Omaha Public Power District
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Omaha, NE 68102-2247

LIC-14-0092
August 13, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Fort Calhoun Station, Unit No. 1
Renewed Facility Operating License No. DPR-40
NRC Docket No. 50-285

Subject: OPPD Response to NRC Request for Additional Information Regarding License Amendment Request (LAR) 13-03, Revising Method for Controlling Raw Water Intake Cell Level

References:
1. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), "License Amendment Request (LAR) 13-03, Request to Revise Updated Safety Analysis Report to Allow Implementation of Modification EC 55394, Raw Water Pump Operation and Safety Classification of Components during a Flood," dated August 16, 2013 (ML13231A178) (LIC-13-0105)
2. E-mails from NRC (J. Sebrosky / J. Rankin) to OPPD (B. Hansher), "Fort Calhoun Request for Additional Information Associated with License Amendment Request to Revise the Method for Controlling Raw Water Intake Cell Level During Floods (MF2591)," dated June 2, 5, 6, and 10, 2014 (ML14156A222 (June 5th E-mail) / ML14162A376 (June 10th E-mail)) (NRC-14-0086)

This letter responds to an NRC request for additional information (RAI) (Reference 2) regarding License Amendment Request (LAR) 13-03 (Reference 1), which proposed revisions to the Updated Safety Analysis Report (USAR) to allow implementation of Modification EC 55394, "Raw Water Pump Operation and Safety Classification of Components During a Flood."

The attachment contains OPPD's response to the NRC questions, which were received in several e-mails from the NRC.

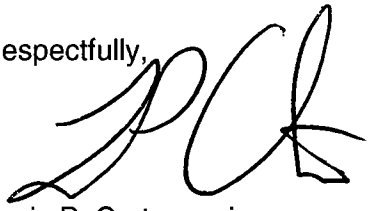
This letter contains no regulatory commitments.

If you should have any questions regarding this submittal or require additional information, please contact Mr. Bill R. Hansher, Supervisor-Nuclear Licensing, at 402-533-6894.

A001
NRR

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 13, 2014.

Respectfully,



Louis P. Cortopassi
Site Vice President and CNO

LPC/CCS/mle

Attachment: OPPD Response to NRC Request for Additional Information Regarding License Amendment Request (LAR) 13-03, Revising Method for Controlling Raw Water Intake Cell Level

OPPD Response to NRC Request for Additional Information Regarding License Amendment Request (LAR) 13-03, Revising Method for Controlling Raw Water Intake Cell Level

By letter dated August 13, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13231A178) Omaha Public Power District (OPPD) submitted a license amendment application to revise the method for controlling raw water intake cell level during floods. The U.S. NRC staff has reviewed the information provided in your August 13, 2013, license amendment request and determined that additional information is required in order to complete its review. These requests for additional information (RAIs) can be found below. Please provide a response to these RAIs by July 7, 2014. Should the NRC determine that the RAIs found below are no longer necessary prior to the dates found above, the request will be withdrawn. If circumstances result in the need to revise the requested response date, please contact me or Jennie Rankin.

REQUEST FOR ADDITIONAL INFORMATION ON LICENSE AMENDMENT FOR REVISING THE METHOD FOR CONTROLLING RAW WATER INTAKE CELL LEVEL FORT CALHOUN STATION OMAHA PUBLIC POWER DISTRICT DOCKET NO. 50-285

SBPB RAI 1

The revised intake cell water level control method assumes that the travelling screen sluice gates are fully closed. If a sluice gate cannot be closed, then the protection of the Raw Water (RW) pumps from flooding is not ensured by the proposed method for controlling the intake cell water level. Provide the following information regarding the sluice gates.

a) **How are the sluice gates verified closed in the event of a flood?**

b) **Should a sluice gate fail to travel to the fully closed position, operators must be able to set it into place by other means. Describe the methods available to move a sluice gate that fails to travel to the fully closed position.**

c) **What steps are taken to ensure the sluice gates are maintained free of obstructions (e.g., ice or debris)?**

d) **Inadvertent opening of a sluice gate during a flood render the proposed method for controlling intake cell water level ineffective. What steps will be taken to prevent the inadvertent opening of a sluice gate during a flood?**

OPPD Response

a) A stem indicator is installed on each stem. The indicators were adjusted during post maintenance testing (PMT), which utilized divers to verify full closure of each sluice gate. Operators manually ensure all "SLUICE GATE(S)", CW-14A/B/C/D/E/F are fully closed by verifying stem horizontal position marks are aligned (Intake Structure Veranda) as required by Abnormal Operating Procedure (AOP)-1, "Acts of Nature."

b) Updated Safety Analysis Report (USAR), Section 2.7.1.2, "River Stage and Flow" shows that it takes approximately two days before large flows reach Fort Calhoun Station,

which is sufficient time to prepare for the design basis flood. Standing Order (SO)-G-124 "Flood Barrier Impairment" is used in the event there is a degraded flood barrier. In this case, the degraded barrier (i.e., sluice gate) would be reviewed and actions implemented (e.g., flush seat, lower gate with rigging equipment, divers, etc.) to fully shut the gate. The sluice gates and gate operators are maintained, inspected, and cycled to ensure that the sluice gates will fully close for a flooding event.

c) The sluice gates are cycled on a frequency determined by the Preventive Maintenance (PM) program. The PM ensures that the sluice gates can be fully closed and are free from debris. In addition, the sluice gates are normally cycled weekly for trash rack backwashing activities. Additionally, during walkdowns, Operations personnel visually ensure that the stems are not bound by ice or other potential issues that could adversely impact functionality of the sluice gates. Finally, the sluice gates are operated in a manner that allows the seats of the sluice gates to be flushed prior to full closure.

d) The sluice gates cannot be accessed during a flood. The sluice gate operators are inaccessible once the intake veranda is secured for flood protection using AOP-01 and PE-RR-AE-1001, "Flood Barrier and Sandbag Staging and Installation." In addition, AOP-01 requires the power to be removed from the sluice gate motor operators to prevent inadvertent opening of a sluice gate.

SBPB RAI 2

The revised intake cell water level control method must be established before floodwaters impact the RW pumps. In the event of a design basis flood, sufficient time must be available to perform the operator actions associated with establishing the revised intake cell water level control method. Provide the following information regarding the ability to perform operator actions within the available time.

a) Are the actions to establish and verify the effectiveness of the revised intake cell water level control method maintained in procedures?

b) Following a plant shutdown in response to flood warnings or river level, how much time is available to establish the proposed intake cell water level control method before the RW pumps are impacted by flood waters?

c) Following a plant shutdown, how much time passes before the RW system cooling loads can be met by the flow provided using the revised intake cell water level control method? (i.e., with only one RW pump in operation, as described in the Updated Final Safety Analysis Report (UFSAR) and License Amendment Request (LAR).

d) Is the revised intake cell water level control method capable of supporting two RW pumps in operation?

OPPD Response

a) AOP-01 contains steps for maintaining intake cell water level control prior to floodwaters impacting the RW pumps. AOP-01 ensures that intake cell water level control is established prior to river level exceeding 1,004 feet MSL because all sluice gates must be closed at that level.

b) As stated above, USAR Section 2.7.1.2, "River Stage and Flow" shows that it takes approximately two days before large flows reach Fort Calhoun Station, which is sufficient time to prepare for the design basis flood. The Shift Manager (SM) is responsible for shutting the plant down and implementing the required lineup prior to the river level reaching 1,004 feet mean sea level (MSL). Additional considerations such as the rate of river rise also factor into the determination of AOP-01 entry. The current USAR Section 2.7.1.2 described methodology requires five (5) of the six (6) sluice gates to be fully closed. Operations personnel then manipulate the remaining sluice gate nearly closed (i.e., ~ 1" gap) to stabilize intake cell water level between 983 feet and 988 feet MSL. RW pump(s) are used to remove excess inflow. In contrast, the proposed method is less complex, more reliable, and quicker to implement because all six (6) sluice gates are closed and the new flood control inlet valves are opened to stabilize intake cell water level. RW pump operation is unchanged from the current methodology.

c) The SM is responsible for initiating plant shutdown prior to the river reaching 1,004 feet MSL and aligning for single RW pump operation. As previously mentioned, the rate of river rise and the forecast are taken in account to allow for adequate lineups as required by station Technical Specifications and AOP-01. Thus, the time required to go on shutdown cooling varies but analysis shows that shutdown cooling can be achieved within 24 hours. This assumes reactor coolant system (RCS) temperature of 350°F (2 hours after plant trip from full power), river temperature of 90°F, component cooling water (CCW) temperature as high as 112°F, and only one shutdown cooling heat exchanger (i.e., nominal fouling levels). An additional shutdown cooling heat exchanger is available to cool down at a faster rate. During hot weather (i.e., river temperature 90°F) in the summer, the typical time to cool down is from 12 to 24 hours and in the winter, the time to cool down is approximately 3 hours.

d) The revised method is designed for the operation of one (1) RW pump. However, two (2) RW pumps can be operated in nearly all situations but the operating duration of the second RW pump will depend on river level as well as sluice gate leakage. For example, two (2) RW pumps can run continuously during a 1,014 foot MSL flood, but for only short durations when the river level is at 1,004 feet MSL. Per AOP-01, the station must have only one (1) RW pump in operation prior to establishing the new method of controlling intake cell water level. A second RW pump can then be started to help maintain intake cell water level if necessary. The operation of one (1) RW pump is also preferred because it helps conserve fuel for the emergency diesel generators (EDG) in the event that offsite power is lost.

SBPB RAI 3

In order to maintain acceptable water level in the intake cells during a flood, the Intake Cell Flood Water Inlet Valves are operated manually to adjust inflow. Changes in the RW system flow rate and changes in the external flood elevation may require valve adjustments to adjust inflow. Therefore, operators should be available to take prompt action to control the intake cell water level. Provide the following information regarding the capability of operators to control the intake cell water level.

a) Will an operator be stationed at the valves for the duration of a flooding event?

b) Indication of the intake cell water level is necessary for the operator to determine whether valve adjustments were effective. Is there indication of the intake cell

water level visible to the operator adjusting the Intake Cell Flood Water Inlet Valves? Describe how the indication provided is adequate to support the operator's assignment.

c) Is the operator protected from outside conditions while stationed at the intake structure?

OPPD Response

a) An operator is stationed in the intake structure during the entire flooding event and is dedicated to controlling intake cell water level per AOP-01.

b) The operator will use the Distributed Control System (DCS) display for cell water level indication. DCS screens are available in the intake structure and the control room. The DCS screen in the intake structure is display only. The intake structure DCS display is located just south of the new flood control inlet valves. In addition, the operator can get visual indication from the north stairway or by removing a traveling screen panel. The digital DCS allows for reading twelve (12) different points for cell water level based on six (6) traveling screens with a transmitter upstream and a transmitter downstream of each screen. During a flood, the water level in all three (3) circulating water cells is nearly identical in height because of the low flow. The six (6) traveling screen transmitters downstream of each screen alarm when water level reaches 979 feet MSL. In the event the DCS is lost, manual measurements can be performed per AOP-01.

c) Yes, the operator is inside the intake structure and is protected from the outside environment. Access to the intake structure is implemented by station flood mitigation procedures with access gained by transiting over the truck dock flood barrier. The intake structure is easily accessed because it is near the service building. The site layout is shown in USAR Figure 1.2-1 "Site Plan."

SBPB RAI 4

Potential failures or inadvertent actuation of equipment may require actions to correct the intake cell water level by manipulating the Intake Cell Flood Water Inlet Valves. Sufficient time must be shown to be available for an operator to perform corrective actions before the RW pumps are impacted by high or low water levels. For the following scenarios, describe how much time is available to identify the problem and perform corrective actions:

a) With water level being maintained at the minimum acceptable level allowed by procedure, an additional RW pump is started.

b) With water level being maintained at the minimum acceptable level allowed by procedure, flow through one fully open Intake Cell Flood Water Inlet Valve ceases.

c) With water level being maintained at the maximum acceptable level allowed by procedure, one additional Intake Cell Flood Water Inlet Valves goes full open.

OPPD Response

No analysis has been performed for the specific scenarios mentioned above. However, the assessment below demonstrates that operator error or valve failure does not pose an immediate threat and that there is adequate time for an operator to recover. The total volume of the intake cells is very large (i.e., approximately 45,000 ft^3 or 336,600 gallons). With only a nominal RW pump output of 5,325 gallons per minute (GPM), gradual increases (or decreases) in cell water level would be detected by the dedicated operator and corrected prior to challenging the RW pumps. Changes in cell level from operator error (e.g., valve mispositioning) could also cause a gradual increase or decrease in cell level.

In maintaining cell water level between 983 feet to 988 feet MSL, gradual increases or decreases in cell level would be detected with sufficient time to adjust the flood control valves. These cell levels are well within the range that the RW pumps are designed to operate, which is from 976 feet-9 inches to 1,007 feet-6 inches MSL. These level bands encompass the scenario of a loss of a running EDG and allow sufficient time to manually start the standby EDG and an additional RW pump to prevent intake cell water level from reaching 1,007 feet-6 inches MSL.

The following hypothetical scenarios were evaluated to determine rate of cell rise and fall in the event an operator severely mispositions a valve:

- Intake cell starting level 983 feet MSL, zero sluice gate leakage, flood control valves closed, one (1) RW pump operation, river level 1,004 feet MSL. This scenario results in a cell water level decrease to 976 feet-9 inches MSL (i.e., RW pump minimum submergence level) in approximately 15 minutes.
- Intake cell starting level 983 feet MSL, 3,500 gpm sluice gate leakage, flood control valves closed, one (1) RW pump operation, river level 1,004 feet MSL. The scenario results in a cell water level decrease to 976 feet-9 inches MSL (i.e., RW pump minimum submergence level) in approximately 2 hours.
- Intake cell starting level 988 feet MSL, 3,500 gpm sluice gate leakage, 1 flood control valve open, one (1) RW pump operation, river level 1,014 feet MSL. The scenario results in a cell water level increase to 1,007 feet-6 inches (i.e., operating deck level) in approximately 55 minutes.

These hypothetical scenarios demonstrate that there is sufficient time for an operator to react in the event that a valve is incorrectly positioned. Furthermore, it is unlikely that in an attempt to maintain intake cell water level between 983 feet to 988 feet MSL, a trained and dedicated operator would make such extreme adjustments so as to cause a rapid rise or fall in cell level. In any case, the scenarios above demonstrate there is sufficient time to correct an error (e.g., valve misposition).

Finally, it should be noted that the current licensing basis for throttling flow using the sluice gates also allows cycling RW pump(s) on and off as needed to control intake cell water level during a flood. While the proposed method replaces the sluice gates as a means to control flow, it does not change that aspect of RW pump operation.

SBPB RAI 5

The trash rack backwash piping must remain intact throughout a flooding event to ensure the water level in the intake structure can be maintained. Fort Calhoun UFSAR Appendix N requires components that "resist failure that could prevent any SC-1, -2, or -3

equipment from performing its nuclear safety function" be classified as Non-Nuclear Safety Class 1. Appendix N also states that the requirements for Non-Nuclear Safety Class 1 equipment "are established on a case-by-case basis commensurate with the specific NNS function performed."

The LAR states that the trash rack backwash piping 'has been designed to withstand hydrostatic loads due to the flood event which are bounded by normal operation design loads." Describe the normal design loads of the trash rack backwash piping.

OPPD Response

The piping is standard industrial process pipe (i.e., Schedule 40 ASTM A106 Gr. B with 150 lb. flanges). The maximum pressure and temperature that occurs in the trash rack backwash piping during a design flood is 16.1 psi @ 90°F, which the piping can easily withstand as it was designed for a pressure and temperature of 50 psi @ 150°F.

SBPB RAI 6

The new intake cell flood water inlet valves are classified as Safety Class 3. Per USAR Appendix N, Safety Class 3 corresponds to the USAS B31.7 Class III or ASME Section III Class 3 component design codes. The design conditions for Class 3 piping contained in these codes include a requirement to consider the effects of seismic events. Additionally, USAR Appendix N states that Safety Class 1, 2, and 3 components are considered to be Seismic Category I. In Section 3.6, the LAR states that the intake cell flood water inlet valves are not required to be seismically qualified or seismically supported. Provide justification for the discrepancy between the code requirements and the piping system with the intake cell flood water inlet valve design.

OPPD Response

A flood and a seismic event are not required to be postulated at the same time. Below 1,007 feet-6 inches MSL, the intake structure is a Class I Structure designed to protect the safety-related RW system. This includes the operating floor above the RW pumps, the RW vault, and the nosing of the intake structure in the river. The superstructure, which is that portion of the intake structure above 1,007 feet-6 inches MSL, is not a Class I structure and houses equipment that is not required to operate during a seismic event. Failure of the superstructure during a seismic event will not cause the Class I substructure to fail, which ensures that the RW system is protected.

USAR Section 9.8.6 shows the RW pumps are permanently protected against any water level up to 1,007 feet-6 inches MSL by the Class I concrete substructure of the intake building.

USAR Section 5.11.3 "Design Criteria – Class I Structures," a. "Loadings" shows that Class I structures other than containment (e.g., the intake structure) were designed for an external hydrostatic load from flooding up to elevation 1,014 feet MSL.

Class I structures were also designed on the basis of no loss of function for load combinations that do not assume a flooding event concurrent with a seismic event:

Flood (i.e., no seismic or tornado load):
$U = 1/\Phi\ (1.0D + 1.25H + 1.0F')$

Seismic (no flood)
U = 1/ Φ (1.0D + 1.0L + 1.0E'); where live load is a consideration

D = Dead load
E' = Seismic load from maximum hypothetical earthquake
F' = Hydrostatic load to elevation 1,014 feet
H = Soil Pressure
L = Live load

Because a seismic event is not postulated to occur simultaneous with a flooding event, the new flood control valves are not required to be seismically qualified or supported.

PRA Operations and Human Factors Branch (APHB) RAI 1

List and describe the procedure revisions required to support the LAR.

OPPD Response

EC 55394 will track implementation of the LAR and the following documents are listed as procedures and other documents that will be revised during amendment implementation:

Document	Description of Change
USAR Section 2.7, *Hydrology*	Modify description of how the intake cell water level is maintained below 1,007 feet-6 inches by closing the exterior sluice gates to severely restrict flow into the cells and then throttling the intake cell flood water inlet valves and/or varying the raw water pump output to remove the inlet flow. This change includes removal of the alternate flow path during a flood due to the change in methodology. Reference OI-CW-1 revision below.
USAR Section 9.8, *Raw Water System*	Same as change to USAR Section 2.7.
USAR Section 2.11, *Section 2 References*	Will add reference to Amendment.
STM-CW Volume 7, *Circulating Water System*	Same as change to USAR Section 2.7.
STM-RW Volume 35, *Raw Water System*	Same as change to USAR Section 2.7.

AOP-01, *Acts of Nature*	AOP-01 previously required all but one or two of the sluice gates to be closed with throttling done by an open sluice gate to maintain cell water level. AOP-01 was modified to instead maintain intake cell water level below 1,007 feet-6 inches by closing all exterior sluice gates to severely restrict flow into the cells and then throttling the intake cell flood water inlet valves (i.e., CW-323, -324, -325, & -326) and/or varying the raw water pump output to remove the inlet flow. No change from current licensing basis regarding ability to start additional RW pump(s) to maintain cell level less than the design level of 1007 feet-6 inches MSL. OI-CW-1 Attachment 18 is removed as described under OI-CW-1 below.
TBD-AOP-01, *Acts of Nature*	Same as change to AOP-01.
OI-CW-1, *Circulating Water System Normal Operation*	Removes Attachment 18, "Sand Intrusion Mitigation," which provided a method of controlling intake cell water level by backflow from the discharge tunnel. This method was developed as a contingency if the partially open sluice gate was blocked. However, because of the enhanced reliability of the new floodwater inlet valves, Attachment 18 is no longer needed.
OI-RW-1, *Raw Water System Normal Operation*	Removes mention of alternate flow path to the intake structure of OI-CW-1, Attachment 18.
SO-G-124, *Flood Barrier Impairment*	References intake cell floodwater inlet valves and removes Attachment 9, "Intake Cell Level Control Components," and references to OI-CW-1, Attachment 18, "Sand Intrusion Mitigation."
New preventive maintenance (PM) procedure for new valves (i.e., CW-323 through CW-326)	Inspects new flood control valves.
New PM procedure for new stop valves (i.e., CW-149 through CW-154)	Inspects new flood control valves.

APHB RAI 2

Describe the training that will be provided to support the LAR and the audience for the training.

OPPD Response

Licensed operators and non-licensed operators were given on shift training prior to the procedures being issued. These procedures were issued to support the compensatory measures associated with the interim measures used for controlling intake cell water level during a flood. Lesson plans for Circulating Water for both non-licensed and licensed operator training programs and AOP-01 lecture for licensed operator training program will be updated for continuing training upon approval of this LAR.

APHB RAI 3

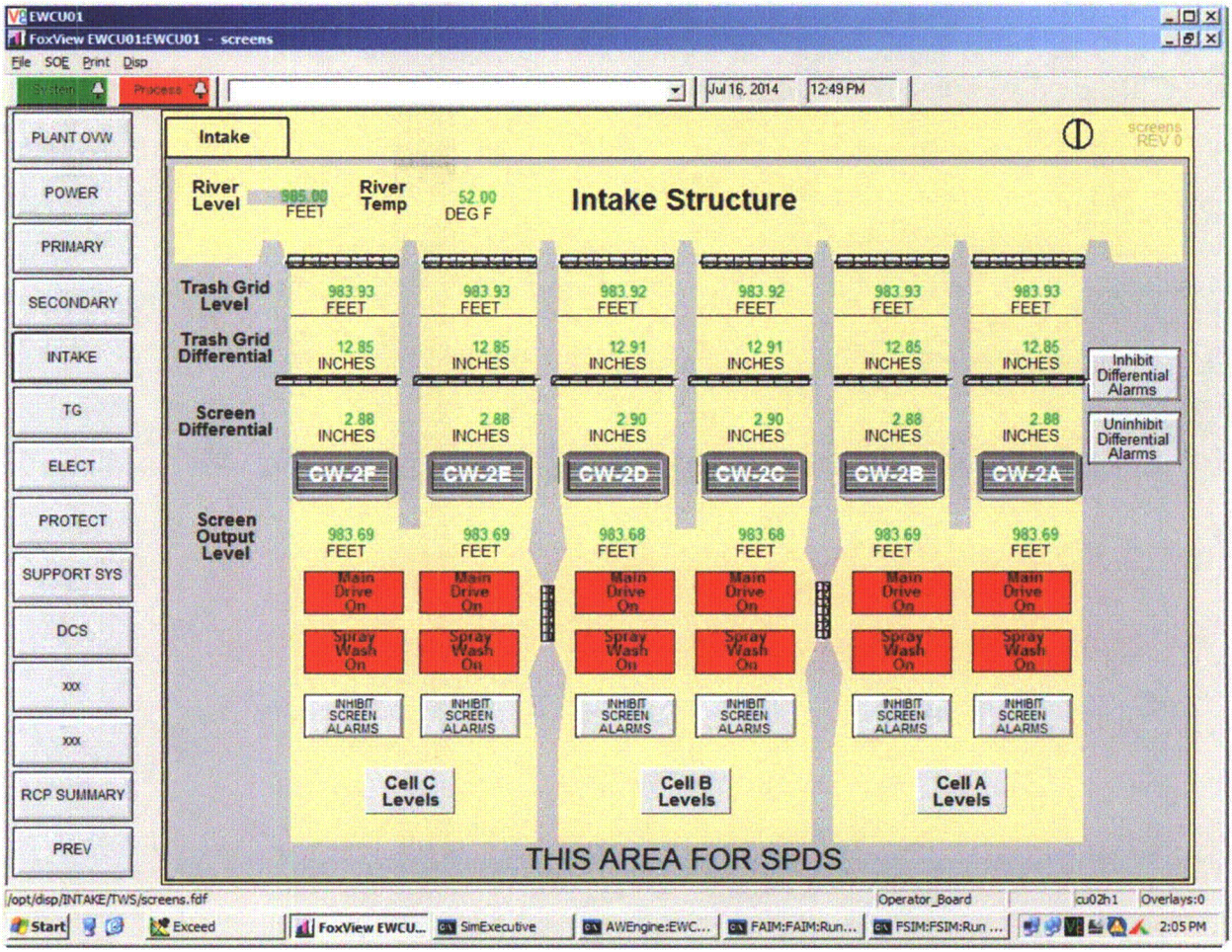
Describe the alarms, displays, and controls that operators will use to accomplish the proposed actions.

OPPD Response

DCS screens are available in the intake structure and the control room. The DCS screen in the intake structure is display only. In the event the DCS is lost, manual measurements can be performed in accordance with AOP-01. An example DCS screen is shown below. The control room would receive the alarm, and open the alarm manager and take actions in accordance with Annunciator Response Procedure ARP-DCS-TWS, "Traveling Water Screens DCS Annunciator Response Procedure." River level alarms are as follows:

High alarm:	999 feet MSL
Low alarm:	982 feet MSL
Low-low alarm:	980 feet MSL

The intake structure operator observes DCS cell water levels and manually adjusts any or all of the intake cell flood water inlet valves (i.e., CW-323, -324, -325, -326) to maintain the desired cell level (i.e., 983 to 988 feet MSL). (During a flood, all three (3) intake cells are nearly identical in height because of the low flow.) If cell levels continue to rise, the operator is directed to start additional RW pump(s) and stop them when cell levels reach 980 feet MSL.



DCS Screenshot

APHB RAI 4

Describe the method(s) that will be used to validate that the actions are feasible, reliable, and can be completed in the time available.

OPPD Response

The current licensing bases requires installing flood gates, closing five (5) sluice gates and maintaining one (1) sluice gate approximately one (1) inch open, the stationing of an operator inside the intake structure to monitor intake cell levels. RW pump(s) are used to maintain intake cell levels. The only significant difference between the current method and the new method is that the new method closes all six (6) sluice gates and then uses the new intake cell flood water inlet and isolation valves to control intake cell level. Operation of the RW pump(s) is similar to the current method.

FCS demonstrated the ability to control intake cell levels for an extended period using the current method during the 2011 Missouri River flood. A Notification of Unusual Event due to high river levels was declared on June 6, 2011 as described in Event Number 46929, which was terminated on August 29, 2011. During that period, flood gates were installed, five (5) sluice

gates were closed and one (1) throttled, and the current method of controlling intake cell levels while maintaining plant cooling functions was demonstrated.

The use of manual control valves for controlling cell level is a significant improvement over the current method. The operation of the manual control valves in this application has been determined to be well within an operator's capability. Engineering change (EC) 55394 contains the analysis documenting the feasibility (i.e., the basis, valve sizing, etc.) of these actions. SO-G-74, "Fort Calhoun Station EOP/AOP Generation Program" was used to implement the changes to AOP-01. SO-G-74 requires a verification and validation of the actions, which includes reviews, challenges, walkdowns, etc., of the proposed changes to ensure that the actions are feasible, reliable and can be completed in the available time.