Market Redefinition: Accreditation Reform

Resource Adequacy Subcommittee

January 18, 2023

Purpose & Key Takeaways

Purpose: Share 2023 work plan based on recent stakeholder feedback and provide further education and discussion on the Direct-Loss of Load (Direct-LOL) method

Key Takeaways:

- MISO provided its recommendation at the Nov 2022 RASC to use the Direct-LOL for wind and solar accreditation
- In the first half of 2023, MISO will evaluate the extension of the Direct-LOL method to non-emergency resources as well as other design elements critical to the PRM calculation
- Detailed design discussions for wind/solar accreditation will resume in Q3 2023
- MISO is targeting a filing for RA accreditation reforms in Q4 2023

The goal of today's discussion is to share detailed recommendations for accreditation

FRAME the issue; set guiding parameters for this year's effort

- ✓ Define the problem statement, scope and key considerations

EVALUATE three broad categories of accreditation approaches for wind and solar resources

- ✓ Define a set of evaluation criteria
- ✓ Select a representative set of three diverse future portfolios in pursuit of a least regrets approach
- ✓ Mine historic data where available; simulate data for emerging technologies and future portfolios
- ✓ Identify periods of high risk under different generation portfolios
- ✓ Evaluate how variations of the three accreditation approaches capture the periods of high risk
- ✓ Apply evaluation criteria to the results
- ✓ Narrow to one general approach for refinement in the design phase

DESIGN the proposed solution showing how the accreditation method would work

We are here

- ✓ Discuss and determine key design attributes
- ✓ Pursue proof of concept and straw proposal
- ✓ Perform impact analysis using today's resource portfolio
- ☐ Refine proposal with stakeholder input

Reminder of the problem statement and scope developed by MISO and stakeholders to guide this effort:

Problem Statement

Resource accreditation should reflect the availability of resources when they are most needed. Significant growth of variable, energy-limited resources in the MISO footprint, along with changing weather impacts and operational practices, are shifting risk profiles in highly dynamic ways with implications to Resource Adequacy and planning. MISO's existing accreditation methods for non-thermal resources require further evaluation to ensure that the accredited capacity value reflects the capability and availability of the resource during the periods of highest reliability risk.

Scope

Revisit the established accreditation practices for non-thermal resources with a priority focus on those with the greatest reliability impact in the near-term.

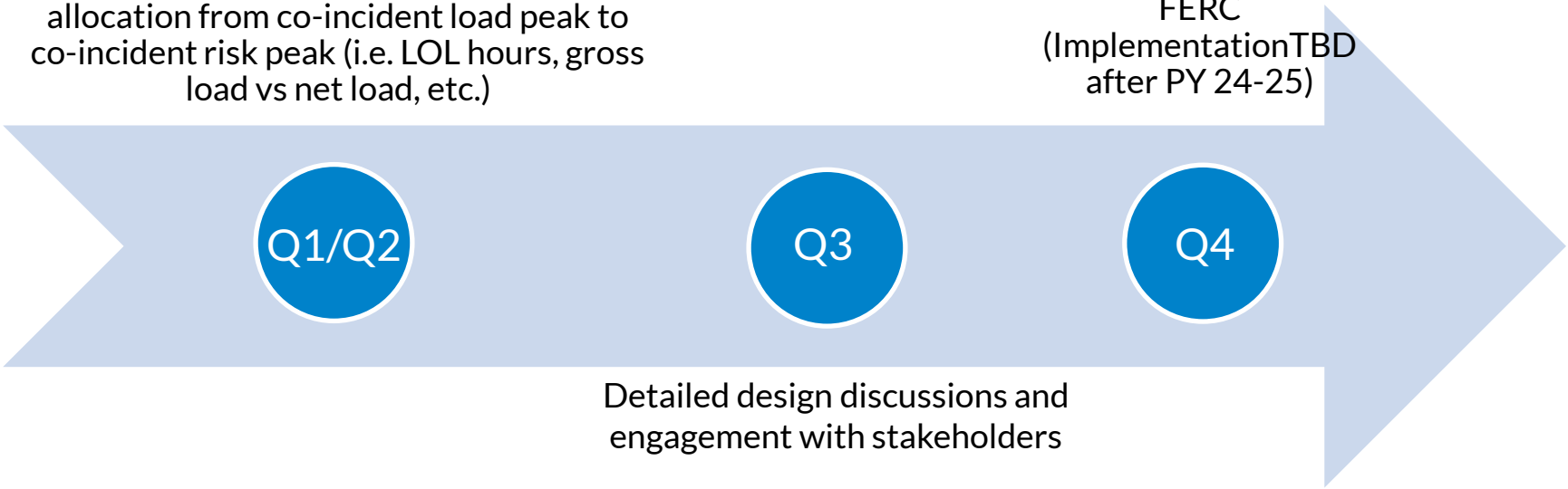
Wind and Solar Accreditation

MISO's 2023 work on non-thermal accreditation will be focused on addressing stakeholder concerns shared in recent feedback

1. Evaluation of extending Direct-LOL recommendation to all non-emergency resources

2. Determine a way to shift PRM allocation from co-incident load peak to co-incident risk peak (i.e. LOL hours, gross load vs net load, etc.)

File comprehensive resource adequacy accreditation reforms at FERC (ImplementationTBD after PY 24-25)



LOL = Loss of Load PRM = Planning Reserve Margin

Based on stakeholder feedback, MISO proposes a strawman to be refined over the course of 2023

1. Adjust accreditation for all non-emergency resources (coal, gas, nuclear, wind, solar, storage, hydro, etc.) to the proposal laid out at the Nov. 30 RASC (and being discussed again today)
   - For current Schedule-53 resources this means adjusting the definition of UCAP from EFORd based to Direct-LOL based
2. Adjust process to calculate LSEs PRMR based on MISO's coincident LOL-hours rather than coincident peak load hours

LOL = Loss of Load PRMR = Planning Reserve Margin Requirement

MISO recommends separately accrediting wind and solar resources based on performance during RA Hours and adjusting unit accreditation to a class capacity value that is derived from the Direct-LOL method

Existing Approach for Wind

Class Level	Unit Level
Individual ELCC - average	Based on performance in peak hours

Existing Approach for Solar

Class Level	Unit Level
N/A	Based on performance in peak hours

Recommended Approach for Wind

Class Level	Unit Level
Direct-LOL Based	ISAC (RA Hours Based)

Recommended Approach for Solar

Class Level	Unit Level
Direct-LOL Based	ISAC (RA Hours Based)

ISAC = Intermediate Seasonal Accredited Capacity LOL = Loss of Load ELCC = Effective Load Carrying Capability

1 Calculate the simulated availability of wind and solar resources during loss of load hours – i.e. Direct-LOL (Loss of Load) measurement

1.1. Extract Loss of Load (LOL) hours and generator availability by unit/sample/weather year

1.2. For each sample take a generator's availability during LOL hours and average the output

2.1. Sum the average generator availability during LOL hours for the entire resource class

2.2. Sum the installed capacities (ICAP) of the generators for the entire resource class

3. Divide the outcomes of Step 2.1 by Step 2.2

Non-thermal Unforced Capacity (UCAP) = (Average output during LOL hours / ICAP)

1 Example: Illustrative direct-LOL accreditation calculation for solar

LOLE Study Model

(used to set the PRMR)

Outputs (LOL, EUE, Generation)

System Unserved Energy

	Weather Year 1			Weather Year 2		
Hour of Year	Sample 1	Sample 2	Sample N	Sample 1	Sample 2	Sample N
1	0	0	0	10	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	20	0	0	0	0	0
5	40	0	0	0	30	0
6	10	0	0	0	10	0
7	0	0	0	0	5	0
8	0	0	0	0	2	0
9	0	0	0	0	1	0
10	0	0	0	0	0	0
...	0	0	6	0	0	0
8758	0	0	10	0	0	0
8759	0	0	2	0	0	0
8760	0	0	0	0	0	0

Two weather years, 6 outage samples
LOLE = 0.67 days/year
LOLH = 2 hours/year
EUE = 24.3 MWh/year

Generator Availability*

(installed capacity = 10 MW)

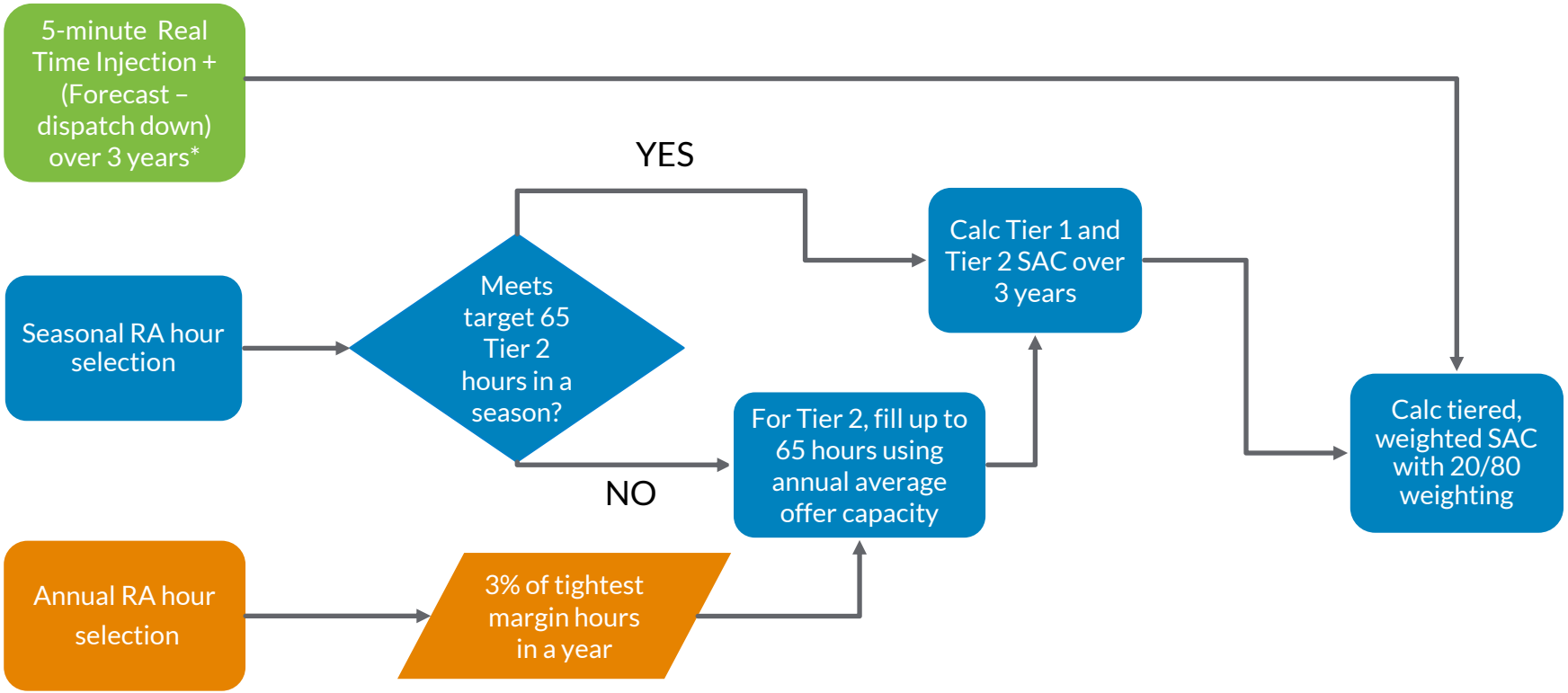
	Weather Year 1			Weather Year 2		
Hour of Year	Sample 1	Sample 2	Sample N	Sample 1	Sample 2	Sample N
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	1	1	1	0	0	0
4	4	4	4	2	2	2
5	8	8	8	3	3	3
6	3	3	3	1	1	1
7	1	1	1	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	1	1	1	2	2	2
...	5	5	5	6	6	6
8758	10	10	10	0	0	0
8759	6	6	6	6	6	6
8760	3	3	3	1	1	1

Average output during events = 3.33 MW
Nameplate Capacity = 10 MW
Capacity Accreditation = 33%

Adapted from: https://www.esig.energy/download/session-5-redefining-capacity-accreditation-derek-stenclik/

LOLH = Loss of Load Hour EUE = Expected Unserved Energy LOLE = Loss of Load Expectation PRMR = Planning Reserve Margin Requirement

2 MISO recommends directly measuring resource availability against operational need to set unit level accreditation – Same as thermal



*Accreditation calculations are based on data between September 1 and August 31 for the previous 3 years

RA = Resource Adequacy

Summary of the total number of loss of load (LOL) hours per season by Planning Year

- In the evaluation/design models, MISO used 1,100 *samples**
- In the full implementation we will use 18,750 *samples**
- The table shows the total number of LOL hours from the latest LOLE model (PY23-24)
  - The PY22-23 shows the seasonal breakdown of LOL hours using the adjusted seasonal LOLE targets
- MISO plans to do full testing and evaluation of LOL hours before making final decisions and preparing a filing

Season	**Seasonal LOLE Target (Days/year)**	**Seasonal loss of load (LOL) hours**
Fall	0.01	477
Spring	0.01	82
Summer	0.1	5,450
Winter	0.01	1,137
Total	**0.13**	**7,146**

*Each sample contains a total of 8760 hours.
**PY22-23 reflects the seasonal LOLE targets and resulting total number of LOL hours.

Discussion related to these Design elements will resume at the RASC in Q3 2023

Design Consideration	Direct LOL Accreditation Proposal	Rationale
Real time offers considered	5-minute Real Time Injection + (Forecast –dispatch instruction) over 3 years*	Measurement of wind/solar availability
Classes	Create separate classes for thermal, wind and solar	Creating separate classes by similarly performing resources will negate the impact mis-aligned RA hours
RA Hours calculation	Unchanged	Creating separate classes of similarly performing resources will negate the impact of mis-aligned RA hours
Region specific sub-classes	MISO wide to start; Additional analysis is needed to define smaller regions	Regional sub-classes can shift over time depending on the performance of resources within a class
Number of weather years	Align with PRM/LOLE model assumptions	Use same assumptions for simplicity and comparability

*Accreditation calculations are based on data between September 1 and August 31 for the previous 3 years

Next Steps

- Evaluate applicability of Direct-LOL method to all non-emergency resources (coal, gas, nuclear, wind, solar, storage, hydro, etc.)
- Evaluate if any other changes are needed for accreditation and conduct reconciliation with other processes to see if they should be modified
  - LOL or tight margin hours
  - Planning Reserve Margin Requirement (PRMR) allocation
  - Resource class definitions
  - Sub-class region definitions

Contact Information

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Appendix

Reminder of the criteria under which MISO is using for its recommendation

Impact

- Ability to identify and sufficiently mitigate actual risk under current and future portfolios and grid conditions, in conjunction with markets and operations
- Ensure sufficient capacity in the planning horizon when needed to maintain reliability
- Results in comparable outcomes with methods for other technology types or resource classes

Feasibility

- Relative practicality/ scalability/ administrative feasibility of implementation for both MISO and Market Participants
- Understandability for both MISO and Market Participants

Flexibility

- Ability to accommodate evolving resource portfolio and technologies that can help mitigate shifting risks across all time periods

Stability

- Ability to reasonably inform state and utility long-term resource planning processes which rely on accreditation

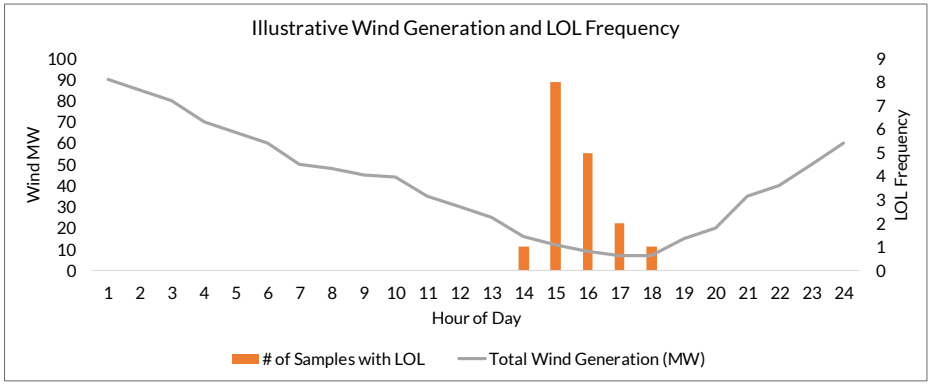
Direct-LOL accreditation offers distinct benefits over the existing accreditation practices for wind and solar resources

Method	*Unit-Level*	*Class-Level*	Impact	Flexibility	Feasibility	Stability
MISO's current Wind method	Performance during *peak hours*	*Average Individual-ELCC*	Aligns availability with need for class only, but not "actual" need	Extending to many other resource types misses synergistic effects	Computationally difficult, and hard to understand as method scales	Results averaged over a range; doesn't inform the future as well
MISO's current Solar method	Performance during *peak hours*	*N/A*	Doesn't align changing needs with availability	Easily extendable to other resource types	Computationally efficient, and easy to administer	Easy to predict, but doesn't reflect changing conditions
Wind/solar recommendation	*Seasonal RA Hours*	*Direct-LOL based Unforced Capacity (UCAP)*	Aligns availability and "actual" need*; Aligns with probabilistic and operational performance	Easily extendable to other resource types; accounts for synergistic effects; comparable to thermal	Computationally efficient, and easy to administer	Results dependent on resource mix; informs the future well
MISO's Thermal Method (Reference)	*Seasonal RA Hours*	*EFORD based Unforced Capacity (UCAP)*				

*Actual for D-LOL = simulated conditions of the current system. See appendix.

Direct-LOL additional example

Total Wind ICAP: 90 MW					
Weather Year	Month	Day	Hour	# of Samples with LOL	Total Wind Generation (MW)
2016	July	28	1	0	90
2016	July	28	2	0	85
2016	July	28	3	0	80
2016	July	28	4	0	70
2016	July	28	5	0	65
2016	July	28	6	0	60
2016	July	28	7	0	50
2016	July	28	8	0	48
2016	July	28	9	0	45
2016	July	28	10	0	44
2016	July	28	11	0	35
2016	July	28	12	0	30
2016	July	28	13	0	25
2016	July	28	14	1	16
2016	July	28	15	8	12
2016	July	28	16	5	9
2016	July	28	17	2	7
2016	July	28	18	1	7
2016	July	28	19	0	15
2016	July	28	20	0	20
2016	July	28	21	0	35
2016	July	28	22	0	40
2016	July	28	23	0	50
2016	July	28	24	0	60

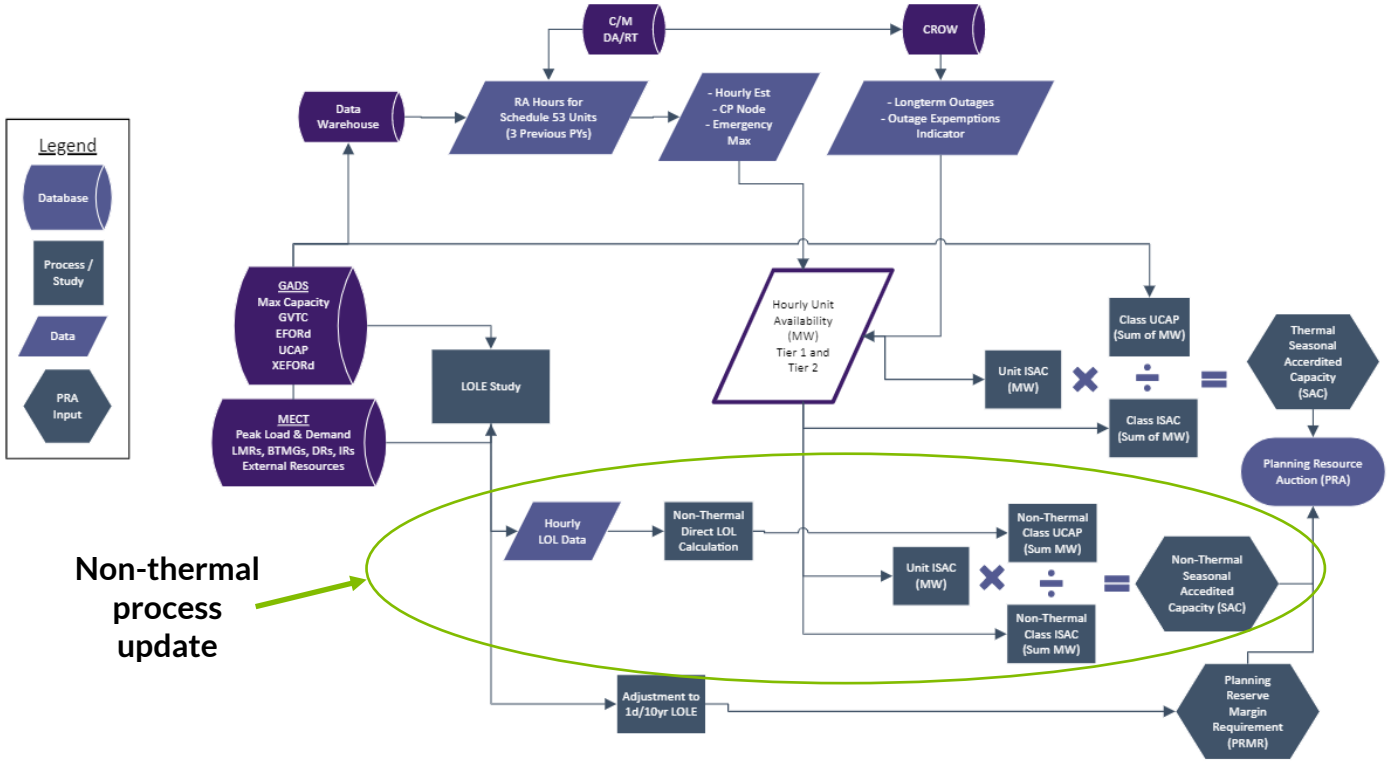


$$\textbf{Direct LOL Reliability Contribution}\ (\%) = \frac{\text{Weighted Average Availability (MW) During LOL Hours}}{\text{ICAP (MW)}}$$

$$\text{Direct LOL Reliability Contribution}\ (\%) = \frac{(1*16)+(8*12)+(5*9)+(2*7)+(1*7)}{17\ \text{LOL Samples}} = 10.5$$

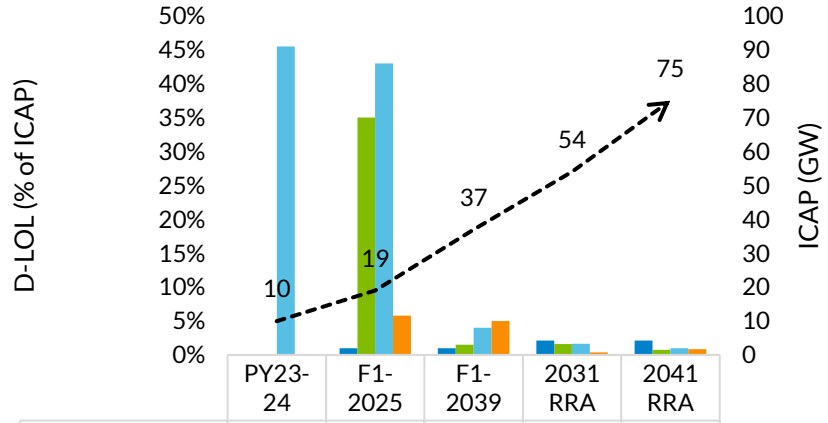
$$\text{Direct LOL Reliability Contribution}\ (\%) = \frac{10.5\ (\text{MW})}{90\ (\text{MW})} = \mathbf{11.7\%}$$

Direct-LOL replaces the calculation of UCAP for non-thermal resources, but the rest of the process remains unchanged



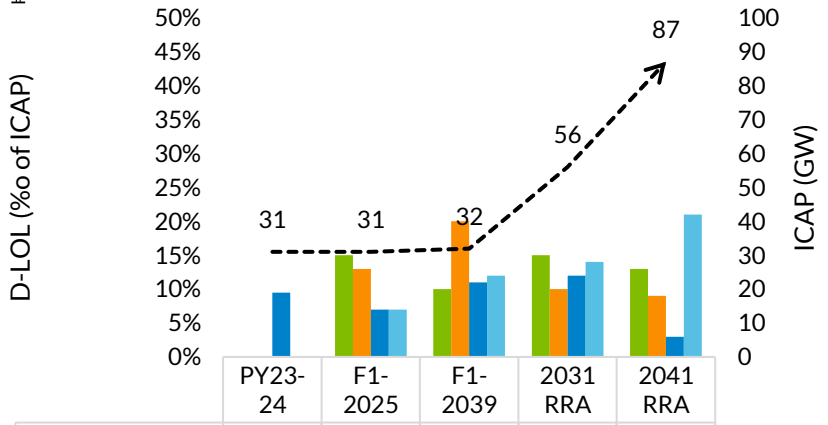
1 Direct-LOL results using latest Planning Year (PY), results from the non-thermal evaluation and the 2022 Regional Resource Assessment (RRA) portfolios

Utility-scale Solar



	PY23-24	F1-2025	F1-2039	2031 RRA	2041 RRA
Winter		1%	1%	2%	2%
Spring		35%	2%	2%	1%
Summer	45%	43%	4%	2%	1%
Fall		6%	5%	0%	1%
ICAP (GW)	10	19	37	54	75

Utility-scale Wind



	PY23-24	F1-2025	F1-2039	2031 RRA	2041 RRA
Winter		15%	10%	15%	13%
Spring		13%	20%	10%	9%
Summer	10%	7%	11%	12%	3%
Fall		7%	12%	14%	21%
ICAP (GW)	31	31	32	56	87

PY: Planning year | F1: Future 1 | RRA: Regional Resource Assessment | ICAP: Installed Capacity | D-LOL: Direct Loss of Load