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POLICY INSTITUTE FOR ENERGY, ENVIRONMENT, AND THE ECONOMY

Leveraging university expertise to inform better policy

The Metamorphosis of the Energy Sector: Maintaining reliability and affordability on the road to decarbonization

Austin Brown

Executive Director

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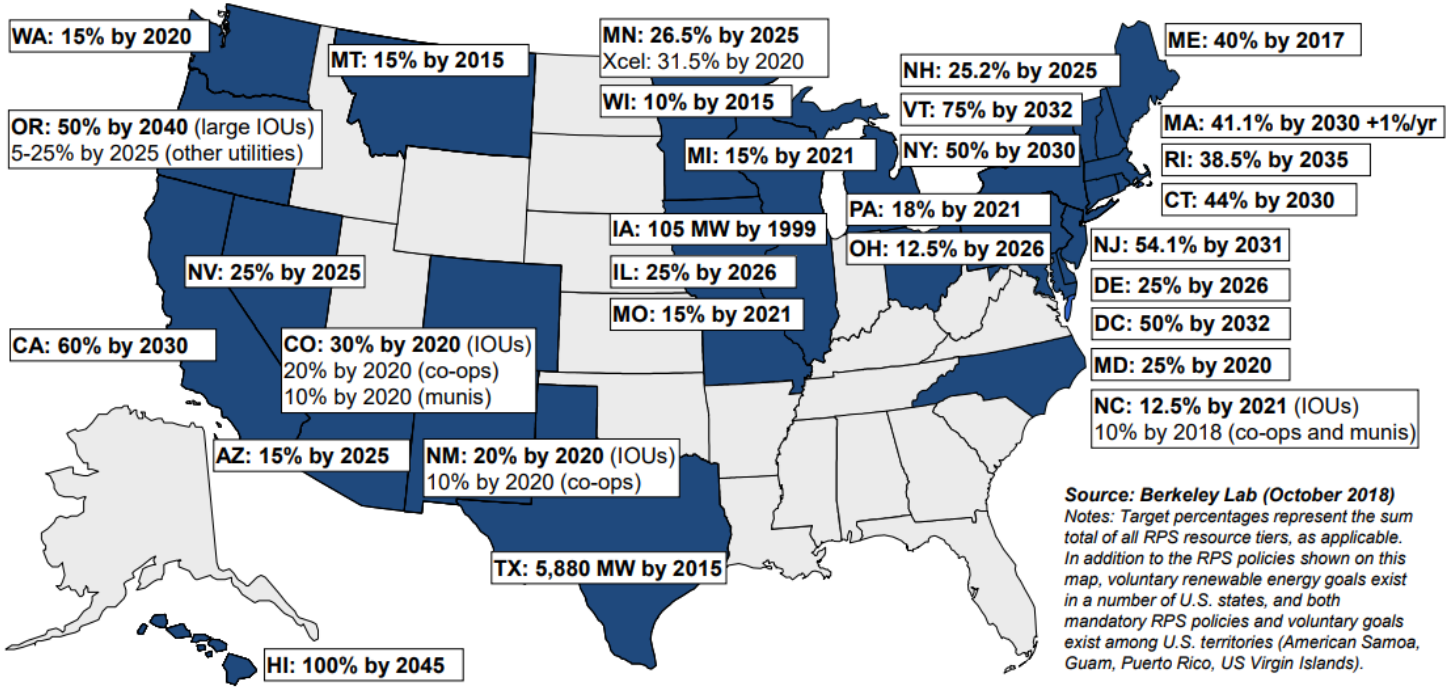
Summary

- California is leading in its clean energy goals
- Reliability is fine by conventional metrics, but worries persist about brittleness
- Our grid faces new challenges
  - Variable energy integration
  - New business models (CCAs)
  - Electric vehicles (also provide potential benefits)
  - Climate change
- How high can clean energy integration go?
  - We have many integration options

Policy Helping Drive Renewables

RPS Policies Exist in 29 States and DC

Apply to 55% of Total U.S. Retail Electricity Sales



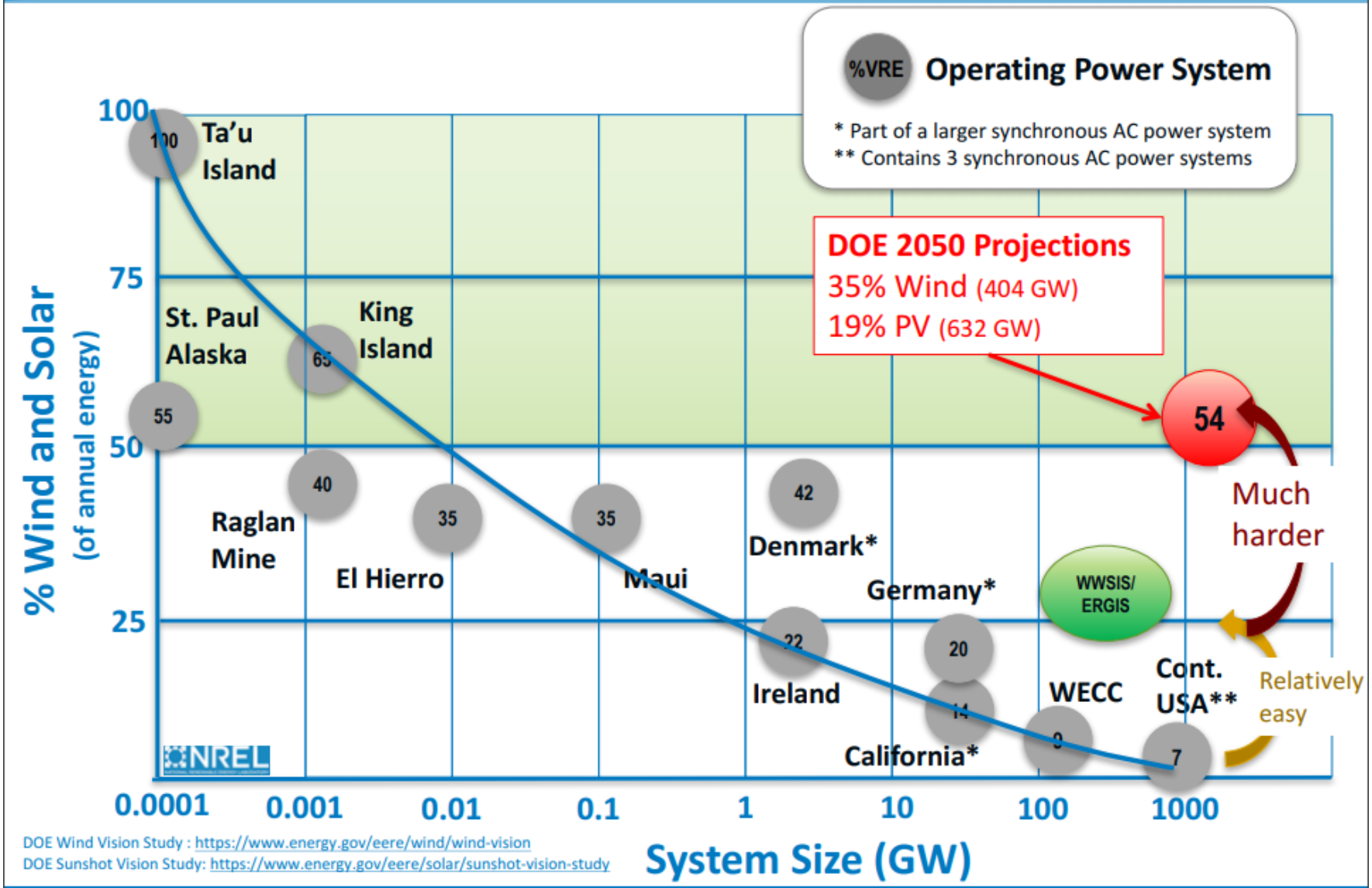
Source: Berkeley Lab (October 2018)

Notes: Target percentages represent the sum total of all RPS resource tiers, as applicable. In addition to the RPS policies shown on this map, voluntary renewable energy goals exist in a number of U.S. states, and both mandatory RPS policies and voluntary goals exist among U.S. territories (American Samoa, Guam, Puerto Rico, US Virgin Islands).

BERKELEY LAB

http://eta-publications.lbl.gov/sites/default/files/2018_annual_rps_summary_report.pdf

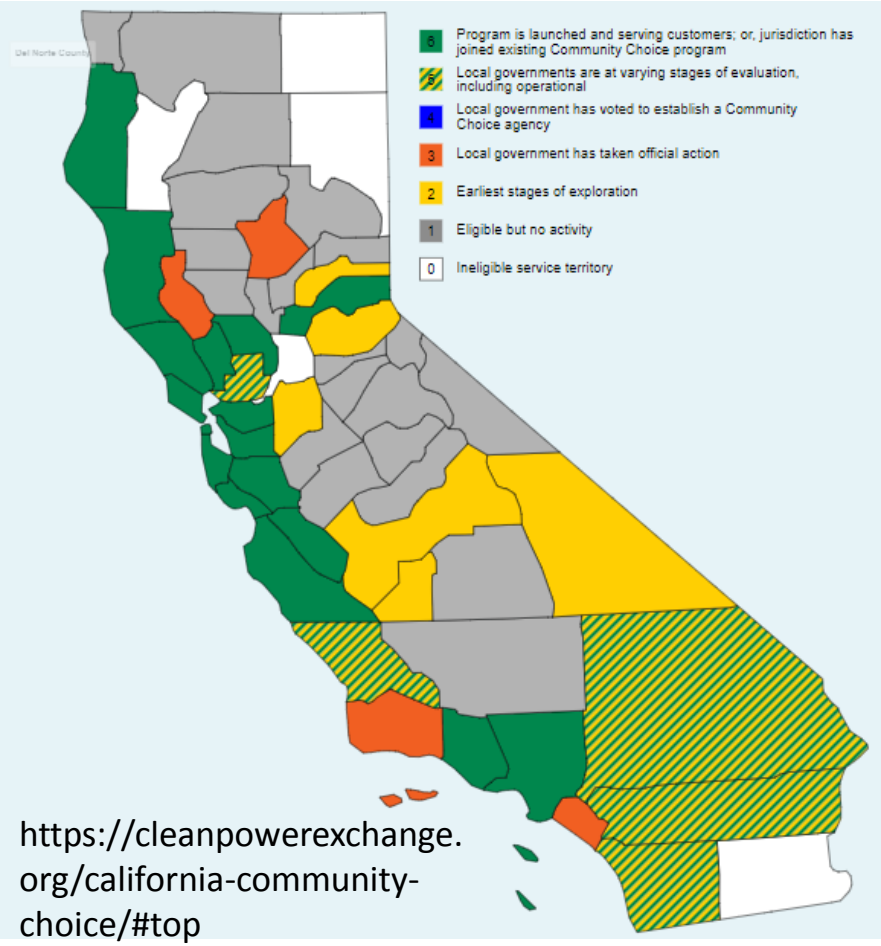
Moving toward Ultra-High Levels of Variable Renewable Energy



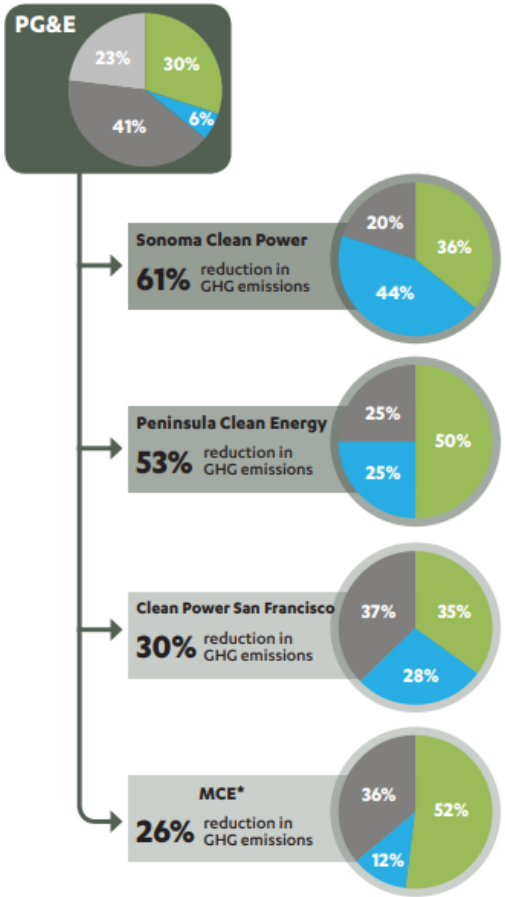
DOE Wind Vision Study : https://www.energy.gov/eere/wind/wind-vision
DOE Sunshot Vision Study: https://www.energy.gov/eere/solar/sunshot-vision-study

https://www.nrel.gov/docs/fy17osti/68349.pdf

Community Choice Increasing



https://cleanpowerexchange.org/california-community-choice/#top



UCLA Luskin School of Public Affairs
Luskin Center
FOR INNOVATION

http://innovation.luskin.ucla.edu/sites/default/files/The%20Promises%20and%20Challenges%20of%20Community%20Choice%20Aggregation%20in%20CA.pdf

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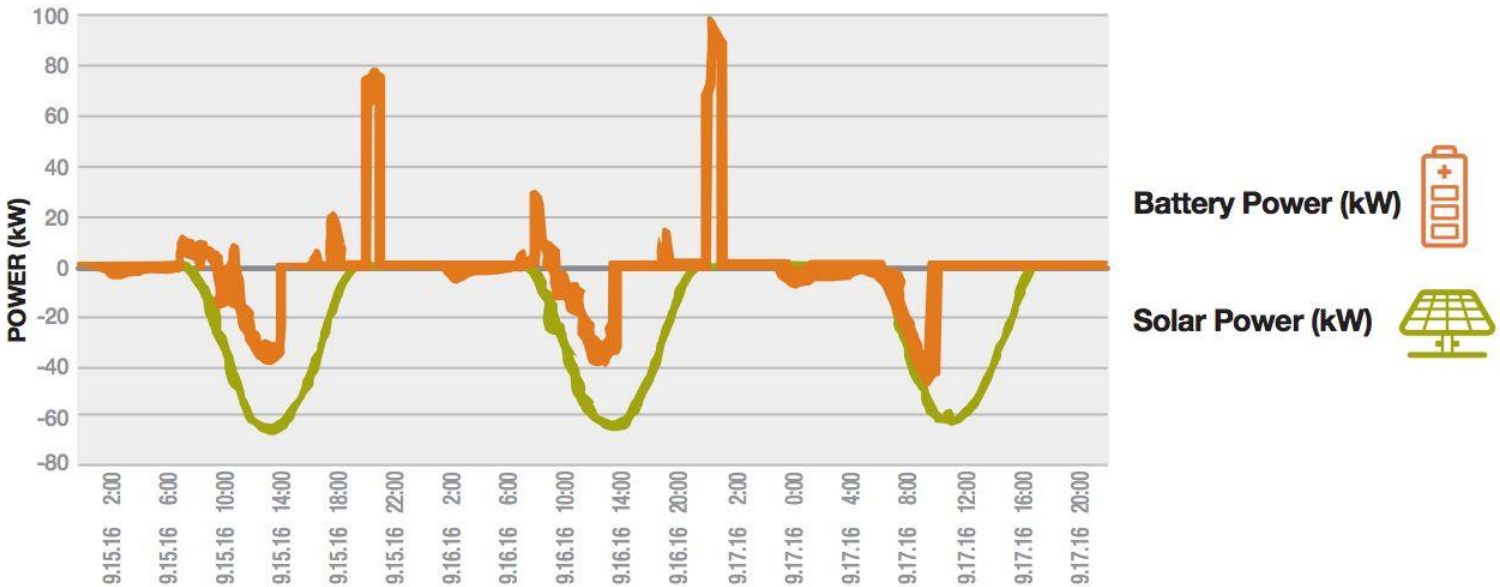
Electric Vehicle Grid Services

FIGURE 4 **Solar Production and Battery Recharge**

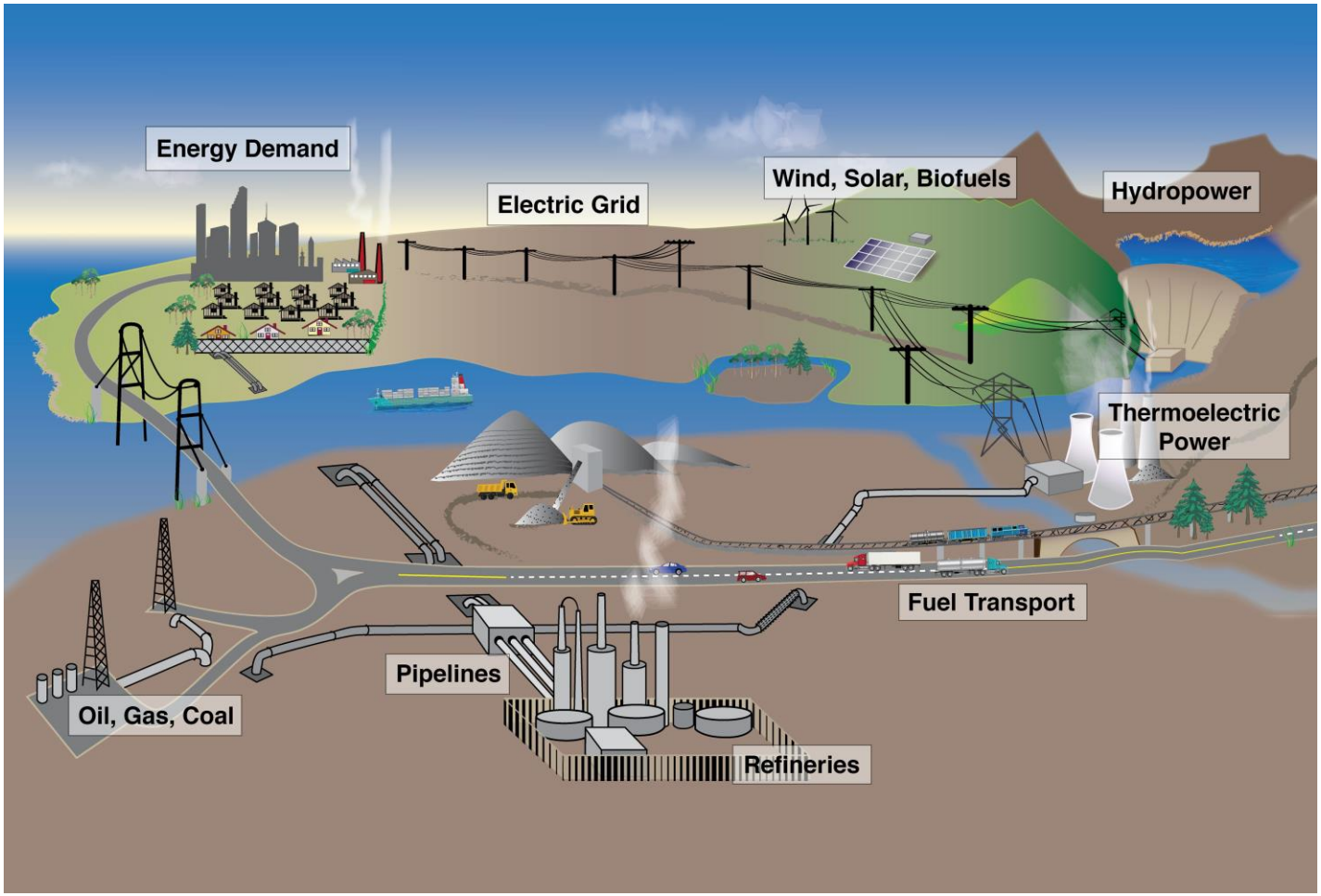
This graph illustrates the local solar production during three consecutive days. Energy production from the solar panels as well as battery recharging is displayed as negative values. The energy exported from the battery to the building or grid is positive. The two distinct orange spikes indicate the DR events called in the evenings where the battery dispatched power.



Solar and Battery Profile of the BMW Group Technology Office USA

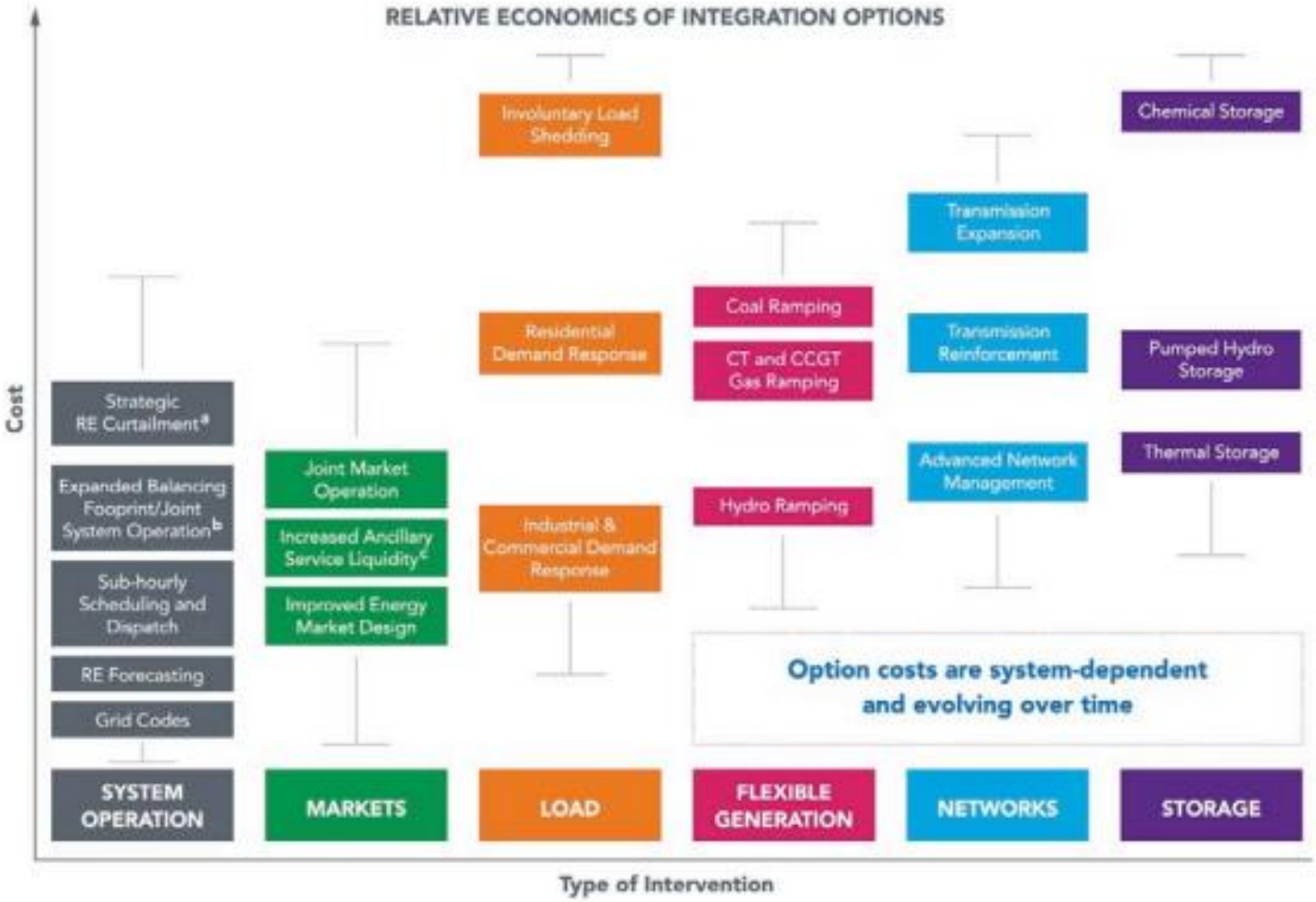
https://www.greentechmedia.com/articles/read/bmw-and-pge-prove-electric-vehicles-can-be-a-valuable-grid-resource

Climate Risks to the Grid



https://nca2018.globalchange.gov/chapter/4/

Many Integration Options



https://www.nrel.gov/docs/fy15osti/62607.pdf