Integrated Resource Planning

ROUNDTABLE 22-7

AUGUST 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 or here:

Click here to join the meeting

Or join by entering a meeting ID
Meeting ID: 239 994 825 841
Passcode: TPmE35

*Please use Microsoft Edge or Google Chrome with Teams as it will give you the best experience

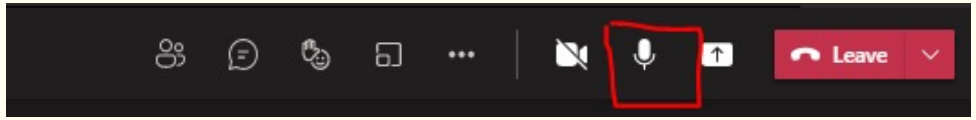
Or join by phone

+1 971-277-2317 (dial this number from your phone for best results)

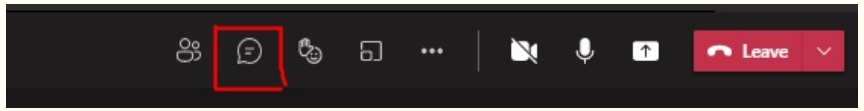
PW: 514 132 568#

PARTICIPATION

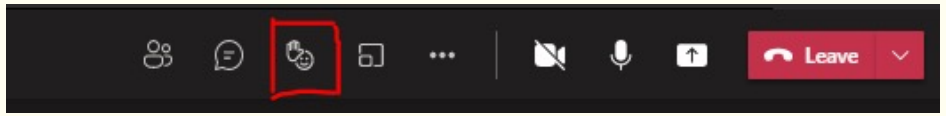
- Mute your mic while others are speaking; to unmute via phone press *6



- 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 and introductions	15 minutes
Safety moment	5 minutes
Transmission Inventories	30 minutes
Hybrid Resource Locations	10 minutes
Draft Supply Side ELCC values	45 minutes
Draft Energy-Load Resource Balance	30 minutes

SAFETY MOMENT

Contrary to popular belief, the human brain cannot multitask. Driving and talking on a cell phone are two thinking tasks that involve many areas of the brain. Instead of processing both simultaneously, the brain rapidly switches between two cognitive activities.

Take the classic example of the act of walking and chewing gum. There is a common misconception that because people appear to simultaneously do both that they can just as easily talk on their cell phones and drive safely at the same time.

The truth is that walking and chewing gum involve a **thinking** task and a **non-thinking** task.

Conversation and driving are **both thinking** tasks.

[130401-NSC-TheGreatMultitaskingLie-FINAL copy (hsewebsite.com)]

TRANSMISSION INVENTORIES

Seth Wiggins

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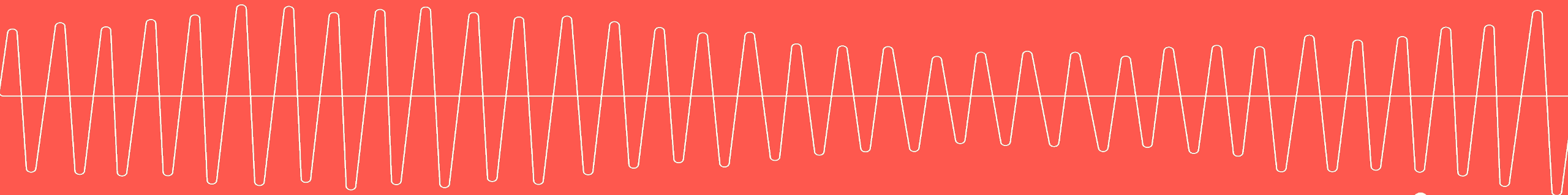

PGE

Transmission in 2023 IRP

Previous IRPs included physical transmission constraints limiting zonal energy transfer in price forecasting

- Generic off-system resources assumed to have all necessary transmission

The 2023 IRP seeks to incorporate the current contractual transmission landscape

- Generic off-system resource additions will be constrained by the long-term posted transmission capacity that is available as of June 2022
- Resource capacity contributions will reflect the applicable transmission quality

Methods to determine available transmission were discussed at the April 2020 and March 2021 roundtable meetings (links below)

March 2021: https://assets.ctfassets.net/416ywc1laqmd/FYE0Gf8xbQgPZ4To88oZx/9f46ea7c1b93f55c1a0188160273880f/irp-roundtable-march-21-2.pdf

April 2020: https://assets.ctfassets.net/416ywc1laqmd/5KMI0Fqc36iRGIA4FvYHv8/1775a0f32fb5014a4a8cc17dd44ffc6f/2020-04-irp-roundtable-20-2.pdf

Available Transmission Inventories

Using the most recent data, we are incorporating the following quantities of available BPA transmission (links below)

These values represent the total MW additions that are available to be added to our system in 2026

A constraint has been added to ROSE-E to prevent any off-system additions past these values

Table Removed: We are reevaluating both the calculations and presentation of the information previously contained here

Long-Term Firm (LTF) Availability: https://www.bpa.gov/-/media/Aep/transmission/transmission-availability/atc-less-pending.xlsx
Available Transfer Capability: https://www.bpa.gov/-/media/Aep/transmission/transmission-availability/long-term-atc.xlsx
Average Flowgate Inventory: https://www.bpa.gov/-/media/Aep/transmission/transmission-availability/short-term-ptdf-table.xlsx

QUESTIONS/ DISCUSSION?

HYBRID RESOURCE LOCATIONS

Tomás Morrissey

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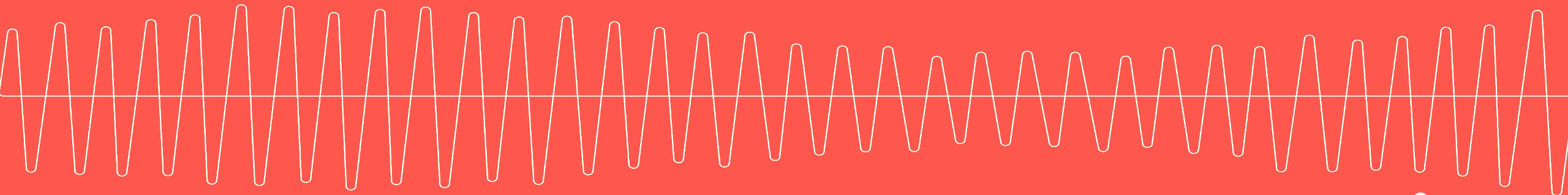

Evaluating Two Hybrid Resources

Hybrid resources combine solar and/or wind with storage. For the 2023 IRP we are testing two configurations:

1. DC-coupled solar (1.50 ILR) + storage with 1:1 solar to battery ratio
2. DC-coupled solar (1.50 ILR) + storage with 2:1 solar to battery ratio

The solar generation profile, and many other characteristics, are based on the NREL SAM model and Benchmark reports

Two Hybrid Resource Locations

- McMinnville is used since it has firm transmission
- Christmas Valley is used since it has the highest capacity factor of Oregon located solar shapes tested

QUESTIONS/ DISCUSSION?

DRAFT SUPPLY SIDE ELCC VALUES

Tomás Morrissey

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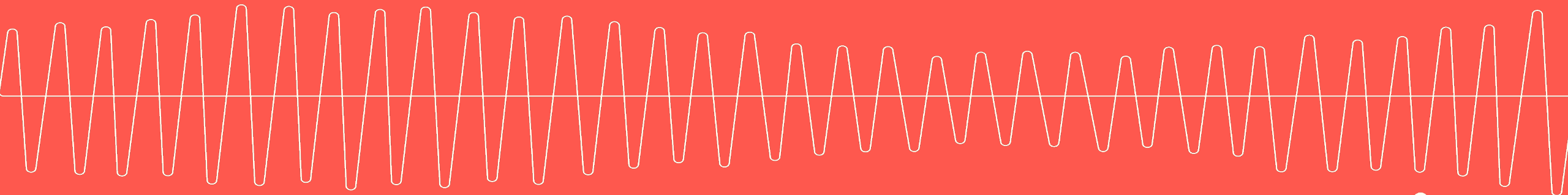


PGE

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 a seasonal (winter/summer) 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

What is ELCC?

- Estimated load carrying capability (ELCC) is a measure of how much capacity a resource provides. It is commonly expressed as a percent of the nameplate MW of a resource added

- As more resource is added, we tend to see flat or decreasing ELCCs in percentage terms, and flat or increasing capacity contribution

$$ELCC(\%) = \frac{Capacity\ contribution\ (MW)}{Resource\ nameplate\ (MW)}$$

Nameplate	Capacity contribution	ELCC
100	54	54%
200	95	48%
300	125	42%
400	152	38%
500	174	35%

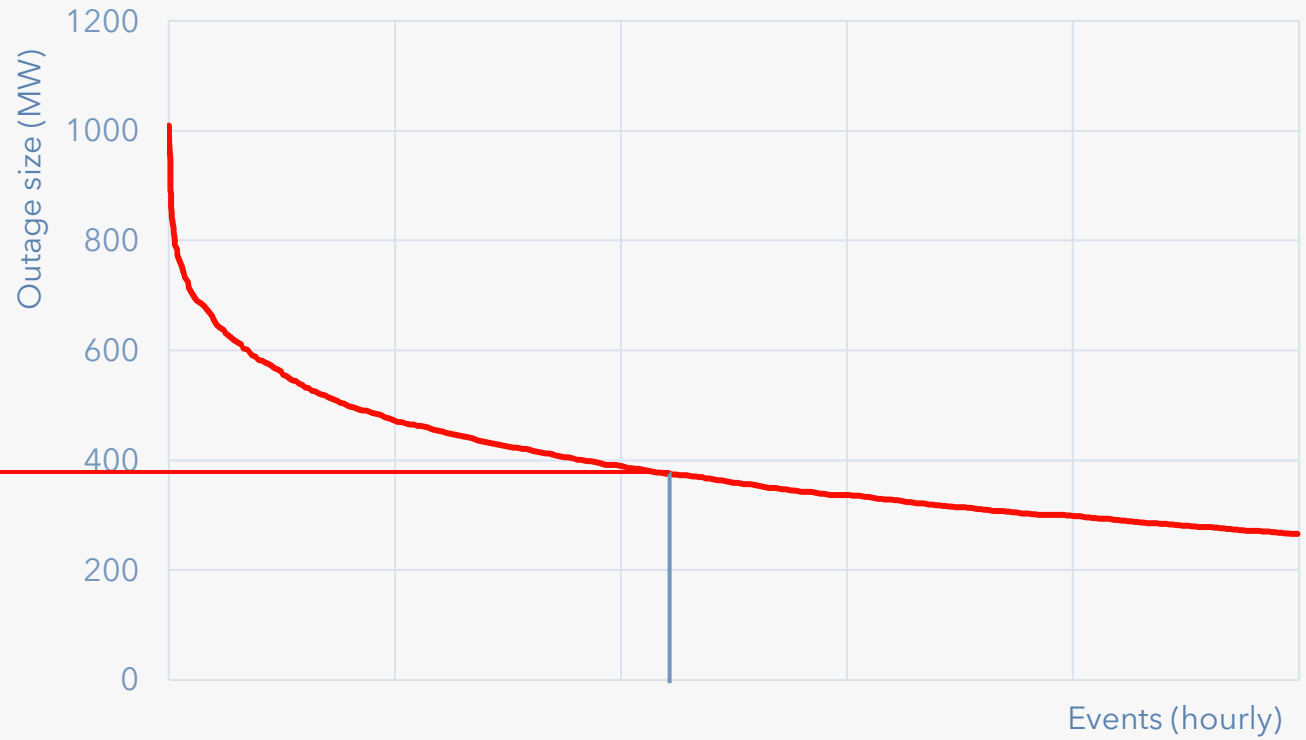
Where Does ELCC Get Used?

Sequoia calculates ELCC values running thousands of stochastic simulations for proxy resources

ROSE-E uses ELCCs values, in conjunction with capacity needs, to make sure it is selecting enough capacity to be resource adequate

Sequoia – Capacity Need Math

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



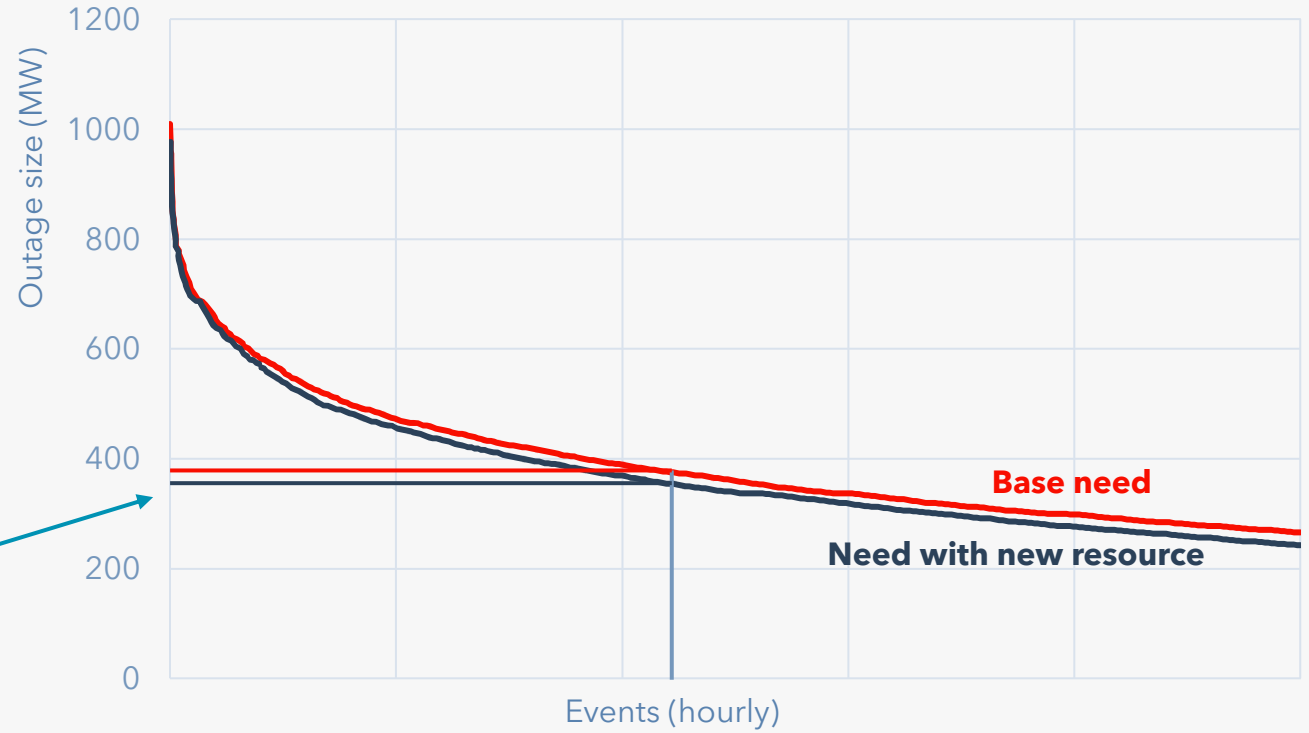
Model calculates number of outage hours in simulation that match our 2.4 LOLH target

Illustrative example

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 example 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%



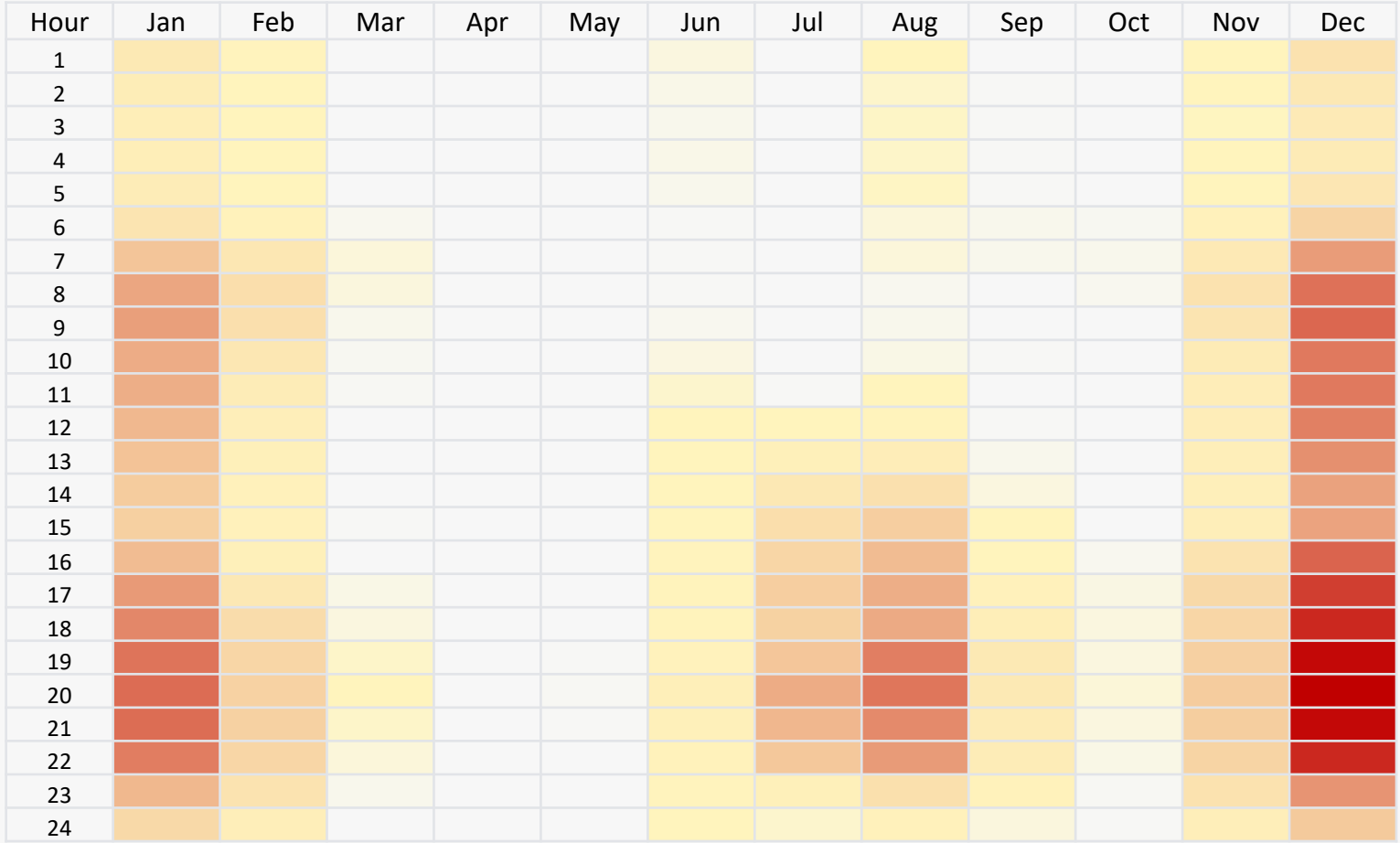
Illustrative example

Current 2026 Outage Heatmap

We are evaluating ELCCs in year 2026 in this presentation

The system has similar capacity needs by season (761 MW in summer, 863 MW in winter), but more outage hours in winter

This system has higher capacity needs than the 2019 IRP Update ELCC year (year 2025, need of 511 MW)



Draft values

Current Transmission Options

Firm Transmission

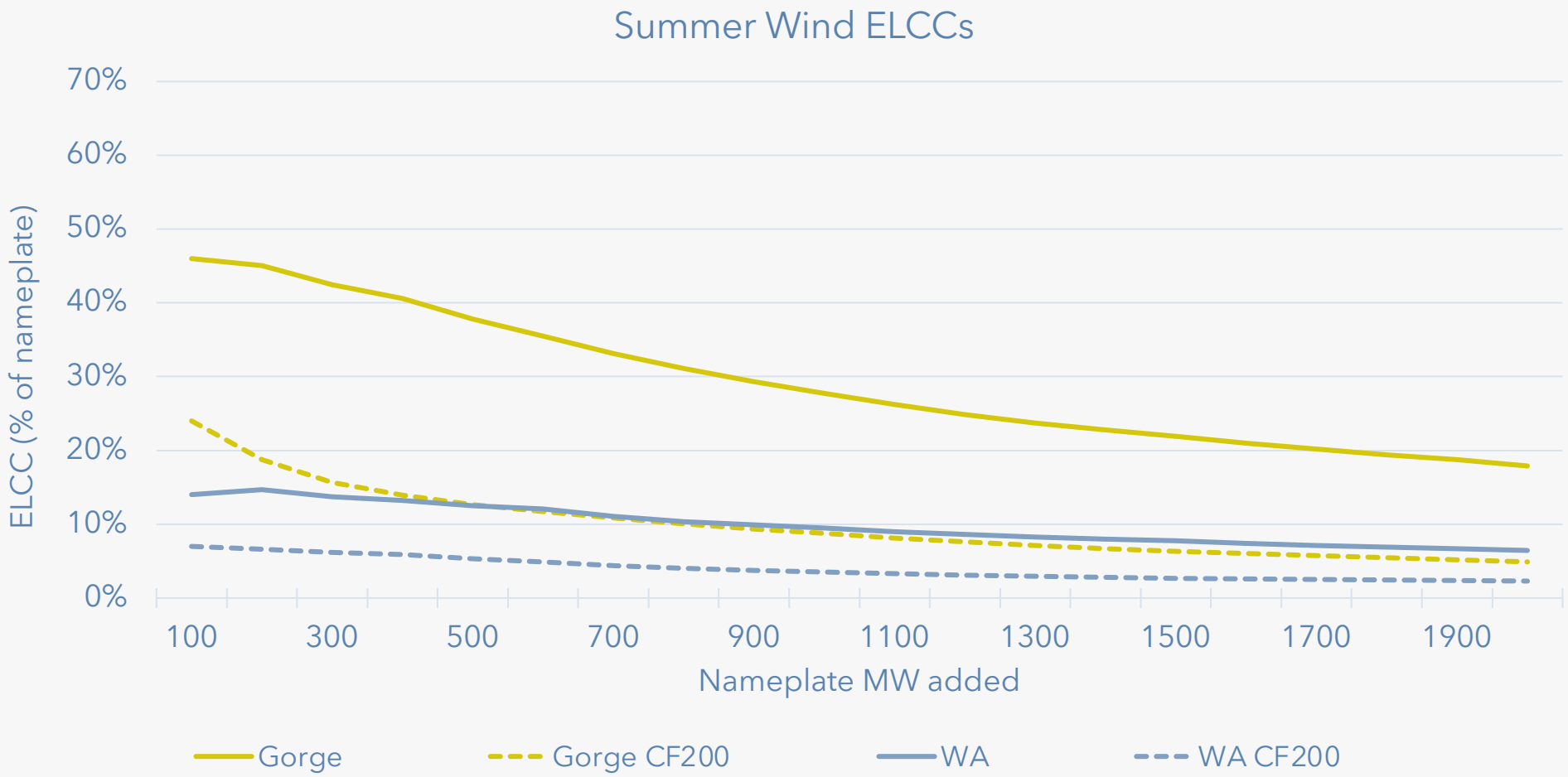
This product assumes 100% transmission availability. If the resource is generating power, all the output is available to the system.

200hr Conditional Firm Transmission

This product assumes lack of transmission during this highest 200 load hours per year. This means that during the highest 200 load hours of the year the resource is essentially not available (even if it is generating). This negatively impacts ELCCs values compared to firm transmission all other factors equal.

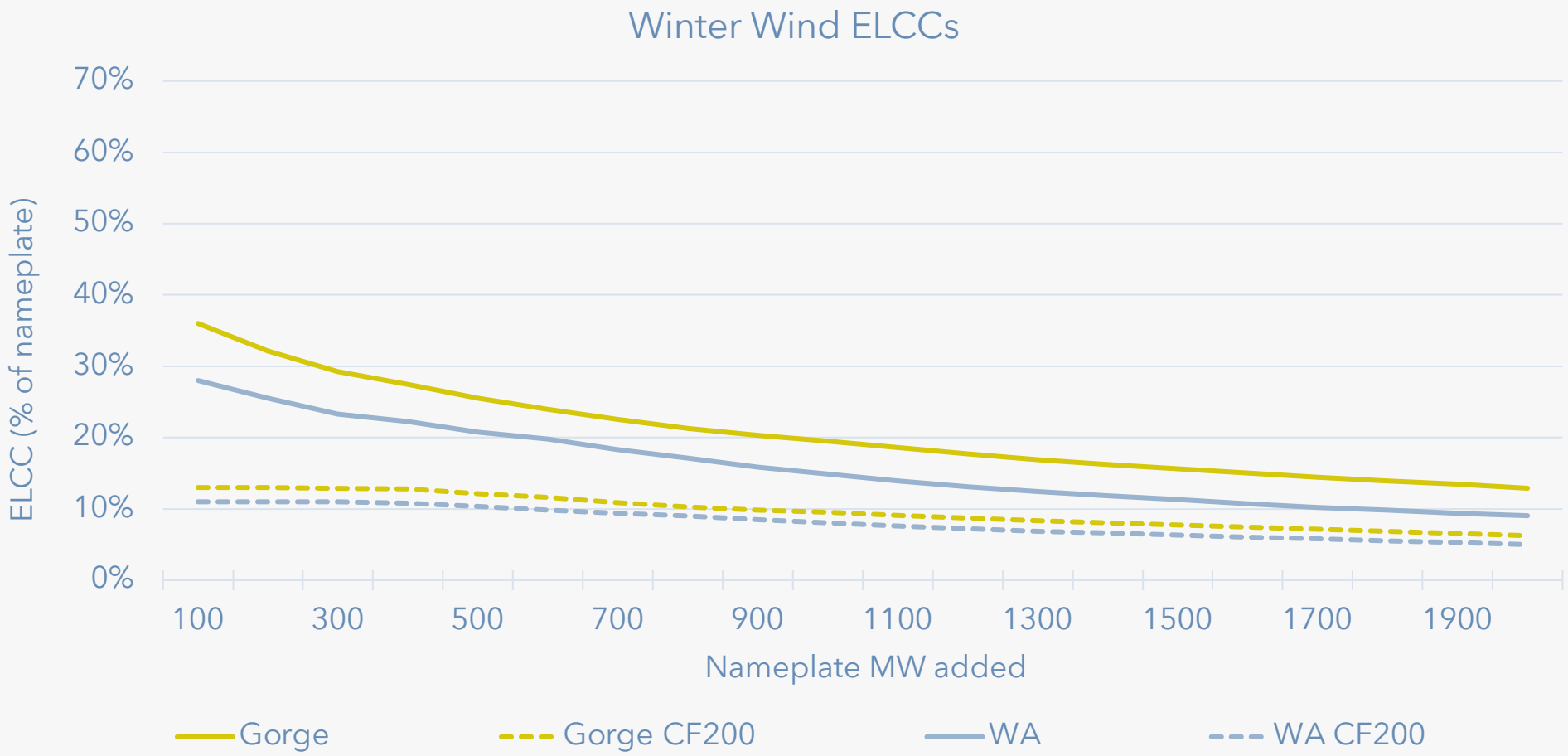
In the IRP, transmission product selection is based on PGE transmission availability

Wind ELCCs – Summer OR & WA



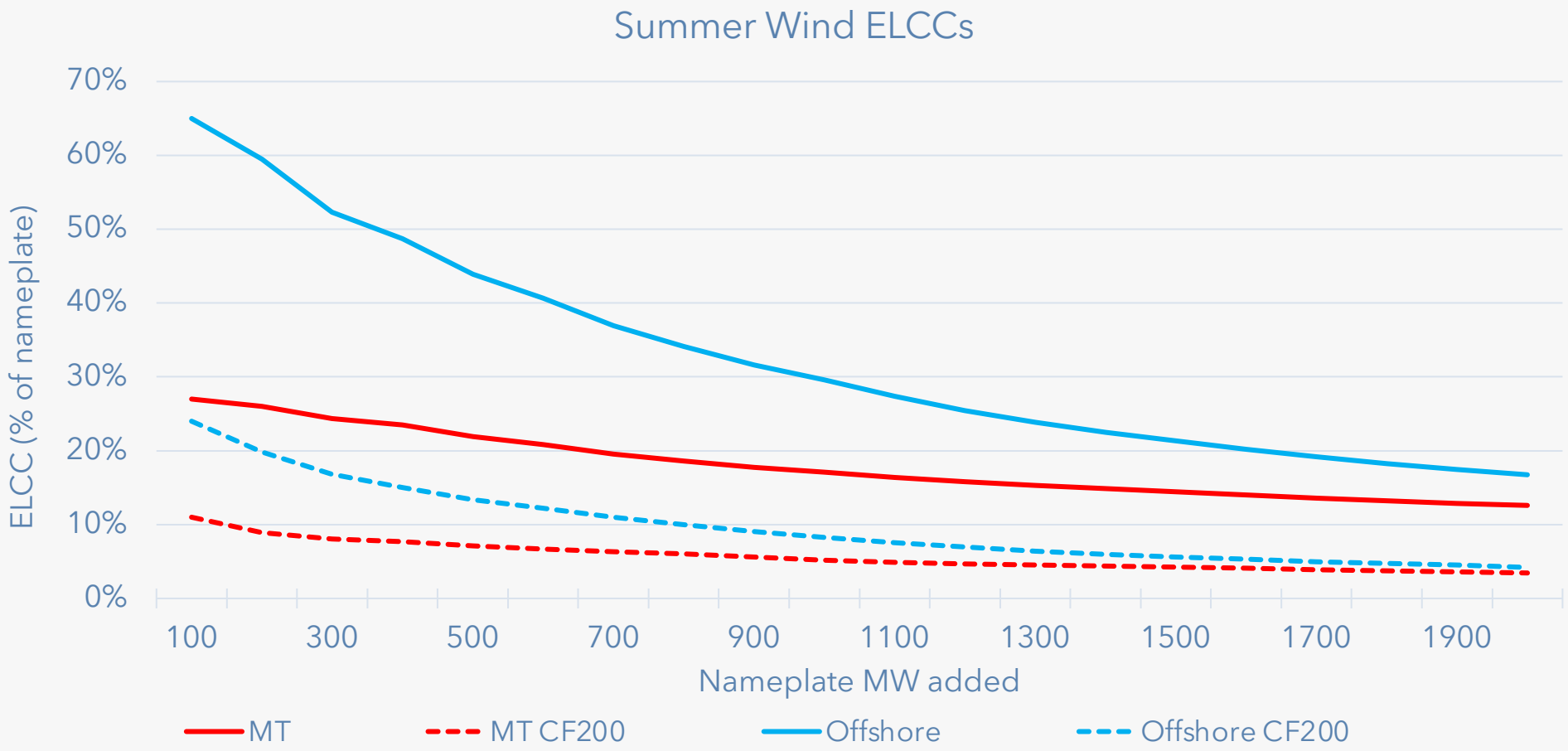
Draft values

Wind ELCCs – Winter OR & WA



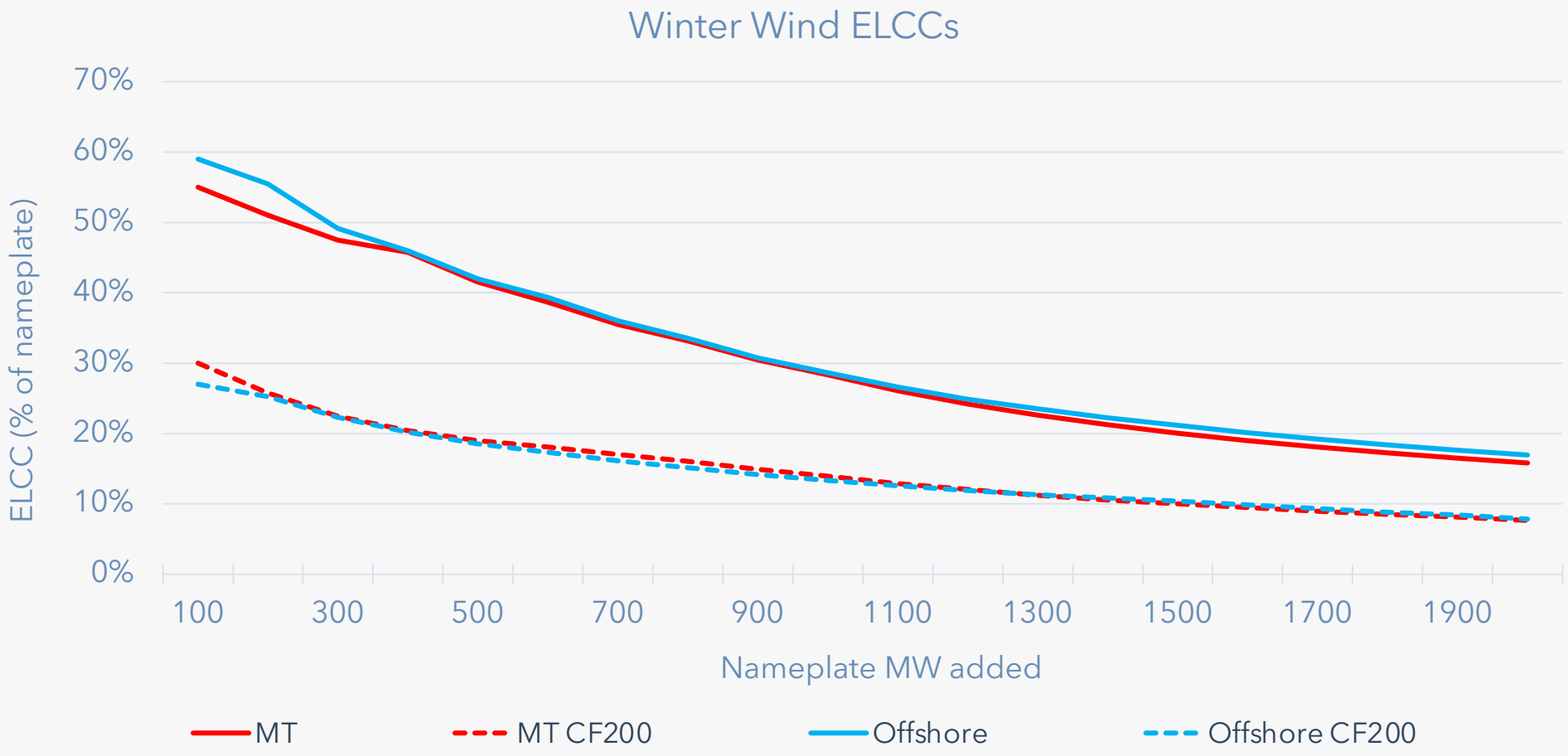
Draft values

Wind ELCCs – Summer MT & Offshore



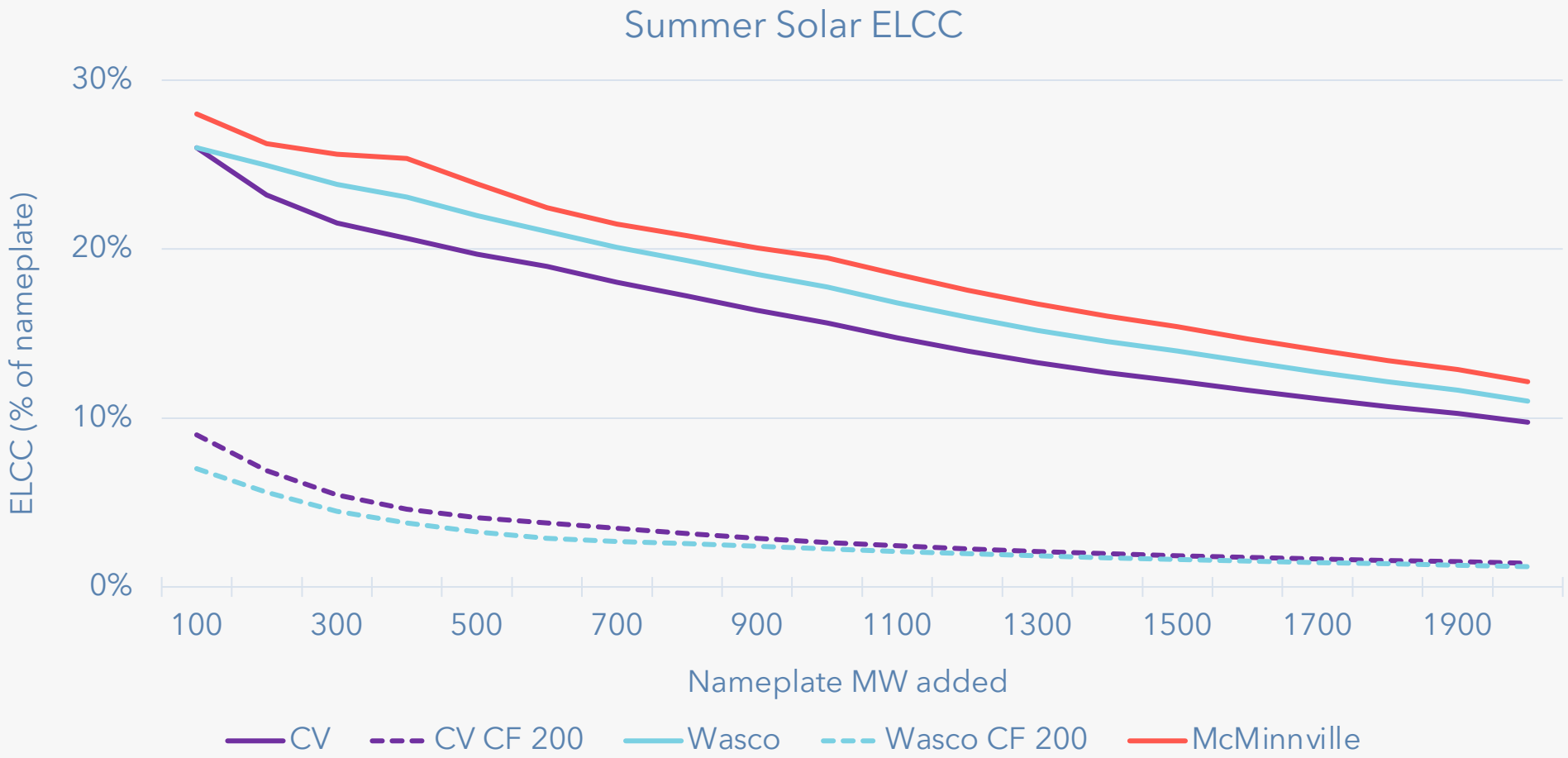
Draft values

Wind ELCCs – Winter MT & Offshore



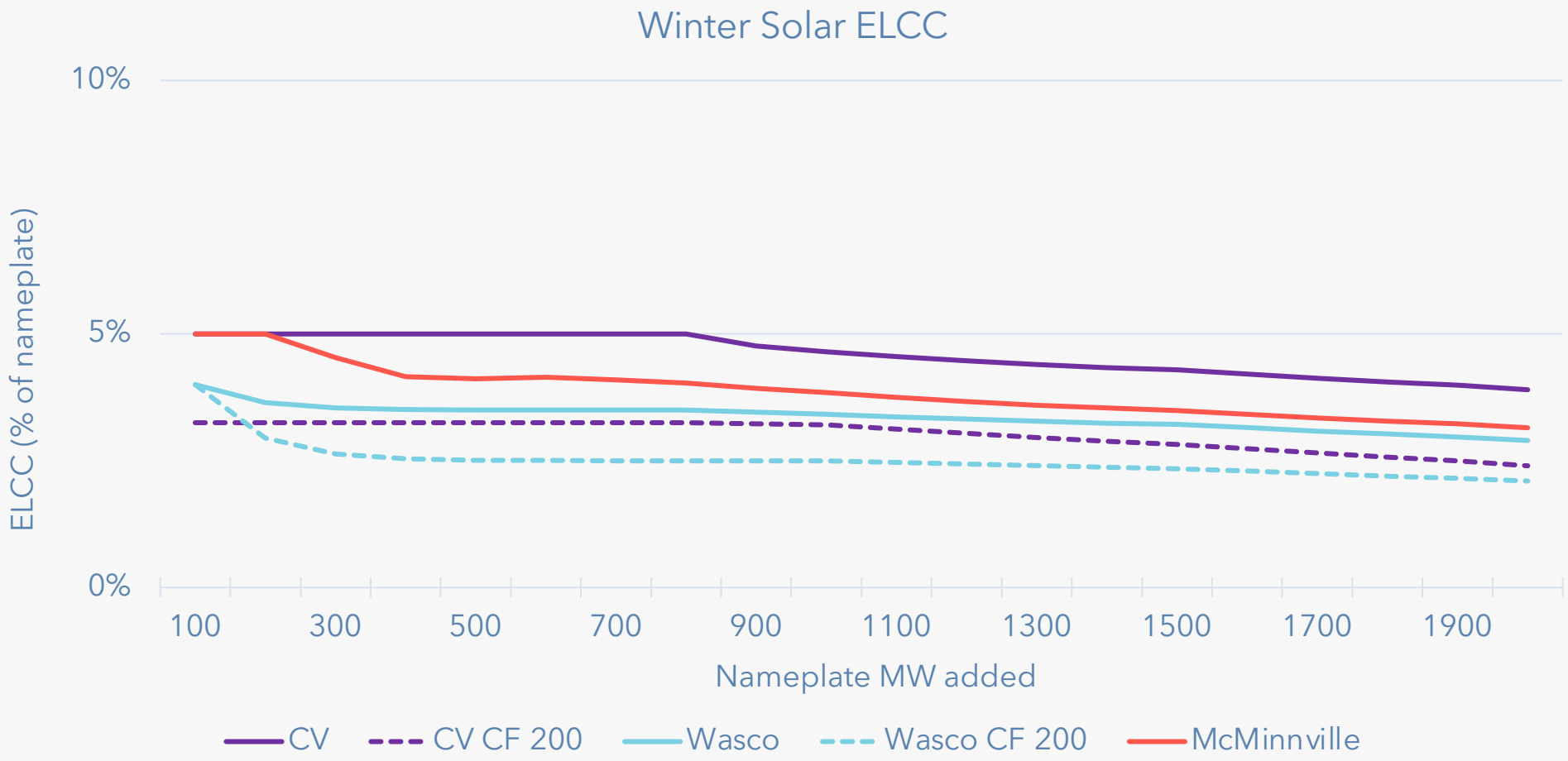
Draft values

Solar ELCCs – Summer



Draft values

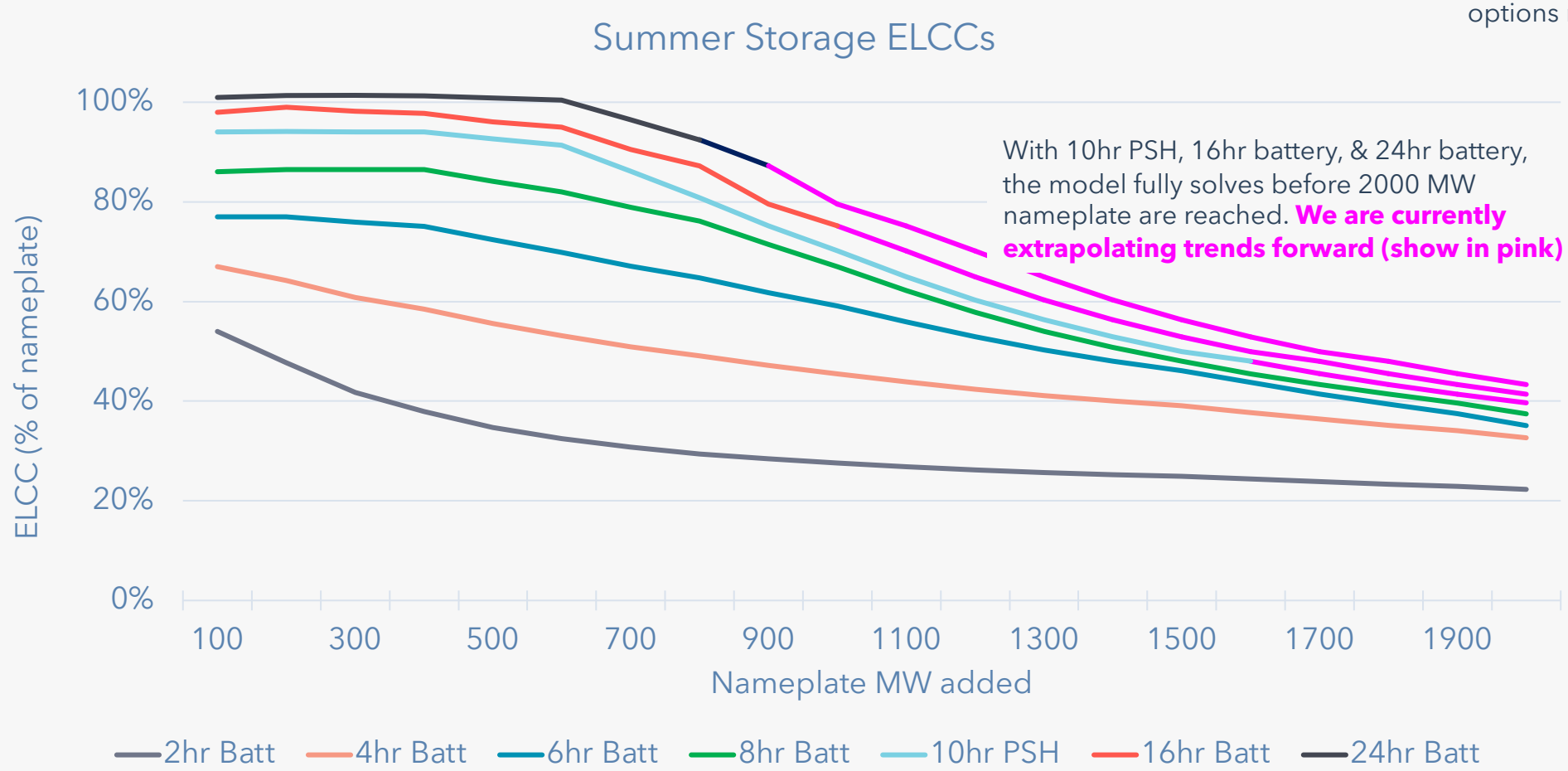
Solar ELCCs – Winter



Draft values

Storage ELCCs – Summer

All battery storage options modeled as lithium ion

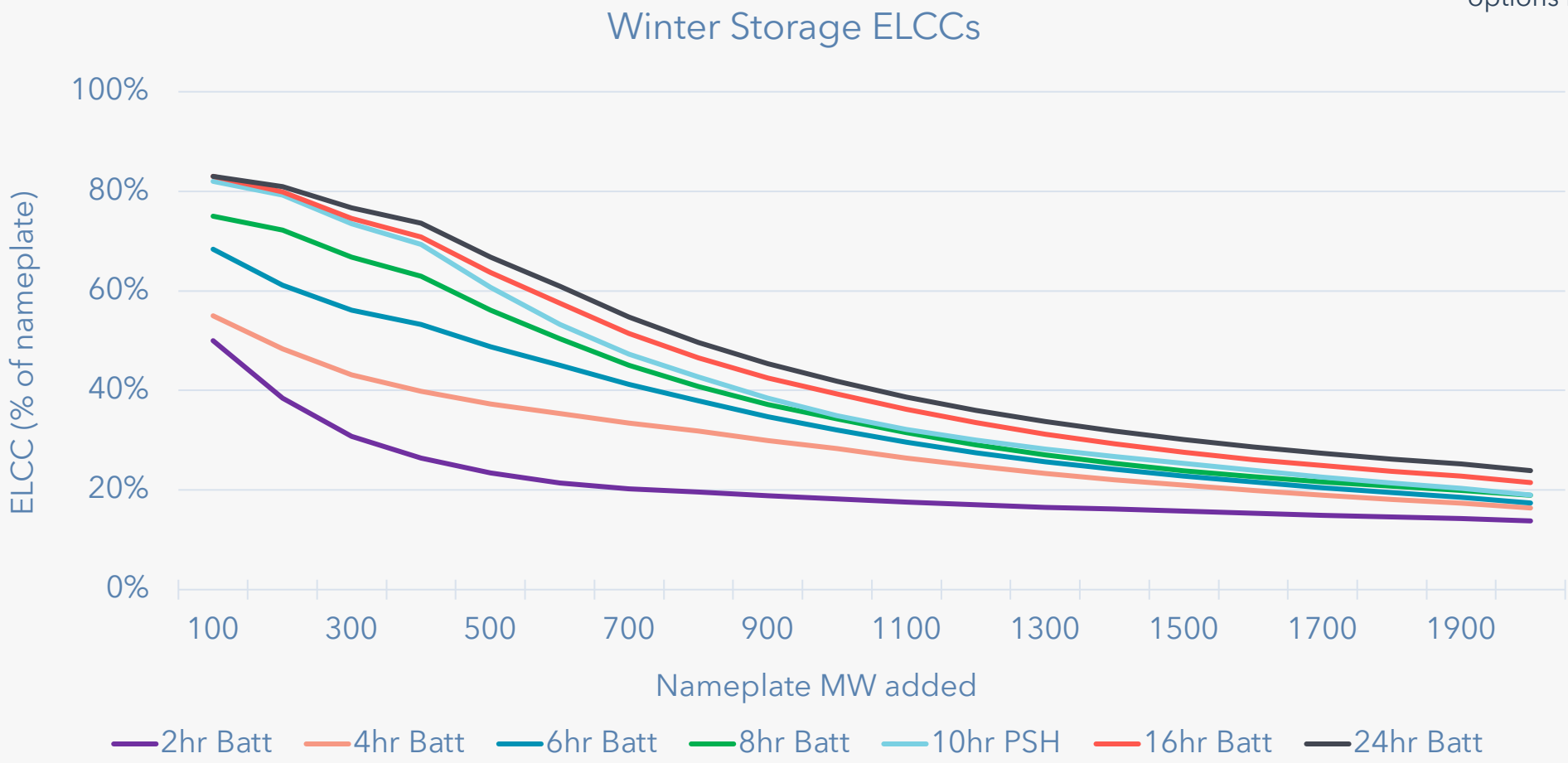


With 10hr PSH, 16hr battery, & 24hr battery, the model fully solves before 2000 MW nameplate are reached. **We are currently extrapolating trends forward (show in pink)**

Draft values

Storage ELCCs – Winter

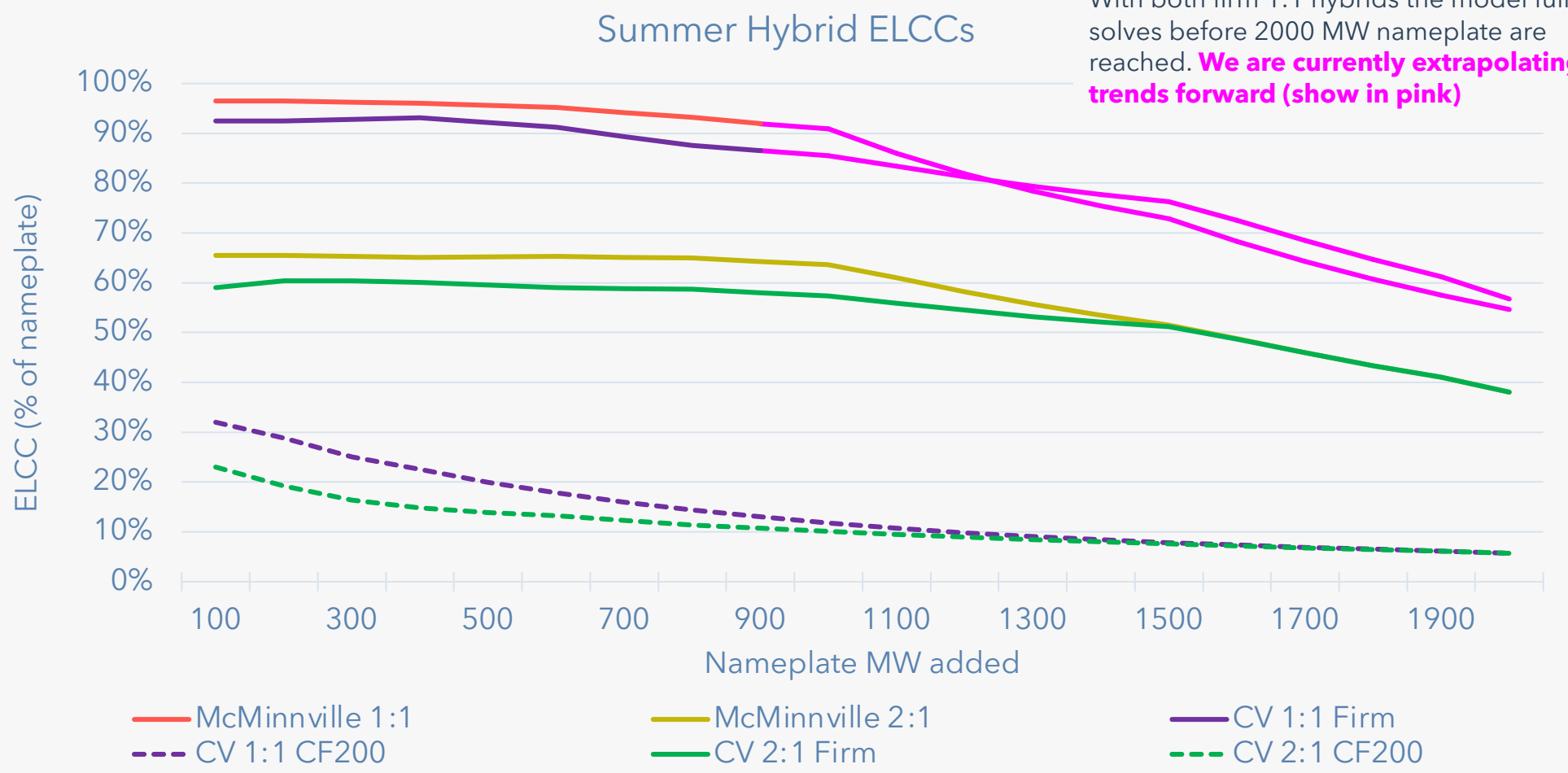
All battery storage options modeled as lithium ion



Draft values

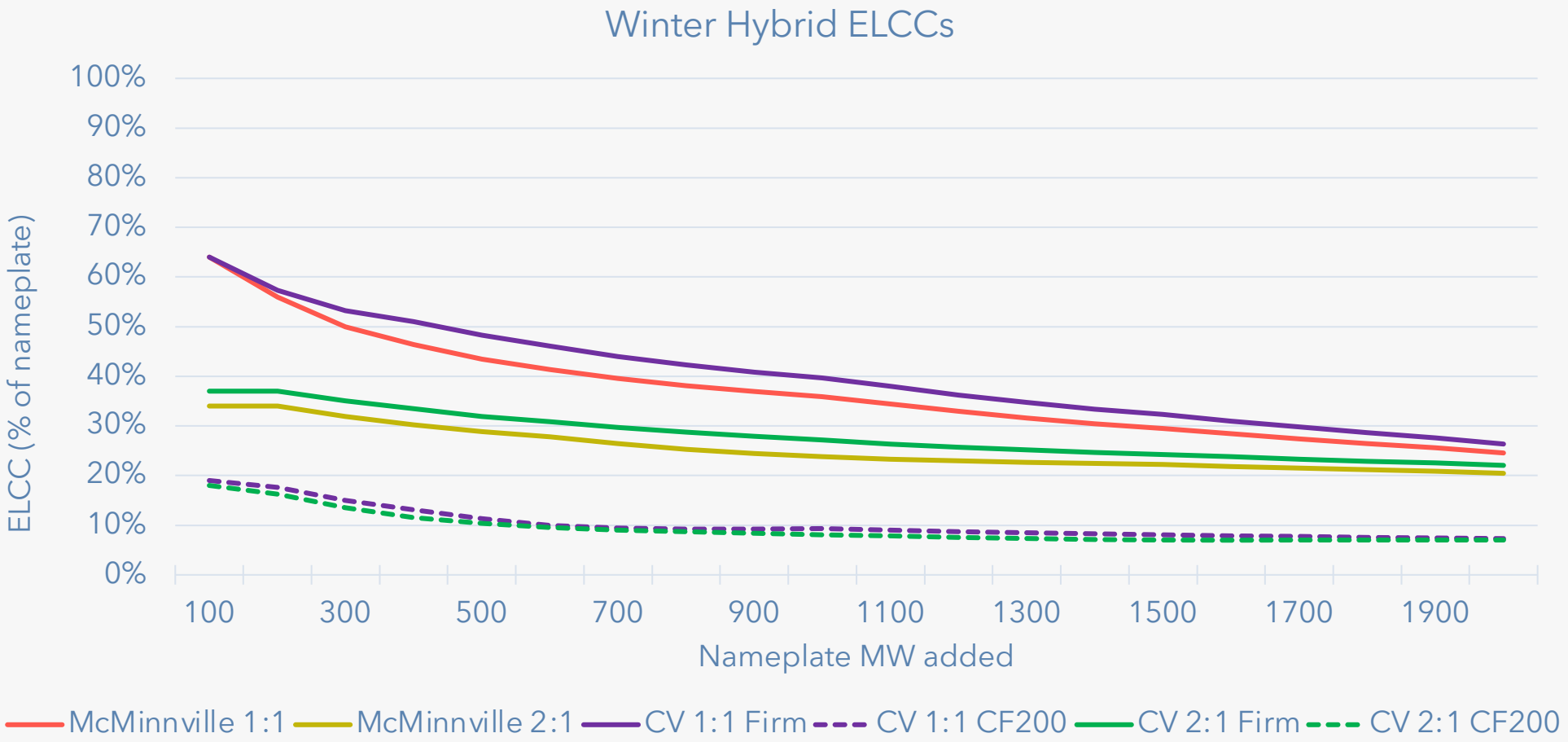
Hybrid ELCCs – Summer

With both firm 1:1 hybrids the model fully solves before 2000 MW nameplate are reached. **We are currently extrapolating trends forward (show in pink)**



Draft values

Hybrid ELCCs – Winter



Draft values

QUESTIONS/ DISCUSSION?

DRAFT ENERGY-LOAD RESOURCE BALANCE

Seth Wiggins

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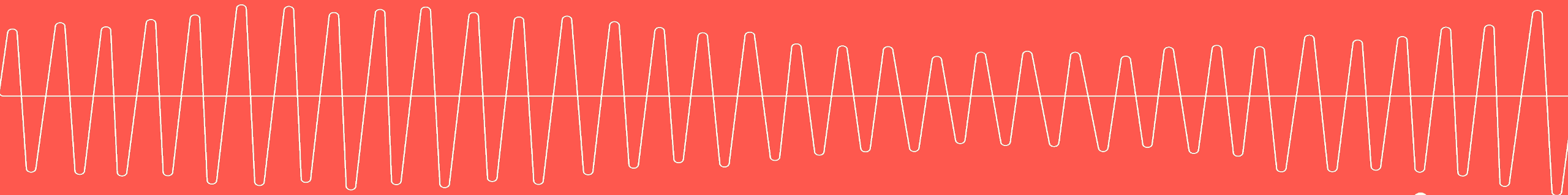
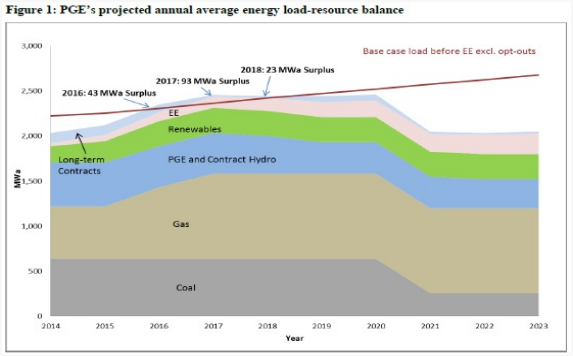


Energy-Load Resource Balance (ELRB)

The ELRB is a method of displaying our energy position

- PGE has included an updated ELRB in each IRP/IRP Update
- The 2019 IRP also introduced the Market Energy Position (MEP)
- The calculation of our energy position was discussed in our June 2021 Roundtable
- The construction of our need futures was discussed in our July 2022 Roundtable

2013 IRP

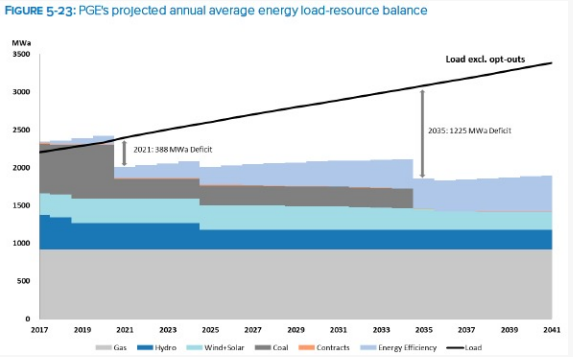


2019 IRP ELRB

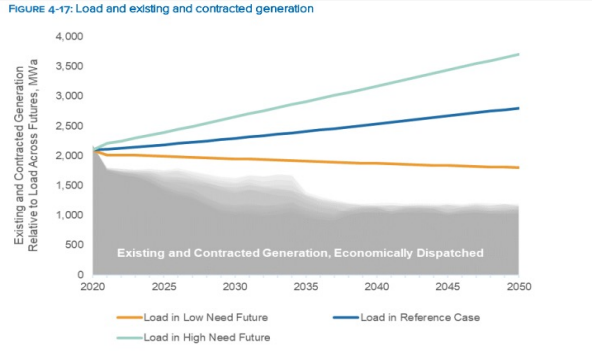
TABLE G-3: PGE's projected annual average energy load-resource balance, MWa

	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
Gas	945	945	945	945	945	945	945	945	945	945
Coal	262	262	262	262	262	262	0	0	0	0
Hydro	417	416	416	413	321	271	259	259	259	259
Wind+Solar	465	500	500	500	500	492	413	338	334	333
Other Contracts	50	50	50	50	50	44	25	0	0	0
Energy Efficiency	41	70	97	124	150	280	400	515	629	742
Total Resources	2179	2244	2271	2294	2228	2294	2043	2059	2167	2280
Load	2153	2198	2248	2292	2337	2574	2810	3051	3300	3545
Energy Deficit / (Surplus)	(26)	(45)	(23)	(2)	109	279	767	993	1133	1265

2016 IRP



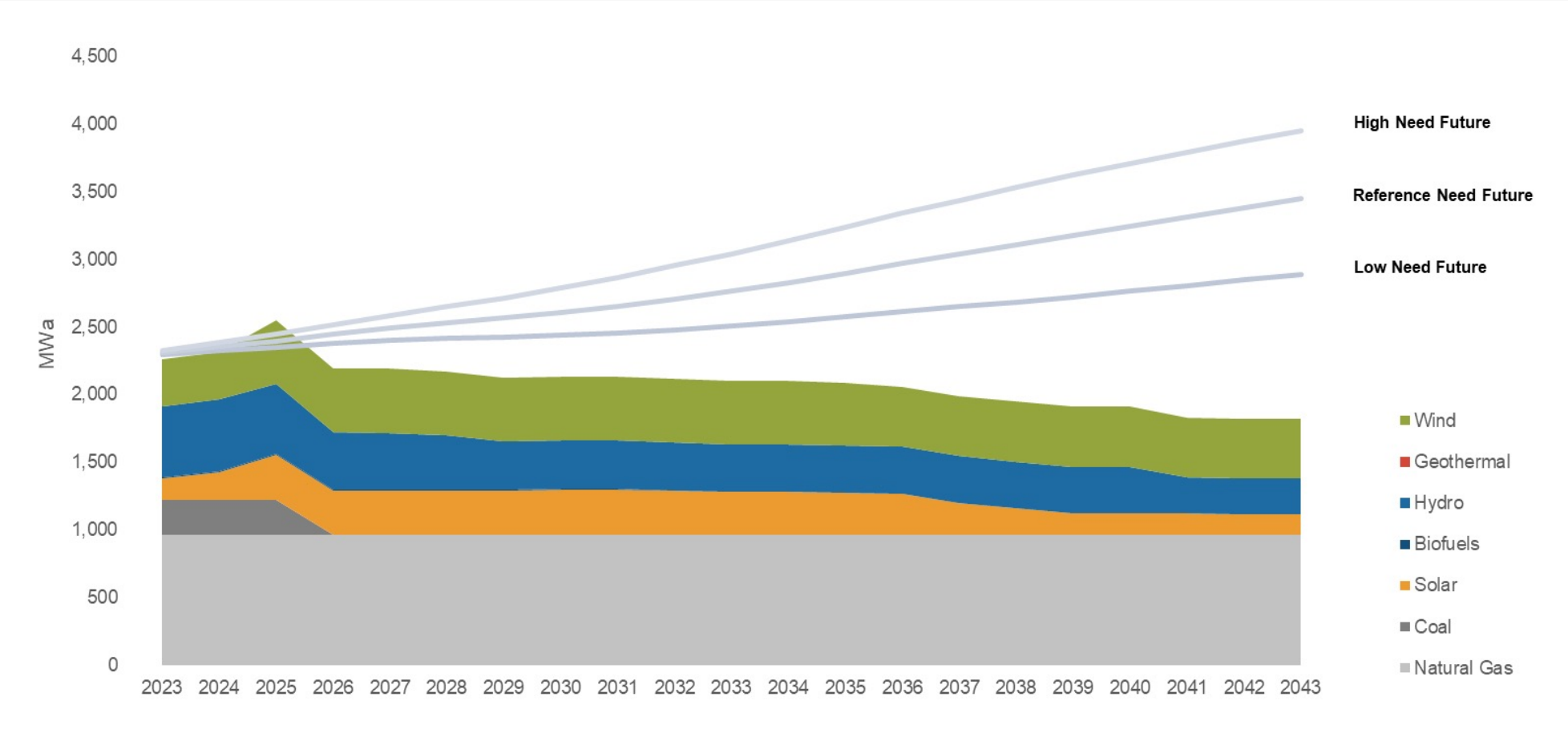
2019 IRP MEP



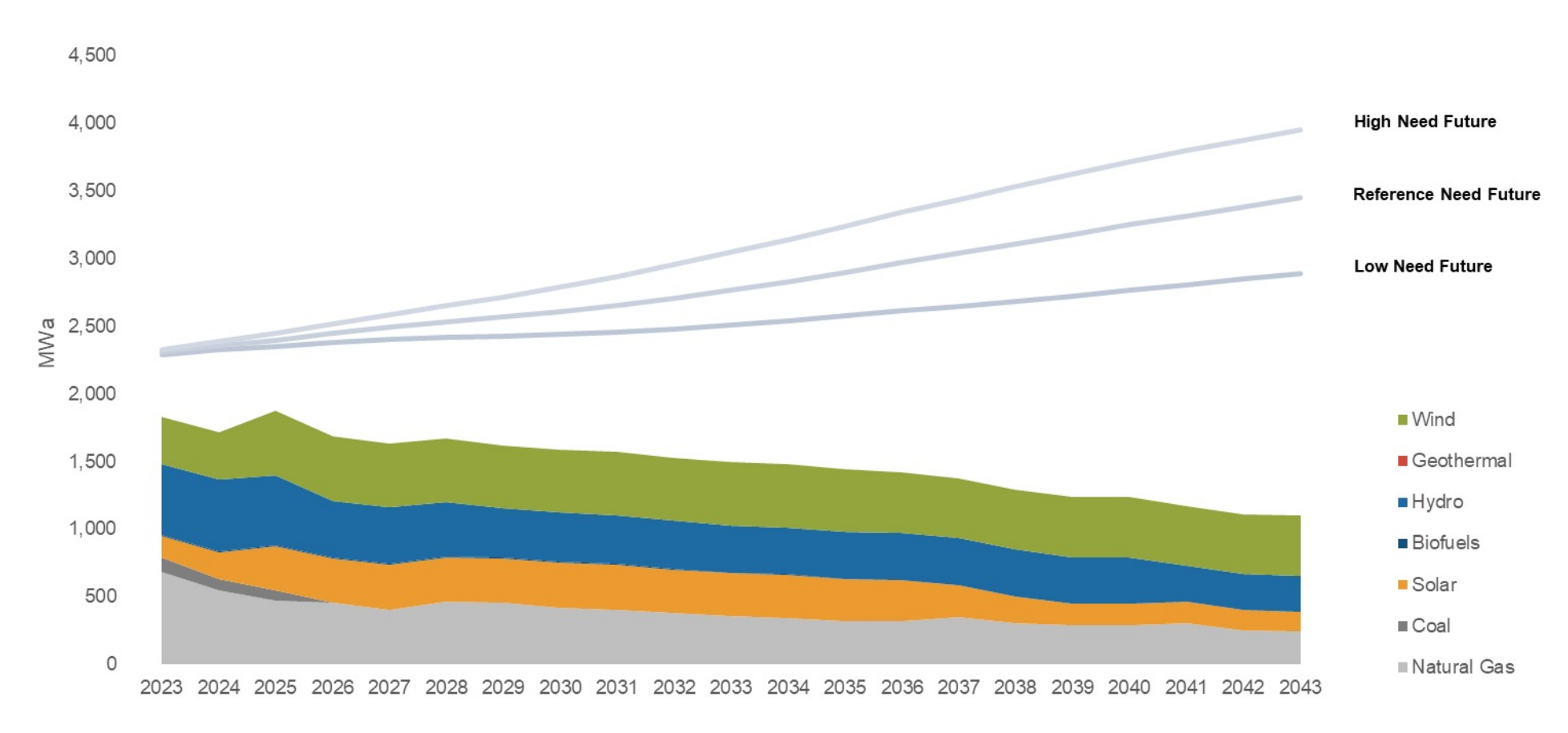
June 2021: https://assets.ctfassets.net/416ywc1laqmd/3cvd1UqpapBboirkYJLTEd/132bb6ab8ce967f92c33549560400ef5/IRP_Roundtable_June_21-4.pdf

July 2022: https://assets.ctfassets.net/416ywc1laqmd/12mmGu2JZNE3tcjLkK6irQ/5220013d807848c057c27cbbed41a46e/IRP_Roundtable_July_22-6.pdf

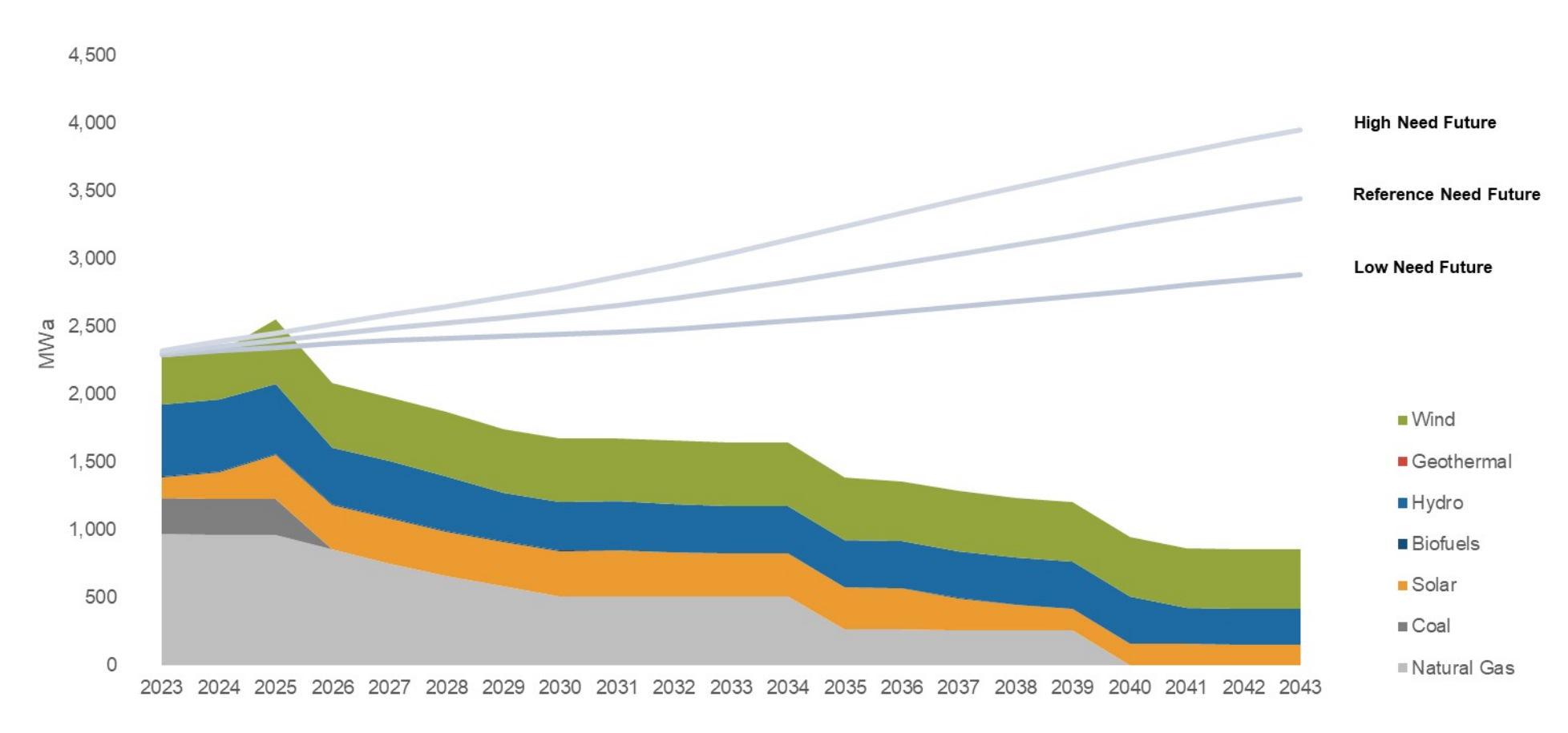
Current Position w/ Traditional Thermal Availability



Current Position w/ Economic Dispatch



Current Position w/ Energy Availability & HB2021 Targets



QUESTIONS/ DISCUSSION?

NEXT STEPS

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

Upcoming Roundtables:
September 22* (date change from 15th)
October 20
November 16
December 15

THANK YOU

CONTACT US AT:
IRP@PGN.COM

APPENDIX A: ACRONYMS

AFC: average flowgate capability

ATC: available transfer capability

BPA: Bonneville Power Administration

DC: direct current

ELCC: effective load carrying capacity

ELRB: energy load resource balance

LOLH: loss of load hours

LTF: long term firm

MEP: market energy position

MW: megawatt

PUC: Public utility commission

RFP: request for proposal

PSH: pumped storage hydro

ROSE-E, LUCAS, ROM, PGE-zone, Sequoia, and AURORA: models PGE uses for IRP analysis (see Appendix I: 2019 IRP Modeling Details from the 2019 IRP)