

February 12, 2009

MEMORANDUM TO: Chairman Klein
Commissioner Jaczko
Commissioner Lyons
Commissioner Svinicki

FROM: R. W. Borchardt */RA Bruce S. Mallett for/*
Executive Director for Operations

SUBJECT: ALTERNATIVE RISK METRICS FOR NEW LIGHT-WATER REACTOR
RISK-INFORMED APPLICATIONS

The purpose of this memorandum is to inform the Commission of the staff's intent to engage stakeholders in the consideration of alternative risk metrics for new light-water reactor (LWR) risk-informed applications. This memorandum also provides additional information on the discussions regarding risk-informed and performance-based regulation for new reactors provided during the February 4, 2009, Commission Briefing on Risk-Informed Performance Based.

Reactor risk metrics refer to the quantitative measures of risk from reactor operations up to and including severe core damage accidents. The two most common metrics used for operating reactors are core damage frequency (CDF) and large early release frequency (LERF).

The Commission has provided guidance regarding risk metrics and safety margins in the past. For example, the Commission stated in its policy statement of 1985 regarding severe reactor accidents for future designs and existing plants that it "fully expects that vendors engaged in designing new standard (or custom) plants will achieve a higher standard of severe accident safety performance than their prior designs." Moreover, in its policy statement of 1994 regarding the regulation of advanced nuclear power plants, the Commission stated its expectation "that advanced reactors will provide enhanced margins of safety and/or utilize simplified, inherent, passive, or other innovative means to accomplish their safety functions." As noted in the staff requirements memorandum dated June 26, 1990, on SECY-90-016, "Evolutionary Light Water Reactor (LWR) Certification Issues and Their Relationship to Current Regulatory Requirements," dated January 12, 1990, the Commission supported a goal of 10^{-4} per year of reactor operation for CDF and 10^{-6} per year for large release frequency (LRF) for use by the staff in its assessment of evolutionary LWRs. Additionally, the Commission approved a conditional containment failure probability (CCFP) objective of 0.1 as a basis for establishing regulatory guidance for evolutionary designs.

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CDF estimates for new reactors¹ are observed to be typically 10 to 1,000 times lower than those for currently operating reactors when internally initiated events and those externally initiated events that have been quantified are included.

Correspondingly, LRF (or LERF) estimates are 10 to 10,000 times lower for new reactors, while CCFP estimates are typically 3 to 10 times lower. The lower risk estimates for new reactors raise several issues regarding how to apply acceptance guidelines for changes to the licensing basis and thresholds in the Reactor Oversight Process (ROP) that were developed for currently operating reactors.

The enclosed white paper presents a full discussion of the issues and options for applying or modifying the current set of reactor risk metrics to new reactors. The paper discusses the issues posed by the lower risk estimates of new reactors in risk-informed applications, including changes to the licensing basis and the ROP, and describes the advantages and disadvantages of each option.

The staff is currently reviewing one application for risk-informed technical specifications initiatives 4b and 5b (concerning completion times and surveillance test intervals, respectively) as part of the US-APWR design certification and the Comanche Peak combined license application. In addition, other industry representatives have expressed interest in pursuing risk-informed inservice inspection of piping for new reactors, and the staff expects additional risk-informed applications for new reactors in the future.

During the staff's consideration of these risk-informed initiatives, the question arose of whether the current numerical risk metric goals for CDF and LERF should be applicable to new LWRs, or whether alternate metrics for CDF and LRF should be developed consistent with the Commission's safety expectations and approved goals for new reactors. If alternate metrics are developed, a related question is whether the new LWR risk metrics should be considered for both licensing and operations reviews.

The staff has developed an initial set of possible options for risk metrics for new reactors. The staff intends to engage stakeholders regarding the issues surrounding the application of the current set of reactor risk metrics to new reactors and to further assess and evaluate these options. Through these interactions, the staff will finalize a set of options for Commission consideration, including possible alternate risk metrics that could be applied to new reactors.

¹ For the purpose of this memo and the attached white paper, the term "new reactor" refers to evolutionary and advanced LWRs, including the plants using multi-train, mostly active engineered safeguards (Advanced Boiling Water Reactor (ABWR), System 80+, U.S. Advanced Pressurized-Water Reactor (US-APWR), U.S. Evolutionary Power Reactor (U.S. EPR)), as well as those plants with mainly passive safeguards systems (Advanced Passive 600 (AP600), Advanced Passive 1000 (AP1000), Economic Simplified Boiling-Water Reactor (ESBWR)).

The Commissioners

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The attached white paper provides a basis for discussion with stakeholders. These interactions will include one or more public meetings, one or more briefings with the Advisory Committee on Reactor Safeguards, and solicitation of written comments from interested stakeholders.

Enclosure:

As stated

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