POLICY ISSUE
NOTATION VOTE

January 9, 2006 SECY-06-0007

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations

SUBJECT: STAFF PLAN TO MAKE A RISK-INFORMED AND PERFORMANCE-BASED REVISION TO 10 CFR PART 50

PURPOSE:

To request Commission approval to (1) issue an Advance Notice of Proposed Rulemaking (ANPR) soliciting stakeholder feedback on rulemaking approaches related to making technical requirements for power reactors risk-informed and performance-based, and (2) allow the staff to supplement the ANPR, with additional information as needed, to solicit stakeholder input.

To provide to the Commission, as part of the ANPR, the program plan to make a risk-informed and performance-based revision to 10 CFR Part 50, including revisions to the applicable Regulatory Guides, Standard Review Plans, and other guidance documents.

BACKGROUND:

On April 5, 2005, the Office of Nuclear Regulatory Research (RES) briefed the Commission on its programs, performance, and plans. In response to this briefing on May 9, 2005, the Commission, in a staff requirements memorandum (SRM), directed the staff "to develop a formal program plan to make a risk-informed and performance-based revision to 10 CFR Part 50, including revisions to the applicable Regulatory Guides, Standard Review Plans, or other guidance documents" (ML051290351).

CONTACTS: M. Drouin, RES/DRAA
301-415-6675

J. Birmingham, NRR/DPR
301-415-2829

In a September 14, 2005 SRM (ML052570437), in response to SECY-05-0130, "Policy Issues Related to New Plant Licensing and Status of the Technology-Neutral Framework for New Plant Licensing," the Commission subsequently directed the staff to develop in an expeditious fashion an ANPR to consider the spectrum of issues relating to risk-informing the reactor regulations. The Commission further directed the staff to incorporate into the ANPR the formal program to risk-inform Part 50, as well as other related risk-informed efforts, and to integrate safety, security, and preparedness throughout the effort.

In September 21, 2005 SRM (ML052640492), in response to SECY-05-0138, "Risk-Informed and Performance-Based Alternatives to the Single-Failure Criterion," the Commission again directed the staff to develop expeditiously an ANPR, to include the effort to develop risk-informed and performance-based alternatives to the single failure criterion, and to integrate safety, security, and preparedness throughout the effort. This is consistent with the Commission direction provided in the SRM to SECY-05-0130.

DISCUSSION:

The staff proposes to achieve the Commission's direction to make a risk-informed and performance-based revision to 10 CFR Part 50 by creating a completely new risk-informed and performance-based Part 50 (to be called Part 53) that is applicable to all reactor technologies. The development of this new Part 53 will integrate safety, security, and preparedness. This approach will ensure that the reactor regulations, and staff processes and programs, are built on a unified safety concept and are properly integrated so that they complement one another.[1] The plan for this effort is incorporated into the enclosed ANPR (see Enclosure).

The first task in this effort is the issuance of an ANPR on revision of the requirements of 10 CFR Part 50 to be risk-informed and performance-based. The ANPR will initiate the rulemaking process by notifying stakeholders and requesting feedback on the Commission's interest in developing a new Part 53. Creating a new risk-informed and performance-based Part 53 is a continuation and advancement of the work described in SECY-05-0006, "Second Status Paper on the Staff's Proposed Regulatory Structure for New Plant Licensing and Update on Policy Issues Related to New Plant Licensing" (ML043560093). The technical basis to support a new Part 53 involves numerous policy and technical issues. However, not all of the issues associated with a new Part 53 have necessarily been identified at this time. The staff anticipates that as the technical basis is further developed, additional issues may be identified. Also, as staff efforts proceed with revising the current 10 CFR Part 50, more policy issues may be identified.

The staff plans to supplement the ANPR with additional information over time so that stakeholders have the opportunity to provide input on all the significant issues early in the rulemaking process. Consequently, the ANPR process will remain open until the technical basis is complete. With completion of the technical basis and closure of the ANPR stage, the

[1]As noted in SECY-05-0199, "Updated of the Risk-Informed Regulation Implementation Plan," dated October 28, 2005 (ML052620538), the staff concluded that it would be more appropriate to discontinue a separate Coherence Plan and include this effort as part of the risk-informed and performance-based revision to 10 CFR Part 50.

staff will request Commission direction and approval regarding initiating formal rulemaking (including development of actual rulemaking language).

Two of the policy issues to be addressed are the level of safety and the integrated risk for future reactors, as discussed in SECY-05-0130 (ML051670388). The Advisory Committee on Reactor Safeguards (the Committee) sent the Commission the Committee's views of these two issues in a letter on September 21, 2005 (ML052640580). In the SRM for SECY-05-0130, the Commission directed the staff to consider the Committee's comments and develop a subsequent notation vote paper. The Committee's letter is attached to the ANPR and the staff is soliciting stakeholder comments on their views. The staff will consider stakeholder feedback and the Committee's views on these issues in preparing a recommendation for the Commission.

Two other policy issues are discussed in SECY-05-0130: containment functional performance requirements and definition of defense-in-depth. With regard to containment functional performance requirements, the staff did not provide recommendations and stated that final options and recommendations would be submitted for Commission approval in coordination with completing the draft work on the technology-neutral framework. With regard to defense-in-depth, the staff stated that it would provide a definition for Commission approval in coordination with completing the draft technology-neutral framework and subsequently incorporate the definition into the Commission's Probabilistic Risk Assessment (PRA) policy statement. These two issues have now been included in the ANPR to solicit stakeholder feedback. The staff will take into account stakeholder feedback and will provide a recommendation on a path forward for Commission approval.

In addition, in SECY-05-0138 (ML051950619), the staff recommended including any followup activities to risk-inform the single failure criterion as part of the formal program plan to risk-inform 10 CFR Part 50. The staff is proposing to address this issue in developing a new Part 53. This issue is also included in the ANPR to solicit stakeholder feedback as directed by the Commission in their SRM to SECY-05-0138.

The staff also plans to continue the ongoing efforts to revise specific regulations in 10 CFR Part 50 as described in SECY-98-300, "Options for Risk-Informed Revisions to 10 CFR Part 50, "Domestic Licensing of Productions and Utilization Facilities" (ML992870048). The staff proposes to focus resources in the near-term on completion and subsequent implementation of the ongoing risk-informed rulemaking efforts for current operating reactors and not to initiate new efforts to risk-inform and performance-base other regulations at this time, unless specific regulations or guidance documents are identified that could enhance the efficiency and effectiveness of staff reviews of near-term applications. However, the staff is requesting public comment in the ANPR on whether there are additional regulations in 10 CFR Part 50 that should be risk-informed. Based on public comments received, the staff will request Commission direction and approval regarding initiating any new revisions to the regulations in 10 CFR Part 50.

The staff will keep the Commission informed on the status of this rulemaking effort through the annual Rulemaking Activity Plan. The staff will also keep the Commission informed on the status of risk-informing activities through the semi-annual updates of the Risk-Informed Regulation Implementation Plan.

COMMITMENTS:

Listed below are the actions or activities committed to by the staff in this paper.

(1) The staff will
- — provide recommendations for Commission direction and approval on the two policy issues regarding the level of safety and integrated risk;
- — provide a path forward for Commission approval on the resolution of containment functional performance standards and on incorporation of a definition of defense-in-depth into the Commission's PRA policy statement; and
- — inform the Commission of stakeholders views on the ANPR.

(NRR/RES/NSIR, October 2006)

(2) The staff will supplement the ANPR with additional issues as needed. (NRR/RES/NSIR)

(3) The staff will request Commission direction and approval on additional policy and technical issues, if identified. (NRR/RES/NSIR)

(4) The staff will provide the Commission, for information, the technology-neutral framework after considering stakeholders comments from the ANPR and incorporating any additional guidance received from the Commission on the issues identified in (1) above. (RES/NRR/NSIR, June 2007)

(5) The staff will request Commission direction and approval to initiate formal rulemaking on a new Part 53 and to initiate efforts to revise other regulations in Part 50, if any are identified. (NRR/RES/NSIR).

RECOMMENDATION:

The staff recommends that the Commission approve

- issuance of the enclosed ANPR on a risk-informed and performance-based revision to 10 CFR Part 50, and

- allow the staff to supplement the ANPR, as needed, with additional information to solicit stakeholder input.

RESOURCE:

To implement the activities listed above, the staff has made preliminary resource estimates as shown in the table below for creating a new Part 53. These estimates address the first part of the rulemaking process (the ANPR and the technical basis as described in the ANPR) and involve the expertise of a board portion of the agency's technical staff.

	FY 2006				FY 2007				FY 2008	
	Proposed		Current		Proposed		Current			
	FTE	$K	FTE	$K	FTE	$K	FTE	$K	FTE	$K
RES	3.6	550	3.6**	550	3.6	550	1.6	550	3	550
NRR	3.5	50	3**	*	5	50	*	*	6	50
NSIR	0.5	25	0.5**	25**	1	25	*	*	1	25

*The current Office of Nuclear Reactor Regulation (NRR) and Office of Nuclear Security and Incident Response (NSIR) budgets only included sufficient resources for development of the technical basis to provide a minimal level of effort to support RES.

**In the August 23, 2005, memo from the EDO and the CFO to the Commission, "Allocation of Additional FY 2006 Funding for New Reactor Licensing and Security," NRR and RES were allocated an additional 5 FTE (2 for RES and 3 for NRR) for risk-informing Part 50 for new reactors. In addition, NSIR was allocated sufficient resources to cover all new reactor licensing requirements.

Implementing this work would necessitate requesting additional resources beyond those currently allocated within NRR, RES, and NSIR. For FY 2006, the budget includes sufficient resources for RES and NSIR. For NRR, an additional 0.5 FTE and $50K is needed. NRR plans to reallocate $50K from topical reports - financial assurance reviews, and 0.5 FTE from the lowest priority licensing actions. The impact of the reallocation would be a slight delay in contractual efforts for financial reviews, and a delay of approximately eight licensing actions.

Consistent with our common prioritization process, the likely areas from which FY2007 and FY2008 resources would be drawn are lower priority licensing actions, topical report reviews, and lower priority rulemakings. In addition, resources associated with research programs for providing technical support for risk-informed and performance-based changes to Part 50 would be realigned. The additional resources needed in FY 2007 and FY 2008 will be addressed during the FY 2008 Planning, Budgeting, and Performance Management (PBPM) process.

The task, Rule Development, if approved by the Commission following completion of the ANPR and development of the technical basis, is scheduled in the plan to start after 2008. The staff will request Commission direction and approval before implementing this task, as well as provide resource estimates for this task.

The information on resources and schedule reflects the current environment. If a significant amount of time (greater than 30 days) passes or the Commission provides the staff direction that differs from or adds to the staff's recommended action(s), this section of the paper would need to be revisited after issuance of the draft SRM.

COORDINATION:

The Office of the General Counsel has no legal objection concerning this paper. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The staff provided Advisory Committee on Reactor Safeguards (ACRS) with a draft copy of this paper on November 18, 2005, and briefed the ACRS on December 8, 2005. The staff will continue to interface with the ACRS on these efforts.

/RA/

Luis A. Reyes
Executive Director
for Operations

Enclosure:
Advance Notice of Proposed Rulemaking
"Approaches to Risk-Inform and Performance-Base the Requirements for Nuclear Power Reactors"

Advance Notice of Proposed Rulemaking

"Approaches to Risk-Inform and Performance-Base the Requirements for Nuclear Power Reactors"

Enclosure

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Parts 50 and 53

RIN 3150-AH81

Approaches to Risk-Inform and Performance-Base Requirements for Nuclear Power Reactors

AGENCY: Nuclear Regulatory Commission.

ACTION: Advance notice of proposed rulemaking (ANPR).

SUMMARY: The Nuclear Regulatory Commission (NRC) is considering modifying its approach to develop risk-informed and performance-based requirements applicable to nuclear power reactors. The NRC is considering an approach that, in addition to the ongoing effort to revise some specific regulations to be risk-informed and performance-based, would establish a comprehensive set of risk-informed and performance-based requirements applicable for all nuclear power reactor technologies as an alternative to current requirements. This new rule would take advantage of operating experience, lessons learned from the current rulemaking activities, advances in the use of risk-informed technology, and would focus NRC and industry resources on the most risk-significant aspects of plant operations to better ensure public health and safety. The set of new alternative requirements would be intended primarily for new power reactors although they would be available to existing reactor licensees.

At the conclusion of this ANPR phase and taking into consideration public comment, the NRC will determine how to proceed regarding making the requirements for nuclear power plants risk-informed and performance-based.

DATES: The comment period expires December 31, 2007. This time period allows public comment on the proposals in this ANPR.

Comments on the general proposals in this ANPR would be most beneficial to the NRC if submitted within 90 days of issuance of the ANPR. Comments on any periodic updates will be most beneficial if submitted within 90 days of their respective issuance. Periodic updates that are issued will be placed on the NRC's interactive rulemaking website, Ruleforum, (http://ruleforum.llnl.gov), for information or comment. Supplements to this ANPR are anticipated to be issued and will request additional public comments.

Comments received after the above date will be considered if it is practical to do so, but the Commission is able to assure consideration only for comments received on or before the above date.

ADDRESSES: You may submit comments by any one of the following methods. Please include the following number RIN 3150-AH81 in the subject line of your comments. Comments on this ANPR submitted in writing or in electronic form will be made available for public inspection. Because your comments will not be edited to remove any identifying or contact information, the NRC cautions you against including information such as social security numbers and birth dates in your submission.

Mail comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.

E-mail comments to: SECY@nrc.gov. If you do not receive a reply e-mail confirming that we have received your comments, contact us directly at (301) 415-1966. You may also submit comments via the NRC's rulemaking web site at http://ruleforum.llnl.gov. Address questions about our rulemaking web site to Carol Gallagher (301) 415-5905; email cag@nrc.gov. Comments can also be submitted via the Federal eRulemaking Portal http://www.regulations.gov.

Hand deliver comments to: 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 am and 4:15 pm Federal workdays. (Telephone (301) 415-1966).

Fax comments to: Secretary, U.S. Nuclear Regulatory Commission at (301) 415-1101.

Publicly available documents related to this ANPR may be viewed electronically on the public computers located at the NRC's Public Document Room (PDR), O1 F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. The PDR reproduction contractor will copy documents for a fee. Selected documents, including comments, may be viewed and downloaded electronically via the NRC rulemaking web site at http://ruleforum.llnl.gov.

Publicly available documents created or received at the NRC after November 1, 1999, are available electronically at the NRC's Electronic Reading Room at http://www.nrc.gov/reading-rm/adams.html. From this site, the public can gain entry into the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC Public Document Room (PDR) Reference staff at 1-800-397-4209, 301-415-4737 or by email to pdr@nrc.gov.

FOR FURTHER INFORMATION CONTACT: Joseph Birmingham, Office of Nuclear Reactor Regulation (NRR), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone (301) 415-2829, email: jlb4@nrc.gov; or Mary Drouin, Office of Nuclear Regulatory Research (RES), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: (301) 415-6675, e-mail: mxd@nrc.gov.

SUPPLEMENTARY INFORMATION:

Background

The Commission directed the NRC staff to: (1) develop an ANPR, (2) incorporate in the ANPR a formal program plan to risk-inform 10 CFR Part 50, as well as other related risk-informed efforts, and (3) integrate safety, security, and preparedness throughout the effort (ADAMS Accession Numbers ML051290351 and ML052570437). The Commission also directed the staff to include the effort to develop risk-informed and performance-based alternatives to the single failure criterion (ADAMS Accession Number ML052640492).

The NRC has conducted public meetings and workshops to engage interested stakeholders in dialogue on the merits of various approaches to risk-inform and performance-base the requirements for nuclear power reactors. In particular, the NRC conducted (1) a workshop on March 14-16, 2005, to discuss the staff's work in development of technology-neutral framework in support of a regulatory structure for new plant licensing, and (2) a public meeting on August 25, 2005, to discuss plans for a risk-informed and performance-based revision to 10 CFR Part 50. Meeting minutes were taken and are available to the public

(ADAMS Accession Numbers ML050900045 and ML052500385, respectively). At the above workshop and meeting, the NRC discussed the desirability of various approaches for risk-informing the requirements for nuclear power reactors and particularly for new reactors of diverse types. The NRC discussed approaches such as (1) developing an integrated set of risk-informed requirements using a technology-neutral framework as a basis for regulation, and (2) continuing to risk-inform 10 CFR 50 on an issue-by-issue basis.

The NRC also plans to continue the ongoing efforts to revise specific regulations in 10 CFR Part 50 as described in SECY-98-300, "Options for Risk-Informed Revisions to 10 CFR Part 50 - Domestic Licensing of Productions and Utilization Facilities" (ML992870048). The Commission proposes to focus resources in the near-term on completion and subsequent implementation of the ongoing risk-informed rulemaking efforts for current operating reactors and not to initiate new efforts to risk-inform and performance-base other regulations at this time, unless specific regulations or guidance documents are identified that could enhance the efficiency and effectiveness of NRC reviews of near-term applications. However, the NRC is requesting public comment in the ANPR on whether there are additional regulations in 10 CFR Part 50 that should be risk-informed. Based on public comments received, the Commission will decide whether to move forward regarding initiating any new revisions to the regulations in 10 CFR Part 50.

Although the NRC conducted the meetings discussed above to get a sense of stakeholder interest and to ascertain the desired path forward, the NRC is issuing this ANPR to obtain additional comment on the proposed approaches, to ensure that the Commission's intent is known to all stakeholders, and to allow the NRC to proceed to risk-inform the requirements for power reactors in an open, integrated, and transparent manner.

Proposed Plan

The NRC has developed a proposed plan to develop an integrated risk-informed and performance-based revision to 10 CFR Part 50 that would cover power reactor applications including non-LWR reactor designs. To accomplish this goal, safety, security, and preparedness will be integrated into one cohesive structure. This structure will ensure that the reactor regulations, and staff processes and programs are built on a unified safety concept and are properly integrated so that they complement one another. Based on the above, the overall objectives of a risk-informed and performance-based revision to 10 CFR Part 50 are to: (1) enhance safety and security by focusing NRC and licensee resources in areas commensurate with their importance to health and safety, (2) provide NRC with the framework to use risk information in an integrated manner to take action in reactor regulatory matters, (3) use risk information to provide flexibility in plant design and operation, which can result in burden reduction without compromising safety and security, (4) ensure that risk-informed activities are coherently and properly integrated such that they complement one another and continue to meet the 1995 Commission's PRA Policy Statement, and (5) allow for different reactor technologies in a manner that will promote stability and predictability in the long term.

The approach addresses risk-informed power reactor activities and the associated guidance documents. Risk-informed activities addressing non-power reactors, nuclear materials and waste are not addressed.

The NRC's proposed approach to develop a risk-informed and performance-based revision to 10 CFR Part 50 is to create an entire new Part in 10 CFR (referred to as "10 CFR Part 53") that can be applied to any reactor technology and that is an alternative to 10 CFR Part

50. Two major tasks are proposed: (1) develop the technical basis for rulemaking for 10 CFR Part 53, and (2) develop the regulations and associated guidance for 10 CFR Part 53.

Task 1: Development of Technical Basis

The objective of this task is to develop the technical basis for a risk-informed and performance-based 10 CFR Part 53. The technical basis provides the criteria and guidelines for development and implementation of the regulations to be included in Part 53. Current activities associated with developing the technical basis are described in SECY-05-006 (ADAMS accession number ML043560093).

As the technical basis is developed and completed, it is anticipated that additional issues will be identified for which stakeholder input is desired. Therefore, it is envisioned that supplemental issues will be added to this ANPR over time. Consequently, the time period for this ANPR is envisioned to be open until the technical basis for Part 53 is complete.

At the end of the ANPR phase, the Commission will decide whether to proceed to formal rulemaking.

Task 2: Rule Development

The objective of this task is to develop and issue the actual regulations for Part 53. The NRC will follow its normal rule development process upon completion of the technical basis. The Commission will direct the staff to develop proposed rule text, interact with stakeholders in an appropriate forum (e.g., posting on web, workshops), and send a proposed rule package to the Commission for consideration, if rulemaking is undertaken.

In development of the rulemaking, the necessary guidance documents to meet the regulations in 10 CFR Part 53 will also be developed.

Specific Considerations

Before determining whether to develop a proposed rule, the NRC is seeking comments on this matter from all interested persons. Specific areas on which the Commission is requesting comments are discussed in the following sections. Comments, accompanied by supporting reasons, are particularly requested on the questions contained in each section.

A. Plan

The NRC is seeking comments on the plan described above:

1. Is the proposed plan to make a risk-informed and performance-based revision to 10 CFR Part 50 reasonable? That is, is there a better approach than to create an entire new Part 53 to achieve a risk-informed and performance-based 10 CFR Part 50? If yes, what is a better and different way?

2. Are the objectives, as articulated, understandable and achievable? If not, why not? Should there be additional objectives? If so, why and what are they?

3. Does the approach described accomplish the objectives? If not, why not?

4. Would existing licensees be interested in using risk-informed and performance-based alternative regulations to 10 CFR Part 50 as their licensing basis?

5. Should the alternative regulations be technology-neutral (i.e., applicable to all reactor technologies, e.g., light water reactor or gas cooled reactor), or be technology-specific? If technology-specific, which technologies?

6. When would alternative regulations and supporting documents need to be in place to be of most benefit? Could supporting guidance be developed later than the alternative regulations, e.g. phased in during plant licensing and construction?

7. If industry wishes to participate in the development of an alternative process, the NRC envisions the process could involve the following: proposed supporting documents and standards and guidance could be developed by industry, and provided in writing to NRC staff for consideration. The proposed documents, standards, and guidance would be reviewed by NRC staff, and the NRC staff could endorse them, if appropriate. To the extent that any documents, standards, or guidance developed by the industry requires further information or explanation, NRC staff could invite industry representatives to a meeting for the purpose of having industry representatives provide additional information and to present their individual views on the subject. What specific documents and standards would industry be willing to take the lead to develop?

B. Integration of Safety, Security and Emergency Preparedness

The Commission believes that safety, security and emergency preparedness should be integrated in developing a risk-informed and performance-based set of requirements for nuclear power reactors (i.e., in this context, Part 53). The NRC has proposed to establish security performance standards for new reactors (see SECY-05-0120, ADAMS Accession Number ML051100233). Under the proposed approach, nuclear plant designers would analyze and establish, at an earlier stage of design, security design aspects such that there would be a more robust and effective security posture and less reliance on operational (extrinsic) security programs (guns, guards and gates). This approach takes advantage of making plants more secure by design rather than security components being added on after design.

As part of this approach, the NRC is seeking comment on the following issues:

8. In developing the requirements for this alternative licensing basis, how should safety, security, and emergency preparedness be integrated?

9. What specific principles, concepts, features or performance standards for security would best achieve an integrated safety and security approach?

10. The NRC is considering rulemaking to require that safety and security be better integrated so that changes in one area would not adversely affect the other. How can

the safety-security interface be better integrated in design and operational requirements?

11. If safety and security requirements are made risk-informed, how should emergency preparedness requirements be modified to be better integrated with safety and security?

C. Level of Safety

The staff, in SECY-05-0130 (ADAMS Accession Number ML051670388), proposed options for specifying a minimum level of safety from the standpoint of risk which would implement the Commission's expectation of enhanced safety for new plants (as expressed in the Commission's policy statement for Regulation of Advanced Nuclear Power Plants). Four options were evaluated which included: (1) perform a case-by-case review, (2) use the Quantitative Health Objectives (QHOs) in the Commission's policy statement on "Safety Goals for the Operation of Nuclear Power Plants" (ADAMS Accession Number ML051580401), (3) develop other risk objectives, and (4) develop new QHOs. The NRC is soliciting stakeholder views on these options.

With regard to specifying the minimum level of safety from the standpoint of risk, subsidiary risk objectives could also be developed. Such subsidiary risk objectives could be a useful way to:

- focus more on plant design,
- provide quantitative criteria for accident prevention and mitigation, and

- provide top level goals to assist in establishing system and hardware reliability and availability targets.

Currently, subsidiary risk objectives of 10^{-5}/plant year and 10^{-6}/plant year that could be applicable to all reactor designs are being considered for accident prevention and accident mitigation, respectively, where:

- accident prevention refers to preventing major fuel damage, and
- accident mitigation refers to preventing releases of radioactive material offsite sufficient to cause one or more early fatalities.

Feedback is sought specifically on the following:

12. Which of the options in SECY-05-0130 with respect to level of safety should be pursued and why? Are there alternative options?

13. Are subsidiary risk objectives useful, and are there other uses of the subsidiary risk objectives that are not specified above?

14. Are the subsidiary risk objectives specified above reasonable surrogates for the QHOs for all reactor designs? Specifically, should a 'preventive' goal be associated with the latent fatality QHO, i.e., should the latent fatality QHO be met by preventive measures alone without credit for mitigative measures, or is this too restrictive? Are there other subsidiary risk objectives applicable to all reactor designs that should be considered? What would be their basis?

15. Should a mitigation goal be associated with the early fatality QHO or should it be set without credit for preventive measures (i.e. assuming major fuel damage has occurred)?

16. Should other factors be considered in accident mitigation besides early fatalities, such as latent fatalities, late containment failure, land contamination, and property damage? If so, what should be the acceptance criteria and its basis?

17. Would a level 3 Probabilistic Risk Assessment (PRA) analysis still be needed if subsidiary risk objectives can be developed? For a specific technology, can practical subsidiary risk objectives be developed without the insights provided by level 3 PRAs?

D. Integrated Risk

For new plant licensing, some licensees have indicated their interest in locating new plants at existing sites or multiple (or modular) reactor units at new sites. The NRC is evaluating the issue of integrated risk. The staff, in SECY-05-0130, evaluated three options which included: (1) no consideration of integrated risk, (2) quantification of integrated risk at the site from new reactors, and (3) quantification of integrated site risk (for all reactors at that site). Another aspect of this issue is the level of safety associated with the integrated risk. The NRC is presently considering whether the integrated risk from the new plants should meet the level of safety that the NRC has proposed for new plants. If this new approach were adopted, for an entity who proposed to add multiple reactors to an existing site, the integrated risk of these new

plants should not exceed the level of safety expressed by the QHOs in the Commission's Safety Goal Policy Statement. The NRC is soliciting stakeholder views on these or other options.

Feedback is sought specifically on the following:

18. Which of the options in SECY-05-0130 with respect to integrated risk should be pursued and why? Are there alternative options?

19. Should the integrated risk from multiple reactors be considered, and if so, should the risk meet a minimum threshold specified in the regulations? If not, why not? Or should the risk be considered on a per reactor basis and meet a minimum threshold specified in the regulations? If yes, why?

E. ACRS Views on Level of Safety and Integrated Risk

In a letter dated September 21, 2005, the Advisory Committee on Reactor Safeguards (ACRS) raised a number of questions related to new plant licensing. The ACRS discussed issues of requiring new plants to meet a minimum level of enhanced safety and how the risk from multiple reactors at a single site should be accounted for. The details of the ACRS discussion are in the September 21, 2005, letter which is attached to this ANPR. The Commission, in a September 14, 2005, SRM, directed the staff to consider ACRS comments in developing a subsequent notation vote paper addressing these policy issues.

Feedback is sought specifically on the following:

20. What are the merits of the questions and views raised by various members of the Committee?

21. How should the views raised by various members of the Committee be factored into the resolution of the issues of level of safety and integrated risk?

F. Containment Functional Performance Standards

The Commission has asked the staff to develop options for containment functional performance requirements and criteria which take into account such features as core, fuel, and cooling system design. In developing these options, the NRC is seeking stakeholder views on the following aspects:

22. How should containment be defined and what are its safety functions? Are the safety functions different for different designs? If so, how?

23. What approach should be taken to develop technology-neutral containment performance standards that would be applicable to all reactor designs and technologies? Should containment performance be defined in terms of the integrated performance capability of all mechanistic barriers to radiological release or in terms of

the performance capability of a means of limiting or controlling radiological releases separate from the fuel and reactor pressure boundary barriers? Should the functional performance standards be design and technology-specific? If so how?

24. What plant physical security functions should be associated with containment and what should be the related functional performance standards?

25. With respect to fission product retention, how should the functional performance requirement and criterion for containment take into account such features as the fuel, core, and cooling system design?

26. How should PRA information and insights be combined with traditional deterministic approaches to defense in depth in establishing the proposed containment functional performance requirements and criteria for controlling radiological releases?

27. How should events in the range 10^{-4} to 10^{-7} be considered in developing the containment functional performance requirements and criteria? Should events below 10^{-7} be considered in developing the containment functional performance requirements and criteria? Should postulated bounding events be considered in design conditions for establishing containment functional performance requirements and criteria?

28. Should public confidence in nuclear plant safety play a role in evaluating options for containment performance requirements and criteria?

G. Technology-Neutral Framework

In support of determining the requirements for these alternative regulations, the NRC is developing a technology-neutral framework. This framework provides one approach in the form of criteria and guidelines that could serve as the technical basis for Part 53 that is technology-neutral, risk-informed and performance-based. A working draft of this framework was issued for public review and comment in SECY-05-0006, dated January 7, 2005 (ML043560093). The framework provides the criteria and guidelines for the following:

- Safety, security, and emergency preparedness expectations
- Defense-in-depth and treatment of uncertainties
- Licensing basis events identification and selection
- Safety classification of structures, systems, and components
- PRA technical acceptability

The latest working draft of the framework will be placed on the Ruleforum website (April 2006) for information and to solicit public comment. The NRC will identify specific questions for stakeholder comment at that time. As the technical basis is further developed, this ANPR will be supplemented to request additional stakeholder comment.

H. Defense-in-Depth

In SECY-03-0047 (ML030160002), the staff recommended that the Commission approve the development of a policy statement or description (e.g., white paper) on defense-in-depth for nuclear power plants to describe: the objectives of defense-in-depth (philosophy); the scope of defense-in-depth (design, operation, etc.); and the elements of defense-in-depth (high level principles and guidelines). The policy statement or description would be technology-neutral and risk-informed and would be useful in providing consistency in other regulatory programs (e.g., Regulatory Analysis Guidelines). In the SRM to SECY-03-0047, the Commission directed the staff to consider whether it can accomplish the same goals in a more efficient and effective manner by updating the Commission Policy Statement on Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities to include a more explicit discussion of defense-in-depth, risk-informed regulation, and performance-based regulation. The NRC is interested in stakeholder comment on a policy statement on defense-in-depth.

29. Would development of a policy statement on defense-in-depth for incorporation into the Commission's Policy Statement on PRA, as described above, be of any benefit? Why or why not?

30. Would a policy statement providing a Commission definition on defense-in-depth be beneficial to current operating plants, as input into near-term designs, or future designs? What would be the nature of the benefit?

31. Does it make more sense to modify Regulatory Guide (RG) 1.174? If so, what section in RG 1.174 with regard to defense-in-depth needs to be revised?

32. RG 1.174 assumes that adequate defense-in-depth exists and provides guidance for ensuring it is not significantly degraded by a change to the licensing basis. If RG 1.174 were to be revised, how should defense-in-depth be addressed for new plants where defense-in-depth is being incorporated into the design?

33. For both near-term and long-term new reactor designs, is revising the PRA Policy Statement the best path forward or development of a new policy statement? Is it reasonable to link development of a policy statement on defense-in-depth (whether as a new statement or a revision to the PRA policy statement) to the development of Part 53? Why or why not? That is, if it is desirable to develop a policy statement on defense-in-depth, when would it be most effective to develop the policy statement?

I. Single Failure Criterion

In SECY-05-0138 (ML051950619), the staff forwarded to the Commission a draft report entitled “Technical Report to Support Evaluation of a Broader Change to the Single Failure Criterion” and recommended to the Commission that any followup activities to risk-inform the Single Failure Criterion (SFC) should be included in the activities to risk-inform the requirements of 10 CFR Part 50. The Commission directed the staff to seek additional

stakeholder involvement. The report provides alternatives to the SFC: (1) maintain the SFC as is, (2) risk-inform the SFC for design bases analyses, (3) risk-inform SFC based on safety significance, and (4) replace SFC with risk and safety function reliability guidelines. The NRC is soliciting stakeholder feedback with regard to the proposed alternatives.

34. Are the proposed alternatives reasonable? If not, why not?

35. Which alternative, if any, should be considered? That is, should any changes to the SFC in 10 CFR Part 50 be pursued or should it be considered in the context of creating a new Part 53? Why or why not?

J. Continue Individual Rulemakings to Risk-Inform 10 CFR Part 50

Currently, 10 CFR Part 50 has a mix of prescriptive and risk-informed requirements. The NRC has for some time been revising certain provisions of 10 CFR Part 50 to make them more risk-informed and performance-based. Examples are: (1) a revision to 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants;" (2) a revision of 10 CFR 50.48 to allow licensees to voluntarily adopt National Fire Protection Association (NFPA) Standard 805, “Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition,” (NFPA 805); and (3) issuance of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," as a voluntary alternative set of requirements.

These actions have been effective but required extensive NRC and industry efforts to develop and implement.

The NRC plans to continue the current risk-informed rulemaking actions, e.g., 10 CFR 50.61 on pressurized thermal shock and 10 CFR 50.46 on redefinition of the emergency core cooling system break size, that are ongoing, and would undertake new risk-informed rulemaking only on an as-needed basis. In the longer term, the NRC could evaluate 10 CFR Part 50 in its entirety and conduct rulemaking for those areas that most readily add flexibility to 10 CFR Part 50 requirements.

The NRC is seeking comment on the following issues:

36. Should the NRC only continue with the ongoing current rulemaking efforts and not undertake any effort to risk-inform other regulations in 10 CFR Part 50, or only undertake new risk-informed rulemaking on a case-by-case priority basis? Which regulations would be the most beneficial to revise? What would be the anticipated safety benefits?

37. In addition to revising specific regulations, are there any particular regulations that do not need to be revised, but their associated regulatory guidance documents, could be revised to be more risk-informed and performance-based? What are the safety benefits associated with revising these guides? Which ones in particular are stakeholders interested in having revised?

38. If additional regulations and associated regulatory guidance documents were to be revised, when does it make sense to initiate these efforts, e.g., immediately or after having started implementation of current risk-informed 10 CFR Part 50 regulations?

At the end of the ANPR phase, the NRC will assess whether to adjust its approach to risk-inform the requirements for nuclear power reactors including existing and new plants.

List of Subjects

10 CFR Part 50

Classified information, Criminal penalties, Fire protection, Intergovernmental relations, Nuclear power plants and reactors, Radiation protection, Reactor siting criteria, Reporting and recordkeeping requirements .

The authority citation for this document is 42 U.S.C. 2201.

Dated at Rockville, Maryland, this _____ day of _____ , 2005.

For the Nuclear Regulatory Commission.

_____

Annette L. Vietti-Cook,

Secretary of the Commission.

Attachment:

Letter from G. B. Wallis, Chairman ACRS, dated September 21, 2005, “Report on Two Policy Issues Related to New Plant Licensing,” ADAMS Accession Number ML052640580

ACRSR-2149

September 21, 2005

The Honorable Nils J. Diaz

Chairman

U.S. Nuclear Regulatory Commission

Washington, DC 20555

SUBJECT: REPORT ON TWO POLICY ISSUES RELATED TO NEW PLANT LICENSING

Dear Chairman Diaz:

During the 523rd meeting of the Advisory Committee on Reactor Safeguards, June 1-3, 2005, we met with the NRC staff and discussed two policy issues related to new plant licensing. We also discussed this matter during our 524th, July 6-8, 2005, and 525th, September 8-10, 2005 meetings. We had the benefit of the documents referenced. These policy issues were:

- What shall be the minimum level of safety that new plants need to meet to achieve enhanced safety?

- How shall the risk from multiple reactors at a single site be accounted for?

In SECY-05-0130, the staff recommends that the expectation for enhanced safety be met by requiring that new plants meet the Quantitative Health Objectives (QHOs), i.e., by applying the QHOs to individual plants. The staff maintains that this would represent an enhancement in safety over current plants, which are now required to meet adequate protection, but may not meet the QHOs. The staff argues that this position is consistent with the Commission's Policy Statement on Regulation of Advanced Nuclear Power Plants.

The staff proposes to address the risk of multiple reactors at a single site by requiring that the integrated risk associated with only new reactors (i.e., modular or multiple reactors) at a site not exceed the risk expressed by the QHOs. The risk from existing plants, which may already exceed the QHOs, is not considered.

We discussed these issues and concluded that use of the existing QHOs is not sufficient to resolve either of these issues. In considering the overall scope of the issues raised by the staff, we found it more apt and effective to reframe the two issues into the following questions:

1. What are the appropriate measures of safety to use in the consideration of the certification of a new reactor design?

2. Should quantitative criteria for these measures be imposed to define the minimum level of safety?

3. How should these measures be applied to modular designs?

4. How should risk from multiple reactors at a site be combined for evaluation by suitable criteria?

5. How should the combination of new and old reactors at a site be evaluated by these criteria?

6. What should these criteria be?

7. How should compliance with these criteria be demonstrated?

DISCUSSION

Question 1. What are the appropriate measures of safety to use in the consideration of the certification of a new reactor design?

The QHOs are criteria for the risk at a site and thus involve not only the design and operation of the reactor(s), but also the site characteristics, the number and power level of plants on the site, meteorological conditions, population distribution, and emergency planning measures. By themselves, the QHOs do not express the defense-in-depth philosophy that the Commission seeks to limit not only the risk from accidents, but also the frequency of accidents.

Although core damage frequency (CDF) and large, early release frequency (LERF) have been viewed by the NRC as light water reactor (LWR)-specific surrogates for the QHOs, they have come to be accepted as metrics to gauge the acceptable level of safety of certified designs and the acceptability of proposed changes in the licensing basis. They are measures of reactor design safety that incorporate a defense-in-depth balance between prevention and mitigation. Currently used values of these metrics have been derived from the QHOs. If they were no longer to be viewed as surrogates, acceptance values for these metrics could be independently specified and need not be derived from the QHOs. Thus, they would be fundamental characteristics of reactor design independent of siting and emergency planning requirements.

If these measures are no longer viewed as surrogates for the QHOs, the appropriate measure of a large release need not be restricted to “early” but could be a “large release frequency” (LRF) which would apply to the summation of all large release frequencies regardless of the time of occurrence. The LRF would thus have broader applicability to designs in which the release is likely to occur over an extended period.

A majority of the Committee members favors the use of CDF and LRF as fundamental measures of the enhanced safety of new reactor designs and not simply as surrogates for the QHOs.

In SECY-05-0130, the staff argues that it will be difficult to derive such measures for different technologies, although the staff proposes to include them as subsidiary goals in their technology-neutral framework document. Although the processes and mechanisms for failure and release will differ greatly for different reactor technologies, technology-neutral definitions in terms of a release from the fuel (the accident prevention/CDF goal) and from the containment/ confinement (the large release goal) seem feasible to us. For example, the CDF of a Pebble Bed Modular Reactor (PBMR), would be an indicator of the success criteria for the design measures intended to prevent release from the fuel of that module. It could be defined in terms of the frequency of exceeding a fuel temperature of 1600 EC.

Question 2. Should quantitative criteria for these measures be imposed to define the minimum level of safety?

In the current Policy Statement on the Regulation of Advanced Nuclear Power Plants, the Commission decided not to set numerical criteria for enhanced safety but rather focused on aspects which might make designs more robust. In addition, the Safety Goal Policy Statement was intended to provide a definition of "how safe is safe enough." If a plant would meet the QHOs at a proposed site, then the additional risk it imposes is already very low compared to other risk in society. It now seems possible to build economically competitive reactors with risks at most sites that would be much lower than implied by the QHOs. The Electric Power Research Institute (EPRI) and European Utility Requirements Documents specify CDF and LERF values that would provide large margins to the QHOs for virtually all sites. An explicit commitment to lower values of CDF and LRF would be responsive to the Commission's desire for enhanced safety and may have significant impact on public perceptions and confidence.

We considered the following alternatives, identifying arguments in favor of each. Since such a decision has broad practical implementation and policy implications, we recommend that the staff further explore the consequences of these (and possibly other) choices as a basis for an eventual Commission decision.

a. Set maximum values for CDF and LRF at 10^{-5}/yr and 10^{-6}/yr for new reactor designs. This would make more explicit the Commission's stated expectation that future reactors provide enhanced safety. This could also provide a basis for establishing multinational design approval (as these would now be independent of U.S. QHOs). The suggested values are consistent with those in the EPRI and the European Utility Requirements Documents, the EPR Safety Document, and those used in the certification of advanced reactors (the ABWR, AP600 and CE-System 80+). These values are also consistent with the generic values for an accident prevention frequency and a LRF in the staff's draft technology-neutral framework document.

b. Leave the values unspecified. CDF and LRF would be considered along with other aspects of the design, such as defense-in-depth and passive safety features, in reaching a decision about design certification. This would give the staff more flexibility to respond to technology-specific features.

On a preliminary basis, the majority of the Committee members favor Alternative (a), but is not ready to make a recommendation until more is understood about the likely consequences and policy implications of the decision.

Question 3. How should these measures be applied to modular designs?

The staff's considerations of integrated risk do not distinguish between criteria for modular reactor designs and criteria for the risk due to multiple plants on a site. Thus, the staff treats CDF and LRF (or LERF) for modular designs and/or multiple plants on a site as still being QHO risk surrogates. In our view, the CDF and LRF metrics are design criteria that are to be "imposed" at the plant design certification stage independent of any site considerations.

New reactors could include PBMR, AP600, AP1000, Economic and Simplified Boiling Water Reactor (ESBWR), and EPR, and the number of new reactors at a site could vary by an order of magnitude.

Some Committee members believe that to get consistency in expectations of enhanced safety in all cases, the integrated risk from all new reactors on a site is the appropriate measure. This is true both for the risk metric LRF and the defense-in-depth accident prevention metric CDF. Thus, for the PBMR, which is proposed in terms of an eight-module package, the CDF and LRF goals (e.g., 10^{-5}/ry and 10^{-6}/ry) would be applied to the package. In effect each module would have to have a somewhat lower CDF and LRF. Because of the potential for interactions, analysis of individual modules may not be meaningful and the analysis should focus on the "eight pack."

Other Committee members prefer CDF and LRF design specifications that are independent of the number of modules. These members believe the specified acceptable CDF for enhanced safety (e.g. 10^{-5}/yr) should be applied to each module at the design stage and would be an indicator of the success criteria for the design measures provided for each module intended to prevent release from the fuel of that module. Similarly, LRF would be on a modular basis. As it may be possible to restrict the total power of a given module to a level that the quantity of fission products releasable cannot exceed the acceptance LRF value (e.g. 10^{-6}/yr), a modular design implicitly represents a kind of defense-in-depth (given appropriate consideration of common-mode failures and module interactions).

Question 4. How should risk from multiple reactors at a site be combined for evaluation by suitable criteria?

The QHOs address the risk to individuals that live in the vicinity of a site. Logically, the risk to these individuals should be determined by integrating the risk from all the units at the site. The manner by which the risks of different units at a site are to be integrated must address the treatment of modular designs, units with differing power levels, and accidents involving multiple units.

Question 5. How should the combination of new and old reactors at a site be evaluated by these criteria?

Any new plant that meets the independent safety criteria discussed in Questions 1 through 3 would be expected to add substantially less risk to an existing site than that already provided by existing plants on the site. If a proposed site already exceeds the QHOs, it should not be approved for new plants. For existing sites not being proposed for the addition of new plants, there would be no need to assess their risk status because they provide adequate protection. These sites would, thus, be grandfathered in the new framework.

Question 6. What should these criteria be?

Use of the QHOs for evaluating the site suitability for new reactors is attractive because the QHOs represent a fundamental statement about risk independent of any particular technology. The current QHOs (prompt and latent fatalities), however, only address individual risk and do not directly address societal risks such as total deaths, injuries, non-fatal cancers, and land contamination. These societal impacts are addressed somewhat in the current regulations by the siting criteria on population.

Some ACRS members believe that measures of societal risk need to be an explicit part of any new technology-neutral framework. The staff argues in the technology-neutral framework document that the limits proposed there for CDF and LRF limit societal risks such as land contamination and dose to the total population. However, these members recognize that CDF and LRF are not equivalent to risk and disagree with the staff's position.

Other ACRS members believe that the current siting criteria have served to limit societal risks. In addition, societal risks are considered in the environmental impact assessments of license renewal. The estimates presented in NUREG-1437 Vol. 1 indicate that the risk of early and latent fatalities from current nuclear power plants is small. The predicted early and latent fatalities from all plants (that is, the risk to the population of the United States from all nuclear power plants) is approximately one additional early fatality per year and approximately 90 additional latent fatalities per year, which is a small fraction of the approximately 100,000 accidental and 500,000 cancer fatalities per year from other sources. The evaluation of Severe Accident Mitigation Alternatives (SAMAs) as part of the license renewal process also considers societal risk measures and monetizes them to perform cost benefit studies. Based on current NRC regulatory analysis guidance, very few of these SAMAs appear cost beneficial.

Environmental impact statements (EISs) also assess the societal costs of probabilistic accidents at the current sites. The results, although very approximate, indicate that the societal costs at many current reactor sites would likely exceed a reasonable societal cost risk acceptance criterion. For example, these would exceed the cost associated with 0.1% of the above noted 100,000 early fatalities due to all accidents.

Thus, the inclusion of a quantitative societal risk acceptance measure appears important and could add to greater public confidence and understanding of the risks of nuclear power. It may be worthwhile for the staff to consider supplementing the current QHOs with additional risk acceptance measures that relate directly to societal risks.

7. How should compliance with these criteria be demonstrated?

The establishment of goals or criteria of various kinds cannot be divorced from the ability to demonstrate compliance. Considerable improvement in PRA practice will be needed to provide confidence that the goals on CDF and LRF for future plants will be met in a meaningful way. Operating experience has been crucial for the analysts to appreciate the significance of potential errors/faults. For example, before TMI, it was assumed that operators would not have problems diagnosing what is going on under certain conditions.

Some of the challenges that new plants will create for PRA analysts are:

I. Operating experience on component failure rate distributions and frequencies developed for light-water reactors has limited applicability to other reactor types.

ii. Some designs are considering components, e.g., microturbines and fuel cells, for which reliability data are nearly non-existent.

iii. Digital Instrumentation and Control systems are expected to be an integral part of future reactor designs. The risk consequences of such practice are difficult to quantify at this time.

Thus, in addition to the imposition of design goals for low CDF and LRF, it will be important to maintain sufficient defense-in-depth in the technology-neutral framework.

We look forward to additional discussion with the staff on these issues.

Sincerely,

/RA/

Graham B. Wallis

Chairman

Additional comments from ACRS Members Dana A. Powers and John D. Sieber

We disagree with our colleagues on the matter of this letter. The Commission has indicated a laudable expectation that future reactors will be safer than current reactors. The question that our colleagues should have addressed first is whether a quantitative metric is needed to substantiate this expectation. It is by no means obvious that such a metric is essential. We can well imagine future plants designed in conjunction with far more comprehensive probabilistic safety analyses that realistically address all known accident hazards during all modes of operation to a depth far greater than is attempted now for elements of the fleet of operating reactors. Our experience has been that whenever improvements are made in quantitative risk analysis methods, unforeseen, hazardous, plant configurations, systems interactions and operations become apparent. Hidden, these configurations, interactions and operations may arise unexpectedly with undesirable consequences. Revealed, they can be avoided often with modest efforts. This is exploitation of the full potential of quantitative risk analysis to achieve greater safety in nuclear power plants. It contrasts with the more effete pursuit of the "bottomline" results of PRA to compare with arbitrarily proliferated safety metrics.

Our objective should be to foster the voluntary development of quantitative risk analysis methods both in scope and depth in order to improve the safety of nuclear power plants. Fostering voluntary development of methods by nuclear community is especially important now when methods developments have stagnated at NRC relative to the situation a decade ago.

Our colleagues seem to presume it essential that future reactors meet the Quantitative Health Objectives (QHOs). These QHOs define a very stringent safety level that has always been viewed as an "aiming point" or a benchmark and not as some minimum standard that cannot be exceeded. Indeed, the definition of the QHOs was undertaken to define "how safe is safe enough" so that no additional regulatory requirements for greater safety would be needed. Requiring such a stringent standard as the QHOs as a minimum level of safety for advanced reactors appears to go well beyond the authority granted by the Atomic Energy Act that requires adequate protection of the public health and safety. We are unaware that the Commission has made such a demand for advanced reactors. Were the Commission to make such a demand, we would question the wisdom of doing so. By demanding such a stringent level of safety, our colleagues appear to be willing to forego great strides in safety that can be achieved with advanced plants if these plants fail to live up to what can only be viewed as an extreme safety standard.

The demands our colleagues appear to make on the safety of advanced reactors lack a critical dimension of practicality since we do not believe the technology now exists to do the calculations needed to compare a plant's safety profile to the QHOs. By the very definitions of the QHOs, such calculations would entail analyses of modes of operation only very crudely addressed today by most (fire risk, shutdown risk and natural phenomena risk) and the conduct of uncertainty analyses dealing with both parameters and models that to our knowledge have been done by no one.

Because of the limitations of risk assessment technology available today for the evaluation of the current fleet of nuclear power plants, surrogate metrics such as core damage frequency (CDF) and large early release frequency (LERF) have been introduced and widely used. Our colleagues seem to believe that there are known critical values of these surrogate metrics that mark the point at which a plant meets the QHOs. We know of no defensible analysis that establishes such critical values of these surrogate metrics. We are, of course, quite aware of very limited analyses considering only risk during normal operations that purport to show existing reactors meet the QHOs. Such limited analyses are simply not pertinent. They do not meet the exacting standards required by the definitions of the QHOs. Should defensible analyses ever be done, we are sure that they will show the critical values of the surrogate metrics are technology dependent. Indeed, more defensible analyses will show in all likelihood that better surrogate measures can be defined for advanced reactor technologies.

Our colleagues are sufficiently enamored with the existing surrogate metrics that they recommend these surrogates be enshrined on a level equivalent to QHOs. More remarkable, our colleagues want to establish critical values of the metrics that are a factor of ten less than the values they assert mark a plant meeting the rather stringent level of safety defined by the QHOs. They do this, apparently, for no other reason than the fact that clever engineers can design plants meeting these smaller values at least for a limited number of operational states. While we are willing to congratulate the engineers on their designs, we can see no reason why such stringent safety requirements should be made regulatory requirements to be imposed on the designers' efforts. Again, we worry that doing so may create unnecessary burdens that cause our society to sacrifice for practical reasons great improvements in power reactor safety simply because these improvements fall short of our colleagues unreasonably high safety expectations.

Though surrogate metrics have been useful, it is important to remember that they are only expedients. The full promise of risk-informed safety assessment will not be realized until it is possible to do routinely risk assessments of sufficient scope and depth so it is possible to dispense with surrogate metrics. Enshrining these surrogates along with the QHOs will only delay efforts to reach this preferred status.

The potential of our colleagues recommendations have to stifle new technology and forego improved safety reaches a crisis when they speak to the location of modern,

safer plants on sites with older but still adequately safe plants. Our colleagues have no tolerance for a single older plant if a newer, safer plant is to be collocated on the site. They are willing to tolerate any number of similarly old plants on a site if a new, safer plant is not added to this site. We find this remarkable. Our colleagues' recommendations give no credit for experience with a site. They fail to recognize the finite life of older plants even when licenses have been renewed. We fear that our colleagues have failed to assess the integral safety consequences of their stringent demands on this matter. A very great concern is that our colleagues pursuit of ideals in risk avoidance may well arrest the current, healthy quest for improved safety among those exploring advanced reactor designs.

References:

1. U.S. Nuclear Regulatory Commission, SECY-05-130," Policy Issues Related to New Plant Licensing and Status of the Technology Neutral Framework for New Plant Licensing," dated July 21, 2005

2. U.S. Nuclear Regulatory Commission, "Safety Goals for the Operations of Nuclear Power Plants, Policy Statement," Federal Register, Vol. 51, (51 FR 30028), August 4, 1986

3. U.S. Nuclear Regulatory Commission, “Commission’s Policy Statement on the Regulation of Advanced Nuclear Power Plants,” 59 FR 35461, July 12, 1994

4. U.S. Nuclear Regulatory Commission, NUREG-1437, Volume 1, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants,” May 1996