

Synapse
Energy Economics, Inc.

Updating Vermont's Renewable Energy Standard

Vermont Senate Finance Committee

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Asa S. Hopkins, PhD

Meet Asa and Synapse

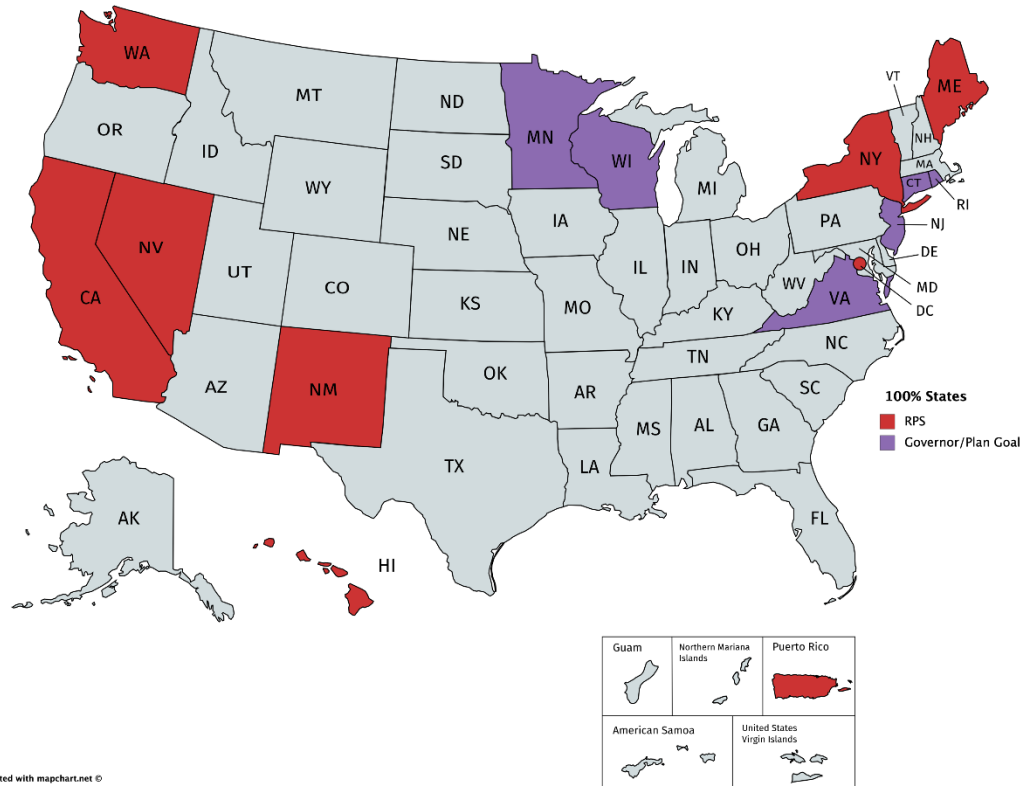
- Synapse Energy Economics was founded in 1996 by CEO Bruce Biewald
- Leader for public interest and government clients in providing rigorous analysis of the electric power sector
- Staff of 35+ includes experts in energy and environmental economics and environmental compliance
- Asa Hopkins, PhD:
 - At Synapse since 2017
 - Director of Energy Policy and Planning, VT DPS 2011-2016
 - One of the key architects of the 2015 VT Renewable Energy Standard
 - Directed the development of the 2016 Comprehensive Energy Plan

VT Renewable Energy Standard: History

- Vermont was a laggard in adopting a renewable electricity standard (29th state)
 - VT is closely linked, electrically, with the rest of New England
 - Being out of sync with the rest of the region became untenable
- RES is ambitious:
 - 75 percent renewable (Tier 1)
 - Allows resources that don't count as premium resources elsewhere (esp. older and larger hydro)
 - Originally designed to prevent backsliding and support Tier 3
 - 10 percent distributed generation requirement (Tier 2)
 - 12 percent “energy transformation” (Tier 3) was novel and uncertain
 - During policy development, Tiers 2 and 3 were originally one tier, and are still linked
 - Ability to use Tier 2 RECs for Tier 3 compliance was important

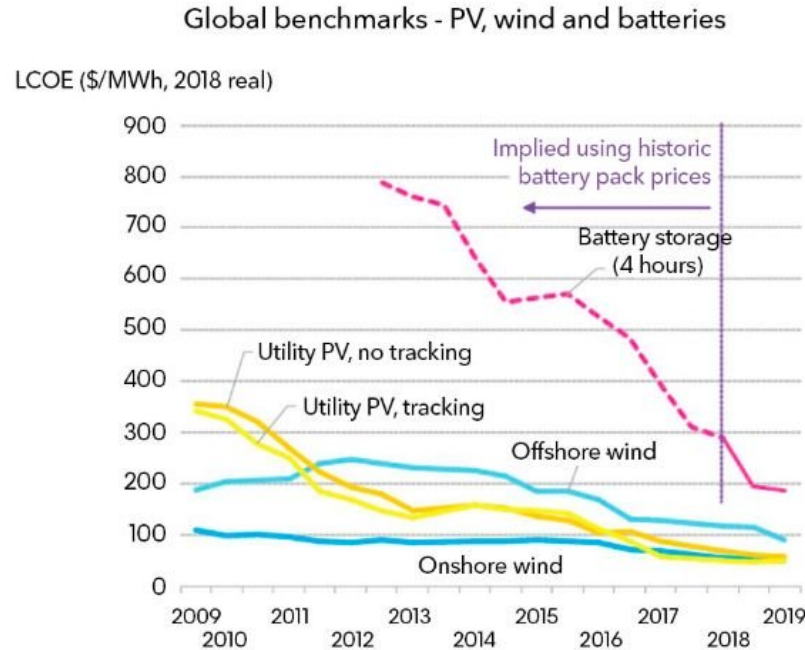
What's changed since 2015?

- 9 U.S. states/territories have adopted 100% renewable electricity mandates, and Governors in 6 more states have established it as a goal



What's changed since 2015?

- Solar PV and (especially) battery costs continue to fall:

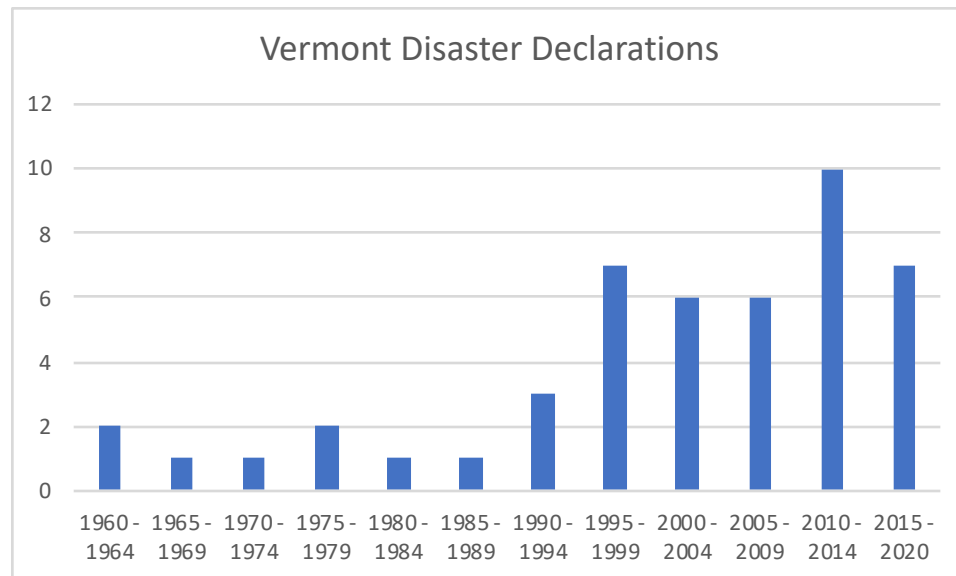


Source: BloombergNEF. Note: The global benchmark is a country weighted-average using the latest annual capacity additions. The storage LCOE is reflective of a utility-scale Li-ion battery storage system running at a daily cycle and includes charging costs assumed to be 60% of whole sale base power price in each country.

- California, New York, and Massachusetts have established storage mandates
- MA “SMART” program has incentives for coupled storage and solar

What's changed since 2015?

- IPCC “1.5 Degree” report changed the global conversation about the necessary pace of GHG reductions
 - Net zero 2050 GHG laws in place in NY and UK, and proposed in the EU; Mass. Gov. proposed 2050 net zero goal this year
- Vermont has had 6 more Federal Major Disaster Declarations due to severe storms



What's changed since 2015?

- Distributed generation deployment in Vermont (mostly solar)
 - If all built, the permitted Tier 2-eligible DG projects in the state would produce 7-8 percent of VT's electric needs
 - Ahead of schedule from Tier 2 (2.8% in 2020)
 - But only slightly ahead of Tiers 2 + 3 (6.8% in 2020; 8.1% in 2021)
 - Increasing circuit-level challenges with interconnection
- Energy Transformation has been working
 - Only a small number of Tier 2 RECS have been needed for Tier 3 compliance
 - After initial start-up stresses, partnerships between utilities and Efficiency Vermont have been established

Updating the RES

- 100 percent renewable is achievable and reasonable
 - Vermont is a small state within the region, and renewable resource availability is growing rapidly
 - BED and WEC have been 100% RE for years already, and GMP has committed to 100% carbon-free by 2025 (its existing nuclear contracts don't expire for a while)
 - Higher total renewable content would mean electrification under Tier 3 reduces more emissions per unit (and thus that fewer adopted EVs or heat pumps would be required to meet Tier 3's requirements)

Tier 2 can rise to its full potential

- With Tier 3's success, Vermont can reasonably allow Tier 2 to rise to 20 percent
- Keeps VT-generated renewable energy in the state
- VT is already approaching 40 percent of the way toward the proposed target

Addressing challenges with high solar penetration

- Integrating non-dispatchable, variable resources on the grid gets harder as the penetration increases

VT can turn the solution to an emerging challenge into an opportunity to build a more resilient electric system

- Storage that turns solar and wind into dispatchable resources has real value in both “blue sky” and “black sky” conditions
- Storage during “blue sky” conditions helps with transmission and capacity costs, as well as integration of other renewables (even the ones not paired with the storage)
- When the grid goes down, “islandable” storage and renewable generation avoids substantial costs to health and economic activity, as well as utility storm recovery costs

Questions?

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