Fort Calhoun Station

Potential NRC License Amendment

April 22, 2013

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Agenda

- Purpose of the meeting – Bruce Rash
- Tornado Missiles – George Wilhelmsen
- Alternate Seismic Criteria and Methodologies – George Wilhelmsen
- Intake Structure – Chris Scofield
- Piping Codes – Don MacIsaac
- Equipment Reclassification – George Wilhelmsen
- Closing comments – Bruce Rash

Tornado Missiles

- OPPD implemented a modification that moved the condensing units from inside the control room to the roof.
- NRC identified that a probabilistic analysis was used for tornado justification of these roof mounted control room condensing units.
- All tornado missile vulnerabilities will be addressed prior to start up.

Existing Tornado Vulnerabilities

Vulnerability	Fix	Reload or Restart
Control Room Condensers[1]	Construct a cage around condensers	Restart
Room 81 Roof Opening[1]	Construct a cage around opening	Restart
FW-10 Stack[1]	Construct a cage around stack	Restart
Diesel Generator Fill Line [2]	Grade beams and grating	Restart
Diesel Generator Vent Line[2]	None, Deterministic Approach	Restart
AC-10 Power Pull Boxes	Concrete wall and grating	**Reload**
Intake Structure	None, Deterministic Approach	Restart

Note 1: Missile threat include pipe and sphere (no car).
Note 2: Applies to both FO-1 and FO-10.

Tornado Protection Commitment

- Omaha Public Power District (OPPD) plans on using the guidance in Regulatory Guide 1.76 Revision 1.
- A License Amendment Request (LAR) is required.
  - OPPD is changing the current licensing basis to account for differences in missile velocities that are contained in Regulatory Guide 1.76.

Implementing RG 1.76

- Fort Calhoun is located in Region I of RG 1.76.
  - Missiles include a six-inch pipe, an automobile, and a small sphere.
  - Velocities listed in the Regulatory Guide will be used as inputs to calculations supporting mods.
  - Automobile is limited to targets within 30 feet of grade.

Tornado Protection Plan is Comprehensive

- Roof-mounted targets: The Control Room condensers, Room 81 roof opening, and the FW-10 stack will be protected from the six-inch pipe and sphere using a missile-resistant cage.
  - Cage will use a small h-shaped metal frame and grating.
- OPPD will use a deterministic approach for the evaluation.

Tornado Protection Plan is Comprehensive

- Diesel generator fill lines will be protected with concrete grade beams and grating to protect against automobiles, pipe, and sphere.
  - Grade beams will displace the forces from the automobiles to the grade around the tank.
  - Grating will be bolted on top of concrete grade beams to protect fill lines against the pipes and spheres.

Tornado Protection Plan is Comprehensive

- Diesel generator vent lines will be addressed using deterministic approach.
- Targets associated with the raw water pumps (AC-10) will be addressed.
  - Grating above the pumps will be reviewed for pipe and sphere protection.
  - Power supply pull boxes will be protected using barriers.

Schedule and Summary

- Schedule: All modifications are planned to be completed by May 31st for plant start up.
- OPPD will determine operability based upon NRC Inspection Manual Section 9900 “alternative methods” for start up.

What is Alternate Seismic Criteria and Methodologies (ASCM)?

- ASCM was initiated to address areas that did not have an NRC-approved seismic Floor Response Spectra (FRS).
  - Turbine Building.
  - Intake Structure.
- ASCM used more advanced techniques for development of FRS.

Alternate Seismic Criteria and Methodologies

- OPPD used ASCM FRS for structure, systems and components (SSCs) other than pipe and duct.
- NRC identified that the ASCM FRS was used for SSCs outside the NRC approval, which is limited to piping and ducts.
- OPPD will request approval to use ASCM FRS for all SSCs (LAR). Alternative to USAR FRS.
  - This will not change methodologies.

Where FCS Used ASCM

- Intake Structure
  - Operability will be provided.
  - Original USAR did not have floor response spectra.
- HE-2
  - Functionality will be provided.
- Cage around FW-10
  - Cage will be removed.

OPPD/NRC ASCM Correspondence

- The initial ASCM LAR was submitted for NRC approval on 12/2/88.
- There were numerous letters to the NRC and requests for information from the NRC. This issue was finalized with an SER (T71408) issued on 4/16/1993.

ASCM Included Many Topics

- ASCM
  - Future Designs.
  - Modifications.
  - Reanalysis of piping and supports.
  - Electrical raceways HVAC systems.
  - Anchor bolts.
- Scope reduced:
  - Floor response spectra
  - Piping and HVAC.

Why is the Floor Response Spectra Acceptable? Per SER (T71408)

- Housner Ground Response Spectrum.
  - The NRC staff agreed with the Housner ground response spectra.
  - The actual time histories used in the analysis.
- Overturning and Sliding.
  - The NRC staff agreed that the difference in pile stresses is not significant.
- Accidental Torsion
  - The NRC staff agrees that the FRS introduces sufficient margin of conservatism.

Why is the Floor Response Spectra Acceptable? Per SER (T71408)

- Upper Bound (UB) Soil Properties:
  - The NRC staff agrees that the use of 1.3 times the best estimate value for the UB value is adequate.
- Radiation Damping:
  - NRC staff considers that the use of 6.7% radiation damping conservative.
- Liquefaction
  - NRC staff is satisfied with the action taken by OPPD to achieve a relative density of 86%.

Safety Evaluation Report

NRC-93-0150 April 16, 1993

- The FRS is the main issue:
  - The SER stated that the ASCM is approved for pipe and duct.
  - This also approves the ASCM developed FRS for pipe and duct methodology.
  - The SER did not specifically state that the FRS was approved.

ASCM Going Forward

- The ASCM FRS developed is acceptable as an alternative to the USAR Appendix F FRS.
- ASCM FRS is acceptable for use on any SSC.
- OPPD will submit an LAR to clarify that the ASCM FRS can be used as an alternative to the USAR Appendix F.
  - This does not change any methodologies.

Intake Structure Flood Control

- Topics:
  - Licensing Basis
  - Current Intake Structure Flood Control
  - Future Bypass Modification Cell Control
  - Modification Safety Classification

Licensing Basis

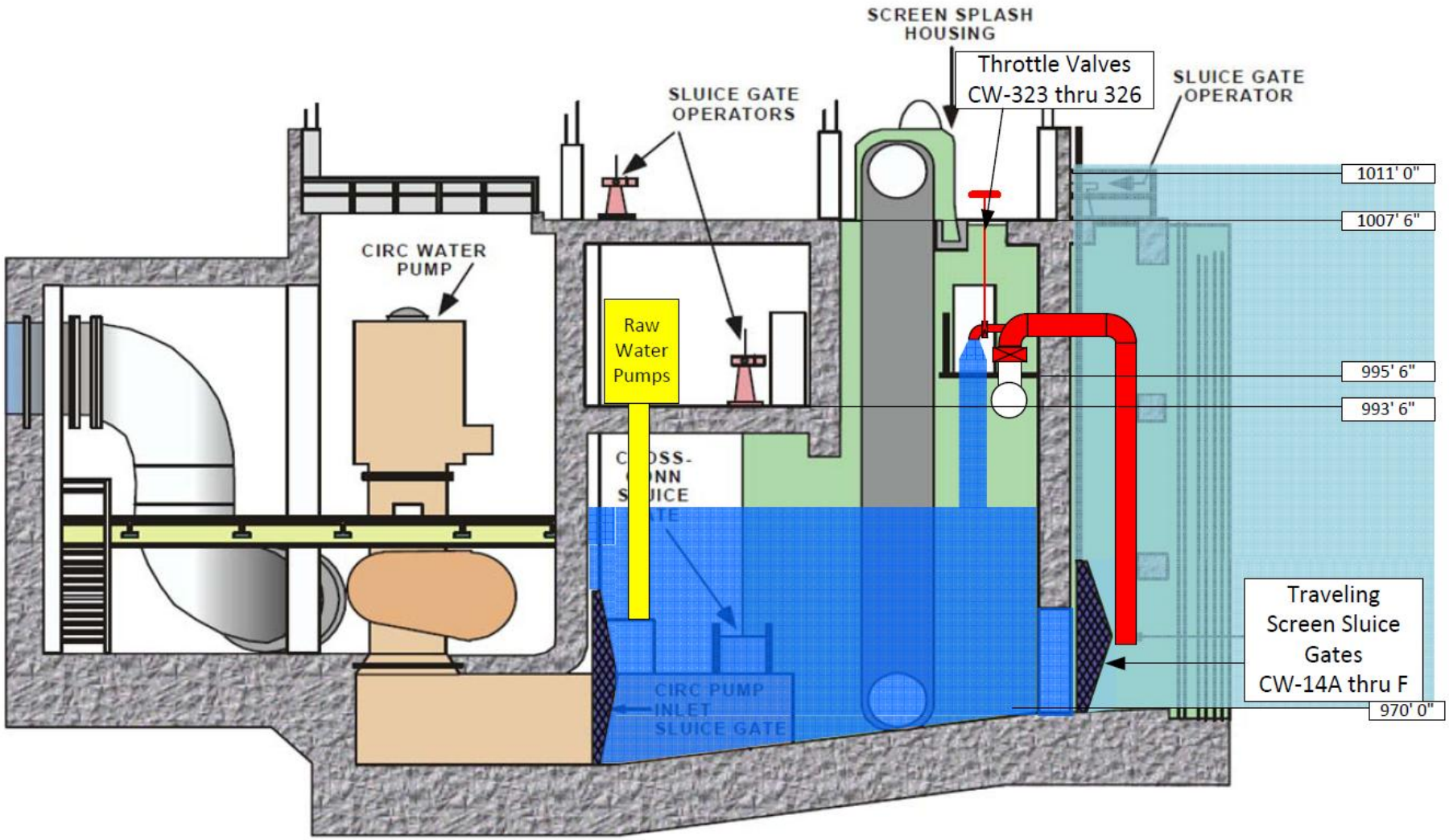
- Draft Description provided to District in response to AEC question in 1970:
  - "For any water levels above 1007.5, the water level inside the intake structure is controlled by positioning the exterior sluice gates to severely restrict the inflow into the wet wells, along with pumping out at a rate equal to the inflow. Because of the wide head variation available, sluice gate and pump settings are self balancing with reasonable limits"
- PSAR / FSAR 9.8 (1972):
  - "For water levels above 1007.5 feet, the water level inside the intake structure is controlled by positioning the exterior sluice gates to restrict the inflow in to the wet wells to match the rate of pumped outflow. Because of the wide head variations possible, the sluice gate and pump settings are automatic self-balancing within reasonable limits." - Underlined language removed during USAR Verification Project (CR1999-01469)
- USAR 9.8 (Current):
  - "The water level inside the intake cells can be controlled by pre-positioning the exterior sluice gates (i.e., before floodwater reaches the elevation that prevents access to the sluice gate actuators) to severely restrict the inflow into the cells. Intake cell level is then controlled by varying the raw water pump output to remove the inlet flow. "

Current Intake Structure Flood Control

- Sluice Gates (incorporated flood barriers) are prepositioned per AOP-01 by 1004’
  - Five of six gates fully closed
  - One gate partially open
- One Raw Water Pump run continuously, second pump cycled

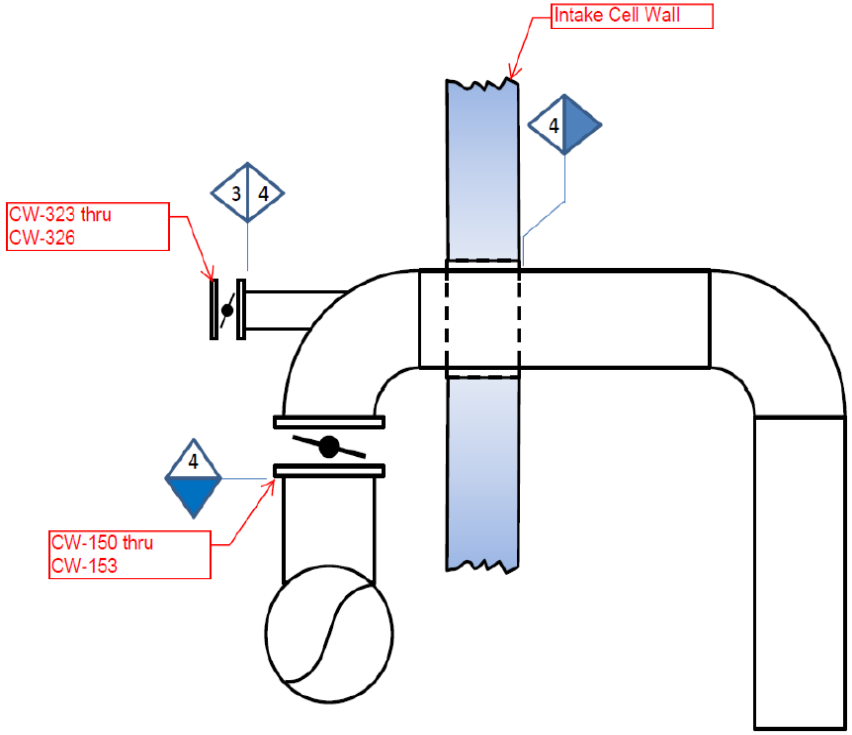
Future Bypass Modification Control

- AOP-01 “Acts of Nature – Flood”:
  - Open new flood control throttle valves and close sluice gates
  - Manually control in-leakage with four 10 inch throttle valves



Modification Safety Classification

- Flood Barriers:
  - 18-inch butterfly valve
    - Class break
    - Normally closed
  - 18-inch pipe
  - Sluice gates
    - Incorporated flood barrier
- Flood Control Valves:
  - Four 10-inch butterfly valves
  - Manually controlled
  - Single failure



Piping Code Issue

- OPPD used ASME Section III analysis in safety-related piping design calculations.
- FCS safety-related piping Design Codes are USAS B31.1 (1967) and USAS B31.7 DRAFT (1968).
- Use of alternate Design Codes, such as ASME Section III (1974, 1980), requires NRC approval (10CFR50.55a).
- OPPD has not submitted an LAR to obtain NRC approval. This issue was discovered by NRC and is documented by Condition Report 2013-05206.

Operability

- NRC Inspection Manual Part 9900, Appendix C, Section C.4 allows the use of Alternate Analytical Methods in Operability Determinations.
- OPPD used an NRC-approved Alternate Analytical Method (ASME Section III Code) in safety-related calculations.
- These calculations have been performed, checked, verified and are analytically acceptable as an Alternate Analytical Method to determine operability.

Operability

- FCS calculations using ASME Section III piping design methodology:
  - Meet the Allowable Stress Criteria of ASME Section III for design of piping systems at FCS.
  - Meet the increased Allowable Stress Criteria of ASME Section III Appendix F as specified by NRC Inspection Manual 9900, Section C.10 for operability determination.
- Therefore, FCS calculations using ASME Section III design code methodology document piping system operability.

Path Forward

- OPPD will prepare an operability evaluation prior to fuel load.
- Based on the requirements of 10 CFR 50.55(a), OPPD will submit an LAR to the NRC requesting approval to use ASME Section III as an optional Design Code.

Equipment Reclassification Issue

- Issue
  - OPPD reclassified systems / components in the early 1990s
  - The effort was designed to close the “code gap” that existed at the time FCS was constructed
    - “Concern that piping and equipment were ‘over-classified,’ resulting in specifying equipment that was more expensive than that required by current standards”

Equipment Reclassification Issue

- Issue (continued)
  - Reclassified systems as part of the process
  - Original evaluation made recommendations
  - A review of those recommendations is being performed.

Equipment Reclassification Issue

- Path Forward
  - Original design of the plant was licensed and approved by the NRC
  - Original plant configuration with these code changes, is in place today – some modifications have been made using NRC approved codes

Equipment Reclassification Issue

- Path Forward (continued)
  - A review of the engineering analysis that changed the FCS code commitment found no issues which have a safety impact on restart
  - OPPD implemented changes to the USAR to use Codes that meet NRC requirements, which differ from the originally licensed Codes
  - Interfaces between high and low pressure systems were properly engineered
  - Path to closure includes an Operability Determination, followed by detailed review to close classification gaps and develop a license amendment post-restart

Equipment Reclassification Issue

- Path Forward (continued)
  - Restart not restricted by this issue
    - A specific safety issue has not been identified
    - FCS was constructed to the approved code in the FSAR or modified using NRC accepted codes
    - Inspection Manual 9900, Page 15, Corrective Action section addresses this situation and does not restrict mode changes

Closing Comments

- Tornado Missiles
- Alternate Seismic Criteria and Methodologies
- Intake Structure
- Piping Codes
- Equipment Reclassification
- Questions