Redefining Capacity Accreditation

ESIG Fall Technical Workshop

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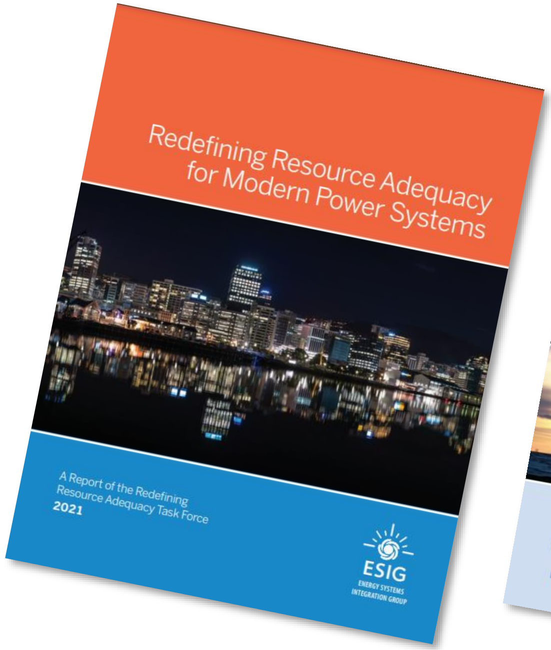
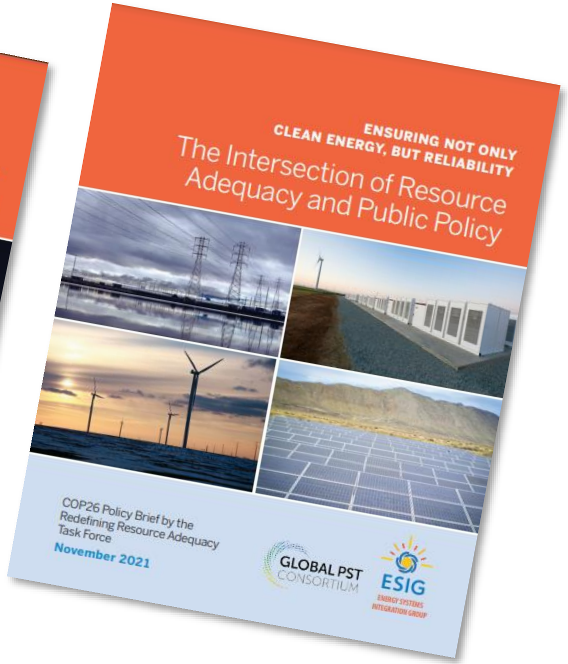
TELOS ENERGY

Redefining Resource Adequacy Task Force

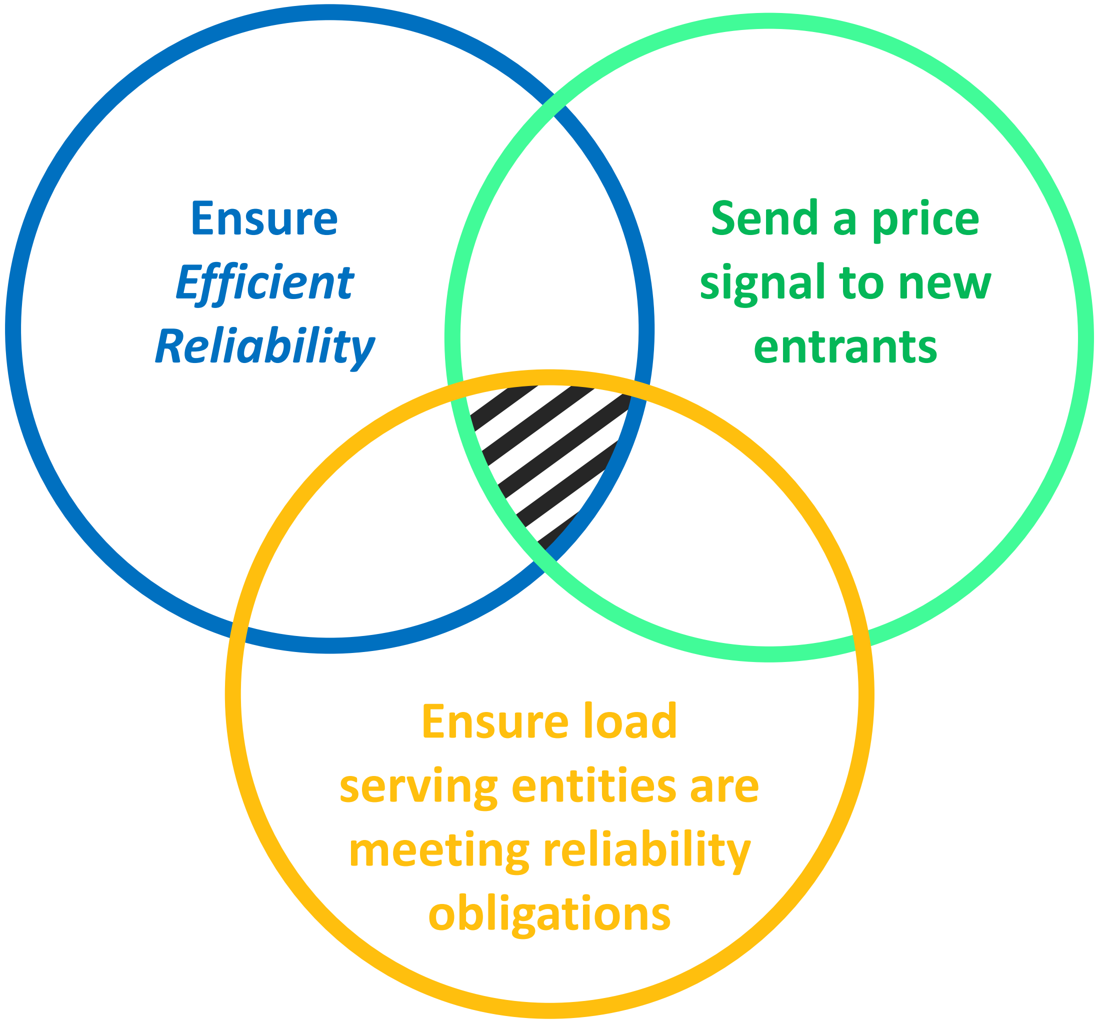




Coming soon! Redefining **capacity accreditation**

- **ESIG Whitepaper:** Redefining Resource Adequacy for Modern Power Systems
- **ESIG/GPST Policy Brief:** The Intersection of Resource Adequacy and Public Policy
- **ESIG Blog:** Five Principles of Resource Adequacy for Modern Power Systems
- **ESIG Webinar 2020:** Redefining Resource Adequacy for Modern Power Systems (part 1)
- **ESIG Webinar 2021:** Redefining Resource Adequacy for Modern Power Systems (part 2)
- Stenclik, et al., Beyond Expected Values Evolving Metrics for Resource Adequacy Assessment, CIGRE Session 2022

Why do we accredit resources?



Accreditation ≠ Reliable System

Resource accreditation does not necessarily ensure a reliable system.

Capacity accreditation should be used for planning new entrants, compensating resources for reliability service, and for allocating responsibility to loads… not for ensuring resource adequacy

(i.e. the planning reserve margin should not be used to determine if a system is resource adequate)

What goes wrong if we rely on accreditation for renewables?

Why is capacity accreditation changing?

Structural changes to resource adequacy

- Energy transition, changes to the underlying resource mix
- Resource adequacy is increasingly provided by variable renewables (wind, solar) and energy limited resources (storage, demand response, load flexibility)
- Risk is shifting away from peak load periods
- Load is changing due to electrification, climate change, structural changes in the economy

Leads to changes in the way resources are accredited

Increasing Shares of variable renewables & energy limited resources

1. Nameplate capacity of resources
2. Expected capacity available at time of *peak load*
3. Expected capacity available at time of peak *net* load
4. Expected capacity available at time of high *risk*
5. Expected capacity *and energy* available from resources during periods of high risk

How do we accredit resources today?

Deterministic vs. Probabilistic

Resource availability during *pre-defined hours* (i.e. peak load window)

vs.

Based on probabilistic resource adequacy analysis (LOLE & ELCC calculations

Prospective vs. Retrospective

Likely, or expected, (modeled) resource performance during scarcity events or tight margin periods

vs.

Actual (historical) performance in recent scarcity events or tight margin periods

Marginal vs. Average

Accredits a resource based on the contribution of the next, incremental, MW added to the system

vs.

Accredits a resource class, or portfolio of resources, on the total contribution towards reliability

Where are the gaps and limitations?

- **Complexity and lack of transparency**

  Requires rigorous modeling, time intensive, prone to error, and limited experience across stakeholders. Creates contentious stakeholder process and difficult for generation owners to predict.

- **Sensitive to modeling and assumptions**

  Simulated capacity accreditation is only as good as the underlying resource adequacy modeling, which is becoming increasingly complex. Given the few number of shortfall hours, modeling is highly sensitive to assumptions.

- **It does not necessarily ensure reliability**

  Modeling simulations are not perfect and do not capture all risk on the system. Linkage to actual performance and operations is limited

- **Every resource is unique & order matters**

  Wind in different regions has different profiles, solar can be configured with different ILRs, hybrids can be fully customized, gas plants can be winterized. Applying accreditation by resource type does not incent plant optimization

- **Portfolio effects**

  Wind in different regions has different profiles, solar can be configured with different ILRs, hybrids can be fully customized, gas plants can be winterized. Applying accreditation by resource type does not incent plant optimization

Pillars of Resource Accreditation

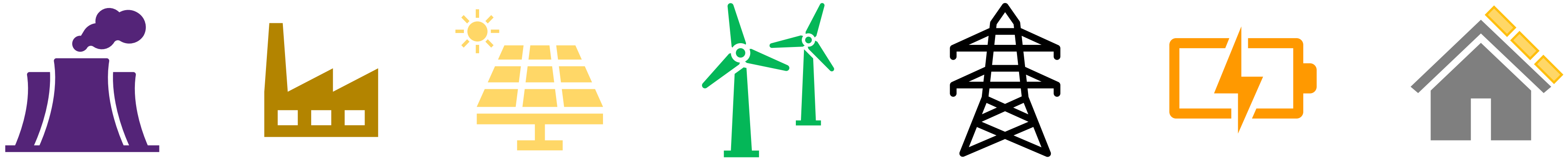
What are the foundational elements that should be considered for any accreditation technique?

Non-Discriminatory	Robust*	Transparent	Reliable	Predictable
Accreditation is applied to all resources using a similar methodology	Continues to work as the resource mix, load patterns, and system risk change over time	Can be effectively communicated to stakeholders, and data is readily available for decision-making	Accurately measures performance during scarcity events	Process is repeatable and consistent. Does not yield volatile or unexplained changes year-to-year

*alternatively: fungible, flexible, durable

See MISO non thermal accreditation presentation: Impact, Feasibility, Flexibility, Stability
See E3 Delta method: Reliability, Fairness, Efficiency, Acceptability

Capacity Accreditation for All



<u>Milligan's Non-Discriminatory Assessment</u>

- **Resource Consistency:** Are all resources assessed during the same periods of risk (consistent risk periods)?

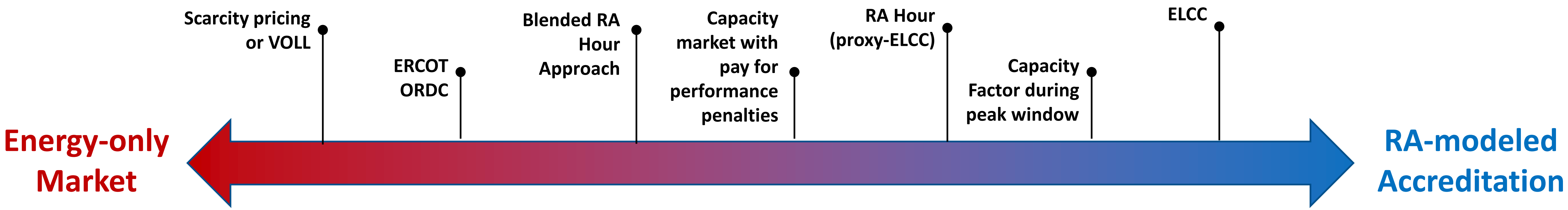
- **Horizontal Consistency:** Do 2 resources with the same MW contribution receive the same accreditation, even if they are different types of resources?

- **Vertical Consistency:** If resource A contributes more MW during risk periods than resource B, does A receive a higher accreditation?

- **Order Independence:** If A is evaluated both before and after B, does A receive the same accreditation regardless of order?

Linking Accreditation to Actual Operations

Recognition that a process that resource accreditation should incorporate *actual* risk on the system, as well as actual unit performance to differentiate generation type



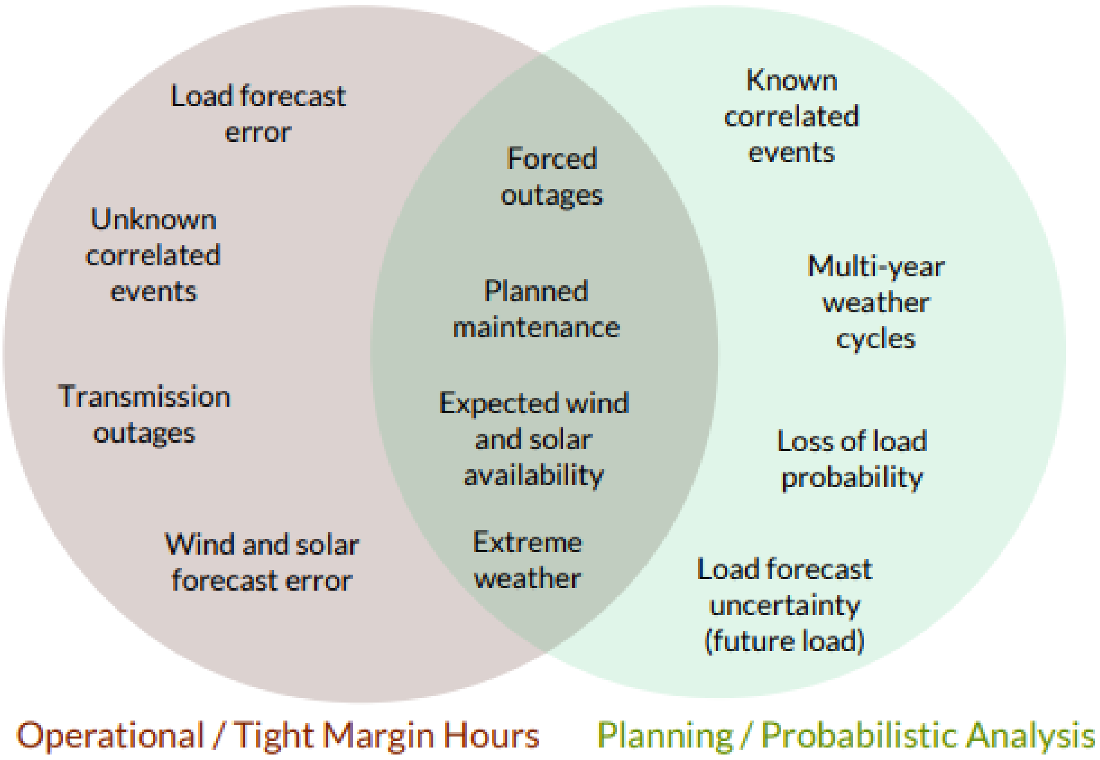
- Risk tolerance selected by each individual group
- Individual groups make their own assumptions about what the future might look like
- No money tied with accreditation rules
- Does not need to be agreed upon because generators can decide
- Generally bottom-up

- Requires system-wide risk level
- Requires some sort of agreed-upon view of what the future will look like
- All groups are subject to same accreditation rules
- More stakeholders weighing in on appropriateness of accreditation rules
- All money is tied to accreditation rules
- Generally top-down

Don't get paid for what you are, get paid for what you do.

Blending both simulated capability and actual performance metrics captures different risks

Common and unique risk drivers captured by each perspective



Source: MISO RASC

A hybrid - or blended - approach, which combines both probabilistic resource adequacy assessment and actual performance during tight operating conditions, can better ensure reliability and compensate resources for appropriate behavior, and helps place resources on an equal playing field

Is there an easier way?

LOLP-weighted capacity factor could blend multiple approaches in an easy-to-calculate, easy-to-understand manner

System Unserved Energy

Hour of Year	Weather Year 1			Weather Year 2		
	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)

Hour of Year	Weather Year 1			Weather Year 2		
	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 out during events = 3.33 MW
Nameplate Capacity = 10 MW
Capacity Accreditation = 33%

Benefits of this Approach

- ✓ **Equitable…** applied to ALL resources equally, is not based on ordering, etc.
- ✓ **Robust…** any hybrid or different resource configuration can easily be measured individually our part of a group of resources
- ✓ **Transparent…** anyone can calculate it for their resource, provided grid operator shares 8760 UE data. System design can be tailored to increasing RA value
- ✓ **Reliable…** still benefits from probabilistic RA analysis and directly tied to LOLE
- ✓ **Predictable…** underlying RA analysis, historical data, and production cost simulations can inform future accreditation

also **Simple…** no computational burden of iterations or separate calculations for each resource type beyond RA model

Thank You!

Questions?

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