Westinghouse Electric Company
Engineering, Equipment and Major Projects
1000 Westinghouse Drive
Cranberry Township, Pennsylvania 16066

U.S. Nuclear Regulatory Commission
Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Direct tel: (412) 374-4643
Direct fax: (412) 374-3846
e-mail: greshaja@westinghouse.com

LTR-NRC-13-52

July 26, 2013

Subject: Notification of the Potential Existence of Defects Pursuant to 10 CFR Part 21

The following information is provided pursuant to the requirements of 10CFR Part 21 to report a defect. The defect being reported concerns an identified inconsistency between the intended design functionality of the **SHIELD®**[1] passive thermal shutdown seal (SDS) and that observed during post-service testing. The purpose of the SDS is to reduce current reactor coolant system inventory losses to very small leakage rates for a plant event that results in the loss of all reactor coolant pump (RCP) seal cooling. The SDS is a thermally actuated, passive device integral to the RCP Number 1 seal insert and is positioned between the Number 1 seal and the Number 1 seal leak-off line to provide a near leak-tight seal once activated.

(i) Name and address of the individual or individuals informing the Commission.

James A. Gresham
Westinghouse Electric Company
Engineering, Equipment and Major Projects
1000 Westinghouse Drive, Suite 310
Cranberry Township, Pennsylvania 16066

(ii) Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect.

There are two delivered basic components associated with this report: 1) the SDS hardware, and 2) the Probability Risk Assessment (PRA) SDS model and the assigned SDS reliability. The hardware basic component is the **SHIELD** passive thermal shutdown seal. The associated PRA SDS model and assigned reliability basic component is WCAP-17100-P-A, Rev. 1, "PRA Model for the Westinghouse Shut Down Seal," (dated August 2011) and Supplement 1, Rev. 0, "PRA Model for the Westinghouse Shutdown Seal Supplemental Information for All Domestic Reactor Coolant Pump Models" (dated December 2012).

[1] **SHIELD** is a registered trademark of Westinghouse Electric Company LLC in the United States and may be registered in other countries throughout the world.

JE19
NRR

The WCAP and its Supplement 1 have been delivered to the Pressurized Water Reactor Owners Group (PWROG) participants supporting the program. The SDS has only been delivered to and installed in the following plants:

- Beaver Valley Unit 2
- Callaway
- D.C. Cook Unit 1
- Farley Units 1 & 2
- Wolf Creek

As explained in Sections (iv) and (vi) below, the delivered defect potential exists only for licensees that are participants of WCAP-17100 or its Supplement 1 and have installed the SDS. As clarified in Section (iv), an installed SDS does not itself represent a delivered defect. Credit taken by the licensee for the installed SDS, through implementing the methodology outlined in the WCAP and its Supplement 1, for example, could potentially constitute a delivered defect. Westinghouse is unaware of an immediate safety concern with respect to this issue (see Section (viii)), but cannot disprove the possibility that a licensee could potentially take credit for the SDS in a way that could adversely impact plant safety.

(iii) Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect.

Westinghouse Electric Company
Engineering, Equipment and Major Projects
1000 Westinghouse Drive
Cranberry Township, Pennsylvania 16066

(iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

SDS Hardware Considerations

Westinghouse has concluded that the SDS hardware itself will not adversely impact safe plant operation. Three conditions were considered:

1. Normal Operation, SDS Not Deployed
2. Normal Operation, SDS Inadvertently Deployed
3. Loss of Seal Cooling, SDS Not Deployed When Called On

During normal operation, when not deployed (i.e., actuated), the SDS does not change normal operating parameters and does not change RCP seal operability. In this state, RCP seal cooling is maintained and the plant operates as it had prior to SDS installation.

During normal operation, the SDS inadvertently deploys on a rotating RCP shaft (which is a low probability event). The SDS is not designed to actuate on a RCP shaft rotating at full speed; it is designed to deploy on a stationary or near stationary RCP shaft. If the SDS deploys on a rotating shaft, the rotating shaft will damage the SDS polymer seal ring and render it ineffective. This will return the plant back to a condition as though the SDS was

never present. Westinghouse determined that the polymer seal ring fragments resulting from actuation on a rotating RCP shaft will not adversely impact plant operation.

During a loss of seal cooling event, if the SDS does not deploy as intended, the plant is in the same condition it was before the SDS was installed. That is, the seal flow path remains unobstructed. Such a failure to deploy is the identified inconsistency between the intended design functionality of the SDS and that observed during post-service testing. In such a situation, the maximum potential seal leakoff flow would be the same as it was prior to the SDS installation.

Risk-Informed and Deterministic Credit Considerations

The failure of the SDS to actuate may adversely impact PRA and deterministic models described in WCAP-17100 and its Supplement 1. The implementation of the analytical models in this WCAP may have a potential downstream impact on other systems where use of risk-informed credit based on the presence of the SDS has been applied. Specifically, the WCAP and its Supplement 1 provide PRA and deterministic models for SDS behavior for a loss of all RCP seal cooling event. Implementation of the WCAP modeling methodology by a licensee would likely result in an improvement in calculated core damage frequency (CDF) and large early release frequency (LERF) values in the plant-specific PRA model. Such improvements could then be used as justification to implement changes to regulatory programs and risk informed applications. Examples include risk-informed changes to the surveillance frequencies and completion times listed in a plant's Technical Specifications. Additionally, the CDF and LERF values are used to identify risk levels of various plant configurations during daily repair, maintenance, and testing of components.

In addition to these risk-informed regulatory applications, there are two specific regulatory applications for which licensees may have made commitments for future installation of the SDS. Specifically, license amendment requests for transition to NFPA-805 and submittals describing diverse mitigation strategies in respsone to NRC Order EA-12-049.

Westinghouse has concluded there is a possibility that a licensee could take credit for the SDS and adversely impact plant safety.

(v) The date on which the information of such defect or failure to comply was obtained.

The Westinghouse president was informed of this defect on July 24, 2013.

(vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

As noted in Section (ii), the WCAP and its Supplement 1 have been delivered to multiple Pressurized Water Reactor Owners Group (PWROG) participants as identified therein. Currently, the SDS has been delivered to and installed in reactor coolant pumps at the following plants:

- Beaver Valley Unit 2
- Callaway
- D.C. Cook Unit 1
- Farley Units 1 & 2
- Wolf Creek

(vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

Westinghouse has completed a root cause analysis (RCA) and an independent third party review of this RCA is expected to be completed by August 2013. In parallel, SDS design improvements are being considered and may be completed during the third quarter of 2013. Additionally, and if necessary, Westinghouse will revise WCAP-17100 and its Supplements, as needed, to reflect any new information that is developed.

(viii) Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

Affected customers have been informed via their respective Customer Project Managers of the post-service test failure. A Westinghouse Nuclear Safety Advisory Letter (NSAL) will be issued to affected licensees within the next week. Westinghouse anticipates recommending that plants review any credit taken for the PRA improvements obtained based on SDS installation. For example, plants that are planning to implement FLEX strategies in response to NRC Order EA-12-049 are likely to take credit for the SDS, once installed. However, the implementation of these plant changes will occur in the future and, therefore, Westinghouse does not consider there to be an associated safety concern at this time. Additionally, Westinghouse anticipates there may be License Amendement Requests (LARs) underway for the transition of licensee fire protection programs from 10 CFR 50, Appendix R, to NFPA-805. Such LARs also are likely to credit the Westinghouse SDS as integral to the strategies, equipment, procedures, and staffing for fire-related events. However, Westinghouse does not consider there to be a safety concern associated with these LAR submittals at this time, as impacted licensees can take actions to determine if a reliable SDS can be installed in a timely manner in order to meet their commitment deadlines.

(ix) In the case of an early site permit, the entities to whom an early site permit was transferred.

N/A

Very truly yours,

James A. Gresham, Secretary
Westinghouse Safety Review Committee

cc: E. Lenning (NRC MS O-11-F1)