Integrated Resource Planning

ROUNDTABLE 22-3

MARCH 2022





MEETING LOGISTICS

Electronic version of presentation:

https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning/irp-public-meetings

Teams Meeting:

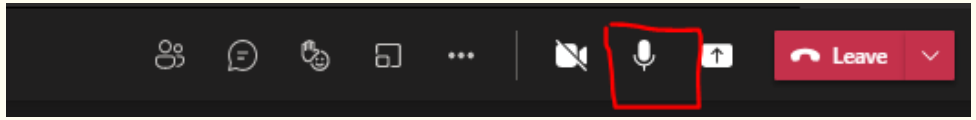
Please click the meeting link sent to your email and here:
Join Microsoft Teams Meeting*
-OR-

Call this number on your phone:
+1 971-277-2317
Conference ID: 738 284 325#

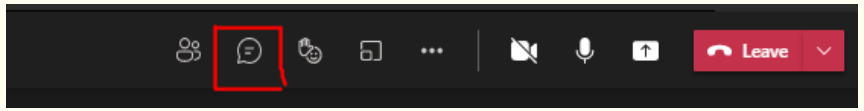
*Please use *Microsoft Edge* or *Google Chrome* for the best experience.

PARTICIPATION

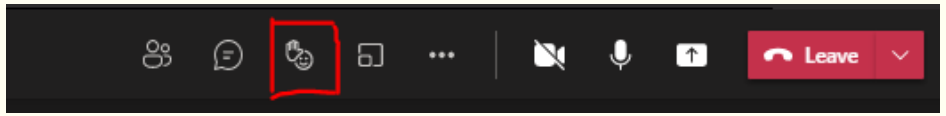
- Mute your mic while others are speaking; to unmute via phone press *6



- We will ask for comments and questions along the way
- Participate using the chat box or ask questions verbally



- Use the “raise hand” feature to signal you would like to ask your question verbally



- Wait to be called on
- Please be polite and respect all participants on the webinar
- Please stay on topic; we may interrupt or shorten questions to meet the time commitment of the meeting

AGENDA

Welcome	5 minutes
Safety Moment	5 minutes
Order 21-215: UM 1728 Settlement	10 minutes
Part 1 – QF Sensitivities	45 minutes
Part 2 – ELCC Sensitivities	45 minutes

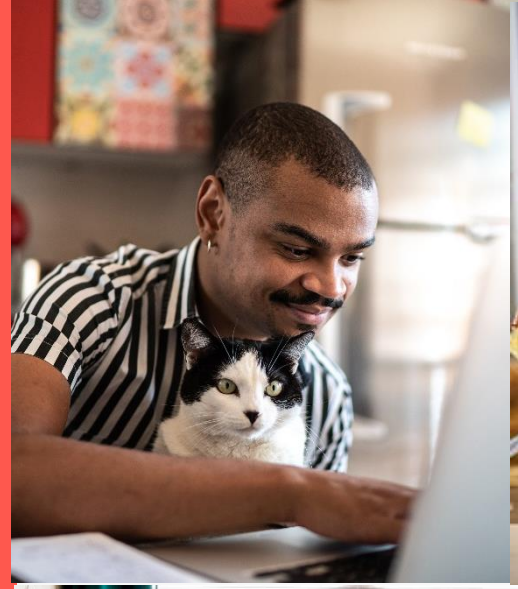
This presentation is being recorded.

SAFETY MOMENT

Working From Home

Slips, trips and falls are some of the most common types of workplace injuries. Now, with so many of us working remotely, safety risks in the home can put not only you in harm's way, but also your kids, spouse, pets, roommates, partners or anyone else in your work environment at home. Remember:

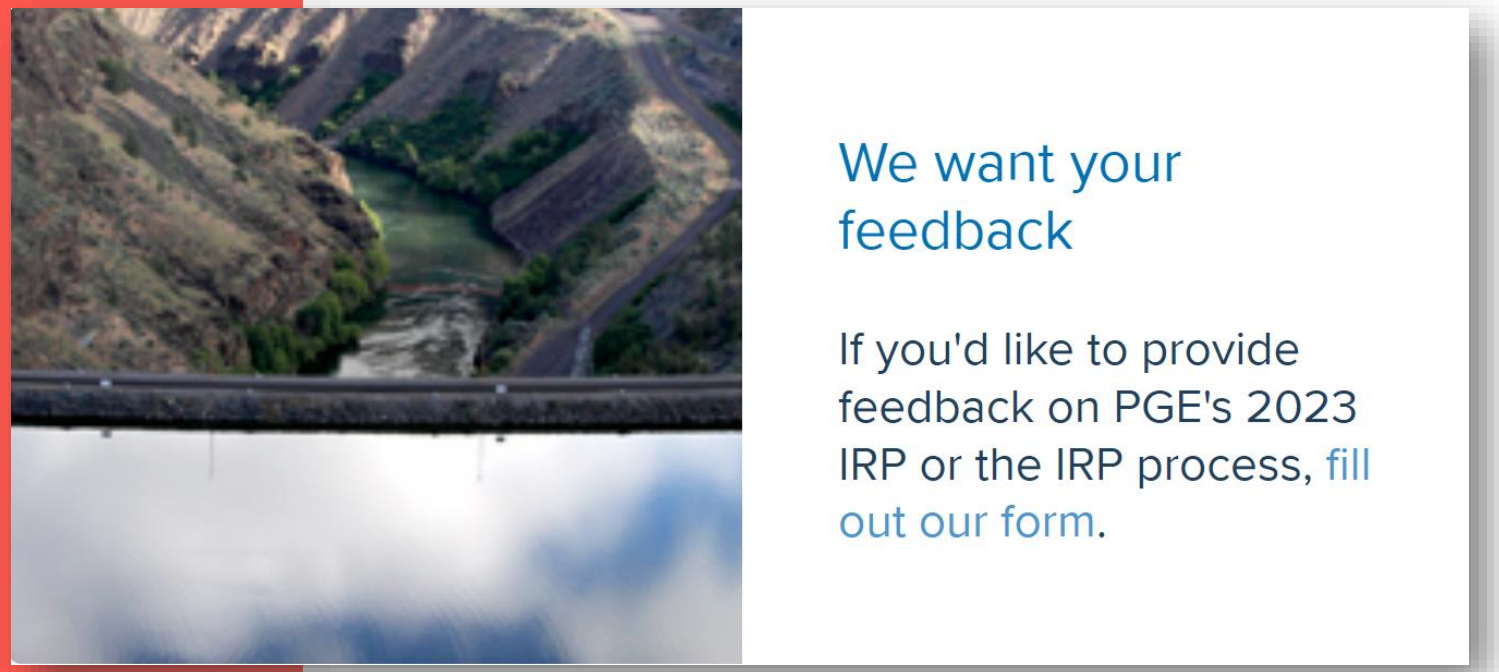
- Stay aware of your surroundings. Focus on what you are doing, where you are going and what is ahead of you.
- Avoid distractions, like being on your phone, while walking into the kitchen or doing a household task.
- Make sure your work area is well-lit and electrical cords are safely secured.
- Clean up spills and fallen objects, immediately.







STAKEHOLDER FEEDBACK



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2021 UM1728 SETTLEMENT

SETH WIGGINS

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UM1728 Timeline

June 2021: Order 21-215 detailed the Commission's approval of PGE's update to Schedule 201 avoided cost payments to Qualifying Facilities (QF)

- The Order adopted Staff's recommendation to approve PGE's filing subject to modifications as outlined in Attachment A to Staff's Report.
- Per Attachment A to Staff's Report, PGE agreed to present analyses in an IRP roundtable as part of its next IRP by the filing

November 2021: The Commission approved PGE's request for IRP extension

In today's roundtable we are presenting the results of these analyses

- Results are draft for the 2023 IRP (expected updates to inputs including load, existing portfolio, etc., as well as modifications of capacity valuation methods)

UM1728 Staff Report: Appendix A

Part 1 – QF Sensitivities:

PGE will develop QF online and renewal sensitivity analyses.
For QFs with contracts that are executed but that are not yet operational at the time of the snapshot, PGE will examine factors including but not be limited to:

- the historic percentage of PGE's QFs having reached commercial operations,
- the opportunities to sell power to other utilities,
- sophistication and experience of project developers,
- contractual provisions,
- technology, and
- interconnection risks.

At least one analysis will start with PGE's historic percentage of PGE's QFs that have reached commercial operations.
For QF renewals, PGE will examine factors including but not limited to:

- the historic percentage of PGE's QFs that have renewed their contracts,
- the sophistication and experience of project developers,
- contractual provisions,
- technology,
- the opportunity to sell power to other utilities, and
- interconnection risks.

At least one analysis will start with PGE's historic percentage of PGE's QFs that have renewed their contracts. PGE will also review the historic percentage of QFs reaching completion and renewals for other utilities.

Part 2 – ELCC Sensitivities:

PGE will provide ELCC values for multiple proxy solar resources based on geographic locations and other relevant technical specifications.

- PGE will consider feedback from IRP participants regarding solar resource characteristics.
- PGE will provide detailed information about the proxy resource characteristics, including outage assumptions.
- There will be at least one ELCC sensitivity model using location specific forecasts for all QF and GEAR solar resources in the baseline.
- Location specific will, at a minimum, include delineation between east-side and west-side solar resources.

PART 1 – QF SENSITIVIES

KORI MEHDIKHAN

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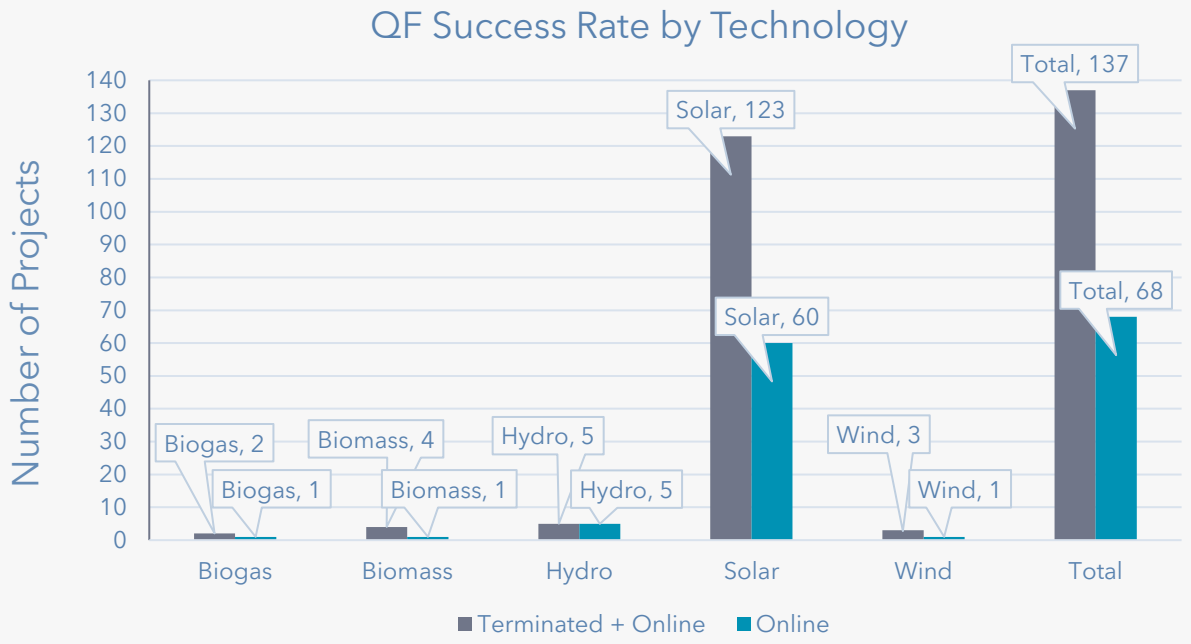
QF Contracts Executed, Not Online

Note that the QF data represented on the following slides is based on a snapshot date of January 6, 2022.

Technology Type	Total MW	# of Projects
Biogas	4.8	1
Geothermal	10.0	1
Solar	349.9	16
Total	**364.7**	**18**

QF Contracts Executed, Not Online

- Historical percentage of QFs having reached commercial operation:
  - All QF Technologies = 50%
  - Solar QFs = 49%



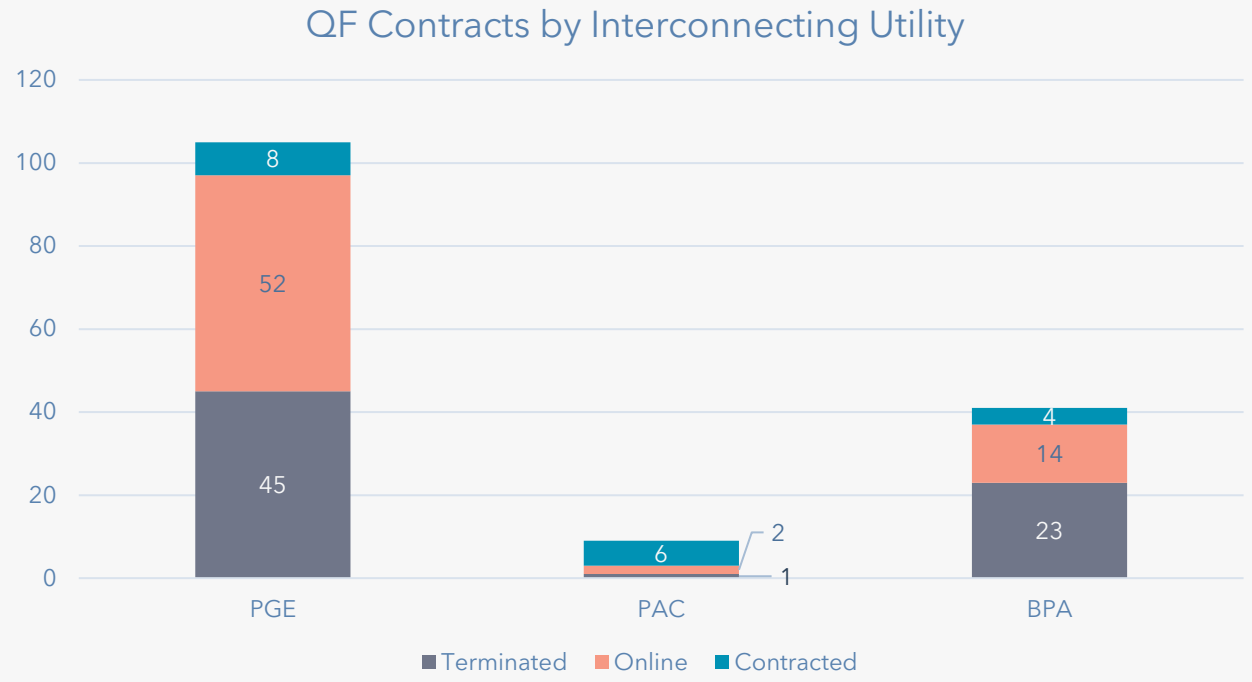
QF Contracts Executed, Not Online

- Historical percentage of QFs having reached commercial operation:

PPA Contract Execution Year	Success Rate
2010	100%
2012	100%
2013	40%
2014	100%
2015	54%
2016	53%
2017	50%
2018	36%
2019	57%
2020	100%
Average	**50%**

QF Contracts Executed, Not Online

- Opportunities to sell to other utilities:
  - QF's may choose to sell to another utility, so long as they can obtain the appropriate transmission (as required) to wheel to that utility.



QF Contracts Executed, Not Online

- Sophistication and experience of project developers:
  - Of the ~365MW of QF contracts executed but not online, 90% are held by three developers, all of which would be considered highly experienced
  - The total MW proposed or constructed for these three developers range from 2,000MW - 8,800MW across the national footprint

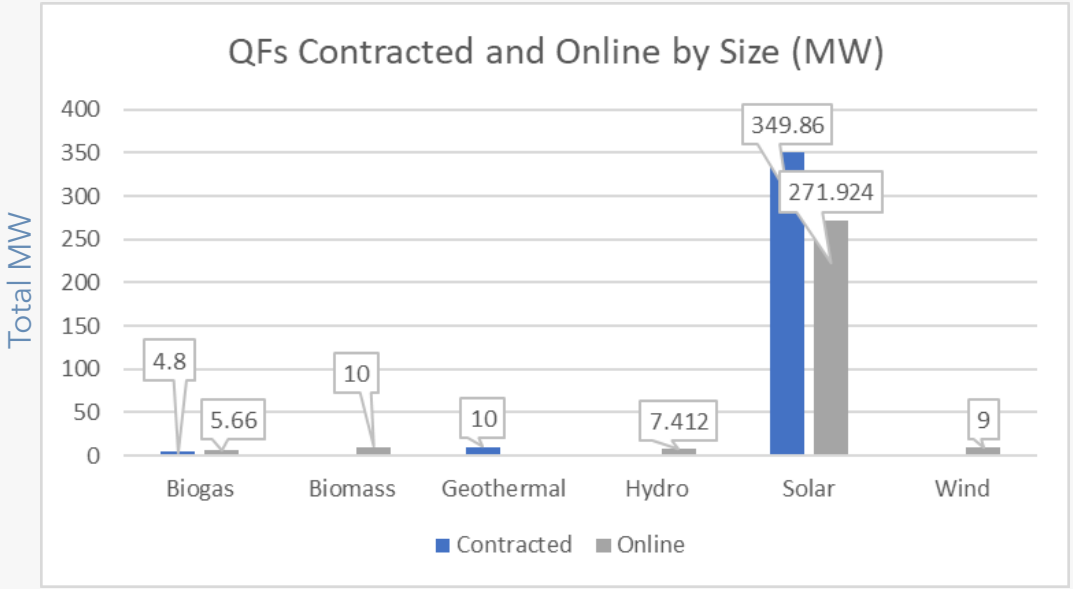
QF Contracts Executed, Not Online

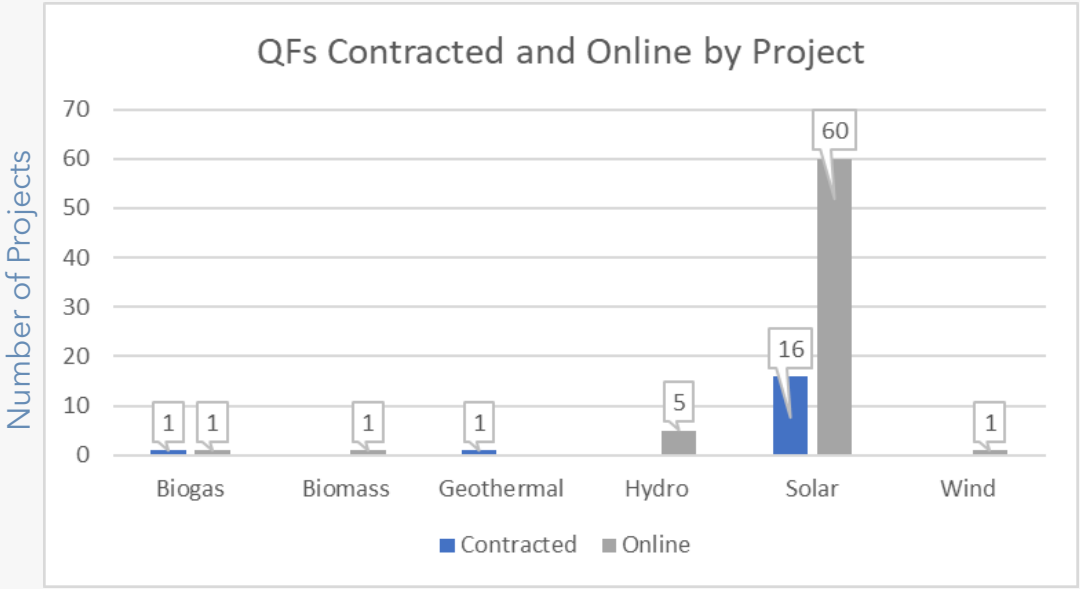
- Contractual provisions:
  - PGE has two types of contracts:
    - Standard – which are defined on form templates and available publicly
    - Negotiated – which vary by PPA/negotiation

Contract Type	Executed, Not Online	Online	Terminated
Standard	14	67	67
Negotiated	4	1	2

QF Contracts Executed, Not Online

- Technology:





QF Contracts Executed, Not Online

- Interconnection risk:
  - For all QF's online:

	Success rate of achieving COD from PPA execution in 3 years or less:	Average time between PPA execution and COD (in years):
On-system	73%	2.50
Off-system	44%	2.85

  - For QF contracts executed not online:
    - Number on-system = 8
    - Number off-system = 10

QF Renewals

Of all QF's online or contracted, not online – none are from a renewal of a previous contract.

PGE does not anticipate any renewals for QFs to occur any earlier than 2027.

PPA End Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2042	2043	Total
MW	6	0	0	0	11	77	10	33	93	67	94	265	4	8	669

PGE currently has two (2) QF contracts with facilities that were previously under contract with a different utility.

Sensitivities

- Case one: 100% of online QFs + 100% contracted QFs
- Case two: 100% of online QFs + 49% of contracted QFs
  - 49% is the current solar QF success rate
- Case three: 100% of online QFs + 75% of contracted QFs

QUESTIONS/ DISCUSSION?

PART 2 – ELCC SENSITIVIES

TOMÁS MORRISSEY

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Sequoia – Model Basics

a) Hourly Monte Carlo adequacy model developed in-house after 2019 IRP
    a) Created to improve modeling of energy limited resources
    b) Has been used in the 2019 IRP Update, various PUC dockets, a PGE RFP, and discussed in in various IRP roundtable meetings

b) Targets an annual loss-of-load-hour metric of 2.4 hours / year

c) Creates synthetic weeks out of input data – currently simulating 50,000 weeks / year

d) Incorporates PGE resources, owned/contracted resources, and new proxy resources
    a) Market available in all light load hours and spring/fall heavy load hours

Sequoia – Example Week Creation

Model starts by randomly picking one week in the load history (1980 – 2020).

A hydro week is picked from the same month. It sets generation min, max, and total MWh parameters by project.

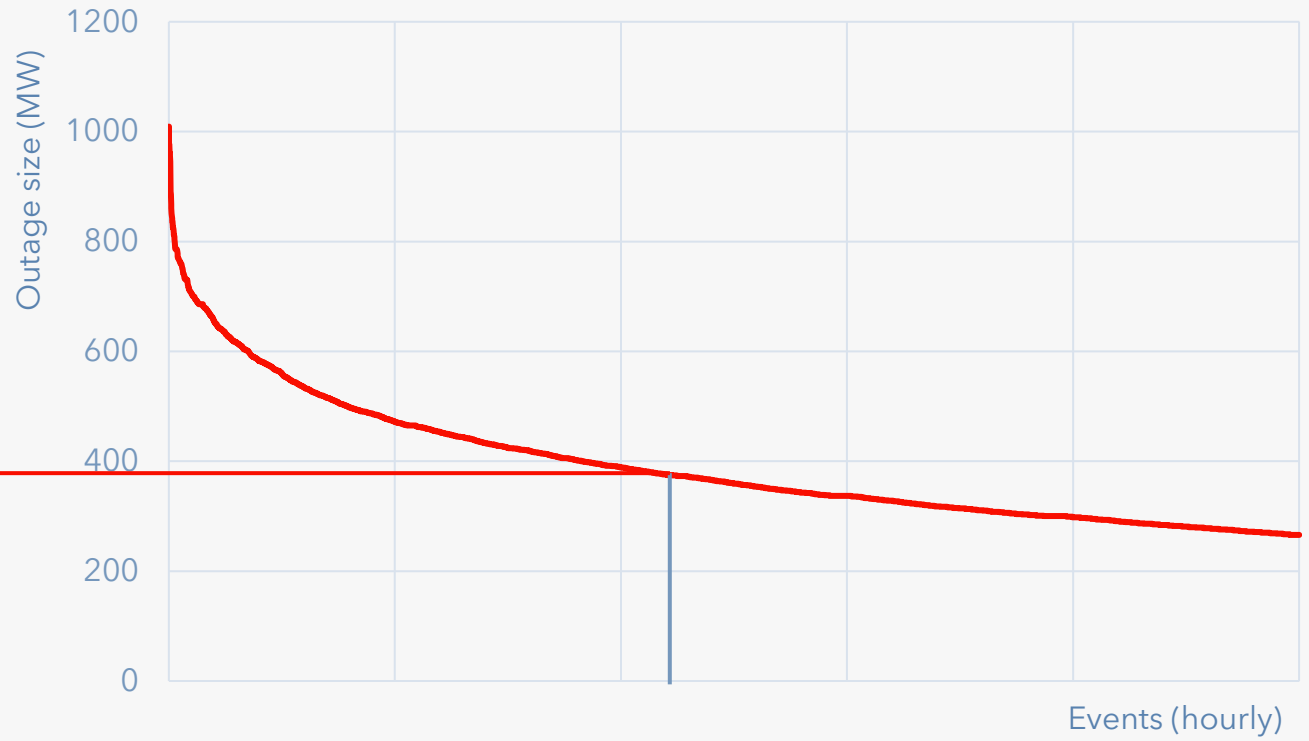
Some resources and load change daily & match the month, load bin, and weekday variables (if appropriate).

Other resources enter model through monthly or weekly inputs and FOR.

Start date	Month	Load bin	Weekday	Hydro year	Biglow	Tucannon	Bakeoven	Load	Colstrip 3	Carty
8/5/1997	8	5	1	2003	8/6/2005	8/28/2017	8/11/2014	8/30/2007		
8/6/1997	8	5	1	2003	8/25/2016	8/12/2004	8/3/2014	8/7/1981		
8/7/1997	8	5	1	2003	8/5/2010	8/3/2017	8/10/2014	8/13/1992	Resource generation varies hourly by month and by forced outage rate	
8/8/1997	8	3	1	2003	8/22/2005	8/21/2006	8/24/2014	8/30/1991		
8/9/1997	8	4	0	2003	8/1/2005	8/27/2005	8/9/2012	8/24/2019		
8/10/1997	8	5	0	2003	8/21/2011	8/11/2017	8/26/2011	8/8/1987		
8/11/1997	8	5	1	2003	8/31/2004	8/7/2006	8/19/2014	8/18/1981		

Sequoia – Capacity Need Math

The model finds the amount of perfect capacity needed to bring the system to an annual 2.4 LOLH. In this case, just under 400 MW.

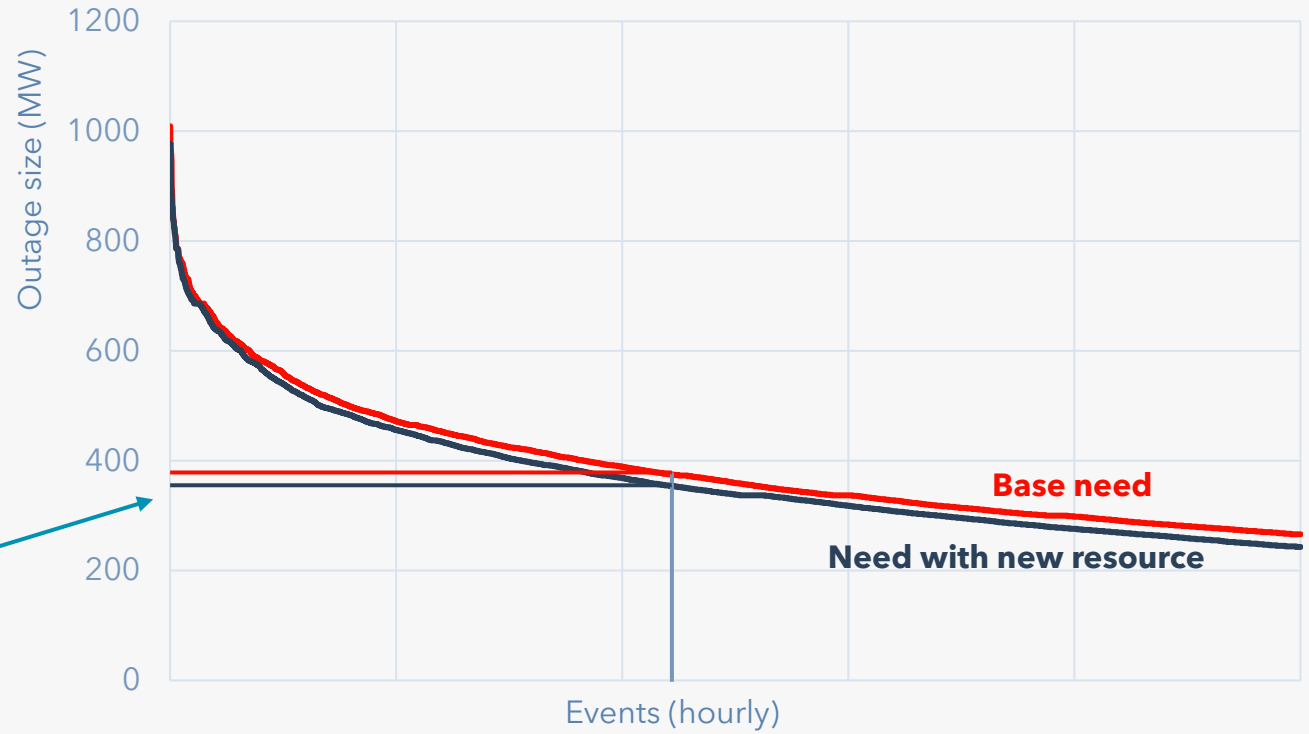


Model calculates number of outage hours in simulation that match our 2.4 annual LOLH target

Sequoia – Capacity Reduction Math

The difference in the amount of capacity needed to achieve 2.4 LOLH is the capacity contribution of the new resource.

In this case the reduction is around 17 MW from 200 MW of new resource. We divide the reduction (17 MW) by the resource size (200 MW) to arrive at a value of 8.5%.



Sequoia – All Models are Myopic

- We use Sequoia to examine capacity needs in the IRP through a 20-year horizon.
- Sequoia relies on our inputs to understand PGEs existing resources, new resource capacity contributions, availability of market power, and more.
- These inputs decline in accuracy going forward. As with most models, the first few years are a road map, the last few years are a compass.

New Solar Sites

Three Oregon solar locations:

1. Christmas Valley
2. McMinnville
3. Wasco County

Shapes Modeled in SAM

- SAM is NREL's System Advisor Model
  - Publicly available software to model the performance of renewable energy projects given system design parameters and weather file inputs (describing the renewable energy resource and weather conditions at the project location)
  - Creates an hourly performance model

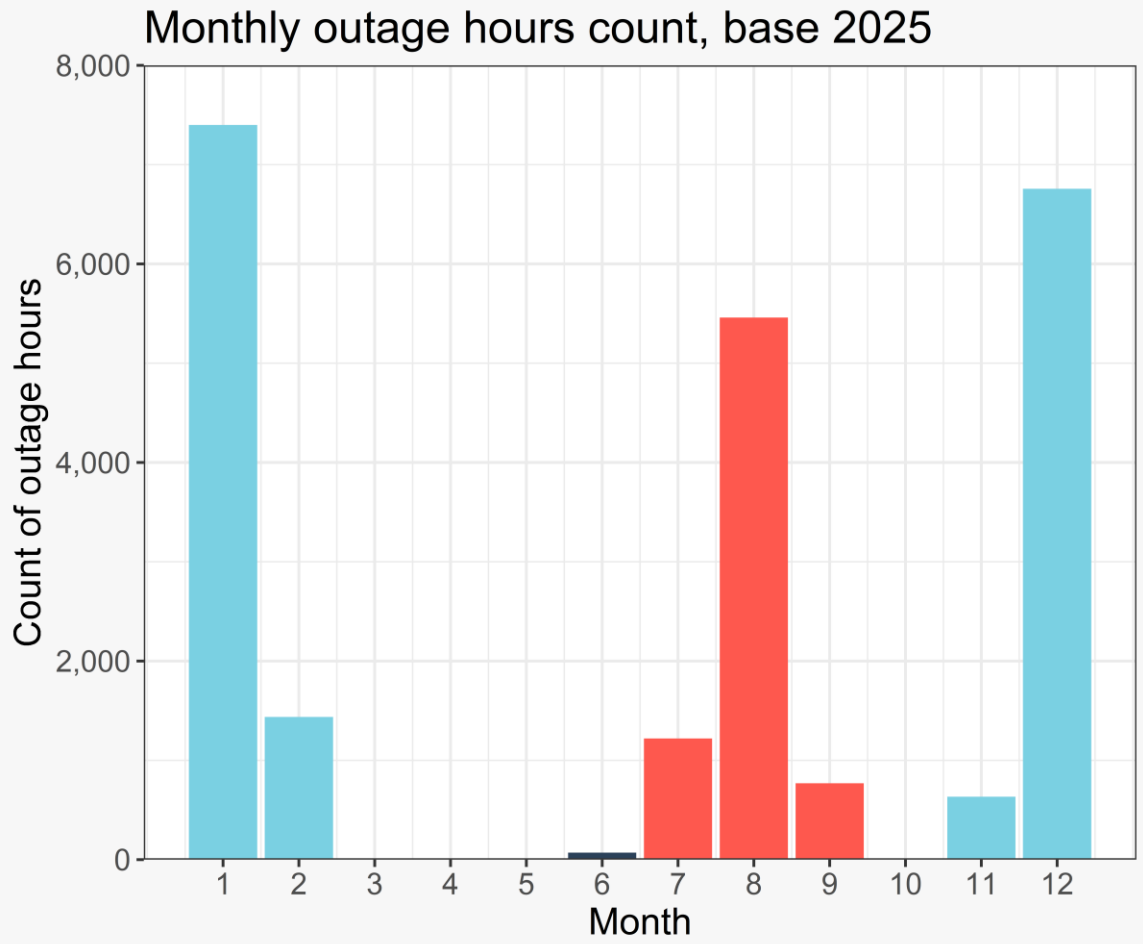
- All three sites are built using the same assumptions, they differ by solar profile
  - Single-axis tracking
  - DC to AC (inverter loading) ratio of 1.34
  - Module efficiency of 21%
  - Inverter efficiency of 98%
  - Solar profiles from years 1998 to 2020 (23 years total)
    - Using publicly available data from NREL's National Solar Radiation Database (NSRDB)

2025 – Capacity Needs by Month

Months with most simulated outages (2025)

Winter: Nov, Dec, Jan, Feb

Summer: Jul, Aug, Sep



Values from Case One with no new solar additions

2025 – Capacity Need by Hour

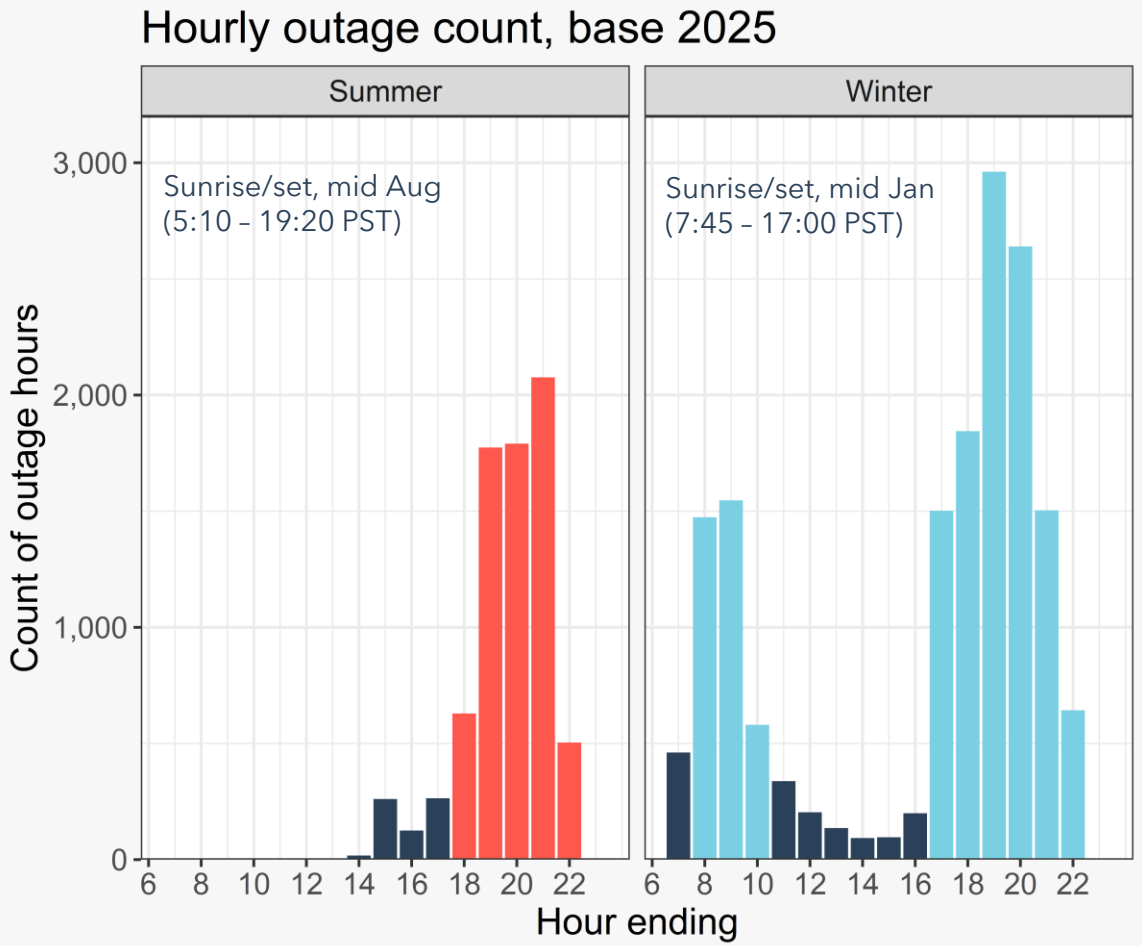
Hours with most simulated outages (2025)

Winter: HE 7, 8, 9, 17, 18, 19, 20, 21, 22

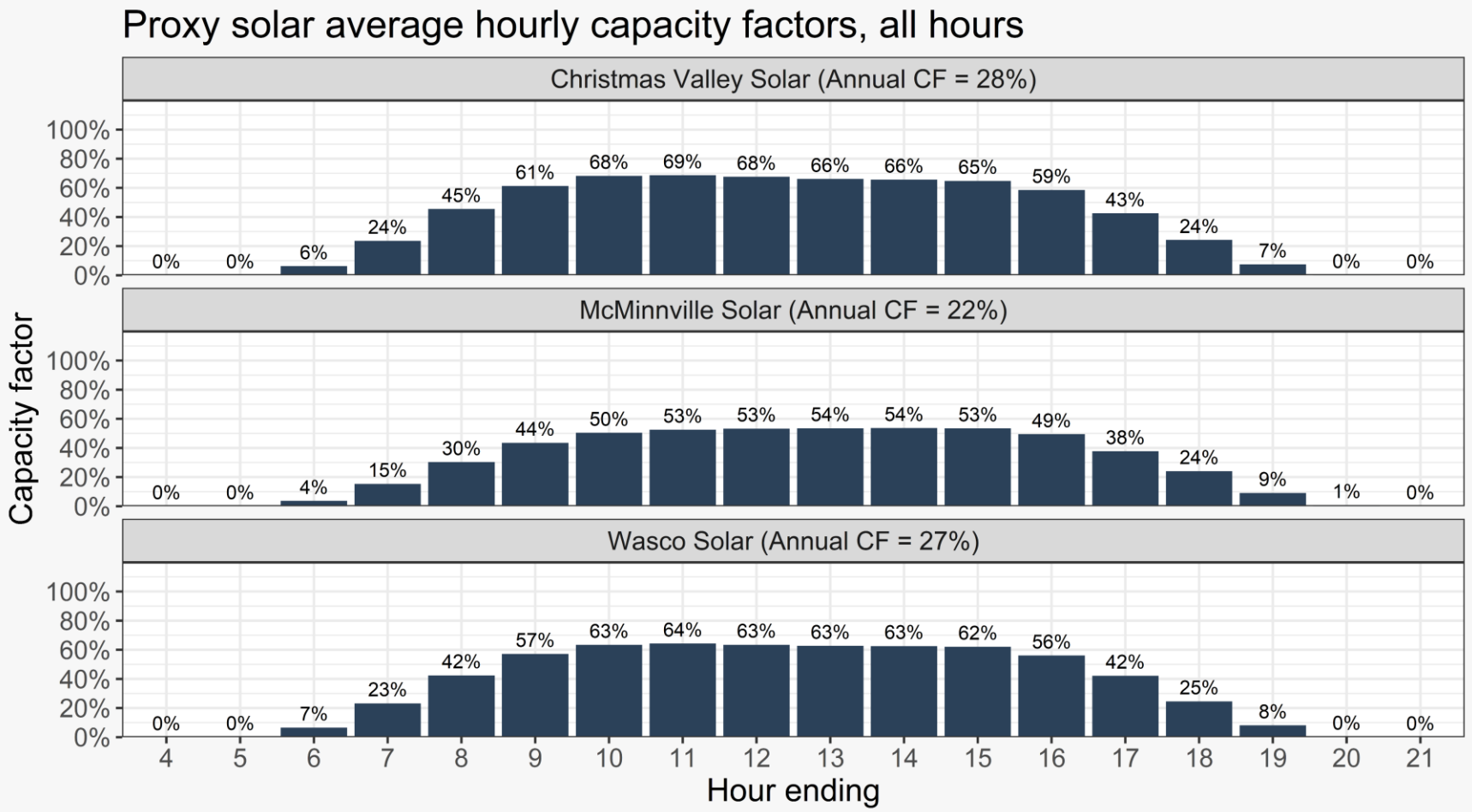
Summer: HE 18, 19, 20, 21, 22

(highlight added to hours with over 500 outages)

Values from Case One with no new solar additions

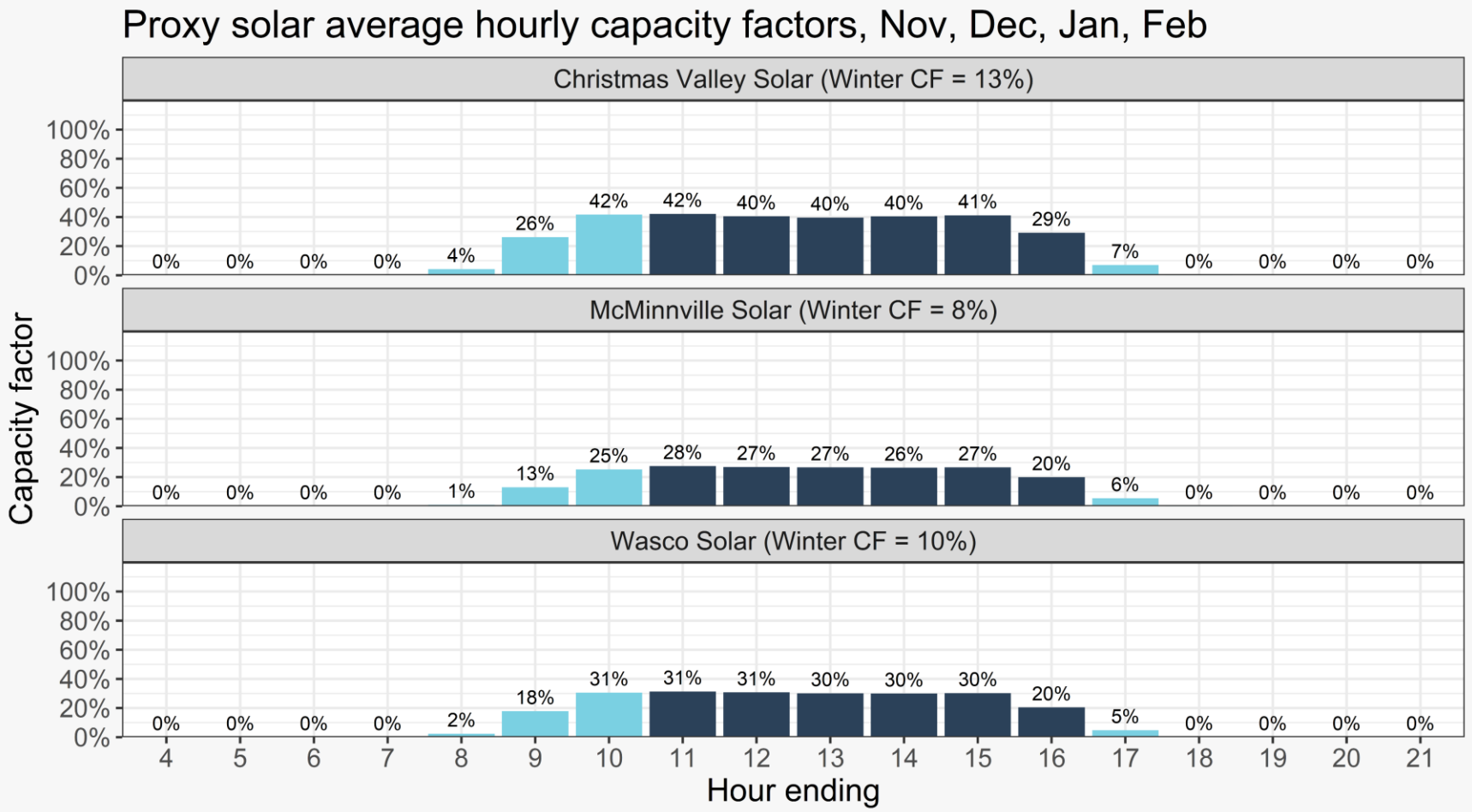


New solar shapes - Annual



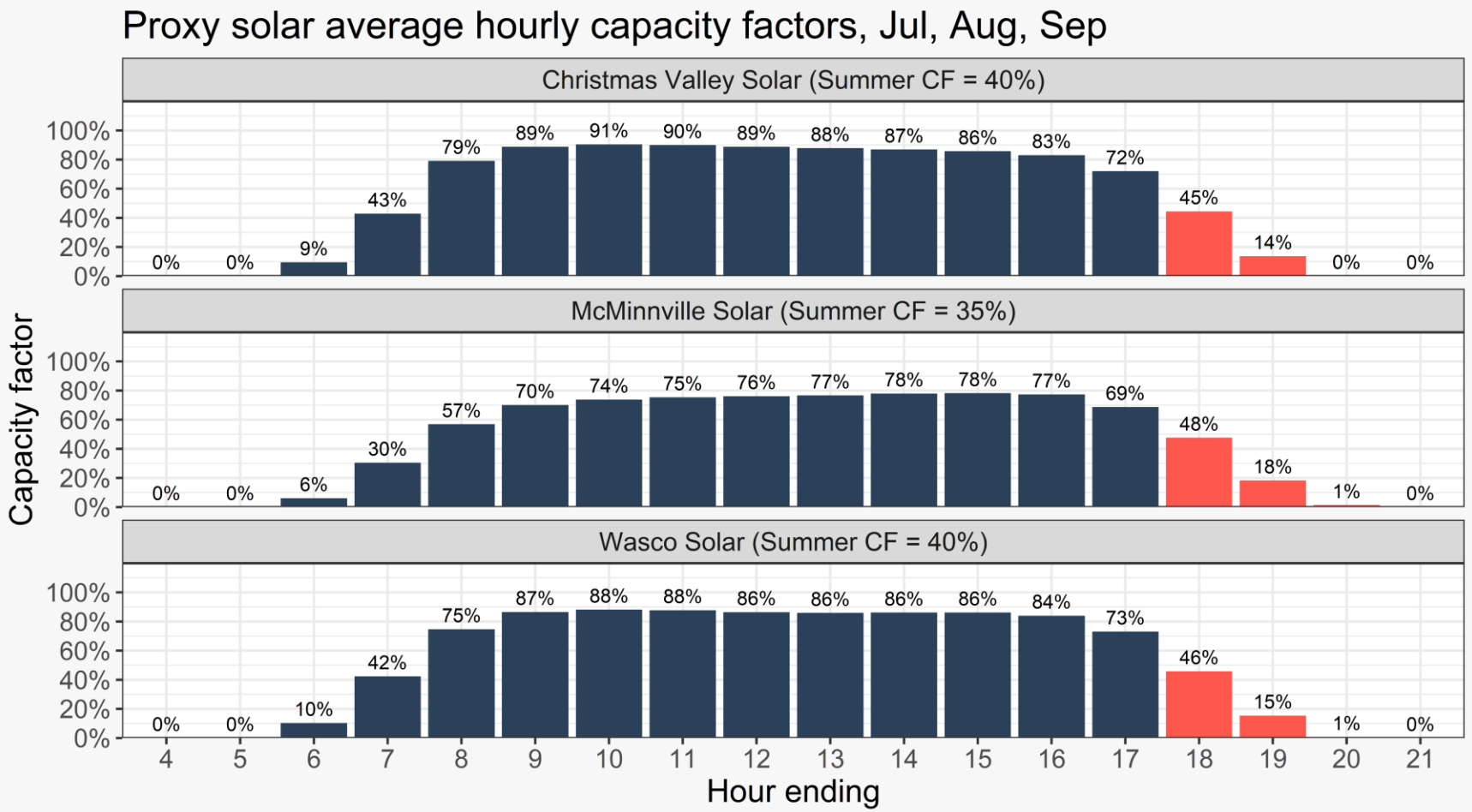
New solar shapes – Winter

In winter high outage hours Christmas Valley solar performs best



New Solar Shapes – Summer

In summer high outage hours McMinnville solar performs best

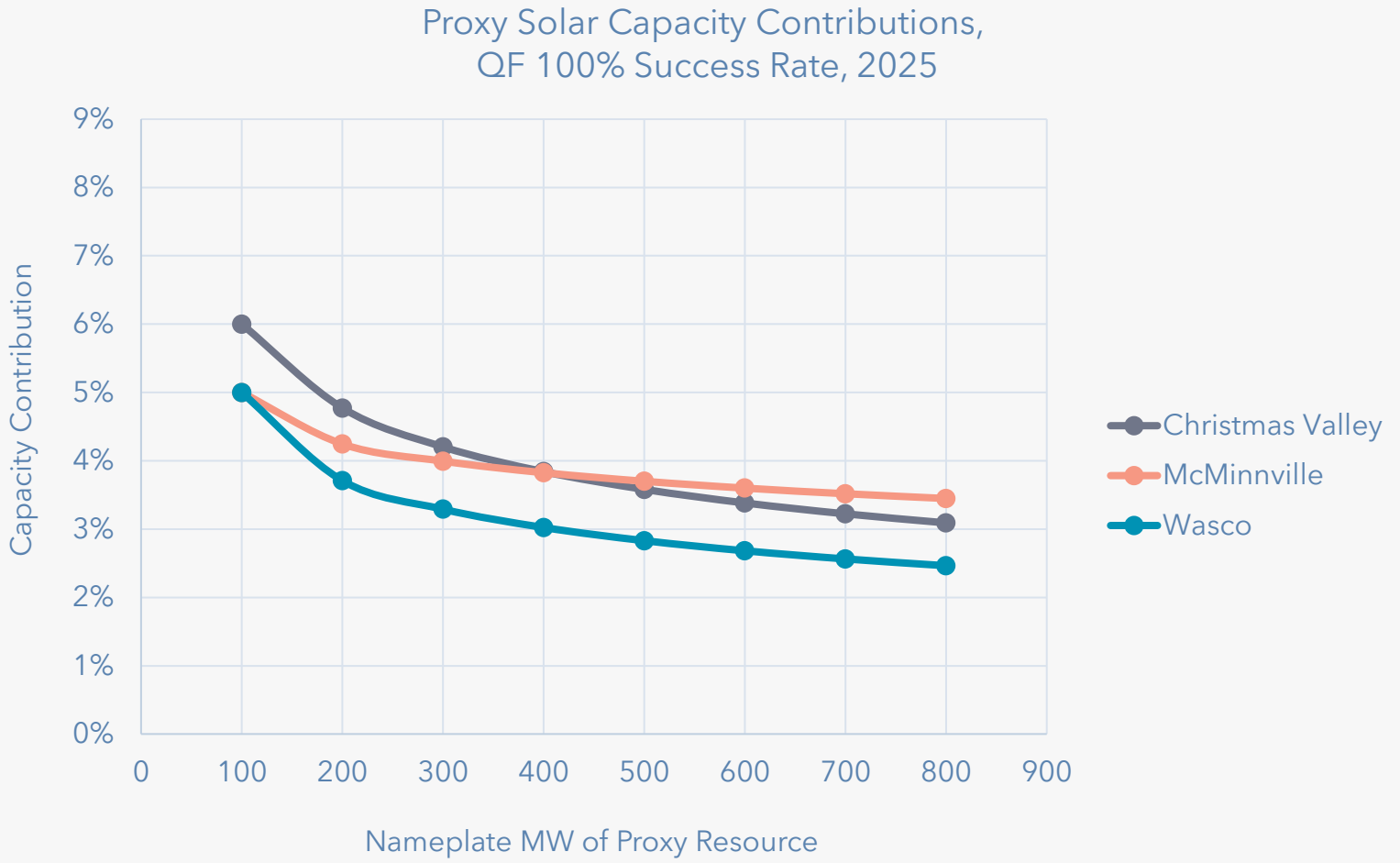


The Sun Sets in the West

- McMinnville Solar has a relatively high-capacity values in the evening hours. Its geographic location may help the resource produce slightly more power late in the day.
- Christmas Valley Solar's more southern location may increase the resources production in the winter.
- There may be other factors at play too (like cloud cover).

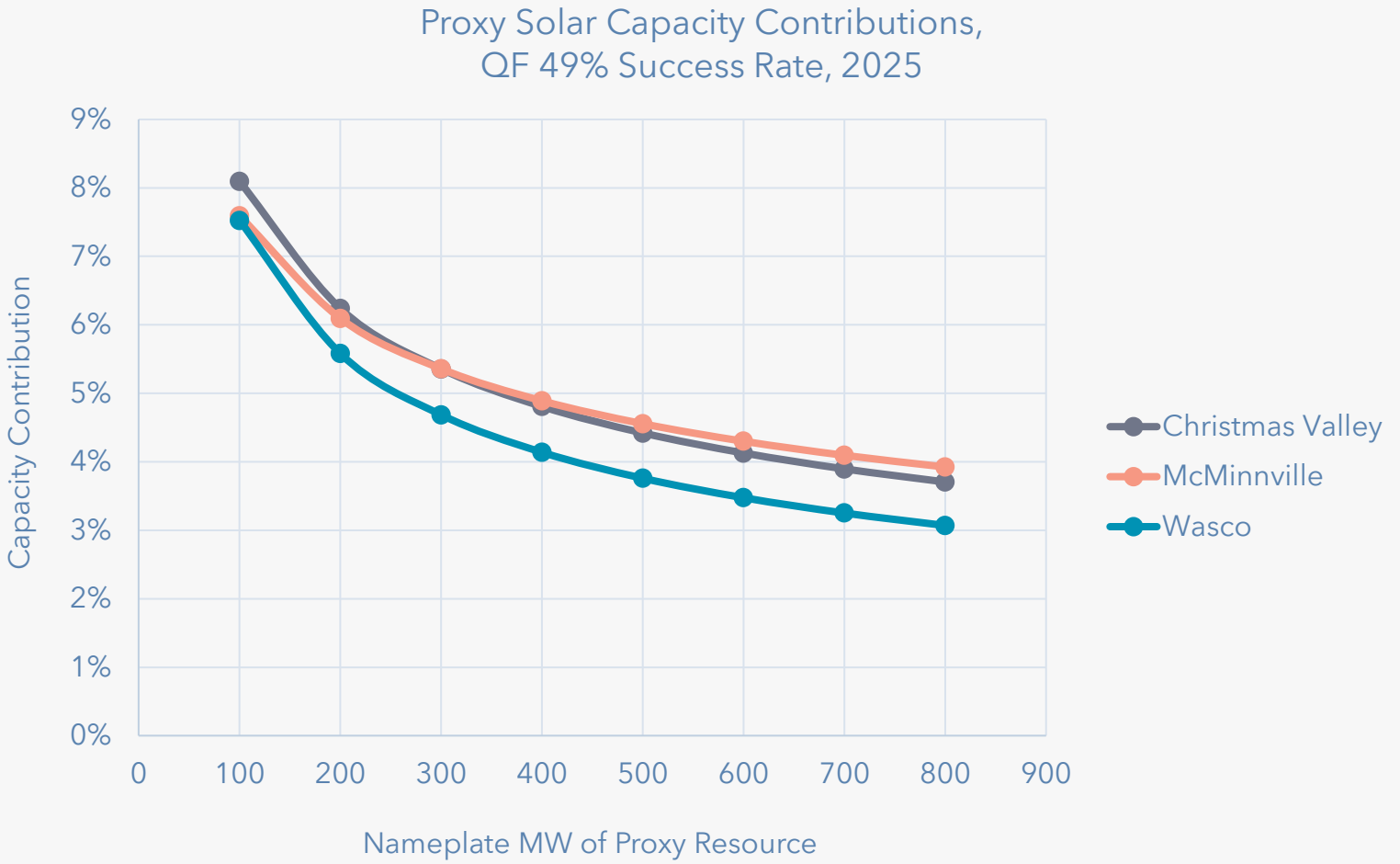
Capacity Contribution of Solar – Case One

QF case one included all online QFs + contracted QFs arriving on schedule



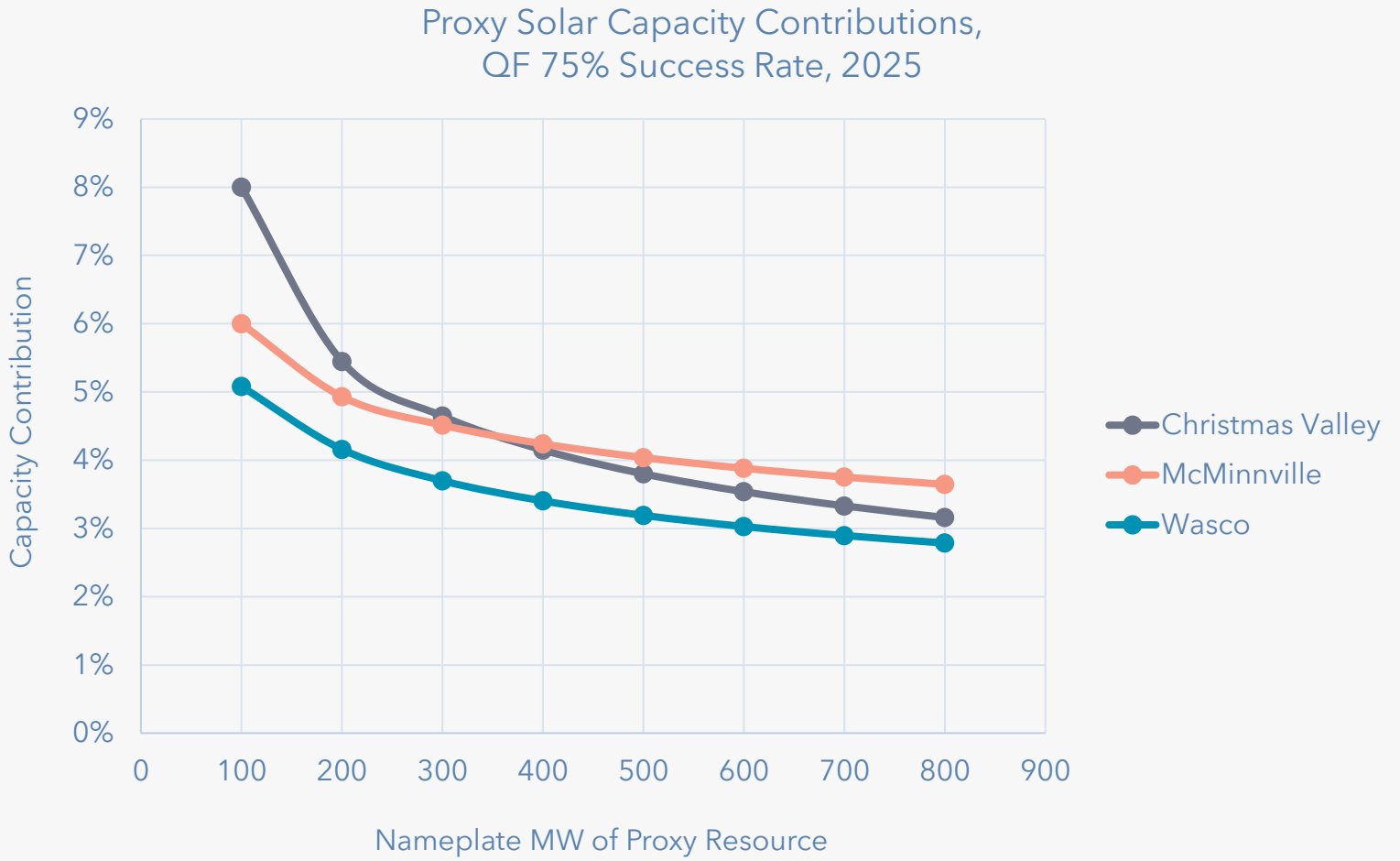
Capacity Contribution of Solar – Case Two

This sensitivity included all online QFs + contracted QFs arriving with a 49% success rate



Capacity Contribution of Solar – Case Three

This sensitivity included all online QFs + contracted QFs arriving with a 75% success rate



Capacity Contribution Results

	Case One			Case Two			Case Three		
MW Addition	Christmas Valley	McMinnville	Wasco	Christmas Valley	McMinnville	Wasco	Christmas Valley	McMinnville	Wasco
100	6.0%	5.0%	5.0%	8.1%	7.6%	7.5%	8.0%	6.0%	5.1%
200	4.8%	4.2%	3.7%	6.2%	6.1%	5.6%	5.4%	4.9%	4.2%
300	4.2%	4.0%	3.3%	5.4%	5.4%	4.7%	4.6%	4.5%	3.7%
400	3.8%	3.8%	3.0%	4.8%	4.9%	4.1%	4.1%	4.2%	3.4%
500	3.6%	3.7%	2.8%	4.4%	4.6%	3.8%	3.8%	4.0%	3.2%
600	3.4%	3.6%	2.7%	4.1%	4.3%	3.5%	3.5%	3.9%	3.0%
700	3.2%	3.5%	2.6%	3.9%	4.1%	3.3%	3.3%	3.8%	2.9%
800	3.1%	3.4%	2.5%	3.7%	3.9%	3.1%	3.2%	3.6%	2.8%

Comparison to Other NW Utilities

Organization	Resource	Capacity Contribution	Notes
Avista	Northwest solar	2.0%	2021 IRP - ELCC method
Idaho Power	Future stand alone solar	10.2%	2021 IRP - ELCC method
Northwestern Energy	Solar PV (50 MW)	12.0%	2021 Updated ELCCs (from E3)
Northwestern Energy	Solar PV (100 MW)	10.0%	2021 Updated ELCCs (from E3)
Northwestern Energy	Solar PV (200 MW)	7.0%	2021 Updated ELCCs (from E3)
Northwestern Energy	Solar PV (300 MW)	6.0%	2021 Updated ELCCs (from E3)
PacifiCorp	Idaho Falls Solar (1 MW)	28.0%	2021 IRP - CF method
PacifiCorp	Lakeview (OR) Solar (1 MW)	39.0%	2021 IRP - CF method
PacifiCorp	Milford (UT) Solar (1 MW)	32.0%	2021 IRP - CF method
PacifiCorp	Yakima (WA) Solar (1 MW)	25.0%	2021 IRP - CF method
PacifiCorp	Rock Springs (WY) Solar (1 MW)	30.0%	2021 IRP - CF method
Puget Sound Energy	Lund Hill Solar (added first)	8.3%	2021 IRP - ELCC method
Puget Sound Energy	WY East Solar (400 MW)	6.3%	2021 IRP - ELCC method
Puget Sound Energy	WY West Solar (400 MW)	6.0%	2021 IRP - ELCC method
Puget Sound Energy	ID Solar (400 MW)	3.4%	2021 IRP - ELCC method
Puget Sound Energy	WA East Solar (100 MW)	4.0%	2021 IRP - ELCC method
Puget Sound Energy	WA West Solar (100 MW)	1.2%	2021 IRP - ELCC method

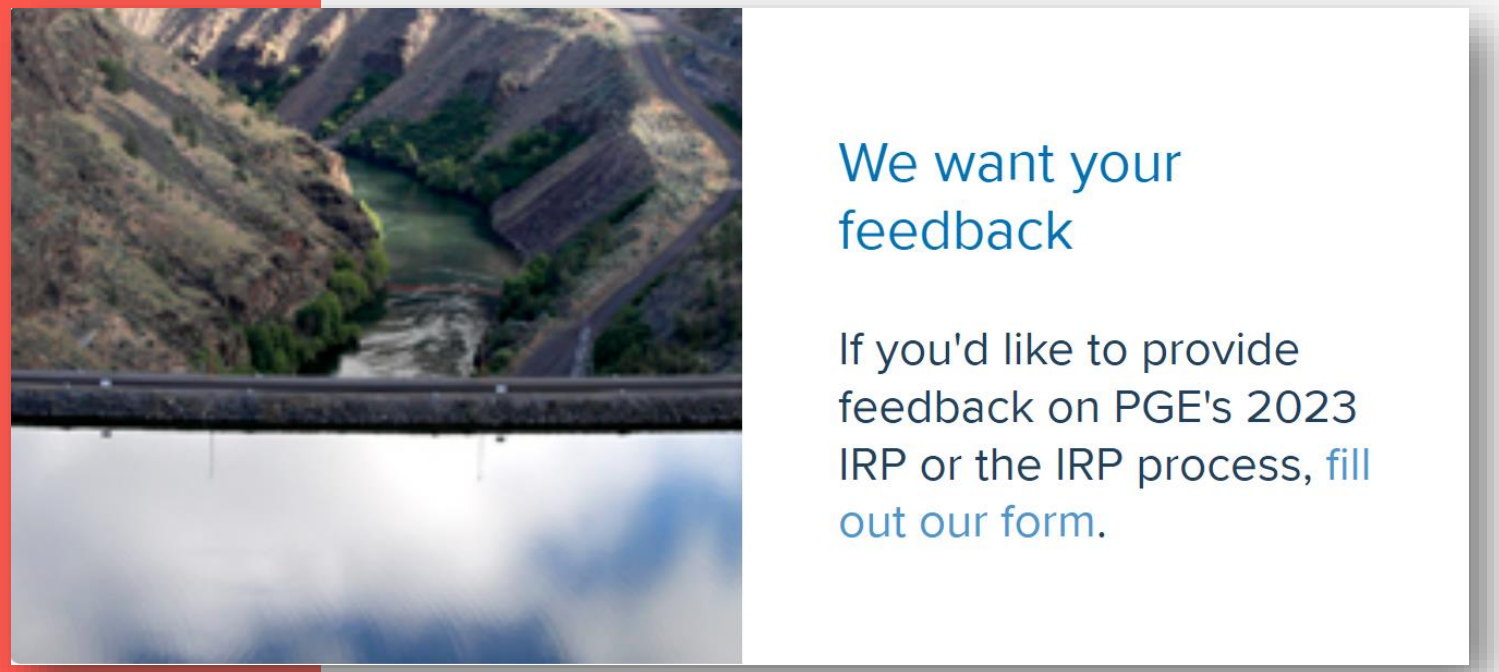
QUESTIONS/ DISCUSSION?

NEXT STEPS

A recording from today's webinar will be available in one week

Upcoming Roundtables:
April 14
May 19
June 30
July 21
August 18
September 15
October 20
November 16
December 15

STAKEHOLDER FEEDBACK



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THANK YOU

CONTACT US AT:
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