INL USQ PROCESS
REASONABILITY DETERMINATION/POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: TRA-670, Advanced Test Reactor

USQ Process No.: ATR Complex-USQ-2009-208

Subject: Pump Motor Room Flooding Following a Cask Drop Onto the Canal Parapet

Describe the New Information/Discovery:

The new information involves water flooding in the first basement pump motor room from canal and overhead piping damage following a cask drop onto the canal parapet. The ATR UFSAR Sections 15.8.4, 15.8.9, and 15.8.10 describe that the low pressure demineralized (LDW) piping may be damaged and cause additional leakage and addresses the resultant loss of power to the various pumps, but does not address the possibility of submerging the emergency coolant pumps prior to fulfilling their safety function (i.e., provide forced flow for 30 minutes following reactor scram).

The accident sequence is the drop of a cask onto the canal parapet with damage to the LDW piping in the pump motor room in addition to overhead cable trays which contain PPS conduits and power supply cables. Subsequently canal water and LDW flood the pump motor room in the first basement (assuming no leakage under the personnel door, rollup door, heat exchanger door, the sliding fire door, and through the canal seepage gutters near the canal walls). Power supply cables to the pressurizing pumps are in the overhead cable trays. The loss of the pressurizing pumps causes the reactor to trip on low pressure which activates the loss of coolant accident (LOCA) primary coolant system pump trip engineered safety feature (ESF). This ESF causes the primary coolant pumps to trip in 65 seconds. Forced flow is supplied by at least one of the two emergency coolant pumps. Power to emergency coolant pump M-10 is diesel-commercial power through overhead cabling that is away from the potential cask drop and is not damaged by the cask drop. Power to M-11 is battery backed utility UPS normally supplied by commercial power through cabling on the floor behind the pumps which may be damaged due to flooding. Power, however, is available to M-10 provided the pump motor does not become submerged. Forced cooling is required for 30 minutes after reactor scram to prevent fuel damage. Therefore, water entering the pump motor room cannot submerge the emergency cooling pump for at least 30 minutes.

The PPS conduits in the overhead primarily contain channel C signals for various RSS and ESF subsystems. Open circuits of channel C for some of the RSS subsystems cause a channel C trip in the PPS. The remaining channel A and B subsystem signals would remain functional. However, channels A, B, and C of the emergency flow and emergency flow recirculation subsystem pass through the pump motor room in overhead cable trays and are expected to be damaged. Open circuit of these channels cause a reactor trip and activates the hardwire automatic start feature of the M-11 battery backed emergency coolant pump. Thus failure of these RSS subsystem signals result in automatic trip of the reactor and automatic start of the emergency coolant pump before or nearly simultaneous with the loss of the pressurizing pumps (power cable failure) and activation of the loss of coolant primary coolant system pump trip. The other channel C RSS subsystems passing through the pump motor room result in a condition where a single additional trip in channels A or B would result in tripping the reactor. All of these conditions result in a reactor shutdown with emergency cooling water immediately following the subject drop event.

The LDW enters the reactor building in the switchgear room through a 10 in. pipe at outside temperature. Flow normally ~~the~~ passes through a 4-in. pipe and flow orifice which restricts the flow to 100 gpm. This 4-in line is a bypass around valve FCV-8-68 which is normally closed and only opens when there is a low low primary surge tank level indication. Primary coolant system (PCS) shrinkage after loss of PCS primary coolant pumps (e.g. upon loss of commercial power) and reactor SCRAM is not expected to create a low low surge tank level indication. Power operations makeup flow is normally much less than 100 gpm. LDW flow is provided by a single operating LDW pump with a standby LDW pump that is activated by a local pressure instrument. (The standby LDW pump is a manual start.) Therefore, assuming the LDW piping is sheared following the cask drop, 100 gpm would flow into the pump motor room. FCV-8-68 would remain closed since there is no low low primary surge tank level indication. A single LDW pump (500 gpm capacity) would remain operating because the local pressure indication is expected to remain nominal and a maximum of 500 gpm would be entering the pump motor room assuming that this flow could pass through a 4-in. pipe.

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Identify the applicable safety basis document(s) (e. g., DSA, SAR, BIO, TSRs, etc.):

- SAR-153, "Upgraded Final Safety Analysis Report for the Advanced Test Reactor," Section 15.8.10, "Dropping a Heavy Cask Onto the Floor North of the Canal."
- TSR-186, "Technical Safety Requirements for the Advanced Test Reactor," Current Revision.
- TRA-ATR-1807, "Updated Evaluation of Cask Drop Accidents," Revision 1, February 2002.
- TRA-ATR-1728, "Evaluation of Consequences of Accidental Cask Drops Onto the ATR Storage Canal Parapet and Wall," Revision 0, April 2001.
- TRA-ATR 1554, "Evaluation of ATR Safety-Related and Risk Significant Equipment Location-Dependent Vulnerability," Revision 1, September 2000.
- OMM-7.6.12.1.4, "Low Pressure Demineralized Water (LDW) System," September 25, 1987.
- OMM-7.6.12.4.3, "LDW System Instrumentation and Control," June 2, 1993.

I. REASONABILITY DETERMINATION (Reasonability determinations made as part of the ATR Design Basis Reconstitution effort may be documented per SP-10.2.4.9)

Is it reasonable that the potential for an inadequate safety analysis exists based on the new information or discovery described above? ☒ Yes ☐ No

If "Yes," proceed to Sections II, III, and IV.
If "No," provide an explanation and basis for the reasonability determination.

NA	NA	NA
USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date
NA	**NA**	**NA**
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

If the answer to the question above is "No," file the completed form. Do not complete Section II, III, or IV.

If the answer to the question above is "Yes," complete Section II, III, and IV.

II. PISA DECLARATION

What is the basis for concern that the safety basis may not be bounding or may be otherwise inadequate? Provide an explanation.

Section 15.8.4, "A Large Failure of the Storage Canal, a Large Failure of the Canal Bellows or a Rapid Draining of the PCS with the Drop Chute Cover Removed," briefly mentions the cask drop on to the canal parapet or canal wall and references TRA-ATR-1728 for canal damage and potential leakage into the pump motor room. Section 15.8.9, "Dropping a Heavy Cask from One Foot Above the Parapet Within the Restricted Cask-Lift Areas of the Canal," also briefly mentions cask drops onto the canal wall supported to bedrock and refers to Section 15.8.4 for extent of damage and canal leakage. Section 15.8.10, "Dropping a Heavy Cask Onto the Floor North of the Canal," describes that if the dropped cask falls into the pump motor room there can be damage to LDW piping with subsequent flooding. This section describes that the pump motors are not likely to be damaged and the power supplies are such that a single drop would not directly affect both emergency coolant pumps and PCPs simultaneously. However, this section does not address that pump room flooding could eventually submerge the emergency coolant pumps (located about 2 feet above the room floor) failing them or that the primary coolant pumps would not remain available since the LOCA ESF trips these pumps 65 seconds after the reactor scram upon low low primary coolant pressure caused by the loss of the pressurizing pumps.

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A PISA exists. Complete the following actions

- Nuclear Facility Manager document actions (below) including interim operating restrictions taken to place or maintain the facility in a safe condition.
- Nuclear Facility Manager execute reporting process for PISA per LWP-9301 and LWP-13830.
- Qualified USQ evaluator proceed to Section III.

ACTIONS TAKEN TO PLACE OR MAINTAIN FACILITY IN A SAFE CONDITION AND THE BASIS FOR THE SELECTION OF ANY INTERIM CONTROLS.

No actions to place the facility in a safe condition are required based on the following simple calculations that provide an estimate of the time to submerge the emergency coolant pumps conservatively assuming that there is no leakage from the pump motor room through or under the rollup door, personnel door, heat exchanger door, the sliding fire door, or the canal seepage gutters.

No interim restriction on ATR operations are required based on same following discussion.

Pump motor room area 2800 ft^2 – EGG-PRP-11229, Table 4.10.3-2.

Assume equipment occupancy of 10% yields pump motor room area of 2520 ft^2

Water in flow over 30 minutes from canal is 19,120 gal. From TRA-ATR-1728 linearly interpolated from table values of 10 min = 16,400 gal and 60 min = 23, 200 gal.

Additional water from LDW if maximum flow from one operating LDW pump of 500 gpm is 15,000 gal.

The maximum volume of water entering the pump motor room in 30 minutes with no leakage is Vol = 19,120 gal + 15,000 gal = 34,120 gal.

Depth of water in the pump motor room is then Depth = (34,120 gal)*(0.1337 ft^3/gal)/(2520 ft^2) = 1.81 ft (~ 1 ft 10 in.).

The emergency coolant pump motors are on pedestals at the west end of the pump motor room while the cask lift area and potential drop location is above the east end of the room. Since the intervening floor area also contains four primary coolant pump motor pedestals and the water from the canal and will mainly be dumping into the room from the south in the south to north direction, it is not expected that waves or splashing will inundate the emergency coolant pump motors. Nor is it expected that flooding will cause immediate failure of power supply cable to M-11, which is insulated and enclosed in conduit as it runs along the pump room floor. It is also not expected that the increase in humidity due to flooding (canal and LDW water are near room temperature) will affect either of the two emergency coolant pump motors. The only hazard to the immediate and continued operation of the emergency coolant pumps is, then, the potential submersion of the pump motors.

Since the water depth is less than 2 ft after 30 minutes of flooding (the height of the emergency coolant pump casing above the pump motor room floor) the emergency coolant pumps will remain operational for the required 30 minutes.

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Subject: Pump Motor Room Flooding Following a Cask Drop Onto the Canal Parapet

B J Harwood/J C Chapman	**See Original**	**March 25, 2009**
Safety Analyst Print/Type Name	Safety Analyst Signature	Date
E J Schuebert	**See Original**	**March 26, 2009**
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

Is independent technical review required? Yes ☐ No ☒

Nuclear Facility Manager Signature or Initials

Independent Reviewer Print/Type Name	Independent Reviewer Signature	Date

III. USQ DETERMINATION

Identify applicable section(s) of the safety basis document(s) (e.g., DSA, SAR, BIO, TSRs, etc.).
SAR-153, "Upgraded Final Safety Analysis Report for the Advanced Test Reactor," Sections 15.3.3, "Long-Term Complete Loss of Flow," Section 15.8.4, "A Large Failure of the Storage Canal, a Large Failure of the Canal Bellows or a Rapid Draining of the PCS with the Drop Chute Cover Removed," Section 15.8.9, "Dropping a Heavy Cask from One Foot Above the Parapet Within the Restricted Cask-Lift Areas of the Canal," and Section 15.8.10, "Dropping a Heavy Cask Onto the Floor North of the Canal."

IIIa: POTENTIAL FOR AN INCREASE IN PROBABILITY OR CONSEQUENCE OF AN ACCIDENT OR MALFUNCTION EVALUATED IN THE SAFETY BASIS

1. Could the PISA increase probability of occurrence of an accident previously evaluated in the safety basis?
Yes ☒ No ☐

Explain:
The initiating event for the accident identified by the PISA is dropping a cask onto the canal parapet over the pump motor room. Dropping a cask in the canal area is considered a Condition 3 event. The PISA does not affect the crane, crane operation, rigging, operator training, or cask handling, and therefore the PISA does not affect the probability of dropping a cask in the canal area. One potential result of dropping a cask in the canal area is draining the irradiated fuel storage section of the canal. Draining the irradiated fuel storage section, however, is considered a beyond design basis event. The safety analysis relies on multiple layered defenses to support the supposition that draining the irradiated fuel storage section, the canal drain event, is a beyond design basis event. The PISA does not affect crane operation, cask handling restriction, isolation of the irradiated fuel section, or the emergency canal makeup to the irradiated fuel storage section. Therefore, the PISA does not affect the probability of draining the irradiated fuel storage section of canal from a cask drop.

The PISA identified the potential of a complete loss of flow accident (CLOFA) within 30 minutes after a reactor scram, an early CLOFA. The cask drop could damage the canal parapet, penetrate the floor north of the canal, rubble the canal wall, and damage the LDW piping and cable trays in the pump motor room overhead. Loss of power to the pressurizing pumps is expected to occur resulting in a low PCS pressure scram. Sixty five seconds after the low pressure scram signal, the primary coolant pump motors are tripped by the LOCA ESF. (The primary coolant pump motors initially could be tripped from damage of the cabling in the pump room overhead.) Flooding in the pump motor room is assumed to cause the loss of the battery-backed utility power to emergency coolant pump (M-11). If the diesel-commercial powered emergency coolant pump (M-10) is operating, it will continue to operate until the motor is inundated by the flood water. If the M-10 is in standby mode, it will start either (a) on low recirculation flow due to the power loss to M-11 or (b) when the primary coolant pump motor breakers open due to the LOCA ESF. M-10 is not expected to be inundated for at least 30 minutes, based on the conservative flooding estimate in Section II. Three conservative assumptions are embedded in this discussion (a) maximum LDW flow has been assumed disregarding the flow restriction in the 4-inch LDW line that bypasses flow control valve FCV-8-68, (b) no leakage from the pump motor room was assumed, and (c) although the power cable for M-11 is insulated and enclosed in conduit it was assumed to fail within 30 minutes. Therefore, based on these conservative assumptions, the PISA does not affect the safety basis supposition that an early CLOFA is beyond design basis.

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Long-term CLOFA, the CLOFA occurring 30 minutes after scram, is considered a Condition 4 event and is analyzed in the safety basis (Section 15.3.3). The Condition 4 long-term CLOFA is hypothesized to be a loss of commercial power in conjunction with the loss of diesel power. Section 5.3.3.1 states: "The probability that both diesel and commercial power will fail simultaneously is relatively high. However, the probability of restoring one or both sources within 30 minutes is also relatively high. With the battery-backed power available to the dc-motor emergency coolant pump, and the diesel power supply to the ac-motor emergency coolant pump [M-10], failure of both emergency pumps resulting in a complete loss of flow in less than 30 minutes is beyond design basis. The complete loss of flow after 30 minutes is estimated to be a Condition 4 event." However, the PISA initiating event is a cask drop, which is considered a Condition 3 event. The resultant pump motor room flooding is assumed to cause the power to M-11 to initially fail and to submerge the motor of M-10 sometime after 30 minutes. The PISA identifies a potential Condition 3 long-term CLOFA.

2. Could the PISA increase the consequences of an accident previously evaluated in the safety basis?
Yes ☐ No ☒

Explain:
Both the cask drop north of the canal onto the canal parapet and the complete loss of flow accidents are analyzed in SAR-153. Sections 15.8.4, 15.8.9 and 15.8.10 indicate that flooding of the pump motor room is possible after a cask drop accident on the north canal wall parapet, and Section 15.3.3 of SAR-153 analyzes the long-term CLOFA. The irradiated fuel storage section of the canal remains protected by the isolation bulkheads and the canal firewater makeup system remains operable. Additionally, the projected extent of canal damage is the top four feet of the canal wall. The storage canal floor is 18 ft. below the top of the canal wall; the fuel storage grids set on the canal floor. The top of the irradiated fuel would be approximate 8 ft. lower than the extent of the projected damage to the canal wall. It is expected that the irradiated fuel storage will remain submerged. In the context of damage to the irradiated fuel, the consequence of the design basis cask drop accidents, the Condition 3 or 4 cask drop, is unaffected by the PISA.

The consequence of the early CLOFA hypothesized in SAR-153 would be unaffected by any sequence of events that lead to the early CLOFA, since the consequence are qualitative. The analysis of the long-term CLOFA, which is considered a Condition 4 fault, is presented in Section 5.3.3. The analysis indicate that the ATR Plant Protection Criteria for Condition 3 faults were ~~meet~~ met for the long-term CLOFA Condition 4 sequence. Although the PISA identified a potential long-term CLOFA initiated by the Condition 3 event, the analysis of the long-term CLOFA indicated that the consequence of that potential Condition 3 fault satisfied the Condition 3 Plant Protection Criteria. Therefore, the PISA will not result in an increase in the consequence of the long-term CLOFA. DJ 5/14/09

3. Could the PISA increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☒ No ☐

Explain:
Prevention and mitigation of canal draining event relies on the structure of the irradiated fuel storage section of the canal, the cane and rigging, the isolation bulkheads for the irradiated fuel storage section, and the firewater and LDW canal makeup systems. The PISA identified the possibility of the cask drop damaging the 6-inch LDW piping in the pump motor room. The LDW canal makeup is taken off the LDW piping prior to entering the pump motor room; the canal makeup piping is 1-inch (Dwg #120884). It is expected that, due to the resultant damage to the 6-inch LDW pipe, the LDW canal makeup system would fail. However, since the cask drop would not damage the irradiated fuel storage section of the canal or the isolation bulkheads, canal makeup would not be needed and would not be considered important to safety for this scenario.

Prevention and mitigation of the CLOFA relies on the emergency coolant pumps (M-10 and M-11), the RSS, and ultimately the emergency firewater injection and the vessel vent systems. Cable trays in the pump motor room overhead carry PPS channel C for various RSS and ESF subsystems, channels A, B, and C of the emergency flow and emergency flow recirculation subsystem, and power to the pressurizing and primary coolant pumps. Power to the pressurizing pumps is expected to fail, which initiates a CLOFA sequence. The failure of channel C creates one-out-of-two logic for the affected RSS and ESF subchannels. Failure channels A, B, and C of the emergency flow and emergency flow recirculation subsystems will cause a reactor scram and will activate the hardwired automatic start feature of the M-11 emergency coolant pump. (Low primary coolant system (PCS) pressure scram signals are also expected due to loss of power to the pressurizing pumps.) Thus, failure of the emergency flow RSS subsystem signals result in a scram and the start of M-11 emergency coolant pump.

The flooding will inundate the M-11 power cable, which runs on the floor along the north wall of the pump motor room. The PISA assumes that the power to M-11 fails as a result. Section 15.3.3 states that since the battery-backed power is available to

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the dc-motor emergency coolant pump, M-11, and the diesel power is supply to the ac-motor emergency coolant pump, M-10, failure of both emergency pumps resulting in a complete loss of flow in less than 30 minutes is beyond design basis. The PISA, however, identifies the potential loss of the power supply to M-11. SAR-153 reference analysis Engineering Design File (EDF) TRA-ATR-1497, *Early Complete Loss of Flow Accident (CLOFA) Re-evaluation for the ATR LOCA USQ Resolution Proposed LOCA ESF,* identifies the potential loss of power to M-11 from the cask drop into the pump motor room and concludes that the early CLOFA will continue to be a beyond design basis event provided M-10 is the running emergency coolant pump. Since that analysis, the M-11 power supply cable has been relocated to the north wall and would not be subject to direct damage from the cask drop. However, that analysis did not consider the loss of power due to flooding of the pump motor room.

The LDW canal makeup system may be disabled, various subsystems of the RSS and ESF may be disabled, and the power to M-11 may be lost due the event identified in the PISA. Of these disabled equipment, only emergency coolant pump M-11 is required to be operable by the safety basis analysis and then, because of the relatively high failure rate of M-10 to start on demand, only if the M-11 is the running emergency coolant pump. The PISA, however, identifies the probable ~~failed~~ of M-11.

FAILURE JCJ 5/14/09

4. Could the PISA increase the consequences of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☒ No ☐

Explain:
The equipment important for the prevention and mitigation of the canal drain accident and the CLOFA are: the structure of the irradiated fuel storage section of the canal, the crane and rigging, the isolation bulkheads, the firewater and LDW canal makeup systems, the emergency coolant pumps (ECPs), the RSS, and the emergency firewater injection (EFIS) and the vessel vent systems (VVS). The irradiated fuel storage section of the canal, the fuel storage isolation bulkheads, the firewater canal makeup system, the overall functionality of the RSS and the emergency coolant pump ESF, and the EFIS and VVS are not expected to be damaged or impaired by the cask drop or the resultant flooding, since these systems and components are not in the vicinity of the cask drop or flooding, or are expected to be able to perform their safety function.

The LDW canal makeup system would be impaired by the damage to the 6-inch LDW piping the in the pump motor room. As discussed in the answer to question 3, canal makeup, however, is not expected to be needed for the accident sequence identified by the PISA. Power to emergency coolant pump M-11 probably would be lost due to flooding in the pump motor room. If M-11 is the running emergency coolant pump and M-10 fails to start, an early CLOFA could occur depending on when the power to M-11 fails. The early CLOFA potentially could result in fuel damage in the core. Various RSS and ESF subsystems and subchannels would be impaired, but the RSS and ESF will still provide their safety functions. (See question 3.)

IIIb: POTENTIAL FOR CREATION OF AN UNANALYZED ACCIDENT OR MALFUNCTION OF A DIFFERENT TYPE

5. Could the PISA create the possibility of an accident of a different type than previously evaluated in the safety basis? Yes ☐ No ☒

Explain:
The PISA identifies an accident sequence that could lead to a CLOFA. Section 15.3 discusses both the early and long-term CLOFA. The PISA does not affect the canal drain sequence, except for the potential impairment of the LDW canal makeup. Section 15.8 discusses cask drop and potential canal drain accidents.

6. Could the PISA create the possibility of a malfunction of equipment important to safety of a different type than previously evaluated in the safety basis? Yes ☐ No ☒

Explain:
EDF TRA-ATR-1564, *Evaluation of ATR Safety-Related and Risk Significant Equipment Location-Dependent Vulnerability,* identifies important to safety equipment in the pump motor room. Systems, structures, and components (SSCs) that are identified in TRA-ATR-1564 and that have not been previously addressed by this USQD are: (a) bottom head EFIS piping, (b) Radiation Monitoring and Seal System (RMSS), (c) LDW PCS purge valve, (d) instrument air, (e) canal drain lines, and (f) experiment loop power, control, or makeup.

(a) The EFIS piping is in the overhead area in the east end of the room and then runs along the north wall. Cask handling above this area of the room is not permitted with irradiated fuel in the vessel. (TSR-186, LCO 3.5.5 (04))
(b) The RMSS shuts off and isolates the confinement ventilation system after stack monitors exceed their radiation setpoint. The RMSS can be manually initiated. The confinement integrity is required to mitigate radioactive release to the environment for certain accident sequences, e.g., LOCAs and in-vessel fuel damage accidents. Mitigation of the long-term CLOFA could include venting the PCS, via the VVS, which will eventually result in dumping primary coolant

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into the confinement. The cask drop through the pump motor room ceiling also penetrates the confinement boundary. The safety basis analysis, Section 15.3, however, does not address the long-term need for confinement isolation. The underpinning assumption is that without fuel damage the radiological consequence of the long-term CLOFA would not require confinement.
(c) The access to the LDW PCS manual purge valve could be restricted or lost. The PCS manual purge valve is not discussed in SAR-153 and is not considered important to safety for this sequence.
(d) Instrument air may be damage from the cask drop. Loss of instrument air will affect the PCS pressure control. However, the PISA identifies the potential loss of PCS pressure control by assuming the failure of the power supply cables to the PCS pressurizing pumps.
(e) The canal drain lines may be damaged. Cask handling, however, is not permitted over the canal drains unless the drain covers are installed. (TSR-186, LCO 3.5.5 (06)).
(f) Experiment loop power, control and makeup may be damaged from the cask drop. Accidents that are initiated by conditions, events, or faults in the experiment pressurized water loops could result in reactivity events in the ATR and are discussed in Section 15.4. The relevant reactivity events are experiment loop voiding due to small loop piping ruptures and due to loss of temperature control for the loop water heaters. Both events are considered Condition 2 faults, while the cask drop is considered a Condition 3 fault.

In summary, although the cask drop may damage equipment that was not specifically discussed in the cask drop analyses, the failure or impairment of any of the SSCs identified above (a) are not SSCs important for the accident sequences identified by the PISA, (b) are addressed elsewhere in the safety analysis, or (c) are conditions identified by the PISA.

IIIc: POTENTIAL FOR REDUCTION IN A MARGIN OF SAFETY

7. Could the PISA reduce a margin of safety as defined in the safety basis? Yes ☒ No ☐

Explain:
The margin of safety for the canal drain accident may be thought of as layered defenses, which supports the supposition that draining the irradiated fuel storage section of the canal is beyond design basis: (a) restrictions on cask handling, e.g., location, lift height and reactor status, (b) isolation bulkheads for the irradiated fuel storage section, (c) energy-absorbing crush pads, (d) canal inventory makeup for the irradiate fuel storage section, (e) procedures, rigging diagrams and training, and (f) canal drain covers. Only the backup canal inventory makeup system, the LDW system, would be impaired by the cask drop over the pump motor room. Due to multiple layered defenses to prevent draining the irradiated fuel storage canal section, the impairment of the LDW canal makeup would have essentially no effect on the margin of safety.

4/14/09 JJ Thought

The margin of safety for the early CLOFA may also be though of as layered defenses, which supports the supposition that the early CLOFA is beyond design basis: (a) two emergency coolant pumps, (b) one ECP operating, one in standby, (c) automatic starts of the standby pump and start signal from primary pump breakers, (d) separate and diverse power supply systems, (e) battery-back utility power supply to M-11, and (f) emergency diesel power to M-10. The PISA, however, identifies the possibility of losing power to M-11 as a result of the flooding caused by the cask drop. Assuming that M-11 will not be available, if M-10 is the operating ECP, the failure rate of M-10 to continue running for 30 minutes after the PCPs are tripped is low enough to continue to support the supposition that the early CLOFA is a beyond design basis accident. However, if M-11 is the operating ECP, the failure rate of M-10 to start upon demand is relatively too high to continue to support that supposition.

IIId: USQ DETERMINATION CONCLUSION

8. Based on the responses to questions 1 – 7 above, does the PISA constitute an Unreviewed Safety Question?
Yes ☒ No ☐

Explain:
SAR-153, Section 15.8.10 considers cask drop damage to power supplies, but did not address the potential CLOFA or flooding which may fail the power source to M-11. The PISA identifies the potential of initiating a Condition 3 long-term CLOFA; the safety analysis considered the long-term CLOFA a Condition 4 fault. The PISA identified that the battery-backed utility power bus emergency coolant pump, M-11, could fail due to flooding (inundation) in the pump motor room; the safety analysis does not consider the potential that the initiating event (cask drop onto the canal parapet north of the canal) for a CLOFA could also fail the M-11 pump. The PISA identifies a potential design basis accident sequence that could result in an early CLOFA; the safety analysis considers the early CLOFA beyond design basis. The inundation failure of M-11 would reduce the multiple layered defenses against the early CLOFA and, in effect, reduce the margin of safety as defined in the safety analysis.

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If "No," is a Safety Basis document revision required at next annual update? ☐ Yes ☐ No

NOTE: If USQ determination result is positive, additional notification for ORPS is required per LWP-9301.

IV. APPROVAL/CONCURRENCE SIGNATURES

APPROVAL:

J. C. Chapman USQ Evaluator Print/Type Name	JC Chapman USQ Evaluator Signature	14 April 2009 Date
E. J. Schuebert Nuclear Facility Manager Print/Type Name	E J Schuebert Nuclear Facility Manager Signature	4/14/09 0900 Date

CONCURRENCE:

J. A. Jacobi Independent Review Committee Chair Print/Type Name	Jack A Jacobi Independent Review Committee Chair Signature	4/14/09 Date