2nd Status Update

Ronald B. Robie (Thermalito) Pumping Generating Plant Fire on November 22, 2012

- No Serious Injuries -

California Water Commission

April 17, 2013

Presentation Highlights

- Recap of the Thermalito Fire Event on November 22, 2012
  - Plant Characteristics
  - Flow Characteristics in relation to Hyatt
  - Fire Sequence Summary
- Plant Clean-up: Current Status
- 3 Step Root Cause Analysis: Process Overview & Current Status
  - Phase I: Investigative analysis of what happened – Incident Command
  - Phase II: Forensic Analysis (Fire forensic & Relay expert analysis)
  - Phase III: Lessons Learned – Apply lessons learned to all SWP plants
    - Hyatt and Thermaltio Fire Detection System Project
    - State Fire Marshal
- Phased Approach to Plant Restoration
  - Plant Assessment (Structural, Electrical, Mechanical)
  - Value Engineering
- Impacts
  - Water Impacts
  - Generation Impacts

Ronald B. Robie (Thermalito) Pumping/Generating Plant Fire

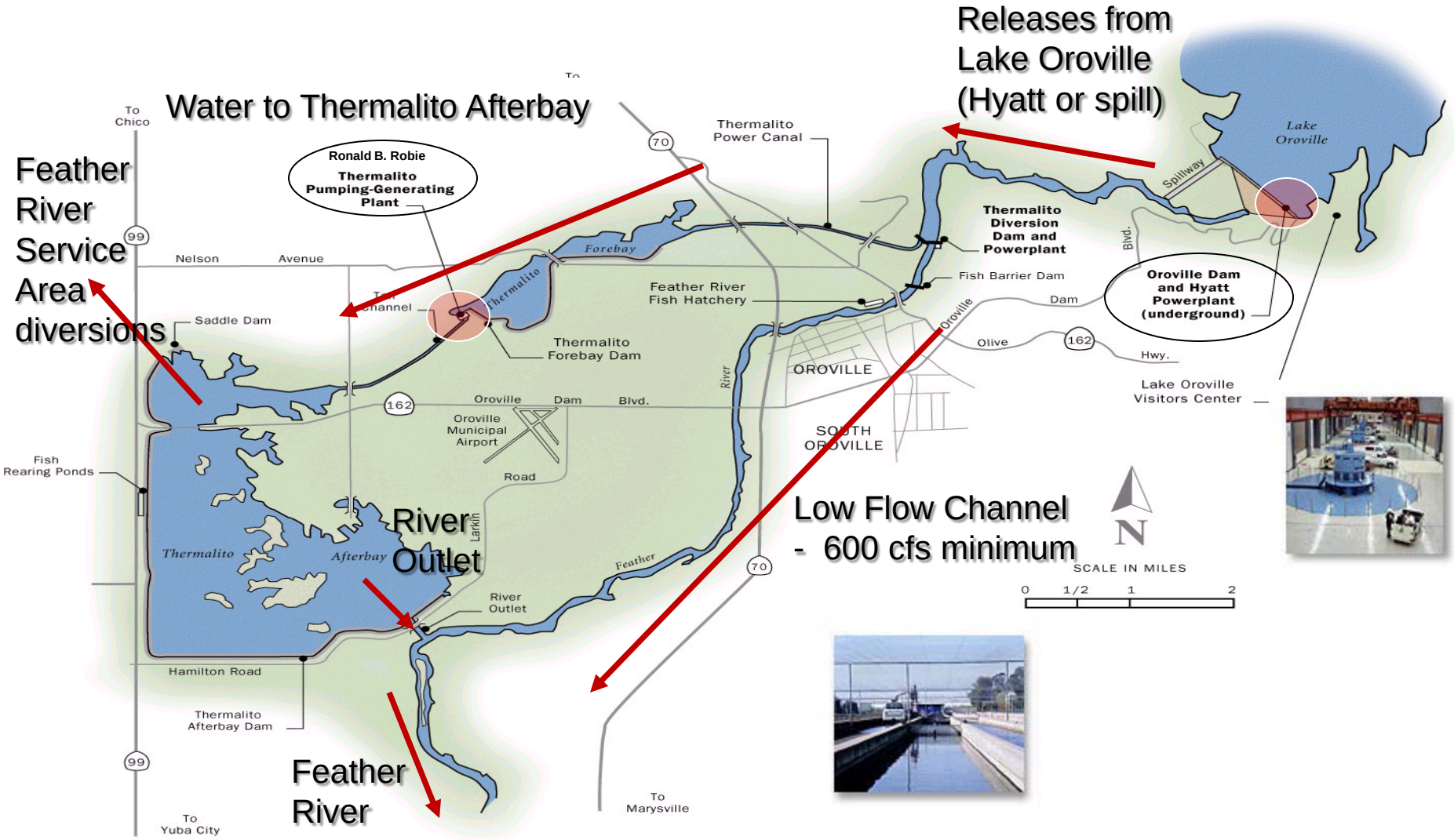
November 22, 2012

Recap of the event

Ronald B. Robie (Thermalito) Pumping/Generating Plant
Plant Characteristics

- Generation:
  - Number of Units: 4 (1 g, 3 p/g)
  - Unit Size: 1 Kaplan type @ 36 MW (4800 cfs), 3 Francis type @ 27 MW (4200 cfs)
- Pumping:
  - Number of Units: 3 p/g
  - Unit Size: 3 @ 28 MW (3040 cfs)

Oroville Complex Water Movement



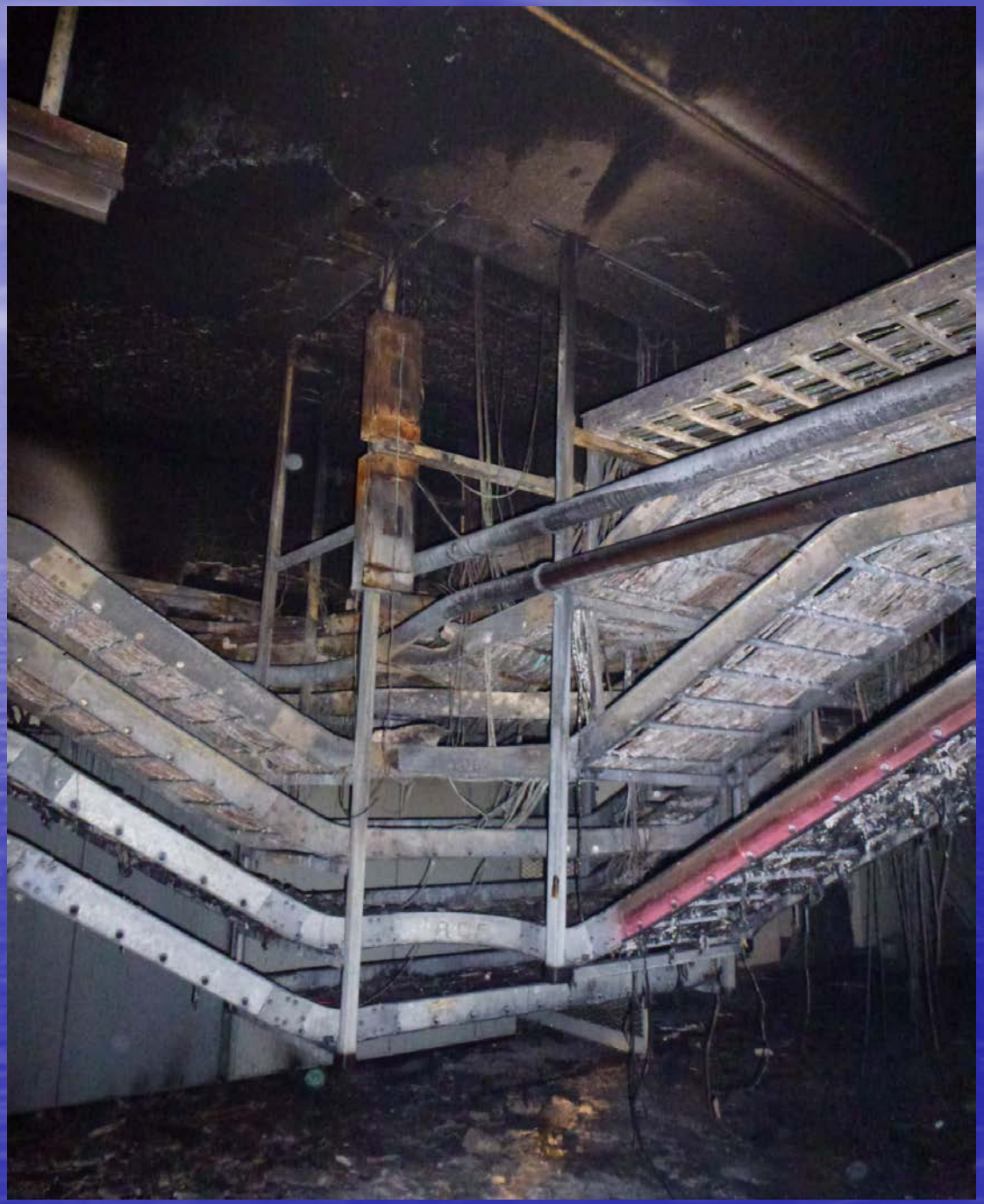
Ronald B. Robie (Thermalito) Pumping Generating Plant

Fire Sequence Summary

- 0650: Beginning of multiple SCADA alarms resulting in Unit trips of 1, 2, & 3, all forced out of service.
- 0720: Operator Apprentice directed to site at 0700 and reports heavy smoke on second floor and indication that CO2 systems had discharged.
- 0731: Cal Fire/Butte Co. ECC received 911 call and dispatched full alarm. Fire resources on scene at 0742 and assumed Incident Command.
- 1300: Cal Fire stood down firefighting efforts due to significant smoke and fire conditions for fire fighter safety.
  - Prior to evacuating the plant, Cal Fire installed an unmanned cellar nozzle to continue to fight the fire – ultimately extinguished the fire
- Plant sustained significant damage to the control room, electrical cables/systems in cable gallery with concrete spalling/damage to the plant structure.

Damage inside
Plant Control Room

Ronald B. Robie (Thermalito) Pumping Generating Plant Fire



Damage to cable trays and electrical cables/systems

Concrete spalling caused by heat of the fire

Ronald B. Robie (Thermalito) Pumping Generating Plant Fire

Plant Clean-up

- Current Status:
  - Plant clean-up continues with approximately 160 personnel on site.
  - Approximately 2,000 cubic yards of debris have been removed from the plant and staged for shipment to appropriate disposal sites or recycled – 132,000 pounds of material has been recycled to date.
  - Approximately 307,000 gallons of water have been transported from the plant for disposal.
  - First and second pass cleanings continue on Elevation 165 (top floor), Elevation 149 (Control Room), and Elevation 136 (Cable Gallery).
    - All cleaning complete on Elevations 121 and 100.
  - Plant cleaning activities anticipated to be completed by end of August 2013. Disassembly and cleaning of the four Thermalito generating units is estimated to continue into 2014.

Ronald B. Robie (Thermalito) Pumping Generating Plant Fire

Safety

- The Onsite Safety Officer makes daily rounds of the job site. Daily JHA's are conducted with personnel.
- The buddy system and extended breaks are used to combat heat related fatigue while wearing protective PPE's.
- NES is performing continuous air monitoring and regularly scheduled wipe samples for safety and to assess cleaning results.

Hazardous Waste

- Waste characterization is routinely performed on 100 cubic yard batches.
  - Analyzing composite samples determines the proper disposal method for the waste. All waste determined as hazardous is being shipped to US Ecology Inc., in Beatty, Nevada.
- Water from the plant sump is being transported to Yolo County Landfill.
  - The results of water samples from the plant drainage sump were examined and compared to the previous samples shows a steady reduction of contaminates.
  - Until the results show that the water is clean; the sump water will be pumped into Baker tanks for removal to Yolo County landfill.

Clean-up Phase
January – August 2013

Ronald B. Robie (Thermalito) Pumping Generating Plant Fire

Three Step Root-Cause Analysis-***Process Overview***

- Phase I: Record of Events: Investigative analysis of what happened
  - Document events before, during, and after fire
    - Sequence of Events
    - Equipment History
    - Lessons Learned
- Phase II: Post Fire Forensics: Investigate origin and cause of fire
  - Document investigation and analysis
    - Post Fire Expert Investigation/Analysis (Origin of Fire)
    - Relay/Breaker Expert Analysis (Cause of Fire)
    - Lessons Learned
- Phase III: Lessons Learned:
  - Prioritize recommendations from Part I and II
  - Recommendations from Hyatt/Thermalito Fire Detection System Project
  - State Fire Marshal Review
  - Management review, prioritize, and Implement recommendations at SWP plants/facilities (phased approach)

Ronald B. Robie (Thermalito) Pumping Generating Plant Fire

Three Step Root-Cause Analysis-***Current Status***

- Phase I: Record of Events: Investigative analysis of what happened
  - Document events before, during, and after fire
    - Report is “draft” complete and in final review
- Phase II: Post Fire Forensics: Investigate origin and cause of fire
  - Document investigation and analysis
    - In the final stages of the fire forensic investigation
    - Numerous plant inspections made by fire forensic consultant and electrical engineer
    - Documented fire damage/evidence and inspected plant electrical systems
    - Fire forensic consultant has identified the point of origin in the cable gallery area and a suspect DC circuit
    - Relay engineering consultant secured to perform design review and breaker tests related to the suspect circuit
      - Reviewing plant alarm list generated during the fire along with breaker test results as further evidence aligning the point of origin and suspect circuit
- Phase III: Lessons Learned: On-going
  - Prioritize Recommendations From Phase I & II
  - Recommendations from Hyatt/Thermalito Fire Detection System Project
  - Management review/implement recommendations at SWP plants/facilities

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Phased Approach to Plant Restoration-***Overview***

- Plant Fire Emergency: 11/22/2012 through 11/24/2012
- Incident Command: 11/24/2012 - ???
  - Hazmat/Air Stabilization: on-going
  - Structural Analysis: on-going
  - Safety: on-going
  - Clean-up: on-going (through August 2013)
  - Root Cause Analysis: on-going (began 12/13/2012)
    - Draft Final Report (Late May 2013)
- Restoration: TBD (Status--Next slide)
  - Plant Assessment: on-going (through June 2013)
  - Value Engineering: Late Fall 2013

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Phased Approach to Plant Restoration - ***Status***

- Plant Assessment currently in progress utilizing engineering consultant and DWR technical staff.
  - Anticipate completion by end of June 2013
    - Unit disassembly, cleaning, & assessment into 2014
- DWR Value Engineering: April 10, 2013 - Late Fall 2013
  - Business case analysis incorporating forecasted water operations, energy production of the facility, future energy market considerations, and regulatory requirements.
  - Along with Plant Assessment, Thermalito Value Engineering will determine best business case alternative for plant restoration.
- Hyatt/Thermalito fire detection system project.

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Impacts – water and generation

- Flows are being bypassed around the plant utilizing the plant bypass gate (capacity 10,000 cfs).
- Anticipated that regulatory releases will be maintained.
- Do not anticipate any water supply curtailments.
- Estimated lost generation is valued between $6.5 Million (90% hydrology) to $10.6 Million (50% hydrology) if plant is out of service during 2013.
  - Generation loss since day of the fire through end of March 2013 is estimated at $1.7 Million.

QUESTIONS