

**BEFORE THE PUBLIC UTILITY COMMISSION
OF THE STATE OF OREGON**

UM ____

**Application to Lower the Standard
Price and Standard Contract
Eligibility Cap for Solar Qualifying
Facilities (QFs)**

PORTLAND GENERAL ELECTRIC COMPANY

Direct Testimony and Exhibits of

Brett Sims
Robert Macfarlane

June 29, 2017

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I. Introduction

1 **Q. Please state your names and positions.**

2 A. My name is Brett Sims. I am the Director of Structuring, Origination, and Resource
3 Strategy at PGE.

4 My name is Robert Macfarlane. I am a senior analyst in Pricing and Tariffs at PGE.

5 Our qualifications are included at the end of this testimony.

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

7 A. The purpose of our testimony is to support PGE's Application to Lower the Standard Price
8 and Standard Contract Eligibility Cap for Solar Qualifying Facilities (Application) and
9 PGE's Motion for Interim Relief seeking the same relief on an interim basis that PGE
10 requested as permanent relief in its Application.

11 **Q. How is your testimony organized?**

12 A. Our testimony is organized into four parts. First, we summarize PGE's request. Second, we
13 discuss the purpose of the Public Utility Regulatory Policies Act of 1978 (PURPA). Third,
14 we describe PGE's significant increase in qualifying facility (QF) power purchase
15 agreement (PPA) requests. Last, we describe how the current 10 MW standard pricing cap
16 harms customers and its potential impacts on system reliability.

17 **Q. Please summarize your Application and Motion for Interim Relief.**

18 A. PGE respectfully requests that the Public Utility Commission of Oregon (Commission):

19 (1) lower the standard pricing eligibility cap from the current 10 MW to 3 MW for solar
20 QFs, similar to the treatment granted to Idaho Power in Order No. 16-129 and PacifiCorp in
21 Order No. 16-130;

1 (2) declare that a solar QF project larger than 100 kW must negotiate a contract,
2 including a project-specific avoided cost price, if any owner of the project has requested or
3 obtained standard prices from PGE for more than 10 MW of aggregate solar QF capacity.

4 In the alternative, PGE requests that the Commission lower the standard pricing
5 eligibility cap from the current 10 MW to 2 MW for solar QFs.

6 In addition, PGE requests that the Commission issue an order to grant PGE immediate
7 temporary relief with the same changes indicated above while the Commission considers its
8 Application.

9 **Q. Please describe the context for PGE's request to the Commission.**

10 A. Since the Commission issued Order No. 14-058 in Phase I of UM 1610 on February 24,
11 2014, PGE has seen an unprecedented and staggering increase in the amount of executed QF
12 PPAs. Much of this increase has occurred since the Commission issued orders in two
13 investigations lowering the standard pricing for solar QFs from 10 MW to 3 MW for QFs
14 selling power to Idaho Power and PacifiCorp under standard contracts.

15 When the Commission issued Order No. 14-058, PGE had only 19 QFs under contract
16 (including both those producing and those with future commercial operation dates) with
17 combined nameplate capacity of 68 MW. As of June 5, 2017, PGE has 467.5 MW of
18 executed QF PPAs under PURPA from 77 QF projects and 487.4 MW of proposed PPAs
19 from 47 proposed QF projects, for a total of 954.9 MW of nameplate capacity from 124
20 projects. More than 86% of the 954.9 MW of nameplate capacity is from solar QF projects,
21 represented by 104 solar QF projects with 824.5 MW of nameplate capacity. Of this 824.5
22 MW of solar QF capacity, 3.2 MW are online, 404.1 MW are under contract but not yet
23 online, and 417.2 MW is proposed. In the last three years, the amount of QF capacity under

contract to PGE has grown sevenfold. If all of the pending requests for contracts result in executed PPAs, then the amount of QF capacity under contract will have increased by 15-fold since February 2014.

Table 1 below summarizes the QF projects, by nameplate capacity and QF type, that have requested or executed PPAs under Schedule 201 and Schedule 202, and demonstrates PGE's significant increase in QF activity.

Table 1

As of June 5, 2017

Contracted and Proposed QF Projects	Number of Projects	Nameplate Capacity (MW)
Bio	11	88.9
Geothermal	2	27.0
Hydro	6	5.6
Wind	1	9.0
Solar	104	824.5
Total	124	954.9

This is in stark contrast to the QF PPAs that were contracted when Order No. 14-058 was issued on February 24, 2014. See Table 2 below.

Table 2

As of Order No. 14-058: February 24, 2014

Contracted QF Projects	Number of Projects	Nameplate Capacity (MW)
Bio	5	21.5
Geothermal	0	0.0
Hydro	6	6.8
Wind	3	29.0
Solar	5	10.7
Total	19	68.0

1 Our testimony describes the staggering increase in QF PPAs and PPA requests since the
2 issuance of Order No. 14-058, the increased risk to customers due to the amount and type of
3 PPA contracts, and the reasons the requested modification to the standard pricing eligibility
4 cap for solar QFs is needed.

5 **Q. Why is PGE's request critical?**

6 A. PGE has experienced a dramatic increase in the amount of requests for QF contracts from
7 large, sophisticated developers, increasing the cost and risk to PGE's retail customers. The
8 developers are disaggregating projects in order to get around the Commission's five mile
9 rule and executing multiple standard QF contracts, allowing utility scale projects (up to 10
10 MW) by sophisticated, out-of-state developers to obtain long-term fixed price contracts that
11 do not reflect the actual avoided cost to PGE's customers. To protect customers from the
12 risk of these contracts, PGE requests that the Commission reduce the nameplate capacity
13 eligible for 15 years of fixed prices through Schedule 201 from 10 MW to 3 MW for solar
14 QFs and remove the eligibility of solar QF projects over 100 kW for standard contracts if
15 any owner of the solar project has requested or obtained standard prices from PGE for more
16 than 10 MW of solar capacity. In the alternative, PGE requests that the Commission reduce
17 the nameplate capacity eligible for 15 years of fixed prices through Schedule 201 from 10
18 MW to 2 MW.

19 **Q. Please summarize your exhibits.**

20 A. Seven exhibits accompany this testimony. PGE Exhibit 101 provides a list of QF projects
21 and includes both QF projects that have signed PPAs and proposed QF projects. It provides
22 a generic unique identifier for each QF project, a generic identifier for the developer, the
23 status, the resource type, the nameplate capacity, whether the QF is on PGE's system or off

1 PGE’s system, the date the PPA was executed, the expected or actual commercial operation
2 date, and whether the PPA was executed before or after the Commission issued Order No.
3 14-058. If the status is “online,” then PGE has a PPA with the QF and the QF has reached
4 commercial operation. If the status is “contracted,” then the PGE has a PPA with the QF
5 and the QF has not yet reached commercial operation. If the status is “proposed,” then the
6 QF has requested a PPA with PGE.

7 PGE Exhibit 102 summarizes the QFs by resource type and separates them into four
8 groups: online, contracted, proposed, and total.

9 PGE Exhibit 103 summarizes solar QFs by whether they are on PGE’s system or off
10 PGE’s system and separates them into four groups: online, contracted, proposed, and total.

11 PGE Exhibit 104 summarizes solar QFs by developer. It also provides a summary of
12 developers with multiple QF projects and developers with only one QF project. It provides
13 these summaries for (1) solar QFs that have executed PPAs, and (2) solar QFs that have
14 requested a PPA.

15 PGE Exhibit 105 summarizes estimated payments to QFs by year and resource type. It
16 does this for QFs for both executed and proposed PPAs, as well as separating the two.

17 PGE Exhibit 106 compares estimated payments to all contracted and proposed QFs
18 using currently available prices and market forward prices.

19 PGE Exhibit 107 compares estimated payments to proposed solar QFs using currently
20 available prices and market forward prices.

II. PURPA

1 **Q. Describe the purpose of PURPA.**

2 A. PURPA was enacted in response to the energy crisis of the 1970s, to encourage the use of
3 renewable resources through small power producers and the efficient use of fossil fuels in
4 electric power production through cogeneration. PURPA requires electric utilities to
5 purchase all electric energy delivered to the utility at prices that¹: (a) are just and reasonable
6 to retail electric customers, (b) do not discriminate against QFs, and (c) do not exceed the
7 incremental cost the utility would otherwise incur. The incremental cost means the cost to
8 the utility, “which, but for the purchase of from such cogenerator or small power producer,
9 such utility would generate or purchase from another source.”²

10 The purpose of the incremental cost criteria is to ensure that the utility’s retail electric
11 customers are economically indifferent to the source of the utility’s energy; it ensures that
12 the cost of purchasing power from a QF does not exceed the cost the utility would pay
13 otherwise.

14 FERC issued rules to implement PURPA in 1980, adopting what it called “avoided
15 costs” as the standard for implementing the PURPA incremental cost requirement. The
16 price methodology, terms, and conditions to implement PURPA are granted to the individual
17 states. In response, the Public Utility Commission of Oregon (Commission) developed rules
18 implementing the federal and state requirements.

¹ 16 U.S.C. § 824a-3.

² 16 U.S.C. § 824a-3(d).

III. PGE's Significant Increase in QF PPA Requests

1 **Q. Has PGE experienced a significant increase in executed PURPA contracts in the last**
2 **two years?**

3 A. Yes. PGE has been inundated with QF contracts over the last two years. Before the
4 Commission issued Order No. 14-058 on February 24, 2014, PGE had entered into or
5 received requests for 19 PPAs with combined nameplate capacity of 68 MW. Since the
6 Commission issued Order No. 14-058, PGE has entered into or received requests for 110
7 PPAs with combined nameplate capacity of 926.2 MW. In total, PGE currently has contracts
8 or requests for contract from 124 QF projects with combined nameplate capacity of
9 954.9 MW.³ Of those executed PPAs, all but one were executed in the last two years.

10 This extreme increase in executed PURPA contracts had not yet started when the
11 Commission last set the nameplate capacity of the standard contract in Docket UM 1610.
12 This demonstrates the need for additional Commission consideration of the maximum
13 nameplate capacity for standard pricing.

14 **Q. Are the majority of those QFs solar projects?**

15 A. Yes. Out of the 110 QFs that have executed or proposed PPAs since the issuance of Order
16 No. 14-058, 99 are solar QFs with 813.8 MW of nameplate capacity.

17 **Q. Do many of these solar QF projects have a common developer?**

18 A. Yes, the vast majority of solar QF projects seeking standard contracts and pricing under
19 PGE's Schedule 201 are from developers with multiple solar QF projects. Only three solar
20 QF projects executed or proposed since the issuance of Order No. 14-058 are from
21 developers with single projects. The remaining 91 solar QF projects (541.3 MW of

³ Five QF projects with a nameplate capacity of 39.3 MW are no longer QFs with PGE: 954.9 MW current *minus* 926.2 since Order No. 14-058 *plus* 39.3 MW no longer QFs *equals* 68 MW as of February 24, 2014.

1 nameplate capacity) executed or proposed since the issuance of Order No. 14-058 are from
2 13 developers with multiple solar QF projects that appear to have obtained or seek to obtain
3 PPAs from PGE for multiple QF solar projects to avoid the 10 MW threshold on standard
4 prices and PPA terms. Those solar QF projects are all sized between 2.2 MW and 10 MW,
5 with only one exception at 1.5 MW. These 13 developers represent 95% of the solar QF
6 activity experienced by PGE since the issuance of Order No. 14-058. PGE Exhibit 104
7 groups solar QFs by common developer.

8 **Q. Do these QFs solar developers appear to be engaging in geographic arbitrage?**

9 A. Yes. As shown in PGE Exhibit 103, the vast majority (84%) of solar QF capacity comes
10 from projects that are off PGE's system. In addition, 90% of the currently proposed solar
11 QF capacity comes from off PGE's system. Developers appear to be attracted to the
12 standard prices available from PGE and are willing to incur the expense to deliver the
13 energy to PGE's system.

14 **Q. Does PGE have QF's submitting multiple projects below 3 MW nameplate capacity?**

15 A. Yes. PGE has proposed projects from four developers each seeking more than 10 MW
16 worth of PPAs for 16 proposed solar QF projects at approximately 2.2 MW of nameplate
17 capacity each.⁴ When combined with the already contracted solar QFs of that size, this
18 represents 42 total projects with a combined nameplate capacity of 92.8 MW from six
19 developers that would qualify for standard prices under a 3 MW individual project cap, but
20 may be required to negotiate a PPA and prices under PGE's proposed 10 MW aggregate cap
21 for solar QF projects.⁵

⁴ See developers A, K, O, and R in PGE Exhibit 104.

⁵ See developers A, B, K, N, O, and R in PGE Exhibit 104.

1 **Q. Is PGE's level of solar QF activity similar to that of Idaho Power and PacifiCorp when**
2 **they filed for relief in UM 1725 and UM 1734, respectively?**

3 A. Yes, PGE has roughly seven times the operational solar, seven times the contracted solar,
4 and 70% more proposed solar QFs than Idaho Power had when it made its filing. PGE has
5 roughly one and a half times as much QF power and at least as much solar QF power as
6 PacifiCorp had when it made its filing. PGE currently has 41 proposed solar QF projects
7 requesting contracts for combined output of 417.2 MW. When Idaho Power made its filing,
8 it had 245 MW of proposed solar QFs and when PacifiCorp made its filing it had 480.1 MW
9 of proposed solar QFs.

10 **Q. Does PGE continue to receive requests for standard PPA's from solar developers?**

11 A. Yes. PGE continues to receive standard solar QF requests at a steady pace.

IV. A Ten MW Eligibility Cap Harms Customers and May Impact System Reliability

12 **Q. What types of technologies are represented by QFs with under 10 MW of nameplate**
13 **capacity?**

14 A. PGE has entered into contracts with QFs of varying technologies including: hydro, biogas,
15 waste, solar, and wind. The majority of QF contracts executed since the issuance of Order
16 14-058 are solar projects, specifically photovoltaic (PV).

17 **Q. What technology types are represented by QFs that have attempted to disaggregate**
18 **into smaller projects in order to become eligible for a standard contract?**

19 A. In PGE's experience, solar and wind QFs have attempted to disaggregate in order to satisfy
20 the eligibility requirements for PGE's Schedule 201 standard rates and contract. PGE often
21 receives QF requests from single solar developers with multiple solar QF projects. PGE
22 must request information to determine if projects are developed, owned, or managed by the

1 same entity. In 2015, two solar QF projects transferred ownership from one large developer
2 to another because two pairs of projects were within five miles of each other.

3 **Q. Please discuss PGE's experience with solar QF projects that have a common developer.**

4 A. Most of the solar QF projects seeking standard fixed prices under Schedule 201 are from
5 sophisticated developers with multiple solar QF projects. Only three of the 94 solar QF
6 projects executed or proposed since the issuance of Order No. 14-058 are from developers
7 with single projects. The remaining 91 solar QF projects are from developers with multiple
8 solar QF projects. On two days in January 2016, PGE executed 14 standard contracts. One
9 developer signed PPAs for four of the solar QF projects, all with 10 MW nameplate
10 capacities. Two other developers signed three PPAs for three solar QF projects each and
11 two developers signed PPAs for two projects each. The developer that signed four of the
12 PPAs also signed four more solar QF PPAs over two days in June of 2016, again each with a
13 nameplate capacity of 10 MW.

14 On May 17, 2016, one developer signed six solar QF PPAs, ranging in size from 4 MW
15 nameplate capacity to 10 MW nameplate capacity. Yet another developer signed five
16 10 MW solar QF PPAs in July and August of 2016. Out of the 37 currently proposed solar
17 QF projects eligible for the standard PPA, only one of them is from a developer with a
18 single project. All of the other developers have multiple QF projects under the standard
19 PPA.

20 In addition, when a developer proposes a project change or seeks a change in a contract
21 detail, the developer frequently seeks the same change for all of its project proposals.

22 PGE Exhibit 104 shows that sophisticated developers are organizing extensive
23 portfolios of solar QF generation into multiple projects with each project sized at 10 MW or

1 less and separated by five miles in order to qualify for standard prices, terms, and
2 conditions. For example, PGE has a single developer (designated as developer R in Exhibit
3 104) who has requested or obtained standard contracts for 14 solar QF projects sized at
4 approximately 2.2 MW each for a combined output of 30.1 MW. These developers treat
5 multiple solar QF projects that qualify for standard prices, terms, and conditions under
6 PGE's Schedule 201 as a single, unified proposal. Thirteen sophisticated developers are
7 taking advantage of standard PPAs and prices intended to support small-scale development
8 to propose large, aggregated projects with hundreds of megawatts of nameplate capacity.
9 They propose multiple projects in groups with similar or identical project configurations and
10 nameplate capacities. These multiple projects appear to be essentially the same solar QF
11 project separated by five miles in order to qualify for standard PPAs and prices.

12 **Q. Are the planning needs for a 2 to 10 MW solar project similar to those of an 80 MW**
13 **solar project?**

14 A. Yes. Development of a 2 to 10 MW project requires interconnection studies that comport
15 with Oregon's interconnection rules and the OATT of the transmission provider, if off
16 system. The planning for the development of a 3 to 10 MW PV system takes a similar
17 amount of time, effort, and expense as a larger project, including an 80 MW project. An
18 eligibility cap at 10 MW doesn't represent a logical delineation between small and large
19 projects in terms of development and planning.

20 **Q. Will simply lowering the threshold for standard pricing stop sophisticated developers**
21 **from disaggregating large projects to take advantage of standard pricing?**

22 A. No. PGE's recent experience demonstrates that sophisticated solar developers are capable
23 of organizing large portfolios of solar QF generation into 3 MW or smaller projects to evade

1 the requirement to negotiate prices on dozens of megawatts of nameplate capacity. As
2 demonstrated in PGE Exhibit 104, these tactics expose PGE's customers to hundreds of
3 megawatts of solar QF capacity using inaccurate standard prices when the developers
4 involved are perfectly capable of negotiating more accurate project-specific prices.

5 **Q. What are the price risks to which retail electricity customers are exposed?**

6 A. The prices for wind and solar projects are dropping dramatically. Renewable avoided cost
7 prices are set based on the last acknowledged integrated resource plan (IRP). By the time
8 the IRP is acknowledged, the capital costs used in the IRP are about a year stale. Those
9 costs then become even more stale because the prices are used for avoided costs for the next
10 two years, often longer, until the next IRP is acknowledged. In addition, the deficiency
11 period for the renewable avoided cost is several years long. By the time the utility builds, or
12 would have built, the next renewable resource, capital costs for that resource are likely
13 materially lower. Currently, the prices contained in PGE's avoided costs are likely eight
14 years out of date by the time customers pay deficiency period avoided costs. In that eight
15 years, the price of the proxy renewable resource will very likely have decreased
16 dramatically, given current trends in the two least cost renewable resources: wind and solar.
17 The higher the eligibility cap for the standard contract in Oregon, the more price risk is
18 experienced by PGE's retail electricity customers.

19 **Q. What are the estimated payments to these QFs?**

20 A. As shown in PGE Exhibit 105, PGE estimates payments over the next 15 years that total
21 over \$3 billion based on the fixed prices. The payments to solar QFs alone are expected to
22 reach \$1.9 billion.

23 **Q. How do these expected payments compare to energy priced at market?**

1 A. Priced at market, these payments would total over \$1 billion. The payments in excess of
2 market are \$2 billion. The payments are three times as much as market. PGE Exhibit 106
3 shows the payments under Schedule 201 avoided costs and market, along with the above
4 market value.

5 **Q. PGE’s proposal addresses proposed solar QF projects. How do the expected payments**
6 **from proposed solar QFs priced at current avoided cost prices compare to market?**

7 A. The expected payments at current fixed prices total about \$941 million over 15 years.
8 Priced at market, these payments would total only \$396 million. The payments in excess of
9 market amount to \$545 million. PGE is required to pay approximately \$30/MWh more, on a
10 levelized basis, than market for solar QF output. These figures are based on the 41 proposed
11 solar QF projects with a combined nameplate capacity of 417.2 MW equaling about
12 13.2 million MWh over 15 years. PGE Exhibit 107 shows the payments to proposed solar
13 QFs under Schedule 201 avoided costs compared to market.

14 **Q. Could the aggregation of small QF projects impact PGE’s system reliability?**

15 A. Yes. Exhibit 104 shows that 13 QF developers have proposed multiple solar projects. These
16 aggregated projects range in size from 4.4 MW to 100 MW. The total from these 13
17 developers is 541.3 MW. These projects, particularly from off-system resources, will have
18 an aggregated impact that is indistinguishable from a large project.

19 When a developer proposes multiple projects with more than 10 MW of solar QF
20 nameplate capacity in aggregate, PGE will need to be able to negotiate appropriate terms
21 and conditions in order to avoid adverse impacts on system reliability. PGE has an
22 obligation to conform to the reliability requirements established by the North American
23 Electric Reliability Corporation and the Western Electricity Coordinating Council. These

obligations could be compromised if PGE is unable to negotiate appropriate, project specific terms and conditions.

Q. Has PGE incorporated reliability provisions into previous negotiations?

A. Yes. PGE has incorporated project-specific terms into negotiations with previous QF projects under PGE's Schedule 202, greater than 10 MW, that address reliability and oversupply concerns.

Q. Have other state commissions in the region recently addressed the eligibility cap?

A. Yes, in 2011 the Idaho Public Utilities Commission (Idaho PUC) reduced the eligibility cap for solar and wind QFs from 10 MW to 100 kW to protect retail customers.⁶ And in 2015, the Idaho PUC reduced the length of PURPA contracts from 20 years to two years.⁷

Q. Please summarize your request.

A. PGE respectfully requests an order from the Commission to lower the standard pricing eligibility cap from the current 10 MW to 3 MW for solar QFs and provide a requirement that a solar QF project larger than 100 kW must negotiate a contract, including a project-specific avoided cost price, if any owner of the project has requested or obtained standard prices from PGE for more than 10 MW of aggregate solar QF capacity. In the alternative, PGE requests that the Commission lower the standard pricing eligibility cap from the current 10 MW to 2 MW for solar QF.

In addition, PGE requests that the Commission issue an order to grant PGE immediate temporary relief consistent with the requests pending a final determination in this docket.

Q. Mr. Sims, please state your educational background and experience.

⁶ Idaho PUC Case No. GNR-E-11-01, Order No 32262 (Jun. 8, 2011).

⁷ Idaho PUC Case No. IPC-E-15-01, Order No. 33357 (Aug. 20, 2015).

1 A. I received a Bachelor of Arts degree in Business and Economics from Linfield College in
2 1990 and a Master of Business Administration degree from George Fox University in 2001.
3 I have been the Director of Origination, Structuring, and Resource Strategy at PGE since
4 2005. Previously, I was a manager and senior analyst with the Origination and Structuring
5 group at PGE. I have also held other managerial positions at a variety of banking and
6 energy companies prior to working at PGE.

7 **Q. Mr. Macfarlane, please state your educational background and experience.**

8 A. I received a Bachelor of Arts business degree from Portland State University with a focus in
9 Finance. Since joining PGE in 2008, I have worked as an analyst in the Rates and
10 Regulatory Affairs Department. My duties at PGE have included pricing, revenue
11 requirement, Public Utility Regulatory Policies Act avoided costs, and regulatory issues.
12 From 2004 to 2008, I was a consultant with Bates Private Capital in Lake Oswego, OR,
13 where I developed, prepared, and reviewed financial analyses used in securities litigation.

14 **Q. Does this conclude your testimony?**

15 A. Yes.

List of Exhibits

<u>PGE Exhibit</u>	<u>Description</u>
101	QF List
102	QF Summaries by Resource Type
103	Solar QF Summaries
104	Solar QFs by Developer
105	Estimated Payments to QFs
106	QF Payments Compared to Market
107	Proposed Solar QF Payments Compared to Market

PGE EXHIBIT 101

Qualifying Facility (QF) List

**Portland General Electric Company
Qualifying Facilities as of June 5, 2017
Online, Contracted and Proposed**

QF	Developer	Status	Resource Type	Nameplate Capacity	On or Off System	Date Executed	COD
1	N/A	Online	Hydro	0.08	On	Apr-13	Dec-85
2	N/A	Online	Wind	9	Off	May-10	Dec-10
3	N/A	Online	Solar	0.025	On	Nov-10	Jan-11
4	N/A	Online	Solar	0.04	On	Oct-11	Dec-11
5	N/A	Online	Bio	5.66	Off	Jun-12	Oct-12
6	N/A	Online	Solar	0.094	On	May-13	Apr-13
7	N/A	Online	Bio	1.6	Off	Dec-11	Oct-13
8	N/A	Online	Bio	0.37	Off	Nov-12	Jan-14
9	N/A	Online	Bio	0.8	Off	Sep-13	Jan-14
10	N/A	Online	Hydro	0.2	On	Feb-14	Feb-14
11	N/A	Online	Hydro	0.2	On	Feb-14	Feb-14
12	N/A	Online	Hydro	0.17	On	Dec-12	Dec-14
13	I	Online	Solar	2.5	On	Feb-14	Dec-15
14	H	Contracted	Solar	8	Off	Sep-13	*Nov-14
15	H	Contracted	Solar	10	Off	Apr-15	Nov-17
16	K	Contracted	Solar	2.2	On	Jul-15	Dec-17
17	K	Contracted	Solar	2.2	On	Jul-15	Dec-17
18	K	Contracted	Solar	2.2	On	Jul-15	Dec-17
19	K	Contracted	Solar	2.2	On	Jul-15	Dec-17
20	K	Contracted	Solar	2.2	On	Jul-15	Dec-17
21	K	Contracted	Solar	2.2	On	Jul-15	Dec-17
22	K	Contracted	Solar	2.2	On	Jul-15	Dec-17
23	H	Contracted	Solar	10	Off	Jul-15	May-18
24	I	Online	Solar	0.5	On	Nov-15	Dec-16
25	N/A	Contracted	Bio	2.2	On	Nov-15	Oct-18
26	I	Contracted	Solar	10	Off	Jan-16	Oct-18
27	I	Contracted	Solar	5	Off	Jan-16	Dec-17
28	I	Contracted	Solar	10	Off	Jan-16	Sep-18
29	G	Contracted	Solar	10	Off	Jan-16	Jan-19
30	G	Contracted	Solar	10	Off	Jan-16	Jan-19
31	G	Contracted	Solar	10	Off	Jan-16	Jan-19
32	G	Contracted	Solar	10	Off	Jan-16	Jan-19
33	K	Contracted	Solar	2.2	On	Jan-16	Dec-17
34	K	Contracted	Solar	2.2	On	Jan-16	Dec-17
35	J	Contracted	Solar	4	On	Jan-16	Dec-17
36	R	Contracted	Solar	2.2	On	Jan-16	Mar-18
37	R	Contracted	Solar	2.2	On	Jan-16	Mar-18
38	E	Contracted	Solar	10	Off	Jan-16	Dec-18

*COD not yet achieved

QF	Developer	Status	Resource Type	Nameplate Capacity	On or Off System	Date Executed	COD
39	I	Contracted	Solar	10	Off	Mar-16	Jun-18
40	G	Contracted	Solar	10	Off	Apr-16	Jan-19
41	G	Contracted	Solar	10	Off	Apr-16	Jan-19
42	R	Contracted	Solar	2.2	On	May-16	Mar-18
43	J	Contracted	Solar	4	On	May-16	Nov-17
44	J	Contracted	Solar	10	On	May-16	Nov-17
45	J	Contracted	Solar	4	On	May-16	Nov-17
46	J	Contracted	Solar	7	Off	May-16	Nov-17
47	J	Contracted	Solar	4	On	May-16	Nov-17
48	J	Contracted	Solar	10	On	May-16	Nov-17
49	R	Contracted	Solar	2.2	On	Jun-16	Mar-18
50	R	Contracted	Solar	2.2	On	Jun-16	Mar-18
51	N/A	Contracted	Geothermal	10	Off	Jun-16	Apr-20
52	R	Contracted	Solar	2.2	On	Jun-16	Apr-18
53	S	Contracted	Bio	10	Off	Jun-16	Jun-19
54	S	Contracted	Bio	10	Off	Jun-16	Jun-19
55	R	Contracted	Solar	2.2	On	Jun-16	Mar-18
56	G	Contracted	Solar	10	Off	Jun-16	Jan-19
57	G	Contracted	Solar	10	Off	Jun-16	May-19
58	G	Contracted	Solar	10	Off	Jun-16	May-19
59	G	Contracted	Solar	10	Off	Jun-16	May-19
60	B	Contracted	Solar	2.2	On	Jun-16	Oct-17
61	B	Contracted	Solar	2.2	On	Jun-16	Oct-17
62	L	Contracted	Solar	10	Off	Jul-16	May-19
63	L	Contracted	Solar	10	Off	Jul-16	May-19
64	L	Contracted	Solar	10	Off	Jul-16	Jun-19
65	L	Contracted	Solar	10	Off	Aug-16	Jul-19
66	L	Contracted	Solar	10	Off	Aug-16	Jul-19
67	D	Proposed	Solar	10	Off		Nov-19
68	D	Proposed	Solar	10	Off		Nov-19
69	I	Contracted	Solar	10	Off	Nov-16	Jun-19
70	I	Contracted	Solar	10	Off	Jun-17	Jun-19
71	H	Contracted	Solar	47.5	Off	Jan-17	Nov-19
72	T	Proposed	Geothermal	17	Off		Nov-18
73	U	Proposed	Bio	28.25	Off	Jun-17	Jan-20
74	R	Contracted	Solar	2.2	On	Jan-17	Dec-17
75	R	Contracted	Solar	2.2	On	Jan-17	Apr-17
76	P	Contracted	Solar	10	Off	Jun-17	Dec-19
77	M	Proposed	Solar	10	Off		Dec-19
78	F	Contracted	Solar	10	Off	Apr-17	Dec-19
79	V	Proposed	hydro	0.35	Off		Jan-20
80	W	Contracted	Bio	10	Off	May-17	Jan-18
81	D	Proposed	Solar	10	Off		Nov-19

QF	Developer	Status	Resource Type	Nameplate Capacity	On or Off System	Date Executed	COD
82	D	Proposed	Solar	10	Off		Nov-19
83	N/A	Proposed	Hydro	4.6	Off		Dec-18
84	R	Contracted	Solar	2.2	On	May-17	Apr-18
85	D	Proposed	Solar	10	Off		Jan-20
86	R	Contracted	Solar	2.2	On	Jun-17	Mar-18
87	R	Contracted	Solar	2.2	On	Jun-17	Mar-18
88	R	Proposed	Solar	2.2	On	Jun-17	Apr-18
89	R	Proposed	Solar	1.5	On		Nov-17
90	G	Proposed	Solar	20	Off		Jul-20
91	L	Proposed	Solar	10	Off		May-20
92	G	Proposed	Solar	35	Off		Jun-20
93	A	Proposed	Solar	2.2	On		Dec-18
94	A	Proposed	Solar	2.2	On		Dec-18
95	A	Proposed	Solar	2.2	On		Dec-18
96	A	Proposed	Solar	2.2	On		Dec-18
97	N	Proposed	Solar	2.2	On		Dec-18
98	N	Proposed	Solar	2.2	On		Dec-18
99	N	Proposed	Solar	2.2	On		Dec-18
100	C	Proposed	Solar	80	Off		Dec-19
101	K	Proposed	Solar	2.2	On		Dec-18
102	K	Proposed	Solar	2.2	On		Dec-18
103	K	Proposed	Solar	2.2	On		Dec-18
104	L	Proposed	Solar	10	Off		Jun-20
105	I	Proposed	Solar	10	Off		Apr-20
106	O	Proposed	Solar	2	On		Apr-20
107	O	Proposed	Solar	2	On		Apr-20
108	F	Proposed	Solar	10	Off		Dec-19
109	F	Proposed	Solar	10	Off		Dec-19
110	F	Proposed	Solar	10	Off		Dec-19
111	F	Proposed	Solar	10	Off		Dec-19
112	F	Proposed	Solar	10	Off		Dec-19
113	L	Proposed	Solar	10	Off		Jun-20
114	L	Proposed	Solar	10	Off		Jul-20
115	N/A	Proposed	Bio	10	On		Sep-19
116	A	Proposed	Solar	2.25	On		Dec-18
117	A	Proposed	Solar	2.25	On		Dec-18
118	N/A	Proposed	Bio	10	Off		Jan-20
119	O	Proposed	Solar	2	On		Apr-20
120	O	Proposed	Solar	2	On		Apr-20
121	Q	Proposed	Solar	60	Off		Jul-20
122	O	Proposed	Solar	4	On		Apr-20
123	I	Proposed	Solar	10	Off		Apr-20
124	I	Proposed	Solar	10	Off		Apr-20

PGE EXHIBIT 102

Qualifying Facility (QF) Summaries by Resource Type

Portland General Electric Company
Qualifying Facilities as of June 5, 2017
Online, Contracted and Proposed by Resource Type

Online QF Projects	Number of Projects	Nameplate Capacity (MW)
Bio	4	8.4
Geothermal	0	0.0
Hydro	4	0.7
Wind	1	9.0
Solar	5	3.2
Total	14	21.2

Contracted QF Projects Not Yet Online	Number of Projects	Nameplate Capacity (MW)
Bio	4	32.2
Geothermal	1	10.0
Hydro	0	0.0
Wind	0	0.0
Solar	58	404.1
Total	63	446.3

Proposed QF Projects	Number of Projects	Nameplate Capacity (MW)
Bio	3	48.3
Geothermal	1	17.0
Hydro	2	5.0
Wind	0	0.0
Solar	41	417.2
Total	47	487.4

All QF Projects	Number of Projects	Nameplate Capacity (MW)
Bio	11	88.9
Geothermal	2	27.0
Hydro	6	5.6
Wind	1	9.0
Solar	104	824.5
Total	124	954.9

PGE EXHIBIT 103

Solar Qualifying Facility (QF) Summaries

Portland General Electric Company
Solar Qualifying Facilities as of June 5, 2017
Online, Contracted and Proposed - On System and Off System

Online Solar QFs	Number of Projects	Nameplate Capacity (MW)	
On System	5	3.2	100.0%
Off System	0	0.0	0.0%
Total	5	3.2	

Contracted Solar QFs Not Yet Online	Number of Projects	Nameplate Capacity (MW)	
On System	29	86.6	21.4%
Off System	29	317.5	78.6%
Total	58	404.1	

Proposed Solar QFs	Number of Projects	Nameplate Capacity (MW)	
On System	19	42.2	10.1%
Off System	22	375.0	89.9%
Total	41	417.2	

All Solar QFs	Number of Projects	Nameplate Capacity (MW)	
On System	53	132.0	16.0%
Off System	51	692.5	84.0%
Total	104	824.5	

PGE EXHIBIT 104

Solar Qualifying Facilities (QFs) by Developer

Portland General Electric Company
Solar Qualifying Facilities as of June 5, 2017
Contracted Since Order No. 14-058 with Standard Contracts

SOLAR QFs - CONTRACTED AND PROPOSED			
	Number of Developers	Number of Projects	Total Nameplate Capacity
Developers with multiple projects	13	91	541.3
Developers with one project	3	3	30.0

SOLAR QF DEVELOPERS WITH MULTIPLE PROJECTS					
Developer	Number of Projects with a Solar QF Contract	Number of Projects Seeking a Solar QF Contract	Total Number of Projects	Average Nameplate Capacity	Total Nameplate Capacity
A	0	6	6	2.2	13.3
B	2	0	2	2.2	4.4
D	0	5	5	10.0	50.0
F	1	5	6	10.0	60.0
G	10	0	10	10.0	100.0
H	2	0	2	10.0	20.0
I	7	3	10	8.6	85.5
J	7	0	7	6.1	43.0
K	9	3	12	2.2	26.4
L	5	4	9	10.0	90.0
N	0	3	3	2.2	6.6
O	0	5	5	2.4	12.0
R	12	2	14	2.2	30.1
Total	55	36	91		541.3

SOLAR QF DEVELOPERS WITH ONE PROJECT					
Developer	Number of Projects with a Solar QF Contract	Number of Projects Seeking a Solar QF Contract	Total Number of Projects	Average Nameplate Capacity	Total Nameplate Capacity
E	1	0	1	10.0	10.0
M	0	1	1	10.0	10.0
P	1	0	1	10.0	10.0
Total	2	1	3		30.0

PGE EXHIBIT 105

Estimated Payments to Qualifying Facilities (QFs)

Portland General Electric Company
Estimated Payments to Online, Contracted and Proposed QFs as of June 5, 2017

ONLINE, CONTRACTED AND PROPOSED QFs

	Total	Bio	Geothermal	Hydro	Wind	Solar
*2017	\$8,979,211	\$4,888,426	\$0	\$125,277	\$2,033,799	\$1,931,709
2018	\$18,730,600	\$6,458,929	\$302,944	\$153,870	\$2,108,535	\$9,706,321
2019	\$36,388,032	\$10,728,073	\$3,867,109	\$436,080	\$2,211,333	\$19,145,437
2020	\$206,365,692	\$61,566,499	\$17,688,337	\$1,131,261	\$2,222,670	\$123,756,925
2021	\$227,671,062	\$63,105,981	\$20,070,523	\$1,159,335	\$2,274,241	\$141,060,982
2022	\$232,237,396	\$64,487,984	\$20,457,858	\$1,184,978	\$2,324,096	\$143,782,480
2023	\$237,025,652	\$65,915,142	\$20,852,746	\$1,212,725	\$2,406,024	\$146,639,014
2024	\$241,580,543	\$67,176,337	\$21,197,182	\$1,235,460	\$2,486,110	\$149,485,455
2025	\$245,786,572	\$68,815,601	\$21,665,329	\$1,265,199	\$882,221	\$153,158,222
2026	\$250,200,590	\$70,065,093	\$22,083,451	\$1,289,972	\$0	\$156,762,073
2027	\$251,324,744	\$67,592,679	\$22,509,730	\$1,308,648	\$0	\$159,913,687
2028	\$251,617,078	\$65,358,065	\$22,881,410	\$1,158,220	\$0	\$162,219,384
2029	\$256,649,668	\$66,769,984	\$23,387,042	\$1,177,375	\$0	\$165,315,267
2030	\$257,757,632	\$67,831,154	\$23,838,326	\$1,200,091	\$0	\$164,888,062
2031	\$201,378,151	\$57,295,423	\$19,226,761	\$1,223,254	\$0	\$123,632,712
2032	\$88,476,391	\$22,423,717	\$7,465,288	\$620,928	\$0	\$57,966,457
Total	\$3,012,169,012	\$830,479,087	\$267,494,036	\$15,882,674	\$18,949,028	\$1,879,364,187

CONTRACTED QFs - ONLINE AND NOT ONLINE

	Total	Bio	Geothermal	Hydro	Wind	Solar
*2017	\$8,976,883	\$4,888,426	\$0	\$125,277	\$2,033,799	\$1,929,381
2018	\$18,287,623	\$6,458,929	\$0	\$131,209	\$2,108,535	\$9,588,949
2019	\$29,752,055	\$10,032,140	\$0	\$137,168	\$2,211,333	\$17,371,414
2020	\$106,359,957	\$26,995,812	\$5,802,898	\$142,877	\$2,222,670	\$71,195,699
2021	\$110,830,268	\$27,692,859	\$7,922,563	\$148,925	\$2,274,241	\$72,791,681
2022	\$113,144,151	\$28,391,129	\$8,075,469	\$155,069	\$2,324,096	\$74,198,388
2023	\$115,626,180	\$29,121,870	\$8,231,325	\$162,935	\$2,406,024	\$75,704,025
2024	\$117,951,679	\$29,775,587	\$8,367,266	\$168,328	\$2,486,110	\$77,154,389
2025	\$119,237,040	\$30,588,481	\$8,552,120	\$174,503	\$882,221	\$79,039,715
2026	\$120,894,258	\$31,100,121	\$8,717,176	\$178,228	\$0	\$80,898,732
2027	\$119,459,687	\$27,875,964	\$8,885,418	\$175,441	\$0	\$82,522,864
2028	\$117,611,065	\$24,985,029	\$9,032,161	\$6,304	\$0	\$83,587,572
2029	\$119,169,764	\$25,505,045	\$9,231,705	\$0	\$0	\$84,433,015
2030	\$117,446,745	\$25,769,916	\$9,409,877	\$0	\$0	\$82,266,952
2031	\$58,151,325	\$14,422,617	\$4,519,824	\$0	\$0	\$39,208,884
2032	\$8,210,427	\$2,208,653	\$0	\$0	\$0	\$6,001,774
Total	\$1,401,109,107	\$345,812,577	\$96,747,801	\$1,706,265	\$18,949,028	\$937,893,435

PROPOSED QFs

	Total	Bio	Geothermal	Hydro	Wind	Solar
*2017	\$2,328	\$0	\$0	\$0	\$0	\$2,328
2018	\$442,977	\$0	\$302,944	\$22,661	\$0	\$117,372
2019	\$6,635,977	\$695,933	\$3,867,109	\$298,912	\$0	\$1,774,023
2020	\$100,005,735	\$34,570,687	\$11,885,439	\$988,384	\$0	\$52,561,226
2021	\$116,840,794	\$35,413,123	\$12,147,960	\$1,010,410	\$0	\$68,269,301
2022	\$119,093,246	\$36,096,855	\$12,382,390	\$1,029,909	\$0	\$69,584,091
2023	\$121,399,472	\$36,793,272	\$12,621,421	\$1,049,791	\$0	\$70,934,989
2024	\$123,628,863	\$37,400,750	\$12,829,916	\$1,067,132	\$0	\$72,331,065
2025	\$126,549,532	\$38,227,120	\$13,113,209	\$1,090,695	\$0	\$74,118,508
2026	\$129,306,332	\$38,964,972	\$13,366,275	\$1,111,744	\$0	\$75,863,341
2027	\$131,865,057	\$39,716,716	\$13,624,312	\$1,133,207	\$0	\$77,390,823
2028	\$134,006,013	\$40,373,036	\$13,849,249	\$1,151,916	\$0	\$78,631,813
2029	\$137,479,904	\$41,264,939	\$14,155,338	\$1,177,375	\$0	\$80,882,252
2030	\$140,310,887	\$42,061,237	\$14,428,449	\$1,200,091	\$0	\$82,621,110
2031	\$143,226,826	\$42,872,806	\$14,706,937	\$1,223,254	\$0	\$84,423,828
2032	\$80,265,964	\$20,215,064	\$7,465,288	\$620,928	\$0	\$51,964,684
Total	\$1,611,059,905	\$484,666,509	\$170,746,235	\$14,176,409	\$0	\$941,470,752

* Partial year from July 2017 through December 2017

PGE EXHIBIT 106

Qualifying Facility (QF) Payments Compared to Market

Portland General Electric Company
Estimated Payments to QFs as of June 5, 2017
Contract Pricing vs. Forward Market Pricing

ONLINE, CONTRACTED AND PROPOSED QFs

	Estimated Payments Under Contract or June 1, 2017 Pricing for Proposed	Estimated Payments at Mid-C Forward Pricing	Above Market Value
*2017	\$8,979,211	\$3,418,058	\$5,561,153
2018	\$18,730,600	\$9,797,465	\$8,933,134
2019	\$36,388,032	\$22,819,346	\$13,568,686
2020	\$206,365,692	\$64,281,112	\$142,084,580
2021	\$227,671,062	\$73,524,735	\$154,146,327
2022	\$232,237,396	\$78,325,661	\$153,911,735
2023	\$237,025,652	\$80,339,577	\$156,686,074
2024	\$241,580,543	\$81,125,105	\$160,455,438
2025	\$245,786,572	\$82,860,342	\$162,926,230
2026	\$250,200,590	\$85,285,103	\$164,915,487
2027	\$251,324,744	\$86,368,394	\$164,956,350
2028	\$251,617,078	\$87,896,266	\$163,720,813
2029	\$256,649,668	\$89,524,770	\$167,124,897
2030	\$257,757,632	\$90,932,989	\$166,824,643
2031	\$201,378,151	\$74,201,256	\$127,176,895
2032	\$88,476,391	\$34,886,799	\$53,589,592
Total	\$3,012,169,012	\$1,045,586,978	\$1,966,582,035

* Partial year from July 2017 through December 2017

PGE EXHIBIT 107

Proposed Solar Qualifying Facility (QF) Payments Compared to Market

Portland General Electric Company
Estimated Payments to Proposed Solar QFs as of June 5, 2017
Currently Available Pricing vs. Forward Market Pricing

Proposed Solar QFs			
	Estimated Payments at June 1, 2017 Pricing	Estimated Payments at Mid-C Forward Pricing	Above Market Value
*2017	\$2,328	\$2,598	(\$271)
2018	\$117,372	\$111,893	\$5,479
2019	\$1,774,023	\$1,600,573	\$173,450
2020	\$52,561,226	\$20,506,840	\$32,054,386
2021	\$68,269,301	\$27,236,459	\$41,032,842
2022	\$69,584,091	\$28,999,882	\$40,584,210
2023	\$70,934,989	\$29,707,448	\$41,227,540
2024	\$72,331,065	\$30,019,292	\$42,311,773
2025	\$74,118,508	\$30,840,480	\$43,278,028
2026	\$75,863,341	\$31,844,148	\$44,019,193
2027	\$77,390,823	\$32,660,234	\$44,730,589
2028	\$78,631,813	\$33,673,683	\$44,958,130
2029	\$80,882,252	\$34,495,378	\$46,386,874
2030	\$82,621,110	\$35,525,496	\$47,095,614
2031	\$84,423,828	\$36,341,775	\$48,082,054
2032	\$51,964,684	\$22,695,509	\$29,269,175
Total	\$941,470,752	\$396,261,686	\$545,209,065

* Partial year from July 2017 through December 2017

	June 1, 2017 Pricing	Mid-C Pricing	Above Market Price
Levelized Price (\$2017)	57.44	26.65	30.79

\$/MWh