

Rocky Mountain Power  
Exhibit RMP\_\_ (JAC-6)  
Docket No. 20-035-34  
Witness: James A. Campbell

BEFORE THE PUBLIC SERVICE COMMISSION  
OF THE STATE OF UTAH

ROCKY MOUNTAIN POWER

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Exhibit Accompanying Direct Testimony of James A. Campbell

Emission Factor

August 2021

## PacifiCorp System Emissions and Renewable Energy Landscape: Information on Greenhouse Gas and Renewables Reporting

### Background: Forecasting Energy Resource Needs for Six States

Every two years PacifiCorp is required to forecast the energy resources needed to meet the electric loads of PacifiCorp's customers in the six states it serves on a 20 year horizon. This forecast is available in a publically-available document called the Integrated Resource Plan (IRP). The IRP is a comprehensive decision support tool and roadmap for meeting the company's objective of providing reliable and least-cost electric service to PacifiCorp's customers throughout Oregon, Washington, California, Wyoming, Idaho and Utah.

PacifiCorp's Six-State Service Territory



The IRP is developed through a robust public process with input from state utility commission staff, state agencies, consumer, environmental and industry advocacy groups, project developers, and other stakeholders. The IRP uses system modeling tools as part of its analytical framework to determine the long-run economic and operational performance of alternative resource portfolios. These models simulate the integration of new resource alternatives with our existing assets, thereby informing the selection of a preferred portfolio judged to be the most cost-effective resource mix after considering risk, supply reliability, uncertainty, and government energy resource policies. While the IRP reflects the best available forecast, many factors ultimately drive PacifiCorp's resource selection. Gas prices and hydroelectric power variability are leading drivers of fuel mix and emissions, and changes in these factors can cause significant deviations in actuals versus the forecast. While PacifiCorp is confident in its trend toward significant renewables additions and emissions reductions, year-to-year actuals can fluctuate considerably.

**Emissions**

PacifiCorp has made significant strides in reducing its system emissions, at a 13% reduction measured from a 2005 baseline as of April 2020. These were driven by significant changes to the fuel mix to date, including the addition of over 3,000 MW of owned and contracted renewable capacity since 2007. Additionally PacifiCorp engaged with customers in innovative solutions that enabled over 800 MW of customer-directed wind and solar projects through their partnership in PacifiCorp’s Blue Sky Select voluntary renewable program.

Every year in June PacifiCorp reports the previous years’ emissions and emissions factor, measured in tons of carbon dioxide equivalent per Megawatt-hour (CO<sub>2</sub>e/MWh).<sup>1</sup> Carbon dioxide equivalent is a unit that includes calculated GHG emissions from methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). The following emissions factor represents emissions across PacifiCorp’s six-state system and is appropriate for use in most GHG reporting protocols.

PacifiCorp System-Wide Emissions (2018)

PacifiCorp 2005 System Emissions (Million MT CO <sub>2</sub> e)	54.6
PacifiCorp 2018 System Emissions (Million MT CO <sub>2</sub> e)	47.7
PacifiCorp 2018 System Emission Intensity (MT CO <sub>2</sub> e / MWh)	0.68
Reduction from 2005 Base	13%

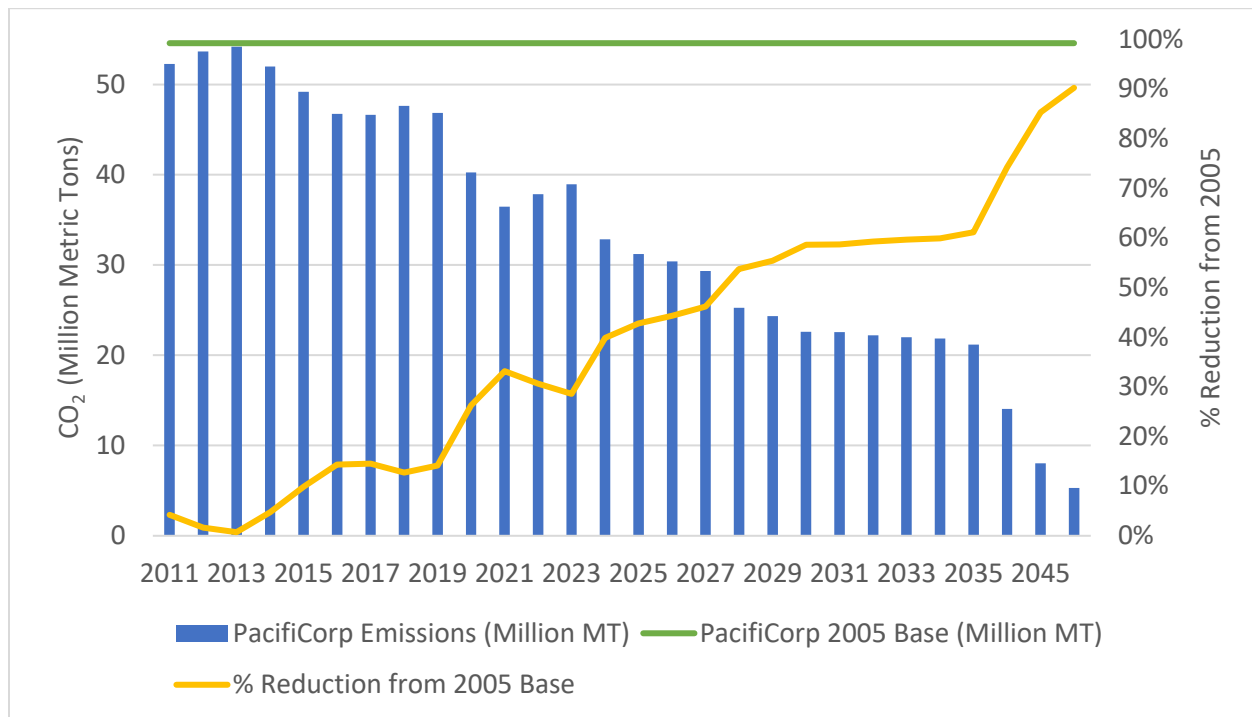
**Emissions and Fuel Mix Projections<sup>2</sup>**

Based on the IRP’s projected changes to PacifiCorp’s fuel mix, PacifiCorp forecasts that emissions will reduce drastically over the planning period – amounting to an 80% reduction in 2045 from a 2005 baseline. This is driven by significant changes to our fuel mix, most notably the addition of over 7,000 MW of new renewables: 3,500 MW of new wind generation by 2025 and a total of 4,600 MW of new wind generation by 2038; and 3,000 MW of new solar by 2025 and 6,300 MW by 2038. In the near term, by the end of 2020, we will see the emissions effects of PacifiCorp’s EV2020 project, a \$3 billion investment into 1,150 MW of new wind and 999 MW of upgraded or “repowered” wind. Emissions forecasts also reflect the planned retirement of 16 of 24 coal units by 2030, and additional 4 units by 2038. Additionally, the IRP calls for large-scale investment in battery storage, amounting to 600 MW of battery storage by 2025 and 2,800 MW by 2038.

<sup>1</sup> All actual emissions data is calculated in accordance with California Air Resources Board (CARB) methodology, reported annually, and third-party verified. The verification occurs by August.

<sup>2</sup> The forecasts below reflect emissions assigned to the six-state system. Customers in Oregon and Washington, due to state policy, will be allocated different emissions. For example, in 2030, emissions from coal resources will no longer be assigned to Oregon customers, as Oregon customers will not pay for those resources in their rates. See corollary documents for Oregon and Washington customers.

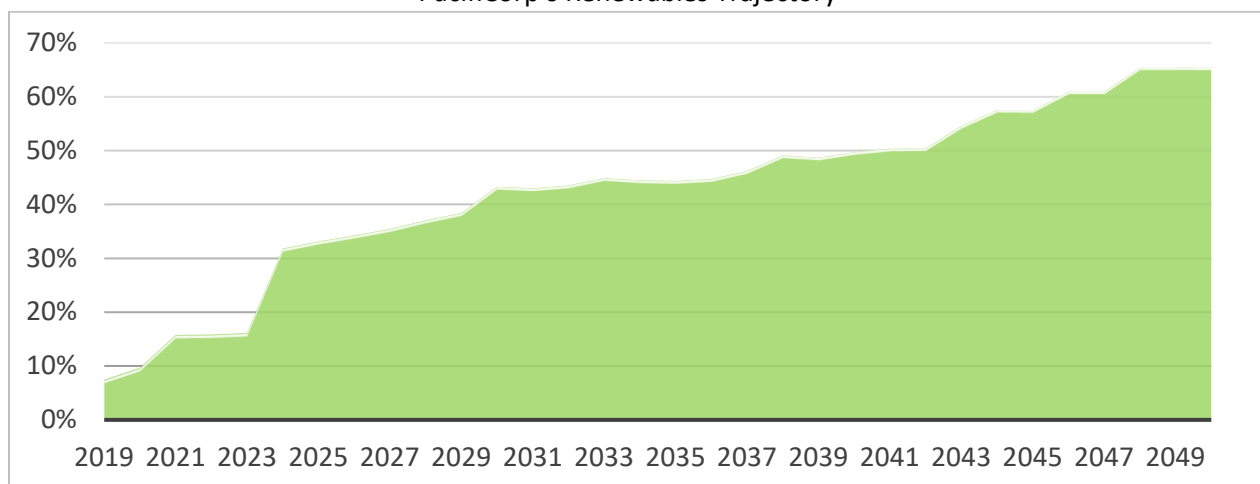
PacifiCorp System CO<sub>2</sub> Emissions Trajectory



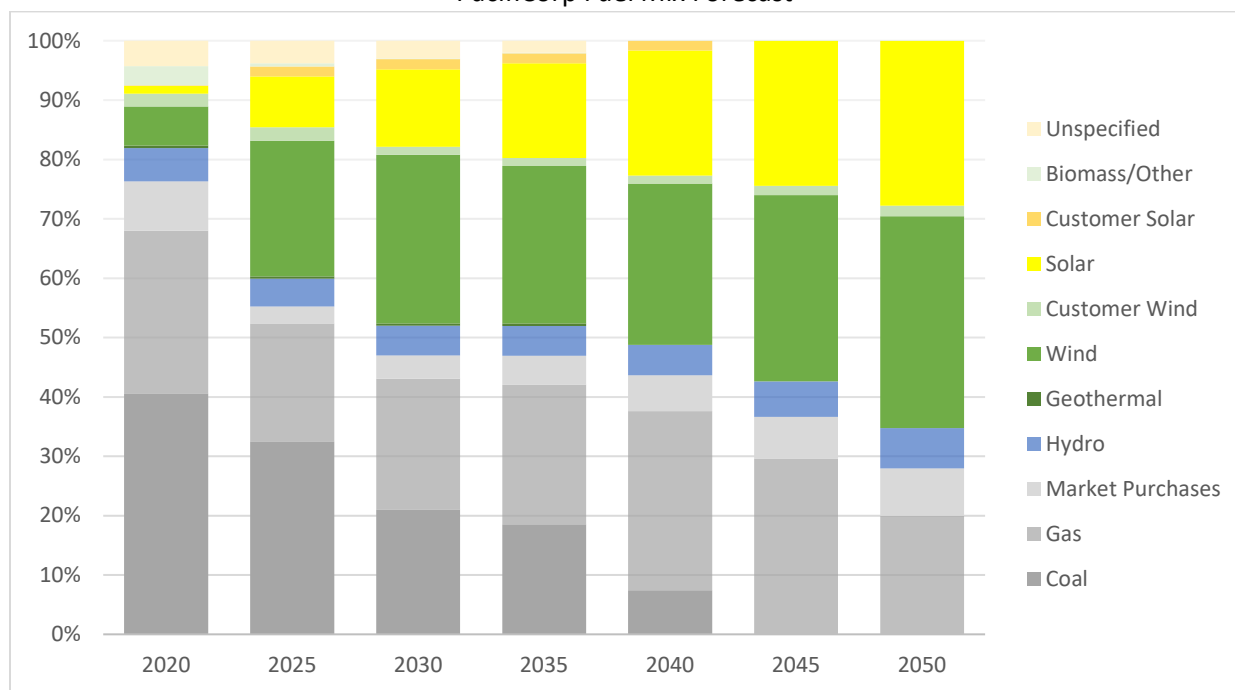
	2020	2025	2030	2035	2040	2045	2050
<b>PacifiCorp Emissions (Million MT CO<sub>2</sub><sup>3</sup>)</b>	0.62	0.48	0.36	0.34	0.23	0.15	0.12
<b>% Reduction from 2005 Base</b>	26%	43%	59%	61%	74%	85%	90%
<b>Emission Intensity (MT CO<sub>2</sub>e / MWh)</b>	0.56	0.44	0.33	0.31	0.21	0.14	0.11

<sup>3</sup> Forecasts are not available in CO<sub>2</sub>e because current IRP modeling does not model emissions from CH<sub>4</sub> and N<sub>2</sub>O.

PacifiCorp’s Renewables Trajectory<sup>4</sup>



PacifiCorp Fuel Mix Forecast<sup>5</sup>



<sup>4</sup> Depending on different protocols for different reporting entities, definitions vary as to what fuels are considered “renewable.” For example, the state of Utah recognizes nuclear power as “renewable” – as nuclear is a non-emitting resource. This chart includes low-impact hydropower resources, but other facilities (such as older and larger hydropower resources) may be considered renewable in some state policy and reporting protocols (they are excluded in this chart).

<sup>5</sup> In forecasted fuel mix, renewable resources without REC entitlement are classified as “unspecified,” which is sometimes referred to as “null power.” This applies to forecasted fuel mix only: in backward-looking actuals, the “unspecified” category refers to market purchases.

PacifiCorp Generation Forecast (GWh)<sup>6</sup>

	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>2035</b>	<b>2040</b>	<b>2045</b>	<b>2050</b>
Coal	29,150	23,275	14,482	12,670	4,919	0	0
Gas	19,714	14,292	15,204	16,056	20,074	16,987	10,092
Market Purchases	5,954	2,021	2,715	3,374	4,000	4,023	4,018
Large Hydro	2,983	2,336	2,356	2,359	2,360	2,360	2,360
Low-Impact Hydro	974	940	975	976	975	975	975
Small Hydro	103	103	103	103	103	103	103
Geothermal	279	277	281	281	0	0	0
Wind	4,738	16,389	19,589	18,162	18,029	18,012	18,015
Customer Wind	1,557	1,617	917	891	896	896	896
Solar	940	6,151	9,011	10,935	14,028	14,017	14,017
Customer Solar	73	1,183	1,165	1,135	1,077	0	0
Biomass/Other	2,294	400	90	60	13	13	13
Unspecified	3,093	2,710	2,057	1,395	0	0	0
<b>TOTAL</b>	<b>71,853</b>	<b>71,693</b>	<b>68,943</b>	<b>68,396</b>	<b>66,474</b>	<b>57,386</b>	<b>50,489</b>
<b>TOTAL RENEWABLE</b>	<b>6,931</b>	<b>23,756</b>	<b>29,855</b>	<b>30,353</b>	<b>33,032</b>	<b>33,005</b>	<b>33,008</b>
<b>TOTAL NON-EMITTING</b>	<b>10,017</b>	<b>26,195</b>	<b>32,314</b>	<b>32,815</b>	<b>35,495</b>	<b>35,467</b>	<b>35,470</b>

<sup>6</sup> Generation numbers are reported using a REC-Based accounting methodology. See Appendix for more details.

## Emissions Factor and Fuel Mix Forecast Methodology

Emissions and fuel mix forecasts that appear in this report based on the Preferred Portfolio published in PacifiCorp's 2019 Integrated Resource Plan (IRP).

Two forecasting models are utilized to determine the least-cost, least-risk portfolio of resources needed to meet projected system load: Planning and Risk (PaR) model, and System Optimizer (SO).<sup>7</sup> For the purpose of emissions and fuel mix forecasting, PaR is used because it more closely resembles actual system dispatch. While the SO model – which is reported in the IRP -- supplies a capacity view, PaR is able to bring the advantages of stochastic-driven risk metrics to the evaluation of the studies while also capturing additional operational considerations that the SO model does not assess (i.e., operating reserve requirements). PaR cost-risk metrics are ultimately used in the preferred portfolio selection, but as the IRP provides a forecast view of capacity needs, SO results are reported.

Importantly, the IRP-utilized PaR model provides the best available forecast for how resources will be dispatched -- but it is subject to changing conditions and assumptions and does not reflect all potential operational conditions. While the IRP reflects the best available forecast, many factors ultimately drive PacifiCorp's emissions intensity. Gas prices and hydroelectric power variability are leading drivers of emissions and changes in these factors can cause significant deviations in actuals versus the forecast. While PacifiCorp is confident in the overall greenhouse gas reduction trend reflected in the 20-year emissions forecast, year-to-year actuals can fluctuate considerably.

In addition, while the IRP calculates emissions associated with PacifiCorp-owned resources, it does not incorporate assumptions for market purchases. In addition, PacifiCorp's IRP is done on a six-state basis and does not allocate emissions to specific states or loads.

### Methodology

- Emission intensity is calculated by dividing annual emissions by annual energy allocation, which in some years exceeds load. No assumptions are made regarding how the energy mix might be reduced to meet load.
- Coal is assumed to be displaced with an increase in proxy market generation.
- Proxy market generation values are assumed to be the difference between load and contribution of the remaining generating sources.
- CO<sub>2</sub> emissions for proxy market are calculated using California Air and Resources Board (CARB) default emission factor (0.428 MT CO<sub>2e</sub>/MWh or 0.471 ST CO<sub>2e</sub>/MWh).
- Other than market generation, emissions are currently reported in CO<sub>2</sub>, not CO<sub>2</sub> equivalent.
- The IRP forecast is extended from 2039-2050 for emissions and fuel mix forecast purposes using four year rolling averages through the life of the resource or the end of a contract.
- For emissions calculations, generation is reported based on energy production (source-based accounting). Some portion of renewable attributes could be sold, transferred to PacifiCorp's customers, or not acquired with the energy. This is consistent with DEQ reporting requirements. However, for the fuel mix data in this document, renewable resources are reported based on REC-based accounting, in which PacifiCorp retains RECs from its own generation; or purchases

<sup>7</sup> For more information on the difference between the two models, please refer to page 182 of Volume I of the 2019 IRP document, available at [https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2019\\_IRP\\_Volume\\_I.pdf](https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2019_IRP_Volume_I.pdf)

energy and RECs from a counterparty. This does not include REC-only purchases for voluntary renewable programs.

- In forecasted fuel mix, renewable resources without REC entitlement are classified as “unspecified,” which is sometimes referred to as “null power.” This applies to forecasted fuel mix only: in backward-looking actuals, the “unspecified” category refers to market purchases.
- Coal plant retirement schedule is aligned with IRP assumptions.
- Although not reflected in this report, the company’s inter-jurisdictional cost allocation methodology will continue to evolve, including changes to both long-term resource planning and cost allocation of resources to PacifiCorp’s six states. These changes will further refine each state’s allocation of portfolio emissions.
- “Renewable” resources in this document includes low-impact hydropower resources, and excludes older and larger hydropower resources despite some state policy considering these resources “renewable.”
- “Customer owned renewables” refers to customer-directed wind and solar projects through their partnership in PacifiCorp’s voluntary renewable program.