
REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 409-8325
SRP Section: SRP 19
Application Section: 19
Date of RAI Issue: 02/22/2016

Question No. 19-27

10 CFR 52.47(a)(27) requires that a standard design certification applicant provide a description of the design specific PRA and the results. Based on Table 19.1-96, LPSD Internal Events PRA Top 100 CDF cutsets – All POSs, the top two cutsets are initiated by overdraining of the RCS to reach midloop conditions. To mitigate these events, the operators need to initiate reactor coolant system (RCS) injection and recover the Shutdown Cooling System. To quantify the failure rate of these operator actions, the analyst should consider dependence for core damage frequency calculations. Dependence was quantified in the top two cutsets. However, the staff searched through the low-power shutdown (LPSD) human reliability analysis (HRA) notebook and could not find how dependence was calculated or what factors were considered in the dependence calculation (e.g. similar alarms and cues). The staff could find the dependence calculations for other LPSD initiators in the LPSD HRA notebooks. The staff is requesting KHNP to provide the staff additional information on how dependence was calculated and update the DCD as necessary for: (1) reactor coolant system (RCS) overdraining at reduced inventory operation and (2) failure to maintain water level during reduced inventory operation, so the staff can better understand the numerical results of the KHNP LPSD PRA.

Response – (Rev. 1)

Human error is dominant in the LPSD cutsets. For example, five (5) of the top ten Level 1 cutsets include a failure to recover the shutdown cooling system (SCS), followed by a subsequent failure to initiate feed & bleed (F&B) operation. Another three (3) of the top ten cutsets include a failure to provide RCS makeup, followed by a failure to initiate F&B operation.

The LPSD HRA is documented in LPSD Human Reliability Analysis Notebook (APR1400-K-P-NR-013705-P, Rev.0). It quantifies the dependency between subsequent human actions with the methodology which was described in Appendix N in the Human Reliability Analysis Notebook of Full Power Level 1 (APR1400-K-P-NR-013105-P, Rev.0). The overdrain during reduced inventory operation (SO) and failure to maintain water level during reduced inventory

operation (SL) initiating events were grouped with the unrecoverable LOCA (JL) for the operator actions addressed by this RAI.

The cues for operator action to attempt SCS recovery or initiate RCS makeup are the SCS pump discharge flow alarm and an abnormal increase in the Reactor Coolant System (RCS) temperature. For example, the worksheets for the development of HR-RS-JL(SO,SL)P05 and HR-MI-JL(SO,SL)P05 in LPSD Human Reliability Analysis Notebook (APR1400-K-P-NR-013705-P, Rev.0). If the initial action fails, the operators must initiate F&B operation to prevent core damage. The cues for F&B operation include the same SCS pump alarm but also uniquely include an abnormal increase in the Core Exit Thermocouple (CET) indications. And for example, the worksheet for HR-FB-JL(SO,SL)P05-01. Since the CET cue for the second action is uniquely different from either cue for the first action, the second action is assigned a low dependence (LD). The combined failure probability is quantified with the Table 10-2 dependency equations in NUREG/CR-1278. [Section 19.1.6.1.1.6 of the DCD will be revised as shown in Attachment 1.](#)

[Summary tables for the dependency analysis performed for APR1400 HFEs are presented in Section 7 of LPSD Human Reliability Analysis Notebook \(APR1400-K-P-NR-013705-P, Rev.0\) in Tables 7-5 through 7-8. The details for dependency analysis are provided in Attachment 2.](#)

[This information will also be added as Appendix E to LPSD Human Reliability Analysis Notebook \(APR1400-KP-NR-013705-P\).](#)

Impact on DCD

[DCD Section 19.1.6.1.1.6 will be revised as shown in Attachment 1.](#)

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on Technical/Topical/Environmental Report.

APR1400 DCD TIER 2

Operator actions for responses to events that occur in TS Modes 4, 5, or 6 are summarized in the following groups:

- a. Actions to restore SCS
- b. Actions to provide reasonable assurance of secondary cooling
- c. Actions to initiate feed and bleed cooling
- d. Actions to isolate RCS leakage and restore inventory
- e. Actions to align the AAC power source

The time available to perform each of these categories of actions varies with POS. As a result, the HEPs for each event also vary with POS. Some actions are not applicable to all initiators and timing can be affected by specific initiating events. For example, actions to isolate RCS leakage and restore inventory are not applicable to loss of SCS initiating events.

19.1.6.1.1.7 Systems Analysis



Insert A in next page

The following summarizes differences in LPSD PRA system models versus at-power PRA modeling:

- a. Safety Injection System
 - 1) The SITs are isolated in the late POS 2 (TS Mode 3) and below. They are considered unavailable during all of POS 3 through POS 13.
 - 2) Manual actuation of the SIPs is assumed to be required in Mode 4 (POS 3) and below. Automatic actuation is not credited.
- b. Shutdown Cooling System
 - 1) The system is modeled as aligned for shutdown with one train in operation and one train on standby.
 - 2) No maintenance is performed on the SCS when operation of the system is required.

A

Some of the top cutsets include operator failures to perform multiple actions including, for example, a failure to restore the Shutdown Cooling System, followed by a failure to initiate feed & bleed operation. The Cause-Based Decision Tree Methodology (CBDTM) methodology, as implemented in the EPRI HRA Calculator (Reference 26), was used to evaluate the dependency of the subsequent operator action. The dependency itself was quantified with NUREG/CR-1278 (Reference 21), Table 10-2 equations.

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
1	HR-RS-S1P03	Operator Fails to Restore SCS at S1 POS03A	2.70E-02	HR-SG-S1P03	Operator Fails to Operate SHR with AFW at S1 POS03A	1.02E-03	HR-SG-S1P03-DE	LD	5.10E-02	No	same	Sequential	Same	>60min	High or Moderate
2	HR-RS-S1P04A	Operator Fails to Restore SCS at S1 POS04A	2.32E-04	HR-SG-S1P04A	Operator Fails to Operate SHR with AFW at S1 POS04A	1.02E-03	HR-SG-S1P04A-DE	LD	5.10E-02	No	same	Sequential	Same	>60min	High or Moderate
3	HR-RS-S1P13	Operator Fails to Restore SCS at S1 POS13	2.32E-04	HR-SG-S1P13	Operator Fails to Operate SHR with AFW at S1 POS13	1.02E-03	HR-SG-S1P13-DE	LD	5.10E-02	No	same	Sequential	Same	>60min	High or Moderate
4	HR-SG-S1P03	Operator Fails to Operate SHR with AFW at S1 POS03A	1.02E-03	HR-FB-S1P03-01	Operator Fails to Operate F&B at S1 POS03A 01	4.55E-03	HR-FB-S1P03-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
5	HR-SG-S1P03	Operator Fails to Operate SHR with AFW at S1 POS03A	1.02E-03	HR-FB-S1P03-02	Operator Fails to Operate F&B at S1 POS03A 02	2.15E-03	HR-FB-S1P03-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate
6	HR-SG-S1P04A	Operator Fails to Operate SHR with AFW at S1 POS04A	1.02E-03	HR-FB-S1P04A-01	Operator Fails to Operate F&B at S1 POS04A 01	4.55E-03	HR-FB-S1P04A-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
7	HR-SG-S1P04A	Operator Fails to Operate SHR with AFW at S1 POS04A	1.02E-03	HR-FB-S1P04A-02	Operator Fails to Operate F&B at S1 POS04A 02	2.15E-03	HR-FB-S1P04A-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
8	HR-RS-S1P04B	Operator Fails to Restore SCS at S1 POS04B	3.97E-04	HR-FB-S1P04B	Operator Fails to Operate F&B at S1 POS04B	1.27E-03	HR-FB-S1P04B-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
9	HR-RS-S1P05	Operator Fails to Restore SCS at S1 POS05	3.37E-03	HR-FB-S1P05	Operator Fails to Operate F&B at S1 POS05	1.27E-03	HR-FB-S1P05-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
10	HR-RS-S1P06	Operator Fails to Restore SCS at S1 POS06	2.32E-04	HR-FB-S1P06	Operator Fails to Operate F&B at S1 POS06	1.34E-03	HR-FB-S1P06-DE	LD	5.13E-02	No	same	Sequential	Same	>60min	High or Moderate
11	HR-RS-S1P10	Operator Fails to Restore SCS at S1 POS10	2.32E-04	HR-FB-S1P10	Operator Fails to Operate F&B at S1 POS10	1.27E-03	HR-FB-S1P10-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
12	HR-RS-S1P11	Operator Fails to Restore SCS at S1 POS11	3.97E-04	HR-FB-S1P11	Operator Fails to Operate F&B at S1 POS11	1.27E-03	HR-FB-S1P11-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
13	HR-RS-S1P12A	Operator Fails to Restore SCS at S1 POS12A	3.37E-03	HR-FB-S1P12A	Operator Fails to Operate F&B at S1 POS12A	1.27E-03	HR-FB-S1P12A-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
14	HR-SG-S1P13	Operator Fails to Operate SHR with AFW at S1 POS13	1.02E-03	HR-FB-S1P13-01	Operator Fails to Operate F&B at S1 POS13 01	4.55E-03	HR-FB-S1P13-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
15	HR-SG-S1P13	Operator Fails to Operate SHR with AFW at S1 POS13	1.02E-03	HR-FB-S1P13-02	Operator Fails to Operate F&B at S1 POS13 02	2.15E-03	HR-FB-S1P13-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
16	HR-RS-JLP03	Operator Fails to Restore SCS at JL POS03A	3.01E-04	HR-IL-JLP03-01	Operator Fails to Isolate Unrecoverable LOCA (JL) PATH at POS03A 01	6.12E-03	HR-IL-JLP03-01-DE	LD	5.58E-02	No	same	Sequential	Same	>60min	High or Moderate
17	HR-MK-JLP03	Operator Fails to Makeup Inventory at JL POS03A	3.58E-02	HR-IL-JLP03-02	Operator Fails to Isolate Unrecoverable LOCA (JL) PATH at POS03A 02	6.12E-03	HR-IL-JLP03-02-DE	LD	5.58E-02	No	same	Sequential	Same	>60min	High or Moderate
18	HR-RS-JLP04A	Operator Fails to Restore SCS at JL POS04A	3.01E-04	HR-IL-JLP04A-01	Operator Fails to Isolate Unrecoverable LOCA (JL) PATH at POS04A 01	6.12E-03	HR-IL-JLP04A-01-DE	LD	5.58E-02	No	same	Sequential	Same	>60min	High or Moderate
19	HR-MK-JLP04A	Operator Fails to Makeup Inventory at JL POS04A	4.98E-04	HR-IL-JLP04A-02	Operator Fails to Isolate Unrecoverable LOCA (JL) PATH at POS04A 02	6.12E-03	HR-IL-JLP04A-02-DE	LD	5.58E-02	No	same	Sequential	Same	>60min	High or Moderate
20	HR-RS-JLP13	Operator Fails to Restore SCS at JL POS13	3.01E-04	HR-IL-JLP13-01	Operator Fails to Isolate Unrecoverable LOCA (JL) PATH at POS13 01	6.12E-03	HR-IL-JLP13-01-DE	LD	5.58E-02	No	same	Sequential	Same	>60min	High or Moderate

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
21	HR-MK-JLP13	Operator Fails to Makeup Inventory at JL POS13	4.98E-04	HR-IL-JLP13-02	Operator Fails to Isolate Unrecoverable LOCA (JL) PATH at POS13 02	6.12E-03	HR-IL-JLP13-02-DE	LD	5.58E-02	No	same	Sequential	Same	>60min	High or Moderate
22	HR-RS-JLP03	Operator Fails to Restore SCS at JL POS03A	3.01E-04	HR-SG-JLP03-01	Operator Fails to Operate SHR with AFW at JL POS03A 01	1.30E-03	HR-SG-JLP03-01-DE	ZD	0.00E+00	Yes	-	-	-	-	-
23	HR-MK-JLP03	Operator Fails to Makeup Inventory at JL POS03A	3.58E-02	HR-SG-JLP03-02	Operator Fails to Operate SHR with AFW at JL POS03A 02	1.30E-03	HR-SG-JLP03-02-DE	ZD	0.00E+00	Yes	-	-	-	-	-
24	HR-RS-JLP04A	Operator Fails to Restore SCS at JL POS04A	3.01E-04	HR-SG-JLP04A-01	Operator Fails to Operate SHR with AFW at JL POS04A 01	1.30E-03	HR-SG-JLP04A-01-DE	ZD	0.00E+00	Yes	-	-	-	-	-
25	HR-MK-JLP04A	Operator Fails to Makeup Inventory at JL POS04A	4.98E-04	HR-SG-JLP04A-02	Operator Fails to Operate SHR with AFW at JL POS04A 02	1.30E-03	HR-SG-JLP04A-02-DE	ZD	0.00E+00	Yes	-	-	-	-	-
26	HR-RS-JLP13	Operator Fails to Restore SCS at JL POS13	3.01E-04	HR-SG-JLP13-01	Operator Fails to Operate SHR with AFW at JL POS13 01	1.30E-03	HR-SG-JLP13-01-DE	ZD	0.00E+00	Yes	-	-	-	-	-

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
27	HR-MK-JLP13	Operator Fails to Makeup Inventory at JL POS13	4.98E-04	HR-SG-JLP13-02	Operator Fails to Operate SHR with AFW at JL POS13 02	1.30E-03	HR-SG-JLP13-02-DE	ZD	0.00E+00	Yes	-	-	-	-	-
28	HR-SG-JLP03-01	Operator Fails to Operate SHR with AFW at JL POS03A 01	1.30E-03	HR-FB-JLP03-01	Operator Fails to Operate F&B at JL POS03A 01	4.55E-03	HR-FB-JLP03-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
29	HR-SG-JLP03-02	Operator Fails to Operate SHR with AFW at JL POS03A 02	1.30E-03	HR-FB-JLP03-02	Operator Fails to Operate F&B at JL POS03A 02	2.15E-03	HR-FB-JLP03-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate
30	HR-SG-JLP04A-01	Operator Fails to Operate SHR with AFW at JL POS04A 01	1.30E-03	HR-FB-JLP04A-01	Operator Fails to Operate F&B at JL POS04A 01	4.55E-03	HR-FB-JLP04A-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
31	HR-SG-JLP04A-02	Operator Fails to Operate SHR with AFW at JL POS04A 02	1.30E-03	HR-FB-JLP04A-02	Operator Fails to Operate F&B at JL POS04A 02	2.15E-03	HR-FB-JLP04A-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate
32	HR-RS-JLP04B	Operator Fails to Restore SCS at JL POS04B	4.66E-04	HR-FB-JLP04B-01	Operator Fails to Operate F&B at JL POS04B 01	1.27E-03	HR-FB-JLP04B-01-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
33	HR-MI-JLP04B	Operator Fails to Isolate and Makeup Unrecoverable LOCA (JL) PATH at POS04B	1.25E-03	HR-FB-JLP04B-02	Operator Fails to Operate F&B at JL POS04B 02	1.05E-02	HR-FB-JLP04B-02-DE	LD	5.99E-02	No	same	Sequential	Same	>60min	High or Moderate

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
34	HR-RS-JLP05	Operator Fails to Restore SCS at JL POS05	7.64E-03	HR-FB-JLP05-01	Operator Fails to Operate F&B at JL POS05 01	1.27E-03	HR-FB-JLP05-01-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
35	HR-MI-JLP05	Operator Fails to Isolate and Makeup Unrecoverable LOCA (JL) PATH at POS05	1.54E-03	HR-FB-JLP05-02	Operator Fails to Operate F&B at JL POS05 02	1.44E-02	HR-FB-JLP05-02-DE	LD	6.37E-02	No	same	Sequential	Same	>60min	High or Moderate
36	HR-RS-JLP06	Operator Fails to Restore SCS at JL POS06	4.66E-04	HR-FB-JLP06-01	Operator Fails to Operate F&B at JL POS06 01	1.30E-03	HR-FB-JLP06-01-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
37	HR-MI-JLP06	Operator Fails to Isolate and Makeup Unrecoverable LOCA (JL) PATH at POS06	1.47E-03	HR-FB-JLP06-02	Operator Fails to Operate F&B at JL POS06 02	1.37E-02	HR-FB-JLP06-02-DE	LD	6.30E-02	No	same	Sequential	Same	>60min	High or Moderate
38	HR-RS-JLP10	Operator Fails to Restore SCS at JL POS10	3.01E-04	HR-FB-JLP10-01	Operator Fails to Operate F&B at JL POS10 01	1.27E-03	HR-FB-JLP10-01-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
39	HR-MI-JLP10	Operator Fails to Isolate and Makeup Unrecoverable LOCA (JL) PATH at POS10	1.25E-03	HR-FB-JLP10-02	Operator Fails to Operate F&B at JL POS10 02	1.70E-03	HR-FB-JLP10-02-DE	LD	5.16E-02	No	same	Sequential	Same	>60min	High or Moderate
40	HR-RS-JLP11	Operator Fails to Restore SCS at JL POS11	3.44E-03	HR-FB-JLP11-01	Operator Fails to Operate F&B at JL POS11 01	1.27E-03	HR-FB-JLP11-01-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
41	HR-MI-JLP11	Operator Fails to Isolate and Makeup Unrecoverable LOCA (JL) PATH at POS11	1.25E-03	HR-FB-JLP11-02	Operator Fails to Operate F&B at JL POS11 02	1.27E-03	HR-FB-JLP11-02-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
42	HR-RS-JLP12A	Operator Fails to Restore SCS at JL POS12A	3.01E-04	HR-FB-JLP12A-01	Operator Fails to Operate F&B at JL POS12A 01	1.27E-03	HR-FB-JLP12A-01-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
43	HR-MI-JLP12A	Operator Fails to Makeup Inventory at SO POS12A	1.25E-03	HR-FB-JLP12A-02	Operator Fails to Operate F&B at JL POS12A 02	1.27E-03	HR-FB-JLP12A-02-DE	LD	5.12E-02	No	same	Sequential	Same	>60min	High or Moderate
44	HR-SG-JLP13-01	Operator Fails to Operate SHR with AFW at JL POS13 01	1.30E-03	HR-FB-JLP13-01	Operator Fails to Operate F&B at JL POS13 01	4.55E-03	HR-FB-JLP13-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
45	HR-SG-JLP13-02	Operator Fails to Operate SHR with AFW at JL POS13 02	1.30E-03	HR-FB-JLP13-02	Operator Fails to Operate F&B at JL POS13 02	2.15E-03	HR-FB-JLP13-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate
46	HR-EA-LXP03	Recover Power from AAC after ADV Opening or Failure at SBO-POS3A AAC	1.30E-02	HR-AV-LXP03	OPERATOR FAILS TO OPERATE ADV AT LX POS03A	5.47E-02	HR-AV-LXP03-DE	LD	1.02E-01	No	same	Sequential	Same	>60min	High or Moderate
47	HR-EA-LXP04A	Recover Power from AAC after ADV Opening or Failure at SBO-POS4A AAC	1.68E-03	HR-AV-LXP04A	Operator Fails to Operate ADV at LX POS04A	1.78E-03	HR-AV-LXP04A-DE	LD	5.17E-02	No	same	Sequential	Same	>60min	High or Moderate

No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
48	HR-SG-RLP03	Operator Fails to Operate SHR with AFW at RL POS03A	4.48E-02	HR-SG-RLP03	Operator Fails to Operate SHR with AFW at RL POS03A	4.48E-02	HR-SG-RLP03-DE	MD	1.81E-01	No	same	Sequential	Same	30-60min	High or Moderate
49	HR-SG-RLP13	Operator Fails to Operate SHR with AFW at RL POS13	4.48E-02	HR-SG-RLP13	Operator Fails to Operate SHR with AFW at RL POS13	4.48E-02	HR-SG-RLP13-DE	MD	1.81E-01	No	same	Sequential	Same	30-60min	High or Moderate
50	HR-FB-RLP03-01	Operator Fails to Operate F&B at RL POS03A 01	4.55E-03	HR-FB-RLP03-01	Operator Fails to Operate F&B at RL POS03A 01	4.55E-03	HR-FB-RLP03-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
51	HR-FB-RLP13-01	Operator Fails to Operate F&B at RL POS13 01	4.55E-03	HR-FB-RLP13-01	Operator Fails to Operate F&B at RL POS13 01	4.55E-03	HR-FB-RLP13-01-DE	LD	5.43E-02	No	same	Sequential	Same	>60min	High or Moderate
52	HR-FB-RLP03-02	Operator Fails to Operate F&B at RL POS03A 02	2.15E-03	HR-FB-RLP03-02	Operator Fails to Operate F&B at RL POS03A 02	2.15E-03	HR-FB-RLP03-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate
53	HR-FB-RLP13-02	Operator Fails to Operate F&B at RL POS13 02	2.15E-03	HR-FB-RLP13-02	Operator Fails to Operate F&B at RL POS13 02	2.15E-03	HR-FB-RLP13-02-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate
54	HR-FB-RLP03-03	Operator Fails to Operate F&B at RL POS03A 03	1.10E-01	HR-FB-RLP03-03	Operator Fails to Operate F&B at RL POS03A 03	1.10E-01	HR-FB-RLP03-03-DE	LD	1.54E-01	No	same	Sequential	Same	>60min	High or Moderate

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No	HFE Name(Pa)	Description	Indep. HEP	HFE Name(Pb)	Description	Indep. HEP	HEPs dependence combinations	Dep. Level	Dep. HEP	Intervening Success	Crew	Cue Demand	Location	Sep. Timing	Stress
55	HR-FB-RLP13-03	Operator Fails to Operate F&B at RL POS13 03	2.15E-03	HR-FB-RLP13-03	Operator Fails to Operate F&B at RL POS13 03	2.15E-03	HR-FB-RLP13-03-DE	LD	5.20E-02	No	same	Sequential	Same	>60min	High or Moderate