

Exh. RAV-1Tr
Docket UE-210532
Witness: Richard A. Vail

**BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION**

WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION,

Complainant,

v.

PACIFICORP dba
PACIFIC POWER & LIGHT COMPANY

Respondent.

Docket UE-210532

**PACIFICORP
DIRECT TESTIMONY OF RICHARD A. VAIL**

REVISED September 21, 2021

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Exhibit No. RAV-2—Energy Vision 2020 Wind Network Improvements

1 **I. INTRODUCTION AND QUALIFICATIONS**

2 **Q. Please state your name, business address, and present position with PacifiCorp.**

3 A. My name is Richard A. Vail. My business address is 825 NE Multnomah Street,
4 Suite 1600, Portland, Oregon 97232. My present position is Vice President of
5 Transmission. I am responsible for transmission system planning, customer generator
6 interconnection requests and transmission service requests, regional transmission
7 initiatives, capital budgeting for transmission, transmission and distribution project
8 delivery, and administration of the Open Access Transmission Tariff (OATT). I am
9 testifying for PacifiCorp dba Pacific Power & Light Company (PacifiCorp or the
10 Company).

11 **Q. Please describe your education and professional experience.**

12 A. I have a Bachelor of Science degree with Honors in Electrical Engineering with a
13 focus in electric power systems from Portland State University. I have been Vice
14 President of Transmission for PacifiCorp since December 2012. I was Director of
15 Asset Management from 2007 to 2012. Before that position, I had management
16 responsibility for a number of organizations in PacifiCorp's asset management group
17 including capital planning, maintenance policy, maintenance planning, and
18 investment planning since joining PacifiCorp in 2001.

19 **II. PURPOSE OF TESTIMONY**

20 **Q. What is the purpose of your testimony in this proceeding?**

21 A. The purpose of my testimony is to provide an overview of PacifiCorp's transmission
22 system, explain the specific transmission investments that the Company is seeking a
23 prudence review of in this proceeding, and explain the process used to exclude

1 transmission voltage radial lines connecting resources that are not otherwise included
2 in Washington rates consistent with the Washington Inter-Jurisdictional Allocation
3 Methodology (WIJAM).

4 **III. OVERVIEW OF PACIFICORP’S TRANSMISSION SYSTEM**
5 **AND INVESTMENT DRIVERS**

6 **Q. Please briefly describe PacifiCorp’s transmission system.**

7 A. PacifiCorp owns and operates approximately 16,500 miles of transmission lines
8 ranging from 46 kilovolts (kV) to 500 kV across multiple western states. PacifiCorp
9 has nearly two million customers with approximately 137,000 customers located in
10 Washington. PacifiCorp operates two balancing authority areas (BAAs) – PacifiCorp
11 East (PACE) BAA and PacifiCorp West (PACW) BAA. The PACW BAA includes
12 interconnections with the Bonneville Power Administration (BPA), the northern
13 portion of the California Independent System Operator (CAISO), and other utilities in
14 California, Oregon, and Washington. The PACE BAA includes interconnections
15 with utilities in the intermountain west and southwest, which also provides access to
16 the southern portion of the CAISO. PacifiCorp has two generation facilities that are
17 “pseudo-tied” into the PACW BAA, but physically located in other BAAs – the Jim
18 Bridger generation facility and the Colstrip generation facility.

19 **Q. Please describe PacifiCorp’s responsibility for maintaining reliability on its**
20 **transmission system.**

21 A. In 1996, the Federal Energy Regulatory Commission (FERC) issued Order No. 888,¹

¹ *Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Pub. Util.; Recovery of Stranded Costs by Pub. Util. and Transmitting Utilities*, Order No. 888, 61 FR 21540 (May 10, 1996), FERC Stats. & Regs. ¶ 31,036 (1996), order on reh’g, Order No. 888-A, 62 FR 12274 (Mar. 14, 1997), FERC Stats. & Regs. ¶ 31,048 (1997), order on reh’g, Order No. 888-B, 81 FERC ¶ 61,248 (1997), order on reh’g, Order No. 888-C, 82 FERC ¶ 61,046 (1998).

1 which required that transmission system owners provide non-discriminatory access to
2 their transmission systems. PacifiCorp is obligated under its OATT to plan its
3 transmission system for the open access of all transmission customers. Through the
4 OATT Attachment K local planning process and the FERC Order 1000 regional and
5 inter-regional planning processes, PacifiCorp participates in open stakeholder
6 planning processes covering its entire transmission footprint. These planning
7 processes result in system plans that incorporate economics, reliability, and public
8 policy inputs and requirements. PacifiCorp must also coordinate with other entities in
9 the region for transmission planning purposes as required under FERC Order No.
10 1000.² In addition to these more general requirements, PacifiCorp also must comply
11 with the specific requirements of the mandatory reliability standards approved by
12 FERC.

13 **Q. Who establishes transmission reliability standards?**

14 A. FERC directs the North American Electric Reliability Corporation (NERC) to
15 develop Reliability Standards to ensure the safe and reliable operation of the Bulk
16 Electric System (BES) in the United States in a variety of operating conditions. On
17 April 1, 2005, NERC established a set of transmission operations reliability standards.
18 A subset of the transmission reliability standards are the transmission planning
19 standards (TPL Standards). The purpose of the TPL Standards is to “establish
20 Transmission system planning performance requirements within the planning horizon
21 to develop a BES that will operate reliably over a broad spectrum of System

² *Transmission Planning and Cost Allocation by Transmission Owning and Operating Pub. Util.*, Order No. 1000, 76 FR 49842 (Aug. 11, 2011), FERC Stats. & Regs. ¶ 31,323 (2011), order on reh’g, Order No. 1000-A, 139 FERC ¶ 61,132 (2012), order on reh’g, Order No. 1000-B 141 FERC ¶ 61,044 (2012).

1 conditions and following a wide range of probable Contingencies.”³ The TPL
2 Standards, along with regional planning criteria (*i.e.*, regional planning criteria
3 established by the Western Electricity Coordinating Council (WECC)) and utility-
4 specific planning criteria, define the minimum transmission system requirements to
5 safely and reliably serve customers.

6 **Q. How does PacifiCorp ensure compliance with the TPL Standards?**

7 A. The Company plans, designs, and operates its transmission system to meet or exceed
8 NERC Standards for BES and WECC Regional standards and criteria. To ensure
9 compliance with applicable TPL Standards, PacifiCorp conducts an annual system
10 assessment to evaluate the performance of the Company’s transmission system and to
11 identify system deficiencies. The annual system assessment is comprised of steady-
12 state, stability, and short circuit analyses⁴ to evaluate peak and off-peak load seasons
13 in the near-term (one-, two-, and five-year) and long-term (10-year) planning
14 horizons. The assessment is performed using power flow base cases maintained by
15 WECC and developed in coordination among all transmission planning entities in the
16 Western Interconnection. These base cases include load and resource forecasts along
17 with planned transmission system changes for each of the future year cases and are
18 intended to identify future system deficiencies to be mitigated.

19 As part of the annual system assessment, corrective action plans are developed
20 to mitigate identified deficiencies, and may prescribe construction of transmission

³ See <http://www.nerc.com/files/tpl-001-4.pdf>.

⁴ Analyses consist of taking a normal system (N-0) and applying events (N-1, N-1-1, N-2, etc.) within each category (P0, P1, P2, P3, etc.) listed within the TPL Standards in order to identify system deficiencies. Example: An N-1-1 event describes two transmission system elements being out of service at the same time, but due to independent causes. An example of an N-1-1 event would be a planned outage of one 230 kV transmission line followed by an unplanned outage of any element in the system being used to continue service with the initial element out.

1 system reinforcement projects or, as applicable, adoption of new operating
2 procedures. In certain instances, operating procedures prescribing action to change
3 the configuration of the transmission system can prevent deficiencies from occurring
4 when there are two back-to-back (N-1-1) (or concurrent) transmission system events.
5 However, the use of operating procedure actions has limitations. In particular,
6 actions taken in connection with operating procedures that are designed to protect the
7 integrity of the larger integrated transmission system in the Western Interconnection
8 of the United States can lead to large numbers of customers being at risk of an outage
9 upon the occurrence of the second of two back-to-back (N-1-1) events. An effective
10 corrective action plan is critical to ensuring system reliability so that large numbers of
11 customers are not subjected to avoidable outage risk.

12 **Q. Is compliance with the reliability standards optional?**

13 A. No. The reliability standards are a federal requirement, subject to oversight and
14 enforcement by WECC, NERC, and FERC. PacifiCorp is subject to compliance
15 audits every three years and may be required to prove compliance during other NERC
16 or WECC reliability initiatives or investigations. Failure to comply with the
17 reliability standards could expose the Company to penalties of up to \$1 million per
18 day, per violation. Accordingly, and as described more fully later in my testimony,
19 compliance with reliability standards is a major driver for the new capital investments
20 in PacifiCorp's system transmission assets identified in and supported by my
21 testimony.

1 **Q. Please identify other drivers that are relevant to the capital investments in**
2 **PacifiCorp’s distribution and transmission systems described in your testimony.**

3 A. There are several other drivers that inform whether PacifiCorp will build new
4 distribution and transmission facilities, including increased demand for transmission
5 capacity, requests for transmission service, increased demand for distribution
6 capacity, and the age and condition of existing distribution and transmission facilities.
7 The specific drivers for the projects addressed in my testimony are described in more
8 detail later in my testimony.

9 **IV. OVERVIEW OF INVESTMENTS DESCRIBED IN TESTIMONY**

10 **Q. What specific transmission system investments are you addressing in your**
11 **testimony?**

12 A. My testimony provides updates on the following projects:

13 The Aeolus to Bridger/Anticline 500 kV Transmission Project includes the
14 construction of facilities to integrate approximately 1,150 megawatts (MW) of new
15 wind generation resources located in southeast Wyoming (*i.e.*, TB Flats, Cedar
16 Springs, and Ekola Flats, collectively referred to as New Wind Projects or
17 individually referred to as a New Wind Project)⁵ and deliver energy from those
18 resources across PacifiCorp’s system. Those facilities include:

- 19 • A 140-mile, 500 kV transmission line (Aeolus-to-Anticline line), which
20 includes construction of the new Aeolus (500/230 kV) and Anticline
21 (500/345 kV) substations; a map of the proposed line can be found
22 attached in Exhibit No. RAV-2;
- 23 • A five-mile, 345 kV transmission line that will extend from the proposed
24 Anticline substation to the Jim Bridger substation, along with associated
25 interconnection facilities at the Jim Bridger substation to accommodate the

⁵ The Energy Vision 2020 Wind Projects are more thoroughly discussed in the testimony of Mr. Timothy J. Hemstreet.

1 interconnection of the 345 kV line from the proposed Anticline substation;
2 and

- 3 • A voltage control device at the existing Latham substation.

4 Additional network upgrades are also required to accommodate the Aeolus to
5 Bridger/Anticline 500 kV Line Project and the interconnection of the New Wind
6 Projects (230 kV Network Upgrades). These network upgrades include:

- 7 • A new 16-mile 230 kV transmission line parallel to an existing 230 kV
8 line from the Shirley Basin substation to the proposed Aeolus substation,
9 including modifications to the Shirley Basin substation to accommodate
10 the new line;
- 11 • The reconstruction of four miles of an existing 230 kV transmission line
12 between the proposed Aeolus substation and the Freezeout substation,
13 including modifications of the Freezeout substation to accommodate the
14 new line; and
- 15 • The reconstruction of 14 miles of an existing 230 kV transmission line
16 between the Freezeout substation and the Standpipe substation, including
17 modifications to the Freezeout and Standpipe substations to accommodate
18 the transmission lines.

19 The reconstructed sections are proposed to be in a parallel alignment to the existing
20 230 kV transmission lines. The Aeolus to Bridger/Anticline 500 kV Transmission
21 Project and 230 kV Network Upgrades are needed to support interconnection of the
22 New Wind Projects, which are described in the testimony of Mr. Timothy J.
23 Hemstreet.

24 **Q. What are the actual costs through May 2021 for these transmission investments**
25 **and their associated in-service dates?**

26 A. Table 1 identifies the specific projects, associated costs, and in-service dates.

Table 1		
Project	Total Company Cost (\$m)	In-Service Date
Aeolus to Bridger/Anticline 500 kV line⁶		
Sequence Three (In Service)	\$12.7	January 2020
Sequence Four (includes 2021 closeout costs)	\$626.7	November 2020
230 kV Network Upgrades		
Q707 TB Flats 1 (includes 2021 closeout costs)	\$35.8	September 2020
Q712 Cedar Springs Wind 1ts) (includes 2021 closeout costs)	\$58.5	November 2020

1 These amounts include costs associated with engineering, project
2 management, materials and equipment, construction, right-of-way (including rights
3 acquired by condemnation), and an allowance for funds used during construction.

4 **Q. Please briefly describe the benefits associated with these investments.**

5 A. The benefits associated with these investments include increased load serving
6 capability, enhanced reliability, conformance with NERC Reliability Standards,
7 improved transfer capability within the existing system, relief of existing congestion,
8 and interconnection and integration of new wind resources into PacifiCorp's
9 transmission system. These benefits will be described more fully below.

10 **Q. Are PacifiCorp's OATT transmission customers paying for some of these assets?**

11 A. Yes; transmission customers pay through OATT transmission charges. The
12 Company's current transmission formula rate (included in PacifiCorp's OATT) was
13 approved by FERC in Docket No. ER11-3643.⁷ The Company's transmission
14 formula rate is updated annually with the annual transmission revenue requirement
15 (ATRR) that represents the annual total cost of providing firm transmission service

⁶ As discussed later in my testimony, Sequence One was placed into service in 2011.

⁷ *In re PacifiCorp*, 143 FERC ¶ 61,162 (May 23, 2013) (letter order approving settlement agreement establishing formula rate).

1 over the test year. The ATRR calculation incorporates all transmission system
2 investments by the Company, a return on rate base, income taxes, expenses, and
3 certain revenue credits, among other specific elements and adjustments.

4 Transmission assets, including new transmission capital, are included in the ATRR,
5 weighted by months in service. The ATRR is converted into a rate by dividing the
6 ATRR by firm transmission demand. All third-party revenues for transmission
7 service (along with third-party revenues for ancillary services) are included as
8 revenue credits in the calculation of rates in each of the Company's state retail
9 jurisdictions.

10 **Q. Please explain how network upgrade cost allocation works under the OATT.**

11 A. In accordance with its OATT, when PacifiCorp receives a request for generation
12 interconnection or transmission service, the Company completes studies to determine
13 what new facilities or upgrades to existing facilities are required to accommodate the
14 request. The studies identify the facilities and upgrades required and classify the asset
15 additions required to support the service into two categories: direct assigned or network
16 upgrade. Direct assigned assets are those assets that only benefit or are used solely by
17 the customer requesting generator interconnection or transmission service. Those costs
18 are directly assigned and paid for by that customer and will not be included in either
19 the Company's ATRR or retail rate base. Network upgrades, on the other hand, are
20 those assets that benefit all customers using the transmission system. Costs associated

1 with network upgrades are investments by the transmission provider and are included
2 in PacifiCorp's ATRR⁸ and retail rate base.

3 **V. AEOLUS TO BRIDGER/ANTICLINE 500 KV TRANSMISSION PROJECT**

4 **Q. Please describe the investment for the Aeolus to Bridger/Anticline 500 kV**
5 **Transmission Project.**

6 A. The Aeolus to Bridger/Anticline 500 kV Transmission Project was placed in service
7 in four sequences. The first sequence was the purchase of property used for the new
8 Aeolus and Anticline substations, which were placed in service in March 2011. The
9 second sequence was to construct a replacement access bridge over the Medicine
10 Bow River and complete associated upgrades to an existing unpaved county road for
11 \$4.1 million in July 2018. The third sequence of work, completed in January 2020,
12 was the expansion of the Latham Substation with a new line termination bay to
13 accommodate the installation of a static synchronous compensator voltage control
14 device. Finally, the last sequence of plant in-service, completed in November 2020,
15 included the two 500 kV substations (*i.e.*, Aeolus and Anticline), the static
16 synchronous compensator voltage control device and the 500 kV transmission line.

17 **Q. Please describe the 230 kV Network Upgrades.**

18 A. The generation interconnection projects selected as part of a request for proposal to
19 interconnect 1,150 MW of new wind generation to the transmission system in eastern
20 Wyoming were fully described in the Company's last general rate case, docket

⁸ For generation interconnection customers, those customers may be required to pay the initial cost of network upgrades, subject to refund through credits to invoiced charges for transmission service and full refund of any remaining amounts after 20 years. See Section 11.4 of PacifiCorp's Standard Large Generator Interconnection Agreement (OATT Attachment N, Appendix 6 and available at http://www.oasis.oati.com/woa/docs/PPW/PPWdocs/20190601_OATTMASTER.pdf); see also Standardization of Generator Interconnection Agreements and Procedures, Order No. 2003-B, 109 FERC ¶ 61,287 (December 20, 2004).

1 UE-191024 (2021 Rate Case)⁹ and are summarized below. Separate generation
2 interconnection agreements were negotiated and signed for each of the projects.

3 Q707 TB Flats 1 was placed in service in November 2020 for \$36.8 million of
4 network upgrades. This project included a new 16-mile 230 kV transmission line
5 parallel to an existing 230 kV line from Shirley Basin substation to the proposed
6 Aeolus substation and included modifications to the existing Shirley Basin substation.

7 Q712 Cedar Springs Wind was placed into service in December 2020 and
8 requires \$59.1 million of network upgrades. This project included the reconstruction
9 of four miles of an existing 230 kV transmission line between the proposed Aeolus
10 substation and the Freezeout substation, including modifications required at the
11 Freezeout substation; the reconstruction of 14 miles of an existing 230 kV
12 transmission line between the Freezeout substation and the Standpipe substation
13 including modifications as required at the Freezeout and Standpipe substations; and
14 the reconstruction of 16 miles of an existing 230 kV transmission line from the
15 proposed Aeolus substation to the existing Shirley Basin substation.

16 **Q. Please explain why this investment in the Aeolus to Bridger/Anticline 500kV**
17 **Transmission Project was needed.**

18 A. As described in more detail in the testimony of Mr. Rick T. Link, the Aeolus to
19 Bridger/Anticline 500 kV Transmission Project supports the Company's short- and
20 long-term energy demands for serving customers across the entire PacifiCorp system,
21 and will strengthen the overall reliability of the existing Wyoming transmission
22 system and therefore PacifiCorp's entire transmission system.

⁹ *WUTC v. Pac. Power & Light Co.*, Docket Nos. UE-191024, UE-190750, UE-190929, UE-190981, UE-180778 (cons.), Order 09 / 07/ 12 (Dec. 14. 2020).

1 The Aeolus to Bridger/Anticline 500 kV Transmission Project has long been
2 recognized as an integral component of PacifiCorp’s long-term transmission
3 planning, but the construction of the project has not been economic until now. The
4 renewal of the federal wind production tax credits (PTCs) created a unique
5 opportunity for the Company to acquire significant cost-effective, zero-emission wind
6 resources, generating PTCs that provide cost savings necessary to economically
7 construct the project. To achieve the full customer benefits of the PTCs, however, the
8 Company had to develop the New Wind Projects and the Aeolus to Bridger/Anticline
9 500 kV Transmission Project together.

10 **Q. How is the Aeolus to Bridger/Anticline 500 kV Transmission Project benefiting**
11 **customers and improving system performance?**

12 A. The Aeolus to Bridger/Anticline 500 kV Transmission Project: (1) relieves
13 congestion and increases transmission capacity across Wyoming, allowing
14 interconnection and integration of new generation resources and more efficient
15 dispatch of and greater flexibility managing existing resources; (2) provides critical
16 voltage support to the transmission system; (3) improves system reliability; and
17 (4) reduces energy and capacity losses. Remarkably, customers are able to receive all
18 of these benefits, while taking advantage of the PTCs from the New Wind Projects to
19 offset the costs of the project.

20 **Q. How does the Aeolus to Bridger/Anticline 500 kV Transmission Project increase**
21 **transmission capacity in southeastern Wyoming?**

22 A. Before the project, the Company’s transmission system in southeastern Wyoming was
23 operating at capacity, which limited transfer of existing resources from eastern

1 Wyoming and precluded the ability to interconnect and integrate additional resources
2 east of Bridger/Anticline. This investment increased the transfer capability from east
3 to west across Wyoming by 951 MW. Now that the Aeolus to Bridger/Anticline
4 500 kV Transmission Project is complete, the Company is able to accommodate up to
5 approximately 1,510 MW of additional new wind resources east of the
6 Bridger/Anticline substation.

7 The increased transmission capacity also provides improved access to existing
8 generation resources, and options to access other resources, including renewable
9 resources. The resulting increase in capacity allows flexibility to use future
10 generation and interconnected transmission facilities.

11 **Q. How is the Aeolus to Bridger/Anticline 500 kV Transmission Project impacting**
12 **the dispatch of the Company's existing generation resources?**

13 A. The Aeolus to Bridger/Anticline 500 kV Transmission Project increased the ability to
14 dispatch the Company's existing resources. With the project located between eastern
15 Wyoming and Jim Bridger/Anticline, eastern Wyoming transmission congestion is
16 mitigated and wind resources entering the Jim Bridger energy hub can flow onto the
17 Bridger West transmission path to PacifiCorp load centers. With increased wind
18 generation entering the Jim Bridger energy hub, Jim Bridger generating plant can be
19 dispatched to maximize wind transfers out of the energy hub.

20 **Q. Will the increased capacity benefit customers in any other ways?**

21 A Yes. To provide low-cost energy, the Company must have the ability to acquire
22 power from numerous generation sources and negotiate the most competitive pricing.
23 By adding transmission capacity, the Company has increased its ability and options to

1 obtain additional generation sources at competitive pricing. The Aeolus to
2 Bridger/Anticline 500 kV Transmission Project provides a stronger transmission
3 system in southern Wyoming and therefore throughout PacifiCorp's entire service
4 territory.

5 **Q. Is the increased capacity provided by the Aeolus to Bridger/Anticline 500 kV**
6 **Transmission Project consistent with the Company's obligation to provide**
7 **transmission service under its OATT?**

8 A. Yes. The Company's OATT, approved by FERC, details the Company's
9 requirements and obligations to provide transmission service. Section 28.2 of the
10 OATT defines the Company's responsibilities, which include the requirement to
11 "plan, construct, operate, and maintain the system in accordance with good utility
12 practice." Section 28.3 states the requirement for the Company to provide "firm
13 service over the system so that designated resources can be delivered to designated
14 loads." The Company is required to provide adequate and non-discriminatory service
15 to all network customers. Although the Aeolus to Bridger/Anticline 500 kV
16 Transmission Project is not specifically mandated by the Company's obligations
17 under its OATT, the project will allow the Company to more efficiently meet current
18 and forecasted customer energy demand by relieving the existing transmission
19 congestion in southeastern Wyoming.

20 **Q. What are the benefits resulting from the critical voltage support that are**
21 **provided by the Aeolus to Bridger/Anticline 500 kV Transmission Project?**

22 A. Under certain operating conditions, voltage control issues have limited the ability to
23 add additional resources, particularly wind resources, in southeastern Wyoming.

1 The Aeolus to Bridger/Anticline 500 kV Transmission Project is enhancing the ability
2 to control voltage issues and allow additional wind generation to be integrated into
3 the Company's system.

4 **Q. How does the Aeolus to Bridger/Anticline 500 kV Transmission Project improve**
5 **system reliability?**

6 A. The transmission grid can be affected in its entirety by what happens on an individual
7 transmission line or path. For example, the transmission system between eastern and
8 central Wyoming is comprised of several individual transmission lines or line
9 segments. A single outage on any of the individual lines or line segments due to
10 storm, fire, or other external human interference can and does cause significant
11 reductions in transfer capability, which can negatively impact the Company's ability
12 to serve customers. Line outages require the Company to curtail generation resources
13 to stabilize system voltages and require less efficient re-dispatch of system resources
14 to meet network load requirements. This in turn places a burden across the entire
15 interconnected system as generation resources across PacifiCorp's service territory,
16 using PacifiCorp's transmission system, are used to ensure the continued reliability of
17 energy supply to all PacifiCorp customers.

18 In the event of a line outage, the redundancy provided by the Aeolus to
19 Bridger/Anticline 500 kV Transmission Project will allow the Company to continue
20 to meet native load service obligations and other contractual obligations to third
21 parties. Strengthening this path and increasing system redundancy will benefit all
22 customers by reducing the risk of outages and inefficient dispatch resulting from
23 those outages.

1 In addition, the Aeolus to Bridger/Anticline 500 kV Transmission Project will
2 improve the Company's ability to perform required maintenance without significant
3 operational impacts to the system, and reduce impacts to customers during planned
4 and forced system outages. Transmission line and substation maintenance windows
5 were limited because the system is highly utilized. By relieving congestion and
6 providing additional transmission paths, this investment allows greater flexibility to
7 the Company in the operation of its transmission system.

8 **Q. Can you provide an example where the Aeolus to Bridger/Anticline 500 kV**
9 **Transmission Project would have mitigated the impact of an outage on the 230**
10 **kV transmission system?**

11 A. Yes. For an outage of the Latham – Point of Rocks 230 kV line, the Aeolus to
12 Bridger/Anticline 500 kV Transmission Project eliminates the overload on the Dave
13 Johnston – Amasa 230 kV line. For an outage of the Mustang – Spence 230 kV line,
14 the Aeolus to Bridger/Anticline 500 kV Transmission Project eliminates the overload
15 on 230 kV lines west of Platte. For an outage of the Riverton – Wyopo 230 kV line,
16 the Aeolus to Bridger/Anticline 500 kV Transmission Project eliminates overloads on
17 230 kV lines west of Platte. For an outage of the Dave Johnston to Amasa 230 kV
18 line, the Aeolus to Bridger/Anticline 500 kV Transmission Project eliminates the
19 overload on the 230 kV lines west of Platte. For an outage of the Platte to Standpipe
20 230 kV line, the Aeolus to Bridger/Anticline 500 kV Transmission Project will
21 eliminate the need to trip approximately 130 MW of wind generation at Foote Creek.

1 **Q. Will the Aeolus to Bridger/Anticline 500 kV Transmission Project also enhance**
2 **the Company's ability to meet the reliability standards applicable to its**
3 **transmission system?**

4 A. Yes. Although the Company currently meets or exceeds the applicable reliability
5 standards and criteria, the addition of the Aeolus to Bridger/Anticline 500 kV
6 Transmission Project will allow the Company to do this more efficiently.

7 **Q. How do NERC and WECC standards and criteria influence the need for the**
8 **Aeolus to Bridger/Anticline 500 kV Transmission Project?**

9 A. The mandatory standards, particularly NERC's TPL-001-4 standard, require the
10 Company to have a forward-looking transmission plan of action to reliably serve
11 current and anticipated customer demands under certain planning horizon conditions,
12 including normal system operations (all system elements in service) and during
13 system contingencies (where elements of the transmission system are out of service),
14 both planned or otherwise.

15 As described earlier in my testimony, the Company performs annual
16 reliability assessments to determine that its transmission system complies with
17 minimum mandatory system performance standards, which require that during loss of
18 any single transmission system element (N-1 single contingencies) that firm service is
19 maintained, no system overloads exist, and there is no loss of customer demand.

20 The Aeolus to Bridger/Anticline 500 kV Transmission Project is sub-segment
21 D.2 of Gateway West, which, as part of Energy Gateway, has been included in the
22 Company's annual TPL-001-4 assessment as part of its short- and long-term plans to
23 dependably meet NERC and WECC reliability requirements. The Aeolus to

1 Bridger/Anticline 500 kV Transmission Project’s new transmission segments are
2 particularly effective in increasing system reliability under the various multiple
3 contingency categories of the TPL-001-4 standard.

4 The NERC Standard TPL-001-4 has category P6 (N-1-1) that results in outage
5 of multiple transmission elements. This category outage allows adjustment of the
6 transmission system after the first outage following which the second outage is
7 conducted. The Aeolus – Anticline 500 kV line will significantly help under these
8 N-1-1 conditions. For example, the N-1-1 outage of Riverton – Wyopo 230 kV line
9 followed with an outage of Spence – Mustang 230 kV line without the 500 kV line
10 would require curtailment of the TOT4A path by approximately 500 MW. But with
11 the addition of the 500 kV line this curtailment would not be required. The study was
12 performed with TOT4A flows at 1,030 MW in the original case. The addition of the
13 500 kV line prevents thermal overload on the 230 kV transmission system west of
14 Platte.

15 **Q. Has the Aeolus to Bridger/Anticline 500 kV Transmission Project been included**
16 **in WECC path rating studies?**

17 A. Yes. The Aeolus to Bridger/Anticline 500 kV Transmission Project has undergone
18 WECC’s Three Phase Ratings Process, and has been approved by WECC for Phase 3-
19 “Construction Phase” status as part of the overall Energy Gateway project. The
20 Aeolus West transmission path and three other Gateway West transmission paths
21 (TOT 4A, Bridger/Anticline West and Path C) have completed the Three Phase
22 Rating Process and were granted Phase 3 status on January 5, 2011.

1 **Q. What is WECC's Three Phase Ratings Process?**

2 A. The purpose of the Three Phase Rating Process is to provide a formal process for
3 project sponsors to attain an accepted rating and demonstrate how their Project will
4 meet NERC Reliability Standards. The Three Phase Rating Process addresses
5 planned new facility additions and upgrades, or the re-rating of existing transmission
6 facilities. It requires coordination through a review group comprised of the project
7 sponsors and representatives of other systems that may be affected by the project. An
8 accepted rating affords the project sponsor some protection against erosion of
9 established capacity of the rated transmission facility when further expansion of the
10 western interconnected transmission system is proposed or new limitations are
11 discovered.

12 **Q. Why is WECC's Three Phase Ratings Process important to the Aeolus to**
13 **Bridger/Anticline 500 kV Transmission Project?**

14 A. This WECC approval is necessary because it allows the Company to interconnect the
15 Aeolus to Bridger/Anticline 500 kV Transmission Project to the wider transmission
16 system in the area and to reliably operate the new line at its approved ratings. The
17 Aeolus to Bridger/Anticline 500 kV Transmission Project, especially when
18 complemented with other Energy Gateway projects (specifically Aeolus to Clover,
19 included in the 2019 Integrated Resource Plan (IRP) preferred portfolio, and
20 Anticline to Populus and Oquirrh to Terminal, included in the PacifiCorp's IRPs over
21 the last several cycles), will greatly strengthen the Company's transmission capacity
22 and flexibility. The Aeolus to Bridger/Anticline 500 kV Transmission Project is
23 regarded as a necessary interconnection point to support the long-term transmission

1 expansion planning established in the WECC Region plans and in the most recent
2 Northern Tier Transmission Group sub-regional plan.¹⁰

3 While the Aeolus to Bridger/Anticline 500 kV Transmission Project provides
4 the next necessary increment of transmission capacity in the area, it also supports and
5 complements other future transmission investments that are currently proposed by the
6 Company as included in the 2019 IRP preferred portfolio, provides recognition for
7 continued permitting and supports the reliability of other utilities in the region as
8 shown in the NTTG regional plans. The construction of this line, as an integral
9 component of the larger Energy Gateway project, positions the Company to be
10 strongly interconnected to other regional projects currently being planned and
11 provides options for access to additional resources.

12 **Q. How does the Aeolus to Bridger/Anticline 500 kV Transmission Project reduce**
13 **energy and capacity losses?**

14 A. Reduced energy and capacity losses on the transmission system have the potential to
15 provide monetary savings over time. The addition of a new transmission line
16 operated in parallel with existing lines reduces the electrical impedance of the
17 transmission system, resulting in lower energy line losses (megawatt-hours) over the

¹⁰ PacifiCorp participates in FERC Order 1000 regional planning through membership in the Northern Tier Transmission Group. Under FERC Order 1000, regional planning groups were established to facilitate coordinated and transparent transmission system planning among the participating member entities to ensure regional transmission stability and efficiency. Currently, there are four sub-regions in the Western Interconnection of the United States, including Northern Tier Transmission Group, ColumbiaGrid, WestConnect, and California ISO. These four sub-regions each develop independent regional plans and then coordinate on interregional planning across the Western Interconnection. Effective January 2020, Northern Tier Transmission Group and ColumbiaGrid will merge into the new NorthernGrid regional planning group, of which PacifiCorp will be a participating member. Further information on NTTG is available at: http://nttg.biz/site/index.php?option=com_docman&task=cat_view&gid=308&Itemid=31.

1 life of the project. Depending on the amount of power flow, line loss savings can be
2 substantial.

3 **Q. What were the major milestones to achieve in-service of the Aeolus to**
4 **Bridger/Anticline transmission line and 230 kV Network Upgrades?**

5 A. Major milestones are identified below:

6 **500 kV Transmission**

- 7 • Mechanical Completion; September 22, 2020
- 8 • Substantial Completion; November 4, 2020

9 **500 kV Substations**

- 10 • Mechanical Completion Aeolus 230 kV yard; May 27, 2020
- 11 • Substantial Completion Aeolus 230 kV yard; June 15, 2020
- 12 • Mechanical Completion (all remaining work); October 30, 2020
- 13 • Substantial Completion (all remaining work); October 31, 2020

14 **230 kV Network Upgrades**

- 15 • Aeolus to Shirley Basin Substantial Completion: October 31, 2020¹¹
- 16 • Aeolus to Freezeout Substantial Completion: October 23, 2020¹²
- 17 • Freezeout to Standpipe Substantial Completion: October 13, 2020
- 18 • Aeolus to Shirley Basin (rebuild) Substantial Completion:
- 19 November 5, 2020

20 **Q. Please describe the total cost of the Aeolus to Bridger/Anticline transmission line**
21 **compared to the amount included in rates in the 2021 Rate Case.**

22 A. The actual and forecasted costs of the Aeolus to Bridger/Anticline transmission line
23 are \$652.9 million (actuals and forecast through December 2021), approximately \$26

⁹ Changed from May 15, 2020, due to additional restrictions imposed by the Bureau of Land Management.

¹⁰ Changed from May 30, 2020, due to additional restrictions imposed by the Bureau of Land Management.

1 million lower than the \$679.2 million included in rates in the 2021 Rate Case. The
2 entire cost of the Aeolus to Bridger/Anticline transmission line will be incurred by the
3 Company without contribution from any transmission customer projects.

4 **Q. Please describe the total cost of the 230 kV Network Upgrades compared to the**
5 **amount included in rates in the 2021 Rate Case.**

6 A. The 230 kV Network Upgrades actual costs through May 2021 are \$94.3 million,
7 approximately \$2.0 million more than the \$92.3 million estimate included in rates in
8 the 2021 Rate Case.¹³

9 **Q. What are the drivers for the cost increase?**

10 A. The increase in cost was due to the competitive bid price received for the
11 transmission line elements of the 230 kV Network Upgrades, which exceeded the
12 initial forecast value. The increase in transmission line costs are attributable to
13 market conditions that changed after the initial cost estimate was prepared in early
14 2017. The estimate was prepared using historical metrics to develop a cost plan,
15 which could not have accounted for the rapid expansion of projects in the industry
16 that occurred just prior to the time of the bid, including Pacific Gas & Electric
17 Company's transmission improvement program, initiated in response to extensive
18 wildfires in California. Further increases were caused by extreme weather conditions,
19 birds and nesting environmental concerns, and delays in getting required outages
20 from the Western Area Power Administration.

¹³ *In the Matter of the Application of Rocky Mountain Power for a Certificate of Public Convenience and Necessity and Binding Rate Making Treatment for New Wind and Transmission Facilities*, Case No. PAC-E-17-07, Order No. 34104 (Jul. 20, 2018).

1 **Q. Did the Company issue a request for proposals for the 230 kV Network**
2 **Upgrades?**

3 A. Yes. The competitively bid price reflected excess demand on lineman resources as a
4 result of the increased project demand described above. In addition, the increase in
5 projects also created cost impacts on steel and other materials. Several potential
6 bidders who had previously done work for PacifiCorp declined to bid, citing lack of
7 resources as their reason. Nevertheless, a subsequent final competitive auction
8 among finalist bidders resulted in an approximate 4.5 percent reduction from the
9 original bid value.

10 **Q. How do the actual costs for the Aeolus to Bridger/Anticline transmission line**
11 **compare to what was filed in your previous testimony in the 2021 Rate Case**
12 **(Exhibit No. RAV-1T)?**

13 The actual costs through May 2021 for the Aeolus to Bridger/Anticline transmission
14 line were \$639.4 million (actuals through May 2021), approximately \$39.7 million
15 lower than the \$679.2 million filed last year.¹⁴

16 **Q. Please describe the total cost of the 230 kV Network Upgrades compared to the**
17 **amount filed in your previous testimony in the 2021 Rate Case (Exhibit RAV-**
18 **1T)?**

19 A. The 230 kV Network Upgrades actual and forecast cost are \$94.3 million,
20 approximately \$2.0 million more than the \$92.3 million estimate approved by the
21 Commission.

¹⁴ The total cost includes the cost of Sequence 2, which was included in base rates in the 2021 Rate Case and not within the scope of this limited-issue rate filing.

1 **Q. What are the drivers for the cost increase?**

2 A. The increase in cost was due to the competitive bid price received for the
3 transmission line elements of the 230 kV Network Upgrades, which exceeded the
4 initial forecast value. The increase in transmission line costs is attributable to market
5 conditions that changed after the initial cost estimate was prepared in early 2017 and
6 approved by the Commission in the 2021 Rate Case. The estimate was prepared
7 using historical metrics to develop a cost plan, which could not have accounted for
8 the rapid expansion of projects in the industry that occurred just prior to the time of
9 the bid, including Pacific Gas & Electric Company's transmission improvement
10 program, initiated in response to extensive wildfires in California. Further increases
11 were caused by extreme weather conditions, birds and nesting environmental
12 concerns, and delays in getting required outages from the Western Area Power
13 Administration.

14 **Q. Did the Company issue a request for proposals for the 230 kV Network Upgrades?**

15 A. Yes. The competitively bid price reflected excess demand on lineman resources as a
16 result of the increased project demand described above. In addition, the increase in
17 projects also created cost impacts on steel and other materials. Several potential
18 bidders who had previously done work for PacifiCorp declined to bid, citing lack of
19 resources as their reason. Nevertheless, a subsequent final competitive auction
20 among finalist bidders resulted in an approximate 4.5 percent reduction from the
21 original bid value.

1 **Q. Why was there an increase for the 230 kV Network Upgrades but not for the**
2 **Aeolus to Bridger/Anticline transmission line?**

3 A. The Company sought bids for the Aeolus to Bridger/Anticline transmission line
4 earlier in the process. The construction requirements in California following the
5 wildfires, however, changed the market conditions when the Company went to bid the
6 230 kV Network Upgrade projects.

7 **VI. EXCLUSION OF CERTAIN TRANSMISSION ASSETS UNDER THE WIJAM**

8 **Q. Why is PacifiCorp proposing to remove certain transmission lines from rates?**

9 A. Consistent with the requirements of the WIJAM as adopted in the Commission final
10 order from the general rate case, “PacifiCorp must present to the Commission a
11 method to exclude all transmission-voltage, radial lines that connect PacifiCorp’s
12 interconnected, network transmission system with any resources not included in
13 Washington rates.”¹⁵

14 **Q. What is the methodology that PacifiCorp used to identify these transmission**
15 **lines that needed to be excluded from rates?**

16 A. PacifiCorp compared a list of all transmission assets against system one-line diagrams
17 to identify the transmission lines that connected to resources not otherwise included
18 in Washington rates. These one-line diagrams allowed the Company to identify the
19 distance, type of conductor, and voltage level. Please refer to the testimony of
20 Ms. Sherona L. Cheung who describes how the costs associated with these lines were
21 determined and how they were removed from rates.

¹⁵ *WUTC v. PacifiCorp d/b/a Pacific Power & Light Co.*, Docket UE-191024 *et. al.*, Final Order 09/07/12 at 43 (Dec. 14, 2020).

1 **VII. CONCLUSION**

2 **Q. Please summarize your testimony.**

3 A. I recommend that the Commission determine that the projects stated above are
4 providing benefits to Washington customers and are therefore prudent and in the
5 public interest.

6 **Q. Does this conclude your direct testimony?**

7 A. Yes.