BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 1742

Surprise Valley Electrification Corp.,	)
Complainant,	)
	)
v.	)
	)
PacifiCorp, dba Pacific Power,	)
Defendant.	)
	)
	)

EXHIBIT SVEC/400

DIRECT TESTIMONY OF STEPHEN ANDERSON

March 15, 2016

I. INTRODUCTION

Q. Mr. Anderson, please state your name and business address.

A. My name is Stephen Anderson. I am the owner of Evergreen Energy. My business address is 8590 SW Miami Street, Wilsonville, Oregon 97070.

Q. Please describe your background and experience.

A. I have a Bachelor's of Science Degree in Electrical Engineering from Oregon State University and I am a Registered Professional Engineer in Oregon. I have worked for Portland General Electric Company ("PGE") for thirteen years, and also for non-regulated subsidiaries of PGE and PacifiCorp for another five years. I have owned and managed my own consulting business for the past 27 years. During this time, I have focused on the development and implementation of renewable and independent power projects.

A further description of my educational background and work experience can be found in Exhibit SVEC/401 in this proceeding.

Q. On whose behalf are you appearing in this proceeding?

A. I am testifying on behalf of Surprise Valley Electrification Corp. ("Surprise Valley") in this Oregon Public Utility Commission (the "Commission" or "OPUC") complaint.

Q. Have you previously testified before the Commission?

A. No.

Q. What topics will your testimony address?

A. My testimony will address the actual electric generation, distribution, transmission, and metering for Surprise Valley and the Paisley geothermal generation facility (the "Paisley Project").

II. SURPRISE VALLEY AND THE PAISLEY PROJECT

Q. Please summarize Surprise Valley's electric system, including its points of interconnection with PacifiCorp and BPA.

A. My understanding is that Surprise Valley purchases electricity to service its total electric load from the Bonneville Power Administration ("BPA"). BPA transmits a portion of the electricity used to meet Surprise Valley's load directly to Surprise Valley at BPA's Canby substation (located in Northern California) in BPA's balancing authority where BPA's and Surprise Valley's facilities are connected. BPA transmits the majority of the electricity used to meet Surprise Valley's load indirectly to Surprise Valley using transmission facilities owned by PacifiCorp. PacifiCorp transmits and delivers the electricity to Surprise Valley at the Alturas, Austin, Cedarville Junction, Lakeview, and Davis Creek substations.

Q. Please describe the current metering at the Lakeview substation.

A. BPA also delivers some of Surprise Valley's power to the PacifiCorp Chiloquin Substation. From there, PacifiCorp transmits it through its Fishole Substation and on to Lakeview. At Lakeview, BPA owns and operates an enclosed substation-like apparatus that includes the "Lakeview Switch 940" and a meter known as "Metering Point #41". Metering Point #41 is BPA's point of delivery for power to Surprise Valley in the Lakeview area.

Q. Please summarize the Paisley Project.

A. Surprise Valley has been developing the Paisley Project since 2009. The Paisley Project is a geothermal electric generation facility located in Paisley, Oregon. The Paisley Project includes a generator with a rated output of 3,650 kilowatts ("kW"). The Project has a maximum net output of 2,349 kW, as a result of normal

station loads. The Paisley Project's expected annual energy output will be approximately 18,285,671 kW hours ("kWh") and expected annual average energy output will be approximately 2,087 kW.

The Paisley Project is located within the service territory of Surprise Valley, and interconnected with its system. The Paisley Project (and this portion of Surprise Valley's customer load) is within the PacifiCorp Balancing Authority.

III. PAISLEY PROJECT NET OUTPUT METERING

Q. Please describe the current metering at the Paisley Project.

A. The Paisley Project includes a dedicated substation located immediately adjacent to power plant itself. This substation steps the voltage up from the generator voltage of 4,160 volts to 69,000 volts. As an integral part of the substation, a 69,000 volt meter system registers the net power generated by the Paisley Project. Two independent meters are located at this facility, registering the same generation data. One is owned and maintained by Surprise Valley and another is owned and maintained by BPA. Both are utility grade meter systems that are considered acceptable for revenue metering.

Q. From an electrical engineering perspective, what will happen to the electrical output from the Paisley Project?

A. Most of the Paisley Project's net output will flow directly into the local Surprise Valley system and is expected to displace electricity BPA must deliver to Surprise Valley. As a result, the power generated at the Paisley Project will displace that which PacifiCorp would otherwise transmit to Surprise Valley. There will be a reduction in current flow metered at the Lakeview Switch/Metering Point from

PacifiCorp's transmission system during hours when Surprise Valley's Paisley Project is operating. This will have two practical impacts.

First, this will result in an increased amount of power flowing on PacifiCorp's electrical system. From a basic electrical engineering perspective, there will be more power on PacifiCorp's system that it can use to serve its end use customer loads. Second, when the Paisley Project operates, there will be reduction in the flow of electrical current on PacifiCorp's transmission system. This will result in reduced transmission losses for PacifiCorp.

There may be a rare time in which the Surprise Valley load is less than the net output of the Paisley Project, and the current will flow into the PacifiCorp system at Lakeview. Based on historic Surprise Valley loads and the expected net output of the Paisley Project, the flow of electrical current into the PacifiCorp system at the Lakeview Switch/Metering Station is likely to only occur during limited light load hours.

Q. Is the current metering at the Paisley Project, the Lakeview Switch/Metering Point and any other locations sufficient to accurately measure the net output of the Paisley Project for a power sale to PacifiCorp?

A. Yes. As explained above, the current metering at the Paisley Project is utility grade metering that should accurately measure the geothermal facility's net output.

The 69 kV line that delivers power to Surprise Valley customers in the Lakeview area is metered at BPA's Meter Point 41. BPA upgraded the metering system at this location in 2014 with a utility grade bidirectional unit. From here, the Surprise Valley system connects to the Paisley Project and also connects to

Surprise Valley's substations named Valley Falls, Adel, Lakeview and Westside, all of which are metered.

Q. Will this metering accurately measure the increased amount of electricity on PacifiCorp's system?

A. Yes. As explained above, when the Paisley Project operates, there will be current flow into the PacifiCorp system equal to the net output of the Paisley Project, minus losses and station service. In order to measure the actual net output of the Paisley Project, all that is necessary is to measure the metering at the geothermal facility itself. However, the amount of Paisley power delivered to the PacifiCorp System may also be confirmed by adding the monthly power deliveries to Surprise Valley loads (using meter readings the Valley Falls, Adel, Westside and Lakeview substations) and deducting the power delivered at the Lakeview Switch/Meter Point 41 which records net power deliveries into Surprise Valley's Lakeview area system. The result will be the net power delivered to PacifiCorp at the Lakeview Switch.

Q. Why is there a second set of meters at the Lakeview Switch/Metering Point?

A. The Paisley Project is what is called a "behind the meter" generation. This means that the Paisley Project is located at or "behind" the end use customer's load and the actual power that is generated is consumed "on site" rather than flowing "off site."

On a smaller scale, an example would be a solar panel on a residential customer's home. The solar panel's actual electrons are consumed at the end use customer's home, and the amount of generation for the solar panel can be metered at the panel itself. On a larger scale, an example would be an industrial customer

selling power under a simultaneous buy-sell arrangement.[1] I am not familiar with the legal and policy issues associated with such arrangements. However, I am generally aware that an industrial customer can purchase some or all of its electrical requirements at tariff rates, and sell the net output of a cogeneration or biomass facility to their utility or a third party. From an electrical engineering perspective, the generator's net output displaces electricity that the purchasing utility would otherwise supply to the generator.

The second set of metering at the Lakeview Switch/Metering Point measures the actual flow of power at a different location. Prior to the Paisley Project operating, this metering point was only used to measure the amount of power that PacifiCorp delivers to Surprise Valley. When the Paisley Project is operating, this metering point will be used to measure the Paisley Project's generation quantities received by PacifiCorp and retail quantities PacifiCorp delivers to Surprise Valley.

As explained above, the net output of the Paisley Project will rarely exceed the amount of power delivered at Lakeview Switch/Metering Point. One way to measure the net output of the Paisley Project is to measure the difference in power flows to Surprise Valley's loads to the power flows at the Lakeview Switch/Metering Point when the Paisley Project operates.

An illustrative example may be helpful. Using round numbers that do not reflect actual operations or losses, assume that Surprise Valley's load is 10 MWs. When the Paisley Project is not operating, PacifiCorp transmission delivers 10

[1] Exhibit SVEC/203, Culp/154 (PacifiCorp's simultaneous buy-sell arrangements).

MWs of power to meet Surprise Valley's load. The Lakeview Switch/Metering Point will read 10 MWs of power. Now, assume that the Paisley Project generates two MWs of power. The Lakeview Switch/Metering Point will now read 8 MW of power, but Surprise Valley's actual loads remain 10 MW as measured by the meters at the four Surprise Valley Lakeview area substations. The difference between these electrons flowing into Surprise Valley's system (8 MWs) and Surprise Valley's load (10 MWs) is the Paisley Project (2 MWs).

Q. Please describe how Surprise Valley proposed to meter the net output of the Paisley Project in the PPA with PacifiCorp.

A. I did not participate in the negotiations regarding the PPA, and I do not know why this particular arrangement was chosen. Also, I am not an expert on contractual or regulatory matters. The PPA includes the following metering arrangement:

> There will be two sets of meters used to measure the generating quantities under this agreement. The generation quantities received and delivered of the Paisley Plant will be metered at SVEC's Paisley generator generation substation with two PacifiCorp revenue grade meters (primary and back-up). The primary meter will be used for SCADA, which will include: bi-directional MWH and MVARH quantities, MW, MVAR, and per phase volts and amps. The back-up meter will be used for telemetry MW data to the Alternate Control Center. Both meters will be capable of: (i) being accessed by PacifiCorp's transmission's MV-90 data acquisition system; and (ii) equipped with digital and analog option cards that conform to current standards as will be outlined in a Facilities Study. The second set of revenue metering will be at SVEC's Lakeview Switch 940 (Bonneville Power Administration's Meter 41) . Two PacifiCorp revenue grade meters (primary and back-up) will be installed at Bonneville Power Administration's (BPA) Meter 41 Substation located near PacifiCorp's Mile Hi Substation to measure generation quantities received and retail quantities delivered to SVEC.

This provides BPA all the information needed to charge Surprise Valley for power delivered to their system, and to credit Surprise Valley for the

power generated at Paisley. The existing meter systems at the Surprise Valley substations will accurately capture all monthly data necessary to establish how much power has been delivered from the Paisley plant to PacifiCorp.

Q. Please describe the additional metering facilities PacifiCorp has requested and/or is planning to have constructed at the Lakeview substation.

A. Again, I have not been involved in the negotiations regarding the Power Purchase Agreement, transmission arrangements, interconnection requirements or construction agreement. I am aware that PacifiCorp Transmission performed transmission studies, and PacifiCorp Energy Services Management and PacifiCorp Transmission entered into a construction agreement to construct upgrades identified as needed in the transmission studies. Mr. Culp's testimony describes the transmission study and construction agreement process, and those documents are attached to his testimony. I have reviewed the transmission studies and construction agreement.

It is my understanding that PacifiCorp has indicated a need for additional metering and communication facilities that have been estimated to cost $450,000. These facilities are to include: 1) new metering and communication facilities to be located at the Paisley Project site at an estimated cost of $200,000; 2) new metering and communication facilities at BPA's Meter Point 41 at an estimated cost of $200,000; and 3) network upgrade work at the Yreka Service Center, the Portland Control Center and the Medford Service Center at an estimated cost of $50,000. As explained above, these additional facilities are not necessary from an electrical engineering perspective to accurately measure the net output of the

Paisley Project. While potentially duplicative or unnecessary, these facilities will also allow the net output of the Paisley Project to be accurately measured.

It is possible that PacifiCorp has required these additional facilities for reasons other than accurate revenue metering. Perhaps they believe that hour-by-hour monitoring of power flows are necessary to provide improved system safety and/or protection. If so, the documentation does not provide a clear explanation or justification for this additional significant expense. Similarly, in my experience this type of ornate communication system is not required by other utilities when similar behind-the-meter generation facilities are installed.

IV. SURPRISE VALLEY TRANSFER SERVICE TO PACIFICORP

Q. Does Surprise Valley provide transfer service to PacifiCorp?

A. Yes. I have been informed that Surprise Valley has historically and is currently providing transfer service to PacifiCorp. I have reviewed a copy of the current transfer service agreement between PacifiCorp and Surprise Valley, which is attached as an exhibit to Mr. Kresge's testimony.[2]

Q. Please describe the metering that is used to track the power flows and deliveries under this transfer agreement.

A. The November 13, 2013 Transfer Agreement is an extension of a 2001 agreement in which Surprise Valley has delivered power over its system from Alturas, California to Cedarville, California for the benefit of PacifiCorp. Surprise Valley has delivered power over its 12.5 kV system for PacifiCorp for 15 years, using a 12.5 kV meter that is owned and operated by Surprise Valley and located within its Cedarville Substation. This meter system measures PacifiCorp's Cedarville

[2] Exhibit SVEC/102.

peak hourly demand and Surprise Valley's peak hourly demand (based on BPA's Cedarville substation peak demand) to determine the Monthly Noncoincidental peak hourly demand. These readings are used along with Capacity Loss Factors to determine the charges that PacifiCorp must pay for this Transfer Service. It is my understanding that the Transfer Agreement contains no requirement for imbalance energy, schedules, any ancillary services, e-Tags, or any sort of Open Access Transmission Tariff or wholesale distribution tariff.

Q. Is there any reason why the metering arrangement for tracking power deliveries under the Transfer Agreement cannot be used for tracking the net output of the Paisley Project?

A. I cannot think of a reason why a similar arrangement would not be satisfactory. The amount of power generated by the Paisley Project is greater, but the situation is similar. There may be an engineering justification associated with protection and control, but that has not been described in the documents to my knowledge.

V. FIRM DELIVERY

Q. Have you reviewed the direct testimony of Gary Saleba and Gail Tabone in this proceeding?

A. Yes. While, I am not expert on regulatory and contractual matters, I am generally familiar with their testimony and the issues identified in it.

Q. Does Surprise Valley have adequate electrical facilities to directly deliver the net output of the Paisley Project to PacifiCorp?

A. Yes. Surprise Valley owns the Paisley Project and all of the electrical equipment required to deliver the Paisley Project's net output to PacifiCorp. From an electrical engineering perspective, Surprise Valley does not need to acquire wholesale transmission from BPA, PacifiCorp or any other party to deliver the power. Surprise Valley has an adequate interconnection to deliver the Paisley

Project's output to PacifiCorp directly. Surprise Valley owns and operates a 45 mile long, 69 kV line that runs directly from the Paisley Project to the PacifiCorp system at the Lakeview Switch / Meter 41 point of delivery. There is sufficient capacity on this existing system to deliver the power.

The Paisley Project is directly connected to Surprise Valley's 69 kV line which runs approximately 45 miles south and easterly toward Lakeview. There are four Surprise Valley connections to that line which deliver power to Surprise Valley customers. Each of these connections are metered substations. They are called Paisley, Valley Falls, Adel, and Lakeview. If these connections did not exist, the Paisley Power Plant would effectively be connected directly (through the 45 mile line) to PacifiCorp at their Lakeview Switch / Meter Point 41 point of delivery. This line is electrically adequate to deliver all of the Paisley Power to the Lakeview Switch location.

VI. BPA METERING SURPRISE VALLEY'S LOADS

Q. Please describe how BPA will track the output of the Paisley Project for the purposes of their power sales to Surprise Valley.

A. Each month BPA will measure the power it delivers to Surprise Valley at its Lakeview Switch/Metering Point 41 for each hour, and will add to that balance the net amount of power the Paisley Project generated each hour during that time period. This amount will be accurately measured by the two metering systems located at the Paisley Project. In addition, meter systems at the four Surprise Valley substations served by the Lakeview Switch/Meter Point 41 will confirm actual power delivery of BPA power to Surprise Valley.

I have been informed that BPA has other situations in which independently owned power generators operate within other publicly-owned utilities and behind the BPA revenue meter. Accurate metering arrangements are used to determine the net load of these requirements customers. BPA plans to treat Surprise Valley in the same way. The result will be the amount of power that Surprise Valley customers utilized during the period.

Similarly, I have been informed that from a contractual perspective Surprise Valley will continue to be a full requirements customer of BPA, and will purchase BPA power for its full retail load. This will occur while Surprise Valley sells the Paisley Project power to a third party like PacifiCorp.

I have also been informed that Surprise Valley's power sales agreement with BPA was amended to include a point of delivery at the Paisley Project location, and that the purpose of this point of delivery is to measure the net output of the Paisley Project.

The existing metering system is sufficient to accurately track power flows for this type of contractual arrangement. The existing metering described above is sufficient to allow BPA to determine the total amount of power that BPA sells to Surprise Valley and the amount of power being delivered to PacifiCorp. The power that BPA sells to Surprise Valley will be measured by tracking the generation output at the Paisley Project and adding that amount of power (minus any line losses) from the power delivered at the Lakeview Switch/Metering Point 41.

VII. KOOTENAI ELECTRIC'S FIGHTING CREEK LANDFILL GAS POWER PLANT

Q. Have you reviewed the direct testimony of Shawn Dolan in this proceeding?

A. Yes, and from an electrical engineering perspective the Kootenai Electric Cooperative ("Kootenai Electric") situation appears to be substantially the same from an electrical delivery and metering standpoint. Kootenai Electric owns and operates a landfill gas fueled power plant called the Fighting Creek Landfill Gas Power Plant. It is located south of Coeur d'Alene, Idaho and is rated at 3.2 megawatts. It is a qualifying facility ("QF") connected to Kootenai's 24.9 kV distribution system. All of the power generated by the plant is consumed within the Kootenai system, but is considered "delivered" to power purchasers as a result of metering transactions.

The plant output was previously sold to Avista under a QF agreement, and the power was transmitted over Kootenai Electric's system to Avista's system. This was the situation from March 2012 until April 2014. During this time, Avista accepted power "delivery" at its 115 kV connection with Kootenai's transmission interconnection at Post Falls. It is my understanding that this was accomplished simply with 1) an interconnection agreement; and 2) a construction agreement for meter upgrades. This power "delivery" was done without scheduling or ancillary services.

Currently, Fighting Creek's net power output is transmitted to Idaho Power, who purchases it. Avista takes "delivery" of the power and transmits it to Idaho Power in Oregon over its 115 kV and 230 kV systems. Again, it is my understanding that measurement of power "delivery" is accomplished with

metering transactions. Both the generating facility and the delivery path from the QF generator to the interconnection between Kootenai Electric's and Avista's systems are located in Avista's balancing authority.

Surprise Valley's electric power metering situation with the Paisley Project is essentially identical to that of Kootenai's with the Fighting Creek Plant. The meter system at the generation plant was used to determine the power that would be "delivered" to the Avista system, even though the power was actually consumed within the Kootenai system. The result of generating power at Fighting Creek was an off-set in the amount of power actually delivered to Kootenai, and the meter system at the plant was solely used for revenue purposes, with a minor deduction for line losses. No additional meters were required by BPA or Avista to determine monthly power sales quantities.

In addition to the Kootenai facility, I am generally aware that Idaho Power entered into a similar QF displacement contract with Co-Gen Co., a QF that was located in the service territory of Oregon Trail Electric Cooperative.

VIII. CONCLUSION

Q. Please summarize why the current and/or planned metering at the Paisley Project and Lakeview substation are sufficient to precisely measure the net output of the Paisley Project.

A. The meter system at the Paisley Project adequately and accurately measures the net power generated at the plant, and delivered into the Surprise Valley transmission system. Additional meter systems located at Valley Falls substation, Adel Substation, Lakeview Substation and Westside Substation on the Surprise Valley system accurately measure customer loads. And metering at the BPA Lakeview Switch/Meter Point 41 into the PacifiCorp system accurately measures

the power delivered to and from the respective systems. In addition, the additional metering and upgrades identified in the PacifiCorp Transmission network transmission studies should also allow the net output of the Paisley Project to be accurately metered. As a result, it should be straightforward to determine, each month, the quantity of energy and level of capacity that has been effectively delivered to the PacifiCorp system. This power will, in fact, be reductions in electrons flowing over the PacifiCorp transmission system resulting in reduced losses and additional power availability to PacifiCorp at other locations.

Q. Does this conclude your testimony?

A. Yes.

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QUALIFICATIONS OF STEPHEN ANDERSON

March 15, 2016

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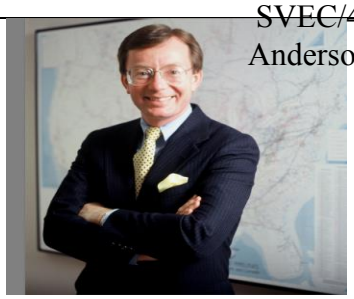

Sustainable and Efficient Power Production

Education
B.S. in Electrical Engineering, 1972
Oregon State University

Course work,
Master's in Business Administration
Portland State University

Registration
Professional Engineer, Oregon
08930PE, 1976

Professional Affiliations
Board Member, Past President
Professional Engineers of Oregon

Fellow; Member, House of Delegates,
National Society of Professional Engineers

Senior Member,
Association of Energy Engineers

Member, American Society of Mechanical Engineers

Member, Biomass Energy Research Association

Awards
2012 Oregon Engineer of the Year
2015 NSPE Fellow Designation

Other Leadership Responsibilities
Chairman of the Board of Trustees,
Warner Pacific College

President, PEO Education Foundation

President,
Oregon MATHCOUNTS Foundation

Industry Advisory Board,
Oregon Institute of Technology

Advisory Experience Examples

Technical and financial reviews for institutional lenders and investors, 70 hydro, solar, wind, geothermal and biomass projects.

Emerging technology evaluations, Venture Capital Investors.

Acting president & senior executive, various energy development companies.

Financial structuring and equipment procurement for two 2,400 MW CCGT Projects.

Project developer and financial arrangements, multiple biomass and geothermal projects.

Electrical Interconnection optimization, Power Purchase Agreement negotiations, various power projects.

Mr. Anderson is a Principal electrical engineer who provides technical and financial advisory services to the independent electric power generation industry. He owns and manages Evergreen Energy which focuses on highly efficient independent power and renewable resource energy projects. He is a Registered Electrical Engineer in the state of Oregon.

Technology Experience
Mr. Anderson has served as lead project developer for five 30 MW gas turbine combined cycle power projects; a 50 MW circulating fluid bed coal plant; two 18 MW biomass plants; three geothermal plants and several run-of-river and irrigation canal hydroelectric plants that are operating today.

He has also participated in development teams that have completed larger wind farms and central station gas turbine facilities, including two 2,400 MW central station gas turbine plants.

He has completed detailed project reviews of a full range of technologies, including solar, wind, geothermal, hydroelectric and biomass. These reviews have been performed for banks, investment bankers and institutional investors.

He has also completed analyses of new and emerging energy technologies associated with new hydroelectric sysems; gas-to-liquid fuels; biomass-to-liquid fuels; and waste plastics-to-liquid fuels technologies for the benefit of venture capital investors and potential customers.

Geographic Experience
Mr. Anderson has completed energy development work in many northeastern states, the western states, Alaska and Hawaii. In addition he has completed work in England, Kenya, Vietnam, Bangladesh and the Philippines.

Transactional Experience
Mr. Anderson has participated in the financing of several power generation projects resulting in the successful construction or asset ownership transition.

Past Management Positions
President, Power Generating, Inc., Fort Worth, Texas
Executive Vice President of LCRW Power Company, Irvine, California
President, Lindner Power Corporation, Irvine, California
Vice President of Development, BTU Energy, Bellevue, Washington
Director of Development, PowerLink Corporation, Portland, Oregon
Manager of Development, Nerco-Pacific and Onsite Energy Corporations, Portland, Oregon
Vice President & General Manager of PLM Power Corp., San Francisco
Manager of Special Projects and Research and Development, Portland General Electric Company, Portland, Oregon