

Stockton Power Plant Major Equipment Repair and Replacement

Southwestern Federal Hydropower Conference
Branson, MO

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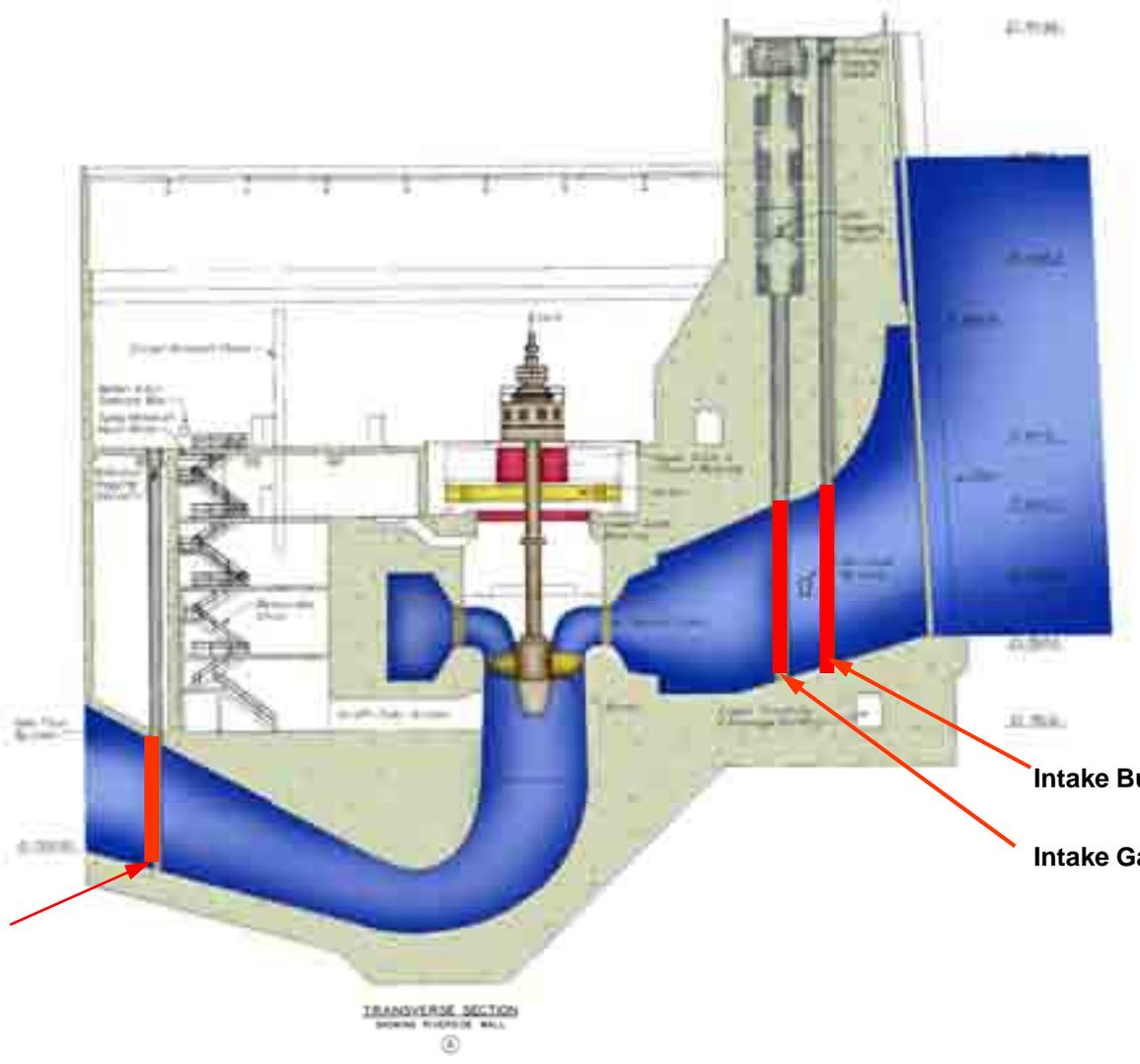


General Plant Information

- 45 MW capacity
- Single vertical axis Kaplan unit
- Peaking plant
- Average annual energy production of 55,000,000 KWH
- Plant placed in service in 1973
- Remote operated from Truman Power Plant
- Located on the Sac River near Stockton, MO



Power Plant Cross Section



Draft Tube Bulkheads

Intake Bulkheads

Intake Gates



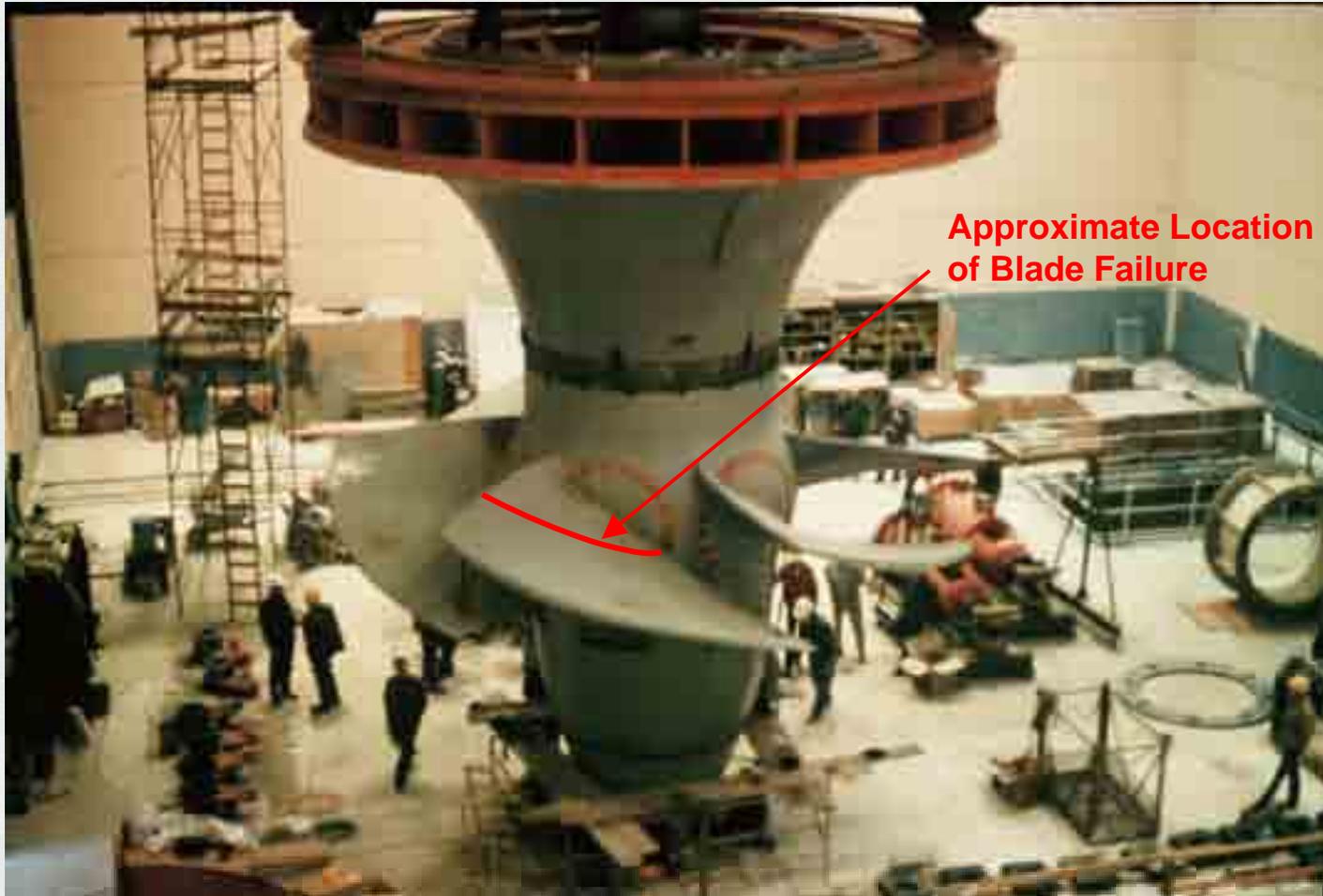
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Blade Failure

- On 4 Feb 2009 the unit experienced a severe vibration activating vibration alarms
- Cyclic pulsations and water leakage at the draft tube hatch door were observed
- Unit was shut down immediately
- Failed blade section was discovered by divers at the bottom of the draft tube
- Partial dewatering was performed to inspect turbine runner
- Turbine blade #4 experienced a catastrophic failure
- Potential cracks were also observed on three of the other five blades (blades #2, #5, and #6)
- Failed blade section was recovered by divers in August 2009



Blade Failure Location



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ARRA Project Scope

- Failed Blade Section Recovery *(Completed)*
- Hydraulic Steel Structures (HSS) Inspection/Repair *(Completed)*
- In-place Turbine Blade Repair *(Contract Ongoing)*
- Main Power Transformer Replacement *(Contract Ongoing)*
- Generator Rewind and Turbine Runner, Governor, and Exciter Replacement *(Contract Ongoing)*

- 13.8 kV GM and Station Service Breakers and Station Service Transformer Replacement *(Awaiting Advertisement)*
- AC/DC Preferred Systems Replacement *(Awaiting Advertisement)*
- Transformer Pad and Secondary Containment Construction *(Awaiting Advertisement)*



Project Funding

- ARRA funds were authorized for this project.
- \$42.73M in ARRA funds have been programmed for this project.



Total ARRA Cost Summary

Work Item	Cost
Failed Blade Section Recovery	\$69,487
Hydraulic Steel Structures (HSS) Inspection/Repair	\$1,156,834
Main Power Transformer Replacement	\$1,134,560
In-place Turbine Blade Repair	\$1,352,250
Generator Rewind and Turbine Runner, Governor, and Exciter Replacement	\$30,818,940
13.8 kV GM and Station Service Breakers and Station Service Transformer Replacement	\$480,000
AC/DC Preferred Systems Replacement	\$800,000
Transformer Pad and Secondary Containment Construction	\$300,000
EDC, S&A, and Contingency	\$6,618,605
Total	\$42,730,676



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Blade Recovery

- Contract Awarded: June 09
- Contractor: Mainstream Commercial Divers, Inc.
- Contract Completion: August 09
- Total Contract Costs: \$69,487



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Hydraulic Steel Structure Repairs

- Contract Awarded: July 09
- Contractor: OCCI, Inc.
- Contract Completion: April 10
- Summary Weld Repair
 - ▶ Draft Tube Bulkheads - 61 cubic inches on all 3 bulkheads
 - ▶ Intake Bulkheads - 45 cubic inches on all 3 bulkheads
 - ▶ Intake Gates - 385 cubic inches on all 3 gates
- Other Work
 - ▶ Replacement of anodes on intake gates
 - ▶ Replacement of seals on intake and draft tube bulkheads
- Total Contract Costs: \$1,156,834



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In-Place Blade Repair

- Contract Awarded: 15 May 10
- Contract Amount: \$1,352,250
- Contractor: Peak Hydro
- Schedule
 - ▶ Preparation/NDE of failed blade section: 9 – 29 Jun 10
 - ▶ Preparation of runner hub & NDE of other blades: 17 Jun – 12 Jul 10
 - ▶ Weld repair of cracks and failed blade section: 13 Jul – 24 Aug 10
 - ▶ NDE weld repairs: 25 – 31 Aug 10
 - ▶ Site cleanup and demob: 1 – 8 Sep 10
 - ▶ Water up unit for test run: 9 Sep 10
 - ▶ Submit final report/work documentation: 13 Sep 10
 - ▶ Contract Complete: 13 Sep 10



Why Repair the Blade?

- Lost Power Generation
 - ▶ 55,000,000 kW/hrs annually
- Lost Power Generation Replacement Costs
 - ▶ \$5.1M per year
 - ▶ \$632K per month
 - ▶ \$14K per day
- Payback < 3 Months



Main Power Transformer Replacement

- Contract Awarded: 8 Mar 10
- Contractor: National Electrical Systems
- Manufacturer: CG Power Systems Canada Inc.
- Contract Amount: \$1,134,560
- Schedule
 - ▶ Design: 8 Mar – Sep 10
 - ▶ Manufacturing: Oct 10 – Sep 11
 - ▶ Factory Acceptance Testing: Sep – Oct 11
 - ▶ Delivery: Late Oct 11
 - ▶ Field Assembly/Testing: Nov – Dec 11
 - ▶ Closeout Submittals: Dec 11
 - ▶ Contract Complete: Jan 12



Generator Rewind and Turbine Runner, Governor, and Exciter Replacement

- Contract Awarded: 8 Apr 10
- Contract Amount: \$30,818,940
- Contractor: Voith Hydro
- Schedule
 - ▶ Turbine model test completed: Apr 11
 - ▶ Prototype coil test completed: Apr 12
 - ▶ Stator winding delivery: Jan 13
 - ▶ Generator-turbine unit disassembly: Jan – Feb 13
 - ▶ Generator-turbine components inspection: Jan – May 13
 - ▶ Turbine runner delivery: May 13
 - ▶ Unit reassembly: Jun – Dec 13
 - ▶ Commissioning: Dec 13 – Jan 14
 - ▶ Unit placed into service: Feb 14



AC/DC Preferred Systems Replacement

- Contract Advertisement: Jun 10
- Contract Award: Jul 10
- Estimated Cost: \$800,000
- Schedule
 - ▶ Design/Manufacture: Aug10 – Feb 11
 - ▶ Delivery/Installation: Mar – Apr 11
 - ▶ Contract Completion: Jun 11



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13.8 kV GM and Station Service Breakers and Station Service Transformer Replacement

- Contract Advertisement: Jun 10
- Contract Award: Jul 10
- Estimated Cost: \$480,000
- Schedule
 - ▶ Design/Manufacture: Aug10 – Feb 11
 - ▶ Delivery/Installation: Mar – Apr 11
 - ▶ Contract Completion: Jun 11



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Transformer Pad and Secondary Containment Construction

- Contract Advertisement: Jun 10
- Contract Award: Jul 10
- Estimated Cost: \$300,000
- Schedule
 - ▶ Design: Aug 10 – Feb 11
 - ▶ Construction: Mar – May 11
 - ▶ Contract Complete: Jul 11



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Transformer Location



Potential Issues

- Funding for Installation of new Main Power Transformer in FY12
- Informal consultation with USFW to review potential design and operational changes of new turbine (i.e. pink mucket and spectaclecase mussels)
- Potential asbestos abatement and lead paint removal (funding, execution, planning, etc.).



Questions?



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