



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

April 21, 2014

The Honorable Allison M. Macfarlane  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT: CREDIT FOR CONTAINMENT ACCIDENT PRESSURE TO ENSURE  
OPERATION OF US-APWR EMERGENCY CORE COOLING SYSTEM PUMPS**

Dear Chairman Macfarlane:

During the 610<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, December 4-7, 2013, we completed our review of Chapter 6, "Engineered Safety Features," of the Safety Evaluation Report with Open Items associated with the United States Advanced Pressurized Water Reactor (US-APWR) design certification application. We also reviewed elements of the US-APWR design and supporting tests and analyses which address long-term core cooling and resolution of Generic Safety Issue 191, "Assessment of Debris Accumulation on Pressurized Water Reactor Sump Performance." Our December 24, 2013, letter report describes the conclusions and recommendations from our review.

In their February 24, 2014, response to our report, the staff disagreed with our Recommendation 5, which stated:

*Best estimate analyses with explicit consideration of uncertainties should be performed to determine the available net positive suction head (NPSH) for the containment spray / residual heat removal pumps and the high head injection pumps during design basis loss of coolant accident (LOCA) scenarios.*

In their response, the staff cited their interpretation of Commission policy and guidance as the basis for their rejection of our recommendation. In particular, the staff noted that their position is justified by the Staff Requirements Memorandum approving Option 1 from SECY-11-0014, "Use of Containment Accident Pressure in Analyzing Emergency Core Cooling System and Containment Heat Removal System Pump Performance in Postulated Accidents." The staff noted that additional thermal-hydraulic analyses to evaluate the extent and duration of the required containment accident pressure (CAP) credit or analyses to evaluate the risk from loss of adequate NPSH are not necessary, provided that the CAP credit is limited to the suction liquid saturation vapor pressure.

We have considered the staff's conclusion and the supporting documents carefully. The staff's position does not resolve the concerns of our December 24, 2013, letter report.

Preparation of SECY-11-0014 was prompted by our interactions with the staff regarding the erosion of available NPSH margin after implementation of an extended power uprate (EPU) for a currently operating reactor. Both of the proposed options in that paper are presented in the context of a timely resumption of staff reviews of pending EPU applications.

In SECY-11-0014, the staff acknowledged that some new "active" PWR designs require CAP credit to maintain adequate NPSH for their emergency core cooling system (ECCS) pumps. It was also noted that:

*The staff will review the use of CAP in NPSH evaluations in the same manner for new reactors and operating plants, except for the treatment of risk.*

and

*New reactor reviews will continue and deviations from guidance will be reviewed on a case by case basis.*

Reliance on CAP credit directly jeopardizes a fundamental principle of defense in depth, the independence of barriers against the release of harmful radioactive materials. The Commission has encouraged new reactor applicants to use innovation, increased reliance on passive safety systems, and risk-informed design processes to reduce functional dependencies and achieve improved safety, compared with currently operating reactors. We reaffirm our position that CAP credit should not be accepted for new reactors without a thorough assessment of feasible design alternatives and a full understanding of the associated risk.

As we noted in our December 24, 2013, letter report, the current US-APWR design-level probabilistic risk assessment does not satisfy the scope, level of detail, or technical quality attributes to support a risk-informed evaluation of this issue. Therefore, to better inform our understanding of the extent and the duration for which CAP credit is needed, and why practical design alternatives are not feasible, we recommend that best estimate analyses with explicit consideration of uncertainties should be performed to evaluate the available NPSH margins for the limiting LOCA event and a range of ECCS operating configurations.

Sincerely,

*/RA/*

John W. Stetkar  
Chairman

## REFERENCES

1. ACRS Letter, Subject: "Chapters 6 and 7 of the Safety Evaluation Report with Open Items for Certification of the US-APWR Design and Related Long-Term Core Cooling Issues," dated December 24, 2013. (ML13346A732)
2. NRO Letter, Subject: "Chapters 6 and 7 of the Safety Evaluation Report with Open Items for Certification of the US-APWR Design and Related Long-Term Core Cooling Issues," dated February 24, 2014. (ML13365A056)
3. SECY-11-0014, "Use of Containment Accident Pressure in Analyzing Emergency Core Cooling System and Containment Heat Removal System Pump Performance in Postulated Accidents," January 31, 2011. (ML102590196)
4. "Staff Requirements – SECY-11-0014 – Use of Containment Accident Pressure in Analyzing Emergency Core Cooling System and Containment Heat Removal System Pump Performance in Postulated Accidents," March 15, 2011. (ML110740254)
5. ACRS Letter, Subject: "Draft Guidance on Crediting Containment Accident Pressure in Meeting the Net Positive Suction Head Required to Demonstrate that Safety Systems can Mitigate Accidents as Designed," dated May 19, 2010. (ML101300332)
6. ACRS Letter, Subject: "SECY-11-0014, 'Use of Containment Accident Pressure in Analyzing Emergency Core Cooling System and Containment Heat Removal System Pump Performance in Postulated Accidents'," dated February 17, 2011. (ML110450555)

**REFERENCES**

1. ACRS Letter, Subject: "Chapters 6 and 7 of the Safety Evaluation Report with Open Items for Certification of the US-APWR Design and Related Long-Term Core Cooling Issues," dated December 24, 2013. (ML13346A732)
2. NRO Letter, Subject: "Chapters 6 and 7 of the Safety Evaluation Report with Open Items for Certification of the US-APWR Design and Related Long-Term Core Cooling Issues," dated February 24, 2014. (ML13365A056)
3. SECY-11-0014, "Use of Containment Accident Pressure in Analyzing Emergency Core Cooling System and Containment Heat Removal System Pump Performance in Postulated Accidents," January 31, 2011. (ML102590196)
4. "Staff Requirements – SECY-11-0014 – Use of Containment Accident Pressure in Analyzing Emergency Core Cooling System and Containment Heat Removal System Pump Performance in Postulated Accidents," March 15, 2011. (ML110740254)
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Accession No: **ML14107A290**

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