Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

Pre-Decisional Enforcement Conference

January 24, 2019

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Participants

- Doug Bauder - Vice President of Decommissioning and Chief Nuclear Officer
- Tom Palmisano - Vice President of External Engagement
- Lou Bosch - Plant Manager
- Al Bates - Manager, Nuclear Regulatory Affairs and Nuclear Oversight
- Jerry Stephenson - Manager, Engineering
- Jim Peattie - General Manager of Decommissioning Oversight
- Mark Morgan - Regulatory Affairs

Agenda

- Introduction
- August 3rd Download Event
  - Description of event
  - Safety Significance
  - Causal Analysis
  - Corrective Actions
- Reportability
  - Timeline
  - Causal Analysis
  - Corrective Actions
- Regulatory Considerations
- Conclusions/Questions

Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

INTRODUCTION

Doug Bauder, Vice President of Decommissioning and Chief Nuclear Officer

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Safety Perspective

The incident on August 3, when the redundant safety functions of our lifting system were not maintained, is a serious matter which we should not have allowed to happen.

Southern California Edison (SCE) accepts the proposed violations of regulatory requirements.

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Safety Perspective

- Immediately following the event, SONGS placed the affected canister in a safe condition and suspended Fuel Transfer Operations (FTO)
- We have analyzed the incident and developed corrective actions with the utmost rigor, depth, and thoroughness
- We have utilized top industry expertise to verify our conclusions and actions
- We now know with full confidence, that in the unlikely event of a load drop on August 3, the canister would not have been breached, and there would have been no radiological hazard to our employees or to members of the public

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Safety Perspective

- There were significant organizational and programmatic lessons learned
- We've established comprehensive and rigorous criteria prior to re-starting FTO
  - Demonstration of effective corrective actions and equipment operations to the NRC
  - Multiple independent reviews
  - Full satisfaction by SCE that our actions are complete and sustainable
- Planned post-restart actions to further ensure sustainability

Decommissioning
San Onofre
Nuclear Generating Station

Focus Areas of Improvement

Training
Better training programs and re-training crews

Procedures
More detailed procedures

Equipment
Load monitoring, cameras & alarms

Oversight
More intrusive and effective oversight of operations

Corrective Action Program
More effective to identify lessons learned

Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

AUGUST 3RD EVENT

Lou Bosch, Plant Manager

Canister Downloading Event

What Happened

- On Aug. 3, 2018, as a loaded Multi-Purpose-Canister (MPC) was being downloaded into its storage vault, it became lodged on the shield ring
  - For less than an hour, the MPC remained lodged and was not suspended by the rigging

Significance

- Although unlikely, the canister could have fallen 18 feet to the bottom of the Cavity Enclosure Container (CEC)
- Canisters have been analyzed to be able to withstand drops of up to 25 feet with a substantial margin of safety
- During the event there was no radiological risk to employees or the public; however, this is still an unacceptable incident

Canister Download Evolution

- Animation deleted due to file size

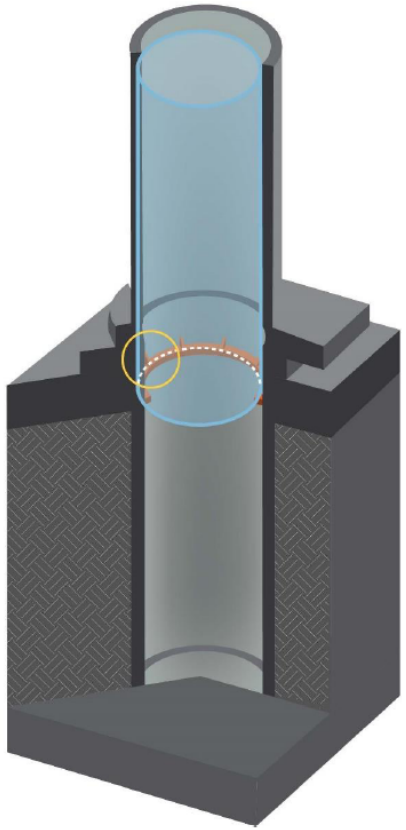
Decommissioning San Onofre Nuclear Generating Station

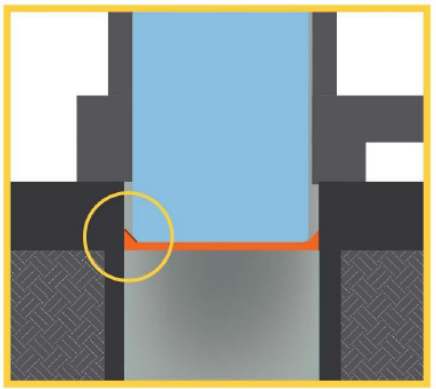
Safety | Stewardship | Engagement

Description of Event

- Multi-Purpose Canister (MPC) lodged on shield ring
- Shield ring is 2” thick; welded in place

What happened on Aug. 3





MPC WEDGED IN CEC

Safety | Stewardship | Engagement

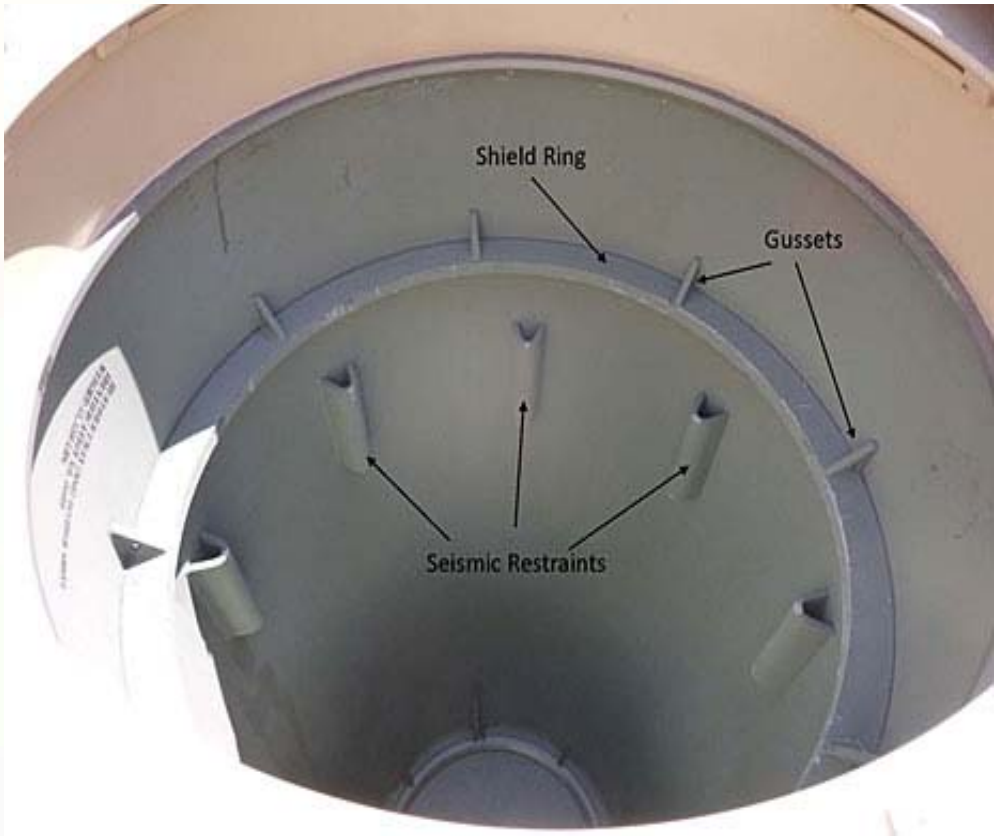
Decommissioning
San Onofre
Nuclear Generating Station

SAFETY SIGNIFICANCE

Jerry Stephenson, Manager of Engineering

Safety Significance of a Load Drop

- Shield ring is located in the CEC
- Shield ring performs dose reduction function
- Tight clearance required for effective shielding
- Shield ring is 2” thick and welded to divider shell
- Reinforced with 8 gussets
- Fully capable of supporting canister without damage



Safety Significance of the Incident

- Actual consequences
  - No breach of the canister
  - No release of radioactive material
  - With the canister resting on the shield ring with slack slings, it was exposed to a possible 18’ drop into the CEC for less than 1 hour
  - Contact with the shield ring may have caused minor scratches to the side of the canister, which have been evaluated to be acceptable, and will be evaluated in the Inspection and Maintenance Program to be implemented in 2020

Safety Significance of a Load Drop

- Probability of a canister drop
  - No release of radioactive material even if it had dropped
  - Lowering the canister onto the shield ring resulted in the ductile baseplate locally conforming to the shape of the ring
  - Significant force required to dislodge the canister from the shield ring (such as a seismic event)
  - The canister was in this condition for less than 1 hour
  - The probability of a seismic event large enough to dislodge the canister during a 1 hour period at SONGS is very low.

Safety Significance of a Load Drop

- Load drop evaluation
  - Deterministic load drop evaluation was performed with very conservative assumptions
    - We analyzed 25’ drop vs. actual height of 18’
    - Assumed ½” wall thickness vs actual thickness of 5/8”
    - Analyzed no friction, and an infinitely rigid bottom
    - Used a conservative strain limit of .55 in/in
    - The calculation used NRC approved code (LS-DYNA)

Safety Significance of a Load Drop

Load drop analysis (continued)

- Calculated maximum strain was well below the conservative calculational limit of .55 in/in. The canister would not have been breached

- This result affirmed that there would be no canister breach and therefore no release of radioactive material

Safety Significance of a Load Drop

- A fuel damage evaluation was performed for a postulated canister drop of 25’
  - Conservative because the potential fall was only 18’
  - Some fuel damage would have occurred
  - However, as previously shown, there would be no canister breach and no release of radioactive material
  - No increase in local or offsite dose rates

Safety Significance of a Load Drop

- No significant effect on cooling as a result of a postulated 25’ drop
  - Helium cooling medium is maintained—no canister breach
  - Fuel bundles remain in their individual cells
  - No significant change in heat transfer
- External cooling of the canister was also reviewed
  - Cooling is maintained per design with air flow past the canister
  - Approximately 6” clearance would be maintained between canister and divider shell
  - Minor changes to external dimensions would not affect overall cooling

Safety Significance of a Load Drop

- Conclusion
  - The possibility of a canister drop was very low
  - Even if it had dropped, there would have been no breach
  - Without a breach, there would have been no release of radioactive material
  - There would have been no change in local or offsite dose rates
  - The canister would have remained cool and safe in the CEC

Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

CAUSAL ANALYSIS

Jim Peattie, General Manager of Decommissioning Oversight

Root and Apparent Cause Evaluations

- Root Cause Evaluation to examine the causes for loss of redundant drop protection features during the download of the loaded spent fuel canister
- Apparent Cause Evaluation to examine ineffectiveness of SCE's oversight of the fuel transfer process, which may have prevented the event

Root Cause Evaluation

- Root Cause: Management failed to recognize the complexity and risks associated with a long duration fuel transfer campaign while using a relatively new system design

Root Cause Evaluation

- Root Cause Evaluation of MPC Downloading Event at SONGS
  - Contributing Causes
    - Design review of the shield ring did not capture unintended consequences
    - Inadequate procedure content
    - Training Program did not capture uniqueness of UMAX system and challenges of a long-term project
    - Continuous Learning Environment not established for use of operating experience and lessons learned
    - Communication protocols for canister movement not well defined

Apparent Cause Evaluation

- Apparent Cause Evaluation of Oversight
  - Apparent Cause
    - Failure to establish rigorous oversight process
  - Contributing Causes
    - Project management observations not routinely performed
    - Low threshold for Corrective Action Program (CAP) entries not enforced

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Corrective Actions

Training
Better training programs and re-training crews

Procedures
More detailed procedures

Equipment
Load monitoring, cameras & alarms

Oversight
More intrusive and effective oversight of operations

Corrective Action Program
More effective to identify lessons learned

Decommissioning San Onofre Nuclear Generating Station

Corrective Actions

Corrective Action Operating Procedures

- Fuel Transfer operating procedures have been revised to identify critical steps, required qualifications, load limits, and use of new equipment
  - HPP-2464-100 MPC Pre-Operational Inspections
  - HPP-2464-200 MPC Loading at SONGS
  - HPP-2464-300 MPC Sealing at SONGS
  - HPP-2464-400 MPC Transfer
  - HPP-2464-500 MPC Unloading
  - HPP-2464-600 Abnormal Conditions

Corrective Action Oversight Procedures

- Oversight procedures revised to improve:
  - Review and acceptance of contractor procedures and training programs
  - Field performance of fuel transfer oversight through use of task guides

Decommissioning San Onofre Nuclear Generating Station

Corrective Actions

Corrective Action Training

- Developed a new SONGS-specific training program and procedure using systems approach to training and trained FTO personnel
- Trained oversight specialists on oversight procedure changes and process fundamentals
- Added a subject matter expert with training experience into oversight organization

Decommissioning San Onofre Nuclear Generating Station

Corrective Actions

Corrective Action Equipment

- Load Monitoring Shackles installed with remote indication and alarms
- Cameras and monitors installed to observe downloading remotely
- Tag-line indicator installed on MPC for physical verification of downloading

Decommissioning San Onofre Nuclear Generating Station

Corrective Actions

Training
Better training programs and re-training crews

Procedures
More detailed procedures

Equipment
Load monitoring, cameras & alarms

Oversight
More intrusive and effective oversight of operations

Corrective Action Program
More effective to identify lessons learned

Corrective Action CAP

- SCE Corrective Action Program is now being used for all problem identification and resolution associated with the fuel transfer project
- Training conducted on Lessons Learned from Aug 3rd event, July 22nd pre-cursor event, and updated CAP training for FTO and oversight personnel

Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

Corrective Actions

Corrective Action Oversight

- Procedures revised to include rigorous review of contractor procedures and training programs
- Procedures revised to include improved task guides, risk management, and direction on intervention
- Implemented a Senior Management observation program for fuel transfer project and oversight activities
- Enhanced oversight organization with additional fuel-transfer-experienced personnel

Decommissioning San Onofre Nuclear Generating Station

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Root Cause Evaluation (RCE) Root Cause 1 - Complexity of long-term project with relatively new design not fully understood	• CAPR-1 Revised Holtec procedure for Project Risk Management • CAPR-2 Evaluated Executive Oversight Board charter to improve effectiveness	Complete Complete

Cause/Action Correlation

Cause Summary	Actions Taken	Status
RCE Contributing Cause 1 - Inadequate procedure content	• Revised Holtec Writer's Guide procedure • Revised Holtec Operating procedures to include responsibilities, qualifications, critical steps and engineering features • Revised scripted pre-job briefs for critical lifts (high risk) • Revised all Job Hazard Analyses (JHA)	Complete Complete Complete Complete

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Cause/Action Correlation

Cause Summary	Actions Taken	Status
RCE Contributing Cause 2 - Design review did not capture unintended consequences	• Revised Holtec design review procedure to enhance review process including use of an additional independent challenge team	Complete
RCE Contributing Cause 3 – Communication Protocols not well defined	• Developed and conducted training on communication protocols including 3-way communication, command and control, and responsibilities	Complete

Cause/Action Correlation

Cause Summary	Actions Taken	Status
RCE Contributing Cause 4 – Continuous Learning Environment not established for use of Operating Experience	• Revised Holtec Project Manager procedure to include section on use of OE from various sources • Revised Holtec Field Condition Report procedure to provide additional clarification on the threshold for initiation of FCRs including any abnormal or unexpected condition	Complete Complete

Cause/Action Correlation

Cause Summary	Actions Taken	Status
RCE Contributing Cause 5 - Training Program did not capture uniqueness of challenges from UMAX system and long-term project	• Developed SONGS site specific training program using elements of Systems Approach to Training (SAT) • Developed SONGS site specific training procedure that includes minimum training and qualification by position • Revised Chapter 9 of Final Safety Analysis Report (FSAR) to increase rigor of load handling activities	Complete Complete Complete

Cause/Action Correlation

Cause Summary	Actions Taken	Status
RCE Effectiveness Reviews	• Perform assessments to verify effectiveness of the CAPRs and a CAs • Perform oversight through a surveillance using an independent evaluator on the first two downloads after restart plus three of the following 10 downloads • Perform an assessment of Holtec's Cask Loading personnel including but not limited to the CLS, RIC, JLG operator, and VCT Operator to ensure proficiency	Due: 60 days after restart Due: After 5 to 10 canister downloads Due: 60 days after restart

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Apparent Cause Evaluation (ACE) Apparent Cause 1 – Failure to establish rigorous oversight process	• Revised Holtec Operating procedures to require load monitoring, stop criteria for safety limit, critical steps, and lessons learned	Complete
	• Revised SCE Oversight procedure to include rigorous review of contractor procedures and training programs	Complete
	• Revised SCE Oversight procedures to include improved task guides, risk management, and guidance	Complete
	• Reviewed and revised Holtec/SCE training materials and provide training to SCE Oversight Specialists	Complete

Cause/Action Correlation

Cause Summary	Actions Taken	Status
ACE Contributing Cause 1 – Project Management Observations not routinely performed	• Revised SCE Oversight guide for Pool to Pad work to include paired observations by peers and management	Complete
ACE Contributing Cause 2 – Low Threshold for CAP entries not enforced	• Developed and conduct Lessons Learned Case Study Aug 3rd event, July 22nd pre-cursor event, and updated CAP refresher training • Developed and conduct SCE oversight training to reinforce observation documentation and identification of trends	Complete Complete

Cause/Action Correlation

Cause Summary	Actions Taken	Status
ACE Effectiveness Reviews	• Qualitative assessment of implementation of corrective actions based programmatic changes implemented and management observation comments as they apply to effectiveness of training, effectiveness of task guides, responses to observer questions • Training SME perform observations of pre-job briefs and OE delivery. Participate in evaluation of qualification and readiness review of Holtec Training	Due: Prior to dual unit operations Due: Prior to dual unit operations

Revised Download Process

- Video deleted due to file size

Corrective Actions Conclusions

- SONGS took immediate action to:
  - Place in-process canisters in safe condition and
  - Suspended all fuel movement activities
- SONGS has performed thorough cause evaluations and implemented extensive corrective actions
- SONGS will ensure sustainability of our corrective actions

Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

REPORTABILITY

Lou Bosch, Plant Manager

Problem Statement

- On August 3, 2018, during the download of a canister, the canister became lodged which led to the rigging becoming slack. This disabled an Important-To-Safety (ITS) load control function while no other supporting function was available. This condition was reportable to the NRC within 24 hours in accordance with 10 CFR 72.75(d)(1)

Reporting Timeline

- Event on Friday August 3rd at approximately 1250 PDT
- Saturday and Sunday (8/4 and 8/5) the station considers reportability for unanalyzed condition [10 CFR 50.72(b)(3)(ii)]
  - Not appropriately assessed by the station for Part 72 reportability
- Monday, August 6 at 0500 PDT - time period for compliant reporting expires - extension allowed per 10 CFR 72.75(d)(2).
- Discussions throughout Monday, August 6
  - Courtesy call to Region at approximately 1500 PDT
- Tuesday, August 7 - Conference call with NRC – questioned reportability
- September 10-14 – Special Inspection - Apparent Violation discussed during debrief
- Friday, September 14 - Late formal report filed

Root and Contributing Causes

- Root Cause
  - Management failed to recognize the transition to fuel transfer operations as requiring the integration, familiarization, and application of 10 CFR 72.75 reporting requirements into plant processes

- Contributing Causes
  - (CC1) There was lack of guidance to facilitate understanding the wording in 10 CFR 72.75(d)(1)
  - (CC2) Management did not encourage, and the organization did not demonstrate, a conservative bias for reporting

Extent Of Condition

- Extent of Condition
  - SCE's review of the extent-of-condition of this event identified two additional issues associated with the HI-PORT, spent fuel transfer vehicle
    - Lateral clearance to fixed objects
    - Height of center of gravity
  - These issues were reported on December 20, 2018 to the NRC and have been corrected

Extent of Cause

- Failure to conduct training on ISFSI reporting regulations prior to the start of initial fuel movements in early 2018

- Failure to conduct training on other decommissioning reporting regulations

Immediate Corrective Actions

- Immediate Corrective Actions Completed
  - Trained Shift Managers and regulatory personnel on this event and the 10 CFR 72.75(d) notification requirements
  - Revised our reporting procedure

Corrective Actions

- Provide enhanced 10 CFR 72.75 training that includes:
  - Identifying accident and design basis events
  - Identifying analytical limits
  - Identifying ITS components
  - Identifying potential failures
- Establish a biennial refresher training requirement for reportability to ensure sustainability

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Corrective Actions

- Enhance reportability procedure with additional reporting guidance
- Conduct and document an assessment of other decommissioning activities that also have reportability requirements

Corrective Actions

- Effectiveness review
  - After the required training is complete, Shift Managers, Plant Manager, Operations Manager, regulatory personnel, and Engineering Manager will be given a real time reporting exercise once a month and success will be based on three consecutive months with no incorrect reportability calls
  - Appoint a skeptic at reportability conference meetings

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Immediate Actions	• Revised procedures to include references to NRC guidance, voluntary reporting, and bias for reportability; also created conference call with management for reportability issues	Complete
	• Trained shift managers on 8/3/18 event and Part 72 reporting requirements	Complete

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Root Cause - Management failed to recognize the transition to fuel transfer operations as requiring the integration, familiarization, and application of 10CFR72.75 reporting requirements into plant processes	CAPR1: Develop and provide training (including re-training) for decision makers that identifies ISFSI related accidents, design basis events, and safety functions specific to 10 CFR 72.75 reporting requirements to determine correct reportability	Due February 19, 2019

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Root Cause - Management failed to recognize the transition to fuel transfer operations as requiring the integration, familiarization, and application of 10 CFR 72.75 reporting requirements into plant processes	CAPR2: Establish a biennial refresher training requirement for reportability training	Due February 19, 2019

Decommissioning San Onofre Nuclear Generating Station

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Root Cause - Management failed to recognize the transition to fuel transfer operations as requiring the integration, familiarization, and application of 10CFR72.75 reporting requirements into plant processes	CAPR-3 (for Root Cause and Contributing Cause 1) - Revise SO123-0-A7 to include guidance for 72.75 reporting that: • disabling a function that "prevents" an accident is equivalent to a function that mitigates an accident • there are two aspects of reporting; the requirement and the time. • Management meeting including participation by the SM	Due February 4, 2019

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Contributing Cause 1 – Lack of procedural guidance to facilitate understanding of the wording in 72.75(d)	Addressed by CAPR-3, above	Due February 4, 2019

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Contributing Cause 2 – Management did not encourage, and the organization did not demonstrate, a conservative bias for reporting	• Revise procedure to include guidance for 72.75 reporting and maintaining a bias for reporting	Due February 4, 2019
	• Assign responsibility for reporting to shift manager	Due February 4, 2019
	• Conduct an event review with decision makers on reportability aspects of August 3rd download event	Due March 14, 2019
	• CNO to conduct All-Leaders and All-Hands briefings that addresses bias for reportability	Due March 14, 2019

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Root Cause - Management failed to recognize the transition to fuel transfer operations as requiring the integration, familiarization, and application of 10CFR72.75 reporting requirements into plant processes	• Effectiveness Review - 1: After training, SCE Shift Managers , Plant Manager, Operations Manager, NRA personnel, and Engineering Manager will be given a real time reporting exercise once a month and success will be based on three consecutive months with no incorrect reportability determinations	Due July 25, 2019

Cause/Action Correlation

Cause Summary	Actions Taken	Status
Root Cause - Management failed to recognize the transition to fuel transfer operations as requiring the integration, familiarization, and application of 10CFR72.75 reporting requirements into plant processes	• Effectiveness Review - 2: Appoint a skeptic at reportability call meetings. Skeptic attends the first 3 reportability call meetings to determine that; using a conservative reporting bias is mentioned, dissenting opinions are encouraged, the Shift Manager (SM) is requested to make the call, the SM is not influenced to not report by other management members • After three observations, conduct and document a qualitative assessment of observations	Due July 25, 2019

Corrective Actions Conclusion

- SONGS has taken immediate actions:
  - Trained Shift Managers and regulatory personnel on this event
  - Revised our reporting procedure
- SONGS has performed a thorough cause evaluation and has taken extensive corrective actions

Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

REGULATORY CONSIDERATIONS

Al Bates, Manager of Nuclear Regulatory Affairs and Oversight

Regulatory Considerations
Violation Severity Level

- Loss of Redundant Load Protection
  - No actual safety consequences
  - Vulnerability lasted for a short period of time (less than 1 hour)
  - If the canister had dropped
    - No radiological release
    - No harm to the health and safety of the public
  - A canister drop is unacceptable, and we have taken strong corrective actions
  - We ask that the NRC consider these factors in determining the final severity level of this violation

Regulatory Considerations Violation Severity Level

- Reportability
  - Considerations include impact on ability of NRC to perform its regulatory oversight function, and willfulness
    - NRC notified informally and thoroughly briefed
    - NRC performed a Special Inspection as a result of the event
    - SCE maintained frequent and transparent communication with NRC following event
  - We ask that the NRC consider these factors in determining final severity level of this violation

Regulatory Considerations

- Redundant Load Drop Protection
  - Enforcement History - No escalated enforcement within 2 years
  - Identification - Self-Revealing
  - Corrective Actions – Timely and Effective
- Reportability
  - Enforcement History – No escalated enforcement within 2 years
  - Identification – NRC-identified
  - Corrective Actions – Timely and Effective

Civil Penalty Escalation/Mitigation

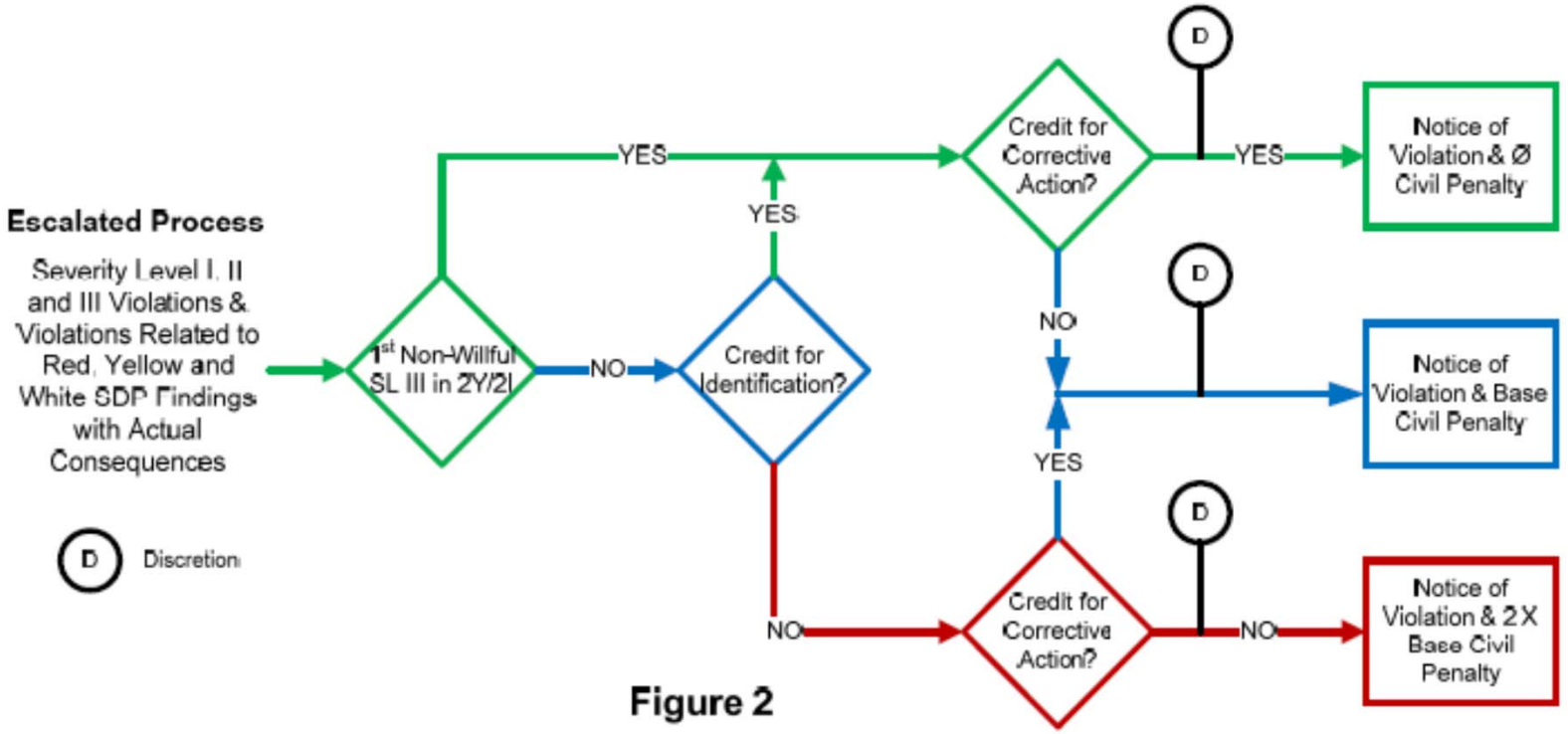


Figure 2

From NRC Enforcement Policy

Safety | Stewardship | Engagement

Decommissioning
San Onofre
Nuclear Generating Station

CONCLUSIONS

Doug Bauder, Vice President of Decommissioning and Chief Nuclear Officer

Decommissioning San Onofre Nuclear Generating Station

Safety | Stewardship | Engagement

Conclusion

- SCE takes this incident and these violations seriously
- We have performed extensive cause evaluations and implemented timely and effective corrective actions
- We will be demonstrating the effectiveness of our corrective actions to the NRC during upcoming inspections
- This incident did not create, nor have the potential to create, a radiological hazard to the public or employees