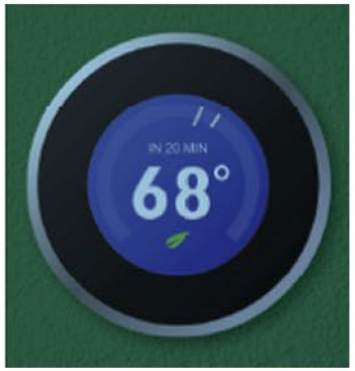
19-035-18 / 20-035-T04
Technical Workshop
May 8, 2020



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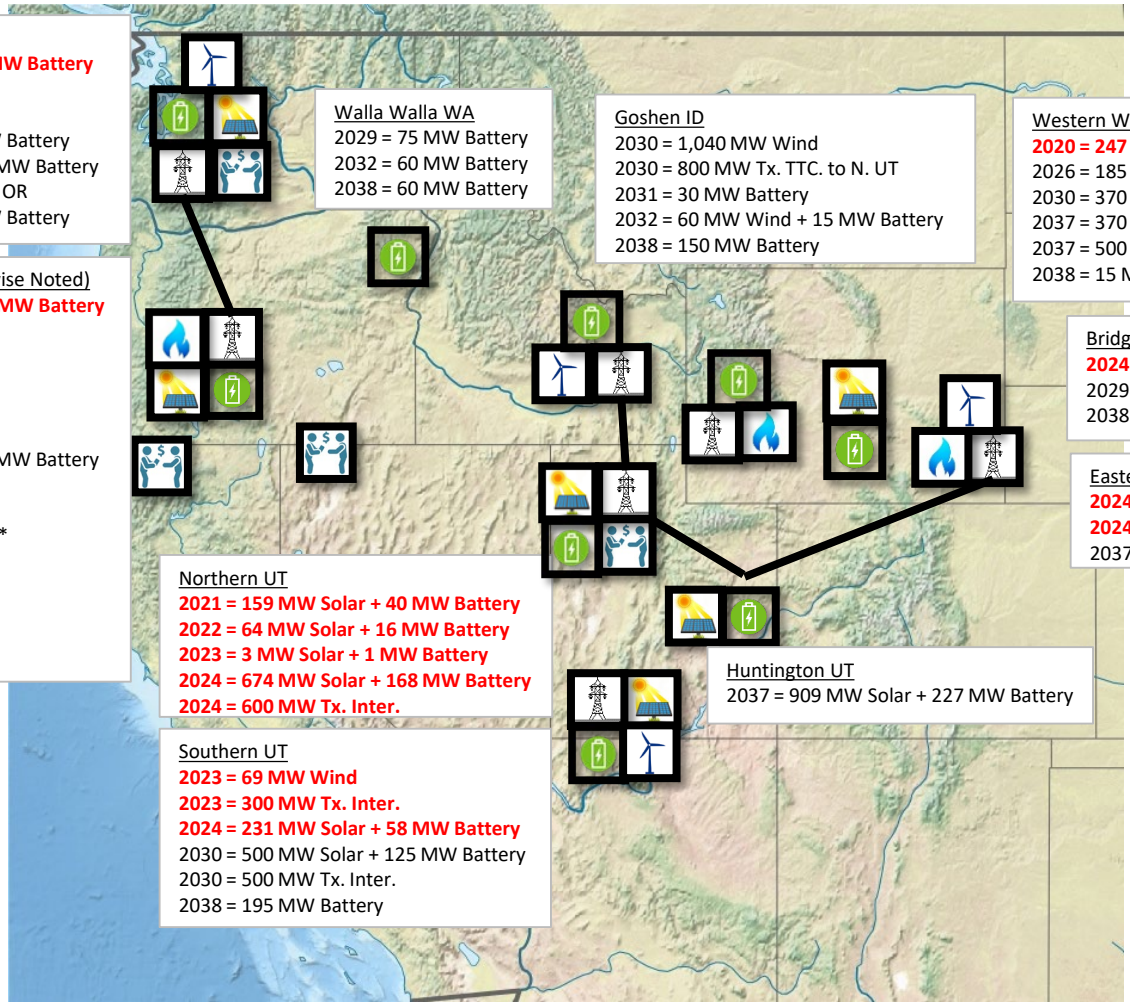
Avoided Cost Pricing Process (DPU 2)

After a QF requests indicative avoided cost:

- Review for completeness.
  - Capacity / Technology / 12 x 24 Generation Profile / Start date and term / Degradation rate
- Prepare a correlated 8760 generation profile
  - Aligns projected generation with regional weather conditions reflected in the GRID model
- Calculate capacity contribution
  - This is a function of the generation profile and is adjusted for regional LOLP impacts
- Identify deferred capacity resources
  - After adjusting for capacity associated signed contracts (and potential QF contracts for Schedule 38), the QF's capacity is added and the capacity of the next deferrable resource of that type is reduced.
  - As a tiebreaker for proxy resources are in the same year, QFs defer the closest proxy resource first.
- Update GRID model inputs
  - Deferred capacity / Battery storage shapes / Regulation reserve requirements
- Run GRID
- Flow results through Avoided Cost template, which adds avoided fixed costs of deferred capacity

Preferred Portfolio Generating Resources (Case P-45CNW)



Yakima WA
2024 = 395 MW Solar + 99 MW Battery
2024 = 405 MW Tx. Up.
2028 = 105 MW Battery
2029 = 10 MW Wind + 3 MW Battery
2036 = 419 MW Solar + 105 MW Battery
2036 = 450 MW Tx. TTC to S. OR
2037 = 10 MW Wind + 3 MW Battery

Walla Walla WA
2029 = 75 MW Battery
2032 = 60 MW Battery
2038 = 60 MW Battery

Goshen ID
2030 = 1,040 MW Wind
2030 = 800 MW Tx. TTC. to N. UT
2031 = 30 MW Battery
2032 = 60 MW Wind + 15 MW Battery
2038 = 150 MW Battery

Western WY/Naughton
2020 = 247 MW Gas Conv.
2026 = 185 MW Gas
2030 = 370 MW Gas
2037 = 370 MW Gas
2037 = 500 MW Tx. Inter.
2038 = 15 MW Battery

Bridger WY
2024 = 354 MW Solar + 89 MW Battery
2029 = 359 MW Solar + 90 MW Battery
2038 = 702 MW Solar + 175 MW Battery

Eastern WY
2024 = 1,920 MW Wind
2024 = 1,700 MW Tx. TTC to N. UT
2037 = 505 MW Gas CCCT

Southern OR (Unless Otherwise Noted)
2024 = 500 MW Solar + 125 MW Battery
2028 = 75 MW Battery*
2029 = 210 MW Battery
2029 = 105 MW Battery**
2029 = 45 MW Battery*
2032 = 60 MW Battery
2033 = 475 MW Solar + 119 MW Battery
2033 = 120 MW Battery
2033 = 475 MW Tx. Inter.
2037 = 443 MW Gas Peaking*
2037 = 615 MW Tx. Inter.*
2038 = 180 MW Battery

*Willamette Valley
**Portland North Coast

Northern UT
2021 = 159 MW Solar + 40 MW Battery
2022 = 64 MW Solar + 16 MW Battery
2023 = 3 MW Solar + 1 MW Battery
2024 = 674 MW Solar + 168 MW Battery
2024 = 600 MW Tx. Inter.

Huntington UT
2037 = 909 MW Solar + 227 MW Battery

Southern UT
2023 = 69 MW Wind
2023 = 300 MW Tx. Inter.
2024 = 231 MW Solar + 58 MW Battery
2030 = 500 MW Solar + 125 MW Battery
2030 = 500 MW Tx. Inter.
2038 = 195 MW Battery

Coal/Early Gas Retirements
2019 = NT3 (280 MW)
2020 = CH4 (387 MW)
2023– JB1 (351 MW)
2025 = CG1 (82 MW)
2025 = NT1-2 (357 MW)
2026 = CG2 (82 MW)
2027 = CS3-4 (148 MW)
2027 = DJ1-4 (755 MW)
2028 = JB2 (356 MW)
2030 = HY1-2 (77 MW)
2036 = HTG1-2 (909 MW)
2037 = JB3-4 (702 MW)

- Solar
- Wind
- Battery
- Pumped Hydro
- Gas
- Market
- Transmission

Note: Resources highlighted in red text trigger an action item in the 2019 IRP action plan.

Proxy Resource Selection (DPU 3)

Thermal:

- **2026: Naughton simple cycle combustion turbine ("SCCT") (185 MW)**

Wind:

- **2023: Utah South wind (69 MW) – designated renewable resource for customer preference requirements**
- *2024: Aeolus wind (1,920 MW)*

Solar:

- 2021 to 2024: Utah South solar combined with energy storage (558 MW) – designated renewable resources for customer preference requirements
- **2024: Utah North solar combined with energy storage (231 MW)**
- 2024: Utah South solar combined with energy storage (342 MW)
- 2024: Jim Bridger solar combined with energy storage (354 MW)
- 2024: Southern Oregon solar combined with energy storage (500 MW)
- 2024: Yakima solar combined with energy storage (395 MW)

Capacity Contribution Background (DPU 7)

ELCC – effective load carrying contribution

- A method that measures how much load could be increased if a given resource was added while meeting the same level of reliability.
- Stochastic model runs and incremental load levels are iterated to hit the targeted reliability, must be repeated for each different resource type/location, and the results are dependent on the underlying portfolio.

LOLP – loss of load probability

- The probability of a loss of load event in a given hour.
- Under the CFAM, LOLP is normalized so that its sums to 100% for the year.

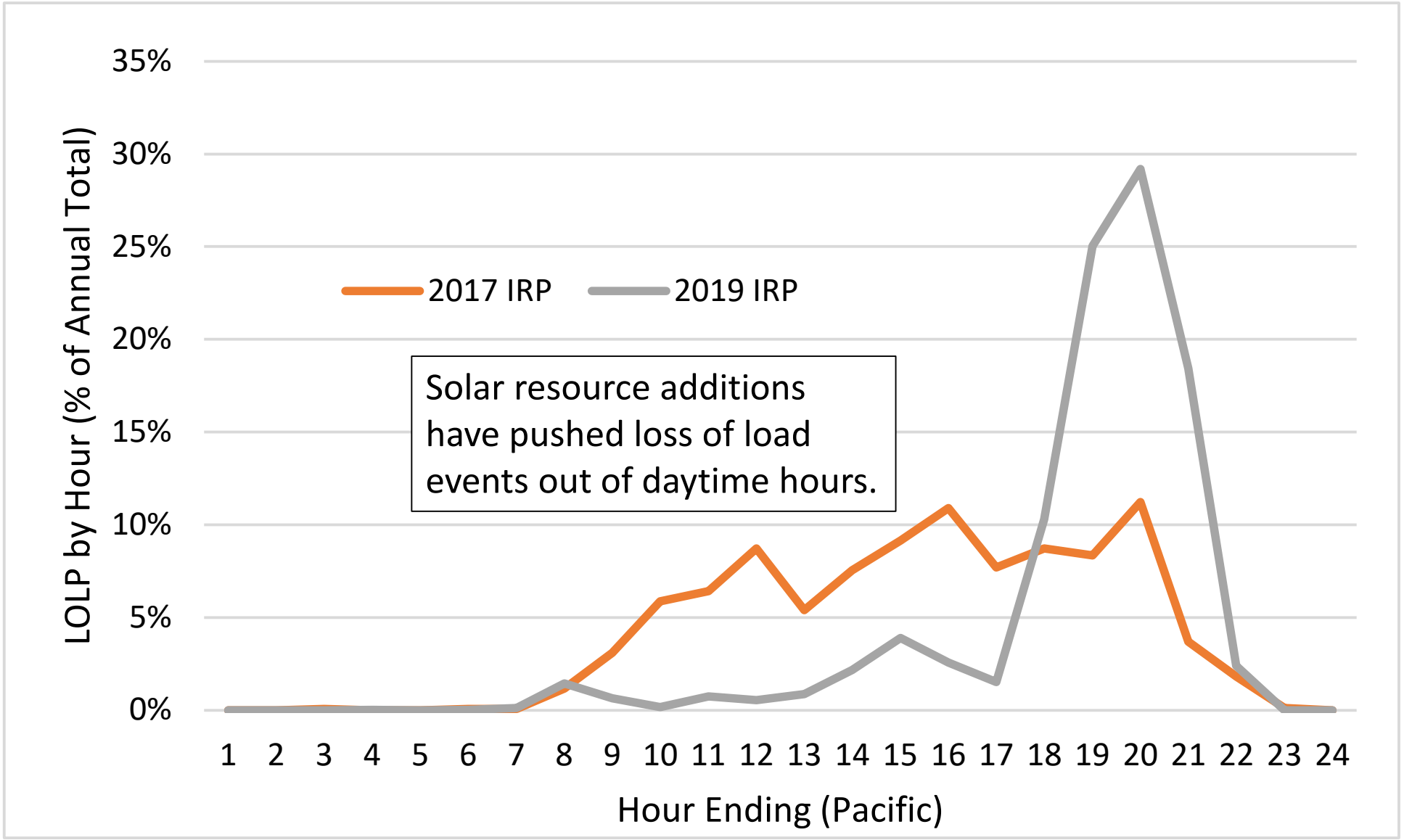
LOLE – loss of load expectation

- A measure of reliability, typically measured in hours per year.

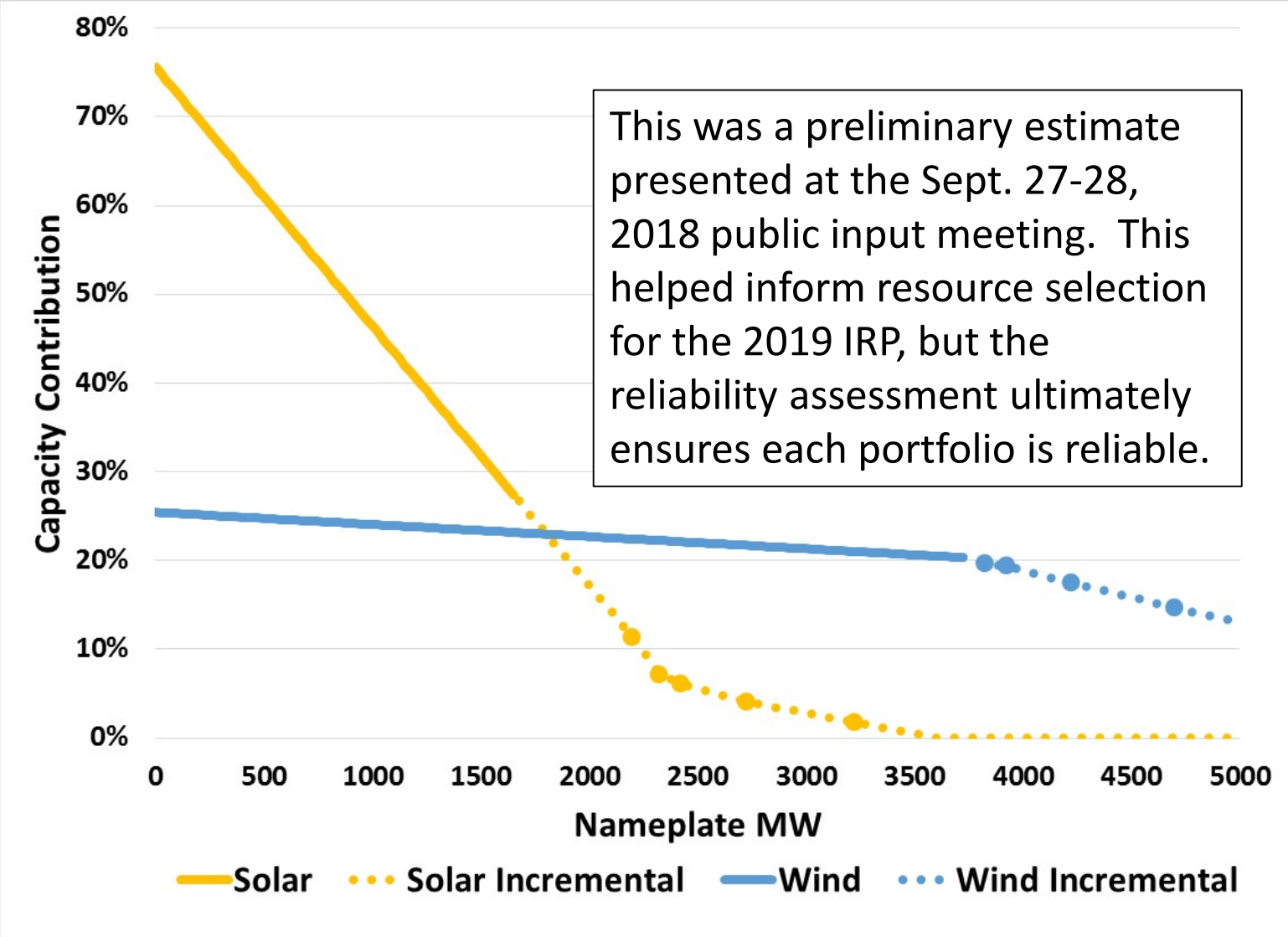
CFAM – Capacity Factor Approximation Method

- Measures the availability of a resource during periods with loss of load events.
- One stochastic model run identifies hourly LOLP across study period. Results are applied to all resource profiles. Results are dependent on the underlying portfolio, and study must be repeated if portfolio changes significantly.

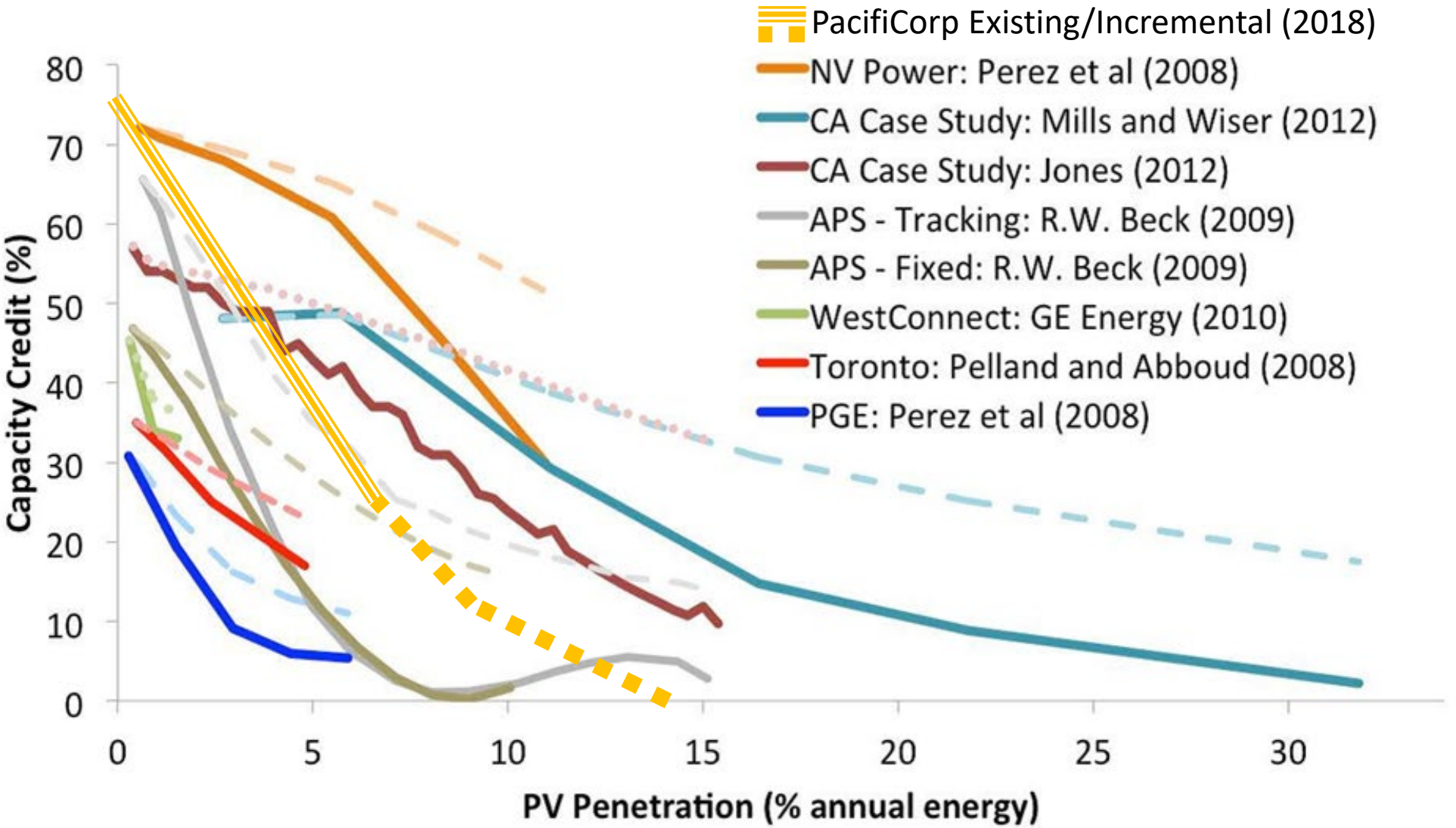
LOLP Distribution



Capacity Contribution vs System Capacity by Technology



Comparison of Solar Capacity Contribution Studies



Non-PacifiCorp source: Mills, Andrew, and Ryan Wiser. 2012. "An Evaluation of Solar Valuation Methods Used in Utility Planning and Procurement Processes." LBNL-5933E, Berkeley, CA: Ernest Orlando Lawrence Berkeley National Laboratory.

Capacity Contribution Calculation

Capacity Contribution is calculated as the sum of:

- Resource Profile * 12x24 LOLP % * Geographic Adjustment
- The Geographic Adjustment (shown in table below), accounts for the difference in contribution of each IRP proxy resources under the 12x24 LOLP and 8760 LOLP
- Resource in locations with lots of existing resources of the same type have larger adjustments – see UT solar and WY wind.

	Solar	ID	OR	UT	WA	WY
Summer	Adjustment	98%	100%	86%	88%	99%
Winter	Adjustment	104%	102%	103%	88%	105%
	Wind	ID	OR	UT	WA	WY
Summer	Adjustment	65%	106%	91%	104%	44%
Winter	Adjustment	76%	81%	75%	82%	57%

- See tech workshop workpaper UCE9

Capacity Deferral Calculation

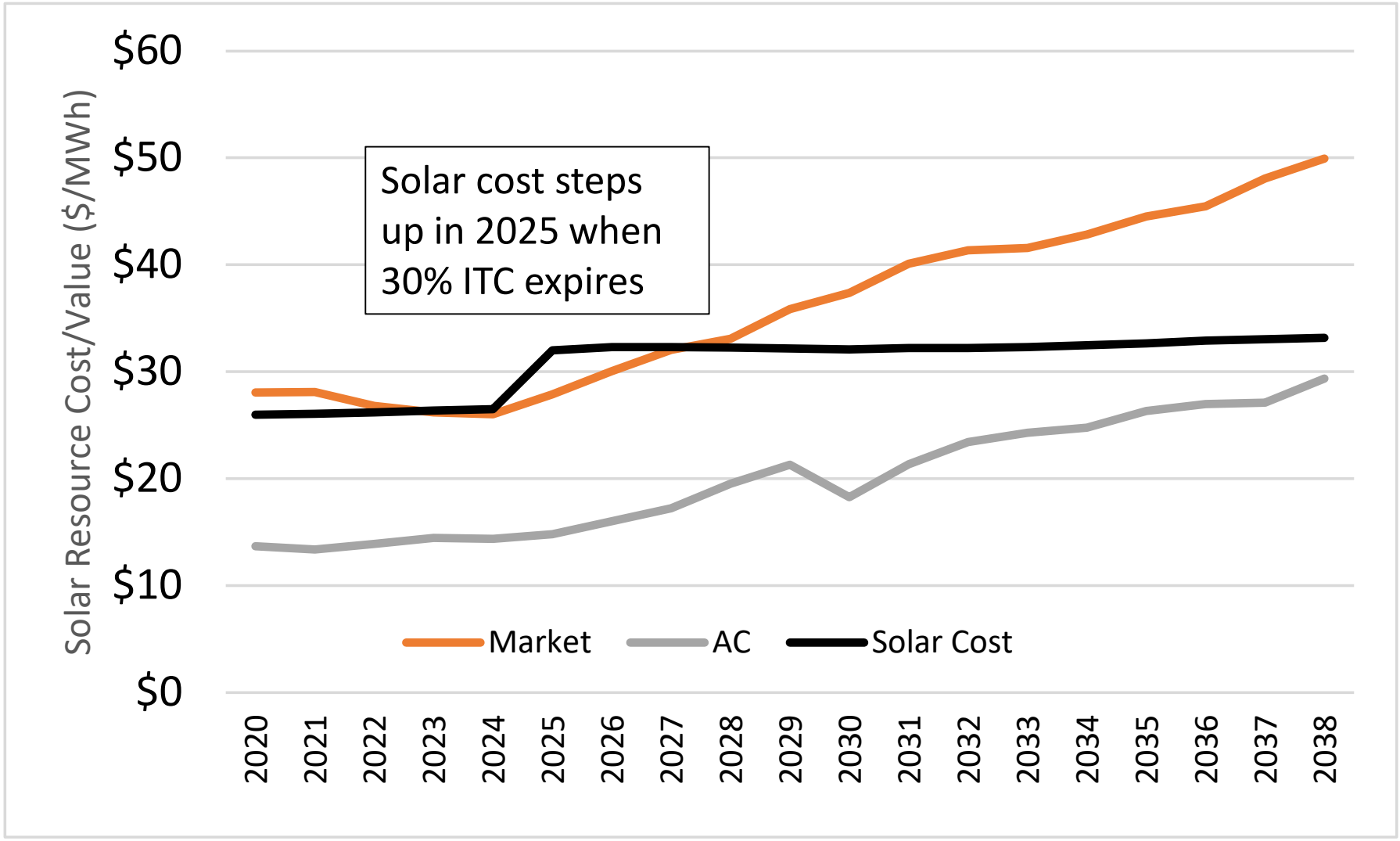
Capacity Contribution is calculated as the sum of:

- Resource Profile * 12x24 LOLP % * Geographic Adjustment
- The Geographic Adjustment (shown in table below), accounts for the difference in contribution of each IRP proxy resources under the 12x24 LOLP and 8760 LOLP
- Resource in locations with lots of existing resources of the same type have larger adjustments – see UT solar and WY wind.

		MW	MW	%	MW
	Type	Nameplate Capacity	After Degradation	Capacity Contribution	Capacity Contribution
QF	Tracking Solar	80	78.4	9.9%	7.8
Proxy	Tracking Solar+Storage	24.7	24.7	31.4%	7.8
	Degradation Rate/year	0.50%			
	QF After Degradation	98%	2020->2024 (4 years)		
	Proxy After Degradation	100%	2024->2024 (0 years)		

- See tech workshop workpaper UCE4

Utah Solar Price Comparison



- Solar+storage is more cost-effective than stand-alone solar in 2019 IRP, so value of solar on its own is less than the cost shown here.