Dominion Generation
5000 Dominion Boulevard, Glen Allen, VA 23060

Dominion™

3/19/03
68FR13338
(4)

April 23, 2003

Rules and Directives Branch
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, DC 20555

GL03-011

COMMENTS ON DRAFT REGULATORY GUIDE DG-1107

Dear Sirs:

Virginia Electric and Power Company (Dominion) and Dominion Nuclear Connecticut appreciate the opportunity to comment on the Draft Regulatory Guide, DG-1107, "Water Sources For Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident" as requested in the Federal Register, volume 68, number 43, page ~~10552~~ 13338 on March ~~5~~ 19, 2003.

Our comments are in the attachment.

If you have any questions regarding our comments, please contact:

Mr. Dana Knee	dana_knee@dom.com or (804) 273-2255 or,
Mr. Don Olson	don_olson@dom.com or (804) 273-2830

Respectfully,

C. L. Funderburk, Director
Nuclear Licensing & Operations Support

Attachment

E-RIDS=ADM-03
cc=B. Said (BPS)
M. Clark (MJC1)

Template=ADM-013

Attachment

Dominion Energy
Comments on Draft Regulatory Guide DG-1107

Section A, "Introduction"

DG-1107 needs a clear explanation of how the ECCS and containment heat removal systems affect the long-term core cooling requirement in 10CFR50.46. A section with definitions and licensing requirements is warranted. Further, DG-1107 needs to clarify differences in requirements for ECCS versus containment heat removal systems. For example, Regulatory Positions 1.1.1.13 and 1.1.1.14 state that the design considerations are applicable to ECCS pumps. While the intent may be to apply them to the containment heat removal pumps, it's not explicit. Nonetheless, several positions are not clear and the guide overall is not clear on the design distinctions between ECCS and containment heat removal systems. In other areas of the guide, conditions are placed on analysis requirements for all pumps based on the time of ECCS switchover to the sump, while the containment heat removal systems may take suction from the sump much earlier than ECCS switchover. In general, DG-1107 should distinguish between design and analytical requirements for the sump based on differences in the ECCS and containment heat removal systems.

Section B, "Discussion"

It's difficult to discern important points from the text. Each major topic should be separated under a heading (e.g., Air Ingestion, Containment Pressure Credit, and Sump Screen Structural Design). Design considerations should be clearly identified rather than embedded in the middle of paragraphs, and direct references to applicable Regulatory Positions in Part C should be included with a cross-reference.

The fifth paragraph on page 4 discusses a "credit for the reduction in required NPSH" without providing a baseline fluid temperature that should be used to determine the required NPSH. It should be acceptable for a licensee, with pump head curves based on sufficient test data, to justify the use of a variable NPSH required based on the calculated fluid temperature during the transient, provided that adequate conservatism is included in the analysis. As an example, a licensee should not be forced to use an NPSH required at 100 F when the transient temperatures are above 160 F during the time of minimum NPSH margin. Dominion disagrees with the draft position, but if it is maintained, then DG-1107 should provide an acceptable fluid temperature for determining the base NPSH required for comparison to the results from a transient analysis.

Section C, "Regulatory Position"

Item 1.1.1.4: It's not clear how a gradual slope away from the sump would reduce debris if water levels are several feet above the floor and most of the lighter, problematic debris (e.g., fibrous insulation) is in solution. This

recommendation may be counterproductive to the primary objective of the floor, which is to slope toward the sump to direct more water to the sump. More technical basis should be provided to justify the trade-off between water flow and debris holdup.

Item 1.1.2.2: This position has no effect on "Minimizing Debris," which is the objective of this section, and should be relocated. Further, this discussion should not be limited to ECCS, since some plants have spray systems that take suction from the sump and may have to find alternative water.

Section 1.1.2 should provide guidance on selecting insulation types (e.g., omit Cal-Sil and fibrous insulation) to minimize the debris head loss, with references to NRC research documents.

Section 1.2: The last sentence should include any valves that align the recirculation spray system to an alternative water source.

Item 1.3.1.1: The statement "no increase in containment pressure from that present prior to the postulated LOCAs" is not consistent with the licensing basis for subatmospheric containment plants, which could operate as low as 9 psia air partial pressure. The regulatory position should recommend that atmospheric pressure, as a minimum, be used in the NPSH available analysis.

Item 1.3.1.2: The second sentence is confusing and leads the reader to think that 0.01 ft of NPSH margin from a static calculation is an acceptable analytical approach to establish operating limits. Dynamic transient analyses (as recommended in Regulatory Position 1.3.1.9) that produce an NPSH available based on the time-dependent containment conditions should be acceptable, provided the analysis uses conservative assumptions to minimize containment pressure and maximize sump liquid temperature. The second sentence should be replaced with a statement advocating transient analyses to determine NPSH available versus time.

Item 1.3.2.3: The last bullet defines a minimum uniform thin bed as 1/8-inch of fiber but does not have a reference. Please add a technical reference to this value and to similar numerical bases throughout the document.

Item 1.3.3.4: This position recommends CFD simulations "to predict debris transport within the sump pool", but does not specify whether CFD analyses are acceptable for predicting debris transport to the sump, e.g., from upper elevations to the sump area. Please specify the types of phenomena and the transport capabilities that should be modeled with CFD computer codes.

Item 1.3.3.6: What is the quantitative threshold for "sink very slowly"? Either debris stays suspended indefinitely or it has the possibility of settling to the floor, depending on the geometry, water level, and flow velocities. Also, some fibrous

or particulate debris from upper elevations may be heldup and may not necessarily reach the sump; thus, a generic statement about "all debris" is inappropriate. This position should generically state that the debris transport analysis must consider for all debris the containment geometry, post-LOCA environment, and debris distribution, physical properties and transport characteristics.

Item 1.3.3.8: What does "all debris" represent? Is it all debris generated in the zone of influence, or all potential debris in containment, regardless of location? The time-dependent accumulation of debris should also be considered, since some debris in upper elevations will take time to transport to the screens. This position needs to specifically identify the default analysis assumption for the debris source term.

Item 1.3.4.2: For some plants, the containment heat removal pumps take suction from the sump before ECCS switchover occurs. Thus, the first sentence should be tailored to address the screen submergence at times earlier than ECCS switchover.

Item 1.3.4.4: This position focuses on the sump screen submergence level at the beginning of recirculation. DG-1107 repeatedly recommends a transient analysis to accurately detail changes in conditions but then restricts credit for any increases in water level after recirculation. Further, this position does not address recirculation spray pumps that experience minimum NPSH margin well before the safety injection system switches to recirculation mode (and perhaps early enough where pool level and debris thickness are changing rapidly). It is recommended that variable pool depths be considered conservatively to ensure a reliable transient prediction of sump behavior. To allow for a generic approach, delete the phrase "at the beginning of recirculation" from Item 1.3.4.4, from the end of the first paragraph on page 6, and from page A-4.

Add descriptive titles to Figures 1 and 2.

Since Figures 4 and 5 are only discussed in Section 2.3 for BWRs, the titles for Figures 4 and 5 should reflect their use for BWRs only.

Appendix A

Page A-3 uses the term $NPSH_{margin}$ without a clear technical definition. Is the term defined as NPSH available (NPSHa) minus NPSH required (NPSHr), where NPSHa already includes all other losses from piping friction, dimensional changes in the pump can, and the sump screens (without debris)? For clarity, the sump failure criterion may be defined plainly as "NPSH required cannot be satisfied".

What does it mean to reach the sump failure criterion and what kind of time-dependence is applied? While NPSHr may not be satisfied for a short period of

time, sump conditions can change enough to return to a positive NPSH margin condition. Regulatory Position 1.3.1.3 allows for credit to be taken for operation of pumps in cavitation for a limited time. If a plant has tested pumps in cavitation and can show that the sump failure criterion was met for a period of time shorter than the test time, then does 1.3.1.3 justify the conclusion that the acceptance criterion for long-term core cooling has been met? Clarify the use of the sump failure criterion relative to 1.3.1.3.

Provide a reference to the technical basis document for the statement "Numerical simulations confirm that an effective head loss across a debris bed approximately equal half the pool height is sufficient to prevent adequate water flow" on page A-3.

The final paragraph should address the use of transient conditions for changing sump screen submergence when the recirculation spray pumps take suction from the sump before ECCS recirculation begins.