

Confidential Per WAC 480-07-160
Exhibit No. CAT-1CT
Docket UE-15____
Witness: Chad A. Teply

**BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

In the Matter of

PACIFIC POWER & LIGHT
COMPANY,

Petition For a Rate Increase Based on a Modified
Commission Basis Report, Two-Year Rate Plan,
and Decoupling Mechanism.

Docket UE-15____

PACIFIC POWER & LIGHT COMPANY

REDACTED - CONFIDENTIAL DIRECT TESTIMONY OF CHAD A. TEPLY

November 2015

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Confidential Exhibit No. CAT-2C—Confidential U3 Replace Cooling Tower 14/15/16

Confidential Exhibit No. CAT-3C—Confidential U3 APH Baskets 15

Confidential Exhibit No. CAT-4C—Confidential U3 Replace Finishing Superheater 15

Confidential Exhibit No. CAT-5C—Confidential U3 Burners – Major 15

Confidential Exhibit No. CAT-6C—Confidential Initial Capital Cost Estimators

Confidential Exhibit No. CAT-7C—Confidential Unit 3 Initial Capital Cost Estimates

Confidential Exhibit No. CAT-8C—Confidential U4 Burners – Major 16

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Confidential Exhibit No. CAT-10C—Confidential U4 Steam-Cooled Floor Replacement 16

Confidential Exhibit No. CAT-7C—Confidential U4 Replace Hot Reheat Pipe 16

Confidential Exhibit No. CAT-7C—Confidential Unit 4 Initial Capital Cost Estimates

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

2 A. My name is Chad A. Teply. My business address is 1407 West North Temple, Suite
3 310, Salt Lake City, Utah 84116. My present position is Vice President of Strategy
4 and Development. I am testifying for Pacific Power & Light Company (Pacific
5 Power or Company), a division of PacifiCorp.

6 **QUALIFICATIONS**

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

8 A. I have a Bachelor of Science degree in Mechanical Engineering from South Dakota
9 State University. I have held positions of increasing responsibility within various
10 Berkshire Hathaway Energy companies since November 1999. In February 2009, I
11 joined PacifiCorp as Vice President of Resource Development and Construction. I
12 am responsible for development and implementation of the Company's major
13 generation resource additions, major environmental compliance projects, and certain
14 routine maintenance and repair projects across the generation fleet.

15 **PURPOSE OF TESTIMONY**

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

17 A. My testimony supports the prudence of the projects placed in service during the major
18 maintenance overhauls at Units 3 and 4 of the Jim Bridger generating plant, which
19 will be completed in November 2015 and November 2016, respectively. More
20 specifically, my testimony supports the prudence of the installation of selective
21 catalytic reduction (SCR) systems completed to ensure environmental compliance for
22 the units and certain routine maintenance and repair projects required to ensure
23 continued safe, reliable, and cost-effective operation of the units. The impact on

1 Washington revenue requirement for the projects placed in service during the Jim
2 Bridger Unit 3 and Jim Bridger Unit 4 major maintenance overhauls is reflected in the
3 testimony of Ms. Shelley E. McCoy.

4 **Q. Which other Company witness provides testimony regarding the prudence of the**
5 **Jim Bridger Units 3 and 4 SCR systems?**

6 A. Mr. Rick T. Link provides testimony explaining the economic analysis used by the
7 Company to support its decision to proceed with installation of the Jim Bridger Units
8 3 and 4 SCR systems.

9 **JIM BRIDGER UNIT 3 MAJOR MAINTENANCE OVERHAUL**

10 **Q. Please describe the projects placed in service as part of the Jim Bridger Unit 3**
11 **major maintenance overhaul included in this case.**

12 A. The Company has included the following projects as part of the Jim Bridger Unit 3
13 major maintenance overhaul.

- 14 • Jim Bridger Unit 3 Cooling Tower Replacement
- 15 • Jim Bridger Unit 3 Air Preheater Baskets Replacement
- 16 • Jim Bridger Unit 3 Finishing Superheater Replacement
- 17 • Jim Bridger Unit 3 Burners Replacement
- 18 • Jim Bridger Unit 3 SCR System

19 The total cost of the Jim Bridger Unit 3 overhaul project included in this filing is
20 \$127.5 million on a total-company basis, or approximately \$28.6 million on a
21 Washington-allocated basis.

1 **Q. When will the Jim Bridger Unit 3 major plant overhaul be completed?**

2 A. The major plant overhaul will be in service by the end of November. At that time, all
3 of the components associated with this overhaul will be in service.

4 **Q. Why were the routine maintenance, repair, and replacement projects described
5 in your testimony completed during the 2015 overhaul?**

6 A. The routine maintenance, repair, and replacement projects require the individual unit
7 to be offline, and in some instances for extended periods, to allow the projects to be
8 completed. It is typical to align the project implementation schedules for these
9 projects with major plant overhaul cycles of large generation resources like Jim
10 Bridger Units 3 and 4. In other words, the timing of these projects is driven by the
11 maintenance cycles for these units.

12 **Q. Why is the Company installing the Jim Bridger Units 3 and 4 SCR systems at
13 this time?**

14 A. I will discuss the environmental compliance drivers that underlie the specific timing
15 of installation of the Jim Bridger Units 3 and 4 SCR systems in detail in the following
16 sections of my testimony. The general need to align the implementation schedules of
17 these major retrofit projects with the established major maintenance overhaul cycles
18 for individual units, however, is consistent with the routine maintenance, repair, and
19 replacement projects described above.

20 **Q. Did the Company assess the benefits associated with each of the projects
21 described?**

22 A. Yes. The Company has analyzed the benefits of all the projects described in the
23 following sections on a present value revenue requirement differential PVRR(d) basis

1 to confirm benefits for customers. The analysis demonstrates that each of these
2 projects is prudent, necessary, and in the best interests of customers. The analyses are
3 provided as exhibits to my testimony, referenced more specifically in the sections
4 below. As noted above, with respect to the Jim Bridger Units 3 and 4 SCR systems,
5 Mr. Rick T. Link is separately sponsoring testimony explaining the Company's
6 economic analysis.

7 **Q. What is the major maintenance overhaul cycle for the Jim Bridger units?**

8 A. Jim Bridger Units 3 and 4 are maintained on a four-year outage cycle. The last major
9 maintenance overhaul on Jim Bridger Unit 3 was in 2011. The last major
10 maintenance overhaul on Jim Bridger Unit 4 was in 2013. These maintenance cycles
11 are based on the Company's operating experience with the Jim Bridger units and have
12 been established to optimize unit reliability and availability, while maintaining
13 appropriate major maintenance outage scope and costs.

14 **Jim Bridger Unit 3 Cooling Tower Replacement**

15 **Q. Please describe the Jim Bridger Unit 3 cooling tower replacement project.**

16 A. This project replaced cells 1-10 of the cooling tower. Cells 1-10 of the Unit 3 cooling
17 tower are constructed with wooden structural members. Over time, the circulating
18 water absorption/evaporation cycle leaves a buildup of dissolved minerals in the
19 lumber fibers that destroys its structural integrity. Degradation of structural integrity
20 eventually reaches the point where the lumber cannot support the applied cooling
21 tower loads, resulting in structural collapse.

22 **Q. Why did the cooling tower need to be replaced?**

23 A. The original equipment manufacturer (OEM) designs cooling tower lumber for a

1 30-year service life, but states that 20-year service life is typical for areas of the
2 country with lower-quality water supplies. The expected service life for a cooling
3 tower at the Jim Bridger Plant with its average water quality (more than 20 cycles of
4 concentration of relatively “hard” water) is approximately 25 years, based on
5 experience and lumber test results.

6 Cells 1-10 of the Unit 3 cooling tower were last replaced in 1990. Random
7 lumber samples removed from cells 1-10 were sent to a testing laboratory for analysis
8 and determination of the predicted remaining service life based on strength losses in
9 2007, 2012, and 2014. The 2014 test results indicated that critical support columns
10 had exceeded life expectancy. The report indicated that the cooling tower had an
11 increased risk of structural failures in the most heavily loaded members before 2019,
12 which is the next scheduled major overhaul for this unit.

13 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger**
14 **Unit 3 cooling tower replacement project?**

15 A. The capital cost of the Jim Bridger Unit 3 cooling tower replacement project is
16 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
17 on a Washington-allocated basis. The assessed PVRR(d) for the project is
18 approximately [REDACTED] on a total-company basis.

19 Confidential Exhibit No. CAT-2C is provided for reference regarding the assessed
20 benefits and justification for the project.

1 **Jim Bridger Unit 3 Air Preheater Baskets Replacement**

2 **Q. Please describe the need for the Jim Bridger Unit 3 air preheater baskets**
3 **replacement project.**

4 A. This project includes the purchase and installation of hot and cold end air preheater
5 baskets for both air preheaters. Both air preheaters were inspected during the 2010
6 air preheater wash. The inspection revealed damage in the form of basket separation
7 in both air preheaters and the unit. Additionally, damage to the periphery of the
8 baskets was noted during the 2011 overhaul inspection. This type of damage cannot
9 be repaired.

10 During a subsequent unit outage in June 2014, an inspection was again
11 conducted on both the hot end and cold end of both air preheaters. The inspection
12 confirmed that cold end baskets had continued to deteriorate. The Company
13 estimated that approximately two-to-five percent of the cold end baskets had eroded
14 away. Additionally, the condition of the hot end baskets had deteriorated since the
15 last overhaul inspection. During the inspection in June 2014, the Company noted that
16 large sections of hot end basket elements were missing.

17 **Q. What is the risk if the air preheater baskets are not replaced?**

18 A. As the condition of the baskets continues to degrade, the risk of an air preheater rotor
19 stoppage increases. If the cold end baskets fail causing a rotor stoppage, the plant
20 would be forced to take a unit outage in order to build a bulk head upstream and
21 downstream of the damaged air preheater. The unit would then be restricted to half
22 load for a significant period of time until a new set of replacement baskets could be

1 installed. It is estimated that the plant would require a seven-day outage to replace
2 the baskets.

3 Additionally, as more of the material from the hot end baskets begins to break
4 apart and settle on the top of the cold end baskets, gas flow will begin to channel.
5 Gas flow channeling accelerates fly ash erosion to the elements, thus accelerating
6 damage to the diaphragms and stay plates. All of these circumstances would increase
7 derates on the unit, damage to the air heater, and associated repair costs.

8 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger
9 Unit 3 air preheater baskets replacement project?**

10 A. The capital cost of the Jim Bridger Unit 3 air preheater baskets replacement project is
11 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
12 on a Washington-allocated basis. The assessed PVRR(d) for the project is
13 approximately [REDACTED] on a total-company basis.
14 Confidential Exhibit No. CAT-3C is provided for reference regarding the assessed
15 benefits and justification for the project.

16 **Jim Bridger Unit 3 Finishing Superheater Replacement**

17 **Q. Please describe the need for the Jim Bridger Unit 3 finishing superheater
18 replacement project.**

19 A. This project includes the purchase and installation of a new finishing superheater for
20 the Jim Bridger Unit 3 boiler. The existing superheater is original equipment and
21 needs to be replaced. The finishing superheater is subject to several different types of
22 failure mechanisms. The first is fly ash erosion. During normal boiler operation, fly
23 ash travels through this pendant section at sufficient velocity to cause erosion on

1 tubing. Another failure mechanism is sootblower erosion. During normal operation,
2 ash and slag accumulate in this area. This must be removed in order to maximize heat
3 transfer through these pendants. This is accomplished through the use of
4 sootblowers. A side effect of sootblower operation is that it also removes a
5 microscopically thin layer of tube material each time it is used. Together, the above
6 two mechanisms can lead to erosion throughout the finishing superheater assemblies.

7 A third failure mechanism is mechanical fatigue at dissimilar metal welds
8 (DMW). Because a DMW is composed of two different materials, with two different
9 coefficients of thermal expansion, a stress is developed when the weld and
10 surrounding material is heated. Due to their location in the furnace, these welds are
11 exposed to repeated temperature fluctuations during normal operation of the unit.

12 During the last major overhaul of Unit 3, 20 percent of tubes inspected had a
13 wall loss of 15 percent or more, and six percent of the tubes had a wall loss of 25
14 percent or more. In addition, the Company has reports and evidence indicating that
15 all DMWs are at or near end of life. The Company's analysis also estimated that
16 90 percent of the remaining life of the tubing had been consumed, which equates to
17 less than four years before end of life is reached.

18 **Q. What was the risk if the finishing superheater had not been replaced?**

19 A. Not replacing the finishing superheater would leave Jim Bridger Unit 3 at risk of
20 experiencing a significant increase in forced outages due to tube leaks, thereby
21 increasing costs to customers.

1 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger**
2 **Unit 3 finishing superheater replacement project?**

3 A. The capital cost of the Jim Bridger Unit 3 finishing superheater replacement project is
4 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
5 on a Washington-allocated basis. The assessed PVRR(d) for the project is
6 approximately [REDACTED] on a total-company basis.

7 Confidential Exhibit No. CAT-4C is provided for reference regarding the assessed
8 benefits and justification for the project.

9 **Jim Bridger Unit 3 Burners Replacement**

10 **Q. Please describe the Jim Bridger Unit 3 burners replacement project.**

11 A. This project includes the purchase and installation of burners (coal and air tips,
12 nozzles, and associated hardware) on the Jim Bridger Unit 3 boiler. Coal burners are
13 impacted by high rates of erosion due to wear and thermal stressing. The erosion
14 rates are high enough that much of the nozzle is eroded away to the point that
15 performance and reliability are impacted.

16 **Q. What is the risk if the burners are not replaced?**

17 A. If a piece of the nozzle itself breaks free, there is a possibility that its sharp edges will
18 cause tube leaks when it falls into the boiler. Another problem with the burners is
19 thermal warping and fatigue. Immense heat is generated by the fireball during
20 operation and over of time, this heat will warp the air and coal tips. Once the tips
21 have reached this point, combustion quality degrades which will adversely impact
22 heat rate. This results in increased fuel usage and costs.

1 An additional impact of less than optimal combustion is increased emissions.
2 The burners are an integral part to optimum firing conditions in the boiler that
3 maximize fuel efficiency while helping to minimize emissions. In fact, the recently-
4 mandated Mercury and Air Toxic Substances require that the boiler firing system be
5 periodically inspected. If anything is found during these inspections that could
6 significantly negatively affect emissions, the condition must be repaired promptly
7 (within 90 days). Execution of this project helped ensure continued compliance with
8 these requirements without negatively impacting equivalent availability.

9 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger**
10 **Unit 3 burners replacement project?**

11 A. The capital cost of the Jim Bridger Unit 3 burners replacement project is
12 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
13 on a Washington-allocated basis. The assessed PVRR(d) for the project is
14 approximately [REDACTED] on a total-company basis.
15 Confidential Exhibit No. CAT-5C is provided for reference regarding the assessed
16 benefits and justification for the project.

17 **Jim Bridger Units 3 and 4 SCR Systems**

18 **Q. Do the SCR systems at Jim Bridger Units 3 and 4 have the same general purpose**
19 **and scope?**

20 A. Yes. For this reason, my testimony here references the SCR systems at both Jim
21 Bridger Units 3 and 4.

1 **Q. Please provide a general description of the Jim Bridger Units 3 and 4 SCR**
2 **systems.**

3 A. The Jim Bridger Units 3 and 4 emissions control retrofit projects include installation
4 of SCR systems and associated ancillary equipment for each unit. Each SCR system
5 is comprised of two separate reactors, with multiple catalyst levels; inlet and outlet
6 ductwork; a shared ammonia reagent system; an economizer upgrade; structural
7 reinforcement of the boiler and flue gas path ductwork and equipment; and extension
8 of the existing plant distributed control system (DCS). An induced draft (ID) fan
9 upgrade and an associated auxiliary power system variable frequency drive (VFD)
10 insertion is required on Unit 4 only.

11 **Q. Why is the Company installing the emissions control equipment projects at Jim**
12 **Bridger Units 3 and 4 at this time?**

13 A. The U.S. Environmental Protection Agency's (EPA) Regional Haze Rules, the Jim
14 Bridger facility Best Available Retrofit Technology (BART) permit issued by the state
15 of Wyoming, a BART appeal settlement agreement with the state of Wyoming, and
16 the Wyoming Regional Haze State Implementation Plan (SIP) require the installation
17 of the SCR systems on Unit 3 by the end of 2015 and on Unit 4 by the end of 2016.

18 **Q. Has EPA approved the state of Wyoming's Regional Haze compliance**
19 **requirements for Jim Bridger Units 3 and 4?**

20 A. Yes. EPA approved these requirements in its final Regional Haze Federal
21 Implementation Plan (FIP) for Wyoming published in the *Federal Register* on June 4,
22 2012. EPA subsequently reiterated its approval of these requirements in its updated
23 Regional Haze FIP for Wyoming published in the *Federal Register* on January 30,

1 2014. EPA's final approval makes these emissions reduction compliance
2 requirements at Jim Bridger Units 3 and 4 federally enforceable, in addition to being
3 enforceable under state law.

4 **2013 Integrated Resource Plan**

5 **Q. Did the Company include analysis of the Jim Bridger Units 3 and 4 SCR systems**
6 **for the Washington Utilities and Transportation Commission (Commission) to**
7 **consider in the Company's 2013 Integrated Resource Plan (IRP) filings?**

8 A. Yes. The Company filed Confidential Volume III of the 2013 IRP on April 30, 2013.
9 Confidential Volume III included detailed analysis of the Jim Bridger Units 3 and 4
10 SCR systems. Mr. Link describes the analysis summarized in that filing in his direct
11 testimony in this docket.

12 **Q. Did the Commission recommend specific action in response to the Company's**
13 **Confidential Volume III analysis of the Jim Bridger Units 3 and 4 SCR systems?**

14 A. Yes. On November 25, 2013, the Commission recommended the following:

15 ...the Commission concludes that PacifiCorp should update its coal
16 analysis as part of its 2013 IRP Update. Moving ahead with the
17 environmental controls identified in PacifiCorp's analysis for the
18 Bridger units requires further justification, particularly in light of
19 forthcoming EPA regulations that may require additional
20 environmental upgrades. This updated analysis is necessary to ensure
21 the Company does not commit itself to investments that later prove not
22 to be cost-effective. As part of its updated coal analysis, PacifiCorp
23 should construct various price curves for carbon regulation
24 representing the range of standards the EPA could impose, as well as
25 various price curves for natural gas that are more closely aligned with
26 current forward prices. This would enable a more detailed sensitivity
27 analysis, which would allow the Company to identify specific
28 emissions standards and natural gas price points at which a given plant
29 becomes more economical to operate with natural gas.

1 **Q. Did the Company complete the requested update?**

2 A. Yes. The Company included Confidential Appendix F in its 2013 IRP Update
3 filing on March 31, 2014, which specifically responded to the Commission's
4 request for review of potential changes in carbon regulation and natural gas
5 market cost impacts.

6 **Q. Did the Company's updated review of potential carbon regulation and natural**
7 **gas forward price curves in its March 31, 2014 IRP Update filing result in**
8 **changes to its earlier economic analysis of the Jim Bridger Units 3 and 4 SCR**
9 **systems?**

10 A. No. The forecast proxy costs for carbon regulations and natural gas included in the
11 2013 IRP Update filing remained within the ranges initially assessed.

12 **Certificate of Public Convenience and Necessity**

13 **Q. Did the Company also file an application for a Certificate of Public Convenience**
14 **and Necessity (CPCN) for the Jim Bridger Units 3 and 4 SCR systems in the**
15 **State of Wyoming, where the projects are constructed?**

16 A. Yes. On August 7, 2012, the Company filed its application requesting a CPCN¹ with
17 the Wyoming Public Service Commission, in compliance with the Stipulation and
18 Agreement (2010 Wyoming Stipulation) approved in Wyoming Docket
19 No. 20000-384-ER-10 (2010 Wyoming Rate Case), to construct two major
20 environmental projects as provided in paragraph 13.b. of the 2010 Wyoming
21 Stipulation. The projects entailed the addition of SCR systems to Units 3 and 4 of the
22 Jim Bridger electric steam plant located in Sweetwater County, Wyoming.

¹ Wyoming Docket No. 20000-418-EA-12.

1 **Q. How does the Jim Bridger Units 3 and 4 SCR systems cost information**
2 **incorporated into the Company's CPCN application compare to the Company's**
3 **2013 IRP analysis of the project?**

4 A. The Company used the same project cost information as the baseline for the CPCN
5 application and the Company's 2013 IRP filing.

6 **Q. Did the Wyoming Public Service Commission approve the Company's request**
7 **for a CPCN?**

8 A. Yes. On May 29, 2013, the Wyoming Public Service Commission approved the
9 Company's request for a CPCN to add SCR systems on Jim Bridger Units 3 and 4, as
10 filed.

11 **Project Implementation and Cost**

12 **Q. When was the EPC contract executed and the contractor released to begin**
13 **work?**

14 A. The Jim Bridger Units 3 and 4 SCR turnkey engineer, procure, and construct (EPC)
15 contract was executed by the parties on May 31, 2013. The turnkey EPC contract
16 included a limited notice to proceed (LNTP) provision which initially released the
17 selected EPC contractor to begin only scheduled critical activities for a period of time
18 while parallel path regulatory proceedings (i.e., environmental agency Regional Haze
19 activities, a voluntary procurement pre-approval docket in Utah, and IRP reviews)
20 proceeded. The Company gave full notice to proceed (FNTP) to the EPC contractor
21 effective December 1, 2013, under negotiated EPC contract provisions established to
22 maintain project cost and schedule certainty. The EPC contractor's construction site
23 mobilization began in December 2013.

1 **Q. What is the Company's cost to complete the Jim Bridger Unit 3 SCR system?**

2 A. The cost of the Jim Bridger Unit 3 SCR system included in this proceeding is [REDACTED]
3 [REDACTED] on a total-company basis, or approximately [REDACTED] on a Washington-
4 allocated basis. These amounts reflect plant-in-service amounts through December
5 2015. Certain closeout capital costs after December 2015 have not been reflected in
6 this filing. The Company's confidential total-company cost to complete the Jim
7 Bridger Unit 3 SCR system, will be approximately [REDACTED], which is
8 approximately [REDACTED] less than the corresponding cost reported in the 2013
9 IRP and CPCN Application, as shown in Confidential Exhibit No. CAT-6C. See
10 Confidential Exhibit No. CAT-7C to this testimony for the cost comparisons.

11 **Q. Did the Company prudently manage the implementation of the Jim Bridger Unit**
12 **3 SCR system?**

13 A. Yes. Beyond management of project costs as discussed above, the Company's project
14 team prudently implemented and maintained an appropriate procurement strategy and
15 project controls to ensure compliance with contract safety program implementation,
16 technical specification requirements, scope of work definition, critical path schedules,
17 quality assurance, and start-up and turnover plans, among other things.

18 **Q. What is the current status of the EPC contract for the Jim Bridger Unit 3**
19 **portion of the overall Jim Bridger Units 3 and 4 SCR systems?**

20 A. The Jim Bridger Unit 3 portion of the EPC contract achieved mechanical completion
21 on November 5, 2015, and the project will be placed in service by the end of
22 November 2015, following the planned major maintenance overhaul for Unit 3. The
23 Company's environmental compliance deadline as established by the governing

1 permits, implementation plans, and agreements described earlier in testimony is
2 December 31, 2015, for Unit 3. The in-service timeline described above will allow a
3 brief period of operation before the compliance deadlines to demonstrate performance
4 of the project. The completion of the Jim Bridger Unit 3 SCR system satisfies the
5 compliance deadlines established by the Wyoming Department of Environmental
6 Quality and the EPA for the unit.

7 **JIM BRIDGER UNIT 4 MAJOR MAINTENANCE OVERHAUL**

8 **Q. Please describe the projects placed in service as part of the Jim Bridger Unit 4**
9 **major maintenance overhaul that the Company has included in this filing.**

10 A. The Company has included in this filing the following projects, which will be placed
11 in service as part of the Jim Bridger Unit 4 major maintenance overhaul.

- 12 • Jim Bridger Unit 4 Burners Replacement
- 13 • Jim Bridger Unit 4 Absorber Reline
- 14 • Jim Bridger Unit 4 Finishing Superheater Replacement
- 15 • Jim Bridger Unit 4 Steam Cooler Floor Replacement
- 16 • Jim Bridger Unit 4 Hot Reheat Pipe Replacement
- 17 • Jim Bridger Unit 4 SCR System

18 The total cost of the Jim Bridger Unit 4 overhaul project included in this filing is
19 \$143.7 million on a total-company basis or approximately \$32.2 million on a
20 Washington-allocated basis.

21 **Q. Is planning and procurement for the overhaul on Jim Bridger Unit 4 now**
22 **underway?**

23 A. Yes. Planning and procurement of equipment, components, and materials necessary

1 to support the Jim Bridger Unit 4 major maintenance overhaul are underway. The
2 overhaul will be completed within one year, or by November 2016. All of the
3 projects associated with the overhaul will be placed in service at that time.

4 **Q. Why are the routine maintenance, repair, and replacement projects being**
5 **completed during the 2016 overhaul?**

6 A. Consistent with my testimony regarding the Jim Bridger Unit 3 major maintenance
7 overhaul projects, the routine maintenance, repair, and replacement projects require
8 the individual unit to be offline, and in some instances for extended periods, to allow
9 the projects to be completed.

10 **Q. Did the Company assess the benefits associated with each of the projects**
11 **included in the Jim Bridger Unit 4 overhaul?**

12 A. Yes. The Company has analyzed the benefits of all the projects on a PVRR(d) basis
13 to confirm benefits for customers. The analysis demonstrates that each of these
14 projects is prudent, necessary, and in the best interests of our customers.

15 **Jim Bridger Unit 4 Burners Replacement**

16 **Q. Please describe the Jim Bridger Unit 4 burners replacement project.**

17 A. This project includes the purchase and installation of burners (coal and air tips,
18 nozzles, and associated hardware) on the Jim Bridger Unit 4 boiler. The project
19 mirrors the burner replacement project on the Jim Bridger Unit 3 boiler and it is
20 supported by the same rationale.

21 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger**
22 **Unit 4 burner replacement project?**

23 A. The capital cost of the Jim Bridger Unit 4 burner replacement project is

1 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
2 on a Washington-allocated basis. The preliminary assessed PVRR(d) for the project
3 is approximately [REDACTED] on a total-company basis.

4 Confidential Exhibit No. CAT-8C is provided for reference regarding the assessed
5 benefits and justification for the project.

6 **Jim Bridger Unit 4 Absorber Reline**

7 **Q. Please describe the Jim Bridger Unit 4 absorber reline project.**

8 A. The Jim Bridger Unit 4 scrubber system has three absorber vessels, each with a
9 separate inlet and outlet duct. The purpose of the scrubber is to remove sulfur dioxide
10 (SO₂) from the flue gas stream before it exits the stack. The purpose of this project is
11 to replace the existing rubber lining on the interior of the three absorber vessels to
12 maintain the integrity of the vessels. The work required includes removing the
13 existing coating, repairing the metal shell, and recoating the vessels.

14 **Q. What is the risk if the absorber is not relined?**

15 A. The existing rubber coating has been in place since the absorber vessels were first
16 constructed in 1980. The rubber has been experiencing delamination for several years
17 which can lead to corrosion of the vessel's metal shell. The integrity of the scrubber
18 vessel is required to maintain compliance with the facility's Title V permit.

19 **Q. What are the capital costs and assessed benefits associated with the Jim
20 Bridger 4 absorber reline project?**

21 A. The capital cost of the Jim Bridger Unit 4 absorber reline project included in this case
22 is approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
23 [REDACTED] on a Washington-allocated basis. The preliminary assessed PVRR(d) for the

1 project is approximately [REDACTED] on a total-company basis.

2 Confidential Exhibit No. CAT-9C is provided for reference regarding the assessed
3 benefits and justification for the project.

4 **Jim Bridger Unit 4 Finishing Superheater Replacement**

5 **Q. Please describe the Jim Bridger Unit 4 finishing superheater replacement**
6 **project.**

7 A. This project includes the purchase and installation of a new finishing superheater for
8 the Unit 4 boiler at the Jim Bridger plant. The existing superheater is original
9 equipment and is at the end of its usable life.

10 **Q. What is the risk if the finishing superheater is not replaced?**

11 A. The Unit 4 finishing superheater is subject to two main failure mechanisms, creep and
12 fatigue. This condition is called creep-fatigue; its effect can be interactive, causing
13 damage to accumulate much more quickly than would be expected for either
14 mechanism alone. There are several factors contributing to creep-fatigue. The first is
15 DMWs. Due to their location in the furnace, these welds are exposed to repeated
16 temperature fluctuations during normal operation of the unit. The higher
17 temperatures also contribute to creep damage in the lower grade material at the
18 DMW. Analyses of the DMWs has revealed that a high number of tube failures will
19 most likely occur in the period prior to the next overhaul if the finishing superheater
20 is not replaced. These tube failures would cause a number of forced outages and have
21 a negative impact on equivalent availability and costs to the Company's customers.

1 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger**
2 **Unit 4 finishing superheater replacement project?**

3 A. The capital cost of the Jim Bridger Unit 4 finishing superheater replacement project is
4 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
5 on a Washington-allocated basis. The assessed PVRR(d) for the project is
6 approximately [REDACTED] on a total-company basis.

7 Confidential Exhibit No. CAT-10C is provided for reference regarding the assessed
8 benefits and justification for the project.

9 **Jim Bridger Unit 4 Steam Cooler Floor Replacement**

10 **Q. Please describe the Jim Bridger Unit 4 steam cooler floor replacement project.**

11 A. This project includes the purchase and installation of a new steam-cooled floor for the
12 Jim Bridger Unit 4 boiler. The steam-cooled floor of the Jim Bridger Unit 4 boiler
13 was originally supplied in 1979. The area consists of a centrally-placed header and
14 34 tube circuits emerging from either side of this header. This area is subject to
15 frequent sootblowing due to its close proximity to high-use retractable sootblowers
16 used to clean the finishing superheater. A side effect of sootblower operation is that it
17 also removes a microscopically thin layer of tube material each time it is used causing
18 the tube thickness to be reduced.

19 **Q. What is the risk if the steam cooler floor is not replaced?**

20 A. Sootblower erosion has been identified as one of the root causes for tube leaks in this
21 area. In an effort to extend the life of the steam-cooled floor, stainless steel overlay
22 was applied years ago. While this served as a temporary solution to the sootblower
23 erosion problem, it introduced significant thermal and mechanical stresses into the

1 tube. These introduced stresses will increase the likelihood of a tube leak that will
2 remain until the steam-cooled floor is replaced.

3 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger**
4 **Unit 4 steam cooler floor replacement project?**

5 A. The capital cost of the Jim Bridger Unit 4 steam cooler floor replacement project is
6 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
7 on a Washington-allocated basis. The preliminary assessed PVRR(d) for the project
8 is approximately [REDACTED] on a total-company basis.

9 Confidential Exhibit No. CAT-11C is provided for reference regarding the assessed
10 benefits and justification for the project.

11 **Jim Bridger Unit 4 Hot Reheat Pipe Replacement**

12 **Q. Please describe the Jim Bridger Unit 4 hot reheat pipe replacement project.**

13 A. This project includes the replacement of select critical seam-welded components of
14 the Unit 4 hot reheat pipe system with seamless pipe. The hot reheat piping on Jim
15 Bridger Unit 4 is original and first went into service in 1979. At the time of
16 installation, it was acceptable practice in the industry to use seam-welded pipe. There
17 are a number of well-publicized seam welded pipe catastrophic failures, including the
18 Mohave plant in 1985, where the reheat piping failed and released a cloud of
19 superheated steam down a door leading to the control room where it fatally scalded
20 six people and injured ten others. Additional seam welded higher energy piping
21 failures occurred at the Monroe plant in 1986, the Mt. Storm plant in 1996, and the
22 Hawthorne plant in 1998. The industry became aware that seam welded steam piping
23 operating in the creep regime (above approximately 950°F for low alloy steel pipe)

1 could be susceptible to catastrophic rupture along the longitudinal seam weld.
2 Inspection results and a comprehensive technical and economic evaluation now
3 provide justification to replace selected sections of the existing seam-welded pipe
4 with seamless pipe.

5 **Q. What is the risk if the hot reheat pipe is not replaced?**

6 A. Since the mid-1980s, considerable effort has been made to examine the seam-welded
7 pipe in critical piping systems at the Jim Bridger Plant. The examinations have
8 provided an understanding of the level of risk associated with the operation of these
9 systems. In 2008, focused array ultrasonic thickness inspections discovered low
10 amplitude indications of incipient creep cavitation on two girth welds. The
11 indications were discovered at a very early stage. The 2012 examinations included a
12 more complete inspection scope, revealing more indications of possible creep damage
13 in the seam welds. At that time, repairs were made to ensure safe operation for the
14 subsequent four years. In early 2015, a comprehensive review of the 2008 and 2012
15 inspection results and reports from earlier inspections, coupled with a failure
16 probability program analysis, identified seven pipe sections with an elevated
17 probability of failure. Due to uncertainty associated with inspection methods and
18 material properties, and the potential for rapid creep propagation with these seam-
19 welded components, the Company decided to replace seven critical piping
20 components with seamless piping during the current overhaul. The replacement will
21 considerably reduce the risk of failure in the hot reheat system, thereby making the
22 plant safer for the people that work there and reducing the risk of an extended outage
23 in the event of a failure.

1 **Q. What are the capital costs and assessed benefits associated with the Jim Bridger**
2 **Unit 4 hot reheat pipe replacement project?**

3 A. The capital cost of the Jim Bridger Unit 4 hot reheat pipe replacement project is
4 approximately [REDACTED] on a total-company basis, or approximately [REDACTED]
5 on a Washington-allocated basis. The assessed PVRR(d) for the project is
6 approximately [REDACTED] on a total-company basis. Confidential Exhibit No.
7 CAT-12C is provided for reference regarding the assessed benefits and justification
8 for the project.

9 **Jim Bridger Unit 4 SCR System**

10 **Q. Please confirm that the drivers, general description, and rationale for the Jim**
11 **Bridger Unit 4 SCR system that will be placed in service in 2016 is consistent**
12 **with that provided above for the Jim Bridger Unit 3 SCR system.**

13 A. Yes. The drivers, general description, and rationale for the Jim Bridger Unit 4 SCR
14 system all mirror the information provided above for the Jim Bridger Unit 3 SCR
15 system.

16 **Project Implementation and Cost**

17 **Q. When was the EPC contract executed and the contractor released to begin**
18 **work?**

19 A. A single EPC contract was executed for the Jim Bridger Units 3 and 4 SCR systems,
20 the time line of which is described above.

21 **Q. What is the Company's current projected cost to complete the Jim Bridger Unit**
22 **4 SCR system?**

23 A. The Jim Bridger Unit 4 SCR system cost included in this case is [REDACTED] on a

1 total-company basis, or approximately [REDACTED] on a Washington-allocated basis.
2 These amounts reflect plant-in-service balances through December 2016. Certain
3 closeout capital costs after December 2016 have not been reflected in this filing. The
4 Company's confidential total-company cost to complete the Jim Bridger Unit 4 SCR
5 system is projected to be approximately [REDACTED], which is approximately [REDACTED]
6 [REDACTED] less than the corresponding cost reported in the 2013 IRP and CPCN
7 Application, as shown in Confidential Exhibit No. CAT-13C. See Confidential
8 Exhibit No. CAT-7C to this testimony for the forecast comparisons.

9 **Q. Has the Company prudently managed implementation of the Jim Bridger Unit 4**
10 **SCR system?**

11 A. Yes. The testimony I provided above relating to the prudent management of the Jim
12 Bridger Unit 3 SCR system is also applicable to the Jim Bridger Unit 4 SCR system.

13 **Q. What is the current status of the EPC contract for the Jim Bridger Unit 4**
14 **portion of the overall Jim Bridger Units 3 and 4 SCR systems?**

15 A. Execution of the Jim Bridger Unit 4 SCR turnkey EPC contract is on schedule for
16 achieving a November 2016 in-service date for the project, with the project being
17 tied-in and placed in service following the planned major maintenance overhaul for
18 Unit 4. The Company's environmental compliance deadline as established by the
19 governing permits, implementation plans, and agreements described earlier in
20 testimony is December 31, 2016, for Unit 4. The currently scheduled in-service dates
21 will allow a brief period of operation before the compliance deadlines to demonstrate
22 performance of the respective systems.

1 As of this filing, all Unit 4 foundations have been constructed; all Unit 4
2 structural steel and SCR modules are erected; and the Unit 4 induced draft fans are
3 being assembled. Unit 4 electrical construction is approximately three percent
4 complete, and Unit 4 piping installation is underway. The Unit 4 economizer
5 modification engineering and materials supply contract has been awarded. The Unit
6 4 boiler and flue gas system reinforcing design has been completed, and the Unit 4
7 boiler and flue gas system reinforcement installation contract will be awarded in the
8 second quarter of 2016. On an overall project completion basis, the Unit 4 SCR
9 system is approximately 70 percent complete, as of the date of this filing.

10 **Q. Does the current schedule for completion of the Jim Bridger Unit 4 SCR system**
11 **support the Company's compliance obligations for the unit?**

12 A. Yes. The turnkey EPC contract, other related ancillary contracts, and the established
13 critical path timeline for tie-in of the Jim Bridger Unit 4 SCR system support the
14 compliance deadlines established by the Wyoming Department of Environmental
15 Quality and EPA, and are aligned with the planned major maintenance overhaul
16 schedule for the unit.

17 **CONCLUSION**

18 **Q. Do you have any final comments?**

19 A. Yes. The Company has prudently managed the analysis, implementation, and costs of
20 the projects I have discussed in my testimony associated with the Jim Bridger Unit 3
21 and Jim Bridger Unit 4 major maintenance overhauls, which will be completed in
22 November 2015 and November 2016, respectively.

1 The Jim Bridger Units 3 and 4 maintenance, repair, replacement, and SCR
2 system projects described in my testimony have been prudently analyzed, managed,
3 and will be placed in service in accordance with the established project plans.

4 The Company analyzed and managed the Jim Bridger Units 3 and 4 SCR
5 systems in accordance with the Company's environmental compliance obligations,
6 IRP and the Wyoming Public Service Commission Order granting a CPCN for the
7 projects. The Company completed the Jim Bridger Unit 3 system on time and under
8 budget, further supporting the prudence of the project. The Jim Bridger Units 3 and 4
9 SCR system projects are also on schedule to meet the all environmental compliance
10 deadlines for both units.

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

12 A. Yes.