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U.S. Nuclear Regulatory Commission
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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 124 Related to ESBWR Design Certification Application – Turbine Main Steam System – RAI Number 10.2-27**

Enclosure 1 contains GEH's response to the subject RAI transmitted via Reference 1.

Should you have any questions about the information provided here, please contact me.

Sincerely,

R. E. Brown for,

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 08-029, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 124 Related to the ESBWR Design Certification Application,* January 14, 2008

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 124 Related to ESBWR Design Certification Application – Turbine Main Steam System - RAI Number 10.2-27

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	eDRF	0000-0080-8793

Enclosure 1

MFN 08-210

Response to Portion of NRC Request for

Additional Information Letter No. 124

Related to ESBWR Design Certification Application

Turbine Main Steam System

RAI Number 10.2-27

NRC RAI 10.2-27

DCD Tier 2, Section 10.2.1.1, Revision 3, states that the main steam stop valve and steam line from the stop valve to the turbine are analyzed to maintain structural integrity following a safe shutdown earthquake (SSE). This statement was deleted in Revision 4. However, this is inconsistent with footnote (9) in Table 3.2-1. Please clarify the seismic design of the turbine stop valves.

GEH Response

The main steam lines from the turbine stop valves (including the stop valves and the control valves) to the turbine nozzles are classified as Quality Group D components in accordance with Regulatory Guide 1.26, Regulatory Position C.1(c) and Branch Technical Position 3-1. They are not required to be safety-related or Seismic Category I. However, they are designed to maintain structural integrity under safe shutdown earthquake (SSE) loading conditions, in accordance with Regulatory Guide 1.29, Regulatory Position C.1(e) and SECY 93-087, Section II.E.

DCD Tier 2, Revision 4, Subsection 10.2.2.1, states "TG system components, equipment, and piping are classified as discussed in Section 3.2." Further clarification of the seismic design requirements will be included in DCD Revision 5. This will include clarification of footnote 9 on Table 3.2-1.

DCD Impact

DCD Tier 1, Section 2.11 will include the attached markup page in Revision 5.

DCD Tier 1, Table 2.11.1-1 will include the attached markup pages in Revision 5.

DCD Tier 2, Table 3.2-1 will be revised in Revision 5 as noted on the attached markup pages.

DCD Tier 2, Figure 3.2-1 will be revised in Revision 5 as noted on the attached markup page.

2.11 POWER CYCLE

The following subsections describe the major power cycle (i.e., generation) systems for the ESBWR.

2.11.1 Turbine Main Steam System

Design Description

The Turbine Main Steam System (TMSS) supplies steam generated in the reactor to the Turbine Generator, moisture separator reheaters, steam auxiliaries and turbine bypass system. The TMSS does not include the seismic interface restraint, main turbine stop valves or bypass valves.

The TMSS consists of four lines from the seismic interface restraint to the main turbine stop valves. The TMSS is nonsafety-related. Regulatory Guide 1.26 Quality Group B portions of the TMSS are designed in accordance with ASME Boiler and Pressure Vessel Code, Section III, Class 2 requirements. The TMSS is located in the Reactor Building steam tunnel and Turbine Building.

(1) The functional arrangement of the TMSS is as described in Subsection 2.11.1.

(2) The ASME Code Section III components of the TMSS retain their pressure boundary integrity under internal pressures that will be experienced during service.

(3) Upon receipt of an MSIV closure signal, the SAIV(s) close(s)and required MSIV fission product leakage path TMSS drain valve(s) open(s).

(4) The SAIV(s) fail(s) closed and required MSIV fission product leakage path TMSS drain valve(s) fail(s) open on loss of electrical power to the valve actuating solenoid or on loss of pneumatic pressure.

(5) TMSS piping, which consists of the piping (including supports) for the MSL from the seismic interface restraint (or seismic guide) to the turbine stop valves (non-inclusive), turbine bypass valves (non-inclusive) and the connecting branch lines 6.35 cm. (2.5 in.) and larger up to and including the first isolation valve which is either normally closed or capable of automatic closure during all modes of normal reactor operation~~including the SAIV(s) from the seismic interface restraint to the main stop and main turbine bypass valves and the required MSIV fission product leakage path~~, is classified as Seismic Category II.

(6) The integrity of the as-built ~~main steam valve~~MSIV leakage path to the condenser (main steam piping, bypass piping, required drain piping, and main condenser) is not compromised by non-seismically designed systems, structures and components.

(7) The non-seismic portion of the MSIV leakage path to the condenser (main steam piping from the stop valve (inclusive) to turbine nozzle, bypass piping, required drain piping, and main condenser) maintains structural integrity under SSE loading conditions.

~~(7)~~(8)The TMSS piping provides a nominal turbine inlet (throttle) pressure that is consistent with assumptions in Abnormal Event analyses.

(8) Hydraulic Control Unit for Control Rod Drive System — Each hydraulic control unit (HCU) is a factory-assembled, engineered module of valves, tubing, piping, and stored water that controls two control rod drives by the application of pressure and flow to accomplish rapid insertion for reactor scram.

Although each HCU is field installed as a unit and connected to process piping, many of its internal parts differ markedly from process piping and components because of the more complex functions of the HCUs. Thus, although the codes and standards invoked by the different quality groups (A, B, C and D) apply to the interfaces between the HCUs and connections to conventional piping components (e.g., pipe nipples, fittings, hand valves, etc.), they are not considered applicable to the specialty parts (e.g., solenoid valves, pneumatic components, and instruments).

However, the design and construction specifications for the HCUs do invoke such codes and standards as can be reasonably applied to individual parts in developing required quality levels. For example: (1) all welds are inspected using liquid penetrant, (2) all socket welds are inspected for gaps between the pipe and socket bottom, (3) all welding is performed by qualified welders, and (4) all work is performed in accordance with written procedures. Quality Group D is generally applicable because the codes and standards invoked by that group permit the use of manufacturer's standards and proven design techniques that are not explicitly defined within the codes for Quality Groups A, B or C. This is supplemented by appropriate quality control (QC) techniques.

(9) Main Turbine ~~Control System~~ —Turbine steam leads from the stop valves to the inlet nozzles, including stop and control valves, are Quality Group D and designed to withstand the SSE and maintain its pressure-retaining integrity.

All cast pressure-retaining parts of a size and configuration for which volumetric methods are effective are examined by radiographic methods by qualified personnel. Ultrasonic examination to equivalent standards is used as an alternative to radiographic methods. Examination procedures and acceptance standards are at least equivalent to those defined in Paragraph 136.4, Nonboiler External Piping, ASME B31.1.

The following qualifications are met with respect to the certification requirements:

a. The manufacturer of the turbine stop valves, turbine control valves, turbine bypass valves, and main steam lines from turbine control valve to turbine casing uses quality control procedures at least equivalent to those defined in GE Publication GEZ-4982A, General Electric Large Steam Turbine Generator Quality Control Program.

b. A certification obtained from the manufacturer of these valves and steam lines demonstrates that the quality control program as defined has been accomplished.

The following requirements are applied in addition to the Quality Group D requirements:

a. All longitudinal and circumferential butt weld joints are radiographed (or ultrasonically tested to equivalent standards). Where size or configuration does not permit effective volumetric examination, magnetic particle or liquid penetrant examination may be substituted. Examination procedures and acceptance standards are at least equivalent to those specified as supplementary types of examinations, Paragraph 136.4 in ASME B31.1.

Table 2.11.1-1

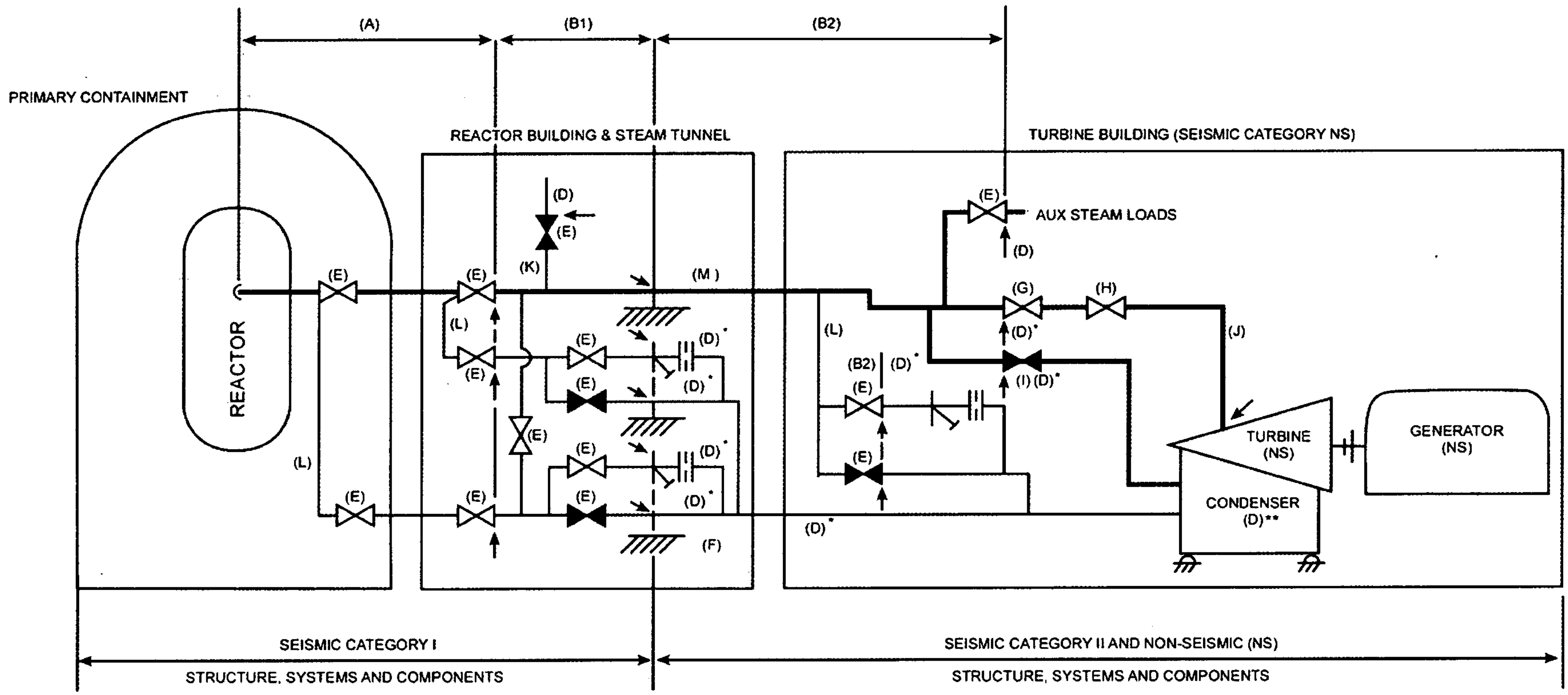
Turbine Main Steam System ITAAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
7. The non-seismic portion of the MSIV leakage path to the condenser (main steam piping from the stop valve (inclusive) to turbine nozzle, bypass piping, required drain piping, and main condenser) maintains structural integrity under SSE loading conditions	An analysis of the as-built non-seismic portion of the MSIV leakage path to the condenser will be performed to verify that it maintains structural integrity under SSE loading conditions.	A report exists and demonstrates that the as-built non-seismic portion of the MSIV leakage path to the condenser (main steam piping from the stop valve (inclusive) to turbine nozzle, bypass piping, required drain piping, and main condenser) maintains structural integrity under SSE loading conditions.
~~7~~8. The TMSS piping provides a nominal turbine inlet (throttle) pressure that is consistent with assumptions in Abnormal Event analyses.	Inspection and/or analysis of the as-built TMSS piping will be performed to confirm the nominal turbine inlet (throttle) pressure.	A report exists and concludes that the TMSS piping provides a nominal turbine inlet (throttle) pressure of [6.57 MPaG (953 psig)].

Table 3.2-1

Classification Summary

Principal Components[1]	Safety Class.[2]	Location[3]	Quality Group[4]	QA Req.[5]	Seismic Category[6]	Notes
N POWER CYCLE SYSTEMS						
N11 Turbine Main Steam System (TMSS)						
1. Turbine Main Steam System (TMSS) consists of the piping (including supports) for the MSL from the seismic interface restraint (or seismic guide) to the turbine stop valves, turbine bypass valves and the connecting branch lines up to and including their isolation valves.	N	TB	B	B	II	**Main Steam Lines** – TMSS lines are designed to ASME Section III Code, Class 2. Lines smaller than 63.5 mm (2.5 inches) are NS. Also see Figure 3.2-1.
2. Other mechanical and electrical modules	N	TB	D	E	NS	
N21 Condensate and Feedwater System (C&FS)						
1. Main feedwater line beyond seismic interface restraint	N	TB	D	E	NS	See Figure 3.2-2
N22 Heater Drain and Vent System (HDVS)	N	TB	—	E	NS	
N25 Condensate Purification System (CPS)	N	TB	D	E	NS	
N31 Main Turbine	~~N~~	~~TB~~	—	~~E~~	~~NS~~	
1. Turbine stop valves (TSVs), turbine control valves (TCVs) and main steam leads from the TSVs to the turbine casing	N	TB	D	E	NS	(9)
2. All other system components	N	TB	—	E	NS	
N32 Turbine Generator Control System (TGCS)	N	TB	— ~~D~~	E	NS	~~(9)~~
N33 Turbine Gland Seal System (TGSS)	N	TB	D	E	NS	
N34 Turbine Lubricating Oil System (TLOS)	N	TB	—	E	NS	



LEGEND:

A. QUALITY GROUP A
B 1. QUALITY GROUP B
B 2. QUALITY GROUP B, SEISMIC CATEGORY II
D. QUALITY GROUP D
E. ISOLATION VALVE
F. SEISMIC INTERFACE RESTRAINT
G. TURBINE STOP VALVE
H. TURBINE CONTROL VALVE

I. TURBINE BYPASS VALVE
J. MAIN STEAM LEAD
K. INSTRUMENT BRANCH LINE
L. DRAIN LINE
M. STEAM LINE
NS NON-SEISMIC
↙ CLASSIFICATION CHANGE

* ANALYZED TO DEMONSTRATE STRUCTURAL INTEGRITY UNDER SSE LOADING CONDITIONS FOR MSIV LEAKAGE PATH

** CONDENSER SUPPORTS AND ANCHORS ARE DESIGNED TO MAINTAIN CONDENSER INTEGRITY FOLLOWING SSE FOR MSIV LEAKAGE HOLDUP VOLUME.

Figure 3.2-1. Quality Group and Seismic Category Classification Applicable to Power Conversion System