

BWR OWNERS' GROUP

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BWROG-10043
September 10, 2010

Project No. 691

Michael D. McCoppin, Acting Chief
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Re: DRAFT SAFETY EVALUATION (SE) FOR BOILING WATER REACTORS OWNERS' GROUP TOPICAL REPORT (TR) NEDO-33349, REVISION 1, "BOILING WATER REACTOR APPLICATION TO REGULATORY GUIDE 1.97, REVISION 4," (TAC NO. MD6697)

ENCLOSURE: Intended Mark-up Changes to NEDO-33349, Revision 1, Table A-1

REFERENCES:

1. BWR Owners' Group Letter From Randy Bunt Dated August 31, 2007 Containing Licensing Topical Report NEDO-33349
2. Letter Dated August 4, 2008 from NRC Containing Request For Additional Information
3. Letter Dated August 19, 2008 from NRC Containing Request For Additional Information
4. Letter Dated June 16, 2009 from NRC Containing Supplemental Request For Additional Information
5. Letter Dated May 14, 2010 from NRC Containing Request For Input to Draft Safety Evaluation (SE)

Dear Mr. McCoppin:

Please find the BWROG response (enclosure) to the NRC request for a markup of Table A-1 of the subject Licensing Topical Report NEDO-33349, Revision 1.

Reference 1 is associated with the BWROG request for NRC acceptance of NEDO-33349, Revision 1. References 2 and 3 are associated with the Requests for Additional Information (RAI) related to NEDO-33349, Revision 1. Reference 4 is associated with the Supplemental Request for Additional Information (SRAI) related to NEDO-33349, Revision 1. Reference 5 is associated with request for Draft Safety Evaluation (SE) input.

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During discussions in December 2009 following submittal of SRAI responses, the NRC requested the BWROG to provide a clean markup of the subject table for incorporation into the Final Safety Evaluation for NEDO33349 R1

Attachment 1 contains NRC requested changes to NEDO-33349 R1, Table A-1 – *Accident Monitoring Variables Comparisons*.

We look forward to your timely review of these responses, and would be happy to meet with you to discuss any remaining issues. Should you have additional questions regarding this submittal, please contact Michael Iannantuono (BWROG - Project Manager) at 910-819-1956.

Regards,

A handwritten signature in black ink, appearing to read 'F. Schiffley II', with a large, sweeping flourish at the end.

Frederick P. "Ted" Schiffley, II
Chairman
BWR Owners' Group

cc: J.A. Golla, NRC
M.H. Crowthers, BWROG Vice Chairman
C.J. Nichols, BWROG Program Manager
BWROG Primary Representatives
A. Klemptner, DTE
M.A. Iannantuono, GEH

Attachment 1: NEDO-33349 R1,
Table A-1 – *Accident Monitoring Variables Comparisons*

Table A-1 – Accident Monitoring Variables Comparison

Variable	RG 1.97 Rev 2 Table 1		RG 1.97 Rev 3 Table 2		IEEE-497 Consistent with RG 1.97 Rev 4			BWR/4 Typical		Comments
	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Type A Variables										Type A parameters are plant specific and Category 1 in RG 1.97. From a BWR safety analysis perspective, these parameters are considered Type A consistent with the criteria identified in RG 1.97 Rev. 3. The typical Plant listed their Type A as also meeting other Rev 2 Type variables as required
Reactor Water Level	A	1	A	1	A, B, C	Y	Y	A,B	1	
Reactor Pressure	A	1	A	1	A, B, C	Y	Y	A,B,C	1	
Drywell Pressure	A	1	A	1	A, B, C	Y	Y	A,B,C, D	1	
Suppression Pool Temperature	A	1	A	1	A, B, C	Y	Y	A,D	1	
Suppression Pool Water Level	A	1	A	1	A, B, C	Y	Y	A,C,D	1	
Type B Variables										
Reactivity Control										
Neutron Flux	B	1	B	1	B, D	N	N	B	2	Classification based on NRC Safety Evaluation Report for BWROG LTR NEDO-31558.
Control Rod Position	B	3	B	3	D	N	N	B	3	Type D because function is to demonstrate safety system performance.
RCS Soluble Boron Concentration (Grab Sample)	B	3	B	3	N/A			B	3	Not a BWR required parameter to measure RCS boron. Some plants refer to SBLC boron tank soluble boron

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Core Cooling										
Coolant Level in Reactor	B	1	B	1	A, B, C	Y	Y	B	1	Deviation approved for range.
BWR Core Thermocouple	B	1			N/A			N/A		NRC approved deviation
BWR Core Temperature			B							NRC approved deviation.
Maintaining Reactor Coolant System Integrity										
RCS Pressure	B	1	B	1	A, B, C	Y	Y	B	1	RPV pressure.
Drywell Pressure	B	1	B	1	A, B, C	Y	Y	B	1	
Drywell Sump Level	B	1	B	1	N/A			B	3	NRC approved deviation.
Maintaining Containment Integrity										
Primary Containment Pressure	B	1	B	1	A, B, C	Y	Y	B	1	Drywell pressure provides containment pressure indication.
Primary Containment Isolation Valve Position (excluding check valves)	B	1	B	1				B	1	
<u>Drywell Pressure</u>					<u>A, B, C</u>	<u>Y</u>	<u>Y</u>			<u>Not included in RG 1.97 Rev 2/3</u>
<u>Suppression Pool Temperature</u>					<u>A, B, C</u>	<u>Y</u>	<u>Y</u>			<u>Not included in RG 1.97 Rev 2/3</u>
<u>Suppression Pool Water Level</u>					<u>A, B, C</u>	<u>Y</u>	<u>Y</u>			<u>Not included in RG 1.97 Rev 2/3</u>
MSIV position switches					D	Y	Y			Type D because function is to demonstrate safety system performance.
Cleanup system isolation valve position switches					D	Y	Y			Type D because function is to demonstrate safety system performance.

Table A-1 – Accident Monitoring Variables Comparison

Variable	RG 1.97 Rev 2 Table 1		RG 1.97 Rev 3 Table 2		IEEE-497 Consistent with RG 1.97 Rev 4			BWR/4 Typical		Comments
	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Shutdown cooling system isolation valve position switches					D	Y	Y			Type D because function is to demonstrate safety system performance.
Other RPV normally open isolation valve position switches on valves inside containment					D	Y	Y			Type D because function is to demonstrate safety system performance.
Other RPV normally closed isolation valve position switches on valves inside containment that require opening for a LOCA					D	Y	Y			Type D because function is to demonstrate safety system performance.
Other RPV normally open isolation valve position switches on valves outside primary containment					D	Y	Y			Type D because function is to demonstrate safety system performance.
Other RPV normally closed isolation valve position switches on valves outside primary containment that require opening for pipe breaks outside primary containment					D	Y	Y			Type D because function is to demonstrate safety system performance.
Other RPV normally closed isolation valve position switches on valves that do not require opening for either a LOCA or pipe breaks outside of containment					D	N	N			Type D because function is to demonstrate safety system performance. Position is known prior to an accident. Both isolation valves not assumed to spuriously operate.

Table A-1 – Accident Monitoring Variables Comparison

Variable	RG 1.97 Rev 2 Table 1		RG 1.97 Rev 3 Table 2		IEEE-497 Consistent with RG 1.97 Rev 4			BWR/4 Typical		Comments
	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Normally open containment isolation valve position switches on valves inside containment					D	Y	Y			Type D because function is to demonstrate safety system performance.
Normally closed containment isolation valve position switches on valves inside containment that require opening for a LOCA					D	Y	Y			Type D because function is to demonstrate safety system performance.
Containment isolation valve position switches on valves outside primary containment that require opening for a LOCA					D	Y	Y			Type D because function is to demonstrate safety system performance.
Normally closed containment isolation valve position switches on valves inside or outside containment that do not require opening for a LOCA					D	N	N			Type D because function is to demonstrate safety system performance. Position is known prior to an accident. Both isolation valves not assumed to spuriously operate.

Table A-1 – Accident Monitoring Variables Comparison

Variable	RG 1.97 Rev 2 Table 1		RG 1.97 Rev 3 Table 2		IEEE-497 Consistent with RG 1.97 Rev 4			BWR/4 Typical		Comments
	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Type C Variables										
Fuel Cladding										
Radioactivity Concentration or Radiation Level in Circulating Primary Coolant	C	1	C	1	N/A			C	3	NRC approved deviation.
Analysis of Primary Coolant (Gamma spectrum)	C	3	C	3	N/A			C	3	NRC approved deviation
BWR Core Thermocouples	C	1			N/A			N/A		NRC approved deviation
BWR Core Temperature			C							NRC approved deviation.
<u>Reactor Water Level</u>					<u>A, B, C</u>					<u>Not included in RG 1.97 Rev 2/3</u>
Reactor Coolant Pressure Boundary										
RCS Pressure	C	1	C	1	A, B, C	Y	Y	A,B,C	1	Reactor pressure.
Primary Containment Area Radiation	C	3	C	3	E	N	N	C,E	1	Not relied on in accident analysis or EPGs for fuel cladding integrity.
Drywell Drain Sump Level (Identified and Unidentified Leakage)	C	1	C	1	N/A			C	3	NRC approved deviation.
Suppression Pool Water Level	C	1	C	1	A, B, C	Y	Y	C	1	
<u>Suppression Pool Temperature</u>					<u>A, B, C</u>	<u>Y</u>	<u>Y</u>			<u>Not included in RG 1.97 Rev 2/3</u>
Drywell Pressure	C	1	C	1	A, B, C	Y	Y	C	1	
<u>Reactor Water Level</u>					<u>A, B, C</u>	<u>Y</u>	<u>Y</u>			<u>Not included in RG 1.97 Rev 2/3</u>
Containment										
RCS Pressure	C	1	C	1	A, B, C	Y	Y	A,B,C	1	Reactor pressure.

Table A-1 – Accident Monitoring Variables Comparison

Variable	RG 1.97 Rev 2 Table 1		RG 1.97 Rev 3 Table 2		IEEE-497 Consistent with RG 1.97 Rev 4			BWR/4 Typical		Comments
	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Primary Containment Pressure	C	1	C	1	A, B, C	Y	Y	A,B,C, D	1	Drywell pressure.
<u>Suppression Pool Water Temperature</u>					<u>A, B, C</u>					<u>Not included in RG 1.97 Rev 2/3</u>
<u>Suppression Pool Water Level</u>					<u>A, B, C</u>					<u>Not included in RG 1.97 Rev 2/3</u>

Table A-1 – Accident Monitoring Variables Comparison

Variable	RG 1.97 Rev 2 Table 1		RG 1.97 Rev 3 Table 2		IEEE-497 Consistent with RG 1.97 Rev 4			BWR/4 Typical		Comments
	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Containment and Drywell Hydrogen Concentration	C	1	C	1	N/A			A,C	1	Provided for severe accident mitigation. Commercial grade equipment is acceptable. Consistent with 10CFR50.44.
Containment and Drywell Oxygen Concentration (for inerted containment plants)	C	1	C	1	N/A			A,C	1	Provided for severe accident mitigation. Commercial grade equipment is acceptable. Consistent with 10CFR50.44. Oxygen monitored during normal operation.
Containment Effluent Radioactivity – noble gases (from identified release points including Standby Gas Treatment)	C	3	C	3	E	N	N	C	3	Plant Deviation approved Cat 3.
Radiation Exposure Rate (including buildings or areas, e.g. auxiliary building, fuel handling building, secondary containment, which are in direct contact with primary containment where penetrations and hatches are located)	C	2			E	N	N	C,E	3	Plant deviation approved for Cat 3
Radiation Exposure Rate (including buildings or areas, e.g. auxiliary building, fuel handling building, secondary containment, which are in direct contact with primary containment where penetrations and hatches are located)			deleted	deleted	E	N	N			NRC approved deviation.

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Variable	RG 1.97 Rev 2 Table 1		RG 1.97 Rev 3 Table 2		IEEE-497 Consistent with RG 1.97 Rev 4			BWR/4 Typical		Comments
	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Effluent radioactivity – noble gases (from buildings or areas where penetrations and hatches are located , e.g., auxiliary building, fuel handling building, secondary containment, which are in direct contact with primary containment)	C	2	C	2	E	N	N	C,E	3	Typical Plant included as Type C and E consistent with RG 1.97 Rev 2 commitments. Approved deviation from Cat 2 to Cat 3
Type D Variables										
Condensate and Feedwater Systems										
Main Feedwater Flow	D	3	D	3	N/A			D	3	Normal operating system.
Condensate Storage Tank Level	D	3	D	3	D	N	N	D	3	Normal operating system.
Primary Containment Related Systems										
Suppression Chamber Spray Flow	D	2	D	2	D	Y	Y	D	2	Approved deviations allows RHR system flow and valve position
Drywell Pressure	D	2	D	2	A, B, C	Y	Y	A,B,C, D	2	
Suppression Pool Water Level	D	2	D	2	A, B, C	Y	Y	A,B,C	2	
Suppression Pool Water Temperature	D	2	D	2	A, B, C	Y	Y	A,D	2	
Drywell Atmosphere Temperature	D	2	D	2	D	Y	N	D	2	
Drywell Spray Flow	D	2	D	2	D	Y	Y	D	2	Approved deviation allows RHR system flow and valve position

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Main Steam System										
Main Steamline Isolation Valves Leakage Control System Pressure	D	2	D	2	N/A			deleted		NRC approved process for elimination of MSIV leakage control system in NEDC-31858P . Plant specific review needed to determine if variable is required.
Primary System Safety Relief Valve Positions, Including ADS or Flow Through or Pressure in Valve Line	D	2	D	2	D	N	N	D	2	NEDO-33160 A contains NRC acceptance of change in requirements for SRV position indication
Safety Systems										
Neutron Flux					B, D	N	N			See NEDO- 331558. Not identified as Type D in RG 1.97 Rev 2/3
Control Rod Position					D	N	N			Not identified as Type D in RG 1.97 Rev 2/3
Isolation Condenser System Shell-Side Water Level	D	2	D	2	D	Y	Y	N/A		Applies plants with isolation condenser only.
Isolation Condenser System Valve Position	D	2	D	2	D	Y	Y	N/A		Applies plants with isolation condenser only.
RCIC Flow	D	2	D	2	D	N	N	D	2	RCIC required only for anticipated operational occurrences.
HPCI Flow	D	2	D	2	D	Y	Y	D	2	HPCI or HPCS flow.
Core Spray System Flow	D	2	D	2	D	Y	Y	D	2	LPCS system flow
LPCI System Flow	D	2	D	2	D	Y	Y	D	2	

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
SLCS Flow	D	2	D	2	D	N	N	D	3	Standby liquid control system pumps running. System not required for anticipated operational occurrences or accidents.

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
SLCS Storage Tank Level	D	2	D	2	D	N	N	D	3	System not required for anticipated operational occurrences or accidents.
Standby Gas Treatment Flow					<u>D</u>	<u>N</u>	<u>N</u>			Not included in RG 1.97 Rev 2/3
Equipment Area Cooling System Cooling Water Temperature					<u>D</u>	<u>N</u>	<u>N</u>			Not included in RG 1.97 Rev 2/3
Residual Heat Removal System										
RHR System Flow	D	2	D	2	D	Y	Y	D	2	
RHR Heat Exchanger Outlet Temperature	D	2	D	2	D	Y	Y	D	2	
Cooling Water Systems										
Cooling Water Temperature to ESF System Components	D	2	D	2	D	Y	Y	D	2	NRC approved as a deviation based on providing alternate means.
Cooling Water Flow to ESF System Components	D	2	D	2	D	Y	Y	D	2	RHR service water flow and essential service water flow.
Radwaste Systems										
High Radioactivity Liquid Tank Level	D	3	D	3	N/A			D	3	Normal operating system.
Ventilation Systems										
Emergency Ventilation Damper Position	D	2	D	2	D	Y	Y	D	2	Differential pressure is an acceptable alternative.
Power Supplies										
Status of Standby Power and Other Energy Sources Important to Safety	D	2	D	2	D	Y	Y	D	2	AC and DC power and pneumatic

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
(hydraulic, pneumatic)										system pressure.

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Type E Variables										
Containment Radiation										
Primary Containment Area Radiation – High Range	E	1	E	1	E	NY	NY	E	1	Type E variable not Category 1. Retained as RG 1.97 Revision 2 and 3 Type E Category 1 variable with requirements contained in NUREG 0737.
Reactor Building or Secondary Containment Area Radiation										
10 ⁻¹ R/hr to 10 ⁴ R/hr for Mark I and II containments	E	2	E	2	E	N	N	E	3	Reactor building area radiation.
1 R/hr to 10 ⁷ R/hr for Mark III containment	E	1	E	1	E	N	N	N/A	N/A	Mark III only
Area Radiation										
Radiation Exposure Rate (inside buildings or areas where access is required to service equipment important to safety)	E	2			E	N	N	E	3	Main control room and areas requiring access
Radiation Exposure Rate (inside buildings or areas where access is required to service equipment important to safety)			E	3						

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Airborne Radioactive Materials Released from Plant										
Noble Gases and Vent Flow Rate <ul style="list-style-type: none"> • <u>Drywell Purge, Standby Gas Treatment System Purge (For Mark III and II plants) and Secondary Containment Purge (for Mark III plants)</u> • <u>Secondary Containment Purge (for Mark I, II and III plants)</u> • <u>Secondary Containment (reactor shield building annulus, if in design)</u> • <u>Auxiliary Building (including any building containing primary system gates, e.g. waste gas decay tank)</u> • <u>Common Plant Vent or Multi-purpose Vent Discharging Any of Above Releases (if drywell or SGTS purge is included)</u> • <u>Offgas System Release Point Radiation Level</u> • <u>All Other Identified Release Points</u> 	E	2	E	2	E	N	N	E	2	Plant specific list. Includes all potential release points.
Particulates and Halogens. All Identified Plant Release Points. Sampling with Onsite Sampling Capability	E	3	E	3	E	N	N	E	3	

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Enviorns Radiation and Radioactivity										
Airborne Radiohalogens and Particulates (portable sampling with onsite analysis capability)	E	3			E	N	N	E	3	Portable instrumentation can be used.
Plant and Enviorns Radiation (portable instrumentation)	E	3			E	N	N	E	3	Portable instrumentation can be used.
Plant and Enviorns Radioactivity (portable instrumentation)	E	3			E	N	N	E	3	Portable instrumentation can be used.
Meteorology										
Wind Direction	E	3	E	3	E	N	N	E	3	
Wind Speed	E	3	E	3	E	N	N	E	3	
Estimation of Atmospheric Stability	E	3	E	3	E	N	N	E	3	

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	Type	Cat.	Type	Cat.	Type	EQ	SQ	Type	Cat.	
Accident Sampling										.
Primary Coolant and Sump	E	3	E	3	N/AE	<u>N</u>	<u>N</u>	E	3	Grab samples. See PASS LTR NED0-32991 A
Containment Air	E	3	E	3	N/AE	<u>N</u>	<u>N</u>	E	3	Grab samples. See PASS LTR NED0-32991 A