December 29, 2011

MEMORANDUM TO: Chairman Jaczko
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff

FROM: Michael R. Johnson, Director ***/RA/***
Office of New Reactors

SUBJECT: STATUS OF STAFF ACTIVITIES TO ADDRESS MECHANISTIC SOURCE TERM METHODOLOGY AND ITS APPLICATION TO SMALL MODULAR REACTORS

The purpose of this memorandum is to inform the Commission of ongoing and planned activities to address methods for determining a mechanistic source term and to describe the applications where use of a source term determined by such methods would be appropriate. The staff defined a mechanistic source term, centered on light-water reactor designs, in SECY-93-0092, "Issues Pertaining to the Advanced Reactor (PRISM, MHTGR, and PIUS) and CANDU 3 Designs and Their Relationship to Current Regulatory Requirements," dated April 8, 1993 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML040210725), and SECY-03-0047, "Policy Issues Related to Licensing Non-Light-Water Reactor Designs," dated March 28, 2003 (ADAMS Accession No. ML030160002):

> A mechanistic source term is the result of an analysis of fission product release based on the amount of cladding damage, fuel damage, and core damage resulting from the specific accident sequences being evaluated. It is developed using best-estimate phenomenological models of the transport of the fission products from the fuel through the reactor coolant system, through all holdup volumes and barriers, taking into account mitigation features, and finally, into the environs.

The staff has been addressing the overall mechanistic source term issue in the context of the next generation nuclear plant (NGNP) project specifically for high-temperature gas-cooled reactors. The staff described the underlying issue in SECY-93-0092 and SECY-03-0047, and most recently in SECY-10-0034, "Potential Policy, Licensing, and Key Technical Issues for Small Modular Nuclear Reactor Designs," dated March 28, 2010 (ADAMS Accession No. ML093290268). The U.S. Department of Energy's (DOE's) recently announced plan for the NGNP project (Secretary of Energy letter to The Honorable Dianne Feinstein, dated

CONTACT: Thomas Kevern, NRO/DARR
301-415-0224

October 17, 2011 (ADAMS Accession No. ML113410485)) has reduced schedule pressures for the staff to address the mechanistic source term for the NGNP. Still, the Secretary has expressed an interest in making progress in addressing key regulatory issues and the determination of an appropriate source term for the NGNP technology is one of those issues. With the development of other small modular reactor (SMR) designs, the integral pressurized-water reactors (iPWRs) in particular, and DOE's current plan for the NGNP, the staff's emphasis has shifted to focus on iPWRs in the near term.

A mechanistic source term could contribute to the staff's evaluation in a number of areas (e.g., siting, control room habitability, emergency preparedness, and security considerations). Pertaining to emergency preparedness, the staff recently described the development of an emergency preparedness framework in SECY-11-0152, "Development of an Emergency Planning and Preparedness Framework for Small Modular Reactors," dated October 28, 2011 (ADAMS Accession No. ML112570439). A key factor in developing that framework is the determination of offsite dose considerations and the staff-described elements that would be involved in the development of an "appropriate method" for use in the framework. As noted in SECY-11-0152, the staff anticipates that industry will develop a proposed detailed calculation method to support the framework and the staff, as warranted, will identify and budget work to confirm the acceptability of the industry approach.

The staff will remain engaged with SMR stakeholders regarding applications of a mechanistic source term, review preapplication white papers and topical reports concerning source term issues that it receives from potential SMR applicants, discuss design-specific proposals to address this matter, and consider research and development in this area. If necessary, the staff will propose changes to existing regulations or regulatory guidance or propose new guidance concerning the source term for an SMR to support development of review standards for iPWRs or other SMR designs. The staff notes that, to date, no potential applicant for an iPWR design has submitted a specific proposal related to the use of a mechanistic source term. The staff's ongoing and planned activities to address the mechanistic source term for SMRs address the actions detailed in WITS 201100172/SECY-2011-0354 and 201100173/SECY-2011-0355.

cc: SECY
EDO
OGC
OCA
OPA
CFO

October 17, 2011 (ADAMS Accession No. ML113410485)) has reduced schedule pressures for the staff to address the mechanistic source term for the NGNP. Still, the Secretary has expressed an interest in making progress in addressing key regulatory issues and the determination of an appropriate source term for the NGNP technology is one of those issues. With the development of other small modular reactor (SMR) designs, the integral pressurized-water reactors (iPWRs) in particular, and DOE's current plan for the NGNP, the staff's emphasis has shifted to focus on iPWRs in the near term.

A mechanistic source term could contribute to the staff's evaluation in a number of areas (e.g., siting, control room habitability, emergency preparedness, and security considerations). Pertaining to emergency preparedness, the staff recently described the development of an emergency preparedness framework in SECY-11-0152, "Development of an Emergency Planning and Preparedness Framework for Small Modular Reactors," dated October 28, 2011 (ADAMS Accession No. ML112570439). A key factor in developing that framework is the determination of offsite dose considerations and the staff-described elements that would be involved in the development of an "appropriate method" for use in the framework. As noted in SECY-11-0152, the staff anticipates that industry will develop a proposed detailed calculation method to support the framework and the staff, as warranted, will identify and budget work to confirm the acceptability of the industry approach.

The staff will remain engaged with SMR stakeholders regarding applications of a mechanistic source term, review preapplication white papers and topical reports concerning source term issues that it receives from potential SMR applicants, discuss design-specific proposals to address this matter, and consider research and development in this area. If necessary, the staff will propose changes to existing regulations or regulatory guidance or propose new guidance concerning the source term for an SMR to support development of review standards for iPWRs or other SMR designs. The staff notes that, to date, no potential applicant for an iPWR design has submitted a specific proposal related to the use of a mechanistic source term. The staff's ongoing and planned activities to address the mechanistic source term for SMRs address the actions detailed in WITS 201100172/SECY-2011-0354 and 201100173/SECY-2011-0355.

cc: SECY
EDO
OGC
OCA
OPA
CFO

DISTRIBUTION:

Public	TKevern	RidsNroOd	RidsNroDarr
APRB/fr	RidsNroMailCenter	NRORidsOgcMailCenter	RidsEdoMailCenter

WITS201100172/EDATS: SECY-2011-0354; WITS201100173/EDATS: SECY-2011-0355

ADAMS Accession No.: ML113410366 ***Via e-mail** **NRC-001**

OFFICE	NRO/DARR/APOB:PM	NRO/DARR/APOB:BC	NRO/DSRA:D	NRO/DSEA:D	RES/DRA:D
NAME	TKevern	ACubbage*	CAder*	SFlanders*	DCoe*
DATE	12/07/11	12/20/11	12/8/11	12/9/11	12/8/11
OFFICE	RES/DSA:D	NRO/DARR:D	Tech Editing	OGC	NRO:D
NAME	KGibson*	MMayfield (SCoffin for)	JDougherty*	SVrahoretis*	MJohnson
DATE	12/9/11	12/12/11	12/12/11	12/19/11	12/29/11

OFFICIAL RECORD COPY