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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 293 - Related to ESBWR Design Certification Application – RAI Number 21.6-92 Supplement 2**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by the Reference 1 NRC letter. GEH response to RAI Number 21.6-92 Supplement 2 is addressed in Enclosure 1.

If you have any questions or require additional information, please contact me.

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

Reference:

1. MFN 09-020, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 293 Related to the ESBWR Design Certification Application*, dated January 8, 2009.

Enclosure:

1. MFN 09-182 – Response to Portion of NRC Request for Additional Information Letter No. 293 - Related to ESBWR Design Certification Application – RAI Number 21.6-92 S02

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF	0000-0097-1032

Enclosure 1

MFN 09-182

Response to Portion of NRC Request for

Additional Information Letter No. 293

Related to ESBWR Design Certification Application

RAI Number 21.6-92 S02

NRC RAI 21.6-92 S02

Code version summaries for FWTOD and Initial Core analysis

The response to RAI 21.6-92 S01 provided code versions for DCD safety analysis in a table. Provide a similar table for the code versions used for the LTR NEDO-33338, "ESBWR Feedwater Temperature Operation Domain Transient and Accident Analysis" and LTR NEDO-33337 "ESBWR Initial Core Transient Analysis".

GEH Response

Table 21.6-92 S02-1 provides the codes used in each safety analysis performed for LTR NEDO-33337 and NEDO-33338. In the right-most column, justification is provided for the use of non-Level 2 versions of TRACG04 for the analyses.

Each category of safety analysis has been broken down in more detail due to the potential that different code modifications are used in different analyses. Table 21.6-92 S02-2 provides the code details based on the abbreviated code version/modification description in Table 21.6-92 S02-1. For GEH/GNF codes, the GEH/GNF QA level, the hardware platform / operating system and executable revision date is given. The tables compiled do not list codes related to stress, dynamic and seismic analyses of structural, mechanical and piping components.

DCD Impact

No DCD changes will be made in response to this RAI.

No changes to the subject LTR will be made in response to this RAI.

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code						
Safety Analysis		**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
				SP1[2]	**SP2[3]**	
Stability Evaluation						
Baseline Decay Ratio Analysis - BOC	Core Wide	TRACG04	T4-1, P11-9, TG6-5, G8-1	T4-1, P11-9, TG6-5, G8-1	N/A	Level 2 Used
	Regional	TRACG04	T4-1, P11-8, TG6-5, G8-1			
Baseline Decay Ratio Analysis - MOC	Core Wide	TRACG04	T4-1, P11-9, TG6-5, G8-1	T4-1, P11-9, TG6-5, G8-1	N/A	Level 2 Used
	Regional	TRACG04	T4-1, P11-8, TG6-5, G8-1			
Baseline Decay Ratio Analysis – EOC (Core Wide)		TRACG04	T4-1, P11-9, TG6-5, G8-1	N/A	N/A	Level 2 Used
AOO Decay Ratio Analysis		TRACG04	N/A	T4-1, P11-9, TG6-5, G8-1	N/A	Level 2 Used
Startup Stability 3-D Kinetics Analysis		TRACG04	T4PN5504, P11-9, TG6-5, G8-1	N/A	N/A	No L2 version available. Used most qualified NL2 available, which runs faster on PC.
LOCA Containment Pressurization Analysis						
Feedwater Line Break – Nominal Analysis		TRACG04	N/A	T4PN53, G8-1	T4PN53, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code					
Safety Analysis	**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
			SP1[2]	**SP2[3]**	
Main Steam Line Break – Nominal Analysis	TRACG04	N/A	T4PN53,G8-1	T4PN53, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Feedwater Line Break – Bounding Analysis	TRACG04	N/A	T4PN53,G8-1	T4PN53,G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Main Steam Line Break – Bounding Analysis (0-72 hrs)	TRACG04	N/A	T4PN53,G8-1	T4PN53,G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
LOCA ECCS Analysis					
GDCS Line Break – Nominal Analysis	TRACG04	N/A	T4PN53, G8-1	T4PN53, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
GDCS Line Break – Bounding Analysis	TRACG04	N/A	T4PN53, G8-1	T4PN53, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code					
Safety Analysis	**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
			SP1[2]	**SP2[3]**	
Anticipated Operational Occurrence Analysis					
Loss of Feedwater Heating	TRACG04	T4-1, P11-8, TG6-5, G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Closure of One Turbine Control Valve	TRACG04	T4-1,P11-8,TG6-5,G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Generator Load Rejection with Turbine Bypass	TRACG04	T4-1,P11-8,TG6-5,G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Generator Load Rejection with a Single Failure in the Turbine Bypass System	TRACG04	T4-1,P11-8,TG6-5,G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Turbine Trip with Turbine Bypass	TRACG04	T4-1,P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Turbine Trip with a Single Failure in the Turbine Bypass System	TRACG04	T4-1,P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Closure of One Main Steamline Isolation Valve	TRACG04	T4-1,P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Closure of All Main Steamline Isolation Valves	TRACG04	T4-1,P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Loss of Condenser Vacuum	TRACG04	T4-1,P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code					
Safety Analysis	**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
			SP1[2]	**SP2[3]**	
Loss of Shutdown Cooling Function of RWCU/SDC	N/A	N/A	N/A	N/A	N/A
Inadvertent Isolation Condenser Initiation	TRACG04	T4-1,P11-8,TG6-5,G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Runout of One Feedwater Pump	TRACG04	T4-1,P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Opening of One Turbine Control or Bypass Valve	TRACG04	T4-1,P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Loss of Non-Emergency AC Power to Station Auxiliaries	TRACG04	T4-1, P11-8, TG6-5,G8-1	N/A	N/A	Level 2 Used
Loss of All Feedwater Flow	TRACG04	T4-1, P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Infrequent Event Analysis					
Loss of Feedwater Heating With Failure of Selected Control Rod Run-In	TRACG04	T4-1, P11-8,TG6-5,G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
1000 Fuel rod Failure Radiological Consequences Analysis	N/A	N/A	N/A	N/A	N/A
Feedwater Controller Failure – Maximum Demand	TRACG04	T4-1, P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Pressure Regulator Failure - Opening of All Turbine Control and Bypass Valves	TRACG04	T4-1, P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Pressure Regulator Failure – Closure of All Turbine Control and Bypass Valves	TRACG04	T4-1, P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code					
Safety Analysis	**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
			SP1[2]	**SP2[3]**	
Generator Load Rejection with Total Turbine Bypass Failure	TRACG04	T4-1, P11-8,TG6-5,G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Turbine Trip with Total Turbine Bypass Failure	TRACG04	T4-1, P11-8,TG6-5,G8-1	N/A	N/A	Level 2 Used
Control Rod Withdrawal Error During Refueling	N/A	N/A	N/A	N/A	N/A
Control Rod Withdrawal Error During Startup	N/A	N/A	N/A	N/A	N/A
Control Rod Withdrawal Error During Power Operation	N/A	N/A	N/A	N/A	N/A
Fuel Assembly Loading Error, Mislocated Bundle	N/A	N/A	N/A	N/A	N/A
Fuel Assembly Loading Error, Misoriented Bundle	N/A	N/A	N/A	N/A	N/A
Inadvertent SDC Function Operation	N/A	N/A	N/A	N/A	N/A
Inadvertent Opening of a Safety/Relief Valve	TRACG04	T4-1, P11-8, TG6-5, G8-1	N/A	N/A	Level 2 Used
Inadvertent Opening of a Depressurization Valve	N/A	N/A	N/A	N/A	N/A
Stuck Open Safety/Relief Valve	TRACG04	T4-1, P11-8,TG6-5,G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Liquid-Containing Tank Failure	N/A	N/A	N/A	N/A	N/A

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code					
Safety Analysis	**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
			SP1[2]	**SP2[3]**	
Accident Analysis					
Fuel Handling Accident	N/A	N/A	N/A	N/A	N/A
LOCA Inside Containment – Radiological	N/A	N/A	N/A	N/A	N/A
Main Steamline Break Outside Containment	N/A	N/A	N/A	N/A	N/A
Control Rod Drop Accident	N/A	N/A	N/A	N/A	N/A
Feedwater Line Break Outside Containment	N/A	N/A	N/A	N/A	N/A
Failure of Small Line Carrying Primary Coolant Outside Containment	N/A	N/A	N/A	N/A	N/A
RWCU/SDC System Line Failure Outside Containment	N/A	N/A	N/A	N/A	N/A
Spent Fuel Cask Drop Accident	N/A	N/A	N/A	N/A	N/A
Special Event Analysis					
MSIV Closure With Flux Scram (Overpressure Protection)	TRACG04	T4-1, P11-8, TG6-5, G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Shutdown Without Control Rods (i.e., SLC system shutdown capability)	N/A	N/A	N/A	N/A	N/A
Shutdown from Outside Main Control Room	N/A	N/A	N/A	N/A	N/A
ATWS – MSIV Closure with ARI	N/A	N/A	N/A	N/A	N/A
ATWS – MSIV Closure with FMCRD Run-In	N/A	N/A	N/A	N/A	N/A

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code					
Safety Analysis	**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
			SP1[2]	**SP2[3]**	
ATWS – MSIV Closure – SLC System Bounding Case	TRACG04	T4PN53, P11-8, TG6-5, G8-1	T4PN53, P11-9, TG6-5, G8-1	T4PN53, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
ATWS – Loss of Condenser Vacuum SLC System Bounding Case	TRACG04	T4PN53, P11-8, TG6-5, G8-1	T4PN53, P11-9, TG6-5, G8-1	T4PN53, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
ATWS – Loss of Feedwater Heating with Boron Injection	N/A	N/A	N/A	N/A	N/A
ATWS – Loss of Normal AC Power to Station Auxiliaries with Boron Injection	N/A	N/A	N/A	N/A	N/A
ATWS – Loss of Feedwater Flow with Boron Injection	N/A	N/A	N/A	N/A	N/A
ATWS – Load Rejection with a Single Failure in the Turbine Bypass System with Boron Injection	N/A	N/A	N/A	N/A	N/A
ATWS – Core Stability	TRACG04	N/A	T4PN53, P11-9, TG6-5, G8-1	N/A	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Station Blackout	TRACG04	T4-1, P11-8, TG6-5, G8-1	T4PN53, P11-9, TG6-5, G8-1	T4-1, P11-8, TG6-5, G8-1	PC version, T4PN53, and the Alpha Level 2 Version, T4-1 are the same technically. T4PN53 is used due to faster running time.
Safe Shutdown Fire	N/A	N/A	N/A	N/A	N/A
Waste Gas System Leak or Failure	N/A	N/A	N/A	N/A	N/A

Table 21.6-92 S02-1 ESBWR LTR Safety Analysis Code Versions[1] with Rationale for Non-Level 2 TRACG Code					
Safety Analysis	**Primary Analysis Code**	**NEDO-33337 Rev. 0**	**NEDO-33338 Rev. 0**		**Rationale for use of TRACG04 NL2 Version**
			SP1[2]	**SP2[3]**	
Notes:					
1. See Table 21.6-92S02-2 for details of code version.					
2. SP1 refers to the reactor operating point at 100% core power and 160°C (320°F) FW temperature.					
3. SP2 refers to the reactor operating point at 85% power, 252.2°C/486°F FW temperature to provide additional power maneuvering capability in ESBWR.					

Table 21.6-92 S02-2 ESBWR LTR Safety Analysis Code Version Details				
Version ID	**Code Version**	**QA Level**	**Hardware Platform / Operating System**	**Executable Revision Date or Code Modification**
T4-1[1]	TRACG04A	Level 2	Alpha / Open VMS	2005-06-27 17:12:40.20
T4PN53[1]	TRACG04P	Non-Level 2	PC / Windows	2005-09-29 12:00:00:00
T4PN5504	TRACG04P	Non-Level2	PC/ Windows	2007-03-10
G8-1	GESTR08V	Level 2	VAX / Open VMS	02/1994
P11-8	PANAC11A	Level 2	Alpha / Open VMS	04/13/2006
P11-9	PANAC11A	Level 2	Alpha / Open VMS	06/14/2007
TG6-5	TGBLA06A	Level 2	Alpha / Open VMS	01/18/2007
Notes:				
1. These two versions of TRACG04 are the same technically; however, were compiled on different platforms. The PC version can accommodate a larger problem size.				