Economic Opportunities from PacifiCorp's Clean Energy Investments in Utah and Wyoming

Prepared for Sierra Club

An analysis of the economic impacts of PacifiCorp's energy transition in Utah and Wyoming, comparing job growth, economic output, and fiscal contributions across three distinct energy resource portfolios.

March 2025

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1. Executive Summary

Electric utilities, such as PacifiCorp (and its subsidiary Rocky Mountain Power), invest billions of dollars each year in the infrastructure necessary to reliably generate and deliver power to their customers. The economic impacts of these investment choices are far reaching. Renewable energy and battery storage investments represent a unique opportunity to drive economic growth while minimizing future fuel-related risks and other costs to electricity customers. Higher deployment of these clean energy resources can drive significant job growth particularly during the project construction phase but also over the long-term from operations and maintenance. Meanwhile, existing coal and gas generation resources also contribute to ongoing employment. However, as many of these facilities age, they are increasingly uneconomic to operate, and their owners have sought to identify optimal retirement schedules in parallel with replacement resource additions. These transitions bring significant economic considerations, including the creation of significant new jobs and tax revenue in the clean energy sector that also coincides with potentially declining employment and tax revenue associated with coal and gas fired power plants as those facilities are phased out.

This study assesses some of these impacts and tradeoffs from PacifiCorp's future investment decisions in its electricity generation resource portfolio. The study focuses specifically on Utah and Wyoming, which are key components of PacifiCorp's "East" region. Using the IMPLAN software platform, Current Energy Group performed a holistic economic impact analysis of several viable resource portfolio options developed by PacifiCorp through its 2023 Integrated Resource Planning process. The analysis quantifies the beneficial impacts of potential clean energy investments, as well as the challenges associated with workforce transitions from existing coal resources as they are displaced.

CEG's analysis compared a "High Renewables" investment plan (based on PacifiCorp's initial 2023 IRP preferred portfolio) to a "Low Renewables" plan (based on PacifiCorp's April 2024 Update to its 2023 IRP).[1] This analysis found that during the planning horizon, from 2024 to 2042, PacifiCorp's clean energy resource additions under the High Renewables plan are projected to generate approximately 39,456 job-years in Utah and 17,533 job-years in Wyoming. For comparison, the Low Renewables plan is estimated to create 20,525 job-years in Utah and 7,600 job-years in Wyoming.

Meanwhile, the High Renewables plan includes accelerated retirement dates for certain coal-fired power plants relative to the Low Renewables plan. These earlier retirements are estimated to result in a net loss of approximately 10,487 job-years in Utah and 536 job-years in Wyoming.

[1] In this instance, the "high renewables" plan refers to the High Renewables plan as defined in Section 3 rather than the High Renewables – UT/WY Focus plan.

Combining the effects of both the clean energy additions and the accelerated plant retirements, the net impact of the High Renewables plan is an overall increase of 18,247 job-years relative to the Low Renewables plan. These results are summarized in the table below.

Table 1. Comparison of Jobs Impact for the Low and High Renewable Energy Plans

Resource	**Low Renewables Plan**	**High Renewables Plan**	**Difference in Job-years Created (High vs. Low RE Plan)**
Renewable Energy	Additions: 5,449 MW wind 3,377 MW solar	Additions: 6,663 MW wind 6,238 MW solar	+23,355 increase in job-years under High RE Plan
Energy Storage	2,136 MW	4,443 MW	+5,509 increase in job-years under High RE Plan
Coal Retirements	663 MW retired by 2034; 2170 MW retired by 2042	Accelerated retirement at: Jim Bridger Units 3-4, Huntington 1-2, Hunter 1-3	-11,023 decrease in job-years under High RE Plan
Coal to Gas Conversions	Jim Bridger units 1-2 and Naughton 1-2 convert to gas	Jim Bridger units 1-4, and Naughton units 1-3 convert to gas	+406 increase in job-years under High RE Plan
Total	--	--	+18,247 increase in job-years under High RE Plan

In addition to employment impacts, this study also quantifies the tax implications of each portfolio. While additional build out of renewable generation ultimately results in significant incremental tax revenue for the state, this is offset by a reduction in tax revenue from retiring coal resources. We estimate that the incremental tax revenue from renewables is close to -- or may even exceed -- this reduction depending on the amount and location of resources deployed. For instance, the High Renewable plan generates $385,657,173 in state taxes, which equates to approximately 88% of the state tax revenue generated under the Low Renewables plan. Meanwhile, the High Renewables plan with focused deployment in Utah and Wyoming generates more than both other plans, generating an estimated $492,854,354 in revenues (a 12% increase versus the Low Renewables plan).

These findings are worth considering as stakeholders evaluate PacifiCorp's recently released draft 2025 IRP. The draft 2025 IRP proposes fewer renewable energy additions than even the Low Renewables plan, signaling a shift away from the higher renewable development strategies analyzed here and shown to be beneficial.

2. Introduction

2.1 Background

PacifiCorp (Rocky Mountain Power) initially released its 2023 Integrated Resource Plan ("2023 IRP") in March 2023. The 2023 IRP included a planned generation portfolio with significant investments in battery storage, solar, and wind resources in the coming decades, as well as planned retirement dates for several aging coal power plants. Many of the new investments and retirements would occur in the Eastern region of PacifiCorp's system (which includes Utah and Wyoming). However, the update to PacifiCorp's 2023 IRP ("2023 IRP Update") released in April 2024 significantly reduced the scale of the initially proposed renewables investments. Aside from reducing the 2023 IRP's level of investment in battery storage, wind and solar capacity, the 2023 IRP Update also delayed many coal plant retirements. PacifiCorp has since released a draft of its 2025 Integrated Resource Planning ("2025 IRP Draft") on December 31, 2024, which delayed the retirement of numerous coal plants even further and includes a preferred generation portfolio that has many similarities to the 2023 IRP Update.

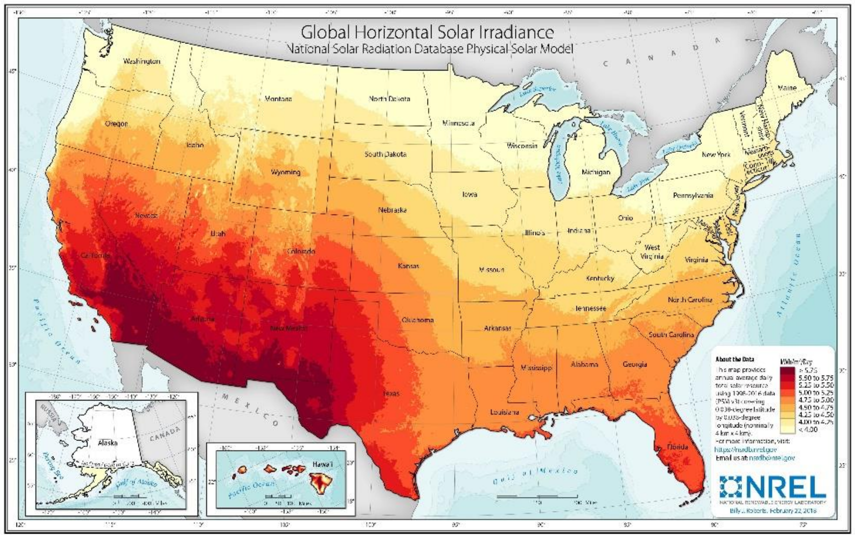
2.1.1 Utah

Utah contains a diverse energy landscape and evolving portfolio aimed at meeting the state's grid resiliency and growing energy consumption needs, with a focus on new resources including geothermal systems, hydrogen, small nuclear reactors, and carbon capture and storage.[2] In 2023, Utah's electricity generation portfolio was comprised of 47 percent coal, 36 percent natural gas, and 17 percent renewables, with ongoing upward trends for renewable and natural gas contributions since 2000.[3]

Utah is particularly suitable for solar energy development due to its high solar irradiance. The National Renewable Energy Laboratory (NREL) provides detailed solar resource maps indicating that visualize Utah's substantial solar radiation, seen below in Figure 1. Additionally, Utah's arid climate and vast open spaces foster logistically accessible land for solar development.

[2] "Utah's Energy Resources," Utah Office of Energy Development, accessed Jan. 3, 2025, https://energy.utah.gov/homepage/about/utah-energy-resources/
[3] *Ibid.*

Figure 1: U.S. Annual Solar Global Horizontal Irradiance (GHI)[4]



Over 60 percent of the state's land is owned by the federal government, with many leases dedicated to producing crude oil and natural gas.[5] The state's economy is primarily service-oriented, with the biggest contributors being the finance, insurance, and real estate industries. [6] The state is a net exporter of electricity to other states.

2.1.2 Wyoming

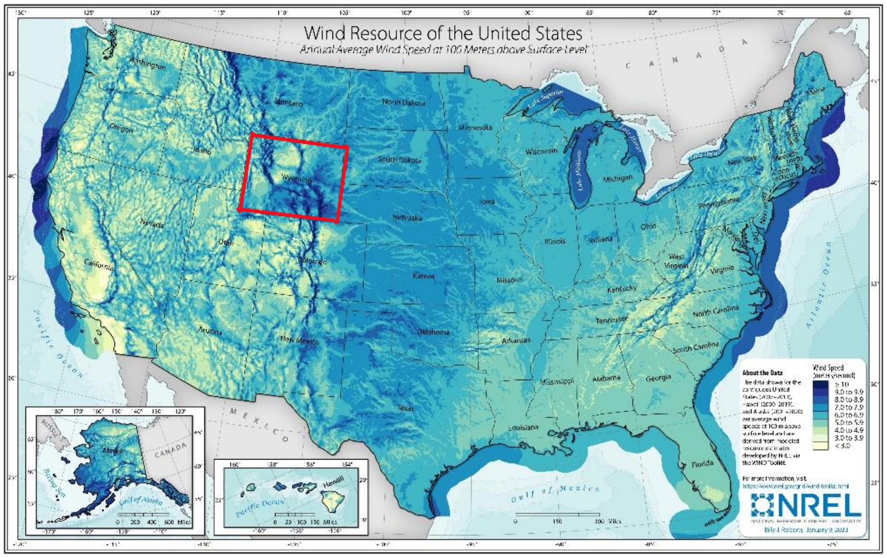
Wyoming has the smallest population of any U.S. state and produces twelve times more energy than it consumes; it is the third largest net energy supplier after Texas and Pennsylvania, as well as the country's largest coal producing state. The largest industries in the state are oil drilling and gas extraction, coal mining, and petroleum refining, which produced $16.0B, $4.0B, and $3.3B in 2024 respectively. [7]

Wyoming contains ten major coal fields and eight of the largest coal mines in the U.S. In 2023, coal-fired power plants produced about 71 percent of Wyoming's total electricity portfolio. Wind power provided 21 percent of the state's generation, with the remaining generation being a combination of natural gas-fired units, hydroelectric facilities, generators fueled by other gases, and solar power. While Wyoming does not currently have any nuclear power generation, PacifiCorp and

[4] National Renewable Energy Laboratory, Solar Resource Maps and Data, Accessed January 21, 2025. https://www.nrel.gov/gis/solar-resource-maps
[5] U.S. Department of the Interior, Bureau of Land Management, Public Land Statistics 2022 (June 2023), Table 3-17, Continuing Oil, Gas, and Geothermal Activities on Federal Lands as of September 30, 2022 (p. 111-112).
[6] U.S. Bureau of Economic Analysis, Interactive Data, Regional Data, GDP and Personal Income, Annual Gross Domestic Product (GDP) by State, SAGDP2, GDP in current dollars, Utah, All statistics in table, Utah, 2023.
[7] "Wyoming - State Economic Profile," IBISWorld, 2024, https://www.ibisworld.com/united-states/economic-profiles/wyoming/

other entities have been actively seeking to develop a new nuclear power plant in the state with commercial operation planned for the 2030s. [8] [9]

Figure 2: U.S. Wind Power Resource at 100-Meter Hub Height (Wyoming Outlined)[10]



Wyoming is exceptionally suited for wind energy development due to its high-altitude prairies and ridges, which contribute to high wind potential. NREL has identified numerous vast areas within the state with significant wind resources at 50-meter hub heights, categorized as "excellent-to-superb" throughout the southeastern portion of the state.[11] Additionally, like Utah, Wyoming's expansive open spaces facilitate the installation of large-scale developments throughout the state.

2.2 Study Objectives

Sierra Club contracted Current Energy Group to analyze the broad economic impacts to Utah and Wyoming of different levels of future investment in clean energy resources (e.g. wind, solar, batteries) on PacifiCorp's system. The analysis presented in this report includes an economy-wide assessment of the jobs created and lost under each investment strategy, as well as impacts on state tax revenue and other factors. A more detailed description of these key metrics assessed is provided below in Section 3.

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[8] U.S. Department of Energy, "Next-Gen Nuclear Plant and Jobs Are Coming to Wyoming," Press Release (November 16, 2021).
[9] "TerraPower Begins Construction on Advanced Nuclear Project in Wyoming," TerraPower, 2024, https://www.terrapower.com/terrapower-begins-construction-in-wyoming
[10] Wind Energy Technologies Office, "U.S. Wind Power Resource at 100-Meter Hub Height," https://windexchange.energy.gov/maps-data/324
[11] Office of Energy Efficiency and Renewable Energy, Wyoming 50-meter community-scale wind resource map, accessed January 22, 2025. https://windexchange.energy.gov/maps-data/143

In conducting this analysis, CEG also sought to illustrate the impact of PacifiCorp's shift in investment strategy from a "high renewables" future, much like the original 2023 IRP, towards a "low renewables" strategy, like the 2023 IRP Update and now, the 2025 Draft IRP. Additionally, CEG further analyzed a portfolio with even greater amounts of renewable energy targeted towards PacifiCorp's East region (i.e., UT and WY). A more detailed description of the portfolios modeled is provided below in Section 3.

3. Methodology Overview

This section is intended to be an overview of the methodology used in this study to estimate the economic impacts of the three portfolios. For transparency and replicability, there is a detailed step-by-step description of the analysis, and its assumptions included as an appendix to this report.

3.1 Portfolios Modeled

CEG quantified the statewide economic impacts (e.g., job creation, labor income, value-added, output, and tax revenue) of different generation resource portfolio investment strategies that could be pursued by PacifiCorp. As a starting point, CEG relied upon pre-existing resource portfolios developed as part of PacifiCorp's 2023 IRP process. PacifiCorp's IRP process results in the development of dozens of different potential resource portfolios and portfolio variants that could serve as an input for further economic analysis. Each of these portfolios includes data and information on the magnitude, type, and timing of resource additions and retirements between 2024 and 2042.

CEG initially selected three of the portfolios developed by PacifiCorp to conduct further economic analysis. Each of these three selected portfolios represents a realistic portfolio for the region. While they include different levels of renewable energy investment, all three were created and modeled by PacifiCorp to reliably meet the utility's projected demand. The three portfolios are summarized below:

- **Low Renewables:** Based on the 2023 IRP Update preferred portfolio; reflects a relatively low renewable buildout while extending the operational years of several coal plants
- **High Renewables:** Based on the original 2023 IRP preferred portfolio; reflects a relatively high renewable buildout while accelerating the retirement of several uneconomic coal plants
- **High Renewables – UT/WY Focus:** Based on the 2023 IRP "Cluster East" portfolio (P18); similar to the High Renewables portfolio but includes additional transmission infrastructure in PacifiCorp's Eastern region, facilitating the integration of significant new renewable capacity.

Additional information about these portfolios is provided in PacifiCorp's definitions as follows:

- 2023 IRP Update preferred portfolio: "The least-cost, least-risk resource portfolio is the portfolio that can be delivered through specific action items at a reasonable cost and with manageable risks while delivering reliable service to customers and ensuring compliance with state and federal regulatory obligations without cost-shifting amongst states for compliance".[12]
- 2023 IRP preferred portfolio (P-MM): "The P-MM case represents a reasonably likely future that assumes medium gas prices and a medium CO2 price proxy for future carbon emissions policy. In this series, coal and natural gas retirement timing is optimized, whereas other existing resources are assumed to operate through end of life; contracts expire at the end of their term. Based on the logic of optimization modeling, P-series cases are expected to perform well compared to other case types within the same price-policy environment assumptions given that the models will have the most latitude to find a low-cost portfolio solution. The P-series of cases includes a unique portfolio developed under each of the five price-policy scenarios".[13]
- 2023 IRP Cluster East (P-18) portfolio.: "This portfolio enables five Clover transmission components associated with Cluster 1, Areas 5, 6, and 7, which includes a prerequisite, and a related transfer capability increase. The portfolio is re-optimized with this transmission expansion to evaluate portfolio impacts, costs and risks".[14]

Capacity installations (MW) by year for each portfolio are outlined in the table below.

Figure 3: Modeled Capacity installations by plan and technology type

Plan	State	Wind (MW)		Solar (MW)		Storage (MW)	
		Additions by 2030	Additions by 2040	Additions by 2030	Additions by 2040	Additions by 2030	Additions by 2040
Low Renewables	Utah	0.0	0.0	1,698.1	3,363.2	1,117.4	2,093.2
	Wyoming	2,001.6	5,449.1	0.0	0.0	0.0	42.9
High Renewables	Utah	0.0	0.0	4,664.5	4,985.2	3,178.9	3,328.9
	Wyoming	4,331.2	6,663.1	314.9	1,253.7	914.9	1,114.9
High Renewables – UT/WY Focus	Utah	0.0	0.0	6,825.4	7,158.2	5,351.9	5,501.9
	Wyoming	4,331.2	6,663.1	314.9	1,253.7	914.9	1,114.9

Portfolio analysis in this study was focused on the impacts of large-scale wind, solar, and energy storage facilities since they are some of the largest portfolio components on a MW basis. However, it should be noted that there are significant other clean energy resources included in PacifiCorp's IRP portfolios including: demand-side management resources (e.g. energy efficiency and demand response), distributed solar, pumped storage hydro, small-modular reactor nuclear facilities, and so on.

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[12] PacifiCorp, "2023 Integrated Resource Plan Update," April 1, 2024. https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2023_IRP_Update.pdf

[13] PacifiCorp, "2023 Integrated Resource Plan," March 31, 2023. https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2023-irp/2023_IRP_Volume_I.pdf

[14] Ibid.

3.2 Multiplier Analysis

The economic impact of each selected portfolio was modeled using an industry standard multiplier analysis software tool (i.e., IMPLAN). Under this approach, the net economic impact resulting from new energy investments and decommissioned power plants can be calculated through analysis using economic multipliers. These multipliers track how spending in one industry flows through the economy, stimulating new economic activity across multiple industries and measured through direct, indirect, and induced effects, defined as follows.

- **Direct effects** refer to the immediate economic impacts within the sector where the initial economic activity occurs. These impacts include changes in output, employment, and labor income directly tied to the activity. For example, in the construction of a solar farm, direct effects include the hiring of workers, procurement of equipment, and expenditures on materials within the construction sector.
- **Indirect effects** capture the *secondary* economic impacts that occur as the initial sector engages with other industries through supply chain interactions. These effects arise from business-to-business transactions necessary to support the direct activity, such as the purchase of raw materials, professional services, or transportation.
- **Induced effects** represent the tertiary economic impacts resulting from the household spending of income earned by workers in both the direct and indirect sectors. As employees spend their wages on goods and services —such as housing, healthcare, and retail purchases— this spending stimulates additional economic activity within the local and regional economy. Induced effects are an indicator of the broader community-level benefits of economic activity.

Every dollar of expenditure generates direct, indirect, and induced economic activity, with economic multipliers quantifying the magnitude of these impacts within the original industry and other sectors. The total economic impacts of a business or sector are calculated by adding together the direct, indirect, and induced effects. This multiplier analysis was conducted using input-output modeling, which simulates the effects of economic activity (i.e., new investments and decommissioned resources) on outputs such as state and local tax revenue, employment, labor income, sales, and gross domestic product (GDP).

3.3 Key Metrics

The following metrics were evaluated for each portfolio:

- **Job-years:** Reflect one year of full-time employment equivalent.
- **Income:** Measures wages, salaries, and benefits generated for workers.
- **Value Added:** Represents the net contribution to the local economy, closely tied to regional GDP.

- **Economic Output:** Reflects the total economic activity generated by the events studied, measured as the monetary value of all transactions and production across the economy.
- **Tax Revenues:** Estimated tax contributions, by payer and by tax generated by each portfolio, including construction and operational phases.

3.4 Tools Used

The analysis employed a combination of the National Renewable Energy Laboratory's (NREL) Jobs and Economic Development Impact (JEDI) models and the IMPLAN economic modeling tool:

JEDI Models: The NREL JEDI models are tools designed to estimate the economic impacts of the construction and operation of new generation projects. These models were used during a pre-process step to estimate the direct economic impacts of renewable energy projects construction and operation. Project-specific details, such as capacity (in megawatts), technology type, installation year, and location, were used as inputs in the corresponding JEDI tool to generate estimates of direct jobs and economic output.

IMPLAN: This tool was used to calculate the total economic impacts, including indirect and induced effects, by simulating how project spending flows through the regional economy. Direct impact results from JEDI were fed into IMPLAN to generate comprehensive economic impact estimates. IMPLAN's input-output data provides insights into industry interactions, supply chain linkages, and household spending patterns to quantify holistic impacts of each portfolio.

3.5 Modeling Process

1. **Renewable Energy Projects:**

For new wind, solar, and storage projects, the newly installed capacity was aggregated annually and entered into the relevant JEDI models.[15] JEDI calculates the on-site labor impacts for both the construction periods and the operational years, which were then used as inputs for IMPLAN. Construction is assumed to take place "overnight" in the year of operation as defined in the Company's IRP files. All new resources are expected to operate through the end of the study period, 2042.

In IMPLAN, construction activities were modeled under "Industry Output Events." The direct employment and direct output figures from the relevant JEDI model were used as inputs. The specification for "Construction of New Power and Communication Structures" was used for new capacity addition events, and operational impacts were modeled under the categories for solar power generation, wind power generation, and other power generation for storage deployments.

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[15] The National Renewable Energy Laboratory maintains JEDI models for photovoltaics, wind, and other resource types, but not for battery storage. In this analysis, battery storage impacts were pre-processed using the wind JEDI model, as its local economic environment most closely reflects that of battery storage.

2. **Coal Plant Operations:**

Nearly all the resource portfolios developed by PacifiCorp to date have included retirement dates for its coal plants at some point within the next 20 years. However, the exact timing of these retirements dates differs by portfolio. CEG's analysis is intended to capture the differential economic impacts that arise from operating each plant for different lengths of time. For instance, under the Low Renewable case, numerous existing thermal generators operate for a longer period of time than the High Renewable case. While the absolute number of jobs and tax revenue from PacifiCorp's coal fleet was not explicitly modeled for each scenario, the difference between scenarios was accurately quantified. For the purposes of calculating these differences, the Low Renewable's case was considered to be the "Business as Usual" case whereas the High Renewable and High Renewable-UT/WY Focus cases were considered to represent the change cases with accelerated retirement dates. As such, the results of these latter two scenarios were reported as economic losses.

Since there is no construction event for this pre-existing capacity, solely the operational impacts of extending the plant's life are considered. These operational impacts were modeled directly in IMPLAN as "Industry Employment Events" without the JEDI pre-processing step. This portion of the analysis was conducted using publicly available employment data from the sources from the Catalyst Cooperative. This dataset provides employee-count numbers for each plant at year-end 2023, aggregated from FERC Form 1. The results captured the economic contributions of each plant's ongoing operations.

There is no difference in the retirement schedules of operating gas plants in any of the plans studied, and therefore those plants are not included in this analysis.

3. **Adjustments and Refinements:**

The JEDI models used in this analysis were updated to reflect current economic conditions and ensure accuracy in estimating economic impacts. Labor costs and wages were adjusted using data from the Bureau of Labor Statistics (BLS), aligning wage rates with average current market rates for each specific sector.[16]

Additionally, default technology CAPEX and OPEX values within the JEDI models were replaced with updated data from the NREL Annual Technology Baseline (ATB) specific to the year of construction for each plant.[17] This adjustment ensures that the cost assumptions align with the most recent advancements in technology and market trends, and future projections. To maintain

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[16] Wage data is sourced from the U.S. Bureau of Labor Statistics Occupational Employment and Wage Statistics (OEWS) program. Average mean wage for all occupations within an industry are used in this analysis (Occupation Codes 00-0000). NAICS codes used in this analysis are as follows: Solar:221114, Wind:221115, Fossil:221112, Other:221118. For more information, see: https://www.bls.gov/oes/home.htm

[17] National Renewable Energy Laboratory, Electricity Annual Technology Baseline (ATB), Accessed January 15, 2025. https://atb.nrel.gov/electricity/2024/data

consistency and account for inflation, all cost data from the ATB, originally reported in 2022-dollar values, were adjusted to 2024-dollar values. The inflation adjustments were calculated using a factor from BLS data. [18]

While most of the customer base and generation assets for PacifiCorp's Eastern region are located in Wyoming and Utah, there is a small portion in Idaho. To simplify this analysis, all of the incremental generation resources identified in PacifiCorp's Eastern region were allocated to either Wyoming or Utah, though conceivably some could be located in Idaho as well.

3.6 Limitations and Assumptions

To ensure the analysis accurately reflects regional economic conditions, state-specific multipliers from the latest releases of IMPLAN and JEDI were used. These multipliers inherently account for labor availability, supply chain composition, and local spending patterns in Utah and Wyoming, allowing the results to be tailored to the economic characteristics of these states without requiring additional customization.[19]

The analysis assumes consistent market conditions and regional economic structures throughout the study period, with changes over time limited to capital expenditure and operational expenditure expectations as noted in section 3.5. This approach ensures that the changing costs of renewable energy projects are incorporated into the model, but will not account for any changes in the specific economic landscape

For transparency and reproducibility, all detailed adjustments and assumptions are documented in Appendix A.

4. Renewable Energy Deployment Impacts

The deployment of renewable energy projects, including wind, solar, and storage facilities, generates significant economic benefits. This section describes CEG's evaluation of these benefits from new projects developed under each of the different portfolios analyzed. These impacts extend beyond the direct investments in construction and operation, driving job creation, economic output, and value added across related industries. The timeline of renewable energy deployment across the three portfolios by technology type is shown in the chart below. This chart visualizes the pace and scale of capacity additions for wind, solar, and storage projects in the first 10 years of the study period where most deployment occurs.

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[18] Inflation was calculated from mid-2022 prices to year-end 2024 prices using the BLS' CPI Inflation Calculator, available here: https://www.bls.gov/data/inflation_calculator.htm

[19] For more information regarding IMPLANs multipliers, see: https://blog.implan.com/understanding-implan-multipliers

Figure 4: Cumulative Installed Renewable Capacity

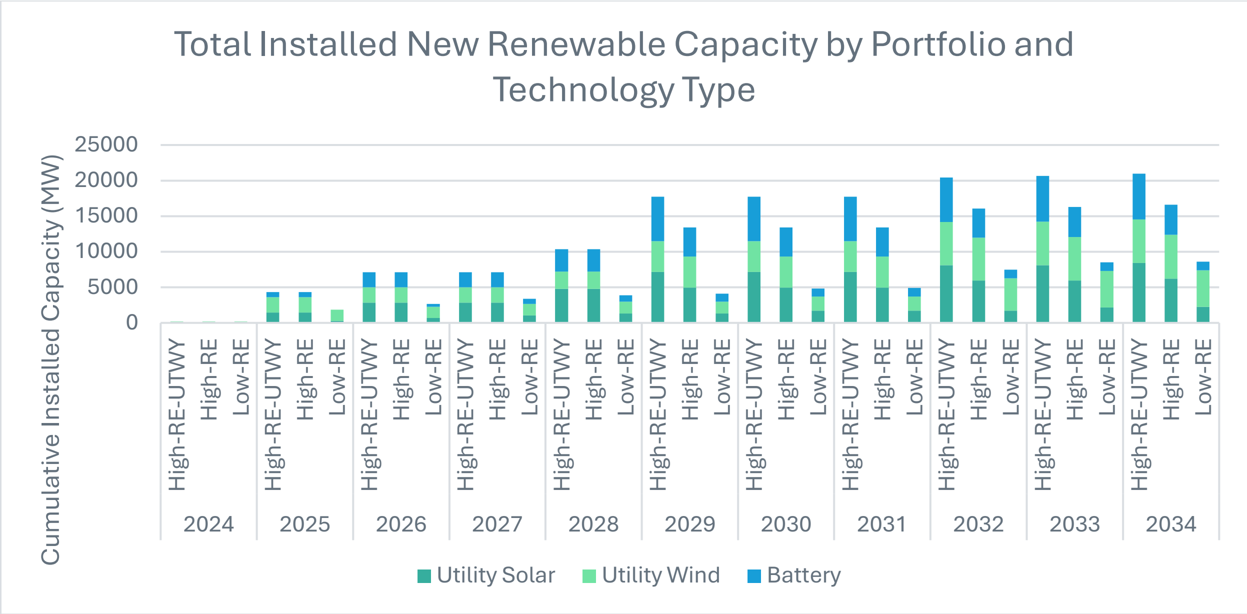
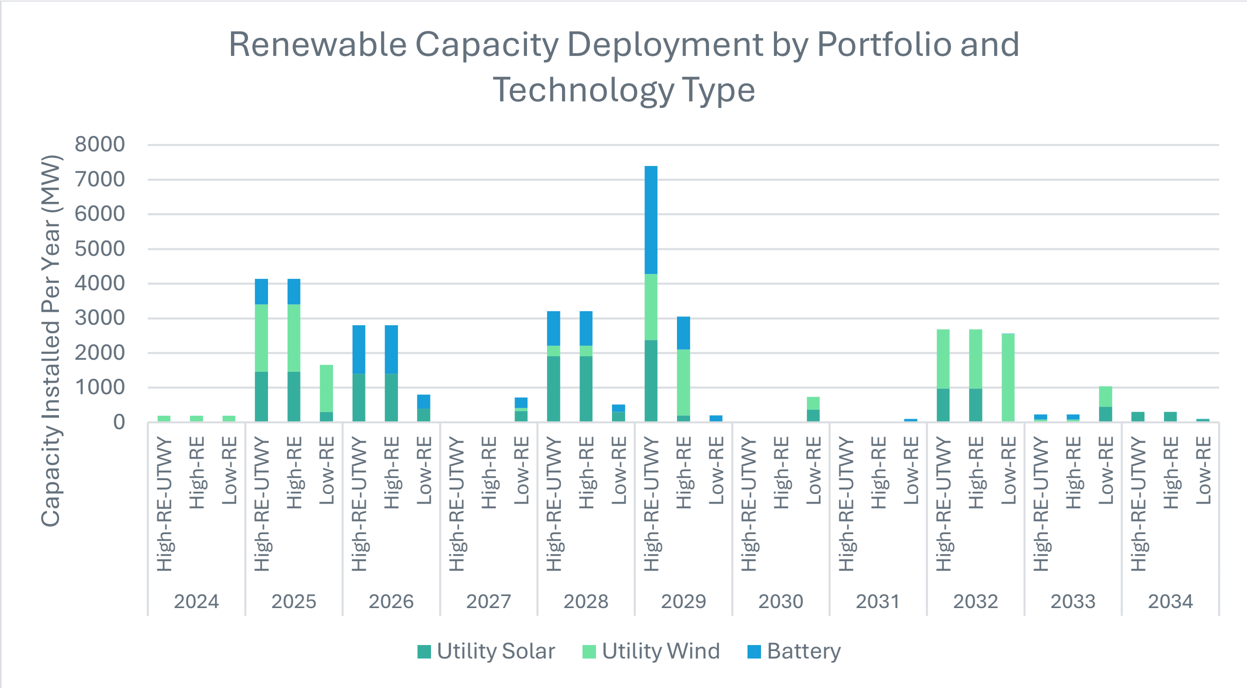


Figure 5: Nominal Installed Renewable Capacity



The P18 portfolio demonstrates the most ambitious deployment, with generally equivalent capacity additions compared to the 2023 IRP preferred portfolio, except for 2029 in which the P18 portfolio calls for over 7GW of renewable capacity. Utility solar generally has the highest installed capacity additions across all portfolios, emphasizing its primary role in the renewable transition. Deployment accelerates in the late 2020s, while later years show slower growth.

4.1 Job Creation

Job creation in this study is measured in full-time equivalent (FTE) positions, where one FTE represents the workload of one full-time worker for a year. The results include the total number of jobs supported across the energy generation sectors, reflecting the impacts of both construction and ongoing operations.

Table 2: Job-year Creation by State and Portfolio

State	Portfolio	Jobs Created (total job-years)			
		Direct	*Indirect*	*Induced*	*Total*
UT	Low RE	12,006	1,258	7,261	20,525
	High RE	23,063	2,333	14,060	39,456
	High RE, UT/WY-focused	32,741	3,294	20,074	56,109
WY	Low RE	5,570	497	1,533	7,600
	High RE	12,384	1,550	3,599	17,533
	High RE, UT/WY-focused	12,382	1,549	3,599	17,530

The analysis of renewable energy deployment highlights significant differences in job creation between Utah and Wyoming, with Utah generating approximately 39,456 job-years under the High RE portfolio compared to Wyoming's 17,533 job-years under the same portfolio. This difference is driven largely by the type of energy development taking place in each state. Utah's renewable energy portfolio is focused on solar development, while Wyoming's projects are predominantly wind-based. Solar installations typically foster a higher concentration of local labor during construction, as much of the work, such as panel installation and wiring, is labor-intensive and performed on-site. This is then captured as local impacts and is accounted for in these results. In contrast, wind projects often rely on prefabricated components manufactured elsewhere, resulting in fewer local job impacts. These dynamics mean that even if the installed capacities in Utah and Wyoming were similar, Utah would still experience greater local job creation due to the nature of its solar-focused energy development.

While the landscapes of Utah and Wyoming foster differing patterns of job growth due to the types of renewable energy deployed, the analysis of the three portfolios demonstrates that greater levels of deployment consistently lead to higher job creation, regardless of the technology mix and state of interest. The High Renewable - UT/WY Focused deployment plan generates approximately 73,639 job-years, compared to 56,989 job-years in the High Renewable plan and 28,125 job-years in the Low Renewable plan. This positive correlation underscores the direct relationship between the scale of renewable energy investment and total employment impacts across the energy generation sectors.

4.1.1 Labor Income

In this study, labor income represents total wages and salaries, excluding benefits and other compensation. Average salaries for workers in fossil, solar, wind, and other energy generation sectors are sourced from the Bureau of Labor Statistics. When combined with job creation estimates, these figures provide the total labor compensation, which are summarized in the table below.

Table 3: Labor Income by Portfolio ($M)

State	Portfolio	Labor Income ($M)			
		Direct	*Indirect*	*Induced*	*Total*
UT	Low RE	$1,533	$115	$410	$2,057
	High RE	$2,968	$220	$794	$3,981
	High RE, UT/WY-focused	$4,243	$308	$1,134	$5,684
WY	Low RE	$541	$40	$68	$649
	High RE	$1,237	$127	$159	$1,523
	High RE, UT/WY-focused	$1,237	$127	$159	$1,523

Based on the figures above, we can calculate the average annual salary across states by dividing a portfolio's total income by the number of job-years created (see Table 3). This results in salaries of approximately $101,000 per year for Utah and $87,000 per year for Wyoming. These averages indicate that new renewables investments are expected to create more high-paying jobs, compared to an annual average of $61,070 in Utah and $57,930 in Wyoming.[20]

4.2. Tax Revenue Impacts

The tax revenue generated from new renewable energy generation across the three portfolios reflects the scale of deployment, with the High Renewable - UT/WY Focused portfolio contributing approximately $2.34B in total taxes, compared to $1.8B in the High Renewable plan and $899.55M in the low renewable plan. Total taxes include contributions at the state, federal, county,

[20] Bureau of Labor Statistics, Occupational Employment Wage Statistics, Accessed January 15, 2025. https://www.bls.gov/oes/current/oes_nat.htm

and sub-county levels, showcasing the broad fiscal benefits of renewable energy projects. Of this total, state tax revenues are approximately $482M for the High Renewable - UT/WY Focused plan, $382M for the High Renewable plan, and $192M for the low renewable plan.

Table 4: State Tax Revenue Generated by Renewable Deployment by Portfolio ($M)

State	**Portfolio**	**Tax Revenue ($M)**			
		Direct	*Indirect*	*Induced*	*Total*
UT	Low RE	$65.58	$11.13	$45.03	$121.73
	High RE	$129.05	$21.29	$82.97	$233.30
	High RE, UT/WY-focused	$183.00	$29.86	$124.47	$337.33
WY	Low RE	$45.30	$7.23	$11.20	$63.74
	High RE	$100.01	$23.31	$24.96	$148.27
	High RE, UT/WY-focused	$99.14	$23.18	$26.09	$148.41

Across both states, the largest collections of state taxes are through sales tax and income tax, totaling $161M and $112M respectively in the High Renewable Plan. For federal taxes, the largest collections come from Social Insurances taxes, which between employee and employer contributions, total $621M. Additionally, federal income tax amounts to $528M.

4.3. Broader Economic Contributions

In addition to employment and income, renewable energy deployment drives significant economic activity, which can be measured through output and value added. Output represents the total value of goods and services generated, including direct contributions from construction and operations as well as indirect and induced effects throughout the supply chain and local economy. Value added captures the net economic contribution within the region, focusing on metrics such as labor income, property income, and taxes, while excluding the cost of intermediate goods and services. These metrics provide critical insight into the scale and local retention of economic benefits associated with renewable energy investments.

Table 5: Economic Output of Renewable Energy Developments by State and Portfolio ($M)

State	Portfolio	Economic Output ($M)			
		Direct	*Indirect*	*Induced*	*Total*
UT	Low RE	$1,565	$414	$1,402	$3,381
	High RE	$2,967	$791	$2,714	$6,473
	High RE, UT/WY-focused	$4,213	$1,110	$3,875	$9,199
WY	Low RE	$680	$215	$259	$1,153
	High RE	$1,538	$703	$608	$2,848
	High RE, UT/WY-focused	$1,538	$702	$607	$2,848

Output represents the total value of all goods and services produced as a result of renewable energy projects. From renewable energy developments across the three portfolios, the High Renewables - UT/WY Focused plan generates approximately $12.04B in total output, compared to $9.3B in the High Renewables and $4.5B in the Low Renewables plan. This includes the direct production value of the projects, such as construction and operations, as well as the indirect and induced economic activities that ripple through the supply chain and local economy. This measure captures the gross economic activity associated with the projects, encompassing both the value added by local industries and the cost of intermediate goods and services purchased from other industries. Output provides a comprehensive view of the total economic scale of these activities.

Table 6: Economic Value Added of Renewable Energy Developments by State and Portfolio

State	Portfolio	Economic Value Added ($M)			
		Direct	*Indirect*	*Induced*	*Total*
UT	Low RE	$1,947	$222	$850	$3,019
	High RE	$3,745	$427	$1,646	$5,818
	High RE, UT/WY-focused	$5,331	$598	$2,350	$8,280
WY	Low RE	$821	$96	$145	$1,062
	High RE	$1,182	$311	$341	$1,834
	High RE, UT/WY-focused	$1,182	$311	$341	$1,834

“Value added” is a subset of output that measures the net economic contribution retained within the region. The renewable deployment associated with the High Renewables UT/WY focused portfolio contributes approximately $8.3B in value added, compared to $6.6B in the High Renewables portfolio and $4.1B in the Low Renewables Portfolio. This is calculated by subtracting the value of intermediate goods and services from the total output. The value added is composed of three primary components: labor income (wages, salaries, and benefits), other property income (rents, royalties, and dividends), and taxes on production and imports (such as property and sales taxes). Unlike output, value added eliminates double counting of intermediate inputs and directly reflects the contribution of renewable energy projects to local Gross Domestic Product (GDP).

5. Implications of Coal Generation Retirement and Coal-Gas Conversions

This section examines the economic and employment impacts due to the timing of retirements or conversions (e.g., coal-to-gas) of thermal generation facilities. The Low Renewables Portfolio, characterized by reduced renewable energy deployment, includes a slower timeline for phasing out coal and gas plants, resulting in the retention of jobs associated with these facilities. These retained jobs represent a key consideration in evaluating the trade-offs between maintaining existing employment in the fossil fuel sector and the potential economic benefits of accelerated renewable energy deployment. Additionally, the High Renewables plan contains three coal-to-gas conversions that were not a part of the low renewables plan, specifically at the following coal units: Jim Bridger 3, Jim Bridger 4, and Naughton 3. The following analysis quantifies the employment impacts of delayed thermal plant retirements and conversions and assesses their significance within the broader context of energy transition.[21]

5.1 Coal Retirement

The table below lists the retirement years for coal units with differing retirement dates across the three studied portfolios. The "retirement year" represents the first year the plant would be unavailable—for example, a plant going offline on December 31, 2024, is identified with a retirement year of 2025. Additionally, while some plants undergo coal-to-gas conversions, these conversions are not reflected in the table, as the years represent the retirement of the plant itself rather than the cessation of coal use. The largest change in retirement dates comes from the Hunter

[21] Note that some of PacifiCorp’s IRP portfolios also include conversion of existing coal facilities to either a) coal with carbon capture and underground storage (CCUS) or b) small modular nuclear (SMR). Since neither of these technologies has been successfully commercialized to date, they were not included as part of CEG’s analysis. Instead, the analysis focused on technologies that have been commercialized to date including wind, solar, and battery storage. Additionally, one coal plant in PacifiCorp’s 2023 IRP Update included CCUS. This plant was assumed to continue operating as a coal facility after the date of the CCUS installation, but no additional impacts were ascribed to the CCUS installation due to lack of available data.

plant, where units 1, 2 and 3 all see their retirement delayed by 10 years under the Low Renewables Portfolio versus the High Renewables Portfolio. Both of the high renewable deployment plans follow the same retirement schedule, other than unit 3 of the Dave Johnston Plant, where this unit is set to retire one year later in the UT/WY Focused plan.

Table 7: Retirement Schedule by Portfolio for Coal Plants

Thermal Unit	**Retirement Year by Portfolio (value indicates first year of non-operation)**		
	Low RE	High RE	**High RE, UT/WY-focused**
Dave Johnston 3	2028	2028	2029
Hunter 1	2043	2032	2032
Hunter 2	2043	2033	2033
Hunter 3	2043	2033	2033
Huntington 1	2037	2033	2033
Huntington 2	2037	2033	2033
Jim Bridger 3[22]	2040	2038	2038
Jim Bridger 4[23]	2040	2038	2038

To estimate the impacts of differing retirement schedules, CEG modeled the annual economic impacts of each coal unit's operations. The chart below illustrates the economic impacts for one year of operation for each plant listed in the retirement schedule, serving as a baseline for comparing the effects of varying retirement timelines across the three portfolios. By modeling a single year of operations for each plant, the analysis quantifies retained jobs and economic activity resulting from differences in retirement years, enabling a detailed evaluation of the cumulative impacts of delayed retirements. These results are then multiplied

Table 8: Annual Impacts of Coal Plants with Variable Retirements

Yearly Impacts	**Direct Jobs**	**Total Jobs**	**State Taxes**	**Total Taxes**
Dave Johnston 3	44	102	$3,017,483	$7,319,535
Hunter 1	61	285	$6,469,480	$23,405,319
Hunter 2	39	184	$4,163,374	$15,062,275
Hunter 3	69	321	$7,289,618	$26,372,419
Huntington 1	62	290	$6,578,257	$23,798,853
Huntington 2	61	284	$6,449,269	$23,332,199
Jim Bridger 3	58	134	$3,944,935	$9,569,265
Jim Bridger 4	58	134	$3,967,564	$9,624,157

[22] Jim Bridger 3, in the 2023 IRP preferred portfolio and P18 portfolio, undergoes a gas conversion in 2030, before retiring in 2038. In the 2023 IRP update, the unit undergoes a CCUS conversion in 2028, before retiring in 2040.
[23] Jim Bridger 3, in the 2023 IRP preferred portfolio and P18 portfolio, undergoes a gas conversion in 2030, before retiring in 2038. In the 2023 IRP update, the unit undergoes a CCUS conversion in 2028, before retiring in 2040.

Table 9: Difference in Cumulative Employment and Tax Impacts due to differing thermal retirement schedules (comparison of the Low RE Plan versus the High RE Plan)

Location	Estimated Differences (Low RE Plan minus High RE Plan)			
	Total Plant Operational Years[24]	*Total Direct Job-years*	*Total All Jobs-years*	*Total State taxes ($M)*
Utah	39	2255	10487	$237.8
Wyoming	4	232	536	$15.8
Total	43	2487	11023	$253.6

The comparison in Table 9 quantifies the cumulative employment impacts of extended plant operations (or conversely delayed retirements) by multiplying the one-year operational impacts from the previous chart by the difference in retirement years between the High Renewable plan and the low renewable plan. The values in Table 10 represent the additional job-years and state tax revenue retained under the High Renewable plan compared to the low. The High Renewable - UT/WY Focus plan is excluded from this analysis, as its retirement dates align closely with those in the Preferred Portfolio. The effects of delayed retirement are far greater in Utah compared to Wyoming. This is due to both the number of thermal units affected, as well as the scale of their delayed retirement. In Utah, there are 5 units retired early in the 2023 IRP preferred portfolio, compared to 3 in the Update. Additionally, the Hunter plant alone results in 31 additional years of operation in the Low Renewables Portfolio (10 years for unit 2 and 3, 11 years for unit 1). While the Jim Bridger Plant units 3 and 4 combine for just 4 operational years in Wyoming. A small portion, just 3.41%, of the state tax revenue retained is due to severance tax. Severance taxes are taxes imposed on the extraction of natural resources. It is important to note that this number is calculated using IMPLANs default multipliers, that represent the average economic activity within each sector in the states of interest. It is possible that these multipliers do not perfectly capture specific agreements in place between plants and the sites in which they source their fuel.

In Utah, by delaying the retirement of these coal fired units, the state retains 10,487 job-years, 2,255 of which reflect direct employment at the plants. In Wyoming, the state retains 536 job-years, 232 of which are at the plants.

5.5. Thermal Retirement and Coal-Gas Conversion Impacts on Tax Revenue

[24] Operational years represent the total cumulative additional years of coal plant operation under the Update Portfolio compared to the Preferred Portfolio, calculated by summing the years of delayed retirement for each individual plant.

Table 10: Economic Impacts of Coal to Gas Conversions

Plant & Unit	Impact	Employment	Labor Income ($M)	Value Added ($M)	Output ($M)
Jim Bridger 3	Direct	106	$12.4	$21.5	$20.8
Jim Bridger 4	Direct	106	$12.5	$21.5	$21.0
Naughton 3	Direct	75	$8.8	$15.2	$14.7
Jim Bridger 4	Induced	35	$1.5	$3.2	$5.8
Jim Bridger 3	Induced	35	$1.5	$3.2	$5.8
Naughton 3	Induced	25	$1.1	$2.3	$4.1
Jim Bridger 4	Indirect	9	$0.6	$1.1	$2.2
Jim Bridger 3	Indirect	9	$0.6	$1.1	$2.2
Naughton 3	Indirect	6	$0.4	$0.8	$1.6

There are coal-to-gas conversions across all portfolios studied in this analysis for Jim Bridger units 1 and 2, as well as Naughton units 1 and 2. However, in the High Renewables Portfolio, additional units are planned to be converted to gas. These units are Jim Bridger units 3 and 4, as well as Naughton unit 3. The impact of the conversion of these units is in Table 11. In total, these additional conversions yield 406 job-years with a total of $70M value added.

6. Key Insights and Policy Implications

Based on this analysis, CEG found that the economic impacts from investment in the High RE plans led to greater overall job creation. In total, the High Renewables case is expected to generate 18,247 more job-years compared to the Low renewables case, with the UT/WY-focused plan to generate 34,999 more job years. In both cases, the majority of these gains come from additional solar capacity. Notably, these values reflect the total *net* impact of the High RE plans, including job losses from earlier thermal retirements.

Table 11: Summary Job Impact Comparison

State	Resource	Low Renewables	High Renewables	High Renewables, UT/WY-focused
Utah	Solar	16,609	32,305	44,662
Utah	Wind	-	-	-
Utah	Storage	3,916	7,151	11,447
Wyoming	Solar	-	5,309	5,309
Wyoming	Wind	7,488	9,838	9,838
Wyoming	Storage	112	2,386	2,384
Utah	Coal and Gas Adjustments	10,487	-	-
Wyoming	Coal and Gas Adjustments	536	406	508
	Portfolio Total	**39,148**	**57,395**	**74,147**

In addition to the significant job creation associated with renewable energy investments, it is important to highlight the minimal wage disparity between jobs in the renewable and fossil fuel sectors. According to average salary estimates from the Bureau of Labor Statistics (BLS), positions in the renewable energy industry offer competitive pay, with compensation levels well above the U.S. mean annual salary of $65,470. As of 2023 BLS data, the annual mean wages for occupations in the fossil fuel, solar, and wind industries are $104,650, $94,450, and $92,530, respectively.[25]

The tax implications of this study favor the High Renewable UT/WY-focused development plan, while ranking the Low Renewable plan above the High Renewable plan. While the High Renewable plan fosters a 47% increase in job-years over the low case, this analysis estimates a 12.1% decrease in state-tax revenue. This is due to the large tax implications of the additional years of fossil generation in the low-renewables case. This may also reflect the fact that states like UT and WY also receive significant tax revenue from coal extraction that would be displaced.

Table 12: Summary State Tax Revenue Comparison

State	Resource	Low Renewables	High Renewables	High Renewables, UT/WY-focused
Utah	Solar	$97,838,569	$190,382,469	$266,696,442
Utah	Wind	$-	$-	$-
Utah	Storage	$23,896,311	$42,921,430	$70,633,758
Utah	Coal and Gas Adjustment	$237,804,304	$-	$-
Wyoming	Solar	$-	$39,709,453	$39,709,453
Wyoming	Wind	$62,584,217	$81,066,155	$81,041,527
Wyoming	Storage	$1,159,721	$27,496,655	$27,656,679
Wyoming	Coal and Gas Adjustment	$15,824,999	$4,099,012	$7,116,495
	Portfolio Total	**$439,108,121**	**$385,675,173**	**$492,854,354**

Based on the results of this analysis, the High RE UT/WY-focused plan appears to generate the highest tax revenue compared to the High and Low Renewables Plan. However, even if this plan were pursued by PacifiCorp, significant challenges remain in terms of facilitating what amounts to a significant transition in the regional energy industries. As such, workforce training programs for fossil fuel industry workers transitioning to roles in renewable energy are critical to ensuring a just and effective clean energy transition. Additionally, greater emphasis on interconnections and grid visibility is essential to accommodate the pace of renewable energy deployment.
To support workforce development, the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) has established initiatives such as the $6 million

[25] U.S. Bureau of Labor Statistics, "Occupational Employment and Wage Statistics," Accessed January 10, 2025. https://www.bls.gov/oes/current/naics4_221100.htm

EMPOWERED funding program, which promotes clean energy career training. Similarly, the DOE's Energy Storage Grand Challenge and Communities Local Energy Action Program (LEAP) further invest in education and training for clean energy systems operation and development. These programs are vital to building a technically skilled workforce capable of meeting the demands of a growing renewable energy sector.

This analysis also underscores the importance of grid interconnectedness and visibility as priorities for policymakers. For instance, in the P18 case modeled in PacifiCorp's 2023 IRP, additional transmission capacity was proposed in the Eastern region of the utility's system to interconnect new solar capacity. This highlights the role of enhanced interconnections in enabling renewable energy development and facilitating workforce opportunities. Furthermore, transmission buildout will remain a key policy focus to deliver power from both new renewable resources and existing energy infrastructure, particularly in states like Utah, which serve as significant energy exporters. Notably, the Department of Energy recently announced a conditional commitment for a loan guarantee of up to $3.52 billion to PacifiCorp to help finance several transmission projects across the utility's system.[26]

7. 2025 Draft IRP Implications

In December 2024, PacifiCorp released its Draft 2025 IRP. This portfolio was not fully evaluated due to time constraints and limited data availability, along with the fact that it is still a draft plan. However, the 2025 Draft IRP is still worth comparing to the portfolios analyzed to understand potential similarities and differences. Of the resource portfolios analyzed in this report, PacifiCorp's 2025 Draft IRP most closely resembles the 2023 IRP Update preferred portfolio (i.e., Low RE case) with some important changes. These changes include extending the planned retirement date of several coal units and decreasing the deployment of renewable resources in the near term. A table of the expected retirement dates between the 2023 IRP Update and the new 2025 draft IRP is shown below. Notably, several units that had retirement dates in the 2023 update are no longer planned for retirement within the 20-year study period. Additionally, no unit has an accelerated retirement date compared to the 2023 update.

[26] U.S. Department of Energy, "LPO Announces Conditional Commitment to PacifiCorp to Expand Transmission in Several Western States," January 16, 2025. https://www.energy.gov/lpo/articles/lpo-announces-conditional-commitment-pacificorp-expand-transmission-several-western

Table 13: 2025 IRP Coal Resource Retirement Year: 2025 IRP and 2023 IRP Update[27]

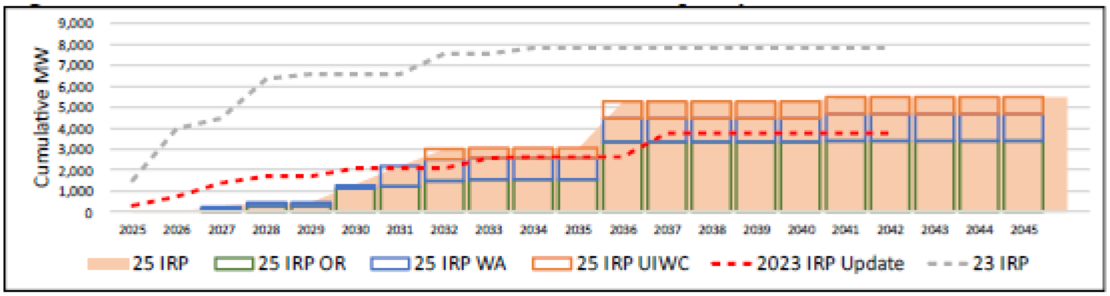
Majority-Owned Coal		
Unit	2023 IRP Update Retirement Year	2025 IRP Retirement Year
	As Selected	As Selected
Dave Johnston 1 & 2	2028 (Coal ash compliance)	Not retired (Gas conversion 2029)
Dave Johnston 3	2027 (Clean air compliance)	2027 (Clean air compliance)
Dave Johnston 4	2039 (Assumed end of life)	Not retired
Hunter 1-3	2042 (Assumed end of life)	Not retired
Huntington 1 & 2	2036 (Assumed end of life)	Not retired
Jim Bridger 1 & 2	2037 (Gas conversion 2024/Assumed end of life)	Not retired (Gas conversion 2024)
Jim Bridger 3 & 4	2039 (CCS/Assumed end of life)	Not retired (CCS)
Naughton 1 & 2	2036 (Gas conversion 2026/Assumed end of life)	Not retired (Gas conversion 2026)
Wyodak	2039 (Assumed end of life)	Not retired (Coal)

Minority-Owned Coal		
Unit	2023 IRP Update Retirement Year	2025 IRP Retirement Year
	As Input	As Input
Colstrip 3	2025 (Transfer capacity to unit 4)	2025 (Transfer capacity to unit 4)
Colstrip 4	2029 (PacifiCorp exit)	2029 (PacifiCorp exit)
Craig 1	2025 (Assumed end of life)	2025 (Assumed end of life)
Craig 2	2028 (Assumed end of life)	2028 (Assumed end of life)
Hayden 1	2028 (Assumed end of life)	2028 (Assumed end of life)
Hayden 2	2027 (Assumed end of life)	2027 (Assumed end of life)

These changes would tend to increase the economic activity generated by continued coal plant operation as discussed above in Section 5. However, this would be offset by the reduction in economic activity from renewable energy deployment. Overall, the 2025 IRP lessens the deployment of renewable resources while battery deployments stay at similar levels. The 2025 Draft IRP includes planned deployment of 6,319 MW of new wind and 2,308 MW of new solar over the 20-year planning horizon. By comparison to the 2023 IRP Update (i.e., Low RE case) included 9,114 MW of new wind and 7,885 MW of new solar. The planned deployment for new solar capacity across PacifiCorp's portfolio is shown below. Note the red line, which represents the low renewables plan as studied in this analysis, out paces the 2025 draft IRP deployment up until 2031. The high renewables plan, visualized by the grey dotted line, not only is drastically higher in the near term, but also remains at a higher overall deployment throughout the study period.

[27] 2025 PacifiCorp Integrated Resource Planning Draft Report Table 1.2

Table 14: New Solar Capacity by PacifiCorp Portfolio[28]



Based on the analysis in this report, CEG expects the new 2025 IRP draft to perform most closely to the Low Renewables plan. In other words, it would create fewer jobs and less tax revenues within Utah and Wyoming when compared to the High Renewables plan. Extended operation of incumbent thermal generators is expected to contribute additional job-years and local tax revenue. While further analysis is needed, CEG does not anticipate that these effects are likely to offset the reduction in jobs and tax revenue from the decreased levels of renewable deployment under the Draft IRP.

[28] 2025 PacifiCorp Integrated Resource Planning Draft Report figure 1.3

APPENDIX: Modeling Procedure

Economic Impact Modeling Overview

Economic impact modeling is a quantitative approach used to measure how investments, projects, or policies affect the economy of a defined region. This type of analysis provides insight into how spending flows through an economy, generating ripple effects that support jobs, income, and economic output. The results are typically broken into three categories: direct, indirect, and induced impacts. Direct impacts refer to the immediate economic activities directly tied to a project, such as construction labor, material procurement, and operational expenditures. Indirect impacts capture the supply chain effects, such as increased demand for goods and services from local suppliers supporting the project. Induced impacts account for the broader economic effects resulting from workers and businesses spending their earnings on goods and services within the region. Together, these effects provide a holistic view of a project's economic contributions.

In addition to categorizing impacts, economic modeling evaluates key economic indicators. Job creation is one critical metric, encompassing full-time, part-time, and temporary positions supported by a project. Income, or labor earnings, measures wages, salaries, and benefits generated for workers. Output quantifies the total economic activity resulting from the project, reflecting both revenues and expenditures across industries. Another important metric is value added, which represents the net contribution to the local economy, excluding intermediate costs like raw materials. Value added is closely related to Gross Domestic Product (GDP) at the regional level and provides a deeper understanding of a project's long-term economic contribution.

Tools Used in This Analysis

The National Renewable Energy Laboratory's (NREL) Jobs and Economic Development Impact (JEDI) models are widely used tools for estimating the economic impacts of renewable energy projects. JEDI models allow users to input project-specific details—such as capacity (in megawatts), technology type, and location—to generate estimates of job creation, income, and economic output during construction and operation. The models are designed to reflect regional conditions by incorporating data on industry structures, wage rates, and supply chain availability. JEDI results provide detailed breakdowns of direct, indirect, and induced effects, offering a starting point for further economic analysis.

IMPLAN is a complementary tool that builds on the results from models like JEDI to provide a more comprehensive picture of economic impacts. IMPLAN uses detailed input-output data to simulate how project spending flows through the local economy, accounting for industry interactions, supply chain linkages, and household spending patterns. By inputting data from JEDI, such as the direct economic impacts of project development and operation, IMPLAN can estimate how those activities influence other sectors in the region. IMPLAN also allows for further refinement, including adjustments for regional purchase coefficients, which determine how much of the spending remains within the local economy versus being imported. When used in parallel, JEDI and IMPLAN provide a detailed framework for evaluating the economic implications of energy investments.

Modeling Process

The economic impacts of the three portfolios—2023 IRP Preferred Portfolio, 2023 IRP P18 Cluster East Portfolio, and 2023 IRP Update Preferred Portfolio—were modeled using a combination of the NREL JEDI models and IMPLAN. This process involves estimating the impacts of construction and operation for new solar and wind projects, thermal plant retirements, and capital expenditures for gas conversions and other coal plant modifications.

First, for new wind solar, and storage capacity, project-specific details, including the capacity in megawatts (MW), location, and other technology details for each portfolio component, were input into the relevant NREL JEDI models.[29] These models were configured to reflect the regional context of the projects, accounting for Utah and Wyoming-specific economic and labor data. JEDI calculates the Project Development and On-Site Labor Impacts, providing subtotals for direct jobs, earnings, and economic output. The labor subtotal, which represents the direct economic effects of construction activities and yearly operational activities, was extracted for use in IMPLAN. In addition to the job-years impacts estimated by JEDI, these values are multiplied by current average salaries for respective energy generation sectors as an estimate for total labor income. In IMPLAN, construction activities were modeled as Industry Outputs events under specification 47 – Construction of New Power and Communication Structures. For yearly operational impacts, the direct results from JEDI were modeled in IMPLAN as Industry Output Events under specification 37 and 38 and 40, Electric power generation Solar, Wind and Other (storage), respectively.

This process of using JEDI as a pre-processor allows CEG to turn project details like year and capacity into local spending figures which can be understood by IMPLAN. CEG elected to use IMPLAN for the modeling of total effects, rather than JEDI, to utilize the latest multipliers available, as well as to have a more detailed breakdown of results by industry, and relevant tax revenue information.

For coal plant retirements, JEDI is not required as a pre-processor. As these are generating assets that are already in operation, this analysis is interested only in the potential of lost operational economic impacts, rather than those associated with construction. Employment data for each plant was obtained from the Catalyst Cooperative database[30], specifically reflecting the number of employees at year-end 2023. These employment numbers were translated directly into IMPLAN as

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[29] The “wind” JEDI model is used to model storage capacity additions, as NREL does not maintain such model for storage projects specifically. All CAPEX and OPEX values are updated in the model to reflect current market expectations for storage costs. It is to be assumed the multipliers used for wind capacity most closely resemble storage capacity, as like wind the majority of storage installations is sourced from out of state.

[30] Catalyst Cooperative, Public Utility Data Library, Accessed February 18, 2025. https://data.catalyst.coop/pudl

industry employment events under the fossil fuel electric power generation sector. This approach allowed IMPLAN to calculate the direct, indirect, and induced economic impacts of each plant's ongoing operations. The results represent the total annual economic contributions of each plant, which are interpreted as yearly economic losses incurred for each year the plant is not in operation.

Assumptions and Manual Adjustments

To ensure the modeling process accurately reflects current data and regional conditions, several assumptions and manual adjustments were applied. These adjustments address labor costs and wage rates, technology classifications and associated costs, and inflation. The NREL JEDI models for wind and solar projects were updated to align with more recent data sources and market conditions. The primary areas of adjustment include updates to labor wage assumptions, replacement of default cost inputs with more recent technology baseline data, and inflation adjustments to align all inputs with 2024 $USD. Additionally, as a simplifying assumption this analysis considers Idaho renewable development, a small portion of that in the PACE region to occur in Wyoming or Utah. Specifically, Idaho cited solar is modeled as component of Utah, and Idaho cited wind is modeled as a component of Wyoming.

Labor Cost and Wage Updates

The NREL JEDI Wind and Solar models used in this analysis were updated to reflect current labor wage rates. For the Wind JEDI model (version W.9.14.18), "Foundation, Erection, Electrical, Management/Supervisor" wages were revised based on the latest data provided in Wind JEDI release W10.30.20. Technician labor wages were updated using data from the Bureau of Labor Statistics (BLS) under NAICS 81131. The weekly wage data was divided by 40 to estimate hourly rates that align with current market conditions. Similarly, the Solar JEDI model (version PV05.20.21) incorporated updated construction and installation labor wages using BLS data for NAICS 23713, applying the same methodology for technician wages as used in the wind analysis. These updates ensure that the labor costs modeled reflect prevailing wage rates for relevant industries.

When transferring pre-processed JEDI results into IMPLAN, rather than retaining the estimated labor income values, average salaries for respective energy generation sectors were sourced from the BLS and multiplied by the corresponding direct employment values. [31]

Replacement of Default CAPEX and O&M Costs

The installed project cost ($/kW) and operations and maintenance (O&M) cost ($/kW) values provided by JEDI were replaced with more recent data from the NREL Annual Technology Baseline (ATB). This change was made to ensure cost estimates reflect the latest advancements in technology and market conditions, and to align with projects for decreasing future costs associated with technology maturity. For wind projects, Class 4 Tech 1 systems under the moderate

[31] Bureau of Labor Statistics, Occupational Employment and Wage Statistics, Accessed February 18, 2025. https://www.bls.gov/oes/current/oes_wy.htm

assumption were used, while for solar projects, Class 4 systems under the moderate assumption were selected.

Inflation Adjustments

All cost data from the NREL ATB, which is reported in 2022 dollars, were adjusted to 2024 dollars using an inflation factor of 1.069. This factor was derived from the Bureau of Labor Statistics (BLS) inflation data, ensuring that CAPEX and O&M costs were consistent with economic conditions anticipated during the project implementation period. By incorporating these updates, the modeling process aligns with current market conditions, resulting in more accurate and regionally relevant results. These adjustments to labor costs, technology assumptions, and inflation provide a consistent and reliable foundation for comparing the economic impacts of the modeled portfolios.