BONNEVILLE POWER ADMINISTRATION

Integrated Program Review 2

Federal hydropower capital program

February 15, 2017
Phone Bridge: 1-203-480-9278
Passcode: 9208236#
Please mute/unmute using *6
WebEx meeting: Join the meeting
Meeting number: 992 984 422
Meeting password: UMkSC382

Recommended capital program

- Following the initial IPR and CIR workshops in 2016, the proposed ramp up to a $300 million (real) annual capital investment level was delayed by a year in the IPR close-out.

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Initial IPR (Nominal)	**236**	**258**	**281**	**306**	**331**	**338**	**344**	**351**	**358**	**365**	**373**	**380**	**388**	**395**
IPR 2 and IPR close-out (Nominal)	**206**	**236**	**258**	**281**	**306**	**331**	**338**	**344**	**351**	**358**	**365**	**373**	**380**	**388**
Initial IPR (2016 Real)	231	248	265	283	300	300	300	300	300	300	300	300	300	300
IPR 2 and IPR close-out (2016 Real)	202	227	243	260	277	294	294	294	294	294	294	294	294	294

$ millions

- Investments address reliability improvements in high risk equipment at critical plants, as well as safety and environmental improvements across the system.
- The increased levels of investment are forecasted to have minimal to no impact on the Tier 1 PF Rate relative to current investment levels due to increased unit availability and decreased lost generation risk.

Investment by equipment category FY 17 – FY 36

Percentage of Capital Investment Forecast FY17 - FY36						
Unit Reliability	Station Service	Operations Support	Water Control	Cranes	Infrastructure	Opportunity
65%	5%	6%	10%	5%	8%	1%

Unit Reliability: Replacements of powertrain equipment and other equipment that directly impact unit reliability.

Station Service: Replacements of electrical equipment that provide power to the powerhouse. Station service equipment failure can result in multiple unit outages.

Operations Support: Replacement of equipment that support day-to-day operations such as SCADA systems, communications equipment, fire protection and detection systems, security systems and control room equipment.

Water Control: Replacement of equipment required to dewater units in support of capital investment as well as spillway gate structural improvements in the Willamette Valley based on recommendations following Tainter Gate failure at Folsom Dam.

Cranes: Replacement of cranes that are required to disassemble units and install or remove water control equipment.

Infrastructure: Replacement of roofs, elevators and HVACs as well as the construction or modification of Oil Water Separators in accordance with the Columbia Riverkeeper settlement.

Opportunity: Adding additional generating units to existing FCRPS facilities.

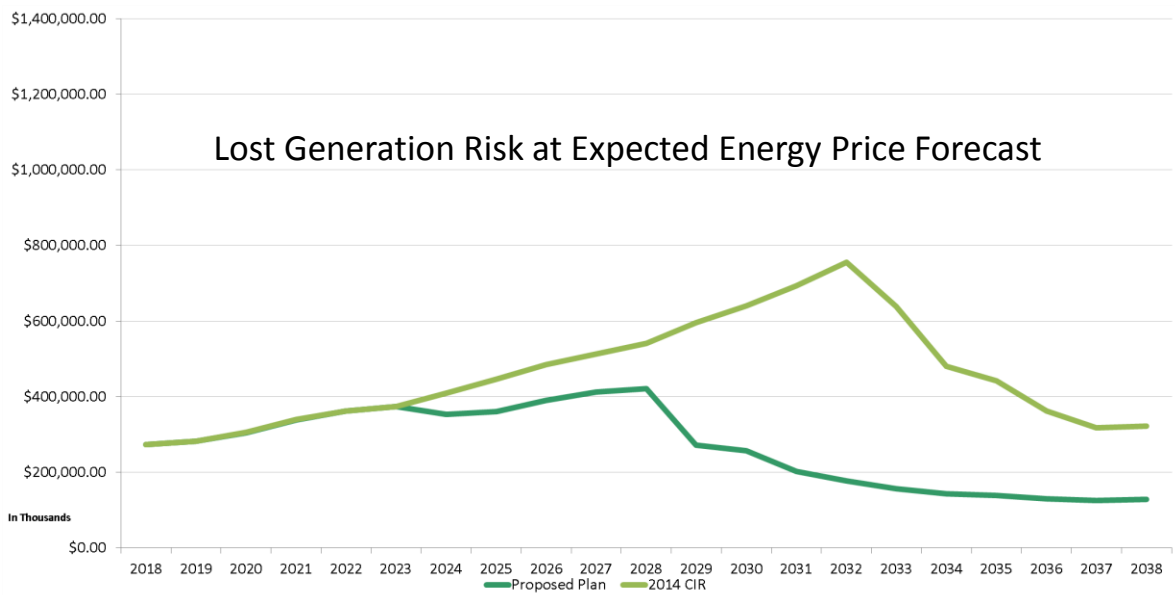
Investments in the next rate period

Owner	Project Name	FY18-FY19 Forecasted Expenditures ($000)
Corps-Portland	BON 1 Main Unit Breaker & Station Service Reconfiguration	13,620
Corps-Portland	JDA BLH Turbine Hub Upgrades and Fixed Blade Conversions	7,640
Corps-Portland	JDA Emergency Gantry Crane Replacement	10,130
Corps-Portland	TDA Fish Attraction Unit Breaker Replacement	7,585
Corps-Portland	TDA Transformer Replacement TA,1,3,5,6,7,8	15,071
Corps-Seattle	CHJ Unit 17-27 Generator Rewind and Cooling	n/a
Corps-Walla Walla	IHR Turbine Runner Design & Repl. Units 1,2,3	29,008
Corps-Walla Walla	IHR Units 1-3 Stator Winding Replacement	8,736
Corps-Walla Walla	MCN 4160-480V Station Service Replacement	13,441
Reclamation	BCD New Unit	n/a
Reclamation	GCL G11-G18 Transformer Replacement	10,580
Reclamation	GCL G19-G21 Modernization and Unit Uprate	n/a
Reclamation	GCL G1-G18 Penstock Stoplogs	n/a
Reclamation	GCL G1-G18 Stator Windings, Cores and Spare Replacement Program	10,985
Reclamation	GCL LPH/RPH Crane Control Upgrades	n/a
Reclamation	GCL P1-P6 Exciters, Relays, & Controls, PG7-PG12 Governors, Exciters, Relays & Controls	6,531
Reclamation	GCL P5 and P6 Impellers, Stators and Core Rewinds	7,050
Reclamation	GCL SCADA Replacement	8,783
Reclamation	GCL TPP Crane Control Upgrades	n/a
Reclamation	HGH Powerplant Cranes and Controls	n/a

Projects in blue are currently under evaluation.

Lost generation risk forecast

- At 2014 Capital Investment Review levels (effectively a $200 million per year real capital investment program), lost generation risk is expected to continue to increase through the 2020s.
- The proposed plan is expected to keep risk more stable across the system during the two long-term modernization projects, with significantly less risk in the 2030s relative to 2014 CIR levels.
- The benefits of reduced lost generation risk alone offset the incremental capital investment as modernized units are returned to service.

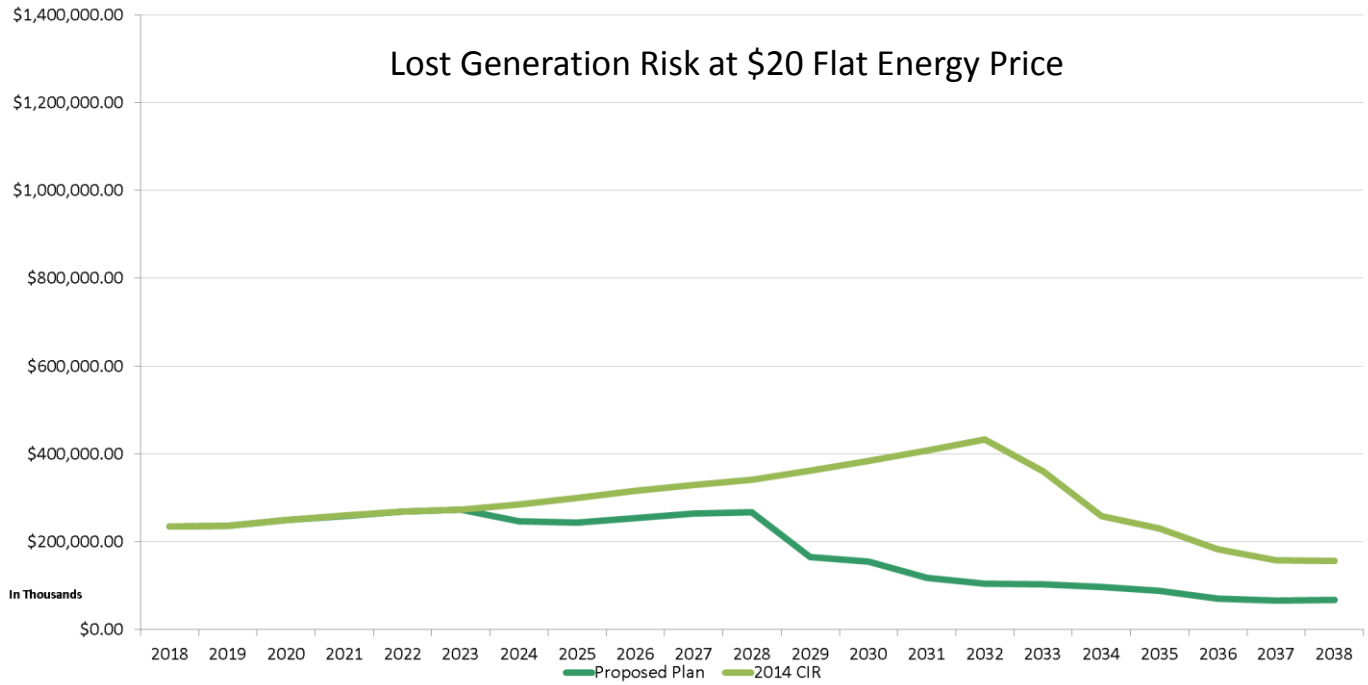


Lost Generation Risk Reduction of Proposed Plan compared to 2014 CIR ($000s)

2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
$55,056	$85,743	$94,769	$100,739	$119,818	$322,903	$382,563	$491,308	$577,291	$482,110	$336,444	$303,284	$232,610	$192,017	$193,076

Lost generation risk forecast

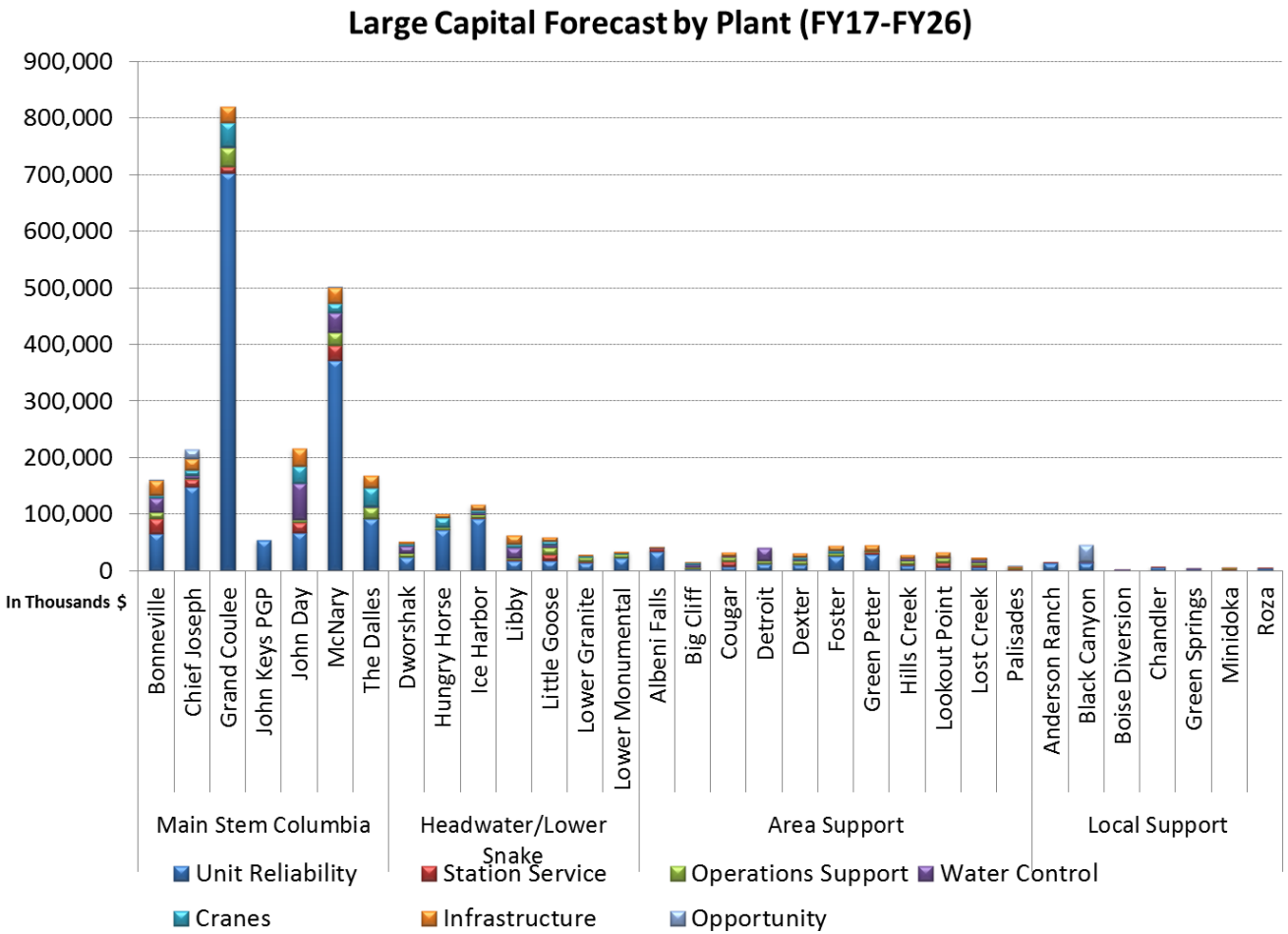
- For illustration purposes, a sensitivity was run using a $20 flat energy price.
- The expected lost generation risk mitigation benefits of the proposed investment plan relative to the 2014 CIR levels are reduced, but still significant with conservative energy price assumptions.



Lost Generation Risk Reduction of Proposed Plan compared to 2014 CIR ($000s)

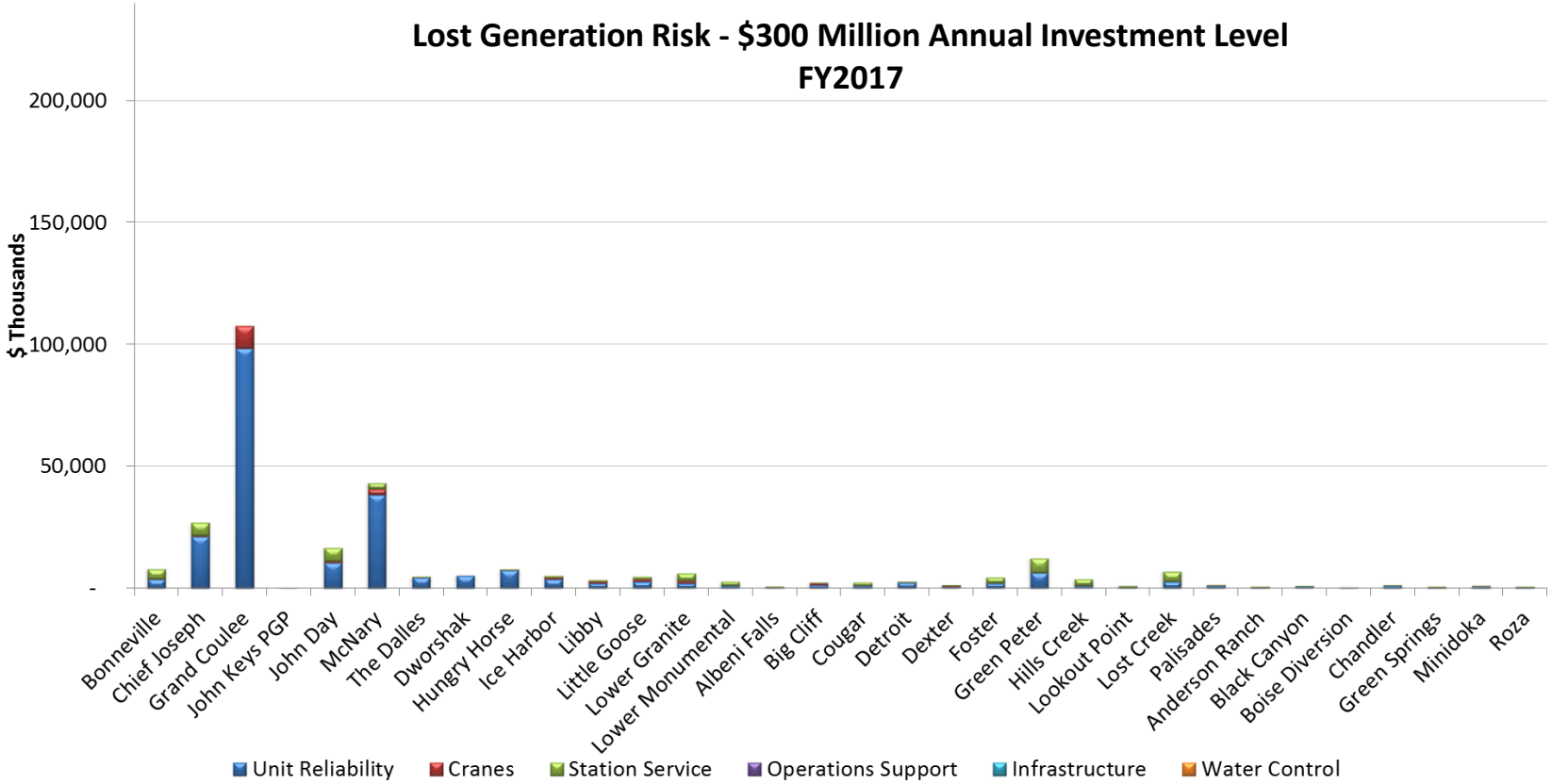
2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
$39,424	$57,485	$61,375	$63,854	$74,669	$196,362	$229,967	$289,161	$328,052	$257,430	$161,069	$142,685	$111,848	$91,931	$88,869

Capital investment by plant - $300 million program



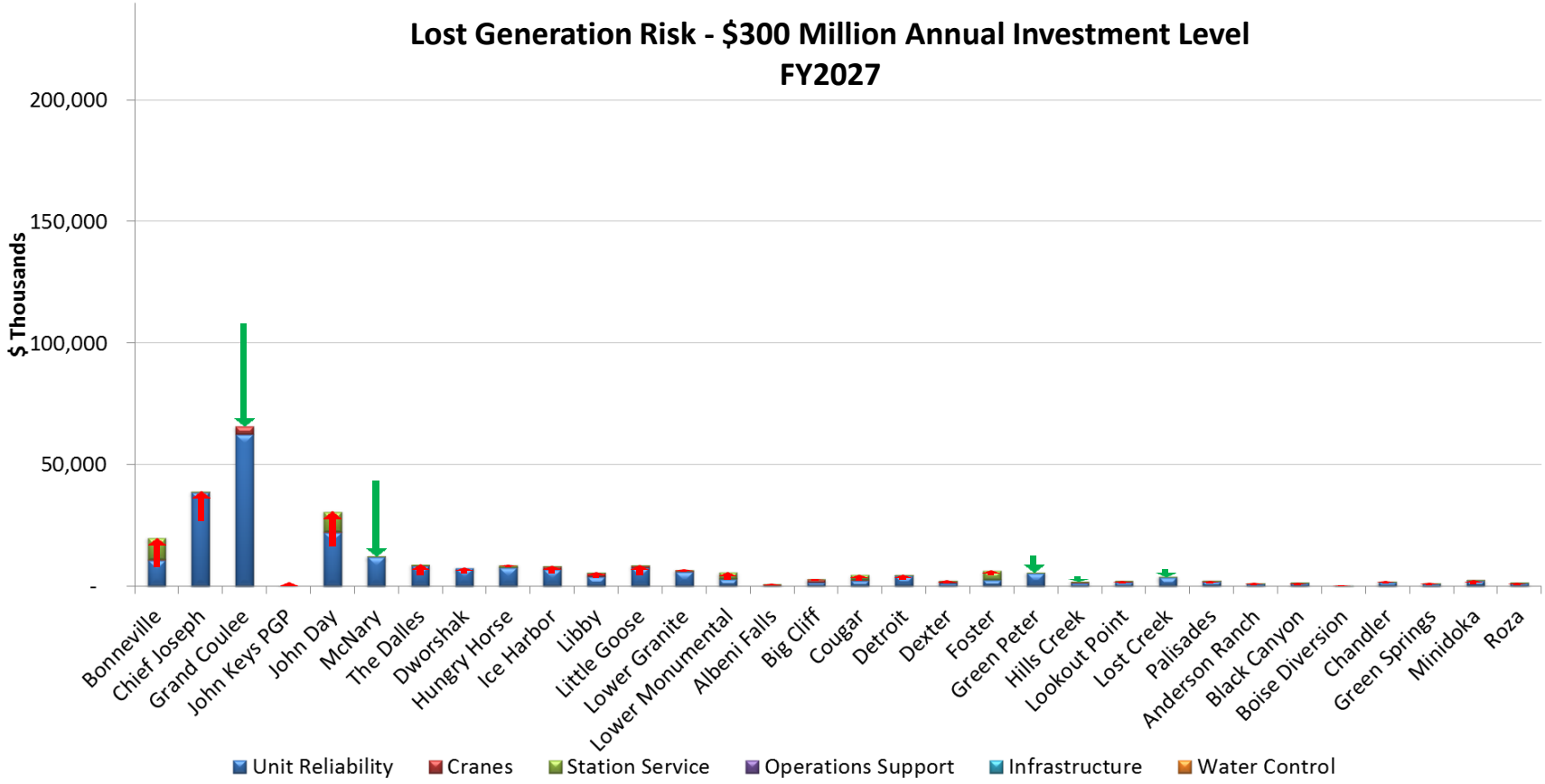
- The majority of the $300 million capital investment program is focused on Grand Coulee and McNary, which represent more than half of the current lost generation risk in the FCRPS.

Lost generation risk by plant - $300 million program



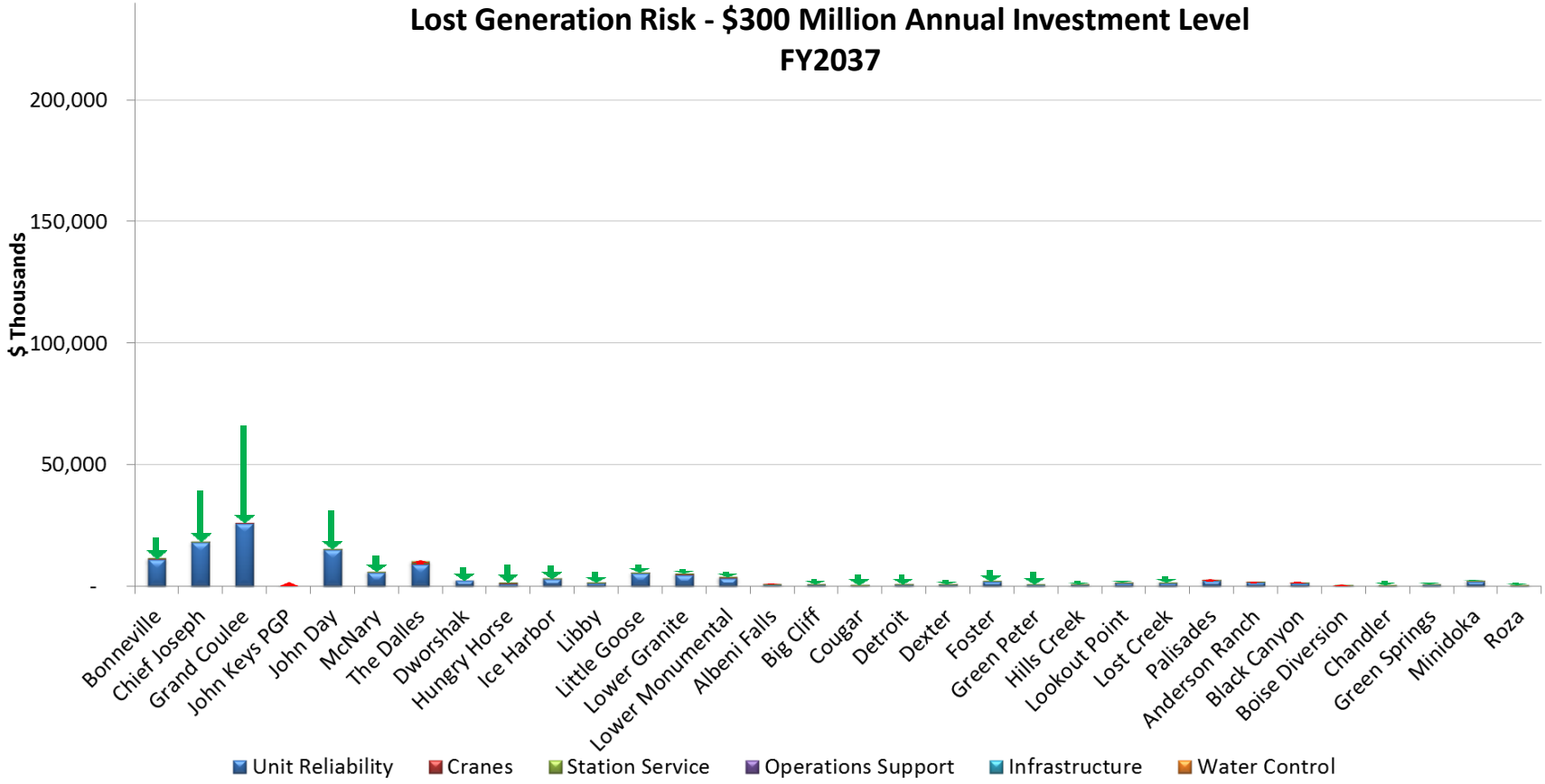
- The current lost generation risk in FY 2017 (~$283 million), is equivalent to about 15 percent of the 5-year average spot market value of FCRPS generation (~$1.9 billion).
- McNary and Grand Coulee represent over half of the current lost generation risk in the FCRPS.

Lost generation risk by plant - $300 million program



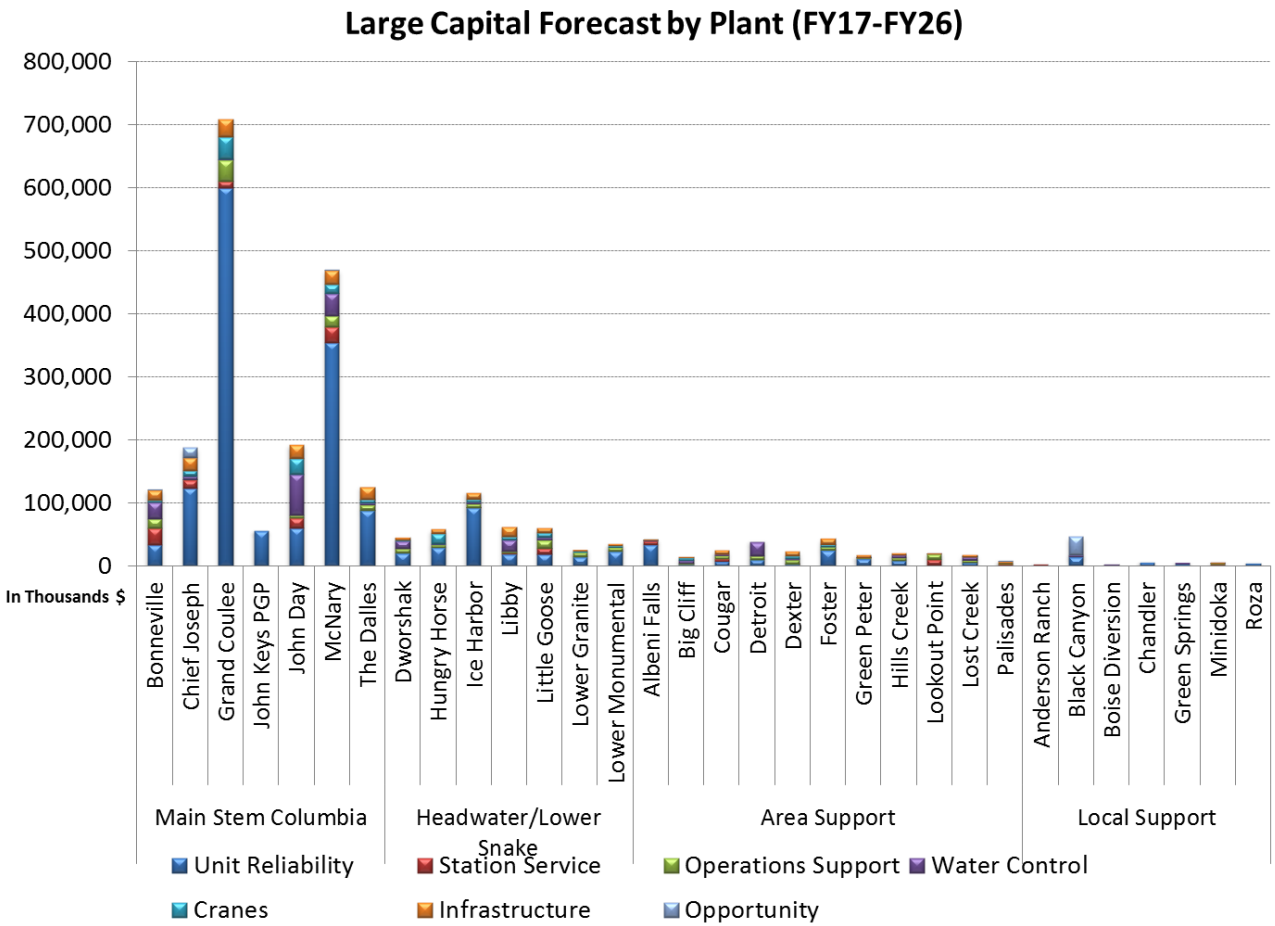
- A $300 million investment level is forecast to hold lost generation risk relatively constant in nominal terms through 2027, reducing lost generation risk from $283 million to $272 million, which is equal to $221 million real.

Lost generation risk by plant - $300 million program



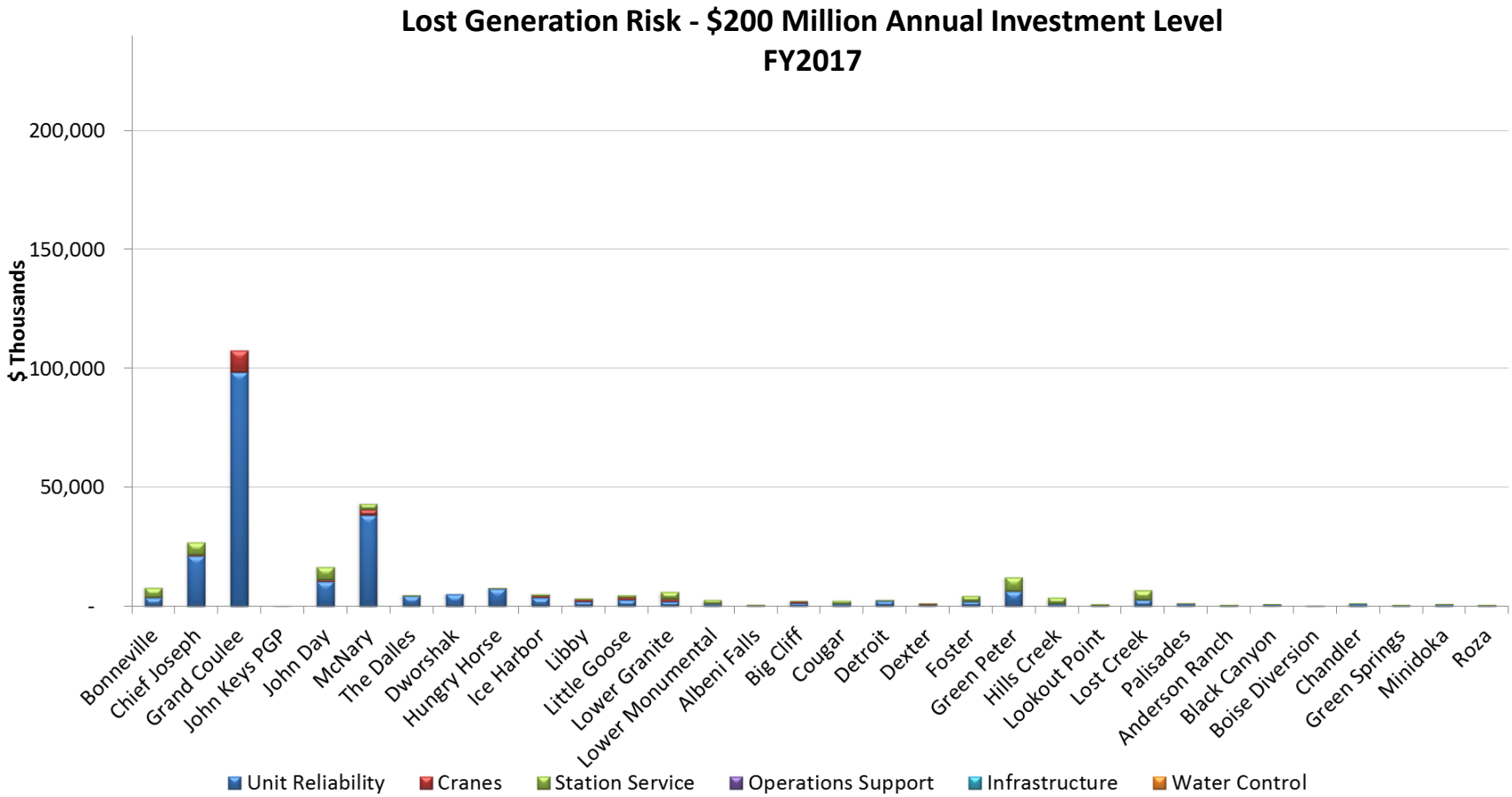
- Following completion of the major investments at Grand Coulee and McNary, investments across the remainder of the system reduce lost generation risk to $129 million, or $87 million in real dollars, by 2037.

Capital investment by plant - $200 million program

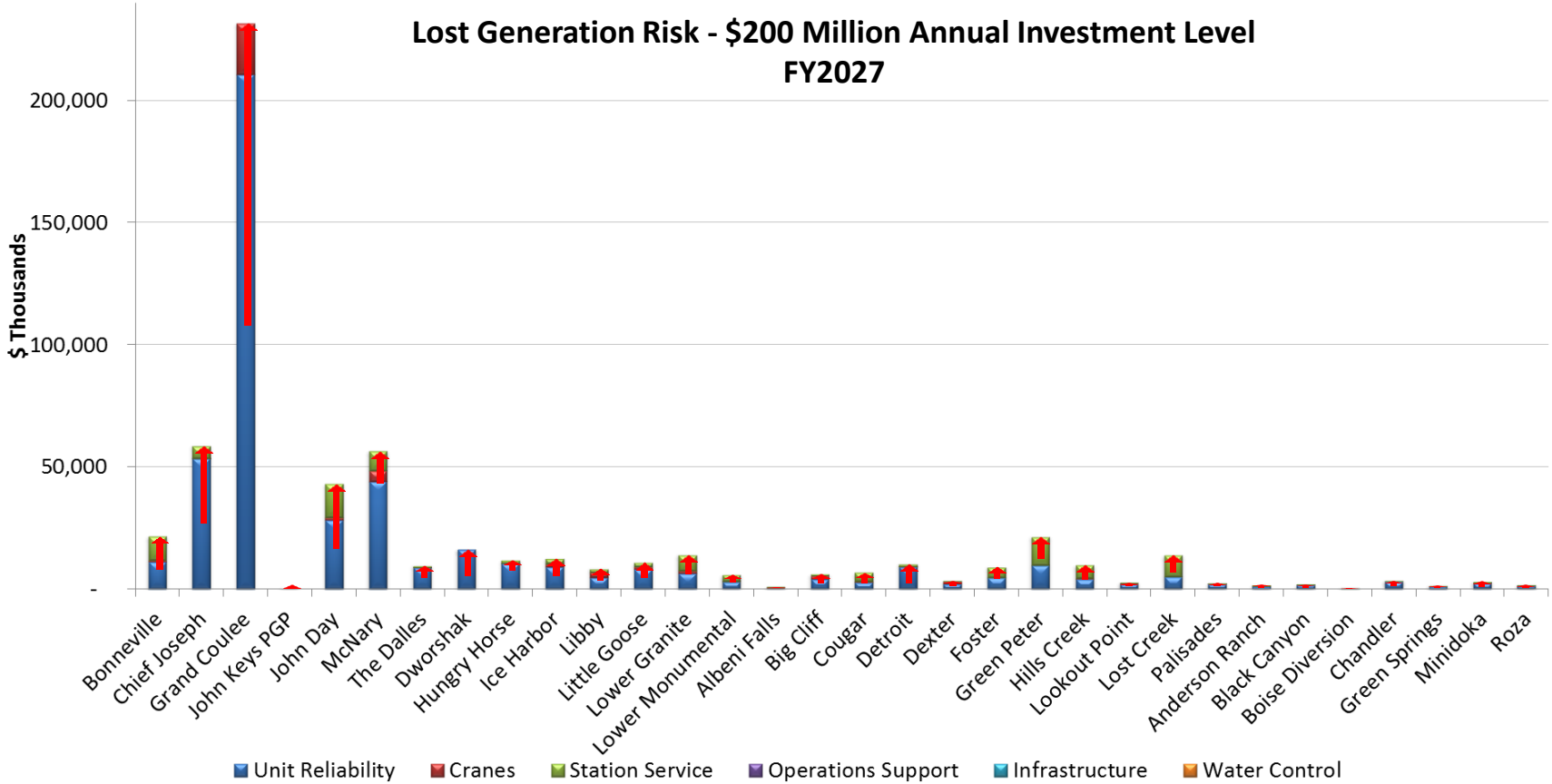


- The majority of the $200 million capital investment program is still focused on Grand Coulee and McNary, however some of the identified investments must be deferred.

Lost generation risk by plant - $200 million program

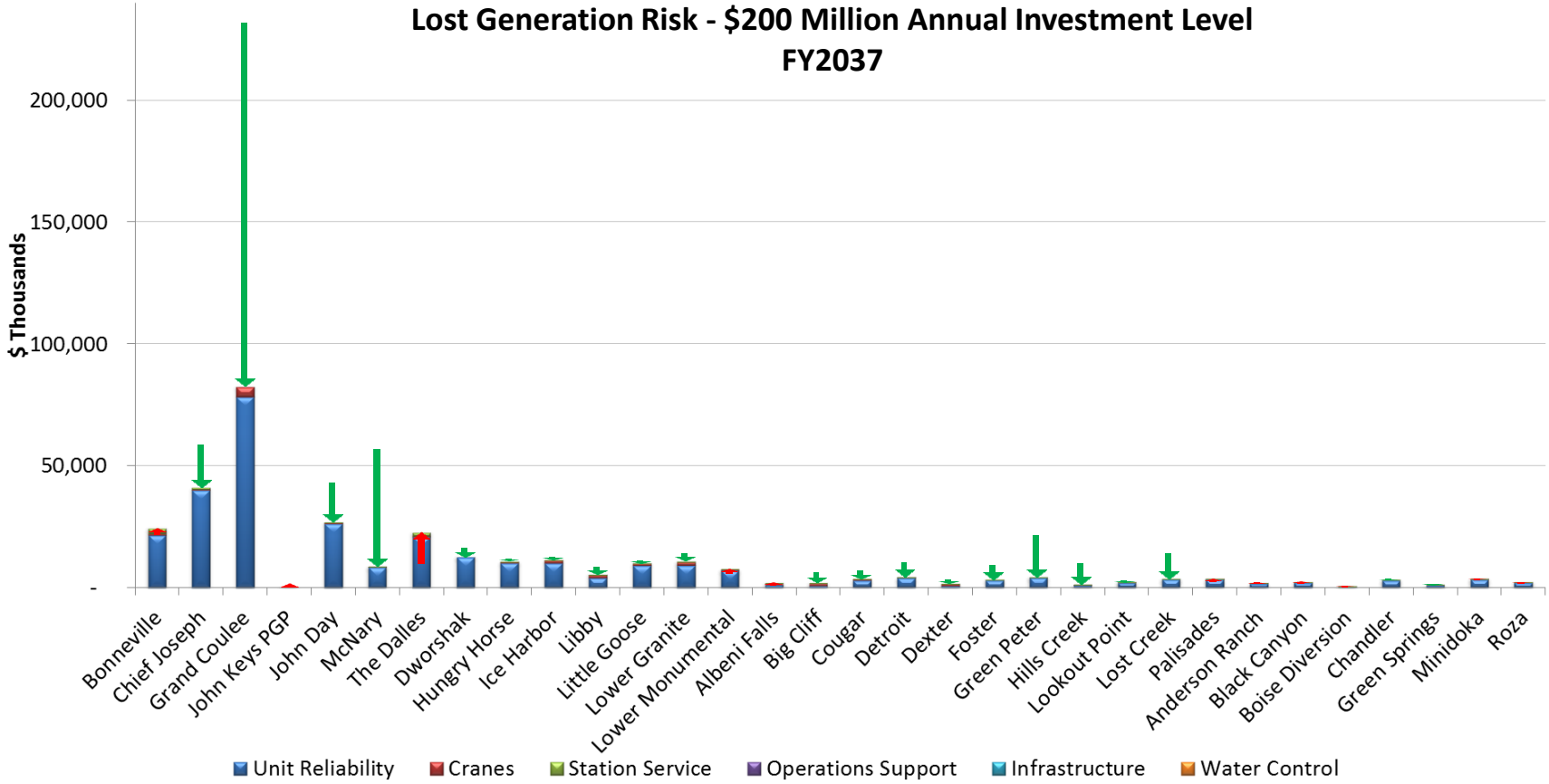


Lost generation risk by plant - $200 million program



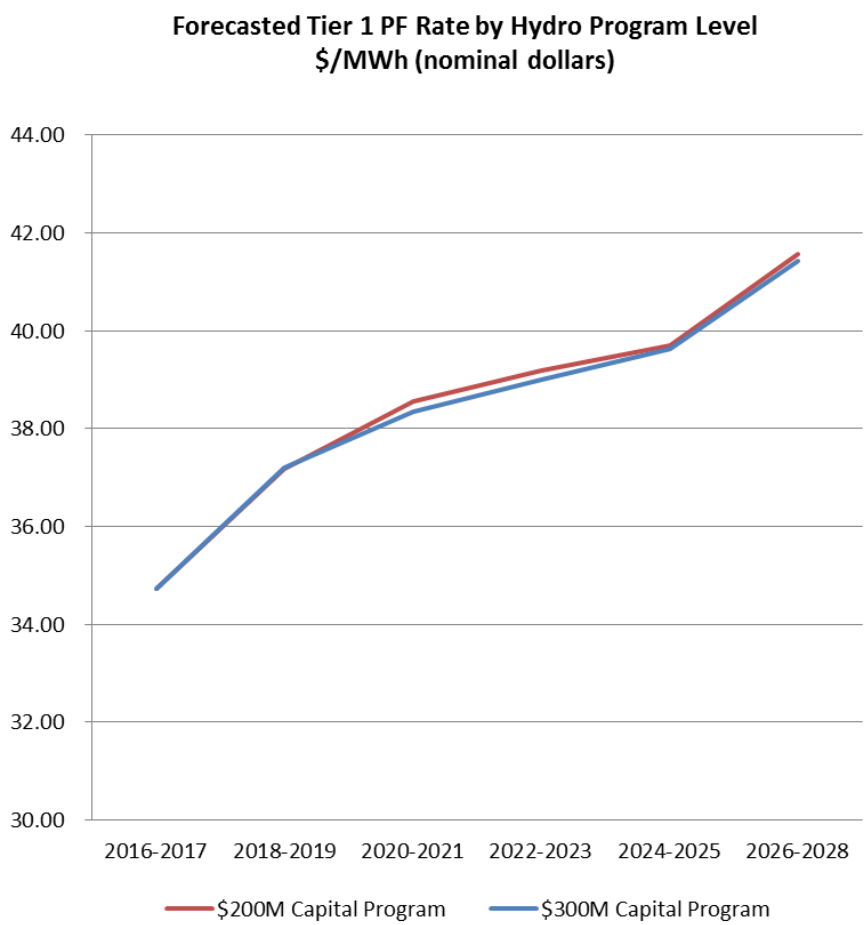
- At a $200 million program, lost generation risk at Grand Coulee and McNary continue to grow as some investments are deferred or are not executed as efficiently.
- Lost generation risk is forecast to increase to $595 million, or $493 million real, compared to $272 million, or $221 million real, in the $300 million investment program.

Lost generation risk by plant - $200 million program



- By 2037, deferred investments are completed at Grand Coulee and McNary and investment begins across the rest of the system.
- Lost generation risk is reduced to $316 million ,or $216 million real, compared to $129 million, or $87 million real, in the $300 million investment program.

Rate impact



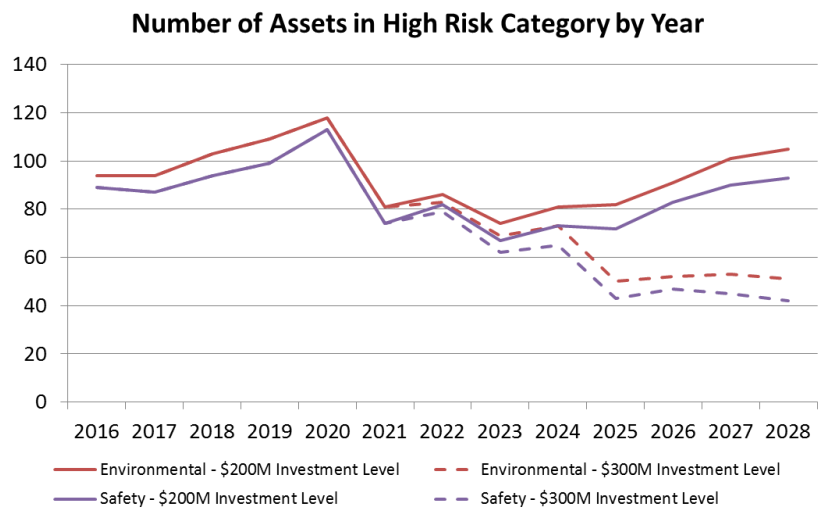
- A long-term rates analysis was performed in late 2015 on the proposed $300 million capital program as well as a $200 million capital program.
- The long-term financial and rates analysis incorporates the results from the hydro asset strategy modeling in order to adjust the expected generation of the hydro system at varying annual capital investment levels over time.
- The analysis showed that the higher investment level is expected to have a slightly lower Tier 1 Priority Firm rate in 2028, due to less lost generation than what is expected at the lower investment level.

Economic analysis

- The hydro asset strategy focuses on the optimal time for asset replacement by minimizing the lifecycle cost of each individual asset.
- Economic assessments are performed on projects developed from hydro asset strategy optimal replacement suggestions.
  - Uprates, efficiency improvements, rehabilitation vs. replacement and the number of units to address are assessed at this time.
- Examples:
  - At McNary, turbine replacement on all 14 units with a mix of fixed and adjustable blade units.
  - At Ice Harbor, turbine and generator winding replacement on three out of six units.
  - At John Day, turbine and generator winding replacements under evaluation for the late 2020s.
  - At Grand Coulee, uprate and efficiency improvements under evaluation on G19-G21 while units are undergoing generator reliability improvements.

Safety and environmental

- A $300 million investment level has significant impacts on the number of assets in the high risk category of the safety and environmental risk matrices. By 2028, the number of assets that pose a high safety and environmental risk is expected to be reduced by 50 percent.
- Investment primarily driven by safety and environmental concerns averages about 12 percent of annual investment at a $200 million investment level and about 9 percent of annual investment at a $300 million investment level.
  - Safety investments:
    - Arc flash hazard reduction.
    - Crane rehabilitations and replacements.
    - Fire protection and detection systems.
  - Environmental investments:
    - Oil water separators.
    - Trash rack replacements.
    - Water control and emergency closure equipment replacements.
    - Environmentally acceptable lubricants.
    - Fish attraction unit and fish pump rehabilitation.



Forecasted Safety and Environmental Investment (Primary Investment Driver)

Capital Program Level	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
$200M Investment Level	42,846	37,859	30,080	19,202	23,218	17,060	18,223	29,002	38,390	36,769	38,313	22,392	15,405	22,958
$300M Investment Level	42,502	43,757	34,666	30,625	20,594	9,940	10,806	27,668	38,529	36,769	38,305	22,109	13,879	22,631

Nominal $000s

Asset Investment Excellence Initiative

Capital investment decision making process changes

Previous Process

Decentralized project submission process.

- ✓ The BPA's ***Asset Strategy*** provided guidance and direction on system needs.
- ✓ Corps and Reclamation provided business cases to justify all investments.
- ✓ The "*FCRPS Capital Program*" was the total of projects that were economically justified.

New Process

Centralized system-wide prioritization of FCRPS projects to return the highest value to the system.

- ✓ Investments are informed and prioritized base on a **"Value Framework"** to optimize both what projects are planned and when capital investments are made.
- ✓ Asset planning team develops the ***System Asset Plan (SAP).***
- ✓ The SAP uses the asset strategy a foundation and is a system-wide, project level planning tool.
- ✓ Business cases are still needed to justify all investments.

US Army Corps of Engineers

Human capital task force

Capital improvement task force

Contracting & procurement task force

Three agency task forces improve acquisitions, processes and human resources

Asset planning team (APT)

The APT develops the long-term capital plans.

Contact Us

Comments:

Participants can submit comments on BPA's IPR 2 proposed levels during a public comment period which opens Feb. 15 and closes March 13, 2017. Comments can be submitted:

- Online: www.bpa.gov/comment.
- By mail: BPA, P.O. Box 14428, Portland, OR 97293.
- By email: BPAFinance@BPA.gov.

Please send questions to BPAFinance@BPA.gov.

Financial Disclosure

- This information was made publicly available on Feb.10, 2017, and contains information not sourced directly from BPA financial statements.