2019 Integrated Resource Plan Preferred Portfolio

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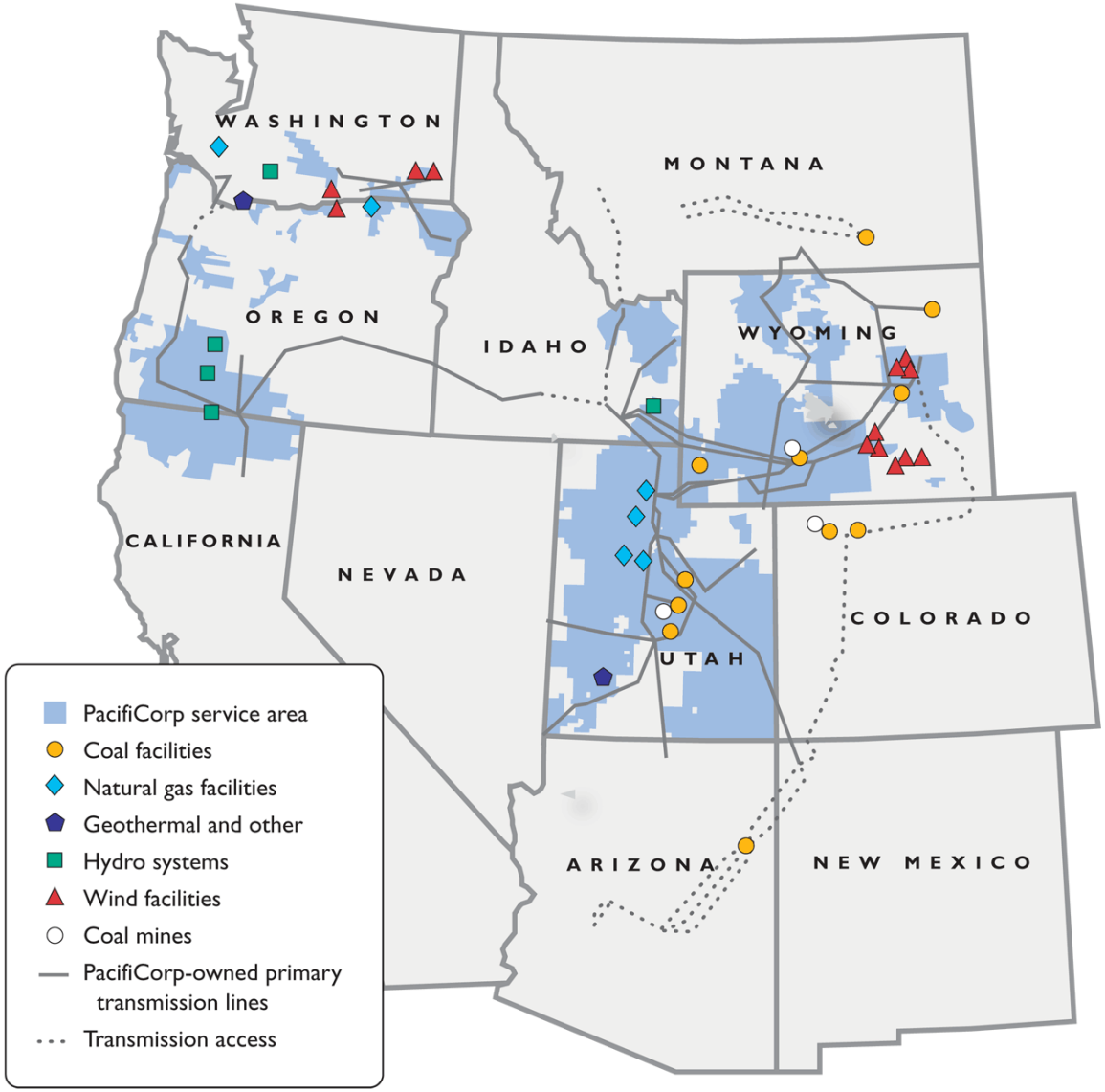
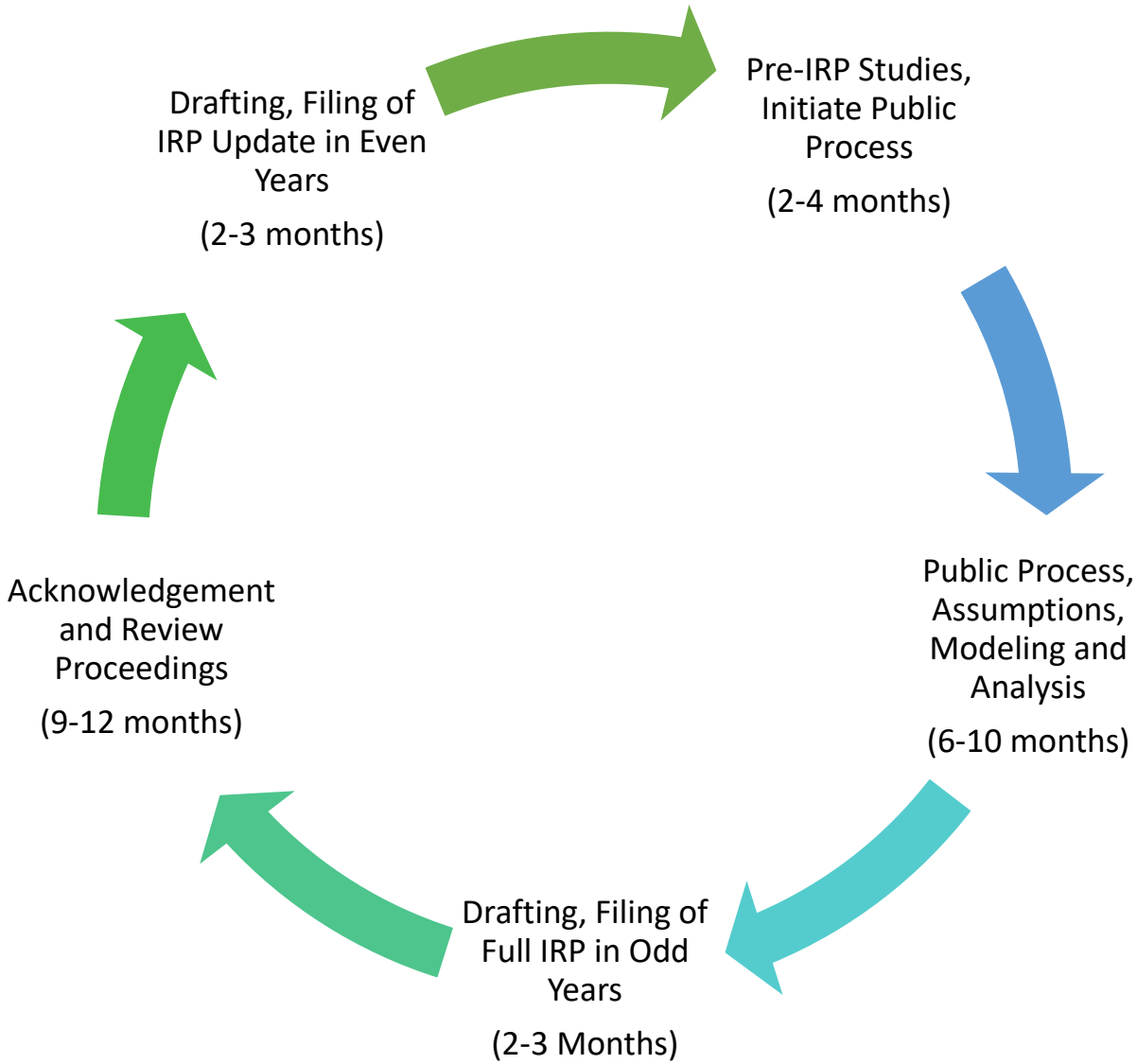
RMP Utah Statistics



- 835,232 customers
- 2,167 employees: $224 million payroll
- State property taxes: $69.1 million
- Net book value: $7.3 billion

IRP Two-Year Cycle



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Key Elements of an IRP

Need

- Cost-and-performance assumptions for existing/firmly committed resources (generating assets, contracts, direct-load control)
- Load forecast without incremental energy efficiency savings and net of customer-sited generation
- Transmission rights/model topology
- Capacity contribution assumptions, planning-reserve margin assumptions

Portfolios

- Proxy supply-side resource cost-and-performance assumptions
- Conservation-potential assessment for new energy efficiency programs and direct-load control programs
- Market price (wholesale power and natural gas) and market depth assumptions (wholesale power)
- Transmission upgrades

Cost & Risk

- Volatility risk assessment (market prices, load, hydro generation, outages)
- Scenario risk assessment (price-policy scenarios)
- Sensitivity studies

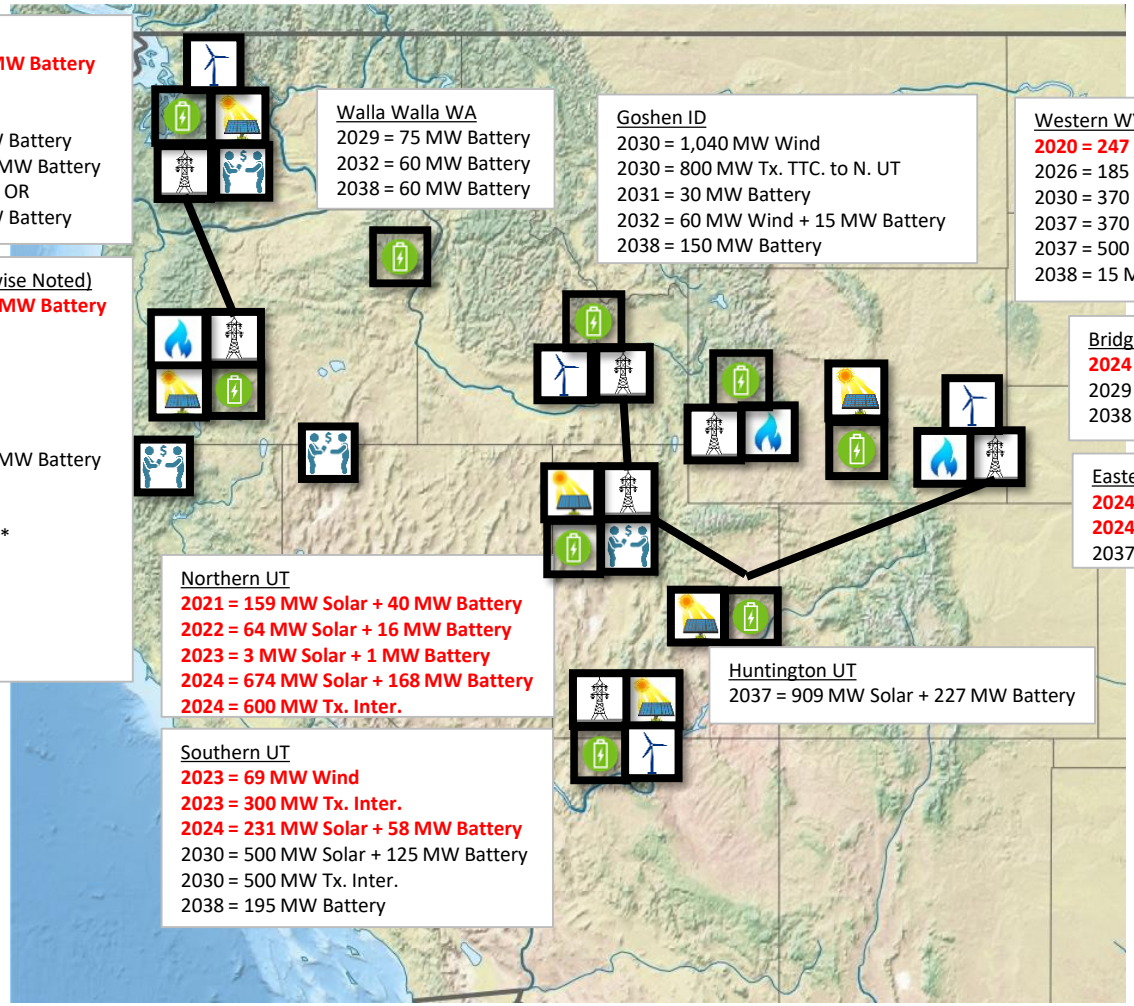
Preferred Portfolio

- Portfolio rankings
- Expected costs
- Low-probability high cost outcomes
- Reliability, emissions, resource diversity, rate implications

Action Plan

- Specific steps needed in the next 2-4 years to deliver least-cost, least-risk resources in the preferred portfolio
- Existing resources
- New resources
- Transmission

Preferred Portfolio Generating Resources (Case P-45CNW)



Yakima WA
2024 = 395 MW Solar + 99 MW Battery
2024 = 405 MW Tx. Up.
2028 = 105 MW Battery
2029 = 10 MW Wind + 3 MW Battery
2036 = 419 MW Solar + 105 MW Battery
2036 = 450 MW Tx. TTC to S. OR
2037 = 10 MW Wind + 3 MW Battery

Walla Walla WA
2029 = 75 MW Battery
2032 = 60 MW Battery
2038 = 60 MW Battery

Goshen ID
2030 = 1,040 MW Wind
2030 = 800 MW Tx. TTC. to N. UT
2031 = 30 MW Battery
2032 = 60 MW Wind + 15 MW Battery
2038 = 150 MW Battery

Western WY/Naughton
2020 = 247 MW Gas Conv.
2026 = 185 MW Gas
2030 = 370 MW Gas
2037 = 370 MW Gas
2037 = 500 MW Tx. Inter.
2038 = 15 MW Battery

Southern OR (Unless Otherwise Noted)
2024 = 500 MW Solar + 125 MW Battery
2028 = 75 MW Battery*
2029 = 210 MW Battery
2029 = 105 MW Battery**
2029 = 45 MW Battery*
2032 = 60 MW Battery
2033 = 475 MW Solar + 119 MW Battery
2033 = 120 MW Battery
2033 = 475 MW Tx. Inter.
2037 = 443 MW Gas Peaking*
2037 = 615 MW Tx. Inter.*
2038 = 180 MW Battery

*Willamette Valley
**Portland North Coast

Bridger WY
2024 = 354 MW Solar + 89 MW Battery
2029 = 359 MW Solar + 90 MW Battery
2038 = 702 MW Solar + 175 MW Battery

Eastern WY
2024 = 1,920 MW Wind
2024 = 1,700 MW Tx. TTC to N. UT
2037 = 505 MW Gas CCCT

Northern UT
2021 = 159 MW Solar + 40 MW Battery
2022 = 64 MW Solar + 16 MW Battery
2023 = 3 MW Solar + 1 MW Battery
2024 = 674 MW Solar + 168 MW Battery
2024 = 600 MW Tx. Inter.

Huntington UT
2037 = 909 MW Solar + 227 MW Battery

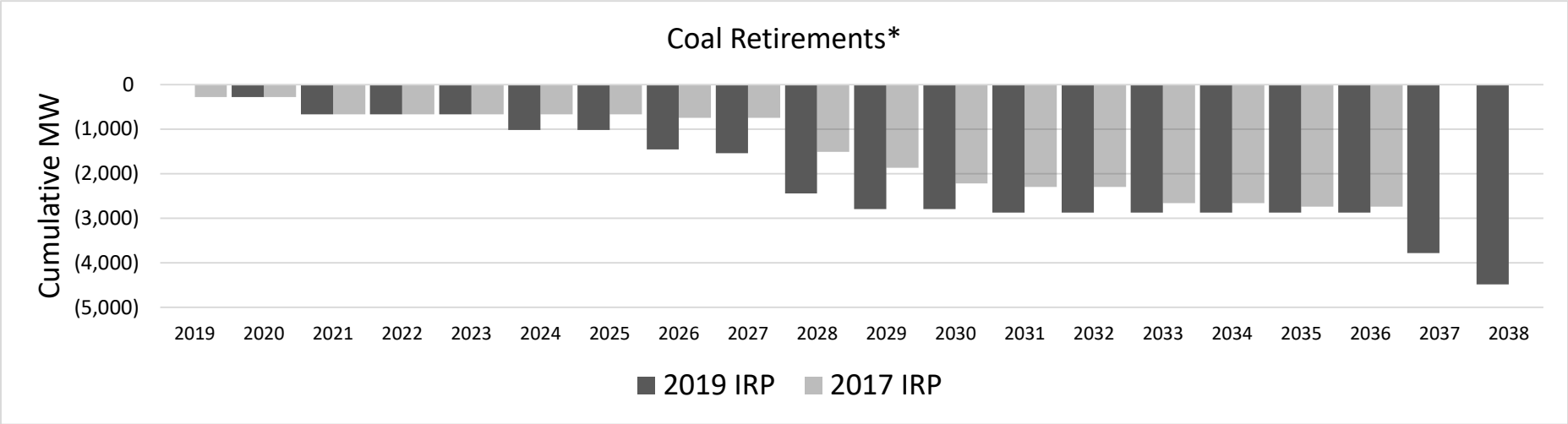
Southern UT
2023 = 69 MW Wind
2023 = 300 MW Tx. Inter.
2024 = 231 MW Solar + 58 MW Battery
2030 = 500 MW Solar + 125 MW Battery
2030 = 500 MW Tx. Inter.
2038 = 195 MW Battery

Coal/Early Gas Retirements
2019 = NT3 (280 MW)
2020 = CH4 (387 MW)
2023– JB1 (351 MW)
2025 = CG1 (82 MW)
2025 = NT1-2 (357 MW)
2026 = CG2 (82 MW)
2027 = CS3-4 (148 MW)
2027 = DJ1-4 (755 MW)
2028 = JB2 (356 MW)
2030 = HY1-2 (77 MW)
2036 = HTG1-2 (909 MW)
2037 = JB3-4 (702 MW)

- Solar
- Wind
- Battery
- Pumped Hydro
- Gas
- Market
- Transmission

Note: Resources highlighted in red text trigger an action item in the 2019 IRP action plan.

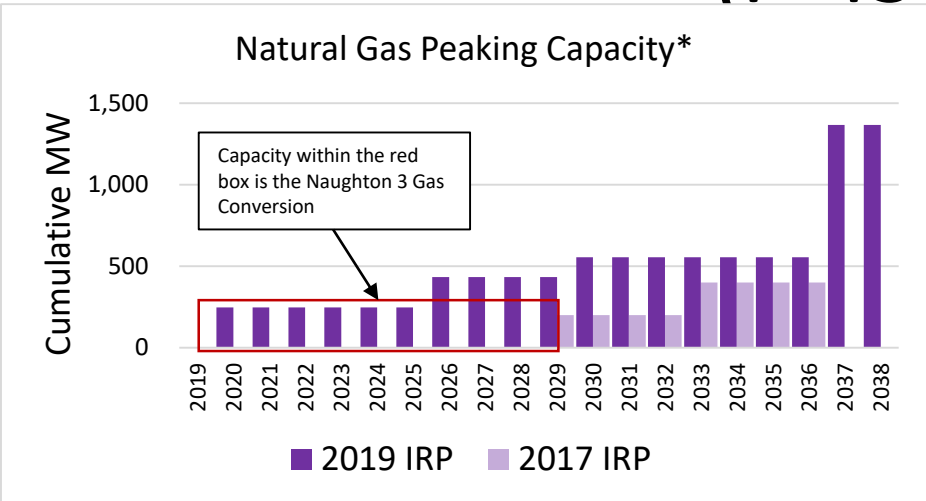
Coal Retirements

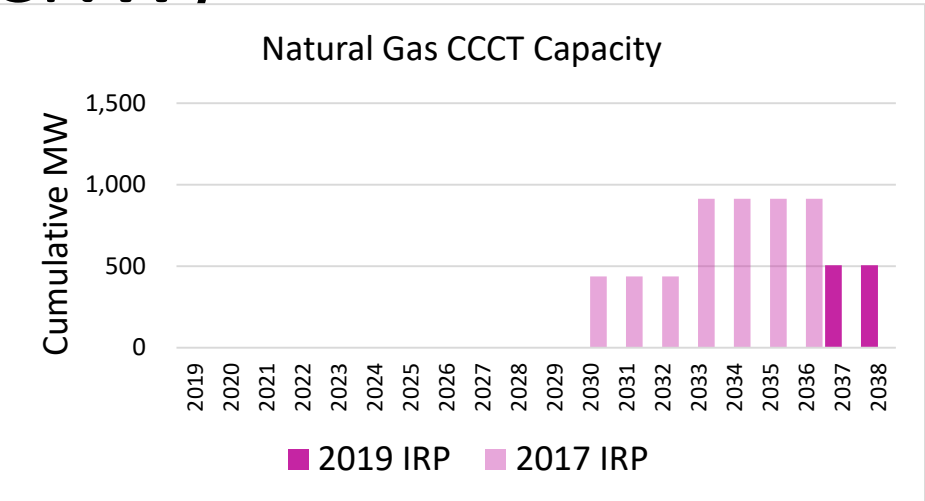


Location	2019 IRP Preferred Portfolio Coal Retirements (2019-2025)	2019 IRP Preferred Portfolio Coal Retirements (2026-2030)	2019 IRP Preferred Portfolio Coal Retirements (2031-2038)
Wyoming	2019 = 280 MW (Naughton 3) 2023 = 351 MW (J. Bridger 1) 2025 = 357 MW (Naughton 1-2)	2027 = 755 MW (D. Johnston 1-4) 2028 = 356 MW (J. Bridger 2)	2037 = 702 MW (J. Bridger 3-4)
Arizona	2020 = 387 MW (Cholla 4)	n/a	n/a
Colorado	2025 = 82 MW (Craig 1)	2026 = 82 MW (Craig 2) 2030 = 77 MW (Hayden 1-2)	n/a
Montana	n/a	2027 = 148 MW (Colstrip 3-4)	n/a
Utah	n/a	n/a	2036 = 909 MW (Huntington 1-2)

*Note: Coal retirements are assumed to occur by the end of the year before the year shown in the graph. The graph shows the year in which the capacity will not be available for meeting summer peak load. All figures represent PacifiCorp's ownership share of jointly owned facilities.

Natural Gas Resources (P-45CNW)

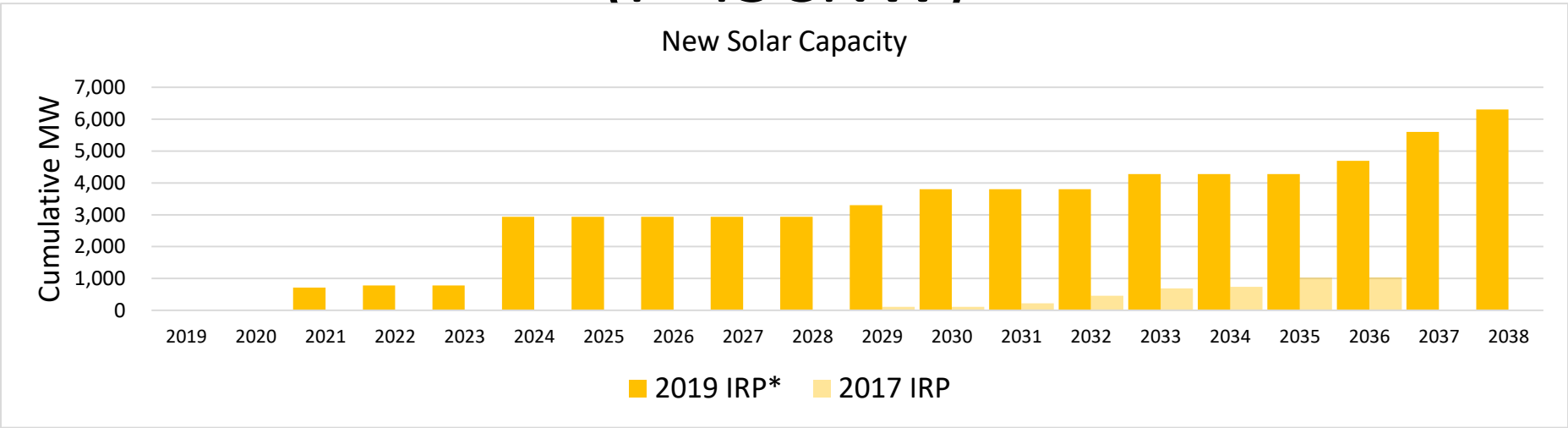




State	2019 IRP Preferred Portfolio Gas (2019-2024)	2019 IRP Preferred Portfolio Gas (2025-2038)
Wyoming	2020 = 247 MW (Naughton Unit 3 Conversion)	2026 = 185 MW peaking 2030 = 370 MW peaking 2037 = 370 MW peaking 2037 = 505 MW CCCT
Oregon	n/a	2037 = 443 MW peaking

*Note: 2019 IRP gas peaking capacity includes the conversion of Naughton Unit 3 to natural gas in 2020 (247 MW).

Solar Resources (P-45CNW)



State	2019 IRP Preferred Portfolio Solar (2019-2024)	2019 IRP Preferred Portfolio Solar (2025-2038)
Utah	2021 = 337 MW + **122 MW** (contracted) 2021 = **159 MW** (with 40 MW battery) 2022 = **64 MW** (with 16 MW battery) 2023 = **3 MW** (with 1 MW battery) 2024 = 904 MW (with 226 MW battery); **331 MW** of the 904 MW is customer preference	2030 = 500 MW (with 125 MW battery) 2037 = 909 MW (with 227 MW battery)
Wyoming	2024 = 354 MW (with 89 MW battery)	2029 = 359 MW (with 90 MW battery) 2038 = 702 MW (with 175 MW battery)
Oregon	2021 = 100 MW (contracted) 2024 = 500 MW (with 125 MW battery)	2033 = 475 MW (with 119 MW battery)
Washington	2024 = 395 MW (with 99 MW battery)	2036 = 419 MW (with 105 MW battery)

- Resources highlighted **blue** in the table represent resources that meet assumed customer preference targets.

*Note: 2019 IRP solar shown in the graph includes 559 MW of contracted new solar (all power-purchase agreements) that was not identified in the 2017 IRP and that is treated as existing resources in the 2019 IRP preferred portfolio. These resources will be online by the end of 2020 and are shown in the first full year of operation (the year after year-end online dates).

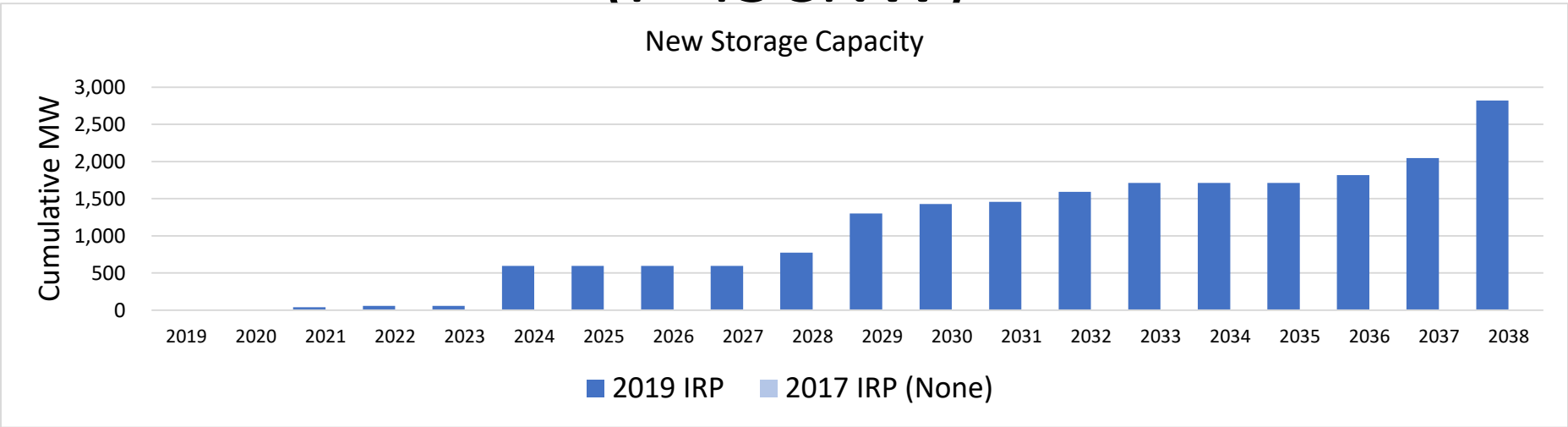
Wind Resources (P-45CNW)

State	2019 IRP Preferred Portfolio Wind (2019-2024)	2019 IRP Preferred Portfolio Wind (2025-2038)
Wyoming	2020 = 23 MW (repowering) 2021 = 1,510 MW (under construction) 2024 = 1,920 MW	n/a
Idaho	n/a	2030 = 1,040 MW 2032 = 60 MW (with 15 MW battery)
Utah	2023 = **69 MW**	n/a
Washington	n/a	2029 = 10 MW (with 3 MW battery) 2037 = 11 MW (with 3 MW battery)

- Resources highlighted **blue** in the table represent resources that meet assumed customer preference targets.

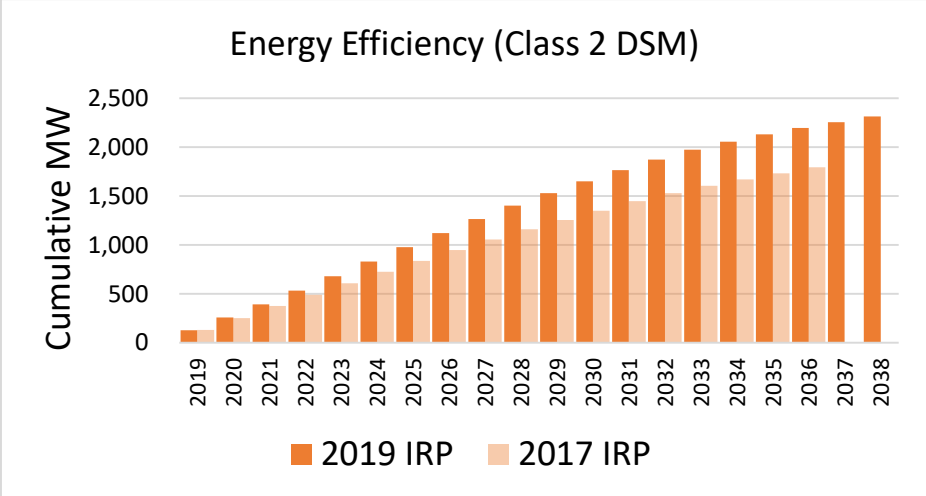
*Note: 2019 IRP wind shown in the graph includes 1,533 MW of contracted new wind (21% power-purchase agreements) that was either identified in the 2017 IRP and is under construction or that was not identified in the 2017 IRP and is under contract. These resources are treated as existing resources in the 2019 IRP preferred portfolio and will come on-line by the end of 2020. These resources are shown in the first full year of operation (the year after year-end online dates).

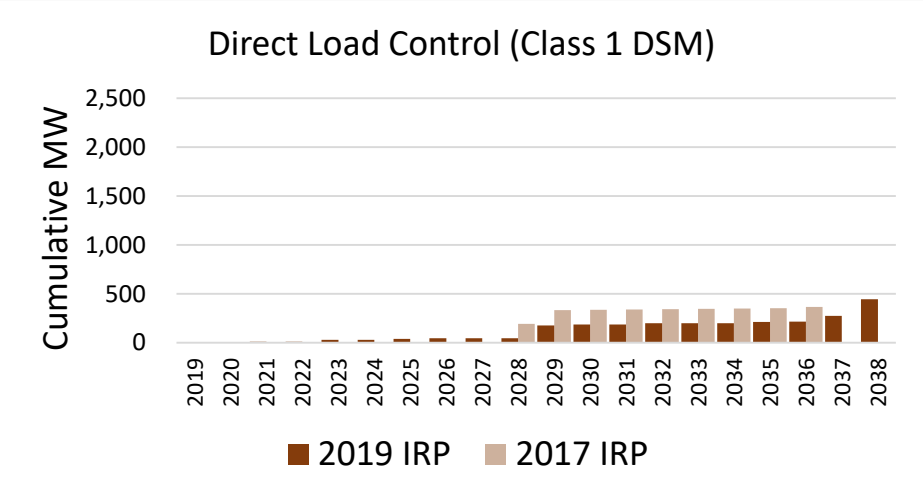
Storage Resources (P-45CNW)



State	2019 IRP Preferred Portfolio Storage (2019-2024)	2019 IRP Preferred Portfolio Storage (2025-2038)
Utah	2021 = 40 MW (with 159 MW solar) 2022 = 16 MW (with 64 MW solar) 2023 = 1 MW (with 3 MW solar) 2024 = 226 MW (with 904 MW solar)	2030 = 125 MW (with 500 MW solar) 2037 = 227 MW (with 909 MW solar) 2038 = 195 MW
Wyoming	2024 = 89 MW (with 354 MW solar)	2029 = 90 MW (with 359 MW solar) 2038 = 175 MW (with 702 MW solar), +15 MW
Oregon	2024 = 125 MW (with 500 MW solar)	2028 = 75 MW 2029 = 360 MW 2032 = 60 MW 2033 = 119 MW (with 475 MW solar) 2038 = 180 MW
Washington	2024 = 99 MW (with 395 MW solar)	2028 = 105 MW 2029 = 3 MW (with 10 MW wind), +75 MW 2032 = 60 MW 2036 = 105 MW (with 419 MW solar) 2037 = 3 MW (with 11 MW wind) 2038 = 60 MW
Idaho	n/a	2031 = 30 MW 2032 = 15 MW (with 60 MW wind) 2038 = 150 MW

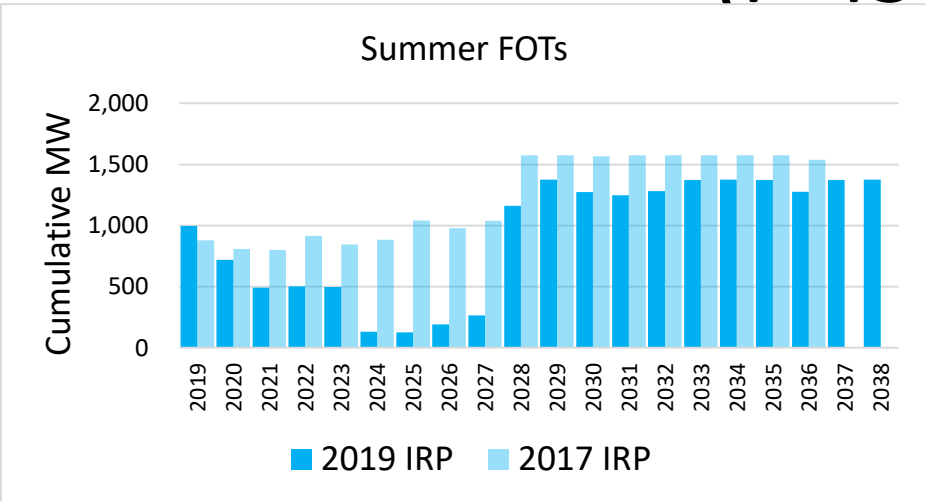
Demand-Side Management Resources (P-45CNW)

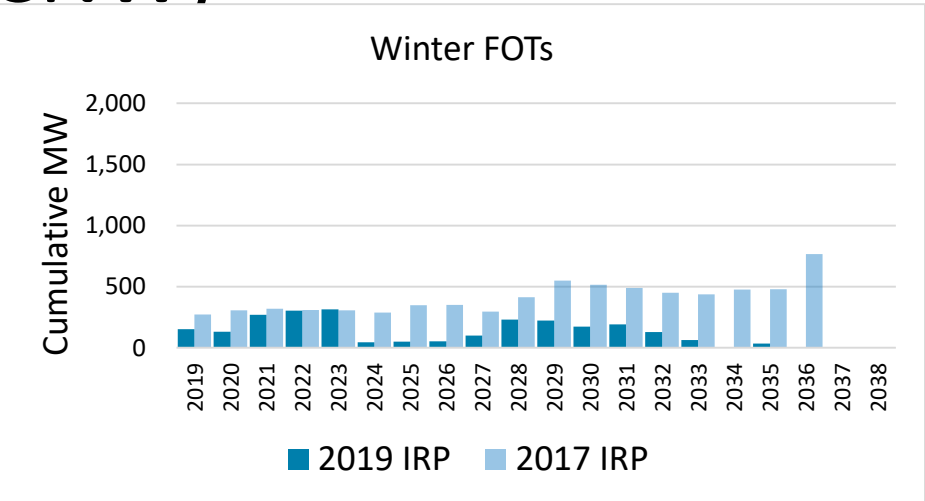




State	2019 IRP Preferred Portfolio DSM (2019-2024)	2019 IRP Preferred Portfolio DSM (2025-2038)
Utah	2019-2024 = 397 MW EE 2019-2024 = 29 MW DLC	2025-2038 = 662 MW EE 2025-2038 = 260 MW DLC
Wyoming	2019-2024 = 77 MW EE	2025-2038 = 171 MW EE 2025-2038 = 54 MW DLC
Oregon	2019-2024 = 242 MW EE	2025-2038 = 438 MW EE 2029-2038 = 32 MW DLC
Washington	2019-2024 = 66 MW EE	2025-2038 = 113 MW EE 2029-2038 = 45 MW DLC
Idaho	2019-2024 = 40 MW EE	2025-2038 = 77 MW EE 2032-2038 = 11 MW DLC
California	2019-2024 = 9 MW EE	2025-2038 = 23 MW EE 2037-2038 = 13 MW DLC

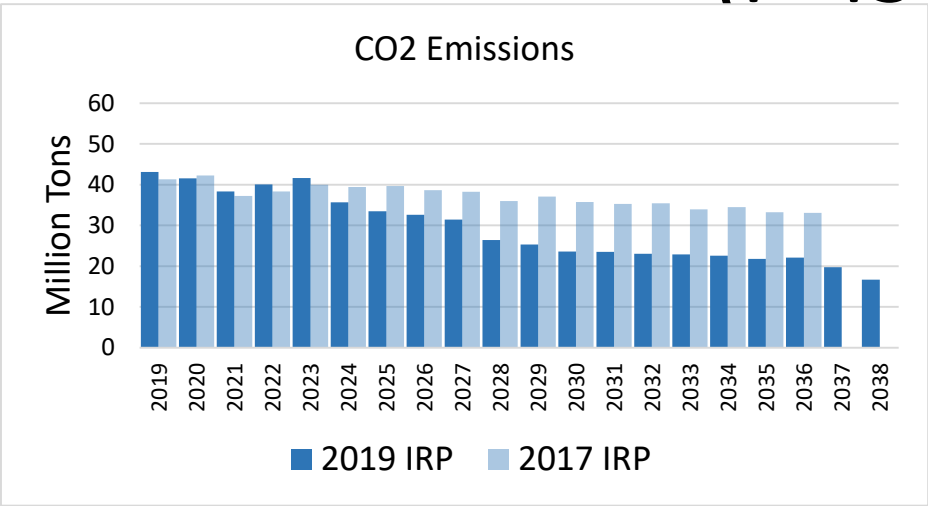
Front Office Transactions (FOTs) (P-45CNW)

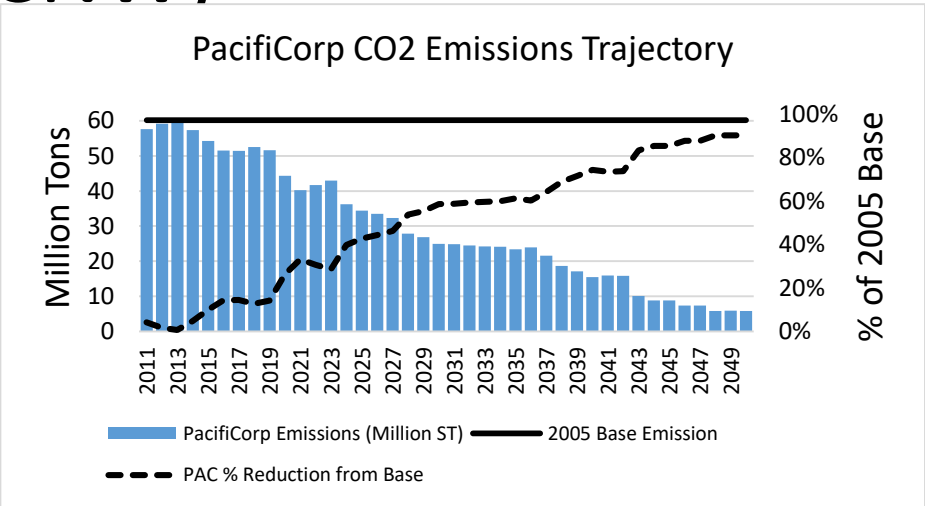




Location	2019 IRP Preferred Portfolio FOTs (2019-2024)	2019 IRP Preferred Portfolio FOTs (2025-2027)	2019 IRP Preferred Portfolio FOTs (2028-2038)
West	2019-2024 Avg. = 557 MW Summer 2019-2024 Avg. = 202 MW Winter	2025-2027 Avg. = 194 MW Summer 2025-2027 Avg. = 68 MW Winter	2028-2038 Avg. = 1,066 MW Summer 2028-2038 Avg. = 95 MW Winter
East	No Summer FOTs No Winter FOTs	No Summer FOTs No Winter FOTs	2028-2038 Avg. = 251 MW Summer No Winter FOTs

CO_2 Emissions (P-45CNW)





- The chart on the left reflects stack emissions over the IRP planning period for the 2019 IRP and 2017 IRP preferred portfolio.
  - There is no assignment of emissions to specified or unspecified purchases.
  - Relative to the 2017 IRP, emissions are down 16 percent in 2025, 34 percent in 2030, and 35 percent in 2035.
- The chart on the right reflects:
  - Actual emissions through 2018 from owned facilities, specified sources, and unspecified sources.
  - From 2019-2038, emissions reflect those from the 2019 IRP preferred portfolio (stack emissions) with market purchases assigned the CARB default emissions factor (0.4708 tons/MWh)—emissions from sales are not removed.
  - Beyond 2038, emissions reflect the rolling average emissions of each resource from the preferred portfolio through the life of the resource.
  - Relative to a 2005 baseline, emissions are down 43 percent in 2025, 59 percent in 2030, 61 percent in 2035, 74 percent in 2040, 85 percent in 2045, and 90 percent in 2050.