both Category 1 instruments (those identified in Part A of Attachment 14) are inoperative. The procedure explicitly states that the alternate pre-planned method must be initiated within 72 hours after both installed drywell monitors cease to function.

3.14.3 Technical Specifications

For containment area high range radiation level instrumentation that performs an accident monitoring function, continued reactor operation at power requires:

- With less than two operable channels, prepare and submit a Special Report to the Commission within 14 days following the event [instrument channel inoperability] outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the inoperable system (channel) to operable status.

- With less than one operable channel, initiate the pre-planned alternate method of monitoring containment area high range radiation level within 72 hours, and:

  1) either restore the inoperable channel(s) to operable status within seven days of the event, or

  2) prepare and submit a Special Report to the Commission within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to system.

(Reference: TS 3.6.11, "Accident Monitoring Instrumentation," Table 3.6.11-1, and Table 3.6.11-2)

3.14.4 Execution of Emergency Operating Procedures.

Not applicable. Monitoring the status of containment (drywell) area high radiation level is not required for execution of the actions specified in the Emergency Operating Procedures.

ATTACHMENT NO. 1

REACTOR POWER - APRM INSTRUMENTS

Parameter: **Neutron Flux - APRM**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05A Pen 1 (Blk) (0 to 125%) via Sel. Switch 10S1 (APRM #11)	RPS 11 Ckt 9	Console E	N*	Y	LPRMs: 28-49A 28-49C 36-41A 36-41C 44-33A 44-33C 28-33A 28-33C	PRM RJ01E	Core	Y	N	PRM RJ01E APRM RI02B Ch 11 Trip Aux. Relays RJ19A	RPS 11 Ckt 6 RPS 11 Ckt 6 RPS 11 Ckt 5	Panel G Panel G Panel G	Y Y Y	NR NR NR	Same as Display Instrument			
RI05A Pen 2 (Red) (0 to 125%) via Sel. Switch 10S5 (APRM #12)	RPS 11 Ckt 9	Console E	N*	Y	LPRMs: 20-25A 20-25C 04-25A 04-25C 12-17A 12-17C 20-09A 20-09C	PRM RJ01C	Core	Y	N	PRM RJ01C APRM RI02A Ch 12 Trip Aux. Relays RJ19B	RPS 11 Ckt 6 RPS 11 Ckt 6 RPS 11 Ckt 5	Panel G Panel G Panel G	Y Y Y	NR NR NR	Same as Display Instrument			

* Upgrade to SR is in progress; will be completed prior to plant restart.

Parameter: **Neutron Flux - APRM**

EOP Key Parameter: Yes ☒ No ☐

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05B Pen 1 (Blk) (0 to 125%) via Sel. Switch 10S2 (APRM #13)	RPS 11 Ckt 9	Console E	N*	Y	LPRMs: 20-49A 20-49C 12-41A 12-41C 20-33A 20-33C 04-33A 04-33C	PRM RJ01B	Core	Y	N	PRM RJ01B	RPS 11 Ckt 6	Panel G	Y	NR	Same as Display Instrument			
										APRM RI02A Ch 13	RPS 11 Ckt 6	Panel G	Y	NR				
										Trip Aux. Relays RJ19A	RPS 11 Ckt 5	Panel G Room	Y	NR				
RI05B Pen 2 (Red) (0 to 125%) via Sel. Switch 10S6 (APRM #14)	RPS 11 Ckt 9	Console E	N*	Y	LPRMs: 44-25A 44-25C 28-25A 28-25C 36-17A 36-17C 28-09A 28-09C	PRM RJ01F	Core	Y	N	PRM RJ01F	RPS 11 Ckt 6	Panel G	Y	NR	Same as Display Instrument			
										APRM RI02B Ch 14	RPS 11 Ckt 6	Panel G	Y	NR				
										Trip Aux. Relays RJ19B	RPS 11 Ckt 5	Panel G	Y	NR				

* Upgrade to SR is in progress; will be completed prior to plant restart.

Parameter: Neutron Flux - APRM

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05C Pen 1 (Blk) (0 to 125%) via Sel. Switch 10S3 (APRM #15)	RPS 12 Ckt 9	Console E	N*	Y	LPRMs: 28-49B 28-49D 36-41B 36-41D 44-33B 44-33D 28-33B 28-33D	PRM RJ01M	Core	Y	N	PRM RJ01M APRM RI02D Ch 15 Trip Aux. Relays RJ19C	RPS 12 Ckt 6 RPS 12 Ckt 6 RPS 12 Ckt 5	Panel G Panel G Panel G	Y Y Y	NR NR NR	Same as Display Instrument			
RI05C Pen 2 (Red) (0 to 125%) via Sel. Switch 10S7 (APRM #16)	RPS 12 Ckt 9	Console E	N*	Y	LPRMs: 20-49B 20-49D 12-41B 12-41D 20-33B 20-33D 04-33B 04-33D	PRM RJ01J	Core	Y	N	PRM RJ01J APRM RI02C Ch 16 Trip Aux. Relays RJ19C	RPS 12 Ckt 6 RPS 12 Ckt 6 RPS 12 Ckt 5	Panel G Panel G Panel G	Y Y Y	NR NR NR	Same as Display Instrument			

* Upgrade to SR is in progress; will be completed prior to plant restart.

Parameter: **Neutron Flux - APRM**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05D Pen 1 (Blk) (0 to 125%) via Sel. Switch 10S4 (APRM #17)	RPS 12 Ckt 9	Console E	N*	Y	LPRMs: 20-25B 20-25D 04-25B 04-25D 12-17B 12-17D 20-09B 20-09D	PRM RJ01K	Core	Y	N	PRM RJ01K	RPS 12 Ckt 6	Panel G	Y	NR	Same as Display Instrument			
										APRM RI02C Ch 17	RPS 12 Ckt 6	Panel G	Y	NR				
										Trip Aux. Relays RJ19D	RPS 12 Ckt 5	Panel G	Y	NR				
RI05D Pen 2 (Red) (0 to 125%) via Sel. Switch 10S8 (APRM #18)	RPS 12 Ckt 9	Console E	N*	Y	LPRMs: 44-25B 44-25D 28-25B 28-25D 36-17B 36-17D 28-09B 28-09D	PRM RJ01N	Core	Y	N	PRM RJ01N	RPS 12 Ckt 6	Panel G	Y	NR	Same as Display Instrument			
										APRM RI02D Ch 18	RPS 12 Ckt 6	Panel G	Y	NR				
										Trip Aux. Relays RJ19D	RPS 12 Ckt 5	Panel G	Y	NR				

* Upgrade to SR is in progress; will be completed prior to plant restart.

Parameter: **Neutron Flux - APRM**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	EQ	SR	Power Supply	
Meter on RI02B for APRM #11	0-125%	Panel G	Y	RPS 11 Ckt 6 via RI02B	See Part A Table for APRM # 11.					
Meter on RI02A for APRM #12	0-125%	Panel G	Y	RPS 11 Ckt 6 via RI02A	See Part A Table for APRM # 12.					
Meter on RI02A for APRM #13	0-125%	Panel G	Y	RPS 11 Ckt 6 via RI02A	See Part A Table for APRM # 13.					
Meter on RI02B for APRM #14	0-125%	Panel G	Y	RPS 11 Ckt 6 via RI02B	See Part A Table for APRM # 14.					
Meter on RI02D for APRM #15	0-125%	Panel G	Y	RPS 12 Ckt 6 via RI02D	See Part A Table for APRM # 15.					
Meter on RI02C for APRM #16	0-125%	Panel G	Y	RPS 12 Ckt 6 via RI02C	See Part A Table for APRM # 16.					
Meter on RI02C for APRM #17	0-125%	Panel G	Y	RPS 12 Ckt 6 via RI02C	See Part A Table for APRM # 17.					
Meter on RI02D for APRM #18	0-125%	Panel G	Y	RPS 12 Ckt 6 via RI02D	See Part A Table for APRM # 18.					

Parameter: **Neutron Flux - APRM**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	EQ	SR	Power Supply	
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #11	On/Off	Console E	Y	RPS 11 Ckt 6 via RI02B	See Part A Table for APRM # 11.					R = Red A = Amber W = White
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #12	On/Off	Console E	Y	RPS 11 Ckt 6 via RI02A	See Part A Table for APRM # 12.					
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #13	On/Off	Console E	Y	RPS 11 Ckt 6 via RI02A	See Part A Table for APRM # 13.					
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #14	On/Off	Console E	Y	RPS 11 Ckt 6 via RI02B	See Part A Table for APRM # 14.					

Parameter: **Neutron Flux - APRM**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	EQ	SR	Power Supply	
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #15	On/Off	Console E	Y	RPS 12 Ckt 6 via RI02D	See Part A Table for APRM # 15.					Red = Red A = Amber W = White
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #16	On/Off	Console E	Y	RPS 12 Ckt 6 via RI02C	See Part A Table for APRM # 16.					
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #17	On/Off	Console E	Y	RPS 12 Ckt 6 via RI02C	See Part A Table for APRM # 17.					
HI HI (R) HI (A) DN SCALE (W) alarm lights for APRM #18	On/Off	Console E	Y	RPS 12 Ckt 6 via RI02D	See Part A Table for APRM # 18.					

Parameter: **Neutron Flux - APRM**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	EQ	SR	Power Supply	
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #11	On/Off	Panel G (Trip Aux. Relay) RJ19A	Y	RPS 11 Ckt 5 via RJ19A	See Part A Table for APRM # 11.					R = Red A = Amber W = White
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #12	On/Off	Panel G (Trip Aux. Relay) RJ19B	Y	RPS 11 Ckt 5 via RJ19B	See Part A Table for APRM # 12.					
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #13	On/Off	Panel G (Trip Aux. Relay) RJ19A	Y	RPS 11 Ckt 5 via RJ19A	See Part A Table for APRM # 13.					
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #14	On/Off	Panel G (Trip Aux. Relay) RJ19B	Y	RPS 11 Ckt 5 via RJ19B	See Part A Table for APRM # 14.					

Parameter: **Neutron Flux - APRM**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	EQ	SR	Power Supply	
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #15	On/Off	Panel G (Trip Aux. Relay) RJ19C	Y	RPS 12 Ckt 5 via RJ19C	See Part A Table for APRM # 15.					R = Red A = Amber W = White
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #16	On/Off	Panel G (Trip Aux. Relay) RJ19C	Y	RPS 12 Ckt 5 via RJ19C	See Part A Table for APRM # 16.					
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #17	On/Off	Panel G (Trip Aux. Relay) RJ19D	Y	RPS 12 Ckt 5 via RJ19D	See Part A Table for APRM # 17.					
SCRAM (R) ALARM (A) DN SCALE (W) alarm lights for APRM #18	On/Off	Panel G (Trip Aux. Relay) RJ19D	Y	RPS 12 Ckt 5 via RJ19D	See Part A Table for APRM # 18.					
Individual LPR meters	0 to 100	Panel F	Y	RPS 11 Ckt 6 and RPS 12 Circuit 6 via resp. PRM RJ01	See Part A Table for APRM #11 through #18.					

Parameter: **Neutron Flux - APRM**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H441	0-125%	Reactivity Control Emergency Response Overview	E336 thru E343	APRM RI02A through RI02D (APRM #11 through #18 analog signal)	Y	Y	Output = average of all valid inputs that deviate from the average of all valid inputs by no more than the Deviation Allowance (of 3%).

Parameter: **Neutron Flux - APRM**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
D050 through D052, F029, F030, F088, F089, F090	High-High Flux (Scram) for APRM #11 through #18, respectively.	RI02A, B, C, D (See Part A Table for Neutron Flux-APRM)	Y	Y
B177 through B180, B185 through B188	Downscale Flux for APRM #11 through #18, respectively.	RI02A, B, C, D (See Part A Table for Neutron Flux-APRM)	Y	Y
B181 through B184, B189 through B192	High Flux (Rod Block) for APRM #11 through #18, respectively.	RI02A, B, C, D (See Part A Table for Neutron Flux-APRM)	Y	Y

Parameter: **Neutron Flux - APRM**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F2-1-6	APRM 11-14 (Setpoint = any of:) (• Inoperative) (• Downscale) (• Upscale Hi) (• Upscale Hi Hi)	RI02A, B	Y	Y
F3-1-1	APRM 15-18 (Setpoint = any of:) (• Inoperative) (• Downscale) (• Upscale Hi) (• Upscale Hi Hi)	RI02C, D	Y	Y

Parameter: **Neutron Flux - APRM**

Part F - Other Methods Available for Determining Current Status

1. Total steam flow (red pen of recorder ID75 located on Panel F and meter ID38 located on Console E, each with an indicating range of 0 to 8,000,000 lbs/hr) converted to equivalent percent reactor power.

   At rated reactor power and normal operating RPV pressure, 100% steam flow is equal to approximately 5,886,000 lbs/hr.

2. "All Rods In" indicated, as determined by the Rod Position Indication System. With all control rods fully inserted to position 00, the "permissive" indicating light will illuminate when the Reactor Mode Switch is in the REFUEL position. Also, an "All Rods In" indicating light is located on each Remote Shutdown Panel, and a rod position printout (full core) can be demanded through the process computer.

   The plant's licensing basis requires that the reactor remain shutdown under all temperature conditions and the core xenon-free with the highest worth control rod fully withdrawn (all other control rods fully inserted). Other clean-core cold shutdown rod configurations might also be able to be determined by the reactor analyst.

3. IRMs indicating less than 100 with the associated detectors fully inserted and range switches at position 8 (or less).

4. SRMs indicating on scale when the associated detectors are fully inserted.

ATTACHMENT NO. 2

RPV WATER LEVEL INSTRUMENTS

- NARROW RANGE
- WIDE RANGE
- ACUREX (FUEL ZONE AND LOLOLO)

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
LI 36-09 (0 to 100 in.)	RPS 11 Ckt 27	Panel F	N*	Y	ΔPT 36-03A (High/Lo)	RPS 11 Ckt 27	West Instr. Room El. 286'	Y	Y	ATS "A" (Ch 11/1) Trip Unit 36-03A-M ATS "A" (Ch 11/1) Trip Unit 36-03A-S	RPS 11 Ckt 27	R.B. Col. N-5 El. 281'	Y	Y	See Acurex System			
LI 36-10 (0 to 100 in.)	RPS 12 Ckt 27	Panel F	N*	Y	ΔPT 36-03D (High/Lo)	RPS 12 Ckt 27	East Instr. Room El. 286'	Y	Y	ATS "D" (Ch 12/1) Trip Unit 36-03D-M ATS "D" (Ch 12/1) Trip Unit 36-03D-S	RPS 12 Ckt 27	R.B. Col. N-12 El. 281'	Y	Y	See Acurex System			

* Upgrade to SR is in progress; will be completed prior to plant restart.

<u>Drawings</u>

C-22005-C; Sh 5, 11

Parameter: **Reactor Coolant Level - Wide Range**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
LI IA-13 (-1 to +27.5 ft)	RPS 11 Ckt 12	Panel F	N*	Y	LT 36-33	RPS 12 Ckt 12	West Instr. Room Col. M-7 El. 281'	Y	Y	Power Sup. ID 28C	RPS 12 Ckt 12	ACC 1S35	N*	NR	See Acurex System			
LI IA-19 (-3 to +3 ft)	RPS 11 Ckt 12	Panel K	N*	Y						PT 36-31	RPS 11 Ckt 12	West Instr. Room Col M-7 El. 281'	Y	Y				
										Prop. Amp. IA16	RPS 11 Ckt 12	ACC 1S33	N*	NR				
										X+ IA17	RPS 11 Ckt 12	ACC 1S33	N*	NR				
										Prop. Amp. IA18	RPS 11 Ckt 12	ACC 1S33	N*	NR				

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-23077-C; Sh 1,2
C-22004-C; Sh 1,3,8
C-18015-C

Parameter: **Reactor Vessel Water Level - Acurex System (Lo/Lo/Lo and Fuel Zone) - Channel 11**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
1F51 (LED) (-240 in. to +110 in.)	RPS 11 Ckt 25	Panel F	N*	Y	LT 36-24A (Fuel Zone)	RPS 11 Ckt 25	North Instr. Room Col. P-8,9 El. 237'	Y	Y	PT 36-23A	RPS 11 Ckt 25	West Instr. Room Col. L-7 El 288' 9"	Y	Y	Acurex Ch. A Data Channel 108 for calculated Fuel Zone RPV Water Level (inches)	RPS 11 Ckt 27	Reactor Water Level Monitor Panel 1S69	N*
										TE 36-29A (DW Ref. Leg Temperature)	RPS 11 Ckt 25	DW Col. L-7 El 315' 4"	Y	Y				
										TE 36-29C (RB Ref. Leg Temperature)	RPS 11 Ckt 25	West Instr. Room Col. M-7 El. 287'	Y	Y	or			
					ΔPT (LT) 36-05A (Lo/Lo/Lo)	RPS 11 Ckt 27	West Instr. Room El. 286'	Y	Y	ATS "A" (Ch 11/1) Trip Unit 36-05A-M (Lo/Lo/Lo)	RPS 11 Ckt 27	RB Col. N-5 El. 281'	Y	Y	Data Channel 088 for calculated Lo/Lo/Lo RPV Water Level (inches)			
										Acurex Channel A Processing Units	RPS 11 Ckt 25	ACC 1S69	N*	NR				

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-18015-C
C-34853-C Sh 2
C-34830-C Sh 2
C-22005-C Sh 6

Parameter: Reactor Vessel Water Level - Acurex System (Lo/Lo/Lo and Fuel Zone) - Channel 12

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
1F52 (LED) (-240 in. to +110 in.)	RPS 12 Ckt 15	Panel F	N*	Y	LT 36-24B (Fuel Zone)	RPS 12 Ckt 15	North Instr. Room Col. P-8,9 El. 237'	Y	Y	PT 36-23B	RPS 12 Ckt 15	East Instr. Room El 288' 9"	Y	Y	Acurex Ch. B	RPS 12 Ckt 15	Reactor Water Level Monitor Panel 1S10	N*
										TE 36-29B (DW Ref. Leg Temperature)	RPS 12 Ckt 15	DW Col. M-9 El 315' 4"	Y	Y	Data Channel 108 for calculated Fuel Zone RPV Water Level (inches)			
										TE 36-29D (RB Ref. Leg Temperature)	RPS 12 Ckt 15	East Instr. Room Col. L-9 El. 287'	Y	Y	or			
					ΔPT (LT) 36-05D (Lo/Lo/Lo)	RPS 12 Ckt 27	West Instr. Room El. 286'	Y	Y	ATS "D" (Ch 12/1)) Trip Unit 36-05D-M (Lo/Lo/Lo)	RPS 12 Ckt 27	RB Col. N-12 El. 281'	Y	Y	Data Channel 088 for calculated Lo/Lo/Lo RPV water level (inches)			
										Acurex Channel B Processing Units	RPS 12 Ckt 15	ACC 1S10	N*	NR				

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-18015-C
C-34853-C Sh 2
C-34830-C Sh 2
C-22005-C Sh 6

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo - Channel 11**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	Additional Remarks
ATS "A" (Ch 11/1) Trip Unit 36-03A-M	0 - 100 in.	R.B. (NW) El. 281'	Y	RPS 11 Ckt 27	ΔPT 36-03A (High/Lo)	West Instr. Room R.B., El. 286'	Y	Y	RPS 11 Ckt 27	
ATS "A" (Ch 11/1) Trip Unit 36-04A-M	0 - 100 in.	R.B. (NW) El. 281'	Y	RPS 11 Ckt 27	ΔPT 36-04A (Lo Lo)	West Instr. Room R.B., El. 286'	Y	Y	RPS 11 Ckt 27	
ATS "C" (Ch 11/2) Trip Unit 36-03C-M	0 - 100 in.	R.B. (SE) El. 281'	Y	RPS 11 Ckt 27	ΔPT 36-03C	East Instr. Room R.B., El. 286'	Y	Y	RPS 11 Ckt 27	
ATS "C" (Ch 11/2) Trip Unit 36-04C-M	0 - 100 in.	R.B. (SE) El. 281'	Y	RPS 11 Ckt 27	ΔPT 36-04C (Lo Lo)	East Instr. Room R.B., El. 286'	Y	Y	RPS 11 Ckt 27	
LI 36-28	0 - 100 in.	RSP Sec. 11	Y	RPS 11A RPS 11 Ckt 27	ATS "C" (Ch 11/2) Trip Unit 36-03C-M	R.B. (SE) El. 281'	Y	Y	RPS 11 Ckt 27	

Drawings:

C-22005-C, Sh 5, 8
C-34813-C, Sh 2

Parameter: **Reactor Vessel Water Level Hi/Lo Lo Lo - Channel 12**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
ATS "D" (Ch 12/1) Trip Unit 36-03D-M	0 - 100 in.	R.B. (NE) El. 281'	Y	RPS 12 Ckt 27	ΔPT 36-03D (High Lo)	East Instr. Room R.B., El. 286'	Y	Y	RPS 12 Ckt 27	
ATS "D" (Ch 12/1) Trip Unit 36-04D-M	0 - 100 in.	R.B. (NE) El. 281'	Y	RPS 12 Ckt 27	ΔPT 36-04D (Lo Lo)	West Instr. Room R.B., El. 286'	Y	Y	RPS 12 Ckt 27	
ATS "B" (Ch 12/2) Trip Unit 36-03B-M	0 - 100 in.	R.B. (SW) El. 281'	Y	RPS 12 Ckt 27	ΔPT 36-03B (High Lo)	West Instr. Room R.B., El. 286'	Y	Y	RPS 12 Ckt 27	
ATS "B" (Ch 12/2) Trip Unit 36-04B-M	0 - 100 in.	R.B. (SW) El. 281'	Y	RPS 12 Ckt 27	ΔPT 36-04B (Lo Lo)	West Instr. Room R.B., El. 286'	Y	Y	RPS 12 Ckt 27	
LI 36-26	0 - 100 in.	RSP Sect. 12	Y	RPS 12A RPS 12 Ckt 27	ATS "B" (Ch 12/2) Trip Unit 36-03B-M	R.B. (SW) El. 281'	Y	Y	RPS 12 Ckt 27	

Parameter: **Reactor Vessel Water Level - Narrow Range GEMAC**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
LI ID59A	0 to 100"	Panel F	N	RPS 11 Ckt 12	LT ID13A	Instr. Room	N	Y	RPS 11 Ckt 12	5-Unit Power Supply ID 28A Cabinet 1S34; NSR RPS11 (Ckt 12)
LI ID59B	0 to 100"	Panel F	N	RPS 12 Ckt 12	LT ID13B	Instr. Room	N	Y	RPS 12 Ckt 12	5-Unit Power Supply ID28B Cabinet 1S35; NSR RPS 12 (Ckt 12)
LR/FR ID14 Black Pen	0 to 100"	Panel F	N	RPS 11 Ckt 12	LI ID59A or LI ID59B	Panel F	N	NR	RPS 11 Ckt 12	High Alarm and Low Alarm
LI ID59D	0 to 100"	Console E	N	RPS 11 Ckt 12	LR/FR ID14	Panel F	N	NR	RPS 11 Ckt 12	
LI ID59C	0 to 100"	Panel K	N	RPS11 Ckt 12						

Drawings:

C-23077-C; Sh 1,2

Parameter: **Reactor Vessel Water Level - Wide Range**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
See Section C Table - SPDS, PID J347					ΔPT 36-35 (LT)	West Instr. Room El. 281' Col. M-6	N	N	RPS 12 Ckt 12	Power Supply ID28B RPS 12 (Ckt 12) ACC 1S35; NSR

Drawings:

C-22004-C; Sh 2,6
C-23077-C; Sh 1,2

Parameter: **Reactor Vessel Water Level - Lo Lo Lo and Fuel Zone (Acurex System)**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
LI 36-19 (Temp. Comp.)	-34 to 102 in.	Panel F	N	RPS 11 Ckt 27	ATS "C" (Ch 11/2) Trip Unit 36-05C-M	R.B. (SE) El. 281'	Y	Y	RPS 11 Ckt 27	
ATS "C" (11/2) Trip Unit 36-05C-M	-34 to 166 in.	R.B. (SE) El. 281'	Y	RPS 11 Ckt 27	ΔPT 36-05C Lo Lo Lo	East Instr. Room El. 286'	Y	Y	RPS 11 Ckt 27	
ATS "A" (11/1) Trip Unit 36-05A-M	-34 to 166 in.	R.B. (NW) El. 281'	Y	RPS 11 Ckt 27	ΔPT 36-05A Lo Lo Lo	West Instr. Room El. 286'	Y	Y	RPS 11 Ckt 27	
LI 36-20 (Temp. Comp.)	-34 to 102 in.	Panel F	N	RPS 12 Ckt 27	ATS "B" (Ch 12/2) Trip Unit 36-05B-M	R.B. (SW) El. 281'	Y	Y	RPS 12 Ckt 27	
ATS "D" (12/1) Trip Unit 36-05D-M	-34 to 166 in.	R.B. (NE) El. 281'	Y	RPS 12 Ckt 27	ΔPT 36-05D Lo Lo Lo	East Instr. Room El. 286'	Y	Y	RPS 12 Ckt 27	
ATS "B" (12/2) Trip Unit 36-05B	34 to 166 in.	R.B. (SW) El. 281'	Y	RPS 12 Ckt 27	ΔPT 36-05B Lo Lo Lo	West Instr. Room El. 286'	Y	Y	RPS 12 Ckt 27	

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H444	0 to 100 in.	Core Cooling Emergency Response Overview	J377	ATS "A" (Channel 11/1) Trip Unit 36-04A-M (Lo Lo)	Y	Y	Output = Average of valid inputs
			J378	ATS "D" (Channel 12/1) Trip Unit 36-04D-M (Lo Lo)	Y	Y	

Parameter: **Reactor Vessel Water Level - Narrow Range GEMAC**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H445	0 to 100 in.	Core Cooling (GEMAC Narrow Range)	D377	LT ID13A	N	N	Output = average of valid inputs
			D378	LT ID13B	N	N	See Part B, Page 3

Drawings:

C-22004-C; Sh 4

Parameter: **Reactor Vessel Water Level - Wide Range**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H446	-2 to +28 ft	Core Cooling (Wide Range GEMAC)	J346	LT 36-33	Y	Y	"Corrected" Levels => Ch 11 is H461 (Press. comp) Ch 12 is H462
			J347	ΔPT 36-35	N	N	Output = average of valid corrected inputs.

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
C011	RPS CH 11 REACTOR LEVEL SENSOR A HIGH (Setpoint = +95 in., incr.)	ATS "A" Trip Unit 36-03A-M	Y	Y
W006	RPS CH 11 REACTOR LEVEL SENSOR A LOW (Setpoint = +53 in., decr.)	ATS "A" Slave Trip Unit 36-03A-S	Y	Y
W020	RPS CH 11 REACTOR LEVEL SENSOR A LO-LO (Setpoint = +5 in., decr.)	ATS "A" Trip Unit 36-04A-M	N	Y
C012	RPS CH 11 REACTOR LEVEL SENSOR C HIGH (Setpoint = +95 in., incr.)	ATS "C" Trip Unit 36-03C-M	N	Y
W007	RPS CH 11 REACTOR LEVEL SENSOR C LOW (Setpoint = +53 in., decr.)	ATS "C" Slave Trip Unit 36-03C-S	N	Y
W021	RPS CH 11 REACTOR LEVEL SENSOR C LO-LO (Setpoint = +5 in., decr.)	ATS "C" Trip Unit 36-04C-M	N	Y

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo**

Part D — Other Computer-Supplied Information

Computer P&ID	Description	Sensor EPN	Cat 1	SR
C026	RPS CH 12 REACTOR LEVEL SENSOR D HIGH (Setpoint = +95 in., incr.)	ATS "D" Trip Unit 36-03D-M	Y	Y
W049	RPS CH 12 REACTOR LEVEL SENSOR D LOW (Setpoint = +53 in., decr.)	ATS "D" Slave Trip Unit 36-03D-S	N	Y
W067	RPS CH 12 REACTOR LEVEL SENSOR D LO-LO (Setpoint = +5 in., decr.)	ATS "D" Trip Unit 36-04D-M	N	Y

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
C025	RPS CH 12 REACTOR LEVEL SENSOR B HIGH (Setpoint = +95 in., incr.)	ATS "B" Trip Unit 36-03B-M	N	Y
W048	RPS CH 12 REACTOR LEVEL SENSOR B LOW (Setpoint = +53 in., decr.)	ATS "B" Slave Trip Unit 36-03B-S	N	Y
W066	RPS CH 12 REACTOR LEVEL SENSOR B LO-LO (Setpoint = +5 in., decr.)	ATS "B" Trip Unit 36-04B-M	N	Y

Parameter: **Reactor Vessel Water Level - Lo Lo Lo and Fuel Zone (Acurex System)**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
D134	RPS CH 11 REACTOR LO-LO-LO LEVEL A LOW (Setpoint = -10 in., decr.)	ATS "A" Trip Unit 36-05A-M	Y	Y
D136	RPS CH 11 REACTOR LO-LO-LO LEVEL C LOW (Setpoint = -10 in., decr.)	ATS "C" Trip Unit 36-05C-M	N	Y
D148	RPS CH 12 REACTOR LO-LO-LO LEVEL D LOW (Setpoint = -10 in., decr.)	ATS "D" Trip Unit 36-05D-M	Y	Y
D150	RPS CH 12 REACTOR LO-LO-LO LEVEL B LOW (Setpoint = -10 in., decr.)	ATS "B" Trip Unit 36-05B-M	N	Y

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F1-4-3	RPS CH 11 REACTOR LEVEL HIGH (Setpoint = +95 in., incr.)	ATS "A" Trip Unit 36-03A-M ATS "C" Trip Unit 36-03C-M	Y N	Y Y
F1-1-3	RPS CH 11 REACTOR LEVEL LOW (Setpoint = +53 in., decr.)	ATS "A" Slave Trip Unit 36-03A-S ATS "C" Slave Trip Unit 36-03C-S	Y N	Y Y
F1-2-3	RPS CH 11 REACTOR LEVEL LOW-LOW (Setpoint = +5 in., decr.)	ATS "A" Trip Unit 36-04A-M ATS "C" Trip Unit 36-04C-M	N N	Y Y
F4-4-6	RPS CH 12 REACTOR LEVEL HIGH (Setpoint = +95 in., incr.)	ATS "D" Trip Unit 36-03D-M ATS "B" Trip Unit 36-03B-M	Y N	Y Y
F4-1-6	RPS CH 12 REACTOR LEVEL LOW (Setpoint = +53 in., decr.)	ATS "D" Slave Trip Unit 36-03D-S ATS "B" Slave Trip Unit 36-03B-S	Y N	Y Y

Parameter: **Reactor Vessel Water Level - Hi/Lo Lo Lo**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F4-2-6	RPS CH 12 REACTOR LEVEL LOW	ATS "D" Trip Unit 36-04D-M	Y	Y
	(Setpoint = +53 in., decr.)	ATS "B" Trip Unit 36-04B-M	N	Y

Parameter: **Reactor Vessel Water Level - Narrow Range GEMAC**

Window	Engraving	Sensor EPN	Cat 1	S R
F2-3-3	REACTOR VESSEL LEVEL HIGH-LOW	L/FR ID14	N	N

Parameter: **Reactor Vessel Water Level - Lo Lo Lo and Fuel Zone (Acurex System)**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F1-3-3	RPS CH 11 REACTOR LEVEL LOW-LOW-LOW	ATS "C" Trip Unit 36-05C-M	N	Y
	(Setpoint = -10 in., decr.)	ATS "A" Trip Unit 36-05A-M	Y	Y
F4-3-6	RPS CH 11 REACTOR LEVEL LOW-LOW-LOW	ATS "D" Trip Unit 36-05D-M	Y	Y
	(Setpoint = -10 in., decr.)	ATS "B" Trip Unit 36-05B-M	N	N

Parameter: **RPV Water Level**

Part F - Other Methods Available for Determining Current Status

1. Compute the head of water above a known elevation, based on the differential pressure between RPV (dome) pressure and a line that connects to the lower region of the RPV. One possibility for use at low pressure would be to determine the head of water above the suction of the Shutdown Cooling pumps. With pumps not running and associated suction line isolation and blocking valves open, RPV dome pressure plus the head of water in the RPV would be indicated on the instruments listed below.

   Pump #11 - PI RV15A (local)
   Pump #12 - PI RV15B (local)
   Pump #13 - PI RV15C (local)

   The computed head of water (shutdown cooling pump suction pressure minus RPV pressure) added to the elevation of the shutdown cooling suction pressure instrument would produce an approximate value (elevation) for water level in the reactor vessel. (Top of active fuel is approximately at Elevation 290 feet.) Elevation can also be converted to the scale of the RPV water level instruments (reference zero is Elevation 297 feet 4 inches).

ATTACHMENT NO. 3

RPV PRESSURE INSTRUMENTS

Parameter: **Reactor Coolant System Pressure**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
PI 36-31A (0 to 1600 psig)	RPS 11 Ckt 12	Panel F	N*	Y	PT 36-31	RPS 11 Ckt 12	West Inst. Room Col. M-7 El. 281'	Y	Y	Prop. Amp. ID23H	RPS 11 Ckt 12	ACC 1S34	N*	NR				
										5 Unit Power Supply ID28A	RPS 11 Ckt 12	ACC 1S34	N*	NR				
										Fcn. Gen. ID21A	RPS 11 Ckt 12	ACC 1S34	N*	NR				
										Sel Switch Press #1/#2 ID20A		Console E	N*	NR	PR/FR ID75 (Black Pen)	RPS 11 Ckt 12	Panel F	N*
PI 36-32A (0 to 1600 psig)	RPS 12 Ckt 12	Panel F	N*	Y	PT 36-32	RPS 12 Ckt 12	East Inst. Room Col. M-9 El. 281'	Y	Y	5 Unit Power Supply ID28B	RPS 12 Ckt 12	ACC 1S35	N*	NR				
										Fcn. Gen. ID21B	RPS 12 Ckt 12	ACC 1S35	N*	NR				

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-22004-C; Sh 3, 6
C-18015-C

Parameter: **Reactor Coolant System Pressure**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
PI 36-31B	0-1600 psig	West Inst. Room El. 281' Col. M-7	N	RPS 11 Ckt 12	PT 36-31	West Inst. Room El. 281' Col. M-7	Y	Y	RPS 11 Ckt 12	
PI ID45A	0-1600 psig	West Inst. Room El. 281' Col. M-7	N	RPS 11 RSP 12	PT ID45	West Inst. Room El. 281' Col. M-7	Y	N	RPS 11 Ckt 12	
PR/FR ID-77 (Black Pen)	950-1050 psig	Panel F	N	RPS 11 Ckt 12	PT ID45	West Inst. Room El. 281' Col. M-7	Y	N	RPS 11 Ckt 12	
PI 36-25	0-1600 psig	RSP Ch. 11 Sect.	N	RPS 11A on RSP	PT 36-07A	West Inst. Room El. 286'	Y	Y	RPS 11 Ckt 27	ATS Cab. "A" Channel 11/1 Trip Unit 36-07A-M, Safety Related
PI 36-32B	0-1600 psig	East Inst. Room El. 281' Col. M-9	N	RPS 12 Ckt 12	PT 36-32	East Inst. Room El. 281' Col. M-9	Y	Y	RPS 12 Ckt 12	
PI 36-27	0-1600 psig	RSP Ch 12 Sect.	N	RPS 12A on RSP 12	PT 36-07D	East Inst. Room El. 286'	Y	Y	RPS 12 Ckt 27	ATS Cab. "D" Channel 12/1 Trip Unit 36-07D-M; Safety Related

<u>Drawings:</u>

C-22004-C; Sh 8
C-22005-C; Sh 4, 10
C-34813-C; Sh 2*, 5
C-18015-C
C-22385-C; Sh 16

* PI 36-25 is incorrectly shown as PI-36-27; correct EPN is shown on C-18015-C.

Parameter: **Reactor Coolant System Pressure**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	Additional Remarks
36-07A-M ATS "A" Master Trip Unit	0-1200 psig	ATS Cabinet "A" (Ch 11/1) R.B. El. 281' Col. N-5	Y	RPS 11 Ckt 27	PT 36-07A	West Instr. Rm R.B. El. 286'	Y	Y	RPS 11 Ckt 27	
36-07B-M ATS "B" Master Trip Unit	0-1200 psig	ATS Cabinet "B" (Ch 12/2) R.B. El. 281' Col. K-4	Y	RPS 12 Ckt 27	PT 36-07B	West Instr. Rm R.B. El. 286'	Y	Y	RPS 12 Ckt 27	
36-07C-M ATS "C" Master Trip Unit	0-1200 psig	ATS Cabinet "C" (Ch 11/2) R.B. El. 281' Col. K-11	Y	RPS 11 Ckt 27	PT 36-07C	East Instr. Rm R.B. El. 237'	Y	Y	RPS 11 Ckt 27	
36-07D-M ATS "D" Master Trip Unit	0-1200 psig	ATS Cabinet "D" (Ch 12/1) R.B. El. 281' Col. N-12	Y	RPS 12 Ckt 27	PT 36-07D	East Instr. Rm R.B. El. 286'	Y	Y	RPS 12 Ckt 27	
36-08A-M ATS "A" Master Trip Unit	0-1200 psig	ATS Cabinet "A" (Ch 11/1) R.B. El. 281' Col. N-5	Y	RPS 11 Ckt 27	PT 36-08A	West Instr. Rm R.B. El. 286'	Y	Y	RPS 11 Ckt 27	
36-08B-M ATS "B" Master Trip Unit	0-1200 psig	ATS Cabinet "B" (Ch 12/2) R.B. El. 281' Col. K-4	Y	RPS 12 Ckt 27	PT 36-08B	West Instr. Rm R.B. El. 286'	Y	Y	RPS 12 Ckt 27	
36-08C-M ATS "C" Master Trip Unit	0-1200 psig	ATS Cabinet "C" (Ch 11/2) R.B. El. 281' Col. K-11	Y	RPS 11 Ckt 27	PT 36-08C	East Instr. Rm R.B. El. 237'	Y	Y	RPS 11 Ckt 27	
36-08D-M ATS "D" Master Trip Unit	0-1200 psig	ATS Cabinet "D" (Ch 12/1) R.B. El. 281' Col. N-12	Y	RPS 12 Ckt 27	PT 36-08D	East Instr. Rm R.B. El. 286'	Y	Y	RPS 12 Ckt 27	

Parameter: **Reactor Coolant System Pressure**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H448	0-1500 psig	Emergency Response Overview Reactor Vessel Integrity	D372	PT P101	N	N	Output = average of valid inputs.
			D373	PT 36-32	Y	Y	

Parameter: **Reactor Coolant System Pressure**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
J370	Reactor Coolant Pressure (Analog)	PT 36-31	Y	Y
H479	Corrected Reactor Pressure (PSIA) from Acurex RPV Water Level System 11 (Analog)	PT 36-23A	Y	Y
H497	Corrected Reactor Pressure (PSIA) from Acurex RPV Water Level System 12 (Analog)	PT 36-23B	Y	Y
W004	RPS CH 11 REACTOR PRESSURE SENSOR A HIGH (Setpoint = 1080 psig, incr.)	PT 36-07A	N	Y
W038	RPS CH 11 REACTOR PRESSURE SENSOR A LOW (Setpoint = 850 psig, decr.)	PT 36-07A	N	Y
W005	RPS CH 11 REACTOR PRESSURE SENSOR C HIGH (Setpoint = 1080 psig, incr.)	PT 36-07C	N	Y
W039	RPS CH 11 REACTOR PRESSURE SENSOR C LOW (Setpoint = 850 psig, decr.)	PT 36-07C	N	Y

Parameter: **Reactor Coolant System Pressure**

Part D — Other Computer-Supplied Information

Computer P&ID	Description	Sensor EPN	Cat 1	SR
W047	RPS CH 12 REACTOR PRESSURE SENSOR D HIGH (Setpoint = 1080 psig, incr.)	PT 36-07D	N	Y
W081	RPS CH 12 REACTOR PRESSURE SENSOR D LOW (Setpoint = 850 psig, decr.)	PT 36-07D	N	Y

Parameter: **Reactor Coolant System Pressure**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
W046	RPS CH 12 REACTOR PRESSURE SENSOR B HIGH (Setpoint = 1080 psig, incr.)	PT 36-07B	N	Y
W082	RPS CH 12 REACTOR PRESSURE SENSOR B LOW (Setpoint = 850 psig, decr.)	PT 36-07B	N	Y
C016	RPS CH 11 CORE SPRAY SYSTEM ON from ATS Cab. "A" (Ch 11/1) Slave Trip Unit 36-08A-S	PT 36-08A	N	Y
	or from ATS Cab. "C" (Ch 11/2) Slave Trip Unit 36-08C-S	PT 36-08C	N	Y
C030	RPS CH 11 CORE SPRAY SYSTEM ON from ATS Cab. "D" (Ch 12/1) Slave Trip Unit 36-08D-S	PT 36-08D	N	Y
	or from ATS Cab. "B" (Ch 12/2) Slave Trip Unit 36-08B-S	PT 36-08B	N	Y

Parameter: **Reactor Coolant System Pressure**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F2-3-4	REACTOR VESSEL PRESSURE HIGH (Setpoint = 1040 psig, incr.)	PR/FR ID77 (See Part B)	N	N
F1-1-2	RPS CH 11 RX PRESS HIGH (Setpoint = 1080 psig, incr.)	PT 36-07A PT 36-07C	N N	Y Y
F1-4-7	RPS CH 11 RX PRESSURE LOW (Setpoint = 850 psig, decr.)	PT 36-07A PT 36-07C	N N	Y Y
F4-1-7	RPS CH 12 RX PRESSURE HIGH (Setpoint = 1080 psig, incr.)	PT 36-07D PT 36-07B	N N	Y Y
F4-4-2	RPS CH 12 RX PRESSURE LOW (Setpoint = 850 psig, decr.)	PT 36-07D PT 36-07B	N N	Y Y
F1-3-6	RPS CH 11 CORE SPRAY VALVE AUTO OPEN (Setpoint = 365 psig, decr.)	PT 36-08A PT 36-08C	N N	Y Y
F4-3-3	RPS CH 12 CORE SPRAY VALVE AUTO OPEN (Setpoint = 365 psig, decr.)	PT 36-08D PT 36-08B	N N	Y Y

Parameter: **Reactor Coolant System Pressure**

Part F - Other Methods Available for Determining Current Status

1. Main turbine bypass valve position, considering the "pressure set" value. Valid only if MSIVs are open.

   - All valves closed would indicate RPV pressure is below the "pressure set" value.

   - All valves full open would indicate RPV pressure is above the "pressure set" value.

2. Indicated pressure in the steam lines to the Emergency Condensers; use of these pressure indicators requires that the respective Emergency Cooling steam line isolation valve (at least one in the loop) is open.

<u>Loop #11</u>:	IVs 39-09R and 39-07R	
	PT IG04A	Elevation 318' Col P-8 RPS Bus 11
	PI IG05A	Panel K RPS Bus 11
	Ann Alarm	K1-4-2 Low Pressure
	Comptr Pt	C185 Low Pressure

Parameter: **Reactor Coolant System Pressure**

Part F - Other Methods Available for Determining Current Status

Loop #12: IVs 39-10R and 39-08R

	PT IG04B	Elevation 318' Col P-8 RPS Bus 12
	PI IG05B	Panel K RPS Bus 12
	Ann Alarm	K1-4-4 Low Pressure
	Comptr Pt	C186 Low Pressure

3. Reactor coolant system temperature, considering the saturation properties of water. Flow through the associated loop/line should exist for the temperature value to be considered representative.

    - Reactor recirculation loop:

      TE IA54E; Temperature Indicator TI IA78-C.

Parameter: **Reactor Coolant System Pressure**

Part F - Other Methods Available for Determining Current Status

- Shutdown Cooling from RPV:

  TE RV07D; Temperature Recorder RV08 in Panel K.

  Annunciator alarm K3-2-2, SD Cooling System Inlet-Outlet Temp High; Setpoint = 340°F.

4. The ability or inability of various pumps to inject into the RPV considering the pump's shutoff head (systems listed in EOP-2 and EOP-3 for RPV water level control).

   - Condensate
   - Core Spray
   - Containment Spray Raw Water
   - Firewater

ATTACHMENT NO. 4

DRYWELL PRESSURE INSTRUMENTS

Parameter: **Drywell Pressure**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
PI 201.2-105A (0 to 75 psig)	RPS 11 Ckt 11	Panel L	Y	A	PT 201.2-105	RPS 11 Ckt 11	West Instr. Room El. 281'	Y	N	Power Supply 93-30D	RPS 11 Ckt 11	ACC 1S77	N*	NR	See below.			
PI 201.2-106A (0 to 75 psig)	RPS 12 Ckt 7	Panel K	Y	A	PT 201.2-106	RPS 12 Ckt 7	East Instr. Room El. 281'	Y	N	Power Supply 201.2-21	RPS 12 Ckt 7	ACC 1S77	Y	NR	See below.			
PI 201.2-484A (-5 to +250 psig)	RPS 11 Ckt 27	Panel L	Y	A	PT 201.2-484	RPS 11 Ckt 27	East Instr. Room El. 281'	Y	Y	ATS "A" Ch 11/1	RPS 11/1 Ckt 27	R.B. Col. N-5 El. 281'	Y	NR	P/LR 201.2-307 (Blue Pen)	RPS 11 Ckt 7	Panel L	N*
PI 201.2-483A (-5 to +250 psig)	RPS 12 Ckt 27	Panel L	Y	A	PT 201.2-483	RPS 12 Ckt 27	West Instr. Room El. 281'	Y	Y	ATS "B" Ch 12/2	RPS 12/2 Ckt 27	R.B. El. 281' Col. K-5,6	Y	NR	P/LR 201.2-308 (Blue Pen)	RPS 12 Ckt 28	Panel L	N*

A Normal operating values are within instrument range; identified instruments are those that would be normally used under post-accident condtions.

* Upgrade to SR is in progress; will be completed prior to plant restart.

<u>Drawings:</u>

C-22020-C; Sh 2, 15
C-18014-C; Sh 1

Parameter: **Drywell Pressure**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
201.2-476A-M ATS "A" Master Trip Unit	0 to 5 psig	ATS Cabinet "A" (Ch 11/1) R.B. El. 281' Col. N-5	Y	RPS 11 Ckt 27	PT 201.2-476A	West Instr. Room R.B. El. 286'	Y	Y	RPS 11 Ckt 27	
201.2-476B-M ATS "B" Master Trip Unit	0 to 5 psig	ATS Cabinet "B" (Ch 12/2) R.B. El. 281' Col. K-4	Y	RPS 12 Ckt 27	PT 201.2-476B	West Instr. Room R.B. El. 286'	Y	Y	RPS 12 Ckt 27	
201.2-476C-M ATS "C" Master Trip Unit	0 to 5 psig	ATS Cabinet "C" (Ch 11/2) R.B. El. 281' Col. K-11	Y	RPS 11 Ckt 27	PT 201.2-476C	East Instr. Room R.B. El. 286'	Y	Y	RPS 11 Ckt 27	
201.2-476D-M ATS "D" Master Trip Unit	0 to 5 psig	ATS Cabinet "D" (Ch 12/1) R.B. El. 281' Col. N-12	Y	RPS 12 Ckt 27	PT 201.2-476D	East Instr. Room R.B. El. 286'	Y	Y	RPS 12 Ckt 27	
PI 201.2-13B	0 to 250 psig	Panel L	N	RPS 12 Ckt 7	PT 201.2-13	RB West Instr. Room El. 281'	Y	Y	RPS 12 Ckt 7	Via alarm unit 201.2-13B in ACC 1S77 RPS 12 Ckt 7 and Power Supply 201.2-21 in ACC 1S77 RPS 12 Ckt 7
PI 201.2-540A (DW and Torus N_2 Fill Press)	0 to 4 psig	Panel L	N	201.9-93 RPS 11 Ckt 26	PT 201.2-540	T.B. Above El. 261' Col. Q&R-11A	N	N	201.9-93 RPS 11 Ckt 26	

Drawings:

C-22020-C; Sh 2, 3, 8
C-18014-C Sh 1 (E-2 & E-3)

Parameter: **Drywell Pressure**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
PI 201.2-94	0 to 4 psig	RSP Sec 12	N	RPS 12A RPS 12 Ckt 27	PT 201.2-476B	West Instr. Room El. 286'	Y	Y	RPS 12A RPS 12 Ckt 27	DW Tap at El. 305' 6" ATS Cab. "B" Ch (12/2) Trip Unit 201.2-476B-M
PI 201.2-95	0 to 4 psig	RSP Sec 11	N	RPS 11A RPS 11 Ckt 27	PT 201.2-476C	East Instr. Room El. 286'	Y	Y	RPS 11A RPS 11 Ckt 27	DW Tap at El. 292' 0" ATS Cab. "C" Ch (11/2) Trip Unit 201.2-476C-M

<u>Drawings:</u>

C-22005-C; Sh 8
C-34813-C; Sh 2
C-18014-C; Sh 1

Parameter: **Drywell Pressure**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H449	0-4 psig (NR) 0-250 psig (WR)	Emergency Response Overview and Reactor Vessel Integrity and Primary Containment Integrity	J349 J350 D320 J345	See Part D	Y Y N N	Y Y N Y	If the input from any narrow range sensor is valid, then valid narrow range inputs are selected (Ch 11 preferred, Ch 12 alternate). If neither narrow range input is valid, the wide range inputs are selected (Ch 11 preferred, Ch 12 alternate).

Parameter: **Drywell Pressure**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
J349	Hi Hi Drywell Pressure Channel 12	PT 201.2-483 (See Part A)	Y	Y
J350	Hi Hi Drywell Pressure Channel 11	PT 201.2-484 (See Part A)	Y	Y
D320	DRYWELL PRESSURE PSIG (Setpoint = 2.5 psig, incr.) (Setpoint = 1.2 psig, decr.)	201.2-13B (See Part B)	N	N
W010	RPS CH 11 DRYWELL PRESSURE SENSOR A HIGH (Setpoint = 3.5 psig, incr.)	PT 201.2-476A via ATS "A" Ch 11/1 Master Trip Unit	N	Y
W011	RPS CH 11 DRYWELL PRESSURE SENSOR C HIGH (Setpoint = 3.5 psig, incr.)	PT 201.2-476C via ATS "C" Ch 11/2 Master Trip Unit	N	Y
J345	RPS CH 12 DRYWELL PRESSURE SENSOR B HIGH (Setpoint = 3.5 psig, incr.)	PT 201.2-476B via ATS "B" Ch 12/1 Master Trip Unit	N	Y
W052	RPS CH 12 DRYWELL PRESSURE SENSOR D HIGH (Setpoint = 3.5 psig, incr.)	PT 201.2-476D via ATS "D" Ch 12/2 Master Trip Unit	N	Y

Parameter: **Drywell Pressure**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
K2-4-3	DRYWELL PRESS HIGH-LOW (Setpoint = 2.5 psig, incr.) (Setpoint = 1.2 psig, decr.)	201.2-13B (See Part B)	N	N
F1-1-5	RPS CH 11 DRYWELL PRESS HIGH (Setpoint = 3.5 psig, incr.)	PT 201.2-476A via ATS "A" Ch 11/1 Master Trip Unit PT 201.2-476C via ATS "C" Ch 11/2 Master Trip Unit	N N	Y Y
F1-1-4	RPS 12 DRYWELL PRESS HIGH (Setpoint = 3.5 psig, incr.)	PT 201.2-476B via ATS "B" Ch 12/1 Master Trip Unit PT 201.2-476D via ATS "D" Ch 12/2 Master Trip Unit	N N	Y Y

Parameter: **Drywell Pressure**

Part F - Other Methods Available for Determining Current Status

1. Integrated Leak Rate Monitoring System

   Electrical Penetration Test Station
   Local PI 201.2-80; associated isolation valve normally closed except to read the indicator.

   Reference: Procedure N1-ISP-IC-23

ATTACHMENT NO. 5

DRYWELL TEMPERATURE INSTRUMENTS

Parameter: **Drywell Temperature**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
TI 201-36B (50 to 300°F)	RPS 12 Ckt 7	Panel L	N*	Y	TE 201-36A	RPS 12 Ckt 7	DW El. 253' Az. 30°	N*	N*	MV/I 201-36 Alarm Unit 201-36C	RPS 12 Ckt 7 RPS 12 Ckt 7	ACC 1S77 ACC 1S77	N* N*	NR NR				
TI 201-27B (50 to 300°F)	RPS 12 Ckt 7	Panel L	N*	Y	TE 201-50A (Element "1")	RPS 12 Ckt 7	DW El. 330'	N*	N*	MV/I 201-27 Alarm Unit 201-27C	RPS 12 Ckt 7 RPS 12 Ckt 7	ACC 1S77 ACC 1S77	N* N*	NR NR				
TI 201-33B (50 to 300°F)	RPS 12 Ckt 7	Panel L	N*	Y	TE 201-51A (Element "1")	RPS 12 Ckt 7	DW El. 230' Az. 35°	N*	N*	MV/I 201-33 Alarm Unit 201-33C	RPS 12 Ckt 7 RPS 12 Ckt 7	ACC 1S77 ACC 1S77	N* N*	NR NR				

* Upgrade to SR and EQ is in progress;
will be completed prior to plant restart.

Drawings:

C-22020-C; Sh 1, 2
C-18014-C; Sh 1

Parameter: **Drywell Temperature**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
TI 201-50B	50-300°F	RSP 11	N	RPS 11A	TE 201-50A (Elem. "2")	DW El. 330'	N	N	RPS 11A	MV/I 201-50 RPS 11A RSP Section 11; NSR
TI 201-51B	50-300°F	RSP 12	N	RPS 12A	TE 201-51A (Elem. "2")	DW El. 237'	N	N	RPS 12A	MV/I 201-51 RPS 12A RSP Section 12; NSR

<u>Drawings:</u>

C-34813-C; Sh 1, 4

Parameter: **Drywell Temperature**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H453	0 to 400°F	Primary Containment Integrity	H464	TE 36-29A	Y	Y	Output = average of valid inputs. Refer to Part D
			H482	TE 36-29B	Y	Y	

Parameter: **Drywell Temperature**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
H464	DW reference leg temperature for ACUREX RPV water level System 11 (Lo-Lo-Lo and Fuel Zone Instruments) Recorder function is provided in Acurex Cabinet 1S69; data channel 004.	TE 36-29A	Y	Y
H482	Same as above, but for System 12; Acurex Cabinet 1S10; data channel 004.	TE 36-29B	Y	Y
D322	DRYWELL ELEV. 25O' F (Setpoint = 150°F, incr.)	TE 201-36A via resp. alarm unit (see Part A)	Y	N*
D321	DRYWELL ELEV. 33O' F (Setpoint = 160°F, incr.)	TE 201-50A via resp. alarm unit (see Part A)	Y	N*
D323	DRYWELL ELEV. 23O' F (Setpoint = 120°F, incr.)	TE 201-51A via resp. alarm unit (see Part A)	Y	N*

Drawings:

C-22005-C; Sh 16

* Upgrade to SR is in progress; will be complete prior to plant restart.

Parameter: **Drywell Temperature**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
L1-4-4	DRYWELL - TORUS TEMP HIGH (Setpoint =160°F, incr. @ 330') (=150°F, incr. @ 250') (=120°F, incr. @ 230')	TE 201-36A TE 201-50A TE 201-51A via respective Alarm Units (See Part A)	Y Y Y	N* N* N*

* Upgrade to SR is in progress; will be complete prior to plant restart.

Parameter: **Drywell Temperature**

Part F - Other Methods Available for Determining Current Status

1. Integrated Leak Rate Monitoring System

   Drywell temperature elements 201.2-43 through 201.2-49 and 201.2-51 through 201.2-56.

   Digital readout (201.2-77) mounted in cabinet No. 1S67 in Relay Room, via resistance bridge and selector switch (201.2-85).

   Reference: Procedure N1-ISP-IC-23.

ATTACHMENT NO. 6

SUPPRESSION POOL (TORUS) WATER LEVEL INSTRUMENTS

Parameter: **Suppression Pool Water Level**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
LI 58-06A (1.25 to 14.75 ft.)	RPS 11 Ckt 7	Panel K	Y	①	LT 58-06	RPS 11 Ckt 7	RB El. 198' NE Corner Room	Y	Y	Power Supply 201.2-377A LS (Alm. Unit) 201.2-07D	RPS 11 Ckt 7 RPS 11 Ckt 7	ACC 1S68 ACC 1S68	Y Y	NR NR	PL/R 201.2-307 (Red Pen)	RPS 11 Ckt 7	Panel L	N*
LI 58-05A (1.25 to 14.75 ft.)	RPS 12 Ckt 28	Panel K	Y	①	LT 58-05	RPS 12 Ckt 28	RB El. 198' SE Corner Room	Y	Y	Power Supply #4 (Device CE)	RPS 12 Ckt 28	ACC 1S12	Y	NR	PL/R 201.2-308 (Red Pen)	RPS 12 Ckt 28	Panel L	N*

① Normal Operating Values are within instrument indicating range. LI 58-04B (see Part B) is normally used for monitoring and control because of its narrower indicating range (i.e., increased accuracy, resolution, readability)

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-22020-C; Sh 13
C-18007-C

Parameter: **Suppression Pool Water Level**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
LI 58-04B	9 to 14.75 ft	Panel K	Y	RPS 12 Ckt 11	LT 58-04	RB Col. H-11	Y	N	RPS 12 Ckt 11	Dual Alarm Unit 58-04A in ACC 1S74 RPS 12 Ckt 11; SR Note: LT 58-04 uses same physical taps as LT 58-05

Drawings:

C-22015-C; Sh 4

Parameter: **Suppression Pool Water Level**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H445	9 to 15 ft (NR) 0 to 15 ft (WR)	Primary Containment Integrity	D326 J348 B476	LT 58-04 LI 58-06A LI 58-05A	N Y Y	Y Y Y	Calc. point J379 is average of WR inputs (J348 and B476). Output = narrow range (D326) if deviation from J379 ≤ Dev. Allowance (0.11 ft). Otherwise, output = wide range (J348 (Ch. 11) preferred, if valid).

Parameter: **Suppression Pool Water Level**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
D326	TORUS WATER LEVEL FT (Setpoint = 4.3 ft., incr.) (Setpoint = 3.2 ft., decr.)	58-04A (See Part B)	N	Y
J348	Wide range pool water level; direct wired. (H/L) (Setpoint = 11.2 ft., incr.) (Setpoint = 10.1 ft., decr.)	LI 58-06A (See Part A)	Y	Y
B476	Wide range pool water level; direct wired. (H/L) (Setpoint = 11.2 ft., incr.) (Setpoint = 10.1 ft., decr.)	LI 58-05A (See Part A)	Y	Y

Parameter: **Suppression Pool Water Level**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
K2-2-4	TORUS WATER LEVEL HIGH-LOW	Dual Alarm Unit 58-04A (See Part B)	N	Y
K3-3-1	TORUS WATER LEVEL HIGH-LOW	LS 201.2-07D (See Part A)	Y	Y

Parameter: **Suppression Pool Water Level**

Part F - Other Methods Available for Determining Current Status

1. Open vent and drain valves in lines that are open ended in the torus (and for which the high point elevation is known) to observe whether or not a constant stream of water is discharged.

   Examples: Variable leg drain line valve for torus water level transmitters 58-04 and 58-05; containment penetration XS-348.

   Variable leg drain line valve for torus water level transmitter 58-06; containment penetration XS-346.

2. Containment Spray pump low suction pressure alarms (setpoint = 3 psig):

Pump Number	Isolation Valve	Press Switch	Computer Point ID	Annunciator Alarm
111	80-01	80-46	C157	K1-2-8
112	80-21	80-70	C158	K1-2-8
121	80-02	80-53	C159	K2-2-2
122	80-22	80-74	C160	K2-2-2

3. Core Spray pump low suction pressure alarms (setpoint - 0.5 psig)

Pump Number	Isolation Valve	Press Switch	Computer Point ID	Annunciator Alarm
111	81-21	81-14R	C149	K2-2-6
112	81-22	81-16R	C150	K2-2-6
121	81-01	81-18R	C151	K2-2-8
122	81-02	81-20R	C152	K2-2-8

Parameter: **Suppression Pool Water Level**

Part F - Other Methods Available for Determining Current Status

4. The absence of an extreme low torus water level can be inferred from a lack of a Reactor Building corner room floor drain sump high water.level alarm:

   H2-2-1 Common alarm; monitors drain sump water level in NW, NE, SW and SE corner areas.

5. Torus Area Water Level Indicators.

West:	LI 80-109:	Panel K; RPS Bus 11, Ckt 11, via LT 80-108 at Elev 198' Col M-4
East:	LI 80-107:	Panel K; RPS Bus 12, Ckt 11, via LT 80-106 at Elev 198' Col M-12

(Reference: Drawing C-22015-C Sheet 7)

ATTACHMENT NO. 7

SUPPRESSION POOL (TORUS) WATER TEMPERATURE INSTRUMENTS

Parameter: **Suppression Pool Water Temperature**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
TI 201.2-519 (30 to 230°F)	RPS 11 Ckt 25	Panel K	N*	Y	TE 201.2-493 through 201.2-504	RPS 11 Ckt 25	Torus (Water) El. 200' 6" Var. Az.	Y	Y	Acurex SYS 201.2-517	RPS 11 Ckt 25	1S69	N*	NR	SYS 201.2-517	RPS 11 Ckt 25	1S69	N*
TI 201.2-520 (30 to 230°F)	RPS 12 Ckt 15	Panel K	N*	Y	TE 201.2-505 through 201.2-516	RPS 12 Ckt 15	Torus (Water) El. 200' 6" Var. Az.	Y	Y	Acurex SYS 201.2-518	RPS 11 Ckt 15	1S10	N*	NR	SYS 201.2-518	RPS 12 Ckt 15	1S10	N*

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-34853-C; Sh 2-5
C-22020-C; Sh 16-19
C-18014-C; Sh 1

NOTE: TI EPN's shown on C-18014-C Sh 1 are believed to be incorrect (-519 and -520 reversed).

Parameter: **Suppression Pool Water Temperature**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
TI 201.2-521B	30°-230°F	RSP Section 11	Y	RPS 11A on RSP	TE (RTD) 201.2-521A	Torus (Water) El. 200' 6" Az. 72°	Y	N	RPS 11A on RSP	RTD/I Converter 201.2-521 RSP (Ch 11 Section) is SR.
TI 201.2-522B	30°-230°F	RSP Section 12	Y	RPS 12A on RSP	TE (RTD) 201.2-522A	Torus (Water) El. 200' 6" Az. 277°	Y	N	RPS 12A on RSP	RTD/I Converter 201.2-522 RSP (Ch 12 Section) is SR.

Drawings:

C-34813-C; Sh 1, 4

Parameter: **Suppression Pool Water Temperature**

Part C — Safety Parameter Display System

Output P&ID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H454	0 to 250°F	Emergency Response Overview Primary Containment Integrity	H478	Avg. of Acurex System 11 inputs listed in Part D.	Y	Y	Output = average of valid inputs.
			H496	Avg. of Acurex System 12 inputs listed in Part D.	Y	Y	

Parameter: **Suppression Pool Water Temperature**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
H465 through H476	Torus water temperature (individual readings); Acurex System 11 (1S69) Channels 10 through 21	TE (RTD) 201.2-493 through 201.2-504	Y	Y
H483 through H476	Torus water temperature (individual readings); Acurex System 12 (1S10) Channels 10 through 21	TE (RTD) 201.2-505 through 201.2-516	Y	Y

Parameter: **Suppression Pool Water Temperature**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F1-2-8	CORE LEVEL TORUS TEMP MONITOR SYS. 11 TROUBLE (Setpoint = 80°F, incr.)	Any of TE (RTD) 201.2-493 through 201.2-504	Y	Y
F4-2-1	CORE LEVEL TORUS TEMP MONITOR SYS. 12 TROUBLE (Setpoint = 80°F, incr.)	Any of TE (RTD) 201.2-505 through 201.2-516	Y	Y

Parameter: **Suppression Pool Water Temperature**

Part F - Other Methods Available for Determining Current Status

1. Containment Spray heat exchanger inlet temperature; pump running in the minimum flow mode or torus cooling mode. Contributors to inaccuracy of using heat exchanger inlet temperature as an indicator of torus water temperature include heat loss that occurs through the piping run and heat addition from the pump.

Containment Spray Pump #	HX Inlet Temp. TE	Display Instr. (TI)
111	80-50 Elev 318' Col Q-9 RPS Bus 11, Ckt 11	80-50B Panel K RPS Bus 11, Ckt 11
112	80-72 Elev 318' Col Q-9 RPS Bus 11, Ckt 11	80-72B Panel K RPS Bus 11, Ckt 11
121	80-57 Elev 318' Col Q-9 RPS Bus 12, Ckt 11	80-57B Panel K RPS Bus 12, Ckt 12
122	80-77 Elev 318' Col P-9 RPS Bus 12, Ckt 11	80-77B Panel K RPS Bus 12, Ckt 12

ATTACHMENT NO. 8

CONTAINMENT OXYGEN CONCENTRATION INSTRUMENTS

Parameter: **Primary Containment Oxygen Concentration**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
H_2O_2/R 201.2-451 (0-100% scale) (Green pen)	RPS 11 Ckt 26	Panel L	N*	Y	201.2-218 (Analyzer)	RPS 11 Ckt 26	H_2O_2 Cabinet Sys #11 T.B. El. 291' Col. J-4,5	N*	NR	201.2-195 "Range" Sel. Switch 0-5% O_2 0-25% O_2	RPS 11 Ckt 26	Panel L	N*	NR	Same as display instrument			
H_2O_2/R 201.2-450 (0-100% scale) (Green pen)	RPS 12 Ckt 26	Panel L	N*	Y	201.2-331 (Analyzer)	RPS 12 Ckt 26	H_2O_2 Cabinet Sys #12 T.B. El. 291' Col. J-10.5	N*	NR	201.2-245 "Range" Sel. Switch 0-5% O_2 0-25% O_2	RPS 12 Ckt 26	Panel L	N*	NR	Same as display instrument			

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-220020-C; Sh 8, 11
C-26949-C (Ch 11)
C-26939-C (Ch 12)
C-27003-C (Ch 11)
C-27004-C (Ch 12)

Parameter: **Primary Containment Oxygen Concentration**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
201.2-19D	0-5% O_2	1S67	SR		201.2-19	1S67	N	N		O_2 Analyzer (Leak Rate Monitor System)
201.2-19C	0-25% O_2	1S67	SR							

Drawings:

C-18014-C Sh 2

Parameter: **Primary Containment Oxygen Concentration**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks	
			PID	Sensor EPN	Cat 1	SR		
H452	0 to 5% (NR) 0 to 25% (WR)	Primary Containment Integrity	J359 J360 F185 F186 G008 G009	201.2-218 201.2-331 201.2-195 201.2-195 201.2-245 201.2-245	Y Y Y Y Y Y	N* N* N* N* N* N*	O_2 Channel 11 O_2 Channel 12 0-5% O_2 Range Ch 11 0-25% O_2 Range Ch 11 0-5% O_2 Range Ch 12 0-25% O_2 Range Ch 12	Output = average of valid inputs. Presentation of NR or WR scale is based on selector switch positions.

* Upgrade to SR is in progress; will be completed prior to plant restart.

Parameter: **Primary Containment Oxygen Concentration**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
None				

Parameter: **Primary Containment Oxygen Concentration**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
7L-5-16	CONTAINMENT MON SYS 11 O_2 LEVEL HI-LO	201.2-218	Y	N*
7L-5-22	CONTAINMENT MON SYS 12 O_2 LEVEL HI-LO	201.2-331	Y	N*

* Upgrade to SR is in progress; will be completed prior to uplant restart.

Parameter: **Primary Containment Oxygen Concentration**

Part F - Other Methods Available for Determining Current Status

1. Grab sample and analysis of containment atmosphere as detailed in Procedures N1-CSP-13A.

   (Sections 8 and 9) and N1-CSP-11V.

ATTACHMENT NO. 9

CONTAINMENT HYDROGEN CONCENTRATION INSTRUMENTS

Parameter: **Primary Containment Hydrogen Concentration**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
H_2O_2/R 201.2-451 (0 - 100% scale) (Red pen)	RPS 11 Ckt 26	Panel L	N*	Y	201.2-217 (Analyzer) (Sample locations selected by system)	RPS 11 Ckt 26	H_2O_2 Cabinet Sys #11 T.B. El. 291' Col. J-4.5	N*	NR	201.2-194 "Range" Sel. Switch 0-5% H_2 0-20% H_2	RPS 11 Ckt 26	Panel L	N*	NR	Same as display instrument			
H_2O_2/R 201.2-450 (0 - 100% scale) (Red pen)	RPS 12 Ckt 26	Panel L	N*	Y	201.2-330 (Analyzer) (Sample locations selected by system)	RPS 12 Ckt 26	H_2O_2 Cabinet Sys #12 T.B. El. 291' Col. J-10.5	N*	NR	201.2-244 "Range" Sel. Switch 0-5% H_2 0-20% H_2	RPS 12 Ckt 26	Panel L	N*	NR	Same as display instrument			

* Upgrade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-26949-C (Ch 11)
C-26939-C (Ch 12)
C-22020-C; Sh 8, 11
C-270030C (Ch 11)
C-27004-C (Ch 12)

Parameter: **Primary Containment Hydrogen Concentration**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
None										

Parameter: **Primary Containment Hydrogen Concentration**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
None							

Parameter: **Primary Containment Hydrogen Concentration**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
None				

Parameter: **Primary Containment Hydrogen Concentration**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
7L-5-15	CONTAINMENT MON SYS 11 H_2 LEVEL HI	201.2-217 via: 201.2-217B Alarm High 0-5% H_2 201.2-217C Alarm High 0-20% H_2	Y	
7L-5-21	CONTAINMENT MON SYS 12 H_2 LEVEL HI	201.2-330 via: 201.2-330B Alarm High 0-5% H_2 201.2-330C Alarm High 0-20% H_2	Y	

Parameter: **Primary Containment Hydrogen Concentration**

Part F - Other Methods Available for Determining Current Status

1. Grab sample and analysis of containment atmosphere per Procedures N1-CSP-13A (Sections 8 and 9) and N1-CSP-11A.

2. Could infer hydrogen concentration is and remains below any measurable level provided that RPV water level has been maintained above the top of active fuel. (Also assumes no hydrogen water chemistry.)

ATTACHMENT NO. 10

DRYWELL WATER LEVEL INSTRUMENTS

Parameter: **Drywell Water Level**

EOP Key Parameter: Yes [X] No [ ]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
LI 80-100 (-30 to 0 ft)	RPS 12 Ckt 7	Panel K	N*	Y	PT 201.2-13	RPS 12 Ckt 7	R.B. West Instr. Room El. 281'	Y	Y	Power Supply 201.2-13B	RPS 12 Ckt 7	ACC 1S77	Y	NR				
					PT 201.2-14	RPS 12 Ckt 7	R.B. El. 261' Col. N-6	Y	Y	Summer 80-100A	RPS 12 Ckt 7	ACC 1S77	N*	NR				

* Uprade to SR is in progress; will be completed prior to plant restart.

Drawings:

C-22020- C; Sh 3
C-22015-C; Sh 4
C-18014-C; Sh 1

Parameter: **Drywell Water Level**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
None										

Parameter: **Drywell Water Level**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
None							

Parameter: **Drywell Water Level**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
None				

Parameter: **Drywell Water Level**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
None				

Parameter: **Drywell Water Level**

Part F - Other Methods Available for Determining Current Status

1. Calculation of water head based on the value of drywell pressure indicated by two sensors with instrument lines penetrating the containment at two different elevations. Head of water is equal to the difference in indicated pessure multiplied by an appropriate psi/ft conversion factor. The calculated head of water is then added to the tap elevation to obtain a water level elevation.

   Relevant data for drywell pressure instruments that might be used for this level determined are listed on the following page. The approximate elevation of the top of active fuel is 290 feet.

Parameter: **Drywell Water Level**

Part F - Other Methods Available for Determining Current Status

DW Pressure Indicator	Indicating Range	Panel Loc	Power Supply	Sensor Number	Sensor Loc	Containment Penetration
PI 201.2 - 484A	-5 to +250 psig	L	RPS Bus 11 Circuit 27	PT 201.2 - 484	East Instr Room; Elev 281 ft	X-168 Elev 267 ft
PI 201.2 - 105A	0 to 75 psig	L	RPS Bus 11 Circuit 11	PT 201.2 - 105	West Instr Room; Elev 281 ft	X-135 Elev 306 ft 6 in
PI 201.2 - 107	0 to 75 psig	Local	N.A.	N.A.	N.A.	X-135 Elev 306 ft 6 in
PI 201.2 - 483A	-5 to +250 psig	L	RPS Bus 12 Circuit 27	PI 201.2 - 483	West Instr Room; Elev 281 ft	X-135 Elev 306 ft 6 in
PI 201.2 - 106A	0 to 75 psig	L	RPS Bus 12 Circuit 7	PT 201.2 - 106	East Instr Room; Elev 281 ft	X-52 Elev 292 ft
PI 201.2 - 108	0 to 75 psig	Local	N.A.	N.A.	East Instr Room; Elev 281 ft	X-52 Elev 292 ft

ATTACHMENT NO. 11

REACTOR POWER - IRM INSTRUMENTS

Parameter: **Neutron Flux - IRM**

EOP Key Parameter: Yes ☐ No ☒

Part A — RG 1.97 Category 1 Instruments (Page 1 of 4)

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05A Pen 1 (Blk) (0 to 125) via Sel. Switch 10S1 (IRM #11)	RPS 11 Ckt 9	Console E	N*	Y	Detector RH02A and drive mechanism	RPS 11	Core and below RPV	Y	N	Preamp RH03A	RPS 11	RB L-10 El. 237'	Y	NR	Same as display instrument			
										Monitor RH01A	RPS 11	Panel G	Y	NR				
										Range Switch RH04A	N/A	Console E	Y	NR				
RI05A Pen 2 (Red) (0 to 125) via Sel. Switch 10S5 (IRM #12)	RPS 11 Ckt 9	Console E	N*	Y	Detector RH02B and drive mechanism	RPS 11	Core and below RPV	Y	N	Preamp RH03B	RPS 11	RB L-10 El. 237'	Y	NR	Same as display instrument			
										Monitor RH01B	RPS 11	Panel G	Y	NR				
										Range Switch RH04B	N/A	Console E	Y	NR				

* Upgrade to Safety Related is in progress; will be completed prior to plant restart. This upgrade is based on the EOP Key Parameter status of the APRM function of the recorder.

Drawings:

C-22024-C; Sh 3, 6

Parameter: **Neutron Flux - IRM** EOP Key Parameter: Yes [ ] No [X]

Part A — RG 1.97 Category 1 Instruments (Page 2 of 4)

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05B Pen 1 (Blk) (0 to 125) via Sel. Switch 10S2 (IRM #13)	RPS 11 Ckt 9	Console E	N*	Y	Detector RH02C and drive mechanism	RPS 11	Core and below RPV	Y	N	Preamp RH03C	RPS 11	RB L-10 El. 237'	Y	NR	Same as display instrument			
										Monitor RH01C	RPS 11	Panel G	Y	NR				
										Range Switch RH04C	N/A	Console E	Y	NR				
RI05B Pen 2 (Red) (0 to 125) via Sel. Switch 10S6 (IRM #14)	RPS 11 Ckt 9	Console E	N*	Y	Detector RH02D and drive mechanism	RPS 11	Core and below RPV	Y	N	Preamp RH03D	RPS 11	RB L-10 El. 237'	Y	NR	Same as display instrument			
										Monitor RH01D	RPS 11	Panel G	Y	NR				
										Range Switch RH04D	N/A	Console E	Y	NR				

* Upgrade to Safety Related is in progress; will be completed prior to plant restart. This upgrade is based on the EOP Key Parameter status of the APRM function of the recorder.

Drawings:

C-22024-C; Sh 3, 6

Parameter: **Neutron Flux - IRM**

EOP Key Parameter: Yes ☐ No ☒

Part A — RG 1.97 Category 1 Instruments (Page 3 of 4)

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05C Pen 1 (Blk) (0 to 125) via Sel. Switch 10S3 (IRM #15)	RPS 12 Ckt 9	Console E	N*	Y	Detector RH02E and drive mechanism	RPS 12	Core and below RPV	Y	N	Preamp RH03E Monitor RH01E Range Switch RH04E	RPS 12 RPS 12 N/A	RB L-5 El. 237' Panel G Console E	Y Y Y	NR NR NR	Same as display instrument			
RI05C Pen 2 (Red) (0 to 125) via Sel. Switch 10S7 (IRM #16)	RPS 12 Ckt 9	Console E	N*	Y	Detector RH02F and drive mechanism	RPS 12	Core and below RPV	Y	N	Preamp RH03F Monitor RH01F Range Switch RH04F	RPS 12 RPS 12 N/A	RB L-5 El. 237' Panel G Console E	Y Y Y	NR NR NR	Same as display instrument			

* Upgrade to Safety Related is in progress; will be completed prior to plant restart. This upgrade is based on the EOP Key Parameter status of the APRM function of the recorder.

Drawings:

C-22024-C; Sh 3, 6

Parameter: **Neutron Flux - IRM** EOP Key Parameter: Yes [ ] No [X]

Part A — RG 1.97 Category 1 Instruments (Page 4 of 4)

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RI05D Pen 1 (Blk) (0 to 125) via Sel. Switch 10S4 (IRM #17)	RPS 12 Ckt 9	Console E	N*	Y	Detector RH02G and drive mechanism	RPS 12	Core and below RPV	Y	N	Preamp RH03G Monitor RH01G Range Switch RH04G	RPS 12 RPS 12 N/A	RB L-5 El. 237' Panel G Console E	Y Y Y	NR NR NR	Same as display instrument			
RI05D Pen 2 (Red) (0 to 125) via Sel. Switch 10S8 (IRM #18)	RPS 12 Ckt 9	Console E	N*	Y	Detector RH02H and drive mechanism	RPS 12	Core and below RPV	Y	N	Preamp RH03H Monitor RH01H Range Switch RH04H	RPS 12 RPS 12 N/A	RB L-5 El. 237' Panel G Console E	Y Y Y	NR NR NR	Same as display instrument			

* Upgrade to Safety Related is in progress; will be completed prior to plant restart. This upgrade is based on the EOP Key Parameter status of the APRM function of the recorder.

Drawings:

C-22024-C; Sh 3, 6

Parameter: **Neutron Flux - IRM**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
Meters on Monitors RH01A,B,C,D	0 to 125 scale	Panel G	Y	RPS 11	See Part A					
Meters on Monitors RH01E,F,G,H	0 to 125 scale	Panel G	Y	RPS 12	See Part A					

Parameter: **Neutron Flux - IRM**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H442	0 to 12.5%	Reactivity Control	J351 thru J358 J361 thru J368	Monitors RH01A thru RH01H* Range Switch Position, RH04A thru RH04H*			Output = average of valid (detector full in) inputs (scaling factor for range switch position) F177 G000 F179 G002 Detector F181 G004 Position (IN/OUT) F183 G006 * IRM 11 thru 18, respectively

Parameter: **Neutron Flux - IRM**

Part D — Other Computer-Supplied Information

Computer P&ID	Description	Sensor EPN	Cat 1	SR
C019	IRM 11 UP-SCALE REACTOR TRIP	RH02A	Y	N
C020	IRM 12 UP-SCALE REACTOR TRIP	RH02B	Y	N
C021	IRM 13 UP-SCALE REACTOR TRIP	RH02C	Y	N
C022	IRM 14 UP-SCALE REACTOR TRIP	RH02D	Y	N
C024	IRM 15 UP-SCALE REACTOR TRIP	RH02E	Y	N
C026	IRM 16 UP-SCALE REACTOR TRIP	RH02F	Y	N
C031	IRM 17 UP-SCALE REACTOR TRIP	RH02G	Y	N
C037	IRM 18 UP-SCALE REACTOR TRIP	RH02H	Y	N
B193	IRM 11 INOP REACTOR TRIP	RH02A	Y	N
B194	IRM 12 INOP REACTOR TRIP	RH02B	Y	N
B195	IRM 13 INOP REACTOR TRIP	RH02C	Y	N
B196	IRM 14 INOP REACTOR TRIP	RH02D	Y	N
B197	IRM 15 INOP REACTOR TRIP	RH02E	Y	N

Parameter: **Neutron Flux - IRM**

Part D — Other Computer-Supplied Information

Computer P&ID	Description	Sensor EPN	Cat 1	SR
B198	IRM 16 INOP REACTOR TRIP	RH02F	Y	N
B199	IRM 17 INOP REACTOR TRIP	RH02G	Y	N
C000	IRM 18 INOP REACTOR TRIP	RH02H	Y	N

Parameter: **Neutron Flux - IRM**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F2-3-6	IRM 11-14	RH02A RH02B RH02C RH02D	Y	N
F3-3-1	IRM 15-18	RH02E RH02F RH02G RH02H	Y	N

ATTACHMENT NO. 12

REACTOR POWER - SRM INSTRUMENTS

Parameter: **Neutron Flux - SRM**

EOP Key Parameter: Yes ☐ No ☒

Part A — RG 1.97 Category 1 Instruments (Page 1 of 2)

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RG 12A (10^0 to 10^6 CPS)	RPS 11	Console E	N	Y	Detector RG01A and drive mechanism (SRM 11)	RPS 11	Core and DW below RPV	N	N	Pulse Preamp. RG03A (SRM 11) Monitor RG07A (SRM 11)	RPS 11 RPS 11	Instr. Rack RB L-10 El 251' Panel G	N N	N NR	Recorder RG05 Pen 1 (SRM 11 or 12, via Selector Switch) (10^0 to 10^6 CPS)	RPS 12	Console E	N
RG 12B (10^0 to 10^6 CPS)	RPS 11	Console E	N	Y	Detector RG01B and drive mechanism (SRM 12)	RPS 11	Core and DW below RPV	N	N	Pulse Preamp. RG03B (SRM 12) Monitor RG07B (SRM 12)	RPS 11 RPS 11	Instr. Rack, RB L-5 El. 249' Panel G	N N	N NR				

DRAWINGS

C-22024-C SH.1

Parameter: **Neutron Flux - SRM**

EOP Key Parameter: Yes ☐ No ☒

Part A — RG 1.97 Category 1 Instruments (Page 2 of 2)

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RG 12C (10^0 to 10^6 CPS)	RPS 12	Console E	N	Y	Detector RG01C and drive mechanism (SRM 13)	RPS 12	Core and DW below RPV	N	N	Pulse Preamp. RG03C (SRM 13) Monitor RG07C (SRM 13)	RPS 12 RPS 12	Instr. Rack, RB L-10 El 237' Panel G	N N	N NR	Recorder RG05 Pen 2 (SRM 13 or 14, via Selector Switch) (10^0 to 10^6 CPS)	RPS 12	Console E	N
RG 12D (10^0 to 10^6 CPS)	RPS 12	Console E	N	Y	Detector RG01D and drive mechanism (SRM 14)	RPS 12	Core and DW below RPV	N	N	Pulse Preamp. RG03D (SRM 14) Monitor RG07D (SRM 14)	RPS 12 RPS 12	Instr. Rack, RB L-5 El. 249' Panel G	N N	N NR				

DRAWINGS

C-22024-C SH. 2

Parameter: **Neutron Flux - SRM**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
Meter on Monitors RG07A,B	10^0 to 10^6 CPS	Panel G	N	RPS 11	See Part A					
Meter on Monitors RG07C,D	10^0 to 10^6 CPS	Panel G	N	RPS 12	See Part A					

Parameter: **Neutron Flux - SRM**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H443	0 to 10^6 CPS (log scale)	Reactivity Control	J371 thru J374	SRMs RG07A thru RG07D	Y	N	Output = Highest of valid inputs (includes detector full in).
			F173 F175 F196 F198	Detector position, SRM 11 thru 14 respectively	N	N	

Parameter: **Neutron Flux - SRM**

Part D — Other Computer-Supplied Information

Computer P&ID	Description	Sensor EPN	Cat 1	SR
B165	SRM 11 SHORT PERIOD YES	RG01A	Y	N
B166	SRM 12 SHORT PERIOD YES	RG01B	Y	N
B167	SRM 13 SHORT PERIOD YES	RG01C	Y	N
B168	SRM 14 SHORT PERIOD YES	RG01D	Y	N

Parameter: **Neutron Flux - SRM**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
F2-4-6	SRM 11-12	RG01A RG01B	Y	N
F2-4-6	SRM 13-14	RG01C RG01D	Y	N

ATTACHMENT NO. 13

TORUS AIRSPACE PRESSURE INSTRUMENTS

Parameter: **Torus Airspace Pressure**

EOP Key Parameter: Yes [ ] No [X]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
PI 201.2-07B (0 to 4 psig)	RPS 12 Ckt 7	Panel L	Y	Y	PT 201.2-07	RPS 12 Ckt 7	RB H,J-11,12 El. 198' Corner Room	Y	NR	Power Supply 203-105	RPS 12 Ckt 7	ACC 1S77	Y	NR	None			
PI 201.2-07C (0 to 4 psig)	RPS 12 Ckt 7	Panel K	Y	Y						Dual Alarm Unit 201.2-07E	RPS 12 Ckt 7	ACC 1S77	Y	NR				

Drawings:

C-22020-C; Sh 1
C-18014-C; Sh 1

Parameter: **Torus Airspace Pressure**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
PI 201.2-07A	0 to 4 psig	N_2 Vap. Panel	Y	RPS 12 Ckt 7	Dual Alarm Unit 201.2-07E	ACC 1S77	Y	NR	RPS 12 Ckt 7	See Part A

Parameter: **Torus Airspace Pressure**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
None							

Parameter: **Torus Airspace Pressure**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
D324	Torus Pressure	Dual Alarm 201.2-07E (See Part A)	Y	Y

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]		[illegible]

Parameter: **Torus AirspacePressure**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
K2-4-4	HIGH/LOW TORUS PRESSURE	Dual Alarm 201.2-07E (See Part A)	Y	Y

[illegible]

[illegible]

ATTACHMENT NO. 14

CONTAINMENT AREA HIGH RANGE RADIATION LEVEL INSTRUMENTS

Parameter: **Containment Area Radiation - High Range**

EOP Key Parameter: Yes [ ] No [X]

Part A — RG 1.97 Category 1 Instruments

DISPLAY INSTRUMENTS					SENSORS					IN-LOOP COMPONENTS					RECORDING DEVICE			
EPN (Range)	Power Supply	Location	SR	Norm Use	EPN	Power Suply	Location	SR	EQ	EPN	Power Supply	Location	SR	EQ	EPN	Power Supply	Location	SR
RAm 201.7-36 (Meter)	RPS 11 (Ckt 4)	Panel 1J2	N	Y	RE 201.7-36A	RPS 11 (Ckt 4)	DW pen. X-E155 Az 340° EL. 263' 6"	N	Y	Power Supply RP-23 (24 VDC)	RPS 11 (Ckt 4)	Panel 1J2	N	NR	RR 201.7-36C Pen 1	I&C 120 VAC Bus 130 (Ckt 7)	Panel JAX	N
										RAm 201.7-36	RPS 11 (Ckt 4)	Panel 1J2	N	NR				
RAm 201.7-37 (Meter)	RPS 12 (Ckt 4)	Panel 1J2	N	Y	RE 201.7-37A	RPS 12 (Ckt 4)	DW pen. X-E234 Az 310° EL. 301'	N	Y	Power Supply RP-23 (24 VDC)	RPS 12 (Ckt 4)	Panel 1J2	N	NR	RR 201.7-36C Pen 2	I&C 120 VAC Bus 130 (Ckt 7)	Panel JAX	N
										RAm 201.7-37	RPS 12 (Ckt 4)	Panel 1J2	N	NR				

Drawings:

C-22020-C; Sh 14
C-18014-C; Sh 2

Parameter: **Containment Area Radiation - High Range**

Part B — Supplemental Instrumentation

DISPLAY DEVICE					SENSOR					Additional Remarks
EPN	Indicating Range	Location	SR	Power Supply	EPN	Location	SR	EQ	Power Supply	
None										

Parameter: **Containment Area Radiation - High Range**

Part C — Safety Parameter Display System

Output PID	Indicating Range	Display	INPUTS				Additional Remarks
			PID	Sensor EPN	Cat 1	SR	
H460	0 to 10^8 R/hr	Radioactivity Release Control	E467	RAm 201.7-36	Y	N	Output = average of valid inputs
			E468	RAm 201.7-37	Y	N	

[illegible] Radiation - High Range

Page [illegible] of [illegible]

[illegible] Information

Rev	[illegible]	[illegible]	Description

Parameter: **Containment Area Radiation - High Range**

Part D — Other Computer-Supplied Information

Computer PID	Description	Sensor EPN	Cat 1	SR
None other than shown for SPDS.				

Parameter: **Containment Area Radiation - High Range**

Part E — Annunciators

Window	Engraving	Sensor EPN	Cat 1	SR
None				