

Application No. 18-04-____
Exhibit PAC/700
Witness: Richard A. Vail

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

PACIFICORP

Direct Testimony of Richard A. Vail
Investment in Distribution and Transmission Systems

April 2018

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ATTACHED EXHIBITS

Exhibit PAC/701 – Lassen Substation Project Area and Project Diagram

Exhibit PAC/702 – Sams Valley Substation Project Area and Project Diagram

Exhibit PAC/703 – Snow Goose Substation Project Area and Project Diagram

Exhibit PAC/704 – Vantage to Pomona Heights Transmission Line Project Area and Project Diagram

Exhibit PAC/705 – Wallula to McNary Transmission Line Project Area and Project Diagram

1 **Q. Please state your name, business address, and present position with PacifiCorp**
2 **d/b/a Pacific Power (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, maintenance policy, and administration
8 of the Open Access Transmission Tariff (OATT).

9 **I. QUALIFICATIONS**

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

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

18 **II. PURPOSE OF TESTIMONY**

19 **Q. What is the purpose of your testimony?**

20 A. The purpose of my testimony is to describe PacifiCorp's significant capital
21 investment projects for new distribution and transmission systems included in this
22 rate case. My testimony demonstrates that the company has made prudent decisions
23 related to these projects and that these investments result in an immediate benefit to

1 PacifiCorp's customers. These benefits include increased load serving capability,
2 enhanced reliability, conformance with the North American Electric Reliability
3 Corporation (NERC) Reliability Standards, and improved transfer capability within
4 the existing system.

5 **III. OVERVIEW OF PACIFICORP'S TRANSMISSION SYSTEM AND**
6 **INVESTMENT DRIVERS**

7 **Q. Please briefly describe PacifiCorp's transmission system.**

8 A. PacifiCorp owns and operates approximately 16,500 miles of transmission lines
9 ranging from 46 kilovolts (kV) to 500 kV across multiple western states. PacifiCorp
10 has a total of 1.8 million customers, 45,000 of which are located in California.

11 Energy and demand requirements for PacifiCorp's customers in California are
12 delivered across the Oregon border and into the California service area via
13 PacifiCorp's transmission system and those assets contained within PacifiCorp's
14 Eastern Balancing Area (PACE) and Western Balancing Area (PACW). Energy can
15 be delivered from Oregon through the existing 115 kV and 69 kV systems into
16 northern California to PacifiCorp's retail customers. Energy can also be delivered
17 from PACE through existing transmission assets originating in Idaho and terminating
18 in southern Oregon. PacifiCorp's balancing areas and related company transmission
19 assets are not part of the California Independent System Operator (CAISO). PACW
20 electrically connects to other transmission providers who are part of the CAISO with
21 interties at the Malin substation in Oregon and the Cascade substation in California.
22 The interconnections provide electric reliability and the ability to utilize point to point
23 transmission service for energy sales and purchases between PacifiCorp and the
24 CAISO for wholesale transactions under PacifiCorp's OATT contracts.

1 **Q. Please describe the NERC reliability standards.**

2 A. The Federal Energy Regulatory Commission (FERC) directs NERC to develop
3 Reliability Standards to ensure the safe and reliable operation of the Bulk Electric
4 System in the United States in a variety of operating conditions. On April 1, 2005,
5 NERC established a set of transmission operations reliability standards. A subset of
6 the transmission reliability standards are the transmission planning standards (TPL
7 Standards). The purpose of the TPL Standards is to “establish Transmission system
8 planning performance requirements within the planning horizon to develop a Bulk
9 Electric System (BES) that will operate reliably over a broad spectrum of System
10 conditions and following a wide range of probable Contingencies.”¹ The TPL
11 Standards, along with regional planning criteria (*i.e.*, regional planning criteria
12 established by the Western Electricity Coordinating Council (WECC)) and utility-
13 specific planning criteria, define the minimum transmission system requirements to
14 safely and reliably serve customers.

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

16 A. To ensure compliance with applicable TPL Standards, PacifiCorp conducts an annual
17 system assessment to evaluate the performance of the company’s transmission system
18 and to identify system deficiencies. The annual system assessment is comprised of
19 steady-state, stability, and short circuit analyses² to evaluate peak and off-peak load

¹ See <http://www.nerc.com/files/tpl-001-4.pdf>.

² Analyses consists 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 seasons in the near term (one, two, and five year) and long term (10 year) planning
2 horizons. The assessment is performed using power flow base cases maintained by
3 WECC and developed in coordination among all transmission planning entities in the
4 Western Interconnection. These base cases include load and resource forecasts along
5 with planned transmission system changes for each of the future year cases and are
6 intended to identify future system deficiencies to be mitigated.

7 As part of the annual system assessment, corrective action plans are developed
8 to mitigate identified deficiencies which may prescribe construction of transmission
9 system reinforcement projects or, as applicable, adoption of new operating
10 procedures. In certain instances, operating procedures prescribing action to change
11 the configuration of the transmission system can prevent deficiencies from occurring
12 when there are two back-to-back (or concurrent) transmission system events.
13 However, the use of operating procedure actions have limitations. An effective
14 corrective action plan is critical to ensuring system reliability so that large numbers of
15 customers are not subjected to avoidable outage risk.

16 In recent annual assessments and TPL Standards screening studies, PacifiCorp
17 identified a number of deficiencies under the TPL Standards which resulted in
18 corrective action plans prescribing a number of the investments in transmission
19 reinforcements described in my testimony.

20 **Q. Please identify other drivers that are relevant to the capital investments in**
21 **PacifiCorp's distribution and transmission systems described in my testimony.**

22 A. There are several other drivers that inform whether PacifiCorp will build new
23 distribution and transmission facilities, including increased demand for transmission

1 capacity, requests for transmission service, and the age and condition of existing
2 distribution and transmission facilities. The specific drivers for the projects addressed
3 in my testimony are described in more detail later in my testimony.

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

5 **Q. What specific distribution and transmission system investments are you**
6 **addressing in your testimony?**

7 A. My testimony addresses PacifiCorp's significant new distribution and transmission
8 system projects included in rate base in this proceeding. Specifically, my testimony
9 addresses the following projects:

- 10 1. Lassen 69/12.5 kV substation to be located in Mount Shasta, California, as
11 shown in the map attached in Exhibit PAC/701;
- 12 2. Sams Valley 500/230 kV substation (the first and second sequences only) to
13 be located north of Medford, Oregon, as shown in the map attached in Exhibit
14 PAC/702;
- 15 3. Snow Goose 500/230 kV substation which is located near Klamath Falls,
16 Oregon, as shown in the map attached in Exhibit PAC/703;
- 17 4. Vantage to Pomona Heights 230 kV new transmission line extending from
18 Vantage substation located northeast of Yakima, Washington, to Pomona
19 Heights substation located in Selah, Washington, as shown in the map
20 attached in Exhibit PAC/704; and
- 21 5. Wallula to McNary 230 kV new transmission line extending from Wallula
22 substation located in Wallula, Washington, to McNary substation located near
23 Umatilla, Oregon, as shown in the map attached in Exhibit PAC/705.

1 **Q. What are the projected costs associated with these distribution and transmission**
 2 **investments and their associated in-service dates?**

3 A. The projected total company costs³ and in-service dates associated with these projects
 4 are as follows:

Project	Total-Company (\$m)	In-service Date
Lassen 69/12.5 kV (with 115 kV system operability) New Substation Project – Distribution	\$7.3	September 2019
Lassen 69/12.5 kV (with 115 kV system operability) New Substation Project – Transmission	\$0.9	September 2019
Sams Valley 500/230 kV New Substation Project		
Sequence One	\$8.6	November 2018
Sequence Two	\$37.5	November 2019
Sequence Three	Outside test period	November 2020
Snow Goose 500-230 kV New Substation Project		
Sequence One (In Service)	\$10.2	May 2017
Sequence Two (In Service)	\$32.5	November 2017
Vantage to Pomona Heights 230 kV New Transmission Line Project		
Sequence One (In Service)	\$9.4	November 2015
Sequence Two	\$34.1	November 2019
Wallula to McNary 230 kV New Transmission Line		
Sequence One (In Service)	\$6.5	December 2017
Sequence Two	\$25.4	November 2018
Total	\$172.5	

5 These amounts include costs associated with engineering, project management,
 6 materials and equipment, construction, right-of-way (including rights acquired by
 7 condemnation), and an allowance for funds used during construction. These costs are
 8 also shown in the testimony and exhibits of company witness Ms. Shelley E. McCoy
 9 (Exhibit PAC/1100). The in-service dates are based on the best available information
 10 at the time of preparing the general rate case.

³ California’s allocated share represents less than two percent of total company costs.

1 **V. LASSEN 69/12.5 KV NEW SUBSTATION**

2 **Q. Please describe the investment for the Lassen 69/12.5 kV New Substation**
3 **project.**

4 A. The project consists of constructing a new distribution substation to replace the
5 existing Mt. Shasta substation and upgrade associated transmission and distribution
6 lines to provide necessary capacity. The project is located in Mount Shasta,
7 California, as shown in the map attached in Exhibit PAC/701, and is expected to be in
8 service in September 2019 for an estimated \$8.2 million of plant in service.⁴ This
9 new substation initially will operate at 69 kV but will be designed to accommodate
10 future operation at 115 kV. A one line diagram of the Lassen 69/12.5 kV New
11 Substation project is included in Exhibit PAC/701.

12 **Q. Please describe the benefits of this investment in the Lassen 69/12.5 kV New**
13 **Substation project and why it is needed.**

14 A. The Lassen 69/12.5 kV New Substation project will replace the aging Mt. Shasta
15 substation. The aging wood structure that supports the substation equipment is near
16 the end of its useful life and in a deteriorated condition due to rot occurring over time
17 and damage caused by birds. This situation has prompted concerns about whether the
18 Mt. Shasta substation is able to continue to safely and reliably meet current and future
19 local and contractual system demand.⁵

20 Accordingly, the new Lassen substation will contain a 115/69 kV to 12.5 kV,

⁴ As discussed below, the company has applied for a permit to construct the Lassen substation in A.15-11-005.

⁵ The Mt. Shasta substation currently delivers power to approximately 4,859 customers, the vast majority of which (*i.e.*, 4,156) are served by a 12.5 MVA transformer. The remaining 703 customers are served by a 3.75 MVA transformer.

1 25 Megavolt-ampere (MVA) transformer rated to support foreseeable load growth in
2 the area. PacifiCorp will also upgrade about two miles of transmission structures
3 which includes adding a second circuit of distribution under-build and installing
4 approximately 1,200 feet of underground cable to increase the capacity of an existing
5 underground distribution line. The new substation and upgraded poles will be
6 designed and built to allow for future operation at 115 kV which in many locations is
7 the current voltage for PacifiCorp's electrical system in the region. For the
8 immediate future, the Lassen substation and associated transmission line will be
9 operated at 69 kV.

10 In summary, this investment will provide a benefit to PacifiCorp's
11 transmission and distribution system and its customers by (i) increasing the reliability
12 of service to customers in the Mt. Shasta, California area, (ii) ensuring that the system
13 has adequate capacity to safely and reliably meet local and contractual system
14 demand, and (iii) supporting conversion to 115 kV as required by future load growth.

15 **Q. Has PacifiCorp made any other filings with the Commission related to the**
16 **construction of the Lassen Substation?**

17 A. Yes. On November 2, 2015, PacifiCorp filed an Application for a Permit to
18 Construct the Lassen substation Project pursuant to General Order 131-D
19 (A.) 15-11-005 (Application). On June 21, 2017, pursuant to the California
20 Environmental Quality Act, the Commission prepared a Final Initial Study/Mitigated
21 Negative Declaration for consideration of PacifiCorp's Application. As of the date
22 this testimony is written, a decision on the Application is pending.

1 **Q. Did PacifiCorp consider alternatives to this project?**

2 A. In lieu of the Lassen 69/12.5 kV New Substation project, PacifiCorp considered
3 increasing transformer capacity at the existing Mt. Shasta substation to support load
4 growth. However, this option is not viable because of the deteriorating condition and
5 insufficient space within this small substation to install a larger transformer and the
6 12.5 kV feeder circuit breakers needed to utilize the capacity or for future conversion
7 to 115 kV. Consequently, PacifiCorp rejected this alternative.

8 **VI. SAMS VALLEY 500/230 KV NEW SUBSTATION**

9 **Q. Please describe the investment for the Sams Valley 500/230 kV New Substation**
10 **project.**

11 A. The Sams Valley 500/230 kV New Substation project located north of Medford,
12 Oregon, as shown on the map attached in Exhibit PAC/702, involves the construction
13 of a new 500/230 kV substation with one 650 MVA transformer bank and various
14 related improvements to comply with NERC reliability standards. The project in its
15 entirety consists of three sequences of work, the first two of which are included in this
16 filing.

17 The first sequence of work includes replacing the three 230/115 kV,
18 125 MVA transformers at Grants Pass substation with two 230/115 kV, 250 MVA
19 transformers and building a new 230 kV line termination at Grants Pass substation
20 with required improvements to the 230 kV bus configuration. Sequence one is
21 estimated to be placed in service in November 2018 for an estimated \$8.6 million of
22 plant in service. See Exhibit PAC/702, Sams Valley Project Diagram Sequence 1
23 Sheet 2 of 4.

1 The second sequence of work includes constructing a new 500 kV yard at the
2 new Sams Valley substation, connecting to the existing Dixonville-Meridian 500 kV
3 line. This sequence is estimated to be placed in service in November 2019 for an
4 estimated \$37.5 million of plant in service. See Exhibit PAC/702, Sams Valley
5 Project Diagram Sequence 2 Sheet 3 of 4.

6 The third sequence of work includes constructing the 230 kV yard at Sams
7 Valley, building a new Sams Valley-Grants Pass 230 kV line, and reconductoring the
8 230 kV Line 71 from Whetstone to Sams Valley. The third sequence of work is
9 estimated to be placed in service in November 2020 and is outside of the test period
10 for this rate case. See Exhibit PAC/702, Sams Valley Project Diagram Sequence 3
11 Sheet 4 of 4.

12 **Q. Please explain why this investment in the Sams Valley 500/230 kV New**
13 **Substation is needed.**

14 A. The need for the Sams Valley 500/230 kV New Substation project is based on
15 achieving continued compliance with reliability standards mandated by NERC under
16 the TPL Standards. In 2010, PacifiCorp performed TPL Standards screening studies
17 that identified multiple scenarios in which transmission outages would require load
18 shedding in the southern Oregon and northern California regions in addition to
19 causing voltage deficiencies and overloading issues.

20 The following is a list of the scenarios identified in the 2010 study resulting in
21 deficiencies under the TPL Standards that will be resolved once the project is
22 completed:

- 23 • Outage of a single 125 MVA transformer at Grants Pass substation

- 1 during moderate or higher load conditions. Currently, the loss of one
2 transformer can result in a directive by the system Reliability
3 Coordinator for preemptive load shedding of as much as
4 106 megawatts (MW) at summer peak load, and 169 MW at winter
5 peak load in anticipation of the next contingency. Additional load
6 shedding may be required after the next outage occurs to avoid
7 damaging the remaining transformer. With the proposed solution of
8 two larger transformers that are individually capable of carrying the
9 entire load, the reliability requirements would be met and load
10 shedding would be alleviated.
- 11 • Failure of a single breaker causes the loss of both 230 kV lines
12 because of the location of the lines terminating on the Grants Pass
13 230 kV bus. With the proposed solution of a new breaker bay,
14 separation of existing line termination positions eliminates the loss of
15 two existing lines in the event of a single breaker failure.
 - 16 • Outage of the 230 kV Grants Pass to Dixonville line overloads the
17 230 kV Meridian to Whetstone transmission line. After 2019, based
18 on projected load growth, completion of the project will maintain
19 compliance with TPL Standards related to a loss of a single
20 transmission element (such as a line or transformer).
 - 21 • Failure of the Meridian breaker 1R49 causes the loss of the 230 kV
22 Meridian to Whetstone and the 230 kV Meridian to Lone Pine No. 2
23 transmission lines which then overloads the Meridian to Lone Pine

1 No. 1 transmission line. After 2019, based on projected load growth,
2 completion of the project would avoid load shedding necessary after
3 an event under the TPL Standards (i.e., loss of two transmission
4 elements).

5 • Outage of both the 230 kV lines supplying Grants Pass substation.

6 Completion of the project avoids the loss of all Grants Pass and
7 Crescent City load resulting from this event under the TPL Standards
8 by adding a third 230 kV source to Grants Pass.

9 • Loss of the 500 kV supply to Meridian or the loss of both 500/230 kV
10 banks at Meridian substation. Completion of the project resolves load
11 shedding due to the low voltage on the 230 kV system caused by either
12 of these events under the TPL Standards.

13 **Q. Please explain the benefits of the Sams Valley 500/230 kV New Substation.**

14 A. The Sams Valley project and associated transmission system upgrades will
15 significantly improve the reliability of service to PacifiCorp customers in northern
16 California and southern Oregon by constructing additional connections between the
17 500 kV backbone transmission system and the 230 kV regional main grid, as well as
18 reinforcing the 230/115 kV transformation at Grants Pass substation that serves as the
19 primary source to Del Norte County, California.

20 As previously described, this project corrects TPL Standards deficiencies and
21 makes load shedding unnecessary upon the occurrence of a range of outage events
22 under the TPL Standards in the Medford, Grants Pass, and Crescent City regions.

23 This project also relieves loading on the Meridian 500/230 kV transformers which

1 otherwise are the main source for Crescent City and Grants Pass, as well as Medford.
2 As discussed below, the new substation also avoids the need to incur the cost to
3 construct a new 230 kV transmission line from Meridian substation east of Medford
4 to the Sams Valley area northwest of Medford.

5 **Q. Did PacifiCorp consider alternatives to investing in the Sams Valley 500/230 kV**
6 **New Substation Project?**

7 A. Yes. To address the applicable deficiencies under the TPL Standards, PacifiCorp
8 considered constructing a second Meridian to Whetstone to Grants Pass 230 kV line
9 and the addition of a new 500/230 kV substation to accommodate two 500/230 kV
10 transformer banks adjacent to the existing Meridian substation. However, the new
11 230 kV line required from an expanded Meridian substation to the existing Grants
12 Pass 230/115 kV substation would be significantly longer and more costly than the
13 new 230 kV line that is being built from the selected Sams Valley location. All other
14 cost elements of the alternative project would remain the same as the recommended
15 project. Due to the length of the transmission line that would be required under this
16 option, the overall cost of this alternative project was estimated at \$133.3 million,
17 approximately \$57.0 million more than the estimated cost to complete all three work
18 sequences of the Sams Valley 500/230 kV New Substation project.

19 **VII. SNOW GOOSE 500/230 KV NEW SUBSTATION**

20 **Q. Please describe the investment for the Snow Goose 500/230 kV New Substation**
21 **project.**

22 A. This in-service project consists of a new 500/230 kV substation located near Klamath
23 Falls, Oregon, as shown on the map attached in Exhibit PAC/703. The new Snow

1 Goose substation has a 500/230 kV, 650 MVA transformer bank and associated
2 switchgear. In addition, PacifiCorp constructed 0.5 miles of 230 kV transmission line
3 and 1.2 miles of 500 kV transmission line to integrate the substation into the area's
4 230 kV and 500 kV systems. The 230 kV yard was placed in service in May 2017,
5 and the 500 kV yard was placed in service in November 2017, for a total of
6 \$42.7 million of plant placed in service. A one line diagram of the Snow Goose
7 500/230 kV New Substation project is included in Exhibit PAC/703.

8 **Q. Please explain the benefits of this investment in the Snow Goose 500/230 kV New**
9 **Substation and why it is needed.**

10 A. As with the investment in the Sams Valley 500/230 kV New Substation project, the
11 need for this investment is based on achieving continued compliance with reliability
12 standards mandated by NERC, including NERC's TPL Standards. In 2012,
13 PacifiCorp performed TPL Standards screening studies that identified system
14 performance deficiencies following the single contingency loss of PacifiCorp's
15 existing 500/230 kV, 650 MVA transformer bank at Malin substation. Specifically,
16 PacifiCorp determined that during the 2017 projected summer peak load conditions,
17 the loss of the transformer bank would result in the system failing to meet the low
18 voltage limits on the PacifiCorp-owned 230 kV, 115 kV and 69 kV systems and an
19 increase in the load on the Copco-Lone Pine 230 kV line. By 2027, the Copco-Lone
20 Pine 230 kV line would exceed its rated thermal continuous and emergency capacity
21 during this outage. This outage would also cause a reduction of the power flow on
22 the Alturas-Reno Western Electricity Coordinating Council path 76. As a result, firm

1 scheduled transfers on this line could not continue to be supported without a second
2 230 kV source.

3 Construction of the Snow Goose substation and providing a second 500 kV to
4 230 kV transmission tie in the area will ensure that PacifiCorp is able to maintain
5 adequate system voltage and power delivery during a single contingency outage
6 condition thus maintaining service for customers in southern Oregon and northern
7 California. In addition, PacifiCorp considered the impact of the potential
8 decommissioning of four dams and four hydro power plants as early as 2020. The
9 resulting loss of 118 MW of generation would reduce the system capacity and
10 amplify the negative impact of the loss of the Malin transformer, compounding need
11 for a second 230 kV source for the Klamath Falls area.

12 By enabling PacifiCorp to comply with the TPL Standards, ensuring that the
13 system has adequate capacity to safely and reliably meet local and contractual system
14 demand, and increasing the reliability of PacifiCorp's transmission system, this
15 project provides benefits to customers.

16 **Q. Did PacifiCorp consider alternatives to investing in the Snow Goose 500/230 kV
17 New Substation Project?**

18 A. In lieu of the Snow Goose 500/230 kV New Substation project, PacifiCorp
19 considered resolving the deficiencies under the TPL Standards by installing a second
20 transformer at Malin substation and building a second line from Malin to Klamath
21 Falls. This alternative was rejected as Malin substation could not be readily expanded
22 to accommodate a new 500/230 kV transformer position due to physical site
23 constraints. This alternative was estimated to be \$85.0 million.

1 A second alternative would have involved installing a 500/230 kV, 650 MVA
2 transformer at the Bonneville Power Administration (BPA)-owned Captain Jack
3 substation and building 27 miles of 230 kV line from Captain Jack to Klamath Falls.
4 Adding another transformer at Captain Jack substation would require increasing the
5 size of the substation property and reaching an agreement with BPA. This alternative
6 was estimated to be \$90.0 million and was rejected because of insufficient space at
7 the BPA-owned Captain Jack substation, inadequacy of site in serving as a new
8 source of 69 kV to the Klamath Falls metropolitan area, and additional reinforcement
9 requirements of the 230 kV path between Captain Jack and Klamath Falls substations.

10 The last alternative considered would have involved installing a 500/230 kV,
11 650 MVA transformer at the Klamath Co-Gen substation and building a new 230 kV
12 line to tap the Klamath Falls-Boyle 230 kV line. As with the first alternative, this
13 option was rejected due to space and cost limitations. Estimated costs for this
14 alternative were \$85.0 million.

15 **VIII. VANTAGE TO POMONA HEIGHTS 230 KV NEW TRANSMISSION LINE**

16 **Q. Please describe the investment for the Vantage to Pomona Heights 230 kV New**
17 **Transmission Line.**

18 A. The Vantage to Pomona Heights 230 kV New Transmission Line project consists of a
19 new 41-mile, 230 kV transmission line that extends from the BPA Vantage substation
20 near Vantage, Washington, and ends at the PacifiCorp Pomona Heights substation in
21 Yakima, Washington, as shown on the map attached in Exhibit PAC/704. The project
22 consists of two sequences of work, the combined costs of which are included in rate
23 base in this proceeding. The first work sequence was placed in service in November

1 2015 for \$9.4 million and included the expansion of the Pomona Heights substation
2 230 kV ring bus to provide adequate breaker separation between lines and
3 transformers for breaker failure and bus fault events. The second sequence of work is
4 projected to be placed in service in November 2019 for an estimated \$34.1 million
5 and includes installation of a new 230 kV transmission line connected at BPA's
6 Vantage substation and ending at PacifiCorp's Pomona Heights substation. This
7 portion of the project will include the installation of breakers, protection and control
8 equipment, and communications equipment at each substation as required to monitor
9 and safely operate the new line. The infrastructure additions at Vantage substation
10 will be designed, purchased, installed, and maintained by BPA. A one line diagram
11 of the Vantage to Pomona 230 kV New Transmission Line project is included in
12 Exhibit PAC/704.

13 **Q. Please explain why this investment in the Vantage to Pomona Heights 230 kV**
14 **New Transmission Line is needed and beneficial.**

15 A. The need for the Vantage to Pomona Heights 230 kV project was identified through
16 internal planning studies and a coordinated Northwest Transmission Assessment
17 Committee study in 2007. NERC screening studies conducted in 2009 and
18 subsequent NERC screening studies additionally identified TPL Standards
19 performance deficiencies following breaker failure and bus fault events on the
20 Pomona Heights 230 kV bus and various N-1-16 outages associated with the
21 Wanapum to Pomona Heights 230 kV line. Breaker failure and bus fault and N-1-1
22 events on other portions of the Yakima 230 kV and 115 kV systems result in

⁶ See footnote 2 for a description of N-1-1 events.

1 additional TPL Standards performance deficiencies. In total, there are eight
2 contingency combinations that were identified that could give rise to the need to shed
3 Yakima area load. The Yakima area is currently served primarily by two 230 kV
4 transmission sources. The loss of both primary 230 kV sources or loss of one primary
5 230 kV source and another major element in the underlying system leaves the
6 remaining system unable to provide adequate electric service to all customers in the
7 area.

8 The addition of a new 230 kV line between Vantage and Pomona Heights
9 substations and providing a third 230 kV source to the area mitigates the identified
10 deficiencies. Specifically, the project eliminates the need to shed Yakima area load
11 for those eight contingency combinations and eliminates overloads in the PacifiCorp
12 and BPA transmission systems with loss of the existing line.

13 By enabling PacifiCorp to comply with the TPL Standards and increasing the
14 reliability of PacifiCorp's transmission system by eliminating the need to shed
15 Yakima area load under certain outage conditions, this project provides benefits to
16 customers.

17 **Q. Did PacifiCorp consider alternatives to investing in the Vantage to Pomona**
18 **230 kV New Substation Project?**

19 A. In lieu of the selected project, the new 230 kV line from Vantage to Pomona Heights,
20 PacifiCorp considered constructing a new 500/230 kV transformer and bus position at
21 Wautoma substation and a new 230 kV transmission line from Wautoma substation to
22 Pomona Heights substation resulting in an estimated cost of \$89.6 million. This
23 alternative was rejected because the costs were higher than the selected project.

1 Another alternative would have involved constructing a second 230 kV transmission
2 line from Midway substation to Union Gap substation. This alternative was rejected,
3 however, because it would have corrected identified deficiencies for only
4 approximately 10 years before additional transmission reinforcement would be
5 required.

6 **Q. Has the Vantage to Pomona 230 kV New Substation Project been reviewed by**
7 **parties other than PacifiCorp?**

8 A. Yes. The Northwest Transmission Assessment Committee of the Northwest Power
9 Pool reviewed the Vantage to Pomona 230 kV New Substation Project along with the
10 alternatives described above and rejected the foregoing alternatives in favor of the
11 selected project. This organization initiated a study among the Mid-Columbia
12 utilities including BPA, Grant County Public Utility District (PUD), Chelan County
13 PUD, PacifiCorp, and Puget Sound Energy resulting in the November 21, 2007,
14 Wanapum/Vantage-Midway Area 230 kV Technical Report. That report identified
15 the Vantage to Pomona Heights 230 kV line as the preferred solution for adding a
16 230 kV source to the Yakima Valley system without negatively impacting facilities in
17 the wider Mid-Columbia region.

1 **IX. WALLULA-MCNARY 230 KV NEW TRANSMISSION LINE**

2 **Q. Please describe the investment for the Wallula to McNary 230 kV New**
3 **Transmission Line.**

4 A. The Wallula to McNary 230 kV New Transmission Line project, for which
5 PacifiCorp has obtained a Certificate of Public Convenience and Necessity from the
6 Public Utility Commission of Oregon,⁷ consists of a new 30-mile, 230 kV
7 transmission line between Wallula, Washington, and McNary, Oregon, as shown on
8 the map attached in Exhibit PAC/705. This project consists of two sequences of
9 work, the combined costs of which are included in this proceeding. The first work
10 sequence was placed in service in December 2017 for \$6.5 million and included
11 expansion at PacifiCorp's Wallula substation as well as relay and communications
12 work at the Nine Mile substation. The second work sequence will include the
13 construction of the new 230 kV transmission line and is projected to go in service in
14 November 2018 for an estimated \$25.4 million of plant in service. A one line
15 diagram of the Wallula to McNary 230 kV New Transmission Line project is
16 included in Exhibit PAC/705.

17 **Q. Please explain why this investment in the Wallula to McNary 230 kV New**
18 **Transmission Line is needed and beneficial.**

19 A. The Wallula to McNary 230 kV New Transmission Line project is needed to enable
20 PacifiCorp to comply with PacifiCorp's OATT, its transmission service agreements
21 and FERC's requirements to provide the requested transmission service. Currently,

⁷ Public Utility Commission of Oregon, Docket UM 1495. Petition for Certificate of Public Convenience and Necessity for the Wallula to McNary 230 kV transmission line. Petition granted by Order issued on September 22, 2011.

1 there are only two MW of available transfer capacity on the existing line between
2 Wallula and McNary which is insufficient to satisfy the requests for service from
3 providers of renewable energy that drive the need for the project. This project will
4 enable PacifiCorp to fulfill such requests which will have the net effect of increasing
5 access to renewable energy.

6 In addition, the project enhances transmission reliability by providing a
7 second connection between BPA's McNary substation and PacifiCorp's Wallula
8 substation. With only a single line between Wallula and McNary, line outages, either
9 planned or unplanned, cause disruption of service to customers. This disruption can
10 result in loss of service under existing contracts or reduced reliability for customers
11 served from the Wallula substation. This new second line will provide service
12 reliability in a single line outage condition, and, because it will be constructed with
13 lightning protection, the new line will reduce lightning-caused voltage sag events in
14 the area.

15 By enabling PacifiCorp to meet its regulatory and contractual requirements to
16 provide transmission service, increasing the reliability of PacifiCorp's transmission
17 system and promoting access to renewable energy, this project provides benefits to
18 customers.

19 **Q. Did PacifiCorp consider alternatives to investing in the Wallula to McNary**
20 **230 kV New Transmission Line project?**

21 A. In lieu of the selected project, PacifiCorp considered re-building the existing Wallula
22 to McNary 230 kV transmission line to a double circuit line at an estimated cost of
23 \$73.6 million. As a second alternative, PacifiCorp considered re-conductoring the

1 existing Wallula to McNary 230 kV transmission line with high temperature
2 conductor. This alternative would have required the addition of phase shifting
3 transformers to produce increased flow on the line and a new substation to place the
4 equipment at an estimated cost of \$53.6 million. Both alternatives were rejected due
5 to costs.

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

7 A. Yes.