



Integrated Program Review

FY 2014 - 2015

CORPS / RECLAMATION O&M Expenses

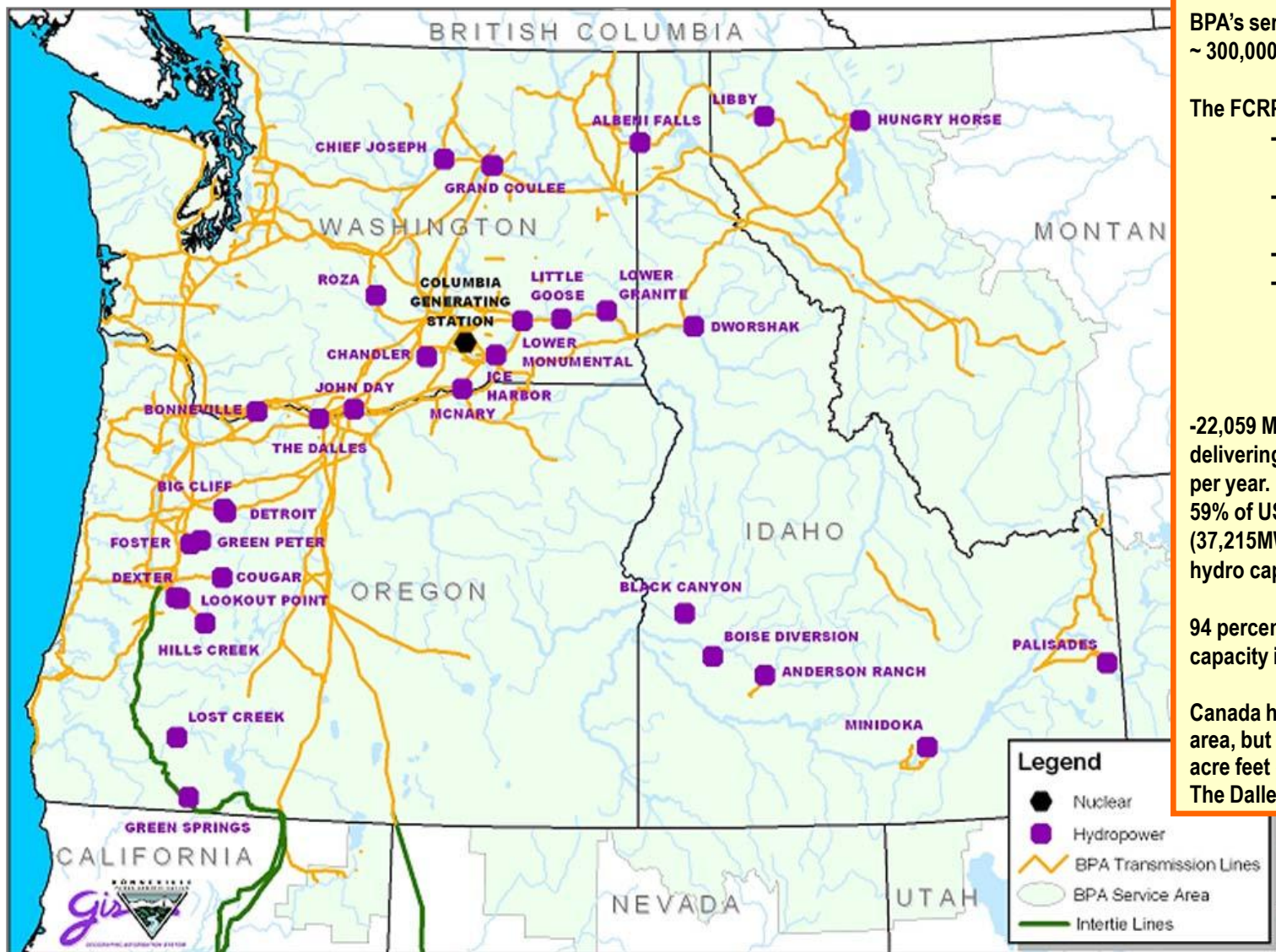
July 17, 2012

9:00 am – 12:00 pm

BPA Rates Hearing Room, 911 NE 11th Ave Portland, OR
To participate via phone dial 503-230-5566, when prompted enter
access code 4433#



Federal Columbia River Power System Generation & Transmission – System Map



BPA's service area:
~ 300,000 sq. miles

The FCRPS: 31 plants

- 21 Corps Projects (14,651 MW's)
- 10 Reclamation Projects (7,807 MW's)
- 209 turbine-generating units
- Generating units range in size from 1 MW (Boise Diversion) to 805 MW (Grand Coulee)

-22,059 MW of nameplate capacity, delivering power worth about \$4 billion per year. Note: The FCRPS is about 59% of US federal hydro capacity (37,215MW), and 29% of US national hydro capacity (74,872MW).

94 percent of the FCRPS generating capacity is in 12 projects

Canada has 15% of basin area, but provides 30% of 34 million acre feet (maf) average annual flow at The Dalles

Program Description and Strategic Objectives

■ Program Description:

- U.S. Army Corps of Engineers, Bureau of Reclamation, and BPA work together to implement funding for operations and maintenance activities, non-routine extraordinary maintenance projects, and Fish and Wildlife and Cultural Resources mitigation activities at 31 hydroelectric facilities throughout the Northwest.

■ Strategic Objectives:

- S2 FCRPS Operations & Expansion
- S7: Environment, Fish & Wildlife
- I4: Asset Management

Key Products and Outputs

■ Key Products and Outputs:

- 8,800 aMW of generation provided to the northwest valued at nearly \$4 billion.
- Reliable Generation and Transmission System Performance and Compliance with WECC/NERC Reliability Standards.
- Safe Work Environment at the Generating Facilities (Complying with new standards for Arc Flash, Lockout/Tagout, Hydraulic Steel Structure Inspections, Asbestos, Emergency Management Systems, etc.).
- Compliance with Biological Requirements for Fish Passage and Clean Water, and Cultural Resources Section 106 requirements.
- Avoids CO2 emissions
- Supports integration of wind and renewables

O&M Program Overview

■ O&M Program Overview:

- 22,059 MW of installed capacity
 - 31 generating plants (including the Pump Generating Plant at Grand Coulee).
 - 212 generating units ranging in size from 1 to 805 MWs.
- Approximately 1560 employees: salaries and benefits, and materials and supplies related costs are 70 to 75% budget.
- The O&M program includes funding for mitigation activities associated with cultural resources and fish and wildlife:
 - **About 15%** of O&M program costs are **Fish and Wildlife O&M** for screens, hatcheries, fish bypass facilities, trap and transport, etc.
 - **About 2%** of O&M program budget is for the **FCRPS Cultural Resource** program and mitigation activities associated with Section 106 compliance

O&M Program Overview (continued)

- **O&M Program Overview (continued)**
 - **About 15%** of O&M program costs are for Non-Routine Extraordinary Maintenance (NREX), the large infrequent activities associated with returning failed units to service, repairing gates and other large equipment and structures, as well as the work required for overhauling the big 805 & 600MW units in the Grand Coulee Third Powerplant. (Note: G19 & G20 600MW units will be updated to 770MW as part of the Grand Coulee Third Powerplant overhauls).
 - Other O&M budgetary components are programs for Dam Safety, Clean Water, Water Management, Employee Safety (safe work environment), Engineering Support, Contracting and other Support Services, Security.
 - The program is implementing industry best practices for O&M through independent outside peer reviews of the management, mechanical, electrical, and operational functions at the generating plants, and participating in hydro benchmarking forums.

FY 2012 FCRPS Hydro Performance Summary (Thru May)

Performance Indicator	Current Score			FY12 Strategic Performance Indicators					
	FCRPS	USBR	CORPS	Measure	Target Thresholds				
					Stretch	Mid	Minimum		
Lost Time Accident Rate (Quarterly)	1.16	0.32	1.54	Number of Lost time accidents per 100 full-time workers (100 FTE = 200,00 person-hours)		1.5	1.7	2.0	
Generation System Reliability	100.0%	100.0%	100.0%	Maintain the reliability of the Federal Columbia River Power System's generators by: (1) no "high risk factor" violation with a "high" or "severe" violation severity level (level 3 or more); (2) 100 percent of submitted WECC approved mitigation plan and related milestones are completed as scheduled.		100%	N/A	N/A	
O&M expenditure rate	93.2%	81.9%	99.1%	Actual O&M expenses divided by planned O&M expenses for the latest Annual Power Budget		94%	96%	100%	
Capital Expenditure Rate	88.8%	66.5%	105.2%	End of Year Expenditures divided by Start of Year Budget (Large Capital only)		95%	90%	85%	
Planned Generation Capacity Part A	101.5%	106.4%	99.5%	Actual Generation Capacity (between the hours of 7am and 10pm) divided by Planned Generation Capacity.		98%	N/A	N/A	
Planned Generation Capacity Part B	74.6%	82.5%	70.8%	The percentage of projects from Part A within the Bandwidth of (98% - 105%) - (Capacity weighted and expressed as a %)		75%	66.7%	58.3%	
Performance Indicator	Current Score			FY12 Tactical Performance Indicators					
	FCRPS	USBR	CORPS	Measure	Target Thresholds				
					Stretch	Mid	Minimum		
Incremental Efficiency Gains	On Track		On Track	Number of new runners installed and units returned to service at Chief Joseph. *Estimated return to service date: Chief Joseph - Units 13 & 14: 9/30/2012.		Corps	2	1	N/A
Cultural Resources Stewardship: Part A	On Track		On Track	Number of APE inventory plans & schedules developed/defined to address inventory gaps for the FCRPS cultural resource program. * Performance results are EOY based. See Cultural Resources Program detail page for interim status		Corps	12	8	6
	On Track	On Track				REC	2	1	N/A
Cultural Resources Stewardship: Part B	On Track		On Track	Program Planning and Execution: All PMs submit all contract documents to their respective contracting offices. Corps/BPA- All FY12 Documents; Reclamation/BPA All FY13 Documents. * Performance results are EOY based. See Cultural Resources Program detail page for interim status		Corps	3 Districts	2 Districts	1 District
	On Track	On Track				REC	1	1	N/A
Performance Indicator	Current Score			FY12 Operational Performance Indicators					
	FCRPS	USBR	CORPS	Measure	Target Thresholds				
					Stretch	Mid	Minimum		
Weighted Availability Factor	76.4%	64.9%	82.4%	Sum of all Available hours divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)		82.5%	80.0%	77.5%	
Forced Outage Factor	4.36%	0.72%	6.23%	Sum of all hours experienced during Forced Outages divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)		1.9%	2.5%	3.1%	
Critical Preventive/predictive	95.4%	92.7%	96.3%	Completion rate for critical planned work on critical equipment		98%	90%	85%	
PM Completion Rate	88.6%	82.3%	95.0%	Percentage completed during a reporting period.		90%	85%	80%	
Completion of Work	82.2%	89.3%	74.8%	Simple ratio of open to closed work orders: Measured by a rolling 365 day time frame.		90%	83%	75%	
Operations coordination	97.9%	98.6%	97.8%	Percentage of participation in weekly operations coordination meetings		100%	95%	90%	
Fish Screen Reliability	86.6		86.6	Total Unit hours forced out of service by fish related issue's.		COE Only	250	350	450
HydroAMP (Quarterly) Powertrain & Ancillary	35.7%	28.2%	37.0%	Powertrain & Ancillary component assessments are performed according to maintenance schedule, and data is periodically entered into the FCRPS hydroAMP database. Critical ancillary equipment is identified at each plant, assessments are completed on those identified as "Critical", and are updated in the FCRPS hydroAMP database by the end of the fiscal year.		100% Powertrain & Ancillary	N/A	N/A	
Performance Indicator	Current Score			Other Performance Data					
	FCRPS	USBR	CORPS	Measure	Target Thresholds				
					Stretch	Mid	Minimum		
Capital Milestone completion rate	81.6%	76.5%	82.3%	Identification and tracking of significant milestones for each investment activity during the current fiscal year. % of completion dates met (at or before the scheduled milestone dates).		95%	85%	75%	

Historical & Current Year (FY 2012) Availability & Critical PM Data (Through May)

	Performance Indicator	FY06	FY07	FY08	FY09	FY10	FY11	Current YTD	Measure	Weighted Industry Avg
FCRPS	Scheduled Outage Factor	12.62%	13.82%	11.48%	12.44%	15.40%	17.90%	19.19%	Sum of all hours experienced during Scheduled Outages divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	12.03% *
	(% Capital)	4.9%	5.5% **	2.99% **	3.13% **	3.58%**	6.57%**			
	Availability Factor	85.7%	82.2%	84.6%	84.9%	82.5%	79.7%	76.4%	Sum of all Available hours divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	85.6%*
	Forced Outage Factor	2.70%	3.78%	3.91%	2.50%	2.13%	2.33%	4.36%	Sum of all hours experienced during Forced Outages divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	2.37%*
	Critical Preventive/predictive maintenance rate	N/A	N/A	95.3%	92.7%	94.5%	94.8%	95.4%	Completion rate for critical planned work on critical equipment	N/A
RECLAMATION	Scheduled Outage Factor	13.6%	13.4%	13.7%	19.7%	23.0%	30.7%	34.4%	Sum of all hours experienced during Scheduled Outages divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	12.03% *
	(% Capital)	4.1%	3.7%**	3.53%**	3.92%**	4.45%**	11.13%**			
	Availability Factor	84.2%	81.8%	85.2%	78.9%	76.1%	68.2%	64.9%	Sum of all Available hours divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	85.6%*
	Forced Outage Factor	2.18%	4.77%	1.03%	1.42%	0.87%	0.97%	0.72%	Sum of all hours experienced during Forced Outages divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	2.37%*
	Critical Preventive/predictive maintenance rate	N/A	N/A	99.0%	99.1%	97.3%	93.0%	92.7%	Completion rate for critical planned work on critical equipment	N/A
CORPS	Scheduled Outage Factor	12.2%	14.1%	10.3%	8.7%	11.50%	11.34%	11.41%	Sum of all hours experienced during Scheduled Outages divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	12.03% *
	(% Capital)	5.3%	6.5% **	2.72%**	2.72%**	3.13%**	4.23%**			
	Availability Factor	84.6%	82.4%	84.3%	88.1%	85.7%	85.7%	82.4%	Sum of all Available hours divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	85.6%*
	Forced Outage Factor	3.2%	3.6%	5.4%	3.1%	2.78%	3.03%	6.23%	Sum of all hours experienced during Forced Outages divided by Period Hours (Capacity Weighted: plant level=unit capacity weighted, District/Partner/FCRPS=plant capacity weighted)	2.37%*
	Critical Preventive/predictive maintenance rate	N/A	N/A	91.5%	91.6%	91.7%	95.3%	96.3%	Completion rate for critical planned work on critical equipment	N/A

** FY05-09 data taken from Fast Facts**

* Industry Average data taken from GADS report. 2006-2010 Generating Unit Statistical Brochure- Units Reporting Events* Weighted Factors.

O&M Program FY 2014-2015 Program Objectives

■ FY 2014-15 O&M Program Objectives:

- Low cost power, reliable power, trusted stewardship:
 - *“Through Operational Excellence, operate and maintain the hydro generation system to maintain reliability and availability while making reliability investments, in preparation for the Grand Coulee Third Power Plant overhauls”.*
 - ✓ *Operational Excellence Initiatives*
 - *Five Year Forecast for Availability: Working to refine understanding of system performance given required routine maintenance, non-routine maintenance, and long term capital investments across the generating facilities*
 - *Power Operations and Maintenance Peer Reviews*
 - Continue to address our Cultural Resources and Fish and Wildlife mitigation responsibilities to enable us to realize the benefits of the low cost hydropower system.

O&M Program FY 2014-2015 Spending Drivers

- **FY 2014-15 O&M Program Spending Drivers:**
 - Cultural Resources:
 - The budget has been flat with no inflation adjustment for 15 yrs (since original SOR agreement). Program requirements for Section 106 compliance have increased in FY 2012 as a result of the program transitioning from inventorying sites to evaluation and mitigation activities.
 - WECC/NERC Reliability Compliance:
 - The program continues to see new standards/requirements, especially Critical Infrastructure Protection (CIP) for cyber security.

O&M Program FY 2014-2015 Spending Drivers

- WECC/NERC Reliability Compliance (continued):
 - Audits:
 - Reclamation internal audit completed February 2012.
 - NWS in April 2013, NWP in August 2013, NWW 2014.
 - Independent estimates for additional costs for audits yielded \$600k per district due to increased man hours, travel, etc.
 - What is the source for the additional manpower needs to support the audit, estimated 200 weeks for a single district.
 - Three districts and HDC will be supporting each other leading up to and assisting with the audits.

O&M Program FY 2014-2015 Spending Drivers

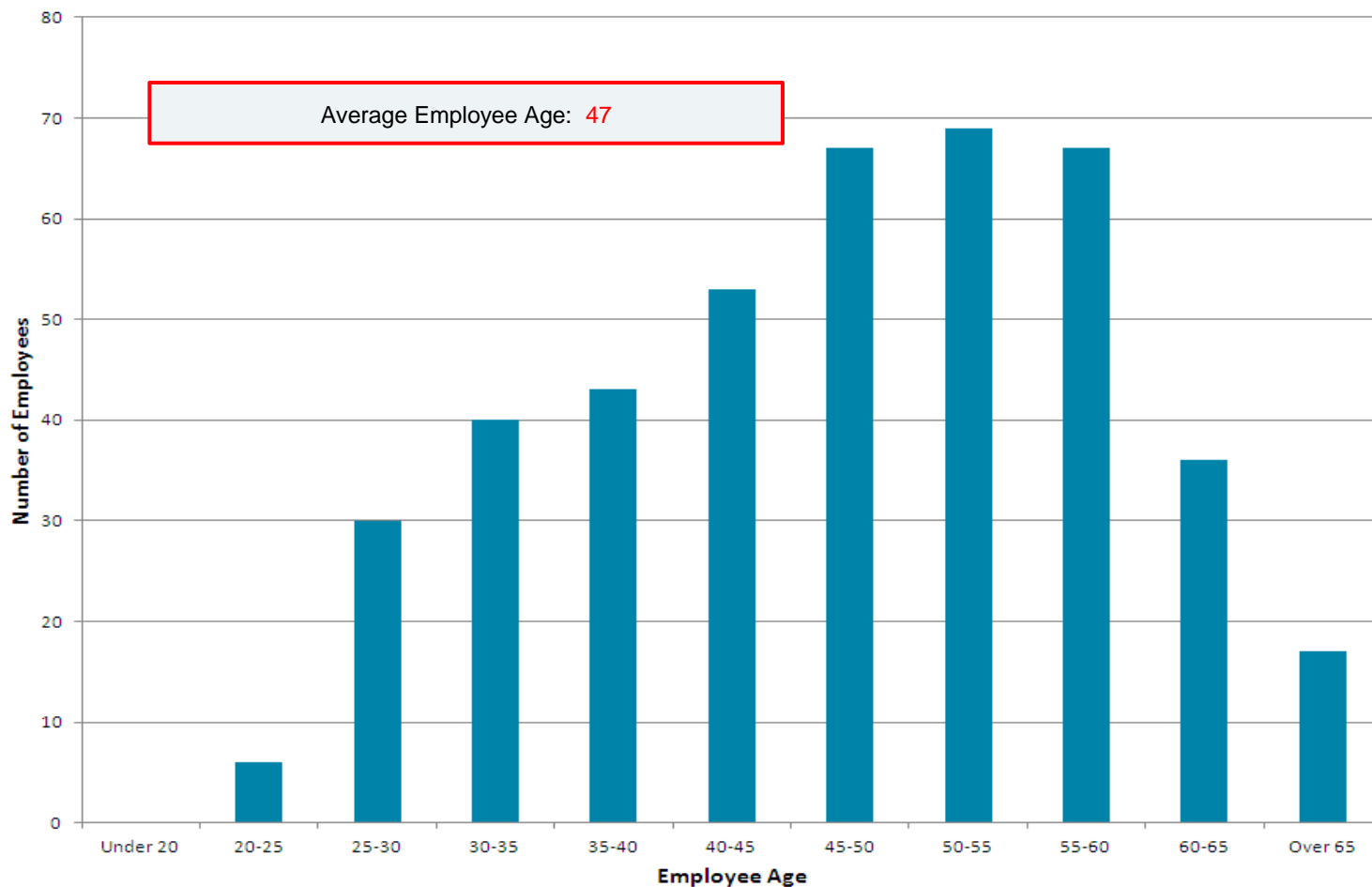
- WECC/NERC Reliability Compliance (continued): *Other issues ...*
 - FISMA (Federal Information security Management Act) training, data calls, staffing needs, etc... for SCADA systems (GDACS – Generic Data Acquisition and Control System).
 - Critical Infrastructure Protection (CIP) requirements, which focus primarily on Cyber Vulnerabilities, has doubled past workload and we expect Testing and Documentation to Increase:
 - NERC CIP standards are evolving and will involve all plants (including the Willamette Valley) in roughly the next two years; 5 of 12 GDACS plants currently have major NERC CIP requirements (Cyber Security).
 - Currently, HDC is performing the Cyber Security tasks associated with the CIP requirements (excluding physical security systems tasks) for NWS, NWW, NWP, and Reclamation. This support will require additional (1 to 3) FTE.
 - Additional coordination and agreements needed between BPA and the Corps, and BPA and Reclamation.
 - Inter Control Center Protocol (ICCP), 3 Agency Non-Disclosure, etc...

O&M Program FY 2014-2015 Spending Drivers (continued)

- FY 2014-15 O&M Program Spending Drivers: (continued)
 - Staffing/Salaries:
 - The Corps and Reclamation are adding staff at several projects (GCL, CHJ, JDA, TDA and others) to improve maintenance and operating performance (i.e. for WECC/NERC, dam and employee safety, completing critical maintenance, managing forced outages and trouble reports, etc.), as well as planning for retirements (adding staff to Trades & Craft training and Engineering CO-OP programs). Also note, over the past 5 years, T&C employees raises have ranged from 3.5 to 5.2%, above the 3% used in budget forecasts.
 - Also, staffing was increased over the 2012-2013 rate period, including the positions associated with increased WECC/NERC reliability and cultural resources requirements noted above.
 - A staffing review of practices and requirements at Grand Coulee was completed in April 2012. The review was conducted by an outside contractor.

Age Profile at Grand Coulee

- Aging Workforce:



- Age profile per Grand Coulee is consistent with age profile across the FCRPS.

O&M Program FY 2014-2015 Spending Drivers (continued)

- FY 2014-15 O&M Program Spending Drivers: (continued):
 - Non-Routine Extraordinary Maintenance (NREX):
 - Aging infrastructure: Average unit age of 48 years, with balance of dam infrastructure as old or older.
 - \$300 million plus in NREX currently accounted for during the 2010-2017. Upcoming work is mostly associated with unit reliability, water control, cranes, and dam infrastructure (some of which are joint items that require matching appropriations).
 - Seeing large costs associated with repairing failed generating units across system and significant NREX requirements for spillway gates, penstock tubes, cranes, etc.
 - ✓ Note: NREX costs for returning failed units to service are usually recovered quickly. For example, the Chief Joseph unit 21 failure cost \$3 million to repair, while the value of generation from unit 21 is \$6.8 million/yr. Bonneville unit 11 estimated repair cost is approximately \$8 million over 4 years, while the value of generation over the same period is \$10.5 million. Grand Coulee G19 repair cost \$500 thousand, while the value of the lost capacity would be ~\$4 million per year.

O&M Program FY 2014-2015 Spending Drivers (continued)

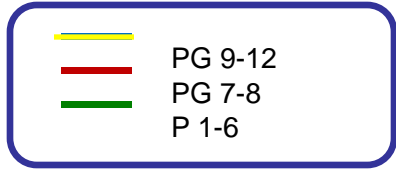
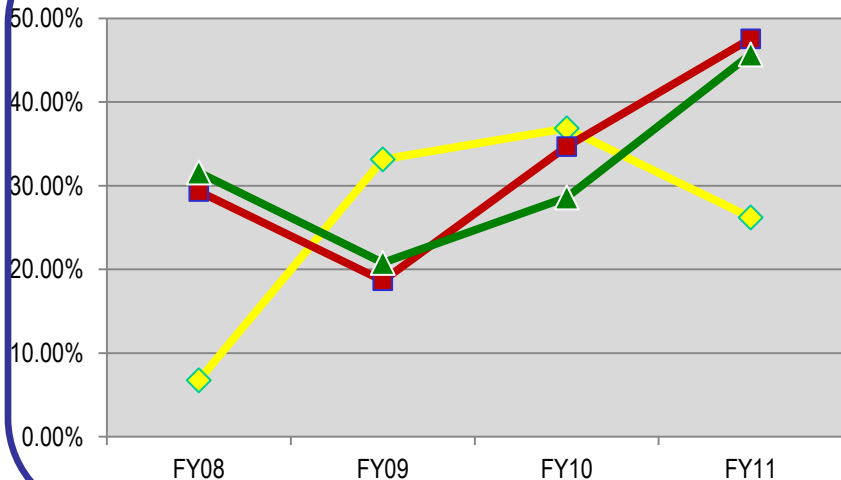
- FY 2014-15 O&M Program Spending Drivers: (continued):
 - Non-Routine Extraordinary Maintenance (NREX): (continued):
 - From 2007 through 2009 the Forced Outage Rate has averaged 3.13 for the system, and we experienced several long term unit outages as noted above. Note, industry average is 3.6 for the 2007 – 2008 period (2009 average is not yet available).
 - Costs for the GCL 3rd Powerplant Overhaul increase from FY 2011 thru 2017 since contract award. This project is the biggest driver in NREX expenses.
 - Appropriated Expenses:
 - This amount is variable and depends on priorities in the Appropriations, but needs to be covered as an in-year expense. An example of this type of cost would be an emergency repair of a joint project feature associated with the dam structure that congress makes a high priority. For example, in 2009 the Corps had \$5.9M in appropriated expenses and accounting cost reversals that had to be incorporated into the program that year.

HydroAMP Equipment Condition Ratings Example, John W. Keys III PG Plant

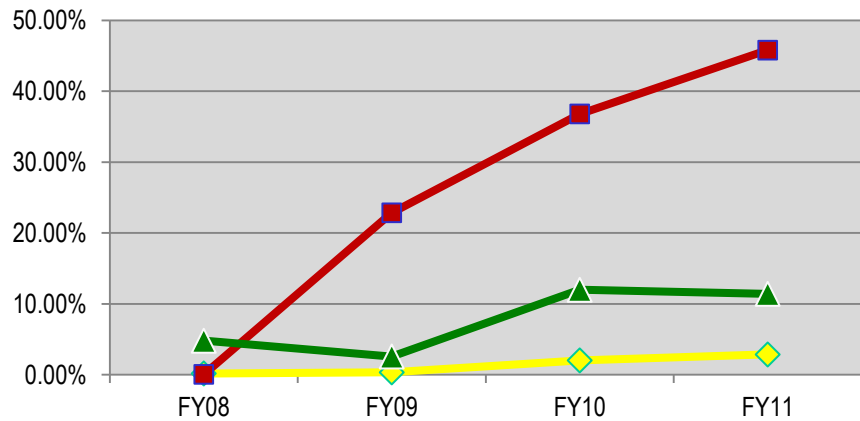
- P1 through P6
 - P1-P6 Exciters – 3.5 (Marginal)
 - P5 and P6 Turbine – 6.2 (Fair)
 - P5 and P6 Generator Stator – 5.3 (Marginal)
- PG7 through PG8
 - PG7-PG8 Exciters – 4.6 (Marginal)
 - PG7-PG8 Governors – 3.5 (Marginal)
 - PG7-PG8 Circuit Breakers – 5.6 (Marginal)
- PG9 through PG12
 - PG9-PG12 Exciters – 5.6 (Marginal)
 - PG9-PG12 Governors – 7.8 (Fair)
 - PG9-PG12 Circuit Breakers – 5.6 (Marginal)
- KP10B Transformer – 4.9 (Marginal)

John W. Keys III PGP Outages (FY08-FY11)

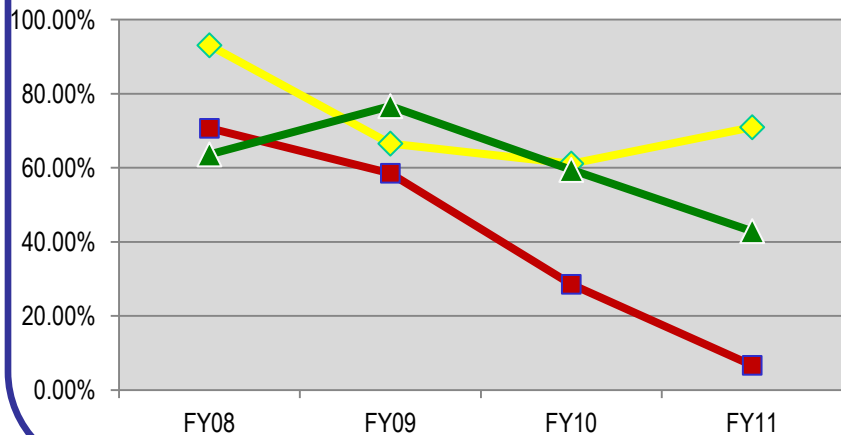
Forced Outage Factors



Scheduled Outage Factors



Availability



HydroAMP Equipment Condition Ratings Example, John W. Keys III PG Plant

- Majority of equipment is past its' useful life – reflected in large number of HydroAMP ratings.
- Requires more frequent maintenance, both routine and non-routine.
- Creates a situation of reacting to unplanned forced outages, requiring additional staff.



B O N N E V I L L E P O W E R A D M I N I S T R A T I O N

John W. Keys III PGP Modernization Base Case Projects

- Projects identified as “Base Case”:
 - Transformer KP10B and Disconnect Switches Replacements (KP10A and KP10B)
 - PG7-PG12 Circuit Breaker Replacements
 - Phase Reversal Switches Replacements
 - P5 and P6 Impellers and Stator Core Replacements, Rewinds
 - P1-PG12 Exciters, Protective Relays, Unit Controls Replacements, and PG7-PG12 Governor Replacements
- Estimated total cost approximately \$90 million, completion in FY 2021.



FY2014-2015 Corps and Reclamation O&M IPR Program Funding Levels



FY 2011 Routine O&M Expense Cost by Category

Materials & Supplies:

Non-capitalized supplies of bolts, nuts, materials, and parts used in the construction, repair, or production of supplies, equipment, building and other structures, etc. used in the day-to-day operations of the facilities.

Materials & Supplies

\$19,672,000

7%

Other

\$14,618,000

5%

Other:

Utilities, travel, equipment rental, rental space, etc.

Support Services & Contracts

\$65,562,000

23%

Support Services and Contracts:

Fish transport contracts, guard services, water management, professional and technical services, buildings and grounds maintenance, etc.

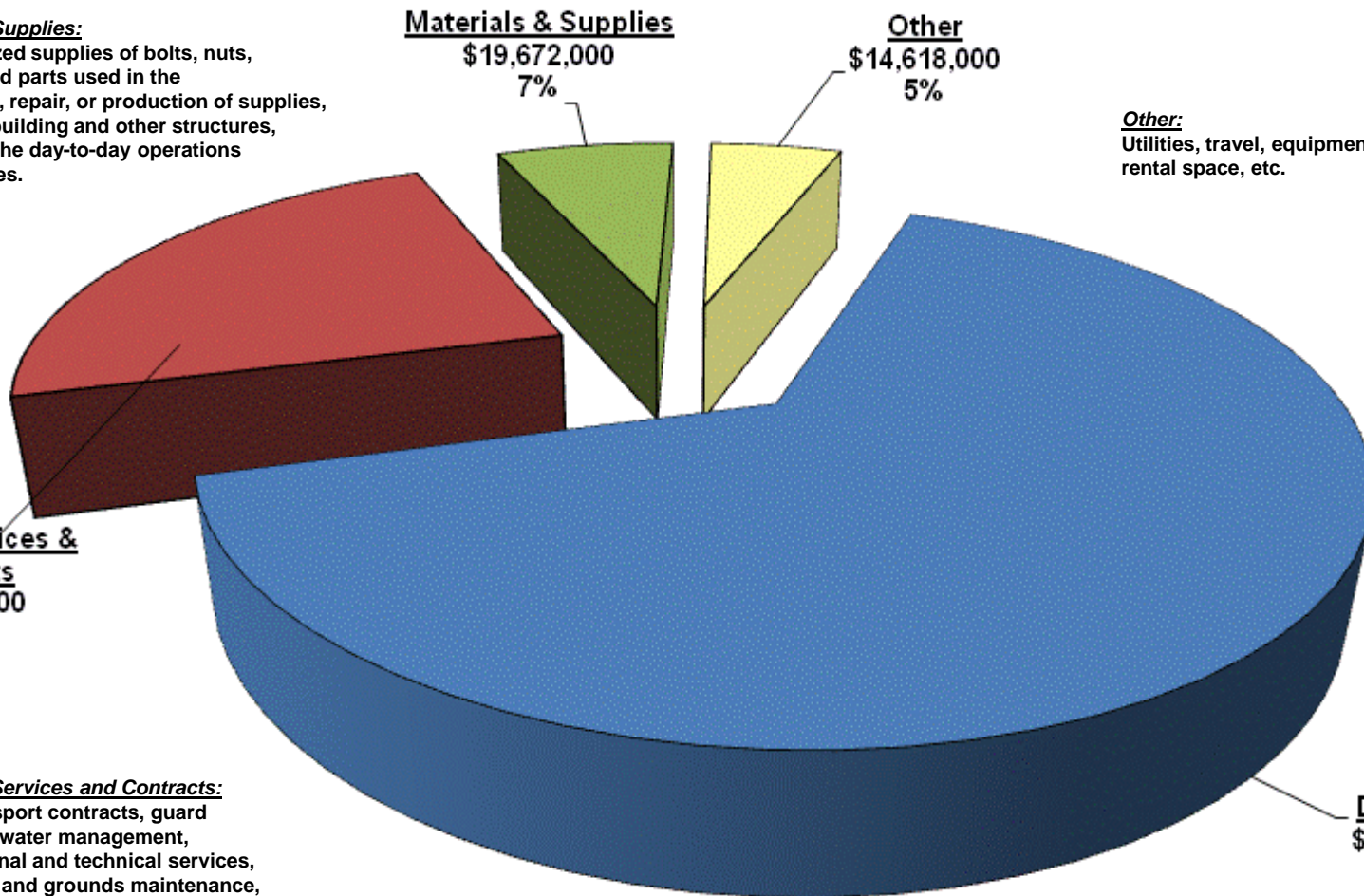
Direct Labor

\$186,933,000

65%

Direct Labor

Salaries and Benefits and indirect overhead labor, Regional and Area office administrative staff costs for legal, payroll, IT, finance, etc.



Corps FY 2014-15 O&M Program Funding Levels

	FY 2012		FY 2013		FY 2014		FY 2015	
	Rate Case	Forecast	Target	Proposed	Target	Proposed	Target	Proposed
WP-10								
BP-12/2010 IPR	\$208,700	\$207,175		\$215,700		\$231,187		\$237,378
2012 IPR			\$215,700	\$215,700	\$215,170	\$231,187	\$219,218	\$237,378

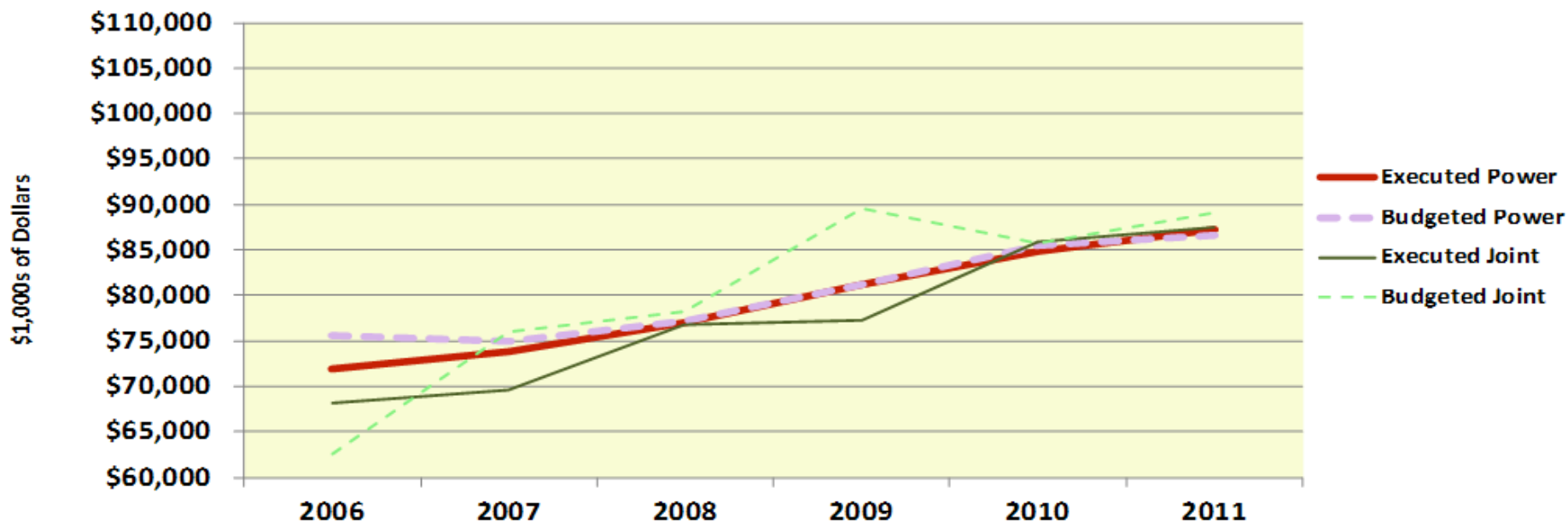
■ Corps Baseline Budgeting Process:

- Establish the minimum funding level required for routine Power and Joint Programs at Hydropower Projects, no contingencies are built in.
- Provide justification for the budget request for BPA's Integrated Program Review.
- Informs the Annual Power Budget Development for subsequent fiscal years.
- Provides a common platform to construct and compare budgets across the FCRPS.
- Provide a consistent and uniform approach for Corps' budgets.
- Do Not address non-routine or cyclical, non-annual needs of less than \$250 thousand.

CORPS Budget Accuracy

- Since 2010 the Corps' budget has been established by a baseline budgeting process.
- One of the goals of this process is to more accurately predict our minimum budget – Request what we need and execute what we request.
- Expected FY 2012 expenditures are consistent with our FY 2010-11 performance

USACE Routine Expense Execution



Corps Operations and Maintenance Expense Budget For FY 2014-19

FY	Budget	WECC/ NERC	Cultural Resources	NREX	Drawings	Base Program	Appropriat ed Expenses
2011	\$192,433,000	\$3,000,000	\$2,500,000	\$14,000,000	\$1,000,000	\$171,433,000	\$500,000
2012	\$214,000,000	\$4,000,000	\$5,055,000	\$18,000,000	\$2,000,000	\$184,445,000	\$500,000
2013	\$221,000,000	\$4,120,000	\$5,206,650	\$18,000,000	\$2,060,000	\$191,113,350	\$500,000
2014	\$231,187,000	\$4,243,600	\$5,207,250	\$18,000,000	\$2,121,800	\$201,114,350	\$500,000
2015	\$237,378,000	\$4,370,900	\$5,286,820	\$18,000,000	\$2,185,500	\$207,034,780	\$500,000
2016	\$243,885,000	\$4,502,000	\$5,368,770	\$18,000,000	\$2,251,000	\$213,263,230	\$500,000
2017	\$250,981,000	\$4,637,000	\$5,453,190	\$18,000,000	\$2,319,500	\$220,071,310	\$500,000
2018	\$258,510,000	\$4,776,200	\$5,616,780	\$18,000,000	\$2,388,100	\$227,228,920	\$500,000
2019	\$266,266,000	\$4,920,000	\$5,785,280	\$18,000,000	\$2,459,700	\$234,601,020	\$500,000

CORPS Budget Drivers

- Aging Equipment and Infrastructure:
 - 27% of all equipment has exceed its design life
 - 22% of all equipment has a 'marginal' or 'poor' condition
 - Average hydroAMP ratings continued to decline from FY 2007-11
 - Old equipment in marginal or poor condition requires more routine maintenance to keep it running reliably
 - NREX budget need has progressively increased in recent years

- Increasing Requirements:
 - WECC/NERC Compliance
 - Post 9/11 Security
 - Cultural Resource Mitigation
 - BiOp Requirements

- Aligning Staffing to Meet Changing Needs

- Capable Workforce

FY 2014-2015 Summary of CORPS FTE & Labor

- Corps staffing increases approved in the 2010 IPR for the FY 2012-13 budget are in progress.

- In the 2012 IPR for the FY 2014-15 budget, an additional 4 FTE were identified to bring John Day's staffing and management in line with hydropower industry standards (Note that John Day's project management separated from The Dalles in 2009):
 - Environmental Compliance and Safety Coordinator
 - Maintenance Control Technician
 - 2 Power Plant Trainees

Note that no staffing increases were planned during the FY09-10 and FY10-11 periods.

FY 2014-2015 Summary of CORPS FTE & Labor (cont.)

- Labor costs account for 2/3 of the annual budget.
- Historically, budget increases for wages haven't kept up with inflation.
- Even with the wage freeze, General Schedule wages across the Corps are increasing about 1.5% per year due to step increases.
- Labor costs will likely increase when Federal Wage freeze is lifted due to adjustment to regional prevailing wage levels (Reclamation T&C wages were not frozen).

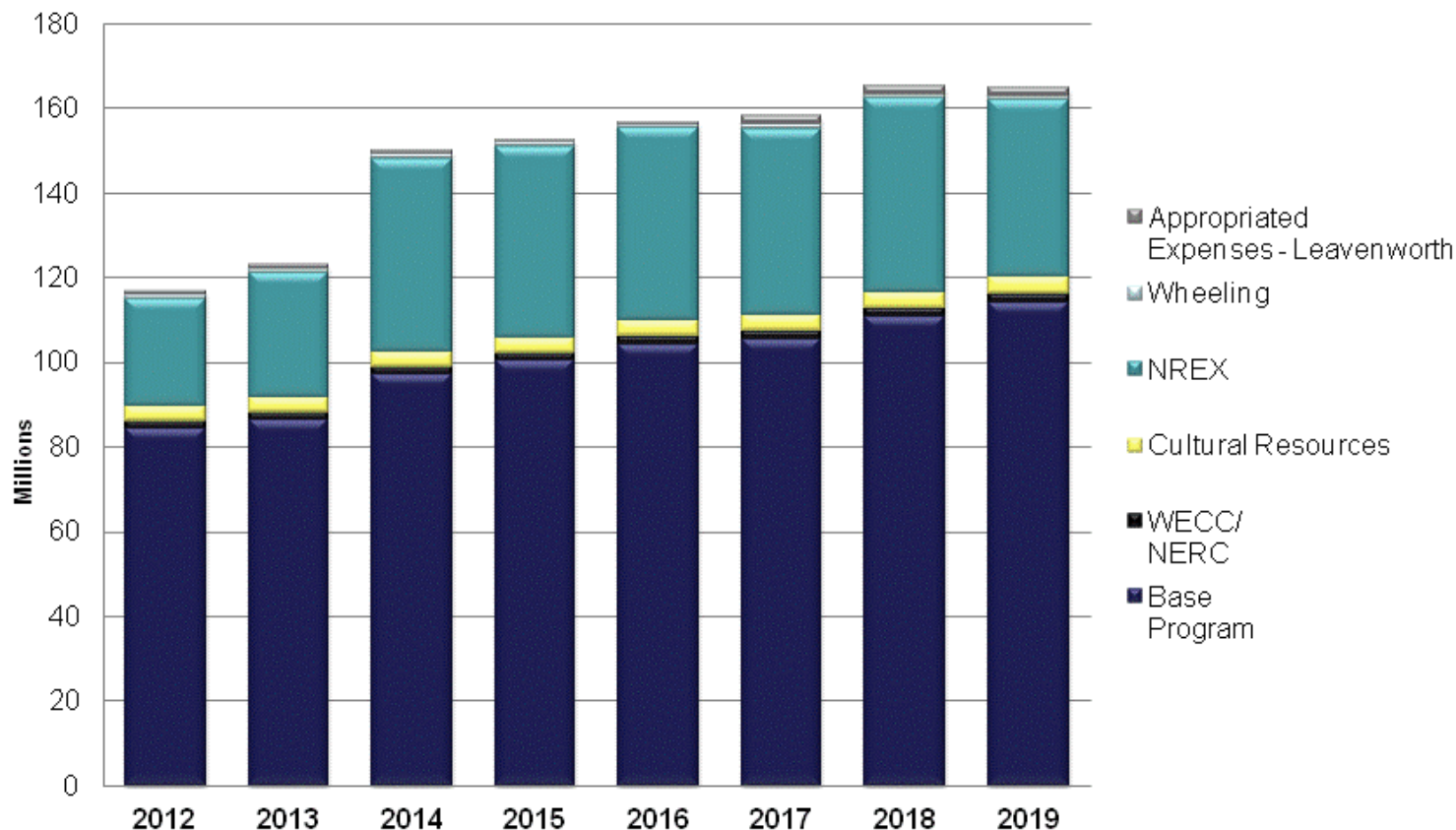
Risks – Other Potential CORPS Funding Needs

- NREX:
 - Current FY 2012 -13 NREX Budgets are almost fully committed
 - \$8 million already committed in FY 2014
 - JDA runner linkage and BON2 generator problems represent significant risk, rather than increase the NREX budget, the Corps is accepting the risk to work these potential costs into our requested budget. *These are discussed in detail later in the briefing.*
- Salaries:
 - The Corps has built in a yearly 3.5% increase for salaries, if the wage freeze is lifted there may be a significant pay adjustment for many employees that exceeds this.
- Federal Information Security Management Act:
 - Recent DoD IG Audits may lead to additional requirements
- USACE Commitment to Environmental Stewardship:
 - Albeni Falls fish passage
 - Willamette BiOp
 - Fish Hatcheries
- Aquatic Nuisance Species (zebra and quagga mussels)

Reclamation Operations and Maintenance Expense Budget For FY 2014-2019

	FY 2012		FY 2013		FY 2014		FY 2015	
	Rate Case	Forecast	Target	Proposed	Target	Proposed	Target	Proposed
WP-10								
BP-12/2010 IPR	\$111,972	\$111,972		\$119,891		\$118,972		\$123,246
2012 IPR			\$119,891	\$119,891	\$115,443	\$150,101	\$117,615	\$152,533

Bureau of Reclamation



Reclamation Operations and Maintenance Expense Budget For FY 2014-2019

FY	Budget	WECC/ NERC	Cultural Resources	NREX	Wheeling	Base Program	Appropriated Expenses - Leavenworth
2012	\$113,672,000	\$ 1,780,000	\$3,469,000	\$25,305,000	\$1,000,000	\$ 81,276,000	\$ 842,000
2013	\$121,591,000	\$ 1,814,000	\$3,536,000	\$29,521,000	\$1,000,000	\$ 84,722,000	\$ 998,000
2014	\$150,101,000	\$ 1,767,000	\$3,645,000	\$45,502,000	\$1,000,000	\$ 97,262,000	\$ 925,000
2015	\$152,533,000	\$ 1,813,000	\$3,758,000	\$45,024,000	\$1,000,000	\$100,438,000	\$ 500,000
2016	\$156,818,000	\$ 1,860,000	\$3,874,000	\$45,260,000	\$1,000,000	\$104,278,000	\$ 546,000
2017	\$158,121,000	\$ 1,913,000	\$3,893,000	\$43,902,000	\$1,000,000	\$105,413,000	\$ 2,000,000
2018	\$165,297,000	\$ 1,968,000	\$4,011,000	\$45,586,000	\$1,000,000	\$110,732,000	\$ 2,000,000
2019	\$164,822,000	\$ 2,023,000	\$4,133,000	\$41,610,000	\$1,000,000	\$114,056,000	\$ 2,000,000

Reclamation Operations and Maintenance Expense Budget For FY 2014-2019 - Drivers

- Grand Coulee and Hungry Horse Staffing Increases
- Trades and crafts employee received raises of 4.9 % (FY 2009) to 3.0 % (FY 2011) and received raises of 3.5% for FY 2012 and FY 2013
- Since the trades and crafts employees were covered by a collective bargaining agreement which was in effect on the date of the Presidential memorandum, they were not affected by the pay freeze.
- This agreement requires that increases be based on a negotiated methodology which requires the surveying (8 Utilities) of prevailing wage rates in the region to determine pay increases.
- About 60% of Reclamation employees are trades and crafts in base program
- NERC/WECC:
 - Electric Reliability Compliance (WECC/NERC) continuing issuance of standards – 41 standards and 381 requirements for NERC & cyber security (CIP) .

Reclamation Operations and Maintenance Expense Budget For FY2014-2019 - Drivers

- Aging Equipment and Infrastructure Non-Routine Extraordinary Expense:
 - 36 percent of all equipment has exceeded its design life (42 percent at GC).
 - 21 percent of all equipment has a 'marginal' or 'poor' condition hydroAMP rating (24 percent at GC).
 - Average hydroAMP rating continue to decline.
 - Increasing routine maintenance on old equipment.
 - Non-Routine Extraordinary Expense are Increasing:
 - Grand Coulee Third Powerplant Overhaul.
 - Major maintenance/repairs related to aging infrastructure and generators (e.g., turbine cavitation repair, Turbine overhauls, ring seal gate overhauls, bulkhead gate rehabilitation, Discharge tube and draft tube rehabilitation, turbine guide bearings).
- Cultural Resources:
 - Mitigation requirements have increased as the program has moved from inventorying to mitigation (resolving adverse effects).
 - Additional resources needed to execute the program and ensure National Historic Preservation Act and section 106 compliance.

Grand Coulee Power Office Staffing Plan

Ensuring Power Production in the Pacific Northwest



**Mark Jenson, Power Manager
Grand Coulee Power Office
July 2012**



Grand Coulee Power Benefits



- Grand Coulee = 6,809 MW = 1/3 of FCRPS capacity
- Provides about 25% of annual generation
- Accounts for 1/3 of FCRPS availability
- The facilities provide an important resource for system reliability – generation & transmission
- The facilities and equipment are aging, resulting in increased outages
- Outages are costly; each week a unit is down can cost about \$4 million



Staffing Plan Benefits: \$7.83 million

\$3.83 million

Reduce Duration of Routine Maintenance Outages

1 week increases Grand Coulee availability by about 0.5% overall

0.5% availability gain at Grand Coulee is worth about \$3.83 million

\$4 million

Reduce Duration of Significant Unplanned Outages

Reduce unplanned outages by 1 week

During high value energy period this is valued at about \$4 million

Cost: \$6.9 million

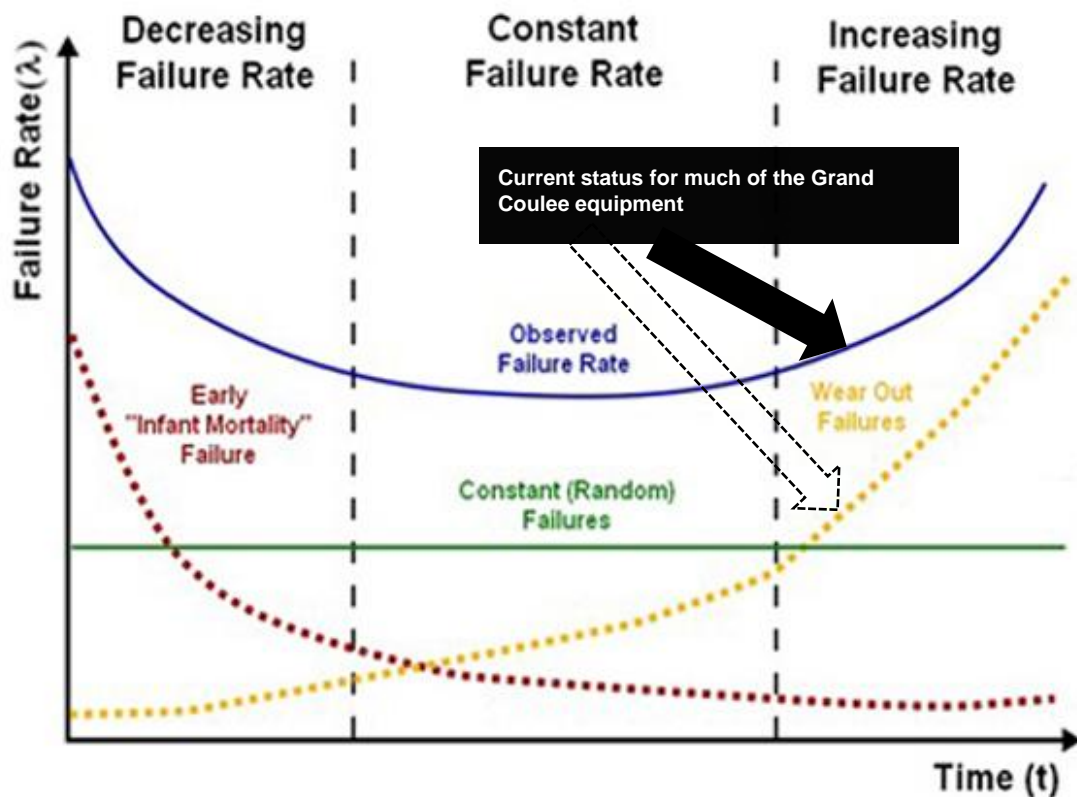
43 additional staff

Staffing Plan Benefit/Cost

- 43 additional employees
- Total cost for the rate period:
 - FY 2014 - \$6.1 million
 - FY 2015 - \$6.9 million long-term increase

Benefit/Cost	Expect	Stretch
Increase Grand Coulee availability between 0.5% - 1%	\$3.83M	– \$7.67M
Decrease unforeseen outage length by 1 week	\$4M	
Total Benefit	\$7.83M	— \$11.67M
Cost – 43 additional staff	\$6.9M	
B/C Ratio	1.13	— 1.69

Equipment Condition



- 46% of GCPO equipment has exceeded its design life
- 24% of GCPO equipment has 'marginal' or 'poor' condition hydroAMP rating
- Average hydroAMP ratings continue to decline

Challenges

- The age and condition of the facility and equipment are driving:
 - Additional maintenance work
 - Longer maintenance outages
 - Higher risk of forced outages
- An active capital improvement program is underway
- With the projected capital investment program, equipment condition will continue to require a higher level of maintenance
- Additional O&M staffing is essential to improve overall facility performance

Staffing Study Analysis

An independent staffing study was completed April 2012.

The study results were used to inform a staffing analysis and plan.

Implementing several industry best practices will help improve efficiency and cost-effectiveness:

- Dedicated asset management team
- Formal project management program
- Centralize non-routine maintenance
- Separate O&M engineering support



Staffing Plan Details

Improve staffing capacity to perform O&M work

- Additional Maintenance Crafts Workers – 12:
 - Improve CM/PM Ratio — Reverse current trend
 - Better Preventative/Predictive Maintenance Balance
 - Keep aging equipment operating while replacements are planned/installed
 - Address backlog of non-critical PMs and non-critical work before it becomes critical
 - Additional required maintenance work created by evolving compliance standards, WECC/NERC, FIST, PEB, D&S, etc
 - Dam Structure Maintenance — ring seal gates, drum gates, drains, etc
 - Downstream stabilization work

Staffing Plan Details (continued)

Position Type	Number of Positions	Fiscal Year
Maintenance Crafts Workers	12 additional	
PSCC Foreman I	1	2015
PSCC	1	2015
Electrician Foreman I	1	2015
Lineman	1	2015
Electrician	1	2015
Hydromechanic	3	2015
PP Operator	2	2015
Senior PP Operator	1	2015
Utilityman (Hungry Horse)	1	2015

Staffing Plan Details (continued)

- Improve Situation for Existing Bottlenecks/Key Positions
 - Safety – 3:
 - Support for JHAs and HECF
 - Assist managers in safety analysis, protect workers, enable better planning
 - Help avoid outage extensions with early recognition of exposures/risks (e.g.: avoid delays like G-24 last spring/summer)
 - Engineering Support to O&M – 9:
 - Maintenance engineers to support O&M activities
 - Large backlog of work orders “awaiting engineering”
 - Improve design review process – savings on contracts
 - Drawings - reduce troubleshooting time, improve contracts & compliance
 - Better focus on long range planning

Staffing Plan Details (continued)

Position Type	Number of Positions	Fiscal Year
Safety	3 additional	
Safety Specialist (Hungry Horse)	1	2013
Industrial Hygienist	2	2014
Engineering	9 additional	
Mechanical Engineer (O&M)	3	2014
Electrical Engineer (O&M)	3	2014
Engineer Technician (O&M)	3	1 in 2013 2 in 2014

Staffing Plan Details (continued)

Improve Situation for Existing Bottlenecks/Key Positions

- Additional Supervisors – 6:
 - employee to supervisor ratio is too high (1:25-30)
 - reducing this ratio will create a more efficient existing workforce
 - will help validate resources needed and inform future hiring actions

- Maintenance Planning/Control/Purchasing – 5:
 - better planning and management of maintenance activities – reduce outage time
 - more timely purchase of materials for O&M work – reduce outage time
 - SOP Updates for NERC/WECC Compliance

Staffing Plan Details (continued)

Position Type	Number of Positions	Fiscal Year
Supervisors	6 additional	
O&M Engineering Supervisor	1	2013
Supervisor II	4	2013
Supervisory Engineering Technician (CADD)	1	2014
Maintenance Management/ Plan/Purchase/Support	5 additional	
Maintenance Management Technician	2	2014
Power Operations Specialist (SOPs)	2	2014
Contract Specialist	1	2013

Staffing Plan Details (continued)

Improve Succession Planning

- Superintendent, Deputy Superintendents & Power Manager – 5:
 - Existing superintendents nearing retirement eligibility
 - Better review of routine and non-routine maintenance and resource needs
 - More accountability for outage management and maintaining schedules

- Training Office – 3:
 - Over 25% retirement eligibility in craft positions
 - Apprenticeship program provides high quality and value
 - New people need more training
 - On-boarding, training, and coordination of training efforts is needed to efficiently bring on additional resources.

Staffing Plan Details (continued)

Position Type	Number of Positions	Fiscal Year
Management	5 additional	
Superintendent	1	2013
Deputy Superintendents	3	2014
Deputy Power Manager	1	2013
Training Office	3 new	
Supervisory Training Officer	1	2013
Training Coordinator	1	2014
Training Support	1	2014

Risk of Not Funding the Staffing Plan

- Expect continuation of current trends:
 - Overall availability will continue to decline
 - Equipment condition will continue to decline
 - Higher risk of additional and longer forced outages
 - Higher risk of losing turbine capacity during high-flow periods — high TDG
 - Issues with compliance: NERC/WECC, Dam Safety, FIST, PEBs, etc.
- Additional overtime will cause burn-out and loss of highly qualified employees
- Overall erosion of ability to achieve mission, meet obligations, and reach performance goals



Summary

Current workload exceeds workforce capacity

High risk — we cannot sustain performance with current staff levels

43 additional staff needed for routine O&M

\$6.0 million savings for the original IPR 2014 – 2015 numbers

Increasing Grand Coulee Routine O&M budget by \$6.9 million will provide positive B/C ratio and could result in well over \$11 million in added value



Reclamation Non-Routine Extraordinary Maintenance For FY 2014-15

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
GC- TPP Overhaul: <u>1</u>/	17M	21M	27M	25M	27M	24M	31M	31M
GC - Other Non-Routine:	7M	7M	14M	16M	14M	18M	11M	11M
Other PP - Non-Routine:	2M	2M	4M	5M	4M	2M	4M	4M
	\$25M	\$29M	\$46 M	\$45M	\$45M	\$44M	\$46M	\$46M

Reclamation Non-Routine Extraordinary Maintenance For FY 2014-15

- Grand Coulee Third Powerplant Overhaul.
- Minidoka Generator 8 and 9 Overhaul.
- Turbine cavitation repairs, ring seal gate overhauls, bulkhead gate rehabilitation, Discharge tube and draft tube rehabilitation, turbine guide bearings, fire protection and life safety requirements and other equipment maintenance/repairs.

B O N N E V I L L E P O W E R A D M I N I S T R A T I O N

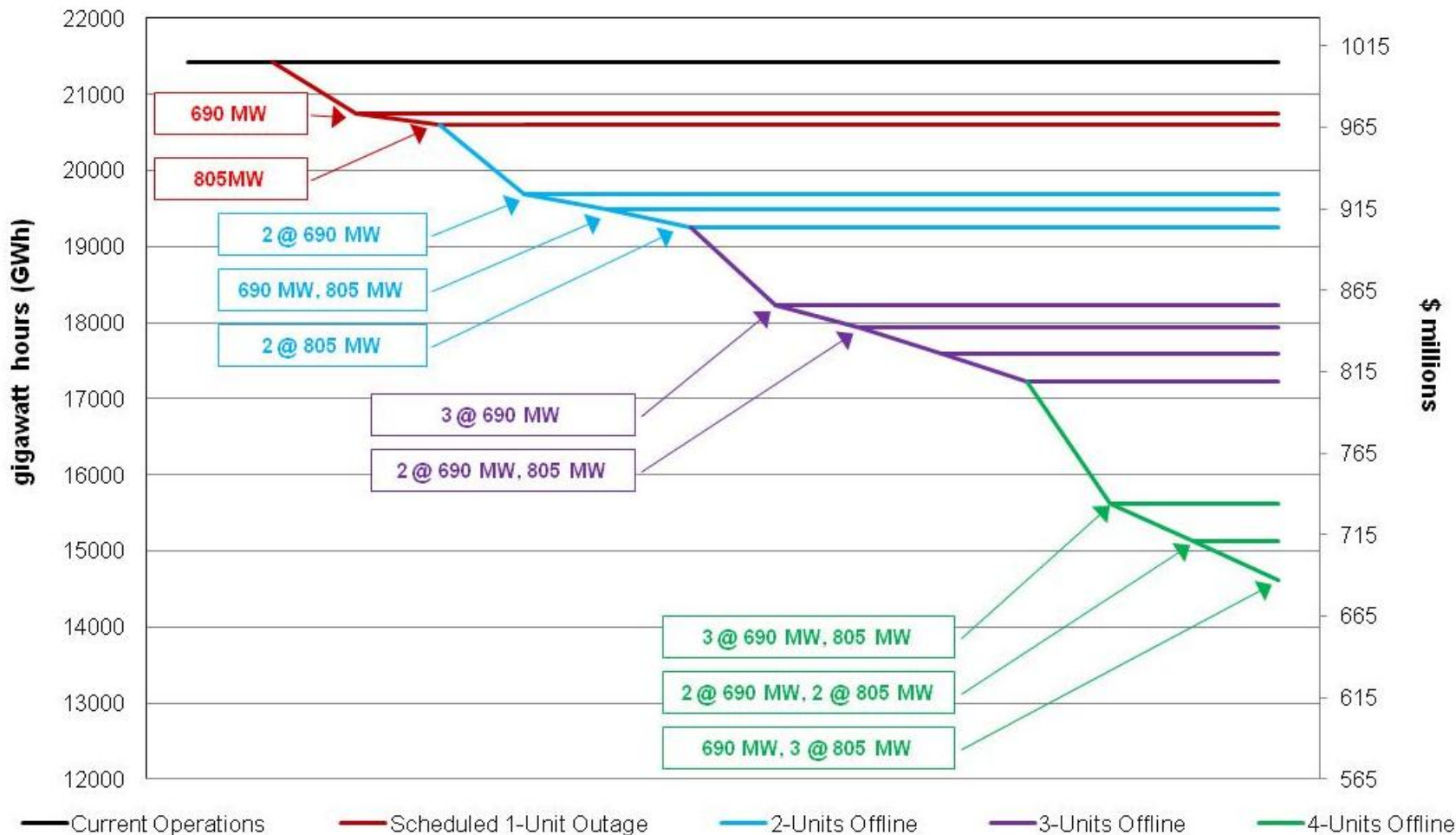
Reclamation Non-Routine Extraordinary Maintenance For FY 2014-19

- Some NERX projects could possibly be moved to out years, but would create a bow wave of future work as well as increases risk.
- A decrease in costs in FY 2014–15, but an increase in costs in FY 2016–17.
- Risks:
 - Increase in maintenance costs
 - Project costs will increase
 - Creating increase funding requirements in future years
 - Increase in force outage rate
 - Unit availability will decrease
 - Decrease in revenue (GC G-24)

Reclamation Non-Routine Extraordinary Maintenance For FY 2014-19 GC Third Power Plant Overhaul Program

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Initial 2012-2013 IPR	7,000	6,234	10,862	13,614	14,912	16,149	16,633						
Modified 2012-2013 IPR	7,000	16,600	20,700	20,900	24,000	23,700	26,100						
Final BPA 2012-2013 IPR	7,000	16,600	20,700	13,614	14,912	16,149	16,633						
2014-2015 IPR	7,000	16,600	20,700	27,300	24,600	27,300	23,800	34,000	29,600	25,400	31,200	20,400	7,000
Difference				13,686	9,688	11,151	7,167	34,000	29,600	25,400	31,200	20,400	7,000

Reduction in TPP Output due to outages during the 12-year overhaul schedule



• Assumes a baseline 5-year average availability of 77.3% at Grand Coulee
 • Assumes a 12-year (2013-2024) levelized energy value of \$48.93/MWh (based on the current forward price curve from BPA's Common Agency Assumptions)

Accounting treatment for NREX costs – Capital vs. Expense

- This issue was discussed during the FY 2010 IPR workshop. Key points from that discussion:
 - Corps and Reclamation have determined NREX to be expense per their respective capitalization policies.
 - BPA researched accounting treatment for NREX at other utilities and PMAs and in general, the research has shown that NREX is consistently expensed except for isolated cases when treated as regulatory asset.
- BPA is continuing to look into this question.

Systemic Forced Outages

Bonneville Powerhouse 2 Generators

- FCRPS Strategic Importance
- History of Failures
- Causes of Failures
- Risk Exposure
- Potential Solutions



Bonn 2 FCRPS Strategic Importance

- 8 units rated at 66.5 MW each
- Combined Capacity= 532 MW, Avg. Generation = 221 aMW
- Produces ~ 3.2% of FCRPS total generation
- Unit availability is important to meet TDG requirements
- Units 11 and 18 are important to attract migrating fish toward fish ladders at either end of the powerhouse



History of Operations

Bonneville 2 Powerhouse was commissioned in 1982, at the time, optimal fish passage was perceived to be at Bonneville 1; the BON2 machines ran on a very limited basis until 2001, when it was determined that BON2 provided the best all around fish passage for the project.

History of Failures

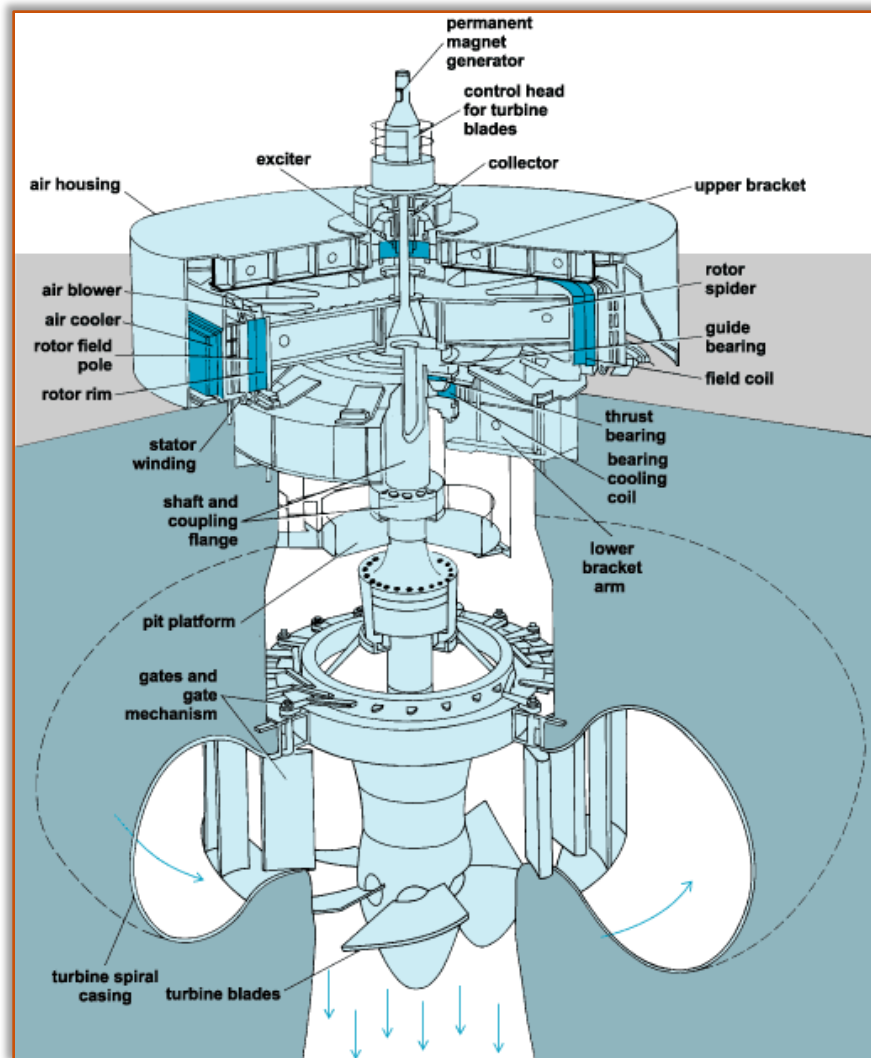
- Unit 11:
 - 2003 Rotor Field Winding Inter Pole Connector (Between Poles 58 and 59)
 - 2005 Rotor Field Winding Inter Pole Connector (Between Poles 52 and 53)
 - 2008 Rotor Amortisseur Connectors (18 poles between pole 32 and 80). Immediately after repair, stator to rotor “rub” (i.e. contact) occurred.

- Unit 15
 - 2007 Rotor Field Winding Inter Pole Connector (Between Poles 42 and 43)
 - 2008 Rotor Field Winding Inter Pole Connector (Between Poles 44 and 45)
 - 2011 Rotor Field Winding Inter Pole Connector (Between Poles 25 and 26)

- Unit 16
 - 2009 Stator Winding Ground. Repair required removal of rotor poles 58 to 61.
 - 2011 Rotor Field Winding Inter Pole Connector (Between Poles 61 and 62)

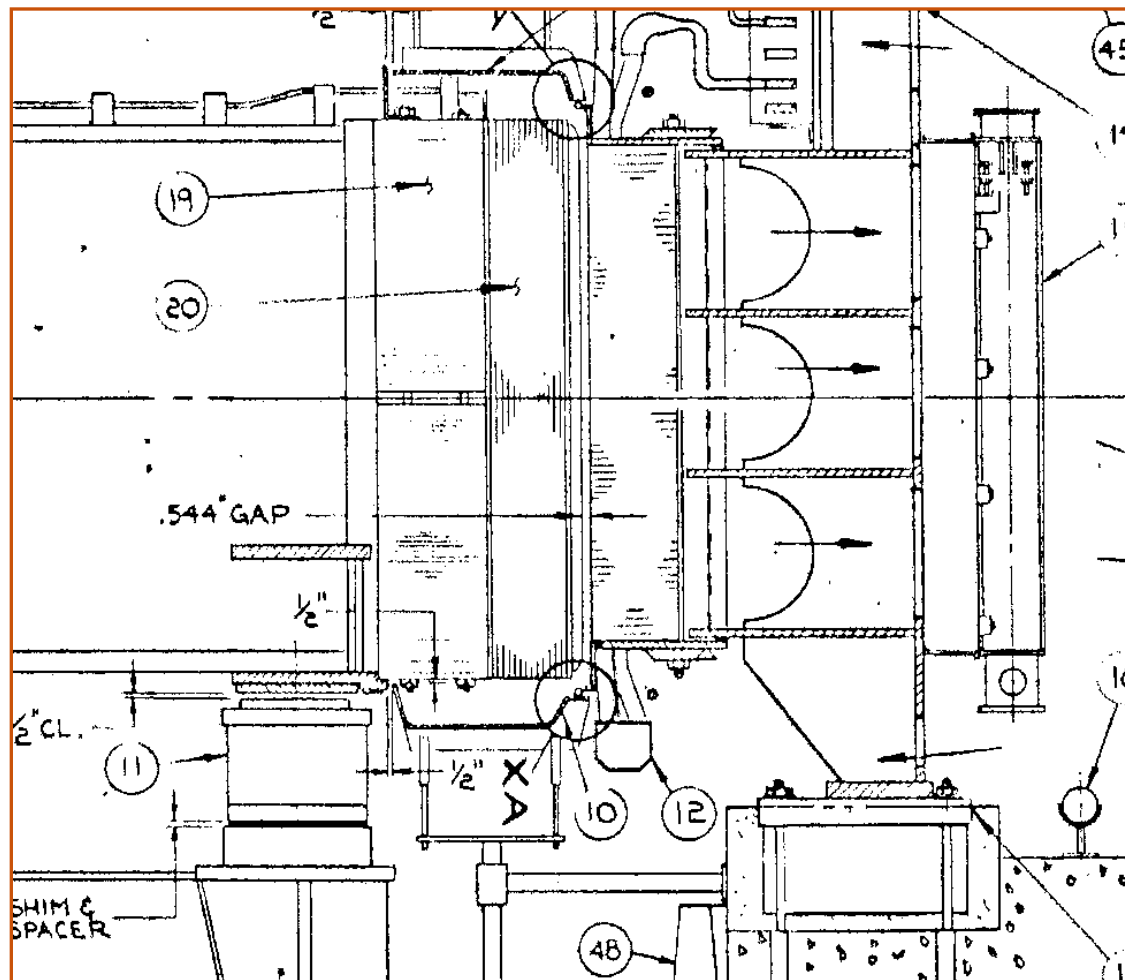
Root Causes of Failures

- OEM (General Electric) points to low factors of safety in rotor and stator structural rigidity of GE generators of this vintage.
 - In particular, the rotor rim and spider connection are less rigid than modern designs.
 - Less rigidity = less tolerance to misalignment and out of round condition.
- Alignment deteriorates with age
 - Causing the stator or rotor to move off center.
 - Off center condition causes unbalanced magnetic forces, gradually shifting the rotor and stator out of round.
 - Out of round condition amplifies forces and vibrations experienced by the stator and rotor, thus leading to failures.



Details of Rotor / Stator Interface

- 0.544 Inch Gap = air gap between rotor and stator
- 19 = rotor rim
- 20 = rotor pole



Bonn 2 Risk Exposure

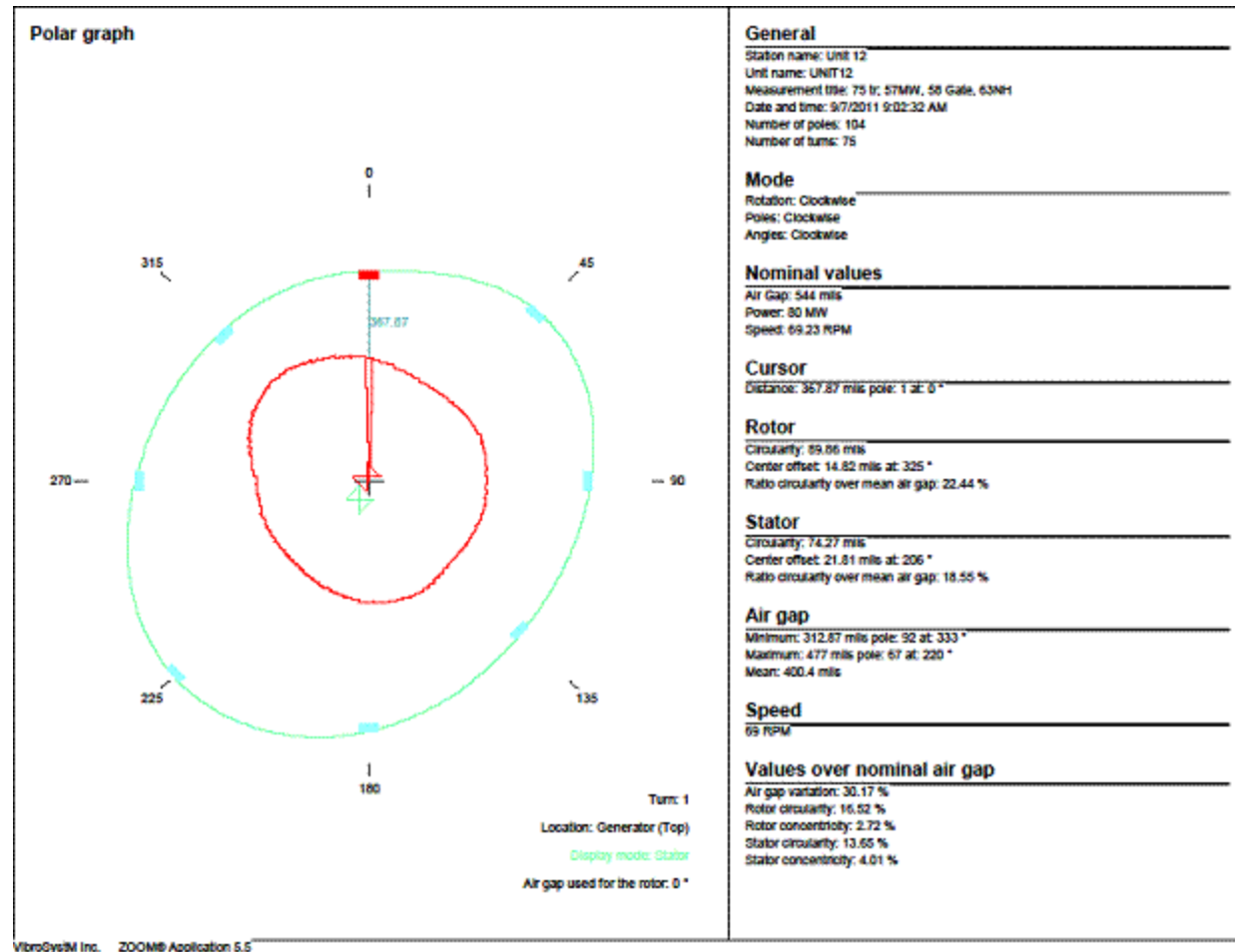
- Probability:
 - Unknown, but ongoing project will help define.
 - Failure is not necessarily imminent.
 - Data indicates Unit 15 is believed to be at risk of continued problems.

- Consequence:
 - Forced Outages: No action will eventually lead to failure of the generators, but the timeline is unknown.
 - Incidental damage, including stator damage, spider cracking.
 - Repair costs for Unit 11 are ~\$9.6 million. Should be reduced due to lessons learned.
 - Current long term planning estimate is ~\$60 million to repair remaining seven units (assuming repairs similar to what has been done on Unit 11).

Bonn 2 Risk Mitigation and Potential Solutions

- Two current projects provide risk reduction:

- Digital Governors are expected to minimize torque fluctuations during synchronization, reducing stresses on rotor rim.
- Air Gap and Vibration Monitoring will allow detection of vibrations, bearing run-outs, and out of round stator and rotor conditions.
- GSU Instrument Transformers



Unit 12 shown. Unit 15 is two to three times worse.

Bonn 2 Risk Mitigation and Potential Solutions

- Unit re-alignment being considered on all units.
- Repair is believed to be possible, Unit 11 repairs included:
 - Stator re-rounded and re-centered
 - Rotor spider reinforced
 - Rotor rim reinforced by providing greater interference fit between rim and spider
 - Rotor re-rounded
 - Cracks repaired.
- Additional data gathering will inform a better solution
- Unit 11 return to service July 2012

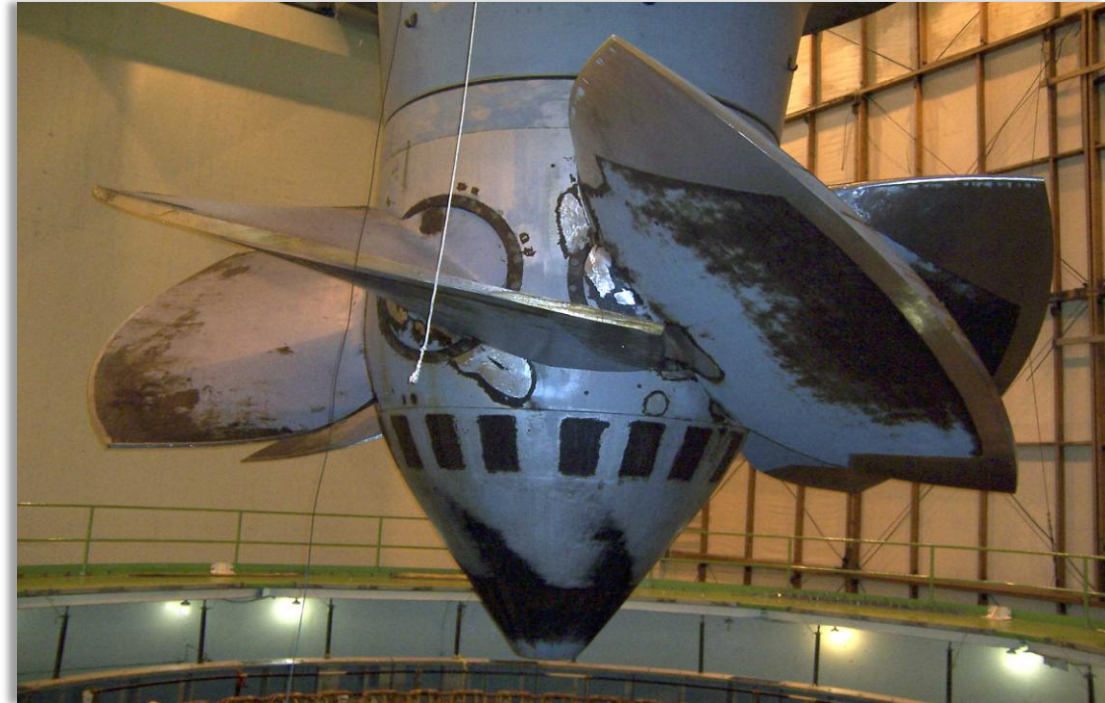
Questions ?



Crack in bottom of spider where it fits to the rim

JDA Turbines – Systemic Forced Outages

- FCRPS Strategic Importance
- History – design flaw
- Typical Failure Scenario
- Recent Failures and Repairs
- Consequences of Reduced Availability
- Risk Mitigation Plan

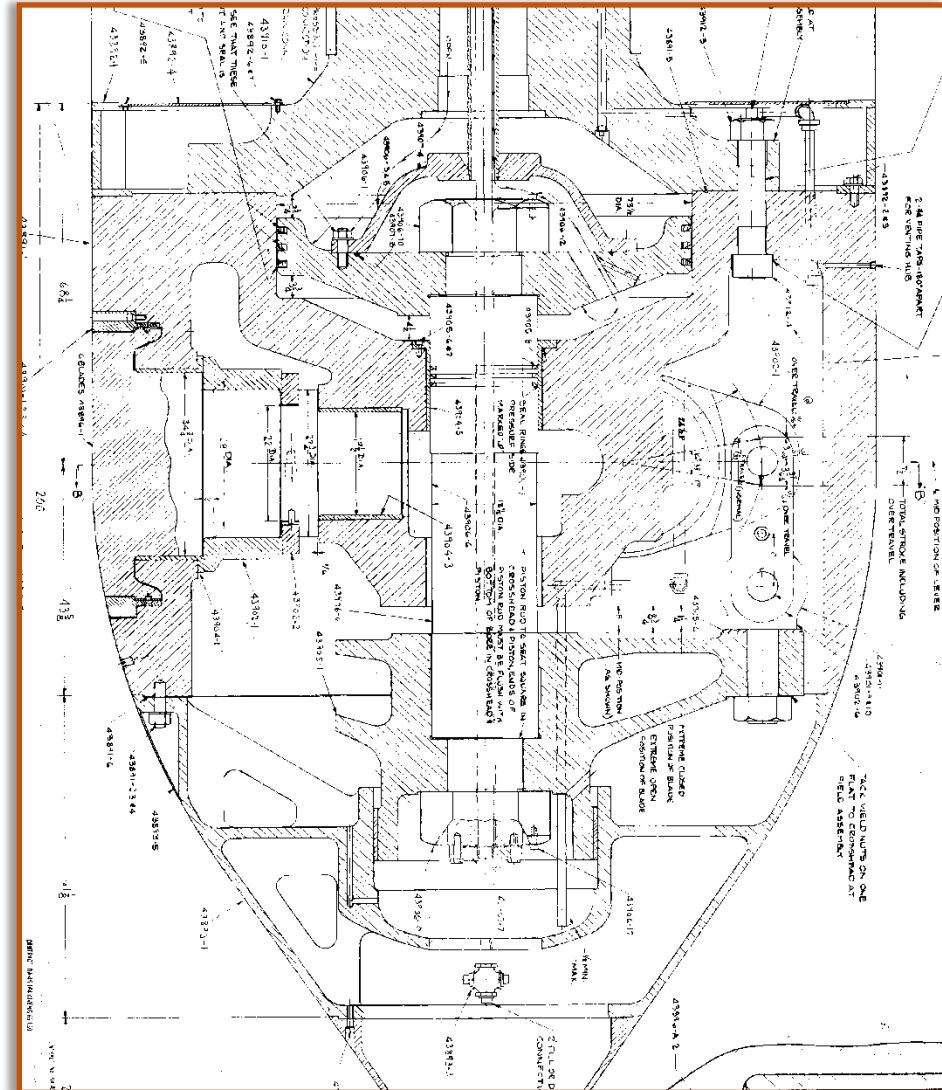


John Day FCRPS Strategic Importance

- 16 units at JDA rated at 155 MW each
- Produces ~ 12.5% of FCRPS total generation:
 - Third to GCL and CHJ
- Spinning Reserves:
 - Current operation/AGC/Wind Integration
 - Future operation, GCL overhaul will reduce availability and spinning reserve capability
- Synchronous Condensing (4 units)

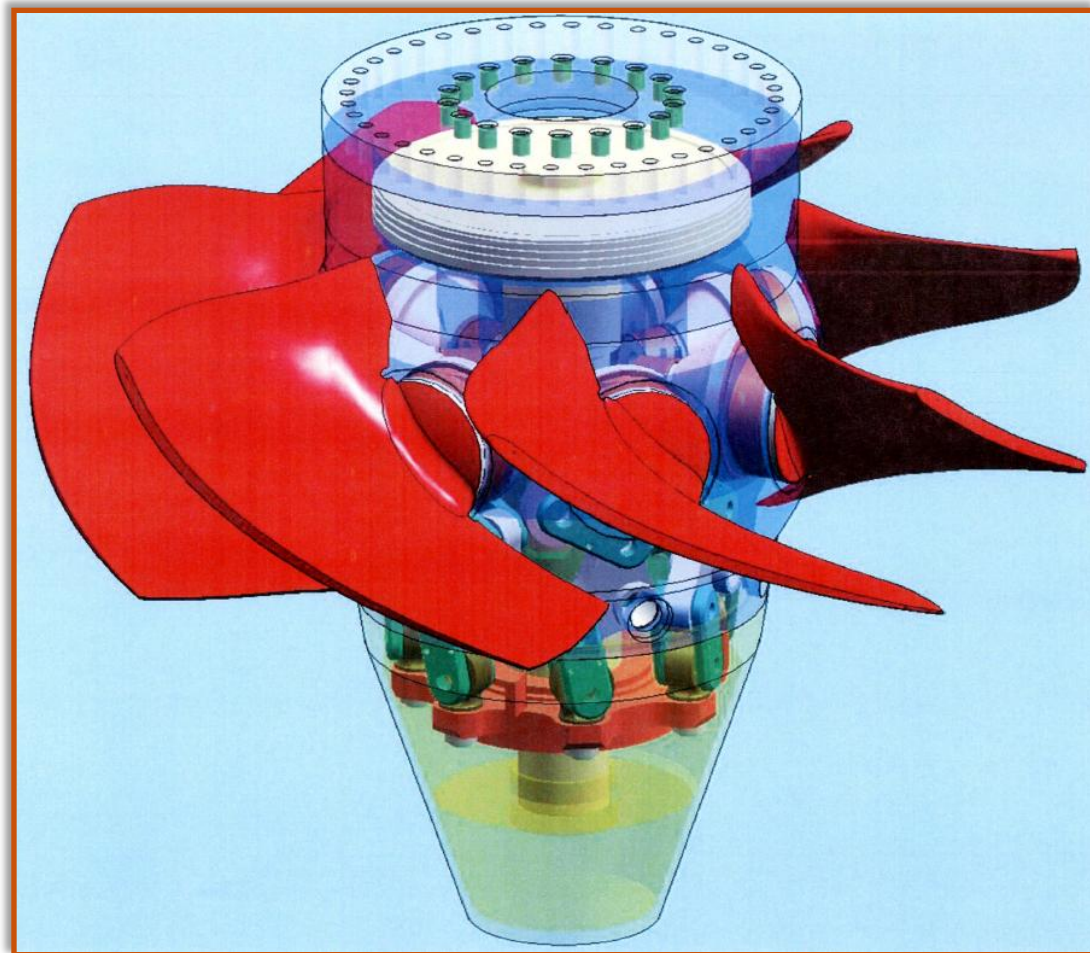
John Day History – Design Flaw

- Original turbines installed 1968-1972 by Baldwin Lima Hamilton (BLH)
- Design flaw; appears systemic to the BLH units at JDA, LMN, LGR, (22+ units):
 - Hub link pin and eye end experience high stresses
 - Aging oil contributes to stick/slip and high stresses
 - Leads to fatigue failure, cracking of link pins or eye ends and sudden fracture



John Day Typical Failure Scenario

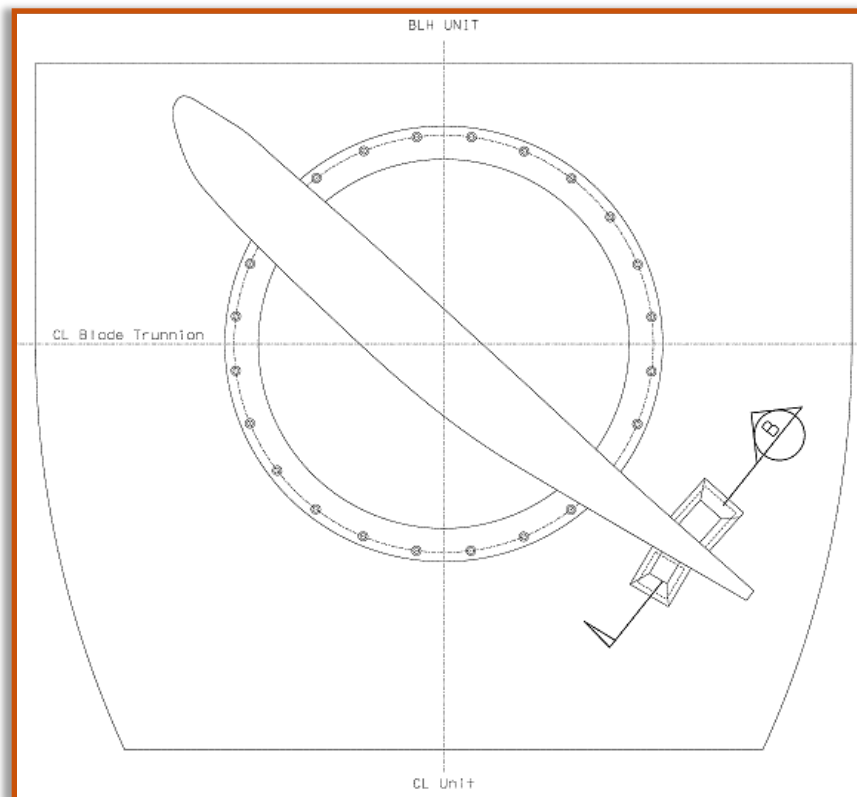
- Linkage failure
- Loss of control of one or more blades
- High vibrations and unit shutdown
- Potential for incidental damage/flooding
- Can't operate unit



John Day Recent Failures and Repairs

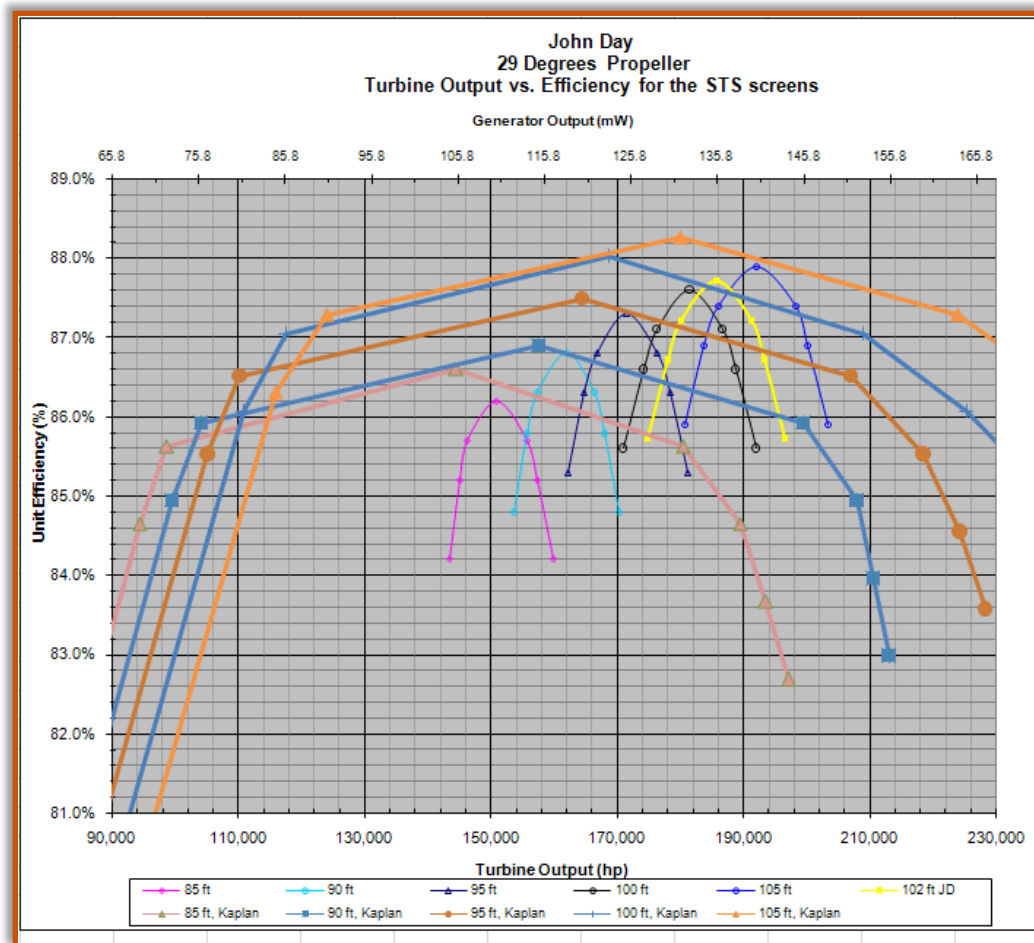
- Failures appear to be accelerating:
 - 2005 Lower Monumental Unit 1, blades blocked
 - 2006 John Day Unit 16, repaired to Kaplan
 - 2011 John Day Unit 11, blades blocked
 - 2011 John Day Unit 5, blades blocked
 - 2011 John Day Unit 6, trunion sleeve failure, blades to be blocked
 - 2012 Lower Granite Unit 1, blades to be blocked

- JDA Units 16, 11, and 5 suffered minor incidental damage



John Day Consequences of Reduced Availability

- Operational:
 - No action will cause significant forced outages
 - Blocked blade units will cause spinning reserve constraints
 - Increased unit starts/stops
 - Kaplan Blade Strategy and BPA model recommended 8 available Kaplans
- Environmental:
 - Forced outages will lead to difficulty meeting TDG requirements



John Day Plan to Boost Availability

- Pro-active approach to repair has been initiated
 - Spare parts: Procure hub rebuild parts to save at least 8 months lead time when needed
 - Inspections: Inspect all remaining JDA Kaplan units 2012–16
 - Block Blades: Block blades on any units found to be near failure from 2012- 16
 - Full Kaplan Repair: Begin to repair units to Kaplan, with site work starting in 2013
 - Oil change
- Repair Cost Estimates: \$73 million over 9 to 10 years

Account Type	Expenditure Name	Prev Years Total	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	Total (Plus outyears thru 2041)	
Capital	JDA BLH Turbine Hub Upgrades and Fixed Blade Conversions (Phase 2)				\$7,035	\$9,435	\$9,555	\$10,190	\$10,790	\$10,900	\$5,775	\$165	\$63,845	
Capital	JDA BLH Spare Linkage Parts			\$85	\$1,090	\$1,715	\$45						\$2,935	
Capital	JDA BLH Turbine Hub Upgrades and Fixed Blade Conversions (Phase 1)			\$115	\$300								\$415	
Expense	JDA BLH Linkage Inspections and Blade Blocking			\$420	\$1,235	\$1,270	\$1,305	\$1,340	\$75				\$5,645	
				Subtotal	\$620	\$9,660	\$12,420	\$10,905	\$11,530	\$10,865	\$10,900	\$5,775	\$165	\$72,840

CORPS and Reclamation Appropriations Challenges

- Mitigation Responsibilities:
 - Cultural Resources – The Cultural program has received a plus up under the PMA, however the appropriated tail is not expected to keep pace.
 - Hatcheries – Many hatcheries for the FCRPS are in need of rehab. Nether the Corps nor Reclamation anticipate increases in appropriated funding for these large ticket items. (ESA, Settlement Negotiations, and Current Mitigation responsibilities).
 - Fish Passage – BiOp requirements are increasing at both mainstem and tributary locations. Appropriated funding for Construction and long term O&M of new or rehabbed facilities is not anticipated to increase.
- Joint Program (Dam Safety, Spillway Gates, Keys Pumping Plant, etc):
 - The appropriated shares of the joint activities are expected to become more difficult to match in the future.

Integrated Program Review

Financial Disclosure

This information has been made publicly available by BPA on July 16, 2012 and contains information not reported in agency financial statements.