

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket No. PRM-50-87]

Raymond A. Crandall;  
Receipt of Petition for Rulemaking

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; Notice of receipt.

SUMMARY: The Nuclear Regulatory Commission (NRC) has received and requests public comment on a petition for rulemaking dated May 17, 2007, filed by Raymond A. Crandall (petitioner). The petition was docketed by the NRC and has been assigned Docket No. PRM-50-87. The petitioner is requesting that the NRC amend the regulations that govern domestic licensing of production and utilization facilities to eliminate the specific criteria related to the radiological doses for control room habitability at nuclear power plants. The petitioner believes that the current deterministic radiological dose requirements for control room habitability have resulted in several negative safety consequences, including an increased risk to public safety.

DATE: Submit comments by (75 days following publication in the *Federal Register*).

Comments received after this date will be considered if it is practical to do so, but assurance of consideration cannot be given except as to comments received on or before this date.

ADDRESSES: You may submit comments by any one of the following methods. Please include the following number (PRM-50-87) in the subject line of your comments. Comments on petitions 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 personal information such as social security numbers and birth dates in your submission.

Mail comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC

20555. Attention: Rulemaking and Adjudications staff.

E-mail comments to: [SECY@nrc.gov](mailto: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 website at <http://ruleforum.llnl.gov>. Address comments about our rulemaking website to Carol Gallagher, (301) 415-5905; (e-mail [cag@nrc.gov](mailto: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, between 7:30 am and 4:15 pm on Federal workdays.

Publicly available documents related to this petition may be viewed electronically on the public computers located at the NRC 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 website at <http://ruleforum.llnl.gov>.

Publically available documents created or received at the NRC after November 1, 1999 are also 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 Documents 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 PDR Reference staff at 1-800-397-4209, 301-415-4737 or by e-mail to [pdr@nrc.gov](mailto:pdr@nrc.gov).

For a copy of the petition, write to Michael T. Lesar, Chief, Rulemaking, Directives and Editing Branch, Division of Administrative Services, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. The petition is also available electronically in ADAMS at ML071490250.

FOR FURTHER INFORMATION CONTACT: Michael T. Lesar, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Telephone: 301-415-7163 or Toll-Free: 1-800-368-5642 or E-mail: [MTL@NRC.Gov](mailto:MTL@NRC.Gov).

#### SUPPLEMENTARY INFORMATION:

##### Background

The NRC has received a petition for rulemaking dated May 17, 2007, submitted by Raymond A Crandall (petitioner). The petitioner requests that the NRC amend 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Specifically, the petitioner requests that 10 CFR 50.67, "Accident source term" and "Criterion 19 - Control room" in Appendix A to Part 50, "General Design Criteria for Nuclear Power Plants" be amended by eliminating the specific criteria related to the radiological doses for control room habitability at nuclear power plants.

The NRC has determined that the petition meets the threshold sufficiency requirements for a petition for rulemaking under 10 CFR 2.802. The petition was docketed by the NRC as PRM-50-87 on May 25, 2007. The NRC is soliciting public comment on the petition for rulemaking.

##### Discussion of the Petition

The petitioner notes that the current regulations provide specific dose criteria, based on deterministic radiological dose analyses performed by the licensee and reviewed by the NRC staff for demonstrating the acceptability of the control room design for radiological release events. NRC regulatory guides and standard review plans provide the methodologies used to perform dose analyses that are incorporated into a licensee's site-specific technical specifications (TS). However, the petitioner believes that the deterministic dose analysis methodology and associated regulatory process has resulted in several negative safety consequences. The petitioner states that these consequences include:

(1) Control designs that are not optimum for ensuring continued control room habitability and may increase the probability of control room evacuation.

(2) Site procedures for mitigation of dose consequences to control room personnel that are not optimum for ensuring control room habitability and are inconsistent with more effective mitigation strategies.

(3) Unnecessary challenges to safety systems, such as increased challenges to the Emergency Diesel Generators if control room ventilation system fans are used early in an accident to meet analysis assumptions.

(4) TS action statement requirements that require a plant shutdown for failure to meet a control room dose analysis input assumption and result in a net increase in the risk to the public.

(5) TS surveillance requirements that cannot be cost-justified based on the risk significance that results in expenditures that could be used on risk-significant improvements.

The petitioner believes the suggested amendments would eliminate the specific radiological dose acceptance criteria; the need for deterministic dose analyses; and the need for the associated regulatory process, including the TS imposed to ensure compliance. The petitioner also states that the proposed change does not eliminate the requirement for the control room to be designed to ensure safe conditions under accident conditions, but would eliminate what he believes are safety concerns with the current regulation.

The petitioner states that because the primary objective of control room habitability is to ensure continuous occupancy, the primary focus should be on minimization of whole body doses from noble gases. The petitioner believes that the current regulation is inconsistent with the goal of allowing the control room operator to remain in the control room to mitigate accident consequences. He states that some common designs focus on compliance with existing criteria, such as a filtered air-intake pressurization design, and increase the probability that the

control room will have to be evacuated. The petitioner has concluded that the current requirements and operational criteria are established to minimize the thyroid dose at the expense of increasing the whole body dose. The petitioner notes that the dose from increased iodine concentration can be mitigated by use of potassium iodide (KI) or respiratory protection, but that the current requirements do not permit these mitigating techniques for radiological releases to be used in design analyses. The petitioner believes it is inconsistent that credit for respiratory protection is permitted in control room habitability toxic gas release evaluations, but not for design analyses.

The petitioner also states that current procedures for dose mitigation are simplified to be consistent with the licensing basis hypothetical analysis and that these analyses have resulted in procedures that may not be an optimum mitigation strategy for more likely conditions. The petitioner believes that mitigation strategies should be based on overall risk reduction that would involve strategies for more likely conditions. The petitioner has concluded that the current mitigation strategies are based on one set of fixed hypothetical conditions that are unlikely as a result of the required deterministic dose analysis specified in the existing regulation.

The petitioner states that procedures for dose mitigation must be consistent with the licensing basis and may not be the optimum mitigation strategy for the more likely conditions. The petitioner states that control room dose models do not model dispersion as a period during the day with higher concentrations while the plume is blowing towards the control room and then a period of zero concentration for the rest of the day. Instead, analysis methods simplify this effect by assuming that a lower concentration is present continuously. The petitioner states that if procedures were revised to include a purge mode strategy, a calculated increase in consequences in the simplistic design basis analysis would result.

The petitioner states that the design requirements in the current regulations result in

unnecessary challenges to safety systems. The petitioner cites an example during an assumed loss-of-coolant accident (LOCA) and states that a common design requirement specifies that the normal control room ventilation must isolate when a safety injection or containment isolation signal occurs. The petitioner believes it would be more logical to delay control room isolation until radioactivity is detected in the control room or it is known that a radioactive plume is blowing towards the control room. The petitioner suggests that mitigating design strategies should be based on overall risk reduction designed for more likely conditions, not on one set of fixed hypothetical conditions that the petitioner believes is unlikely.

The petitioner states that current radiological dose mitigation analyses also result in inappropriate TS action statements. The petitioner explains that radiological dose analyses differ from other types of engineering calculations. The petitioner states that even though most engineering analyses involve some amount of uncertainty, the results reasonably match what can be expected during a real event. The petitioner cites the thermal hydraulic analyses for an assumed LOCA event and explains that conservatism is built into the model, and that numerous assumptions go into the analysis to demonstrate that fuel damage will not occur due to overheating. The petitioner states that for other assumptions such as the temperature of the safety injection water or the flow rate of the safety injection pump, uncertainty is limited by specifying an acceptable value for such a parameter in the TS. The petitioner believes that TS requirements for a safety injection system that cannot meet design requirements impose a shutdown requirement.

The petitioner states that a large break LOCA is usually the limiting accident for control room habitability design and that the associated radiological analysis requires multiple inputs, including the source term, which is the amount of radioactivity released from the reactor core that can reach the environment. The petitioner explains that the source term assumption can vary by many orders of magnitude and that total curies released is not the only consideration.

The calculated and actual dose during an event depends on the nuclide mix of the release, decay time since reactor shutdown, the fraction of particulate nuclides that become airborne, and the chemical form of the source term. The petitioner also states that many uncertainties are considered in these models that include the removal mechanism for the various nuclides; the release pathway and forces that cause a release by that pathway; atmospheric dispersion; and dose modeling that depends on the size of an exposed individual, their breathing rate, biological removal mechanisms, etc.

The petitioner believes that the combined probability of all assumptions being at the high end of uncertainty is so small that the design basis event will not be realistic and makes each assumption meaningless for predicting actual results. The petitioner cites the Three Mile Island accident as an example when the dose analysis input assumptions had no significance in predicting the actual consequences of the event. The petitioner states that for control room habitability TS, the analyses assumptions and results are even further removed from any significance because there is no direct public impact from not meeting control room habitability system requirements, any dose an operator receives can be mitigated by KI, and the dose limit is overly restrictive. The petitioner states that the potential indirect impact on public safety of having to evacuate the control room can be easily avoided, regardless of the control room habitability system status. The petitioner has concluded that this means “there is insignificant safety significance to the TS associated with control room habitability and yet there are shutdown requirements.”

The petitioner notes that in the past, the NRC has specified on numerous occasions that the inability to meet the assumptions or criteria of control room habitability analyses has low safety significance. The petitioner states that the primary basis for the low safety significance was usually due to the existence of mitigating actions such as the issuance of KI tablets to ensure continued occupancy of the control room and to justify continued operation. The

petitioner believes that to evaluate the net public safety risk associated with these TS shutdown requirements, small but quantifiable public risks associated with the shutdown of a nuclear power plant must be considered that include but are not limited to the:

(1) Risk associated with bringing the plant through a transient and another thermal cycle;

(2) Airborne pollutants released by the fossil units required to operate to make up for lost power; and

(3) Potential for challenging electric power grid stability with the public risk associated with the possibility of rolling blackouts or brownouts, or under the worst conditions of grid stability, the potential for a loss of offsite power at multiple nuclear power facilities.

The petitioner states that the shutdown requirement increases the net public risk and has concluded that the shutdown requirement needs to be eliminated because it is only imposed as a “matter of compliance” that he believes results from the way the input assumptions are treated when using deterministic calculations.

The petitioner also states that “individual input assumptions for radiological dose analyses have no significance in predicting reality or the acceptability of results. Even if actual conditions were such that one of the assumptions was non-conservative by a couple orders of magnitude, the ultimate result (in this case habitability of the control room) would still be acceptable due to the significant conservatisms in the other assumptions and the simplicity of effective mitigating actions such as the use of KI.”

The petitioner states that although most control room habitability surveillances can be performed with minimal resources, licensees have been required to demonstrate the accuracy of the assumption on unfiltered inleakage using a tracer gas testing method that costs approximately \$100,000 per test and cannot be justified. The petitioner believes these tests have demonstrated that although inleakage values assumed in the analyses were non-

conservative, there was no safety significance and continued operation was justified. The petitioner has concluded that the expenditure for tracer gas testing could be better used for improvements that would likely be more beneficial to plant safety and, therefore, the required performance of this test could have a net negative safety consequence. The petitioner states that previous surveillances, such as a pressurization test, combined with lessons learned from tracer gas testing results in an effective preventative maintenance program to provide a cost-justified approach to ensure that there are no significant failures of the control room habitability boundary and an insignificant potential for control room evacuation.

#### The Petitioner's Proposed Actions

The petitioner suggests that the regulations should be revised to eliminate the specific radiological criteria for control room habitability. The petitioner believes this would result in the ability to revise the industry guidelines to eliminate the specified guidelines for performing deterministic dose analyses and eliminate all negative safety consequences discussed in the petition. Specifically, the petitioner recommends that 10 CFR 50.67(b)(2)(iii) and the second sentence of Criterion 19 of Appendix A to Part 50 that contain specific criteria for control room habitability be removed from the regulations.

The petitioner suggests that the current guidelines be replaced with guidelines that he believes would ensure that the control room remains habitable under most postulated conditions, such as:

(1) The control room ventilation system should isolate on the detection of high radiation or toxic gas intake.

(2) The control room should have a minimum of one foot of concrete shielding (or equivalent) on all surfaces.

(3) Self Contained Breathing Apparatus (SCBAs) and KI tablets should be readily available for operator use. Operators should maintain training in SCBAs.

(4) Procedural controls to maintain a low leakage boundary, such as preventive maintenance/routine inspection of door seals and dampers should be implemented.

(5) Procedures should be developed to ensure control room purging is considered when the outside concentration is less than the inside concentration.

(6) Existing emergency filtration systems should be maintained to practical performance criteria.

The petitioner also states that current TS for system performance would be eliminated and that the administrative portion of the TS could include a requirement to have a Control Room Habitability Program. The petitioner believes that because of the low public risk significance of being outside design guidelines in a Control Room Habitability Program, a plant shutdown would not be required if it is outside of the guidelines. Rather, the petitioner believes that the program could specify that timely actions should be taken to return the plant within the guidelines. If not complete within 30 days, the petitioner suggests that a special report would be sent to the NRC with a justification for continued operation and a proposed schedule for meeting the guidelines.

The petitioner states that removing the specific dose criteria would not eliminate the need to perform quantitative analyses as required to demonstrate the acceptability for certain conditions. The petitioner also states that although the current regulation has no specific quantitative limits for toxic gases, the guidelines require quantitative analyses for toxic gas habitability assessments under certain conditions. The petitioner suggests that as an alternative to total removal of dose guidelines from the regulations, most of his concerns could be resolved if the dose criteria were based solely on the whole body dose from noble gases that he believes is the only possible dose impact that may result in control room evacuation. The petitioner suggests, as another option, that most of his concerns would be resolved if credit for SCBAs and/or KI was allowed in the analysis of the dose from iodine and particulates. The

petitioner also proposes that the TS be revised to eliminate shutdown requirements for failure to meet control room habitability requirements.

Dated at Rockville, Maryland, this 6<sup>th</sup> day of July 2007.

For the Nuclear Regulatory Commission.

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J. Samuel Walker,  
Acting Secretary of the Commission.