NUCLEAR ENERGY INSTITUTE

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Mr. Michael L. Marshall Jr.
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Office of Research
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Comments on NRC Staff Proposed Debris Testing Program

PROJECT NUMBER: 689

Dear Mr. Marshall:

At our March 22 meeting, you invited industry to comment on the NRC staff proposed debris generation test program. We understand that the test results will be used as an input for resolution of Generic Safety Issue 191. The enclosed comments developed by the NEI Sump Performance Task Force are provided for your consideration.

The NRC staff and its contractors provided only a general description of an approach for performing debris generation testing. In response, our comments are also general, but do offer key aspects that should be evaluated as the test program develops.

Prior to proceeding with the test program, we propose a public meeting to discuss further the specifics of the proposed testing. In addition, we request that the NRC provide an opportunity for representatives from the task force to witness the debris generation tests.

We appreciate this opportunity to provide comments and hope that you find them useful. If you have any questions, please contact Kurt Cozens at (202) 739-8085.

Sincerely,

David J. Modeen

KOC/
Enclosure

c: Mr. Robert B. Elliot, U.S. Nuclear Regulatory Commision

INDUSTRY COMMENTS

ON

PROPOSED NRC-SPONSORED DEBRIS GENERATION TESTING

GENERAL COMMENTS:

It is anticipated that debris testing for PWRs will collect data in at least three areas of interest:

- **Zone of Influence:** Used to set the breadth and depth of the region that will incur damage due to a break in the reactor coolant system of a PWR.

  It is generally accepted that the zone of influence is related to how the break initiates and progresses; that is, it is a function of the break geometry. Prior work resulted in the zone of influence being defined by either a 45 degree half-angle cone with height L/D or a sphere of radius L/D.

- **Mass Volume of Debris:** Amount of debris generated from a given set of initial conditions and the total mass of dislodged materials.

  This will set the total mass of debris generated from a given break location and break configuration.

- **Distribution of Debris Size and Mass:** The distribution of sizes and corresponding fraction of total volume of the generated debris, to be used as input for the transport evaluation.

  This will set the volume of transportable debris that is generated from a given break location and break configuration.

The following general considerations are suggested for setting test parameters:

1) Consider break geometries:
   - 1.1) Model a circumferential double-ended guillotine break (DEGB) where there is limited displacement of the pipe but the break opens up in a zipper-like fashion. This configuration resembles a two-dimensional jet discharge from a slot.
   - 1.2) Model a DEGB wherein the ends move laterally apart. This configuration resembles more of a three-dimensional jet.
2) Simulate initial conditions:
   - 2.1) Initial pressure of 2250 psia
   - 2.2) Initial temperature of between 530° F and 600° F (hot leg versus cold leg breaks).

3) Model prototypic PWR transients

   3.1) Large break LOCA blowing down to 45 psia in about 25 seconds

   3.2) Other break sizes and consequential blowdown durations

4) Debris Sources / Targets:

   4.1) Test most common types of insulation used inside PWR containments

   4.2) Consider geometry of insulation; shapes are dependent upon components to which it is applied

5) Intervening structures:

   5.1) Consider modeling intervening structures that may affect or participate in the zone of influence.

SPECIFIC COMMENTS:

In developing the test plan, the following items should be explicitly considered and dispositioned:

1) Use materials typical of PWR installations

   1.1) RMI

   1.2) Fibrous materials

   1.3) Calcium silicate

   1.4) Others; for example, fire barrier material

   1.5) Consider thermally aged materials; for example, calcium silicate, fiber glass

2) Use debris transport tests and industry survey data to screen materials that won't transport

   2.1) Aluminum RMI

   2.2) Stainless Steel RMI

   2.3) Coatings

3) Use installation techniques typical of PWR as-built configurations. Use volunteer plants for initial information

   3.1) Metal wrap and method of fastening

   3.2) Canvas wrap and method of fastening

4) Consider debris generation from all loadings associated with a pipe break:

   4.1) Resulting from pipe break (loading on inside diameter of insulation wrapped on a pipe)

   4.2) From impact of jet on adjacent/surrounding piping (loading on outside diameter of insulation wrapped on a pipe)

5) Account for containment features

   5.1) Use industry risk informed in service inspection (RI-ISI) submittal information to guide selection of likely break locations

   5.2) Consider as-built configuration of volunteer plant containment structures in directing or blocking jet for determining zone(s) of influence

   5.3) Consider non-direct, or glancing, impingement of escaping jet flow

6) Test conditions should model PWR accident conditions

   6.1) Two phase working fluid (steam and water)

   6.2) Large break LOCA blowdown: from 2250 psia to 45 psia in about 25 seconds

   6.3) Consider various break sizes; differing pressure decays and time of jet impingement

   6.4) Use industry RI-ISI submittals to guide selection of most likely break location(s)

7) Test Planning

   7.1) Develop test plan and matrix

   7.2) Solicit input from industry or volunteer plants the availability of insulating materials

8) Data to collect

   8.1) Break size modeled

   8.2) Initial pressure, temperature of mass source

   8.3) Mass flow rate and pressure at break

   8.4) Pressure at impingement point

   8.5) Mass and size distribution of resulting debris

   8.6) Mass of collected debris

   8.7) Location of debris following test

   8.8) Filter working liquid; collect debris carried with it

8.9) Video of test chamber

8.10) Calibration of all instruments

9) Communication with Industry

9.1) NRC should continue the dialogue, using the public meeting forum, that it has implemented so effectively with this program

9.2) If NRC performs debris generation testing, industry should be given the opportunity to observe a portion of the tests to be performed