Attachment

Industry Responses to NRC General Questions on Methodology and Modeling in Support of Containment Protection and Release Reduction of BWR with Mark I and Mark II Containments Rulemaking (CPRR Rulemaking) September 15, 2014

The following responses are provided to clarify the industry statements regarding the methodology and modeling terms used in the EPRI work supporting the CPRR rulemaking.

1) NRC Question: Please clarify when Severe Accident Water Addition (SAWA) is initiated. Please explain whether this is into the reactor pressure vessel (RPV) at multi-sensor core logger (MSCL). *(Note: Correct reference is Minimum Steam Cooling Water Level Limit (MSCWLL))*

   Response: SAWA would be initiated as soon as the operators identify the need for alternative RPV/Drywell (DW) injection systems and identify that SAWA is an available option; this will vary by individual site.

   Additional Modelling Discussion: The EPRI technical basis analysis assumes that RPV SAWA can be deployed within four hours of ELAP initiation based on the procedural direction to restore level. In cases where RPV SAWA is not effective in cooling core debris in the RPV, SAWA through the RPV would be continued as a means to cool core debris in the DW. For cases that assume SAWA into the drywell, the EPRI technical basis analysis assumes that this occurs at the time of vessel breach.

2) NRC Question: Please clarify whether Severe Accident Water Management (SAWM) is basically the same as SAWA with flow throttling to ensure that the wetwell (WW) vent path is preserved. Please describe when SAWA is transitioned to SAWM.

   Response: The first sentence is correct, however, there is no transition. The objective of SAWM is to control the torus water level below the point at which the operators are instructed to isolate the wetwell vent. Actions to limit the SAWA rate to preserve the wetwell vent path would be initiated based on suppression pool (SP) water level approaching the point when wetwell vent isolation would be required. Thus, SAWM would simply be based on the SP level already monitored in the BWROG EOP/SAGs.[1] As SP water level rises, the operators would be expected to gradually reduce the SAWA rate to maintain SP level.

   Additional Modelling Discussion: Given that all Mark I/II containments have SP freeboard (difference between normal level and WW vent termination level) over several hundred thousand to a million gallons of water and the fact that the initial SAWA rate is 500 gpm, there is an extended period of time for the operators to execute SAWM. SAWM actions are the same for RPV SAWA and DW SAWA.

   In the EPRI technical analysis, this is represented by starting to reduce flow from the original

[1] BWR Owner's Group Emergency Operating Procedures / Severe Accident Guidance.

flow rate once the torus level exceeds 18 feet. Adjustments are made to reduce the flow in 30 minute intervals by a factor of 2, not to go below a lower flow rate of 50 gpm. If level drops below 17 feet, then flow is increased using the same relative increases and time intervals as was done to reduce the flow.

3) NRC Question: Please explain why industry is evaluating drywell (DW) venting without a filter (EPRI case 1A). Please clarify whether this is because of liner melt-through.

   Response: Case 1A is required to provide a base case for any plant that may decide to install a severe accident capable drywell vent in compliance with Phase 2 of EA 13-109. This does not relate to liner melt-through.

   Additional Modelling Discussion: Being a base case, it does not include any of the filtering strategies such as severe accident water addition or an external filter.

4) NRC Question: Please explain why industry is not considering DW venting in the absence of SAWM (EPRI cases 2A, 2C, 3A, and 3C), especially if the WW is flooded.

   Response: These cases address Phase 2 Option B.2 of EA 13-109, in which a plant may not be required to have a severe accident capable drywell vent. The original alternative selection process did not include a strategy that involved SAWM.

   Additional Modelling Discussion: The EPRI technical basis analysis assumed that without a severe accident capable drywell vent (2A, 2C, 3A, and 3C), combined with cases where the wetwell vent is unavailable, release will occur due to drywell leakage.

5) NRC Question: Please explain what SAWM means with regard to RPV water addition (EPRI cases 2B, 2D, 2F, and 2H) and describe water management action(s) being performed in this situation.

   Response: As described in the response to Question 2, the SAWM actions are independent of the SAWA path (RPV or DW). SAWM refers to actions taken by the operators to preserve the wetwell vent path by controlling water injection flow rate.

6) NRC Question: Please define "vent control." Please explain if this is considered vent cycling between a specified pressure band. If so, what is the pressure band?

   Response: That is correct.

   Additional Modelling Discussion: Vent control is the same as vent cycling and is being represented in the EPRI technical basis analysis using a 20 psid pressure band. This applies to both venting at PSP (prior to vessel breach) and PCPL (post vessel breach).

7) NRC Question: Please clarify if all EPRI alternatives assume anticipatory venting. If so, please explain at what containment pressure this would occur.

   Response: No.

   Additional Modelling Discussion: For cases with RCIC available, anticipatory venting is modelled in order to maintain SP temperature below the temperature at which long term RCIC operation could be challenged (i.e. 240 °F). In the EPRI technical basis analysis, this is modeled when the drywell pressure reaches 15 psig.

8) NRC Question: Please define "filter path." Please clarify if the filter path is synonymous with vent path. If so, please explain whether the vent path is only out of the WW vent or is it through both the DW and WW vent paths with a common downstream path to the filter.

   Response: For the MAAP analysis, the filter path and the vent path are the same. This utilizes a common downstream pathway to a single filter.

   Additional Modelling Discussion: The analysis assumes a DF of 1000 up until either the aerosol loading limit or the decay heat limits are exceeded. Beyond that point, the filter is assumed to be bypassed.

   NRC has provided their filter design diagram in an email from A. Szabo on August 29, 2014. In scenarios where anticipatory venting occurs, operator action will be required to enable the vent path. The EPRI technical basis analysis will use this NRC diagram in establishing the success of both anticipatory venting and filter operation.

9) NRC Response: Please define "manual" with regard to the filter path. Please clarify whether this is the manual operation of the vent.

   Response: The term manual simply indicates that human action is required to open the vent path.

10) NRC Question: Please differentiate between EPRI case 5B ("manual" filter path) and EPRI case 6C ("all manual" filter path).

    Response: Now that the NRC has provided a diagram of the filter design, the EPRI technical basis analysis will remove case 6C as it is now identical to 5B.