

Docket No. UM 1856

Witness: Cameron Yourkowski

**BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON**

UM 1856

RENEWABLE NORTHWEST'S EXHIBIT 100

Opening Testimony of Cameron Yourkowski

February 16, 2018

1 **I. QUALIFICATIONS**

2 Q. Please state your name, occupation, and business address.

3 A. My name is Cameron Yourkowski. I am a Senior Policy Manager at Renewable
4 Northwest. My business address is 421 Sw 6th Ave. # 975, Portland OR 97204.

5
6 Q. Please describe your educational background.

7 A. I received a B.A. in Economics and a B.A. in Political Science from the University of
8 Montana in 2002, and I completed all required coursework toward an M.S. in Economics at
9 Portland State University in 2007.

10

11 Q. Please summarize your professional experience.

12 A. I have worked at Renewable Northwest (formerly “Renewable Northwest Project”) since
13 2007. While at Renewable Northwest, I have actively participated in various storage-related
14 dockets in Washington and Oregon, including Docket No. UM 1751. I have also represented the
15 renewable energy industry in front of state and federal regulatory bodies on issues related to
16 transmission and to the integration of renewable energy.

17 Prior to working at Renewable Northwest, I was employed at McCullough Research, where I
18 provided support and technical analysis for the expert witness in *Snohomish County PUD v.*

19 *Enron*. Prior to that, I was the Committee Aide to the Alaska State Legislature’s House Special
20 Committee on Fisheries.

21

22

23

1 **II. BACKGROUND**

2 Q. What is your general view of storage technologies and their deployment in the
3 Northwest?

4 A. As reflected in Renewable Northwest’s previous comments leading up to this docket,¹ I
5 view storage technologies as the next pillar of a cleaner, more efficient, and more reliable
6 electric grid. Storage technologies can provide a wide range of benefits to utilities, customers,
7 society, and the environment. For example, they can add value to utility portfolios through the
8 provision of capacity, ramping, transmission deferral, ancillary services, and improved reliability
9 and resiliency. As such, storage technologies add important flexibility and responsiveness to a
10 utility’s system, facilitating more cost-effective renewable energy integration and carbon dioxide
11 emissions reductions.

12 While PGE was an early leader in storage with the development of the Salem Smart
13 Power Center in 2013, Oregon and other Northwestern states have since lagged behind other
14 parts of the country that are seeing increasingly rapid deployment of energy storage systems
15 (“ESSs”).²

16
17 Q. Have you identified any aspects of the regulatory and market landscape in the Northwest
18 that may cause barriers to the deployment of energy storage in Oregon?

19 A. Yes. Storage technologies present unique modeling challenges for Integrated Resource
20 Planning (IRP) processes because these technologies can provide so many services across all
21 aspects of the utility’s business. The methods for fully capturing all of a storage technology’s
22 potential benefits across the generation and transmission business lines within the IRP

¹ UM 1751, Comments of Renewable Northwest at 1 (Jun. 22, 2016).

² <http://css.umich.edu/factsheets/us-grid-energy-storage-factsheet>

1 framework is still developing in the Northwest. In addition, vertically integrated utility structure
2 and the primarily bilateral wholesale market in the Northwest provides few price signals for the
3 capacity, ramping capability, and ancillary services storage technologies can provide.

4
5 Q. Are you aware of any efforts to address regulatory barriers to the deployment of energy
6 storage elsewhere in the Northwest?

7 A. In Docket No. U-161024, the Washington Utilities and Transportation Commission
8 (“WUTC”) is attempting to address these issues holistically by “developing a new planning
9 framework that more cohesively considers the relationship between generation, transmission, and
10 distribution, allowing for a fair evaluation of hybrid resources such as energy storage.”³ The
11 WUTC lays out that framework in its *Report and Policy Statement on Treatment of Energy
12 Storage Technologies in Integrated Resource Planning and Resource Acquisition*. As part of that
13 framework, the WUTC encourages utilities to consider storage in all aspects of their asset
14 planning and to transition to modeling practices that can more accurately consider the benefits of
15 the resource. While utilities complete that transition, the WUTC statement provides them
16 additional guidance for how to model energy storage.

17 In Oregon, the implementation of House Bill 2193 of 2015 (“HB 2193”) created a
18 process for investor owned utilities, stakeholders, the Oregon Public Utility Commission
19 (“OPUC”), and OPUC Staff to increase their experience with modeling and evaluating the
20 benefits of storage technologies. The projects that emerge from this program will allow

³ Washington UTC’s Docket No. U-161024, *Report and Policy Statement on Treatment of Energy Storage Technologies in Integrated Resource Planning and Resource Acquisition* at 10 (Oct. 11, 2017) available at <https://www.utc.wa.gov/layouts/15/CasesPublicWebsite/CaseItem.aspx?item=document&id=00076&year=2016&docketNumber=161024&resultSource=&page=1&query=161024&refiners=&isModal=false&omItem=false&doItem=false>.

1 PacifiCorp and Portland General Electric to gain valuable experience operating and integrating
2 ESSs, as well as maximizing the benefits ESSs can provide. However, the value of this program
3 goes beyond particular projects or learnings to an individual utility. Moving forward, the
4 experience developed throughout implementation of HB 2193 should be leveraged into a more
5 cohesive and fair consideration of storage technologies in all aspects of utility asset planning.

6

7 **III. CRITERIA FOR EVALUATION OF THE PROPOSALS AND EVALUATIONS**

8 Q. What is your understanding of the Commission-established criteria for PGE’s Energy
9 Storage Proposals and Revised Storage Potential Evaluation (“the Filing”)?

10 A. I understand that the Commission established guidelines and requirements for PGE’s
11 project proposals and storage potential evaluation in Orders 16-504 and 17-118.

12 In Order 16-504, the Commission established project guidelines encouraging the utilities
13 to submit 1) “multiple projects with an aggregate capacity close to the full one percent of 2014
14 peak load allowed by HB 2193”; 2) “a range of projects that are differentiated by use case,
15 application, or other differentiating factors”; 3) “a portfolio of resources that balance technology
16 maturity, technology potential, short- and long-term project performance and risks, and short-
17 and long-term potential value”; 4) “projects that can serve multiple applications”; and 5)
18 “projects that are strategically located to help defer or eliminate the need for system upgrades,
19 provide voltage control or other ancillary services, or supply some other location-specific service
20 that will improve system operation and reliability”. The Commission also encouraged utilities to
21 6) “identify qualified vendors and viable energy storage technologies through a Request for
22 Information (RFI) process”, and 7) “use established models ... to estimate the value of energy
23 storage applications... [that were] transparent and auditable.”

1 In Order 17-118, the Commission adopted Staff’s recommended framework for the
2 storage potential evaluations that HB 2193 required.⁴ That framework includes criteria for
3 identifying system locations with the greatest storage proposals like 1) the capacity of the system
4 in relation to the need it would address; 2) locational planning information; 3) “the investment
5 needed for both the storage infrastructure and the grid infrastructure whether storage is used or
6 not”; 4) permitting and approval challenges, and space limitations.⁵ Additional criteria includes
7 consideration of diversity of technologies with varying degrees of maturity, diversity of
8 ownership models, grid placement at the transmission and distribution levels, and locations
9 where storage can serve multiple use cases.⁶

10 The framework that the Commission adopted in Order 17-118 also offers additional
11 criteria for identifying main opportunities for investment in storage.⁷ That criteria includes cost-
12 effectiveness “with tolerance for proposals that are reasonable and meet statutory requirements
13 even if ... not cost effective,” diversity (of ownership, technology, and applications), a portfolio
14 that examines a range of locations in the utility’s system, and the potential for operational
15 experience and for leading to future high-value deployments.⁸

16

17 Q. What is your understanding of the “public interest” test relevant to this docket?

18 A. My understanding of the “public interest” criterion is that it allows space for the
19 Commission to consider societal benefits. With respect to storage technologies and the proposals
20 under consideration in this docket, the societal benefits that are most relevant include the ability

⁴ UM 1751, Order No. 17-118 at 1 (Mar. 21, 2017).

⁵ UM 1751, Appendix A to Order 17-118 at 6 (Mar. 21, 2017).

⁶ *Id.* at 6-7.

⁷ *Id.* at 5-6.

⁸ *Id.* at 6.

1 of storage projects to increase the flexibility of the utility's system and facilitate the cost-
2 effective integration of renewable energy resources while minimizing carbon emissions as well
3 as their ability to increase reliability and resiliency of electric service to customers, especially
4 during extreme events. Advancing PGE's (and the region's) understanding and experience with
5 diverse storage applications—"learning"—is itself an additional important societal benefit.

6

7

IV. PGE's PROPOSALS AND EVALUATION

8 Q. What is your view of PGE's Filing?

9 A. In general, and given the history and circumstances described above, I consider PGE's
10 Filing to be a robust effort that advances the utility's and the region's understanding of storage
11 applications and benefits. Overall, the Filing shows an effort by PGE to follow the guidelines
12 and requirements that the Commission established in Orders 16-504 and 17-118.

13

14 Q. In your view, did PGE meet that Commission-established criteria?

15 A. Overall, and again, recognizing that the region is at the early stages of incorporating
16 storage technologies into utility planning, I think PGE did generally well meeting the
17 Commission's criteria. For example, the evaluation meets the "application diversity" criteria by
18 evaluating and proposing projects at all levels of the utility's business (generation, transmission,
19 distribution, and reliability). Many of the individual projects themselves can serve multiple
20 applications, including the provisions of ancillary services, location specific benefits and
21 improved system operations and reliability. The Filing is also consistent with the Commission's
22 encouragement to propose projects with an aggregate capacity of 1% of PGE's peak load (2014).

23

1 Q. Do you identify any areas for future improvement?

2 A. Yes, consistent with the comments that Renewable Northwest and the NW Energy
3 Coalition submitted on September 16, 2016 in Docket No. UM 1751, I believe that in the future
4 PGE could better identify storage potential applications and specific storage projects on its
5 system if it works with storage developers to identify storage needs and optimize the solutions at
6 an earlier stage in the process.

7 Also, it is unclear to me how the PGE considered diversity of ownership in its as required
8 under Order 17-118.⁹ PGE points to the fact that one of its proposed projects have a customer
9 ownership option. However, PGE does not elaborate on how it considered diversity of ownership
10 in the evaluation and project selection processes

11

12 Q. What is your view of the net-benefits calculations in PGE's Energy Storage Proposals
13 and Revised Potential Evaluation?

14 A. My view is that the net-benefits may be understated for the proposed projects because the
15 costs of energy storage technologies are declining rapidly and the range of cost estimates
16 provided by PGE is likely skewed to the high-end.

17 The most recent cost information in PGE's proposal appears to have come from a
18 refreshed RFI conducted in July of 2017. This RFI was issued to three vendors and asked for cost
19 estimates for projects completed in 2020.¹⁰ I understand from discussions with PGE that the
20 range of cost-estimates provided by PGE includes cost information from all respondents,
21 including for technologies that may not be best suited for a particular project, which are
22 technology neutral. As a result, I understand that the cost range is not illustrative of "uncertainty"

⁹ *Id.* at 5-6.

¹⁰ Exhibit 101, PGE's Response to Staff's Data Request No. 69.

1 around costs, but rather that the range of costs is made up of different RFI responses that, for
2 whatever reason, were not all as competitive as others. If my understanding is correct, it is very
3 unlikely that the upper range of the cost estimates provided by PGE are representative of the
4 lowest-cost bid likely to emerge from an RFP.

5
6 Q. Did PGE utilize the most updated storage cost information from Lazard?

7 A. No. Lazard's most recent *Levelized Cost of Storage Analysis—Version 3.0* was published
8 in November of 2017. As a result, PGE could not have incorporated that cost information into
9 their November 1, 2017 Filing. Lazard projects a 36% cost decline in Lithium-Ion batteries
10 between 2017 and 2021; 19% for Vanadium Flow Batteries; and, 28% for Zinc Bromide Flow
11 Batteries.¹¹

12

13 Q. What is your understanding of the statutory guidance in HB 2193 for the Commission on
14 how to evaluate the proposals?

15 A. I understand that under HB 2193 the Commission is to consider whether the proposal 1)
16 is consistent with its guidelines, 2) reasonably balances potential value for ratepayers and for the
17 utility's operations with the costs, and 3) is in the public interest.

18

19

V. RECOMMENDATIONS

20 Q. What do you recommend?

21 A. At a minimum, I recommend that the Commission authorize the "Power System
22 Integration (Coffee Creek) Project" and the "Generation Kick-Start Project" and that it consider

¹¹ *Lazard's Levelized Cost of Storage Analysis—Version 3.0* at 16 (November 2017) available at <https://www.lazard.com/media/450338/lazard-levelized-cost-of-storage-version-30.pdf>.

1 avenues for updating and refining cost and benefit information for the other projects prior to
2 making a final determination to authorize those projects or not (discussed more below).

3

4 Q. Why do recommend the Commission authorizes the Power System Integration (Coffee
5 Creek) Project and the Generation Kick-Start Project?

6 A. First, PGE's evaluation identifies these two projects as having the best benefit-cost ratios.
7 The Power System Integration (Coffee Creek) Project has a benefit-cost ratio ranging from a low
8 0.61 to a high of 1.06. Similarly, the Generation Kick-Start Project has a benefit-cost ratio
9 ranging from a low 0.58 to a high of 1.23. For the reasons discussed above, these benefit cost
10 ratios are likely closer to the high end and should improve even further as updated cost
11 information becomes available closer to the procurement date.

12 Second, these projects also present additional societal benefits. For example, the
13 Generation Kick-Start Project would increase the flexibility of PGE's system, facilitating cost-
14 effective renewable energy integration while simultaneously minimizing the greenhouse gas
15 emissions from conventional resources. California's recent experience integrating greater
16 penetrations of solar energy, and the oft-publicized "duck curve" associated with the steep
17 afternoon ramp, demonstrates the importance of finding ways to reduce the idling of natural gas
18 plants in order to meet capacity and flexible ramping requirements.¹² The Generation Kick-Start
19 Project would give PGE important experience in this area and would make PGE's system more
20 flexible while reducing emissions. The learning from this project can be applied to the other 11

¹² <https://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleResourceAdequacyCriteria-MustOfferObligations.aspx>

1 units at Port Westward II and, more generally, to PGE's other conventional capacity and ramping
2 resources.¹³

3 benefits that should be considered. The unique aspect of this project is its locational
4 value and ability to support an entire substation's load for sustained periods, providing
5 significant potential societal benefits and learnings for improved reliability and resiliency.
6 Additionally, this project also boasts impressive economies of scale and the ability to deliver 17-
7 20 MW (68-80 MWh) of capacity, ramping capability, and other ancillary services. These
8 additional use-cases allow this project to also significantly contribute to the flexibility of PGE's
9 system, improving the ability of the utility to cost-effectively reduce carbon emissions.

10 Given that these two projects already demonstrate a positive benefit-cost ratio to
11 ratepayers, consideration of their additional societal benefits suggest to me that these two
12 projects should be authorized by the Commission.

13

14 Q. What is your position with respect to the other three projects in PGE's proposal?

15 A. I do not have a strong position one way or another on these projects at this time. Still, it
16 would be premature to reject any projects at this stage in the project evaluation process. New
17 information about storage costs is now available. Additionally, PGE has until April 2 to make
18 updates to its proposal. Finally, the RFP itself will provide the most concrete and timely
19 information about the costs of these projects. As a result, I think it would be premature to reject
20 any of these projects without first gaining additional information.

21

22

¹³ Exhibit 102, PGE's Response to Staff's Data Request No. 68.

1 **V. ADDITIONAL ISSUES**

2 Q. Are there any additional issues you would like to address?

3 A. Yes, I am unclear about, and potentially concerned with, PGE's proposal to use the
4 renewables automatic adjustment mechanism (Schedule 122) to recover the costs of any storage
5 projects authorized in this docket.¹⁴ PGE provided very little information about its rationale for
6 this cost recovery mechanism in its testimony and in its response to Staff's data request on that
7 issue.¹⁵ My understanding is that Senate Bill 1547 included "costs related to *associated* energy
8 storage" among the costs recoverable under the renewables automatic adjustment clause.¹⁶ I
9 understand that the renewables automatic adjustment clause establishes a mechanism for
10 recovery of costs of compliance with the Oregon RPS requirements. It is unclear to me whether
11 the storage projects encouraged by HB 2193 are "associated" with meeting the Oregon RPS
12 requirements. Additionally, my understanding is that as of now the Commission has not
13 determined what "associated" means and that it intends to do so as part of its RPS Rulemaking.

14 My primary concern with PGE's proposal here is the possibility that if these costs were
15 included in the renewables automatic adjustment clause, they could contribute to triggering the
16 cost cap under ORS 469A.180(1). More generally, I think it would be appropriate to have a
17 transparent discussion about the pros and cons of bundling storage and renewables cost recovery
18 mechanisms together versus establishing separate mechanisms for each.

19 Q. Does this conclude your testimony?

20 A. Yes.

21

¹⁴ PGE/100 Riehl-Brown/2, ln 7-10.

¹⁵ Exhibit 103, PGE's Response to Staff's Data Request No. 12.

¹⁶ HB 1547 of 2016, Section 11(2)(a)

Docket No. UM 1856

Witness: Cameron Yourkowski

**BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON**

UM 1856

RENEWABLE NORTHWEST'S EXHIBIT 101

PGE's Response to Staff's Data Request No. 69

January 31, 2018

TO: Kay Barnes
Public Utility Commission of Oregon

FROM: Robert Macfarlane
Interim Manager, Pricing and Tariffs

PORTLAND GENERAL ELECTRIC
UM 1856
PGE Response to OPUC Data Request No. 069
Dated January 17, 2018

Request:

For each proposed project, PGE provides two sets of costs (low and high) which can vary by 100%. During the 1/12 stakeholder meeting PGE Staff repeatedly noted that the cost data is more than one year old in some cases and may not be reflective of costs they would actually see in an RFP situation. Is there any better market data available? If not, can any inference be made on the range of values (ie, the standard deviations are small, the mean greatly differs from the median, etc.) that could better inform cost projections?

Response:

PGE issued the initial Request for Information (RFI) associated with our proposal development in May of 2016; in June 2016 PGE received RFI responses from 27 vendors. As part of this initial request PGE asked for generic pricing information for equipment, installation, testing and commissioning with construction completion in 2020. This required each vendor to apply their forecasted market pricing in their response.

In July 2017, PGE issued an additional RFI requesting a pricing refresh for multiple projects sized to match PGE's proposed projects (with the exception of the Residential Storage Pilot, where publically available retail pricing was used). This RFI was issued to three vendors who offer energy storage systems sized to match our project proposals, also for construction completion in 2020. Again, this required each vendor to apply their forecasted market pricing in their response and the variance between the low and high costs in the proposal reflect the range of pricing that was received from these vendors.

A competitive RFP will request pricing based on detailed project scope and project specific requirements. Assumptions made by the vendor in the RFI would be replaced with the detailed project scope in an RFP, and the competitive nature will require vendors to provide their best pricing. PGE will select the vendor that presents the least cost, least risk proposal.

The variation in the proposed project costs is discussed in section 200 of PGE's testimony and summarized here. The Coffee Creek and Generation Kick Start project saw very little variation in the range of between vendor quotes. The Baldock Mid-feeder project saw a larger variation, but similar to Coffee Creek this variation was minimal for the 4 hour duration estimates we received. For the 2 hour system at Baldock all vendors increased their cost per MWh except one that had the same price for both the 2 and 4 hour systems, this drove the large range for that project. The Microgrid Pilot uniquely includes more power in the high range than the low range; this amplifies the vendor price variation. Finally the Residential Storage Pilot variation is driven by the large range of costs seen in the products available.

Docket No. UM 1856

Witness: Cameron Yourkowski

**BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON**

UM 1856

RENEWABLE NORTHWEST'S EXHIBIT 102

PGE's Response to Staff's Data Request No. 68

January 31, 2018

TO: Kay Barnes
Public Utility Commission of Oregon

FROM: Robert Macfarlane
Interim Manager, Pricing and Tariffs

**PORTLAND GENERAL ELECTRIC
UM 1856
PGE Response to OPUC Data Request No. 068
Dated January 17, 2018**

Request:

On page 121 of PGE's proposal, it is stated that only Port Westward 2 units "qualified by meeting the 10 minute startup time required for spinning reserve". If this is true, then how does this qualify as a pilot? What can be learned here that would be applicable to the rest of PGE's generation fleet? How does PGE's Beaver plant operations compare to operations of Port Westward 2 units?

Response:

The Port Westward 2 Energy Storage System will be coupled with one of the twelve total reciprocating engines that make up our Port Westward 2 generating facility. The 10 minute startup requirement is only related to utilizing a relatively small energy storage system to realize the full value of spinning reserves of the off-line turbine (18.9 MW). All of the other use cases, learnings, and benefits identified in Section 8 of the proposal will apply regardless of the startup time of the generation unit.

All of the learnings from this project could be applied to additional energy storage system installations coupled with any of the other eleven reciprocating engines at Port Westward 2. With the exception of the specific learnings related to spinning reserve, the learnings from this project could be applied to other generation plant sited energy storage systems, including learnings related to the integration of storage into an existing plant control system, the utilization of existing generation assets, and operations and maintenance issues arising from generation sited energy storage.

The startup time to minimum load on Beaver units 1-6 (~30MW) is approximately 20 minutes. The startup time to full load on Beaver 8 (~23MW) is typically in the 12-15 minute range. The startup times for these units are in excess of the 10 minute requirement in order to capture

additional spinning reserve learnings, however all other use cases, learnings, and benefits identified in Section 8 of the proposal will apply to energy storage sited at any generation site.

Docket No. UM 1856

Witness: Cameron Yourkowski

**BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON**

UM 1856

RENEWABLE NORTHWEST'S EXHIBIT 103

PGE's Response to Staff's Data Request No. 12

January 15, 2018

TO: Kay Barnes
Public Utility Commission of Oregon

FROM: Robert Macfarlane
Interim Manager, Pricing and Tariffs

**PORTLAND GENERAL ELECTRIC
UM 1856
PGE Response to OPUC Data Request No. 012
Dated December 27, 2017**

Request:

On page 12 of the Application, PGE describes plans for cost recovery through Schedule 122. Why does PGE believe Schedule 122 is an appropriate cost recovery mechanism when HB 2193 does not reference SB 838 and was passed prior to SB 1547?

Response:

In HB 1547, Section 11, Part (2)(a)/ORS 469A.120 states:

The Public Utility Commission shall establish an automatic adjustment clause as defined in ORS 757.210 or another method that allows timely recovery of costs prudently incurred by an electric company to construct or otherwise acquire facilities that generate electricity from renewable energy sources, costs related to associated electricity transmission and **costs related to associated energy storage.** [emphasis added]

PGE believes that the existing Schedule 122 – Renewable Adjustment Clause would be applicable and serve its intended purpose.