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Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident

Comment On: NRC-2022-0036-0001
Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident; Public Comment Period Extended

Document: NRC-2022-0036-DRAFT-0005
Comment on FR Doc # 2022-02562

Submitter Information

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General Comment

Please see attached comments.

Attachments

Nubar LLC Comments on DG-1385

April 8, 2022 Docket NRC 2022-0036

SUBJECT: Nubar LLC Submittal of Comments on DG-1385, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident

Per Section B-3 of DG-1385, staff were to include the guidance in Enclosure 1 of SECY-11-0014 in DG-1385. Enclosure 1, *Section 5.2, Conservative Calculations and Statistical Approach*, contains Tables for conservative assumptions to be used on the calculation of NPSHa. However, this important and specific information is not included in the proposed DG other than a caveat[i]. In addition the tables from the SECY-11-0014 enclosure are not suitable for industry guidance; please see attachment for comments. I would recommend a second round of comments and a public meeting to address the calculation conservatisms.

Also, the memorandum from Ahsan Sallman, NRC, to Robert Dennig, NRC, "*GOTHIC Calculations for a Typical BWR/4 with a Mark I Containment to Study the Use of Containment Accident Pressure*", ADAMS Accession No. ML 100480097 should be made publically available. This is Reference 58 to Enclosure 1 of SECY-11-0014.

Questions can be directed to Barry Quigley at 243@NubarLLC.com.

Respectfully,

Barry Quigley
Nubar, LLC

[i] "…the calculation of available containment pressure and sump/pool water temperature as a function of time should underestimate the expected containment pressures and overestimate the sump/pool water temperatures."

Comment	BWR Conservatisms (Table 4, Enc 1, SECY-11-0014)	PWR Conservatisms (Table 5, Enc 1, SECY-11-0014)	Comments and sugges ted Resolution
1	The worst single failure occurs.	The worst single failure occurs.	This criterion is quite problematic for both passive and active failures. PASSIVE FAILURE In practice, passive failures of fluid systems are not postulated in the ECCS injection phase, but are postulated in the recirculation phase. In the application of passive failures it is current practice to assume fluid leakage owing to gross failure of a pump or valve seal during the long-term cooling mode following a LOCA (SECY-77-439, Single Failure Criterion); this is the phase where CAP credit is desired. Usually, the passive failure is taken to be a piping breach in a train of ECCS/support system or a 50 gpm leak on an ECCS pump mechanical seal. Recommendation: NRC staff to determine application of passive failure with respect to CAP application. ACTIVE FAILURE The most conservative application of active single failure is not clear. The number of failures (e.g., full ECCS train, single Containment Spray pump, single RH pump, recirculation sump isolation valve etc) and their interactions with the key parameters of CAP and sump temperature, prevents an *a priori* determination of the limiting active single failure. Recommendation: Licensees to perform studies sufficient to determine the limiting active single failure.
2	Core decay heat is based on conditions bounding specific plant cycles.	Not listed	Requirement is not clear and the operating history is specified in ANSI/ANS 5.1-1979. Recommendation: Delete this parameter.

Comment	BWR Conservatisms (Table 4, Enc 1, SECY-11-0014)	PWR Conservatisms (Table 5, Enc 1, SECY-11-0014)	Comments and sugges ted Resolution
3	The initial drywell and suppression chamber pressures are at the minimum expected values to minimize the containment accident pressure.	Not listed	Add equivalent statement for PWRs.
4	The maximum operating value of the drywell temperature and the maximum relative humidity (100 percent) are used to minimize the initial noncondensable gas mass and minimize the long-term containment pressure.	A conservatively high value of initial containment temperature is assumed. This temperature could be based on containment coolers not in service before the postulated accident.	1.Use consistent wording between BWR and PWR parameters; not "A conservatively high value..." and "...maximum operating value...". 2. The relative humidity of 100% should be added to the PWR parameter.
5	The initial suppression pool temperature is the maximum technical specification value to maximize the calculated suppression pool temperature.	The RWST initial temperature is at its maximum technical specification value.	The direction of conservatism is not apparent. For PWRs, the Containment Spray pumps initially draw water from the RWST. A hot RWST supplying CS may result in an initial increase in CAP (non-conservative) as well as a hot sump (conservative). A cooler RWST could result in a reduced CAP (conservative) and a cooler sump (non-conservative). Recommendation: Perform a sensitivity analysis with respect to to temperature.
6	Passive heat sinks are modeled to reduce containment pressure.	Not listed	Passive heat sinks should be modeled for PWRs.
7	All core spray and RHR pumps have 100 percent of the brake horsepower rating (rather than the water horsepower) converted to pump heat that is added to the suppression pool water.	Not listed	This parameter appears quite arbitrary. Recommendation: Unless this item has a rigid precedent in BWR analysis, it should be deleted or a least subject to a sensitivity study.
8	Feedwater flow into the vessel continues until all feedwater that would increase the suppression pool temperature has been added.	N/A for PWRs	Credit should be allowed for Feedwater Isolation.

Comment	BWR Conservatisms (Table 4, Enc 1, SECY-11-0014)	PWR Conservatisms (Table 5, Enc 1, SECY-11-0014)	Comments and sugges ted Resolution
9	The initial suppression pool water volume is the minimum allowed by the technical specifications to maximize the suppression pool temperature and minimize the positive contribution resulting from the static head.	The RWST level is at its minimum technical specification value. This causes recirculation to begin at a lower sump water level and with a hotter core.	For PWRs, the direction of conservatism is not apparent. While a reduced inventory during the injection phase may cause the sump water to be hotter, CAP will also be higher (non-conservative) due to the reduced amount of Containment Spray. This comment is inter-related with that of RWST temperature. Recommendation: Licensees to perform sensitivity studies to determine direction of conservatism.
10	For the LOCA, a conservative estimate is made of blockage of the suction strainers resulting from LOCA-generated debris. This increases the head loss (hloss).	The head loss resulting from debris on the sump screens is maximized.	With the exception of "sump screens" and "suction strainers" the PWR and BWR versions of this parameter should be identical.
11	Containment leakage is equal to La.	Not listed	Add for PWRs.
12	The water flowing through the debris bed on the suction strainer is assumed to be at a temperature below the peak suppression pool temperature. This assumption results in a higher than expected head loss.	The head loss resulting from debris on the sump screens is maximized.	With the exception of "sump screens" and "suction strainer" the PWR and BWR versions of this parameter should be identical.
13	Not listed	Initial conditions are chosen to minimize containment pressure and maximize containment emergency sump water temperature.	This is very high level and is more appropriate as introductory material. It is also redundant to the last sentence in Position C.1.3.1.2. Recommendation: Move to introductory material.
14	Not listed	The pressure of the containment atmosphere is equal to the vapor pressure of the sump water at the sump water temperature. This results in the static height of water in the sump above pump suction elevation as the only positive contribution to the NPSHa.	As written, this negates the application of CAP. Recommendation: Delete

Comment	BWR Conservatisms (Table 4, Enc 1, SECY-11-0014)	PWR Conservatisms (Table 5, Enc 1, SECY-11-0014)	Comments and sugges ted Resolution
15	Not listed	The distribution of the energy released with the assumed break is distributed in the containment atmosphere in such a way that the sump temperature is maximized and the containment pressure is minimized. For older computer simulations, this is accomplished with the "pressure flash" model. More current, physically based analysis methods accomplish this by assuming that the liquid in the break flow that does not flash to vapor is dispersed as droplets of a size that maximizes the sump temperature and minimizes the containment pressure as the droplet falls to the containment floor and heat and mass are transferred between the droplets and the containment atmosphere.	A reference is needed for the statement: "...liquid in the break flow that does not flash to vapor is dispersed as droplets of a size that maximizes the sump temperature and minimizes the containment pressure as the droplet falls to the containment floor and heat and mass are transferred between the droplets and the containment atmosphere." Also, evaluate for applicability to BWRs.
16	Not listed	The sump recirculation switchover setpoint (RWST level) is at its maximum. This leaves more water in the RWST, which minimizes the water initially in the sump.	For PWRs, the direction of conservatism is not apparent. While a reduced inventory during the injection phase may cause the sump water to be hotter, CAP will also be higher (non-conservative) due to the reduced amount of Containment Spray. This comment is inter-related with that of RWST temperature.
17	N/A for BWRs	Not listed	The mass of the Safety Injection Accumulator water (approximately 250,000 lb, or almost half the mass of the RCS), should be included in a manner similar to the RWST. This would include variations of initial temperature and mass and analysis of sensitivities.