POLICY ISSUE
NOTATION VOTE

November 26, 2012 SECY-12-0157

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: CONSIDERATION OF ADDITIONAL REQUIREMENTS FOR CONTAINMENT VENTING SYSTEMS FOR BOILING WATER REACTORS WITH MARK I AND MARK II CONTAINMENTS

PURPOSE:

The purpose of this paper is to provide the U.S. Nuclear Regulatory Commission (NRC) with information, options, and a recommendation from the NRC staff to impose new requirements for containment venting systems for boiling-water reactors (BWRs) with Mark I and Mark II containments. This paper is provided in response to the Commission's staff requirements memorandum (SRM) for SECY-11-0137, "Prioritization of Recommended Actions To Be Taken in Response to Fukushima Lessons Learned," dated December 15, 2011.

SUMMARY:

As directed by the Commission, the NRC staff evaluated the addition of filtered containment venting systems to BWRs with Mark I and Mark II containments to address lessons learned from the events at the Fukushima Dai-ichi nuclear accident in Japan. Specifically, the options presented include: (1) the status quo including completing requirements established for reliable hardened vents; (2) issuance of Orders requiring containment venting systems capable of operating under severe accident conditions; (3) issuance of Orders requiring containment venting systems capable of operating under severe accident conditions that have filters within

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the controlled release pathways; and (4) developing a severe accident confinement strategy for BWRS with Mark I and Mark II containments. The NRC staff performed various assessments and analyses of possible requirements for licensees to have containment venting systems capable of operating under severe accident conditions and possible requirements for the installation of containment vent filtration systems. Several public meetings and other interactions with stakeholders, including the NRC's Advisory Committee on Reactor Safeguards (ACRS), informed the NRC staff's assessments. The evaluation of options used existing NRC processes and addressed possible updates to associated regulatory guidance and insights from the Fukushima Dai-ichi accident.

Based on its regulatory analyses, the staff concludes that installation of engineered filtered venting systems for Mark I and Mark II containments is the option that would provide the most regulatory certainty and the timeliest implementation. The vast majority of Mark I and Mark II severe accident sequences would benefit from a containment vent, (whether the vent includes an engineered filter or not) and the addition of an engineered filter reduces the release of radioactive materials should a severe accident occur. A comparison of only the quantifiable costs and benefits of the proposed modifications, if considered safety enhancements, would not, by themselves, demonstrate that the benefits exceed the associated costs. However, when qualitative factors such as the importance of containment systems within the NRC's defense-in-depth philosophy are considered, as is consistent with Commission direction, a decision to require the installation of engineered filtered vent systems is justified.

BACKGROUND:

The accident at the Fukushima Dai-ichi nuclear facility in Japan highlighted the need for safety improvements for nuclear power plants related to beyond-design-basis natural hazards and the resulting effects on plant systems and barriers from an extended loss of electrical power and access to heat removal systems. In SECY-11-0137, "Prioritization of Recommended Actions To Be Taken in Response to Fukushima Lessons Learned," dated October 3, 2011, the NRC staff described its proposals for the regulatory actions to address the recommendations of the Fukushima Near-Term Task Force (NTTF). Among the immediate (Tier 1) actions that the NRC staff proposed was the issuance of orders requiring reliable hardened containment vents for those licensees with BWR facilities with Mark I and Mark II containment designs. Ensuring the availability of reliable, hardened containment vents addresses some of the problems encountered during the Fukushima Dai-ichi accident by providing plant operators with improved methods to vent containments during beyond-design-basis accidents (but before core melt). Venting containment can help prevent or delay the loss of, or facilitate recovery of, important safety functions such as reactor core cooling, reactor coolant inventory control, containment cooling, and containment pressure control. The NRC subsequently issued orders requiring reliable hardened vents for these plants on March 12, 2012. The NRC staff identified an additional issue in SECY-11-0137 related to possible upgrading of the containment vents, including the addition of engineered filters, to improve reliability during severe accident conditions and limit the release of radioactive materials if the venting systems were used after significant core damage had occurred.

In the staff requirements memorandum (SRM) for SECY-11-0137, dated December 15, 2011, the Commission directed the NRC staff as follows:

> The staff should quickly shift the issue of "Filtration of Containment Vents" from the "additional issues" category and merge it with the Tier 1 issue of hardened vents for Mark I and Mark II containments such that the analysis and interaction with stakeholders needed to inform a decision on whether filtered vents should be required can be performed concurrently with the development of the technical bases, acceptance criteria, and design expectations for reliable hardened vents.

In response to the SRM, the staff included plans to address the filtered venting issue for Mark I and Mark II containments in SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," dated February 17, 2012. The staff explained the proposed evaluations and need for timely consideration as follows:

> The staff has determined that some of the additional issues should be included in existing Tier 1 activities. In accordance with the direction in SRM-SECY-11-0137, the additional issue of filtration of containment vents was merged with the Tier 1 issue of hardened vents for Mark I and Mark II containments such that further analysis and interaction with stakeholders will inform whether filtered vents should be required. The staff has determined that consideration of severe accident conditions in the design and operation of the vent, the addition of filters to hardened reliable vents, and consideration of vents in areas other than primary containment, will be the topic of a policy paper to the Commission in July 2012.[1]
>
> The staff believes that the requirements for hardened reliable vents in the proposed order are important to ensure core and containment cooling, and that these requirements should be imposed before the staff completes its evaluation of the technical and policy issues associated with imposing additional requirements, as described above. In public meetings, the staff has encouraged licensees to consider the potential for the later addition of filters. However, the industry has stated that the addition of filters to hardened containment vents may require modifications to the vent design. In light of this, a consideration in the staff's proposal to issue the proposed order now is that the proposed order requires submission of integrated plans for implementing the requirements of the order by February 28, 2013, eight months after the staff plans to send the July 2012 policy paper to the Commission for consideration. As a result, licensees should have time to revise draft plans in response to any new Commission direction before the integrated implementation plans are due.

In SECY-12-0095, "Tier 3 Program Plans and 6-Month Status Update in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami," dated July 13, 2012, the staff described the current course of action as follows:

> One of the six additional recommendations identified in SECY-11-0137, and further developed in SECY-12-0025, was consideration of additional performance

[1] The schedule for this paper was subsequently extended to November 30, 2012, in a memorandum dated August 6, 2012, "Staff Requirements - COMSECY-12-0014 - Revised Schedule and Plans for Japan Lessons- Learned."

> requirements, including filters, for hardened containment vent systems for boiling-water reactor Mark I and Mark II containment designs. In SECY-12-0025, the staff explained that it needed to resolve technical and policy issues before regulatory action could be proposed that would require licensees to install filters, or change any other performance requirement, for hardened containment vent systems. The staff's recommendation on additional performance requirements for containment vents will be provided in a separate paper.

On August 7, 2012, the staff briefed the Commission on the status of actions taken in response to lessons learned from the Fukushima Dai-ichi accident. In the resulting SRM, "Briefing on the Status of Lessons Learned from the Fukushima Dai-ichi Accident (M120807B)," dated August 24, 2012, the Commission provided the following direction to the staff:

> In the forthcoming notation vote paper on filtered vents, the staff should include a discussion of accident sequences where the filters are and are not beneficial.

This paper provides the staff's assessment and recommendation on the installation of filtered vents and provides a discussion of those accident sequences in which the filters are both beneficial and nonbeneficial.

DISCUSSION:

A key element of the design of nuclear power plants is the inclusion of multiple barriers to prevent or contain potential release of radioactive materials created within the fuel by the fission process. In the United States, multiple structural barriers always have been required to confine the fission products to the plant should an accident lead to a compromise of one or more of the barriers provided by the fuel design, the reactor coolant pressure boundary, and the containment.

For currently operating plants, the design of the containment barrier provides either (1) a large enough air volume to accommodate the energy released from a design-basis loss-of-coolant accident (LOCA) while not exceeding the design pressure for the containment, or (2) systems that include water or ice to absorb the energy released from a LOCA by condensing steam and thereby suppressing the increase in pressure to values below the design pressure for the containment. BWRs employ such pressure suppression containment designs. Mark I and Mark II containments are specific containment configurations for BWRs that use water suppression pools to condense the steam released from the reactor following a LOCA or other plant transients or accidents. As a result of the heat capacity of a suppression pool (i.e., the ability to condense steam), Mark I and Mark II containments have relatively small free volumes compared to other types of containments (e.g., large dry containments). For additional background information on Mark I and Mark II containments, see Enclosure 2.

Mark I and Mark II containments (as well as other pressure suppression containments) have been shown to be capable of addressing the requirements related to the design-basis accidents that the NRC and its predecessor (Atomic Energy Commission) established for the licensing of currently operating plants. However, various studies (e.g., NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants") and events have shown that the Mark I and Mark II containments do not have the same margins of safety that other containments (e.g., large dry ones) have during accidents that exceed the conditions

established by design basis events. These include events that result in an extended addition of energy (i.e., decay heat from the reactor core) to the containment and suppression pool without having available heat removal systems that include pumps and heat exchangers to direct that energy to the ultimate heat sink (e.g., the atmosphere, a nearby river, reservoir), and events that result in the production of significant quantities of noncondensable gases (e.g., hydrogen, carbon monoxide) that are released into the containment. The events at the Fukushima Dai-ichi nuclear power plant involved an extended loss of electrical power and heat-removal systems, resulting in containment pressures that exceeded the containment design pressure. Plant conditions at Fukushima Dai-ichi (e.g., loss of all electrical power or station blackout) hampered the efforts of operators to address the containment overpressure conditions using the installed venting systems, which ultimately contributed to the compromise of all fission product barriers and significant releases of radioactive material. The insights that the NRC gained from Fukushima Dai-ichi on the difficulties in venting the containments led the agency to impose additional requirements for reliable hardened venting systems for plants with Mark I and Mark II containments. It also led the NRC to initiate proposed new regulations for all plants to improve operator readiness to respond to severe accident conditions.

The NRC and nuclear industry have recognized the potential need to vent Mark I and Mark II containment designs to cope with severe accident conditions since at least the early 1980s. In 1983, the NRC approved Revision 2 to the Boiling Water Reactor Owners' Group Emergency Procedure Guidelines, which included guidance for operators to vent Mark I and Mark II containments in response to containment overpressure conditions. The emergency procedure guidelines are used to develop plant specific emergency operating procedures. Though emergency procedures have existed since the 1980s for Mark I and Mark II containment venting systems for beyond-design-basis accidents and severe accidents, the NRC's actions to date, for operating reactors, have not required containment venting systems for Mark I and Mark II containments be designed for severe accident conditions. In keeping with its Severe Accident Policy Statement, the NRC defined in Section 52.79 of Title 10 of the *Code of Federal Regulations* (10 CFR 52.79) requirements for new reactor designs to include in applications " … a description and analysis of design features for the prevention and mitigation of severe accidents."

The NRC has evaluated the possible imposition of such design requirements for operating reactors in previous studies (e.g., the containment performance improvement program (CPIP) in the late 1980s) and has determined that the low probability of such events resulted in the costs of design improvements exceeding the calculated benefits. While the cost/benefit assessment performed by the NRC at that time determined that additional requirements were not cost-justified for Mark I and Mark II containment designs, legislators and regulators in other countries did impose requirements in the aftermath of the accidents at Three Mile Island and Chernobyl. In effect, those other regulatory authorities assessed filtered vents and other severe accident protections with an emphasis on the defense-in-depth argument and with less or no consideration of cost/benefit analyses. A discussion of the requirements in various countries can be found in Enclosure 3. Through interactions with nuclear safety regulators and licensees in other countries and in conducting independent assessments, the staff did not identify any adverse systems interactions or potential negative consequences associated with the installation of filtered containment venting systems.

The performance of existing plant features is an important consideration in evaluating plant behavior under severe accident conditions and possibly adding regulatory requirements to address such conditions. Although not specifically designed to address severe accident conditions, existing plant systems for core cooling, coupled with containment cooling and the suppression pool, can serve to limit the releases of radioactive materials from the plant. Additional plant capabilities and guidelines for accident management have come from previous plant studies and response to events such as the Three Mile Island accident and the terrorist attacks on September 11, 2001. A discussion of the potential capabilities and limitations of existing systems to limit the release of radioactive materials following significant core damage at plants with Mark I or Mark II containments is available in Enclosure 4.

To support deliberations of possible actions related to the performance of Mark I and Mark II containments during severe accidents, the NRC staff, with assistance from Sandia National Laboratories, performed various simulations using the MELCOR and MACCS2 computer codes to evaluate plant response and possible releases from a representative plant assuming various capabilities and configurations. As discussed in Enclosure 5, these simulations provide an assessment of the sensitivity of the plant risks to particular features or parameters. The NRC used lessons-learned and best practices from the recently completed State-of-the-Art Reactor Consequence Analysis (SOARCA) project in conducting the MELCOR and MACCS2 simulations. The simulations in Enclosure 5 were used along with insights from previous studies (e.g., individual plant examinations, NUREG-1150, CPIP, severe accident mitigation alternatives) to help evaluate the potential benefits of features such as revising Mark I and Mark II containment designs to ensure that containment venting systems are capable of working under severe accident conditions and adding engineered filters to the containment venting systems. The technical analysis, discussed in Enclosure 5, includes an assessment of various scenarios to determine those that might benefit from proposed severe accident features, such as engineered filters, and those that would not benefit because the release would bypass such features. In general, the vast majority of Mark I and Mark II severe accident sequences would benefit from a containment vent (whether the vent includes an engineered filter or not). Examples of those sequences for which such vents (with or without engineered filters) would not be beneficial include containment bypass events and intersystem LOCAs, which represent a small fraction of the failure modes for Mark I and Mark II containments. The staff notes that while an engineered filtered vent or a severe accident capable vent (without an engineered filter) is beneficial to many accident sequences, additional measures are needed to provide cooling to core debris released to the containment and to prevent other types of containment failure (e.g., Mark I liner melt through, Mark II suppression pool bypass). The staff's evaluation includes consideration of the need for additional measures to provide core debris cooling.

In addition to its own assessments and analyses, the staff also relied on information gained through interacting with various stakeholders. The nuclear industry provided insights to the NRC staff during several public meetings and through a report that the Electric Power Research Institute prepared. Several nongovernmental organizations and individuals in correspondence and during public meetings provided information to the NRC staff. Enclosure 6 provides additional information on the NRC staff's interactions with external stakeholders.

The NRC staff used the assessments, analyses, and interactions that are discussed above to inform its evaluation of options in Enclosure 1 and the regulatory analysis available in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession No. ML12312A456. In evaluating the possible approaches to address the issue of containment venting for BWRs with Mark I and Mark II containments, the staff identified the following options:

(1) Reliable hardened vents (Status Quo): Continue with the implementation of Order EA-12-050 for reliable hardened vents to reduce the likelihood of core damage and failure of BWR Mark I and Mark II containments and take no additional action to improve their ability to operate under severe accident conditions or to require the installation of an engineered filtered vent system.

(2) Severe accident capable vents order: Upgrade or replace the reliable hardened vents required by EA-12-050 with a containment venting system designed and installed to remain functional during severe accident conditions.

(3) Filtered vents order: Design and install an engineered filtered containment venting system that is intended to prevent the release of significant amounts of radioactive material following the dominant severe accident sequences at BWRs with Mark I and Mark II containments.

(4) Severe accident confinement strategy: Pursue development of requirements and technical acceptance criteria for confinement strategies and require licensees to justify operator actions and systems or combinations of systems, such as suppression pools, containment sprays, and separate filters to accomplish the function and meet the requirements.

In evaluating these options, the staff assumed, to the extent practical, the completion of the post-Fukushima Tier 1 items (e.g., implementation of mitigating strategies, reliable hardened containment vents, and integration of accident-related procedures). In its evaluation of the above options, the NRC staff chose not to apply any of the exceptions to the backfit regulations prior to conducting the cost-benefit analysis. The staff proceeded with analyses of the proposed venting modifications as possible cost-justified substantial safety improvements. As stated in Enclosure 1, the staff performed its cost and benefit evaluation using established agency practices for evaluating potential safety enhancements as described in NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission." In that evaluation, the NRC staff did not assume any changes in the traditional approaches to imposing safety enhancement requirements or the consideration of economic consequences (e.g., land contamination) from possible severe accidents. The evaluation of options is therefore presented in terms of a comparison of the possible benefits from new requirements and the associated costs of those requirements. The staff's regulatory analysis focuses on Option 2 (severe accident capable vent order) and Option 3 (filtered vent order) as those options involve potential near term regulatory action. Option 4 involves a longer-term effort, and the associated regulatory analysis, which includes a cost/benefit assessment, would be developed once the approach and possible regulatory changes are better defined.

The staff conducted sensitivity studies to evaluate the implications of possible changes to assumptions used in the cost-benefit analysis and major uncertainties in factors, such as event frequencies and consequences. The best-estimate quantitative evaluations, excluding any qualitative factors and sensitivity analysis, indicate that the costs of the proposed actions outweigh the benefits. However, when values from the higher end of the uncertainty bands are assumed for event frequencies or event consequences, the calculated benefits from the proposed options can exceed the estimated costs. The following table provides a summary of the quantitative evaluation from Enclosure 1, showing the sensitivity to event frequency:

Quantitative Cost/Benefit Analysis Per Plant				
	Severe Accident Capable Venting System		Engineered Filtered Venting System	
Total Costs ($k)	(2,027)[1]		(16,127)	
Core Damage Frequency	$2x10^{-5}$/yr	$2x10^{-4}$/yr	$2x10^{-5}$/yr	$2x10^{-4}$/yr
Total Benefits ($k)	938	9,380	1,648	16,480
Net Value (Benefits – Costs)	(1,089)	+7,353	(14,479)	+353

- Total costs include industry and NRC development, implementation, and operating costs.
- Total benefits include averted dose (offsite and occupational assuming $4K/person-rem) and averted property damage (offsite and onsite)

(1) As discussed in Enclosures 1 and 4, the costs for severe accident capable vents for Mark II containment designs will likely be higher than for Mark I plants. The higher cost reflects the likely need to modify the containments to prevent molten core debris in the lower drywell sump drain lines or downcomers from causing a bypass of the suppression pool. Avoidance of suppression pool bypass is needed to make the severe accident capable vents a viable option for the Mark II containment design.

In addition to the analyses discussed above, the NRC staff identified other factors that are not readily represented in quantitative terms but nevertheless warrant consideration in making a decision on possible changes to the performance requirements under severe accident conditions for BWRs with Mark I and Mark II containments. Inclusion of these factors in decisionmaking is consistent with the Commission's guidance on the Backfit Rule in the June 30, 1993, SRM on SECY-93-086, "Backfit Considerations." This guidance is reflected in NUREG/BR-0058. The qualitative factors included in this evaluation include:

- providing defense in depth (including importance of containment function);
- addressing significant uncertainties (frequencies and consequences);
- supporting severe accident management and response;
- improving hydrogen control;
- addressing external events;
- addressing multi-unit events;
- considering independence of barriers;
- improving emergency planning;
- considering consistency between reactor technologies;
- considering severe accident policy statement; and
- addressing international experience and practices (including availability of technology).

The majority of these qualitative factors, which are discussed in Enclosure 1, provide additional support to pursuing an improved containment venting system for BWRs with Mark I or Mark II containments to address specific design concerns (e.g., high conditional containment failure probability given a core melt); to support severe accident management functions by preventing releases of radioactive materials, hydrogen, and steam into the reactor building or other locations on the site; to minimize the contamination of the site environs; and to reduce the reliance on long term emergency planning for protection of public safety. The summary section of Enclosure 1 provides a discussion of the positive and negative attributes (i.e., pros and cons) of each option with respect to these qualitative factors.

The staff concludes that considering both the quantitative and qualitative factors shows the direct and indirect costs associated with Options 2 and 3 are cost-justified in light of the substantial increase in the overall protection of the public health and safety that is provided by addressing severe accident conditions for BWRs with Mark I and Mark II containments. Option 4 also appears to be justified; however, the staff would need to complete the regulatory analysis once the potential technical requirements were better defined, which, if successful, would likely take several years. The uncertainties, schedules, and resource requirements associated with Option 4 are described in Enclosure 1 and are identified as significant challenges to implementing this approach. The timeliness of developing and implementing Option 4 is a potential issue because the Commission identified the evaluation of filtered vents as a Tier 1 issue, which is reserved for those actions to be initiated without unnecessary delay. Based on the assessments completed this past year, the staff concludes that approaches, such as filtering technologies, currently exist and could be implemented in the near term to resolve issues related to Mark I and Mark II severe accident containment venting. These technologies are technically feasible and have been demonstrated through significant testing and application at nuclear power plants worldwide. Furthermore, the staff concludes that the best solution to address the combination of quantitative and qualitative factors (e.g., providing improved defense in depth) is the installation of passive, engineered filtered venting systems at BWRs with Mark I and Mark II containments.

On June 20, September 5, October 3, October 31, and November 1, 2012, the staff briefed the ACRS on the results of its assessments and evaluations, and the resulting conclusions and recommendations. In a letter dated November 8, 2012, the ACRS provided its own recommendations and views on the staff's recommendations. The ACRS concluded that additional defense in depth measures should be considered for plants with BWR Mark I and Mark II containments and they recommended Option 4. The ACRS noted that severe accident capable vents (Option 2) are an essential part of any controlled venting strategy and that installation of additional engineered filters (Option 3) may be an outcome of the assessments associated with Option 4.[2]

Regarding the need for reliable hardened vents, severe accident capable vents, or engineered filtered containment vents for containment designs other than Mark I and Mark II (e.g., Mark III, ice condenser, and large dry containments), the staff stated in SECY-12-0095 that it would

[2] The ACRS reviewed a draft of this Commission paper in which Option 4 was entitled "Performance-based approach." The NRC staff's internal review and concurrence process led to revisions to the paper, including clarifying the title and descriptions of Option 4 as developing a severe accident confinement strategy for Mark I and Mark II containments. The general proposal and most of the discussions related to Option 4 remain the same as that reviewed and commented on by the ACRS.

revise and develop a program plan with an appropriate schedule and milestones following the Commission's decision on the need for severe accident venting or filtered venting for BWRs with Mark I and Mark II containments. Accordingly, following the Commission's decision and direction on this paper, the staff will revise the program plan and proceed with the evaluation of the technical and safety merits of venting for each particular class of containment designs. The staff noted in SECY-12-0095 that expecting different decisions for each class of containment designs is reasonable. The staff continues to believe this is the case, and will address the specifics for each containment design.

RECOMMENDATION

The staff recommends that the Commission approve Option 3 to require the installation of an engineered filtered containment venting system for BWRs with Mark I and Mark II containments. If the Commission approves Option 3, the staff will engage stakeholders on possible implementation issues (e.g., schedules) related to the draft proposed order provided in Enclosure 7b.[3] Within 60 days of the staff requirements memorandum, the staff will provide the Commission a summary of the stakeholder interactions via a Commission Note and the final order via a Regulatory Notification. The staff would likewise engage stakeholders on the draft proposed order in Enclosure 7a if the Commission were to chose Option 2 or Option 4 with a more immediate requirement to make the containment vents capable of operation during severe accident conditions while relying on existing containment systems to limit possible releases.

RESOURCES

	Option 1		Option 2		Option 3		Option 4		Option 2/4	
	FTE	$K	FTE	$K	FTE	$K	FTE	$K	FTE	$K
FY 2013	2	$500	1	$100	1.5	$100	1.5	$175	1.75	$175
FY 2014	Official Use Only – Sensitive Internal Information									
FY 2014 Unbudgeted										

OUO

NRR has budgeted approximately 2 full-time equivalent (FTE) and $500K in the fiscal year (FY) 2013 current estimate (CE) budget and [ ] FTE and $[ ] K in the FY 2014 Performance Budget. If the Commission approves Option 2, 3, or 4, the NRC staff will reallocate additional resources associated with the Fukushima near-term task force tier 3 recommendations during the FY 2015 Planning, Budgeting, and Performance Management process. This reallocation would be less than the 4 FTE or $500,000 that requires Commission approval. Resources beyond 2014 will be addressed during the Planning, Budgeting, and Performance Management process.

[3] It is likely that the draft proposed orders for Options 2 and 3, provided in Enclosure 7a or 7b respectively, will require revision based on interactions with stakeholders and continuing internal discussions on technical or legal issues. If the Commission approves Option 2 or Option 3, the staff will provide the Commisison with a final order via a Regulatory Notification.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has concurred.

/RA/

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Enclosures:
1. Evaluation of Options
2. Design and Regulatory History
3. Foreign Experience
4. BWR Mark I and Mark II Containment Performance during Severe Accidents
5. Technical Analyses
6. Stakeholder Interactions
7. Draft Proposed Orders

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