Considering Regional Resource Additions and Retirements in Resource Adequacy Assessments

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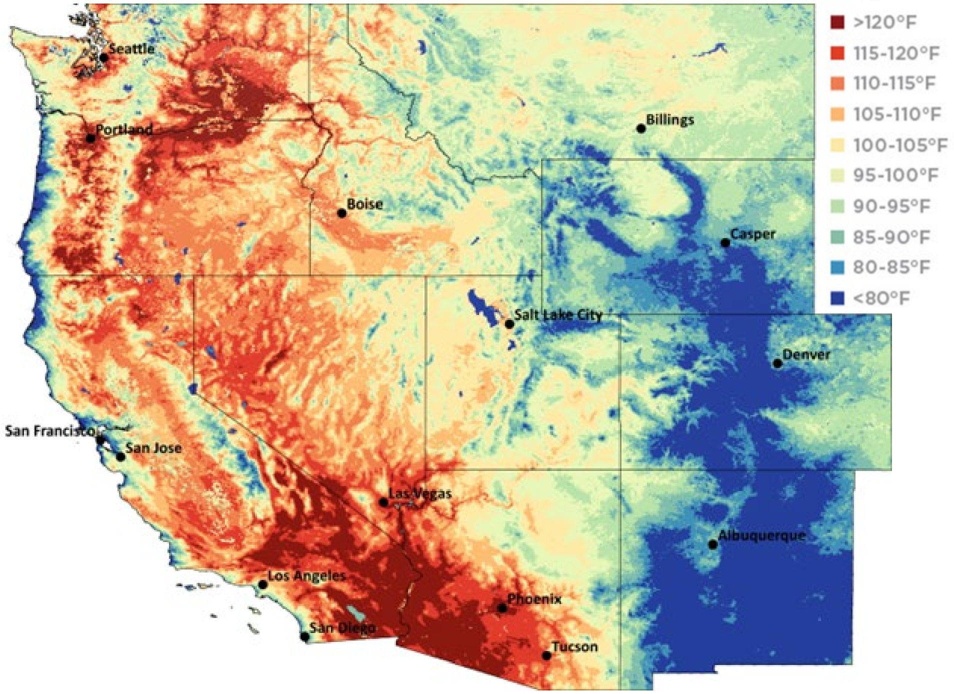
Why is considering neighboring grids important?

Including neighboring grids in the resource adequacy analysis can substantially change the answer

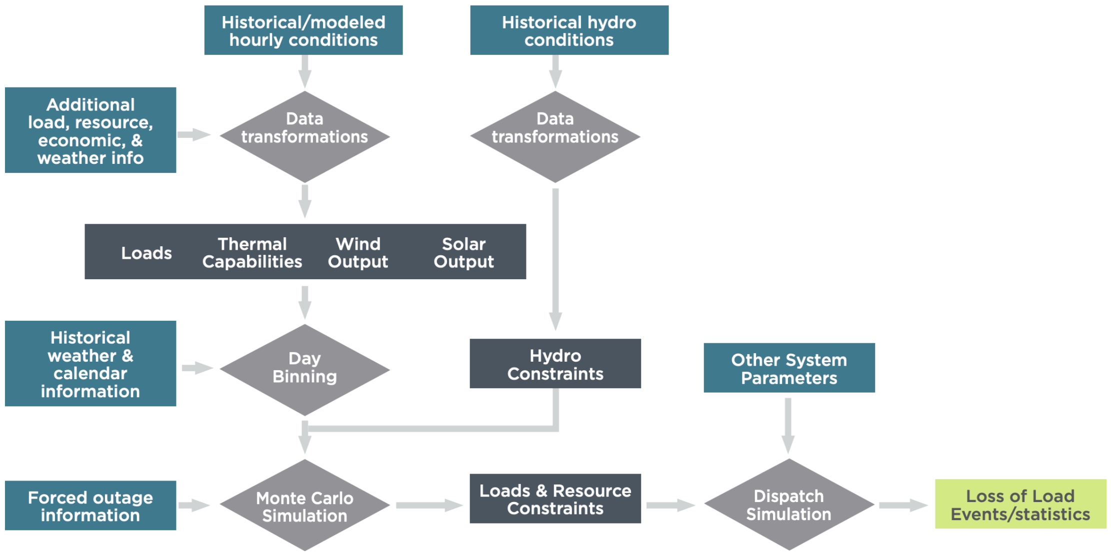
- **Geographic diversity** in load and variable energy generation reduces variability and the relative peak load
- **Extreme weather** that drives resource adequacy challenges does not generally occur everywhere at the same time
- **Resource-sharing** can be a cost-effective alternative to procuring new capacity



Max Daily Temperature, June 21, 2021, PNW Heat Dome Event

Source: "Advancing RA analysis with the GridPath RA Toolkit," Oct 2022
https://gridlab.org/gridpathratoolkit/

Why is considering neighboring grids challenging?



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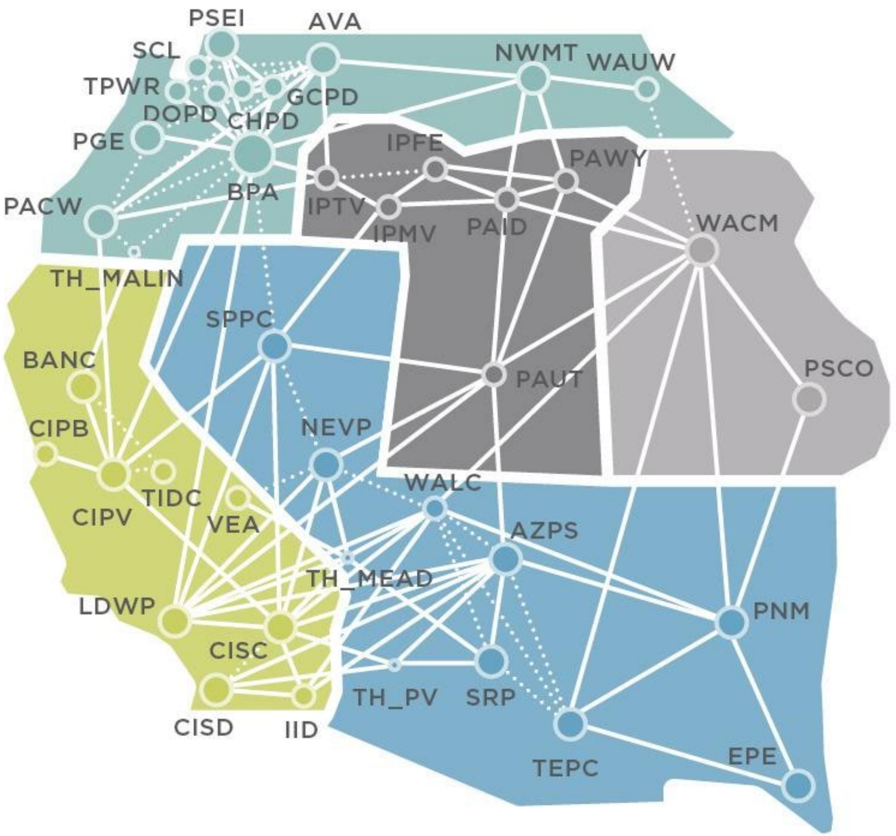
Including neighboring grids in the resource adequacy analysis poses a range of challenges

- **Data requirements** are substantial
- **Novel modeling capabilities** are required
- **Limited visibility** into neighbors' plans
- **Limited jurisdiction** over neighbors' procurement decisions

Key challenges: data requirements and modeling capabilities



Source: "Advancing RA analysis with the GridPath RA Toolkit," Oct 2022
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- Resource adequacy analysis looks for very rare events and therefore requires the use of weather-driven and weather-synchronized datasets with sufficient granularity, historical coverage, and geographic coverage
- **Weather correlations:** must account for complex weather correlations between load and resource availability over very large geographical areas
- **Energy-limited resources:** must account for the dynamic capabilities and limitations of energy-limited resources, e.g., hydropower, energy storage, and hybrid resources
- **Transmission:** must account for the benefits and limitations of the transmission system

Considering neighbors is planning under uncertainty

- Neighboring grids are a resource
- But how does one consider neighbors without depending on them?
- What is reasonable to assume about neighbors' resource additions and retirements without jurisdiction over those decisions?
- **No right or wrong answer**, it's a **policy decision** that depends on risk tolerance
- More certainty over the near term than in the longer-term development of the grid

Two examples:

- Near-term case: *Advancing RA analysis with the GridPath RA Toolkit*, Oct 2022, https://gridlab.org/gridpathratoolkit/

- Long(er)-term case: *The Moonshot 100% Clean Electricity Study*, Aug 2023, https://gridlab.org/moonshot-study/

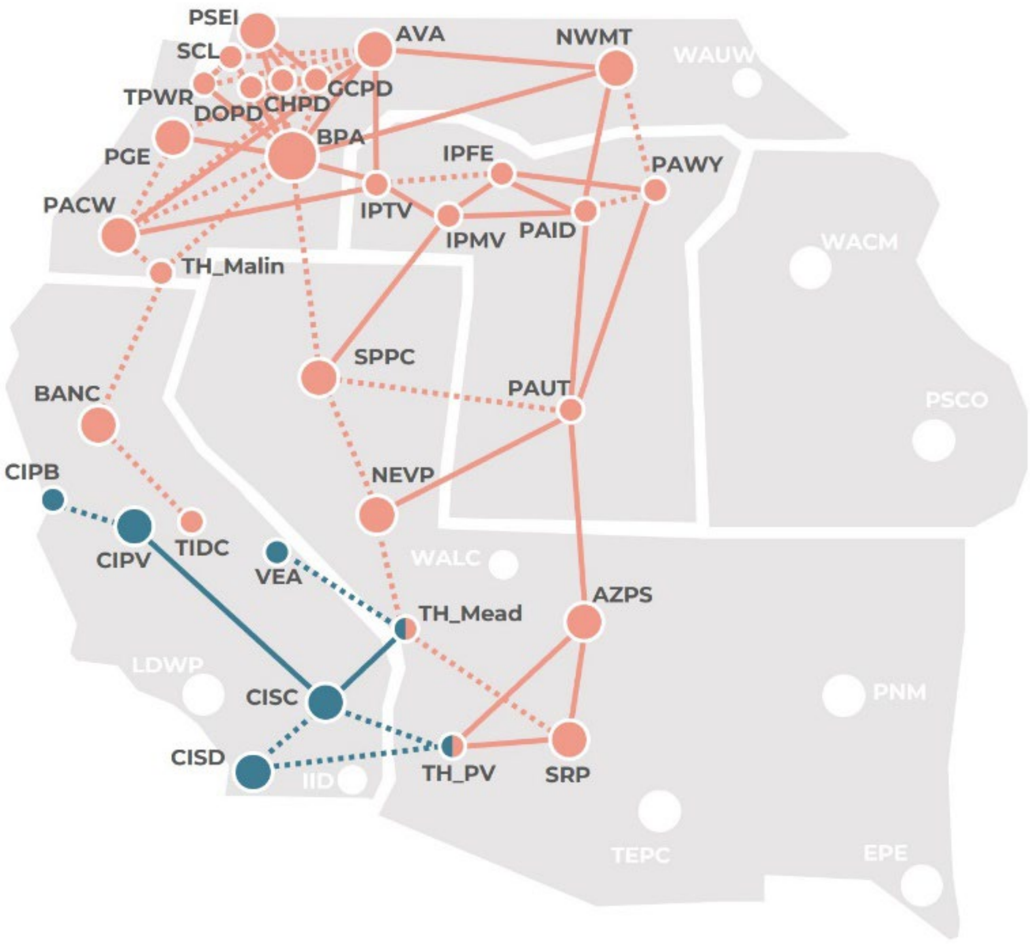
Example 1 of subregional analysis approach

Near-term (2026) Western US case study explored three scenarios:

- **No Additions Scenarios:** planned retirements, but no planned additions through 2026
- **California Additions Scenario:** layers on CPUC Preferred System Plan additions through 2026
- **Less Coal Scenario:** removes an additional 11 GW of coal resources from the California Additions Scenario

Subregional analysis for CAISO-like and WRAP-like footprints in additional to West-wide analysis:

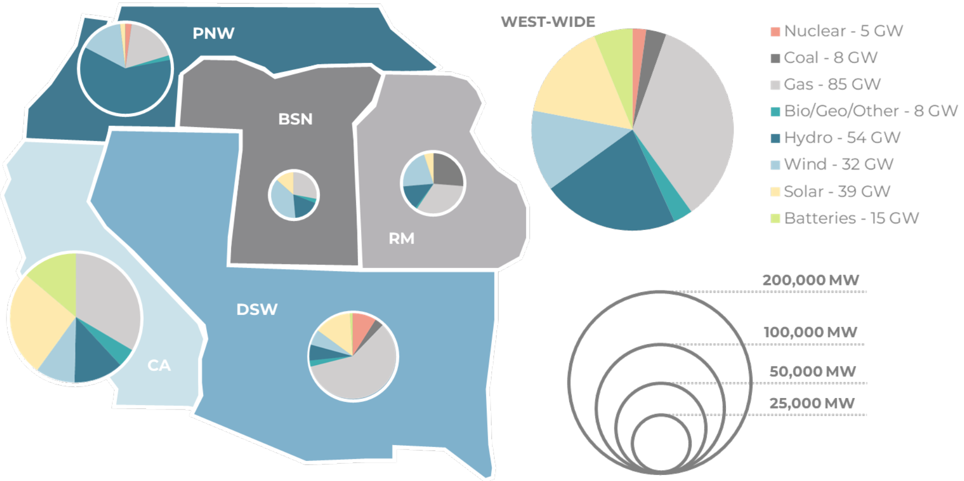
- Weather-coherent and transmission-constrained imports based on the islanded simulation and the West-wide simulation under the same weather conditions



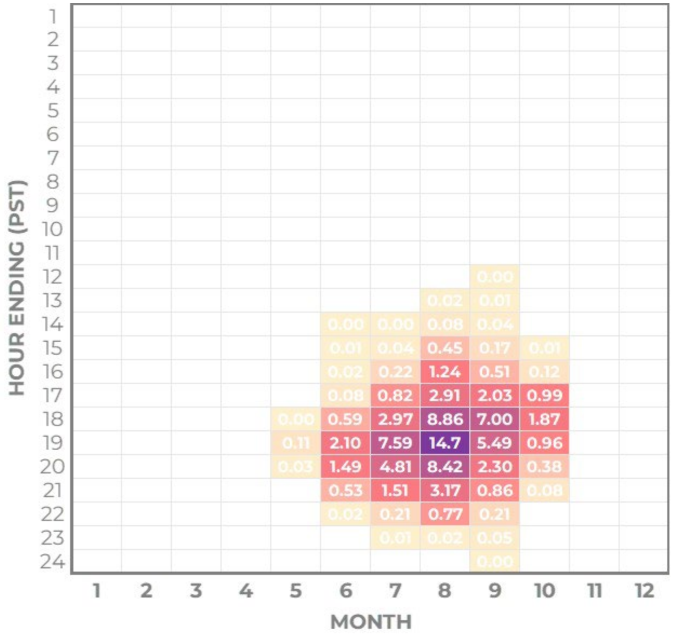
Source: "Advancing RA analysis with the GridPath RA Toolkit," Oct 2022 https://gridlab.org/gridpathratoolkit/

Baseline analysis: what if the region doesn't add resources?

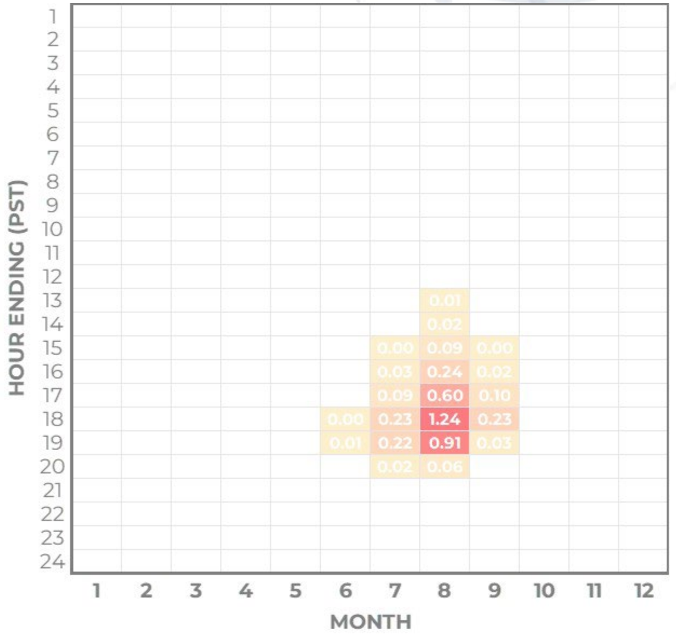
No Additions Scenario
Planned retirements, but no planned additions



CAISO – Islanded
Loss of load hours per year



CAISO – With imports
Loss of load hours per year



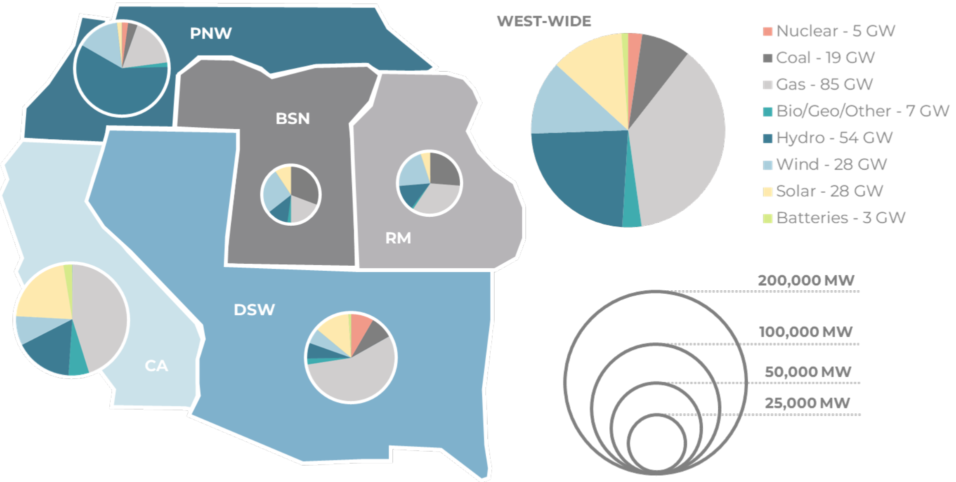
Note: This study uses a physical representation of CAISO and does not account for resources outside of CAISO that are contractually obligated to serve LSEs within CAISO

- Accounting for regional coordination reduces subregional loss of load, and concentrates the identified risk into fewer months and hours of day

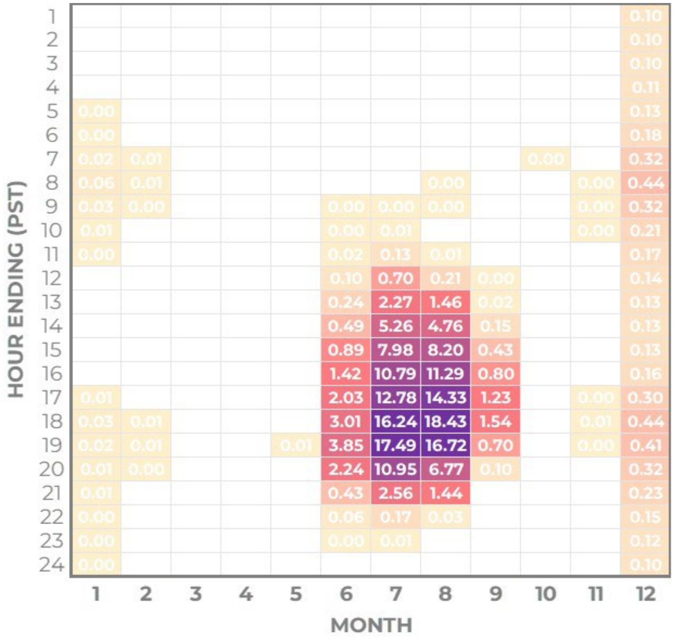
Source: "Advancing RA analysis with the GridPath RA Toolkit," Oct 2022
https://gridlab.org/gridpathratoolkit/

Stress case: what if the region accelerates retirements?

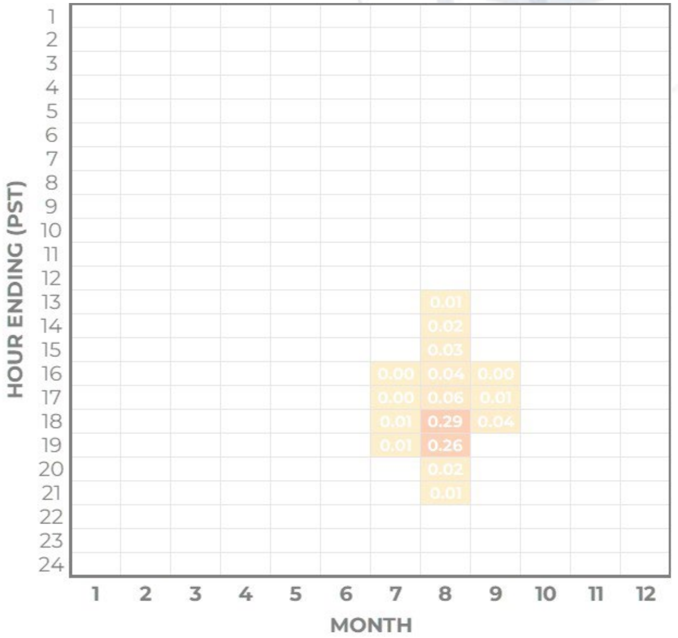
Less Coal Scenario
Incorporates CA additions, retires 11 GW of coal



WRAP – Islanded
Loss of load hours per year



WRAP – With imports
Loss of load hours per year



Note: This study uses a physical approximation of the WRAP footprint, which includes loads and resources in the following WECC BAs: AVA, AZPS, BANC, BPAT, CHPD, DOPD, GCPD, IPFE, IPMV, IPTV, NEVP, NWMT, PACW, PAID, PAUT, PAWY, PGE, PSEI, SCL, SPPC, SRP, TIDC, TPWR

- Accounting for regional coordination alleviates most subregional RA risk and narrows the nature of the resource adequacy shortage

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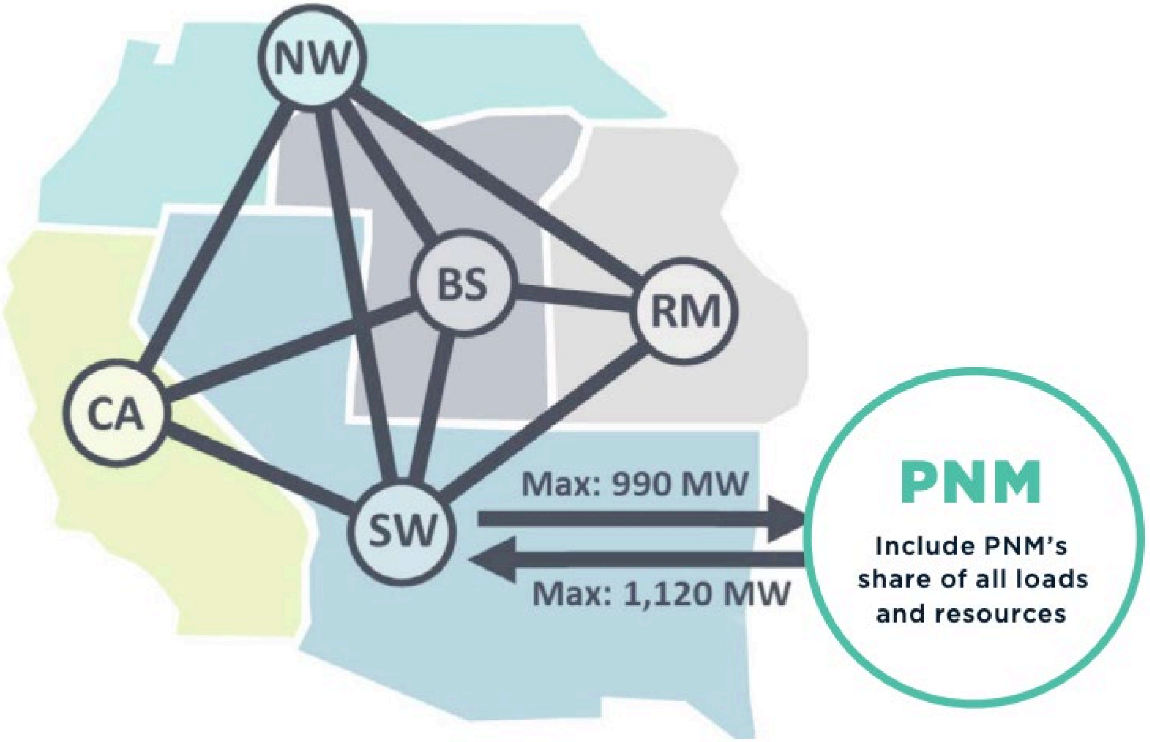
Example 2 of subregional analysis approach

Longer-term (2035) PNM case study explored 100% clean electricity scenarios



Source: "The Moonshot 100% clean electricity study," Aug 2023
https://gridlab.org/moonshot-study/

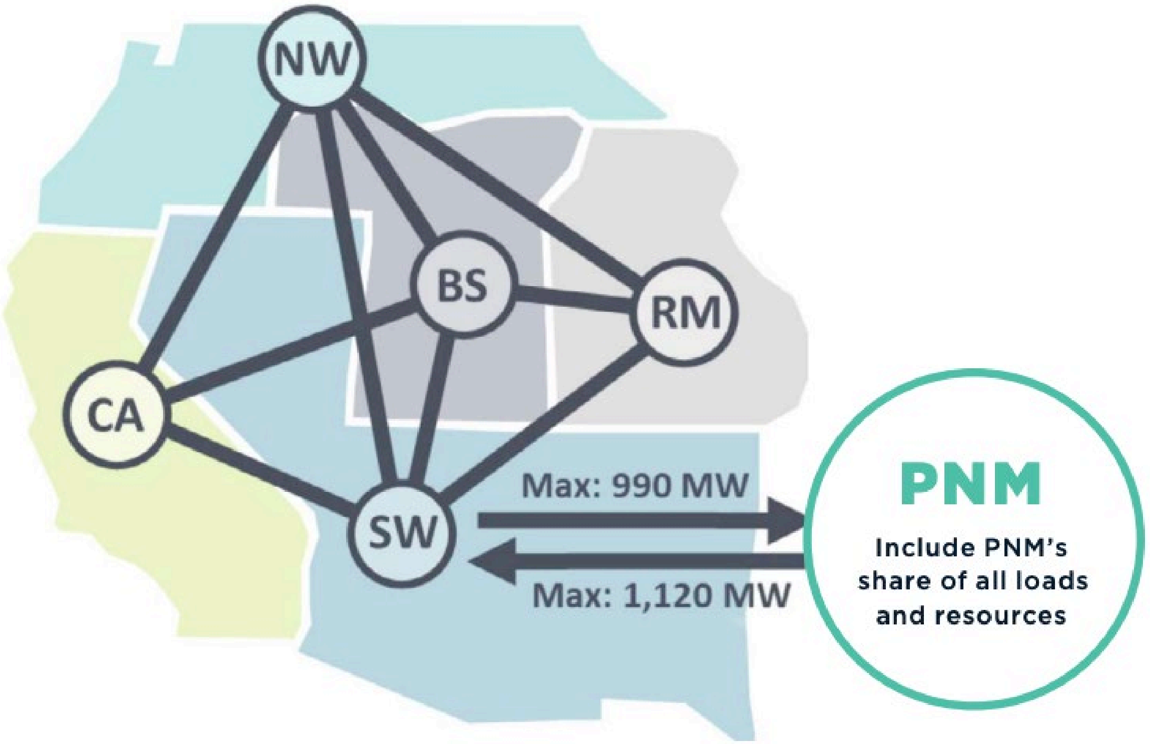
Challenge of considering imports: develop a methodology to consider the potential benefits of importing excess renewable energy from neighboring systems without overbuilding the rest of the West or relying on fossil fuel resources

Objectives

- Account for coherent weather conditions across the West
- Capture region-wide load and resource diversity benefits
- Respect transmission constraints
- Avoid free-ridership and net reliance on fossil generation outside of PNM
- Avoid subsidizing RA for the rest of the West

Example 2 of subregional analysis approach

Longer-term (2035) PNM case study explored 100% clean electricity scenarios



Source: "The Moonshot 100% clean electricity study," Aug 2023
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Step 1. Add currently planned clean resources (based on IRPs) and remove all emitting resources across the West.

Step 2. Simulate operations in the West without PNM to identify shortages not associated with PNM.

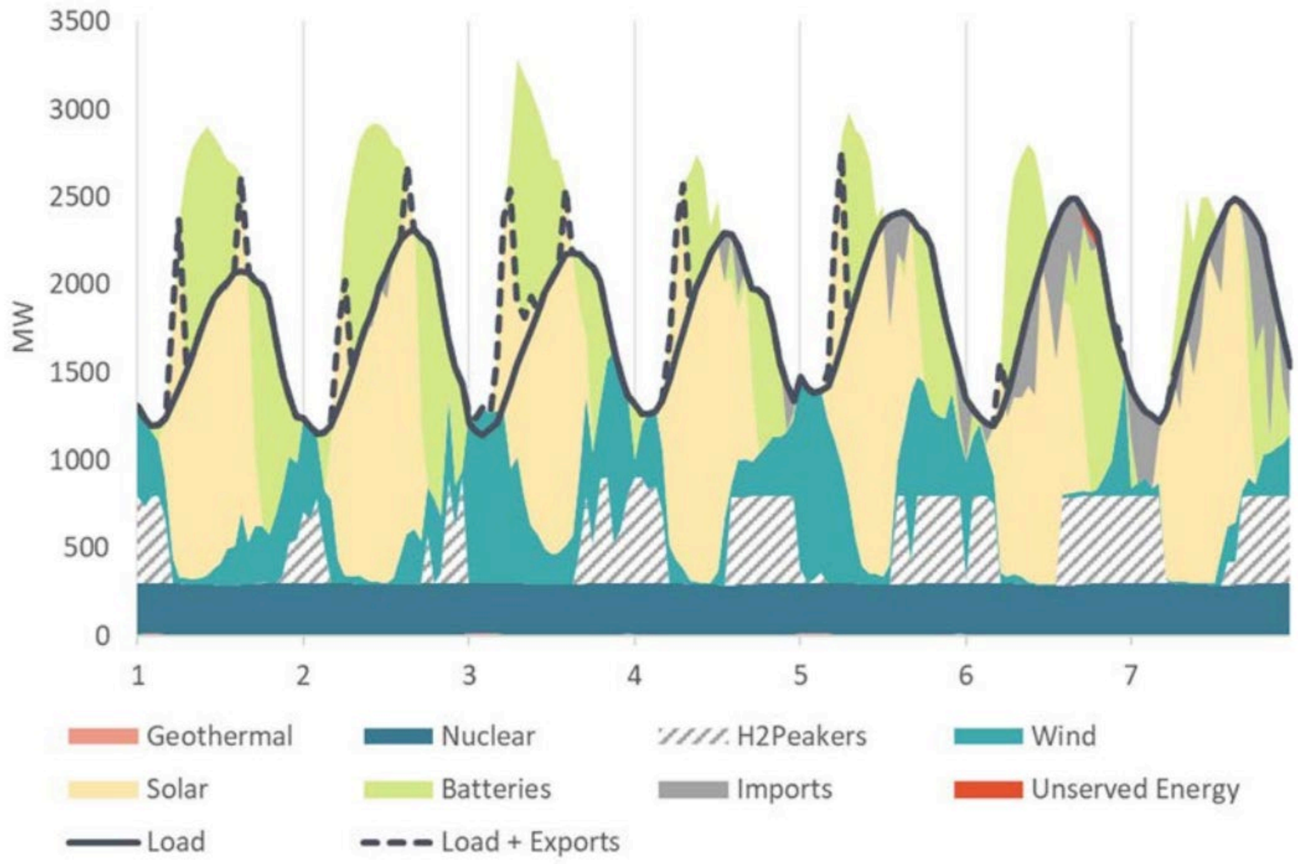
Step 3. Add technology-agnostic energy-limited resources to the rest of the West to exactly avoid all unserved energy.

Step 4. Add PNM loads and resources back into the model and attribute any simulated shortages to PNM.

Example 2 of subregional analysis approach

Outcome

- Coherent weather conditions simulated across region
- Excess solar used mostly to charge batteries with some excess exported
- Imports available during the day (excess solar in the rest of the west) and occasionally at night
- Approach allowed PNM to benefit from regional coordination while isolating the resource adequacy challenge specifically attributable to meeting PNM loads



Source: “The Moonshot 100% clean electricity study,” Aug 2023
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Summary

- Considering regional resource availability and coordination is an important aspect of resource adequacy planning and an alternative to resource overbuild
- Accounting for coherent weather conditions across the region and transmission constraints is critical for meaningful results
- Considering neighboring resources can change the nature of the resource adequacy problem and the appropriate solutions
- How to consider neighboring grids and the level of reliance on them is a policy decision that depends on risk tolerance

Thank You

Contact

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