VERMONT YANKEE
NUCLEAR POWER CORPORATION

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FVY 84-127

REPLY TO:
ENGINEERING OFFICE
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FRAMINGHAM, MASSACHUSETTS 01701
TELEPHONE 617-872-8100

October 30, 1984

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

Attention: Office of Nuclear Reactor Regulation
Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing

References:
(a) License No. DPR-28 (Docket No. 50-271)
(b) Letter, USNRC to VYNPC, NVY 84-128, dated June 12, 1984, "Issuance of Order Confirming Licensee Commitments on Emergency Response Capability"
(c) Letter, VYNPC to USNRC, FVY 84-61, June 12, 1984, "NUREG-0737, Supplement 1 - Regulatory Guide 1.97, Application to Emergency Response Facilities"
(d) Letter, USNRC to All Operating Licensees, Generic Letter 82-23, NVY 82-213, dated December 17, 1982, Supplement 1 to NUREG-0737 - Requirements for Emergency Response Capability (Generic Letter 82-23)
(e) Letter, VYNPC to USNRC, FVY 84-34, dated April 11, 1984, "Vermont Yankee Environmental Qualification of Electrical Equipment"
(f) Letter, VYNPC to USNRC, FVY 84-92, dated July 25, 1984, "Additional Information for Scheduler Extensions for Environmental Qualification of Certain Electrical Components at Vermont Yankee"
(g) Letter, VYNPS to USNRC, FVY 82-10, dated February 5, 1982, "Additional Response to NUREG-0737, Item III.A.1.2

Subject: NUREG-0737, Supplement 1 - Regulatory Guide 1.97

Dear Sir:

By Reference (c), we committed to provide you the results of our engineering assessment of Regulatory Guide 1.97, Revision 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident". The purpose of this letter is to provide you with the results of our review and evaluation.

A003
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Vermont Yankee's method of providing each of the plant parameters recommended by Regulatory Guide 1.97, Revision 3, is described in Attachment A to this letter. This attachment is divided into three sections.

1. Equipment which is in full agreement with Regulatory Guide 1.97 requirements.

2. Equipment where range, environmental qualification, or other attributes have been determined on a plant-specific basis, to be appropriate for Vermont Yankee. Where these attributes differ from those shown in the Regulatory Guide, justification of the appropriateness of the attributes selected is provided.

3. Equipment which must be modified or upgraded in order to provide adequate range, environmental qualification, or other characteristics.

In the determination of the appropriate category of environmental qualification, we have utilized the analyses developed during our review of plant systems and equipment for compliance with 10CFR50.49 [Reference (e)]. We have done this to insure that the environmental qualification of the instrumentation is appropriate to the function it monitors, thereby providing integration between safety functions and the monitoring instrumentation. Additionally, this submittal provides the results of our investigation of the environmental qualification requirements concerning local power range monitors and control rod position indication probes and associated components, which we committed to provide by Reference (f).

Attachment B provides a tabular description of all Regulatory Guide 1.97 instrumentation at Vermont Yankee.

Those components identified in Attachment A, Section 3, requiring modification to achieve compliance with 10CFR50.49, will be upgraded prior to restart from the 1985 refueling outage unless otherwise impacted by problems with timely receipt and installation. For that equipment which does not require environmental qualification compliance, a schedule will be established to insure installation prior to restart from the 1987 refueling outage.

By Reference (g), we described the parameters to be provided in the Technical Support Center (TSC) and Emergency Operations Facility (EOF). It is our intention to continue to provide these parameters until a final determination is made of the instrumentation display requirements based upon the results of the development of the Safety Parameter Display System (SPDS) and the relocation of the EOF in North Brattleboro. This determination is expected concurrent with the finalization of the SPDS scope committed for February 1985.

We trust that you will find this information satisfactory; however, should you have any questions, please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

W. P. Murphy
Vice President and Manager of Operations

WPM/hja

Attachments

STATE OF VERMONT)
ss)
WINDHAM COUNTY)

Then personally appeared before me, Warren P. Murphy, who, being duly sworn, did state that he is a Vice President and Manager of Operations of Vermont Yankee Nuclear Power Corporation, that he is duly authorized to execute and file the foregoing document in the name and on the behalf of Vermont Yankee Nuclear Power Corporation and that the statements therein are true to the best of his knowledge and belief.

DIANE M. McCUE
NOTARY
PUBLIC
WINDHAM COUNTY, VERMONT

Diane M. McCue Notary Public
My Commission Expires February 10, 1987

ATTACHMENT A

Qualification Summary

The following is a list of Regulatory Guide 1.97 Instrumentation divided into three (3) sections:

1) Fully Qualified Instrumentation
2) Equipment Determined to be Appropriate on a Plant-Specific Basis
3) Instrumentation Requiring Upgrade or Modification

Section 1 is a list of fully qualified instrumentation.

Section 2 details equipment presently existing at Vermont Yankee, how it differs from the Regulatory Guide specified instrumentation, and a justification for the existing equipment acceptability. This justification is based upon the use of other instrumentation qualified under the VY EQ Program, which bears a known relationship to the specified variable, or a Vermont Yankee position that the specified variable is not warranted.

Section 3 details additional instrumentation needed for compliance to the Regulatory Guide. This additional instrumentation consists of any equipment which may require modifications to establish qualification. This could consist of entirely new instrument channels or existing instrument channels which require some upgrading.

Under the EQ Program [Reference (e)], in determining environmental qualification requirements, we have addressed all design basis events, including flooding outside containment. The flooding and environmental effects resulting from all postulated design-basis accidents documented in Chapter 14 of the VY Final Safety Analysis Report (FSAR), as well as High Energy Line Breaks (HELBs) outside containment, were considered in identification of safety-related electrical equipment requiring environmental qualification. This is consistent with the intent of Paragraph (b)(1) to 10CFR50.49.

The method for identifying electrical equipment within the scope of Paragraphs (b)(1) and (b)(2) of 10CFR50.49 (i.e., safety-related as well as non-safety-related electrical equipment relied upon to remain functional or whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions during and following design basis accidents) is described and documented in Reference (e). This included:

a) Identification of General Design Criteria consistent with Vermont Yankee's plant-specific design and 10CFR50.49;

b) Defining required safe-shutdown-safety functions for design basis accidents utilizing shutdown sequence diagrams based upon existing Emergency Operating Procedures and the Vermont Yankee Final Safety Analysis Report (FSAR);

c) Identification of the major electrical components required for each postulated accident, in potentially harsh environments which are relied upon to operate (or to fail) for required safety functions. These components were identified by reviewing Plant Piping and Instrumentation Diagrams (P&IDs); and

d) Identification of the remaining electrical components in potentially harsh environments (associated with the major required electrical components) that are relied upon to function, or whose failure could impact any required safety functions or mislead the operator such that required safety functions could be jeopardized. These components were identified by reviewing plant electrical Control Wiring Diagrams (CWDs).

The method used for identifying electrical equipment within the scope of Paragraph (b)((3) of 10CFR50.49 (i.e., "certain post-accident monitoring equipment") included the review of plant LOCA and HELB emergency operating procedures to identify a complete list of associated display instrumentation. The instrumentation necessary to determine that a system is performing its safety function is required to be environmentally qualified.

A review for plant-specific Type A variables was conducted utilizing the draft symptom based emergency procedures currently under development. When these procedures have been finalized, it may be necessary to add or subtract instruments due to changes in procedural requirements.

The Category 1 variables which require redundancy have been evaluated to ensure that a sigle failure will not result in information ambiguities that could lead operators to defeat or fail to accomplish a required safety function. One or more of the following means are available to access plant status of the affected parameter.

a. Cross-checking with an independent channel that monitors a different variable bearing a known relationship to the failed monitoring channel.

b. Perturbing the measured variable to determine the failed channel by observing the response on each instrument.

c. Operating procedures.

1. Fully Qualified Instrumentation

The following instrumentation currently installed at Vermont Yankee fully complies with Regulatory Guide 1.97 requirements:

Item #	Service
B3	RCS soluble boron concentration.
C2	Primary coolant analysis (gamma spectrum).
C5/E1	Primary containment area radiation.
C11/C12	Containment/drywell hydrogen and oxygen concentration.
D1	Main feedwater flow.
D2	Condensate storage tank level.
D10	Primary safety relief valve position - ADS.
D23	Radwaste System.
D24	Emergency vent damper position.
E10	Particulates/halogens.
E11	Airborne radiohalogens.
E13	Isotopic analysis.
E14	Wind speed.
E15	Wind direction.
E16	Atmospheric stability.
E17	Primary coolant sample.
E18	Containment air sample.

2. Equipment Determined to be Appropriate on a Plant-Specific Basis

This section details equipment presently existing at Vermont Yankee, how it deviates from the Regulatory Guide specified instrumentation, and a justification for the existing equipment acceptability. This justification is based upon the use of other instrumentation qualified under the Vermont Yankee Environmental Qualification Program which bears a known relationship to the specified variable, or a Vermont Yankee position that the specified variable is not warranted. This equipment is:

Item #	Results
A4 - Drywell Pressure - B7 - Reactor Coolant System Integrity - Drywell Pressure B9 - Maintaining Containment Integrity - Drywell Pressure C8 - RCS Pressure Boundary - Drywell Pressure C10 - Containment - Primary Containment Pressure D4 - Primary Containment Related Systems - Drywell Pressure	Regulatory Guide 1.97 requires both drywell narrow and wide-range pressure measurement. Drywell narrow-range pressure transmitter, PT16-19-28, is a single channel instrument. The wide-range pressure transmitters, PT16-19-29A/B, encompass both the narrow and wide ranges required and are recorded and displayed on CRP 9-25 and CRP 9-3, respectively. These transmitter loops also meet the requirements for Category 1 variables. It is Vermont Yankee's position that narrow range drywell pressure is not needed post-LOCA due to the fact that once the LOCA has been controlled, the Drywell will not repressurize. However, if that were to happen, any changes in pressure will be displayed and recorded in the Control Room. Therefore, it is not necessary to provide Category 1 instrumentation for narrow range pressure. It is Vermont Yankee's position that PT16-19-29A/B instrument loops meet the intent of these six variables post-LOCA.
B8 - Maintaining Containment Integrity - Drywell Sump Level C6 - RCS Pressure Boundary - Drywell Sump Level	The drywell sump level uses level switches to start/stop pumps during normal operation. Regulatory Guide 1.97 requires continuous sump level indication from the bottom to the top. The existing configuration is designed to detect and measure leaks in the drywell by measuring both the sump pump running time and the time between pump initiations with external pump monitoring equipment. During a LOCA, drywell sump level is ineffective due to the fact that the sump will fill and overflow into the torus which has environmentally qualified level measurement and indication. Additionally, drywell pressure is also monitored by environmentally qualified instrumentation which will indicate a break in the drywell before the torus level indicates a rise. Therefore, it is Vermont Yankee's position that drywell sump level indication is not appropriate for Vermont Yankee and that the existing system is adequate.

Item #	Results
C1 - Fuel Cladding-Radiation Level in Circulating Primary Coolant	The main steam line radiation monitors lack environmental qualification documentation. They monitor the main steam lines and generate a scram if the steam radiation exceeds a preset level which would indicate a failure of the fuel cladding. For this reason they are assumed to accomplish their intended function and scram the reactor prior to failure. In accordance with the methodology used in the VY E.Q. Program, these detectors, although utilized for fuel failure events, are not relied upon for LOCA or HELB events. Once the MSIVs have closed, there is no circulating primary coolant in the main steam lines, and they are no longer able to accurately monitor steam line radiation levels. However, the drywell high-range rad monitors, which are environmentally qualified, will monitor the radiation buildup within the drywell, with direct coolant radiation level assessment being available from Chem and HP Analysis via the Post-Accident Sampling System. For this reason, it is Vermont Yankee's position that the existing instrumentation is acceptable.
D13 - Safety Systems - RCIC Flow D14 - Safety Systems - HPCI Flow	Both the HPCI and RCIC flow transmitters supply flow indication to the Control Room during the onset of a LOCA. Regulatory Guide 1.97 requires these two variables to be environmentally qualified. Per the VY EQ Program, these two variables do not experience harsh environments during the small break LOCA event in which they are relied upon. Once the vessel has been depressurized, both HPCI and RCIC become inoperative and their flow indication is not needed. Therefore, it is Vermont Yankee's position that the existing equipment is acceptable.
C13 - Containment - Effluent Radiation Noble Gases C14 - Containment - Effluent Radioactivity (from buildings and areas in direct contact with Primary Containment) E4 - Airborne Radioactive Material Releases - Drywell/Standby Gas Treatment Purge Flow	Since all plant effluents pass through the plant stack, only monitoring the common plant vent is required by the Regulatory Guide since it will provide indication of effluent radiation levels from these areas. The stack monitoring instruments cover the range required. Since they are located in the stack, the only possible harsh environment is due to radiation. However, since this equipment is specifically designed and tested to measure radiation levels higher than those which will be encountered, they are qualified for their intended service.

Item #	Results
E5 - Airborne Radioactive Material Releases - Secondary Containment Purge Flow E6 - Airborne Radioactive Material Releases - Secondary Containment E7 - Airborne Radioactive Material Releases - Auxiliary Building E8 - Airborne Radioactive Material Releases - Common Plant Ventilation E9 - All Other Identified Release Points	These instruments read-out in millirem, however, a simple conversion to microcuries per cubic centimeter can be accomplished.
E12 - Environs Radiation Radioactivity Plant and Environs. Radiation	Presently, there is one (1) portable survey instrument at Vermont Yankee that can measure up to 10^4 R/Hr photons, but none that can measure the Regulatory Guide required 10^4 R/Hr beta. The existing instrumentation can measure approximately 10^2 R/Hr beta. These ranges are sufficient for portable plant use.
A8 - Torus Water Level C7 - Reactor Coolant Pressure Boundary - Suppression Pool Water Level - Wide Range D5 - Suppression Pool Water Level - Narrow Range	Regulatory Guide 1.97 requires both narrow and wide range torus level indication. The torus is presently monitored by fully qualified level transmitters which supply level signals to the Control Room that are both indicated and recorded. These transmitters cover the wide range of the torus from bottom to near the top. This range encompasses the narrow range required by Item D5. Two narrow-range transmitters supply level indication to the Control Room during normal operation which is not needed post-LOCA. Post-accident Torus Level indication will be trended on the recorders such that a change in level will be clearly visible to the plant operators. It is Vermont Yankee's position that recording the wide range level, combined with the fact that these wide-range level transmitters are fully qualified, should be adequate for these variables; therefore, no further action is required.

Item #	Results
D17 - SLCS Flow D18 - SLCS Storage Tank Level	SLCS flow and storage tank level is required by Regulatory Guide 1.97 to be environmentally qualified. However,per Section 5 of the EQ Matrix Report, the SLC System is not required to be environmentally qualified since it is never expected to be needed for plant safety following a DBA (see FSAR Section 3.8.4). This System is not relied upon in mitigating an accident, but provides a method to shut down the reactor from the full power condition and maintain the reactor subcritical during cooldown independent of the control rods. Since this system is for independent backup of the control rods, it is not relied upon for accidents in which harsh environments are created. Therefore, environmental qualification of any SLC component is not warranted, although specified in Regulatory Guide 1.97.
D15 - Core Spray Flow D22 - Cooling Water Flow to ESF System Components	In the EQ Program, flow indication for these Safety Systems was not required to be qualified. In lieu of various flows, the instrumentation that monitors the reactor and primary containment responses post-accident would be the ultimate indication of ECCS performance (i.e., Rx vessel level, pressure, drywell temperature, drywell pressure). In addition, ECCS valve position information, along with ECCS pump motor running current (amps) indicates the mode of operation and is far more valuable than monitoring flow. Therefore, additional qualification or upgrading is not warranted.
D20 - RHR Heat Exchanger Outlet Temperature D21 - Cooling Water Temperature to ESF System Components	Regulatory Guide 1.97 requires environmentally qualified monitoring of these two variables. In the VY EQ Program, monitoring the RHR heat exchanger shell and tube side outlet temperature was not relied upon. The function of the RHR heat exchangers post-accident is to remove stored and decay heat. In lieu of the RHR heat exchanger temperature variables, monitoring the reactor and primary containment responses (i.e., torus water temperature, drywell, and reactor pressure) would be the most important indicators of RHR heat exchanger performance. Therefore, additional qualification or upgrading is not warranted.

Item #	Results
B10 - Primary Containment Isolation Valve Position	Regulatory Guide 1.97 requires fully qualified isolation valve position indication. Per Section 5 of the EQ Matrix, PC Isolation Valve Position Indication is required to be qualified for ten minutes following a design Basis LOCA. The first ten (10) minutes following a LOCA is generally acknowledged as a period in which the operator gathers information, tries to understand what has happened, and determines plant status. Primary containment isolation status would be part of the information that the operator would gather during this period. If one or more PC isolation valves were to indicate a failure to automatically close, the operator (when not occupied by more vital activity) could attempt to manually close from the Control Room those valves that indicate open and should have closed. The qualification of PC isolation valve indication is therefore warranted for initial verification of the PC isolation safety function. The required qualification time per Regulatory Guide 1.97 (page 1.97-3) is: "... as long as the information it provides is needed by the Control Room operating personnel". This is the same approach utilized in the EQ Matrix Report. For long-term post-LOCA, PC isolation valve position is not needed for the following general reasons: o Any corrective action required would be done in response to the initial verification of PC isolation. o Subsequent failure of indication will not impact the actual valve position (i.e., fail safe). o Subsequent false valve indication would <u>not</u> result in the operator taking action that would be detrimental to safety. Even if the operator did not verify that all isolation valves did close within the first ten minutes, his only option is to attempt to close those valves that (correctly or incorrectly) <u>INDICATE</u> open whenever he observes an open indication on a valve that should be closed.

Item #

Results

- Radiation monitoring outside the Reactor Building compared with the radiation inside the containment will provide the best indication of the primary containment isolation safety function.

- Many PC isolation valves are also associated with other safety functions (i.e., ECCS valves). Position indications for these valves are qualified based upon safety functions other than PC isolation. The following PC isolation valves have been qualified for long-term post-LOCA operation including valve position.

Valve Number	Service
10-13A	RHR Pump Suction From Torus
10-13B	RHR Pump Suction From Torus
10-13C	RHR Pump Suction From Torus
10-13D	RHR Pump Suction From Torus
10-16A	RHR Test Line to Torus
10-16B	RHR Test Line to Torus
10-18	RHR Shutdown Cooling Supply (Inboard)
10-25A	RHR LPCI to Reactor
10-25B	RHR LPCI to Reactor
10-26A	RHR Drywell Spray
10-26B	RHR Drywell Spray
10-27A	RHR LPCI to Reactor
10-27B	RHR LPCI to Reactor
10-31A	RHR Drywell Spray
10-31B	RHR Drywell Spray
10-34A	RHR Suppression Pool
10-34B	RHR Suppression Pool

Valve Number	Service
10-38A	RHR Torus Spray
10-38B	RHR Torus Spray
10-39A	RHR Torus Spray Upstream Valve
10-39B	RHR Torus Spray Upstream Valve
14-7A	Core Spray Suction
14-7B	Core Spray Suction
14-11A	Core Spray to Reactor
14-11B	Core Spray to Reactor
14-12A	Core Spray to Reactor
14-12B	Core Spray to Reactor
16-19-11A	Vac Breaker Sec. Cont. to Torus
16-19-11B	Vac Breaker Sec. Cont. to Torus

For the reasons stated above, it is Vermont Yankee's position that these valves meet the intent of this Regulatory Guide parameter.

B2 - Control Rod Position

The EQ Program originally required the qualification of control rod position components. However, Regulatory Guide 1.97 specifies control rod position as a Category 3 variable. Category 3 variables apply to backup and diagnostic instrumentation and only require high quality off-the-shelf equipment, per Regulatory Guide 1.97.

Since the LPRMs provide sufficient information for verification of scram, given a worst case single failure in the neutron monitoring system, the control rod position backup instruments do not warrant environmental qualification.

Therefore, it is Vermont Yankee's intent that the EQ Program be revised to delete the environmental qualification requirements for the control rod position components, but maintain control rod position as a Category 3 variable, as recommended in Regulatory Guide 1.97.

Item #	Results
E2 - Reactor Building or Secondary Containment Area Radiation	Post-accident secondary containment area radiation monitoring, as well as radiation monitoring in other areas where personnel access may be desirable, would be helpful to the Health Physics Department in determining local radiological conditions prior to entering these areas. This function is important from the standpoint of evaluating personnel habitability in the event of a severe core damage accident. However, areas outside the Reactor Building that do require personnel access post-accident have been analyzed using very conservative assumptions to show that habitability would be allowed. Also, the EQ Program assumes that habitability in the Reactor Building is not possible for at least three months post-accident; and the essential equipment necessary to function for an extended period post-accident has generally been environmentally qualified for one (1) year. Therefore, any decisions on habitability inside the Reactor Building would not be necessary for some time after the event. If the secondary containment area radiation monitors were not functioning at this time, alternate means to estimate secondary containment radiation levels would be possible (i.e., correlations based on drywell, vent stack, and site area radiation measurements). In light of this, Vermont Yankee considers variable (E2), "Secondary Containment Area Radiation", as a Category 3 variable that does not require environmental qualification.

3. Instrumentation Requiring Upgrade or Modification

This section details additional instrumentation needed for compliance to the Regulatory Guide. This additional instrumentation consists of any equipment which requires modifications to establish qualification. This could consist of entirely new instrument channels or existing instrument channels which require some upgrading.

Item #	Results
A1 - Reactor Vessel Pressure A2 - Reactor Vessel Level B4 - Core Cooling - Coolant Level B6 - RCS Integrity - RCS Pressure C4 - RCS Pressure Boundary - RCS Pressure C9 - Containment - RCS Pressure	Vessel level and pressure are presently monitored by qualified instrumentation, however both of these variables need to be trended by qualified recorders to ensure full compliance. These two variables are the only parameters deemed necessary for trending by Vermont Yankee.
A7 - Torus Water Temperature D6 - Primary Containment Related Systems - Suppression Pool Water Temperature	Suppression pool water temperature displays 60°F to 180° in the Control Room, which is less than the required 40°F to 230°F range specified. The existing range calibration will be expanded to accommodate a higher torus temperature.
A5 - Drywell Temperature D7 - Primary Containment Related Systems - Drywell Atmospheric Temperature	Drywell atmospheric temperature displays 0-300°F, which is less than the 40°F to 440°F range required. Per the post-LOCA temperature profiles, the postulated drywell temperature will not exceed 350°F. In light of this, range expansion of the readout instrumentation will be done to bring these variables into compliance with the analysis. Additionally, a power source change will be done to provide redundancy between the channels.
D25 - Power Supplies - Standby Power Status	120/240 V ac vital bus voltage and frequency have local indication on the vital ac control panel. Instrumentation will be added to indicate these variables in the Control Room. All other power supply presently have instrumentation in the Control Room.

Item #	Results
E2 - Containment Radiation - Reactor Building/ Secondary Containment Area Radiation E3 - Area Radiation - Radiation Exposure Rate	The area radiation monitors detect 0 to 10^4 mR/Hr, which is several decades below the NRC required range of 10^{-1} R/Hr to 10^4 R/Hr. The radiation in the Reactor Building following a design basis LOCA, based upon conservative assumptions, would rise above 10 R/Hr within 100 hours and remain there for a minimum of 90 days. To allow an accurate assessment of Reactor Building area radiation, additional instrumentation will be installed in selected areas. This instrumentation will have adequate range to ensure continued on-scale monitoring.
B1 - Reactivity Controls Neutron Flux	As described in the Vermont Yankee EQ Programs, only the LPRMs are required to verify scram, not SRM/IRM equipment. This is based on a position that indication of neutron flux down to 1% power (rather than 10^{-6}% power) is sufficient to determine that a successful scram has occurred. It should be remembered that for accidents, a successful reactor scram by the control rods is anticipated even given a worst case single failure. A failure to scram event (ATWS) is not considered to be an accident in which harsh environments develop. It is Vermont Yankee's position that the LPRMs are adequate to verify a scram. As a result, the LPRMs will be qualified.
A3 - Reactor Vessel Reference Leg Area Thermo-couples	Thermocouples will be installed in the upper drywell in the areas of the vessel level reference legs. These thermocouples will supply the Control Room with area indication of ambient temperature.
A6 - Torus Pressure	Presently, one transmitter supplies the Control Room with Torus pressure indication, but lacks any environmental qualification. This will be upgraded to fully qualified redundant instrument loops.
A9 - Torus Airspace Temperature	Presently, one instrument supplies the Control Room indication of Torus Air Temperature. This will be upgraded to fully qualified redundant instrument loops.

The equipment listed below meets the range requirement of Regulatory Guide 1.97 but needs environmental qualification to fully comply with Regulatory Guide 1.97 requirements:

Item #	Service
D3/D8	Suppression chamber/drywell spray flow.
D16	LPCI flow.
D19	RHR system flow.

ATTACHMENT B

Regulatory Guide 1.97

Instrumentation Matrix

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
A1	Reactor Vessel Pressure	1	0 - 1500 psig	0 - 1500 psig	Yes	PT2-3-56A/B	ECCS 24 V dc A/B	CRP 9-5	None	None
A2	Reactor Vessel Level	1	-200 to +200 inches H_2O	-200 to +200 inches H_2O	Yes	LT2-3-73A/B	ECCS 24 V dc	CRP 9-3	None	None
			77 to 187 inches H_2O	77 to 187 inches H_2O	Yes	LT2-3-67/68	A/B Vital ac Inst ac		CRP 9-3 CRP 9-4	None
A3	Reactor Vessel Level Reference Leg Area Temps	1	0 - 350°F	0-350°F	No	Needed	None	None	None	None
A4	Drywell Pressure	1	0 - 275 psia	0 - 275 psia	Yes	PT16-19-29A/B	Vital ac Inst ac	CRP 9-3	CRP 9-25	None
A5	Drywell Temp	1	0 - 350°F	0 - 300°F	No	TE1-149-1 Through 8	Vital ac CKT 18	None	CRP 9-25	None
			0 - 350°F	0 - 300°F	No	TE16-19-30	Vital ac			
A6	Torus Pressure	1	0-80 psia	0 - 80 psia	No	PT16-19-36	Vital ac CKT 18	None	CRP 9-25	None
A7	Torus Water Temp	1	40 - 230°F	60 - 180°F	Yes	TE 16-19-33A/C	Vital ac	CRP 9-25	None	None
A8	Torus Water Level	1	3 - 16 Ft	2 - 17.5 Ft	Yes	LT 16-19-10A/B	Vital ac Inst ac	CRP 9-3	CRP 9-25	None
A9	Torus Airspace Temp	1	0 - 300°F	0 - 300°F	No	TE16-19-34	Vital ac CKT 18	None	CRP 9-25	None
REACTIVITY CONTROL:										
B1	Neutron Flux	1	10^{-6} to 100% Full Power	1 to 100%	Yes	LPRMS	RPS Bus A/B	CRP 9-5 9-14	CRP 9-5	Yes
B2	Control Rod Position	3	Full In/Not Full In	Full In to Full Out	No	Rod Position Numbers	Inst. AC	CRP 9-5	N/A	Yes
B3	RCS Soluble Boron Concentration (Grab Sample)	3	0 to 1000 ppm	0 to 1000 ppm	No	Grab Sample	N/A	N/A	N/A	N/A

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
A1	Reactor Vessel Pressure	1	Yes	Yes	Yes
A2	Reactor Vessel Level	1	Yes	Yes	Yes
A3	Reactor Vessel Level Reference Leg Area Temp	1	Needed	Needed	Needed
A4	Drywell Pressure	1	Yes	Yes	Yes
A5	Drywell Temp	1	Yes	Yes	Yes
A6	Torus Pressure	1	None	Yes	Needed
A7	Torus Water Temp	1	Yes	Yes	Yes
A8	Torus Water Level	1	Yes	Yes	Yes
A9	Torus Airspace Temp	1	None	Yes	Needed
REACTIVITY CONTROL:					
B1	Neutron Flux	1	Needed	Yes	Yes
B2	Control Rod Position	3	N/A	N/A	N/A
B3	Soluble Boron Concentration	3	N/A	N/A	N/A

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
CORE COOLANT:										
B4	Coolant Level	1	Bottom of Core Plate to Centerline of MSIV	-200 to +200 inches H_2O	Yes	LT2-3-73A/B	ECCS 24V DC A/B	CRP 9-3	None	None
* B5	Core Thermocouples	1	200°F to 2300°F	None		None				
REACTOR COOLANT SYSTEM INTEGRITY:										
B6	RCS Pressure	1	0 to 1500 psig	0 to 1500 psig	Yes	PT2-3-56A/B	ECCS 24V DC A/B	CRP 9-5	None	None
B7	Drywell Pressure	1	0 to Design Pressure	0 to 275 psia	Yes	PT16-19-29A/B	Vital AC Inst. AC	CRP 9-3	CRP 9-25	None
B8	Drywell Sump Level	1	Bottom to Top	Level Switches	Yes	LS20-351 (Floor) LS20-360 (Equipment)	MCC 6A/7A		Annun. CRP 9-5	None
MAINTAINING CONTAINMENT INTEGRITY:										
B9	Primary Containment Pressure	1	-5 psig to Design Pressure	0 to 275 psia	Yes	PT16-19-29A/B	Vital AC Inst. AC	CRP 9-3	CRP 9-25	None
B10	Primary Containment Isolation Valve Position	1	Closed/Not Closed	Closed/Not Closed	Yes	Per each valve	Various	CRP 9-3	None	Yes

* May not be required per Secy. 82-111.

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
CORE COOLANT:					
B4	Coolant Level	1	Yes	Yes	Yes
B5	Core Thermocouples	1	N/A	N/A	N/A
REACTOR COOLANT SYSTEM INTEGRITY:					
B6	RCS Pressure	1	Yes	Yes	Yes
B7	Drywell Pressure	1	Yes	Yes	Yes
B8	Drywell Sump Level	1	No	Yes	Yes
B9	Primary Containment Pressure	1	Yes	Yes	Yes
B10	Primary Containment Isolation Valve Position	1	Yes	Yes	Yes

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
FUEL CLADDING:										
C1	Rad Levels in Circulating Primary Coolant	1	1/2 to 100X Tech. Spec. Limit	0 to 10^6 Mr/Hr	Yes	RM 17-251 A/B/C/D	RPS Bus A/B	CRP 9-10	CRP 9-2	None
C2	Primary Coolant Analysis (Gamma Spectrum)	3	10 uCi/ml to 10 Ci/ml or TID 14844 Source Term	10 uCi/ml to 10 Ci/ml	No	Grab Sample	N/A	N/A	N/A	N/A
* C3	Core Thermocouples	1	200°F to 2300°C	None						
RCS PRESSURE BOUNDARY:										
C4	RCS Pressure	1	0 to 1500 psig	0-1500 psig	Yes	PT2-3-56A/B	ECCS 24V DC A/B	CRP 9-5	None	None
C5	Primary Containment Area Rad	3	1R to 10^5R/Hr	1R/Hr to 10^7R/Hr	Yes	RM16-19-1A/1B	Vital AC Inst. AC	CRP 9-3	CRP 9-2	None
C6	Drywell Drain Sumps Level	1	Bottom to Top	Level Switches	Yes	LS20-351 (Floor) LS20-360 (Equip)		MCC 6A/7A	Annun. CRP 9-5	None
C7	Torus Water Level	1	Bottom of ECCS Suction to 5 feet Above Normal	2 - 17.5 feet	Yes	LT16-19-10A/B	Vital AC Inst. AC	CRP 9-3	CRP 9-25	None
C8	Drywell Pressure	1	0 to Design Pressure	0-275 psia	Yes	PT16-19-29A/B	Vital AC Inst. AC	CRP 9-3	CRP 9-25	
CONTAINMENT:										
C9	RCS Pressure	1	0 to 1500 psig	0-1500 psig	Yes	PT2-3-56A/B	ECCS 24V DC A/B	CRP 9-5	None	None
C10	Primary Containment Pressure	1	-5 psig to 1X Design	0-275 psia	Yes	PT16-19-29A/B	Vital AC Inst. AC	CRP 9-3	CRP 9-25	None

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
FUEL CLADDING:					
C1	Rad. Levels in Circulating Primary Coolant	1	Yes	Yes	Yes
C2	Primary Coolant Analysis (Gamma Spectrum)	3	N/A	N/A	N/A
C3	Core Thermocouples	1			
RCS PRESSURE BOUNDARY:					
C4	RCS Pressure	1	Yes	Yes	Yes
C5	Primary Containment Area Rad	3	Yes	Yes	Yes
C6	Drywell Drain Sump Level	1	No	Yes	Yes
C7	Torus Water Level	1	Yes	Yes	Yes
C8	Drywell Pressure	1	Yes	Yes	Yes
CONTAINMENT:					
C9	RCS Pressure	1	Yes	Yes	Yes
C10	Primary Containment Pressure	1	Yes	Yes	Yes

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	DISPLAY INDICATOR	DISPLAY RECORDER	COMPUTER
CONTAINMENT: (Continued)										
C11	Containment and Drywell Hydrogen Concentration	1	0-30% from -5 psig to Design Pressure	0-10%-30%	Yes	SAH VG-5A/B	AC/DP5 LP-1L	CAD PNL A/B	CAD PNL A/B	NA
C12	Containment and Drywell Oxygen Concentration	1	0-10% from -5 psig to Design Pressure	0-10%-25%	Yes	SAH VG-5A/B	DC/DP5 LP-1L	CAD PNL A/B	CAD PNL A/B	NA
C13	Containment Effluent Rad. (Noble Gasses from Identified Release Pts.)	3	10^{-6} uCi/cc to 10^{-2} uCi/cc							
C14	Containment Effluent Rad. (from Bldgs. and Areas in Direct Contact With Primary Containment)	2	10^{-6} uCi/cc to 10^{3} uCi/cc							

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
C11	Containment Hydrogen Concentration	1	Yes	Yes	Yes
C12	Containment Oxygen Concentration	1	Yes	Yes	Yes
C13	Containment Effluent Radiation Noble Gasses	3	N/A	N/A	N/A
C14	Containment Effluent Radiation - from Bldgs.	2	N/A	N/A	N/A

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
CONDENSATE AND FEEDWATER SYSTEM:										
D1	Main Feedwater Flow	3	0-110% Design	0-4x10^6 lb/Hr	No	FT102-1A/1B (FT6-50A/B)	Vital AC	CRP 9-5	CRP 9-5	A17-13 A17-14
D2	Condensate Storage Tank Level	3	Bottom to Top	0-35 feet	No	LT107-5A/5B	Vital AC	CRP 9-6	CRP -9-3	F004
PRIMARY CONTAINMENT RELATED SYSTEMS:										
D3	Suppression Chamber Spray Flow	2	0-110% Design	0-17000 gpm	No	FT10-111A/B	120V Inst. AC	CRP 9-3	None	None
D4	Drywell Pressure	2	-5 psig to 3 psig Narrow 0-110% Design-Wide	0-275 psia	Yes	PT16-19-29A/B	Vital AC Inst. AC	CRP 9-3	CRP 9-25 CRP 9-25	None
D5	Suppression Pool Water Level	2	Bottom of ECCS Suction to 5 feet Above Normal	2 - 17.5 feet	Yes	LT16-19-10A/B	Vital AC Inst AC	CRP 9-3	CRP 9-25	None
D6	Suppression Pool Water Temp.	2	40°F to 230°F	60-180°F	No	TE16-19-33A/C	Vital AC	CRP 9-25	None	None
D7	Drywell Atmospheric Temp.	2	40°F to 440°F	0-300°F 0-300°F	No	TE16-19-30 TE-149-8 TE-1-149 1 through 8	Vital AC Vital AC CKT 18	None	CRP 9-25	None
D8	Drywell Spray Flow	2	0 to 110% Design	0-17000 gpm	No	FT10-111A/B	Vital AC	CRP 9-3	None	None
MAIN STEAM SYSTEM:										
D9	MSL Isolation Valve Leakage Control System	2	0 to 15 inches Water/Narrow 0 to 5 psia Wide	NOT APPLICABLE TO VERMONT YANKEE						
D10	Primary System Relief Valve Position-ADS	2	Closed/Not Closed or 0 to 50 psia	Closed/ Not Closed	Yes	PS2-71-1/2/3 A/B/C/D	Vital AC	CRP 9-3	None	C1180 C1581 C1582 C1583
SAFETY SYSTEMS:										
D11	Isolation Condenser Shell Side Level	2	Top to Bottom	NOT APPLICABLE TO VERMONT YANKEE						
D12	Isolation Condenser Valve Position	2	Closed/Not Closed	NOT APPLICABLE TO VERMONT YANKEE						

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
CONDENSATE AND FEEDWATER SYSTEM:					
D1	Main Feedwater Flow	3	N/A	N/A	N/A
D2	Condensate Storage Tank Level	3	N/A	N/A	N/A
PRIMARY CONTAINMENT RELATED SYSTEMS:					
D3	Suppression Chamber Spray Flow	2	Needed	N/A	Yes
D4	Drywell Pressure	2	Yes	N/A	Yes
D5	Suppression Pool Water Level	2	Yes	Yes	Yes
D6	Suppression Pool Water Temp	2	Yes	N/A	Yes
D7	Drywell Atmosphere Temp	2	Yes	N/A	Yes
D8	Drywell Spray Flow	2	Needed	N/A	Yes
MAIN STEAM SYSTEM:					
D9	MSL Isolation Valve Leakage Control	2	NOT APPLICABLE TO VERMONT YANKEE		
D10	Primary System Relief Valve Position ADS	2	Yes	Yes	Yes
SAFETY SYSTEMS:					
D11	Isolation Condenser Shell Side Level	2	NOT APPLICABLE TO VERMONT YANKEE		
D12	Isolation Condensor Valve Position	2 2	NOT APPLICABLE TO VERMONT YANKEE		

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
SAFETY SYSTEMS: (Continued)										
D13	RCIC Flow	2	0-110% Design	0-500 gpm	No	FT13-58	Vital AC	CRP 9-4	None	None
D14	HPCI Flow	2	0-110% Design	0-5000 gpm	No	FT23-82	125 V DC Dist. Panel	CRP 9-3	None	None
D15	Core Spray Flow	2	0-110% Design	0-5000 gpm	No	FT14-40A/B	120V Inst. AC	CRP 9-3	None	None
D16	LPCI Flow	2	0-110% Design	0-20000 gpm	No	FT10-109A/B	120V Inst. AC	CRP 9-3	CRP 9-3	None
D17	SLCS Flow	2	0-110% Design	0-2000 psig	No	PT11-52	120V Inst. AC	CRP 9-5	None	None
D18	SLCS Tank Level	2	Bottom to Top	0-127.5 inches	No	LT11-45	120V Inst. AC	CRP 9-5	None	None
RHR SYSTEM:										
D19	RHR System Flow	2	0-110% Design	0-20000 gpm	Yes	FT10-109A/B	ES10 -145A/B	CRP 9-3	CRP 9-3	None
D20	RHR Heat Ex. Outlet Temp	2	40°F to 350°F	0 to 300°F	Yes	TE10-93A/B TE10-95A/B	Inst. AC		CRP 9-21	M062 W098 M064 W099
COOLING WATER SYSTEM:										
D21	Cooling Water Temp. to ESF Components	2	40°F to 200°F	0 to 150°F	Yes	TE10-94A/B	Inst AC CKT 17	None	9-21	None
D22	Cooling Water Flow to ESF Components	2	0-110% Design	0-200 psig	No	FT10-97A/B	120V Inst. AC	CRP 9-3	None	None

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
SAFETY SYSTEMS: (Continued)					
D13	RCIC Flow	2	Yes	N/A	Yes
D14	HPCI Flow	2	Yes	N/A	Yes
D15	Core Spray	2	N/A	N/A	Yes
D16	LPCI Flow	2	Needed	N/A	Yes
D17	SLCS Flow	2	No	N/A	Yes
D18	SLCS Level	2	No	N/A	Yes
RHR SYSTEM:					
D19	RHR System Flow	2	Needed	N/A	Yes
D20	RHR Heat Ex. Outlet Temp.	2	N/A	N/A	Yes
COOLING WATER SYSTEM:					
D21	Cooling Water Temp. to ESF Components	2	N/A	N/A	Yes
D22	Cooling Water Flow to ESF Components	2	N/A	N/A	Yes

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
RADWASTE SYSTEM:										
D23A	High Radioactivity Liquid Tank Levels	3	Top to Bottom	0-140 inches	No	LT20-369	120V Inst. AC		Radwaste Panel	
D23B	High Radioactivity Liquid Tank Levels	3	Top to Bottom	0-336 inches	No	LT20-395	120V Inst. AC		Radwaste Panel	
D23C	High Radioactivity Liquid Tank Levels	3	Top to Bottom	0-140 inches	No	LT20-420	120V Inst. AC		Radwaste Panel	
D23D	High Radioactivity Liquid Tank Levels	3	Top to Bottom	0-250 inches	No	LT20-437	120V Inst. AC		Radwaste Panel	
D23E	High Radioactivity Liquid Tank Levels	3	Top to Bottom	0-215 inches	No	LT20-388A	120V Inst. AC		Radwaste Panel	
D23F	High Radioactivity Liquid Tank Levels	3	Top to Bottom	0-215 inches	No	LT20-388B	120V Inst. AC		Radwaste Panel	
VENTILATION SYSTEM:										
D24	Emergency Vent. Damper Position	2	Open/Closed	Open/Closed	Yes	SB-9/10/11/12	AC-DP-5 PP-9A	CRP 9-26	None	None
POWER SUPPLIES:										
D25	Standby Power Status and Other Safety Energy Sources	2								
A	4160 V Emergency Bus 3 Voltage		0-5000 V dc	0-5000 V ac		EI-20		CRP 9-8		E006
B	4160 V Emergency Bus 4 Voltage		0-5000 V dc	0-5000 V ac		EI-21		CRP 9-8		E007
C	DG 1-1A Watts		0-4000 kW	0-4000 kW		EI-43		CRP 9-8		
D	DG 1-1B Watts		0-4000 kW	0-4000 kW		EI-42		CRP 9-8		
E	DG 1-1A Frequency		55-65 Hz	55-65 Hz		EI-36		CRP 9-8		
F	DG 1-1B Frequency		55-65 Hz	55-65 Hz		EI-35		CRP 9-8		
G	125V DC Dist. PNL DC-1 Voltage		0-150 V dc	0-150 V dc		EI-52A/B 27-1		CRP 9-8 CRP 9-49		E008
H	125V DC Dist. PNL DC-2 Voltage		0-150 V dc	0-150 V dc		EI-53A/B 27-2		CRP 9-49 CRP 9-8		E009
I	125V DC Battery Bus DC-2As		0-150 V dc	0-150 V dc				CRP 9-8		

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
RADWASTE SYSTEM:					
D23A	High Radioactivity Liquid Tank Level	3	N/A	N/A	N/A
D23B	High Radioactivity Liquid Tank Level	3	N/A	N/A	N/A
D23C	High Radioactivity Liquid Tank Level	3	N/A	N/A	N/A
D23D	High Radioactivity Liquid Tank Level	3	N/A	N/A	N/A
D23E	High Radioactivity Liquid Tank Level	3	N/A	N/A	N/A
D23F	High Radioactivity Liquid Tank Level	3	N/A	N/A	N/A
D24	Emergency Damper Vent Position	2	Yes	N/A	Yes
D25	Standby Power Status	2	Yes	N/A	Yes

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
D25 (con't)										
J.	MCC89 B Voltage (UPS-1A)	2	0-600 V ac	0-600 V ac		N/A		CRP 9-3	None	None
K.	MCC89 B Voltage (UPS-1B)	2	0-600 V ac	0-600 V ac		N/A		CRP 9-3	None	None
L.	120/240 V Uninterruptable AC Voltage	2	0-150/ 0-300 V ac	0-150/ 0-300 V ac		Needed		Local Panel	None	None
M.	120/240 V Uninterruptable AC Frequency	2	55-65 Hz	55-65 Hz		Needed		Local Panel	None	None
N.	ECCS 240 dc Bus A Voltage	2	0-24 V dc	0-24 V dc						
O.	ECCS 240 dc Bus B Voltage	2	0-24 V dc	0-24 V dc						
CONTAINMENT RADIATION:										
E1	Primary Containment Area High Rad	1	1R/Hr to 10^7R/Hr	1R/Hr to 10^7R/Hr	Yes	RM16-19-1A/B	Vital AC Inst. AC	CRP 9-3	CRP 9-2	None
E2	Rx Bldg./Secondary Containment Area Rad.	3	10^{-1}R/Hr to 10^4R/Hr	0 to 10^4MR/Hr 0 to 10^3MR/Hr	Yes	RM17-453A/B 17-452A/B	RPSA/B	CRP 9-10	CRP 9-2	None
AREA RAD:										
E3	Rad Exposure Rate (Safety Access Areas)	3	10^{-1} to 10^4R/Hr	0 to 10^4MR/Hr	No	RM18-56 1-16	Inst. AC	CRP 9-11	None	M000 M059 M067 M069 M073
AIRBORNE RADIOACTIVE MATERIAL RELEASES:										
E4	Drywell/Standby Gas Treatment Purge Flow	2	10^{-6} uCi/cc to 10^5 uCi/cc- 0-110% Design	NOT NEEDED DUE TO STACK EXHAUST						
E5	Secondary Containment Purge Flow and Secondary Containment	2	10^{-6} uCi/cc to 10^4 uCi/cc 0-110% Design	NOT NEEDED DUE TO STACK EXHAUST						
E6	Secondary Containment Rx Shield Building Annulus	2	10^{-6} uCi/cc to 10^4 uCi/cc	NOT APPLICABLE TO VERMONT YANKEE						

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
E1	Ctnt High Range Radiation Monitors	1	Yes	Yes	Yes
E2	Reactor Bldg Area Rad	3	Needed	N/A	Yes
E3	Area Rad Monitors	3	Needed	N/A	Yes
E4	Drywell Stby Gas Treatment Purge Flow	2	N/A	N/A	Yes
E5	Secondary Ctnt Purge Flow	2	N/A	N/A	Yes
E6	Secondary Ctnt Rx Shield Building Annulus	2	NOT APPLICABLE TO VERMONT YANKEE		

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
E7	Auxiliary Building	2	10^{-6} uCi/cc to 10^{3} uCi/cc 0-110% Design	NOT NEEDED DUE TO STACK EXHAUST						
E8	Common Plant Vent	2	10^{-6} uCi/cc to 10^{4} uCi/cc 0-110% Design	10^{-7} to 10^{-1} uCi/cc	No	None	DG-1	CRP 9-2	CRP 9-2	M001
	(If SGTS is Included)		10^{-6} to 10^{4} ucI/cc	10^{-2} to 10^{5} uCi/cc		17-155A		CRP 9-2	CRP 9-2	
AIRBORNE RADIOACTIVE MATERIALS RELEASED:										
E9	All Other Identified Release Pts.	2	10^{-6} to 10^{2} uCi/cc 0-110% Design	NOT NEEDED DUE TO STACK EXHAUST						
E10	Particulates and Halogens	3	10^{-3} to 10^{2} uCi/cc 0-110% Design	10^{-3} to 10^{2} uCi/cc	No	Stack Grab Sample	N/A	N/A	N/A	N/A
ENVIRONS RADIATION AND RADIOHALOGENS:										
E11	Airborne Radio-halogen	3	10^{-9} to 10^{-3} uCi/cc	10^{-9} to 10^{-3} uCi/cc	N/A	Portable Sampling	N/A	N/A	N/A	N/A
E12	Plant and Environ Rad. (Portable)	3	10^{-3} to 10^{4}R/Hr Photons and Beta	10^{-3} to 10^{2}R/Hr Beta 10^{-3} to 10^{4}R/Hr Photons	N/A	Portable Sampling	N/A	N/A	N/A	N/A
E13	Isotopic Analysis	3	Multi Channel Gamma Ray Spectrometer							
METEOROLOGY:										
E14	Wind Direction	3	0-360° .1 mph Start ±.5% Accuracy @ 10° Deflection 0-360° ± 3°	Accuracy Deflection Starting .75 mph .4 Delay Dist. Less 1 Meter	No	Wind Direction	John Deere Diesel	None	Relay House Primary CRP 9-48 Backup	Relay House
E15	Wind Speed	3	0-50 mph ±.5 mph For Speed 5 mph or Less Start @ 1 mph	.6 to 90 mph .6 Start Accuracy ± 190 or .15 mph-Greater of Two; Start .6 mph Distance Constant 5 feet	No	Wind Speed	John Deere Diesel	None	Relay House Primary CRP 9-48 Backup	Relay House

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
E7	Auxiliary Bldg	2	N/A	N/A	Yes
E8	Common Plant Vent	2	Yes	N/A	Yes
E9	Other Identified Release Points	2	N/A	N/A	Yes
E10	Particulates, and Halogens	3	N/A	N/A	N/A
E11	Airborne Radio Halogen	3	N/A	N/A	N/A
E12	Plant and Environ Rad Portable	3	N/A	N/A	N/A
E13	Isotopic Analysis	3	N/A	N/A	N/A
E14	Wind Direction	3	N/A	N/A	N/A
E15	Wind Speed	3	N/A	N/A	N/A

ITEM NUMBER	VARIABLE	CATEGORY	REQUIRED RANGE	AVAILABLE RANGE	REDUNDANCY	INSTRUMENT NUMBER	POWER SUPPLY	INDICATOR	DISPLAY RECORDER	COMPUTER
E16	Estimation of Atmospheric Stability	3	Based on Vert. Temp. Diff. -9°F to 18°F ±.3°Fper 164 feet Interval	-5°F to +15°F Accuracy ± .1°C/Top to Bottom	No	Delta Temp.	John Deere Diesel	None	Relay House Primary CRP 9-48 Backup	Relay House
ACCIDENT SAMPLING:										
E17	Primary Coolant Sample:	3	Grab Sample	Same	No	Grab Sample	NA	NA	NA	NA
	. Gross Activity		1 uCi/ml to 10 Ci/ml							
	. Gamma Spectrum		Isotopic Analysis							
	. Boron Content		0-1000 ppm							
	. Chloride Content		0-20 ppm							
	. Dissolved Hydrogen		0-2000 cc (stp)							
	. Dissolved Oxygen		0-20 ppm							
	. pH		1 to 13							
E18	Containment Air:									
	. Hydrogen Content	3	0-10 Vol. % 0-30 Vol. %	Same	No	Grab Sample	NA	NA	NA	NA
	. Oxygen Content		0-30 Vol. %							
	. Gamma Spectrum		Isotopic Analysis							

ITEM NUMBER	VARIABLE	CATEGORY	ENVIRONMENTAL QUALIFICATION	SEISMIC QUAL.	QA
E16	Atmospheric Stability	3	N/A	N/A	N/A
E17	Primary Coolant Sample	3	N/A	N/A	N/A
E18	Containment Air	3	N/A	N/A	N/A