ArevaEPRDCPEm Resource

From: Tesfaye, Getachew
Sent: Friday, July 17, 2009 6:57 PM
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Cc: Fuller, Edward; Clark, Theresa; Phan, Hanh; Hamzehee, Hossein; Mrowca, Lynn; Chowdhury, Prosanta; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: Draft - U.S. EPR Design Certification Application RAI No. 262 (3292), FSAR Ch. 19
Attachments: Draft RAI_262_SPLB_3292.doc

Attached please find draft RAI No. 262 regarding your application for standard design certification of the U.S. EPR. If you have any question or need clarifications regarding this RAI, please let me know as soon as possible, I will have our technical Staff available to discuss them with you.

Please also review the RAI to ensure that we have not inadvertently included proprietary information. If there are any proprietary information, please let me know within the next ten days. If I do not hear from you within the next ten days, I will assume there are none and will make the draft RAI publicly available.

Thanks,
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 673

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Request for Additional Information No. 262 (3292), Revision 0

7/17/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19.2

QUESTIONS for PRA Licensing, Operations Support and Maintenance Branch 2 (ESBWR/ABWR Projects) (SPLB)

19-319

It appears from the MAAP parameter file “us_epr_407.par” that there is no unconditionally open drainage path from the lower annular rooms (compartments 15 and 16) to points at lower elevations, suggesting that condensate may accumulate in these compartments unless or until a mixing damper may be opened due to water build-up (hydrostatic head of the pool).If there are any ducts, channels, or drains in the U.S. EPR containment compartments that direct liquid condensate from upper regions of the containment into the IRWST or other locations, please describe their features, including:

a) The beginning and ending locations (i.e., compartments) of the drainage paths.

b) The beginning and ending elevations of the drainage paths.

c) The effective cross-sectional dimensions and flow area of the drainage paths.

d) The lengths of the drainage paths.

e) Whether the paths are normally open or closed during plant operation, and what other conditions (if any) may result in their being closed.

19-320

If any openings exist for overflow from the IRWST, should the water level in the IRWST increase above its nominal value, please supply the following information about each opening:

a) The elevations of the bottom of the overflow paths relative to the nominal IRWST level;

b) The volume of water that must be added beyond the IRWST nominal inventory in order to reach the bottom of the overflow paths;

c) The beginning and end locations (i.e., compartments) of the overflow paths;

d) The beginning and end elevations (for the bottom of the openings) of the overflow paths;

e) Are the overflow paths normally open or closed during plant operation?

f) What conditions might result in these paths opening or closing, either during normal operation or during an accident?

g) If physically reasonable amounts of added IRWST inventory (i.e., RCS and accumulator volumes) were to spill over into other compartments as a result of these overflows, could this water reach the spreading compartment prior to initiation of SAHRS passive flooding?

19-321

Please provide the following information regarding data in the MAAP parameter file “us_epr_407.par”:

a) Many of the flow junctions in the containment are of the “Failure” junction type, which normally open in response to a specified value of pressure differential. Please specify for each such junction any other accident conditions under which it might be assumed to open (e.g., in response to loss of offsite power).

b) A list of any changes made to the base parameter file since the last version of the file was provided to NRC, including new values of the updated or added parameters. Please include the file "fchf.inc", which was not included with the base parameter file, and the basis for the development of the functions included therein.

c) Please provide the following information regarding the melting of portions of the heavy reflector and their incorporation into the molten/core debris:

i. Input parameters, models, and input assumptions that govern the potential relocation of large parts of the heavy reflector and their incorporation into the molten/core debris;

ii. For calculations performed using this parameter file as part of the Level-2 PRA (FSAR Chapter 19), provide the fraction of the heavy reflector that typically melts and is incorporated in this way, and justification for this amount (if not self-explanatory given the response to (i)).

iii. Describe the potential impacts on severe accident progression during in- and ex-vessel phases if the majority of the reflector were to relocate.

d) Please describe the model and any other governing parameters used to calculate the extent of in-vessel oxidation, and the extent to which any aspects of the in- and ex-vessel progression might be affected by reasonable variations in these parameters due to uncertainty.

19-322

Please provide the following information regarding the MAAP source term calculations “st1_1_5bar”, “st1.5”, and “st1_10a” performed as part of the Level-2 PRA (FSAR Chapter 19):

a) What is the time of scram relative to accident initiation? If not equal to time zero (i.e., accident initiation time), what is the proximate cause of scram?

b) For the seal LOCAs (in “st1_1_5bar” and “st1.5”), what assumptions were used regarding the break flow rates, either in terms of the area, dimensions, and discharge coefficient, or in terms of any tabular data of mass and energy flow rates out the break?

c) What is the total release fraction to the environment of cesium in each chemical form, (e.g., CsI, CsOH, etc.)? Alternately, please provide the mass released to the environment of each chemical form of cesium together with the pre-accident mass of elemental cesium in the reactor core.

d) Please provide the details and any sources of information for the heat transfer rate modeled between the debris and overlying water in the spreading compartment for those scenarios involving SAHRS passive flooding (if not already included in 3(b), above). This should include the time-dependent rate of steam and (any) hydrogen production during the cooling period.

e) Please provide the mass and energy flow rate out the break that was used in MAAP calculation of the containment transient following a main steam line break.

19-323

In MAAP scenario st1_10a, hydrogen generation in the ex-vessel phase ceases at 20 hours at a peak value of about 1200 kg, indicating complete oxidation of the available previously unoxidized metal. Please provide an inventory of the amounts of metal in the corium outside the vessel at the various stages prior to this point, i.e., before and after vessel failure and before and after failure of the melt plug gate. This will help in understanding the MELCOR results which show the oxidation continuing unabated.

19-324

In several instances, the MAAP results have been "influenced to the conservative side" by the judgmental use of selected model and parameters. This appears in

such areas as in-vessel hydrogen generation, melt temperature at vessel breach, water/steam discharge from the reactor coolant system into the containment, MCCI, and containment pressurization, among others. Please provide a discussion of significant input parameters of this nature, especially, as related to the above listed figures-of-merit.

19-325

Please provide the view factors and surface emissivity values used in the MAAP calculation of radiation heat transfer from the core debris to various heat sinks/surfaces inside the reactor pit.

19-326

RAI 19-161 follow-up: It was pointed out by AREVA in the audit meeting on 6/25/2009 that several of the tables of MAAP results reported in response to RAI 19-161 contain transcription errors. Please provide the corrected tables.