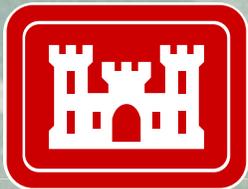


Webbers Falls and Ozark Powerhouse Major Rehabilitation

**Briefing for 2012 Southwestern Federal
Hydropower Conference**

Lee Beverly - Project Manager
Little Rock District

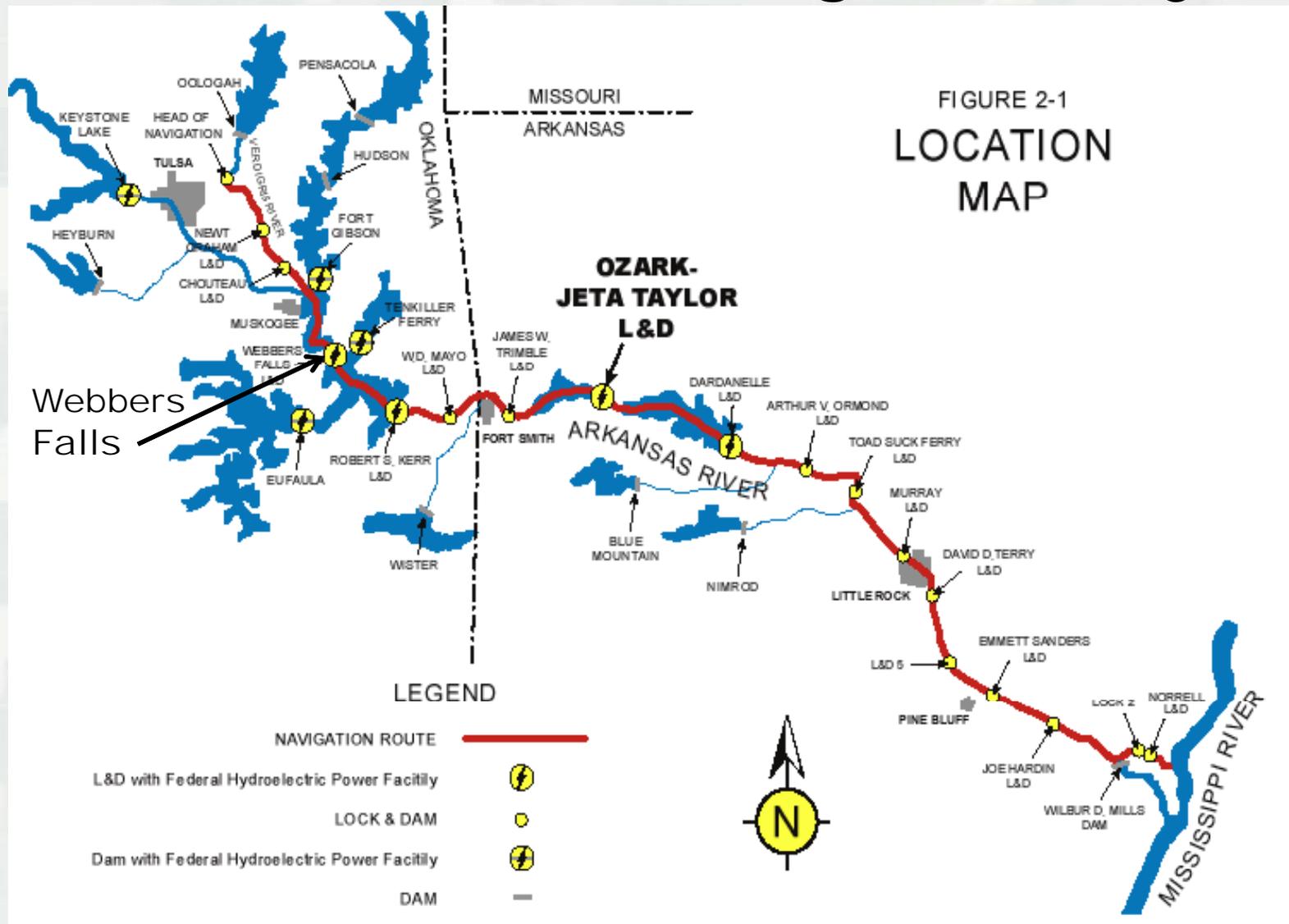
13 June 2011



US Army Corps of Engineers
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McClellan-Kerr Navigation Project

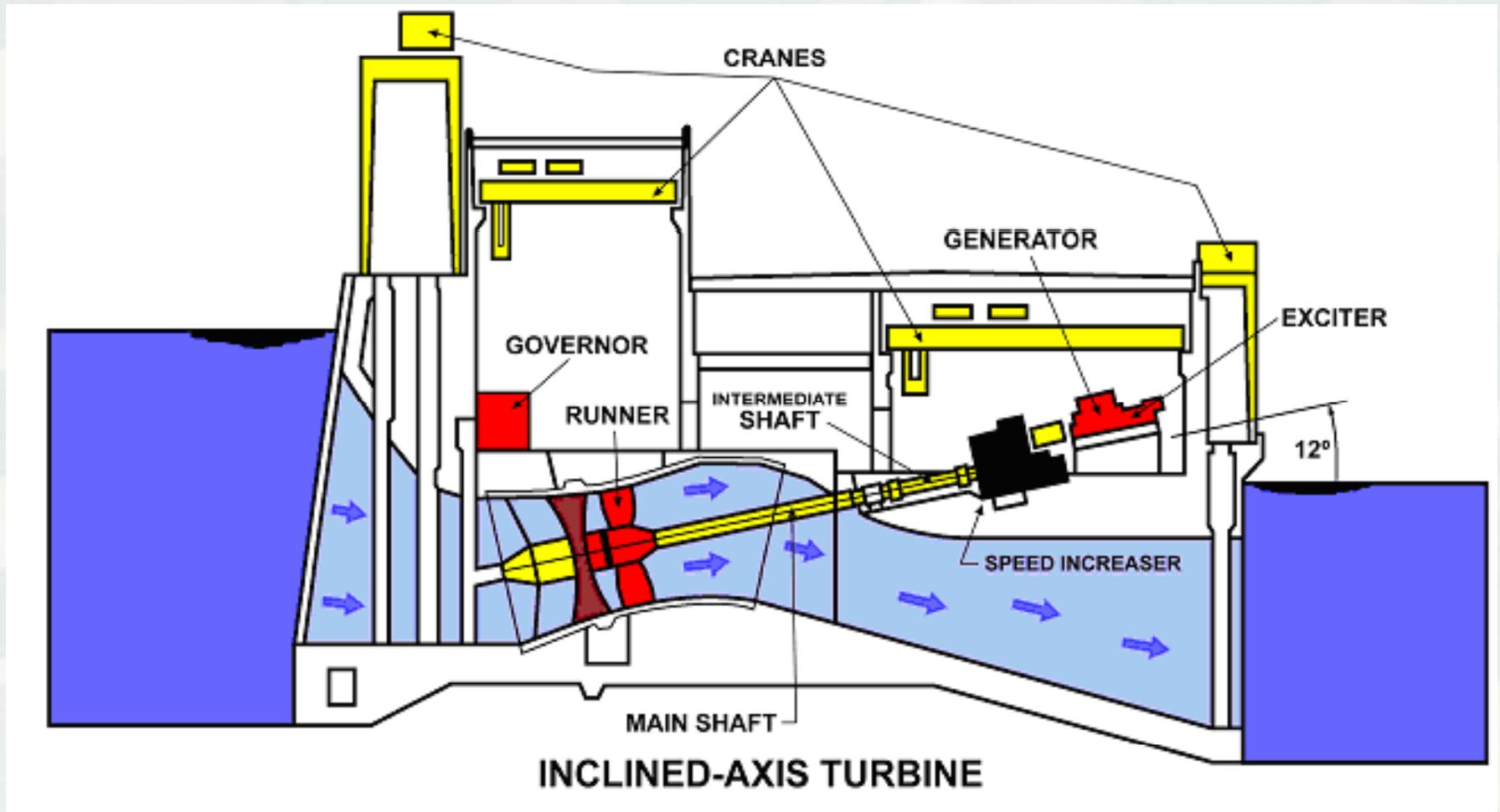


Background

- **Run of River Plants**
- **Webbers –**
- **Three inclined axis units, 23 megawatt each**
- **Placed in service in 1973.**
- **Average annual energy 213,000 MW-hours.**
- **Ozark –**
- **Five inclined axis units, 23 MW each**
- **Placed in service in 1974.**
- **Average annual energy 429,000 MW –hours.**



Section View of the Powerhouse



Webbers Falls Major Rehab Project

- **Project Scope:**
 - Replace three turbines
 - Rewind generators (uprate of 8%)
 - Rehabilitate all cranes, tailrace and intake gates and bulkheads.
- **Project Cost: \$72.7M (\$67.9M Customer Funded)**



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Ozark Major Rehab Project

- **Project Scope:**
 - **Replace five turbines**
 - **Replace speed increaser low speed gears**
 - **Rehabilitate the cranes, generator air coolers, water treatment, misc.**
- **Project Cost: \$125.7M**



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Turbine Rehab Onsite Work Schedule

Task Name	Duration	Start	Finish	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
OZ Unit 4	1191 days	Thu 11/15/07	Thu 6/7/12												
OZ Unit 2	747 days	Mon 4/12/10	Sat 2/16/13												
OZ Unit 3	540 days	Fri 6/8/12	Fri 6/27/14												
OZ Unit 1	482 days	Mon 2/18/13	Fri 12/19/14												
OZ Unit 5	468 days	Mon 12/22/14	Sat 10/1/16												
WF Unit 3	862 days	Wed 3/25/09	Thu 7/12/12												
WF Unit 1	484 days	Mon 6/11/12	Fri 4/11/14												
WF Unit 2	436 days	Mon 4/14/14	Fri 12/11/15												

Original Ozark Contract Completion Date: October 2012

Ozark Expected Completion Date: October 2016

Original Webbers Falls Contract Completion Date: June 2012

Webbers Falls Expected Completion Date: December 2015



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Webbers Falls Total Cost Breakdown

Turbine Rehab -	55.3
Generator Rewind -	6.0
Intake/Draft Tube Cranes –	4.0*
Rehab Two Bridge Cranes –	2.6
Intake Gates & Bulkheads -	4.0* *
New 13.8KV Breakers -	0.8*
Total -	\$72.7M

*** ARRA Funded * * Partial ARRA funded**

Cost include administration and contingency



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Webbers Falls Turbine Rehab Sub-agreement Funding

	Unit 3 (S127)	Unit 2 (S131)	Unit 1(S135)
Contracts, Modifications, Support and S&A	\$18,648,000	\$15,644,000	\$14,959,000
Est. Remaining Contract Escalation	\$100,000	\$2,097,000	\$2,061,000
Est. Credit for Misc CLINs and Metal Repair	-\$500,000	-\$500,000	-\$500,000
Est. Required S&A	\$0	\$880,000	\$880,000
Total Requirement	\$18,248,000	\$18,121,000	\$17,400,000
Contingencies	\$1,252,000	\$-221,000	\$500,000
Sub Agreement Totals	\$19,500,000	\$17,900,000	\$17,900,000

* Unit 1 Speed Increaser Work Not Included



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Webbers Additional Sub Agreements

S138 – Rewind Generators Units 1,2 & 3 = \$6.0M

Contract Awarded - \$4.96M

Coils manufactured, waiting installation.

S092- Rehab Bridge Cranes - \$2.62M

Actual Expenditures – \$2.606

Contract Complete

S088- 13.8KV Circuit Breakers - \$320K

Contract Awarded - \$787K through ARRA

S137- Misc Mech and Electrical - \$4M

Contract Awarded – \$3.56M

\$518K funded through ARRA



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Webbers Turbine Unit 3 Schedule

- Reassembly – Complete
- Dry commissioning – Complete
- 72 Hr Run Test – 12 July 12

Webbers Turbine Unit 1 Schedule

- Runner Manufacturing – 86% Complete
- Shaft Manufacturing - Complete
- Wicket Gate Manufacturing - Complete
- Disassembly – Jun 12- Sep 12
- Reassembly – Sep 13 – Apr 13
- Testing & Acceptance – Apr 14



Webbers Unit 1 Speed Increaser

Situation –

2 inch section of low speed pinion gear tooth found missing.

Inspection showed cracks in teeth on both pinions.

Result - Unit 1 out of service

Tentative Solution –

Transfer new Ozark unit 5 gear and pinions to Webbers.

Will require a new Sub-agreement to refund the Ozark cost.

Ozark unit 5 gears will be re-evaluated for replacement.



Ozark Unit 5 Low Speed Gear



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Webbers Unit 1 Speed Increaser

Budget Cost for gear and pinions- \$5.6 million

Based on current Ozark contract pricing for Unit 5 speed increaser

The blank forgings have already been purchased, at \$1.8 million per set.



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Spare Low Speed Gear Forging



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Webbers Falls Recent Major Challenges

- Tail Race Gates
- Runner Blade Strike
- Corrosion of Wicket Gates and Runner Blades
- Weld Repairs

Ozark/Webbers Falls Major Rehab



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Tail Race Gates

Problem:

- Unit testing did not flush out debris and silt in tailrace gate slots. Unit could not be unwatered to investigate blade contact.

Solution:

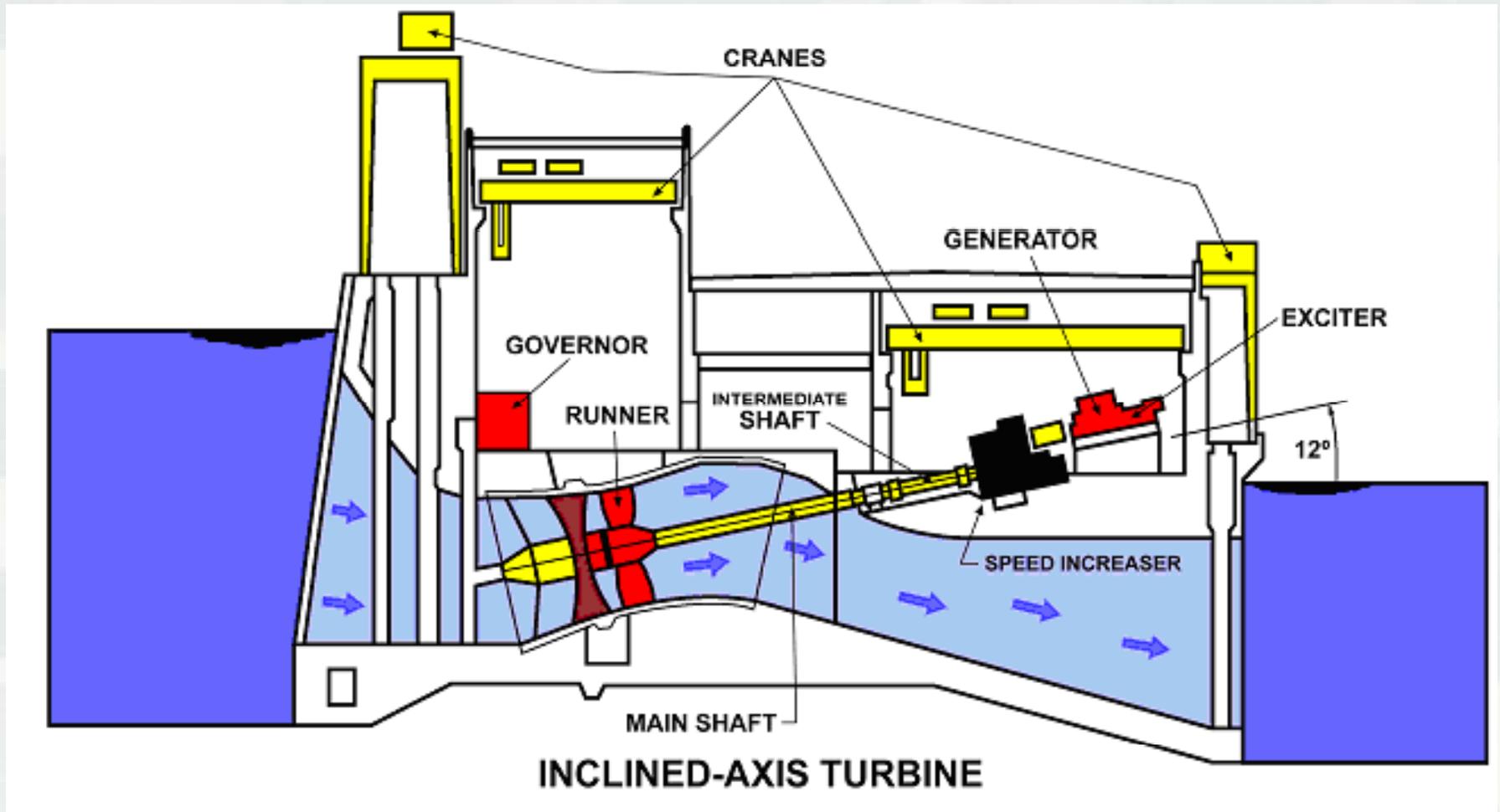
- Hydro jetting, dredging and divers were used to clean the gate slots.

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Powerhouse Intake and Tailrace Gate Slots



Runner Blade Strike

Problem: At zero pitch the blades would strike the water passage liner.

Solution: Unit 3 was un-watered and high spots in the existing stainless steel overlay were removed to allow adequate clearance between blade tip and water passage liner.

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Corrosion of Wicket Gates/Blades

Problem: Significant corrosion occurred on Ozark Unit 4 and Webbers Unit 3 prior to startup. Wicket gates were pitted, turbine blades had minor pitting.

Solution: Weld up pits in wicket gates. Passivate all stainless steel in place.

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Corrosion of New Units



Ozark/Webbers Falls Major Rehab



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Weld Repairs

Problem: During the weld repairs of corrosion damage, the wicket gates warped as a result of the heat from the welding.

Solution: The gates required re-filing to meet closure tolerances

Ozark/Webbers Falls Major Rehab



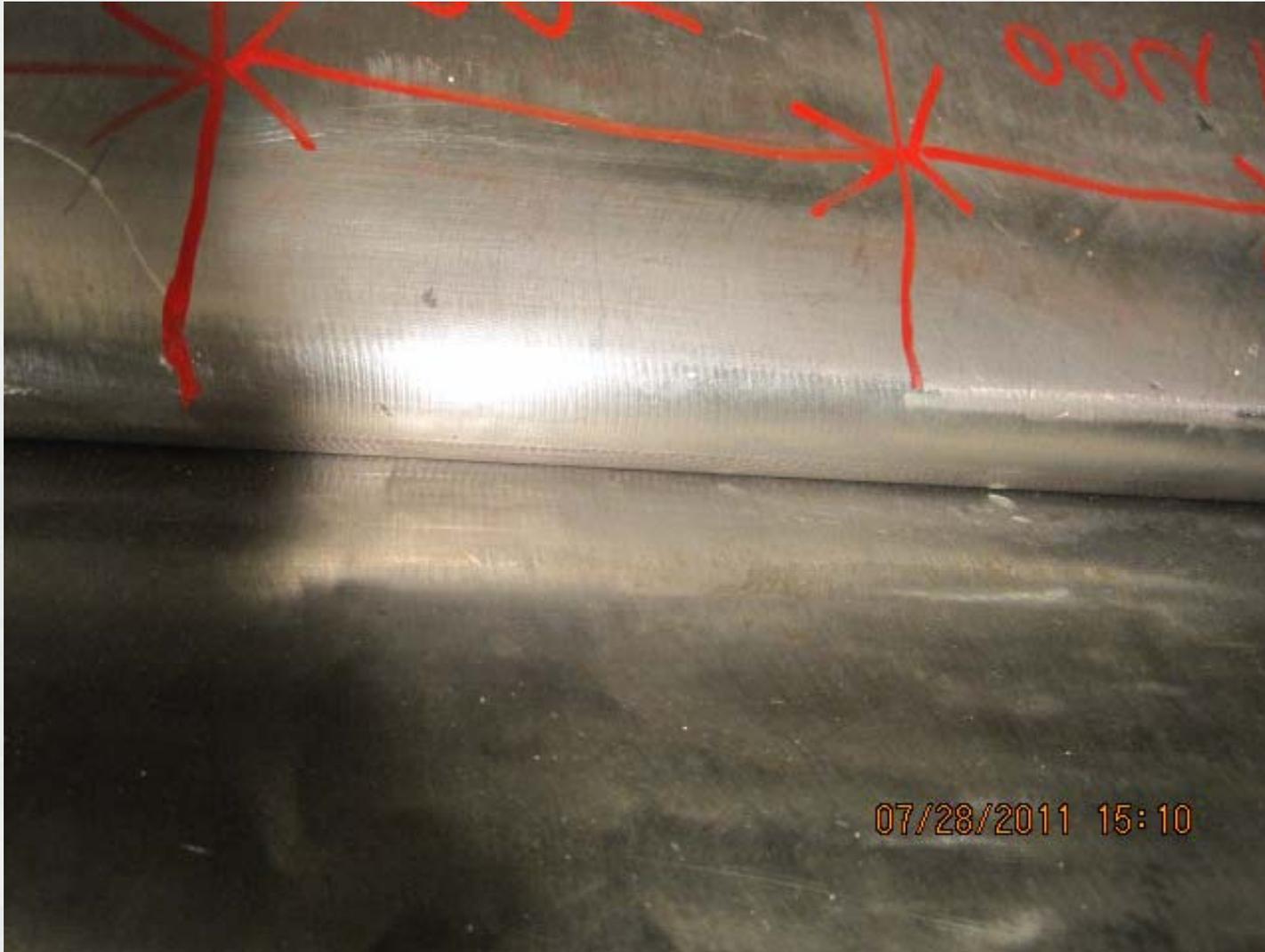
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Wicket Gate Re-filing



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Wicket Gate Clearance- 0.003"



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Ozark Funding Status

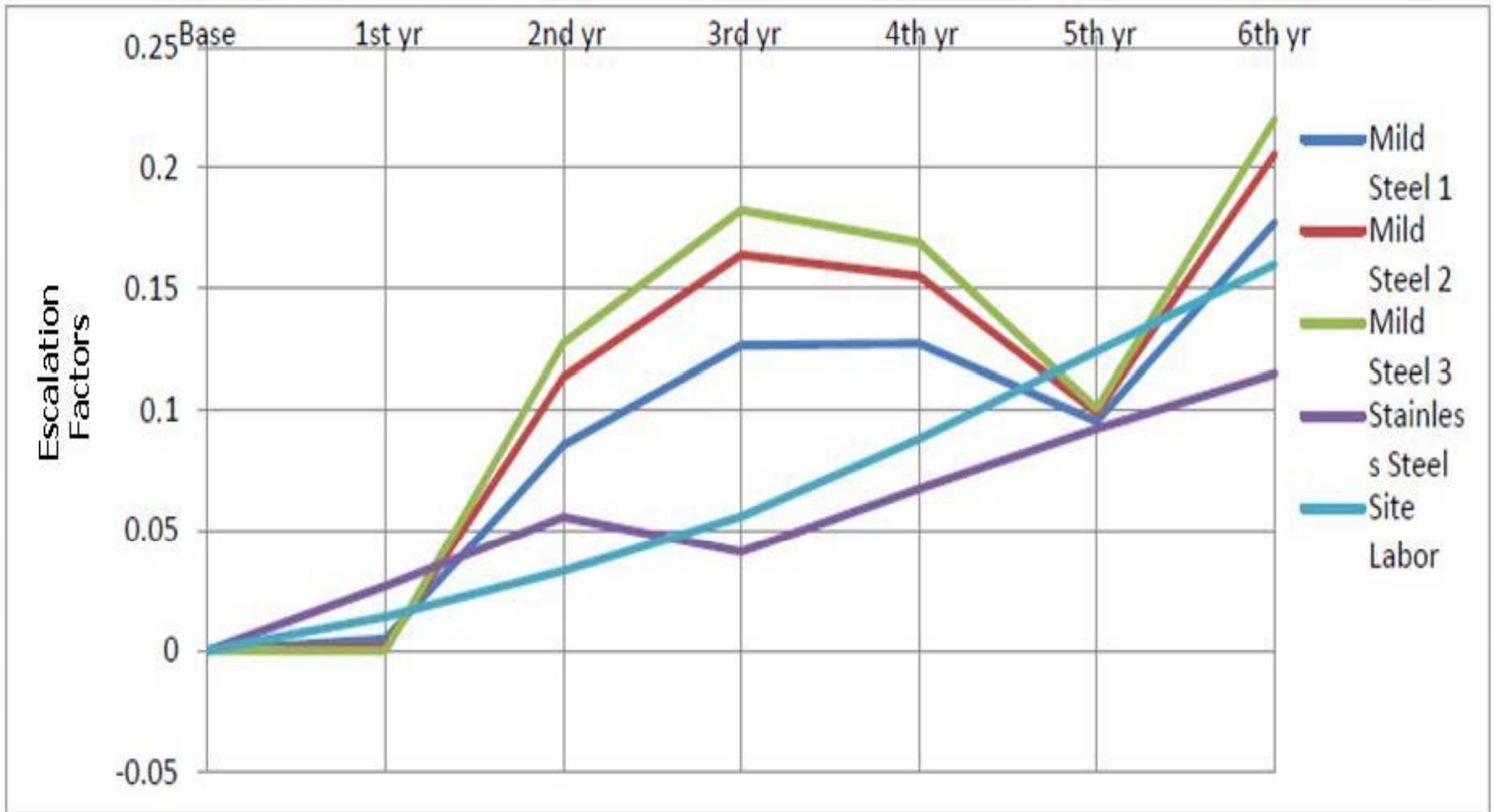
Ozark Rehab Project Estimate	\$125.7M
Cranes, Gates, Generator Coolers, Plant Prep	\$3.9M
Turbine Contract	\$97.0M
Engineering, Project Support, Contract Mgmt	\$17.6M
Remaining Escalation @18%	\$7.2M
Funding Received to Date	\$107.2M
Regular Appropriations	\$44.6M
Recovery Act Funding	\$29.7M
FY06-FY07 Customer Funding	\$20.1M
FY12 Customer Funding	\$12.8M
Balance To Complete	\$18.5M

Ozark/Webbers Falls Major Rehab



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Contract Escalation Factors



Ozark/Webbers Falls Major Rehab



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Ozark Recent Major Challenges

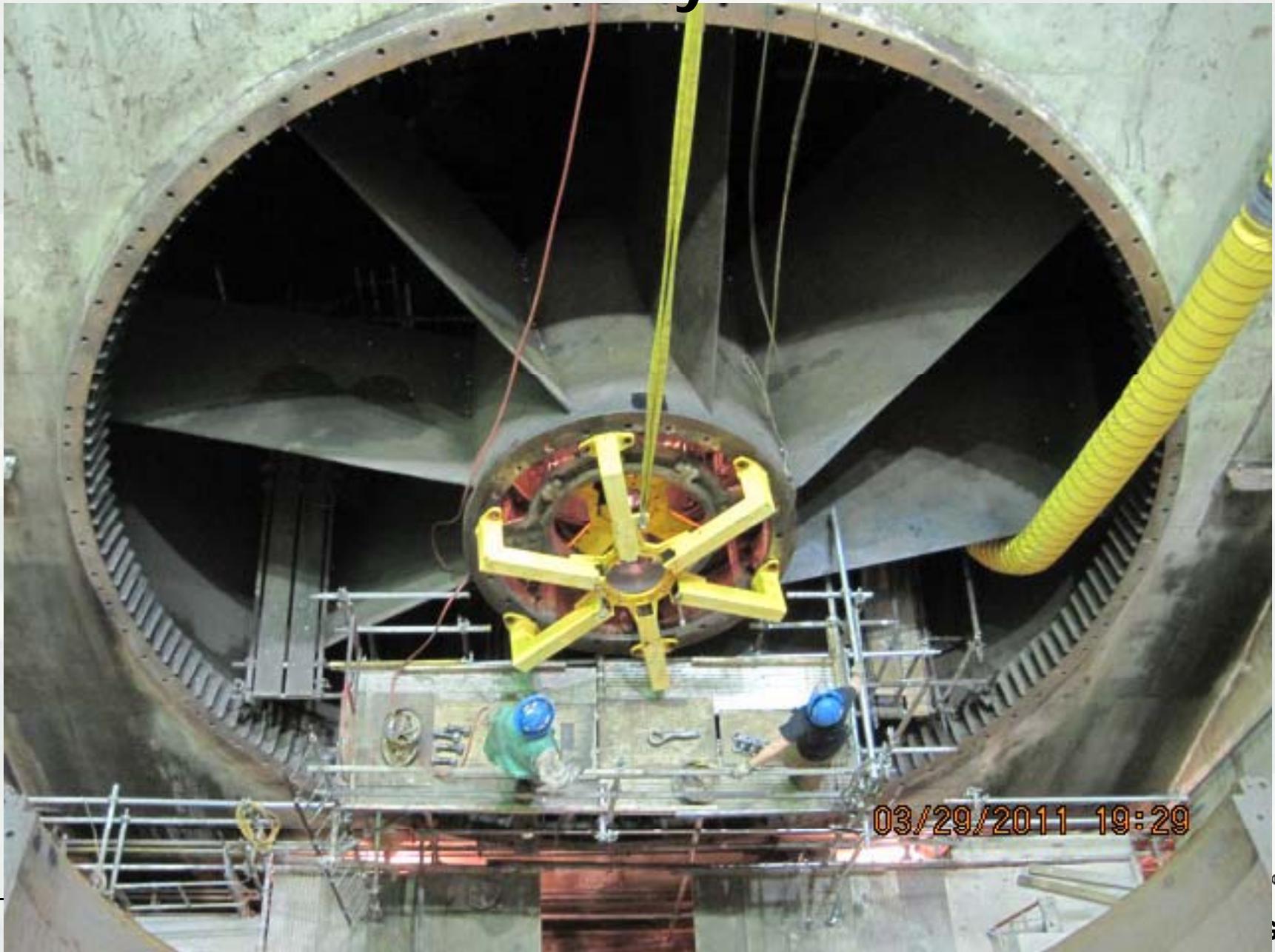
- Gate slot blockage/unit unwatering
- Unit 4 Stay Vane Crack
- Unit 2 Upper Main Shaft Crack
- Unit 4 Corrosion/Weld Repairs

Ozark/Webbers Falls Major Rehab



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Unit Stay Vanes



Stay Vane Crack – Before Repair



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Stay Vane Crack – After Repair



Ozark/Webbers Falls Major Rehab



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Ozark Turbine Unit 4 Schedule

- 72 hour run test completed on 8 June 12

Ozark Turbine Unit 2 Schedule

- Wicket Gate reassembly – Ongoing
- New upper shaft installed- 1 Sep 12
- 72 hour run test – Feb 2013

Ozark Turbine Unit 3 Schedule

- Unit unwatering starts this week
- 72 hour run test- June 2014



Ozark Unit 2 In Progress



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Questions?

