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Additional Sensitivity Analysis

In addition to the studies developed as part of the 2021 Integrated Resource Plan (IRP) portfolio-development process supporting selection of the preferred portfolio, additional sensitivity cases were conducted to better understand how certain modeling assumptions influence the resource mix and timing of future resource additions. These sensitivity cases are useful in understanding how PacifiCorp's resource plan would be affected by changes to uncertain planning assumptions and to address how alternative resources and planning paradigms affect system costs and risk.

As in the initial portfolios presented in the 2021 IRP Volume I, Chapter 9 – Modeling and Portfolio Selection Results, the analysis of sensitivities is grouped according to coal retirement assumptions:

- P02, optimized coal retirements [1,3]
- BAU1, end-of-life coal retirements [1,2,3]
- BAU2, 2019 IRP coal retirements [1,3]

To isolate the impact of a given planning assumption, the present value revenue requirement (PVRR) of the sensitivity cases is compared to the PVRR of the 2021 IRP preferred portfolio, case P02-MM-CETA. In addition to conducting sensitivity analysis on the P02-MM (medium gas / medium CO_2) portfolio, sensitivity analysis was also conducted on the BAU1-MM and BAU2-MM portfolios.

P-02 Sensitivity Cases (optimized coal retirements)

Table S.1 describes the sensitivity studies conducted under the P-02 case definitions with full optimization of coal retirement options.

[1] "P" refers generically to "portfolio"; "BAU" refers to "business as usual", a designation derived from stakeholder feedback recommending the BAU1 and BAU2 series of cases.
[2] Optimized proxy portfolio selections exclude new gas proxy resources except for gas-conversion of specific existing coal resources.
[3] Aligned with the intent of the BAU2 study requests, the description "2019 IRP" means that existing resources maintain 2019 retirement assumption except where updated information has changed known planning.

Table S.1 – Summary of P02-MM Sensitivity Cases

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

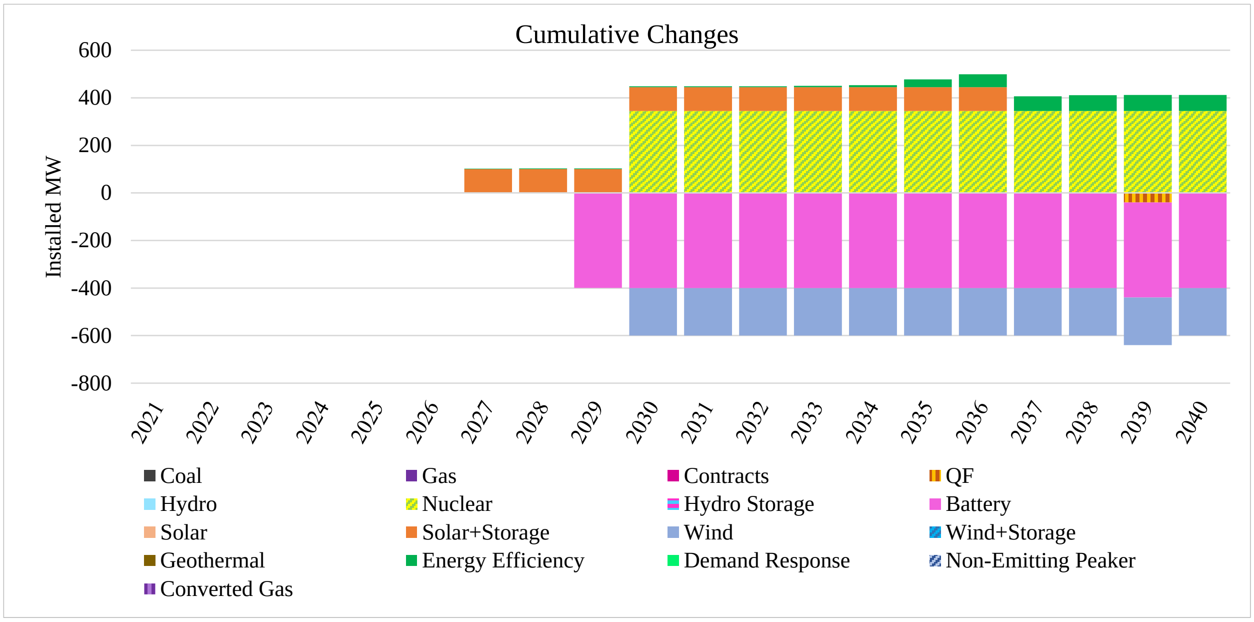
High Load Growth Sensitivity (S-01)

Table S.2 shows the PVRR impacts of the S-01 sensitivity relative to P02-MM CETA. Higher loads result in increased resource requirements which translate into higher system costs. Figure S.1 summarizes the portfolio impacts. The higher loads accelerated the Central Oregon transmission upgrade and associated solar with storage resources from 2037 to 2027. Additionally, lower cost wind and battery resources at Dave Johnston were displaced by 500 MW of advanced nuclear. Energy efficiency increased by 67 MW through the end of the study period. The higher loads are also met by advanced nuclear and solar additions, increased thermal output and market purchases. In combination, this resulted in higher fuel costs, higher emission costs, and higher market purchases. CO_2 emissions over the study period increased by 10 million tons.

Table S.2 – Risk-Adjusted PVRR (Benefit)/Cost of S-01 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	S-01	(Benefit) / Cost Relative to P02-MM CETA
$26,343	$28,019	$1,676

Figure S.1 – Increase/(Decrease) in Nameplate Capacity of S-01 Relative to Case P02-MM CETA



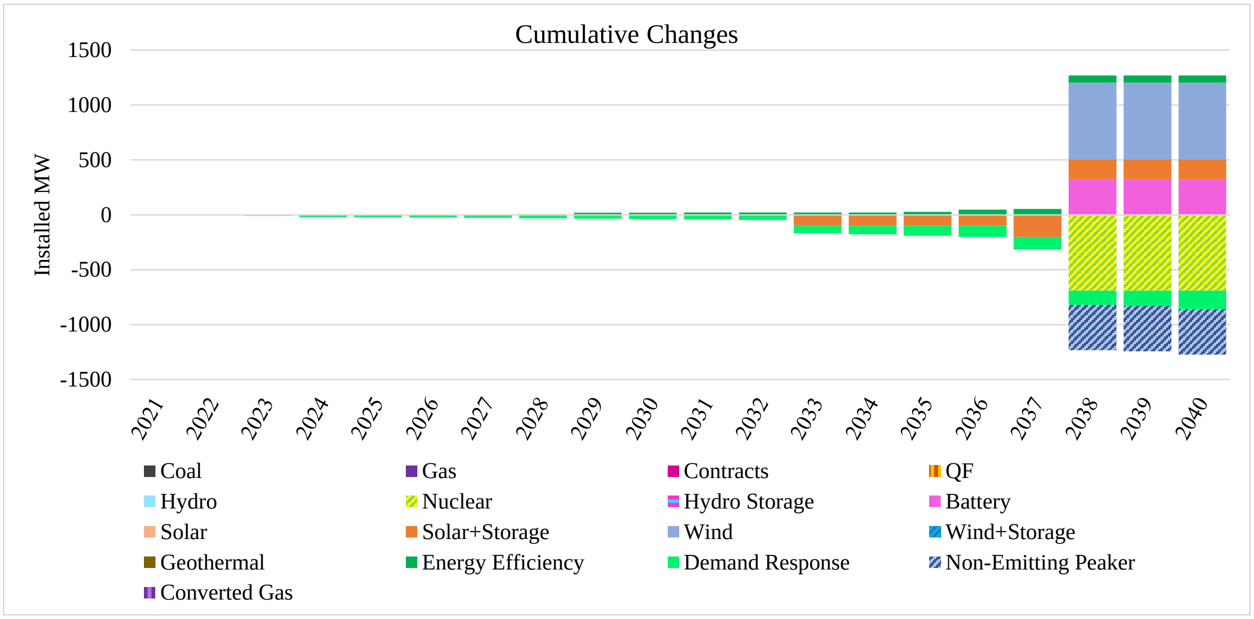
Low Load Growth Sensitivity (S-02)

Table S.3 shows the PVRR impacts of the S-02 sensitivity relative to P02-MM CETA. The reduced loads lower system costs significantly over the 20-year study period. Figure S.2 summarizes portfolio impacts. In the low load sensitivity, a total of 200 MW of solar and storage was delayed from 2033 and 2037 out to 2038. Additionally, replacement resource requirements decreased, reducing the need for 412 MW of non-emitting peaker resources and 1,000 MW advanced nuclear resources in 2038, partially offset by the addition of 1,205 MW of solar with storage, wind and stand-alone battery. Over the 20-year study period, demand response resources were lower by 171 MW partially offset by 64 MW of additional energy efficiency. Given reductions in advanced nuclear, non-emitting peakers and demand-side management resources, the lower loads are met by incremental solar, wind and energy efficiency in years 2038 through 2040. 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.

Table S.3 – Risk-Adjusted PVRR (Benefit)/Cost of S-02 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	**S-02**	**(Benefit) / Cost Relative to P02-MM CETA**
$26,343	$24,781	($1,562)

Figure S.2 – Increase/(Decrease) in Nameplate Capacity of S-02 Relative to Case P02-MM CETA



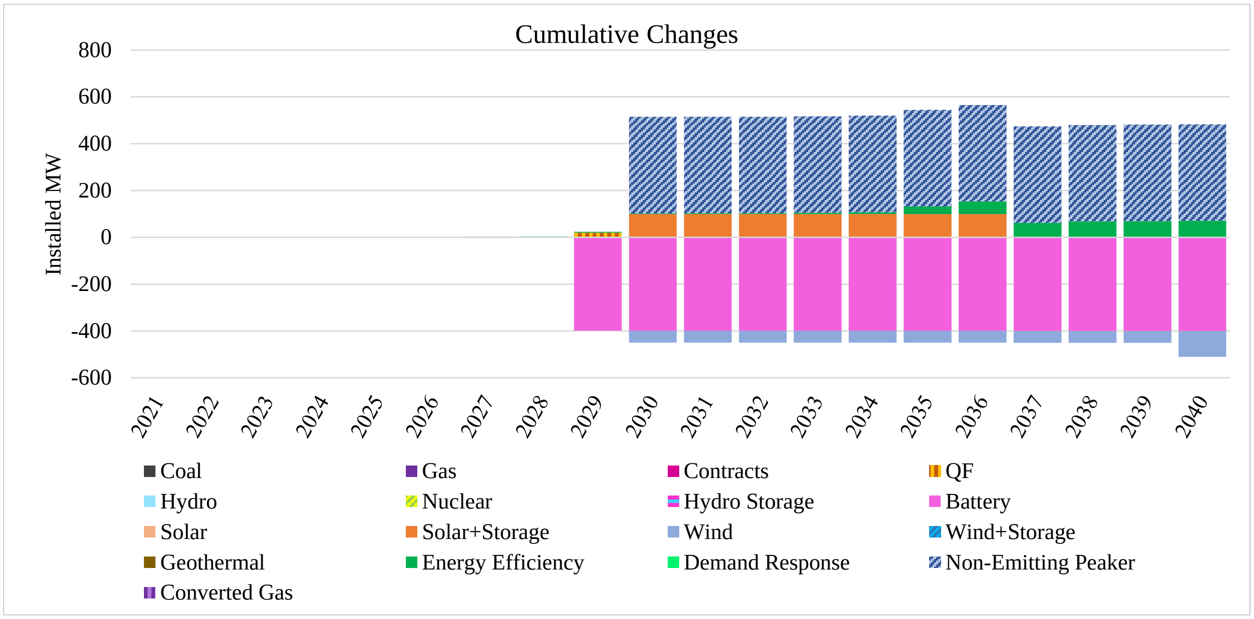
1-in-20 Load Growth Sensitivity (S-03)

Table S.4 shows the PVRR impacts of the S-03 sensitivity relative to P02-MM CETA. This sensitivity assumes 1-in-20 extreme weather conditions during the summer (July) for each state. System costs are higher due to requirements to meet additional peak load. Figure S.3 summarizes portfolio impacts. 412 MW of non-emitting peaker resources in 2030 replaced the need for 50 MW of wind and 400 MW of stand-alone battery resources in 2029 and 2030, respectively. The Central Oregon transmission upgrade and associated solar with storage resources was accelerated from 2037 to 2030. An additional 71 MW of energy efficiency was also selected.

Table S.4 – Risk-Adjusted PVRR (Benefit)/Cost of S-03 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	**S-03**	**(Benefit) / Cost Relative to P02-MM CETA**
$26,343	$26,507	$164

Figure S.3 – Increase/(Decrease) in Nameplate Capacity of S-03 Relative to Case P02-MM CETA



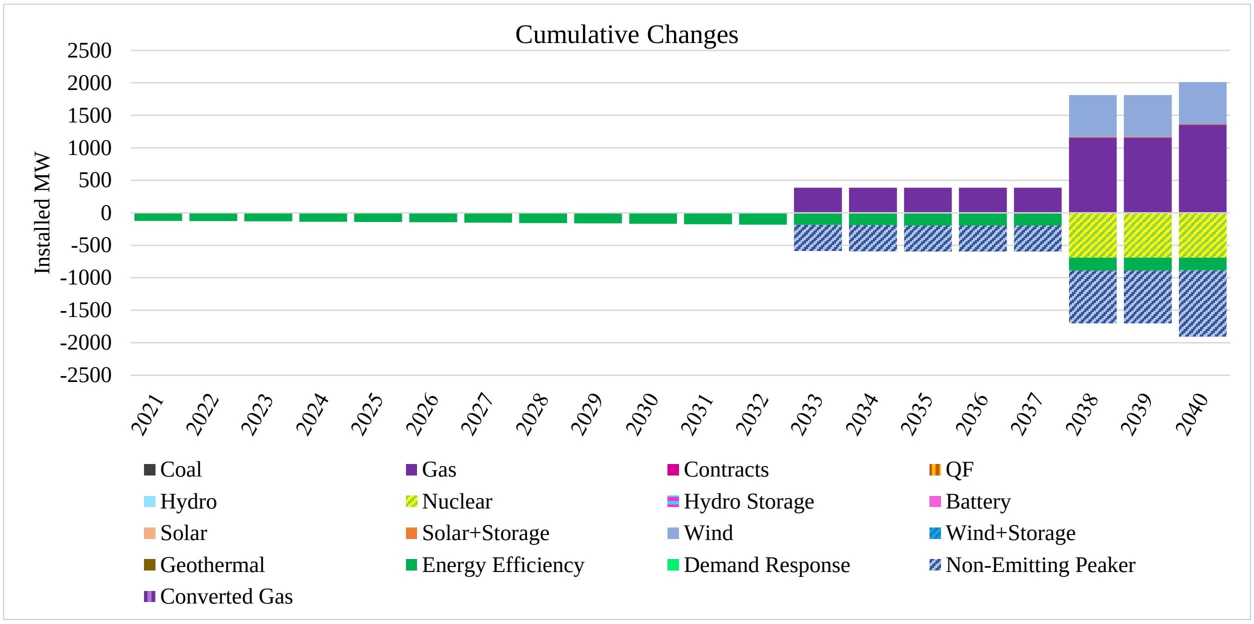
Allowance of Proxy Gas under P-02 (S-04)

Table S.5 shows the PVRR impacts of the S-04 sensitivity relative to P02-MM CETA. This sensitivity allowed proxy gas resource selections over the 20-year study period. Figure S.4 summarizes portfolio impacts. In 2033, 387 MW of new proxy gas resources were selected increasing to 1,357 MW in total over the 20-year study period. These resources displaced 1,020 MW of non-emitting peaker resources in 2033, 2038 and 2040 and 1,000 MW of advanced nuclear resources in 2038. CO_2 emissions increased 6 million tons over the study period.

Table S.5 – Risk-Adjusted PVRR (Benefit)/Cost of S-04 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	**S-04**	**(Benefit) / Cost Relative to P02-MM CETA**
$26,343	$26,184	($159)

Figure S.4 – Increase/(Decrease) in Nameplate Capacity of S-04 Relative to Case P02-MM CETA



Business Plan Sensitivity (S-05)

Table S.6 shows the PVRR impacts of the S-05 sensitivity relative to P02-MM CETA. System costs increase by $840m. This sensitivity complies with Utah requirements to perform a business plan sensitivity consistent with the Public Service Commission of Utah's order in Docket No. 15-035-04, summarized as follows:

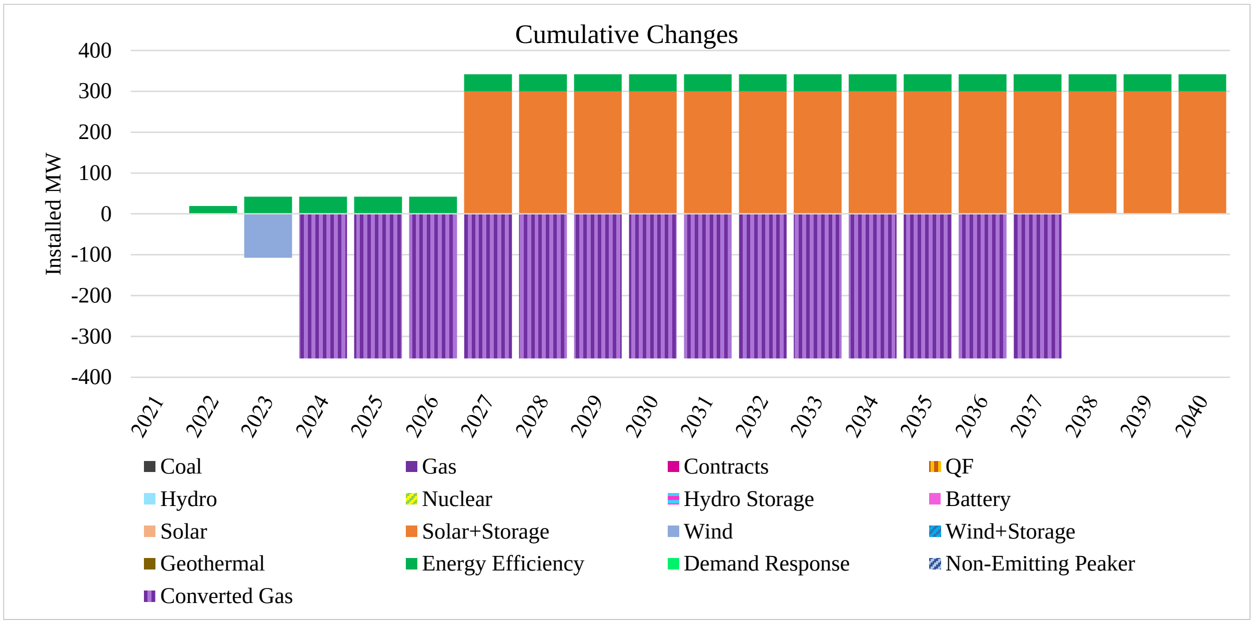
- Over the first three years, resources align with those assumed in PacifiCorp's December 2020 Business Plan.
- Beyond the first three years of the study period, unit retirement assumptions are aligned with the preferred portfolio.
- All other resources are optimized.

Error! Reference source not found. summarizes portfolio impacts, driven by the business plan assumption of Jim Bridger unit 1 retirement at the end of 2023. In contrast, the preferred portfolio assumes Jim Bridger 1 ceases coal-fired operations and converts to gas-fired operations at year-end 2023. In the business plan, the acquisition and repowering of 43 MW of Foote Creek II-IV wind is accelerated into the 3-year business plan window, year 2023. A single 151 MW RFP final short list wind resource shifts its online date from 2023 to 2024. Also, in the first 3 years, 42 MW of incremental DSM is added in accordance with the business plan. Over the 20-year study period, under the business plan solar and storage resource selections increase 300 MW. CO2 emissions over the study period decreased by 7 million tons.

Table S.6 – Risk-Adjusted PVRR (Benefit)/Cost of S-05 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	**S-05**	**(Benefit) / Cost Relative to P02-MM CETA**
$26,343	$27,184	$840

Figure S.5 – Increase/(Decrease) in Nameplate Capacity of S-05 Relative to Case P02-MM CETA



LCOE Energy Efficiency (S-06)

The levelized cost of energy (LCOE) energy efficiency sensitivity reflects a change in the bundling of energy efficiency to align with the bundling process used in the 2019 IRP. There were no other changes to the preferred portfolio.

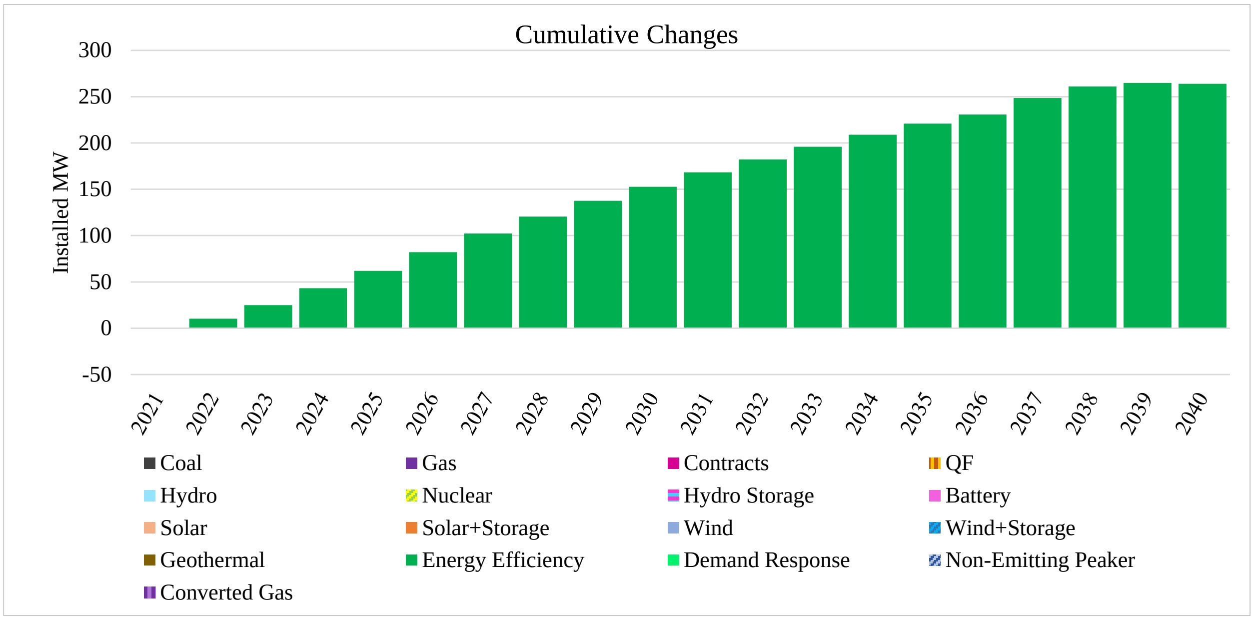
The Net Cost of Capacity (NCOC) methodology used in the 2021 IRP differentiates between measures based on the timing of their load reductions. Specifically, the energy value and capacity contribution of each measure was estimated based on its hourly load savings. After subtracting the energy value from the measure cost, the resulting net cost is divided by the capacity contribution, to produce the net cost of capacity value for the measure. Measures with more energy savings during expensive periods will have higher energy value and a lower net cost. Measures with more energy savings during periods with a risk of loss of load events will have a higher capacity contribution, and a lower net cost. To allow for additional targeting of specific system needs, separate Net Cost of Capacity bundles were created for three distinct categories: winter measures, weather-sensitive summer measures, and everything else, consisting of summer and annual measures that were not weather sensitive. Each measure was bundled with measures in the same category and with a similar net cost of capacity values. In contrast, under the LCOE bundling methodology, measures are bundled strictly based on their levelized cost of energy, which is independent of the timing of the reduction in load and energy and capacity benefits to the system. Note that the modeled cost of measures is not impacted by the bundling strategy, as both the energy and capacity values are ultimately determined in the modeled results. While the same measure cost is modeled under both methodologies, the totals within each bundle vary as individual measures move around.

Table S.7 shows the PVRR impacts of the S-06 sensitivity relative to P02-MM CETA, while Figure S.6 summarizes portfolio impacts. Under the LCOE approach, total cumulative energy efficiency increased 264 MW through the 20-year study period. This represents a 6.2 percent increase in energy efficiency selections and a 29 percent increase in energy from the energy efficiency relative to the preferred portfolio. The LCOE portfolio results in higher energy efficiency and higher system costs due to the energy efficiency selections being less targeted to resource needs than the NCOC approach used in the preferred portfolio. CO_2 emissions decreased over the study period by 8 million tons, consistent with higher energy efficiency.

Table S.7 – Risk-Adjusted PVRR (Benefit)/Cost of S-06 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	**S-06**	**(Benefit) / Cost Relative to P02-MM CETA**
$26,343	$26,533	$190

Figure S.6 – Increase/(Decrease) in Nameplate Capacity of S-06 Relative to Case P02-MM CETA



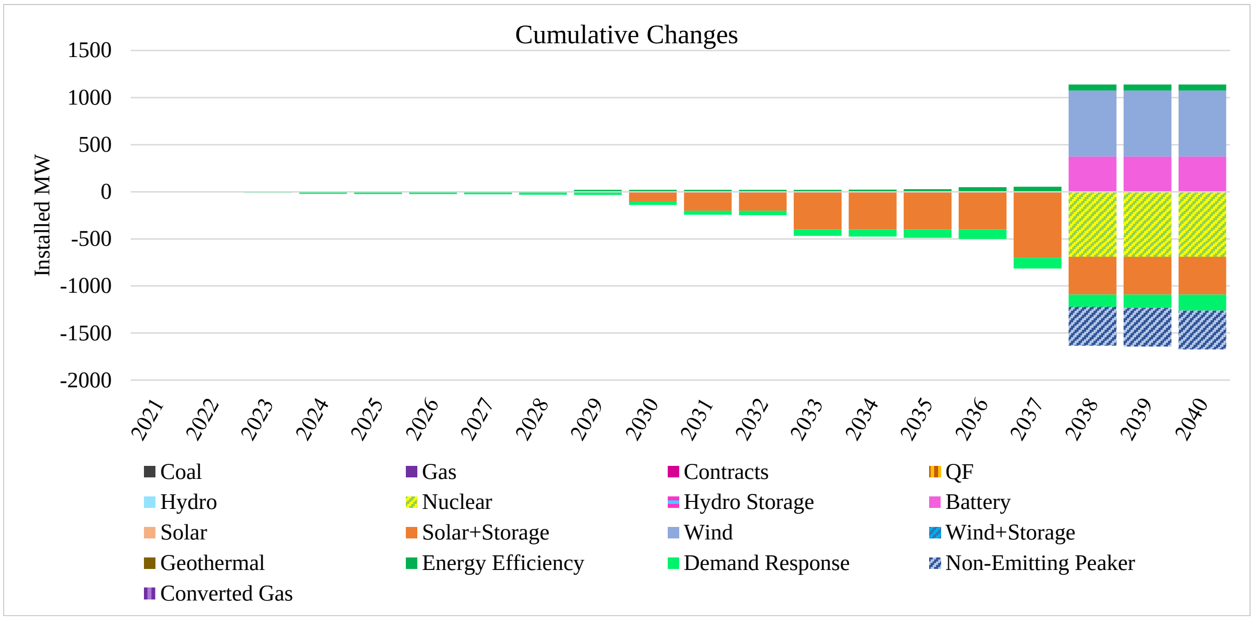
High Private Generation Sensitivity (S-07)

Table S.8 shows the PVRR impacts of the S-07 sensitivity relative to P02. Higher private generation assumptions decrease net load, which in turn decreases system costs. Figure S.7 summarizes portfolio impacts. 64 MW of additional energy efficiency was selected over the 20-year period. 171 MW less demand response was selected over the 20-year period. An additional 700 MW of wind is offset by a reduction of 401 MW in solar and storage capacity, 412 MW of non-emitting peaker resources, and 1,000 MW of advanced nuclear resources over the 20-year study period. The CO_2 emissions over the study period increased by 3 million tons.

Table S.8 – Risk-Adjusted PVRR (Benefit)/Cost of S-07 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	**S-07**	**(Benefit) / Cost Relative to P02-MM CETA**
$26,343	$25,737	($606)

Figure S.7 – Increase/(Decrease) in Nameplate Capacity of S-07 Relative to Case P02-MM CETA



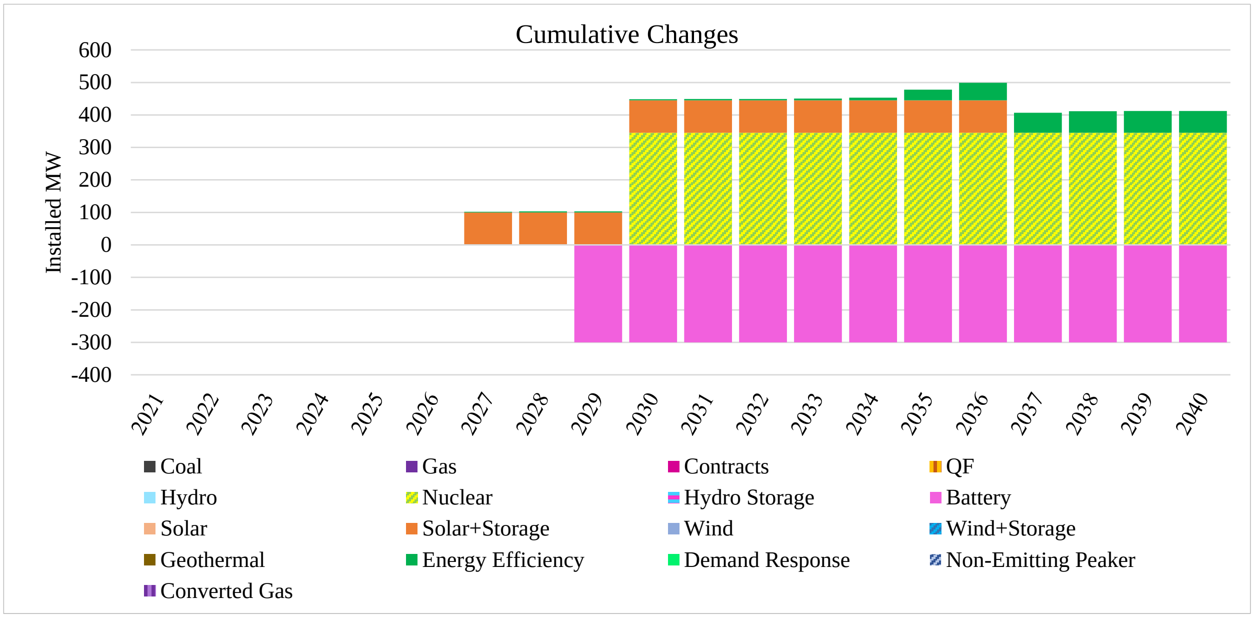
Low Private Generation Sensitivity (S-08)

Table S.9 shows the PVRR impacts of the S-08 sensitivity relative to P02-MM CETA. The lower private generation assumption results in higher net loads and increased system costs. Figure S.8 summarizes portfolio impacts. 300 MW of standalone battery was replaced with 500 MW of advanced nuclear capacity in 2030. Additionally, the Central Oregon transmission upgrade and associated solar with storage resources was accelerated from 2037 to 2027. Energy efficiency increased by 67 MW. CO_2 emissions over the study period decreased by 11 million tons.

Table S.9 – Risk-Adjusted PVRR (Benefit)/Cost of S-08 vs. P02-MM CETA

Medium Gas - Medium CO_2 ($ Million)		
P02-MM CETA	**S-08**	**(Benefit) / Cost Relative to P02-MM CETA**
$26,343	$26,596	$253

Figure S.8 – Increase/(Decrease) in Nameplate Capacity of S-08 Relative to Case P02-MM CETA



BAU1 Sensitivity Cases (end-of-life coal retirements)

Each sensitivity was run under the BAU1 case definitions with end-of-life coal retirements. Table S.10 reports the definitions and PVRR for each case.

Table S.10 – Summary of Additional BAU1 Sensitivity Cases

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

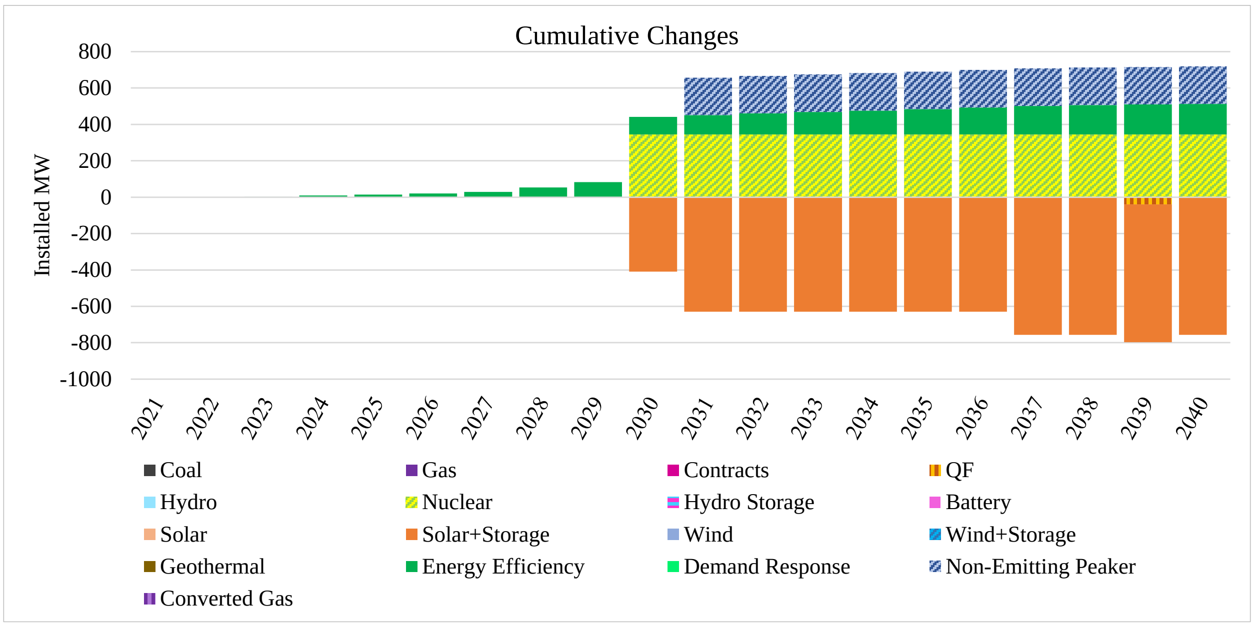
High Load Growth Sensitivity (S-01)

Table S.11 shows the PVRR impacts of the S-01 sensitivity relative to BAU1-MM. Due to the higher load profile, an additional 168 MW of energy efficiency was selected over the 20-year study period. An additional 500 MW advanced nuclear resource was selected in 2030 and replaced 500 MW of utility scale solar and storage. In 2031, 206 MW of non-emitting peaker resource replaced 220 MW of solar and storage. Higher loads necessitated the acceleration of the Central Oregon transmission upgrade and solar and storage resources from 2037 to 2030. CO2 emissions over the study period increased by 16 million.

Table S.11 – Risk-Adjusted PVRR (Benefit)/Cost of S-01 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-01**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$28,416	$1,215

Figure S.9 – Increase/(Decrease) in Nameplate Capacity of S-01 Relative to Case BAU1-MM



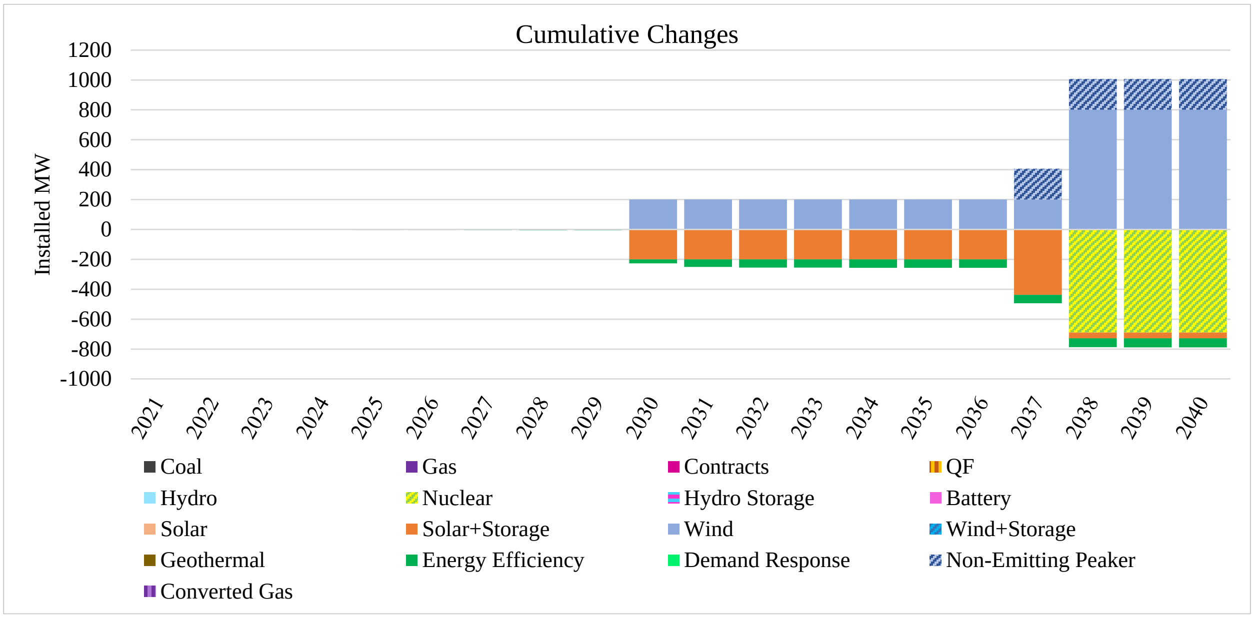
Low Load Growth Sensitivity (S-02)

Table S.12 shows the PVRR impacts of the S-02 sensitivity relative to BAU1-MM. The reduced loads lower system costs significantly over the 20-year study period. Figure S.10 summarizes portfolio impacts. 200 MW of solar and storage resources in 2030 was replaced with less expensive wind without storage. Additionally, 2037 and 2038 resource additions shifted from 1,000 MW nuclear resources to 600 MW wind, an additional 163 MW solar and storage and 206 MW of non-emitting peaker resource. The lower load profile also required 61 MW less energy efficiency. In total this portfolio selected 201 MW fewer resources than the base case. Given reductions primarily in nuclear resources, the lower loads are met by wind and non-emitting peaker additions in years 2038 through 2040. This resulted in lower fuel costs, lower emission costs, and lower market purchases. CO_2 decreased by 24 million tons.

Table S.12 – Risk-Adjusted PVRR (Benefit)/Cost of S-02 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-02**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$25,702	($1,498)

Figure S.10 – Increase/(Decrease) in Nameplate Capacity of S-02 Relative to Case BAU1-MM



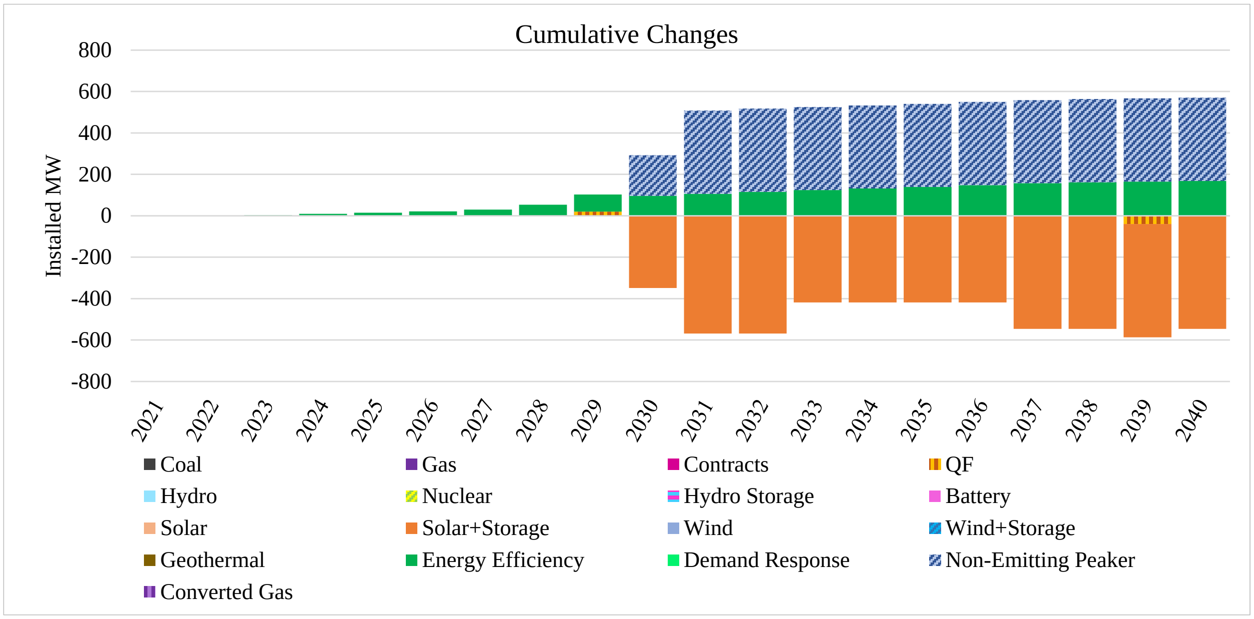
1-in-20 Load Growth Sensitivity (S-03)

Table S.13 shows the PVRR impacts of the S-03 sensitivity relative to BAU1-MM. This sensitivity assumes 1-in-20 extreme weather conditions during the summer (July) for each state. Due to the timing of load spikes, there was a need for resources that could be responsive to peaks at any time. As a result, 2030 and 2031 saw a total of 402 MW of non-emitting peaker resources replacing 569 MW of solar and storage resources. In 2033, an additional 150 MW of solar and storage was selected. Additionally, this led to acceleration of the Central Oregon transmission upgrade and associated solar and storage resources from 2037 to 2030. 168 MW of additional energy efficiency was also selected. The higher 1-in-20 loads are met by increased coal and gas generation, and market purchases. This resulted in higher fuel costs, higher emission costs, and higher market purchases. The CO_2 emissions over the study period increased by 7 million tons.

Table S.13 – Risk-Adjusted PVRR (Benefit)/Cost of S-03 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-03**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$27,404	$204

Figure S.11 – Increase/(Decrease) in Nameplate Capacity of S-03 Relative to Case BAU1-MM



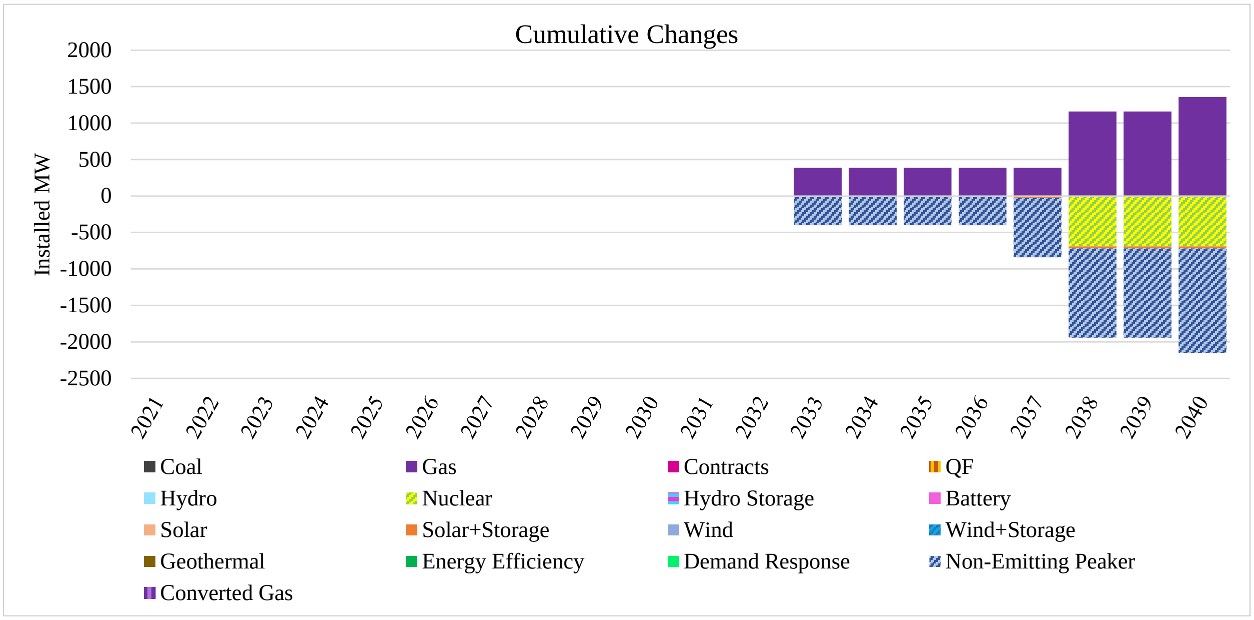
Allowance of Proxy Gas under BAU1-MM (S-04)

Table S.14 shows the PVRR impacts of the S-04 sensitivity relative to BAU1-MM. This sensitivity allowed proxy gas resource selections over the 20-year time frame. **Error! Reference source not found.** summarizes resource portfolio impacts. This sensitivity adds new proxy gas resources beginning in 2033. A total of 1,357 MW of new proxy gas was built in this sensitivity displacing 1,020 MW of non-emitting peaker and 1,000 MW of advanced nuclear. The PVRR decreased as a result of lower cost gas additions. CO_2 emissions in this sensitivity increased by a total of 6 million tons over the 20 years.

Table S.14 – Risk-Adjusted PVRR (Benefit)/Cost of S-04 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-04**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$26,968	($232)

Figure S.12 – Increase/(Decrease) in Nameplate Capacity of S-04 Relative to Case BAU1-MM



Business Plan Sensitivity (S-05)

Table S.15 shows the PVRR impacts of the S-05 sensitivity relative to BAU1-MM. System costs increase by $553m. This sensitivity complies with Utah requirements to perform a business plan sensitivity consistent with the Public Service Commission of Utah's order in Docket No. 15-035-04, summarized as follows:

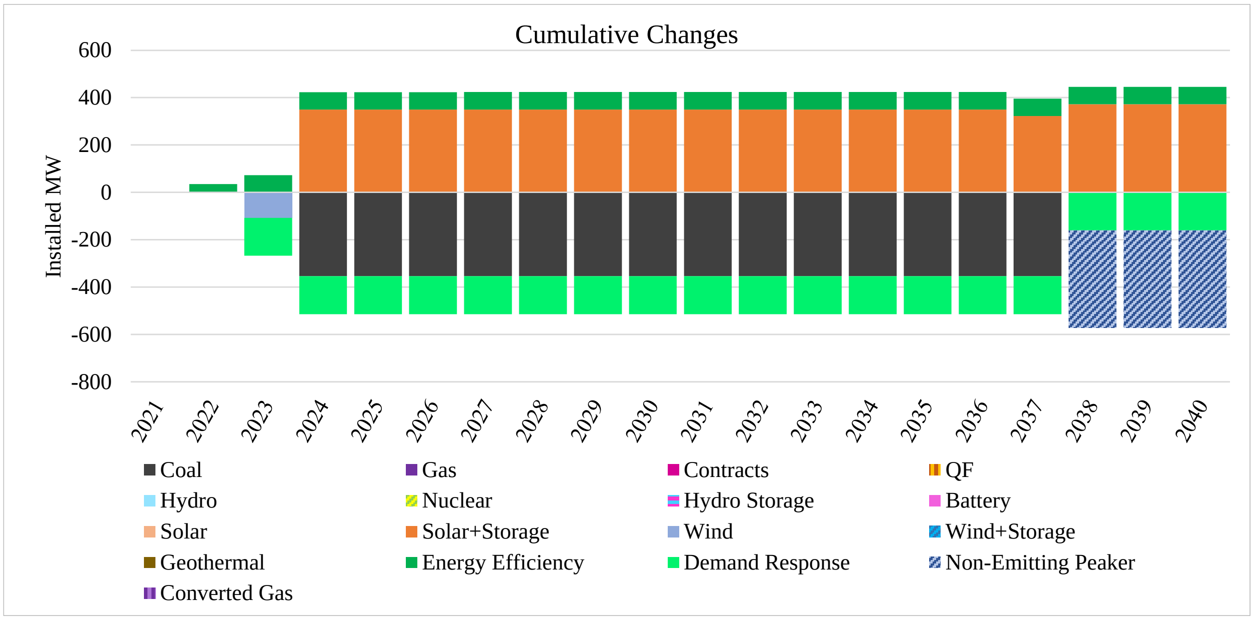
- Over the first three years, resources align with those assumed in PacifiCorp's December 2020 Business Plan.
- Beyond the first three years of the study period, unit retirement assumptions are aligned with the preferred portfolio.
- All other resources are optimized.

Figure S.13 summarizes portfolio impacts, driven by the business plan assumption of Jim Bridger unit 1 retirement at the end of 2023. In contrast, the preferred portfolio assumes Jim Bridger 1 ceases coal-fired operations and converts to gas-fired operations at year-end 2023. In the business plan, the acquisition and repowering of 43 MW of Foote Creek II-IV wind is accelerated into the 3-year business plan window, year 2023. A single 151 MW RFP final short list wind resource shifts its online date from 2023 to 2024. Also, in the first 3 years, 42 MW of incremental DSM is added in accordance with the business plan. Over the 20-year study period, under the business plan solar and storage resource selections increase 300 MW and DSM additions increase to 74 MW. CO_2 emissions over the study period decreased by 11 million tons.

Table S.15 – Risk-Adjusted PVRR (Benefit)/Cost of S-05 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-05**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$27,753	$553

Figure S.13 – Increase/(Decrease) in Nameplate Capacity of S-05 Relative to Case BAU1-MM



LCOE Energy Efficiency (S-06)

The levelized cost of energy (LCOE) energy efficiency sensitivity reflects a change in the bundling of energy efficiency to align with the bundling process used in the 2019 IRP. The balance of the portfolio remained largely the same.

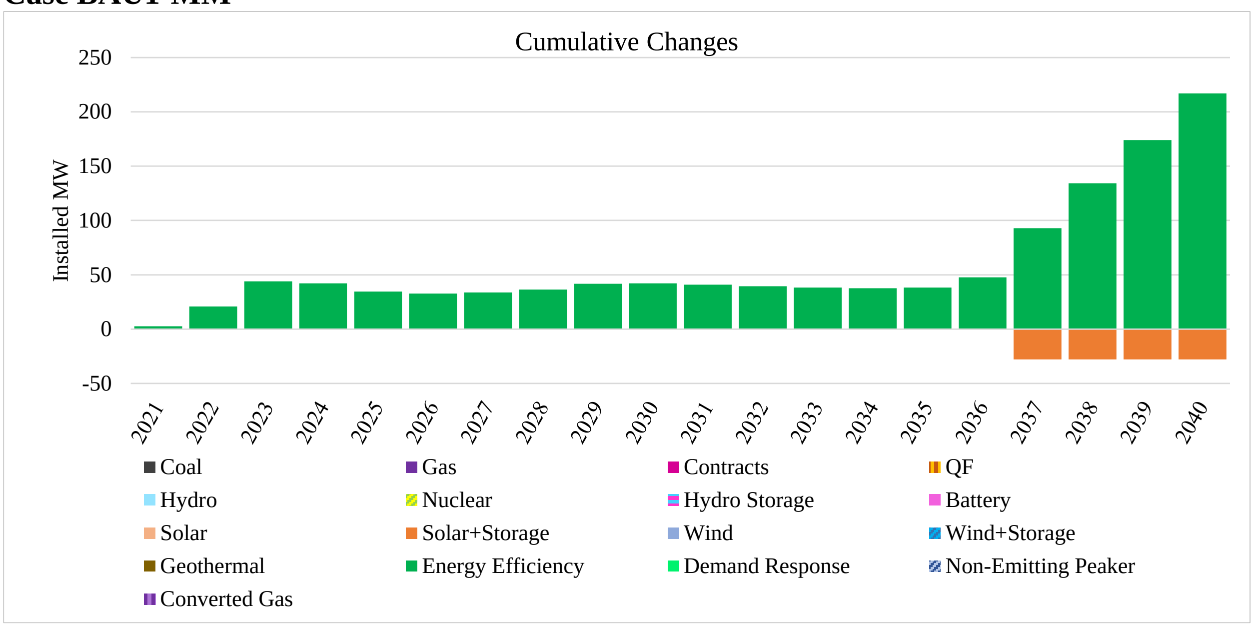
The Net Cost of Capacity (NCOC) methodology used in the 2021 IRP differentiates between measures based on the timing of their load reductions. Specifically, the energy value and capacity contribution of each measure was estimated based on its hourly load savings. After subtracting the energy value from the measure cost, the resulting net cost is divided by the capacity contribution, to produce the net cost of capacity value for the measure. Measures with more energy savings during expensive periods will have higher energy value and a lower net cost. Measures with more energy savings during periods with a risk of loss of load events will have a higher capacity contribution, and a lower net cost. To allow for additional targeting of specific system needs, separate Net Cost of Capacity bundles were created for three distinct categories: winter measures, weather-sensitive summer measures, and everything else, consisting of summer and annual measures that were not weather sensitive. Each measure was bundled with measures in the same category and with a similar net cost of capacity values. In contrast, under the LCOE bundling methodology, measures are bundled strictly based on their levelized cost of energy, which is independent of the timing of the reduction in load and energy and capacity benefits to the system. Note that the modeled cost of measures is not impacted by the bundling strategy, as both the energy and capacity values are ultimately determined in the modeled results. While the same measure cost is modeled under both methodologies, the totals within each bundle vary as individual measures move around.

Table S.16 shows the PVRR impacts of the S-06 sensitivity relative to BAU1-MM. This sensitivity results in a total cumulative increase of 217 MW of selected energy efficiency through the 20-year study period. This represents a 5.4% increase in energy efficiency selections, and the energy efficiency generation compare indicates that the LCOE portfolio reports 10 percent more energy from energy efficiency than the BAU1-MM case. This highlights the fact that the NCOC bundles are more targeted towards the specific resource needs of PacifiCorp customers. The LCOE portfolio results in higher energy efficiency and higher system costs due to the energy efficiency selections being less targeted to resource needs than the NCOC approach used in the preferred portfolio. 28 MW of solar and storage was not selected in this study in 2037. CO_2 emissions over the study period increased by 1.1 million tons.

Table S.16 – Risk-Adjusted PVRR (Benefit)/Cost of S-06 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-06**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$28,030	$830

Figure S.14 – Increase/(Decrease) in Nameplate Capacity of S-06 Relative to Case BAU1-MM



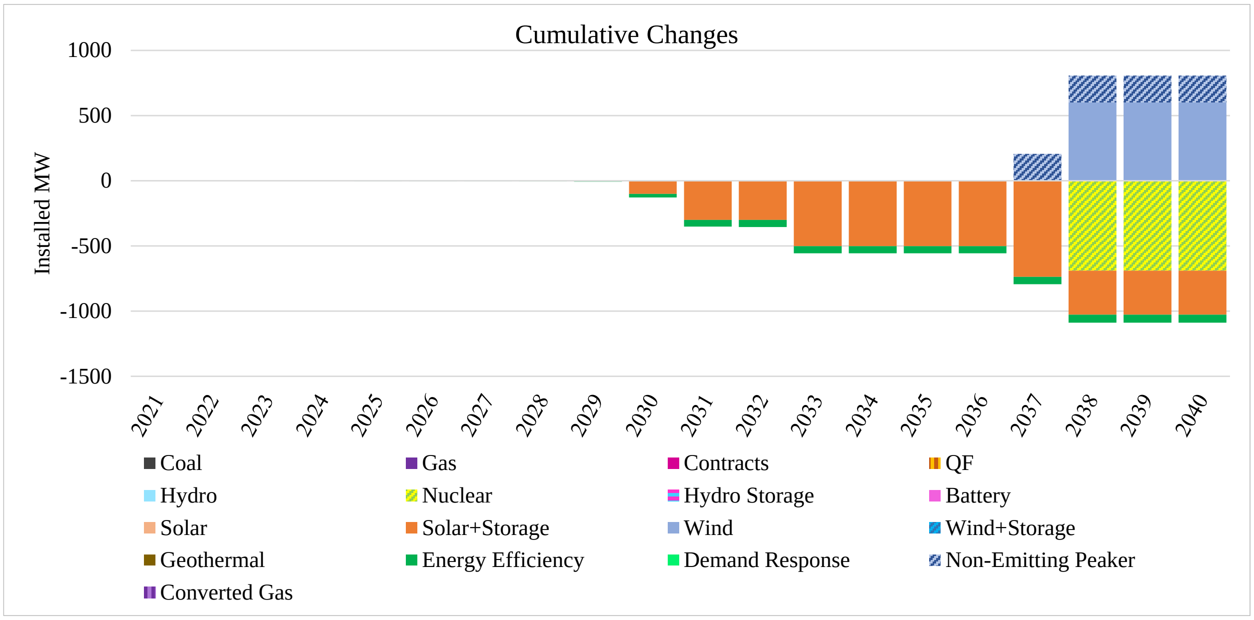
High Private Generation Sensitivity (S-07)

Table S.17 shows the PVRR impacts of the S-07 sensitivity relative to BAU1-MM. The higher private generation assumptions decrease net load, which in turn decreases system costs. Figure S.15 summarizes portfolio impacts. In this scenario, 61 MW less energy efficiency was selected over the 20-year period. Additionally, a total of 500 MW fewer solar and storage resources were built in 2030, 2031 and 2033. In 2037, 206 MW of non-emitting peaker are offset by 236 MW of solar and storage resource reductions. At coal retirements in 2038 the model replaced 1,000 MW of advanced nuclear resources with 600 MW wind and 400 MW non-emitting peaker resources. The higher private generation resulted in lower net loads, decreasing system costs. CO_2 emissions over the study period increased by 5 million tons.

Table S.17 – Risk-Adjusted PVRR (Benefit)/Cost of S-07 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-07**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$26,690	($510)

Figure S.15 – Increase/(Decrease) in Nameplate Capacity of S-07 Relative to Case BAU1-MM



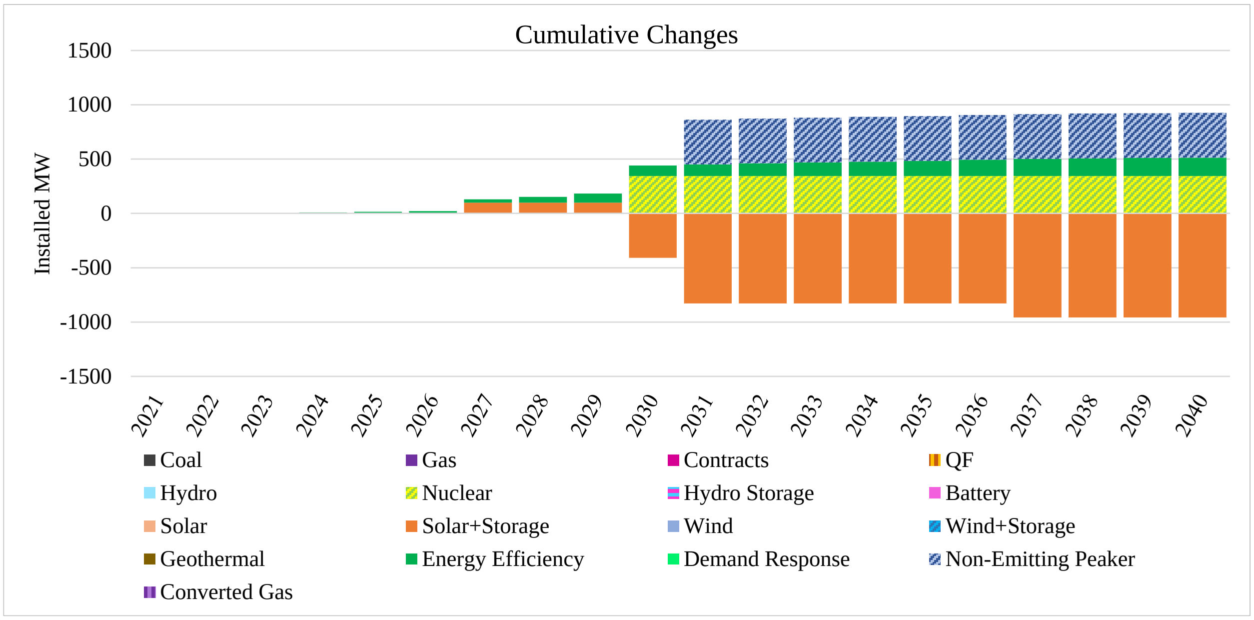
Low Private Generation Sensitivity (S-08)

Table S.18 shows the PVRR impacts of the S-08 sensitivity relative to BAU1-MM. Due to the reduction in private generation and the need for higher generation and energy 500 MW of solar and storage was replaced with 500 MW of advanced nuclear in 2030. Additionally, the Central Oregon transmission upgrade and associated solar and storage resource was accelerated from 2037 to 2027. The model also selected 412 MW of non-emitting peaker resource in 2031 in place of 420 MW of solar and storage resources. 168 MW of additional energy efficiency was selected over 20-years. Lower private generation resulted in higher net loads, increasing system costs. CO_2 emissions over the study period decreased by 1 million tons.

Table S.18 – Risk-Adjusted PVRR (Benefit)/Cost of S-08 vs. BAU1-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU1-MM	**S-08**	**(Benefit) / Cost Relative to BAU1-MM**
$27,200	$27,424	$224

Figure S.16 – Increase/(Decrease) in Nameplate Capacity of S-08 Relative to Case BAU1-MM



BAU2 Sensitivity Cases (2019 IRP coal retirements)

Each sensitivity was run under the BAU2 case definitions with coal retirements approximating those from the 2019 IRP preferred portfolio. Table S.19 reports the definitions and PVRR of each case.

Table S.19 – Summary of Additional BAU2 Sensitivity Cases

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

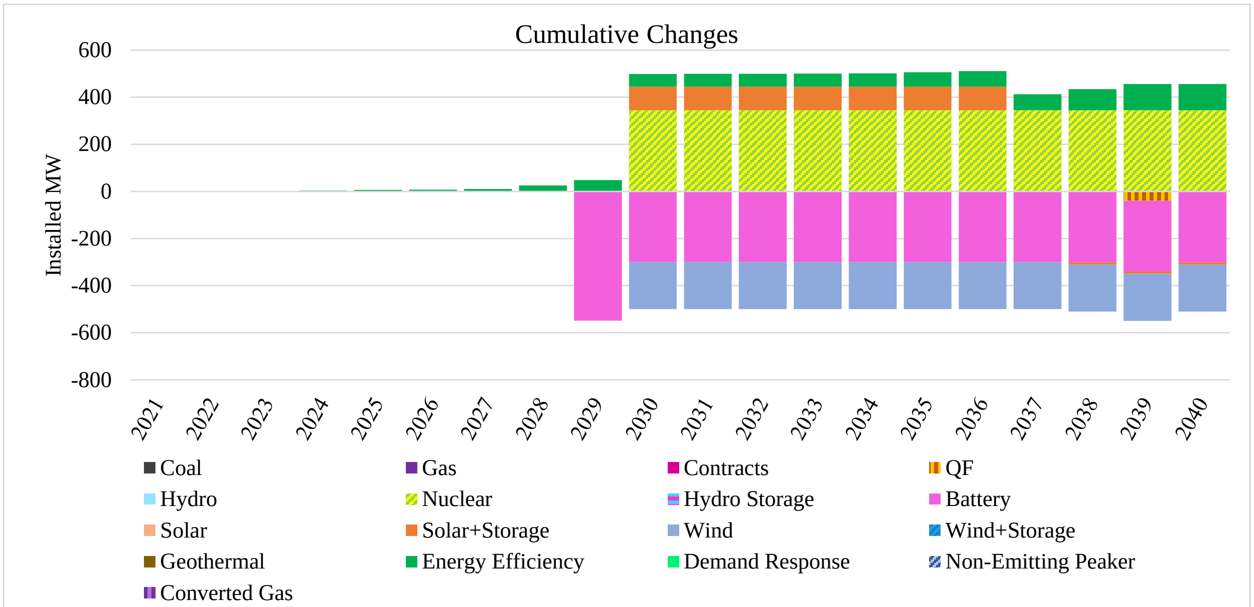
High Load Growth Sensitivity (S-01)

Table S.20 shows the PVRR impacts of the S-01 sensitivity relative to BAU2-MM. Due to the higher load profile, an additional 111 MW of energy efficiency was selected over the 20 years. The need for higher energy resources led to the selection of 500 MW of advanced nuclear resource in 2030 instead of 200 MW of wind and 300 MW of standalone battery. The higher loads necessitated the acceleration of the Central Oregon transmission upgrade and solar and storage resources from 2037 to 2030. The higher loads are met by nuclear, solar and storage, increased thermal output, and market purchases. This resulted in higher fuel costs, higher emission costs, and higher market purchases. The CO_2 emissions over the study period increased by 10 million.

Table S.20 – Risk-Adjusted PVRR (Benefit)/Cost of S-01 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU2-MM	**S-01**	**(Benefit) / Cost Relative to BAU2-MM**
$27,054	$28,393	$1,339

Figure S.17 – Increase/(Decrease) in Nameplate Capacity of S-01 Relative to Case BAU2-MM



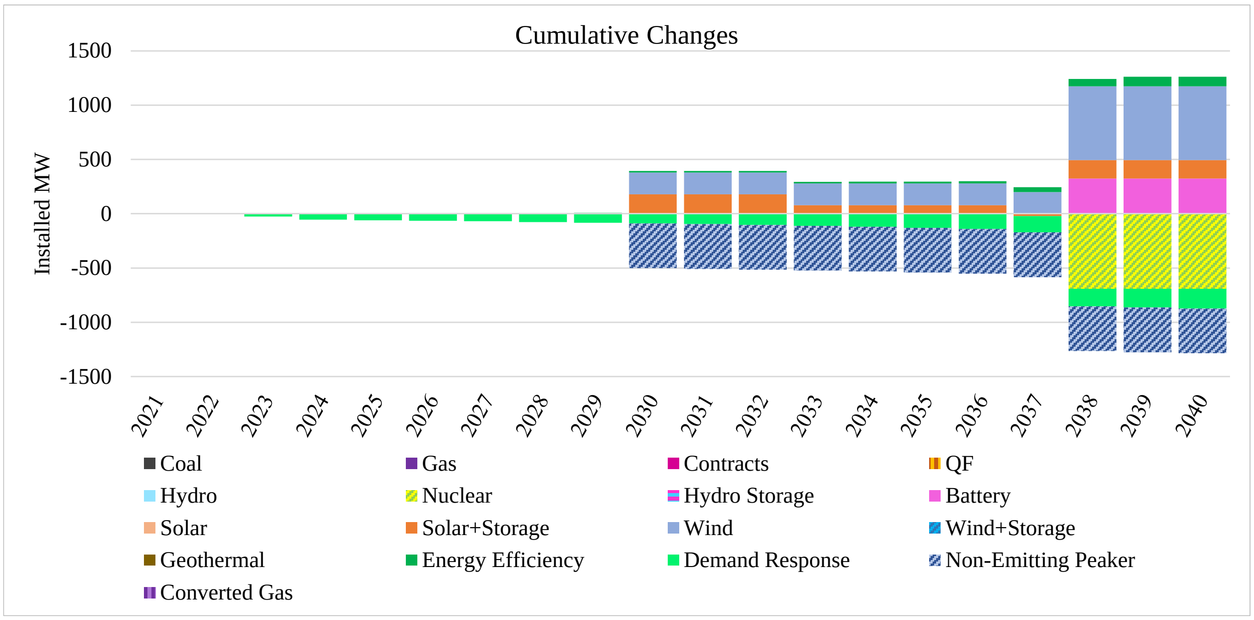
Low Load Growth Sensitivity (S-02)

Table S.21 shows the PVRR impacts of the S-02 sensitivity relative to BAU2-MM. In the low load sensitivity, the lower energy need meant that 412 MW of non-emitting peaker was replaced by 200 MW of wind and 179 MW solar and storage in 2030. 100 MW less solar and storage was built in both 2033 and 2037. Additionally, 2038 resource additions shifted from 1,000 MW of advanced nuclear resources to 480 MW wind, an additional 190 MW solar and storage and 325 MW standalone battery. The lower load profile also resulted in 183 MW fewer Demand Response selections which were partly offset by 88 MW more of energy efficiency. Given reductions in nuclear, non-emitting peaker resources and demand-side management, the lower loads are met by incremental solar and storage, wind, and energy efficiency in years 2038 through 2040. This resulted in lower fuel costs, lower emission costs, and lower market purchases. CO_2 decreased by 30 million tons

Table S.21 – Risk-Adjusted PVRR (Benefit)/Cost of S-02 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU2-MM	**S-02**	**(Benefit) / Cost Relative to BAU2-MM**
$27,054	$25,495	($1,559)

Figure S.18 – Increase/(Decrease) in Nameplate Capacity of S-02 Relative to Case BAU2-MM



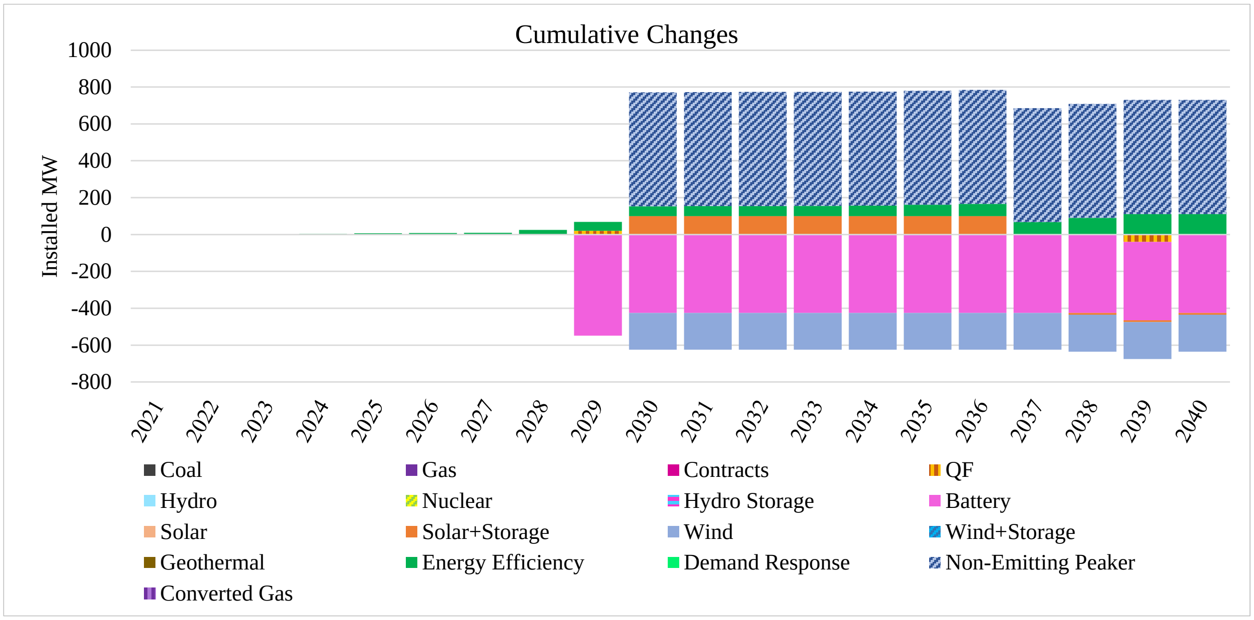
1-in-20 Load Growth Sensitivity (S-03)

Table S.22 shows the PVRR impacts of the S-03 sensitivity relative to BAU2-MM. This sensitivity assumes 1-in-20 extreme weather conditions during the summer (July) for each state. Due to the timing of load spikes, there was a need for resources that could be responsive to peaks at any time. As a result, in 2030, 618 MW of non-emitting peaker resources replaced 200 MW of wind and 425 MW standalone battery. Additionally, this led to acceleration of the Central Oregon transmission upgrade and associated solar and storage resources from 2037 to 2030. 111 MW of additional energy efficiency was also selected. The 1-in-20 loads are met by higher system costs. CO_2 emissions increased by 4 million tons.

Table S.22 – Risk-Adjusted PVRR (Benefit)/Cost of S-03 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU2-MM	**S-03**	**(Benefit) / Cost Relative to BAU2-MM**
$27,054	$27,394	$340

Figure S.19 – Increase/(Decrease) in Nameplate Capacity of S-03 Relative to Case BAU2-MM



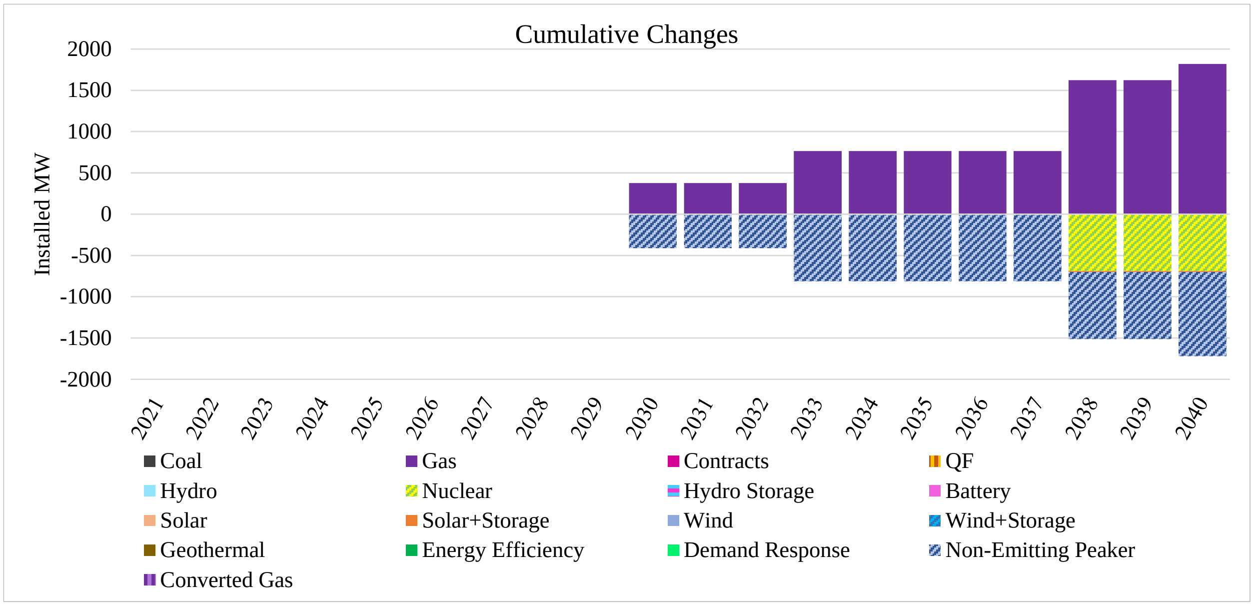
Allowance of Proxy Gas under BAU2-MM (S-04)

Table S.23 shows the PVRR impacts of the S-04 sensitivity relative to BAU2-MM. This sensitivity allowed proxy gas resource selections over the 20-year time frame. **Error! Reference source not found.** summarizes resource portfolio impacts. This sensitivity added new proxy gas resources beginning in 2030. A total of 1,821 MW of new proxy gas was built in this sensitivity. These resources displaced 1,020 MW of non-emitting peaker resources and 1,000 MW of advanced nuclear. The PVRR decreased as a result of lower cost gas additions. CO2 emissions in this sensitivity increased by a total of 6 million tons over the 20 years.

Table S.23 – Risk-Adjusted PVRR (Benefit)/Cost of S-04 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU2-MM	**S-04**	**(Benefit) / Cost Relative to BAU2-MM**
$27,054	$26,970	($84)

Figure S.20 – Increase/(Decrease) in Nameplate Capacity of S-04 Relative to Case BAU2-MM



Business Plan Sensitivity (S-05)

Table S.24 shows the PVRR impacts of the S-05 sensitivity relative to BAU2-MM. System costs increase by $724m. This sensitivity complies with Utah requirements to perform a business plan sensitivity consistent with the Public Service Commission of Utah's order in Docket No. 15-035-04, summarized as follows:

- Over the first three years, resources align with those assumed in PacifiCorp's December 2020 Business Plan.
- Beyond the first three years of the study period, unit retirement assumptions are aligned with BAU2 base case assumptions.
- All other resources are optimized.

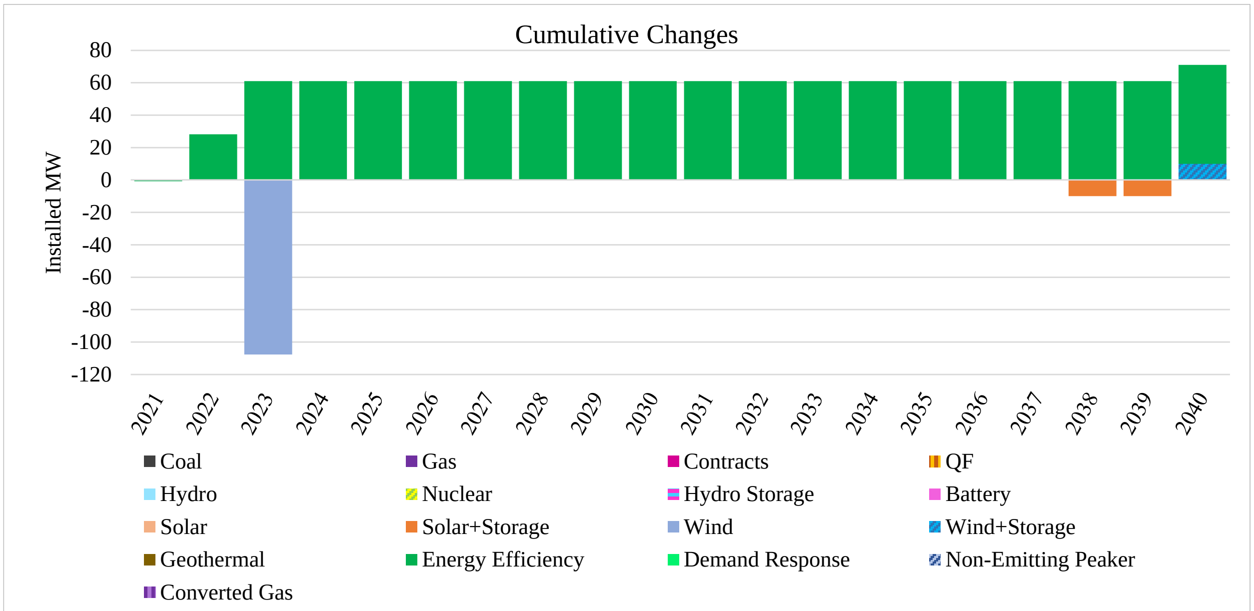
Figure S.21 summarizes portfolio impacts, driven by the business plan assumption of Jim Bridger unit 1 retirement at the end of 2023. In contrast, the preferred portfolio assumes Jim Bridger 1 ceases coal-fired operations and converts to gas-fired operations at year-end 2023. In the business plan, the acquisition and repowering of 43 MW of Foote Creek II-IV wind is accelerated into the 3-year business plan window, year 2023. A single 151 MW RFP final short list wind resource shifts its online date from 2023 to 2024. Also, in the first 3 years, 42 MW of incremental demand-side management is added in accordance with the business plan. Over the 20-year study period, under the business plan 10 MW of solar and storage was replaced with hybrid solar and storage plus wind resource in 2040. Also, over the 20-year window, demand-side management additions increase to 61 MW. CO_2 emissions over the study period decreased by 2 million tons.

Table S.24 – Risk-Adjusted PVRR (Benefit)/Cost of S-05 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)

BAU2-MM	S-05	(Benefit) / Cost Relative to BAU2-MM
$27,054	$27,778	$724

Figure S.21 – Increase/(Decrease) in Nameplate Capacity of S-05 Relative to Case BAU2-MM



LCOE Energy Efficiency (S-06)

The levelized cost of energy (LCOE) energy efficiency sensitivity reflects a change in the bundling of energy efficiency to align with the bundling process used in the 2019 IRP. The balance of the portfolio remained largely the same.

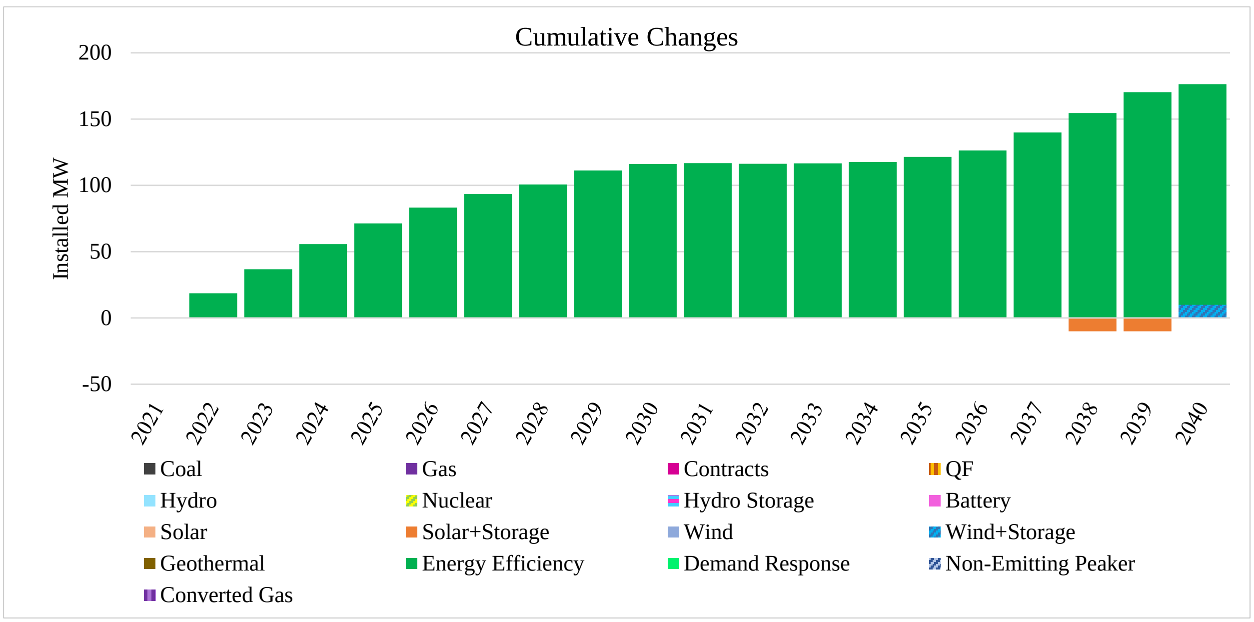
The Net Cost of Capacity (NCOC) methodology used in the 2021 IRP differentiates between measures based on the timing of their load reductions. Specifically, the energy value and capacity contribution of each measure was estimated based on its hourly load savings. After subtracting the energy value from the measure cost, the resulting net cost is divided by the capacity contribution, to produce the net cost of capacity value for the measure. Measures with more energy savings during expensive periods will have higher energy value and a lower net cost. Measures with more energy savings during periods with a risk of loss of load events will have a higher capacity contribution, and a lower net cost. To allow for additional targeting of specific system needs, separate Net Cost of Capacity bundles were created for three distinct categories: winter measures, weather-sensitive summer measures, and everything else, consisting of summer and annual measures that were not weather sensitive. Each measure was bundled with measures in the same category and with a similar net cost of capacity values. In contrast, under the LCOE bundling methodology, measures are bundled strictly based on their levelized cost of energy, which is independent of the timing of the reduction in load and energy and capacity benefits to the system. Note that the modeled cost of measures is not impacted by the bundling strategy, as both the energy and capacity values are ultimately determined in the modeled results. While the same measure cost is modeled under both methodologies, the totals within each bundle vary as individual measures move around.

Table S.25 shows the PVRR impacts of the S-06 sensitivity relative to BAU2-MM. In 2040, 10 MW of solar and storage is replaced by 10 MW of the hybrid solar and storage plus wind resource. This sensitivity results in a total cumulative increase of 166 MW of selected energy efficiency through the 20-year study period. This represents a 4.1% increase in energy efficiency selections, and the energy efficiency generation compare indicates that the LCOE portfolio reports 29% more energy from energy efficiency than the BAU2-MM case. This highlights the fact that the NCOC bundles are more targeted towards our specific resource needs. The LCOE portfolio results in higher energy efficiency and higher system costs due to the energy efficiency selections being less targeted to resource needs than the NCOC approach used in the preferred portfolio. The CO_2 emissions over the study period decreased by 9 million tons.

Table S.25 – Risk-Adjusted PVRR (Benefit)/Cost of S-06 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU2-MM	**S-06**	**(Benefit) / Cost Relative to BAU2-MM**
$27,054	$27,268	$214

Figure S.22 – Increase/(Decrease) in Nameplate Capacity of S-06 Relative to Case BAU2-MM



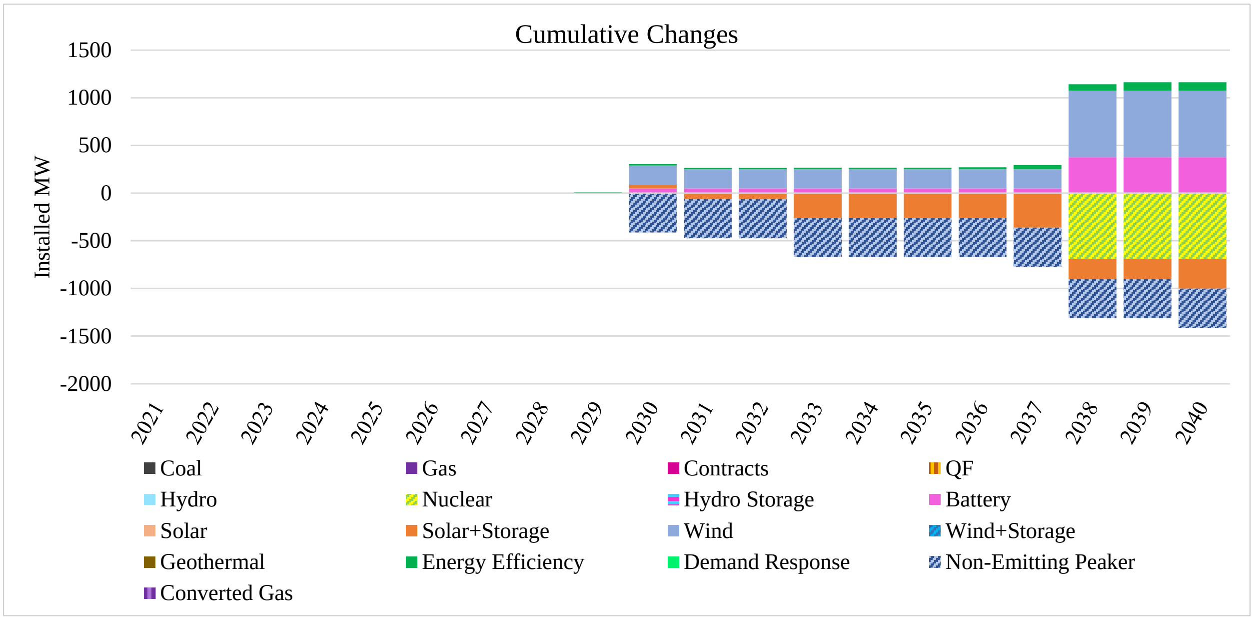
High Private Generation Sensitivity (S-07)

Table S.26 shows the PVRR impacts of the S-07 sensitivity relative to BAU2-MM. The higher private generation assumptions decrease net load, which in turn decreases system costs. Figure S.23 summarizes portfolio impacts. Overall resource selections were lower. However, in this scenario, 88 MW of additional energy efficiency was selected over the 20-year period. In 2030, 412 MW of peaker resource was replaced by 200 MW of wind, 140 MW solar and storage and 50 MW of standalone battery. In total, 400 MW fewer solar and storage resources were built in 2031, 2033, 2037 and 2040. In 2038, 1,000 MW of advanced nuclear resources were replaced with 500 MW wind, 160 MW of solar and storage and 325 MW of standalone storage. The higher private generation resulted in lower net loads, decreasing system costs. CO_2 emissions in this sensitivity decreased by a total of 4 million tons over the 20 years.

Table S.26 – Risk-Adjusted PVRR (Benefit)/Cost of S-07 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU2-MM	**S-07**	**(Benefit) / Cost Relative to BAU2-MM**
$27,054	$26,507	($547)

Figure S.23 – Increase/(Decrease) in Nameplate Capacity of S-07 Relative to Case BAU2-MM



Low Private Generation Sensitivity (S-08)

Table S.27 shows the PVRR impacts of the S-08 sensitivity relative to BAU2-MM. Figure S.24 summarizes portfolio impacts. An additional 500 MW of advanced nuclear resource was selected in 2030. Additionally, the Central Oregon transmission upgrade and associated solar and storage resource was accelerated from 2037 to 2027. 111 MW of additional energy efficiency was selected over 20 years. The lower private generation assumption result in higher net loads, increasing system costs. CO_2 emissions decreased by 13 million tons.

Table S.27 – Risk-Adjusted PVRR (Benefit)/Cost of S-08 vs. BAU2-MM

Medium Gas - Medium CO_2 ($ Million)		
BAU2-MM	**S-08**	**(Benefit) / Cost Relative to BAU2-MM**
$27,054	$27,598	$544

Figure S.24 – Increase/(Decrease) in Nameplate Capacity of S-08 Relative to Case BAU2-MM