



FCRPS Program Strategy

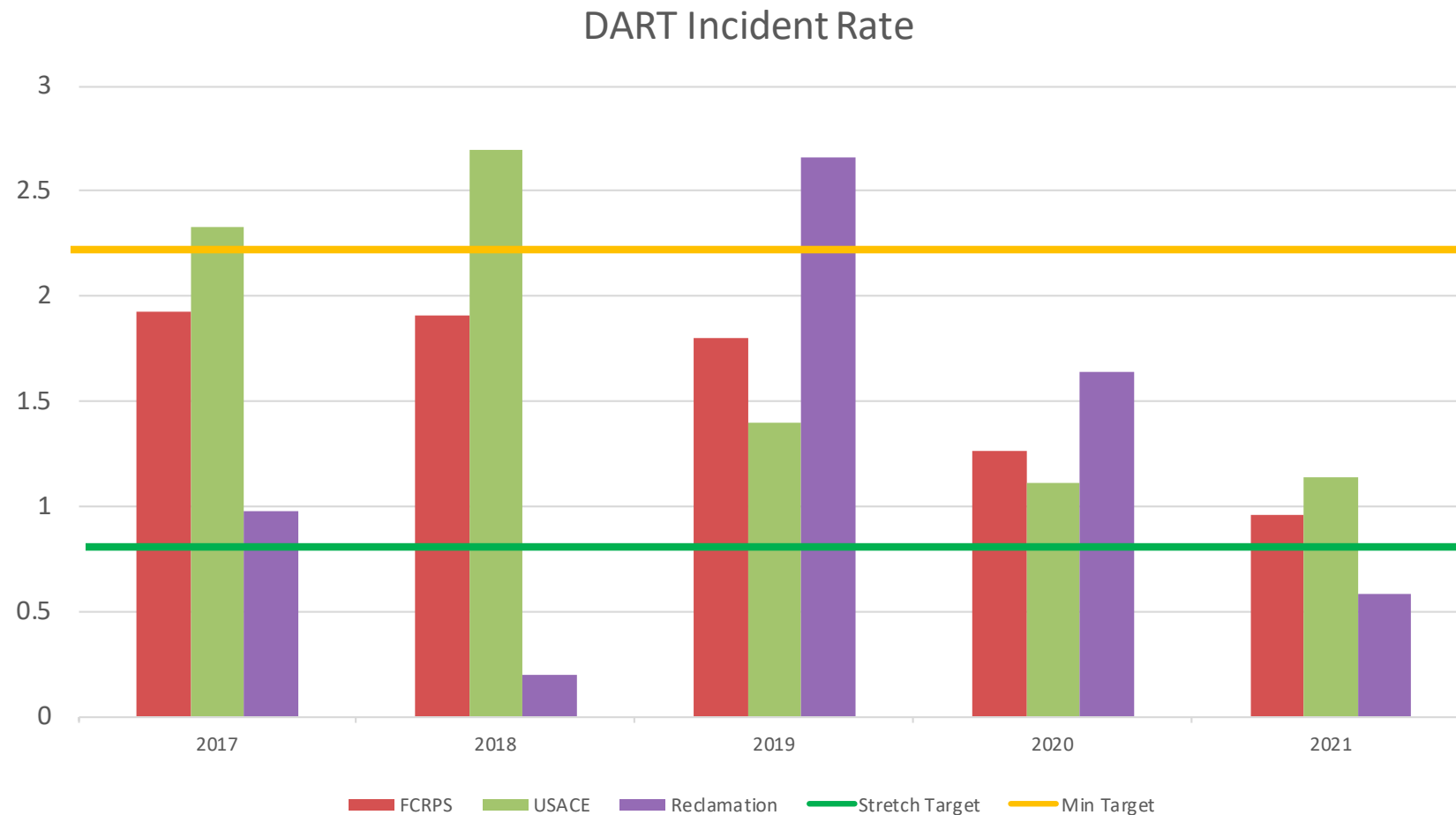
Federal Columbia River Power System

Presenters:

- Bonneville Power Administration
 - Kim Johnson, Fed Hydro Manager
 - Gordon Ashby, Resource Economic Planner
 - John Hayes, FCRPS Asset Manager
- Bureau of Reclamation – Columbia-Pacific Northwest Region
 - Joe Summers, Regional Power Manager
 - Craig Parker, Deputy Regional Power Manager
 - Ben Cano, Strategic O&M Planner
- USACE – Northwestern Division
 - Shawn Worthington, Deputy Ops Chief
 - Roger James, O&M and Capital Program Manager
 - Mike Villamar, Strategic O&M Planner

Safety

- Days Away, Restricted, or Transferred
 - Min target and Stretch target are established by the Performance Subcommittee



Fed Hydro Commitment

- Safety First - protect our people and equipment
- Asset Management principles that improve efficiency, affordability and reliability
 - Process improvements for program execution
- Cost effective operation and maintenance
 - Balance cost, performance, and risk
- Risk informed investment decisions
- Deliver value to customers and stakeholders

Direct Funding History: USACE and BOR

- 1992 National Energy Policy Act
 - Section 2406: Direct Funding Legislation
 - Capital investments, operations, and maintenance
 - Power specific and joint costs
- Memoranda of Agreement between Agencies
 - Bureau of Reclamation
 - 1993: Capital
 - 1996: O&M
 - USACE
 - 1994: Capital
 - 1997: O&M

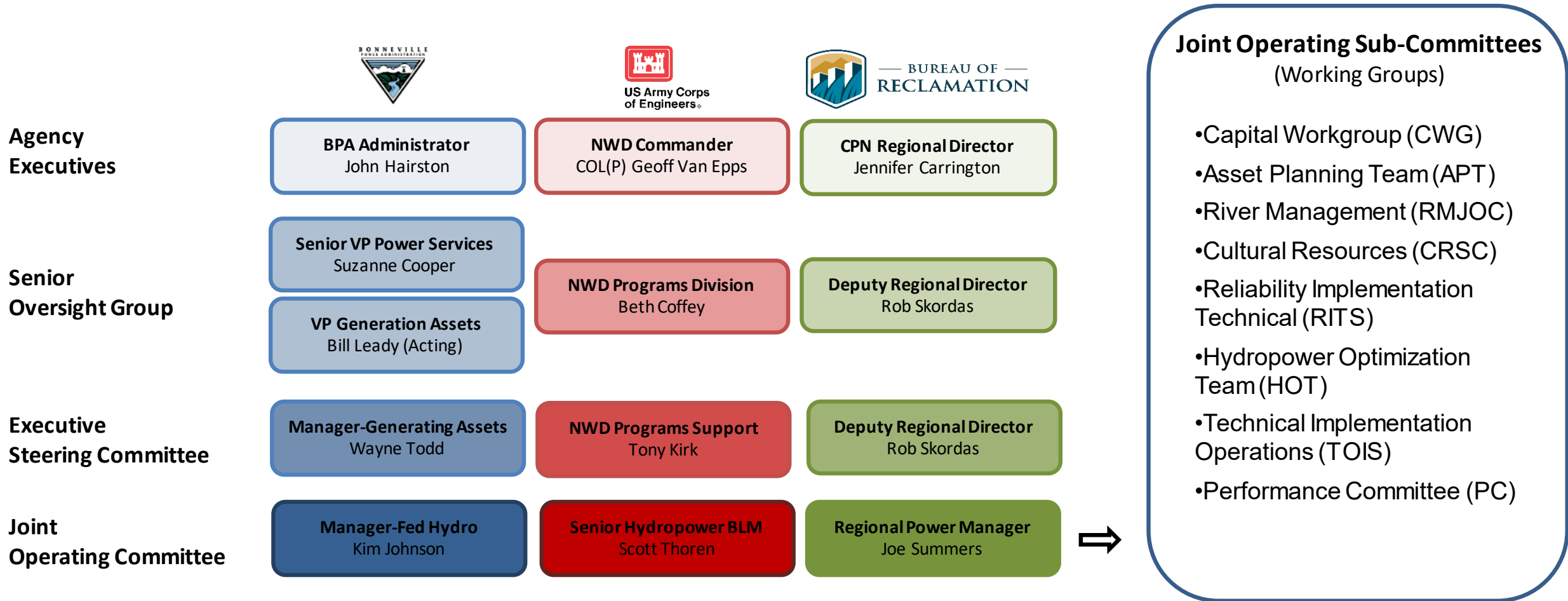


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**— BUREAU OF —
RECLAMATION**

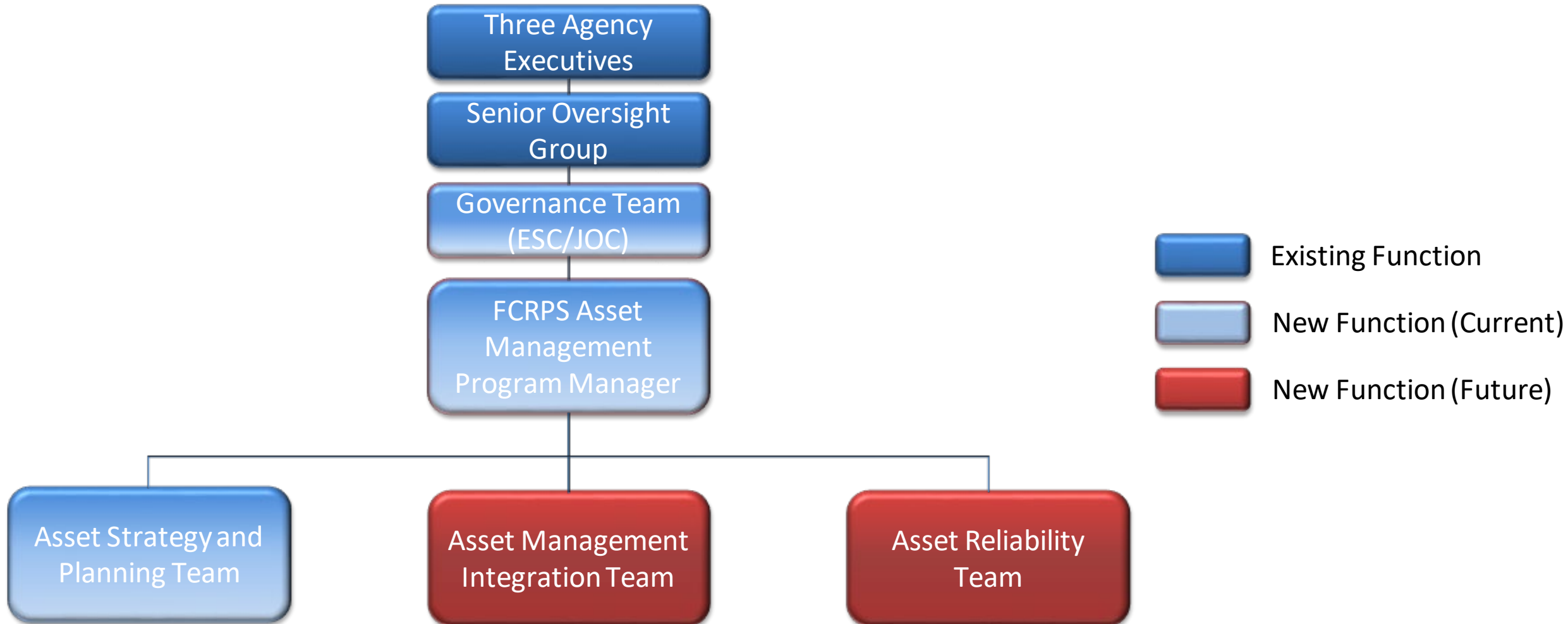
FCRPS Organization



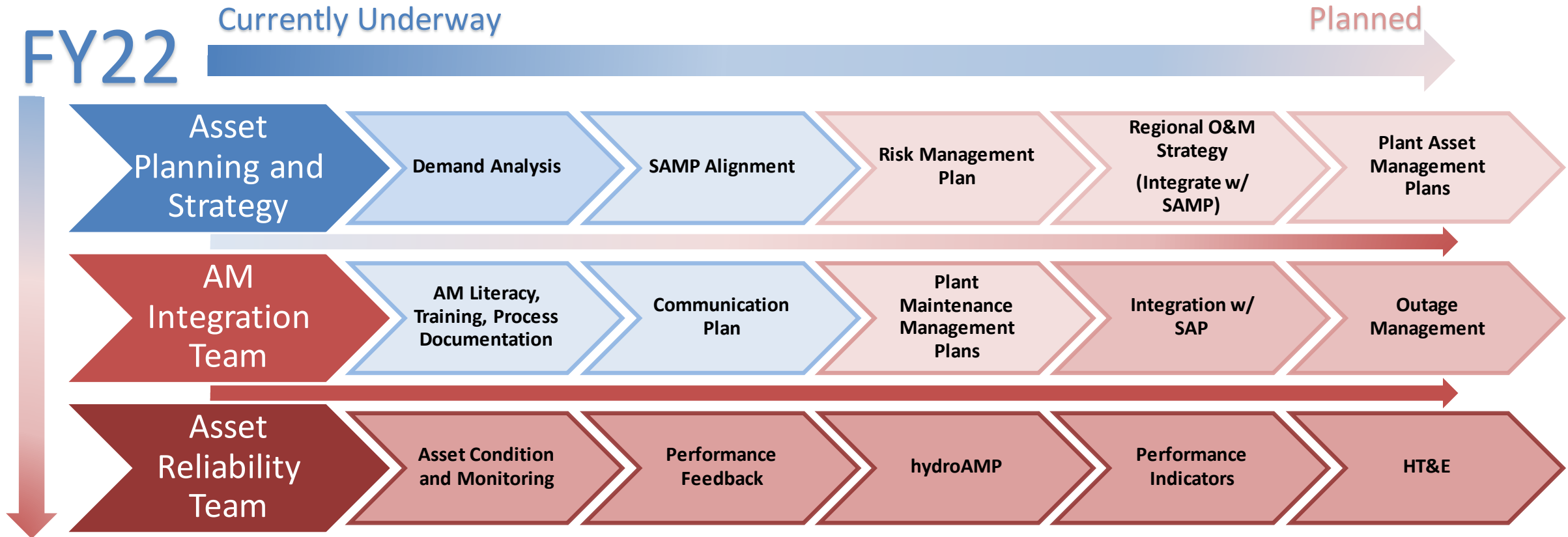
Asset Management – Strategic Goals

Goal	Description
Low Cost, Reliable Power	We will make sound operations, maintenance, and investment decisions to meet the needs of our power customers, comply with regulations, and support regional generation and transmission requirements at competitive rates.
Trusted Stewardship	We will balance the multiple uses of our physical assets and natural resources on behalf of the region in support of flood risk mitigation, water delivery, navigation, fish and wildlife mitigation, cultural resources, and recreation.
Long-term Sustainability	We will balance the cost, performance, and risk of FCRPS assets while investing in our workforce and culture to cultivate the competencies necessary to safely and efficiently deliver upon our missions.

FCRPS Asset Management Structure



FCRPS Asset Management – Roadmap



FCRPS Asset Management – Near Term Objectives

Asset Strategy and Planning Team

- Demand Analysis
- Risk Management Plan
- SAMP Alignment / Incorporate O&M
- Update Strategic Objectives
- APT / System Asset Plan
- Plant Asset Plans

AM Integration Team

- Integration with SAP
- Project Maintenance Plan Dev
- Outage Management
- AM Literacy, Training
- Communications

Asset Reliability Team

- Asset Condition & Monitoring
- Performance Feedback
- hydroAMP
- Performance Indicators
- HT&E Program

- Objectives
 - Demand analysis underway at USACE and USBR, these will be used to help inform FCRPS AM strategies/plans.
 - Improve literacy of AM principles among workforce (MAX.GOV site).
 - Begin work to define FCRPS risk appetite and tolerances.
 - Analyze regional O&M strategies and incorporate into SAMP.
 - Develop plant-specific asset/maintenance plans that integrate and implement O&M and Capital strategies.

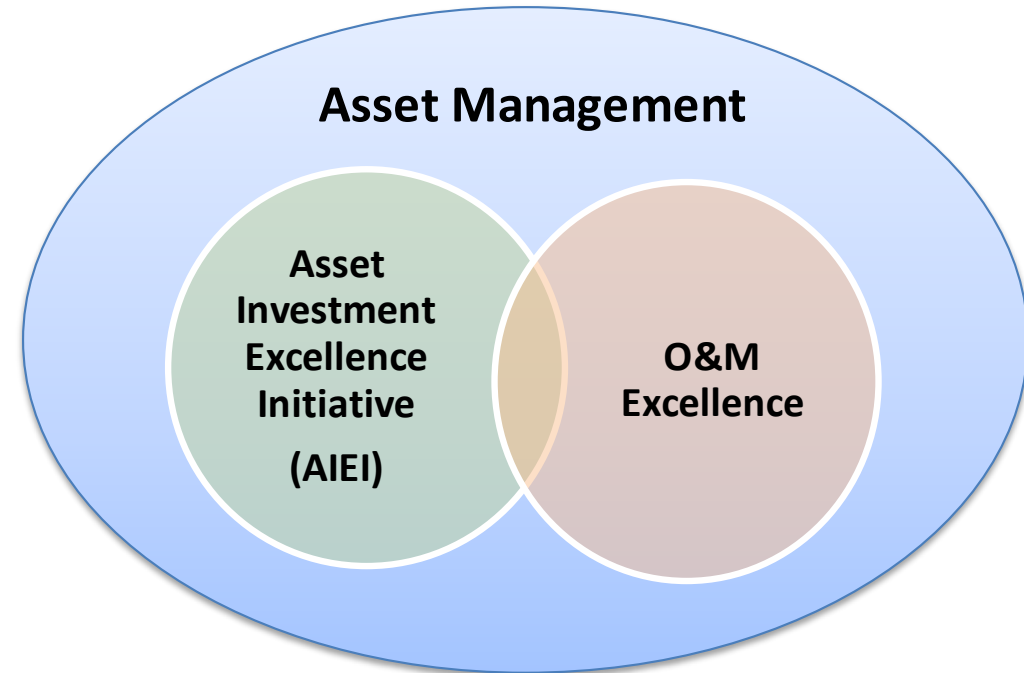
FCRPS Asset Management – O&M Integration

- Marriage of Capital and O&M strategies to create a holistic life cycle asset management program.
- Share best practices between the agencies and document processes to ensure sustainability.
- Encourage open communication at all levels, top down and bottom up; improved maintenance practices must provide true value to our teams working at the plants and our customers



Reclamation Asset Management – O&M Integration

- Initiatives: Pilot efforts to Evaluate Value
 - O&M Excellence Initiatives
 - Hydropower Research Institute
 - Maintenance Historian
 - Rotating Machines Big Data
 - AIEI and O&M Excellence
 - Machine Condition Monitoring
 - Predictive/start/stop Analysis
 - Hydropower Value Analysis

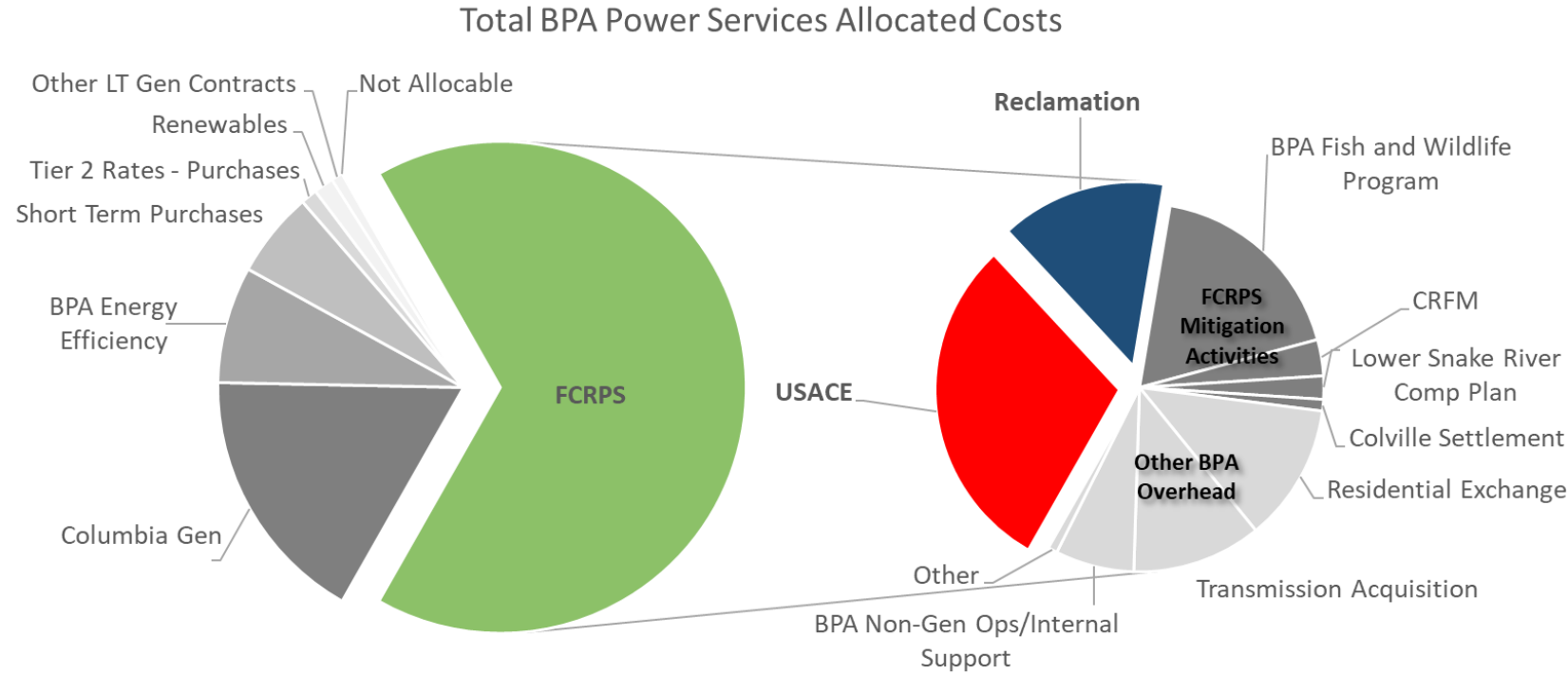


USACE Asset Management – O&M Integration

- O&M Optimization Initiative (OMOI)
- O&M Budget Planning
 - Labor analysis: Identify areas where efficiencies can be gained
 - Multi-crafting: Improve efficiencies in operations
- Outage Planning
 - O&M: Implement seasonal availability targets and track compliance with outage schedule
- Investment Planning
 - Value measure improvements: Asset life cycle framework initiative
- Maintenance Plans
 - PMMP: Pilots planned for FY23

Cost Effectiveness

- FCRPS related costs represent about 2/3rds of Power Services total costs.
- USACE and Reclamation costs (O&M and Capital-related costs) represent 44% of the fully-loaded Federal Hydro System costs.

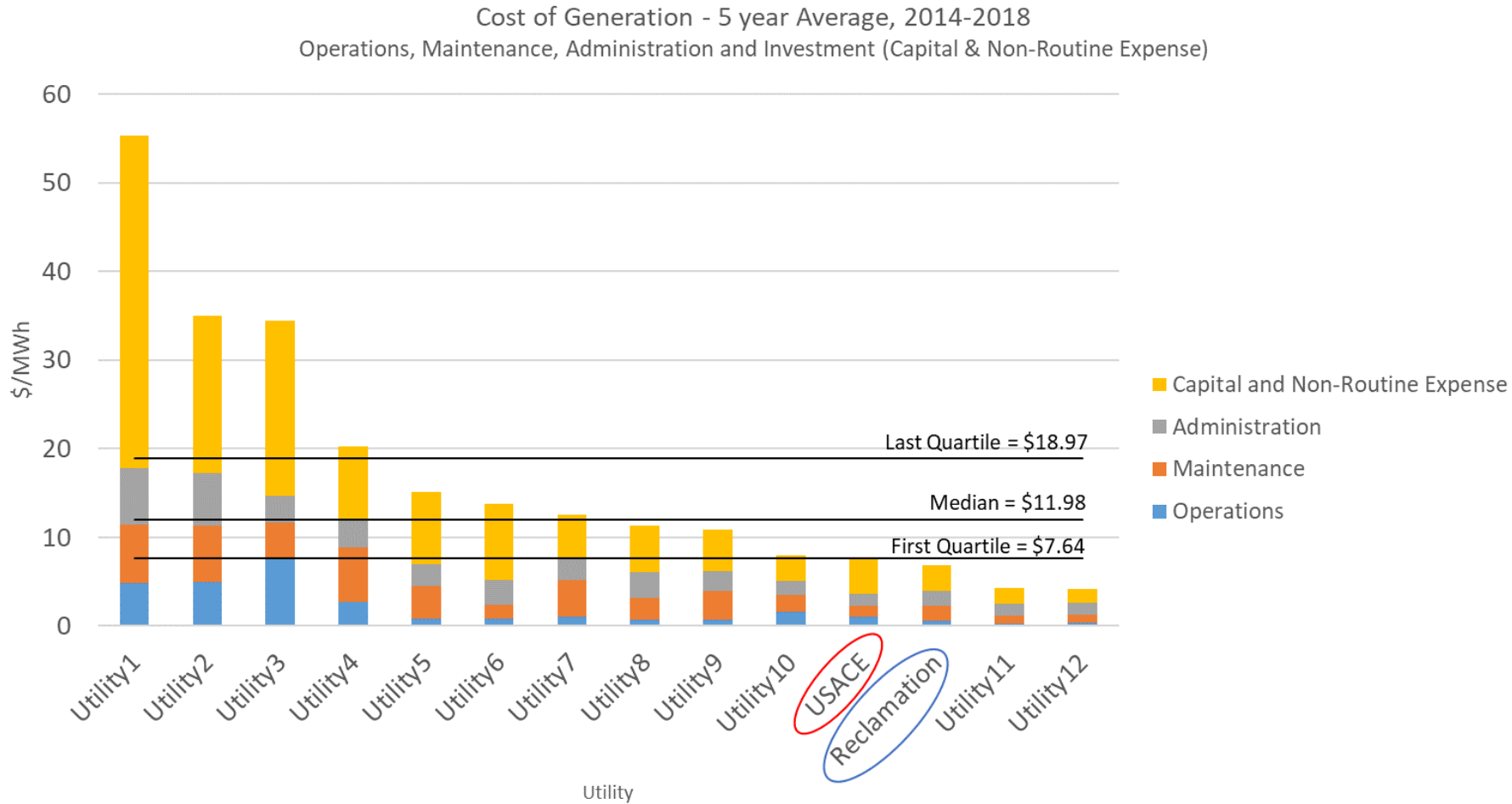


- Total Power Services costs

- Break down of all costs allocated to the FCRPS.

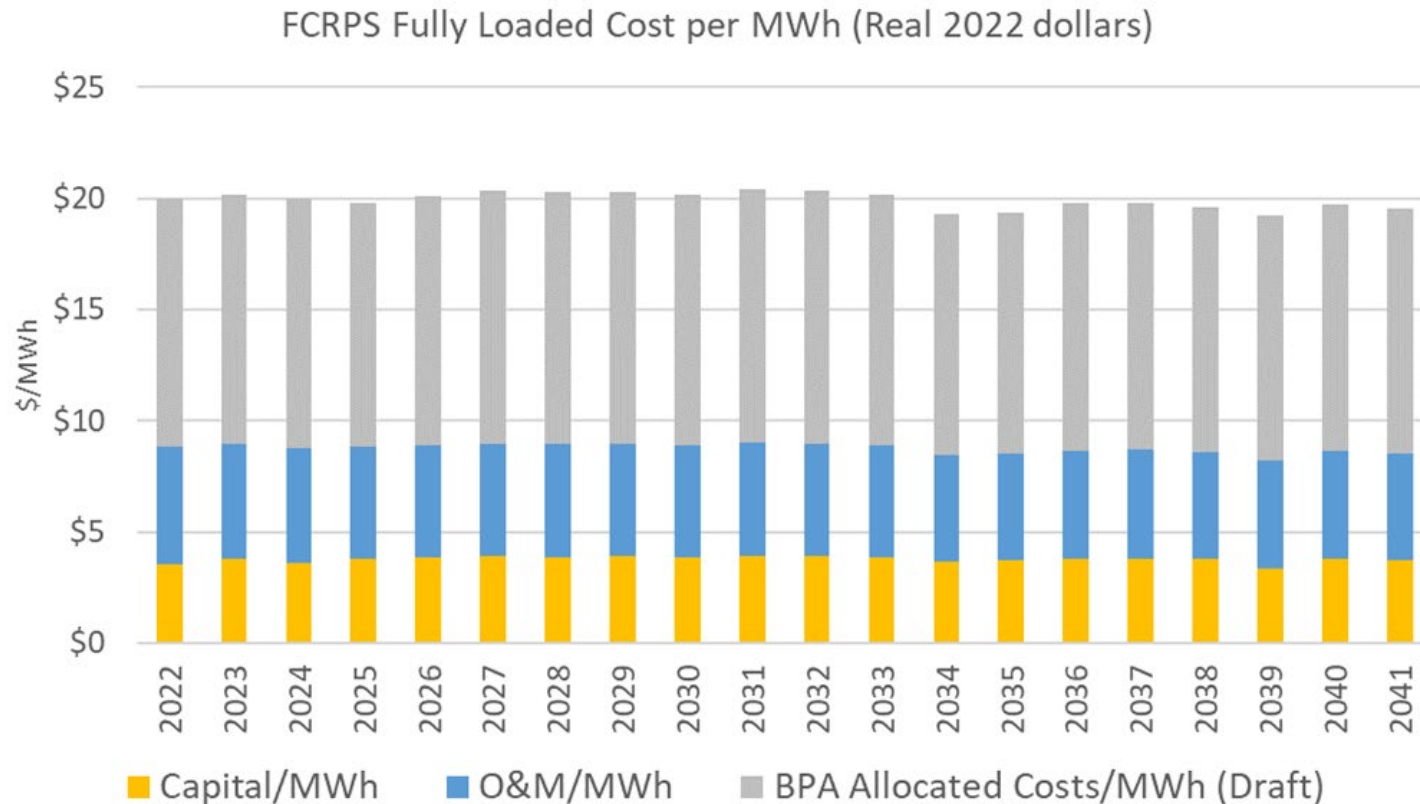
*3-year average

Cost Effectiveness



- Cost of Generation represents the Capital and O&M costs associated with producing power at the facilities.
- Corps and Reclamation are first quartile performers among 13 North American utilities.
- BPA costs (asset management, generation planning, etc.) are allocated to Corps and Reclamation facilities and included in benchmark costs.

Cost Effectiveness



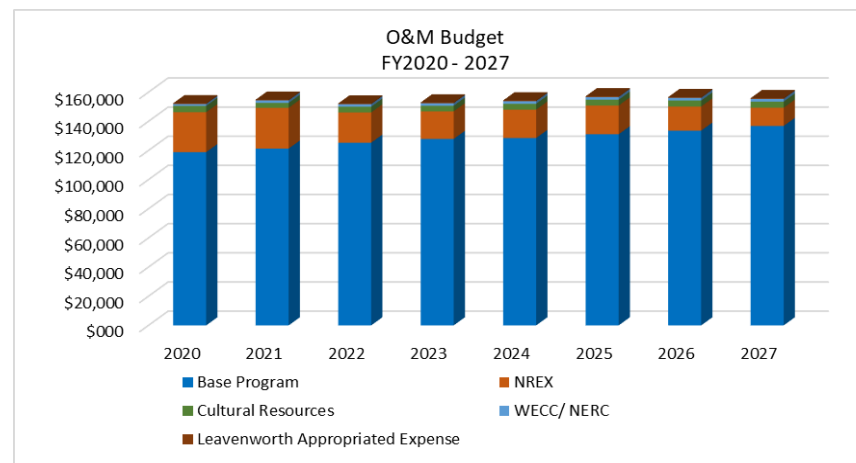
- Fully Loaded Cost represent all Power Services costs attributable to the FCRPS (including Fish and Wildlife).
- Increases in Capital investment are offset by mitigated lost generation risk.
- O&M program is assumed to increase at ~2% per year

Reclamation - O&M Budget

- Reclamation Detailed Budget and Proposed Spending Levels

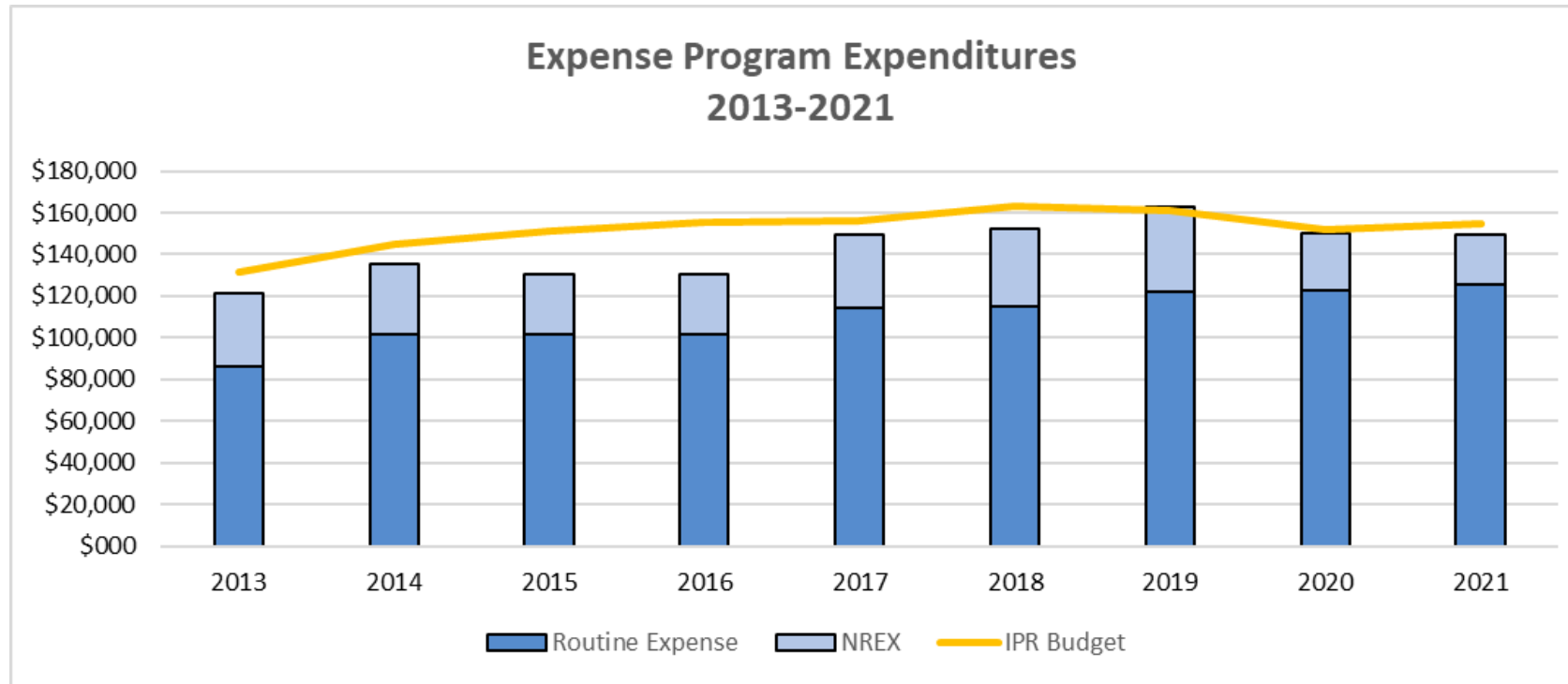
Fiscal Year	Base Program	NREX	Cultural Resources	WECC/ NERC	TOTAL BOR APB EXPENSE BUDGET	Leavenworth Appropriated Expense	Total Budget
2020	\$118,839	\$27,445	\$4,325	\$1,290	\$151,899	\$500	\$152,399
2021	\$121,309	\$28,008	\$3,363	\$1,699	\$154,379	\$500	\$154,879
2022	\$125,358	\$20,747	\$3,932	\$1,732	\$151,769	\$500	\$152,269
2023	\$127,899	\$18,956	\$3,850	\$1,758	\$152,463	\$500	\$152,963
2024	\$128,559	\$19,481	\$4,034	\$1,790	\$153,864	\$500	\$154,364
2025	\$131,124	\$19,737	\$4,035	\$1,822	\$156,718	\$500	\$157,218
2026	\$133,623	\$16,546	\$4,116	\$1,856	\$156,141	\$500	\$156,641
2027	\$136,828	\$12,528	\$4,199	\$1,891	\$155,446	\$500	\$155,946

Note: Does Not Include Potential NREX Costs for Grand Coulee G19-21 Modernization and Arc Flash Mitigation Projects



Reclamation - O&M Budget

- Expenditures

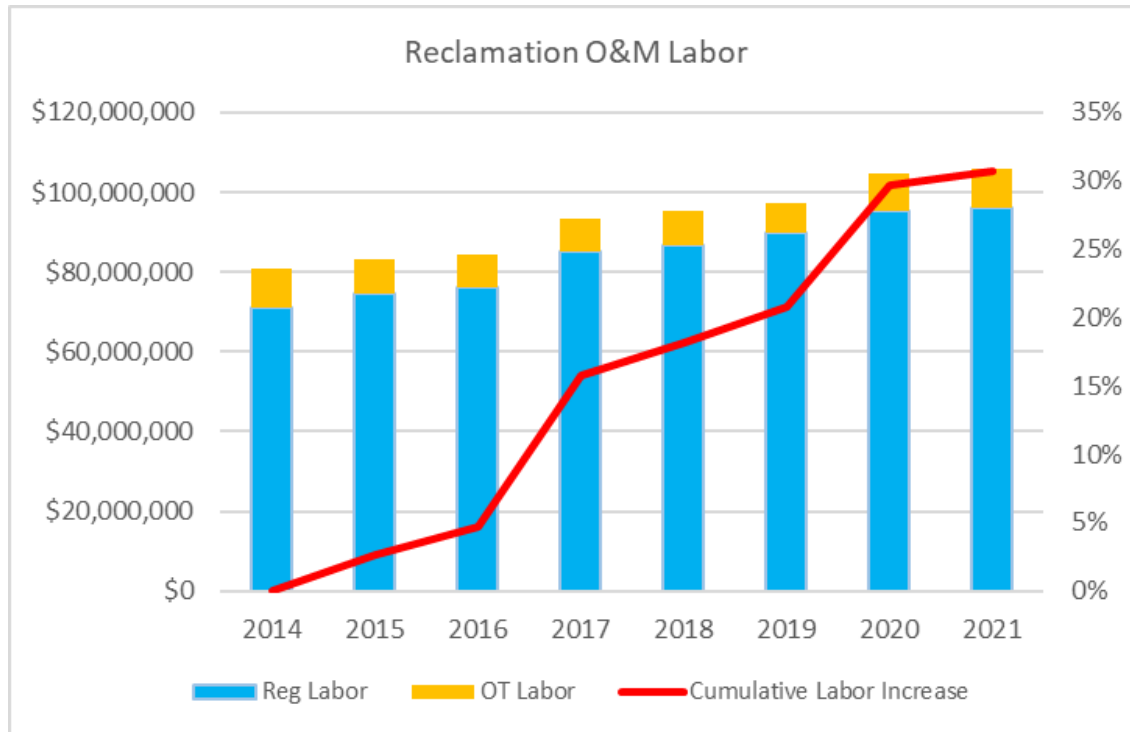


	2013	2014	2015	2016	2017	2018	2019	2020	2021
Routine Expense	\$85,992	\$101,801	\$101,582	\$101,617	\$114,481	\$114,817	\$121,971	\$122,862	\$125,464
NREX	\$35,137	\$33,676	\$28,709	\$28,591	\$35,177	\$37,288	\$40,780	\$27,204	\$24,165
IPR Budget	\$131,193	\$145,176	\$151,033	\$155,272	\$156,121	\$163,109	\$161,123	\$151,899	\$154,379

Note: 2013 WPP Overhaul Project Begins

Reclamation – Cost Drivers

- Labor



- \$24.8M Increase in Labor Costs
- 30.7% Cumulative Increase
- Overtime Costs Consistent
- Staffing Levels Relatively Constant in this Period

- Wage Increase Summary

FY	Average Craft Wage Increase at Grand Coulee	Average Craft Wage Increase in Snake River Area Office	GS Wage Increase
2015	3.54%	3%	1%
2016	1.95%	2.65%	1.17%
2017	1.30%	2.38%	1.63%
2018	4.62%	2.88%	1.67%
2019	3.95%	3%	1.66%
2020	3.47%	3%	2.85%
2021	4.34%	2.98%	1%
2022 (est)	3% - 3.5%	3% - 3.5%	2.42%

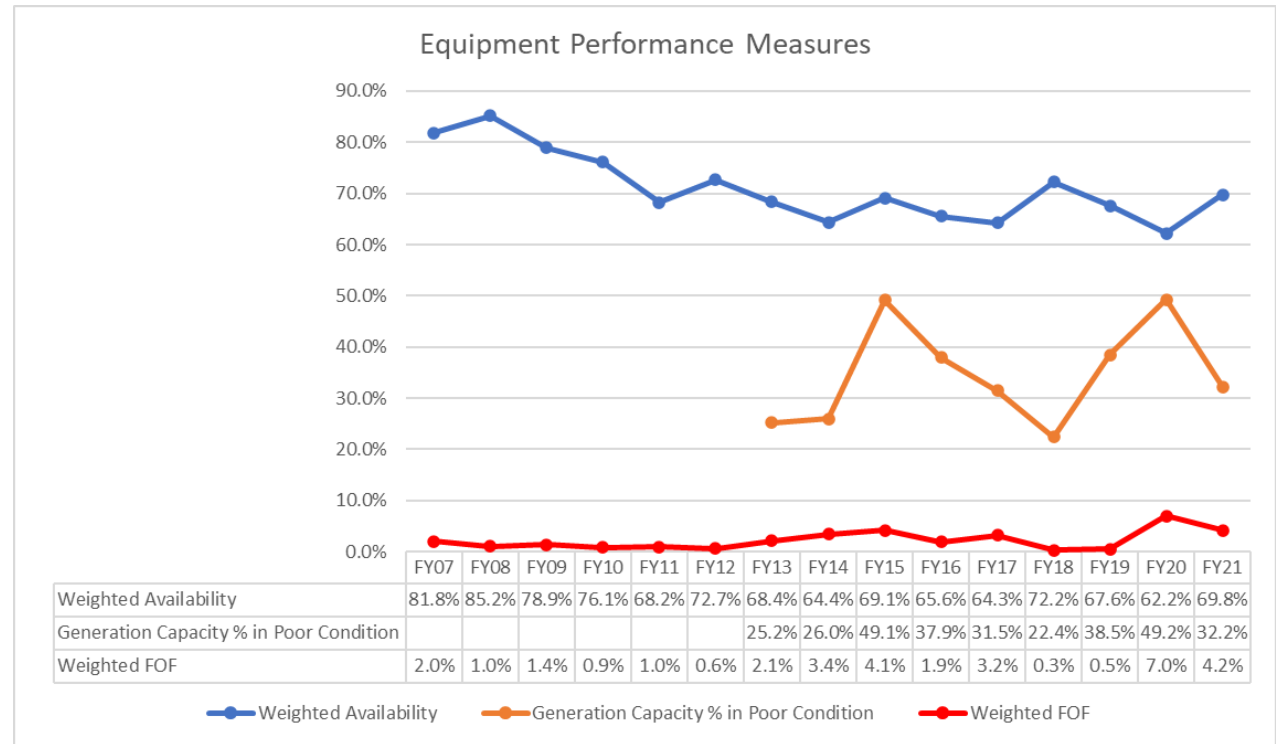
Reclamation – Cost Drivers

- Backlog of NREX Activity
 - Budget Constraints
 - Baseline Budget Defines Minimum Funding to Maintain Capabilities
 - FY18/19 Budget was Reduced \$5.6M from the Baseline Budget IPR Request
 - FY20/21 Budget was Reduced \$18M from FY18/19 IPR Approved Budget
 - FY22/23 Flat Budget
 - Deferred and Delayed Projects (Partial List)

Facility	Deferred Project	Notes
BCD	Safety - Switchyard Grounding	Deferred
BCD	Cooling Water Supply Tubing	Delayed FY18 to FY24
BCD	Machine Condition Monitoring	Deferred
MSFO	Safety - Noise Survey and Mitigation	Survey Complete. Mitigation Deferred.
CDR	Trash Rack Conveyor System Replacement	Deferred
GCPO	Safety - Power Circuit Breaker Refurbishment	Delayed. Work Commenced 2021
GCPO	WPP Foundation Drain Cleaning	Delayed 1 year.
GCPO	G1-18 Paint Penstocks	Delayed FY19. Contract Award 2020.
GCPO	Patriotic Pride	Deferred

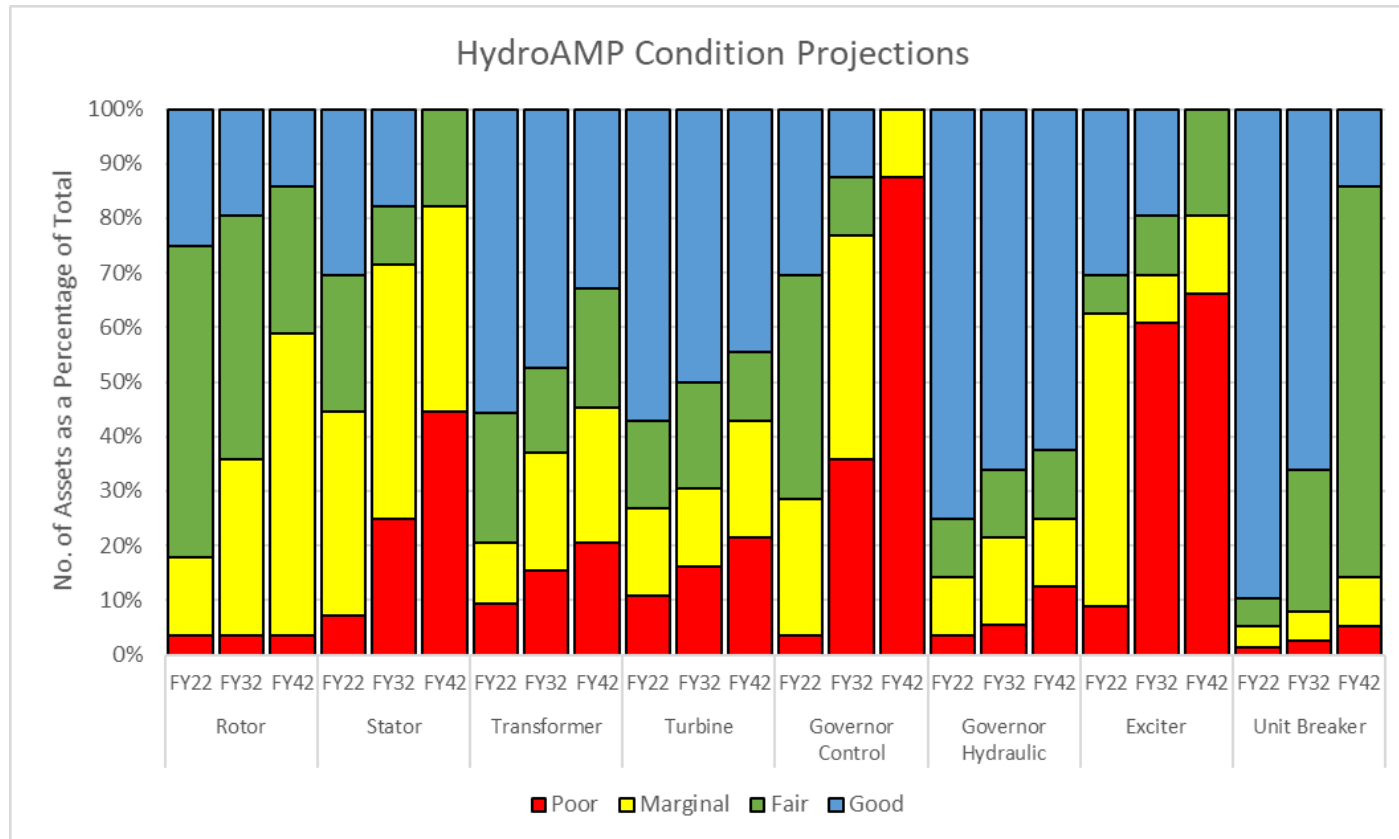
Reclamation – Cost Drivers

- Equipment Condition/Aging Infrastructure
 - Weighted Availability
 - Industry Average = 83.57%
 - Generation Capacity % in Poor Condition
 - Based on HydroAMP Condition
 - Reclamation Average = 19.8%
 - Weighted Forced Outage Factor
 - Industry Average = 3.54%



Reclamation – Cost Drivers

- Equipment Condition



- Major Drive Train Assets

- Forecast Condition Based on Predictive Lifecycle analysis and Assumes Routine O&M and Current Planned NREX

- NREX and Capital Investments Needed to Address Bow Wave

Reclamation – Cost Drivers

- Equipment Condition
 - Poor Condition Components (Red)
 - Rotor: GCL G16, G24
 - Stator: GCL G8, HGH G3, G4
 - Transformer: GCL G22
 - Turbine Runner: AND G2, HGH G1,G2,G3,G4, MIN G7
 - Exciter: GCL G16, HGH G1,G2,G3,G4,
 - Marginal Condition Components (Yellow)
 - Stator: CDR G1-G2, GCL G1-G3, G6, G19-G21, MIN G7, ROZ G1
 - Exciter: GCL G1-G18 (G16 Poor), PG7-PG12, S1-S3, PAL G1-G4
 - Transformers: GCL 3, 7, 12, 14, 16, 21, BCD 1-2

Reclamation – Major NREX Projects



Grand Coulee

- G1-18 Penstocks Rehabilitation(1)
- Safety - Power Circuit Breaker Refurbishment (2)
- PGP Discharge Tube Recoating (3)
- PGP Reverse Flow Coaster Gates (4)

1. Contract Awarded 8/2020
2. Staff commenced work 9/2021
3. Contract Awarded 8/2020
4. Contract Awarded 9/2017



Hungry Horse

- Fixed Wheel Gate Refurbishment (1)

1. Planning and Design Commenced April 2021.
May Become a Capital Project.



Black Canyon

- Safety - Switchyard Grounding

New Start



Chandler

- Generator Test Model Validation

New Start

Reclamation – Delivering Value

- Reclamation Efficiency/Availability Improvements
 - Grand Coulee Left and Right Powerhouse Crew Realignment
 - Major Maintenance Crew
 - Six Year Major Maintenance
 - 15% Increase in Annual Capacity Available
 - Running Crew
 - Routine Maintenance
 - Support Crew
 - Forced Outages, Backlog
 - Crew composition defined by need not by craft



FY18 Grand Coulee Right Power House (9 units online)

Reclamation – Delivering Value

- Grand Coulee Transformer Dissolved Gas Analysis
 - Transformers in Marginal and Poor Condition
 - Asset Management and O&M Emphasis
 - DGA Important to Monitor Condition
 - Annual Testing too Infrequent
 - Manual Testing/Analysis ~20 Hours
 - 10 Days for Results
 - Calisto-9 Selected for Installation on 110 Transformers
 - Online
 - Networked/Component of Asset Monitoring Network
 - Remote Annunciation



Reclamation – Delivering Value

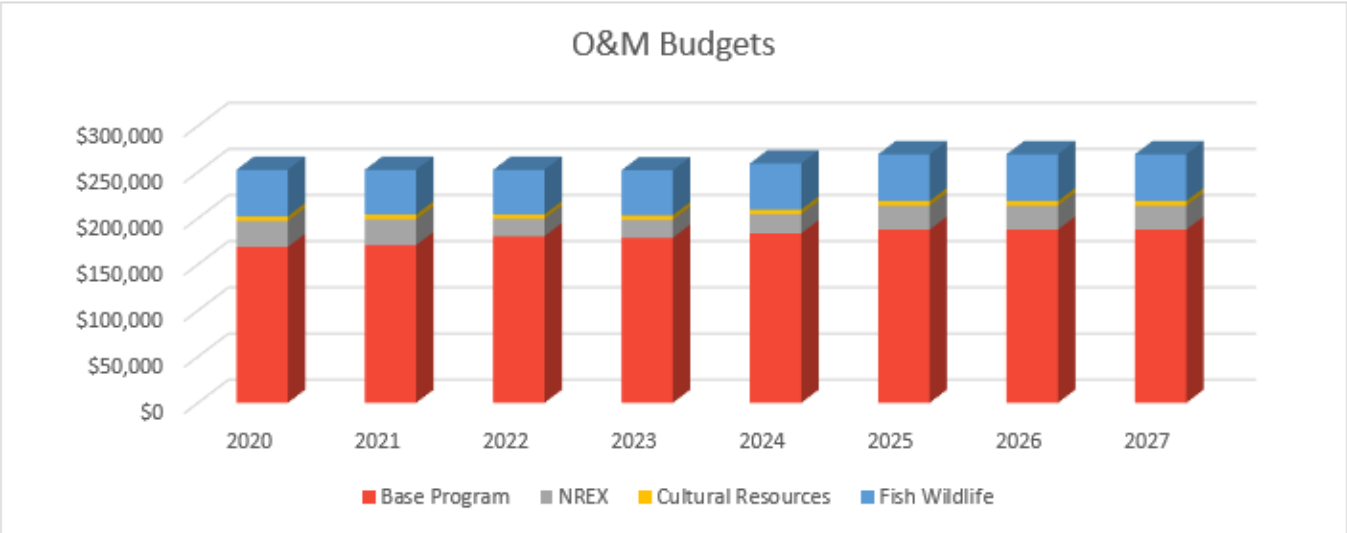
- Projects Completed in FY21
 - Grand Coulee WPP Overhaul
 - 2011 Contract Award
 - April 13, 2016: G24 RTS
 - February 1, 2019: G23 RTS
 - September 30, 2021: G22 RTS
 - Grand Coulee GDACS
 - February 2009: Decision to Proceed
 - April 2021: Grand Coulee Complete
 - Inman 8&9 Overhaul
 - May 2015 Contract Award
 - June 2021 RTS



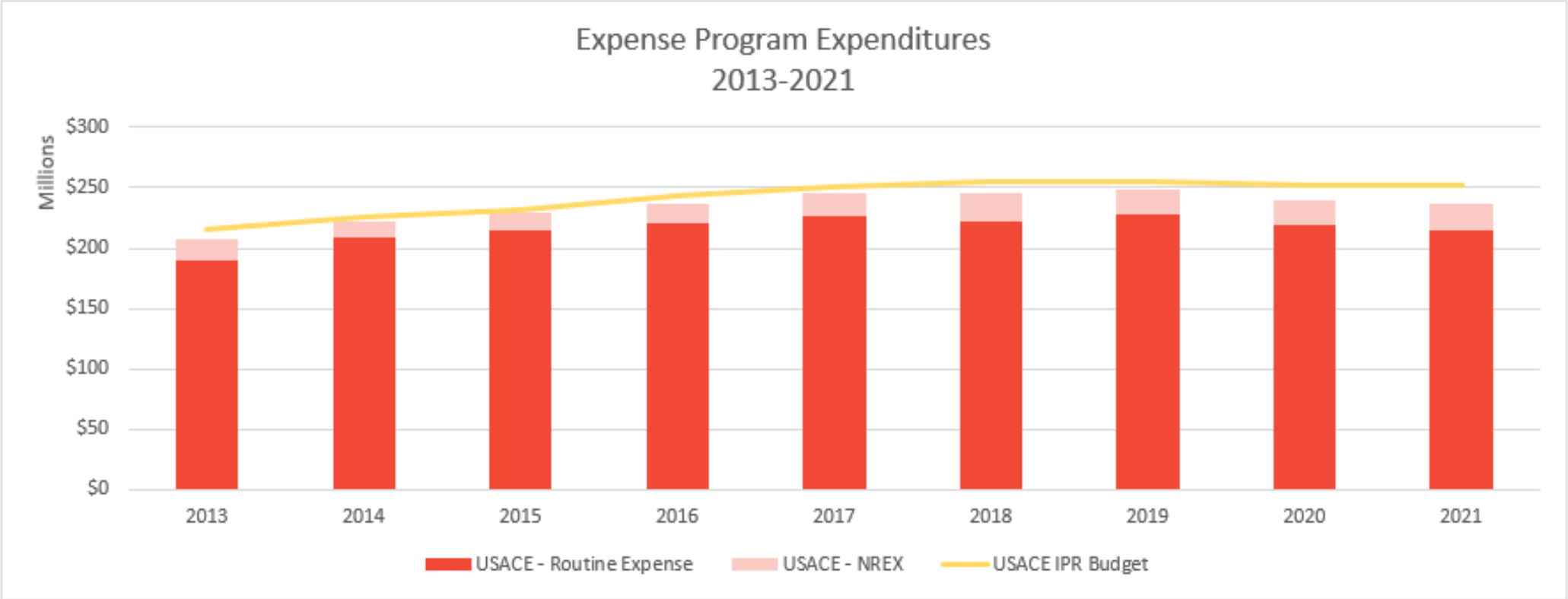
USACE O&M Budget

- USACE Detailed Budget and Proposed Spending Levels

FY	Base Program	NREX	Cultural Resources	Fish Wildlife	Total USACE APB Expense Budget	Appropriated	Total Budget
2020	\$169,002	\$28,100	\$4,996	\$50,459	\$252,557	\$500	\$252,557
2021	\$170,905	\$28,100	\$5,072	\$48,480	\$252,557	\$500	\$252,557
2022	\$180,598	\$18,985	\$4,625	\$48,349	\$252,557	\$500	\$252,557
2023	\$178,997	\$19,500	\$4,671	\$48,889	\$252,557	\$500	\$252,557
2024	\$183,679	\$20,987	\$4,727	\$49,998	\$259,391	\$500	\$259,891
2025	\$187,687	\$26,038	\$4,844	\$50,823	\$269,392	\$500	\$269,892
2026	\$187,687	\$26,038	\$4,844	\$50,823	\$269,392	\$500	\$269,892
2027	\$187,687	\$26,038	\$4,844	\$50,823	\$269,392	\$500	\$269,892



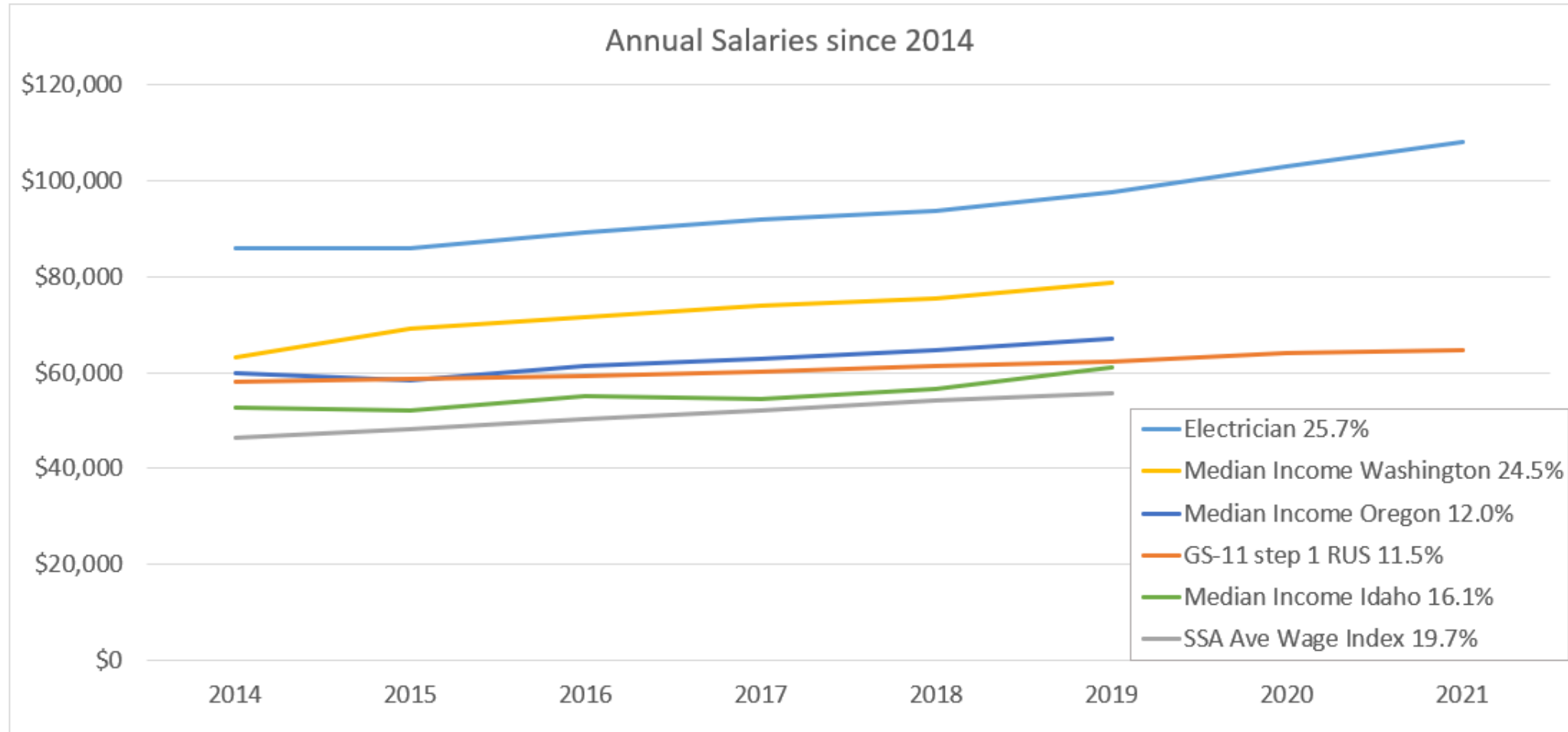
USACE O&M Budget



	2013	2014	2015	2016	2017	2018	2019	2020	2021
USACE - Routine Expense	\$189,680,233	\$208,271,687	\$214,235,000	\$220,986,635	\$225,956,798	\$221,471,906	\$227,957,000	\$219,554,000	\$215,260,000
USACE - NREX	\$17,471,000	\$13,463,000	\$15,823,000	\$16,521,000	\$15,122,000	\$24,116,000	\$20,763,000	\$19,524,000	\$20,811,000
USACE IPR Budget	\$215,700,000	\$225,687,000	\$231,878,000	\$243,885,000	\$250,981,000	\$254,457,000	\$254,457,000	\$252,557,000	\$252,557,000

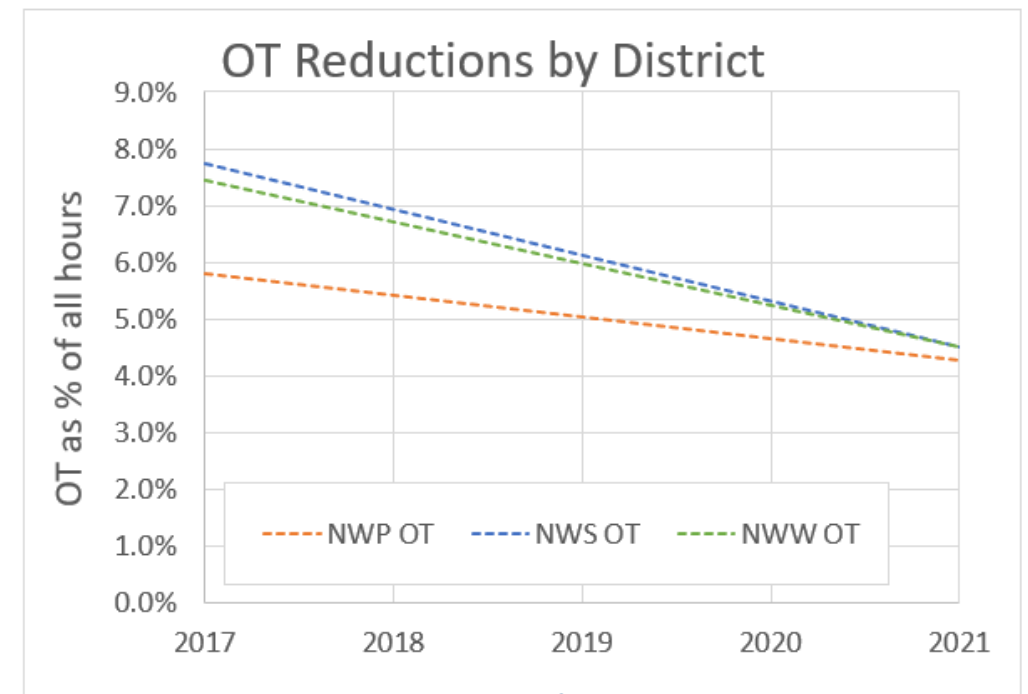
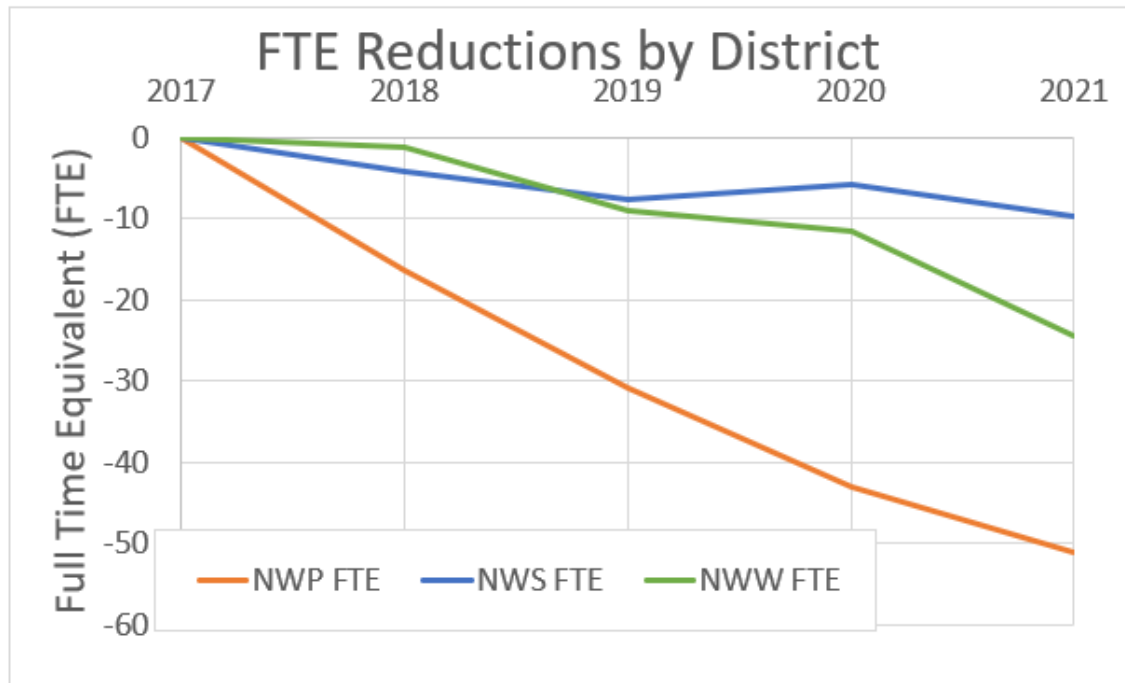
USACE - Cost Drivers

- Inflationary Pressures
- Supply Chain delays
- Wage increases



USACE - Cost Drivers

- Flat Budget Changes
 - Hiring Board to evaluate backfills vs. leave vacant
 - NWP reduced 51 FTE & ~16k OT hrs
 - NWW reduced 24.5 FTE & ~19k OT hrs
 - NWS reduced 10 FTE & ~11k OT hrs
 - ~\$7M reduction in supplies, materials, contracts



USACE – Major NREX Projects



McNary

- GSU T1-T7 Oil Leak Repair
- Preparing construction contract



Chief Joseph

- Spillway Monolith Joint Repairs
- Preparing construction contract



Chief Joseph

- Turbine Oil and Pipe Replacement
- Contract awarded, work in progress



John Day

- Powerhouse Monolith Joint & Drainage Repair
- Contract Awarded, construction in progress



Little Goose Dam

- DSAC Spillway 1 Failed Waterstop
- Contract awarded, work in progress

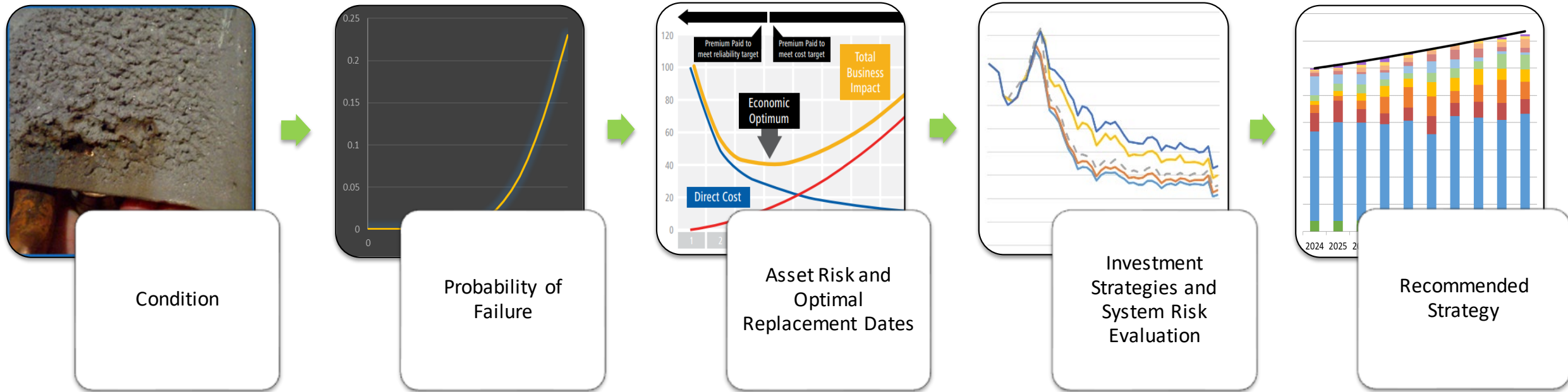
USACE – Notable NREX Projects at Funding Risk

- FY22/23 NREX New Starts
 - Bonneville PH Metering Improvements for EIM
 - Libby PH Joint Seals
 - The Dalles Transformers 9-11
 - CHJ Spillway Surface Seal Replacement (Downstream)
 - Lower Granite Stilling Basin Sediment Removal
 - Little Goose Stilling Basin Sediment Removal
 - Lower Monumental Stilling Basin Sediment Removal
- FY24/25 NREX New Starts
 - BON 1 Spillway Gates
 - BON 1 Preferred AC/DC Improvement
 - BON 2 Forebay Dredging - 2nd period
- Program Risk
 - TDA Headgate Rehabilitation
 - Libby Transformer T2 rehab
 - Chief Joseph and The Dalles SF6 Breaker Refurbishment

USACE – Remoting Initiative Update

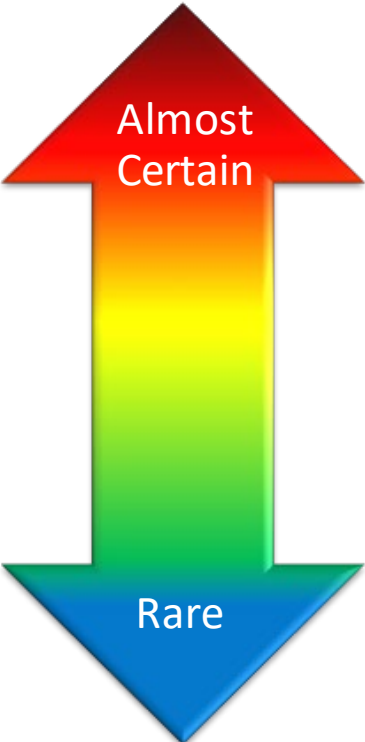
- Remote Control of Hydropower
 - Evaluation
 - Multi-disciplinary team established
 - Evaluated central and nodal control centers
 - Remoting equipment gap analysis and ROM estimate
 - Staffing analysis
 - Conclusions
 - Multi-purpose missions don't allow de-staffing of plants
 - Minimal staffing reductions
 - Significant remoting costs
 - Economic challenges to feasibility

FCRPS Strategy Development



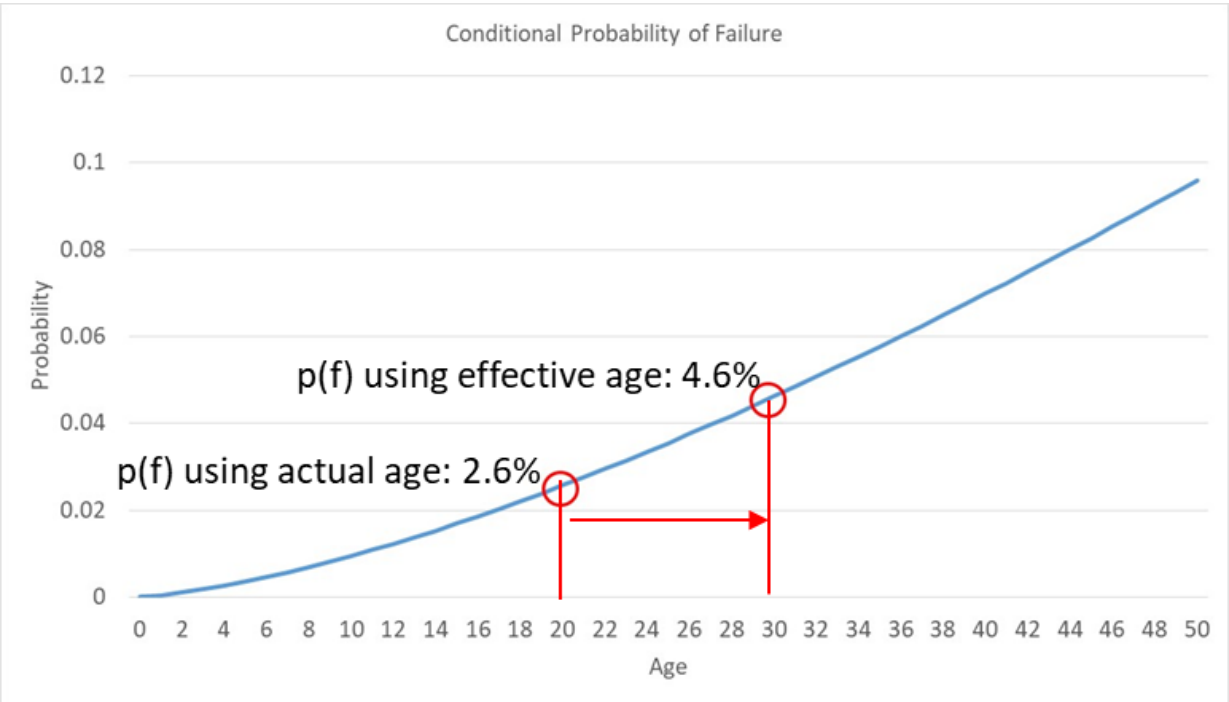
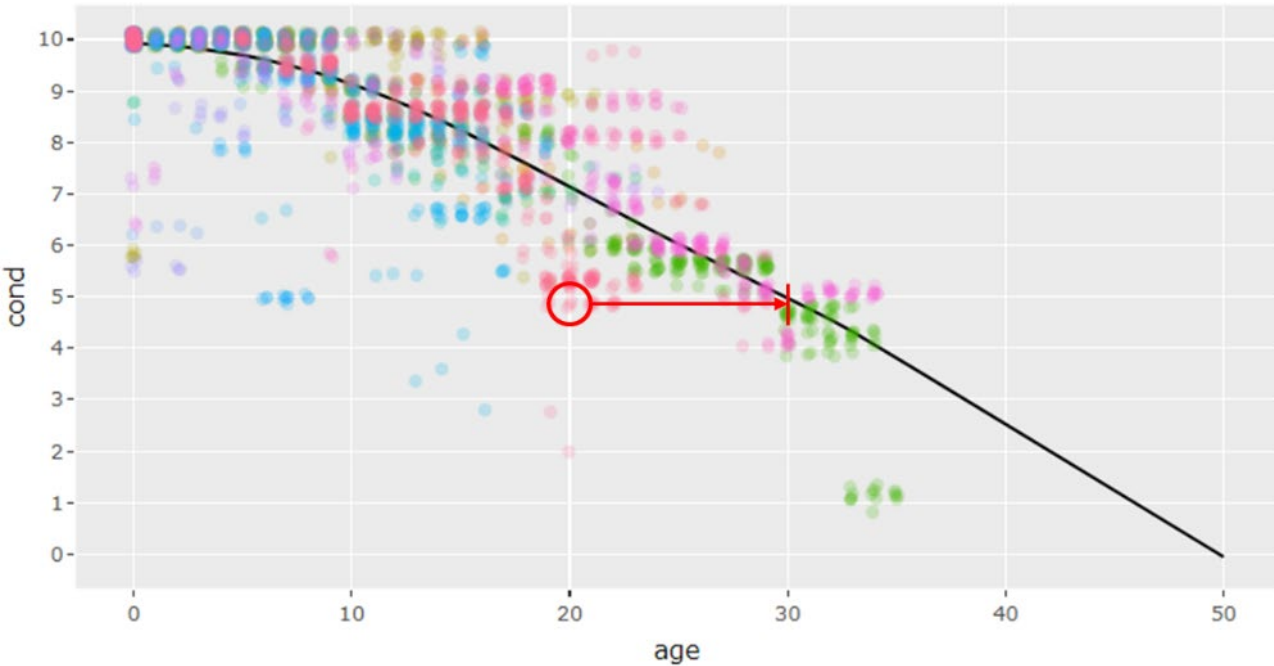
Strategic Asset Management Plan (SAMP) – Capital Forecast Process

Asset Condition

Likelihood	Condition Index	Description
	0 to 0.9	Poor
	1 to 1.9	
	2 to 2.9	
	3 to 3.9	Marginal
	4 to 4.9	
	5 to 5.9	
	6 to 6.9	Fair
	7 to 7.9	
	8 to 8.9	
	9 to 10	Good

- Asset health is assessed with the hydroAMP condition assessment framework
- Condition is assessed for 10,000+ assets/systems of assets
- hydroAMP is a hydro industry framework that provides guides to objectively assess equipment condition

Asset Probability of Failure

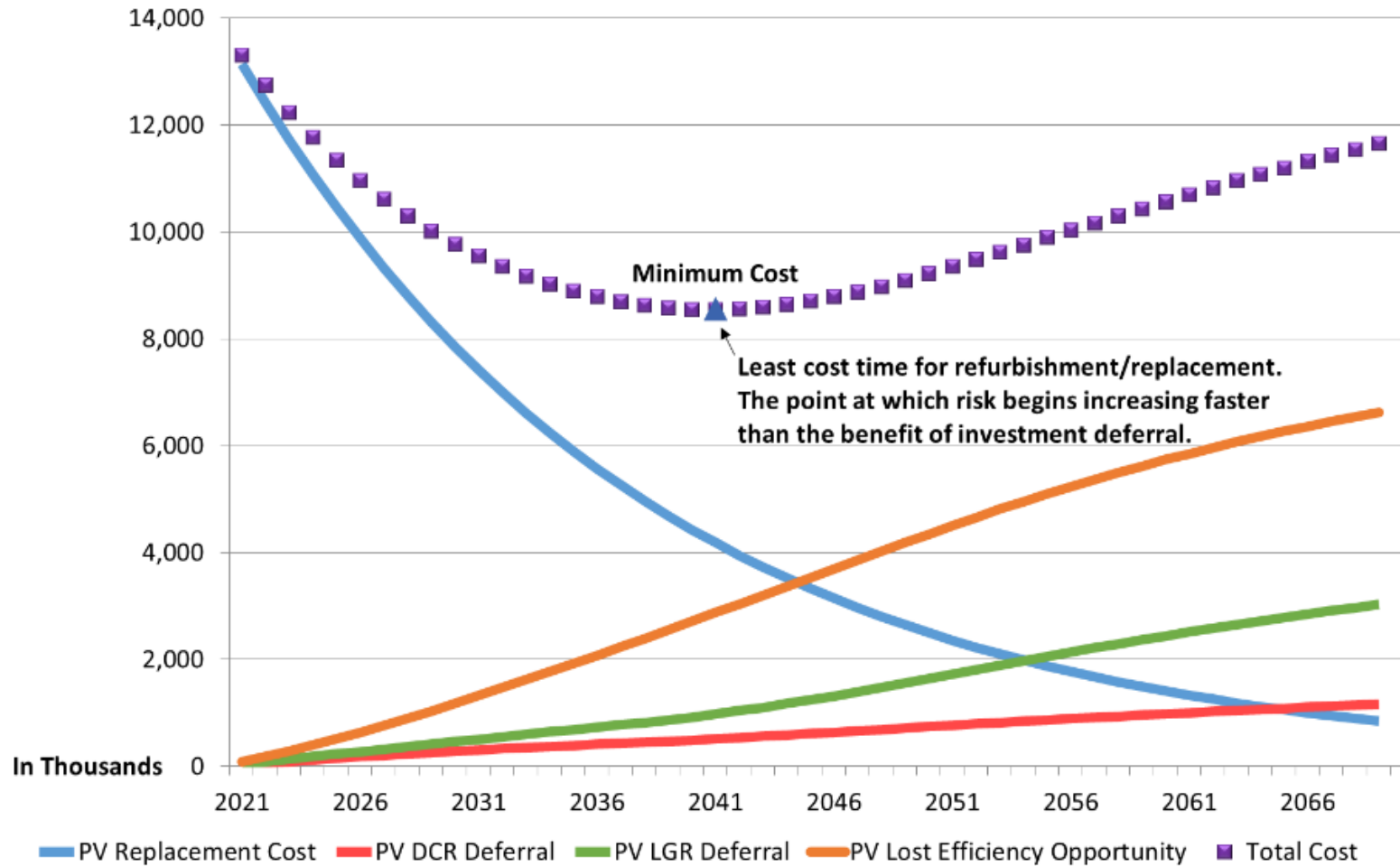


Equipment Condition



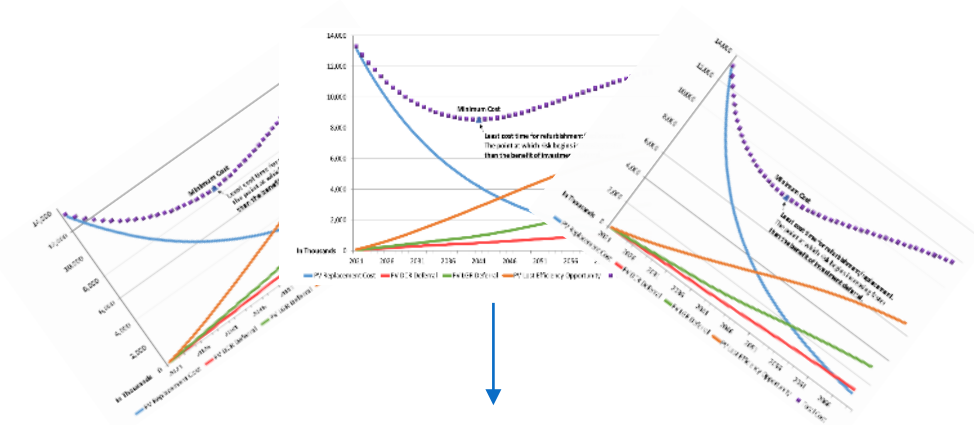
Probability of Failure

Asset Risk and Optimal Intervention Calculation



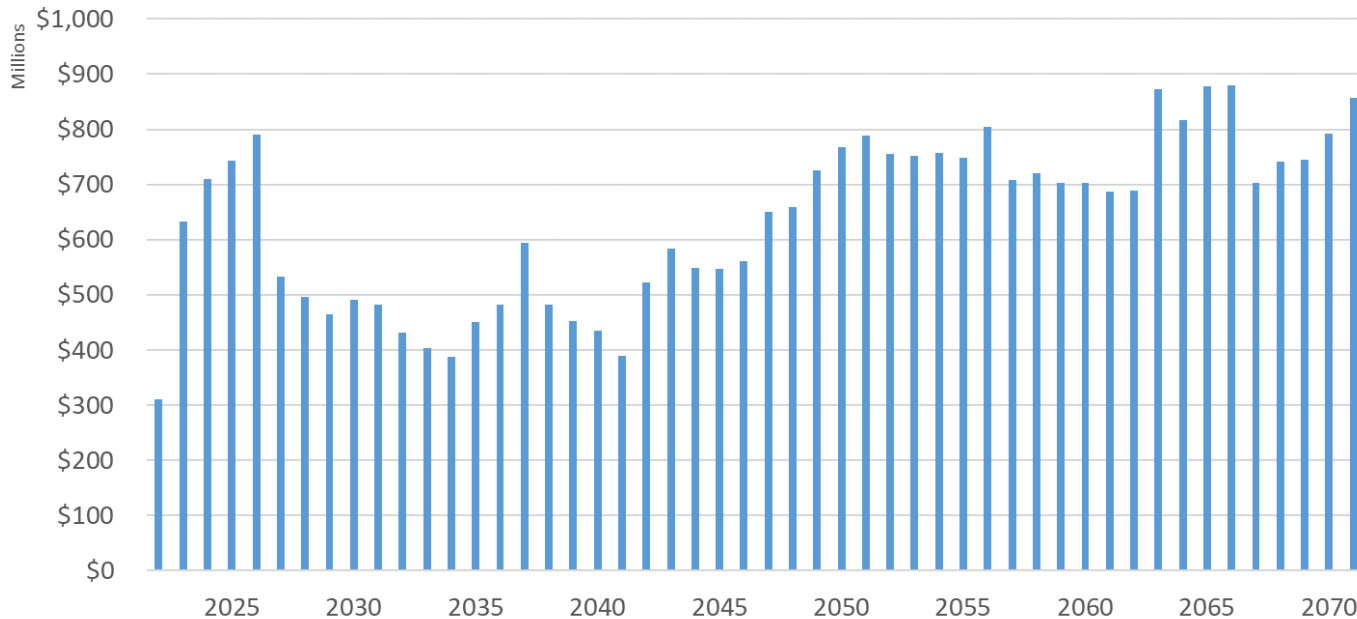
- Use condition and probability of failure to forecast risks and costs
 - Lost Generation Risk (LGR)
 - Direct Cost Risk (DCR)
 - Lost Efficiency Opportunity
 - Asset replacement cost

Capital Budget Level Development



"Optimal" Capital Investment Forecast

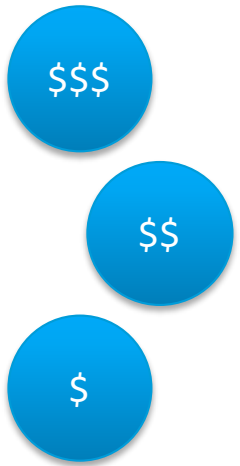
(if all assets could be replaced at their optimal replacement date that minimizes lifecycle cost)



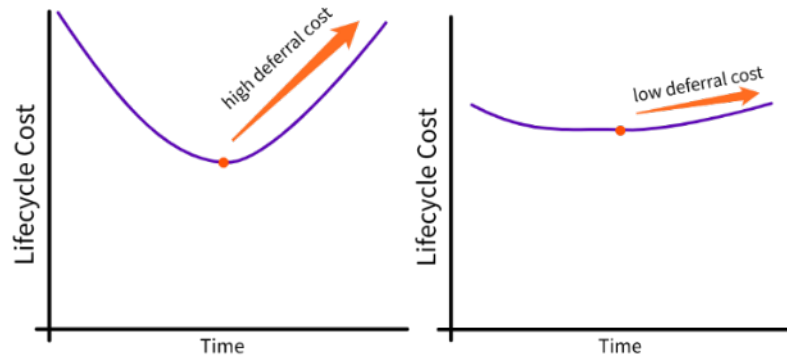
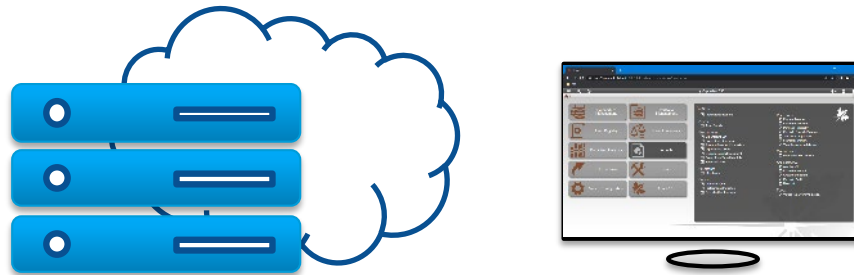
- The “optimal” Capital investment forecast represents the level of investment needed to replace every asset at its optimal replacement date
- Logistically not possible, but sets a baseline for comparison
- Further modeling prioritizes assets within constraints based on their relative risk

Capital Budget Alternatives Analysis

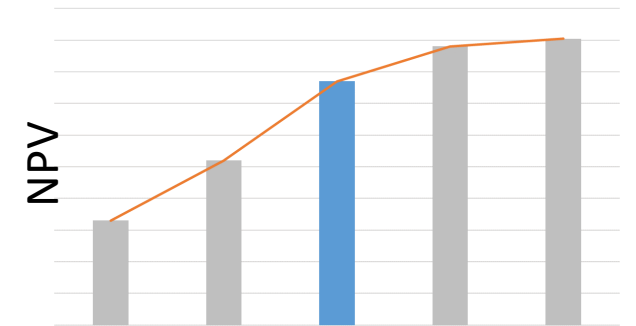
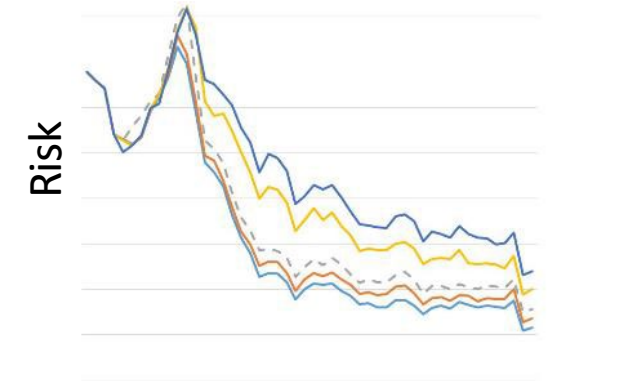
Determine budget levels to evaluate



Model asset replacements under each budget level

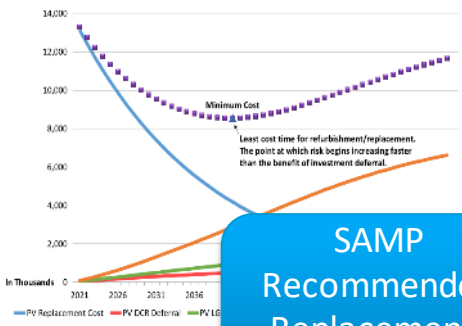
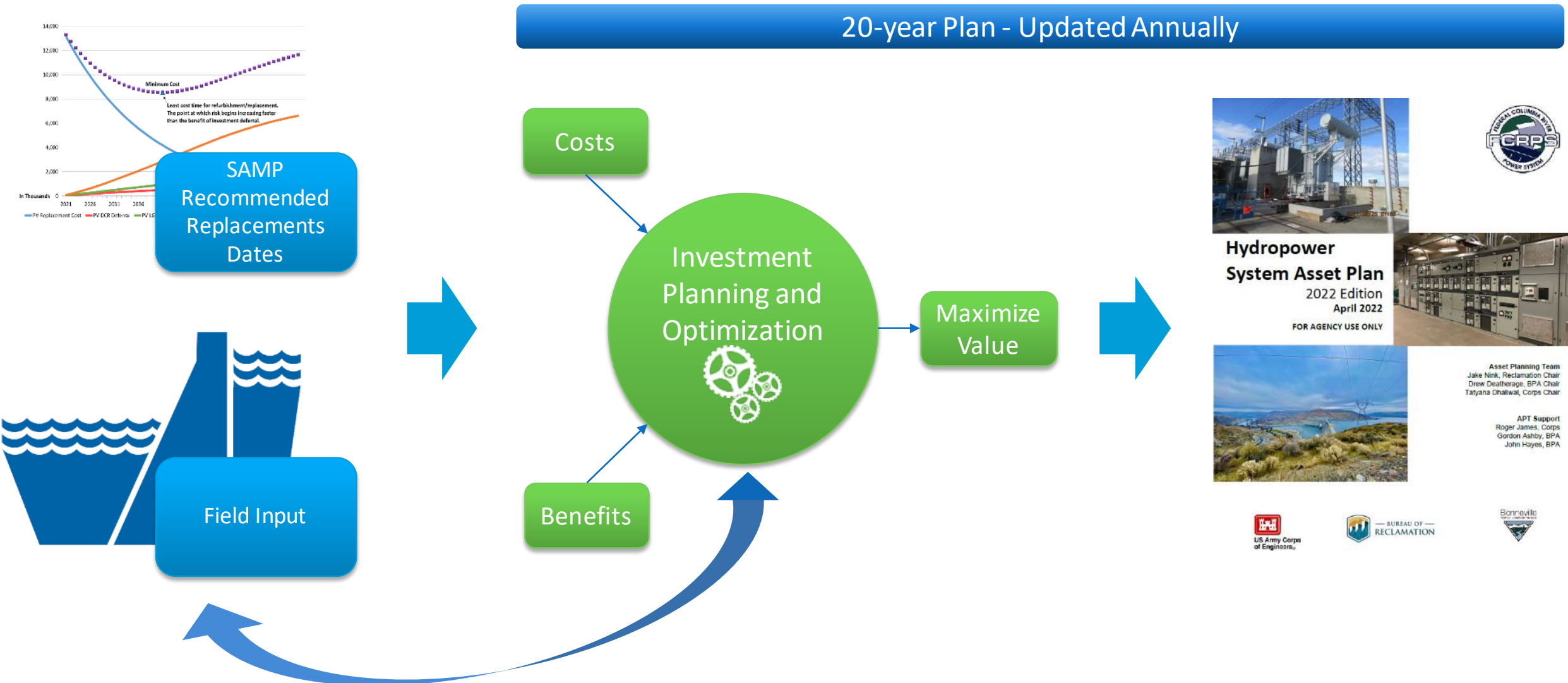


Evaluate impacts on condition, risk, and value

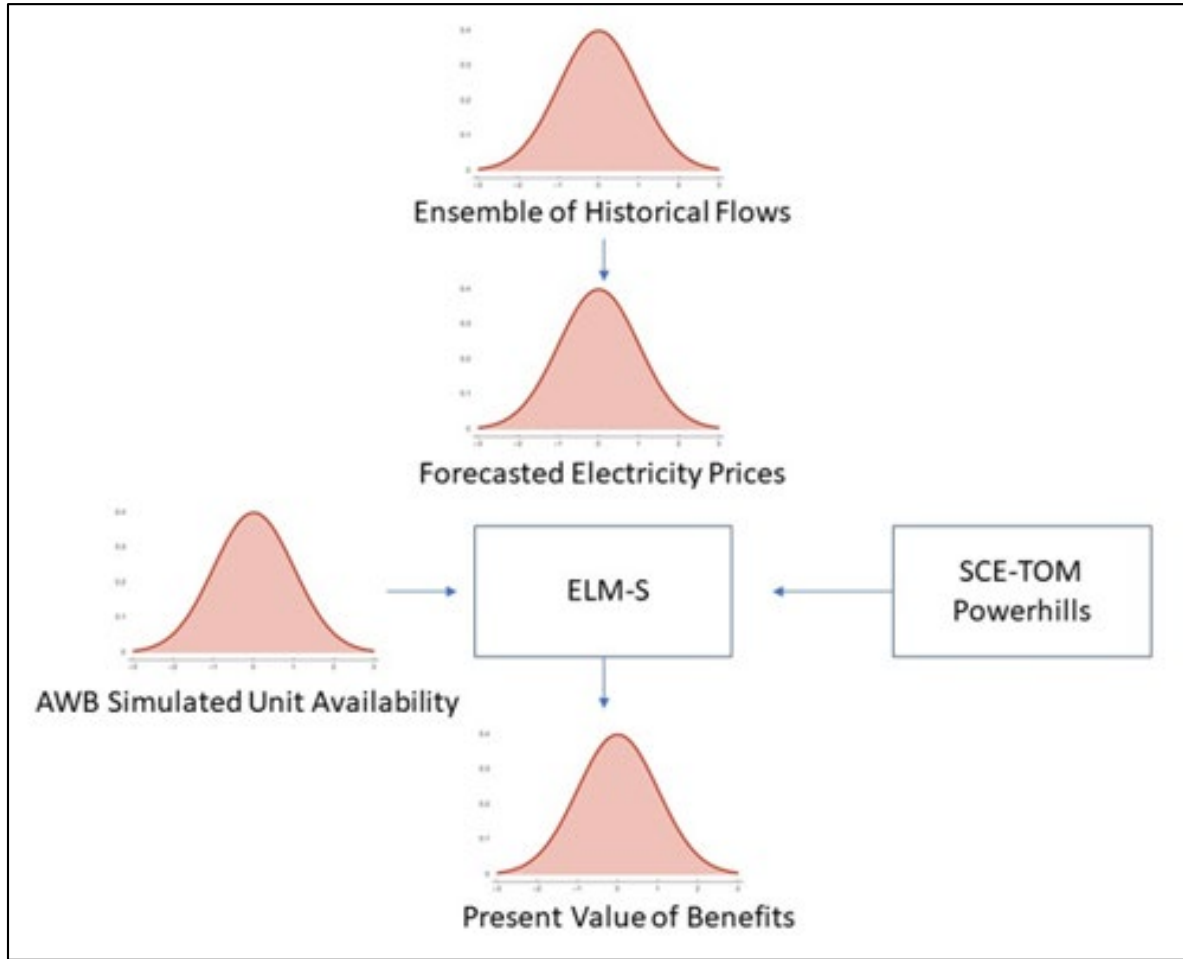


SAMP Recommended Strategy

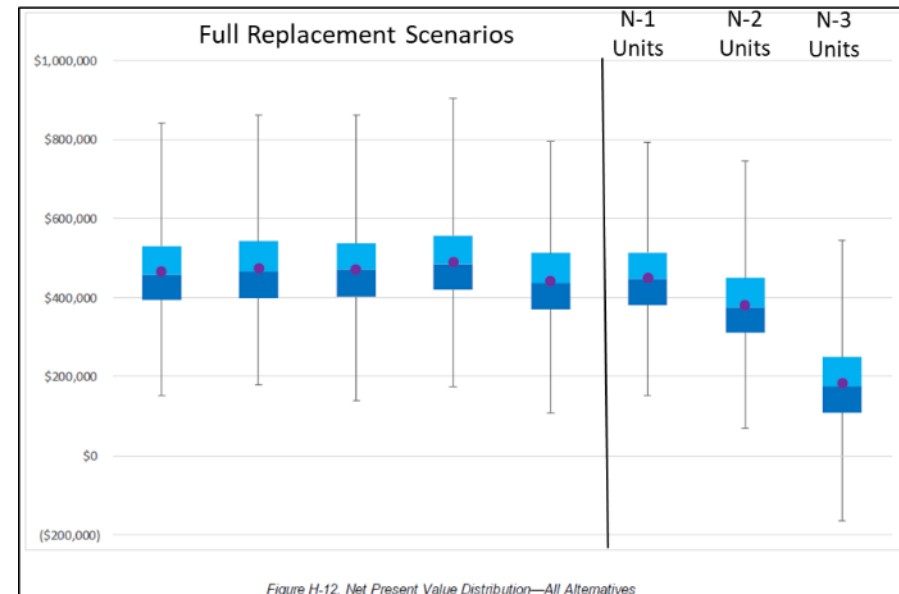
Converting Strategy to a Plan



Investment Alternative Optimization

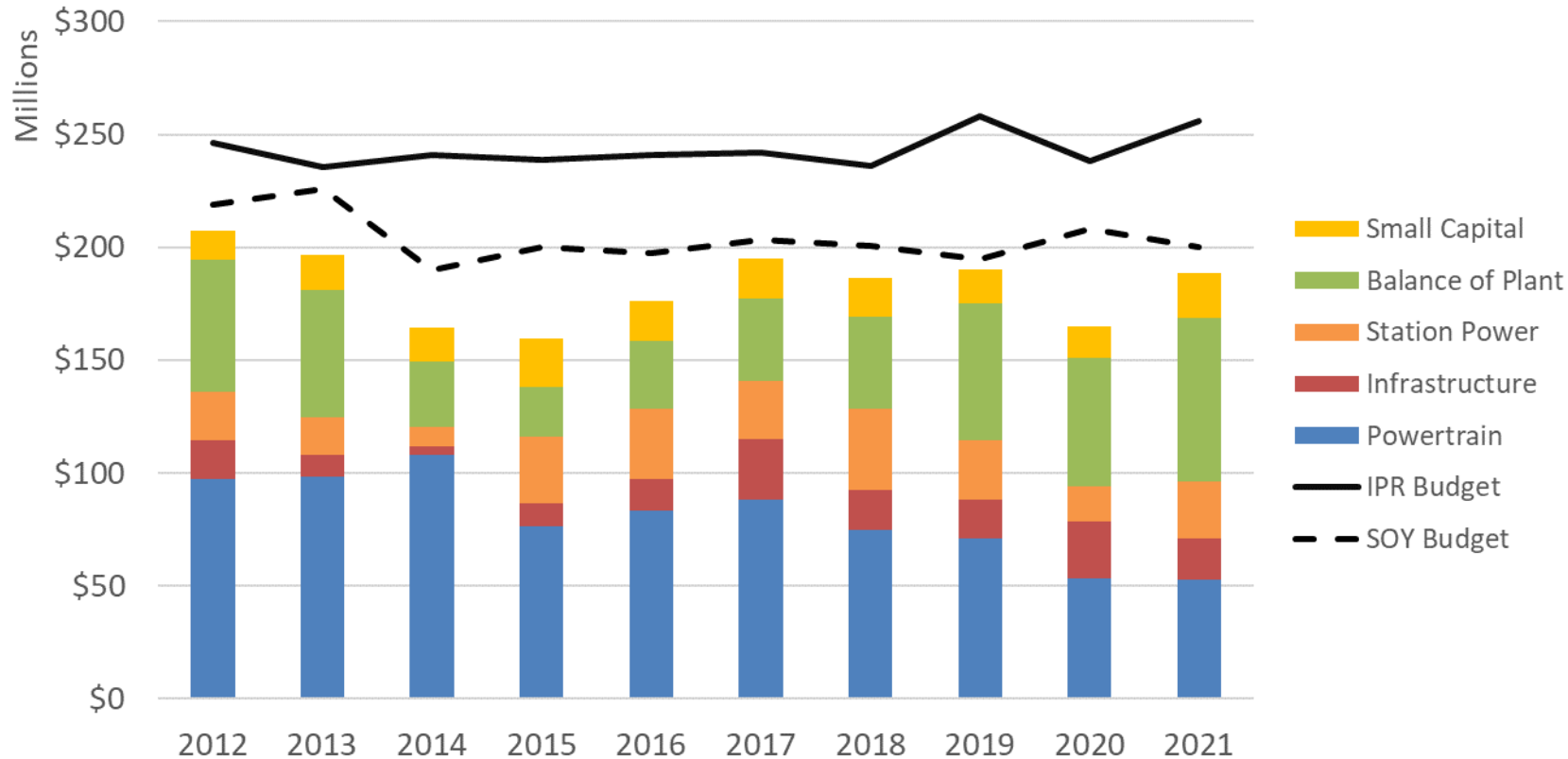


Major powertrain modernizations are extensively studied to select an alternative that balances operational, economic, environmental, safety, and other benefits



Historical Program Execution

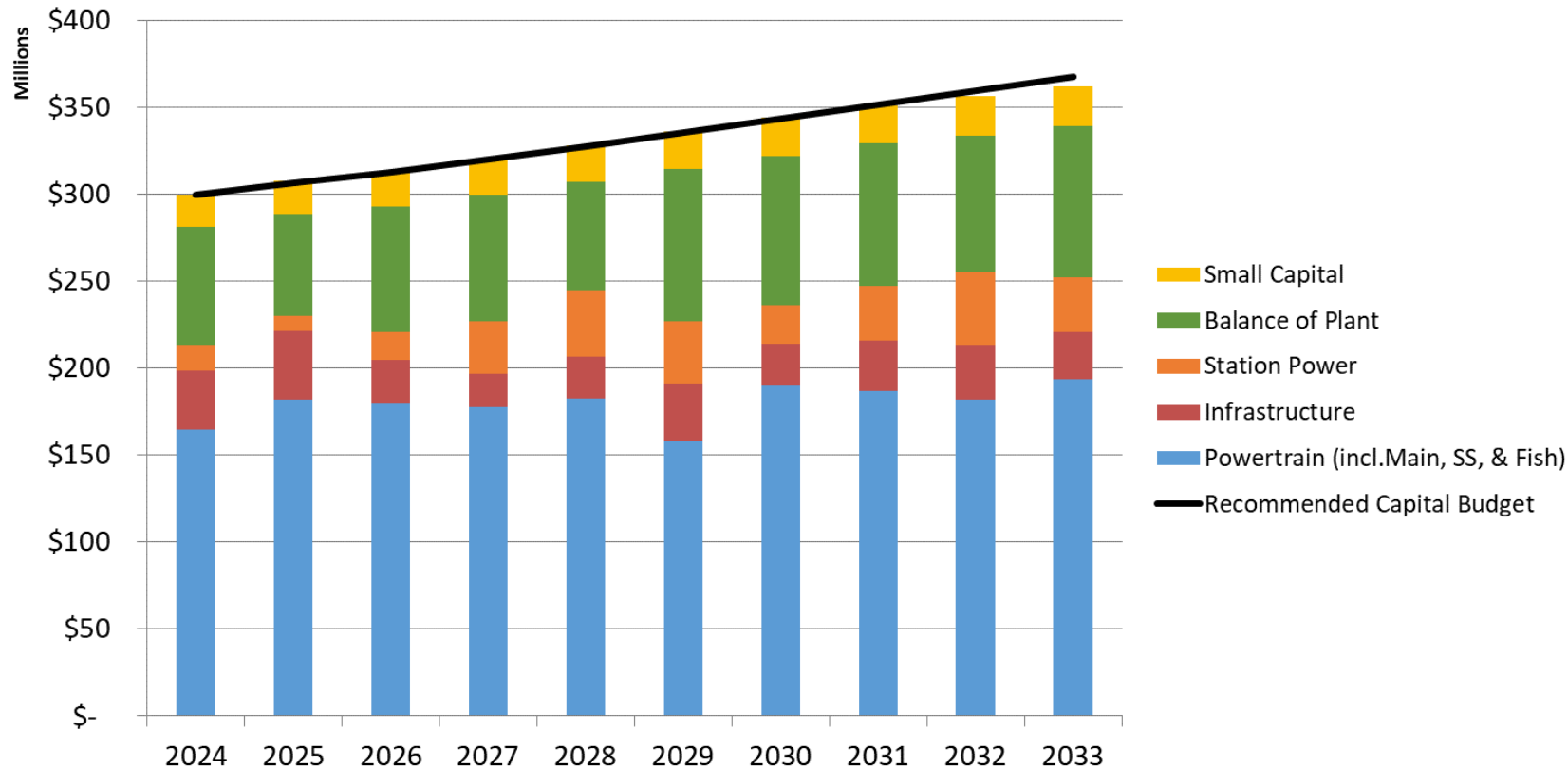
Capital Program Historical Actuals by Equipment Category
2012-2021



- Large powertrain investments that justify the \$300 million target have taken longer to plan and execute than expected
- Due to their size and complexity, “filling in the gaps” is not always possible when a large powertrain investment is delayed
- BPA’s requests for additional analysis to select the best investment extended some project planning processes

Recommended Capital Investment Level

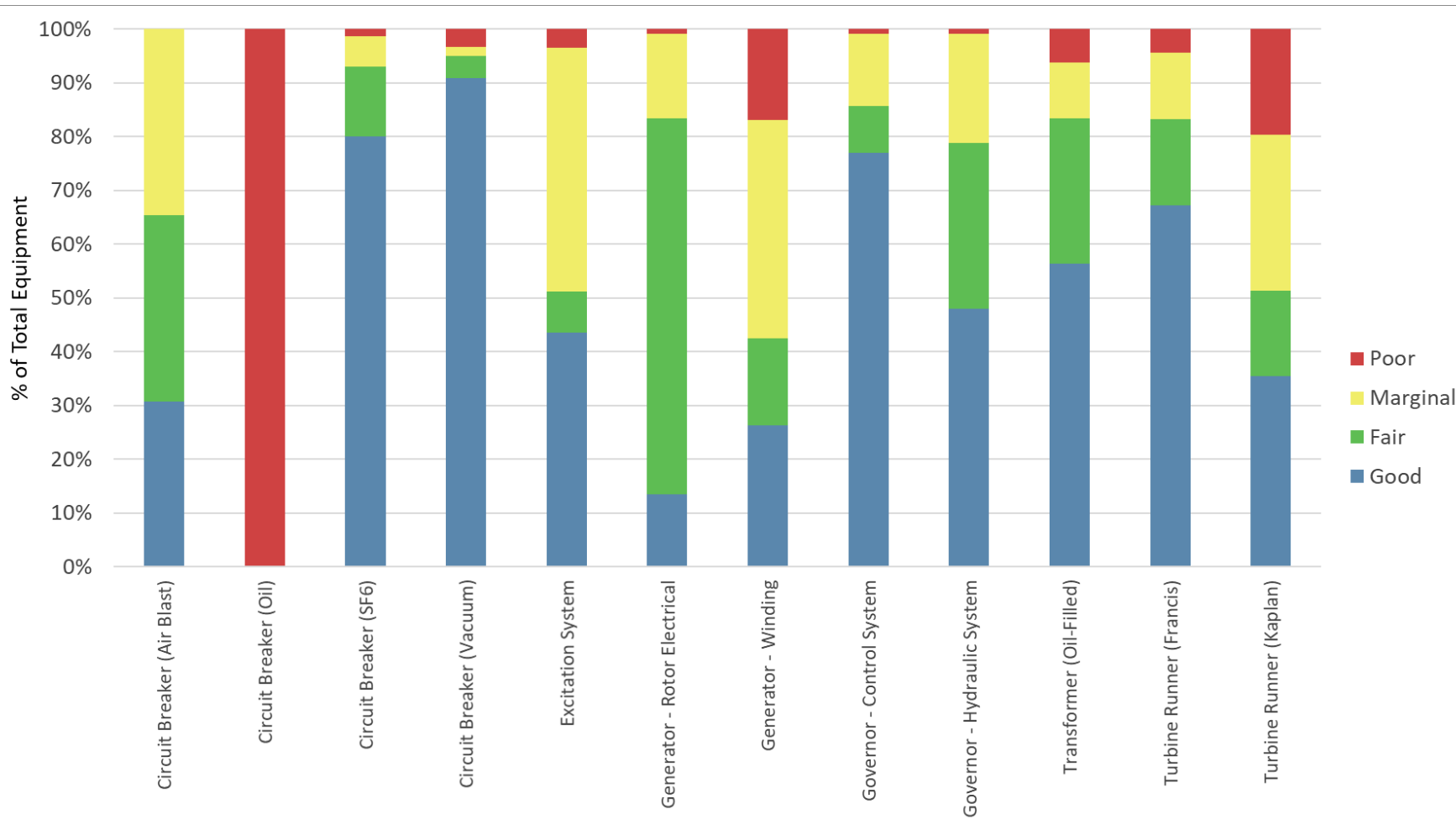
**10-Year Capital Program Forecast by Equipment Category
2024-2033**



- Minimal changes from 2020 IPR recommendation
- Target reaches \$300 million in 2024 and then escalates at just over 2% per year
- Corps/Reclamation authorized to spend up to recommended level
- 10% reduction assumed in rates

Current Equipment Condition

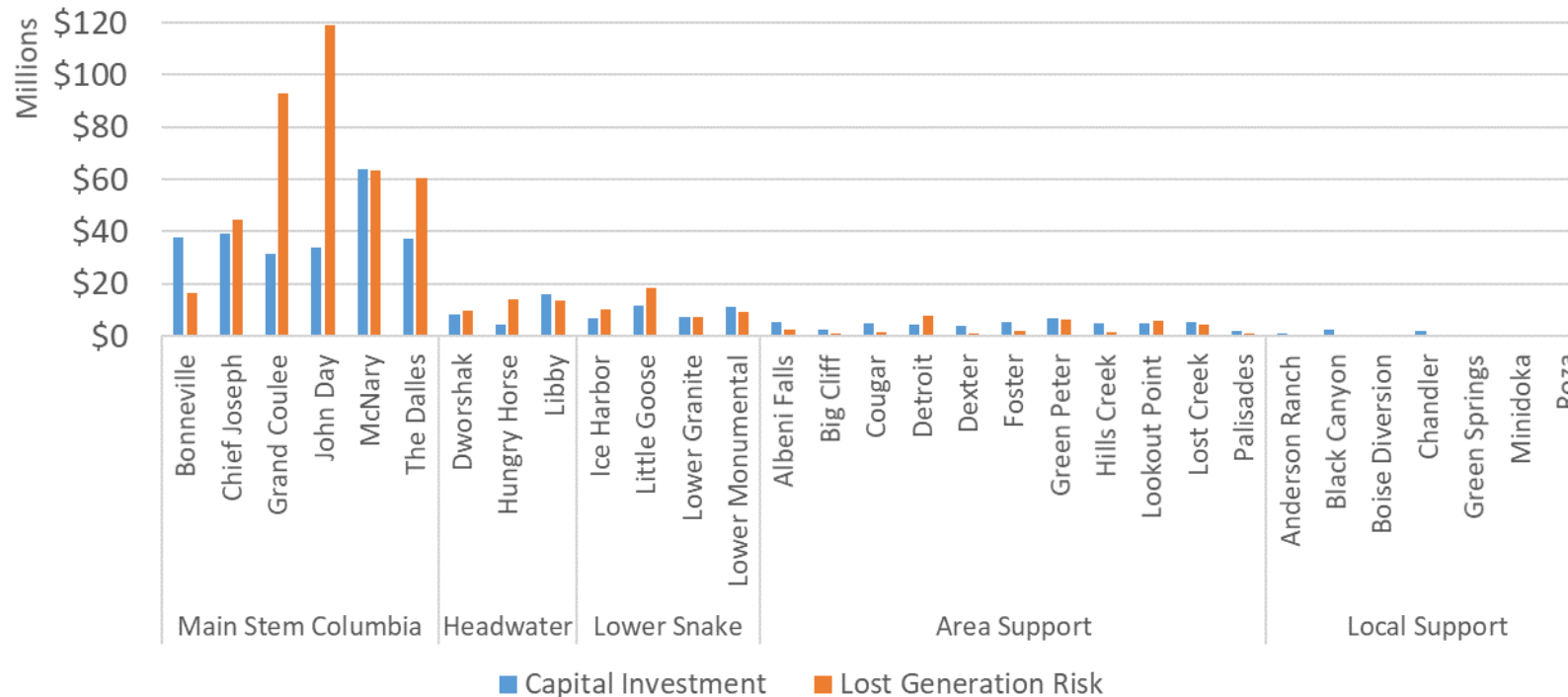
Critical Powertrain Equipment Condition



- Turbines and windings account for over 45% of the estimated cost of a unit and are a major driver of our investment program
- Approximately 50% of Kaplan Turbines and more than 50% of generator windings are in marginal or poor hydroAMP condition ratings.
- Note that there are very few Oil Circuit Breakers left in the system

Plant Detail

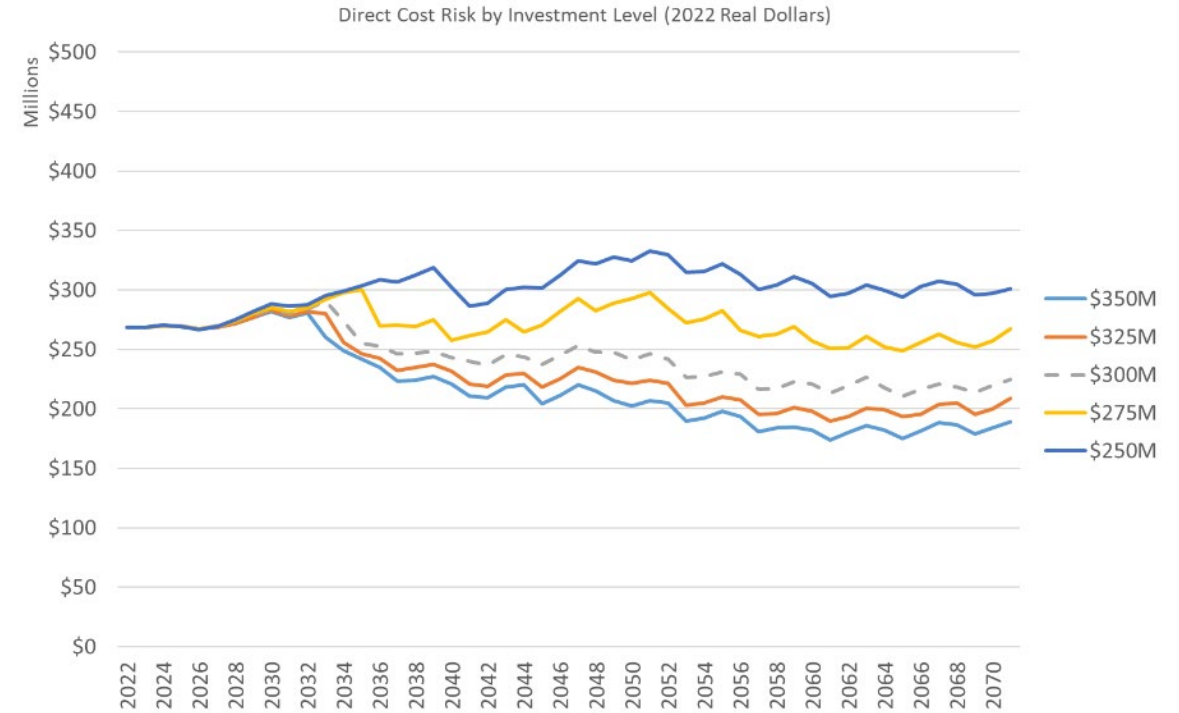
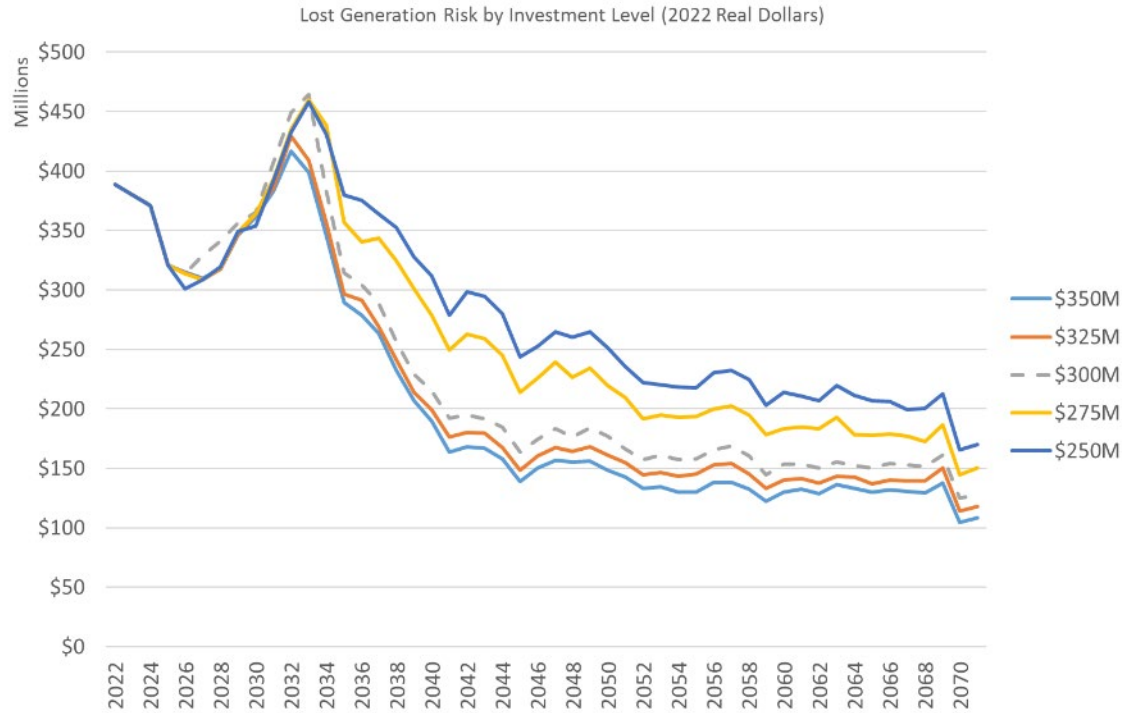
Average Annual Investment vs Average Annual Lost Generation Risk without Investment
(2022-2034, 2022 Real Dollars)



- Majority of Capital investment is targeted at Main Stem Columbia.
- Generally, investments are closely tied to lost generation risk mitigation.
- Other investments target multipurpose missions

*Lost Generation Risk is the expected value of lost revenue from replacement power purchases or lost sales due to equipment failure. It is the product of equipment probability of failure times outage consequences at average water conditions. Current Lost Generation Risk by plant is a sum of the lost generation risk for each piece of equipment based on current equipment condition.

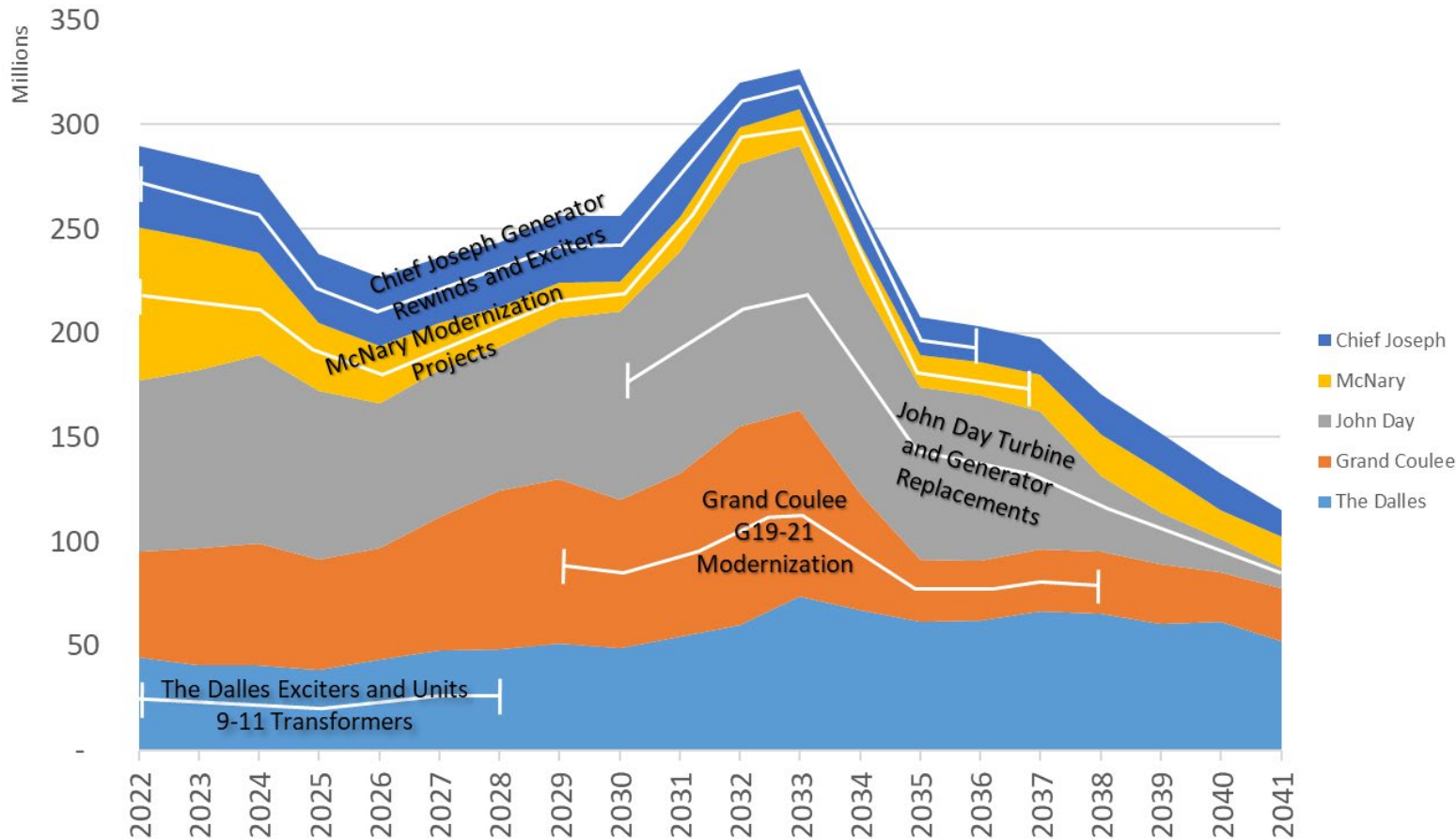
Financial Risk Reduction Benefits



- Risk impacts were evaluated across five different Capital investment levels
- Results from the recommended strategy are illustrated by the dashed line

Lost Generation Risk – Plant Detail

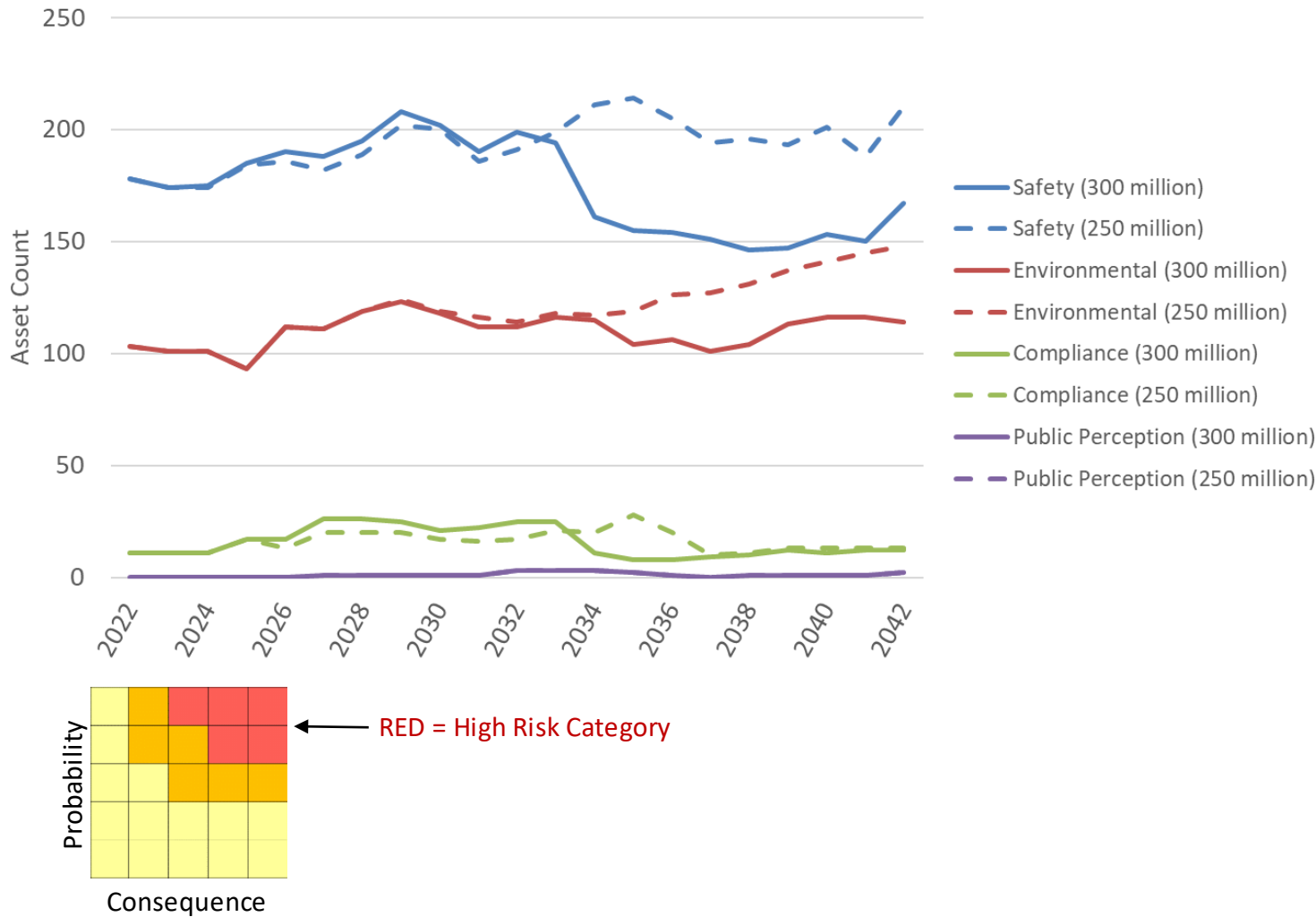
20-year Lost Generation Risk Forecast
Top 5 highest risk plants in 2022 and related investments



- 75% of current system lost generation risk (LGR) represented by these 5 dams
- White bars illustrate duration of major projects
- Investments expected to reduce annual LGR by \$210 million (in real 2022 dollars) by 2041.

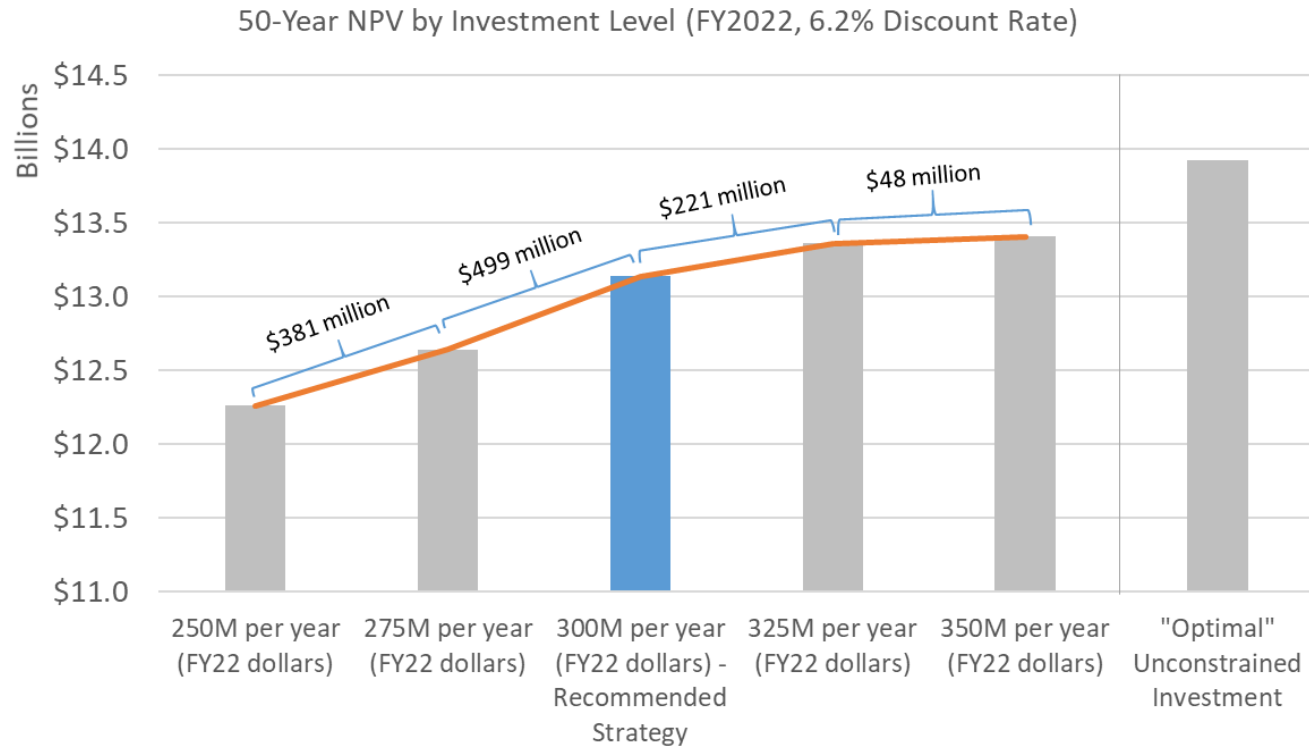
Non-Financial Risk Reduction Benefits

Assets in the "High Risk" Category



- High risk assets are typically mitigated through operational measure until they can be replaced
- These counts are not necessarily additive (a single asset can pose both a high safety risk and high environmental risk)
- Minor differences between investment scenarios

Net Present Value of Investment



*Net Present Values greater than 0 mean annual benefits are higher than costs

- The Recommended Strategy is believed to provide the best balance of:
 - Risk Reduction (Financial and Non-Financial)
 - Efficiency improvements
 - Affordability
 - Implementability
- Higher levels of investment:
 - Higher NPV but decreasing incremental benefits
 - Less affordable
 - Harder to implement
- Lower levels of investment:
 - Less upfront Capital cost
 - Lower NPV from increasing risk costs
- The recommended strategy achieves 94% of the net benefits of the “optimal” scenario.

Reclamation Major Capital Projects

Grand Coulee Projects					
Project Title	Current Phase	Planned Schedule			Value to Cost Ratio
		Scoping (FY)	Design (FY)	Construction (FY)	
LPH/RPH Bridge Cranes	Construction	--	--	22 – 26	2.43
G11-18 & WPP Transformer Replacement	Construction	--	--	22 – 27*	6.51 & 3.30
G19-G21 Modernization	Design	--	22 – 24	34-48**	TBD
LPH/RPH Gantry Cranes	Scoping	22	24	25 - 28	2.17
Fire Protection Modernization	Scoping	22 - 23	23 – 24	24-36	0.63
Arc Flash Mitigation	Scoping	22	TBD	TBD	TBD

*Supply chain issues will likely delay current project milestones

**Results of design will influence planned construction timeframe

Reclamation Major Capital Projects

Hungry Horse Projects

Project Title	Current Phase	Planned Schedule			Value to Cost Ratio
		Scoping (FY)	Design (FY)	Construction (FY)	
Powerplant Cranes	Construction	--	--	22-24	6.05
Transformer Fire Protection	Construction	--	--	23-24	2.77
Static Exciters	Construction	--	--	24-26	2.53

Palisades Projects

Project Title	Current Phase	Planned Schedule			Value to Cost Ratio
		Scoping (FY)	Design (FY)	Construction (FY)	
Hollow Jet Valve	Construction	--	--	22-23	4.17
Butterfly Valve Replacement	Planning	23	24	25-30	1.89

USACE Major Capital Projects

McNary Projects					
Project Title	Current Phase	Planned Schedule			Value to Cost Ratio
		Scoping (FY)	Design (FY)	Construction (FY)	
MCN Turbine Design and Replacement	Construction	--	--	22 – 38*	3.20
MCN Headgate System Rehabilitation (McMod)	Construction	--	24	25 – 28*	0.25
MCN Iso-phase, HV Bus and Switch Upgrade McMod	Construction	--	23 – 24	24-36*	2.75
MCN Levee Drainage Pump Station Upgrades	Construction	--	--	22-27*	2.18
MCN Exciters Upgrade	Construction	--	--	22-26*	1.32
MCN Spillway Gate Rehab and Gate Hoist Uprate	Design	21-22	23-24	24-37**	0.33

*Supply chain issues will likely delay current project milestones

**Results of design and cost share funding availability may influence planned construction timeframe

USACE Major Capital Projects

Chief Joseph Projects

Project Title	Current Phase	Planned Schedule			Value to Cost Ratio
		Scoping (FY)	Design (FY)	Construction (FY)	
CHJ Unit 1-16 Generator Rewind	Design	--	22	23 – 31**	2.89
CHJ Intake Gantry Crane	Construction	--	--	22-24*	2.06
CHJ Upgrades for Station Service Units SS01 & SS02	Construction	--	--	22-24*	-0.08

John Day Projects

Project Title	Current Phase	Planned Schedule			Value to Cost Ratio
		Scoping (FY)	Design (FY)	Construction (FY)	
JDA Turbine Runner Replacement and Generator Rewind	Design	--	22-24	24 – 41**	0.84
JDA Submerged Traveling Screen Crane	Construction	--	--	22-26	5.52

*Supply chain issues will likely delay current project milestones

**Results of design may influence planned construction timeframe

FCRPS Long-Term Program Summary

Strategic Class	% of FCRPS Average Annual Generation	% of 50-Year Capital Forecast	% of 50-Year Expense Forecast	50-Year Cost of Generation ^{1/} (\$/MWh)	50-Year Fully Loaded Cost ^{2/} (\$/MWh)
Main Stem Columbia	77%	63%	66%	\$8.08	\$19.46
Lower Snake	12%	12%	13%	\$12.50	\$27.22
Headwater	6%	9%	8%	\$13.15	\$24.97
Area Support	4%	12%	9%	\$32.77	\$47.87
Local Support	1%	4%	4%	\$42.24	\$55.17
FCRPS	100%	100%	100%	\$10.14	\$22.13

- Capital and Expense programs are heavily driven by generation importance but support multiple missions for the three agencies.
- The long-term programs developed for this IPR result in a 50-year Cost of Generation of \$10.14/MWh and a fully loaded cost of \$22.13/MWh.

1/ Cost of Generation represents the forecasted levelized capital and expense costs associated with producing power at the facilities for the next 50 years.

2/ Fully Loaded Cost includes the Cost of Generation plus allocations for all remaining Power Services costs attributable to the FCRPS including Fish and Wildlife. The majority of these costs are system-wide costs that would still be incurred and reapportioned across other Strategic Classes if generation ceased at a certain project or projects.



Questions?