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
Q. Please state your name, business address, and present position with PacifiCorp d/b/a Pacific Power (PacifiCorp).

A. My name is Richard A. Vail. My business address is 825 NE Multnomah Street, Suite 1600, Portland, Oregon 97232. My present position is Vice President of Transmission. I am responsible for transmission system planning, customer generator interconnection requests and transmission service requests, regional transmission initiatives, capital budgeting for transmission, maintenance policy, and administration of the Open Access Transmission Tariff (OATT).

I. QUALIFICATIONS

Q. Please describe your education and professional experience.

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

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe PacifiCorp’s significant capital investment projects for new distribution and transmission systems included in this rate case. My testimony demonstrates that the company has made prudent decisions related to these projects and that these investments result in an immediate benefit to
PaciﬁCorp’s customers. These beneﬁts include increased load serving capability,
enhanced reliability, conformance with the North American Electric Reliability
Corporation (NERC) Reliability Standards, and improved transfer capability within
the existing system.

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

Q. Please briefl y describe PaciﬁCorp’s transmission system.

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

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

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

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

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

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.

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

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

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

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

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

IV. OVERVIEW OF INVESTMENTS DESCRIBED IN TESTIMONY

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

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

1. Lassen 69/12.5 kV substation to be located in Mount Shasta, California, as
   shown in the map attached in Exhibit PAC/701;

2. Sams Valley 500/230 kV substation (the first and second sequences only) to
   be located north of Medford, Oregon, as shown in the map attached in Exhibit
   PAC/702;

3. Snow Goose 500/230 kV substation which is located near Klamath Falls,
   Oregon, as shown in the map attached in Exhibit PAC/703;

4. Vantage to Pomona Heights 230 kV new transmission line extending from
   Vantage substation located northeast of Yakima, Washington, to Pomona
   Heights substation located in Selah, Washington, as shown in the map
   attached in Exhibit PAC/704; and

5. Wallula to McNary 230 kV new transmission line extending from Wallula
   substation located in Wallula, Washington, to McNary substation located near
   Umatilla, Oregon, as shown in the map attached in Exhibit PAC/705.
Q. What are the projected costs associated with these distribution and transmission investments and their associated in-service dates?

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

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

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

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3 California’s allocated share represents less than two percent of total company costs.
V. LASSEN 69/12.5 KV NEW SUBSTATION

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

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

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

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

Accordingly, the new Lassen substation will contain a 115/69 kV to 12.5 kV, 4

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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.

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

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

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

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

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

VI. SAMS VALLEY 500/230 KV NEW SUBSTATION

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

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

The first sequence of work includes replacing the three 230/115 kV, 125 MVA transformers at Grants Pass substation with two 230/115 kV, 250 MVA transformers and building a new 230 kV line termination at Grants Pass substation with required improvements to the 230 kV bus configuration. Sequence one is estimated to be placed in service in November 2018 for an estimated $8.6 million of plant in service. See Exhibit PAC/702, Sams Valley Project Diagram Sequence 1 Sheet 2 of 4.
The second sequence of work includes constructing a new 500 kV yard at the new Sams Valley substation, connecting to the existing Dixonville-Meridian 500 kV line. This sequence is estimated to be placed in service in November 2019 for an estimated $37.5 million of plant in service. See Exhibit PAC/702, Sams Valley Project Diagram Sequence 2 Sheet 3 of 4.

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

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

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

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

• Outage of a single 125 MVA transformer at Grants Pass substation
during moderate or higher load conditions. Currently, the loss of one
transformer can result in a directive by the system Reliability
Coordinator for preemptive load shedding of as much as
106 megawatts (MW) at summer peak load, and 169 MW at winter
peak load in anticipation of the next contingency. Additional load
shedding may be required after the next outage occurs to avoid
damaging the remaining transformer. With the proposed solution of
two larger transformers that are individually capable of carrying the
entire load, the reliability requirements would be met and load
shedding would be alleviated.

• Failure of a single breaker causes the loss of both 230 kV lines
  because of the location of the lines terminating on the Grants Pass
  230 kV bus. With the proposed solution of a new breaker bay,
  separation of existing line termination positions eliminates the loss of
  two existing lines in the event of a single breaker failure.

• Outage of the 230 kV Grants Pass to Dixonville line overloads the
  230 kV Meridian to Whetstone transmission line. After 2019, based
  on projected load growth, completion of the project will maintain
  compliance with TPL Standards related to a loss of a single
  transmission element (such as a line or transformer).

• Failure of the Meridian breaker 1R49 causes the loss of the 230 kV
  Meridian to Whetstone and the 230 kV Meridian to Lone Pine No. 2
  transmission lines which then overloads the Meridian to Lone Pine
No. 1 transmission line. After 2019, based on projected load growth, completion of the project would avoid load shedding necessary after an event under the TPL Standards (i.e., loss of two transmission elements).

- Outage of both the 230 kV lines supplying Grants Pass substation. Completion of the project avoids the loss of all Grants Pass and Crescent City load resulting from this event under the TPL Standards by adding a third 230 kV source to Grants Pass.

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

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

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

As previously described, this project corrects TPL Standards deficiencies and makes load shedding unnecessary upon the occurrence of a range of outage events under the TPL Standards in the Medford, Grants Pass, and Crescent City regions. This project also relieves loading on the Meridian 500/230 kV transformers which
otherwise are the main source for Crescent City and Grants Pass, as well as Medford.

As discussed below, the new substation also avoids the need to incur the cost to construct a new 230 kV transmission line from Meridian substation east of Medford to the Sams Valley area northwest of Medford.

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

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

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

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

A. This in-service project consists of a new 500/230 kV substation located near Klamath Falls, Oregon, as shown on the map attached in Exhibit PAC/703. The new Snow
Goose substation has a 500/230 kV, 650 MVA transformer bank and associated switchgear. In addition, PacifiCorp constructed 0.5 miles of 230 kV transmission line and 1.2 miles of 500 kV transmission line to integrate the substation into the area’s 230 kV and 500 kV systems. The 230 kV yard was placed in service in May 2017, and the 500 kV yard was placed in service in November 2017, for a total of $42.7 million of plant placed in service. A one line diagram of the Snow Goose 500/230 kV New Substation project is included in Exhibit PAC/703.

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

A. As with the investment in the Sams Valley 500/230 kV New Substation project, the need for this investment is based on achieving continued compliance with reliability standards mandated by NERC, including NERC’s TPL Standards. In 2012, PacifiCorp performed TPL Standards screening studies that identified system performance deficiencies following the single contingency loss of PacifiCorp’s existing 500/230 kV, 650 MVA transformer bank at Malin substation. Specifically, PacifiCorp determined that during the 2017 projected summer peak load conditions, the loss of the transformer bank would result in the system failing to meet the low voltage limits on the PacifiCorp-owned 230 kV, 115 kV and 69 kV systems and an increase in the load on the Copco-Lone Pine 230 kV line. By 2027, the Copco-Lone Pine 230 kV line would exceed its rated thermal continuous and emergency capacity during this outage. This outage would also cause a reduction of the power flow on the Alturas-Reno Western Electricity Coordinating Council path 76. As a result, firm
scheduled transfers on this line could not continue to be supported without a second 230 kV source.

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

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

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

A. In lieu of the Snow Goose 500/230 kV New Substation project, PacifiCorp considered resolving the deficiencies under the TPL Standards by installing a second transformer at Malin substation and building a second line from Malin to Klamath Falls. This alternative was rejected as Malin substation could not be readily expanded to accommodate a new 500/230 kV transformer position due to physical site constraints. This alternative was estimated to be $85.0 million.
A second alternative would have involved installing a 500/230 kV, 650 MVA transformer at the Bonneville Power Administration (BPA)-owned Captain Jack substation and building 27 miles of 230 kV line from Captain Jack to Klamath Falls. Adding another transformer at Captain Jack substation would require increasing the size of the substation property and reaching an agreement with BPA. This alternative was estimated to be $90.0 million and was rejected because of insufficient space at the BPA-owned Captain Jack substation, inadequacy of site in serving as a new source of 69 kV to the Klamath Falls metropolitan area, and additional reinforcement requirements of the 230 kV path between Captain Jack and Klamath Falls substations.

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

VIII. VANTAGE TO POMONA HEIGHTS 230 KV NEW TRANSMISSION LINE

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

A. The Vantage to Pomona Heights 230 kV New Transmission Line project consists of a new 41-mile, 230 kV transmission line that extends from the BPA Vantage substation near Vantage, Washington, and ends at the PacifiCorp Pomona Heights substation in Yakima, Washington, as shown on the map attached in Exhibit PAC/704. The project consists of two sequences of work, the combined costs of which are included in rate base in this proceeding. The first work sequence was placed in service in November
2015 for $9.4 million and included the expansion of the Pomona Heights substation 230 kV ring bus to provide adequate breaker separation between lines and transformers for breaker failure and bus fault events. The second sequence of work is projected to be placed in service in November 2019 for an estimated $34.1 million and includes installation of a new 230 kV transmission line connected at BPA’s Vantage substation and ending at PacifiCorp’s Pomona Heights substation. This portion of the project will include the installation of breakers, protection and control equipment, and communications equipment at each substation as required to monitor and safely operate the new line. The infrastructure additions at Vantage substation will be designed, purchased, installed, and maintained by BPA. A one line diagram of the Vantage to Pomona 230 kV New Transmission Line project is included in Exhibit PAC/704.

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

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

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

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

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

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

A. In lieu of the selected project, the new 230 kV line from Vantage to Pomona Heights,
PacifiCorp considered constructing a new 500/230 kV transformer and bus position at
Wautoma substation and a new 230 kV transmission line from Wautoma substation to
Pomona Heights substation resulting in an estimated cost of $89.6 million. This
alternative was rejected because the costs were higher than the selected project.
Another alternative would have involved constructing a second 230 kV transmission line from Midway substation to Union Gap substation. This alternative was rejected, however, because it would have corrected identified deficiencies for only approximately 10 years before additional transmission reinforcement would be required.

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

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

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

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

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

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

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

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

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

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

A. In lieu of the selected project, PacifiCorp considered re-building the existing Wallula to McNary 230 kV transmission line to a double circuit line at an estimated cost of $73.6 million. As a second alternative, PacifiCorp considered reconductoring the
existing Wallula to McNary 230 kV transmission line with high temperature conductor. This alternative would have required the addition of phase shifting transformers to produce increased flow on the line and a new substation to place the equipment at an estimated cost of $53.6 million. Both alternatives were rejected due to costs.

Q. Does this conclude your direct testimony?

A. Yes.