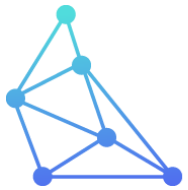
Redefining Resource Adequacy for Modern Power Systems

California Resource Adequacy Workshop | 9/22/2021



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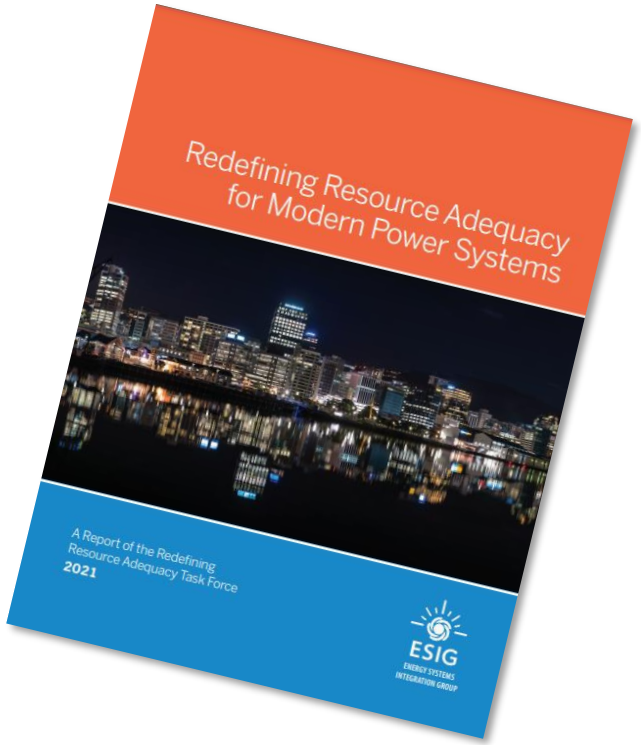
Acknowledgements



ESIG Whitepaper: Redefining Resource Adequacy for Modern Power Systems

ESIG Blog: Five Principles of Resource Adequacy for Modern Power Systems

ESIG Webinar: Redefining Resource Adequacy for Modern Power Systems

This project is supported by the Energy Systems Integration Group (ESIG), as part of the Redefining Resource Adequacy Task Force. The contents of this presentation are solely the responsibility of the authors and do not necessarily represent the official views of ESIG or its members

» **Next Steps:**

- Whitepaper on Evolving Metrics
- Policy Brief for GPST & COP26

What can we learn from recent reliability events in Texas and California?

- **Not all shortfalls are alike**… need to characterize size, frequency duration, and timing of events

- **Risk is shifting**… periods of concern longer occur during gross-peak load, need to look across an entire year of operation
- **Weather** is the single most important driver for resource adequacy…
  - Cross-disciplinary power systems and meteorological expertise is necessary
  - We need a North-American Weather Dataset for correlated wind, solar, and load
  - Climate trends should be considered
  - Correlated events are the issue!

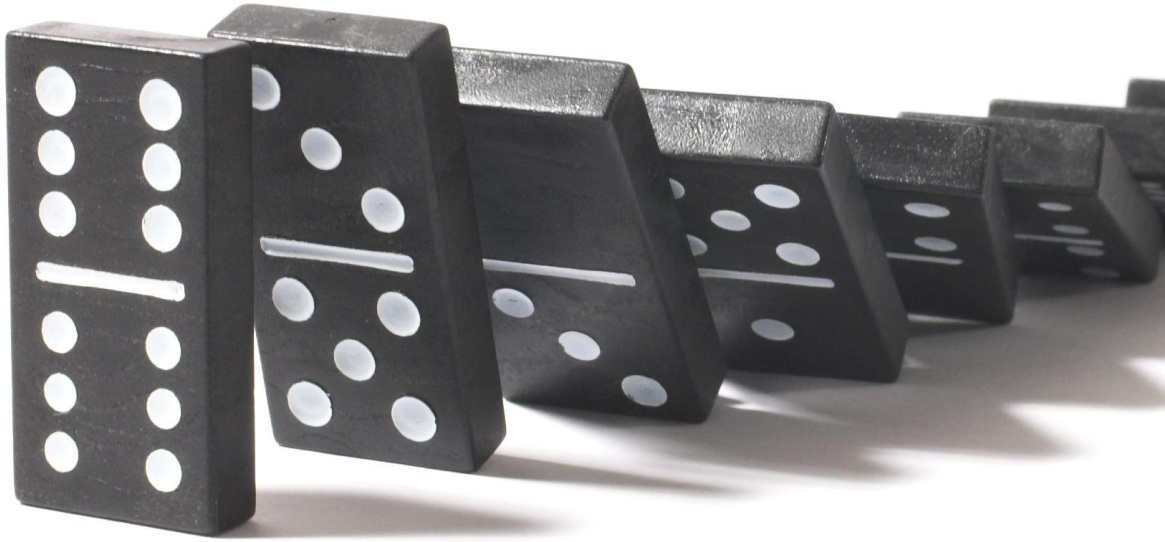
- **Resource sharing** is critical, transmission is a capacity resource

Why is Resource Adequacy Broken?

CHRONOLOGY + CORRELATION

- ✓ Variable Renewables
- ✓ Energy Storage
- ✓ Load Flexibility
- ✓ Hybrid resources

- ✓ Weather
- ✓ Combined Outages
- ✓ Modular Technology
- ✓ Climate Trends



= fundamental need to rethink RA

Six principles of resource adequacy for modern power systems

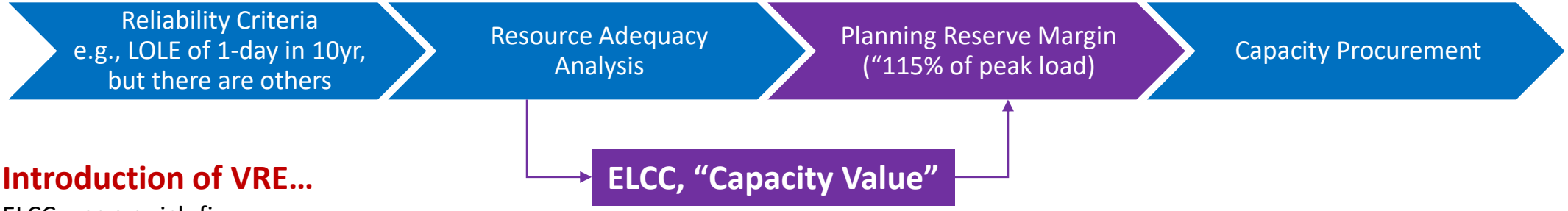
1. Quantifying size, frequency, duration, and timing of capacity shortfalls is critical to finding the right resource solutions
2. Chronological operations must be modeled across many weather years
3. There is no such thing as perfect capacity.
4. Load participation fundamentally changes the resource adequacy construct.
5. Neighboring grids and transmission are a key part of the RA challenge
6. Reliability criterion should not be arbitrary, but transparent and economic.

Translating the resource adequacy analysis into procurement decisions

Where does the current planning and procurement process break down?

Conventional Planning Process…

Traditional Translation of RA metrics



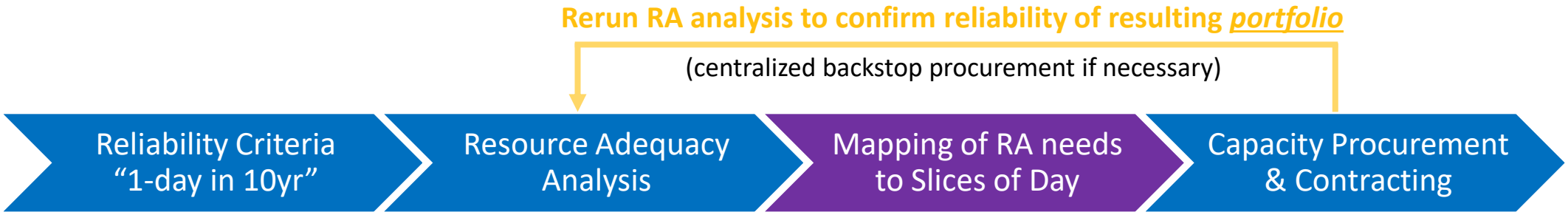
Introduction of VRE…

ELCC was a quick-fix

Limitations for future use…

- Planning reserve margin looks at peak load only, and requires accurate ELCC assumptions across the horizon
- ELCC is an *expected value only,* and is an average across all hours, seasons, and does not differentiate
- ELCC for storage and energy limited resources is highly dependent on the rest of the system ("portfolio effects") and the "saturation effects" at higher penetrations
- In order to be useful, ELCC calculations must be routinely updated across the planning horizon and resource mixes

A **new way** to translate resource adequacy into procurement decisions



- Still need to link the heuristic "slice of day" to a detailed probabilistic analysis
  Many years of weather day, load variability, resource profiles, generator outages, etc
- No longer rely on the ELCC or equivalent for capacity accreditation ("counting rules)
- Resource adequacy modeling only used to *quantify system risk*
- Resource adequacy modeling informs the counting rules, not the other way around
- Backstop procurement could be conducted to specifically target the size, frequency, duration, and timing, of remaining reliability shortfalls
- The reliability criteria becomes transparent and flexible, based on cost and reliability tradeoffs

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Context reminder

Resource adequacy procurement vs. IRP

- CA RA is short term contracting with existing resources to ensure they show up
- Procurement of new resources is an IRP issue
- As we transition, links need to be tightened, but let's focus on RA and Slice of Day as the key to deal with energy sufficiency in all hours – in particular "net peak" hours.

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Synergies / recommendations

- Importance of **pre-contracting and post-contracting modeling**
  - Step (1) pre-contracting granular 8760 RA modeling following the ESIG principles (with estimates of the portfolio)
  - Step (2) mapping granular modeling to the PG&E slices
  - Step (3) contracting process
  - Step (4) confirmation of the resulting portfolio with granular 8760 RA modeling

- **Decouple reliability modeling from the counting rules:** reliability modeling informs counting rules; not the other way

- Policy discussions should recognize Principles 3 & 6
  - There is no perfect capacity
  - Reliability criteria should be transparent and economic

Thank You!

Questions?

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