



Status Update & Next Steps

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

- No Serious Injuries -

California Water Commission

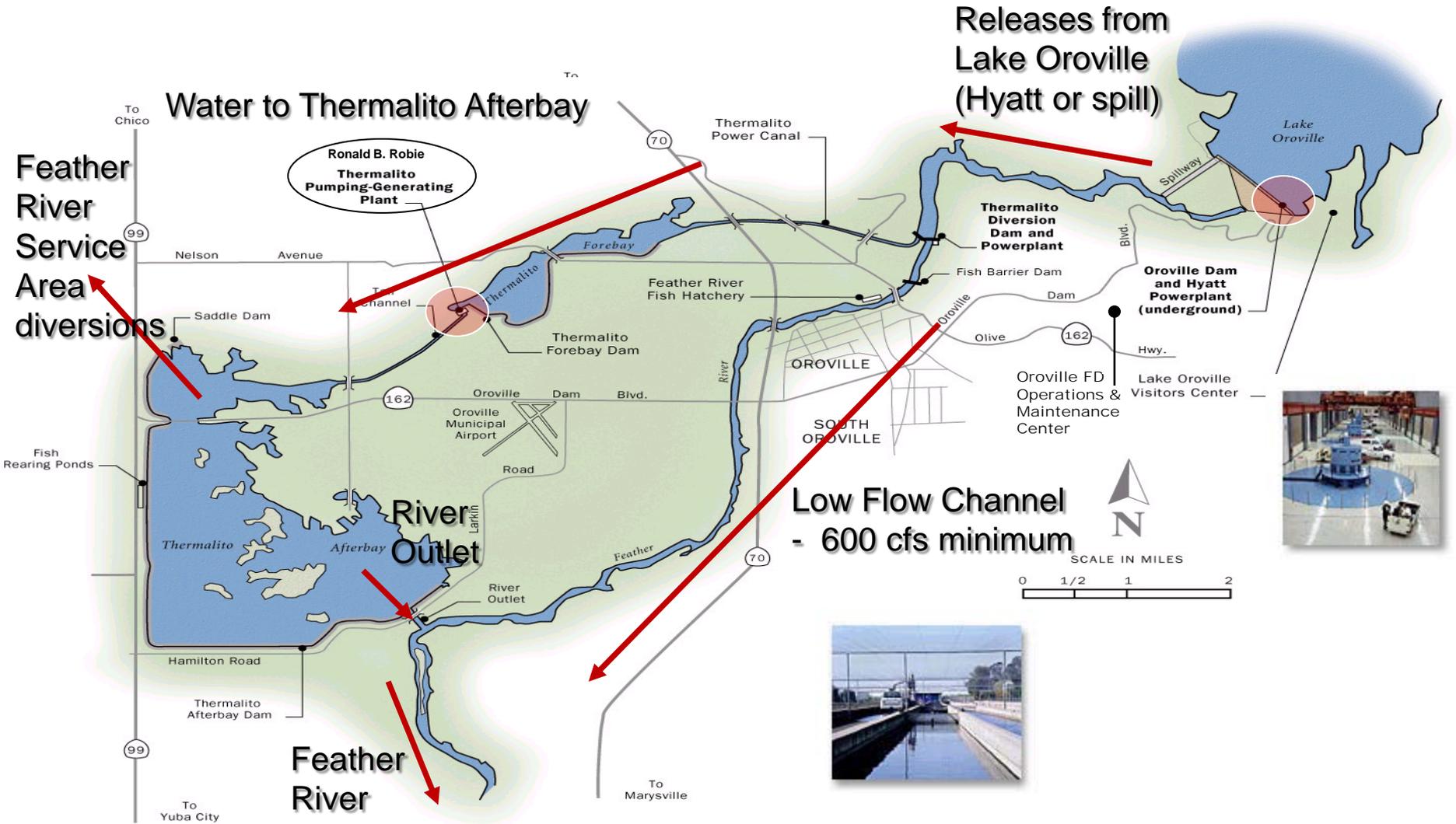
September 2013

Presentation Highlights

- Recap of the Thermalito Fire Event on November 22, 2012
 - Fire Summary
- 3 Phase Root Cause Analysis
 - Cause of fire
- Plant Clean-up:
 - Current Status
 - Estimated/Current Costs
- Plant Restoration:
 - Plant Assessment: Completed
 - Estimated Costs for Restoration
 - Value Engineering: On-Going
- SWP Fire Systems Modernization Project(s): Next Steps to enhance Fire Safety
 - Project 1: Enhance SWP fire safety and Develop a two-phase implementation plan for modernizing SWP Fire Systems
 - 6 goals: Goals 1 - 3: Enhance Fire Safety; Goals 4 – 5: Implementation Plan
 - Project 2: SWP Fire Systems Design and Construction



Oroville Complex Water Movement

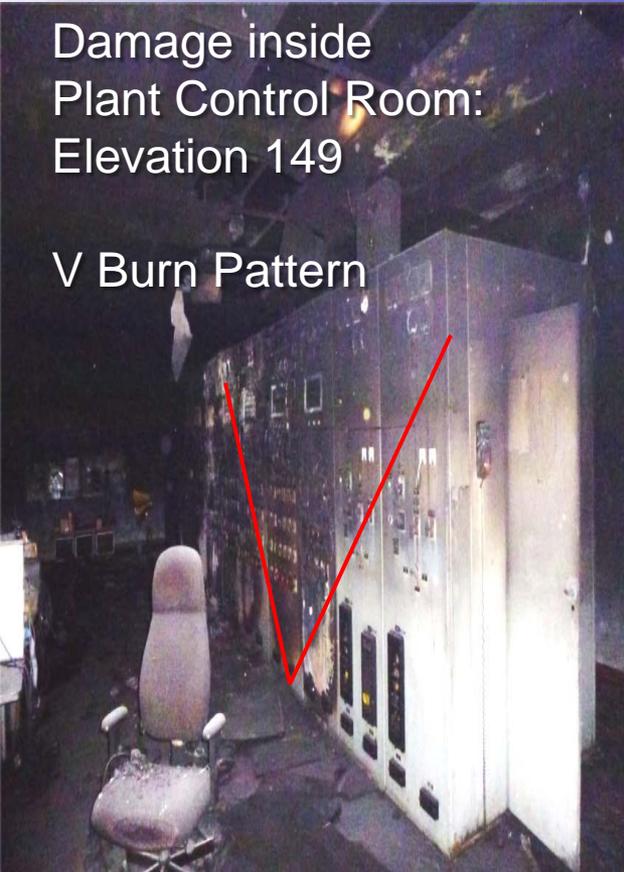


Fire Summary

- Plant sustained significant damage to the control room, electrical cables/systems in cable gallery with concrete spalling/damage to the plant structure.
- **Origin of Fire:** Elevation 136

Damage inside
Plant Control Room:
Elevation 149

V Burn Pattern



Damage inside Cable
Gallery: Elevation 136



Concrete Spalling:
Elevation 136



3 Step Root Cause Analysis: Cause of Fire

- Phase I: Investigative analysis of what happened – Incident Command
 - Incident Command Report: Completed May, 2013
- Phase II: Forensic Analysis (Fire forensic & Relay expert analysis)
 - Forensic Analysis Report: Completed July 2013
 - **Fire Root Cause Conclusion:** From the investigations performed by fire forensic experts, DWR is confident that Thermalito's fire point of origin occurred on Elevation 136, the cable tray gallery. Because so much evidence was incinerated by the fire, along with the complexities and limitations of a root cause fire forensic and laboratory testing analysis, the root cause of the fire could not be conclusively determined.
- Phase III: Document Fire Investigation and lessons learned
 - DWR Report: Completed August, 2013
 - Apply lessons learned to all SWP plants

Plant Clean-up

- Current Status as of early September 2013:
 - Plant clean-up continues with approximately 100 personnel on site.
 - Once all cleaning complete, anticipated to drop to less than 50.
 - Approximately 3,800 cubic yards of debris have been removed from the plant and staged for shipment to disposal sites or recycled.
 - Over 350,000 pounds of scrap steel has been recycled.
 - Approximately 905,000 gallons of waste water has been transported from the plant for disposal.



Plant Clean-up

- Current Status as of early September 2013:
 - Final pass cleaning completed on Elevation 165 (top floor) and clearance testing completed on 8/27 & 8/28 – awaiting results.
 - Continuing with final pass cleaning Elevation 149 (control room); scheduled to be complete on 9/21. Clearance testing is scheduled for 9/23 & 9/24.
 - Clearance testing performed on Elevation 136 (cable gallery) and elevator on 8/8 and 8/9. Sample results received 8/28 with failures on lead; Area re - cleaned with retesting scheduled for 9/18.
 - Clearance testing performed on Elevation 121. Sample results received with failure on lead. Area re – cleaned and clearance testing completed – awaiting results.
 - Elevation 100 has been cleaned, clearance tested, and passed.



- *Plant cleaning activities anticipated to be completed by end of September 2013.*

Plant Clean-up : Units

- Disassembly and cleaning of the three Thermalito generating units is estimated to begin during Fall 2013 and continue into 2014.
 - *Contingent on results of the DWR Thermalito Value Engineering*

MAIN UNITS (4 Units)	
Turbines	Drain, remove from loose assembly, inspect, clean, reassemble for operation
Kaplan Turbine	Drain, remove from loose assembly, pull turbine from pit, clean, inspect, repair and reassemble for operation
Motor / Generator	Remove rotor, clean, inspect, machine brake ring
Shaft	Clean & Inspect
Thrust and Guide Bearing	Clean & Inspect
Bearing Bracket	Clean & Inspect
Turbine Guide Bearings	Remove, Clean, Inspect
Packing Box	Clean, Inspect, Refurbish
Lubrication System	Drain, clean, inspect replace some components
Main Exciter & Voltage Regulating Equipment	Combination of clean, inspect and replace
Governor	Replace portions of governor system
Governor Oil Accumulators & Piping	Drain, Inspect, Clean; Replace some components
Wicket Gate Servos	Clean, Inspect, Repair, Machine
Wicket Gates & Mechanisms	Clean, Inspect, Repair/Replace components
Air Housing Heaters	Replace
Air Brakes & Jacks	Replace portions of system
Instrumentation	Replace
Elevated Neutral Grounding Equipment	Replace all equipment with a new dry type transformer enclosure and resistor bank

Clean – Up Costs Through July 2013

THERMALITO RECOVERY PROJECT COST CATEGORY			
Project Task Category	Estimated Total Cost	Estimated % Completed	Total \$ through July (appx)
Plant and Equipment Clean Up	48,500,000	85	42,553,000
Hazardous Waste Testing / Characterization / Disposal	3,000,000	85	2,714,000
Forensic Investigation	528,000	100	662,000
Structural Analysis / Testing / Plant Repairs	600,000	10	197,500
Furnish and Install Wheel Gates and Stop Logs	3,200,000	40	1,460,000
Essential Plant Systems (Air, Oil, Light, Interim Power, Comm, etc.)	2,500,000	30	668,000
Strategic Recovery Analysis	550,000	100	736,000
Value Engineering Study	150,000	0	0
Industrial Hygienist Services (Air, Wipe Sampling, Consultation, etc)	2,500,000	70	1,707,000
Unit 1-3 Disassembly and Cleaning	1,750,000	0	0
General Support (DWR Labor, Safety, etc.)	3,500,000	65	1,917,000
PROJECT EXPENDITURES TOTAL	66,778,000		52,614,500

Plant Assessment

- Plant assessment **completed** utilizing engineering consultant (HDR), on-site contractor, and DWR technical staff.
- Assessment approach: Plant systems, structures, and components (SSC's) in the plant were inspected and jointly evaluated by teams comprised of consultants/DWR for thermal fire damage, smoke damage, design suitability, compliance with current standards, and compliance with DWR design standards.
 - Guiding documents: Department of Energy (DOE) hydropower best practices guides, guides/standards produced by NEMA, IEEE, ASME, and other organizations
- Plant systems including sub – systems assessed:

MAIN ELECTRICAL SYSTEM AC STATION SERVICE DC SYSTEMS PLANT SERVICE SYSTEMS MAIN UNITS (4 Units) CONTROL BOARDS	SUPERVISORY CONTROL COMMUNICATIONS MAINTENANCE SYSTEMS ENVIRONMENTAL SYSTEMS FIREFIGHTING SYSTEMS BALANCE OF PLANT
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Plant Assessment Restoration: Cost Estimate

- The estimate includes costs necessary to recover the plant to the condition that it was prior to the fire.
- The estimate has an accuracy range of +30 to +50%. Some activities have higher contingencies, while others have lower contingencies.
- Equipment estimates obtained from vendor quotes are considered more accurate. Labor and material estimates tend to have higher contingencies.

Thermalito Fire Recovery Cost Opinion (Shown in Millions of \$)												
SYSTEM	UNIT 1		UNIT 2		UNIT 3		UNIT 4		COMMON		TOTAL	
	Cost	Conting.	Cost	Conting.	Cost	Conting.	Cost	Conting.	Cost	Conting.	Cost	Conting.
Main Electrical System	0.58	0.24	0.60	0.25	0.60	0.25	0.60	0.25	1.66	0.55	4.05	1.54
AC Station Service	0.20	0.07	0.17	0.06	0.13	0.06	0.20	0.07	2.32	0.84	3.02	1.11
DC Systems	--	--	--	--	--	--	--	--	0.32	0.12	0.32	0.12
Plant Service Systems	--	--	--	--	--	--	--	--	0.19	0.09	0.19	0.09
Main Units	12.09	5.78	10.61	4.92	10.80	5.02	7.93	3.77	--	--	41.43	19.48
Control Boards	0.62	0.34	0.62	0.23	0.62	0.23	0.62	0.23	2.24	0.94	4.72	1.98
Supervisory Controls	--	--	--	--	--	--	--	--	--	--	--	--
Communications	--	--	--	--	--	--	--	--	1.15	0.38	1.15	0.38
Maintenance Systems	--	--	--	--	--	--	--	--	0.20	0.09	0.20	0.09
Environmental Systems	--	--	--	--	--	--	--	--	2.34	1.00	2.34	1.00
Fire Fighting Systems	--	--	--	--	--	--	--	--	1.94	0.65	1.94	0.65
Balance of Plant	--	--	--	--	--	--	--	--	14.81	6.54	14.81	6.54
TOTAL COST	\$ 13.49	\$ 6.44	\$ 12.01	\$ 5.46	\$ 12.16	\$ 5.56	\$ 9.36	\$ 4.32	\$ 27.19	\$ 11.21	\$ 74.20	\$ 32.99

Value Engineering

- DWR Value Engineering initiated on April 10, 2013.
 - Business case analysis incorporating forecasted water operations, energy production of the facility, future energy market considerations, and regulatory requirements.
- Value Engineering consultant secured to facilitate the Value Engineering process.
- Value Engineering workshop orientation held on May 31, 2013
 - Identified VE Team Members
 - Developed documentation package and responsible parties
 - Identified action items and responsible party
- VE Workshop completed mid – August with site tour of Thermalito and actual workshop held in West Sacramento.
- **Along with Plant Assessment, Thermalito Value Engineering will determine best business case alternative for plant restoration.**
- **Draft Report/White Paper: October 2013**

SWP Fire Systems Modernization Project(s)

- Project 1: SWP Fire Systems Enhancement and Implementation Plan
 - Enhancement: Goals 1 – 3
 - **Goal 1:** Review and rank the suggested corrective measures and lessons learned, as identified in the Incident Command and DWR Thermalito Fire reports. Use this information to supplement and enhance Goals 2 – 6.
 - **Goal 2:** Develop a quick-hit list, and document actions completed. With assistance from hydroelectric power plant fire systems consultants, provide a list of proactive fire systems actions to be accomplished for SWP plants during 2013/14.
 - **Goal 3:** Continue to work with consultant to address fire risk at Hyatt Power Plant, adjusting tasks to align with future implementation plan (Goal 5).
 - Implementation Plan: Goals 4 – 5
 - **Goal 4:** Perform the following tasks with help of consultants who specialize in hydroelectric power plant fire systems, risk methods, and the California Fire Code.
 - Develop an SWP risk-based fire systems scoring method.
 - Determine and establish current California fire code requirements for SWP plants/facilities.
 - **Goal 5:** Develop an implementation plan for modernizing fire systems statewide for the SWP Phase I plants only (14 main stem plants)
 - **Goal 6:** Develop an implementation plan for modernizing fire systems statewide for the SWP Phase II plants only (remaining 14 plants)
- Project 2: SWP Fire Systems Design and Construction

QUESTIONS

