



# 2019 Integrated Resource Plan (IRP) Public Input Meeting

## June 20-21, 2019





# Agenda

## **June 20 – Day One**

- 9:00am-10:00am – Modeling Updates
- 10:00am-11:15am pacific – Portfolio Analysis Results
- 11:15am-12:00pm pacific – Lunch Break
- 12:00pm-2:00pm pacific – Portfolio Analysis Results
- 2:00pm-2:15pm pacific – Break
- 2:15pm – 4:00pm pacific – Portfolio Analysis Results

## **June 21 – Day Two**

- 8:30am – 11:15am pacific - Portfolio Analysis Results
- 11:15am – 12:00pm pacific – Lunch Break
- 12:00pm – 2:00pm pacific - Portfolio Analysis Results
- 2:00pm-2:20pm pacific – Stakeholder Feedback Form Recap
- 2:20pm-2:30pm pacific – Wrap-Up/Next Steps



# Summary

- On track to complete and file the 2019 Integrated Resource Plan with state regulatory commissions on August 1, 2019.
- We continue to analyze several scenarios and considerations that will ultimately guide a final IRP and accompanying action plan.
- Thorough and complete data modelling and analysis is an essential step to delivering a plan that meets our customers needs now and into the future.
- The company will continue to work with stakeholders on development of its 2019 IRP and will keep regulators and other interested parties informed. Our next open meeting is July 18-19, 2019.

# Reconciliation of C-42 and P-04 PVRR(d) (Granularity Adjustment Revision)



| Case | Inc. Retired Capacity in 2023 (MW) | PVRR(d) (Benefit)/Cost of Early Retirement (\$m)<br>April 2019 PIM | PVRR(d) (Benefit)/Cost of Early Retirement (\$m)<br>Revised for Granularity Adjustment | Naughton 1 | Naughton 2 | Bridger 1 | Bridger 2 | Hayden 1 | Hayden 2 | Craig 1 | Craig 2 | Dave Johnston 3 |
|------|------------------------------------|--|--|------------|------------|-----------|-----------|----------|----------|---------|---------|-----------------|
| C-34 | 357                                | (\$123)  | (\$123)  | ✓          | ✓          |           |           |          |          |         |         |                 |
| C-35 | 711                                | (\$211)  | (\$210)  | ✓          | ✓          | ✓         |           |          |          |         |         |                 |
| C-36 | 510                                | (\$158)  | (\$158)  | ✓          |            | ✓         |           |          |          |         |         |                 |
| C-37 | 554                                | (\$143)  | (\$143)  | ✓          |            | ✓         |           | ✓        |          |         |         |                 |
| C-38 | 755                                | (\$120)  | (\$120)  | ✓          | ✓          | ✓         |           | ✓        |          |         |         |                 |
| C-39 | 834                                | (\$52)   | (\$46)   | ✓          | ✓          | ✓         |           | ✓        |          |         | ✓       |                 |
| C-40 | 1,193                              | (\$191)  | (\$146)  | ✓          | ✓          | ✓         | ✓         | ✓        |          |         | ✓       |                 |
| C-41 | 1,529                              | (\$12)   | \$34   | ✓          | ✓          | ✓         | ✓         | ✓        | ✓        | ✓       | ✓       | ✓               |
| C-42 | 1,063                              | (\$248)  | (\$207)  | ✓          | ✓          | ✓         | ✓         |          |          |         |         |                 |
| C-43 | 928                                | (\$31)   | (\$26)   | ✓          | ✓          | ✓         |           |          |          |         |         | ✓               |

- A version of the table above, summarizing updated stacked retirement case results from the coal studies, was originally presented at the April 2019 public-input meeting (PIM).
- Upon reviewing the differential in PVRR(d) between C-01 and C-42 from April 2019 PIM and the PVRR(d) between P-01 and P-04 from the May PIM, PacifiCorp identified a reporting error that affected the PVRR(d) results presented in the April PIM.
- The reporting error was associated with the removal of the granularity cost-driver adjustment—which is applied in the SO model to affect resource selections—from the PaR results.
- This cost-driver adjustment is removed from PaR, because PaR, with more hourly granularity, captures the very impact that cost-driver adjustment is intended to represent when applied in the SO model.
- With the granularity cost-driver correction, the PVRR(d) benefit for Case C-42 should have been reported as \$207 million instead of \$248m.
- Note, that with this correction, Case C-42 produces PVRR(d) benefits similar to those from Case C-35 but is still among the top of the list as a potential retirement scenario that could generate customer benefits.

# Reconciliation of C-42 and P-04 PVRR(d) (Overstated DSM Costs in C-01)



- In the following slide, you will see that the current PVRR(d) benefit of P-04 relative to P-01 is \$140m, which is \$67m lower than the \$207m benefit of C-42 relative to C-01 when corrected for the granularity cost-adjustment driver.
- In reviewing the remaining variance, PacifiCorp observed that the C-01 benchmark case included a large amount of very high cost Class 2 DSM resources in Goshen that were unnecessarily added as reliability resources.
- Assuming that Goshen Class 2 DSM selections above \$110/MWh (based upon review of other cases) were unnecessarily included in the C-01 benchmark case, the overstated PVRR of this case is estimated at \$78m, which is generally in line with the \$67m variance in the PVRR(d) between the April PIM and the most current P-04 to P-01 modeled results.
- While other stacked cases from the coal study have some level of high cost DSM, the most material impact is isolated to the C-01 benchmark case, and thus, the relative ranking of stacked cases shown on the previous slide would not be impacted.
- Further, as discussed later in this presentation, PacifiCorp is evaluating in the portfolio development phase of the 2019 IRP coal retirement scenarios that are much broader in scope than what was considered in the coal studies.



# Updates Since the May Public-Input Meeting

| Case | Stochastic Mean<br>PVRR<br>(\$m) |        |        | EGS<br>Cost<br>Update | Gas<br>Capacity<br>Correction | Other<br>Corrections |
|------|----------------------------------|--------|--------|-----------------------|-------------------------------|----------------------|
|      | May                              | June   | Change |                       |                               |                      |
| P-01 | 23,973                           | 23,949 | (25)   | ✓                     |                               | ✓ <sup>1</sup>       |
| P-02 | 24,888                           | 24,879 | (9)    | ✓                     |                               |                      |
| P-03 | 23,823                           | 23,814 | (9)    | ✓                     |                               | ✓ <sup>2</sup>       |
| P-04 | 23,841                           | 23,809 | (32)   | ✓                     |                               | ✓ <sup>3</sup>       |
| P-05 | 23,926                           | 23,917 | (9)    | ✓                     |                               |                      |
| P-06 | 23,657                           | 23,728 | 71     | ✓                     | ✓                             |                      |
| P-07 | 23,644                           | 23,757 | 114    | ✓                     | ✓                             |                      |
| P-08 | 23,809                           | 23,800 | (9)    | ✓                     |                               |                      |
| P-09 | 23,671                           | 23,662 | (10)   | ✓                     | ✓                             |                      |
| P-10 | 23,799                           | 23,843 | 45     | ✓                     | ✓                             |                      |
| P-11 | 23,539                           | 23,650 | 111    | ✓                     | ✓                             |                      |
| P-12 | 23,655                           | 23,684 | 28     | ✓                     | ✓                             |                      |
| P-13 | 23,936                           | 24,000 | 64     | ✓                     | ✓                             |                      |

1. P-01 benchmark PVRR improved by \$25m due to decrease in calculated reliability requirement
2. May results overstated P-03 benefits by \$17m due to a calculation error
3. P-04 PVRR improves by \$32m due to decrease in calculated reliability requirement

- The cost for Gateway South has been updated (reduced) and applied to all cases.
- Gas unit capacity varies seasonally. Seasonality was not captured due to data type selection using higher Winter (December) capacities.
- Impacts of correcting the gas capacities vary by case, affected by:
  - Early coal retirements
  - Early Gadsby (gas) retirements
  - Re-optimization

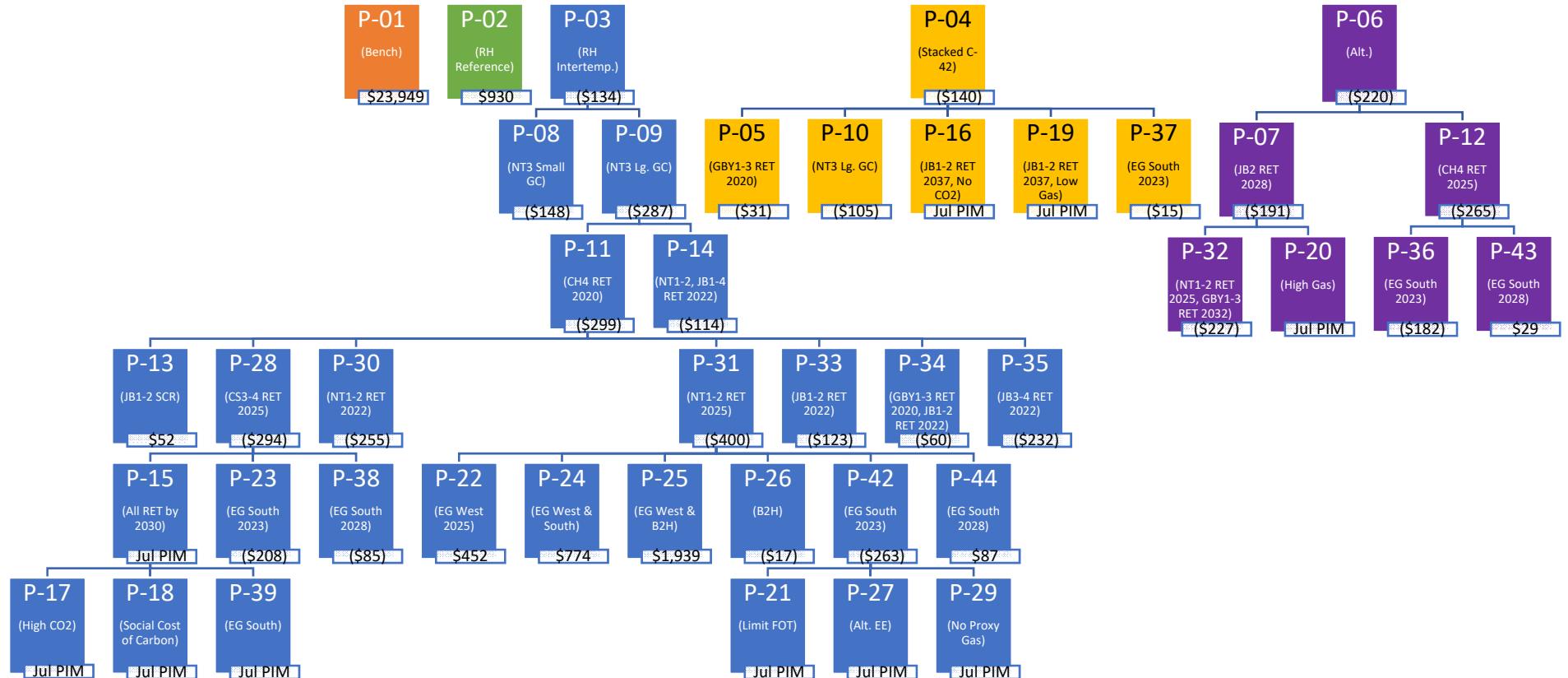
# Initial Early Retirement Assumptions



| Coal Unit<br>(PAC Share MW) | P-01<br>(Coal Study Benchmark) | P-02<br>(Reg. Haze Ref.) | P-03<br>(Reg. Haze. Intertemp.) | P-04<br>(Stacked Case C-42) | P-06<br>(Econ. Ret. Alt. 1) |
|-----------------------------|--------------------------------|--------------------------|---------------------------------|-----------------------------|-----------------------------|
| Cholla 4 (387)              | RET 2020                       | RET 2025                 | RET 2025                        | RET 2020                    | RET 2020                    |
| Colstrip 3 (74)             | RET 2046                       | RET 2027                 | RET 2027                        | RET 2046                    | RET 2027                    |
| Colstrip 4 (74)             | RET 2046                       | RET 2027                 | RET 2027                        | RET 2046                    | RET 2027                    |
| Craig 1 (82)                | RET 2025                       | RET 2025                 | RET 2025                        | RET 2025                    | RET 2025                    |
| Craig 2 (82)                | RET 2034                       | RET 2026                 | RET 2026                        | RET 2034                    | RET 2025                    |
| Dave Johnston 1 (106)       | RET 2027                       | RET 2027                 | RET 2027                        | RET 2027                    | RET 2027                    |
| Dave Johnston 2 (106)       | RET 2027                       | RET 2027                 | RET 2027                        | RET 2027                    | RET 2027                    |
| Dave Johnston 3 (220)       | RET 2027                       | RET 2027                 | RET 2027                        | RET 2027                    | RET 2027                    |
| Dave Johnston 4 (330)       | RET 2027                       | RET 2027                 | RET 2027                        | RET 2027                    | RET 2027                    |
| Hayden 1 (44)               | RET 2030                       | RET 2030                 | RET 2030                        | RET 2030                    | RET 2030                    |
| Hayden 2 (33)               | RET 2030                       | RET 2030                 | RET 2030                        | RET 2030                    | RET 2030                    |
| Hunter 1 (418)              | RET 2042                       | SCR 2022 RET 2042        | RET 2042                        | RET 2042                    | RET 2042                    |
| Hunter 2 (269)              | RET 2042                       | SCR 2023 RET 2042        | RET 2042                        | RET 2042                    | RET 2042                    |
| Hunter 3 (471)              | RET 2042                       | RET 2042                 | RET 2042                        | RET 2042                    | RET 2042                    |
| Huntington 1 (459)          | RET 2036                       | SCR 2022 RET 2036        | RET 2036                        | RET 2036                    | RET 2036                    |
| Huntington 2 (450)          | RET 2036                       | SCR 2023 RET 2036        | RET 2036                        | RET 2036                    | RET 2036                    |
| Jim Bridger 1 (354)         | SCR 2022 RET 2037              | SCR 2022 RET 2037        | No SCR RET 2028                 | No SCR RET 2022             | No SCR RET 2022             |
| Jim Bridger 2 (359)         | SCR 2021 RET 2037              | SCR 2021 RET 2037        | No SCR RET 2032                 | No SCR RET 2022             | No SCR RET 2032             |
| Jim Bridger 3 (349)         | RET 2037                       | RET 2037                 | RET 2037                        | RET 2037                    | RET 2037                    |
| Jim Bridger 4 (353)         | RET 2037                       | RET 2037                 | RET 2037                        | RET 2037                    | RET 2037                    |
| Naughton 1 (156)            | RET 2029                       | RET 2029                 | RET 2029                        | RET 2022                    | RET 2029                    |
| Naughton 2 (201)            | RET 2029                       | RET 2029                 | RET 2029                        | RET 2022                    | RET 2029                    |
| Naughton 3 (280)            | RET 2019                       | RET 2019                 | RET 2019                        | RET 2019                    | Ig. GC 2020 RET 2029        |
| Wyodak (268)                | RET 2039                       | SCR 2024 RET 2039        | RET 2039                        | RET 2039                    | RET 2039                    |
| Gadsby 1-3 Gas (238)        | RET 2032                       | RET 2032                 | RET 2032                        | RET 2032                    | RET 2020                    |



# Portfolio Development Case Relationships



- The dollar value shown for Case P-01 represents the stochastic mean PVRR—dollar values for all other cases represent either the incremental cost or (benefit) relative to Case P-01.
- All figures shown in this graphic are based on medium natural gas and medium CO<sub>2</sub> price assumptions.
- Text in parentheses summarize changes in assumptions relative to the case above it in the hierarchy.

# Energy Gateway South Cases (2028 vs. 2023)



|  | P-38 (2028) Relative to<br>P-23 (2023) | P-44 (2028) Relative to<br>P-42 (2023) | P-43 (2028) Relative to<br>P-36 (2023) |
|--|--|--|--|
| PVRR with GWS in 2028 (\$m)                    | \$23,864                               | \$24,035                               | \$23,978                               |
| PVRR with GWS in 2023 (\$m)                    | \$23,740                               | \$23,686                               | \$23,767                               |
| PVRR(d) (Benefit)/Cost of GWS in<br>2023 (\$m) | (\$124)                                | (\$349)                                | (\$211)                                |

- Rights-of-way (ROW) grants with the BLM can be terminated via a rebuttable presumption of abandonment if the ROW is not used for a continuous five-year period.
- Should on-going work on Energy Gateway South (i.e., surveys and geotechnical assessments, preliminary engineering, and rights of entry) cease in 2020 (i.e., absent a path forward via the 2019 IRP), the risk of abandonment increases in 2025 and increases each year thereafter.
- Studies that select Energy Gateway South as late as 2032 carry a proportionately higher risk that the ROW grants could be terminated by the BLM in the interim—eliminating the possibility of constructing the project by 2032.
- To evaluate this increasing risk, PacifiCorp developed several cases that evaluated model selections if the availability of Energy Gateway South were assumed to sunset at an interim date of 2028 (assuming the IRP action plan provides a path forward through the currently deliverable 2023 in-service date)—in each of these cases, the SO model selected the Energy Gateway South upgrade in 2028.
- Relative to cases selecting Energy Gateway South in 2028, cases where Energy Gateway South is operational by the end of 2023 (enabling 40-percent PTC eligible wind) reduce total system costs—the range in benefits varies depending upon underlying early retirement assumptions.

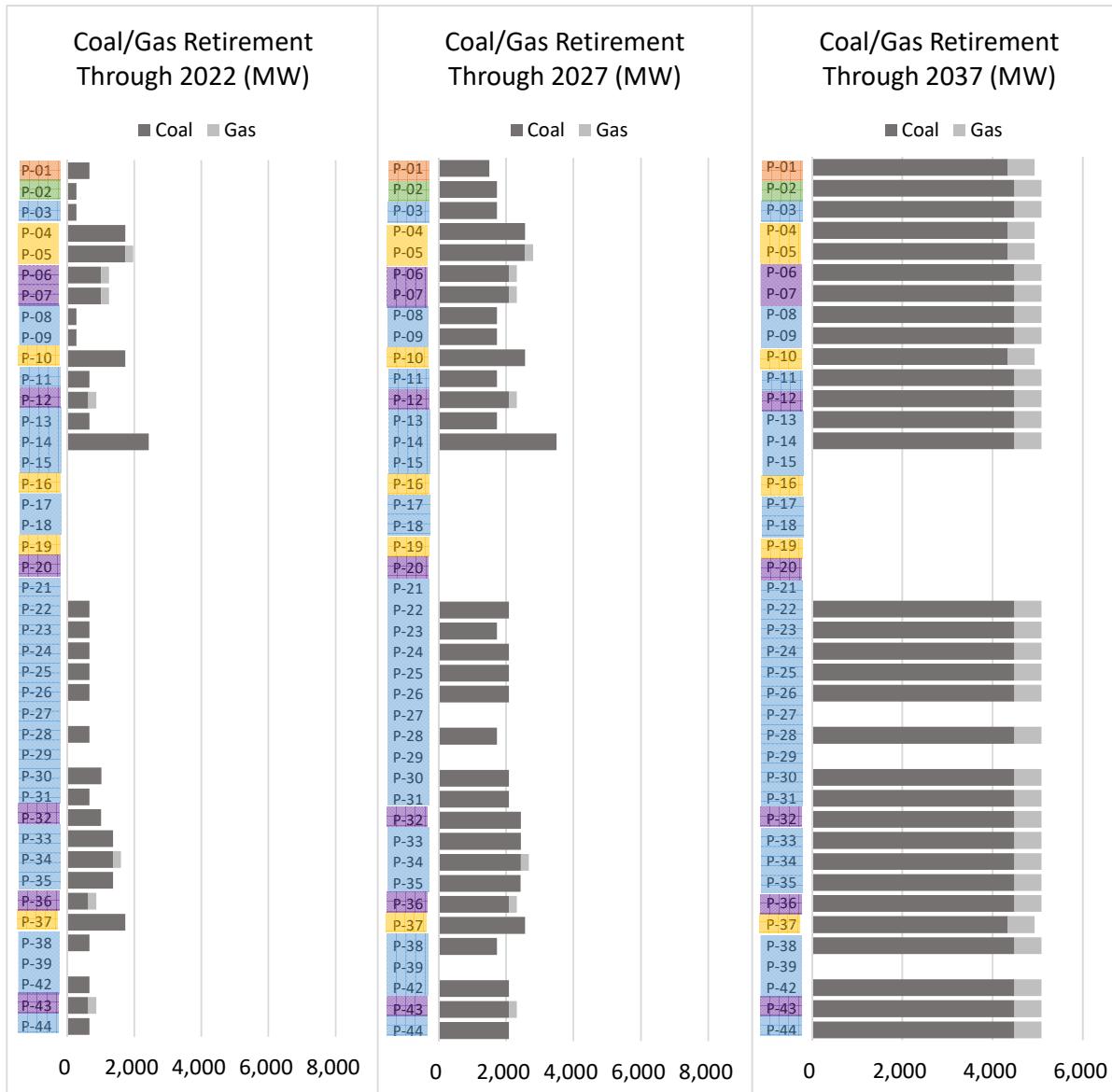
# Early Retirement Assumptions for P-15



| Coal Unit<br>(PAC Share MW) | P-15<br>(All Coal Retired by 2030) |
|-----------------------------|------------------------------------|
| Cholla 4 (387)              | RET 2020                           |
| Colstrip 3 (74)             | RET 2025                           |
| Colstrip 4 (74)             | RET 2025                           |
| Craig 1 (82)                | RET 2025                           |
| Craig 2 (82)                | RET 2026                           |
| Dave Johnston 1 (106)       | RET 2027                           |
| Dave Johnston 2 (106)       | RET 2027                           |
| Dave Johnston 3 (220)       | RET 2027                           |
| Dave Johnston 4 (330)       | RET 2027                           |
| Hayden 1 (44)               | RET 2030                           |
| Hayden 2 (33)               | RET 2030                           |
| Hunter 1 (418)              | RET 2024                           |
| Hunter 2 (269)              | RET 2028                           |
| Hunter 3 (471)              | RET 2025                           |
| Huntington 1 (459)          | RET 2030                           |
| Huntington 2 (450)          | RET 2029                           |
| Jim Bridger 1 (354)         | RET 2028                           |
| Jim Bridger 2 (359)         | RET 2026                           |
| Jim Bridger 3 (349)         | RET 2023                           |
| Jim Bridger 4 (353)         | RET 2023                           |
| Naughton 1 (156)            | RET 2029                           |
| Naughton 2 (201)            | RET 2029                           |
| Naughton 3 (280)            | Lg. GC RET 2029                    |
| Wyodak (268)                | RET 2026                           |
| Gadsby 1-3 Gas (238)        | RET 2032                           |



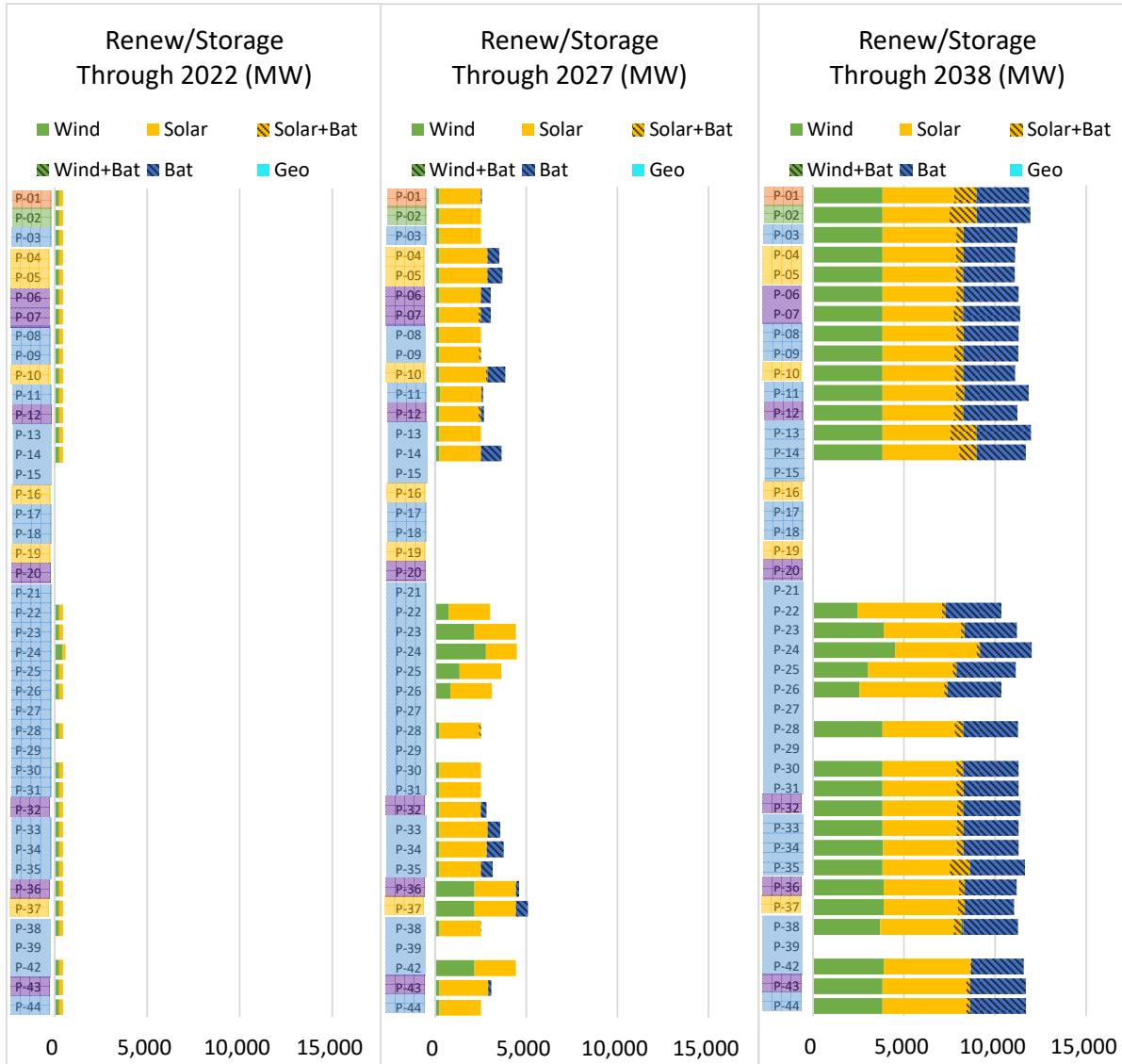
# Coal/Gas Resource Retirements



- Cases that are descendants of P-04 (yellow cases) assume coal retirements that total 1,730 MW through 2022.
- Cases that are descendants of P-06 (purple cases) assume coal retirements of either 631 MW or 1,018 MW (depending upon the timing for Cholla 4) through 2022.
- Cases that are descendants of P-03 (blue cases) assume coal retirements ranging between 280 MW and 2,432 MW (depending upon timing for Cholla 4, Naughton 1-2, and Jim Bridger 1-4).
- Cases that show gas retirements through 2022 and through 2027 assume Gadsby 1-3 retire at the end of 2020.
- Through 2027, coal retirements for descendants of P-04 total 2,568 MW, coal retirements for descendants of P-06 range between 2,084 MW and 2,441 MW (depending upon timing for Naughton 1-2), and coal retirements for descendants of P-03 range between 1,734 MW and 2,440 MW (depending upon timing for Naughton 1-2, Jim Bridger 1-4, and Cholla 4).
- By the end of the study period, coal retirements are similar among all cases, with slight variations dependent upon timing for Colstrip 3-4, and gas retirements are the same among all cases.



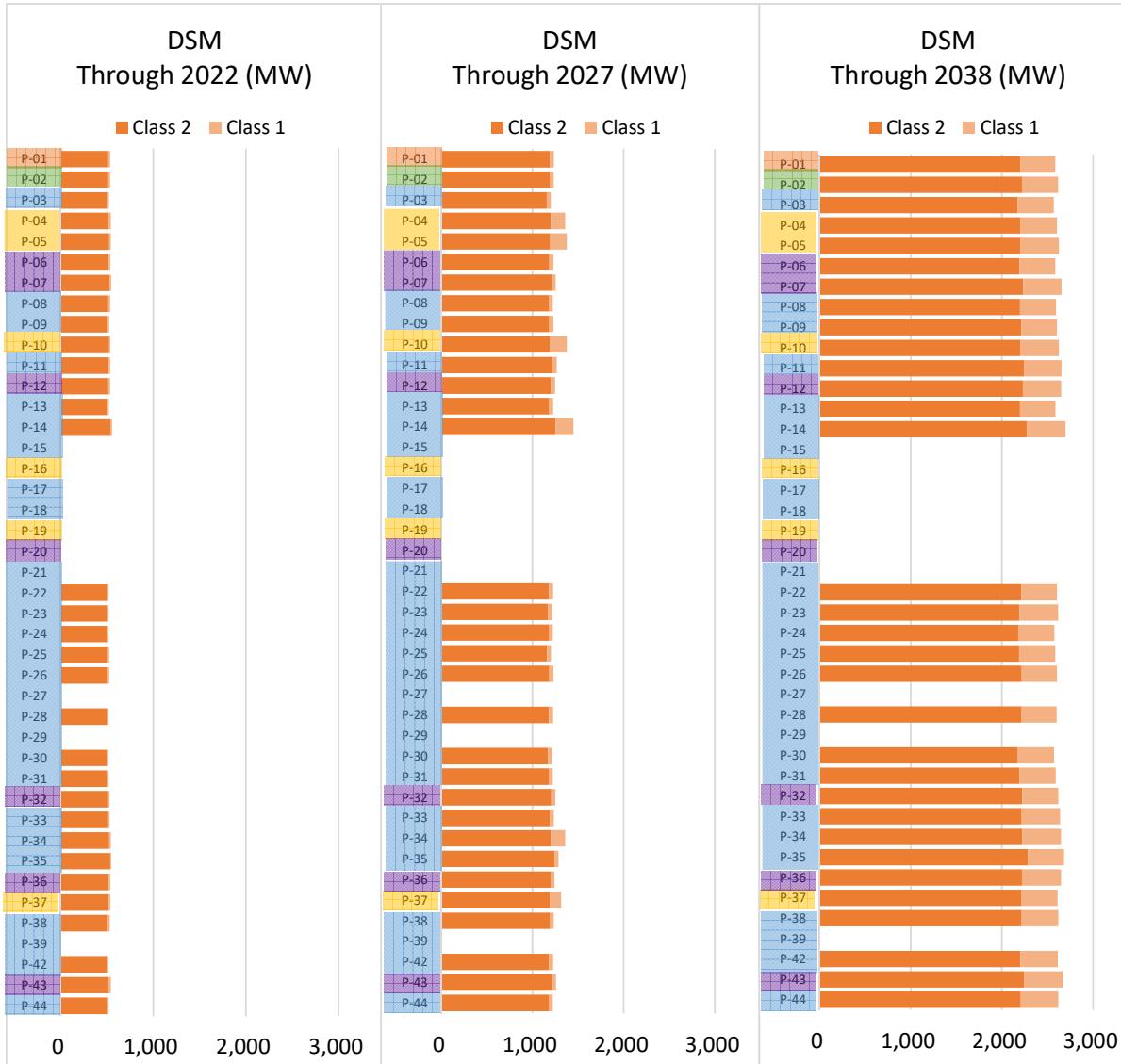
# New Renewable and Storage Resources



- In the near term, all cases continue to include 240 MW of new Wyoming wind and between 147 MW and 205 MW of new Utah solar.
- Through 2027, new wind and solar capacity increases significantly in all cases, ranging between 2,520 MW (multiple cases) and 4,486 MW (Case P-24).
- Through 2027, cases with incremental or accelerated Energy Gateway transmission investments support more wind resources relative to cases without these investments—cases with Energy Gateway South in 2023 have between 2,160 MW and 2,785 MW (P-24, which also includes Energy Gateway West) of new wind capacity.
- Cases with more accelerated coal retirements drive a need for new battery storage capacity in the 2023 timeframe, which is as high as 1,140 MW in Case P-14.
- Over the long term, there is a relatively balanced mix of wind and solar capacity that totals between 7,283 MW (Case P-22) and 9,191 MW (Case P-24).
- Through the end of the study period, battery storage capacity ranges between 2,807 MW (Case P-37) and 3,654 MW (Case P-11).



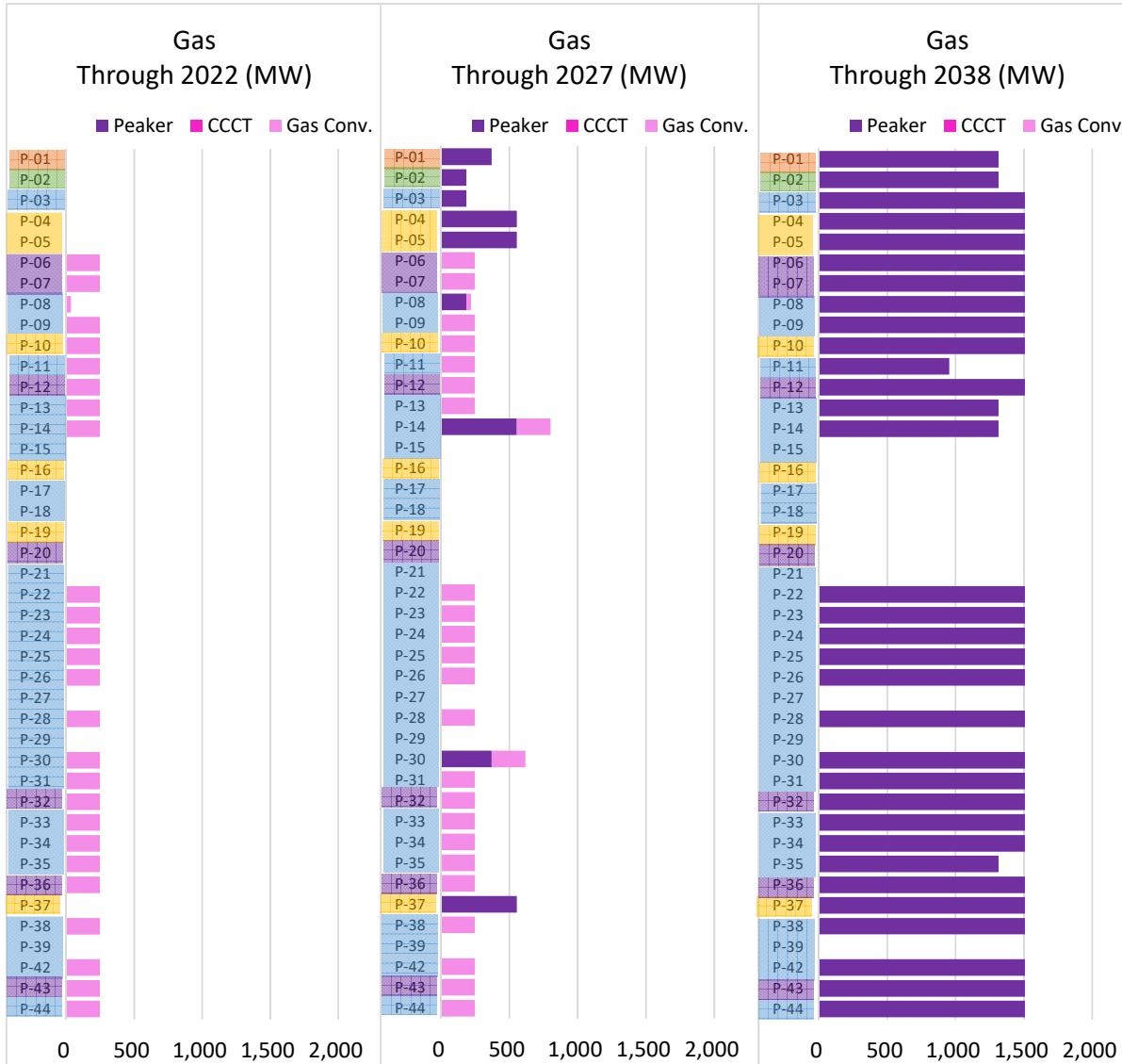
# Incremental Demand-Side Management



- Demand-side management (DSM) selections continue to be relatively stable among all cases.
- Through 2022, Class 2 DSM selections range between 501 MW (Case P-03) and 543 MW (Case P-14); Class 1 DSM ranges between 11 MW and 19 MW.
- Through 2027, Class 2 DSM selections range between 1,155 MW (Case P-03) and 1,254 MW (Case P-14); Class 1 DSM ranges between 45 MW and 194 MW.
- More Class 1 DSM resources are accelerated into the mid term among those cases that have higher levels of accelerated coal and gas retirements (Cases P-04, P-05, P-10, P-14, P-34, and P-37).
- Through 2038, Class 2 DSM selections range between 2,173 MW (Case P-03) and 2,286 MW (Case P-35); Class 1 DSM ranges between 384 MW (Case P-01) and 427 MW (Case P-43).



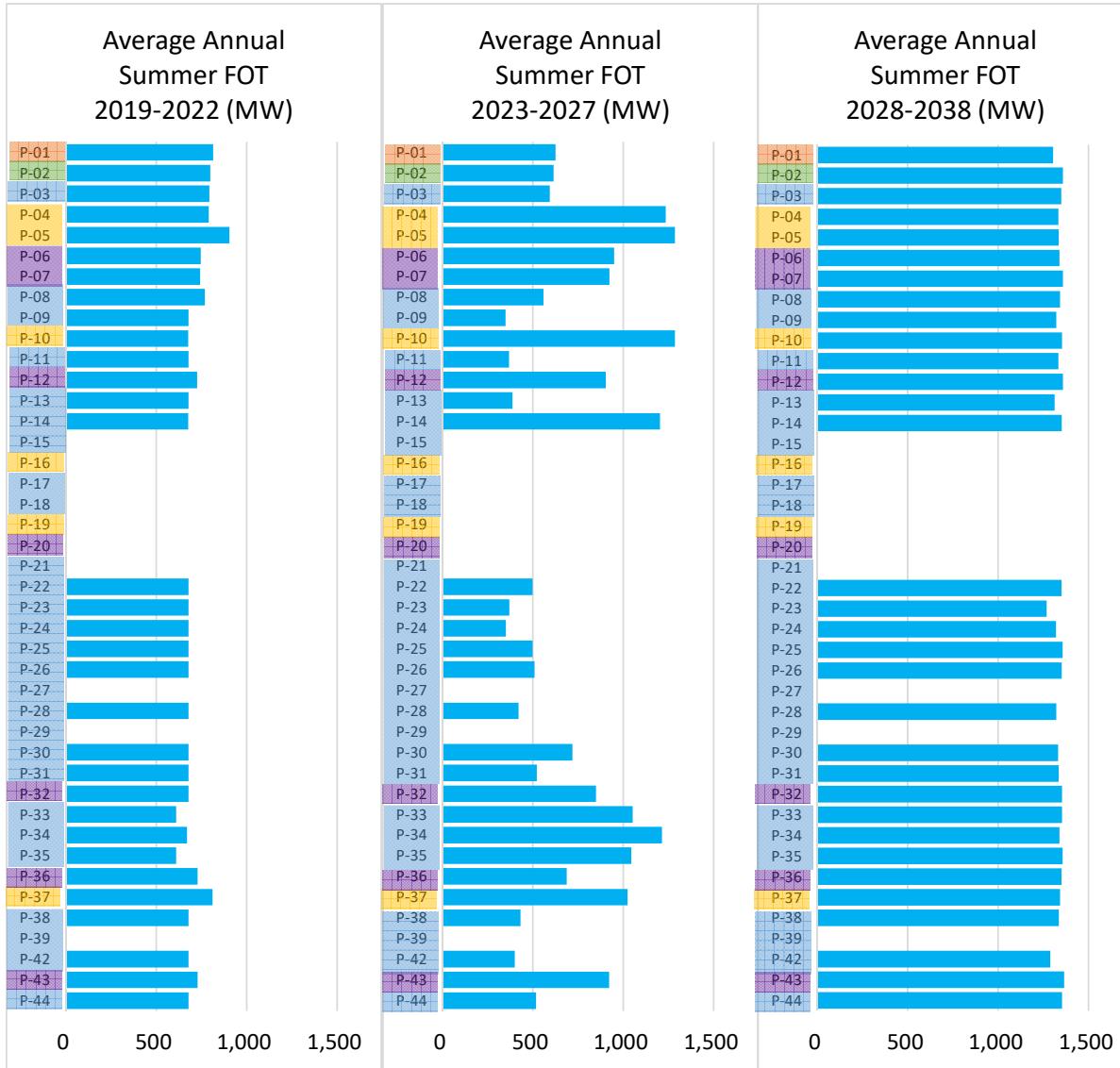
# New/Incremental Natural Gas Resources



- Naughton 3 is assumed to convert to natural gas in 26 of the cases that have been completed to date—the converted unit is assumed to retire at the end of 2029, so it does not show up in the results through 2038.
- In all but two cases (Cases P-14 and P-30), conversion of Naughton 3 to natural gas defers the need to new natural gas capacity into 2028 or beyond.
- Six cases show a need for new gas capacity as soon as 2023 (Cases P-01, P-04, P-05, P-14, P-30, and P-37)—it is likely not possible to procure new natural gas resources in this timeframe.
- Through 2038, new peaking gas capacity ranges between 953 MW (Case P-11) and 1,508 MW (multiple cases).



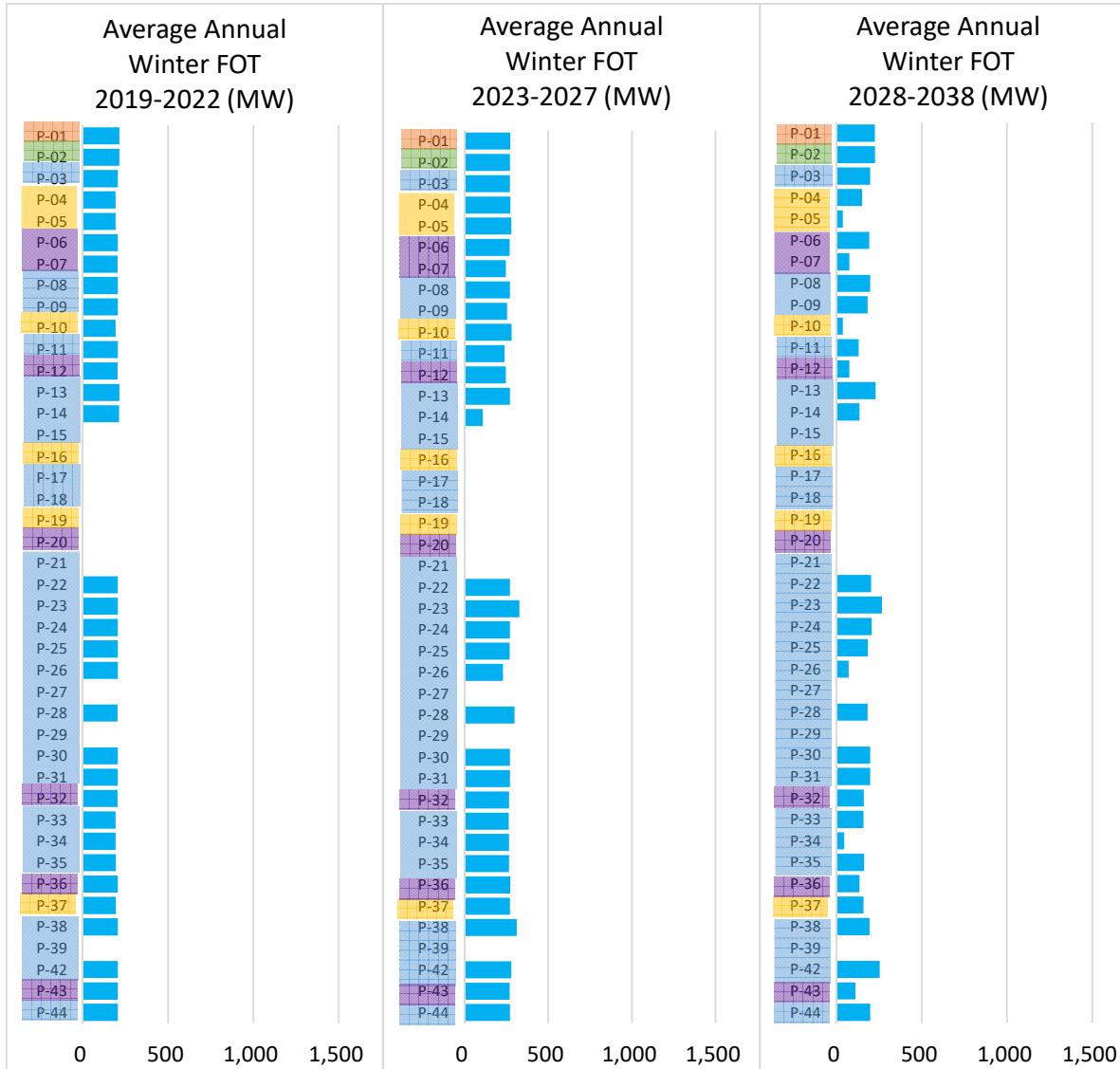
# Summer Front Office Transactions



- The summer FOT limit assumed for the 2019 IRP is 1,425 MW.
- Through the near term, average annual summer FOT purchases range between 609 MW (multiple cases) and 906 MW (Case P-05).
- In the 2023-2027 timeframe, a period where there are resource-adequacy concerns in the region, summer average annual FOT purchases range between 349 MW (Case P-09) and 1,286 MW (Cases P-05 and P-10)—among cases where coal retirements exceed 2,400 MW, the average annual FOT purchases are 1,132 MW, which is approximately twice as high as the summer FOT purchases in all other cases.
- Over the long term, the level of summer FOTs is relatively stable among all cases, ranging between 1,268 MW (Case P-23) and 1,364 MW (Case P-43).



# Winter Front Office Transactions

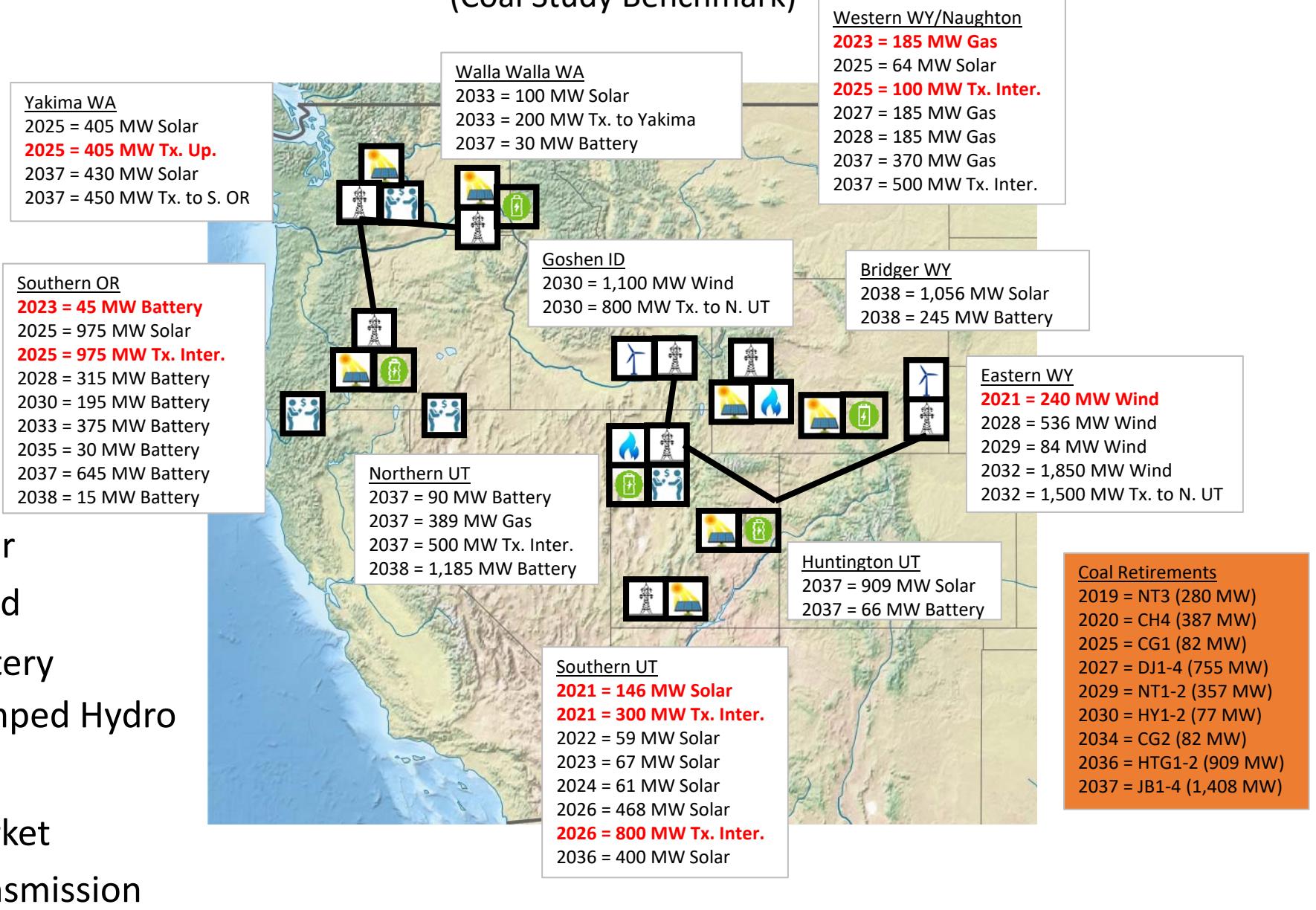


- Relative to the summer period, winter FOTs are much smaller among all cases and timeframes.
- Winter FOT purchases are relatively stable among most cases through both the short and mid term.
- Over the long term, winter FOT purchases are reduced when incremental capacity is added to the system.
- For instance, Case P-05 has relatively low winter FOT purchases in the long term. By 2028, this case has more new battery and natural gas capacity relative to other cases, and its winter FOT purchases drop significantly in this timeframe.



# Case P-01

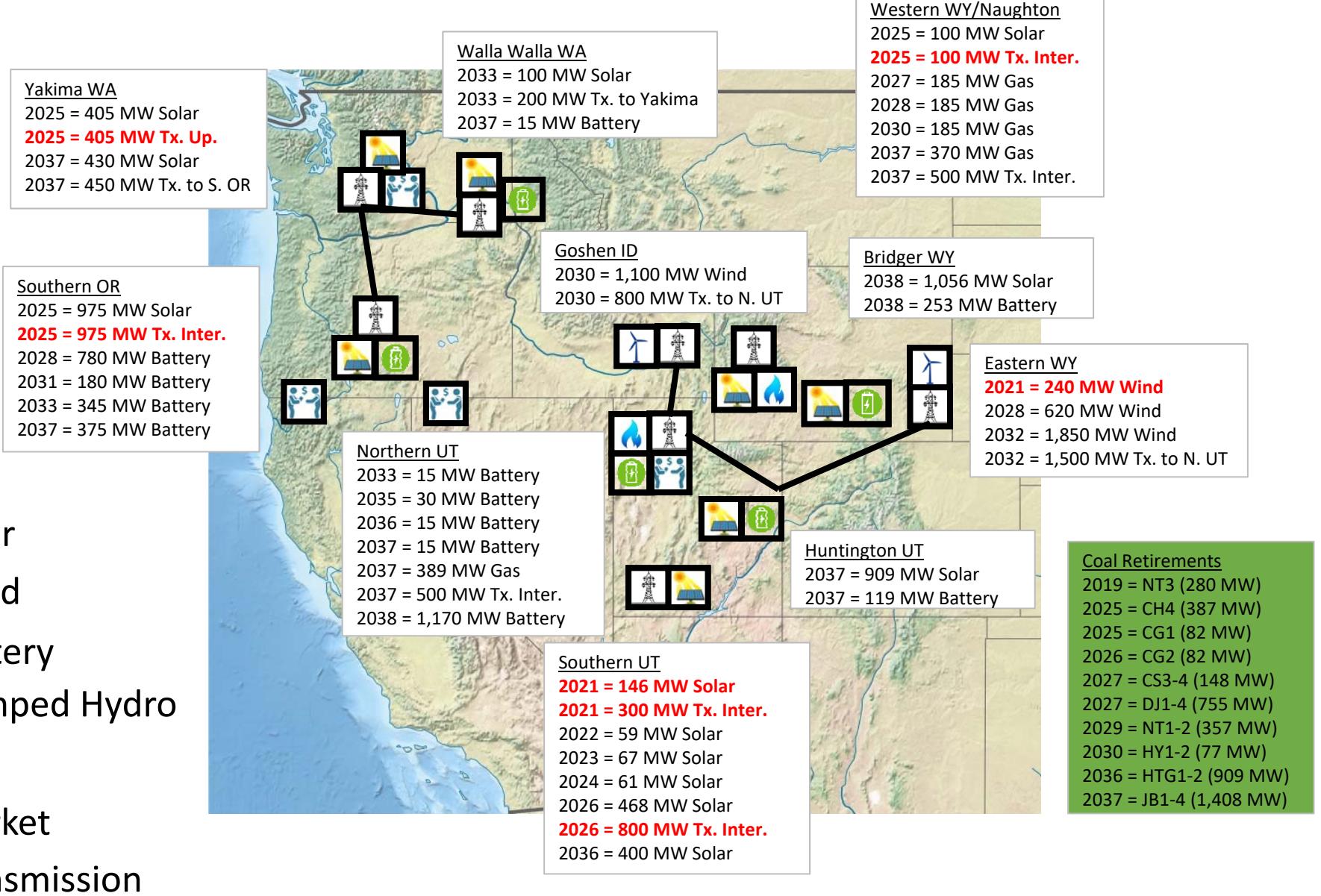
## (Coal Study Benchmark)





# Case P-02

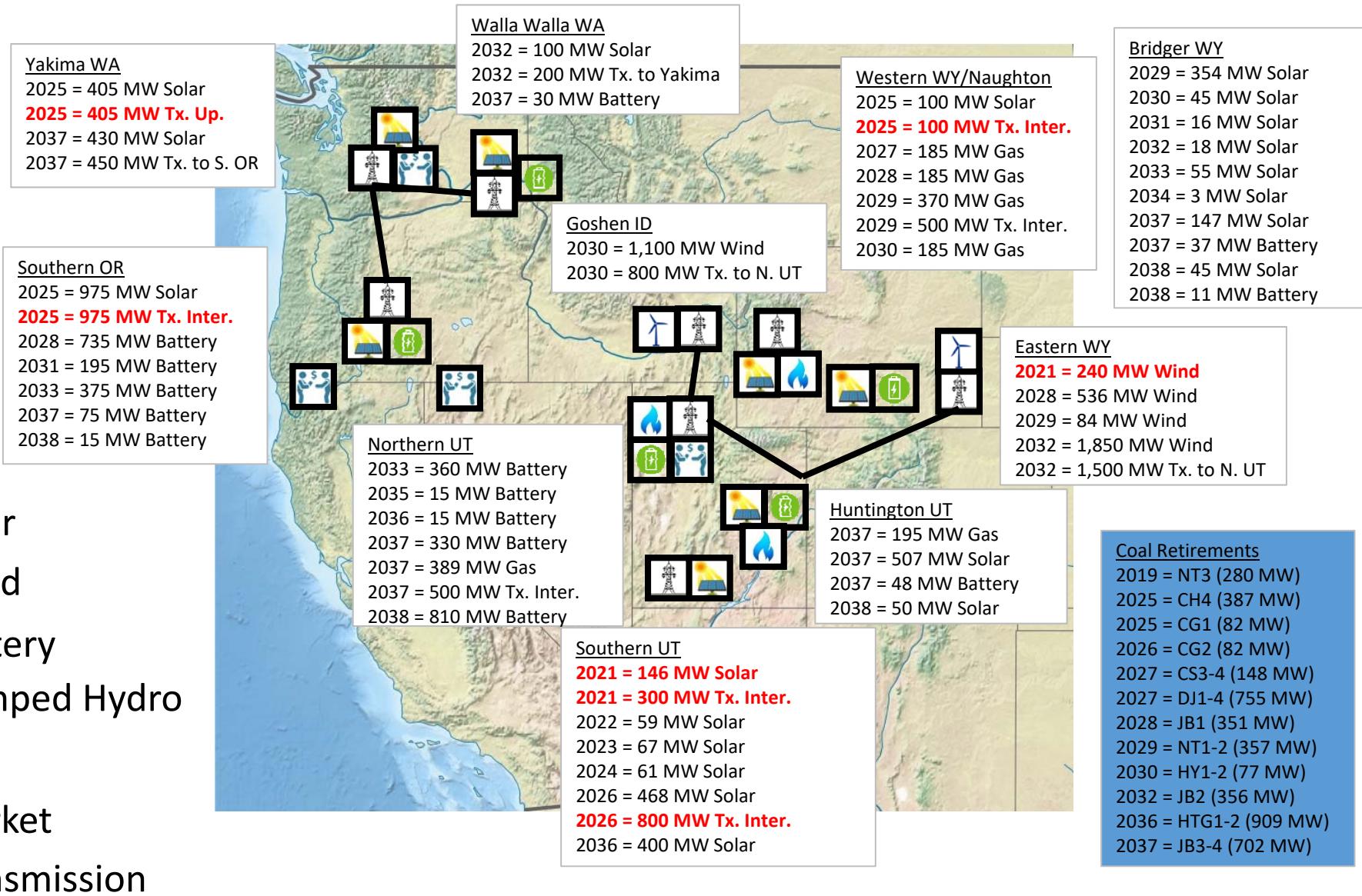
## (Regional Haze Reference)





# Case P-03

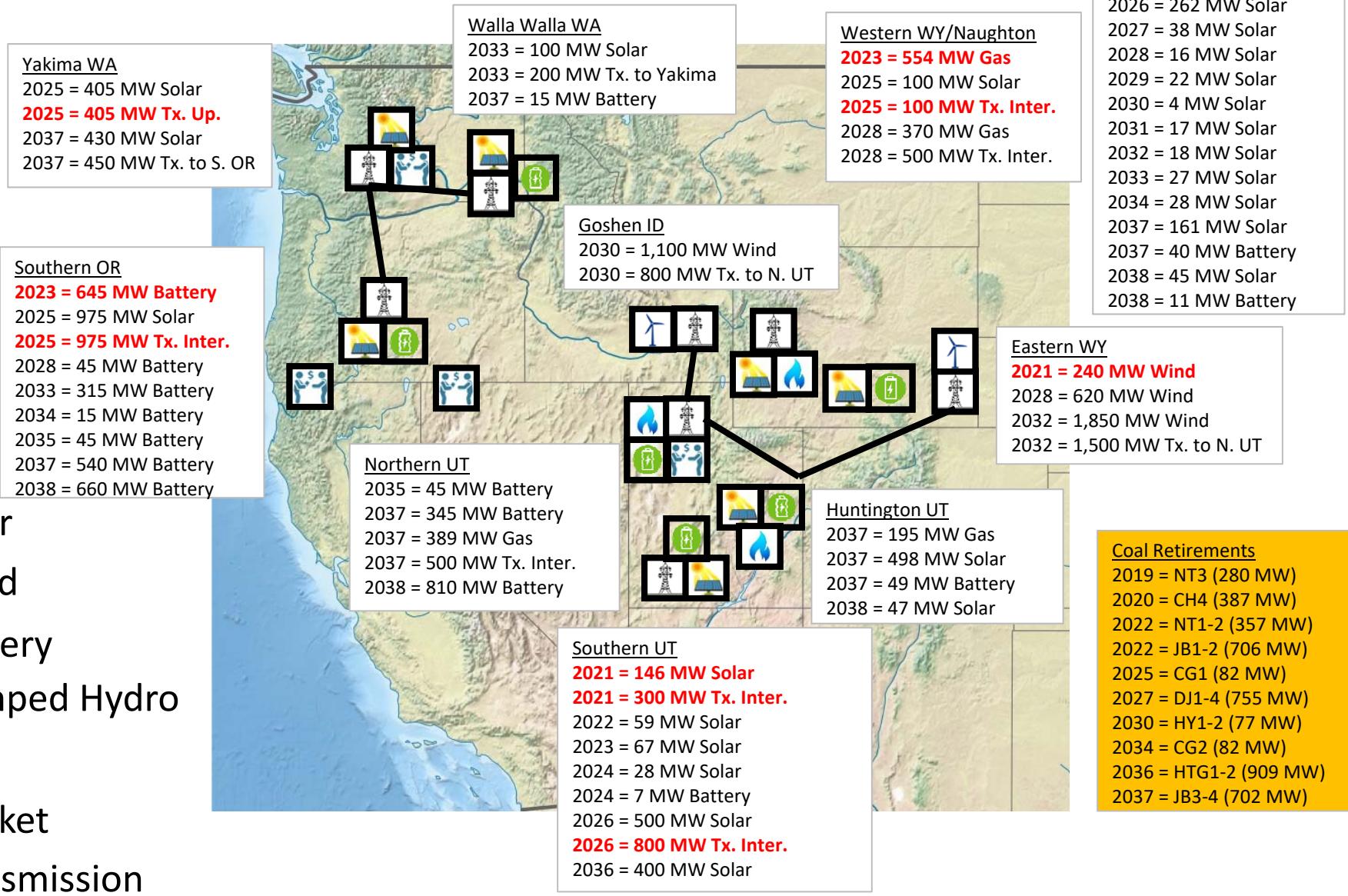
## (Regional Haze Intertemporal)





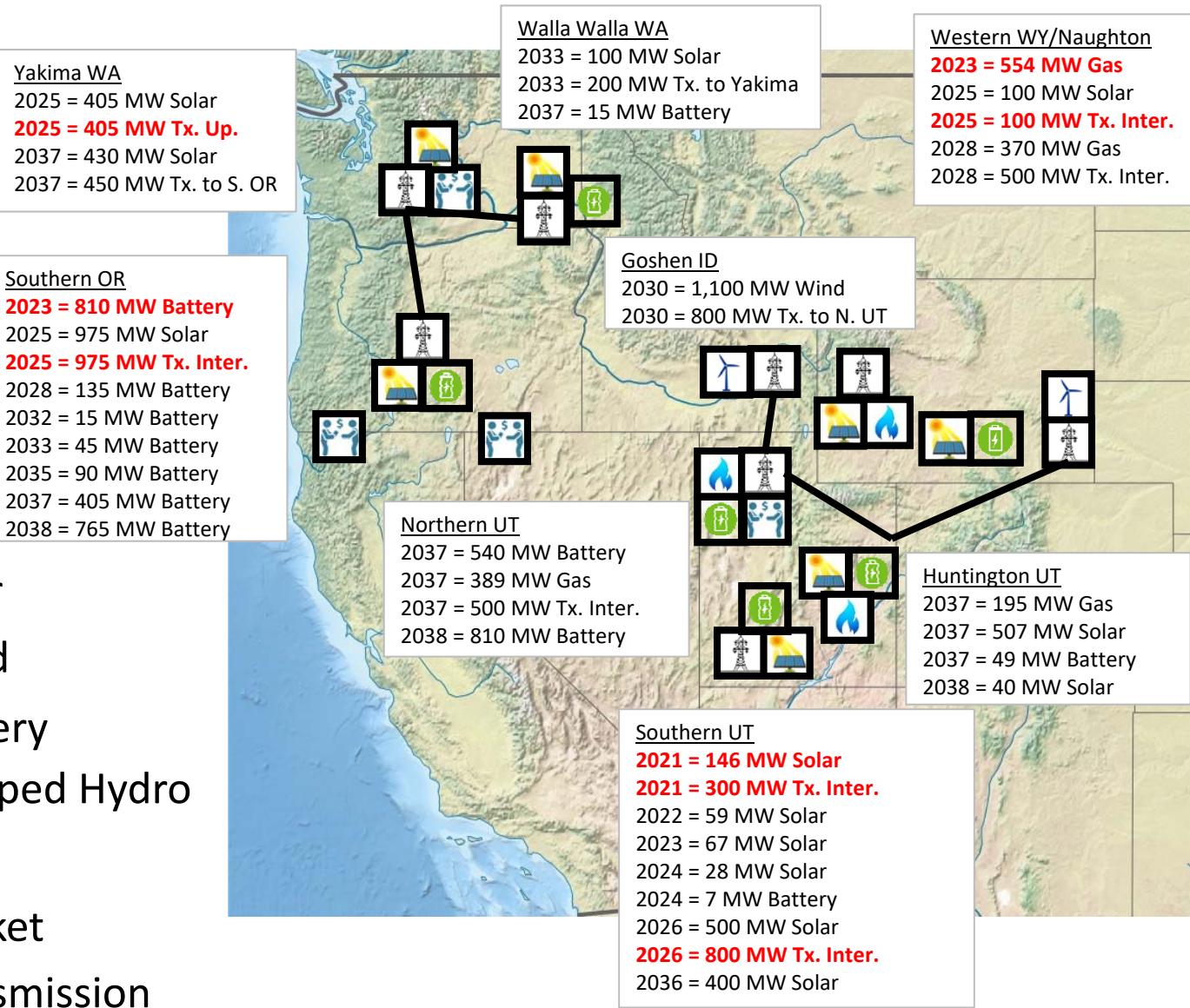
# Case P-04

## (Coal Study Stacked Case C-42)



# Case P-05

(P-04 with Gadsby 1-3 Accelerated to 2020)



| Bridger WY |                 |
|------------|-----------------|
| 2024       | = 229 MW Solar  |
| 2026       | = 94 MW Solar   |
| 2027       | = 43 MW Solar   |
| 2028       | = 16 MW Solar   |
| 2029       | = 22 MW Solar   |
| 2030       | = 4 MW Solar    |
| 2031       | = 17 MW Solar   |
| 2032       | = 18 MW Solar   |
| 2033       | = 52 MW Solar   |
| 2033       | = 1 MW Battery  |
| 2034       | = 9 MW Solar    |
| 2034       | = 2 MW Battery  |
| 2037       | = 145 MW Solar  |
| 2037       | = 38 MW Battery |
| 2038       | = 38 MW Solar   |
| 2038       | = 5 MW Battery  |

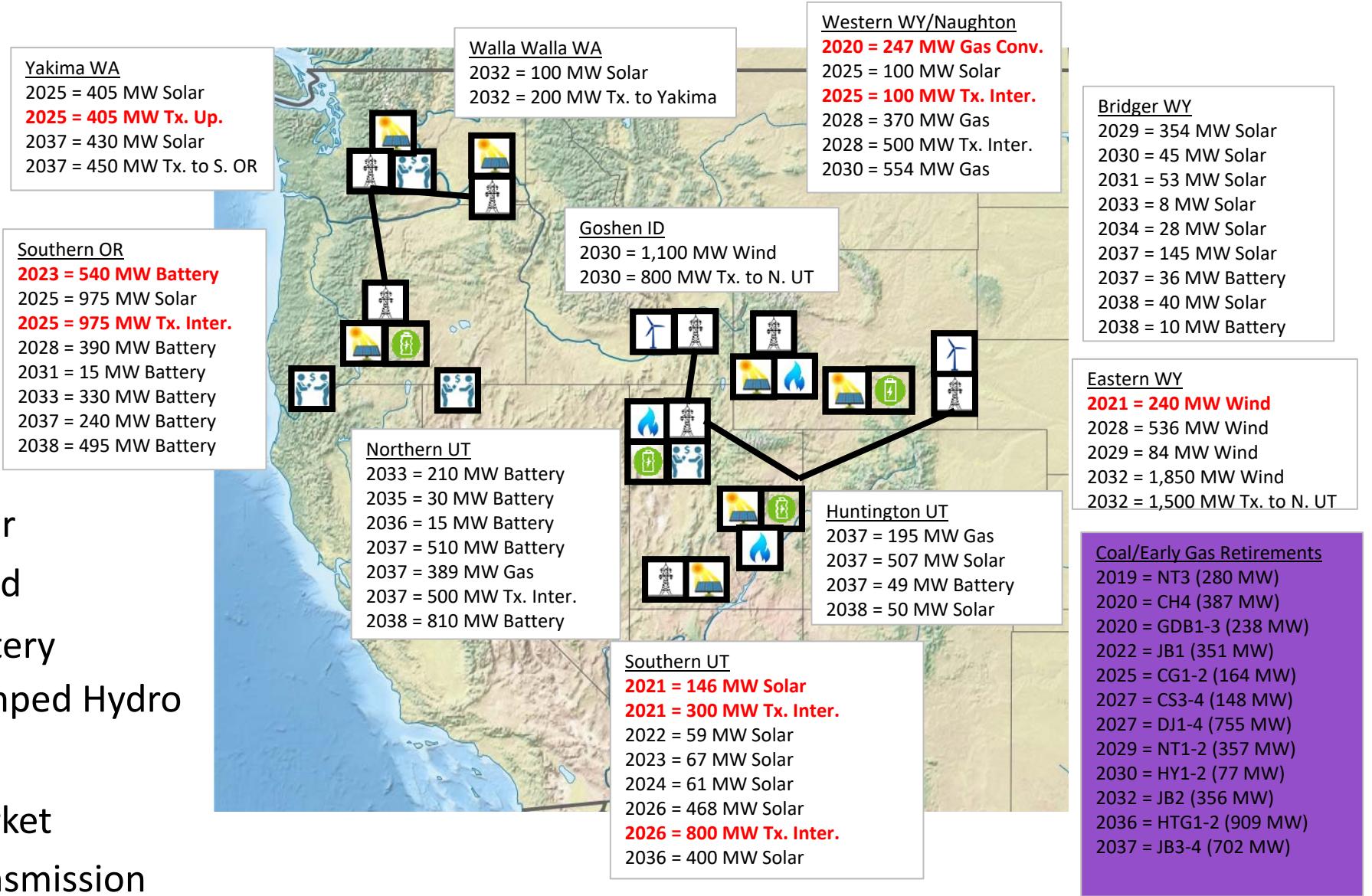
| Eastern WY                |                         |
|---------------------------|-------------------------|
| <b>2021 = 240 MW Wind</b> |                         |
| 2028                      | = 620 MW Wind           |
| 2032                      | = 1,850 MW Wind         |
| 2032                      | = 1,500 MW Tx. to N. UT |

| Coal/Early Gas Retirements |                   |
|----------------------------|-------------------|
| 2019                       | = NT3 (280 MW)    |
| 2020                       | = CH4 (387 MW)    |
| 2020                       | = GDB1-3 (238 MW) |
| 2022                       | = NT1-2 (357 MW)  |
| 2022                       | = JB1-2 (706 MW)  |
| 2025                       | = CG1 (82 MW)     |
| 2027                       | = DJ1-4 (755 MW)  |
| 2030                       | = HY1-2 (77 MW)   |
| 2034                       | = CG2 (82 MW)     |
| 2036                       | = HTG1-2 (909 MW) |
| 2037                       | = JB3-4 (702 MW)  |



# Case P-06

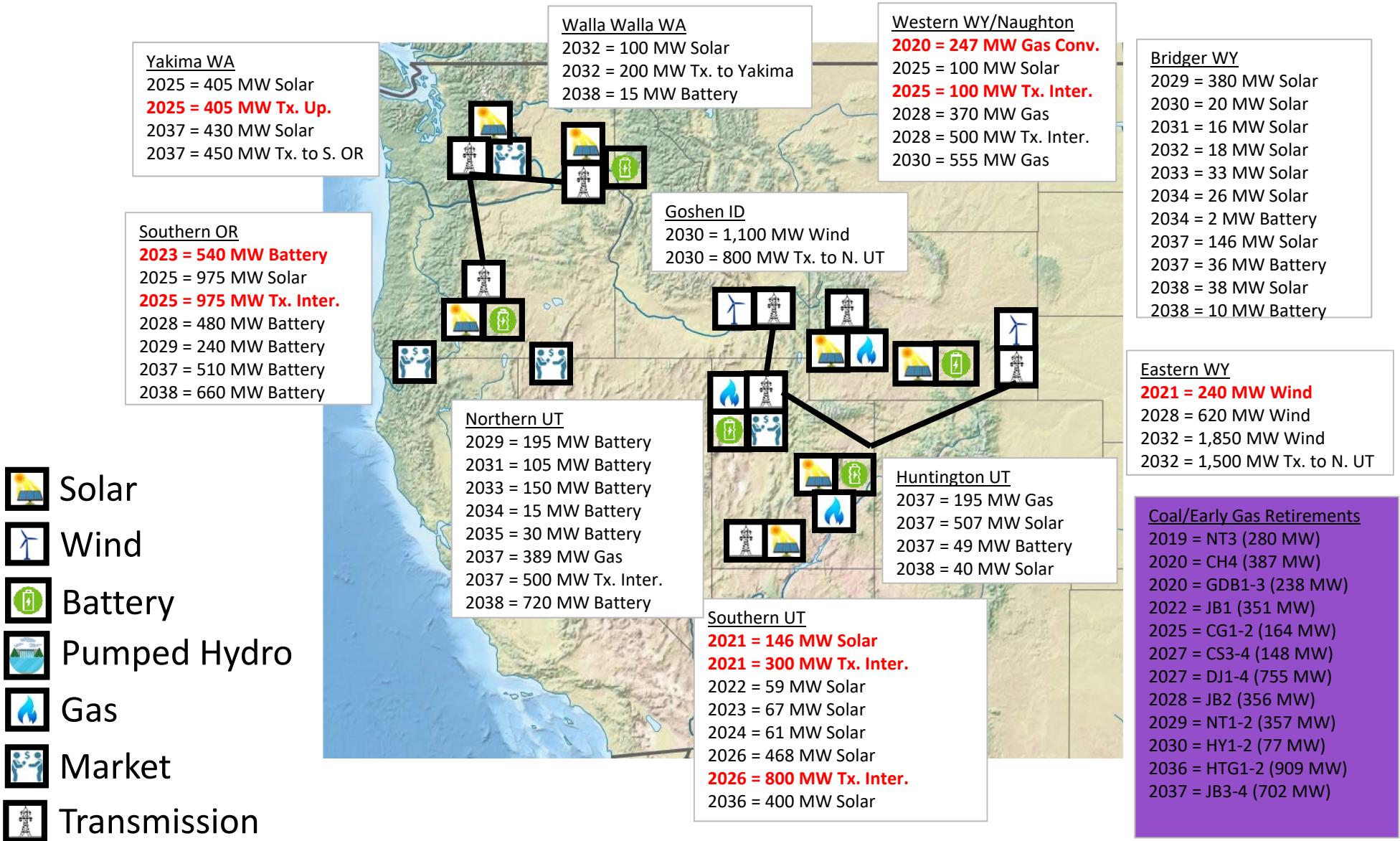
## (Alternative Retirements)





# Case P-07

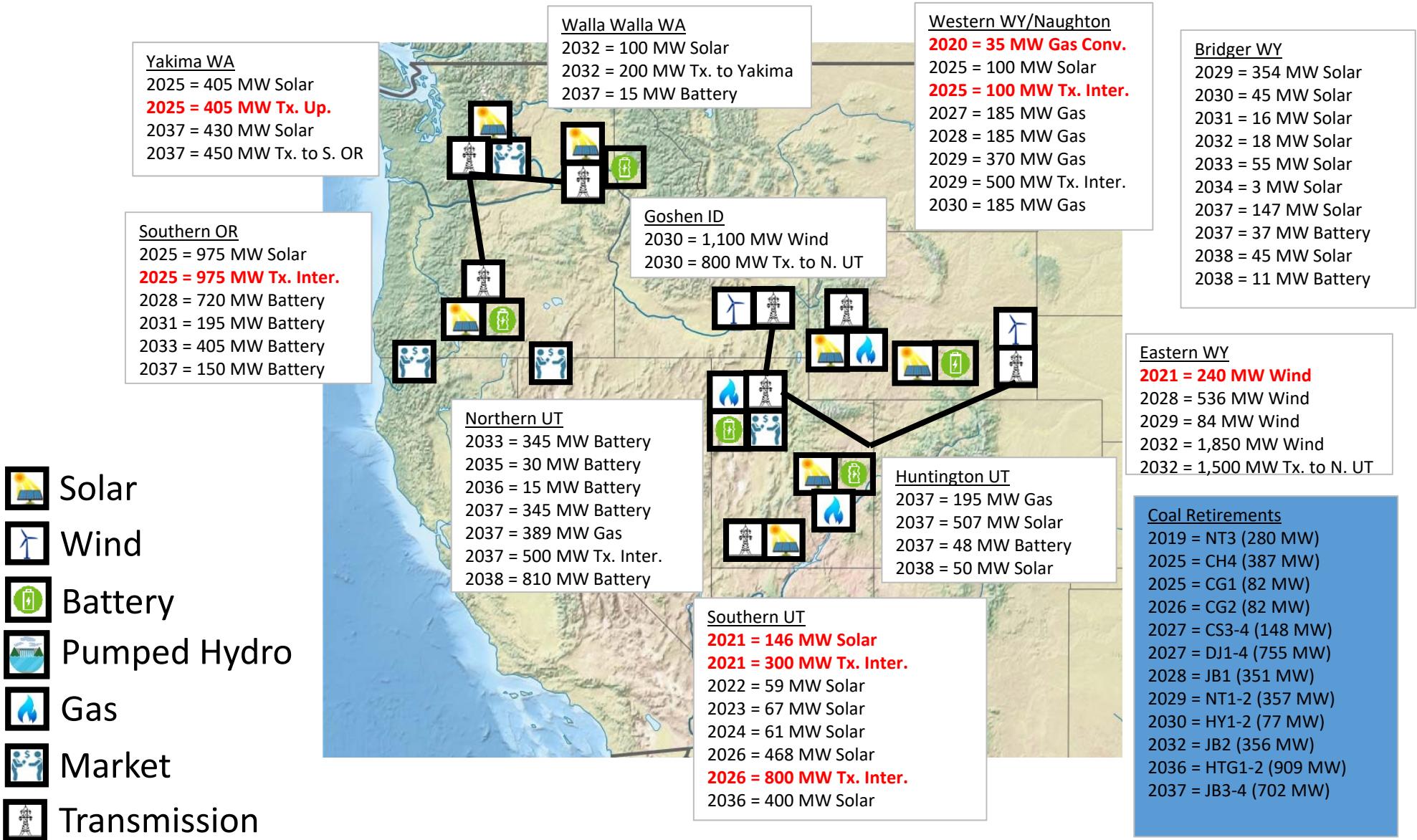
(P-06 with JB2 Accelerated to 2028)





# Case P-08

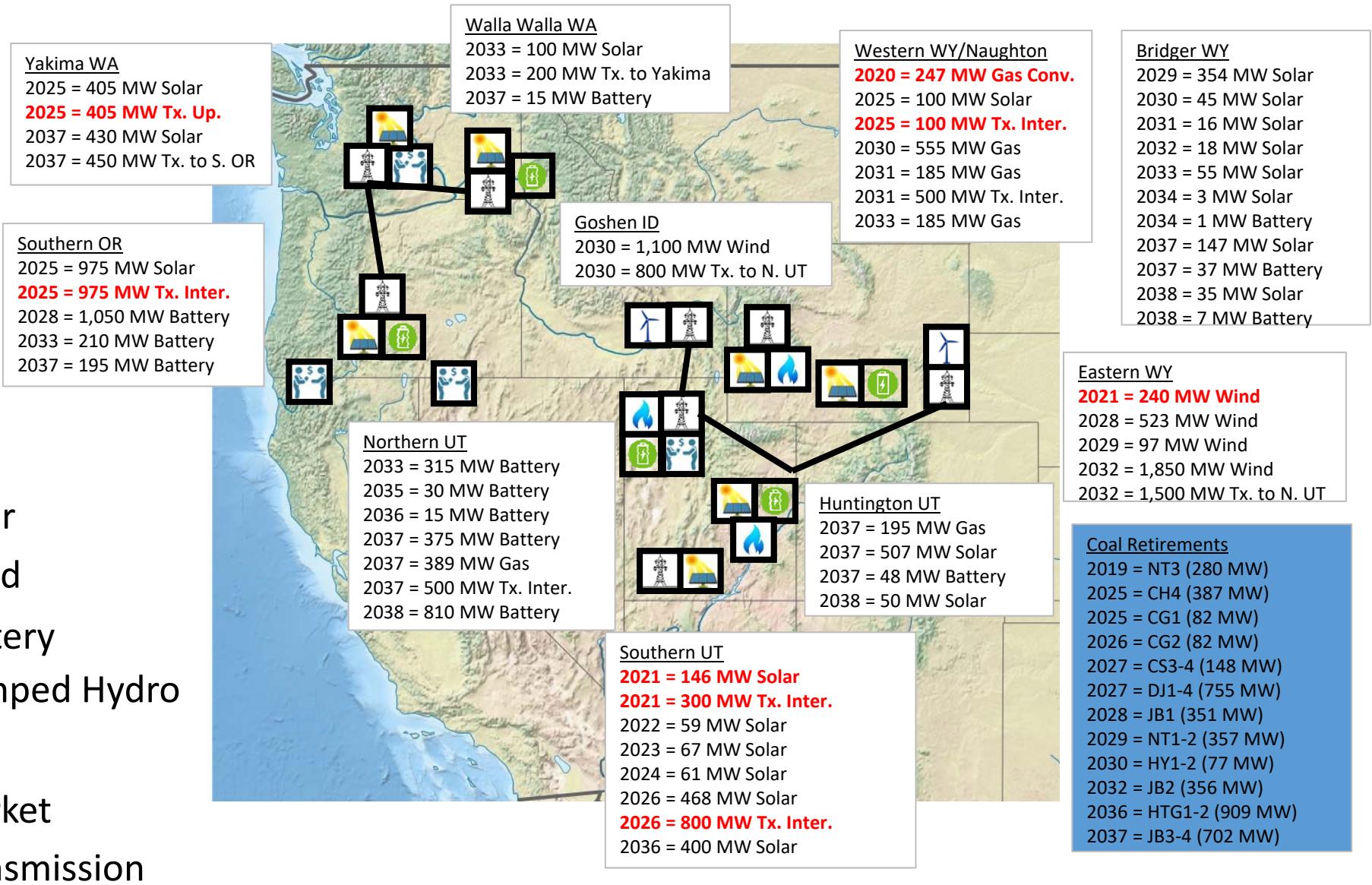
(P-03 with Naughton 3 Small Gas Conversion)





# Case P-09

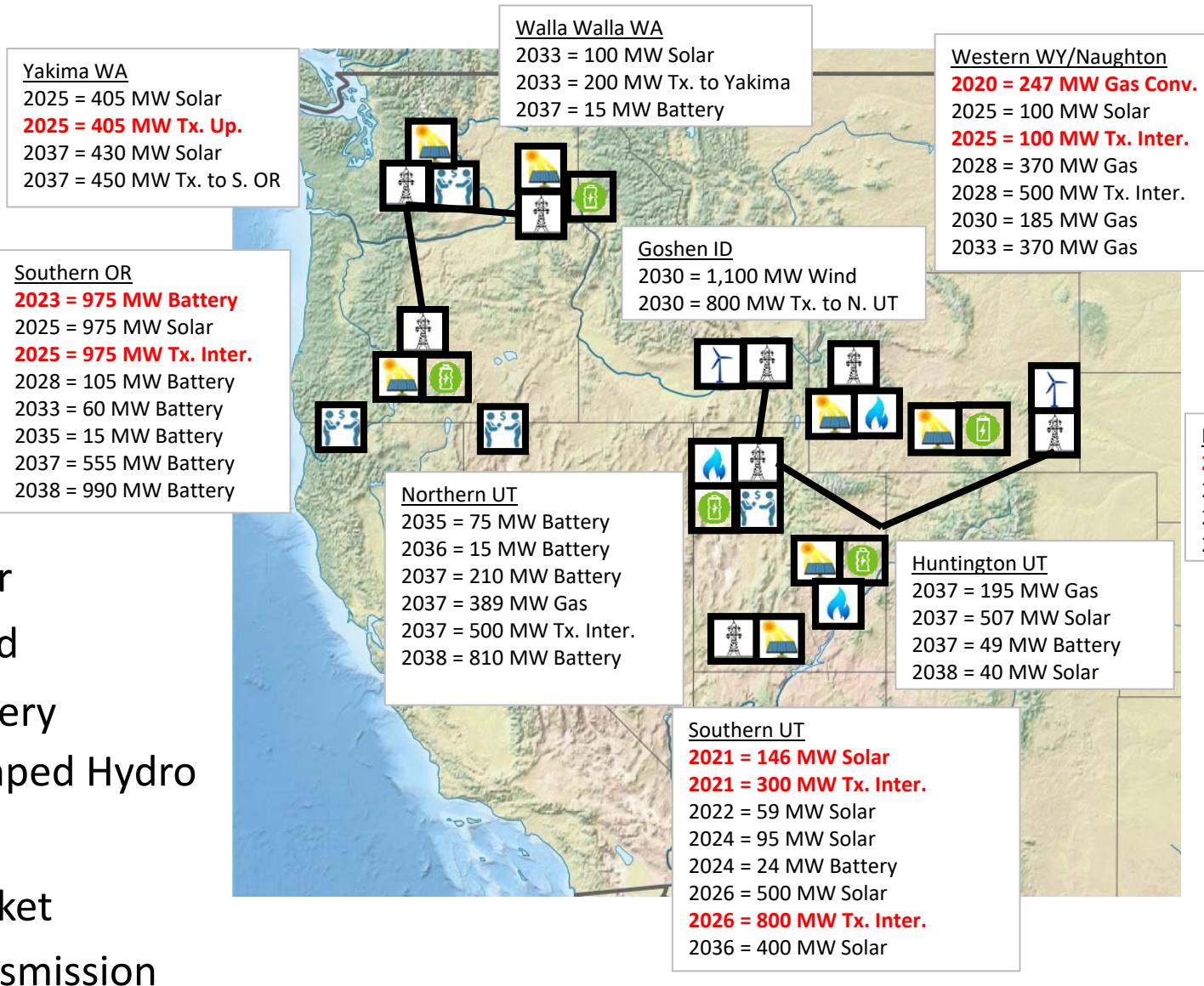
(P-03 with Naughton 3 Large Gas Conversion)





# Case P-10

## (P-04 with Naughton 3 Large Gas Conversion)



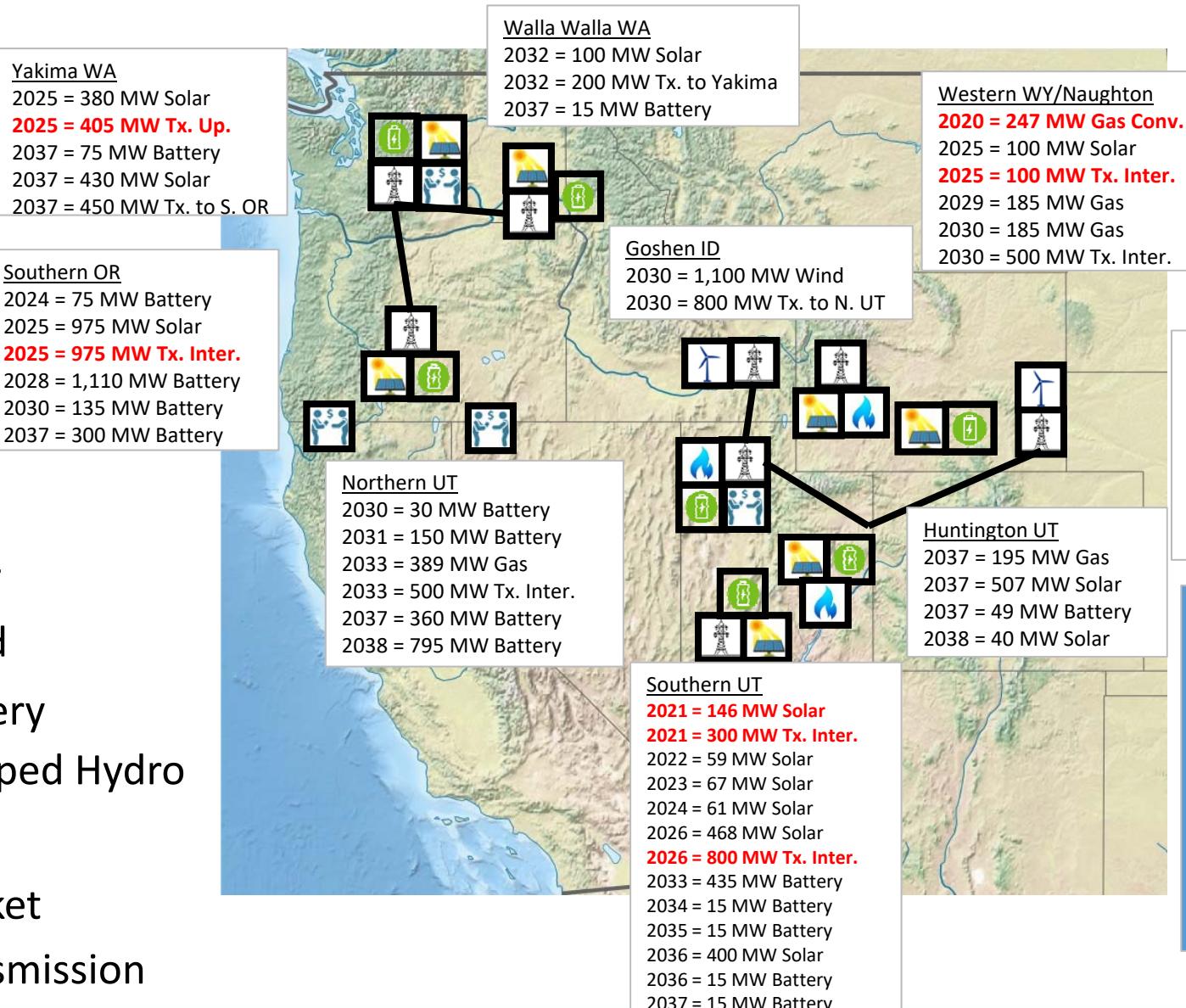
**Bridger WY**  
2023 = 73 MW Solar  
2024 = 149 MW Solar  
2026 = 125 MW Solar  
2027 = 18 MW Solar  
2028 = 16 MW Solar  
2029 = 22 MW Solar  
2030 = 4 MW Solar  
2031 = 17 MW Solar  
2032 = 18 MW Solar  
2033 = 37 MW Solar  
2034 = 19 MW Solar  
2035 = 4 MW Solar  
2037 = 133 MW Solar  
2037 = 33 MW Battery  
2038 = 52 MW Solar  
2038 = 11 MW Battery

**Eastern WY**  
**2021 = 240 MW Wind**  
2028 = 620 MW Wind  
2032 = 1,850 MW Wind  
2032 = 1,500 MW Tx. to N. UT

**Coal Retirements**  
2019 = NT3 (280 MW)  
2020 = CH4 (387 MW)  
2022 = NT1-2 (357 MW)  
2022 = JB1-2 (706 MW)  
2025 = CG1 (82 MW)  
2027 = DJ1-4 (755 MW)  
2030 = HY1-2 (77 MW)  
2034 = CG2 (82 MW)  
2036 = HTG1-2 (909 MW)  
2037 = JB3-4 (702 MW)

# Case P-11

(P-09 with Cholla 4 Accelerated to 2020)



| Bridger WY |                 |
|------------|-----------------|
| 2029       | = 354 MW Solar  |
| 2030       | = 45 MW Solar   |
| 2031       | = 16 MW Solar   |
| 2032       | = 18 MW Solar   |
| 2033       | = 49 MW Solar   |
| 2033       | = 4 MW Battery  |
| 2034       | = 9 MW Solar    |
| 2034       | = 2 MW Battery  |
| 2037       | = 134 MW Solar  |
| 2037       | = 34 MW Battery |
| 2038       | = 100 MW Solar  |
| 2038       | = 25 MW Battery |

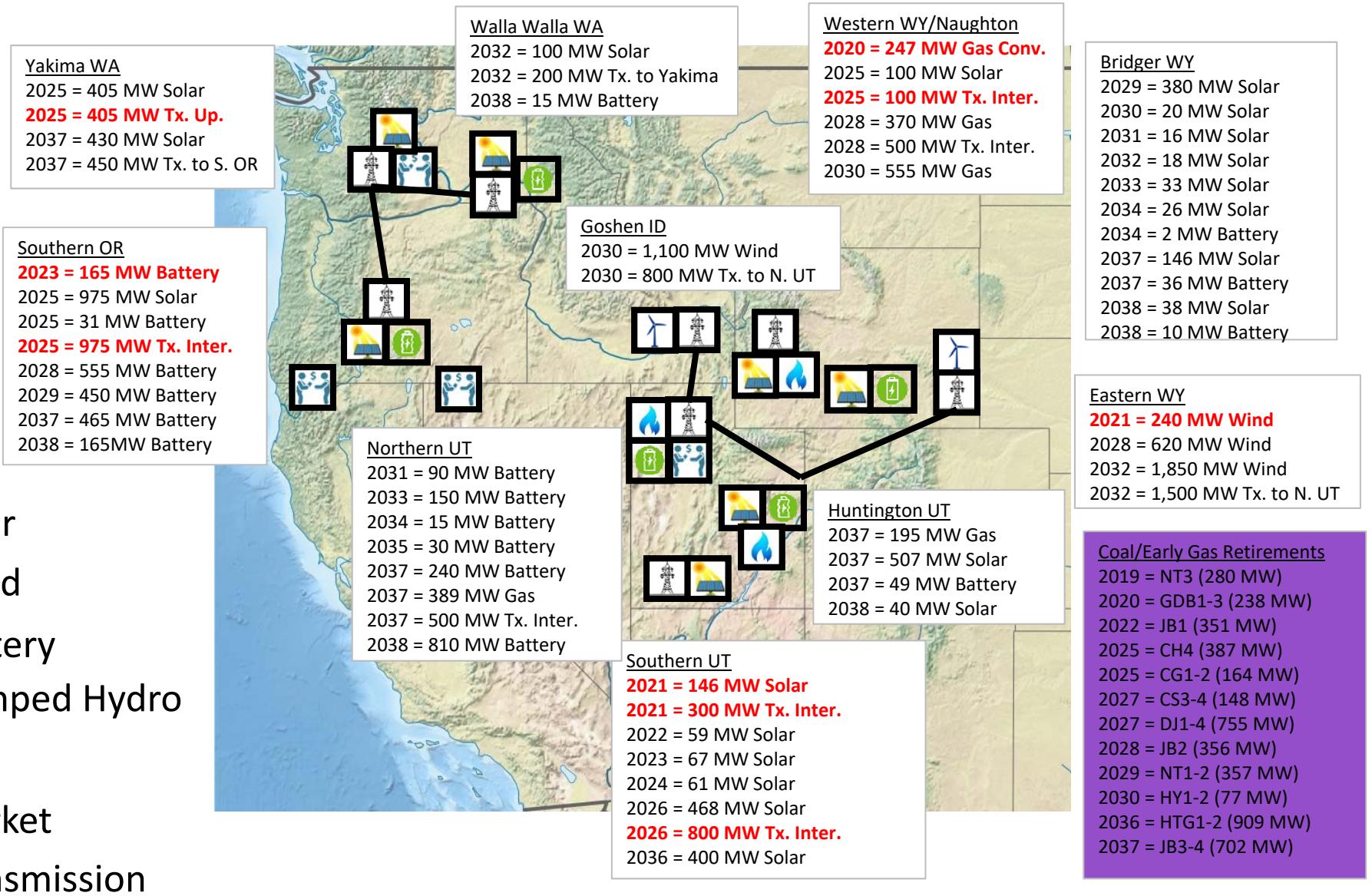
| Eastern WY  |                         |
|-------------|-------------------------|
| <b>2021</b> | = 240 MW Wind           |
| 2027        | = 33 MW Wind            |
| 2028        | = 33 MW Wind            |
| 2029        | = 33 MW Wind            |
| 2030        | = 521 MW Wind           |
| 2032        | = 1,850 MW Wind         |
| 2032        | = 1,500 MW Tx. to N. UT |

| Coal Retirements |                   |
|------------------|-------------------|
| 2019             | = NT3 (280 MW)    |
| 2020             | = CH4 (387 MW)    |
| 2025             | = CG1 (82 MW)     |
| 2026             | = CG2 (82 MW)     |
| 2027             | = CS3-4 (148 MW)  |
| 2027             | = DJ1-4 (755 MW)  |
| 2028             | = JB1 (351 MW)    |
| 2029             | = NT1-2 (357 MW)  |
| 2030             | = HY1-2 (77 MW)   |
| 2032             | = JB2 (356 MW)    |
| 2036             | = HTG1-2 (909 MW) |
| 2037             | = JB3-4 (702 MW)  |



# Case P-12

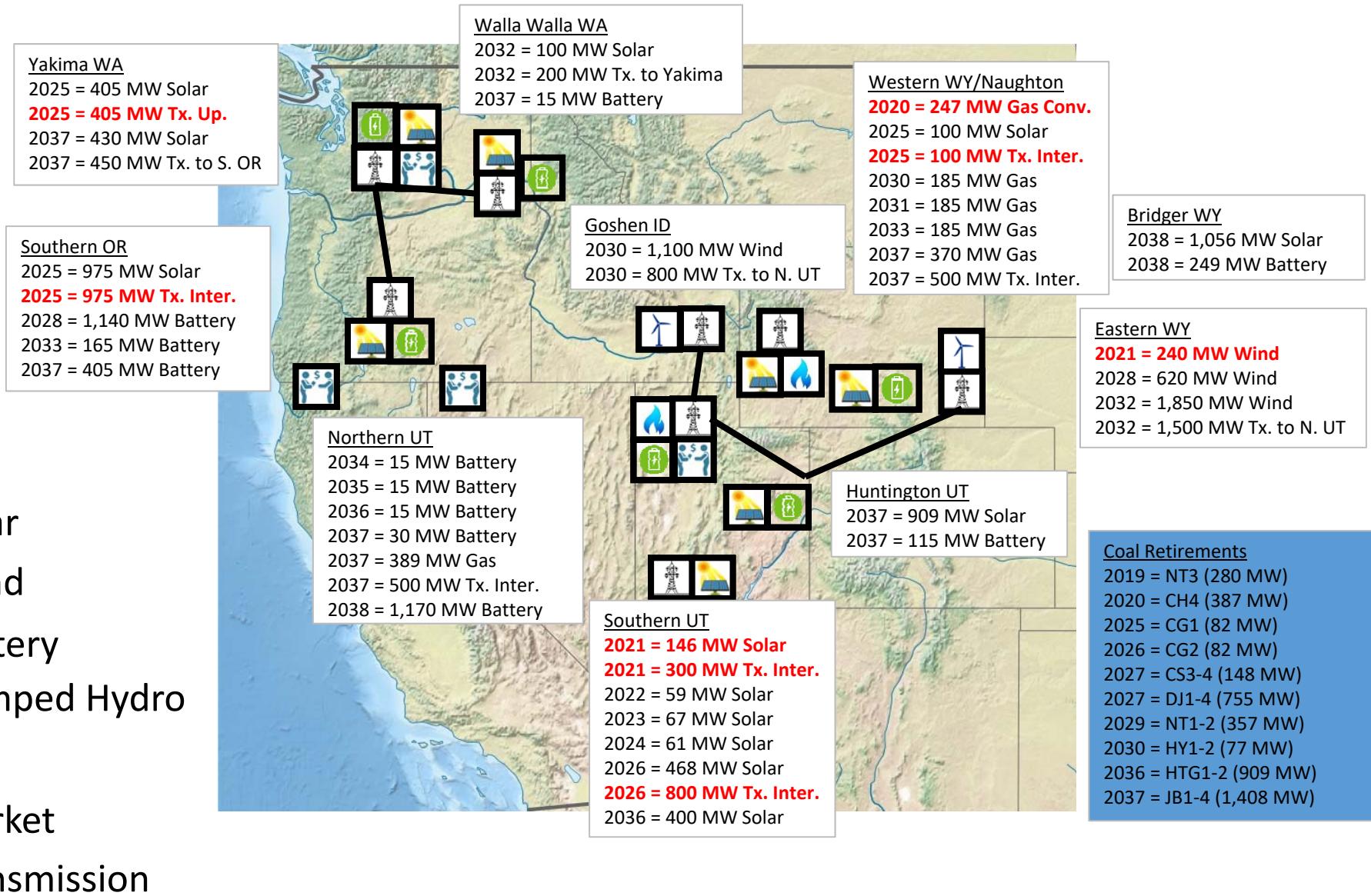
(P-06 with Cholla 4 Retired 2025)





# Case P-13

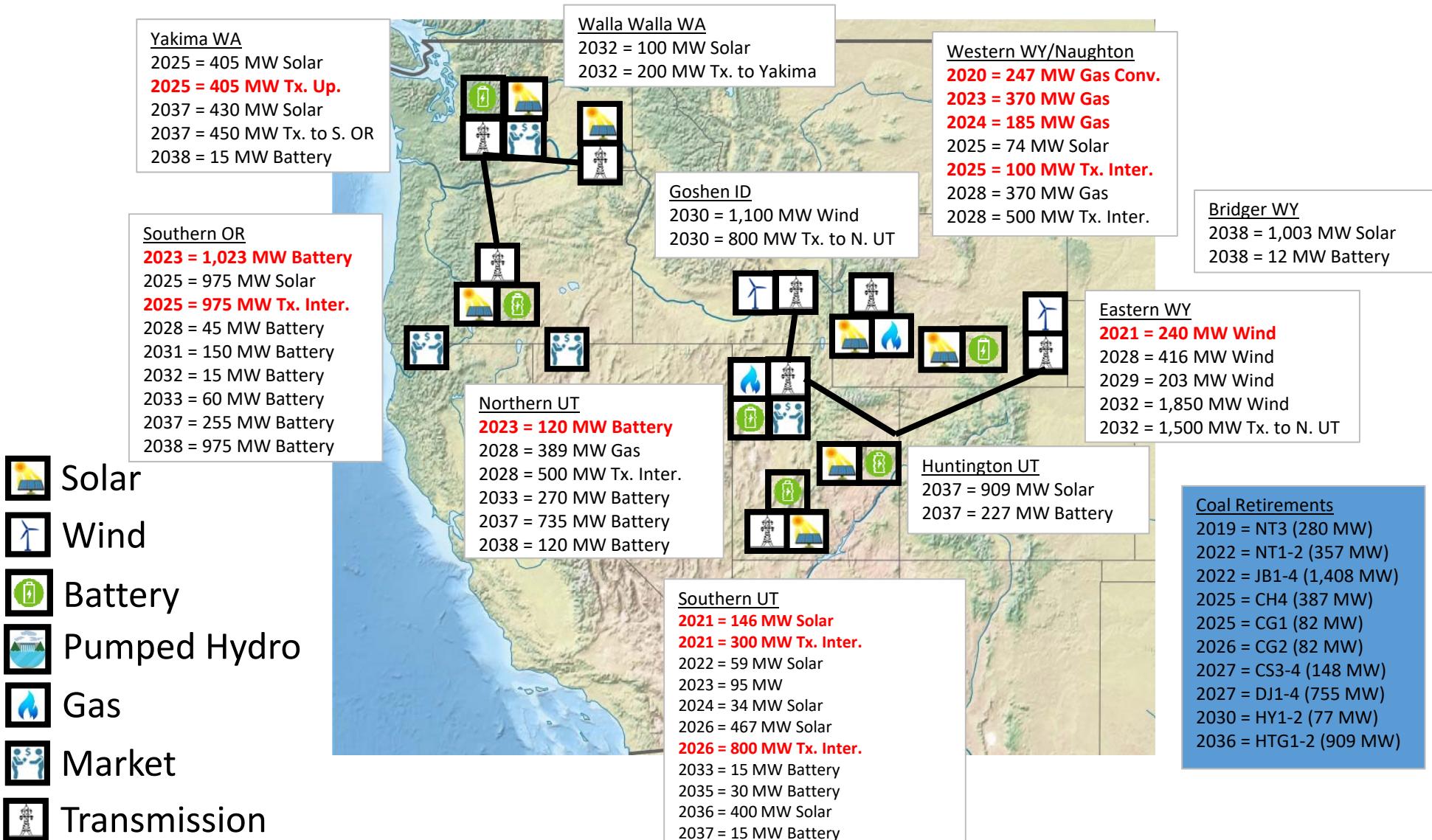
(P-11 with Jim Bridger 1-2 SCRs)





# Case P-14

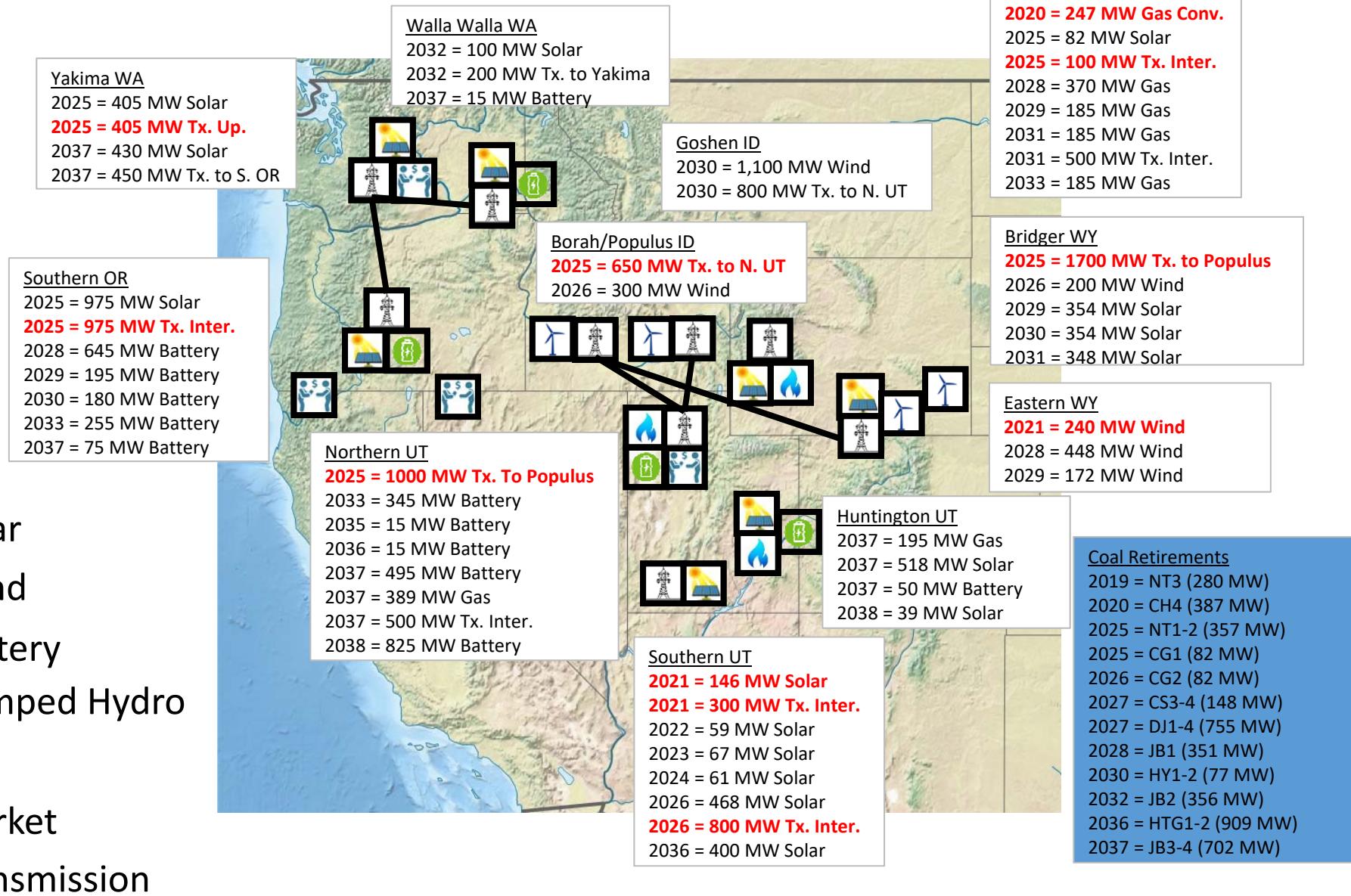
(P-09 with Naughton 1-2 and Jim Bridger 1-4 Retired 2022)





# Case P-22

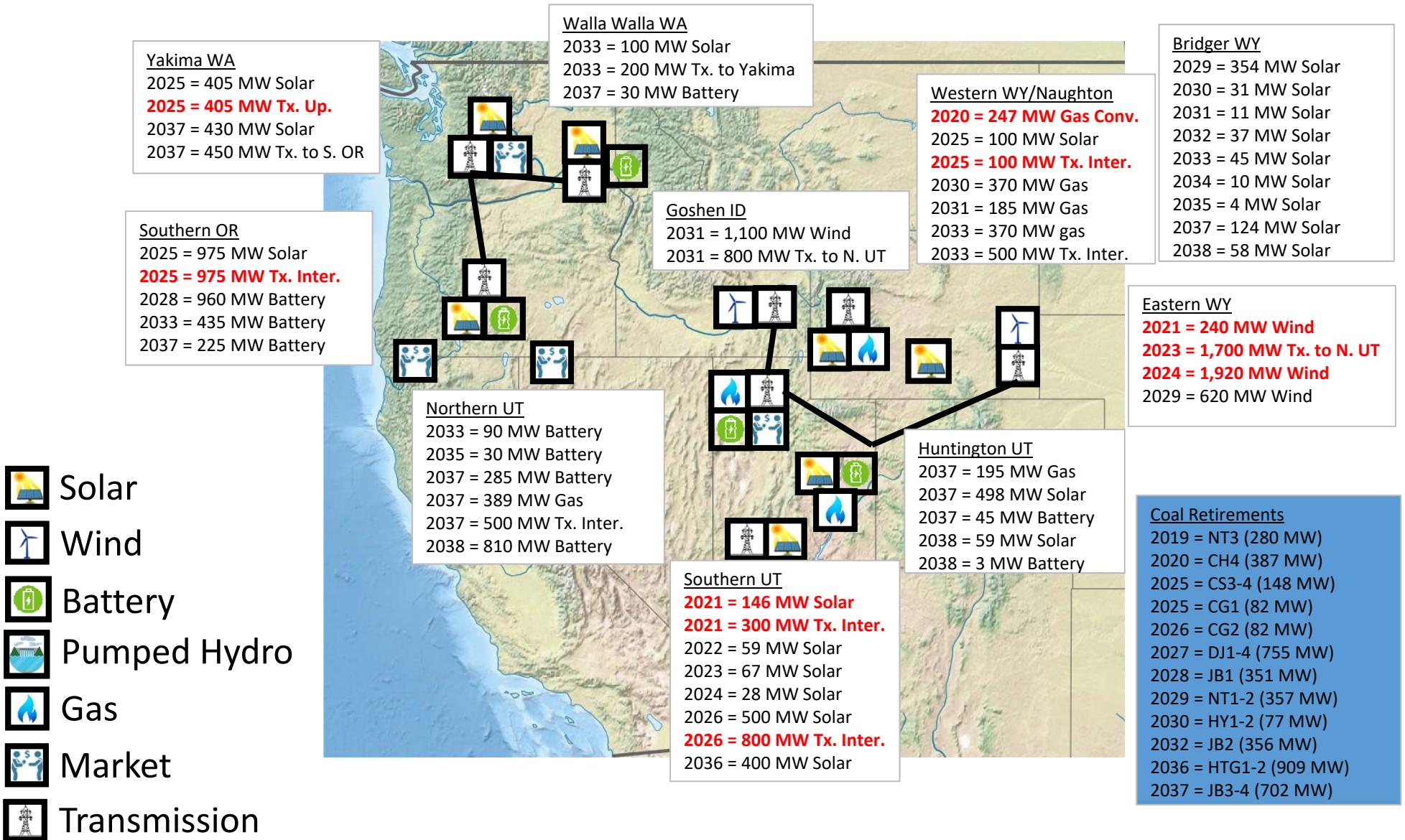
(P-31 with Energy Gateway West in 2025)





# Case P-23

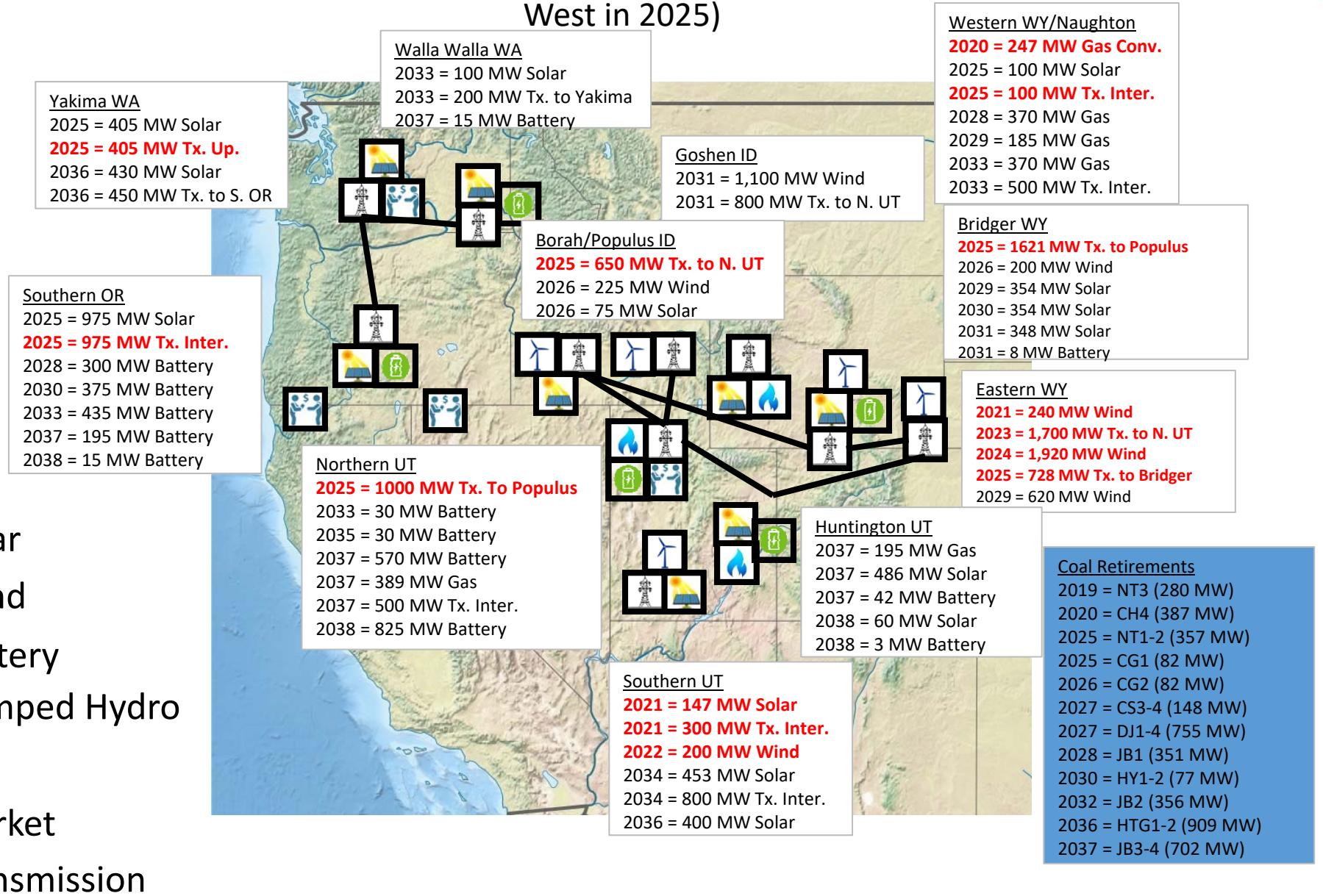
(P-28 with Energy Gateway South in 2023)





# Case P-24

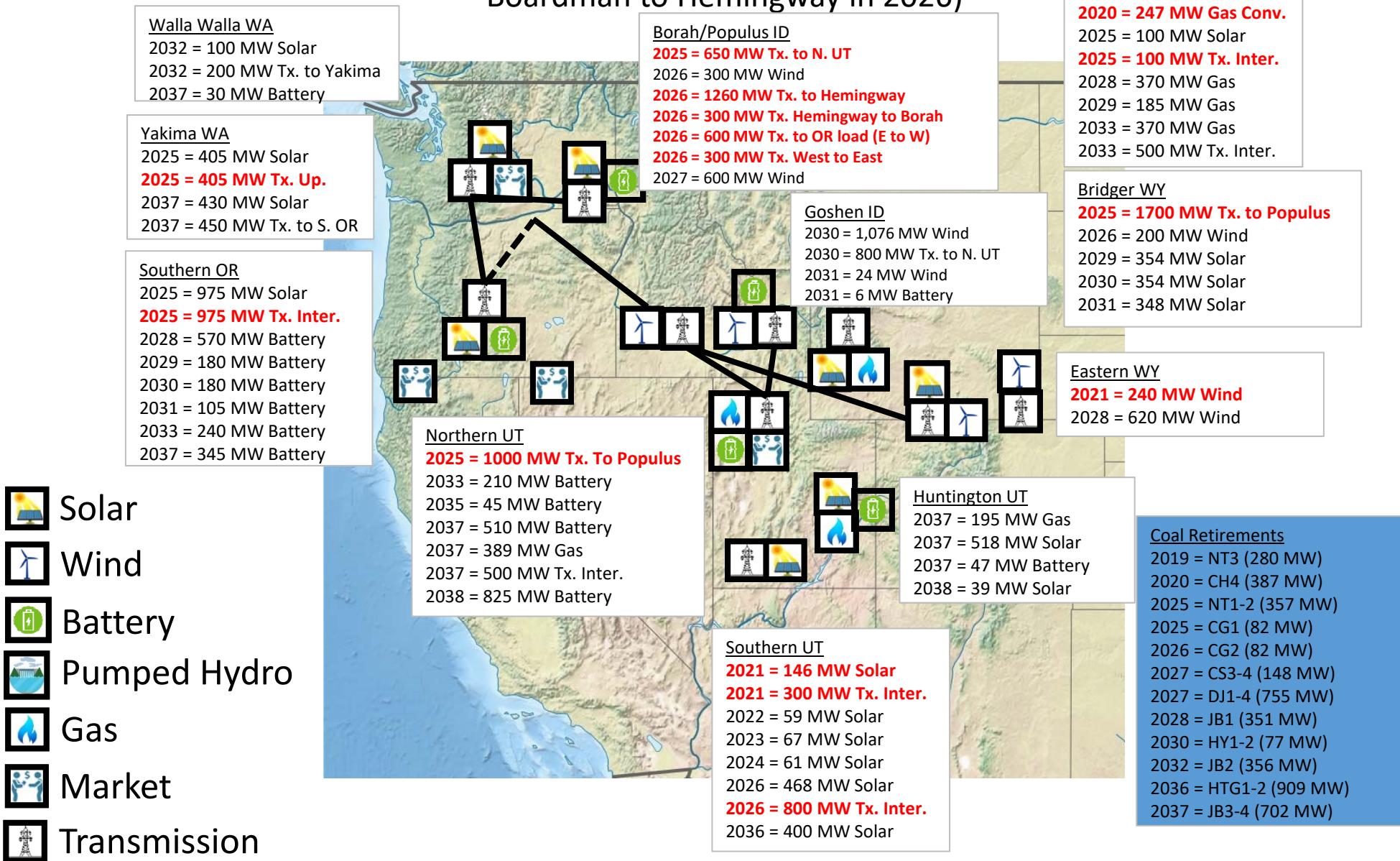
(P-31 with Energy Gateway South in 2023 and West in 2025)



# Case P-25



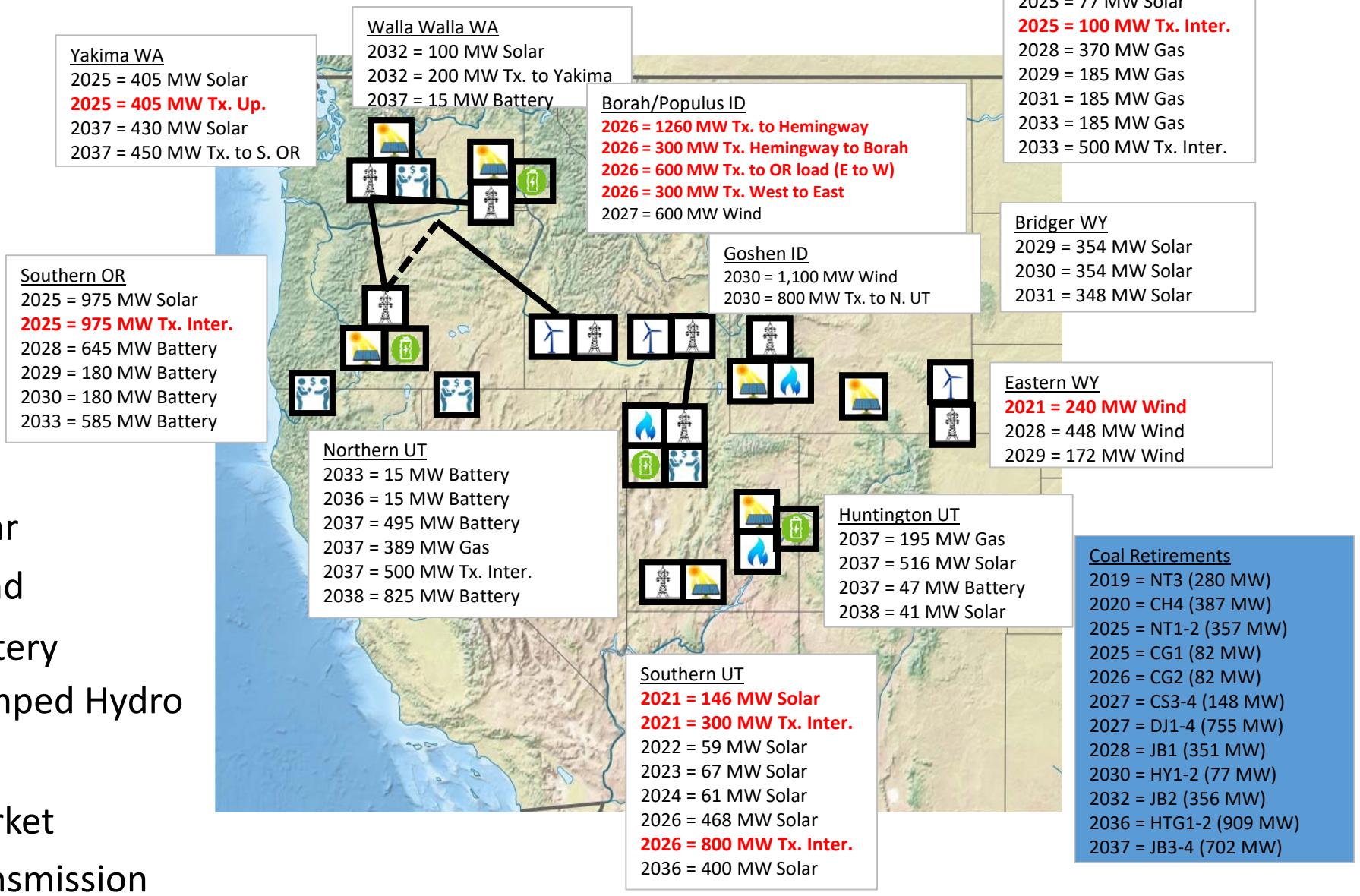
## (P-31 with Energy Gateway West in 2025 and Boardman to Hemingway in 2026)





# Case P-26

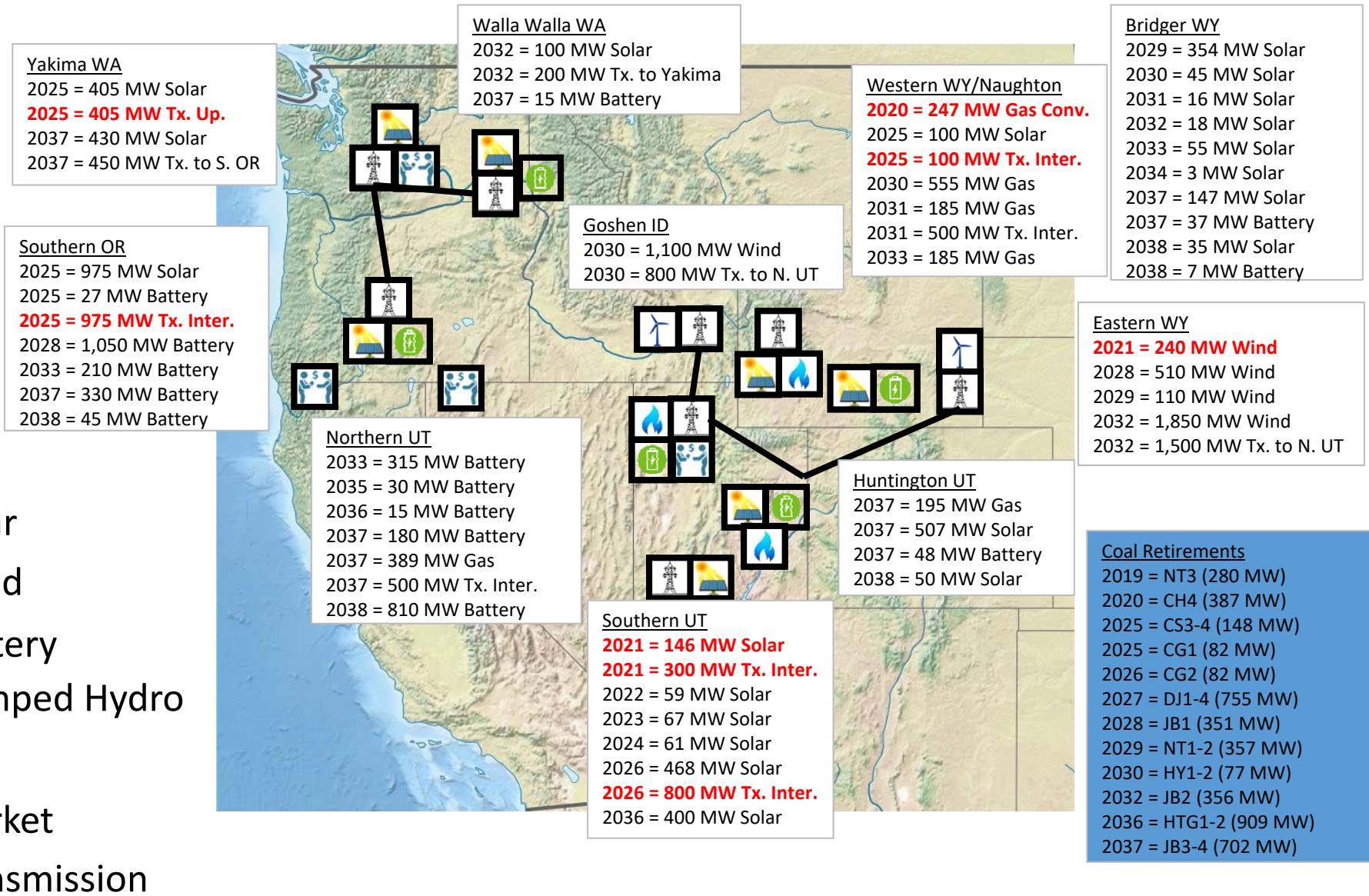
(P-31 with Boardman to Hemingway in 2026)





# Case P-28

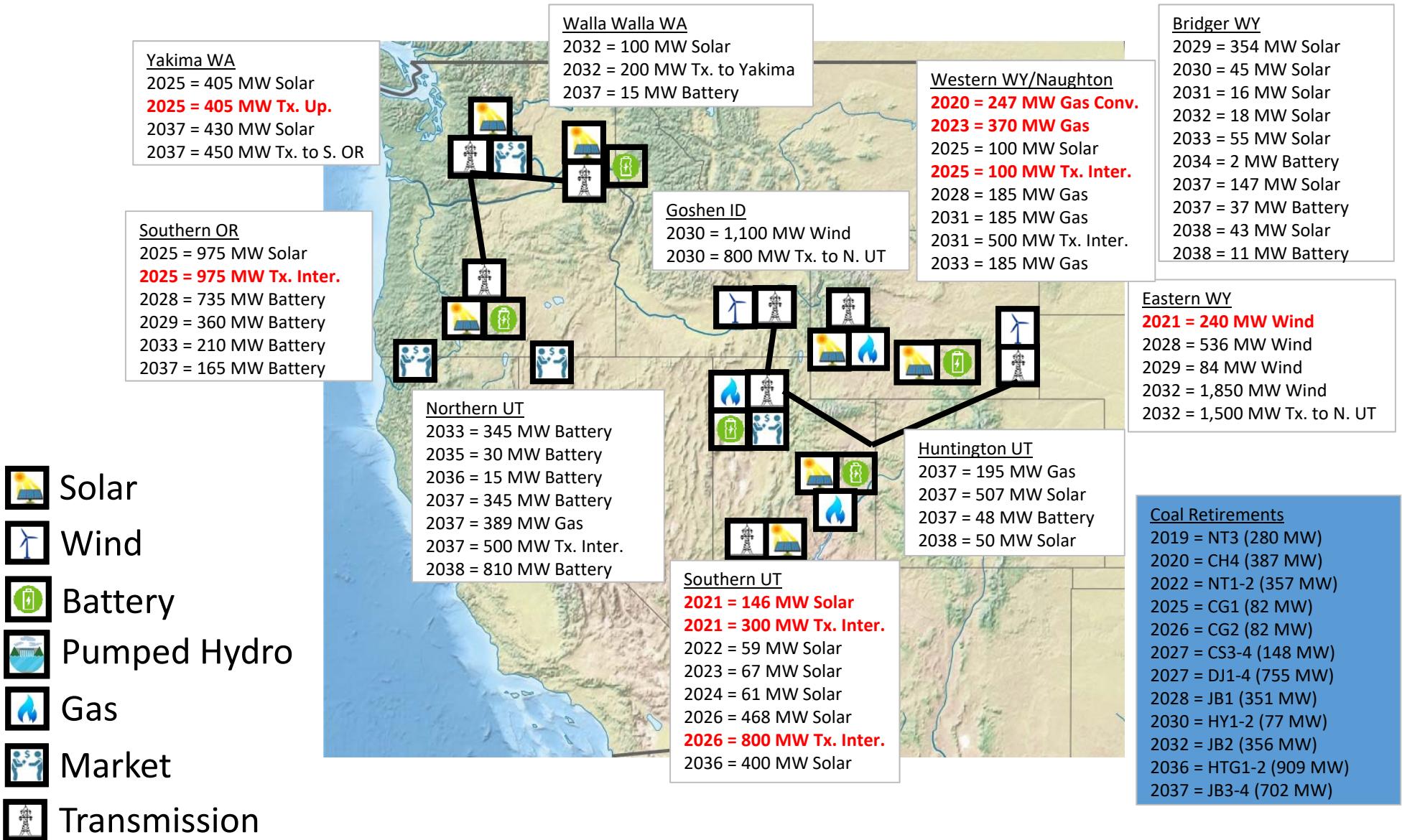
(P-11 with Colstrip 3-4 Accelerated to 2025)





# Case P-30

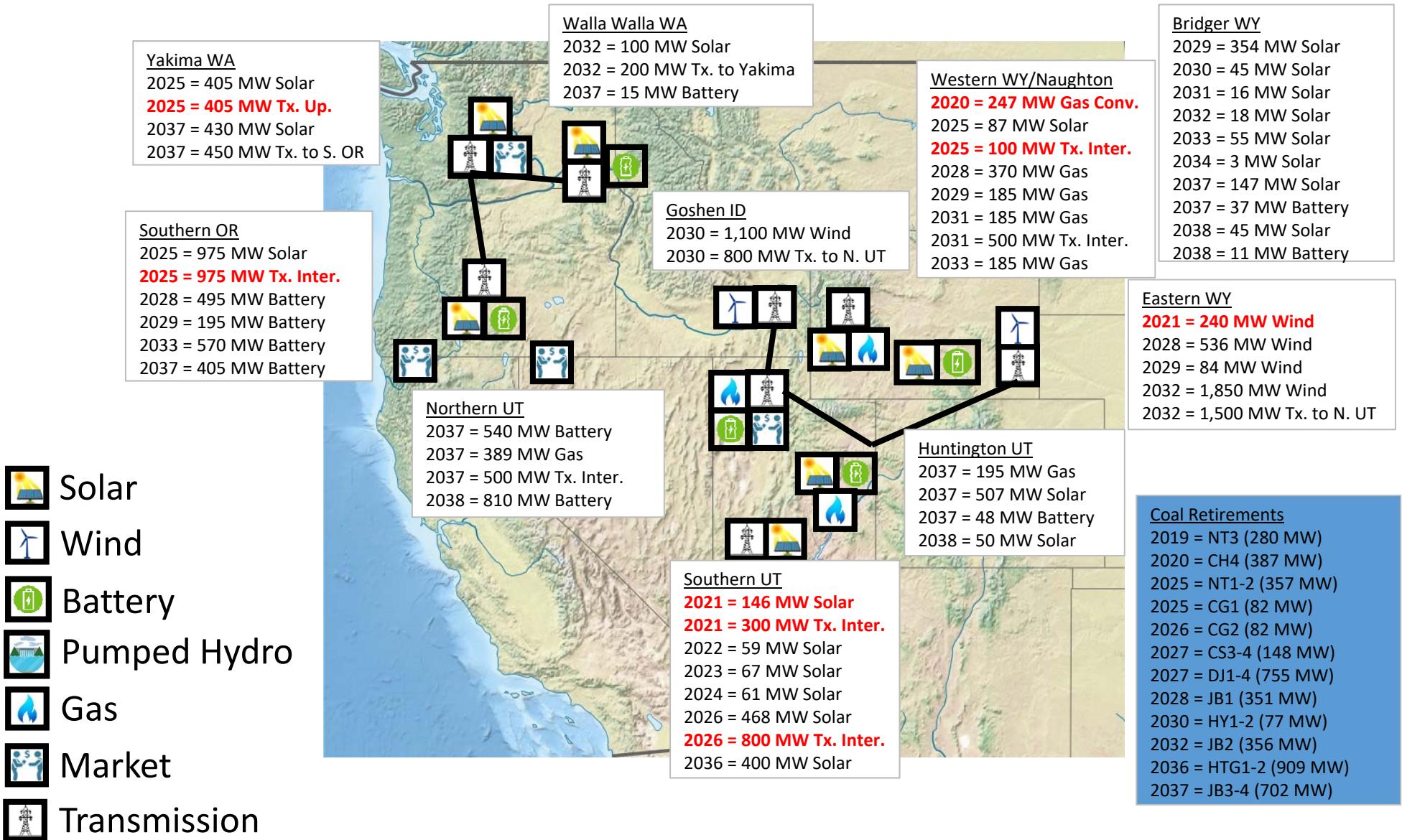
(P-11 with Naughton 1-2 Accelerated to 2022)





# Case P-31

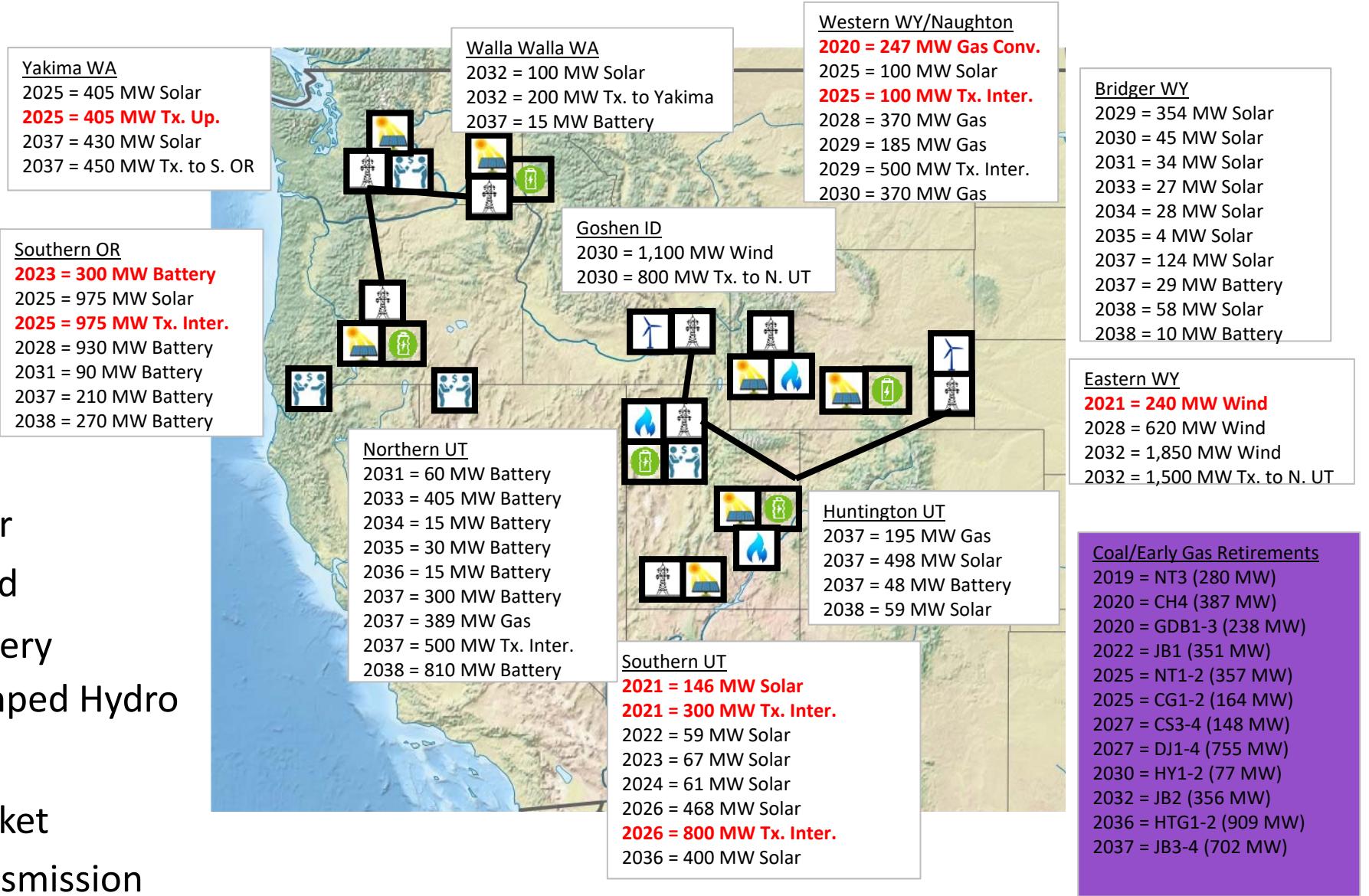
(P-11 with Naughton 1-2 Accelerated to 2025)





# Case P-32

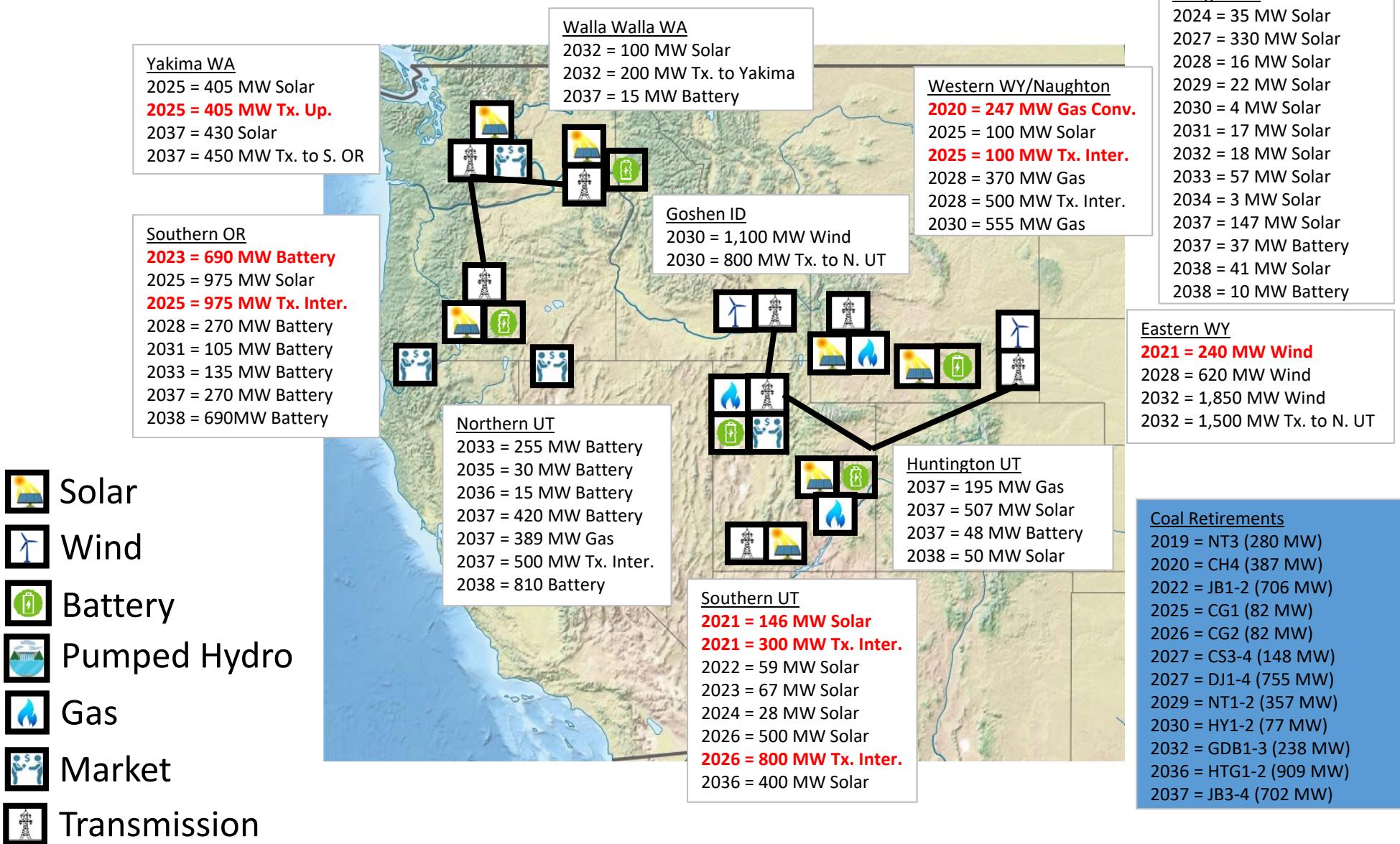
(P-07 with Naughton 1-2 Accelerated to 2025 and Gadsby 1-3 Retired 2032)





# Case P-33

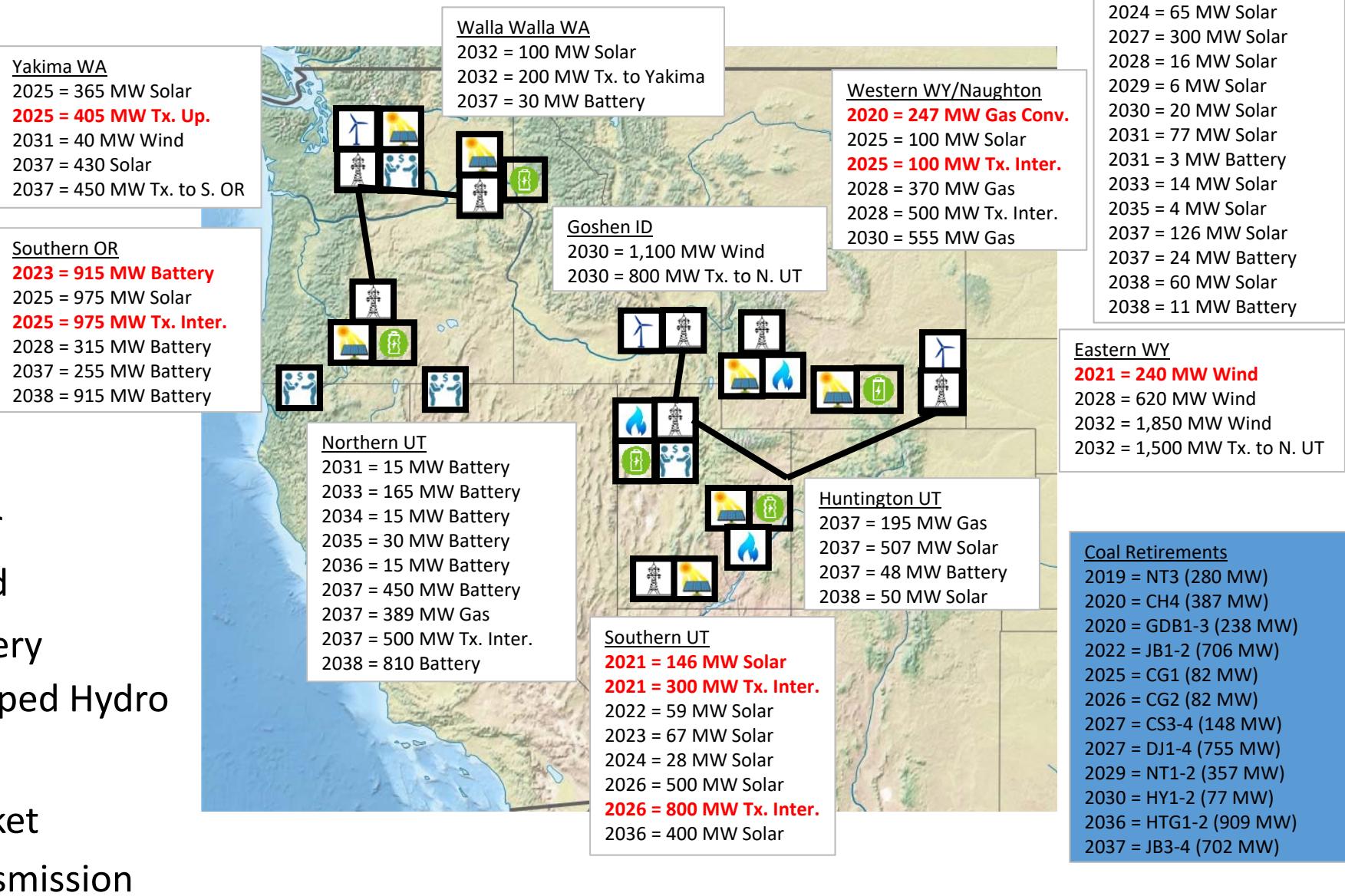
(P-11 with Jim Bridger 1-2 Accelerated to 2022)



# Case P-34



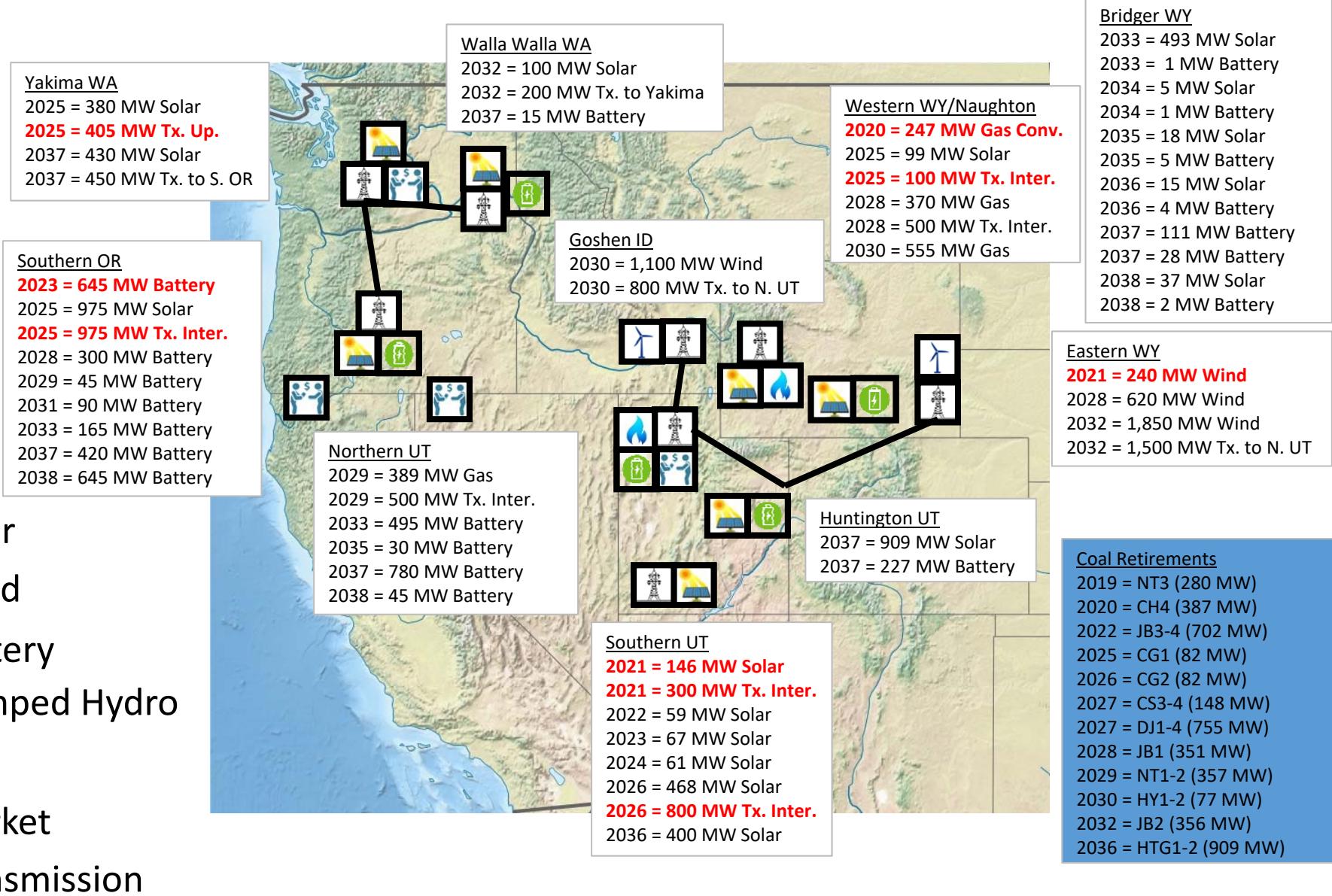
(P-11 with Gadsby 1-3 Accelerated to 2020 and Jim Bridger 1-2 Accelerated to 2022)





# Case P-35

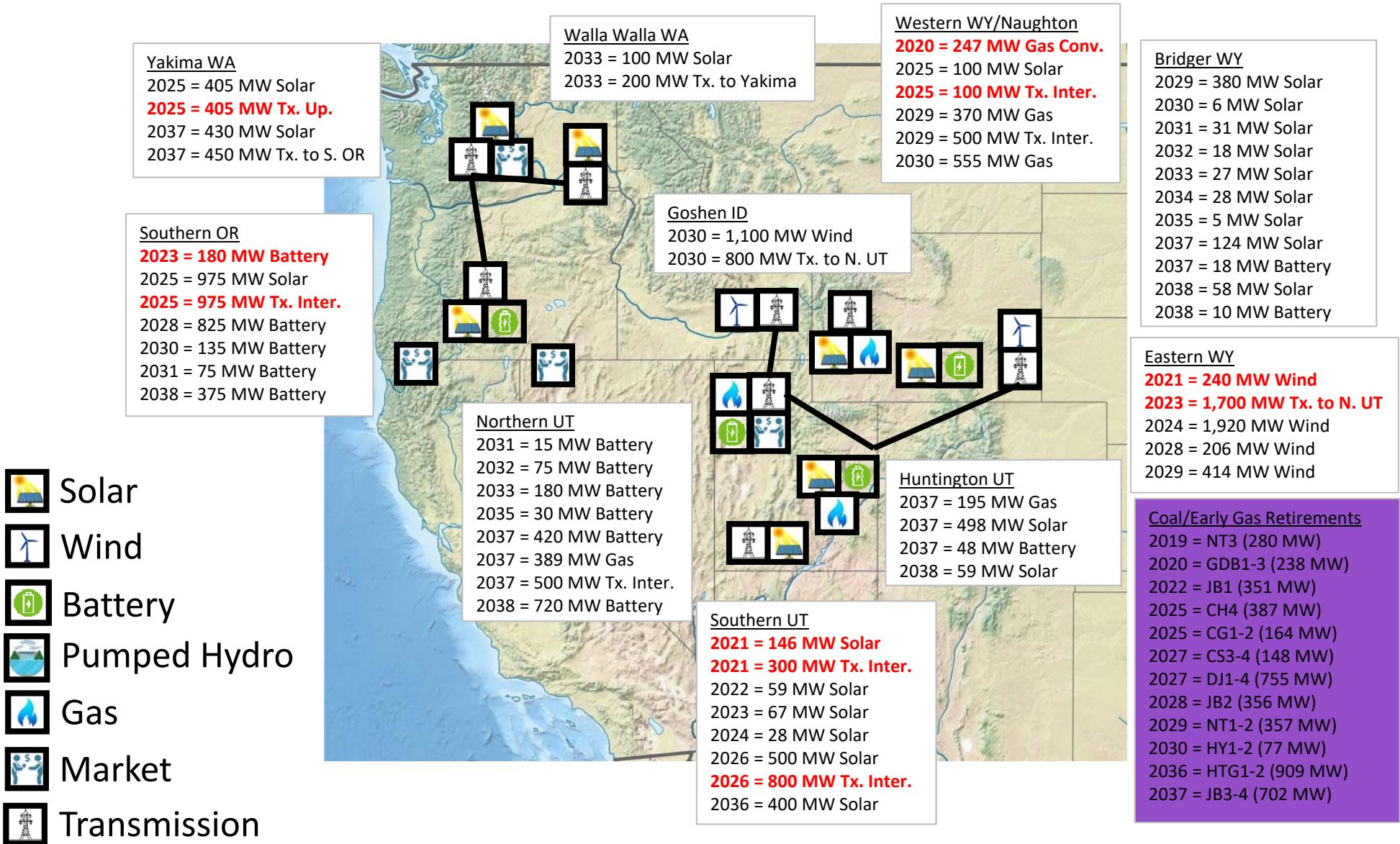
(P-11 with Jim Bridger 3-4 Accelerated to 2022)





# Case P-36

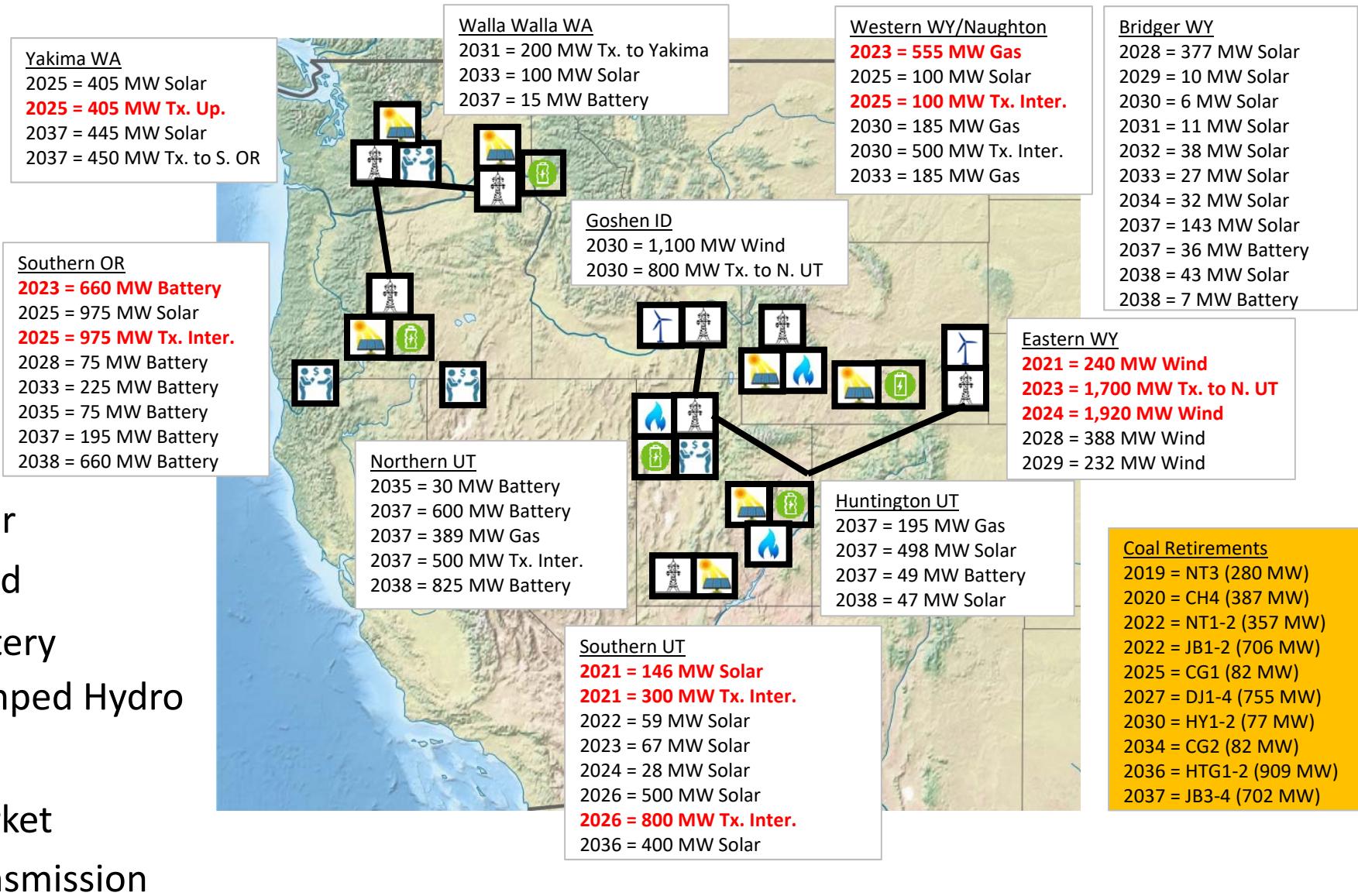
(P-12 with Energy Gateway South in 2023)





# Case P-37

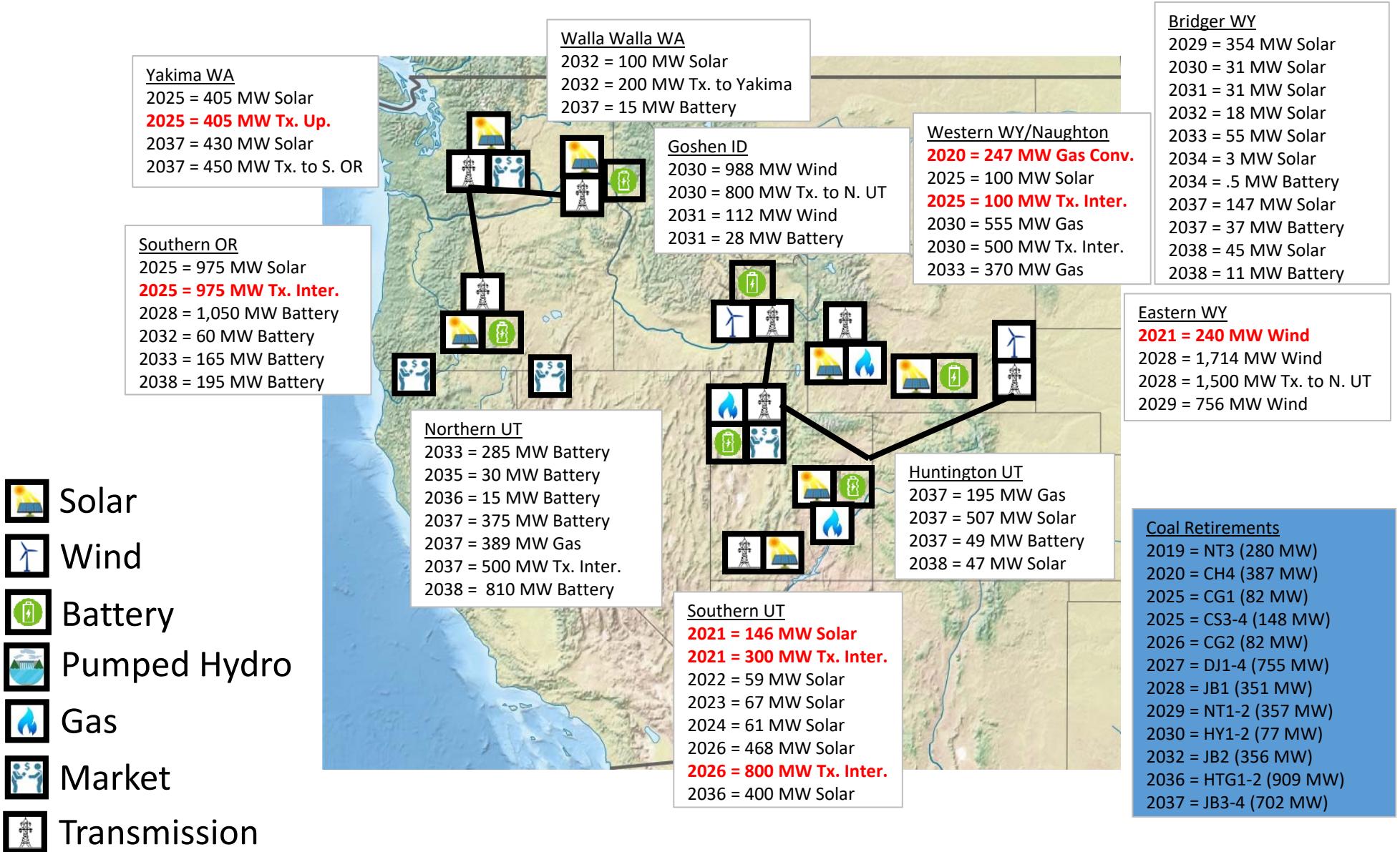
(P-04 with Energy Gateway South in 2023)





# Case P-38

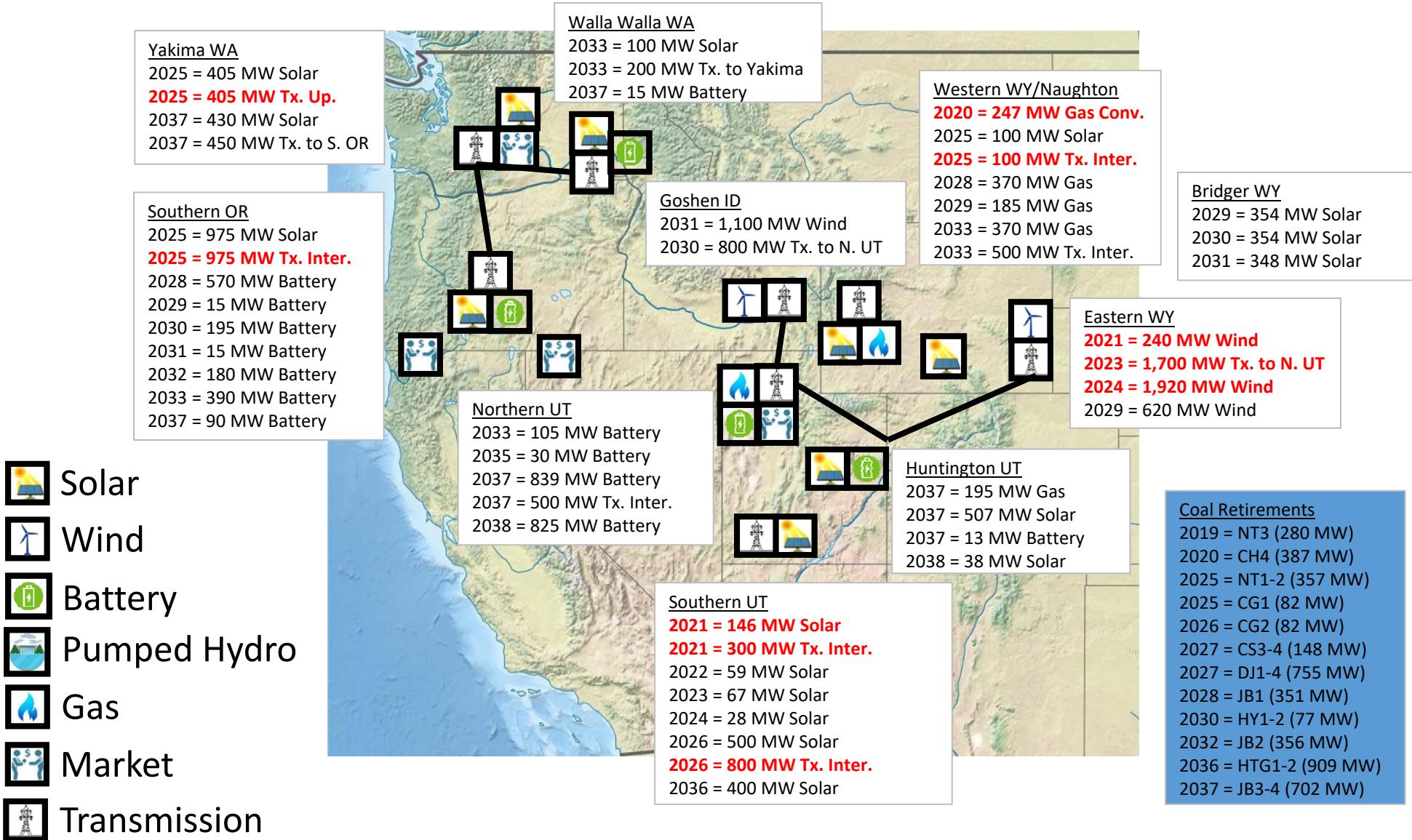
(P-28 with Energy Gateway South in 2028)





# Case P-42

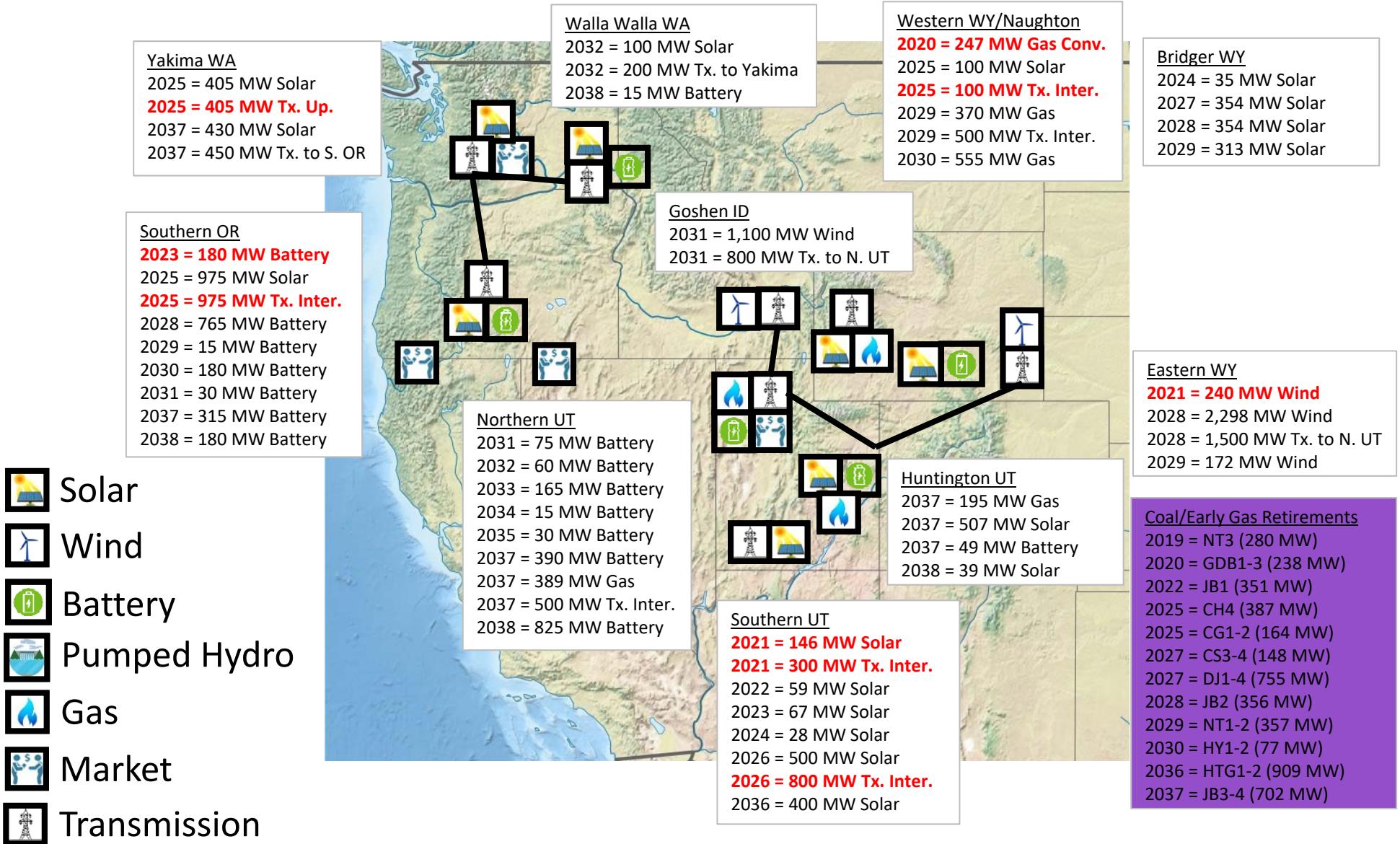
(P-31 with Energy Gateway South in 2023)





# Case P-43

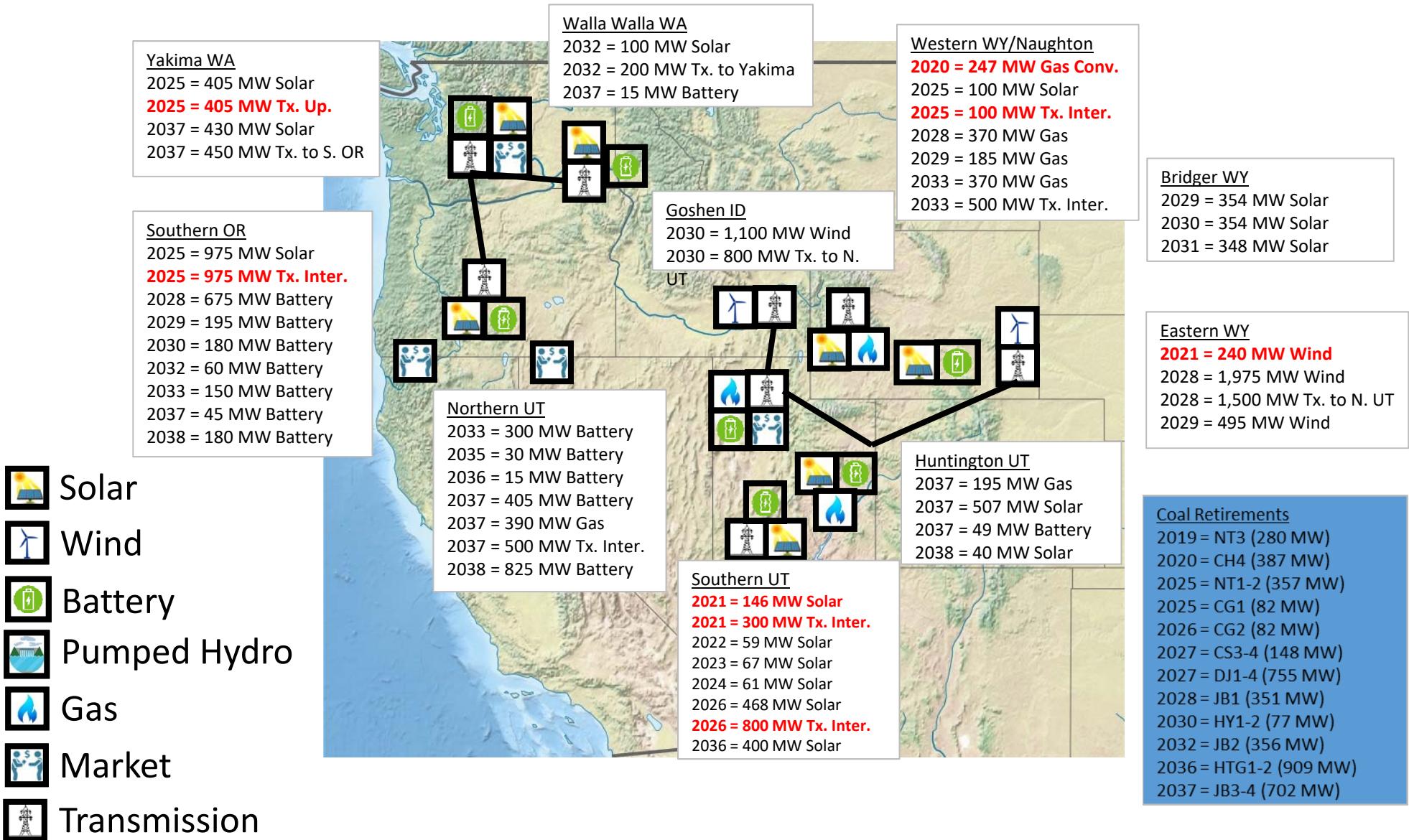
## (P-12 with EG South 2028)





# Case P-44

(P-31 with EG South 2028)



# Portfolio Cost and Risk Summary

## (All Completed Cases: 1 of 2)



| Case | Stochastic Mean |   |      | Risk Adjusted |   |      | ENS Average Percent of Load                     |                                  |      | CO2 Emissions                                  |                                       |      |
|------|-----------------|---|------|---------------|---|------|---|----------------------------------|------|--|---------------------------------------|------|
|      | PVRR (\$m)      | Change from Lowest Cost Portfolio (\$m) | Rank | PVRR (\$m)    | Change from Lowest Cost Portfolio (\$m) | Rank | Average Annual ENS, 2019-2038 % of Average Load | Change from Lowest ENS Portfolio | Rank | Total CO2 Emissions, 2019-2038 (Thousand Tons) | Change from Lowest Emission Portfolio | Rank |
| P31  | 23,548          | 0                                       | 1    | 24,735        | 0                                       | 1    | 0.009%  | 0.003%                           | 25   | 631,339  | 50,699                                | 26   |
| P11  | 23,650          | 101                                     | 2    | 24,841        | 106                                     | 2    | 0.010%  | 0.004%                           | 30   | 626,418  | 45,778                                | 21   |
| P28  | 23,655          | 107                                     | 3    | 24,847        | 112                                     | 3    | 0.007%  | 0.001%                           | 9    | 629,102  | 48,463                                | 23   |
| P09  | 23,662          | 113                                     | 4    | 24,857        | 122                                     | 4    | 0.007%  | 0.001%                           | 11   | 629,920  | 49,280                                | 24   |
| P12  | 23,684          | 135                                     | 5    | 24,880        | 145                                     | 6    | 0.009%  | 0.003%                           | 28   | 620,875  | 40,236                                | 15   |
| P42  | 23,686          | 138                                     | 6    | 24,879        | 144                                     | 5    | 0.007%  | 0.001%                           | 7    | 601,803  | 21,163                                | 5    |
| P30  | 23,693          | 145                                     | 7    | 24,888        | 153                                     | 7    | 0.006%  | 0.000%                           | 3    | 626,129  | 45,489                                | 20   |
| P35  | 23,717          | 168                                     | 8    | 24,913        | 178                                     | 8    | 0.010%  | 0.004%                           | 31   | 598,838  | 18,199                                | 3    |
| P32  | 23,721          | 173                                     | 9    | 24,917        | 182                                     | 9    | 0.006%  | 0.000%                           | 1    | 618,710  | 38,070                                | 14   |
| P06  | 23,728          | 180                                     | 10   | 24,927        | 192                                     | 10   | 0.008%  | 0.002%                           | 22   | 624,025  | 43,385                                | 18   |
| P23  | 23,740          | 192                                     | 11   | 24,936        | 201                                     | 11   | 0.008%  | 0.002%                           | 19   | 604,874  | 24,235                                | 6    |
| P07  | 23,757          | 209                                     | 12   | 24,958        | 223                                     | 12   | 0.007%  | 0.001%                           | 15   | 617,727  | 37,087                                | 13   |
| P36  | 23,767          | 219                                     | 13   | 24,968        | 233                                     | 13   | 0.007%  | 0.001%                           | 10   | 594,540  | 13,900                                | 2    |
| P08  | 23,800          | 252                                     | 14   | 25,003        | 268                                     | 14   | 0.008%  | 0.002%                           | 18   | 631,146  | 50,507                                | 25   |
| P04  | 23,809          | 261                                     | 15   | 25,012        | 277                                     | 15   | 0.008%  | 0.002%                           | 24   | 625,044  | 44,405                                | 19   |
| P03  | 23,814          | 266                                     | 16   | 25,014        | 279                                     | 16   | 0.007%  | 0.001%                           | 8    | 631,667  | 51,028                                | 28   |

# Portfolio Cost and Risk Summary

## (All Completed Cases: 2 of 2)



| Case | Stochastic Mean |   |      | Risk Adjusted |   |      | ENS Average Percent of Load                     |                                  |      | CO2 Emissions                                  |                                       |      |
|------|-----------------|---|------|---------------|---|------|---|----------------------------------|------|--|---------------------------------------|------|
|      | PVRR (\$m)      | Change from Lowest Cost Portfolio (\$m) | Rank | PVRR (\$m)    | Change from Lowest Cost Portfolio (\$m) | Rank | Average Annual ENS, 2019-2038 % of Average Load | Change from Lowest ENS Portfolio | Rank | Total CO2 Emissions, 2019-2038 (Thousand Tons) | Change from Lowest Emission Portfolio | Rank |
| P33  | 23,826          | 278                                     | 17   | 25,030        | 295                                     | 17   | 0.008%  | 0.002%                           | 23   | 615,754  | 35,114                                | 11   |
| P14  | 23,834          | 286                                     | 18   | 25,040        | 305                                     | 18   | 0.013%  | 0.007%                           | 32   | 580,640  | 0                                     | 1    |
| P10  | 23,843          | 295                                     | 19   | 25,048        | 313                                     | 19   | 0.009%  | 0.003%                           | 27   | 621,702  | 41,062                                | 17   |
| P38  | 23,864          | 316                                     | 20   | 25,066        | 331                                     | 20   | 0.007%  | 0.001%                           | 6    | 616,769  | 36,129                                | 12   |
| P34  | 23,889          | 340                                     | 21   | 25,096        | 361                                     | 21   | 0.009%  | 0.003%                           | 26   | 612,409  | 31,769                                | 9    |
| P05  | 23,917          | 369                                     | 22   | 25,127        | 392                                     | 22   | 0.010%  | 0.004%                           | 29   | 621,454  | 40,815                                | 16   |
| P26  | 23,932          | 384                                     | 23   | 25,138        | 403                                     | 23   | 0.008%  | 0.002%                           | 21   | 628,989  | 48,349                                | 22   |
| P37  | 23,933          | 385                                     | 24   | 25,142        | 407                                     | 24   | 0.007%  | 0.002%                           | 17   | 600,025  | 19,385                                | 4    |
| P01  | 23,949          | 400                                     | 25   | 25,154        | 419                                     | 25   | 0.006%  | 0.000%                           | 2    | 655,675  | 75,035                                | 32   |
| P43  | 23,978          | 429                                     | 26   | 25,189        | 454                                     | 26   | 0.007%  | 0.001%                           | 12   | 605,377  | 24,737                                | 7    |
| P13  | 24,000          | 452                                     | 27   | 25,209        | 474                                     | 27   | 0.007%  | 0.001%                           | 14   | 640,376  | 59,736                                | 30   |
| P44  | 24,035          | 487                                     | 28   | 25,246        | 511                                     | 28   | 0.006%  | 0.000%                           | 4    | 614,218  | 33,579                                | 10   |
| P22  | 24,401          | 852                                     | 29   | 25,631        | 896                                     | 29   | 0.007%  | 0.001%                           | 16   | 640,851  | 60,212                                | 31   |
| P24  | 24,722          | 1,174                                   | 30   | 25,968        | 1,233                                   | 30   | 0.007%  | 0.001%                           | 5    | 611,257  | 30,618                                | 8    |
| P02  | 24,879          | 1,330                                   | 31   | 26,131        | 1,396                                   | 31   | 0.008%  | 0.002%                           | 20   | 639,894  | 59,254                                | 29   |
| P25  | 25,888          | 2,339                                   | 32   | 27,192        | 2,457                                   | 32   | 0.007%  | 0.001%                           | 13   | 631,483  | 50,843                                | 27   |

# Portfolio Cost and Risk Summary (Cases with GWS 2028 or Sooner)



| Case | Stochastic Mean |  |      | Risk Adjusted |  |      | ENS Average Percent of Load                              |  |      | CO2 Emissions  |   |      |
|------|-----------------|--|------|---------------|--|------|--|--|------|--|---|------|
|      | PVRR<br>(\$m)   | Change from<br>Lowest Cost<br>Portfolio<br>(\$m) | Rank | PVRR<br>(\$m) | Change from<br>Lowest Cost<br>Portfolio<br>(\$m) | Rank | Average<br>Annual ENS,<br>2019-2038 % of<br>Average Load | Change<br>from<br>Lowest<br>ENS<br>Portfolio | Rank | Total CO2<br>Emissions,<br>2019-2038<br>(Thousand<br>Tons) | Change<br>from<br>Lowest<br>Emission<br>Portfolio | Rank |
| P42  | 23,686          | \$0  | 1    | 24,879        | \$0  | 1    | 0.007%   | 0.000%                                       | 4    | 601,803  | 7,263   | 3    |
| P23  | 23,740          | \$54   | 2    | 24,936        | \$57   | 2    | 0.008%   | 0.001%                                       | 8    | 604,874  | 10,334  | 4    |
| P36  | 23,767          | \$81   | 3    | 24,968        | \$89   | 3    | 0.007%   | 0.001%                                       | 5    | 594,540  | 0   | 1    |
| P38  | 23,864          | \$178  | 4    | 25,066        | \$187  | 4    | 0.007%   | 0.000%                                       | 3    | 616,769  | 22,229  | 8    |
| P37  | 23,933          | \$247  | 5    | 25,142        | \$263  | 5    | 0.007%   | 0.001%                                       | 7    | 600,025  | 5,485   | 2    |
| P43  | 23,978          | \$292  | 6    | 25,189        | \$310  | 6    | 0.007%   | 0.001%                                       | 6    | 605,377  | 10,837  | 5    |
| P44  | 24,035          | \$350  | 7    | 25,246        | \$367  | 7    | 0.006%   | 0.000%                                       | 1    | 614,218  | 19,678  | 7    |
| P24  | 24,722          | \$1,036  | 8    | 25,968        | \$1,089  | 8    | 0.007%   | 0.000%                                       | 2    | 611,257  | 16,717  | 6    |

# Outstanding Items for July 2019 Public-Input Meeting



- Complete outstanding portfolio development cases
  - Update cost and risk metrics
  - Complete price-policy scenarios and cost and risk metrics
- Complete sensitivity cases
- Identify preferred portfolio
- Review action plan
- Update capacity contribution values specific to resources in the preferred portfolio



# Anticipated Action Plan Elements

- Transmission
  - Energy Gateway
  - Upgrades in Preferred Portfolio
- New Supply-Side Resources
  - All Source RFP
  - Front Office Transactions
- Existing Supply-Side Resources
  - Naughton 3 Gas Conversion
  - Coal Retirements
- Demand-Side Resources
  - Energy and Capacity Targets
  - State-Specific for Planning for DSM Acquisitions as Appendix
- Renewable Energy Credits
  - RPS Compliance
  - REC Sales

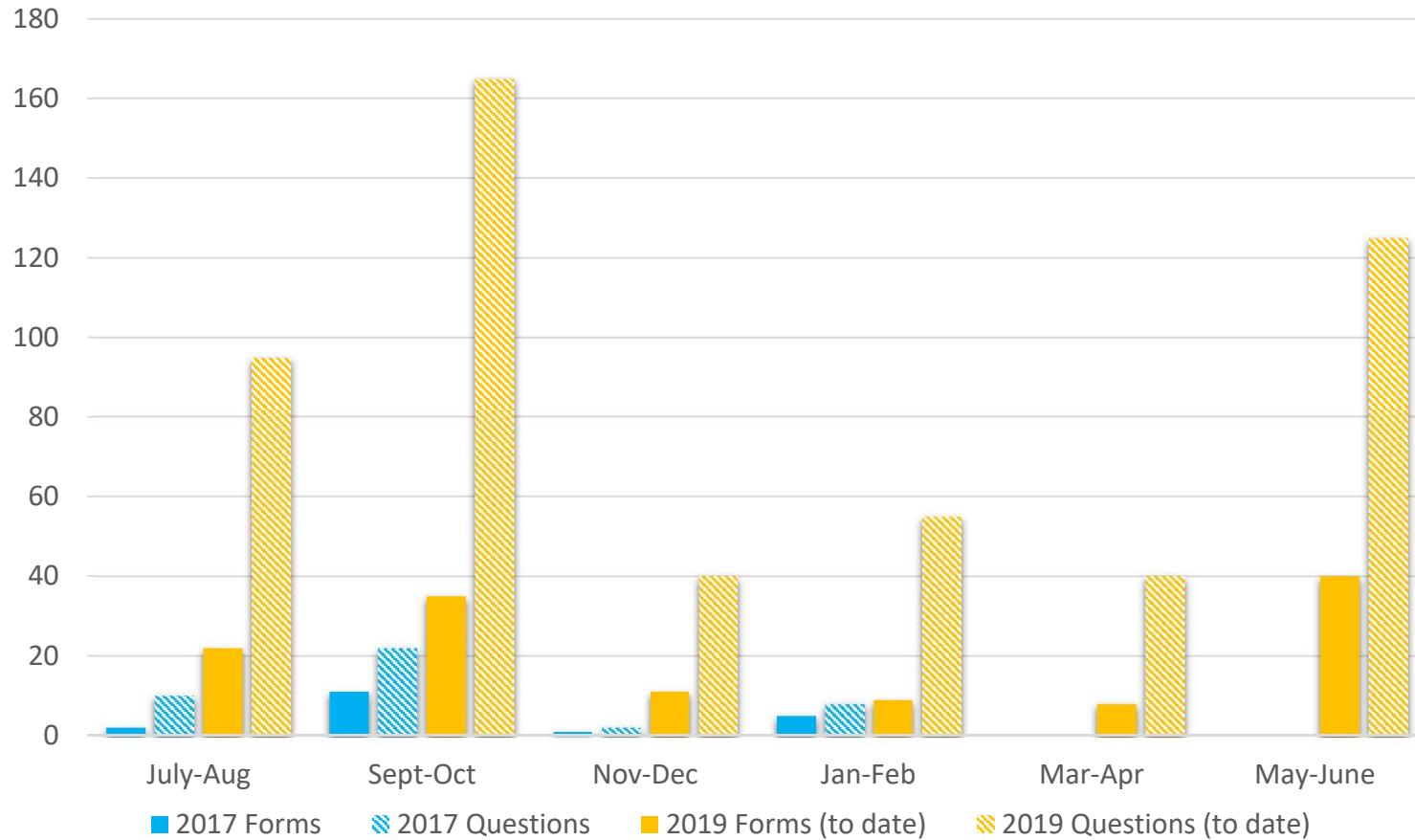


# Stakeholder Feedback Form Recap





# 2019 IRP vs. 2017 IRP Stakeholder Feedback Form Activity to Date





# Stakeholder Feedback Forms

- 125 stakeholder feedback forms submitted to date.
- Stakeholder feedback forms and responses can be located at:  
[www.pacificorp.com/es/irp/irpcomments.html](http://www.pacificorp.com/es/irp/irpcomments.html).
- Depending on the type and complexity of the stakeholder feedback received responses may be provided in a variety of ways including, but not limited to, a written response, a follow-up conversation, or incorporation into subsequent public input meeting material.
- Stakeholder feedback following the most recent public input meeting is summarized on the following slides for reference.

# Summary - Recent Stakeholder Feedback Forms

| Stakeholder               | Date   | Topic                      | Brief Summary (complete form available online)   | Response (posted online when available)      |
|---------------------------|--------|----------------------------|--|--|
| Utah Clean Energy         | May 20 | Renewable Energy Resources | Requests description of PacifiCorp's dispatch and treatment of renewable energy generating resources.  | Response targeted for week of June 24, 2019. |
| Wyoming House District 18 | May 22 | General Comments           | Questions regarding energy storage, pumped hydro, and CO <sub>2</sub> emission cost savings from earlier public input meeting discussion and comments regarding the Naughton Power Plant in Kemmerer, Wyoming. | Response targeted for week of June 24, 2019. |
| Utah Clean Energy         | May 24 | DSM                        | Requests that PacifiCorp model a high DSM sensitivity as part of the 2019 IRP process. Also describe how PAC has incorporated actual utility DSM costs from 2016, 2017, and 2018 into the CPA for Class 2 DSM. | Response targeted for week of June 24, 2019. |
| NW Energy Coalition       | May 24 | DSM                        | Requests the Conservation Potential Assessment inputs for Oregon, and detailed information regarding the DSM Class 2 input correction discussed at the May 20, 2019 public input meeting.                      | Response targeted for week of June 24, 2019. |
| SWEEP                     | May 24 | DSM                        | Requests an Accelerated DSM Portfolio or Sensitivity for analysis in the 2019 IRP process.   | Response targeted for week of June 24, 2019. |



# Summary - Recent Stakeholder Feedback Forms

| Stakeholder                | Date   | Topic                       | Brief Summary (complete form available online)   | Response (posted online when available)  |
|----------------------------|--------|-----------------------------|--|--|
| Sierra Club                | May 24 | Portfolio Analysis          | Request to run four additional portfolios – which are variants of P-11.                                      | PaciCorp will discuss results of additional analysis at June 20-21, 2019 public input meeting. |
| Western Resource Advocates | May 24 | Portfolio Analysis          | Request to run two additional portfolios – which are variants of P-11.                                       | PaciCorp will discuss results of additional analysis at June 20-21, 2019 public input meeting. |
| Wyoming OCA                | May 31 | Coal Analysis – Jim Bridger | Questions related to possible outcomes of alternate scenarios at Jim Bridger Power Plant.                    | Response targeted for week of June 24, 2019.   |
| Wyoming OCA                | May 31 | Coal Analysis - Naughton    | Questions related to possible outcomes of alternate scenarios at Naughton Power Plant and Westmoreland mine. | Response targeted for week of June 24, 2019.   |
| Oregon CUB                 | May 31 | Portfolio Analysis          | Request to run additional portfolio - which is a variant of P-11.  | PaciCorp will discuss results of additional analysis at June 20-21, 2019 public input meeting. |

# Summary - Recent Stakeholder Feedback Forms

| Stakeholder                    | Date    | Topic              | Brief Summary (complete form available online)  | Response (posted online when available)  |
|--------------------------------|---------|--------------------|---|--|
| Utah Clean Energy              | May 31  | DSM                | Provide detailed explanation about why the Technical Achievable Potential per year is lower than the amount of Class 2 DSM that has been achieved annually in Utah in recent years. | Response targeted for week of June 24, 2019.   |
| S. Lincoln Medical Center      | June 5  | Coal Analysis      | Request PacifiCorp reconsider potential future of Naughton Power Plant in Kemmerer, Wyoming.  | Response targeted for week of June 24, 2019.   |
| OPUC                           | June 6  | Portfolio Analysis | Request to run two additional portfolios – which are variants of P-11.  | PacifiCorp will discuss results of additional analysis at June 20-21, 2019 public input meeting. |
| Lincoln County School District | June 8  | Coal Analysis      | Request PacifiCorp reconsider potential future of Naughton Power Plant in Kemmerer, Wyoming.  | Response targeted for week of June 24, 2019.   |
| Mary Ann Putnam - Wyoming      | June 11 | Coal Analysis      | Request PacifiCorp reconsider potential future of Naughton Power Plant in Kemmerer, Wyoming.  | Response targeted for week of June 24, 2019.   |
| IPUC                           | June 13 | Portfolio Analysis | Questions related to future operations of Naughton units, with specific scenario requests.  | Response targeted for week of June 24, 2019.   |

# Summary - Recent Stakeholder Feedback Forms



| Stakeholder                         | Date    | Topic         | Brief Summary (complete form available online)   | Response (posted online when available)      |
|-------------------------------------|---------|---------------|--|--|
| Oyster Ridge BOCES                  | June 17 | Coal Analysis | Request PacifiCorp reconsider potential future of Naughton Power Plant in Kemmerer, Wyoming. | Response targeted for week of June 24, 2019. |
| Citizens of Kemmerer & Diamondville | June 17 | Coal Analysis | Request PacifiCorp reconsider potential future of Naughton Power Plant in Kemmerer, Wyoming. | Response targeted for week of June 24, 2019. |



# Additional Information and Next Steps





# Draft Topics for Upcoming PIMs\*

July 18-19, 2019\*

- Portfolio Modeling Results
- Sensitivity Results
- Preferred Portfolio
- Action Plan
- Stakeholder Feedback Form  
Recap

*\* Topics and timing are tentative and subject to change*



# Additional Information and Next Steps

- Public Input Meeting Presentation and Materials:
  - [pacificorp.com/es/irp.html](http://pacificorp.com/es/irp.html)
- 2019 IRP Stakeholder Feedback Forms:
  - [pacificorp.com/es/irp/irpcomments.html](http://pacificorp.com/es/irp/irpcomments.html)
- IRP Email / Distribution List Contact Information:
  - [IRP@PacifiCorp.com](mailto:IRP@PacifiCorp.com)
- Upcoming Public Input Meeting Dates:
  - July 18-19, 2019
  - August 1, 2019 – 2019 IRP File Date