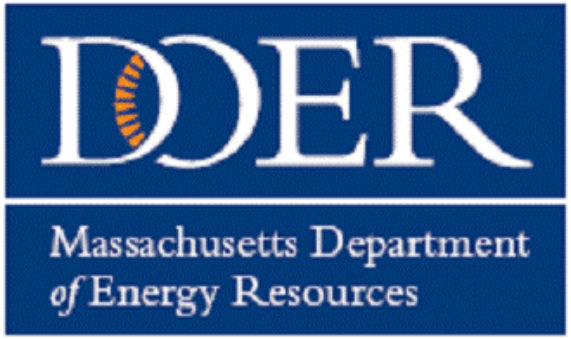


NESEA PRESENTATION
MASSACHUSETTS ENERGY STORAGE
ACCOMPLISHMENTS & NEXT STEPS

MARCH 15, 2019

AMY MCGUIRE

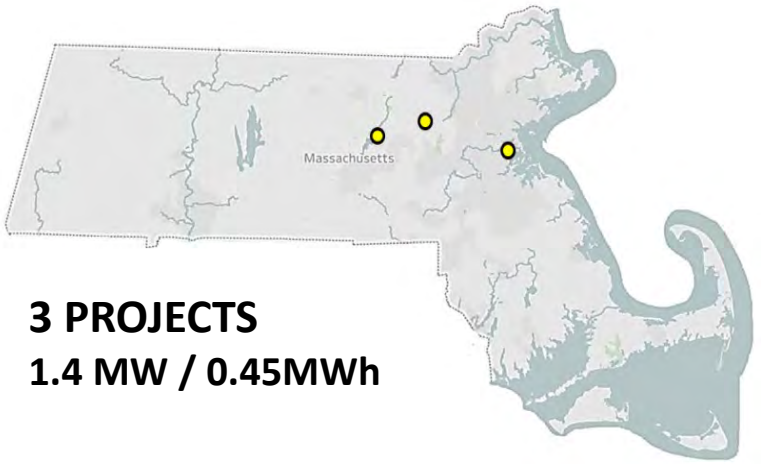
Introduction

- Amy McGuire
  - MA DOER. Emerging Technology Division – Energy Storage and Resiliency Program Coordinator
  - Focused on:
    - Advancing Commonwealth Energy Storage (ACES)
    - Clean Peak Standard (CPS)
    - Community Clean Energy Resiliency Initiative (CCERI)
    - Various ongoing initiatives

Massachusetts Energy Storage Success

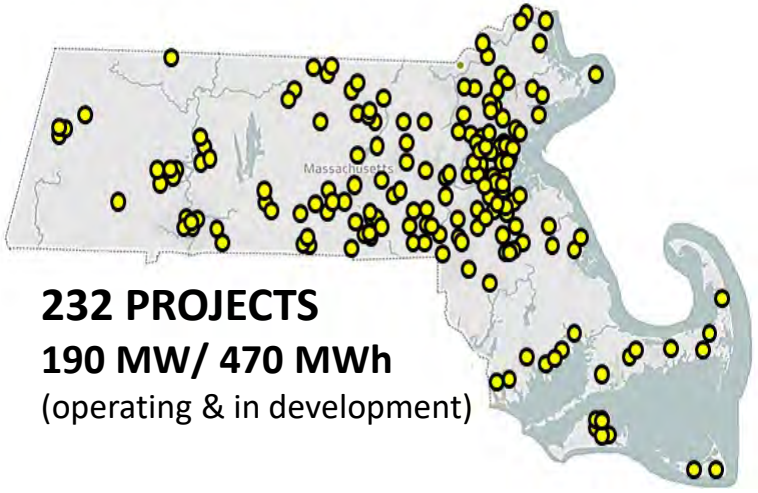
- Since launching our **Energy Storage Initiative** in 2015, Massachusetts has become a national leader for policies and programs for storage deployment

2015



3 PROJECTS
1.4 MW / 0.45MWh

January 2019



232 PROJECTS
190 MW/ 470 MWh
(operating & in development)

National Ranking: #23

National Ranking*: #2

*U.S. Energy Storage Monitor Q3 2018, Energy Storage Association. Ranking based on utility-scale storage deployed front-of-meter.

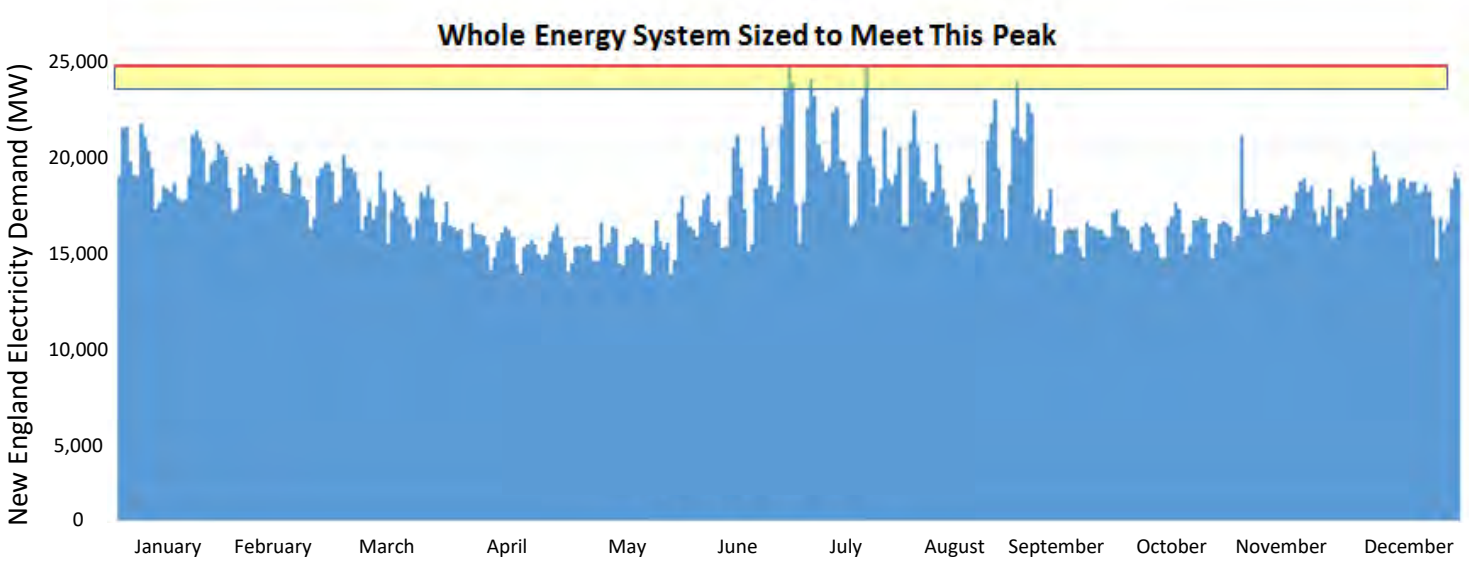
BENEFITS OF STORAGE

Recent advances in new storage technologies have made wide-scale storage of electricity possible

Historically the inability to store electricity (other than pumped hydro storage), required the power grid to be sized for the highest annual peak demand resulting in inefficiencies, underutilization of assets, and high cost.

Storage is "Game Changer":

- Allows use of energy generated during low cost periods to serve load during expensive peak
- Defers investment in transmission and distribution "wires", reduces need for "peaker" plants
- Enables wind and solar energy to be used when the sun isn't shining and the wind isn't blowing
- Provide resiliency during severe weather
- Benefits increase as we electrify transportation and thermal sectors



In 2015 :
The top 1% of Hours accounted for 8% of MA Spend on Electricity

Top 10% of Hours accounted for 40% of Electricity Spend

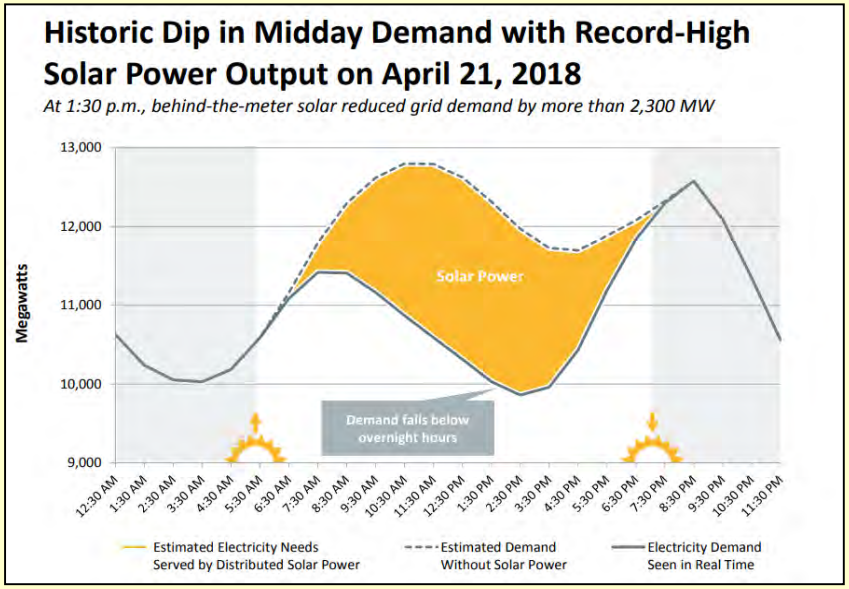
Storage is a Solution for Interconnecting Solar

Storage can assist with the PV "Duck Curve" load profile

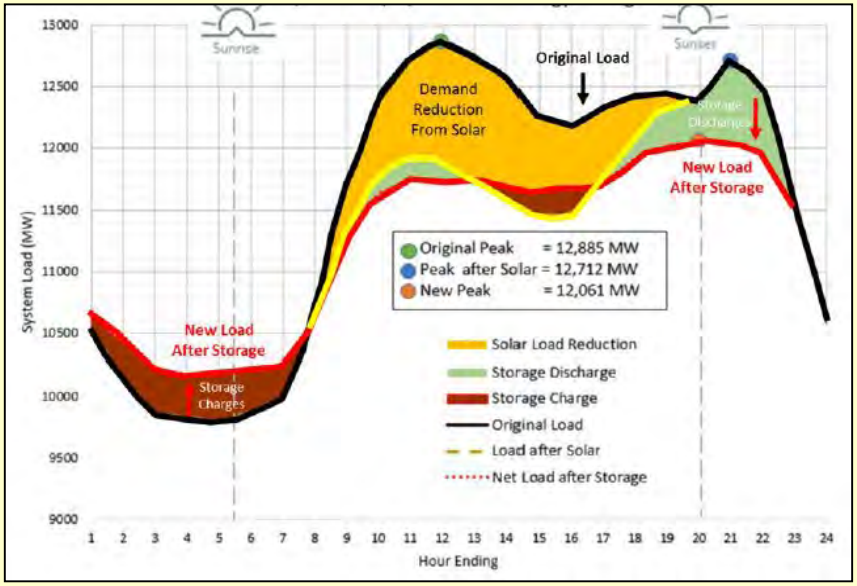
Storage can assist with PV reverse power flows and substation overloading

- After SMART is completed, over 4,000 MW of solar in MA
- MA has peak load of approximately 12,000 MW and minimum daytime load of approximately 6,000 MW
  - By 2022/2023, solar may meet 1/3 of peak load and 2/3 of min daytime load

ISO-NE Data



MA State of Charge Storage Study



Storage is a flexible resource that can assist with interconnection of DERs

Key Policy Actions and Milestones to Promote Storage Deployment

2016

- DOER and MassCEC published the "State of Charge" Energy Storage Study
- Storage included in Comprehensive Energy Legislation
  - Defined storage, clarified utilities may own storage, authorized DOER to set target

2016/2017

- Funded Grant and Demonstration opportunities
  - **$20 million Advancing the Commonwealth Energy Storage (ACES)** Program funded 26 storage projects to demonstrate multiple applications and use cases
  - **$40 million Community Clean Energy Resiliency Initiative**, includes storage
  - **$4.6 million Peak Demand Reduction** grants, includes storage
  - Utility demonstrations of storage in Energy Efficiency programs
  - Made eligible for Green Communities technical assistance grants

Sterling
2 MW / 3.9MWh ESS
Community Resilience Grant

Holyoke
3 MW / 6 MWh ESS
Peak Demand Grant

Braintree MLP
2 MW / 4.2 MWh ESS
ESI-ACES Grant

Key Policy Actions and Milestones to Promote Storage Deployment

2017

- DOER set 200 MWh Target for Storage in MA by Jan 1, 2020
  - 3rd state in nation to set a target for storage deployment
- DPU approved electric distribution companies proposals for utility storage
  - National Grid Owned Solar approved to pair with storage
  - Eversource rate case approved $45 million for storage on Cape Cod & Martha's Vineyard
  - National Grid announces "non wires" solution to peak demand on Nantucket

2018

- DOER launched SMART solar incentive program with 1st in nation incentive "adder" for storage paired with solar
  - 135 projects with 70 MW/150 MWh of storage have submitted applications to date
- Legislation increased Storage Target to 1,000 MWh by 2025
- 1st in nation Clean Peak Standard announced
- Storage included in Next Three Year Statewide Energy Efficiency Plan 2019 – 2021, including specific goals for Active Demand reduction in Summer and Winter
- Eight standalone storage projects totaling 956MW submitted applications in the ISO-NE interconnection queue

MA Storage Economic Development Landscape

Massachusetts Department of Energy Resources

Large corporations basing storage business in MA

Enel Green Power
€ 3B Revenue
North American HQ
Andover

Lockheed Martin
$51B Revenue
Energy Storage Division
Cambridge

NEC
$24B Revenue
Energy Solutions HQ
Westborough

Schneider Electric
€ 25B Revenue
North American HQ
Andover

Project Developers and Installers

BlueWave
Borrego
Lodestar
Nexamp
NextEra
Solect
SunBug
Sunrun
Syncarpha
Tesla

Universities with Storage Research

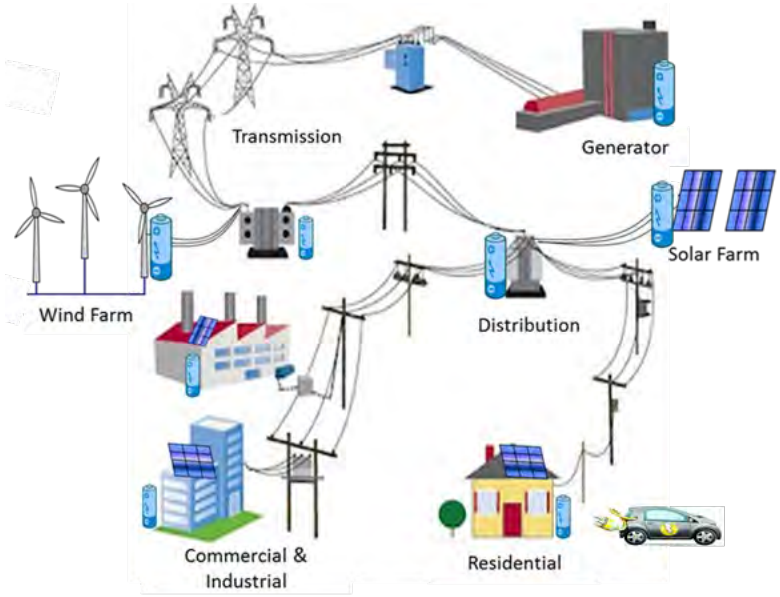
BC
BU
Harvard
MIT
NEU
Tufts
Umass
WPI

MA-based Storage Start-ups

24M Technologies
Acumentrics
Ambri
Beacon Power
Boston Power
Exponent
FastCap Systems
General Compression
IHI Energy
Kinetic Battery
Levisys
Lithio Storage
Mosaic Power
Pellion
Protonex
SiEnergy Systems
SparkCharge
Sparkplug Power
SolidEnergy Systems
Solvus Global
Vionx
Titan Advanced Energy
Xilectric
WattJoule

Priorities & Next Steps

- **DOER/MassCEC Storage Stakeholder discussion series**
  - Focus on project development issues: Interconnection, metering/telemetry, permitting and inspections, financing
- **Potential working group (DOER/EEA/DPU/EDCs) to standardize distribution interconnection process**



- **Continue to promote the pairing of Renewables with Storage**
  - Implement Clean Peak Standard
  - Evaluate incentives for adding storage to pre-SMART solar projects
  - Evaluate stronger requirements for pairing Solar and Storage in future SMART program
  - Analyze ways to encourage storage + Off-shore Wind in DOER's OSW study
- **Review results of ISO-NE Capacity Auction**

Priorities & Next Steps

- **Work with ISO-NE on rules for storage paired with renewables in the wholesale market**
  - Define process for adding storage to existing renewable generation
  - Interconnection study methodology for storage paired with renewables
- **Continue to promote use of storage in Distribution System Planning as "non-wires" alternative**
  - Participate in National Grid's Rate Case
- **Evaluate price signals/rate structures to align storage charging/discharging with policy goals to reduce system peak and improve system utilization**
  - Explore EV time-of-use rate structures to promote charging off-peak
- **Promote co-location of standalone storage with electric vehicle (EV) charging infrastructure**
- **Study long-term potential of new long-duration storage technologies, such as hydrogen "power-to-gas", breakthrough battery technology**

Energy Storage as an Energy Efficiency Measure

Valuing storage for cost/benefit calculations
The Massachusetts EE Plan

3/15/19

Todd Olinsky-Paul
Project Director
Clean Energy Group


MASSACHUSETTS
CLEAN ENERGY
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Innovation in Finance, Technology & Policy


Meridian Institute
Connecting People to Solve Problems


CleanEnergy
States Alliance


Barr
Foundation


THE JPB FOUNDATION


SURDNA
ANDRUS

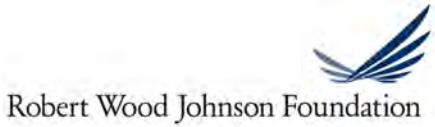

11TH HOUR PROJECT
THE SCHMIDT FAMILY FOUNDATION


THE
KRESGE
FOUNDATION


THE NEW YORK
COMMUNITY TRUST
NYCT


THE NATHAN
CUMMINGS
FOUNDATION


MFF


Robert Wood Johnson Foundation

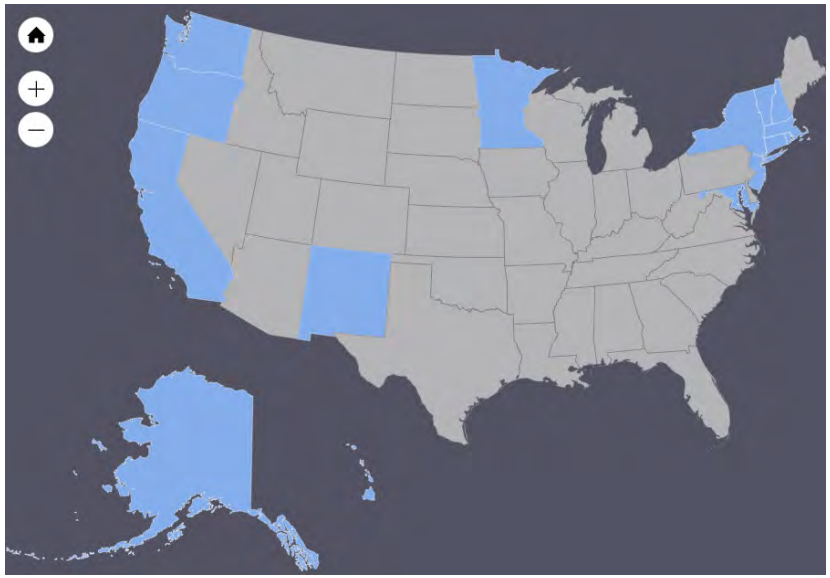
State Policy Tools for Energy Storage

MARKETS

1. Studies and planning
2. Grants (demonstration projects)
3. Longer-term policy and programs
   - Utility mandates/procurement targets/portfolio standards
   - Incorporating storage into existing incentive programs (storage adders, storage as an efficiency measure)
   - Rebates/performance incentives
   - Tax incentives
   - Financing, clean energy financial institutions
   - Market-based tools and regulatory reform
   - Removal of barriers/soft costs
   - Technical assistance, tools, and resources

States Policy Landscape

- Studies/Roadmaps
  - CA, NY, MA, NM, RI, OR, VT, NJ, MN, MD, others
- Grants/Demonstration projects
  - NY, NJ, MA, CA, WA, OR, VT, CT, Others
- Longer-term programs
  - Utility procurement targets
    - CA, OR, MA, NY, NJ
  - Rebates/Other incentives
    - Rebates (CA, NJ, NY)
    - State tax incentives (MD)
    - Storage adder in solar incentive program (MA)
    - IRP reform (NM, WA)



Appendix B. Electric Efficiency Program Spending per Capita

State	2017 electric efficiency spending ($ million)	$ per capita
Vermont	64.0	102.42
Massachusetts	620.8	91.11
Rhode Island	83.4	78.85
Connecticut	153.9	43.03
Oregon	158.8	38.75
Washington	281.8	38.67
Idaho	64.8	38.35
California	1,412.1	35.88
Iowa	112.3	35.82
Maryland	201.5	33.50
Minnesota	165.0	29.89
Illinois	348.1	27.27
Maine	31.1	23.38
Arkansas	68.8	22.88
New York	450.1	22.80
Michigan	220.4	22.20
District of Columbia	13.9	20.41
New Hampshire	26.1	18.55
Kentucky	84.7	18.09
Delaware	18.2	18.08
New Mexico	38.7	18.80
Wyoming	10.5	17.88
North Carolina	180.9	17.62
Colorado	98.2	17.38
Nevada	51.0	17.34
Utah	51.4	16.85
Oklahoma	66.0	16.82

State	2017 electric efficiency spending ($million)	$ per capita
Arizona	115.4	16.65
Missouri	100.0	16.41
Ohio	188.9	16.09
Hawaii	20.8	14.55
Indiana	87.0	13.12
Pennsylvania	164.1	12.84
New Jersey	113.5	12.68
Montana	13.0	12.43
Wisconsin	70.8	12.22
Texas	257.7	9.25
Florida	180.3	8.23
Mississippi	27.8	9.23
Tennessee	52.5	7.88
West Virginia	14.2	7.75
South Carolina	28.8	6.01
Georgia	55.5	5.38
Nebraska	10.2	5.34
South Dakota	4.4	5.09
Alabama	16.2	3.33
Louisiana	7.3	1.57
Virginia	0.1	0.02
Alaska	–	0.00
Kansas	–	0.00
North Dakota	–	0.00
US total	8,811.7	20.25
Median	68.2	23.38

Massachusetts Energy Efficiency Plan

- 3-year plan
- Budget > $2 Billion
- First in the nation to include energy storage

In Massachusetts, two conditions needed to be met before storage could be included in the efficiency plan:

1. **Redefining efficiency.** In order to include storage within the energy efficiency plan, Massachusetts first had to **include demand reduction, a major application of battery storage, within the efficiency plan.** This underlying expansion of the Commonwealth's efficiency efforts to include demand reduction was formalized as early as 2008 with the Massachusetts *Green Communities Act*.

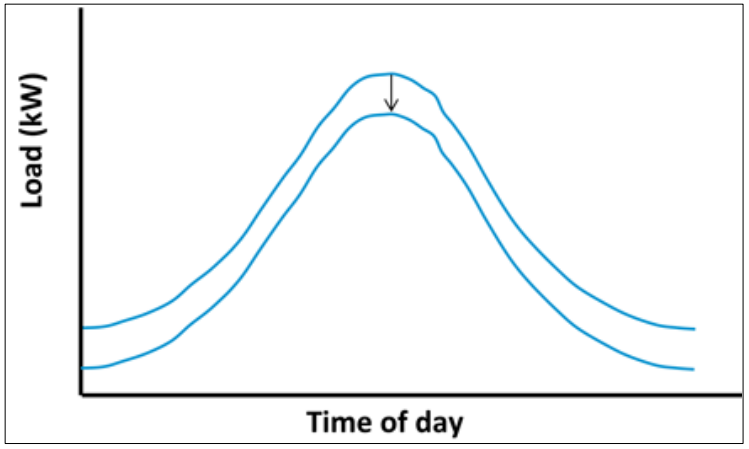
2. **Showing that storage is cost-effective.** In order for energy storage to qualify for the efficiency plan, it first had to be shown to be cost-effective. This meant that **storage had to be able to pass a Total Resource Cost** (TRC) test with a benefit-cost ratio (BCR) equal to or greater than 1. This was demonstrated in our July, 2018 white paper (see *A cost/benefit analysis for energy storage,* below).

1. Redefining efficiency

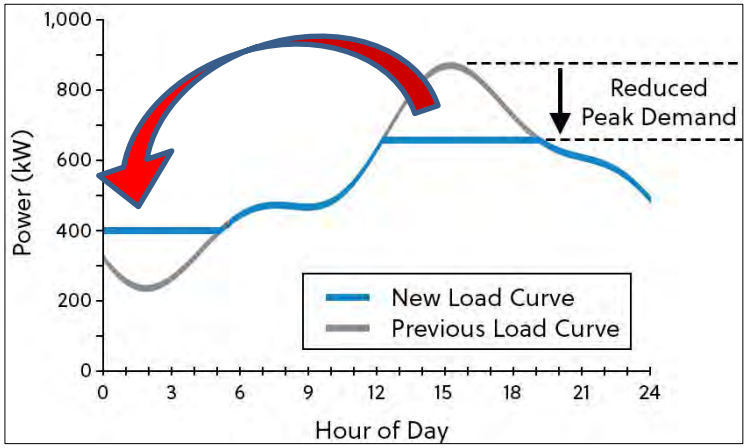
- Traditionally, electrical efficiency is defined as “using fewer electrons”
  - Storage does not normally qualify due to round trip losses
- Massachusetts expanded the traditional definition of efficiency to include peak demand reduction
  - Storage is well-suited to shifting peak demand, something traditional passive efficiency measures don’t do

Key concept: Not all load hours should be valued the same

Traditional efficiency reduces overall consumption, but does not shift peaks

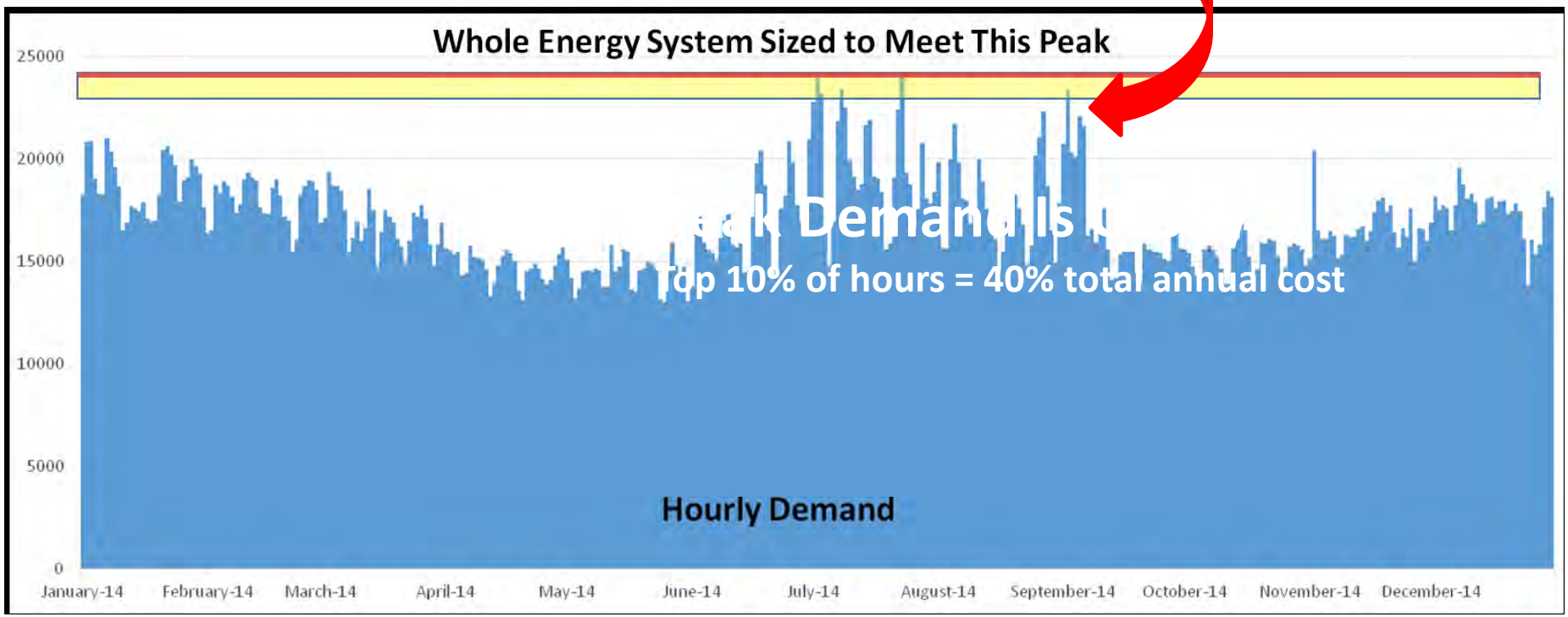


Peak demand reduction reduces peaks, but does not reduce net consumption



The monetizable value of storage is partly due to the high costs of our oversized grid

The highest value of storage is in providing *capacity* to meet demand peaks… *not* in providing bulk energy.



From Massachusetts *State of Charge* report

Case: Boston Medical Center

Project goals:

- Resiliency
- cost savings
- power quality

Project Economics

Baseline Capacity Charges

Eversource T&D charge:
Summer = $24.82/kW
Winter = $18.86/kW

ISO-NE Capacity Cost (icap) charge:
$9.96/kW-month

Total: Hospital is currently paying **annual demand costs of $1,247,000**

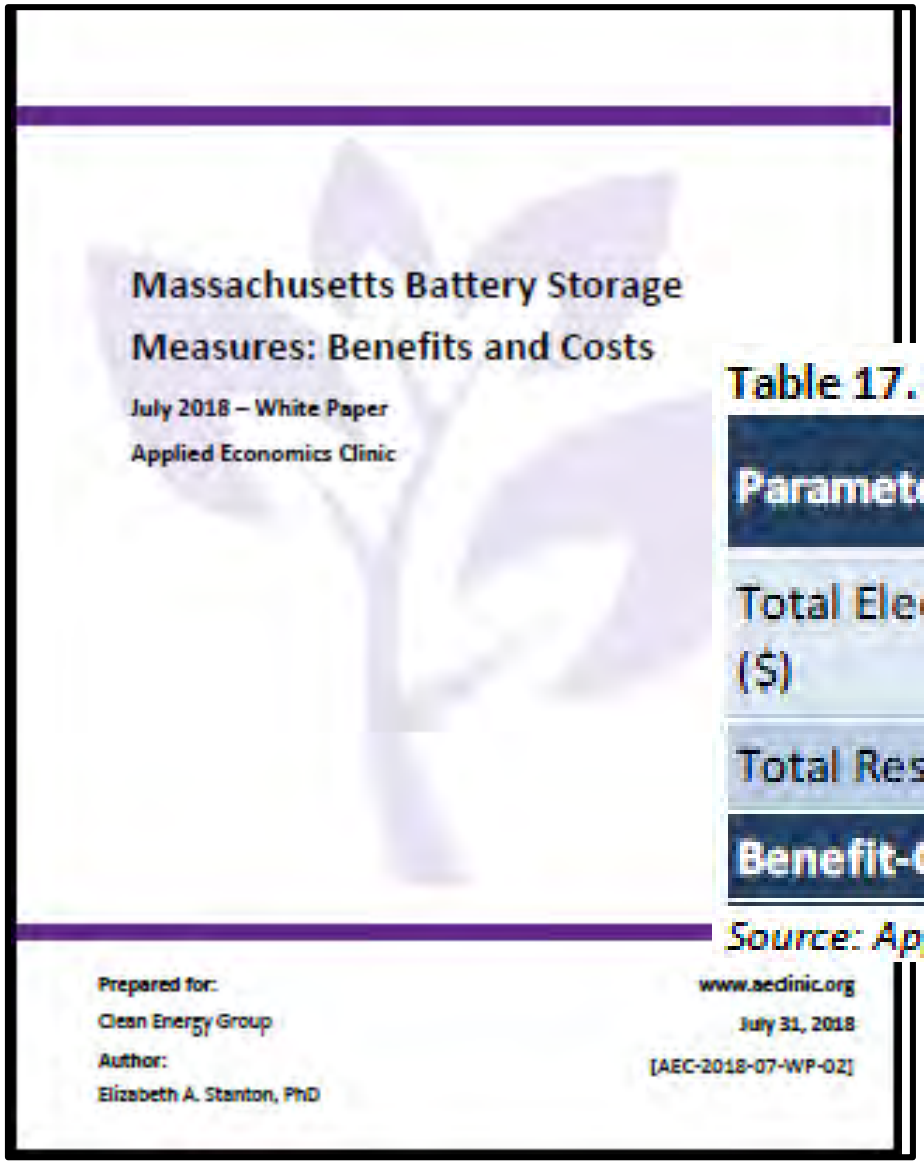
Redefining efficiency

Massachusetts ***Green Communities Act of 2008*** requires that efficiency program administrators seek "…all available energy efficiency **and demand reduction resources** that are cost effective or less expensive than supply."

-Massachusetts state law, M.G.L. c.25, §21

Massachusetts ***State of Charge*** report of 2016 notes that "**Storage and other measures that shift load are firmly covered by the intent of the [Green Communities] Act**" and adds, "The 2016-2018 Statewide **Energy Efficiency Investment Plan ("Three Year Plan") identifies peak demand reduction as an area of particular interest** in the term sheet and in the EEAC resolution supporting the Three Year Plan…. **Energy storage, used to shift and manage load as part of peak demand reduction programs, can be deployed through this existing process."**

2. Showing that storage is cost-effective



To qualify for state energy efficiency plans, *storage must pass a cost/benefit test*

Table 17. Total benefits and costs

Parameter for 2019	Low-Income	C&I
Total Electric Benefits ($)	$36,296	$155,782
Total Resource Cost ($)	$13,163	$46,322
Benefit-Cost Ratio	**2.8**	**3.4**

Source: Applied Economics Clinic calculations

CEG published independent economic analysis – July, 2018

Storage BCRs from Massachusetts EE plan PAs

NOTE: These numbers do not include non-energy benefits!

BCRs	Cape Light			Eversource			National Grid			Unitil		
	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021
Residential Advanced Demand Management Program (A2e)												
Program BCRs	*1.6*	*2.4*	*2.4*	*1.0*	*1.4*	*1.6*	*1.5*	*2.4*	*2.5*	*0.7*	*1.1*	*1.2*
Direct Load Control	4.9	6.6	7.4	5.0	5.0	5.0	5.3	5.5	5.3	5.2	9.6	9.6
Behavioral DR												
Storage System and Performance		3.0	3.0									
Storage Daily Dispatch				1.5	1.5	1.5	4.9	4.9	5.0			
Storage Targeted Dispatch				0.0	0.0	0.0	0.1	0.1	0.1			
EV Load Management								0.8	0.8			
Income-Eligible Advanced Demand Management Program (B1b)												
Program BCRs		*2.3*	*2.4*					*2.4*	*2.4*			
Direct Load Control												
Behavioral DR												
Storage System and Performance		3.0	3.0									
Storage Daily Dispatch												
Storage Targeted Dispatch												
EV Load Management												
Commercial/Industrial Advanced Demand Management Program (C2c)												
Program BCRs	*7.5*	*4.6*	*4.7*	*2.9*	*2.9*	*2.8*	*7.9*	*4.8*	*4.9*	*2.7*	*2.9*	*3.1*
Interruptible Load	9.7	9.8	9.8	7.9	7.9	7.9	7.5	7.5	7.5	4.2	4.2	4.2
Winter Interruptible Load												
Storage System and Performance		3.0	3.0									
Storage Daily Dispatch				1.7	1.7	1.7	4.9	4.9	5.0	6.2	6.2	6.2
Storage Targeted Dispatch				3.2	3.2	3.2	0.1	0.1	0.1	0.1	0.1	0.1
Custom	8.3	8.3	8.3		2.0	2.0	1.3	1.3	1.3			

Massachusetts Energy Efficiency Plan Incentive Structure

- Three year plan > $2 Billion (electric and gas)
- Storage measures are in new Active Demand Reduction program
- Incentive is for performance (load reduction), not installation
- New BTM storage is eligible (with or without renewable generation)
- Residential and commercial customers may participate
- Two programs offered:
  - Daily discharge - $200/kWh (demonstration program)
  - Targeted discharge - $100/kWh (full program offering)
- Incentive payment based on *average load reduction* during hours called by utility
- Discharges will be called in *three hour blocks*
- Incentive paid at end of each year
- Utilities execute 5-year contract with customers
- HEAT loans available for storage

Anticipated Results (Deployment)

- Massachusetts 2019-2021 Energy Efficiency Plan includes BTM storage as a demand reduction measure
- Incentive payments = **~$13 million** over three years
- Expected results = **~34 MW** new behind-the-meter storage

Shortcomings:

- No enhanced incentive, financing or carve-out for **low-income customers**
- No up-front **rebate**
- Daily discharge proposal downgraded to demonstration program
- Cape Light Compact proposal was NOT approved as proposed
- Numerous omissions mean **storage BCRs are likely too low**

Project Economics Example

A commercial customer participating in the targeted dispatch program installs a 30 kW battery. Assuming perfect call response:

30 kW battery = 10 kw/hr load reduction averaged over 3-hour calls

Incentive payment calculation: 10 kW x $100 = $1,000 annual incentive payment

Note: a customer installing new solar+storage could qualify for energy efficiency performance incentive *and* the SMART solar rebate with storage adder

Customers can participate in these programs while engaging in net metering *and* demand charge management

Upcoming Report

New report to be published April 2019 by Clean Energy Group

New report does four things:

1. Revises **battery storage BCR** for Massachusetts
2. Reviews and critiques **new storage incentive** in MA efficiency plan
3. Identifies issues and makes **recommendations for other states** to incorporate storage in efficiency plans
4. Assigns, for the first time, dollar values to **seven non-energy benefits of storage**
    a) Avoided power outages (combines value to customer and value to grid)
    b) Higher property values
    c) Avoided fines
    d) Avoided collections and terminations
    e) Avoided safety-related emergency calls
    f) Job creation
    g) Less land used for power plants (expressed in acres)

PRELIMINARY RESULTS

	Non-Energy Benefit (2018$)
1) Avoided power outages	
Battery storage measure participants avoid outages, and all of the costs that come with outages for both families and businesses	Residential: **$1.72**/kWh Commercial/Industrial: **$15.64**/kWh
2) Higher property values	
Installing battery storage in buildings increases property values for storage measure participants by: (1) increasing leasable space; (2) increasing thermal comfort; (3) increasing marketability of leasable space; and (4) reducing energy costs	**$5,325**/housing unit for low-income single family participants **$510**/housing unit for owners of multi-family housing
3) Avoided fines	
Increasing battery storage will result in fewer power outages and fewer potential fines for utilities	**$24.8 million** in 2012
4) Avoided collections and terminations	
More battery storage reduces the need for costly new power plants, thereby lowering ratepayer bills, and making it easier for ratepayers to consistently pay their bills on time. This reduces the need for utilities to initiate collections and terminations	Terminations and Reconnections: **$1.85**/year/participant Customer calls: **$0.77**/year/participant
5) Avoided safety-related emergency calls	
Increasing battery storage results in fewer power outages, which reduces the risk of emergencies and the need for utilities to make safety-related emergency calls	**$10.11**/year/participant
6) Job creation	
More battery storage benefits society at large by creating jobs in manufacturing, research and development, engineering, and installation	**3.3 jobs**/MW **$310,000**/MW
7) Less land used for power plants	
More battery storage reduces the need for peaker plants, which are more land-intensive than storage installations—benefitting society by allowing more land to be used for other purposes	**12.4 acres**/MW

Thank You

Todd Olinsky-Paul

Project Director

CEG/CESA

Email for new report: Todd@cleanegroup.org

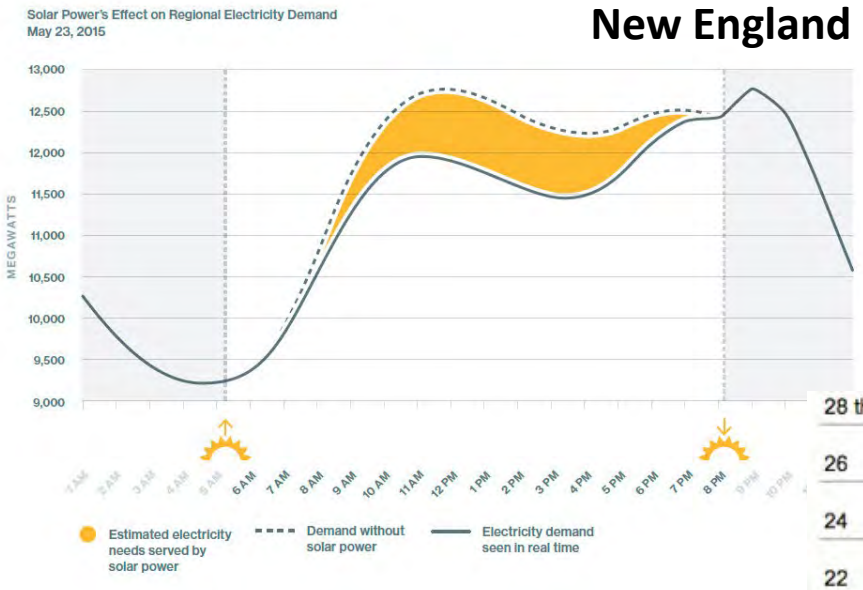
CEG webinar on new report: April 4, 12:30 p.m. Webinar is free, register at http://bit.ly/CESA-Webinar-4-4-19

Website: www.resilient-power.org

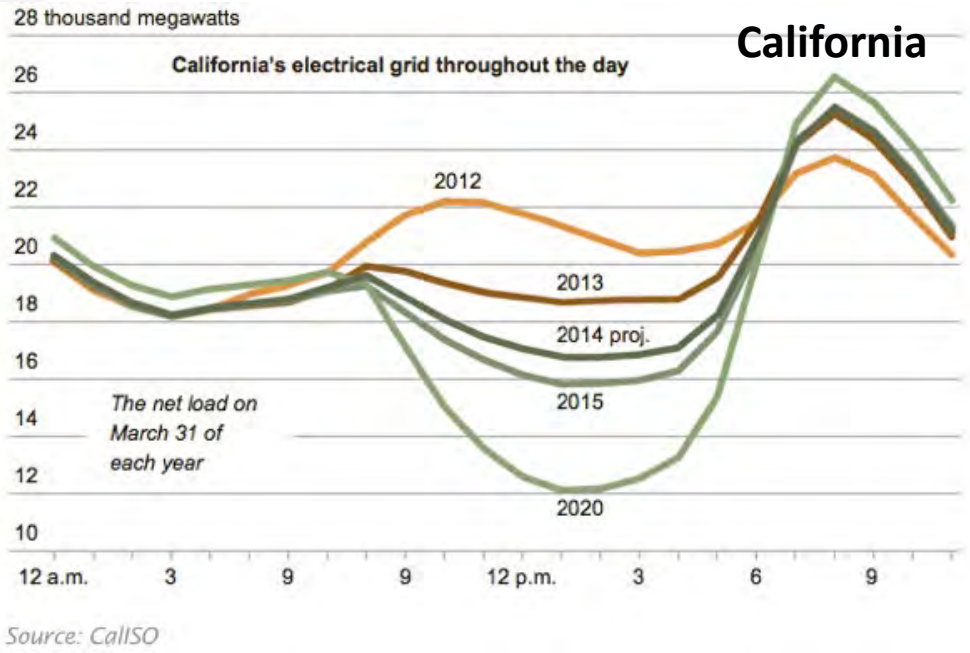
Innovation in Finance, Technology & Policy

Utility markets:
capacity and transmission cost reductions

New England



California



Source: CalISO

Increased solar production is reducing midday demand for grid power

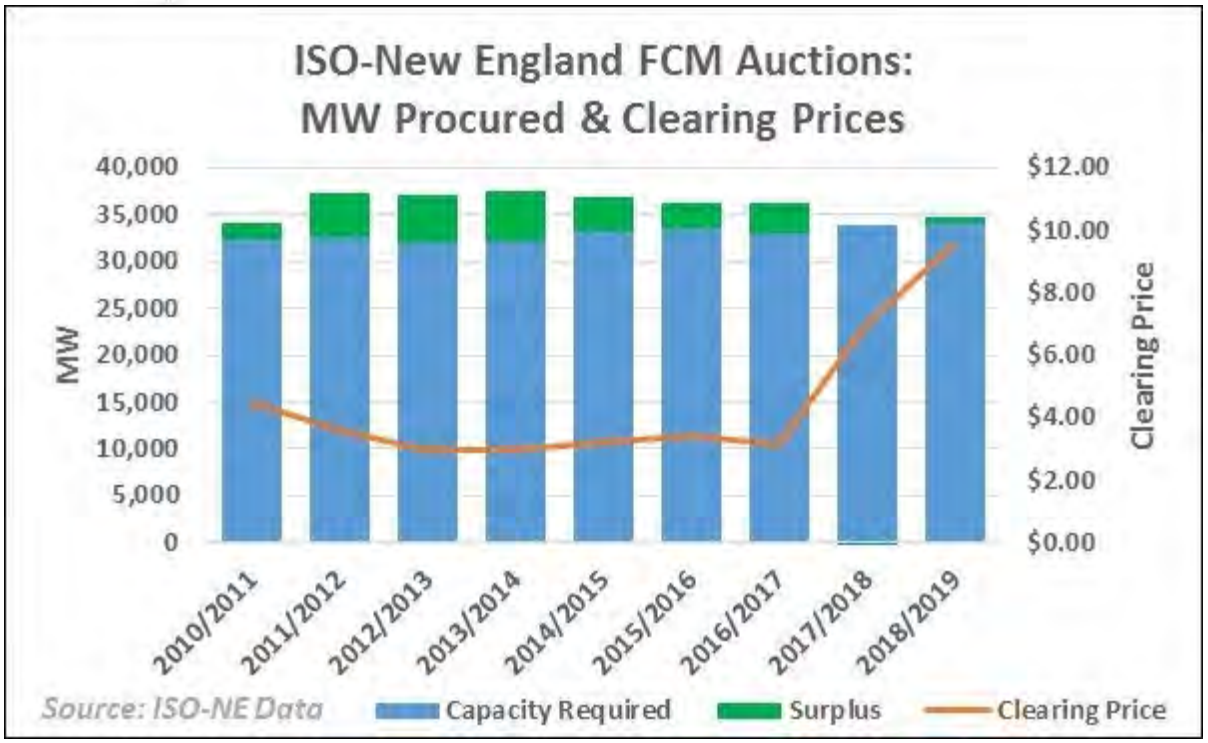
SMLD Capacity Clearing Price, ISO-NE.

Year	Price ($/kW-Month)
2010-2011	$4.254
2011-2012	$3.119
2012-2013	$2.535
2013-2014	$2.516
2014-2015	$2.855
2015-2016	$3.129
2016-2017	$3.150
2017-2018	$7.025
2018-2019	$9.551

Result:

Electricity demand = flat or decreasing

Capacity demand = increasing



Behind the Meter Markets

- Demand Charge Management
- Resiliency

Demand Charge Management:

Commercial customers pay as much as **50%** of their monthly electric bill for demand charges

Energy storage can reduce demand charges by managing peak demand

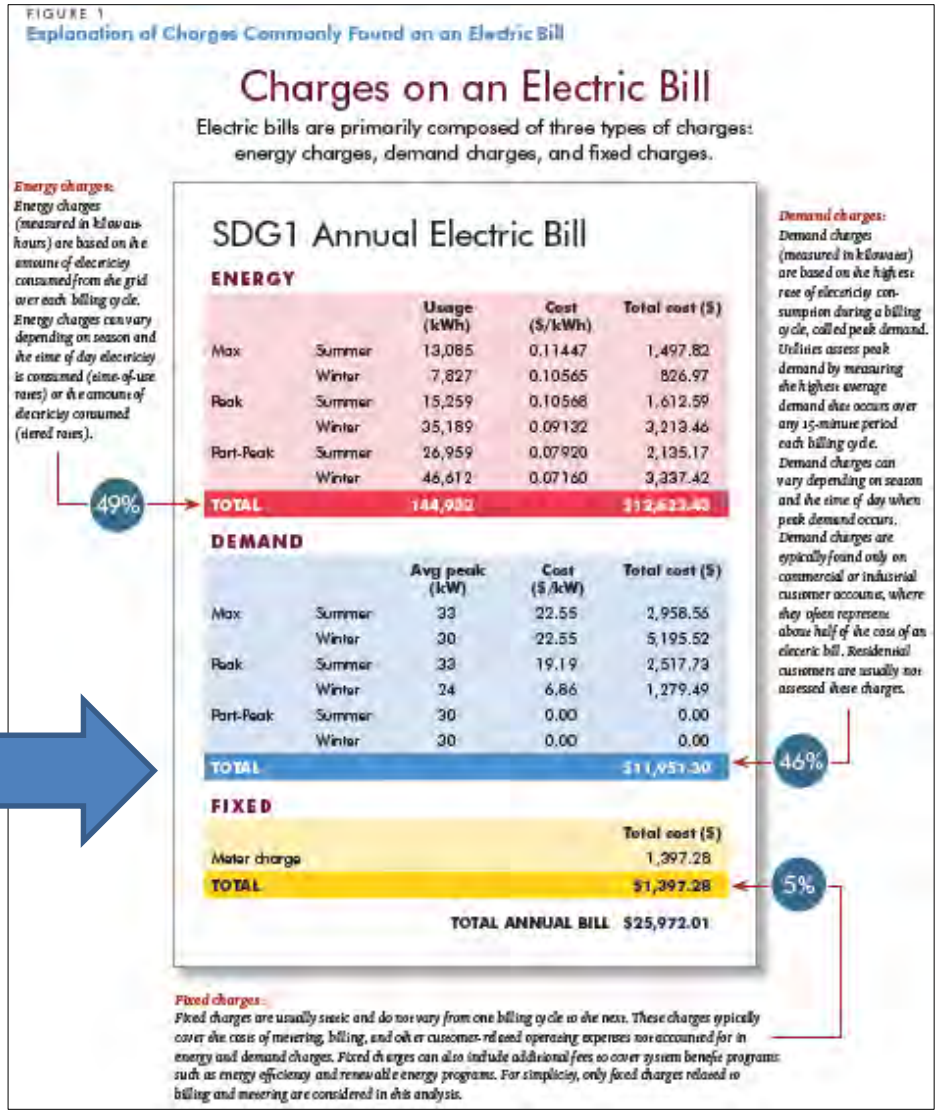


FIGURE 1
Explanation of Charges Commonly Found on an Electric Bill

Charges on an Electric Bill

Electric bills are primarily composed of three types of charges: energy charges, demand charges, and fixed charges.

Energy charges: Energy charges (measured in kilowatt-hours) are based on the amount of electricity consumed from the grid over each billing cycle. Energy charges can vary depending on season and the time of day electricity is consumed (time-of-use rates) or the amount of electricity consumed (tiered rates).

Demand charges: Demand charges (measured in kilowatts) are based on the highest rate of electricity consumption during a billing cycle, called peak demand. Utilities assess peak demand by measuring the highest average demand that occurs over any 15-minute period each billing cycle. Demand charges can vary depending on season and the time of day when peak demand occurs. Demand charges are typically found only on commercial or industrial customer accounts, where they often represent about half of the cost of an electric bill. Residential customers are usually not assessed these charges.

Fixed charges: Fixed charges are usually static and do not vary from one billing cycle to the next. These charges typically cover the costs of metering, billing, and other customer-related operating expenses not accounted for in energy and demand charges. Fixed charges can also include additional fees to cover system benefit programs such as energy efficiency and renewable energy programs. For simplicity, only fixed charges related to billing and metering are considered in this analysis.

SDG1 Annual Electric Bill

ENERGY

		Usage (kWh)	Cost ($/kWh)	Total cost ($)
Max	Summer	13,085	0.11447	1,497.82
	Winter	7,827	0.10565	826.97
Peak	Summer	15,259	0.10568	1,612.59
	Winter	35,189	0.09132	3,213.46
Part-Peak	Summer	26,959	0.07920	2,135.17
	Winter	46,612	0.07160	3,337.42
TOTAL		144,932		$12,623.43

49%

DEMAND

		Avg peak (kW)	Cost ($/kW)	Total cost ($)
Max	Summer	33	22.55	2,958.56
	Winter	30	22.55	5,195.52
Peak	Summer	33	19.19	2,517.73
	Winter	24	6.86	1,279.49
Part-Peak	Summer	30	0.00	0.00
	Winter	30	0.00	0.00
TOTAL				$11,951.30

46%

FIXED

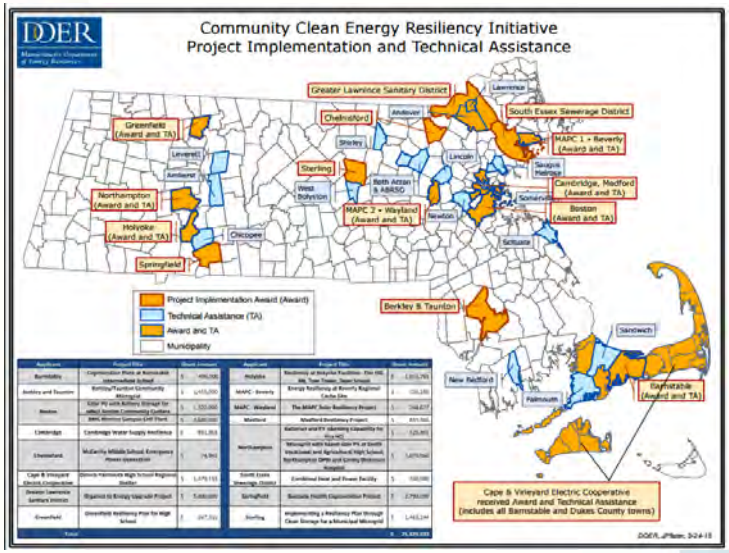
	Total cost ($)
Meter charge	1,397.28
TOTAL	$1,397.28

5%

TOTAL ANNUAL BILL $25,972.01

State policy example: Massachusetts Energy Storage Initiative

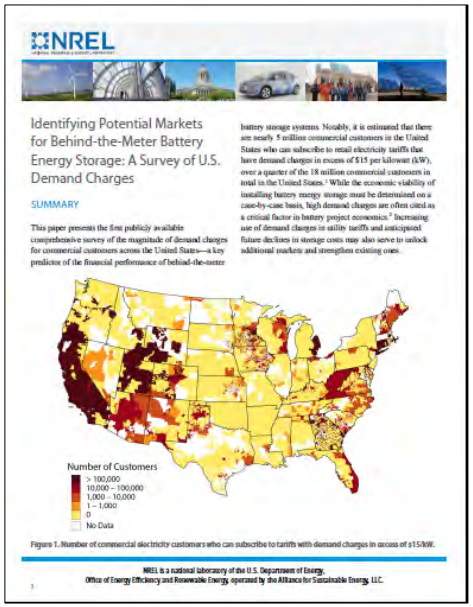
- Current Policy/Programs
  - CCERI $40M resiliency grants (2014-2017)
  - Energy Diversity Act (2016)
    - Utilities can own storage
    - DOER to assess need for utility procurement target
  - *State of Charge* report (2016)
    - State energy storage roadmap and analysis; recommendations for energy storage policy and program development
  - ACES $20M Energy Storage Demonstration Grants (2017)
  - SMART Solar Incentives with storage adders
  - Procurement Target – 1,000 MWhs by 2025
  - Storage added to EE plan (2019-2021)
- Policy/programs in development
  - Clean Peak Standard
  - Microgrids program
  - Resilient fueling stations program
  - Grid modernization
  - Storage inclusion in Alternative Portfolio Standard



With federal and foundation support, CEG/CESA is providing free technical assistance to DOER awardees for project implementation, as well as to DOER and MassCEC for policy and program development; and we are extending this policy support to the other New England states.

First National Survey of Demand Charge Rates

Based on a survey of more than 10,000 utility tariffs, ***Nearly 5 million commercial customers may be paying more than $15/kW in demand charges***


NREL

Identifying Potential Markets for Behind-the-Meter Battery Energy Storage: A Survey of U.S. Demand Charges

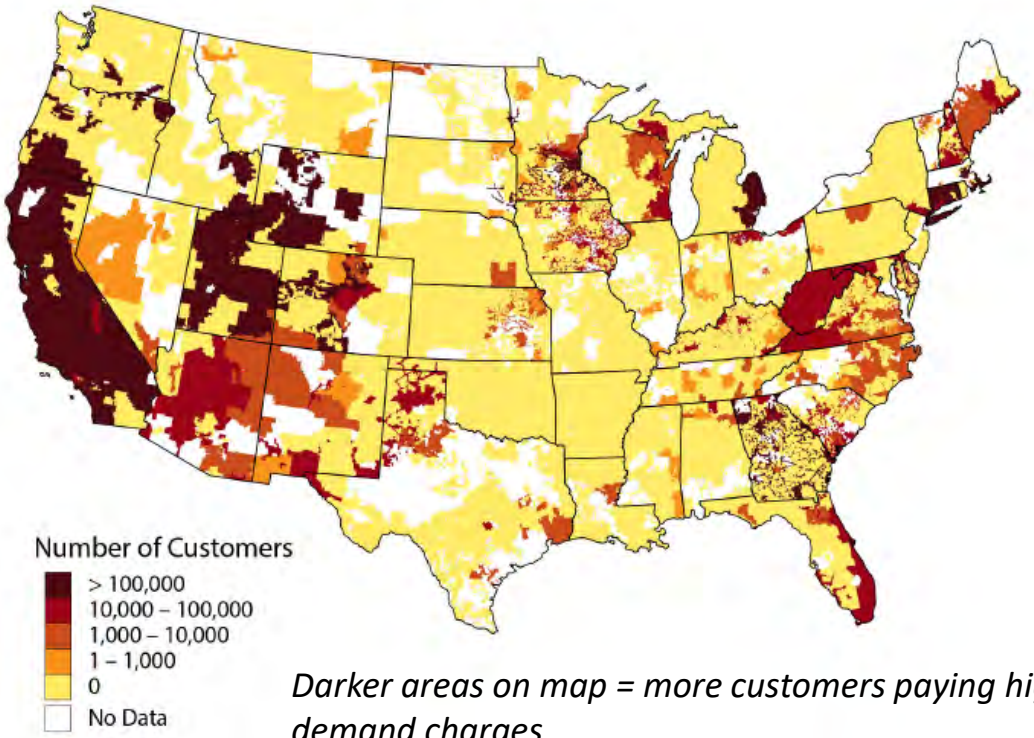
SUMMARY

This paper presents the first publicly available comprehensive survey of the magnitude of demand charges for commercial customers across the United States—a key predictor of the financial performance of behind-the-meter battery storage systems. Notably, it is estimated that there are nearly 5 million commercial customers in the United States who can subscribe to retail electricity tariffs that have demand charges in excess of $15 per kilowatt (kW), over a quarter of the 18 million commercial customers in total in the United States.[1] While the economic viability of installing battery energy storage must be determined on a case-by-case basis, high demand charges are often cited as a critical factor in battery project economics.[2] Increasing use of demand charges in utility tariffs and anticipated future declines in storage costs may also serve to unlock additional markets and strengthen existing ones.

Number of Customers
> 100,000
10,000 – 100,000
1,000 – 10,000
1 – 1,000
0
No Data

Figure 1. Number of commercial electricity customers who can subscribe to tariffs with demand charges in excess of $15/kW.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.



Darker areas on map = more customers paying high demand charges

Figure 1. Number of commercial electricity customers who can subscribe to tariffs with demand charges in excess of $15/kW.

Boston Medical Center

1,060 kW / 2,120 kWh battery connected to existing CHP

Project goals:

- Resiliency
- cost savings
- power quality

Baseline Capacity Charges

Eversource T&D charge:
Summer = $24.82/kW
Winter = $18.86/kW

ISO-NE Capacity Cost (icap) charge:
$9.96/kW-month

Total: Hospital is currently paying **annual demand costs of $1,247,000**

Project Economics:

- Project Installed Cost: $1.9 M
- MassCEC Grant: $402,500
- **Annual Savings:** $200,000

Simple Payback: 6.5 years