Integrated Resource Plan

2021 IRP Public-Input Meeting

October 1, 2021




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Agenda

- 9:00am-9:15am pacific – Welcome and Introductions
- 9:15am-9:30am pacific – 2021 IRP Filing Update
- 9:30am-10:15am pacific – 2021 IRP Sensitivities Discussion
- 10:15am-10:45am pacific – 2021 IRP Workpapers Discussion
- 10:45am-11:00am pacific – Wrap-up and Additional Information

2021 IRP Filing Update




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2021 IRP Filing Update

September 1, 2021 – IRP filed

California Docket R 18-07-003

Idaho Case No. PAC-E-21-19

September 15, 2021 – IRP data discs; errata filed

Oregon Docket LC 77

- Scheduling conference October 1, 2021

Utah Docket 21-035-09

- Technical Conference January 19, 2022
- Comments due March 4, 2022
- PacifiCorp reply comments due April 7, 2022

September 30, 2021 – IRP supplemental filing sensitivity cases; errata to data discs

Washington Docket UE-200420

Wyoming Docket 20000-603-EA-21 (Record No. 15935)

2021 IRP Sensitivities




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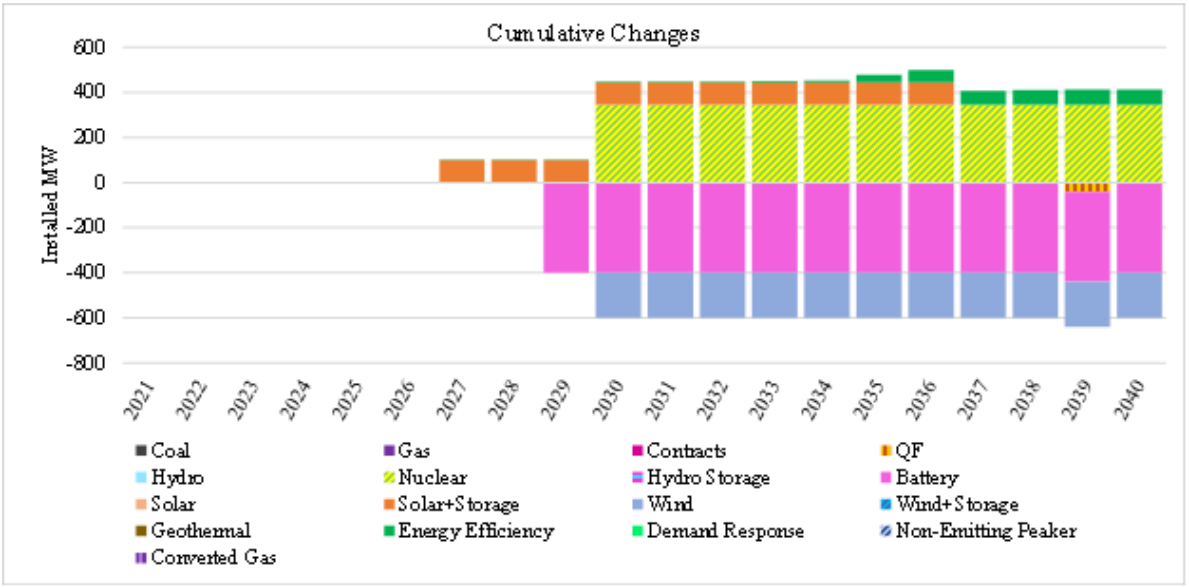
P02-MM Sensitivity Case Summary

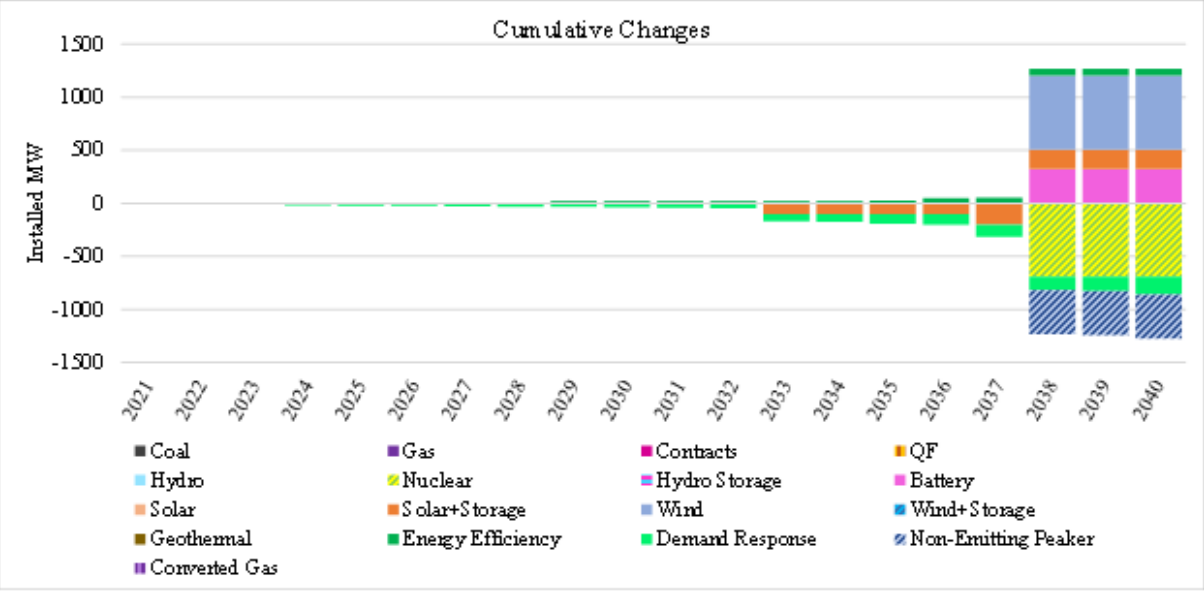
Case	Description	Parent Case	PVRR ($m)	Load	First Year New Gas
S-01	High Load	P02-MM CETA	28,019	High	N/A
S-02	Low Load	P02-MM CETA	24,781	Low	N/A
S-03	1 in 20 Load Growth	P02-MM CETA	26,507	1 in 20	N/A
S-04	MM Price with New Gas	P02-MM CETA	26,184	Base	2033
S-05	Business Plan	P02-MM CETA	27,184	Base	N/A
S-06	LCOE Energy Efficiency Bundles	P02-MM CETA	26,533	Base	N/A
S-07	High Private Generation	P02-MM CETA	25,737	Base	N/A
S-08	Low Private Generation	P02-MM CETA	26,596	Base	N/A

P02 High Load Growth Sensitivity (S-01)



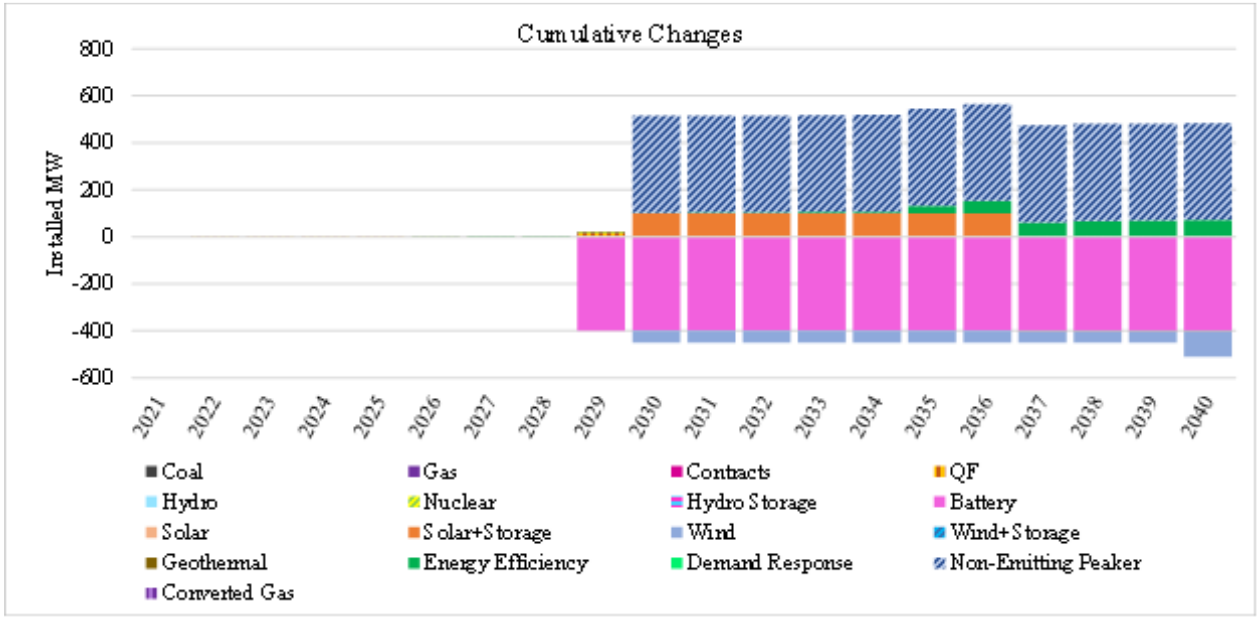
- The high load forecast sensitivity reflects optimistic economic growth assumptions and the upper bound of model error bands
- Lower energy wind and storage are replaced by advanced nuclear and solar additions, energy efficiency, increased thermal output and market purchases
- Higher energy, higher cost resources increase system costs by $1.7b on a PVRR basis

P02 Low Load Growth Sensitivity (S-02)



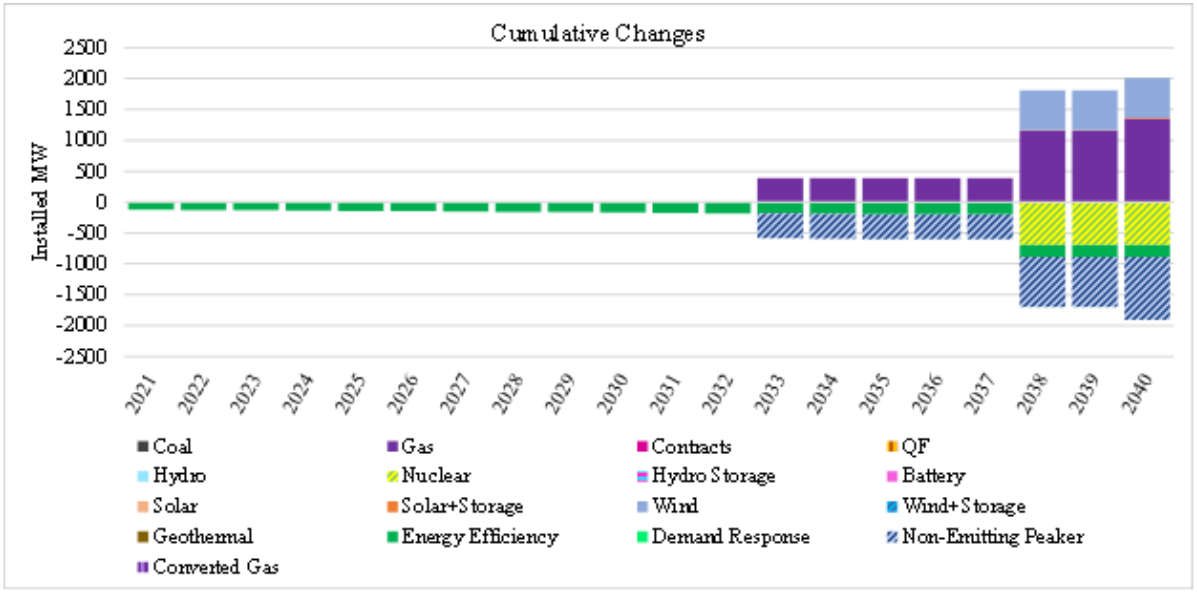
- The low load forecast sensitivity reflects pessimistic economic growth assumptions and the lower bound of model error bands
- In lower load conditions, DSM and solar with storage are delayed, and high energy high-cost peaking and nuclear resources are replaced with less expensive renewables and storage in the last three years
- These changes resulted in lower fuel costs, lower emission costs, and lower market purchases. CO_2 emissions over the study period decreased by 25 million tons
- Lower load reduces systems cost by $1.6b on a PVRR basis

P02 1-in-20 Load Growth Sensitivity (S-03)



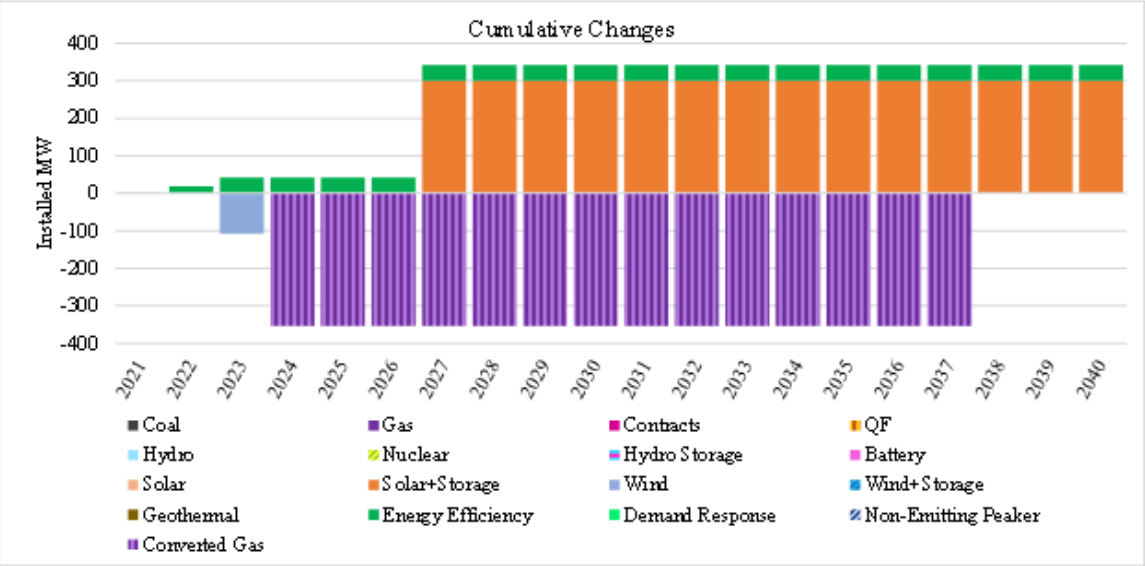
- This sensitivity assumes 1-in-20 extreme weather conditions during the summer (July) for each state.
- Lower cost energy wind and storage resources are replaced by non-emitting peaker resources in addition to solar with storage additions, energy efficiency, and increased thermal output and market purchases
- Higher energy, higher cost resources increase system costs by $164m on a PVRR basis

P02 New Proxy Gas Sensitivity (S-04)



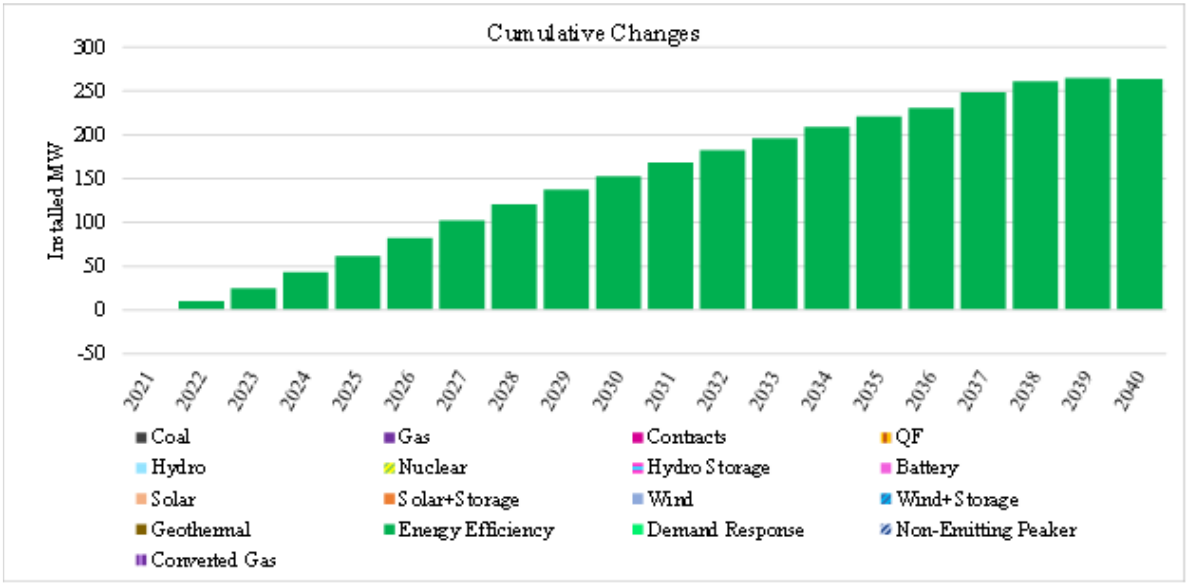
- In this sensitivity, new gas peaking resources replace non-emitting peaking resources and new combined cycle combustion turbines replace advanced nuclear resources
- The replacement of non-emitting resources with new proxy gas increases emissions and decreases energy efficiency
- The replacement of higher cost non-emitting dispatchable resources with lower cost thermal resources decreases system costs by $159m on a PVRR basis

P02 Business Plan Sensitivity (S-05)



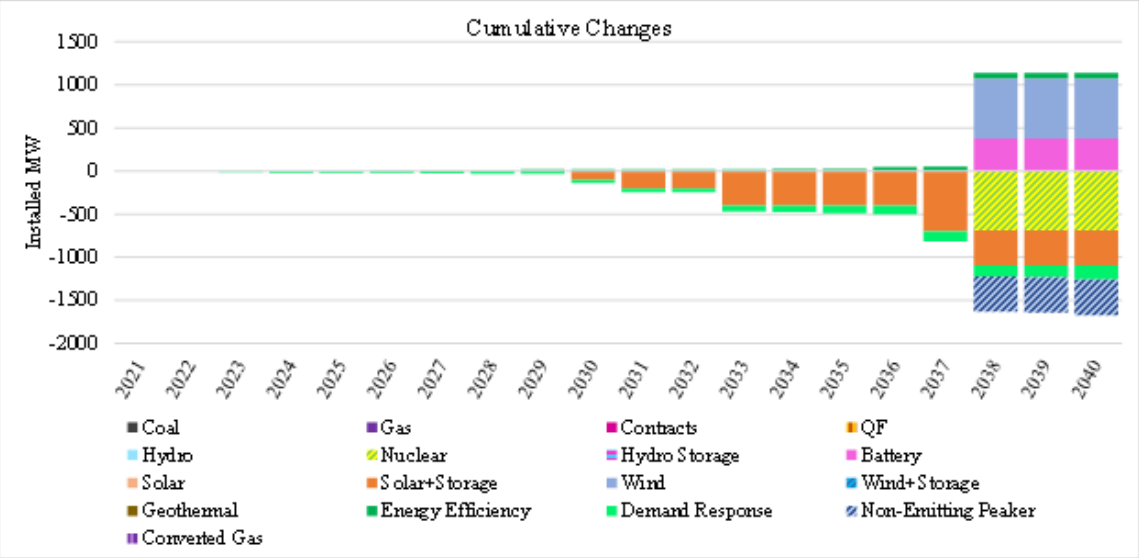
- Over the first three years, resources align with those assumed in PacifiCorp's 2020 Business Plan
- Beyond the first three years of the study period, unit retirement assumptions are aligned with those identified in the preferred portfolio
- Portfolio impacts are driven by the business plan assumption of Jim Bridger unit 1 retirement at the end of 2023 instead of Jim Bridger 1 gas conversion
- When retired from service early, solar with storage and energy efficiency resources increase to replace lost generation capability
- Unfavorable economics of replacement resources compared to gas conversion increases system costs by $840m on a PVRR basis

P02 LCOE Energy Efficiency Sensitivity (S-06)



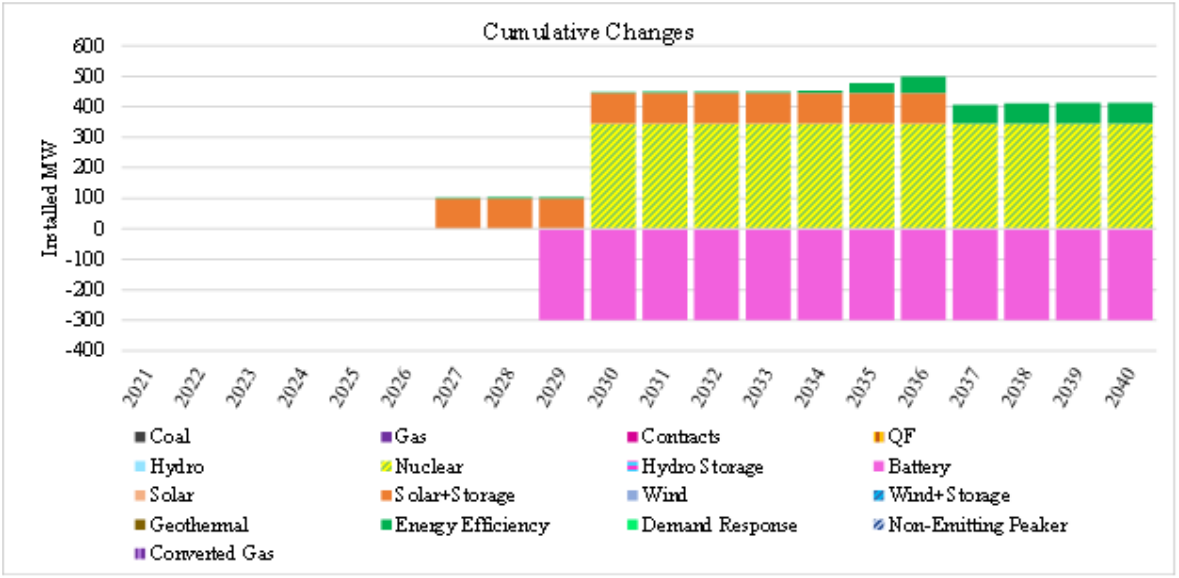
- In the 2019 IRP, energy efficiency bundles were created using the levelized cost of energy (LCOE) method
- For the 2021 IRP, PacifiCorp reshaped the daily volumes from energy efficiency to better align with the load forecast using a net cost of capacity (NCOC) method
- The NCOC method creates a realistic representation of the relationship between load and weather-sensitive energy efficiency resource options
- The LCOE portfolio results in higher and less efficient bundle selections as efficiency selections are less targeted to resource needs than the NCOC approach
- These inefficiencies results in a system cost increase of $190m on a PVRR basis

P02 High Private Generation Sensitivity (S-07)



- The high private generation study (S07) reflects more aggressive technology cost reduction assumptions, greater technology performance levels, and higher retail electricity rates.
- Higher private generation decreases load, reducing selections of nuclear, solar with storage, and non-emitting peaking resources, and increasing selections of lower energy wind and storage resources
- Lower energy, lower cost resources decrease system costs by $606m on a PVRR basis

P02 Low Private Generation Sensitivity (S-08)

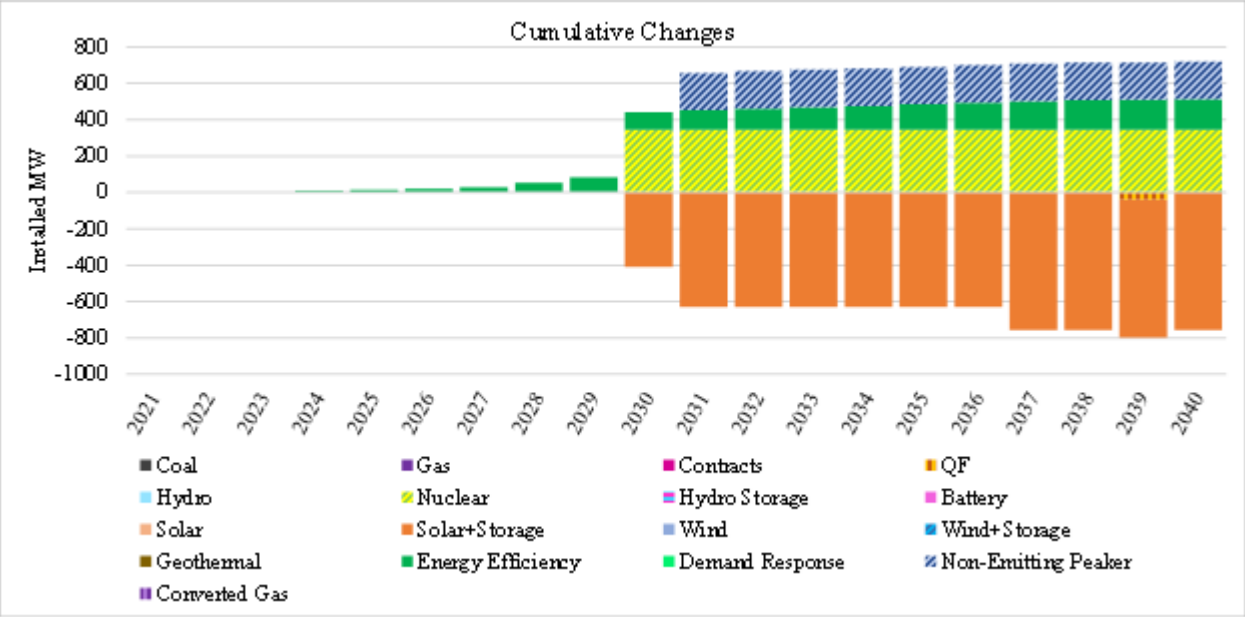


- The low private generation sensitivity (S08) reflects lesser reductions in technology costs, reduced technology performance levels, and lower retail electricity rates.
- The relative increase in load reduces storage in favor of incremental nuclear, solar with storage and energy efficiency
- Higher energy, higher cost resources increase system costs by $253m on a PVRR basis

BAU1-MM Sensitivity Case Summary

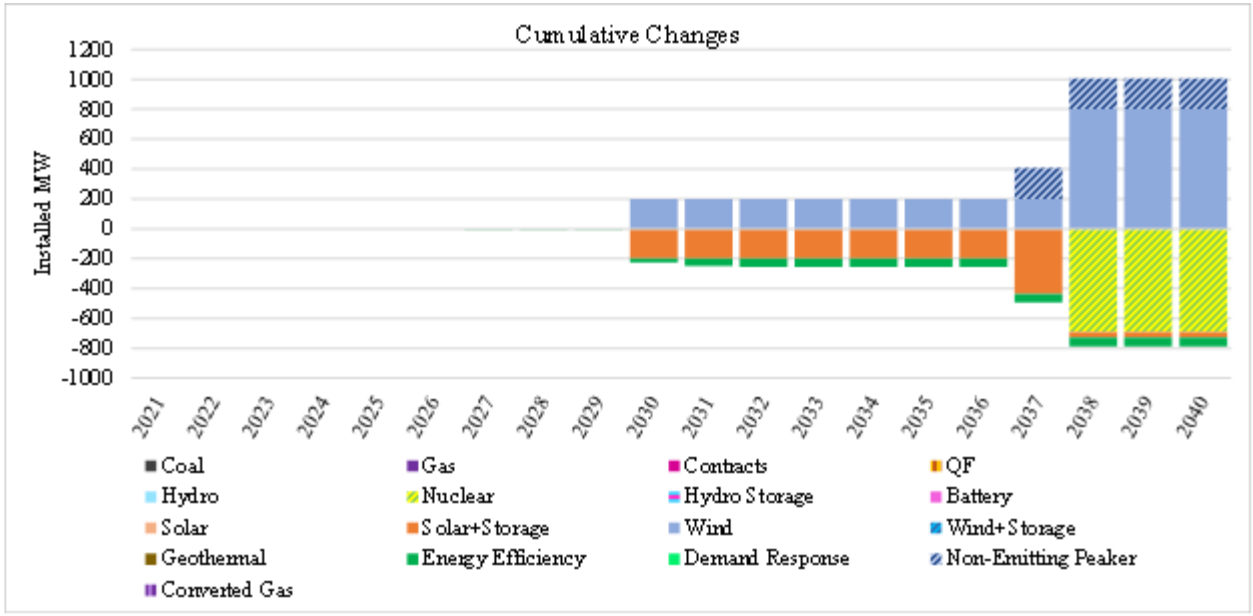
Case	Description	Parent Case	PVRR ($m)	Load	First Year New Gas
S-01	High Load	BAU1-MM	28,416	High	N/A
S-02	Low Load	BAU1-MM	25,702	Low	N/A
S-03	1 in 20 Load Growth	BAU1-MM	27,404	1 in 20	N/A
S-04	MM Price with New Gas	BAU1-MM	26,968	Base	2033
S-05	Business Plan	BAU1-MM	27,753	Base	N/A
S-06	LCOE Energy Efficiency Bundles	BAU1-MM	28,030	Base	N/A
S-07	High Private Generation	BAU1-MM	26,690	Base	N/A
S-08	Low Private Generation	BAU1-MM	27,424	Base	N/A

BAU1 High Load Growth Sensitivity (S-01)



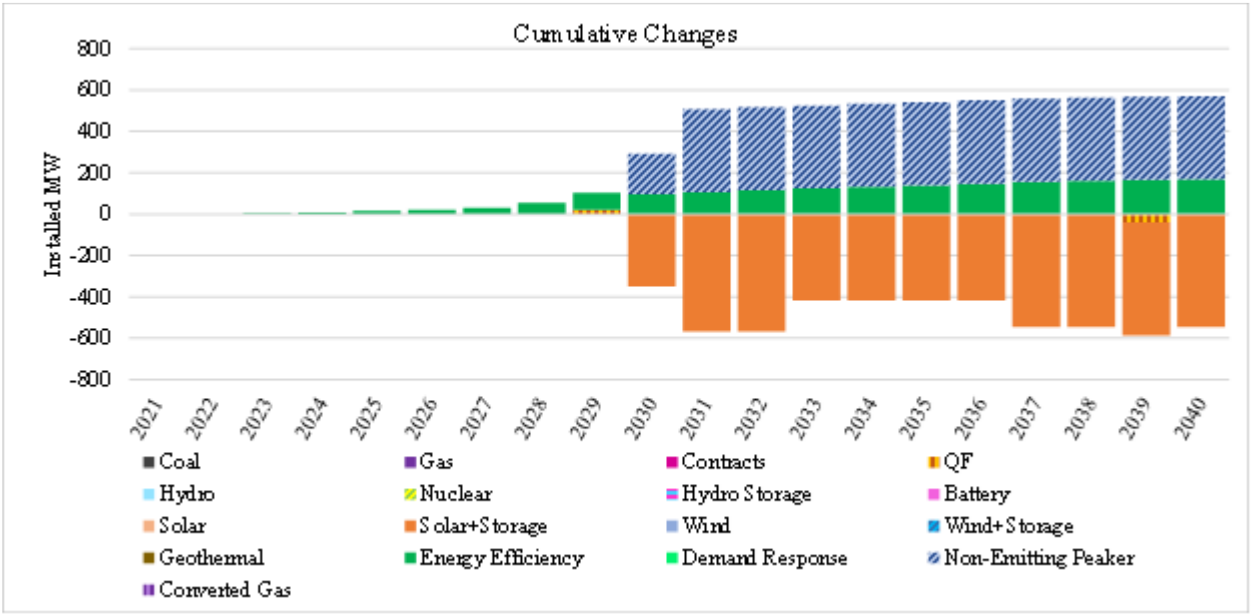
- The high load forecast sensitivity reflects optimistic economic growth assumptions and the upper bound of model error bands
- Lower energy solar with storage are replaced by advanced nuclear, non-emitting peaker resources and energy efficiency
- Higher energy, higher cost resources increase system costs by $1.2b on a PVRR basis

BAU1 Low Load Growth Sensitivity (S-02)



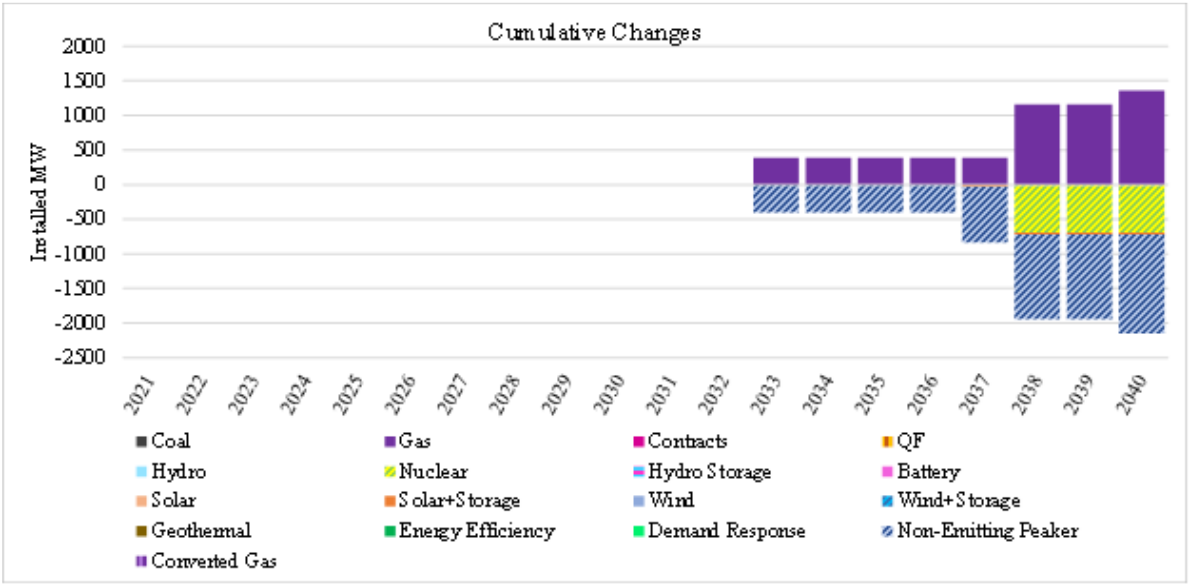
- The low load forecast sensitivity reflects pessimistic economic growth assumptions and the lower bound of model error bands
- In lower load conditions, solar with storage additions are delayed, and high energy high-cost nuclear resources are replaced with wind and non-emitting peaking resources in the last 3 years
- These changes resulted in lower fuel costs, lower emission costs, and lower market purchases. CO_2 emissions over the study period decreased by 24 million tons.
- Lower load reduces systems cost by $1.5b on a PVRR basis

BAU1 1-in-20 Load Growth Sensitivity (S-03)



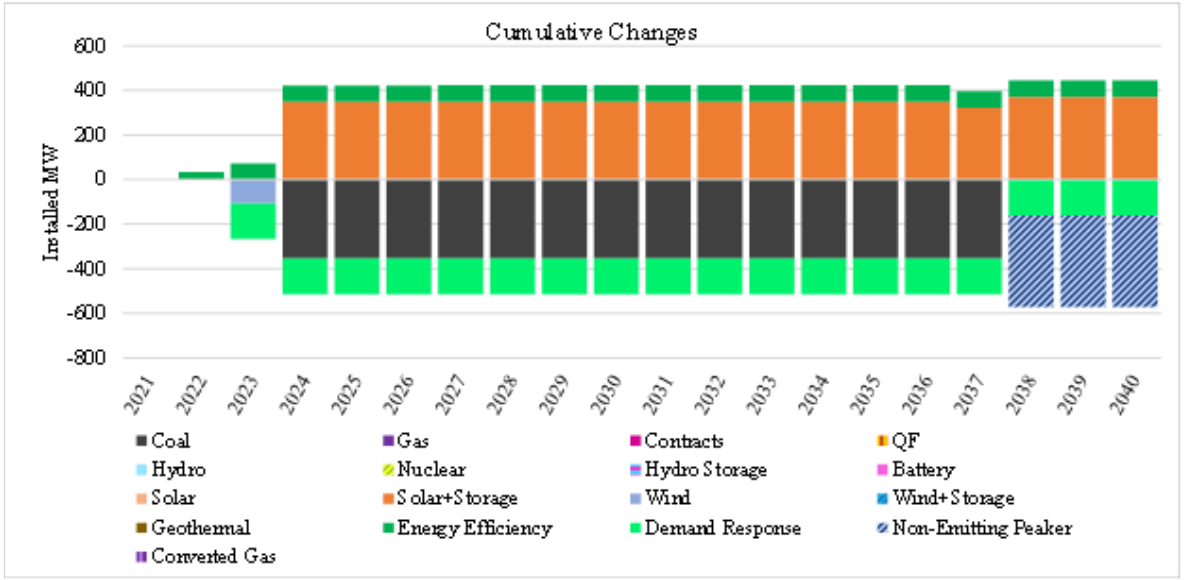
- This sensitivity assumes 1-in-20 extreme weather conditions during the summer (July) for each state.
- Lower energy solar and storage are replaced by non-emitting peaker resources, energy efficiency, and increased thermal output and market purchases
- Higher energy, higher cost resources increase system costs by $204m on a PVRR basis

BAU1 New Proxy Gas Sensitivity (S-04)



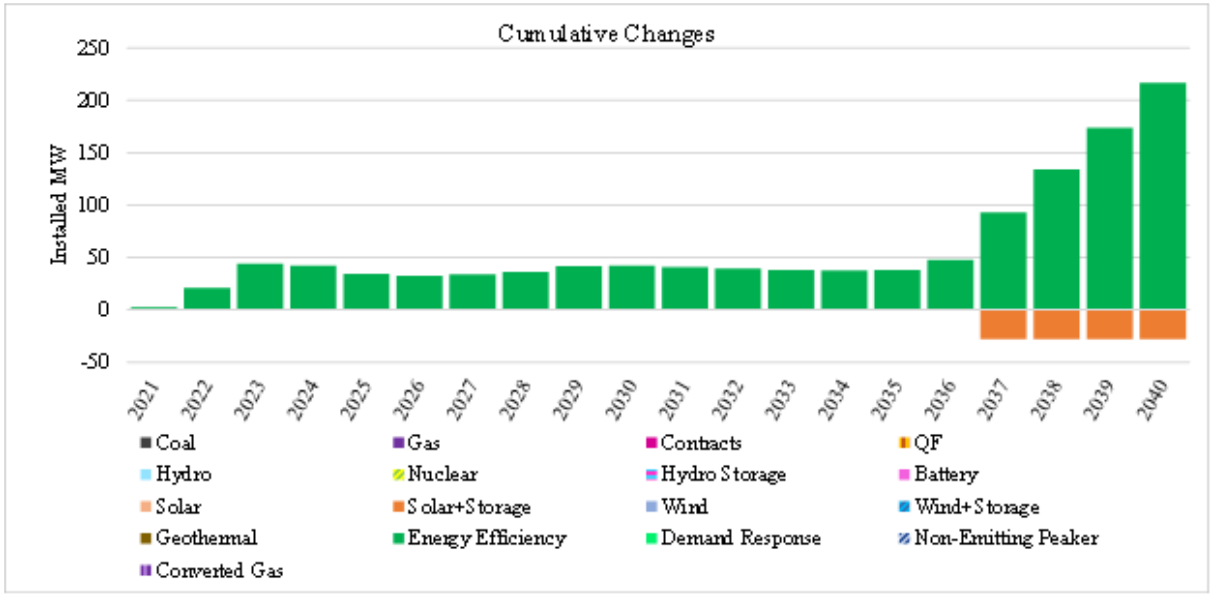
- In this sensitivity, new gas peaking resources replace non-emitting peaking resources and new combined cycle combustion turbines replace advanced nuclear resources
- The replacement of higher cost non-emitting dispatchable resources with lower cost thermal resources decreases system costs by $232m on a PVRR basis

BAU1 Business Plan Sensitivity (S-05)



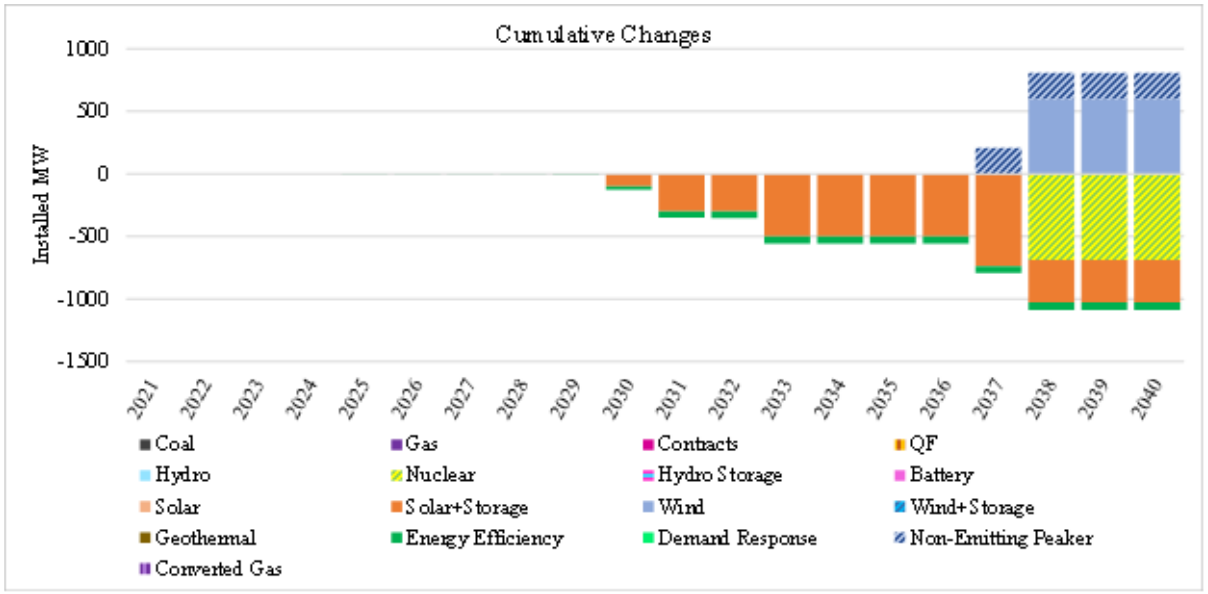
- Over the first three years, resources align with those assumed in PacifiCorp's 2020 Business Plan
- Beyond the first three years of the study period, unit retirement assumptions are aligned with those identified in the preferred portfolio
- Portfolio impacts are driven by the business plan assumption of Jim Bridger unit 1 retirement at the end of 2023. In contrast, the base case assumes Jim Bridger 1 continues coal-fired operation through year-end 2037.
- Unfavorable economics of replacement resources compared to gas conversion increases system costs by $553m on a PVRR basis

BAU1 LCOE Energy Efficiency Sensitivity (S-06)



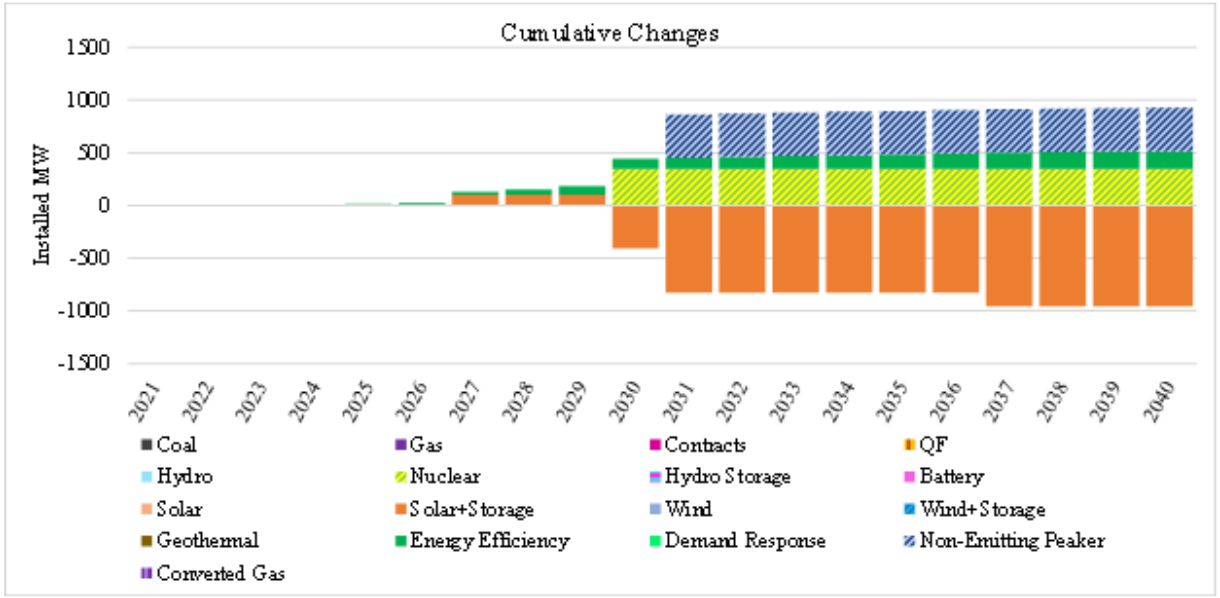
- In the 2019 IRP, energy efficiency bundles were created using the levelized cost of energy (LCOE) method
- For the 2021 IRP, PacifiCorp reshaped the daily volumes from energy efficiency to better align with the load forecast using a net cost of capacity (NCOC) method
- The NCOC method creates a realistic representation of the relationship between load and weather-sensitive energy efficiency resource options
- These inefficiencies results in a system cost increase of $830m on a PVRR basis

BAU1 High Private Generation Sensitivity (S-07)



- The high private generation study (S07) reflects more aggressive technology cost reduction assumptions, greater technology performance levels, and higher retail electricity rates.
- Higher private generation decreases load, reducing selections of nuclear, solar with storage, and energy efficiency, and increasing selections of lower energy wind supported by an additional non-emitting peaker
- Lower energy, lower cost resources decrease system costs by $510m on a PVRR basis

BAU1 Low Private Generation Sensitivity (S-08)

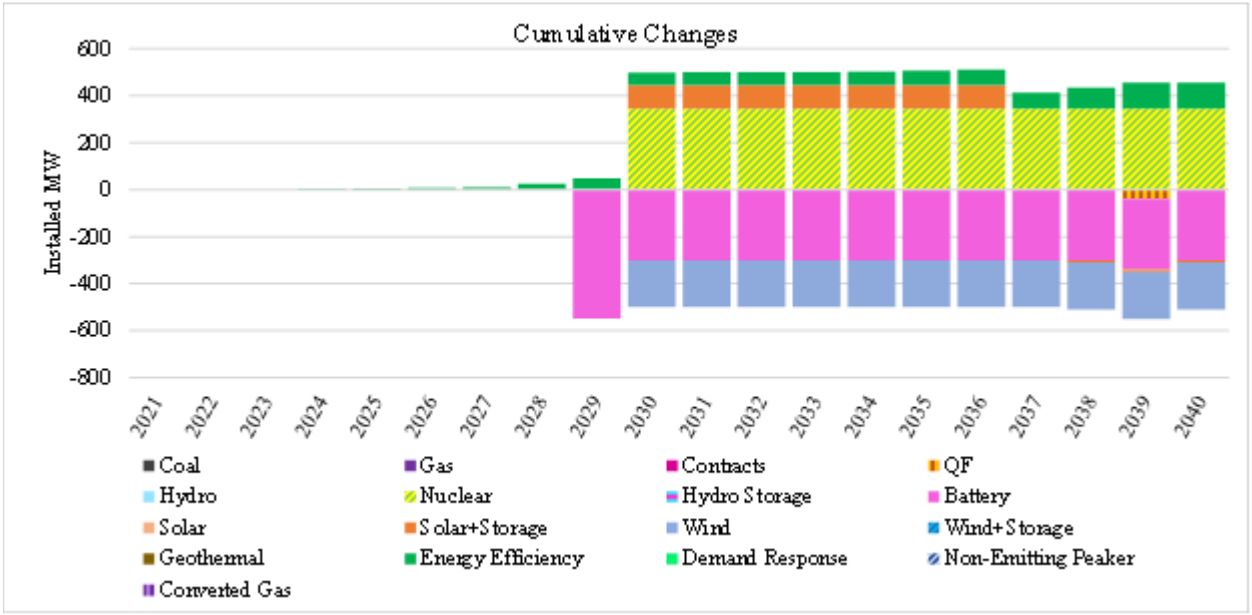


- The low private generation sensitivity (S08) reflects lesser reductions in technology costs, reduced technology performance levels, and lower retail electricity rates.
- The relative increase in load reduces solar and storage in favor of incremental nuclear, non-emitting peaker and energy efficiency
- Higher energy, higher cost resources increase system costs by $224m on a PVRR basis

BAU2-MM Sensitivity Case Summary

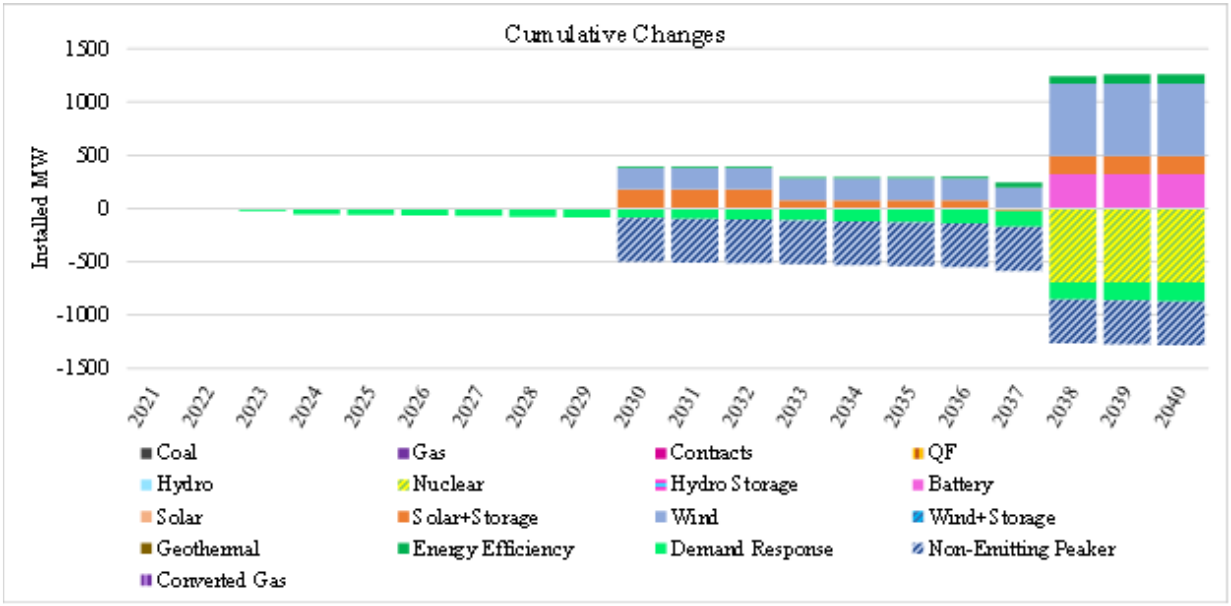
Case	Description	Parent Case	PVRR ($m)	Load	First Year New Gas
S-01	High Load	BAU2-MM	28,393	High	N/A
S-02	Low Load	BAU2-MM	25,495	Low	N/A
S-03	1 in 20 Load Growth	BAU2-MM	27,394	1 in 20	N/A
S-04	MM Price With New Gas	BAU2-MM	26,970	Base	2030
S-05	Business Plan	BAU2-MM	27,778	Base	N/A
S-06	LCOE Energy Efficiency Bundles	BAU2-MM	27,268	Base	N/A
S-07	High Private Generation	BAU2-MM	26,507	Base	N/A
S-08	Low Private Generation	BAU2-MM	27,598	Base	N/A

BAU2 High Load Growth Sensitivity (S-01)



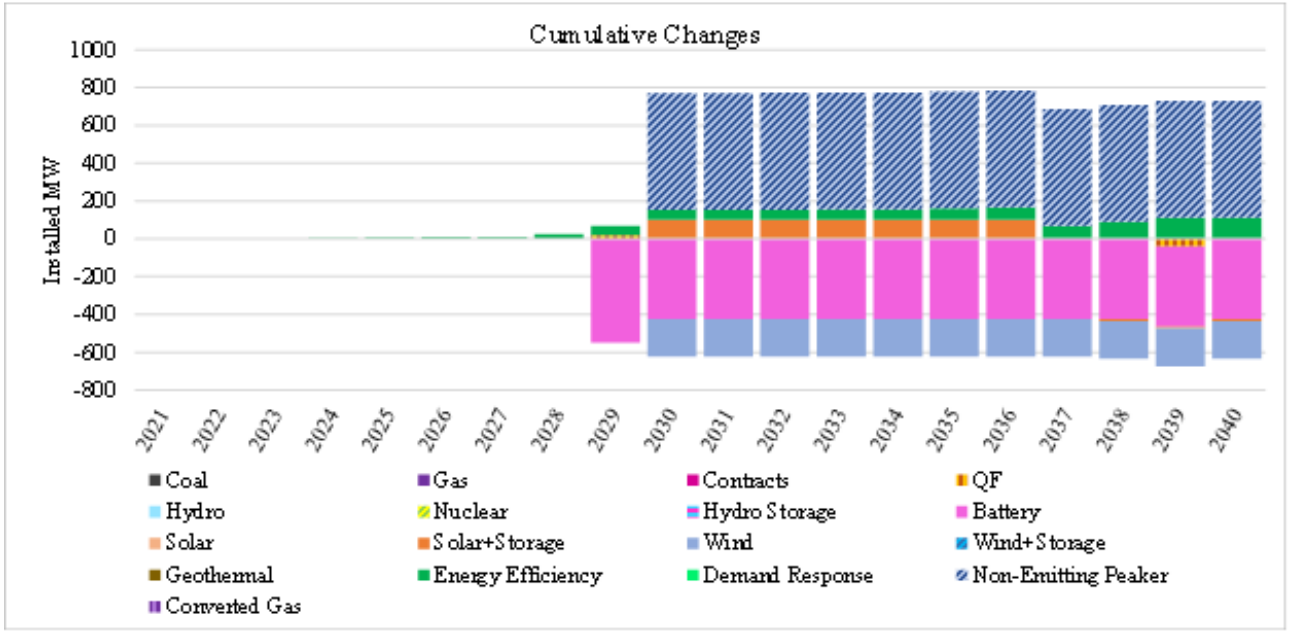
- The high load forecast sensitivity reflects optimistic economic growth assumptions and the upper bound of model error bands
- Lower energy wind and storage are replaced by advanced nuclear and solar with storage additions, energy efficiency, increased thermal output and market purchases
- Higher energy, higher cost resources increase system costs by $1.3b on a PVRR basis

BAU2 Low Load Growth Sensitivity (S-02)



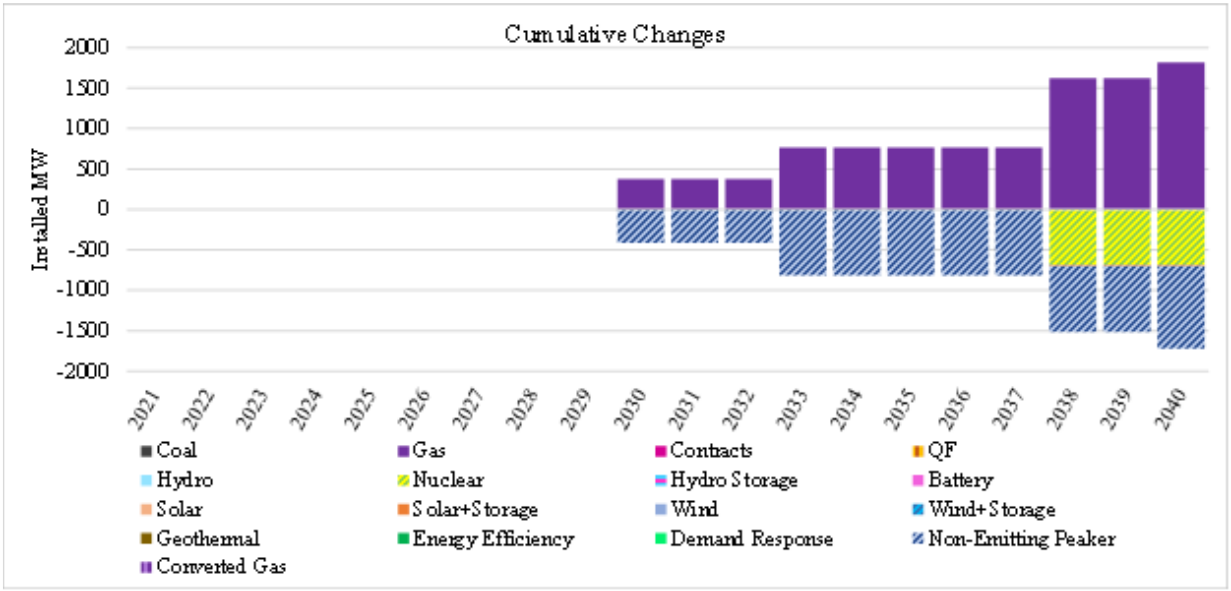
- The low load forecast sensitivity reflects pessimistic economic growth assumptions and the lower bound of model error bands
- In lower load conditions, demand response is reduced, and high energy high-cost peaking and nuclear resources are replaced with less expensive renewables and storage, particularly in the last three years
- These changes resulted in lower fuel costs, lower emission costs, and lower market purchases. CO_2 emissions over the study period decreased by 25 million tons.
- Lower load reduces systems cost by $1.6b on a PVRR basis.

BAU2 1-in-20 Load Growth Sensitivity (S-03)



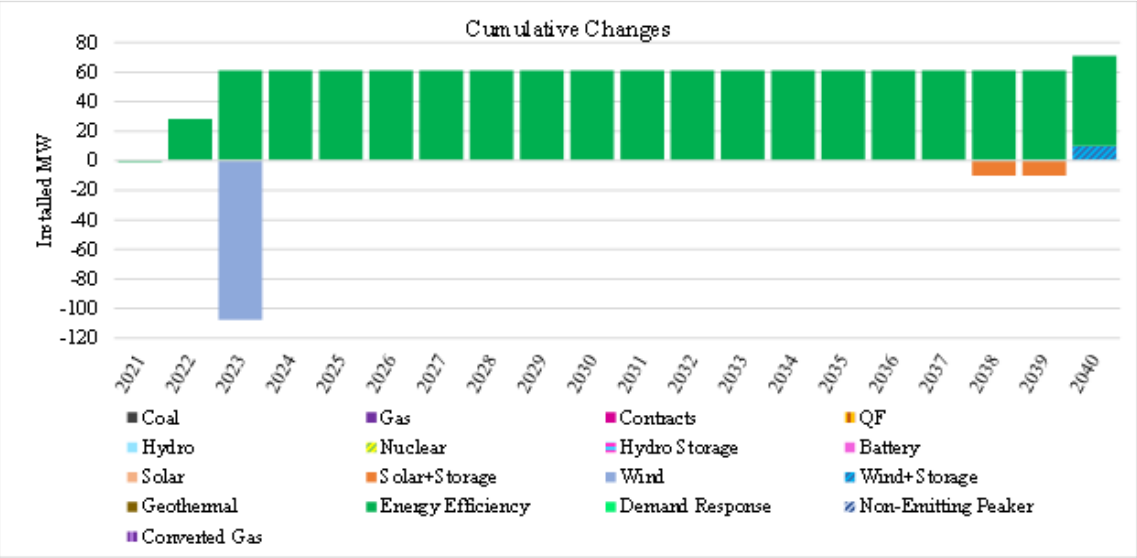
- This sensitivity assumes 1-in-20 extreme weather conditions during the summer (July) for each state.
- Lower energy wind and storage are replaced by non-emitting peakers, solar with storage additions, energy efficiency, and increased thermal output and market purchases
- Higher energy, higher cost resources increase system costs by $340m on a PVRR basis

BAU2 New Proxy Gas Sensitivity (S-04)



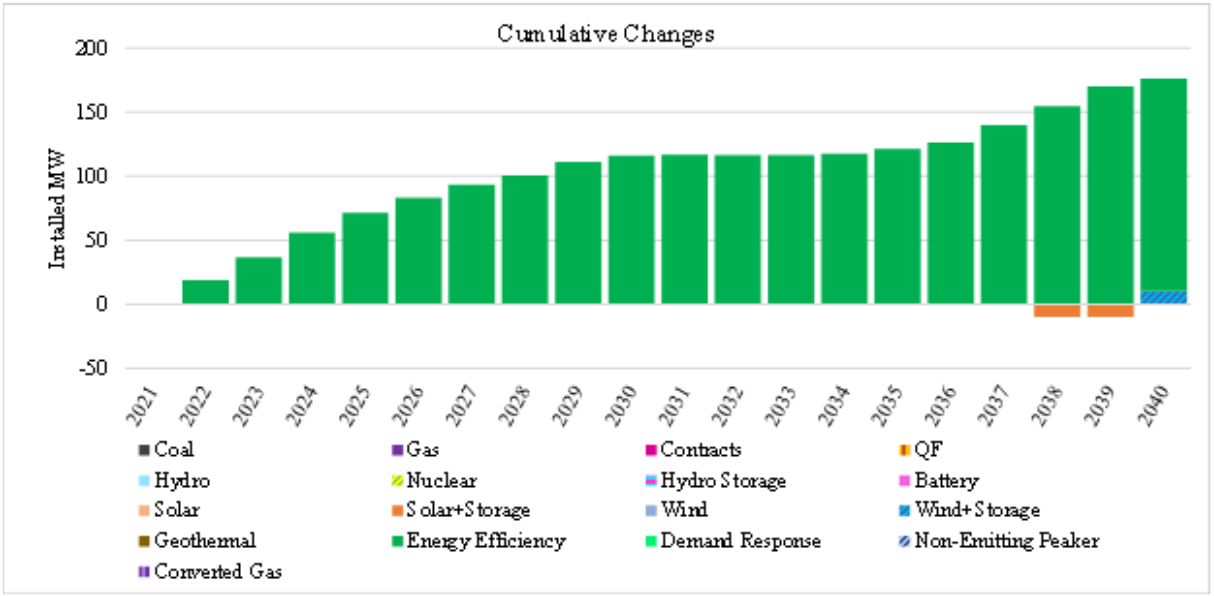
- In this sensitivity, new gas peaking resources replace non-emitting peaking resources and new combined cycle combustion turbines replace advanced nuclear resources
- The replacement of non-emitting resources with new proxy gas increases CO2 emissions
- The replacement of higher cost non-emitting dispatchable resources with lower cost thermal resources decreases system costs by $84m on a PVRR basis

BAU2 Business Plan Sensitivity (S-05)



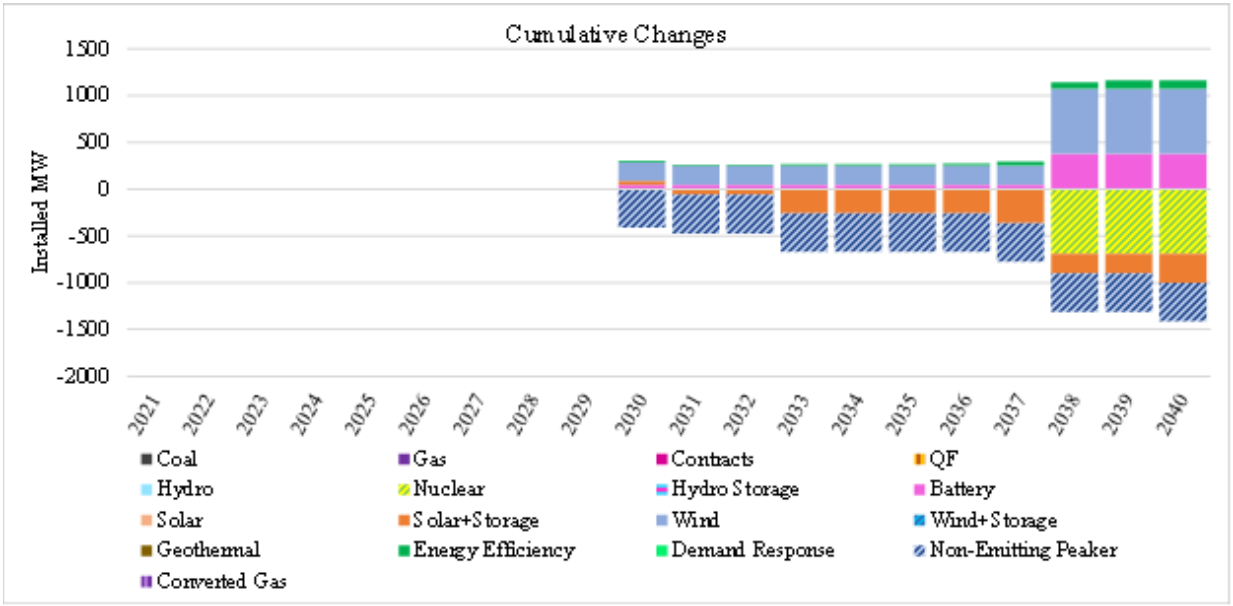
- Over the first three years, resources align with those assumed in PacifiCorp's 2020 Business Plan
- Beyond the first three years of the study period, unit retirement assumptions are aligned with those identified in the preferred portfolio
- Portfolio differences are driven by higher business plan energy efficiency assumptions and 2021 IRP updates over the 20-year study period
- Unfavorable economics of replacement resources compared to gas conversion increases system costs by $724m on a PVRR basis

BAU2 LCOE Energy Efficiency Sensitivity (S-06)



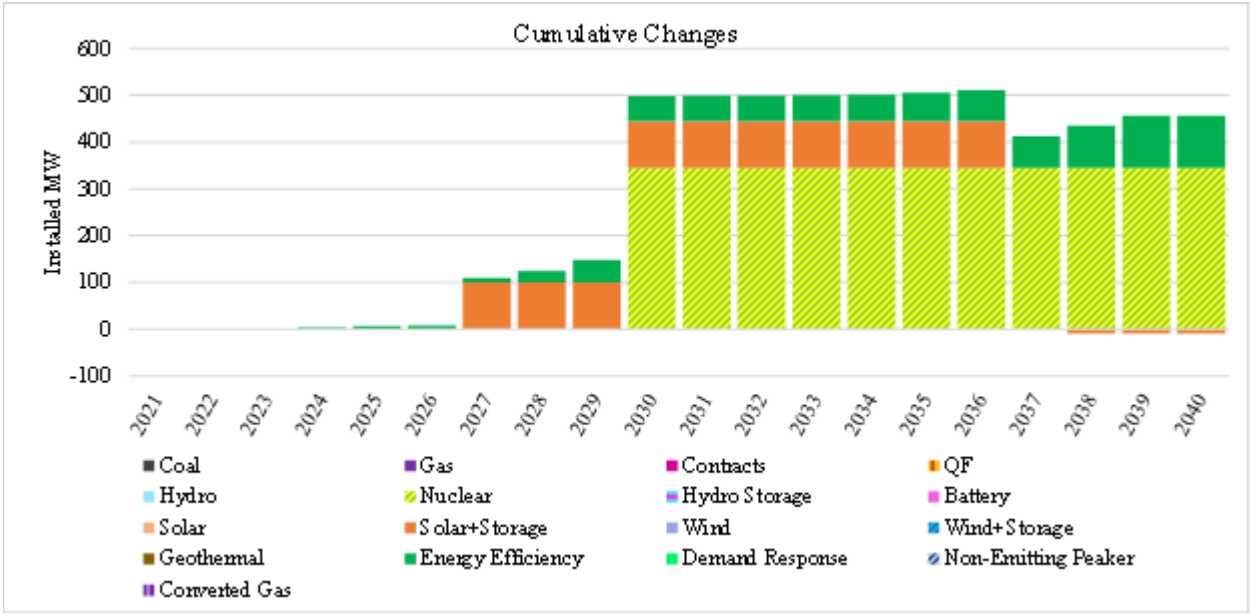
- In the 2019 IRP, energy efficiency bundles were created using the levelized cost of energy (LCOE) method
- For the 2021 IRP, PacifiCorp reshaped the daily volumes from energy efficiency to better align with the load forecast using a net cost of capacity (NCOC) method
- The NCOC method creates a realistic representation of the relationship between load and weather-sensitive energy efficiency resource options
- These inefficiencies results in a system cost increase of $214m on a PVRR basis

BAU2 High Private Generation Sensitivity (S-07)



- The high private generation study (S07) reflects more aggressive technology cost reduction assumptions, greater technology performance levels, and higher retail electricity rates.
- Higher private generation decreases load, reducing selections of nuclear, solar with storage, and non-emitting peaking resources, and increasing selections of lower energy wind and storage resources
- Lower energy, lower cost resources decrease system costs by $547m on a PVRR basis

BAU2 Low Private Generation Sensitivity (S-08)



- The low private generation sensitivity (S08) reflects lesser reductions in technology costs, reduced technology performance levels, and lower retail electricity rates.
- The relative increase in load increase nuclear, solar with storage and energy efficiency in the portfolio
- Higher energy, higher cost resources increase system costs by $544m on a PVRR basis

2021 IRP Workpapers Discussion

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Main Data Disc - Confidential

Confidential	
_Preferred Portfolio CONF	
LT	Preferred portfolio long-term capacity expansion model results
MT	Preferred portfolio medium-term stochastic model results
ST	Preferred portfolio ahort-term deterministic model results
Chapters and Appendices CONF	
Appendix A - Load Forecast Details	Confidential Workpapers supporting 2021 IRP tables and figures
Appendix B - Regulatory Compliance (No Contents)	
Etc.	
Input Assumptions	
DSM	State-specific T&D Credits
Loads	2021 load data files and load sensitivity data files
Master Assumptions	Detailed input data for each retirement assumption
DJ1 2022	
DJ2 2024	
Etc.	
Reliability	ST model reliability adjustments for price-policy scenarios
RFP Bids FSL 2020 AS	Input data for 2020 All-source RFP final shortlist resources
SST	Supply-side resource table workpapers
LT Studies	Long-term capacity expansion model results
MT Studies	Medium-term stochastic model results
ST Studies	Short-term deterministic model results
Plexos Inputs	Plexos objects, memberships and properties in Excel file format

Main Data Disc - Public

Public

Chapters and Appendices

- Appendix A - Load Forecast Details — Public workpapers supporting 2021 IRP tables and figures
- Appendix B - Regulatiry Compliance (No Contents)

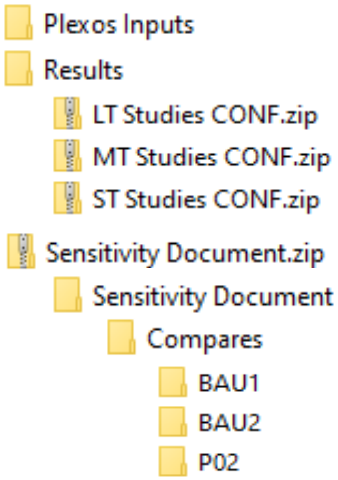
Etc.

Input Assumptions

- DSM — DSM workpapers for LCOE, NCOC methodologies
- Price Curves — Monthly price curves by east-west

Sensitivities Data Discs

Confidential



Plexos objects, memberships and properties in Excel file format

Long-term capacity expansion model results

Medium-term stochastic model results

Short-term deterministic model results

Portfolio comparison files for BAU1 sensitivities

Portfolio comparison files for BAU2 sensitivities

Portfolio comparison files for PO2 sensitivities

Public

Load sensitivity workpapers

Wrap-Up/Additional Information

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Additional Information

- Public Input Meeting and Workshop Presentation and Materials:
  - pacificorp.com/energy/integrated-resource-plan/public-input-process
- 2021 IRP Stakeholder Feedback Forms:
  - pacificorp.com/energy/integrated-resource-plan/comments
- IRP Email / Distribution List Contact Information:
  - IRP@PacifiCorp.com
- IRP Support and Studies:
  - pacificorp.com/energy/integrated-resource-plan/support
- Information on PacifiCorp's Washington-specific Clean Energy Implementation Plan:
  - pacificorp.com/energy/washington-clean-energy-transformation-act-equity.html