



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

March 22, 1994

Project No. 669

APPLICANT: Electric Power Research Institute (EPRI)
PROJECT: ADVANCED LIGHT WATER REACTOR (ALWR) UTILITY REQUIREMENTS DOCUMENT
SUBJECT: SUMMARY OF MEETING BETWEEN THE NUCLEAR REGULATORY COMMISSION (NRC) STAFF AND EPRI HELD ON MARCH 9, 1994, IN ROCKVILLE, MARYLAND, CONCERNING PHYSICALLY-BASED SOURCE TERM

A public meeting was held on March 9, 1994, at the NRC headquarters in Rockville, Maryland, between the NRC staff and EPRI to discuss industry comments on the draft Commission paper, "Source Term Related Technical and Licensing Issues Pertaining to Evolutionary and Passive Light-Water Reactor Designs," dated February 10, 1994. A list of attendees and their affiliation is provided in Enclosure 1.

Staff from EPRI summarized comments in eight technical areas and stated that they would provide these comments to the Advisory Committee on Reactor Safeguards (ACRS) full committee in a meeting on source term the next day, March 10. The slides used by EPRI in their presentation are provided in Enclosure 2.

EPRI stated that these eight issues, if not properly resolved, could significantly complicate the ALWR designs. Each issue of concern to EPRI is discussed below (issue numbers follow those in draft Commission paper), along with the staff's preliminary response to EPRI's comment.

- Timing (Issue 6) - According to the staff guideline in draft NUREG-1465 (assuming leak-before-break), gap release starts no more than 10 minutes into the accident and early in-vessel release starts no later than 30 minutes (PWR) and 60 minutes (BWR). EPRI stated that 1 hour is a better guideline for gap release, and proposed that plant-specific justification be considered for release times greater than that. The staff agreed that it is appropriate for designers to provide justification for timing of releases, based on details of each specific design.
- Containment Natural Aerosol Removal (Issue 7) - The passive plant designers do not agree with the natural aerosol removal coefficients in draft NUREG-1465, since they are based on operating plants. Staff from the Office of Nuclear Regulatory Research (RES) stated that the numbers in the draft NUREG were for illustrative purposes only and that the final NUREG may contain a discussion of compilation of research, with no numerical values given.
- Selective Use of Draft NUREG-1465 (Issue 1) - EPRI does not agree with the draft NUREG-1465 in-vessel and ex-vessel low volatile release fractions, since they are much larger than warranted, given experimental and TMI-2 data. Staff from RES stated that the release fractions for low volatiles is expected to be lower in the final NUREG-1465.

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- Iodine Chemical Form (Issue 2) - EPRI suggests that the organic iodine fraction for passive BWRs is lower than shown in draft NUREG-1465, because the gaseous iodine fraction is much lower due to larger water volumes in the passive BWR. Staff from RES stated that preliminary information based on NRC contractor research indicated little difference in organic iodine between PWRs and BWRs. However, the staff indicated that it would re-examine this issue.
- Secondary Building Holdup (Issue 5) - Although secondary building holdup is not credited for the design basis accident (DBA) in the passive PWR design, it will be used for protective action guideline (PAG) dose assessment. The NRC staff stated that PAG doses were not a consideration for DBAs.
- Containment Spray (Issue 9) - EPRI stated that hygroscopicity is an important phenomenon for aerosols, especially in a spray environment where humidity is high. In recognition that neither of the two passive plant designs currently under staff review contains a containment spray system, draft NUREG-1465 focuses its discussion of containment spray on why sprays are not necessary. Consequently, the draft NUREG does not contain a discussion of hygroscopicity. Staff from RES stated that quantitative numbers will likely be deleted from the discussion of containment spray in the final NUREG-1465.
- Failure of Heat Exchanger Tubes in SBWR PCCS (Issue 12) - EPRI expressed its opposition to the position in the draft Commission paper on source term that the failure of the heat exchanger tubes in the passive containment cooling system (PCCS) should be considered a new DBA for the SBWR. The staff agreed to reconsider whether PCCS heat exchanger tube failure should be considered a DBA. GE, however, will provide additional information on this issue in response to RAI 470.10.
- Non-Fission Product Aerosol Quantity - EPRI stated that the fixed quantities of non-fission product (inert) aerosol, specified in draft NUREG-1465, greatly overestimate the inert release for the SBWR. Staff from RES stated that these numbers will likely be removed from the final NUREG.

In addition to the specific comments above, EPRI repeated a general concern expressed at the previous meeting on source term held on January 27, 1994, that the language in the draft Commission information paper seems to indicate that the positions based on draft NUREG-1465 are final positions. Because discussions are continuing concerning implementation of the new source term

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in the individual applications for FDA/DC, the staff agreed to clarify that it is envisioned that the details of implementation will have to be resolved with the individual ALWR vendors during the course of each design review.

At the end of the meeting, EPRI stated that it will provide its comments on the draft source term Commission paper in a letter to the NRC staff.

(Original signed by)

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Enclosures:
As stated

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See next page

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LIST OF ATTENDEES AT MEETING WITH EPRI HELD IN
ROCKVILLE, MARYLAND ON MARCH 9, 1994

<u>Name</u>	<u>Affiliation</u>
F. Congel	NRC
J. Cunningham	NRC
R. Barrett	NRC
J. H. Wilson	NRC
T. Essig	NRC
J. Lee	NRC
A. Drozd	NRC
L. Soffer	NRC
J. Trotter	EPRI/Polestar
D. Leaver	EPRI/Polestar
S. Additon	EPRI/TENERA

ALWR Program Comments on NRC Source Term

Presented to ACRS

David E.W. Leaver
John Trotter

March 10, 1994

General Comments

- NRC's work on the source term has been high quality and will be of significant benefit to nuclear plant safety since it provides a more rational basis for fission product mitigation system design
- A few areas of the source term are still unresolved between industry and NRC as discussed below
- Draft NUREG 1465 is based on operating plants; industry notes that plant specific ALWR design features will have an important effect on source term, and that regulations should explicitly allow for plant specific source term variations based on such features

Unresolved Source Term Issues (from 1/27/94 meeting between NRC and industry)

- Timing (NRC #6)
- Containment Natural Aerosol Removal (NRC #7)
- Selective Use of Draft NUREG 1465 (NRC #1)
- Iodine Chemical Form (NRC #2)
- Secondary Building Holdup (NRC #5)
- Containment Spray (NRC #9)
- Failure of Heat Exchanger Tubes in SBWR PCCS (NRC #12)
- Non-Fission Product Aerosol Quantity

All of these issues, if not properly resolved, could significantly (and unnecessarily) complicate the ALWR designs

Positions on Unresolved Issues

- Timing
 - Draft SECY states that as a guideline the staff proposes to start the gap release no later than 10 minutes into the accident (with credit for leak before break) and the early in-vessel release no later than 30 minutes (PWR) and 60 minutes (BWR)
 - Passive plant designers do not agree with this guideline since it significantly underestimates the time to the beginning of gap and fuel release in both passive plants
 - A more meaningful, useful guideline would be to start the gap release at approximately 1 hour, with a requirement for plant specific justification
- Containment natural aerosol removal
 - Draft NUREG 1465 includes natural aerosol removal coefficients for operating plants (NUREG 1150), based on dry conditions late in the accident sequence
 - Passive plant designers do not agree with these coefficients since they are not applicable to ALWRs; if coefficients are to be included, they should be representative of ALWR designs

Positions on Unresolved Issues (continued)

- Selective use of draft NUREG 1465
 - EPRI agrees with use of gap and early in-vessel releases for DBA
 - EPRI generally agrees with volatile release fractions
 - EPRI does not agree with the draft NUREG 1465 in-vessel and ex-vessel low volatile release fractions since they are much larger than warranted based on experiment and TMI-2 data
- Iodine chemical form
 - Draft SECY specifies 0.25% organic I for PWR and BWR
 - For BWRs, organic I fraction is much lower (0.05% was suggested by industry) since the gaseous I₂ fraction is much lower due to larger water volumes
- Secondary building holdup
 - Draft SECY states that AP600 is not crediting secondary building holdup
 - AP600 does want credit for secondary building holdup in PAG dose calculation

Positions on Unresolved Issues (continued)

- Containment spray
 - Draft NUREG 1465 notes that existing SRP guidance on spray removal coefficients needs to be reevaluated; an RES contractor report provides a reevaluation, but does not consider the effect of hygroscopic aerosols and has limited discussion of mixing of sprayed and unsprayed regions
 - Hygroscopicity is an important (and real) phenomenon for aerosols, especially in a spray environment where humidity is high; mixing rates are significantly higher than SRP guidance; industry has provided information to NRC on these matters and believes it should be factored into the regulatory guidance
- Failure of Heat Exchanger Tubes in SBWR PCCS
 - The draft SECY states that PCCS tube failure is a new DBA for SBWR
 - Industry does not agree that this should be a DBA; GE will be providing additional information on this in response to RAI 470.10

Positions on Unresolved Issues (continued)

- Non-Fission Product Aerosol Quantity
 - Draft NUREG 1465 specifies a fixed amount of non-fission product (inert) aerosol mass released as part of the source term; this greatly overestimates the inert release for SBWR (and would complicate the design from the standpoint of heat exchanger tube fouling)
 - Industry has provided information to NRC which supports a ratio of about 1:1 for inert to fission product aerosol mass for BWRs; for SBWR, this results in a number that is less than the NUREG 1465 number by a factor of about 13 (780 kg vs. 60 kg)