ENCLOSURE 3

MFN 05-081

Revised Responses to ATWS RAIs 2.1, 2.4, 3.1, and 6.4

These revised responses replace the response previously provided in GE Letter, MFN 04-027, dated 03/10/2004

Non-Proprietary Version

IMPORTANT NOTICE

This is a non-proprietary version of Enclosure 1 to MFN 05-081, which has the proprietary information removed. Portions of the enclosure that have been removed are indicated by an open and closed bracket as shown here [[ ]]

NRC RAI I-2.0, Determining the Peak Clad Temperature (PCT)
The MLTR states that [[

]] The following questions are related to the PCT.

NRC RAI I-2.1
Explain how, during an ATWS event, the hot bundle operation will be constrained by the same operating thermal limits as at the maximum core flow condition. Wouldn't the fuel experience thermal overpower conditions that are higher than the peak design limits?

GE Response
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]] However, the fuel acceptance criteria for ATWS are the 10 CFR 50.46 limits.

NRC RAI I-2.4
Explain why the ATWS analysis performed at the minimum core flow statepoint is more limiting than the analysis performed at the maximum achievable core statepoint for the EPU/MELLLA+ operation.

GE Response
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]] Therefore, ATWS analysis is performed at the minimum core flow state point. Table 2.4-1 below provides a representative comparison between an ATWS overpressure and an ASME overpressure event.

Table 2.4-1

Item	Response	ASME Overpressure (sec)	ATWS (sec)
1	[[		
2			
3			
4			
5			
6			
7			
8			]]

NRC RAI I-3.0, Applicability of the ODYN Licensing Methodology to ATWS Analyses
The Emergency Procedure Guidelines (EPGs) require a number of operator actions, and they allow a range of water level control strategies during isolation ATWS events, from 2 feet below the feedwater spargers to the minimum steam cooling water level (MSCWL). However, limitations in the approved ODYN methodology only allows for an ATWS calculation with a minimum water level of top-of-active (TAF+5 ft), and do not allow for accurate modeling of all required operator actions (such as depressurization when the heat capacity temperature limit (HCTL) is reached). The relevant question is whether the approved ODYN ATWS methodology provides conservative results that can be used to evaluate the impact of MELLLA+ operation on ATWS performance.

NRC RAI I-3.1
Provide a description of the approved ODYN ATWS methodology and its limiting assumptions (e.g., control level at TAF+5, do not depressurize). Provide a description of the treatment of uncertainties in approved ODYN licensing calculations.

GE Response
NEDC-24154P-A, Revision 1, February 2000, Qualification of the One-Dimensional Core Transient Model (ODYN) for Boiling Water Reactors (Supplement 1 -Volume 4), provides the description of the NRC approved ODYN ATWS methodology and assumptions that limit the application range of ODYN. Section 4.1 from the NRC Safety Evaluation for this Supplement (reproduced below) identifies the restrictions on ATWS applications.

4.1 Application Scope of ODYN

GENE proposes to expand the scope of ODYN applications to include ATWS and non-pressurization transients. The LTR under review contains ODYN results to validate its application to ATWS and a discussion and example evaluation of the proposed method for calculating non-pressurization transient ΔCPR. GENE proposes to follow a conservative method for non-pressurization transient ΔCPR calculations discussed in section 5 of the report (ref. 1). Prior to the current modifications ODYN was fully capable of predicting non-pressurization transients and with the current modifications it is also capable of predicting ATWS conditions. During the course of generation of the LTR and the staff review, GENE identified the following restrictions on ODYN ATWS applications:

a. The downcomer level must remain above the jet pump suction and no prolonged level in the active channel is allowed:
b. The duration of the simulation after the upper plenum subcools should be limited.
c. The mass in the separators should not remain zero and, therefore, the code is restricted to applications where the water level remains at or above the top of active fuel plus 5 feet.
d. The code is not presently qualified to perform stability calculations.
e. No lower plenum voiding is allowed.

Section 5.4 of NEDC-24154P-A, (Supplement 1-Volume 4), Input Parameters/Event Simulation, provides a list of the key parameters for ATWS and non-pressurization transients. The NRC Safety Evaluation for Volume 1, NEDO-24154-A, Volume 2, NEDC-24154-A, and Volume 3, NEDE-24154P-A, August 1986 provides a summary of code uncertainties in Section 6.

In Section 5.6 of NEDC-24154P-A, (Supplement 1-Volume 4), it is stated that the ODYN comparison to TRACG and TRAC-BF1 demonstrates that it qualifies as a best estimate code for ATWS analysis, which is conservative in most cases. It is also stated in this section that for ATWS applications, prior regulatory approval has been granted for best-estimate code application based on the low probability of the event, conservatisms in key inputs and the acceptance criteria. [[

]] The approach with ODYN is more conservative than the historical licensing philosophy for ATWS.

NRC RAI I-6.2

For the above cases, provide the sequence of events (system and equipment actuation and operator actions for the mitigated cases) and the corresponding times. For example, for the MSIVC mitigated case, tabulate when the high pressure ATWS setpoint is reached, main steam isolation valve (MSIV) closes, ATWS-RPT occurs, peak vessel pressure is reached, feedwater (FW) reduction is initiated, boron injection initiation temperature (BIIT) is reached, SLC pumps starts, and water level increases.

GE Response

The sequence of events for the MSIVC event is listed below:

BWR4			
Item	**Response**	**OLTP Event Time (sec)**	**M+ Event Time (sec)**
1	[[		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			]]

BWR6*			
Item	**Response**	**OLTP Event Time (sec)**	**M+ Event Time (sec)**
1	[[		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			]]

* For upper plenum boron injection plants, the water level stays at TAF or TAF+5' during the ATWS event. The operators do not need to raise water to promote boron mixing because the boron stratification is not an issue.

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