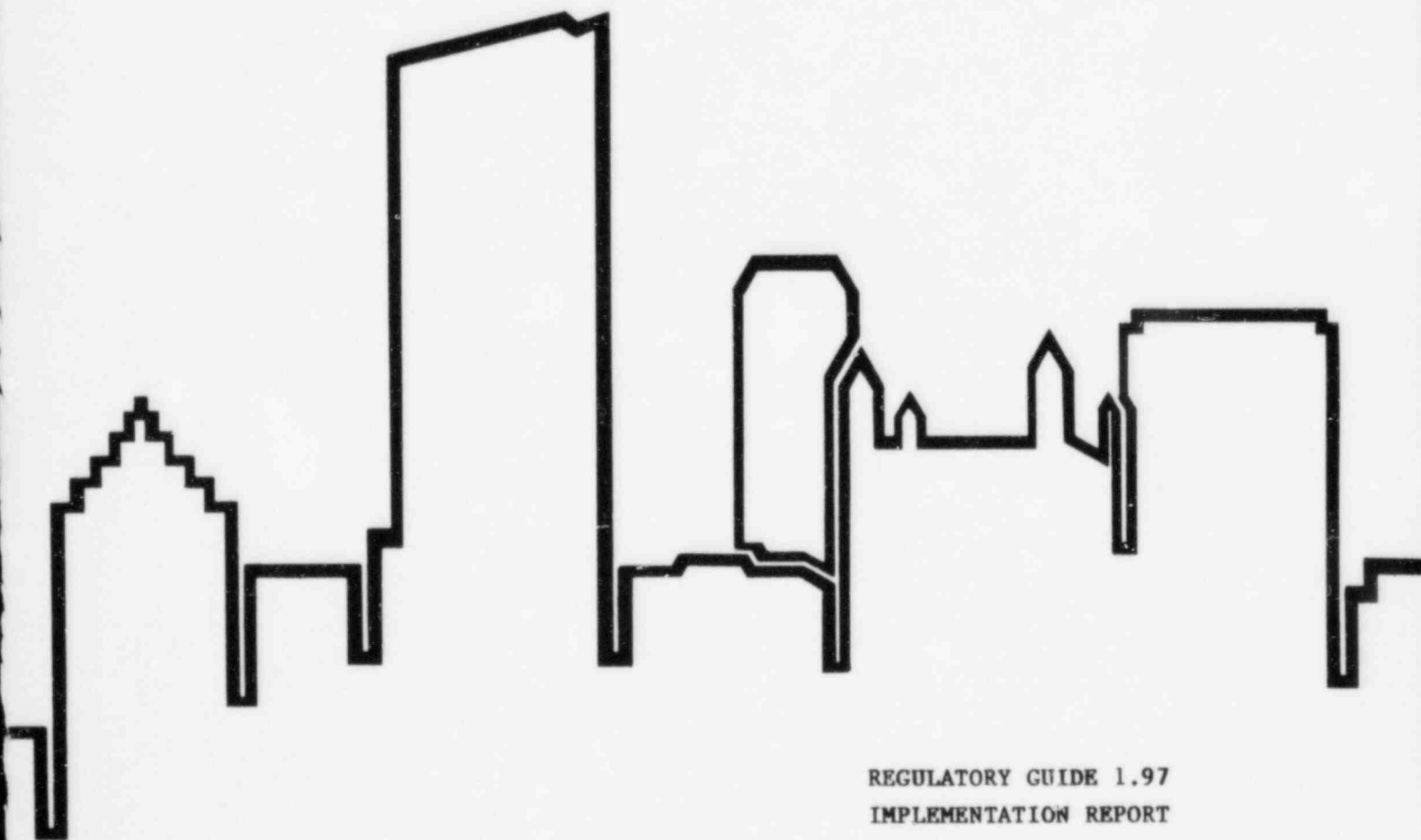




Duquesne Light



REGULATORY GUIDE 1.97
IMPLEMENTATION REPORT

Beaver Valley Power Station - Unit No. 2
Duquesne Light Company

September 15, 1983

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SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
			<u>Environmental</u>	<u>Seismic</u>					
RCS pressure (WR)	0-3,000 psig	A1, B1, C1, B2, C2, D2	Yes	Yes	3 per plant	3 meters 1 recorder	fuel load	IE	Yes
RCS T _{hot} (WR)	0-700°F	A1, B2	Yes	Yes	1 per loop	3 meters 3 recorders	fuel load	IE	Yes
RCS T _{cold} (WR)	0-700°F	A1, B2	Yes	Yes	1 per loop	3 meters 3 recorders	fuel load	IE	Yes
Steam generator level (WR)	0-100% of span	A1, B1, B2, D2	Yes	Yes	1 per steam generator	3 meters 3 recorders	complete	IE	Yes
Steam generator level (NR)	0-100% of span	A1, B1, D2	Yes	Yes	3 per steam generator	9 meters 3 recorders	fuel load	IE	Yes
Pressurizer level	0-100% of span	A1, B1, D2	Yes	Yes	3 per plant	3 meters 3 recorders	complete	IE	Yes
Containment pressure	-5 to 65 psig	A1, B1, B2, C2, D2	Yes	Yes	4 per plant	4 meters 2 recorders	complete	IE	Yes
Steamline pressure	0 to 1,200 psig	A1, B1, D2	Yes	Yes	3 per loop	9 meters 3 recorders	complete	IE	Yes
Containment water level (WR)	0-200 in	A1, B1, B2, C2, D2	Yes	Yes	2 per plant	2 meters 1 recorder	complete	IE	Yes

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SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
			<u>Environmental</u>	<u>Seismic</u>					
Containment water level (NR)	0-12 in	A1, B1, B2, C2, D2	Yes	Yes	2 per plant	2 meters 1 recorder	fuel load	IE	Yes
Refueling water storage tank level	0-700 in	D2	Yes	Yes	2 per plant	2 meters 1 recorder	complete	IE	Yes
Primary Plant DWST level	0-350 in	A1, D2	Yes	Yes	3 per plant	3 meters 1 recorder	fuel load	IE	Yes
Auxiliary feedwater flow	0-400 gpm	A1, B1, D2	Yes	Yes	2 per loop	6 meters 3 recorders	fuel load	IE	Yes
Core exit temperature	200-2300°F	A1, B1, C1	Yes	Yes	51	plasma display	fuel load	IE	Yes
Containment area radiation level (high range)	Later*	A1, B1, B2, E2	Yes	Yes	2 per plant	1 per channel	fuel load	IE	Yes
Secondary system radiation	Later*	A1, B2, E2	Yes	Yes	2 per plant	1 per channel	fuel load	IE	Yes
RCS subcooling	200°F sub-cooling to 35°F super-heated	A2, B2	Yes	Yes	2 per plant	plasma display	fuel load	IE	Yes

SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u> <u>Environmental</u>	<u>Seismic</u>	<u>Number</u> <u>of Channels</u>	<u>Indicator</u> <u>Device</u>	<u>Implementation</u> <u>Date</u>	<u>Power</u> <u>Supply</u>	<u>Conformance</u>
Control rod position	In/out	B3	No	No	1/rod	1 status light/rod	complete	non-IE	Yes
Neutron flux	1 to 10^6 CPS 10^{-11} to 10^{-3} AMPS 0-200% of power	B1	No	No	Later*	Later*	fuel load	IE	No (4)
Reactor vessel level instrumentation system	0-100% plenum & core height	B2, C2	Yes	Yes	2 per plant	plasma display	fuel load	IE	No (5)
Containment hydrogen concentration	0-10%	B1, C1	Yes	Yes	2 per plant	plasma display	fuel load	IE	Yes
Plant vent radiation level	Later*	C2, E2	Yes	Yes	1 per plant	1 meter 1 recorder	fuel load	IE	Yes
Containment isolation valves status	Open/closed	C2, D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Containment pressure (extended range)	0-180 psia	C1, C2	Yes	Yes	2 per plant	2 meters 1 dual recorder	complete	IE	Yes

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SAFETY RELATED DISPLAY INSTRUMENTATION

Variable	Range/Status	Type/Category	Qualification		Number of Channels	Indicator Device	Implementation Date	Power Supply	Conformance
			Environmental	Seismic					
Primary coolant activity	1 μ ci/ml to 10 ci/ml	C3	No	No	N/A	Analysis	complete	non-IE	Yes
Site environmental radiation level	Later*	C3, E3	No	No	N/A	Portable	complete	non-IE	Yes
Pressurizer heater power availability	Closed-trip	D2	Yes	Yes	1 per heater	7 pair lights per heater	complete	IE	No (6)
PORV status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Charging system flow	0-150 gpm	D2	Yes	No	1 per plant	1 meter	complete	non-IE	Yes
Primary safety valve status	Open/closed	D2	Yes	Yes	1 per valve	plasma display	fuel load	IE	Yes
Letdown flow	0-200 gpm	D2	Yes	No	1 per plant	1 meter	complete	non-IE	Yes
Volume control tank level	0-100% of span	D2	Yes	No	1 per plant	1 meter	complete	non-IE	Yes
CVCS valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes

SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
Decay heat removal valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Main steamline isolation valve status	Open/closed	B2, D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Main steamline isolation bypass valve	Open/closed	B2, D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
S/G safety valve status	Open/closed	D2	Yes	Yes	1 per valve	plasma display	fuel load	IE	Yes
RCP seal injection flow	0-15 gpm	D2	Yes	No	1 per pump	3 meters	complete	non-IE	Yes
S/G atmospheric steam dump valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Main feedwater con- trol valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Main feedwater control bypass valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes

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SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
			<u>Environmental</u>	<u>Seismic</u>					
Main feedwater isolation valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Main feedwater flow	0-5 MPPH	D2	Yes	Yes	2 per S/G	6 meters	complete	IE	Yes
S/G blowdown isola- tion valves status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
HHSI flow	0-1,000 gpm	D2	Yes	Yes	1 per train	2 meters	complete	IE	Yes
LHSI flow	0-5,000 gpm	D2	Yes	No	1 per train	2 meters	complete	non-IE	Yes
ECCS valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Auxiliary feedwater valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Containment spray flow	0-110%	D2	Yes	Yes	1 per pump	4 meters	complete	IE	Yes
Containment spray system valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes

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SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
			<u>Environmental</u>	<u>Seismic</u>					
CCW header pressure	0-150 psig	D2	Yes	Yes	1 per header	3 meters	complete	non-IE	Yes
CCW header temperature	0-200°F	D2	Yes	Yes	1 per header	3 meters	complete	non-IE	Yes
CCW surge tank level	0-70 in	D2	Yes	Yes	1 per tank	2 meters	complete	IE	Yes
CCW flow	0-7,000 gpm	D2	Yes	Yes	1 per header	2 meters	complete	IE	Yes
CCW valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Service water system valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Service water system pressure	0-150 psig	D2	Yes	Yes	1 per train	2 meters	complete	non-IE	Yes
HVAC	Open/closed	D2	Yes	Yes	1 per damper	1 pair lights per damper	complete	IE	Yes
Ac/dc, vital instrument voltage	Bus specific	D2	Yes	Yes	1 per bus	1 per bus	complete	IE	Yes

SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
			<u>Environmental</u>	<u>Seismic</u>					
RHR heat exchanger discharge temperature	50-400°F	D2	Yes	No	1 per heat exchanger	2 meters	complete	non-IE	Yes
RHR flow	0-5,000 gpm	D2	Yes	Yes	1 per train	2 meters	complete	IE	Yes
RHR valve status	Open/closed	D2	Yes	Yes	1 per valve	1 pair lights per valve	complete	IE	Yes
Reactor trip breaker position	Close-trip	N2	Yes	Yes	1 per breaker	1 pair of lights per breaker	complete	IE	Yes
Turbine stop valve position	0-100%	D2	No	No	1 per valve	4 meters	complete	non-IE	Yes
Turbine throttle valve position	0-100%	D2	No	No	1 per valve	4 meters	complete	non-IE	Yes
Motor driven auxiliary feedwater pump status	Run-trip	D2	Yes	Yes	1 per pump	1 pair lights per pump	complete	IE	Yes
Turbine driven auxiliary feedwater pump status	Open/close	D2	Yes	Yes	1 per steam admission valve	1 pair of lights per valve	complete	IE	Yes

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SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
			<u>Environmental</u>	<u>Seismic</u>					
Safety injection pump status	Run-trip	D2	Yes	Yes	1 per pump	1 pair lights per pump	complete	IE	Yes
Service water pump status	Run-trip	D2	Yes	Yes	1 per pump	1 pair lights per pump	complete	IE	Yes
CCW pump status	Run-trip	D2	Yes	Yes	1 per pump	1 pair lights per pump	complete	IE	Yes
Control room radiation	Later*	E2	Yes	Yes	1 per room	1 per room	fuel load	IE	Yes
Service water to recirculation heat exchanger concentration from liquid pathways	Later*	E2	Yes	Yes	1 per pathway	1 per pathway	fuel load	IE	Yes
Plant vent air flow rate	0 to 75,000 SFCM	E2	Yes	Yes	2	2 meters	complete	IE	Yes
Meteorological parameters	parameter specific	E3	No	No	1	None	fuel load	non-IE	No (7)

SAFETY RELATED DISPLAY INSTRUMENTATION

<u>Variable</u>	<u>Range/Status</u>	<u>Type/Category</u>	<u>Qualification</u>		<u>Number of Channels</u>	<u>Indicator Device</u>	<u>Implementation Date</u>	<u>Power Supply</u>	<u>Conformance</u>
			<u>Environmental</u>	<u>Seismic</u>					
Condenser air ejector radiation									
Air ejector discharge	Later*	E3	No	No	one per vent	one per vent	fuel load	non-IE	Yes
Air ejector delay ted exhaust	Later*	E3	No	No	one per vent	one per vent	fuel load	non-IE	Yes
SI accumulator tank level									No (8)
SI accumulator tank pressure									No (8)
SI accumulator isolation valve status									Yes (8)
Boric acid charging flow									No (9)
RCS soluble boron concentration	50-6000 ppm	B3	No	No	1	1 per channel	fuel load	non-IE	Yes
Analysis of primary coolant (gamma spectrum)	Isotopic analysis	E3	N/A	N/A	1	analysis	fuel load	non-IE	Yes

REGULATORY GUIDE 1.97 REVISION 2 IMPLEMENTATION REPORT (SEE NOTES 1,2,3)

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SAFETY RELATED DISPLAY INSTRUMENTATION

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NOTES

1. Quality Assurance is in accordance with the BVPS-2 program defined in FSAR Chapter 17.
2. EOF and TSC indications of the BVPS-2 Post Accident Monitoring Instrumentation will be addressed in the TSC and EOF submittals.
3. The BVPS-2 Design Basis only identified the key variables that are used for monitoring the performance of safety systems and other systems normally employed for attaining a safe shutdown condition. Per the definitions in the Design Basis, these variables are designated Type D, Category 2. The preferred backup variables to the Type D variables are not specified in this document. Since these variables are designated Type D, Category 3, the instrumentation is only required to be high quality commercial grade without any post-accident environmental qualification. A decision was made not to specifically identify the potential long list of instrumentation available at BVPS-2 that meets this definition. Indeed, if the list were generated, it would be much more inclusive than the variables identified in Reg. Guide 1.97, Revision 2.
4. The installed equipment is a standard Westinghouse Nuclear Instrumentation system, powered from a battery backed Class 1E Power Source. The equipment contains isolated monitoring channels which cover the range required to be monitored. The equipment is suitable for normal operation, and the qualified instrument rack portion is installed in the control room which is an accessible and controlled mild environment. Currently, no sensors are commercially available with post-accident environmental qualification; therefore no implementation schedule can be provided at this time. Borating the primary system after an accident per the EOP's ensure that adequate shutdown margin is maintained.

5. BVPS-2 is installing the Westinghouse differential pressure Reactor Vessel Level Instrumentation System (RVLIS). This is an acceptable system for measuring coolant level in the reactor according to Generic Letter 82-28. BVPS-2 uses Core Exit Temperature and RCS Subcooling to support operation according to the Westinghouse Owners Group Emergency Response Guidelines. These guidelines require that the RVLIS meet Regulatory Guide 1.97 Category 2 criteria only. Operator verification of flows during safety injection operation and stringent termination criteria preclude the need for RVLIS under design basis accidents
6. Pressurizer Heater Status - Regulatory Guide 1.97, Rev. 2 specified that heater current was the preferred parameter for determining heater status. For BVPS-2 heater breaker position, not current indication, was selected for determining pressurizer heater status due to hardware considerations. Breaker position provides adequate indication to the operator to ensure the pressurizer heaters are operable.
7. The recommended ranges for this instrumentation are: Wind speed 0 to 67 and -9 to 18°F for estimation of atmospheric stability. The instrumentation to be installed will cover the following ranges: Wind speed 0 to 50 mph and estimation of atmospheric stability T (150-35 ft) -4.0 to +8.0°F; (500-35 ft) -6.0 to +12.0°F. The instrumentation for wind speed meets the guidance of Regulatory Guide 1.23. The vertical temperature ranges cover the range of lapse rates (change of temperature with height) guidance of Reg. Guide 1.23 required to estimate the atmospheric stability class.
8. The licensing basis assumed in the BVPS-2 Regulatory Guide 1.97 Revision 2 Design Document was that a safe shutdown condition was a hot standby condition. Parameters necessary to monitor the status of the plant while proceeding to a cold shutdown condition are not included in the Design Document. The accumulator pressure, accumulator isolation valve status and accumulator nitrogen vent valve status were identified as Category 2 only if the plant has committed to safety grade cold shutdown.

9. The Westinghouse Owner's Group Emergency Response Guidelines do not consider boric acid charging flow as a parameter to be used by operators during or following an accident. Under these conditions borated water is pumped from the large volume RWST into the RCS. BVPS-2 has designated RWST level, HHSI flow, LHSI flow, containment water level and emergency core cooling system (ECCS) valve status for monitoring the performance of the ECCS since the ECCS does not normally take suction from the boric acid tank. If boration is used following an accident, qualified charging flow indication and RCS sampling are used to demonstrate that the RCS is being adequately borated.
10. The installed instrumentation is designed to Category 3 criteria and the measured temperature is from 0° to 200°F. The Westinghouse Owners Group Emergency Response Guidelines do not require operator action based on containment temperature indication, but rather use containment pressure indication, therefore containment temperature is considered a Category 3 parameter, and the existing range is adequate for normal operation.
11. The Westinghouse Owner's Group Emergency Response Guidelines do not require operator action based on containment sump water temperature indication. At saturated condition, sump water temperature can be inferred from containment pressure. Containment spray system valve status and containment spray flow indications are used to demonstrate that the Emergency Core Cooling System is operating properly when taking suction from the containment sump.

WR = Wide range.

NR = Narrow range.

* = Range/Status information for radiation monitors is not final.