

POLICY ISSUE **(Notation Vote)**

June 12, 2013

SECY-13-0063

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: DENIAL OF PETITION FOR RULEMAKING PRM-50-105 REQUESTING AMENDMENTS REGARDING IN-CORE THERMOCOUPLES AT DIFFERENT ELEVATIONS AND RADIAL POSITIONS THROUGHOUT THE REACTOR CORE

PURPOSE:

To obtain Commission approval to deny a petition for rulemaking (PRM), PRM-50-105, submitted by Mr. Mark Leyse (petitioner). This paper does not address any new commitments or resource implications.

BACKGROUND:

The petitioner filed the petition on February 28, 2012 (U.S. Nuclear Regulatory Commission's (NRC) Agencywide Documents Access and Management System (ADAMS) Accession No. ML12065A215), asking the NRC to amend its regulations to require all holders of operating licenses for nuclear power plants (NPP) to operate NPPs with in-core thermocouples at different elevations and radial positions throughout the reactor core. The NRC published a notice of receipt and request for public comment in the *Federal Register* (FR) on May 23, 2012 (77 FR 30435). The comment period closed on August 6, 2012. The NRC received four comment submissions, three of which contained comments on the PRM and one that responded to another comment submission.

DISCUSSION:

Four Issues that the Petitioner Raised

PRM Issue 1: Core Exit Thermocouple (CET) Limitations

The petition states that, in many cases in a severe accident, a predetermined core-exit

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temperature measurement (e.g., 1200 °F) would be used to signal the time for NPP operators to transition from emergency operating procedures (EOP) to severe accident management guidelines (SAMG). The petition provides experimental data that indicates CETs have limitations, including a significant time delay (up to several hundred seconds) and significantly lower temperature indication (up to several hundred Kelvin lower than the actual maximum cladding temperature). The petition asserts that the NRC and the nuclear industry have ignored this experimental data.

The NRC staff acknowledges the limitations of CETs; however, the staff believes, consistent with the various industry documents, that the use of CETs remains appropriate and would help NPP operators manage an accident. Furthermore, at no point, either during the diagnosis of a severe accident or follow-on actions to restore cooling, is there an operational necessity for the level of accuracy in the measurement of core temperatures at various locations throughout the core, which the petition asserts is necessary.

PRM Issue 2: Nuclear Power Plant Operators' Use of In-core Thermocouples

The petition asserts that in the event of a severe accident, in-core thermocouples would enable NPP operators to accurately measure in-core temperatures better than CETs, providing crucial information to help operators manage the accident (e.g., indicating the time to transition from EOPs to implementing SAMGs).

In-core thermocouples, however, would also have limitations. For instance, it is impractical to mount thermocouples to the fuel cladding or fuel spacers, and the addition of in-core thermocouples and the associated supporting components would likely result in significant adverse effects on fluid flow in the core. Thermocouples installed within instrument tubes may be subject to significant temperature differences between the bulk coolant and the fuel cladding surface. The *Federal Register* notice (FRN) denying PRM-50-105 (Enclosure 1) provides a more detailed discussion of these reasons. In addition, the staff notes that the installation and maintenance associated with in-core thermocouples would result in higher doses to plant workers, with no added safety benefit. Further, the petitioner provides no justification why the precise knowledge of core temperature would enhance safety or change operator actions during normal or accident conditions.

PRM Issue 3: Post-Three Mile Island Accident Actions

The petition states that the NRC has not adopted a regulation requiring NPPs to operate with in-core thermocouples at different elevations and radial positions throughout the reactor core to enable NPP operators to accurately measure a large range of in-core temperatures in NPP steady-state and transient conditions. The petition asserts that doing so would help fulfill the 1979 President's Commission recommendations following the accident at Three Mile Island (TMI) that stated: "Equipment should be reviewed from the point of view of providing information to operators to help them prevent accidents and to cope with accidents when they occur. Included might be instruments that can provide proper warning and diagnostic information; for example, the measurement of the full range of temperatures within the reactor vessel under normal and abnormal conditions."

Contrary to the petition's assertion, the NRC completed several actions in response to the TMI accident as discussed in the FRN denying PRM-50-105, including installing sub-cooled margin

monitors, post-accident monitoring instrumentation systems (including CET indications available to operators), and the reactor vessel level monitoring system. These actions obviate the need for in-core thermocouples as a response to the President's Commission recommendations.

PRM Issue 4: Consideration of Experimental Data

The petition emphasizes that the NRC and Westinghouse do not consider experimental data derived from experiments conducted at four facilities (Loss of Fluid Test (LOFT), Primarkreislauf (PKL), Rig of Safety Assessment Large-Scale Test Facility (ROSA/LSTF), and Organization for Economic Cooperation and Development (OECD)/Nuclear Energy Agency (NEA) computer codes validation project (PSB-VVER)). The petition lists 13 conclusions from a report by the OECD/NEA Committee on the Safety of Nuclear Installations, entitled, "Core Exit Temperature Effectiveness in Accident Management of Nuclear Power Reactor," (NEA/CSNI/R(2010)9) dated November 26, 2010 (see www.oecd-nea.org/nsd/docs/2010/csni-r2010-9.pdf).

The staff is aware of the conclusions listed in the OECD report that the petition references. The NRC and the industry have known of the limitations of CETs since the 1980s. However, for the reasons set forth in the FRN denying PRM-50-105, the staff concluded that the use of CET indications for their intended purposes remains appropriate and would help operators to manage an accident.

Stakeholder Comments

The NRC received three comment submissions from the public on the PRM: one submission from the Nuclear Energy Institute (NEI), one from Exelon Generation Company, and the other from the petitioner. In addition to those submissions, the NRC received a late-filed comment submission from the petitioner responding to NEI's submission. The late-filed comment submission, submitted by the PRM-50-105 petitioner, contains some reiteration of information and assertions in PRM-50-105. The NRC is not addressing those portions of the late-filed comment response. However, the late-filed comment submission also discussed matters related to the use of in-core thermocouples in gamma thermometers, the use of in-core thermocouples in the Economic Simplified Boiling Water Reactor design, and the radiation dose to workers due to in-core thermocouples; these issues were not raised in the PRM. The NRC's responses to these issues, as well as the responses to the other three comment submissions on the PRM, are in the FRN denying PRM-50-105.

RECOMMENDATION:

The NRC staff has reviewed the PRM and the public comments, and recommends that the Commission deny the petition for the reasons indicated in the FRN. In summary, the petitioner asserts that, in the event of a severe accident, in-core thermocouples would enable NPP operators to accurately measure in-core temperatures better than CETs, and would provide crucial information to help operators manage an accident. The NRC staff's evaluation of this petition and relevant information did not reveal added insights on how greater accuracy in the measurement of in-core temperatures would result in more effective operator action in core damage sequences. The correlation between CET readings and fuel cladding temperature, in conjunction with other indications, is sufficient for determining the onset of fuel damage and the need for operator action. Furthermore, the staff concludes that at no point, either during the diagnosis of a severe accident or during follow-on actions to restore cooling, is there an

operational necessity for exact measurement of core temperatures at various locations throughout the core. The CETs have sufficient precision to achieve the desired purpose.

The staff requests the Commission's approval to publish the FRN denying PRM-50-105. The enclosed letter for signature by the Secretary of the Commission (Enclosure 2) informs the petitioner of the Commission's decision to deny PRM-50-105. The staff will inform the appropriate congressional committees.

COORDINATION:

The Office of the General Counsel has reviewed this package and has no legal objection.

/RA/

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Enclosures:

1. *Federal Register* Notice
2. Letter to the Petitioner

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