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DCP_NRC_003331

March 28, 2018

Subject: Submittal of Slide Package for the April 2018 WCAP 17938 Revision 2, ACRS Full Committee (Non-Proprietary)

Enclosure 1 of this letter transmits the non-proprietary slide package for the ACRS Full Committee on Topical Report WCAP-17938 ("AP1000 In-Containment Cables and Non-Metallic Insulation Debris Integrated Assessment") Revision 2. The meeting will be held on April 5, 2018.

A handwritten signature in black ink, appearing to read 'Zachary S. Harper'.

Zachary S. Harper, Manager
AP1000 Regulatory Support, Mechanical & Structures

/Enclosures

1. APP-GW-GLY-153 Revision 0, "ACRS Full Committee on WCAP 17938 Revision," (Non-Proprietary)

cc: Donald Habib U.S. NRC

Westinghouse Non-Proprietary Class 3

ENCLOSURE 1 to DCP_NRC_003331

APP-GW-GLY-153, Revision 0
“ACRS Full Committee on WCAP 17938 Revision 2”

(Non-Proprietary)

This presentation is non-proprietary

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WCAP 17938 Revision 2, ACRS Full Committee Meeting

April 5, 2018

Zachary Harper

Shayan Sinha



Background

AP1000 GSI 191 Design Bases

- **AP1000** design significantly reduces / eliminates debris sources that are typically found in Generation II plants
- Maximum allowable fibrous debris inside containment is 6.6 lbs
 - All fibrous debris is attributable to latent debris
 - There is no fibrous debris generated during a LOCA
- Metal reflective insulation (MRI) is extensively used in containment
- DCD/FSAR provides requirements that must be demonstrated if an alternative (fibrous) insulation to MRI is utilized
 - Insulation must be demonstrated to be a suitable equivalent insulation to MRI for the purposes of GSI 191
 - To qualify a suitable equivalent testing must be performed to demonstrate that debris will not be generated or transported
 - Suitable equivalent testing must be approved by the NRC



Background

WCAP 17938 Purpose

Purpose of WCAP 17938 is to obtain approval of the following:

1. Establish a zone of influence (ZOI) applicable to all **AP1000** plant in-containment cabling to demonstrate cabling will not generate LOCA debris
2. Gain approval that the non-metallic insulation (NMI) utilized in the reactor vessel insulation systems (RVIS) is a suitable equivalent to MRI for the purpose of GSI 191 as applied in **AP1000**
3. Gain approval to utilize the approved NEI 04-07 alternative methodology for defining debris generation break sizes for **AP1000**

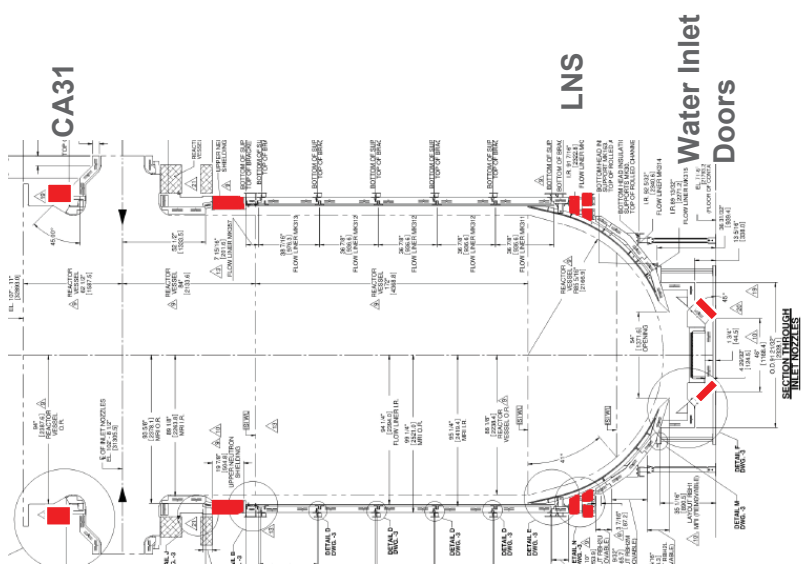
Testing and analysis is complete to demonstrate that neither cabling nor NMI will contribute to post LOCA debris



Background

WCAP 1793

- **AP1000** cabling may contain fibrous and other materials that were not considered in initial GSI 191 debris source term evaluations
 - Corrective actions included development of a test program to establish a ZOI for in-containment cabling
- NMI is required in RVIS because subcomponents of the RVIS perform functions in addition to insulation (such as shielding and in-vessel retention support)



Summary of Results

- Extensive large scale jet impingement testing established a ZOI for in-containment cables of 4 L/D
 - Cabling ZOI design requirements were incorporated into the detailed design in advance of any cable or tray installation
- WCAP invokes the alternate evaluation methodology provided in NEI 04-07 to determine a limiting RCS break size in debris generation evaluation for certain **AP1000** components
- Insights from NMI jet impingement and submergence testing resulted in strengthening design for elements of the RVIS
 - Design was changed to use thicker and more robust encapsulation



WCAP justifies no new debris generation for AP1000 from cabling or NMI

Conclusions



Conclusions

- A ZOI radius of 4 IDs is applicable to the AP1000 in-containment cables bounded by testing and analysis
- Application of NEI 04-07 alternative break methodology is acceptable for **AP1000**
- Cabling does not contribute to **AP1000** post LOCA debris limits
- Encapsulated NMI applications utilized within the AP1000 RVIS will not produce debris when subjected to jet impingement from limiting line breaks
- Neither cabling nor NMI within the RVIS contribute to GSI 191 chemical debris limits
- NMI utilized as part of the RVIS is a suitable equivalent to MRI for the locations bounded by testing and analysis (for the purpose of GSI 191)



WCAP justifies no new debris generation for AP1000 from cabling or NMI