Introduction to Energy Storage Policies

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Topics I will cover in this presentation.

- Setting the context for energy storage policymaking
- Current federal & state activities
  - ✓ Recent policy developments
- Ongoing state-level policy issues
  - ✓ Theoretical policy questions with state examples
  - ✓ Snap-shots into state “best practices”

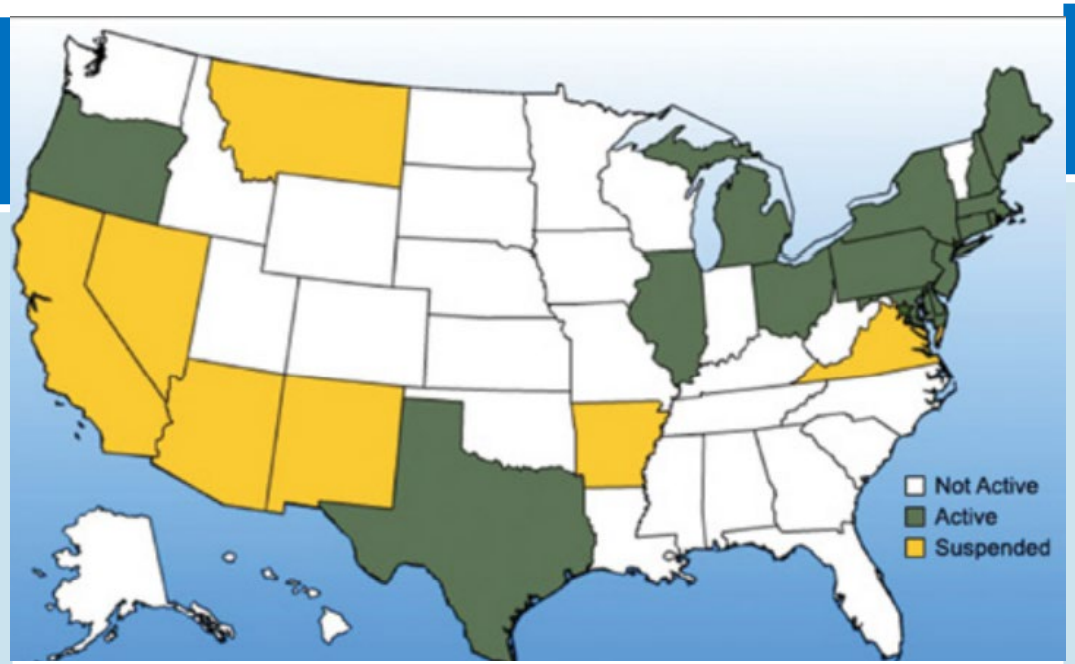
The U.S. market is not homogenous.

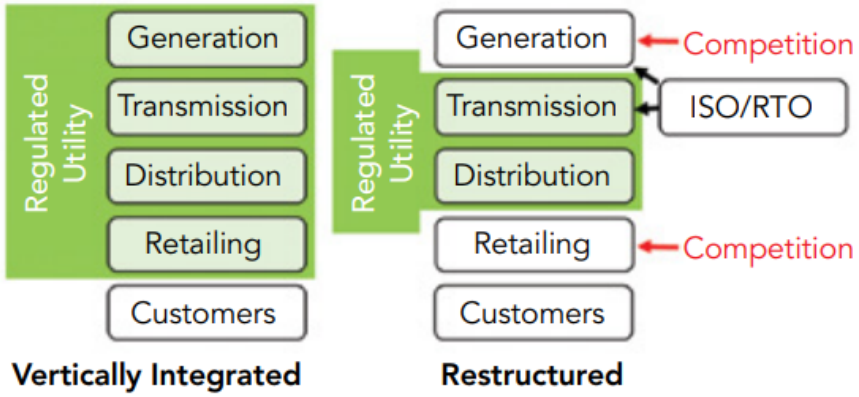
Status of Electric Restructuring by State

Regulated Markets

"Vertically integrated" utility **owns or controls** generation, transmission, and distribution

Regulated by states (public utility commissions) Cost recovery via rates charged to customers





Restructured Markets

Market is **competitive**

Utilities usually prohibited from owning G&T assets.

RTOS/ISOs responsible for inter-/intra-state T, D and O&M with oversight from FERC

Role of PUC varies state to state

Federal vs. State Responsibilities

FEDERAL

FERC, Congress, DOE

- Rules governing wholesale markets / RTOs (FERC)
- Rules governing transmission lines (FERC)
- Tax credit for solar + storage (Congress)
- R&D funding, deployment grants, resilience programs (DOE)

STATES

PUCs, state legislatures, state energy offices & executive directives from governors

- Retail markets
- Operations of distribution networks
- Utility rates
- Other enabling policies

What are the drivers for energy storage policymaking?

To Create Enabling Policies: ACCESS, COMPETITION & VALUATION/COMPENSATION

- To enable **ACCESS** for energy storage to the grid and markets
  - *Policy examples:* Interconnection, Ownership, Multiple Use Applications
- To enable energy storage to **COMPETE** against traditional resources in grid planning & procurements
  - *Policy examples:* Integrated Resource Plan requirements, wholesale market rules
- To enable appropriate **VALUATION/COMPENSATION** of energy storage
  - *Policy examples:* Tariff/rate design, incentive programs, procurement targets

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ES development pathways vary across states.

Energy Storage Development: Regulatory Guidance From NARUC

Regulated states may emphasize distribution system needs: *"ES needs to solve a problem."*

Restructured states may emphasize developing a market: *"ES needs to make money."*

States with Vertically Integrated IOUs	States with Restructured IOUs
• Consider expanding policies that encourage value stacking of BTM services (third-party asset ownership of BES assets is particularly effective) • Consider developing policies that encourage a wider range of BES services at the grid scale • Evaluate integrated resource planning (IRP) requirements for opportunities to encourage BES consideration • Consider adopting BES targets or mandates, and/or expanding renewable energy targets	• Consider developing policies that encourage value stacking of BES services at the grid scale • Consider adopting BES targets or mandates • Work with wholesale market organization to enable competition for grid services that BES can qualify to provide

Current Federal & State Activities

FERC Orders

FERC Order 841

- Directed RTOs to remove barriers to the participation of electric storage in wholesale markets
- RTOs must establish rules that open capacity, energy, and ancillary services markets to energy storage
- Does not apply to vertically integrated, non-RTO markets (e.g., the Southeast, Texas)
- Preliminary approval for PJM and SPP plans

Applicable To:

RTO/ISO
CAISO
NYISO
PJM
ISO-NE
MISO
SPP

FERC Order 2222

- Intended to create a level playing field for aggregated DERs (typically 1 kW to 10,000 kW)

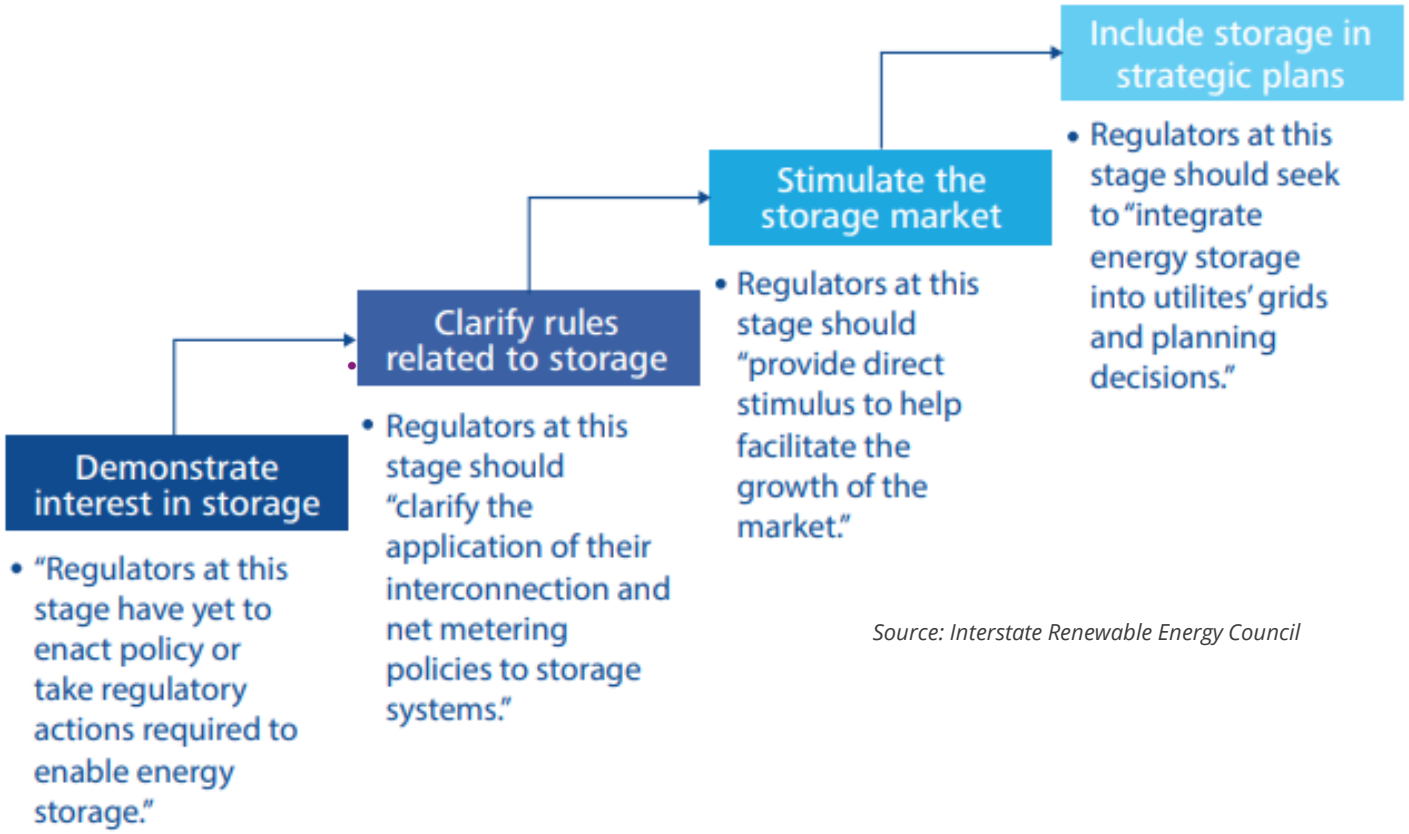
Definition of DER: "any resource located on the distribution system, any subsystem thereof or behind a customer meter. These resources may include, but are not limited to, electric storage resources, distributed generation, demand response, energy efficiency, thermal storage, and electric vehicles and their supply equipment."

Federal Legislation—2 key laws passed that benefit energy storage.

- Infrastructure Investment and Jobs Act (IIJA) : became law in November 2021
  - ✓ Half a billion dollars for energy storage demonstration projects.
  - ✓ $3 billion for manufacturing, helping to scale production lines for new battery technologies.
  - ✓ $14 billion for resiliency programs.
  - ✓ $8 billion to establish at least four regional clean hydrogen hubs.

- Inflation Reduction Act (IRA): became law in August 2022
  - ✓ Stand-alone ITC for storage; increased to 30% under 10-year fixed term; munis and co-ops now eligible.
  - ✓ Greenhouse Gas Reduction Fund to allocate $7B in grants to states, munis and tribal governments to develop zero-emission technologies; 50% dedicated to disadvantaged communities.
  - ✓ $760 million for grants to state, local and tribal governments to accelerate siting of transmission.

State-level policymaking specific to ES is still quite nascent.



Source: Interstate Renewable Energy Council

- The majority of U.S. states are still at the far left of this trajectory, and may not have even taken the first step yet.
- This is particularly true of the Southeastern region—very little if any policymaking on ES.
- Arguably less than a handful of states have reached the top level (CA, NY, HI)

An increasing number of states are establishing 100% decarbonization goals.

STATE	TYPE OF 100-PERCENT TARGET	YEAR	ORIGIN
California	Clean energy	2045	Legislation
Colorado	Clean energy	2050	Legislation
Connecticut	Clean energy	2040	Regulatory order
Hawaii	Renewable energy	2045	Legislation
Illinois	Clean energy	2050	Legislation
Maine	Renewable energy	2050	Legislation
Nevada	Clean energy	2050	Legislation
New Jersey	Clean energy	2050	Regulatory order
New Mexico	Clean energy	2045	Legislation
New York	Clean energy	2040	Legislation
Oregon	Clean energy	2040	Legislation
Rhode Island	Renewable energy	2030	Regulatory order
Virginia	Clean energy	2045	Legislation
Washington	Clean energy	2045	Legislation
Wisconsin	Clean energy	2050	Regulatory order

Key Energy Storage Policy Issues—States

Policymaking at the state level has been focused on the following core issues:

1. Procurement mandates, targets, or goals
2. Utility ownership
3. Inclusion of storage in utility IRPs
4. Incentives / tax credits
5. Multiple use applications
6. Cost / benefit analysis
7. Distribution system modeling
8. Changes to net metering policies
9. Changes to interconnection standards
10. Changes to RPS programs
11. Rate design
12. Equity

#1 Procurement Mandates, Targets & Goals

The Issue:
Should a state create a leg or reg mandate for ES development?

Procurement *mandates* for energy storage are still rather uncommon.

	CA	MA	NJ	NY	OR	VA ★
	1,825 MW by 2020 Carve-out of 500 MW for BTM	1,000 MW by 2025	2,000 MW by 2030	6,000 MW by 2030	5 MW by 2020	3,100 MW by 2035
Originating Source	**LEGISLATIVE & REGULATORY**	**LEGISLATIVE**	**LEGISLATIVE**	**LEGISLATIVE with increase set by Gov.**	**LEGISLATIVE**	**LEGISLATIVE**

Other Targets and Goals:

Connecticut: Goal of 1,000 MW by 2030 (Leg)
Maine: Goal of 400 MW of energy storage by 2030 (Leg)
Nevada: Target of 1,000 MW by the end of 2030 (Reg)

★ Most aggressive mandate to date

#2: Utility ownership

The Issue:
Given that storage is typically classified as generation, should utilities be allowed to own storage assets in deregulated markets?

Various models for ownership are emerging in restructured markets:

- Utility owned
- Third party owned
- Hybrid
- Virtual power plants—aggregated DERs, owned by third parties but managed by utilities.

Texas has been a battleground on the issue of utility ownership. Existing law defines ESS as generation. New law allows ownership only among public power entities.

Regulatory directive requires consideration of multiple options, including utility ownership.

Xcel Energy's plan is to replace coal-fired generating plants with utility-owned storage.

#3: Inclusion of storage in utility IRPs

The Issue:
33 states (mostly regulated states) require utilities to file IRPs. Should energy storage be mandated as a consideration within IRPs?

Colorado

New Mexico

Only a handful of states have thus far explicitly required the inclusion of ES in IRPs (as opposed to voluntary inclusion).

Indiana

North Carolina

Others states (e.g., AZ) have rejected utility IRPs because they did not consider ES.

#4: Incentives/tax credits

The Issue:
Should a state subsidize (e.g., rebates, grants, tax incentives) the development of BTM or FTM energy storage, perhaps serving as a bridge to jumpstart a market while regulatory policies are finalized.

- 1st state to adopt a state-level, 30 percent tax credit for energy storage devices (*to be sunset at end of 2024, replaced with a grant program)
- 1st state to allow BTM batteries to be eligible for funding support from a large energy efficiency budget

- California, New Jersey, Maryland and Nevada are acting as leaders in this movement
  - CA: Smart Grid Incentive Program; incentives for customers who produce electricity through storage
  - MD: First (and only) state to provide an ITC for storage*
  - NV: SESIP program; rebates for solar + storage
- Massachusetts, New York and Hawaii seem to be next in line
- So far, California is the only state in which an incentive program for storage has actually be implemented (the SGIP)

#5: Multiple Use Applications

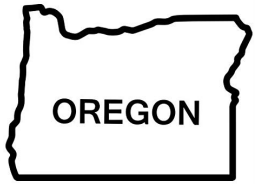
The Issue:

ES can involve multiple uses or applications at both retail and wholesale levels, sometimes simultaneously, and therefore layer on more than one revenue stream.

How should multiple uses be regulated, and prioritized?

BULK ENERGY SERVICES	ANCILLARY SERVICES	TRANSMISSION INFRASTRUCTURE SERVICES	DISTRIBUTION SERVICES	CUSTOMER ENERGY MGT SERVICES
Electric energy time shift (arbitrage)	Regulation	Transmission upgrade deferral	Distribution upgrade deferral	Power quality
Electric supply capacity	Spinning, Non-Spinning & Supplemental Reserves	Transmission congestion relief	Voltage support	Power reliability
	Voltage Support			Retail electric energy time-shift
	Black Start			Demand charge management

Developed a set of 11 rules on revenue stacking



PUC encourages projects that "stack" revenues by being able to serve multiple applications.

#6: Cost Benefit Analysis

The Issue:
Current market structures and policies lack clear mechanisms to identify and capture the full value of ES.

Should a state mandate a CBA specific to ES?

- Minnesota's CBA is now is publicly available: https://mn.gov/commerce/policy-data-reports/energy-data-reports/?id=17-415938

- Example: Legislation in MN directed the state's Department of Commerce to conduct an energy storage C/B analysis, in order to determine the value of adding the resource to the electric grid.

Key Findings:

- Solar plus storage is cost-effective today.
- Stand-alone storage could become cost-effective in 2025.
- Over the next 10 years, storage will show increasingly positive cost-benefit ratios for more and more use cases as technology costs decline.
- In MN, 324 MW "peaking capacity" could be "mimicked" by 4-hour duration energy storage.

#7: Distribution System Modeling

The Issue:

Much of new storage is expected to be connected to distribution feeders.

Should utilities be required to develop distribution modeling plans and include energy storage in those plans?

California and New York lead the way for requiring utilities to include energy storage in advanced distribution system modeling and planning.

- CPUC required 3 IOUs to submit Distribution Resource Plans that find opportunities to site, value and integrate renewable energy.
- The Plans include site specific evaluations for ES

- REV model envisions utilities acting as Distributed System Platform providers
- For the past three years, regulators, utilities and other stakeholders concentrated on filing proposals for the DSIP (Distribution Service Implementation Plans) process and rolling out pilot programs

#8: Changes to Net Metering Programs

The Issue:

Pairing solar-plus-storage with NEM has received minimal policy attention to-date due to low level deployments.

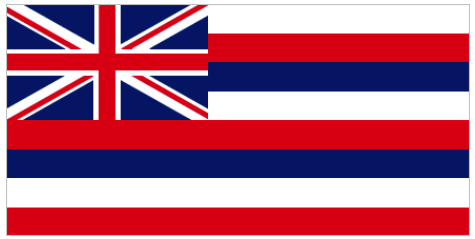
However, the issue is emerging as pairing energy storage with solar energy systems becomes more economical.

CALIFORNIA:

December 2017: NEM successor tariff modified virtual net metering to facilitate pairing eligible generation with energy storage.

COLORADO:

1st state to adopt a consumer right to energy storage, which is prompting revision of NEM policy, among other policies.



HAWAII:

Successor tariffs to NEM allow customers to choose a "smart export" option for solar + storage systems (among other non-exporting tariffs)

#9: Changes to RPS Programs

The Issue:
Should an RPS require energy storage, or should objectives for ES be addressed separately?

8 states have adopted an RPS of 50% or more; four of these states also have separate procurement targets for storage.

	CA	HI	ME	NJ	NY	OR	RI	VT
RPS Mandate	60% by 2030	100% by 2045	100% by 2050	50% by 2030	70% by 2030	50% by 2040	100% By 2030	75% by 2032
Storage Mandate	1,825 MW by 2020	N/A	400 MW by 2030 (Goal not a mandate)	2,000 MW by 2030	3,000 MW by 2030	5 MW by 2020	N/A	N/A

#10: Interconnection Rules

The Issue:
Interconnection standards that preceded renewables and ES technologies are likely in need of revision.

Seeking consistency with IEEE 1547 guidelines.

- The ACC has recognized that its legacy standards need to be revised to address the unique interconnection requirements of DERs and storage
- Draft rules were published in June 2015 but by late 2019 final statewide rules have not been adopted
- Utilities in Arizona have developed their own rules, but this has caused inconsistent requirements

- Interconnection rules have not been revised since 2004.
- New revisions include energy storage systems in the definition of eligible projects
- Modeled off of 2014 FERC SGIP
- Fast-track approval allowed for some ES projects

#11: Rate design

The Issue:
Should a state regulatory commission adopt new rate designs to spur the development of BTM energy storage?

To what extent would such a strategy be successful?

- Historically electricity rates have bundled all electric services into one volumetric rate.
- Increasing reliance on renewables and DERs (especially EVs) necessitates increased grid flexibility.
- Load shaping through rates is one method to address systemic flexibility needs (e.g., reducing height of an afternoon peak).
- TOU rates can help stimulate optimal EV charging behavior (e.g., charging overnight when demand is lowest) and smooth demand throughout the day.

Time Varying Rate Categories

Structure	Definition
Time-of-Use (TOU)	The most basic pricing scheme, which consists of a tiered pricing structure with pre-defined peak and off-peak time periods
Critical Peak Pricing (CPP)	Traditional flat-rate volumetric pricing coupled with higher rates during peak demand events that are announced in advance
Peak Time Rebate (PTR)	Essentially the inverse of a CPP: a flat rate coupled with a rebate when customers reduce their usage during a peak demand event.
Real Time Pricing (RTP)	The most sophisticated pricing scheme, with hourly prices determined by day-ahead market prices or real-time spot market prices.

Source: By Advanced Energy Economy

#12: Equity

The Issue:

What policies will ensure that:

1. *Underserved communities receive the benefits resulting from grid modernization*
2. *Underserved communities do not disproportionately incur costs to maintain parts of the system that do not benefit their communities.*

- Marginalized (aka disadvantaged, aka low-income) communities remain virtually unrepresented in the energy planning and decision-making processes that drive energy production, distribution, and regulation.
- At the same time, these communities bear an inequitable proportion of the negative impacts of disparities in racial and economic energy burden and environmental injustices related to fossil fuel-based energy production and climate change.

New Jersey:
Created an Office of Clean Energy Equity, charged with requiring equity considerations to be incorporated in decision-making for state agencies, including the Public Utilities Commission.

Maryland: 2 grant programs (energy efficiency and solar) aimed at providing access to clean energy and reducing energy costs for low- and moderate-income residents.

State Activities—The Current Status

- Approximately 15 U.S. states have developed substantive energy storage policy as of mid 2022.
- At this time, these states represent “best practices” for state-level energy storage policies.

PM	I/TC	IRPs	NEM	RPS	C/B A	DSM	IC
CA MA NJ NY OR VA	MD	CO IN NJ NM	CA CO HI	CA HI NJ NY OR VT	MN	CA NY	AZ

Recent Policy Updates (State)—2022

- **Virginia**: New Republican governor and House majority, have indicated a desire to eradicate the 100 percent clean energy by 2045 goal previously adopted through legislation.
- **Connecticut** also created a new incentive program offering upfront subsidies of around $200/kWh for R, C&I customers who install energy storage systems.
- **California** has become the first state to identify specific amounts of ES/LDES that will be needed to meet its clean energy goal (37GW and 4GW, respectively).
- **New York:** Governor increased storage target from 3GW by 2030 to 6GW by that year.
- **Arizona**: ACC voted against adopting proposed Energy Rules that would require the state's electric utilities to reduce their carbon emissions and pave the way for 100% clean energy for the state. The rationale was that utilities are doing this voluntarily.

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The energy storage policy landscape continues to evolve.

Sandia National Labs monitors and analyzes activity at the federal and state levels and publishes information in the Global Energy Storage Database, available at this link:

https://www.sandia.gov/ess-ssl/global-energy-storage-database/

Thank you!

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