Modification: Feedwater Heaters

Initial Scope and Estimate	• Feedwater heaters:
	  o Rerate 12, 14, and 15 feedwater heaters,
	  o Rerate dump and drain piping, and
	  o Rerate drain coolers and install bypass;
	• Replace Cross-Around Relief Valves ("CARV") – piping and setpoints;
	• Modify navy nipples;
	• Modify Moisture Separator Drain Tank ("MSDT") with condensate injection; and
	• Testing.
	• **$37.0 million**

Final Scope	• Replace and rerate feedwater heaters:
	  o Replace six feedwater heaters (13 A/B, 14 A/B, 15 A/B);
	  o Replace discharge nozzles on three of four low pressure feedwater heaters (11 A/B, 12 A) with larger diameter nozzles;
	  o Replace 400 feet of dump and drain insulated piping and remove asbestos insulation from existing piping;
	  o Install two four ton jib cranes;
	  o Replace dump and drain venting and valves; and
	  o Replace drain coolers.
	• Replace CARV piping and establish new setpoints.
	• Enlarge Turbine Floor #2 Hatch.
	• Reinforcement of Turbine Floor 951'.
	• Remove and cap main steam thermowell.
	• Modify main steam Navy Nipples.
	• Modify MSDT.
	• Replace Feedwater Flow Transmitters.
	• Testing.

Milestones	• 2007: Decision to replace six feedwater heaters instead of rerates. • 2009 Outage: 14 of 18 dump and drain valves replaced, CARV piping replaced. • June 2009: Fabrication (13 A/B, 14 A/B, and 15 A/B) awarded. • October 2010: Stop Work order issued (tube denting). • November 2010: Stop Work order lifted. • End of 2010: Deferral of 13 A/B replacement to 2013 Outage. • March 2011: Feedwater heaters delivered (14 A/B and 15 A/B arrived but 13 A/B delivered post-outage). • March 2011: Final feedwater heater, moisture separator drain tank, turbine floor, and jib crane modification engineering changes approved. • April 2011: Final dump and drain piping and valve modification engineering changes approved. • 2011 Outage: Replacement of 14 A/B and 15 A/B feedwater heaters, CARV (except for setpoints), MSDT condensate injection (partial), 180 feet of low pressure heating drain piping, and remaining control valves; reinforcement of turbine floor 951'. • August 2011: Main steam thermowell modification engineering change approved. • 2013 Outage: Removal and cap of main steam thermowell, CARV setpoints, enlarge turbine deck hatch #2, modify main steam navy nipples, replacement of 13 A/B

Modification: Feedwater Heaters

	feedwater heaters, 11 A/B and 12 A nozzle installation, and complete replacement of remaining piping.
Costs Incurred	• *Materials*: $3.0 million o 2007: $10 million increase in equipment for decision to replace heaters 13 A/B, 14 A/B, and 15 A/B series heaters instead of rerating four feedwater heaters. (does not include removal or installation costs). o 2008: Decision to replace CARV piping in addition to valves. o 2010-2011: Fabrication and delivery challenges. Vendor, during fabrication, dropped and damaged baskets for which there were insufficient spares on hand and new baskets had to be fabricated. Issues with bundle insertion (13 A, October 29, 2010-Stop Work Order). o March 2011: 14 A/B and 15 A/B heaters arrived on site with defects (welding slag and moisture) that required time and effort to correct and extended the outage. o 2011-March 2013: Storage of 13 A/B heaters onsite. • *Installation:* $59.5 million o 2011 & 2013: $30 million for replacement of 400 feet of dump and drain piping (asbestos abatement of existing piping to be removed). o 2011 & 2013: Turbine floor hatch enlargement and reinforcement of turbine floor (approximately $6 million in installation and analysis). o 2011 & 2013: Non-Destructive Evaluation of welds. On-site required x-ray radiograph necessitating removal of all personnel from building during testing and time for film to develop. o 2013: 12 A drain nozzle installed at wrong orientation requiring follow-on modification. o 2013: $1.1 million in underestimated electrical work. o 2013: $2.9 million in scope changes identified during the outage for unanticipated and unpredictable engineering modifications needed to accommodate replacement of feedwater heaters. o 2013: Space limitations affected removal and installation of the 13 A/B feedwater heaters, including 22 interferences encountered during removal. o Testing of equipment including construction testing, pre-operational testing, and operational testing. • *Design/Engineering*: $26.1 million o Multiple contractors for engineering and design of feedwater heaters, piping, loading and support. o New piping design for CARVs. o Design changes to feedwater heater piping to avoid interferences requiring additional analysis for strain and supports. o Reinforcement of turbine floor loading with increased 14 A/B and 15 A/B weight and enlargement of turbine floor hatch to 13 A/B. o Design revisions to account for facility specifications (generic piping as-built model vs. MNGP-specific model). • August 31, 2013: **$114.9 million**
WOs	11133719 (D&D Valves); 11133713 (CARV); 11284286 (D&D Piping);

Modification: Feedwater Heaters

	11286961; 11638897; 11757884; 11842626 (FWHs, Cranes; Navy Nipple, and MS Thermowell); 11286981 (MSDT); 11376086 (Drain Coolers); 11133856 (Feedwater Flow Transmitters); 11376103 (Turbine Floor)

Feedwater Heater	2008	2009	2010	2011	2012	2013	Total
Licensing-Related	$ -	$ 3,100	$ -	$ 3,850	$ -	$ -	$ 6,950
Design/Engineering	$ 111,266	$ 2,398,605	$ 1,840,595	$ 19,742,184	$ 451,533	$ 1,561,561	$ 26,105,744
Materials/Components	$ 26,855	$ 1,124,177	$ (4,274,838)	$ 3,854,511	$ 1,532,069	$ 750,736	$ 3,013,511
Installation	$ -	$ 8,861,196	$ 719,803	$ 24,492,226	$ 1,864,078	$ 23,531,639	$ 59,468,942
Common**	$ -	$ -	$ -	$ 12,016,229	$ 9,362,294	$ 4,433,901	$ 25,812,425
Xcel General Costs	$ 167	$ 22,362	$ (4,989)	$ 436,028	$ 9,470	$ 74,430	537,468
Total	**$ 138,288**	**$ 12,409,440**	**$ (1,719,429)**	**$ 60,545,029**	**$ 13,219,445**	**$ 30,352,267**	**$ 114,945,040**

* Child Work Order - 11638897 - MNGP EPU 13 A&B Feed Wtr Heater, 11842626 - EPU 13 A & 13B Feed Water Heater Repair, 11133719 - EPU FW Heater Drain & Dump Valve, 11284286 - MNGP EPU Rpl 4 FW Drain & Dump, 11757884 - MNGP Replc 14/15 FW, 11286961 - MNGP EPU Rpl 14&15 A/B FW Heater, 11133856 - EPU FW Flow Transmitters/PC In, 11133713 - EPU CARV Replacement, 11286981 - Moisture Separator Drain Tank, 11376086 - Drain Coolers, 11376103 - Turbine Floor 951'

** "Common" represents the allocated portion of the $103 million of Work Order 10435578. See Exhibit __ (SLW-1), Schedule 3.

Modification: Feedwater Heaters

Arrival of Feedwater Heater 15A for Installation

Feedwater Heater 15A on Turbine Deck