

Energy Storage: Massachusetts Perspective

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Energy Storage Growth in MA

Top energy storage states, full year 2020

California's front-of-the-meter installations were the key storage success story of 2020

Top three markets by segment in 2020 (energy capacity)

Rank	Residential	Deployments (MWh)	Non-residential	Deployments (MWh)	Front-of-the-meter	Deployments (MWh)
1 	California	309	California	139	California	2,372
2 	Hawaii	85	Massachusetts	94	Texas	116
3 	"All Others"	64.9	Hawaii	43	New Jersey	42

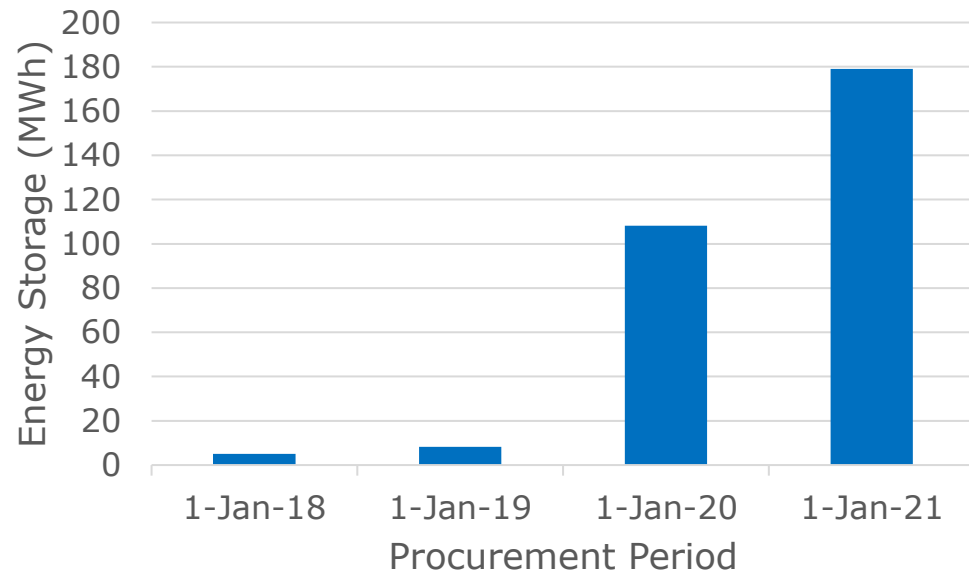
Past: SMART Solar program has been the primary driver of storage deployments to-date

Present: Clean Peak Standard entered effect in 2020, beginning to influence ESS financing & development in 2021. Currently finalizing utility procurement structure to secure financing.

Future: ISO-NE FCA #15 results included nearly 600 MW of new energy storage to be operational in 2024: market turning point

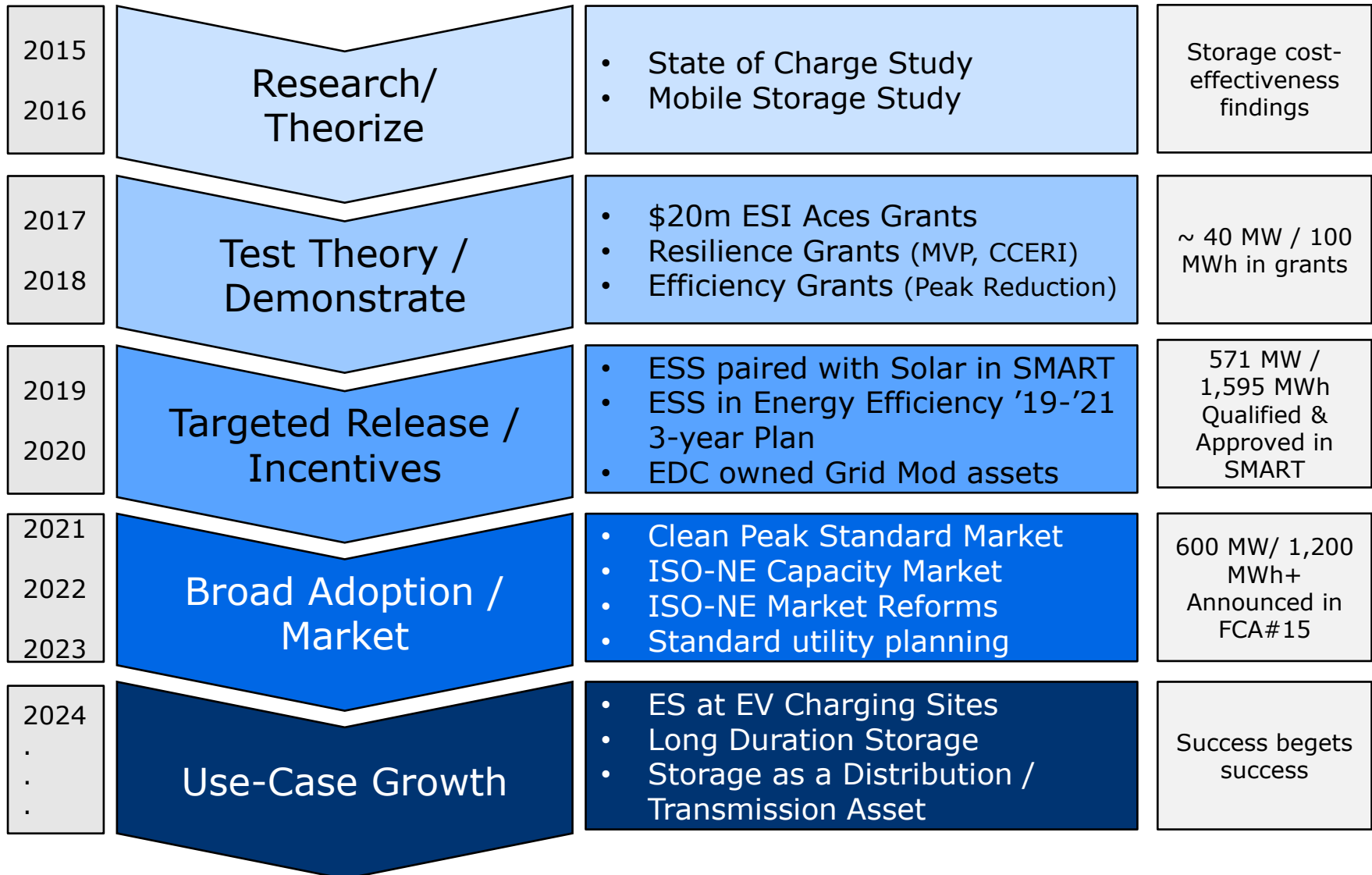
Challenge: Interconnection upgrade costs and timelines associated with coordinating distribution and transmission impact studies remains a barrier to development

2018 Act to Advance Clean Energy established a Target of 1,000 MWh by 12/31/2025



■ Cumulative Installed Energy Storage Reported by EDCs

Sequence of Success

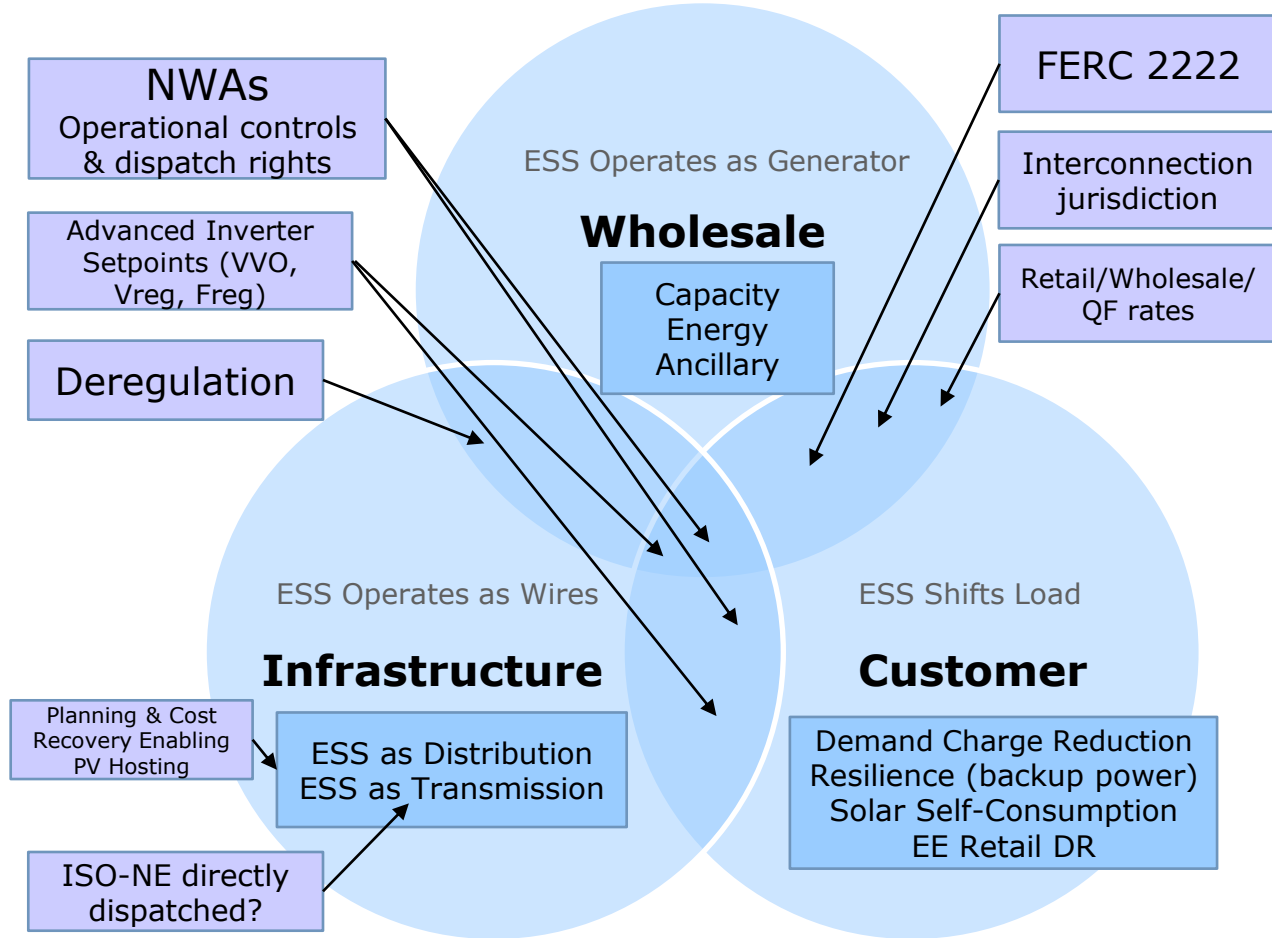


Storage is Simple: Charge energy, later discharge same energy
Storage is Flexible: Single facility can provide multiple services
Storage is Complex: Multiple services to multiple customers/markets

Regulatory Focus Points

- **Interconnection**
 - How to study & ‘trust’ as mitigating rather than exacerbating
- **Metering configurations**
 - Configuration matters
- **Tariffs & Billing**
 - Net Metering
 - Station power
- **Deregulated EDC Ownership**
 - EDC facilities operating in Energy / Capacity Market?
- **Dispatch Rights of Mixed-Use Storage**
 - If BTM ESS participates in NWA, can Utility directly control it?
- **Reconstitution**
 - Rule changes may alter BCA of policies
- **Cost Awareness:** Rapid cost declines change BCA results quickly
- **Siting:** e.g. EFSB jurisdiction
- **BTM Resilience:** consideration in reliability
- **Cost Recovery:** Mixed-Purpose ESS (PV hosting, electrification, etc.)

Overlapping Use-Cases Introduce Regulatory Complexity



Complexity = A Lot of Work

Is it necessary?

- **Costs declining rapidly and will continue this decade**
 - Wires, poles, transformers, RoWs not getting cheaper
 - ESS cost dropping ~85%/decade
 - Cost-effective crossover happens quickly
 - Establish regulatory frameworks in advance or risk incurring unnecessary costs soon
 - Flexible asset, reduce odds of stranded investment supporting electrification
- **Offer customers direct & indirect benefits:**
 - direct & indirect cost savings, clean backup power, & solar self-consumption
- **Necessary component of a clean energy future**
 - High penetration renewables change Ancillary grid support needs of system

85% cost decline per decade
Sense of scale

2010	\$2,250k/	MWh
2020	\$340k /	MWh
2030	\$50k /	MWh

Manufacturing doublings and learning-rate cost declines largely the result of EVs. Grid applications will free-ride the savings.

Major cost declines lead to rapid transitions to ESS as the cheapest solution, and opens project sizes unimaginable today

It is prudent to prepare for and enable customers to benefit from a foreseeable technology disruption

APPENDIX

Appendix – SMART Storage

- **SMART program on track to meet State’s storage target**
 - % pairing with storage is increasing
- **Developers say requiring storage is “healthy medicine”**
- **Interconnection holding up hundreds of MW of ESS in SMART**
 - DOER receives SMART application after facility has an Interconnection Service Agreement (ISA)
 - Storage held up in same queues as solar

SMART Status	# With Storage	MW of Storage	MWh of Storage
Approved	788	63	136
Qualified	1,088	508	1,459
Under Review	300	16	50
Approved + Qualified	1,876	571	1,595
Approved, Qual, & Under Review	2,176	587	1,645



Happy Hollow Community Solar + Storage Farm

Appendix – Energy Efficiency Storage

- **Available to Residential & Commercial customers**

- Pilot program in ‘19-’21 3-year plan
- Size & incentive levels may change in next plan



- **How it Works**

- Utility sends Day Ahead notification of dispatch windows
- Customer responsible for cycling battery responsive to the dispatch
 - Sunrun/Tesla etc. often perform on behalf of customer
- Utility pays customer based on average actual performance across all dispatch calls made for the entire season (only pay for benefits received)

Eligible Systems include:

- [Generac PWRCell](#)
- [SolarEdge](#) (National Grid Only)
- [Outback Connected To Sonnen](#) (National Grid Only)
- [Sonnen](#)
- [Tesla](#)

	Summer	Winter
Performance Incentive	\$225 per kW-summer	\$50 per kW-winter
Discharge Events per Season	30 to 60	5 - 15
Months Discharge Events Can Occur	June through September	December through March
Time Discharge Events Can Occur	2 p.m. to 7 p.m.	2 p.m. to 7 p.m.
5-year incentive lock	Yes	No

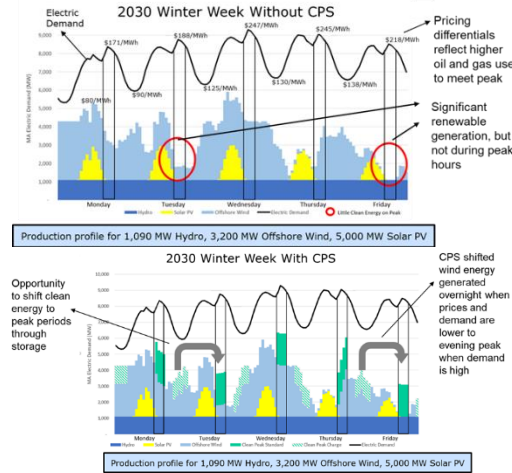
Appendix - Clean Peak

2020 Qualified Clean Peak Resources

- Resource diversity**

- Range of technology within resource pool
 - Energy storage
 - QESS (in SMART & not in SMART)
 - DR (all registered Demand Response was customer sited energy storage)
 - RPS Class I/II
 - Solar PV
 - Land based wind
 - Anaerobic digestors
- Sizes range from 0.3 MW to 7 MW
- Many program participants
- Geographic diversity

- 5 Projects with 9MW received the Resilience Multiplier**



Resource Type	Qualified Capacity (MW)
Qualified Energy Storage (QESS)	19.3
RPS Class I/II	13.5
Demand Response (DR)	4
TOTAL	36.8

Region	#	Participants include	
Northeast	5	EnelX	Nexamp
		NextEra/Lodestar	Syncarpha
Southeast	3	Clean Peak Power	SunRaise
		Kearsarge	Frontier
Central	2	MMWEC	AlsoEnergy
Western	7	NextGrid Markets	Green Harbor Energy
		UMass	Belden Farm & Rockwood Farm
TOTAL	17		

Clean Peak ES growth expected following EDC issuance of RFP for CPEC Procurement Targeting Late 2021 for first RFP, then twice-annually thereafter

Appendix – Storage in ISO-NE Market

- FCA #15 resulted in nearly 600 MW of new energy storage securing a Capacity Supply Obligation, to be operational in 2024**
 - Previously there was a cumulative 30MW of ES with CSO
 - FCA #15 clearing prices were not particularly high (higher than FCA #14 record lows, but otherwise lower than all past years). Indicates competitiveness of storage.
 - 1,706 MW of ESS qualified & participated in the auction, 971 MW of which was in MA (table to-right)
- Results not yet released on which specific 600MW of resources cleared and were awarded CSOs**

Table to Right

- ISO-NE FCA #15 ES Participants
- Green highlight in Massachusetts
- Ordered Large to Small (MW)
- Don't yet know which cleared market

State	Load Zone	Status	Lead Participant Name	FCA Qual MW
CT	CT	New	Able Grid Infrastructure Holdi	300
MA	SEMA	New	Able Grid Infrastructure Holdi	250
MA	SEMA	New	Interconnect Energy Storage	246
CT	CT	New	KCE CT 1, LLC	200
ME	ME	New	Energy Storage Resources, LLC	175
MA	SEMA	New	Energy Storage Resources, LLC	150
MA	WCMA	New	Able Grid Infrastructure Holdi	150
MA	SEMA	New	Able Grid Infrastructure Holdi	150
CT	CT	New	KCE CT 2, LLC	20
ME	ME	New	Brookfield Renewable Trading A	20
ME	ME	New	New England Battery Storage, L	10
ME	ME	Existing	New England Battery Storage, L	4.9
ME	ME	New	New England Battery Storage, L	4.9
ME	ME	New	New England Battery Storage, L	4.9
MA	SEMA	New	Vermont Public Power Supply Au	2.5
MA	WCMA	New	Enel X North America, Inc.	2.5
MA	WCMA	New	Genbright, LLC	2.4
MA	WCMA	New	Enel X North America, Inc.	2.2
MA	NEMA	New	Boston Energy Trading and Mark	2
MA	WCMA	Existing	Enel X North America, Inc.	1.9
MA	SEMA	New	Genbright, LLC	1.9
MA	SEMA	New	Genbright, LLC	1.9
MA	WCMA	Existing	Enel X North America, Inc.	1.7
MA	SEMA	New	Enel X North America, Inc.	1.7
MA	WCMA	Existing	Genbright, LLC	1.6
MA	WCMA	New	Genbright, LLC	1.5
MA	WCMA	Existing	Genbright, LLC	1.4
MA	SEMA	Existing	Enel X North America, Inc.	1.3
MA	SEMA	Existing	Genbright, LLC	1.3
MA	WCMA	Existing	Genbright, LLC	1.3
MA	WCMA	New	Boston Energy Trading and Mark	1.3
MA	SEMA	New	Genbright, LLC	1.2
MA	WCMA	New	Genbright, LLC	1.0
MA	WCMA	Existing	Genbright, LLC	0.9
MA	SEMA	New	Genbright, LLC	0.9
MA	NEMA	New	Genbright, LLC	0.8
MA	SEMA	New	Boston Energy Trading and Mark	0.8
MA	WCMA	New	Ictec Energy Services, Inc.	0.7
MA	NEMA	Existing	Genbright, LLC	0.7
MA	WCMA	Existing	Ictec Energy Services, Inc.	0.4
MA	WCMA	Existing	Ictec Energy Services, Inc.	0.2
MA	WCMA	New	Ictec Energy Services, Inc.	0.1

Appendix – Reliability Events of Other States



- **California Summer outages resulted in increased residential and commercial adoption of Solar PV paired with Energy Storage for clean backup power**
 - Large-scale storage would have helped the CA grid situation
 - Small distributed solar + storage kept lights on /appliances working in outage, and kept EVs charged for transportation access
- **Texas Winter outage event likely to result in similar adoption increase**
 - Large-scale storage would not have improved the TX grid situation
 - Small distributed solar + storage kept lights on for households with installs, however cold temperatures & poor insulation mean electric-heated homes did not have sufficient energy to heat to normal temperatures.

Reminder: Clean Peak Energy Portfolio Standard is the First in the Nation to provide an incentive to configure distributed renewables & storage to provide backup power