October 15, 2012

J. A. Gresham
Westinghouse Electric Company
1000 Westinghouse Drive
Cranberry Township, Pennsylvania 16066

Dear Mr. Gresham:

Studsvik Nuclear AB has completed a loss-of-coolant accident (LOCA) research program for the U.S Nuclear Regulatory Commission (NRC) that provides new information on the behavior of high burnup fuel rods under LOCA conditions. This program tested ZIRLO clad fuel manufactured by Westinghouse Electric Company, and irradiated in U.S. commercial nuclear power plants. These specimens were made available to Studsvik under another program sponsored by the Electric Power Research Institute (EPRI) in cooperation with Westinghouse.

The NRC LOCA program at Studsvik has produced valuable insights into high burnup fuel behavior under LOCA conditions, including information related to fuel fragmentation, relocation and dispersal under LOCA conditions. A few questions still remain in order to consider this information in a regulatory context.

We understand that sibling rods, to those tested in the LOCA program, were the subject of an extensive post-irradiation examination (PIE) campaign conducted by the EPRI and funded by Westinghouse. We anticipate that the PIE results from the sibling rods will provide valuable information related to the interpretation of the NRC LOCA program results. Specifically, the PIE results will provide details on the initial condition of the rods tested. The NRC is currently focused on three specific research objectives which are postulated in an NRC staff paper[1] presented at the Halden LOCA Workshop in Lyon, France in May 2012. The research objectives are to:

- Understand where the fuel fragments originate that subsequently disperse (relative to the pellet radius) and how the dispersed fuel fragments are related to the formation of the “rim zone” in the fuel at high burnup.

- Investigate the time of fuel fragmentation. Specifically, to what extent is the fuel fragmented prior to the LOCA transient (due to operation), and how the fuel fragments (if at all) during the LOCA transient.

- Investigate the physical boundary for fuel mobility. Specifically, investigate the cladding strain and/or significant fuel-clad bonding necessary for fuel mobility.

A small work scope has been proposed for additional examinations of the segments tested in the NRC’s LOCA program at Studsvik. This work scope is designed to focus on these three specific research objectives. The additional examinations will be performed exclusively on the segments which were subjected to LOCA testing. The results of these examinations will be significantly enhanced by a reference to the initial conditions.

[1] M. Flanagan and P. Askeljung, “Observations of Fuel Fragmentation, Mobility and Loss in Integral, High-Burnup, Fueled LOCA Tests” May 2012. Paper and presentation attached.

To enhance this follow-up research effort, the NRC requests access to photomicrographs captured in the PIE of the sibling and/or father rods to those tested in the LOCA program. The rods tested in the LOCA program originated from two irradiation campaigns. The first four LOCA tests were conducted on segments from rods identified as AM2-E08 and AM2-F10 in a transmittal on December 7, 2009 with Westinghouse reference FMDT-09-70. The last two LOCA tests were conducted on segments from a rod identified as M14 in a transmittal on June 23, 2011 with Westinghouse reference FMDT-11-36 Rev. 1.

Specifically, the NRC is requesting photomicrographs which characterize (1) the extent (if any) of pellet fragmentation, (2) the extent (if any) of a visible "rim" region, and (3) the extent (if any) of fuel-cladding bonding[2]. It is our intent to use this information to inform any future regulatory determinations related to fuel fragmentation, relocation and dispersal. Therefore, transmittal of photomicrographs which are considered non-proprietary and which can be included in NRC public documents would be highly desirable. If the content or implications of the photomicrographs is considered proprietary to Westinghouse, the NRC will handle the photomicrographs accordingly and coordinate directly with Westinghouse prior to release of any technical basis documents developed based on the content and implications of these photomicrographs.

We understand that the work involved in producing this information has already been performed, and the results have been made available in EPRI reports (1003216 for the poolside; 1003218 for the hot cell investigation).

If you have any questions or concerns about this request, please contact Michelle Flanagan of my staff at michelle.flanagan@nrc.gov or (301) 251-7547.

Sincerely,

/RA/

Kathy Halvey Gibson
Director, Division of Systems Analysis
Office of Nuclear Regulatory Research
U.S Nuclear Regulatory Commission

Attachments:

- *"Observations of Fuel Fragmentation, Mobility and Loss in Integral, High-Burnup, Fueled LOCA Tests"* paper submitted to the Halden LOCA workshop in Lyon, France, May 2012
- *"Observations of Fuel Fragmentation, Mobility and Loss in Integral, High-Burnup, Fueled LOCA Tests"* presentation delivered at the Halden LOCA workshop in Lyon, France, May 2012

[2] Similar characterization information has been published for material tested in the IFA-650 LOCA series in the Halden Reactor Project This information has been published in HWR-824, published in 2005, and in HWR-1033, expected to be published later this year.

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DATE	9/13/12	9/13/12	9/17/12	9/17/12	10/5/12

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