

December 4, 2014

MEMORANDUM TO: Richard P. Correia, Director  
Division of Risk Analysis  
Office of Nuclear Regulatory Research

FROM: John A. Nakoski, Chief */RA/*  
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Division of Risk Analysis  
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SUBJECT: FISCAL YEAR 2013 LICENSEE EVENT REPORT DISPOSITION  
SUMMARY FOR THE ACCIDENT SEQUENCE PRECURSOR  
PROGRAM

### Background

Each year the Office of Nuclear Regulatory Research (RES) submits an information paper (SECY) to inform the Commission of the status of the Accident Sequence Precursor (ASP) Program. The ASP Program systematically evaluates U.S. nuclear power-plant operating experience to identify, document, and rank operational events that are precursors to core damage. The ASP Program defines a precursor as an event with a conditional core damage probability (CCDP) or an increase in core damage probability ( $\Delta$ CCDP) greater than or equal to  $1 \times 10^{-6}$ . For initiating event analyses, and to focus analyses on the more safety-significant events, the ASP Program excludes as precursors reactor transients whose results would be similar to or less significant than the loss of balance-of-plant systems (e.g., feedwater and condenser heat sink) with no degradation of safety-related equipment. Therefore, the ASP Program uses an initiating-event precursor threshold of a CCDP of  $1 \times 10^{-6}$  or the plant-specific CCDP<sup>1</sup> for the non-recoverable loss of balance-of-plant systems, whichever is greater. Since 1988, this initiating-event precursor threshold screens out reactor trips with no losses of safety-system equipment from being precursors because of their relatively low risk significance.

### Process

While the annual ASP Commission paper discusses operational events that exceed the precursor threshold, considerable effort is expended evaluating operational events that do not exceed the threshold. These events are more commonly referred to as "rejects." Idaho National Laboratory (INL) is responsible for reviewing all Licensee Event Reports (LERs) to determine which operational events meet the ASP screening acceptance criteria. That is, INL acts as the initial filter to disposition events as either screened-in or screened-out. The

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<sup>1</sup> The plant-specific CCDP is determined using NRC's Standardized Plant Analysis Risk (SPAR) models to analyze the non-recoverable loss of the condenser heat sink and the non-recoverable loss of main feedwater initiating events for each plant. If the results from either of these analyses are greater than  $1 \times 10^{-6}$ , the highest value is used as the precursor threshold for the subject plant.

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acceptance criteria are established broadly such that all potential precursors should be screened-in, but not too broad as to unduly burden the NRC ASP Program Manager (PM) and NRC Risk Analysts. INL does not perform quantitative analyses of LERs. The acceptance criteria are strictly qualitative at this point in the screening process.

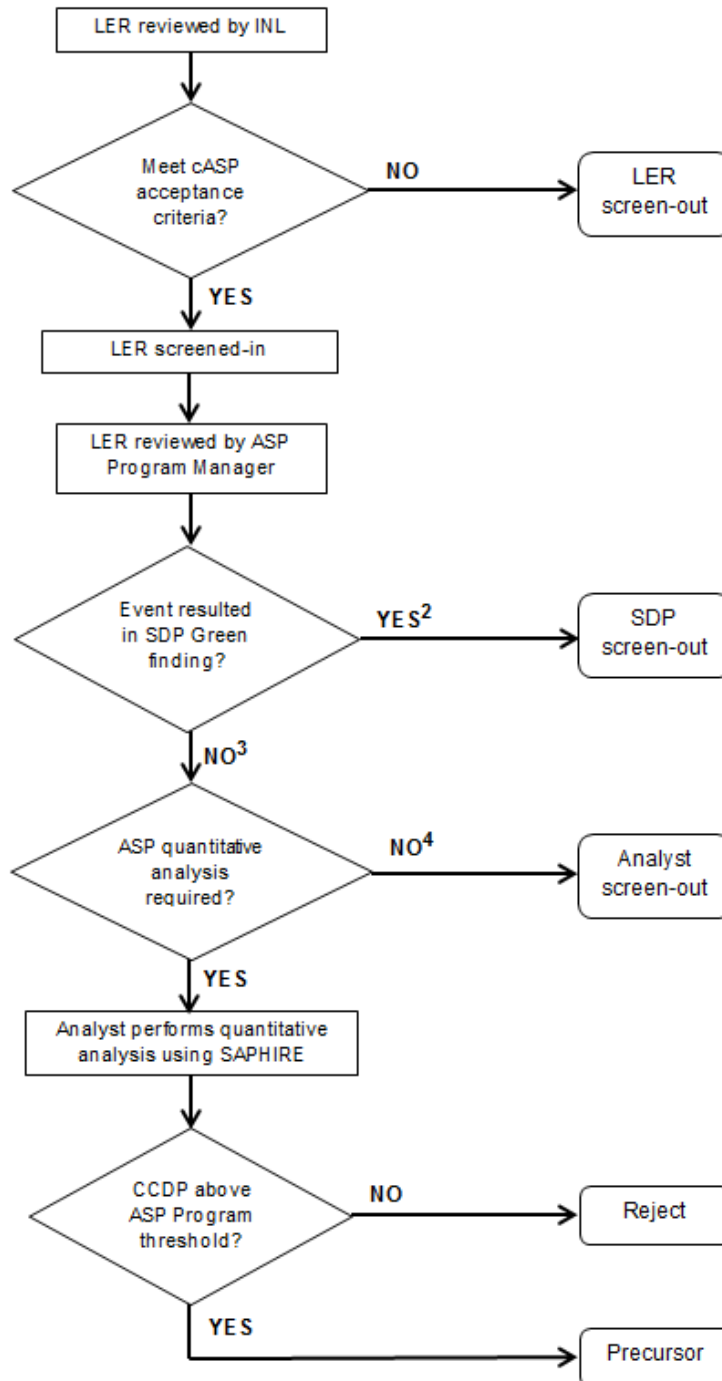
INL sends a weekly report to the ASP PM that details every LER reviewed and coded that week. The code corresponds to a specific criterion listed in the Candidate ASP (cASP) Pilot Screening Criteria (see Enclosure). The ASP PM reviews the weekly report from INL and records the screened-in LERs on an internal tracking spreadsheet. Any LER that does not have a code is considered a “LER” screen-out and no further review is performed. From there, each screened-in LER, along with any associated NRC Inspection Reports (IRs), are reviewed to determine if detailed ASP analyses are warranted.

At this point, an event reported by an LER can be screened out from further review for two reasons:

- 1) If the event was determined to be a Green finding under the Significance Determination Process (SDP), it is considered a “SDP” screen-out. For events that fall outside the scope of the assessments performed within the SDP (e.g., initiating events, concurrent equipment unavailabilities due to separate performance deficiencies, and safety-related equipment unavailabilities with no licensee performance deficiency), a quantitative ASP analysis is required.
- 2) If the event is unlikely a precursor to core damage based on the knowledge of the ASP PM and other ASP Analysts, it is considered an “Analyst” screen-out. Given the results of past event analyses, an understanding of accident phenomenology, and the current development of the Standardized Plant Analysis Risk (SPAR) models, the ASP PM will recommend for screen-out LERs with low risk to the public health and safety, such as an equipment failure at shutdown with all fuel in the spent fuel pool or a containment-related event. An independent review and concurrence by other ASP analysts and/or Branch Chief is performed.

The remaining LERs that were not screened out require formal quantitative analyses using plant-specific SPAR models. Typically, an Analyst’s effort ranges from a few days for a basic operational event, up to several months for a complicated operational event. Events that result in a CCDP or  $\Delta$ CDP below the ASP Program threshold are considered “rejects” and a report entitled “ASP Screening Analysis” is generated for each event. Events with a CCDP or  $\Delta$ CDP above the ASP Program threshold are considered “precursors” and are documented separately in a “Final Precursor Analysis” report. Precursor trends and insights are reported in an annual status paper to the Commission.

The LER disposition process is illustrated in Figure 1.



**Figure 1: LER Disposition Process**

<sup>2</sup> SDP Green findings are only accepted as “SDP” screen-outs for singular degraded conditions where a performance deficiency was identified. Initiating events, multiple degraded conditions, or separate events occurring close in time all require an independent ASP analysis.

<sup>3</sup> Greater-than-Green SDP findings (White, Yellow, and Red) are considered “precursors” in the ASP Program.

<sup>4</sup> Given the results of past event analyses, an understanding of accident phenomenology, and the current development of the SPAR models, the ASP PM will recommend for screen-out LERs with low risk to the public health and safety (e.g., limited shutdown events and containment-related events).

## Results

There were 458 LERs reviewed during fiscal year (FY) 2013. Table 1 depicts the breakdown of LERs into the five disposition categories.

**Table 1: Fiscal Year 2013 LER Breakdown**

<b>Disposition Category</b>	<b>LER Count</b>
LER Screen-out	334
SDP Screen-out	72
Analyst Screen-out	8
Reject	27
Precursor	17
<b>Total</b>	<b>458</b>

As shown in Table 1, RES, Division of Risk Analysis (DRA) completed 27 analyses of operational events that resulted in a CCDP below the ASP Program precursor threshold. The results of these analyses are documented in their respective "ASP Screening Analysis" reports. Table 1 also indicates that 17 operational events (initiating events or degraded conditions) were determined to be precursors in FY 2013. Refer to the ASP SECY (SECY-14-0107) for more information on precursor trends and insights.

Table 2 lists the eight "Analyst" screen-outs in FY 2013 along with the justification as to why the event reported by the LER did not require a formal quantitative analysis.

**Table 2: Fiscal Year 2013 "Analyst" screen-outs**

<b>LER</b>	<b>Plant</b>	<b>LER Title</b>	<b>cASP Criterion</b>	<b>Disposition Comments</b>
259-2011-003	Browns Ferry 1,2,& 3	Loss of Safety Function (SDC) Resulting from Emergency Diesel Generator Output Breaker Trip.	3.d	Accounted for in precursor analysis of LER 259-2011-001
271-2013-001	Vermont Yankee	Potential to Flood Switchgear Rooms due to Missing Conduit Flood Seal.	3.e	Green Finding; LER closed in IR 50-257/13-003
285-2012-017	Fort Calhoun	Containment Valve Actuators Design Temperature Ratings Below those Required for Design Basis Accidents.	3.g	Containment related issue
285-2012-019	Fort Calhoun	Traveling Screen Sluice Gates Found with Dual Indication.	3.f	Finding is bounded by the Yellow finding for an external flooding event (EA-10-084)
352-2013-001	Limerick 1	High Pressure Coolant Injection System Pressure Switch Lubricating Oil Leak.	3.d	No Finding; LER closed in IR 50-352/13-003; other injection sources available
373-2013-003	LaSalle 1	Low Pressure Core Spray Declared Inoperable Due to Faulty Control Switch.	3.d	Accounted for in precursor analysis of LER 373-2013-002
374-2013-001	LaSalle 2	Pin Hole Leaks Identified in High Pressure Core Spray Piping.	3.d	Accounted for in precursor analysis of LER 373-2013-002
482-2009-005	Wolf Creek	Loss of both Diesel Generators with all Fuel in the Spent Fuel Pool.	3.e	No possibility of core damage because all fuel in spent fuel pool

Table 3 lists the 27 “rejects” for FY 2013.

**Table 3: Fiscal Year 2013 Rejects**

LER	Plant	LER Title	cASP Criterion
219-2012-002	Oyster Creek 1	Loss of Offsite Power During Hurricane Sandy.	2.a
220-2012-005	Nine Mile Point 1	Feedwater Level Control Failure, HPCI Initiation and Reactor Scram.	In-house <sup>5</sup> 3.b
247-2013-003	Indian Point 2	Manual Reactor Trip Due to Decreasing Steam Generator Water Levels Due to Loss of Main Feedwater (FW) Flow Caused by a Loss of Instrument Air to the FW Regulating Valves.	2.i
250-2013-002	Turkey Point 3	Automatic Reactor Trip due to Low Condenser Vacuum.	2.h
250-2013-006	Turkey Point 3	Reactor Protection and Auxiliary Feed Water System Actuations Due to Trip of Operating Feedwater Pump.	In-house 2.i
251-2013-002	Turkey Point 4	Reactor Trip Due to Loss of Offsite Power Resulting From Generator Testing.	1.c
255-2013-001	Palisades	Technical Specification Required Shutdown Due to a Component Cooling Water System Leak.	In-house 3.h
263-2013-004	Monticello	Loss of Normal Off-Site Power as a Result of Switchgear Fault.	3.e
266-2013-001	Point Beach 1	Loss of Offsite Power to Unit 1 Safeguards Buses	In-house 2.a
293-2013-008	Pilgrim	Manual Scram - Reactor Feed Pump Trip.	1.k
296-2013-003	Browns Ferry 3	Automatic Reactor Shutdown due to an Actuation of the Reactor Protection System from a Turbine Trip.	2.h
318-2013-003	Calvert Cliffs 2	Reactor Trip Due to Intermittent Failure in the Turbine Control System.	4
318-2013-004	Calvert Cliffs 2	Manual Reactor Trip Due to 22 Steam Generator Feed Pump Trip.	4
328-2013-001	Sequoyah 2	Manual Reactor Trip due to Loss of Hotwell Level.	2.h
333-2012-005	FitzPatrick	Transformer Installation Error Causes Loss of Off-Site Power	In-house 2.a
348-2013-001	Farley 1	Automatic Reactor Trip and B-Train Loss of Off-Site Power Caused by the Failure of a Startup Transformer Lightning Arrester.	2.a
354-2013-002	Hope Creek	Reactor Scram due to Degrading Condenser Vacuum.	1.k
369-2013-001	McGuire 1	Valid Actuation of Unit 1 Reactor Protection and Auxiliary Feedwater Systems	In-house 2.i
370-2012-002	McGuire 2	Automatic Actuation of the Auxiliary Feedwater and Nuclear Service Water Systems	In-house 3.h
382-2013-002	Waterford 3	Emergency Feedwater System Flow Control Valve Fails to Close due to Valve Positioner Failure	In-house 4
388-2012-002	Susquehanna 2	Unit 2 Manual Scram Due to Loss of the Integrated Control System.	1.k
388-2013-003	Susquehanna 2	Unit 2 Manual Reactor Scram due to Loss of Reactor Feedwater Pumps.	1.k
416-2012-008	Grand Gulf	Reactor Protection System Actuation due to a Main Turbine Generator Trip	In-house 3.d
423-2013-007	Millstone 3	Reactor Trip on Low-Low Steam Generator Level.	1.e
440-2013-001	Perry	Loss of Feedwater Results in Automatic Reactor Protection System Actuation	In-house 2.i
499-2013-001	South Texas 2	Unit 2 Manual Reactor Trip due to Dropped Rods M8 and D8	In-house 4
499-2013-002	South Texas 2	Reactor Trip Due to main Transformer Lockout Relay Trip.	1.c

<sup>5</sup> Any LER reviewed by RES/DRA during the screening contractor switch from ISL to INL is labeled “In-house.” See “Discussion” section for additional details.

## Discussion

In FY 2013, 80 LERs were categorized as either “SDP” or “Analyst” screen-outs. This number is relatively higher than prior years because there was a gap in LER screening performed by a commercial contractor. LER screening was previously performed by Information Systems Laboratories, Inc. (ISL) whose contract ended at the conclusion of FY 2012. INL began LER screening at the beginning of calendar year 2013. Any LERs issued during this three-month gap, as well as any that were not reviewed by ISL, were reviewed by RES/DRA. Some LERs were decidedly “LER” screen-outs, but many were reviewed by a second or third Analyst and classified as “SDP” or “Analyst” screen-outs. Operational events that occurred in FY 2014 will have continuous LER screening performed by INL.

During FY 2013, the guidance regarding “ASP Screening Analysis” (reject) reports changed to require that all reports include a quantitative analysis (i.e., plant-specific SPAR analysis) whenever possible. Previously, ASP Analysts could document certain events and dispositions in a one-page “ASP Screening Analysis” without a quantitative analysis. Some events, such as low-power and shutdown events, may still not require a quantitative SPAR analysis. Table 3 includes four events without a quantitative, plant-specific SPAR analysis (LERs 219-2012-002, 250-2013-006, 333-2012-005, and 370-2012-002).

An analysis of Table 2 (Fiscal Year 2013 “Analyst” screen-outs) shows that all eight LERs were coded with a cASP Screening Criteria related to safety system functional failures. If this trend continues, the cASP Screening Criteria could be potentially enhanced to screen-out these LERs during the initial LER screening phase.

No observable trend currently exists in Table 3 (Fiscal Year 2013 Rejects) regarding cASP Screening Criteria coding.

## Summary

There were 458 LER dispositions in FY 2013. RES/DRA completed 27 reject analyses of operational events that did not exceed the established precursor threshold. There were 17 operational events determined to be precursors in FY 2013. Refer to the ASP SECY (SECY-14-0107) for more information.

Enclosure:  
Candidate ASP (cASP) Pilot Screening Criteria

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