Massachusetts Department of Energy Resources

Ask the Experts: Peak Demand

Massachusetts Climate Week 2021
Leading by Example Program

DOER
Massachusetts Department of Energy Resources

Agenda

- 12-12:05: Welcome and Introduction
  - Eric Friedman, DOER
- 12:05-12:25: Overview of Peak Demand, Response, and Incentives
  - Zac Bloom, CES: Demand Charges 101
  - Phil Ciulla, CPower: Demand Response Programs in New England
  - Amy McGuire, DOER: The Massachusetts Clean Peak Standard
- 12:25-1:00: Ask the Experts

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Leading by Example by Responding to Peak Demand

Reducing electricity demand at state facilities during peak periods…

Reduces the cost of energy, both at the facility and region-wide, especially as we expand electrification efforts in support of decarbonization

Supports statewide emissions and clean energy goals by limiting the need for ‘peaker plants,’ fossil fuel-powered plants often needed to meet high grid demand

Can improve resiliency by supporting the adoption of clean onsite backup energy systems

COMPETITIVE ENERGY SERVICES, LLC

ELECTRICITY DEMAND IMPACT

LBE-DOER

Competitive Energy SERVICES

Sept 2021

ELECTRICITY | Wholesale Markets

ISO-NE administers New England's wholesale energy markets, which consist of:

1. **ENERGY MARKET**- consisting of day-ahead (DA) and real-time (RT) markets to facilitate electricity trading, hedge against price fluctuations, and coordinate dispatch to meet incremental demand
2. **ANCILLARY SERVICES MARKET**- addresses frequency regulation, voltage support, reserve pricing, and other services
3. **CAPACITY MARKET (FCM)**- ensures the grid has sufficient capacity to meet future demands

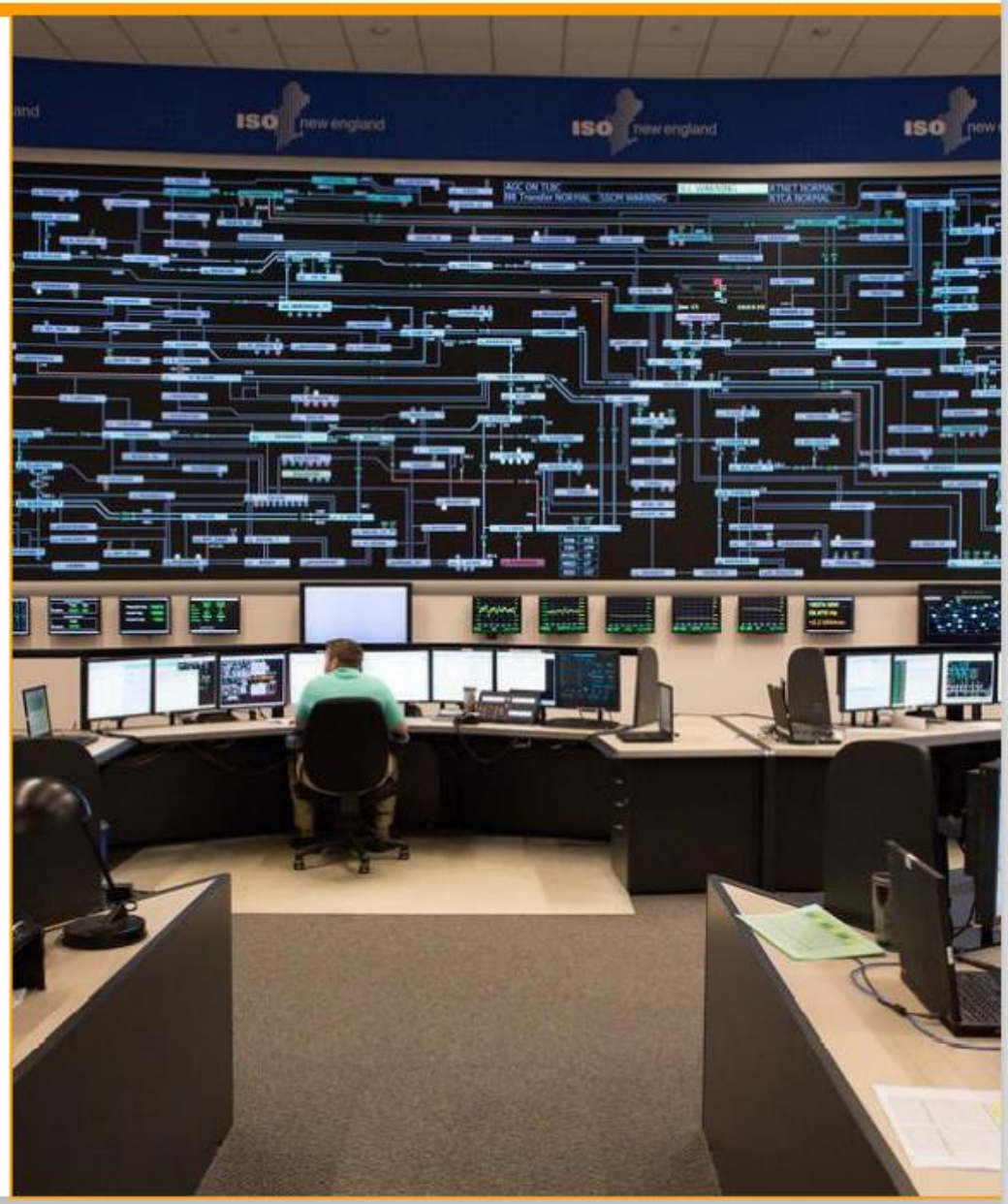
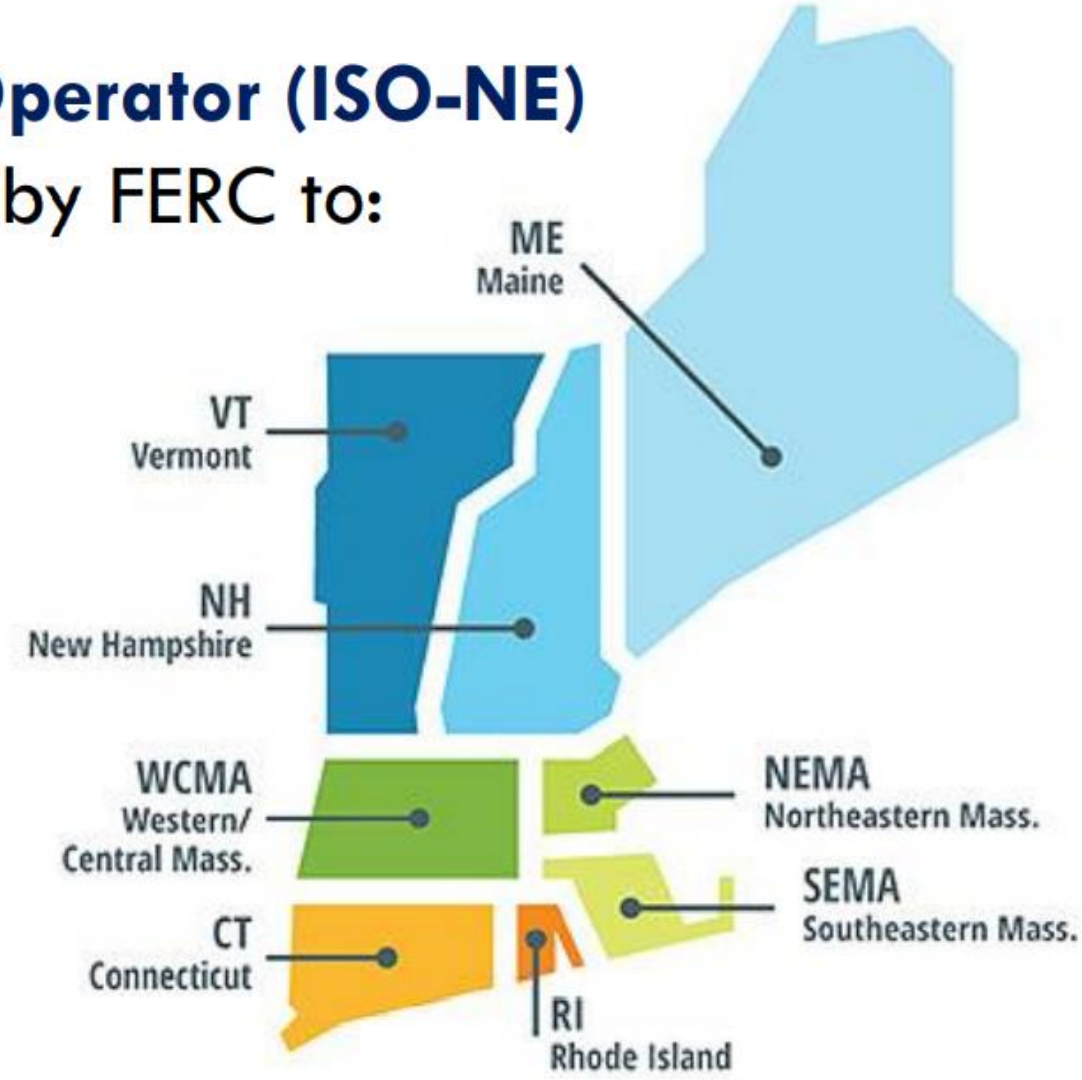


Photo credit: ISO-NE

ELECTRICITY | Overview of ISO-NE

New England's **Independent System Operator (ISO-NE)** is a voluntary organization authorized by FERC to:

1. Oversee grid operations
2. Administer wholesale energy markets (note this is separate from retail energy markets)
3. Conduct long-term power system planning

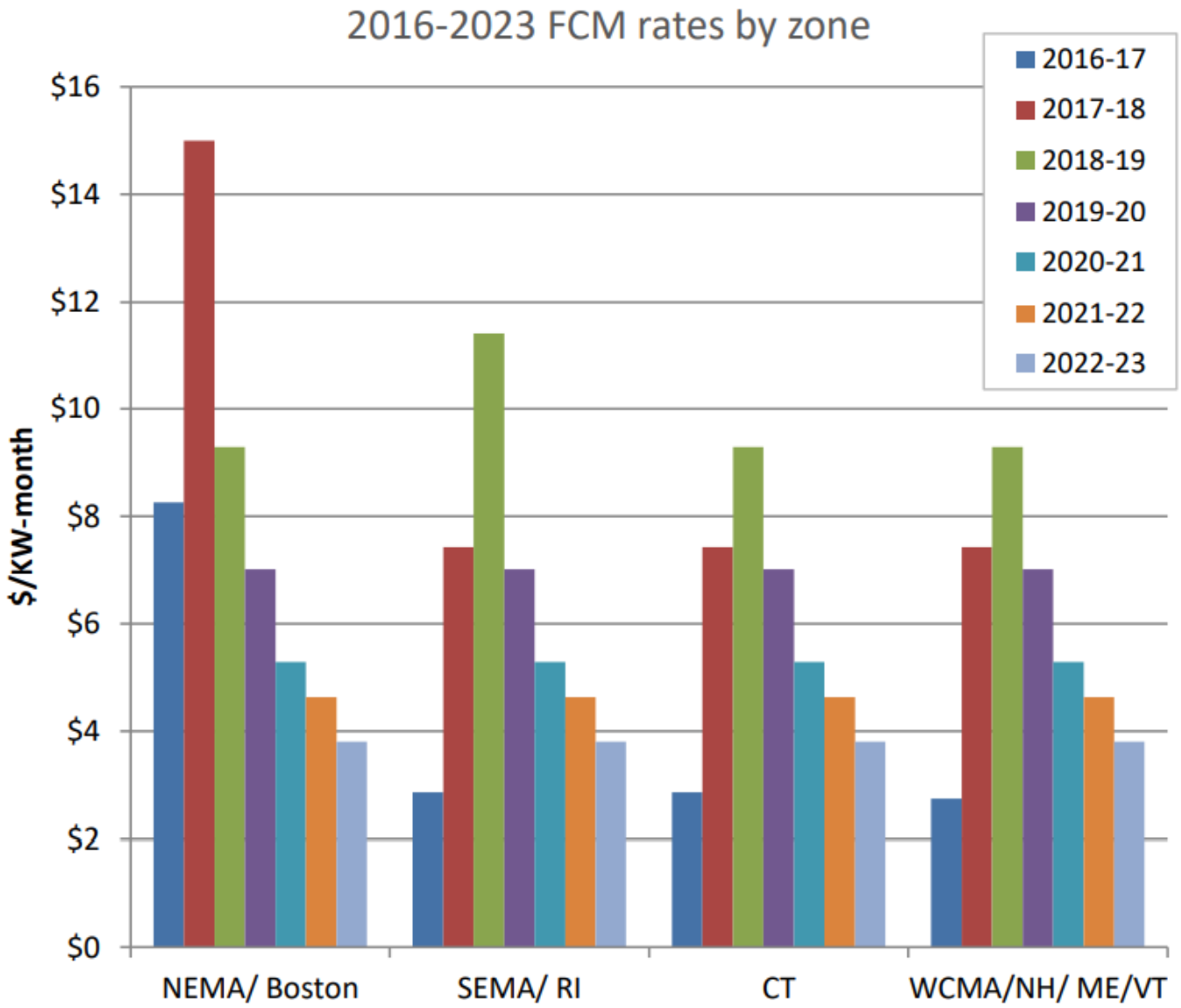


Wholesale Load Zones in New England

CAPACITY | ISO New England

FORWARD CAPACITY MARKET FEATURES:

- Annual auction for period three years into the future (Forward Capacity Auction)
- Generation resources submit a bid for their capacity and ISO takes the lowest bids until they meet projected demand to establish a **clearing price** paid to all generators
- FCM costs are charged to consumers based on their capacity tag – kW demand during the hour of the system peak
- FCM costs **are trending down after 2017**
- Capacity charges could make up anywhere from **30-70% of your energy bill**



CAPACITY | Calculating Charges

CAPACITY CHARGE = CAPACITY TAG X NRCP X RESERVE MARGIN
(CUSTOMERS CAN INFLUENCE) (CUSTOMERS CAN NOT INFLUENCE)

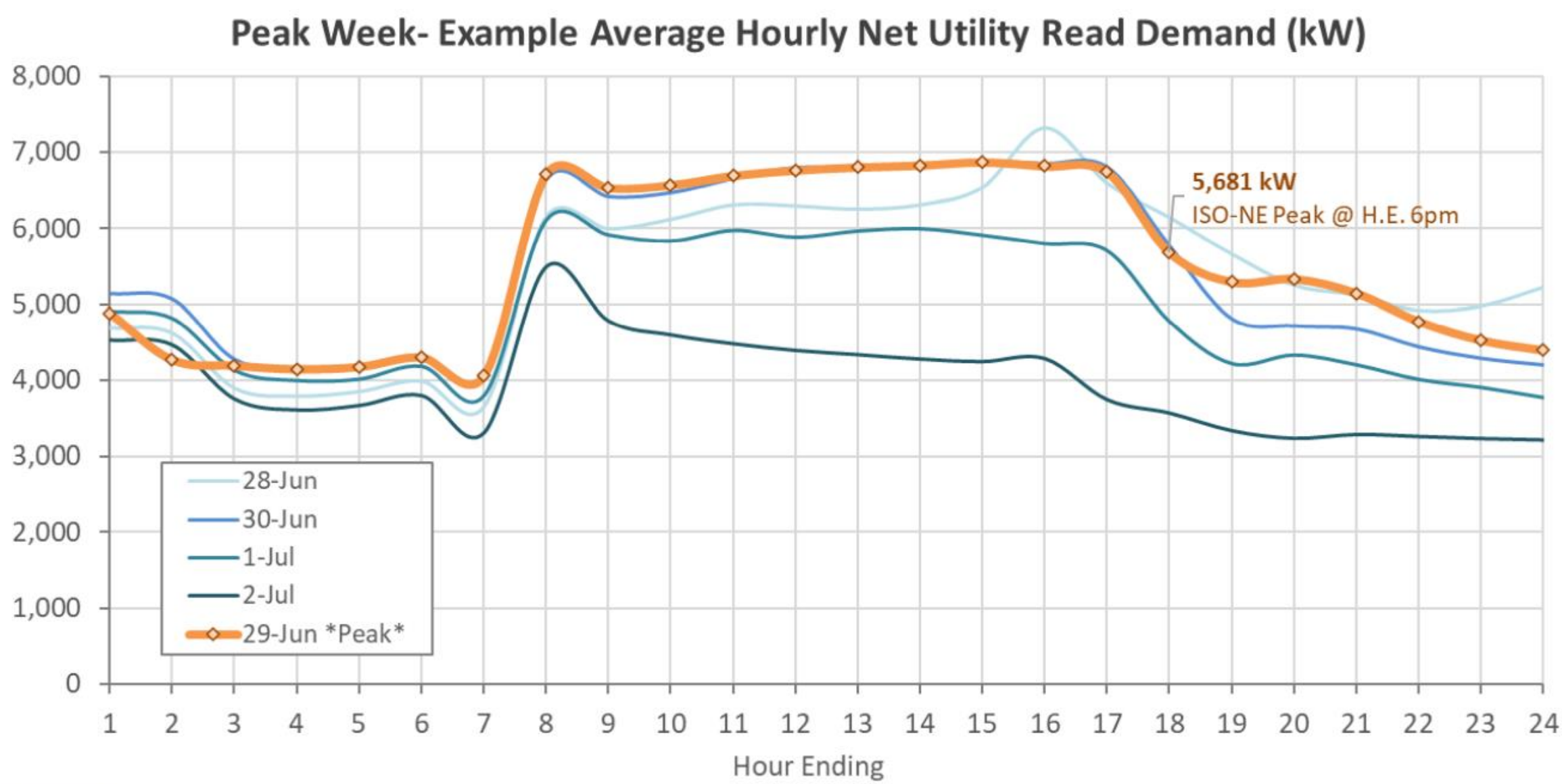
CAPACITY TAG (or Cap Tag) is the demand (kW) on an account during the hour when New England grid is at annual peak demand Cap Tags indicate each account's share of the total capacity costs for the region.

NET REGIONAL CLEARING PRICE (NCRP) NRCP is the price that is set for the power year based on the result of the FCM auction three years prior

RESERVE MARGIN ISO-NE Gross-up factor to account for the difference between the system peak reached and the total capacity required by ISO for reliability

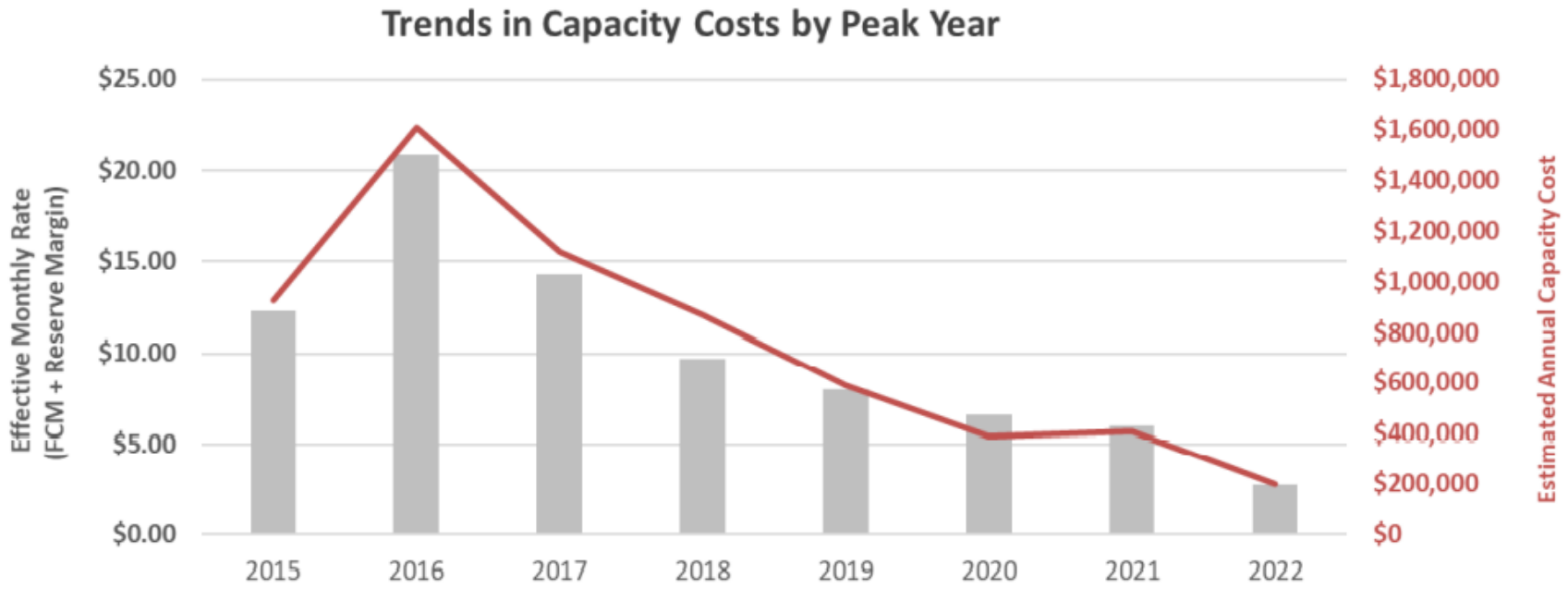
	500 KW CAP TAG	X	**$7.00/KW** NRCP	= $3,500
+ AN ADDITIONAL	**30%** RESERVE MARGIN ($3,500 X .30)			= $1,050
	TOTAL MONTHLY CAPACITY CHARGE			**= $4,550**

CAPACITY | Example 2021 Peak Day Load Profile

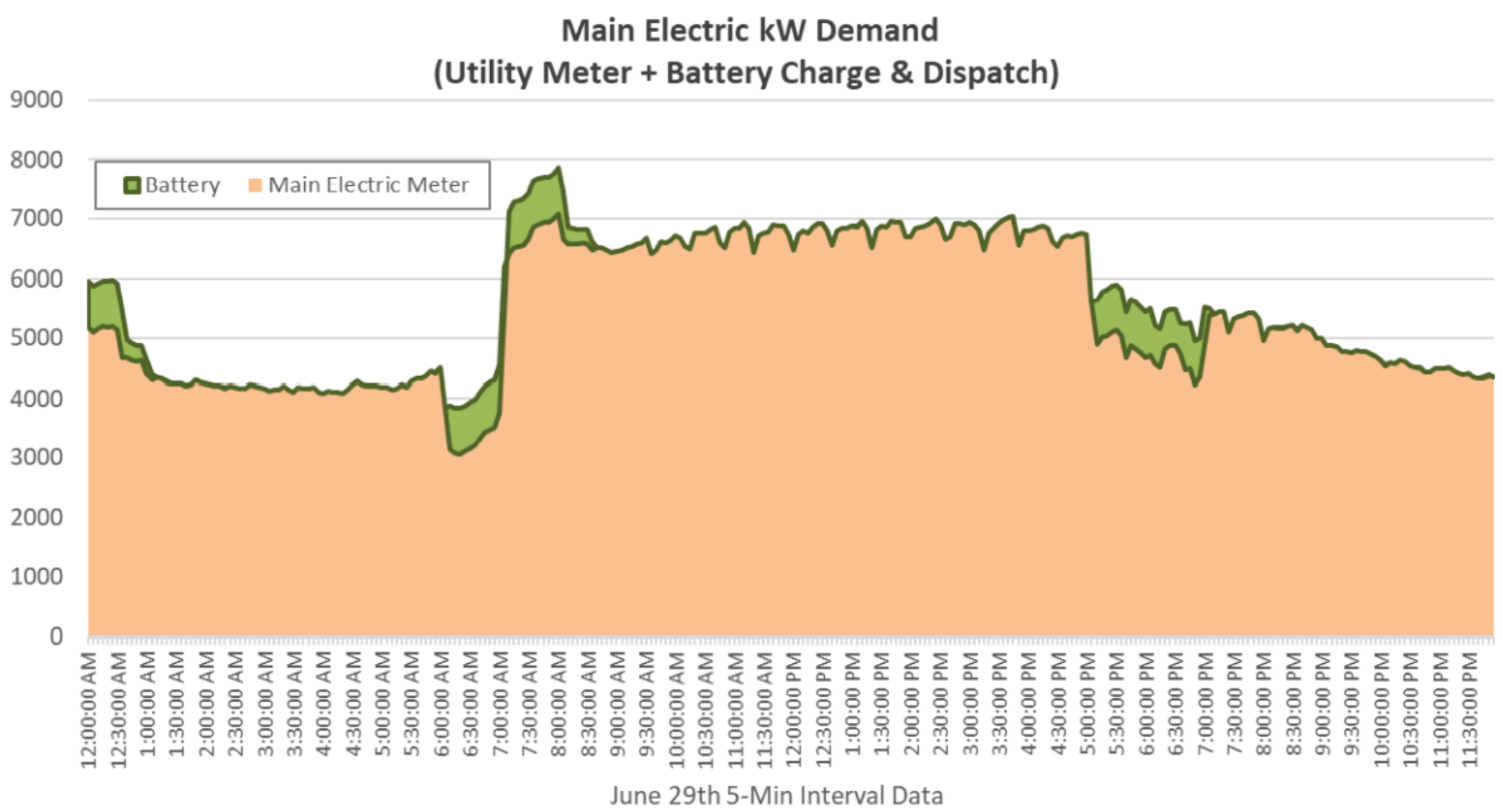


CAPACITY | Past, Present & Future FCM Costs

Peak Year	Applicable Time Range	Settlement Rate ($/kW/month)	Reserve Margin	Effective Rate ($/kW/month)	Main Eleectric Cap Tag (kW)	Est. Annual Capacity Cost
2015	6/1/2016 - 5/31/2017	$8.26	49%	$12.31	6,264	$925,143
2016	6/1/2017 - 5/31/2018	$15.00	39%	$20.85	6,432	$1,609,308
2017	6/1/2018 - 5/31/2020	$9.29	54%	$14.31	6,497	$1,115,282
2018	6/1/2019 - 5/31/2020	$7.03	38%	$9.70	7,457	$868,159
2019	6/1/2020- 5/31/2021	$5.30	50%	$7.95	6,195	$591,036
2020	6/1/2021- 5/31/2022	$4.63	42%	$6.57	4,966	$391,815
2021	**6/1/2022 - 5/31/2023**	**$4.30**	**40%**	**$6.02**	***5,681***	***$410,381***
2022	6/1/2022 - 5/31/2024	$2.00	38%	$2.76	6,000	$198,720

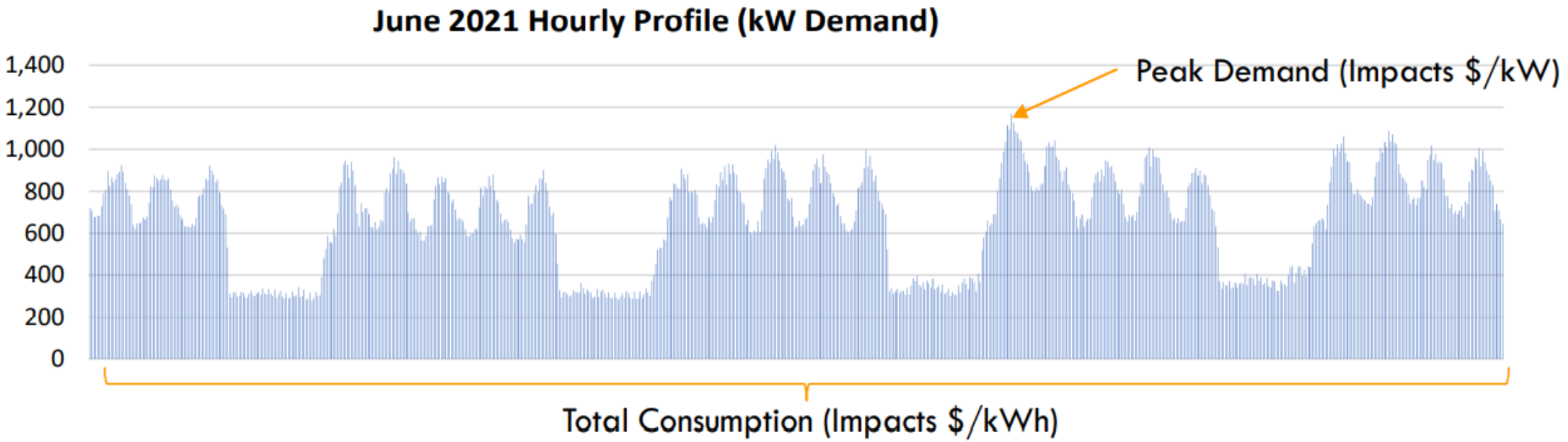


CAPACITY | Impact of Battery Storage



Impact of Demand on LDC Cost?

- Typical end-user is charged for electricity using different types of charges:
  - Fixed monthly customer charge ($/month)
  - Consumption charge ($/kWh) – Impacted by total usage in a billing cycle
  - **Demand charge ($/kW) – Impacted by the maximum, instantaneous demand in a billing cycle**
    - Can be either a "coincident peak" or a "non-coincident peak"
    - Time period of demand may matter as well (ex. time-of-use rates)



THANK YOU

Competitive Energy SERVICES

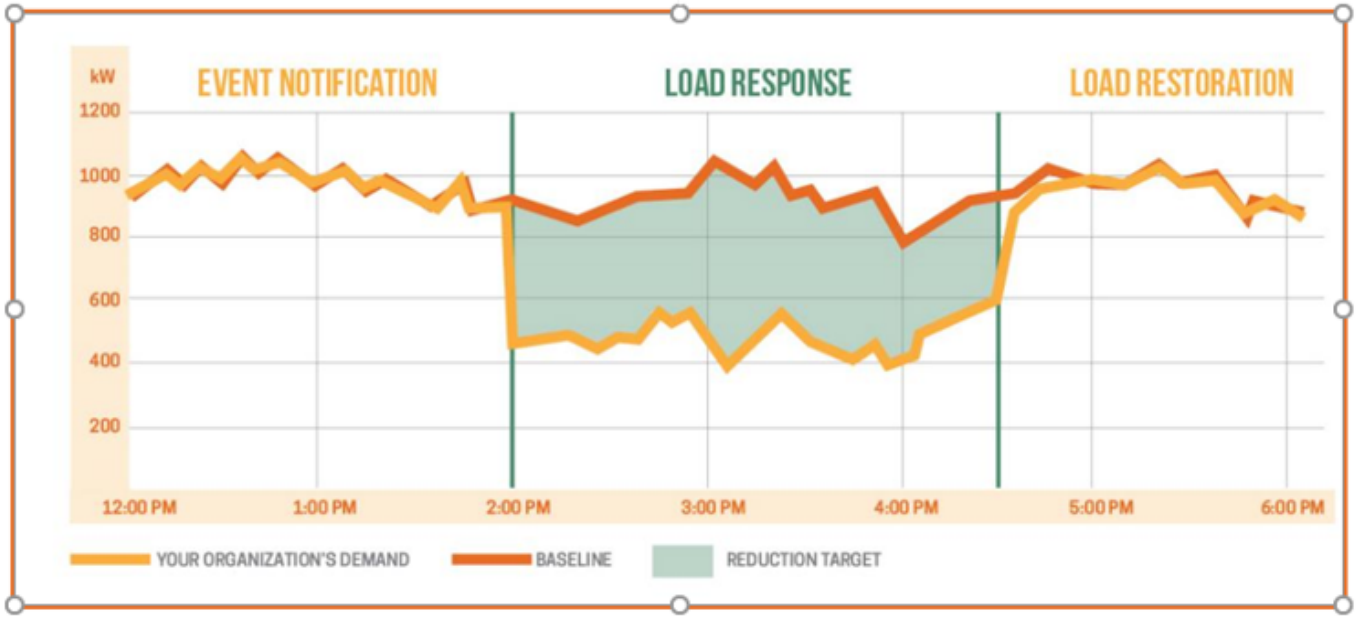
Demand Response in New England

WHAT IS DEMAND RESPONSE?

DR
Demand Response

Programs that pay organizations to reduce energy load during times of grid stress or high energy prices.

Provides energy users the ability to earn revenue and lower net energy costs.



CPower

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New England Demand Response Options

Program name	Propose	Notification lead time	Typical Curtailment Frequency	Administrator	Earnings/Savings per year – 1000 KW
Active Demand Capacity Resource	Avoiding Blackouts	30 minutes	2-5 hours per year	ISO-NE	$28K
Connected Solutions	Lowering System Peaks	Day Ahead	9-15 hours per Summer	Utility	$25K
Peak Demand Management (Cap Tag)	Energy Bill Cost Avoidance	Day Ahead	9-15 hours per Summer	CPower	$55K (savings)
On Peak Hours Resources	On-site DG, co-gen, solar, fuel cell	Passive (no curtailment)	None	ISO-NE	$6K

How to Succeed at Demand Response

HVAC

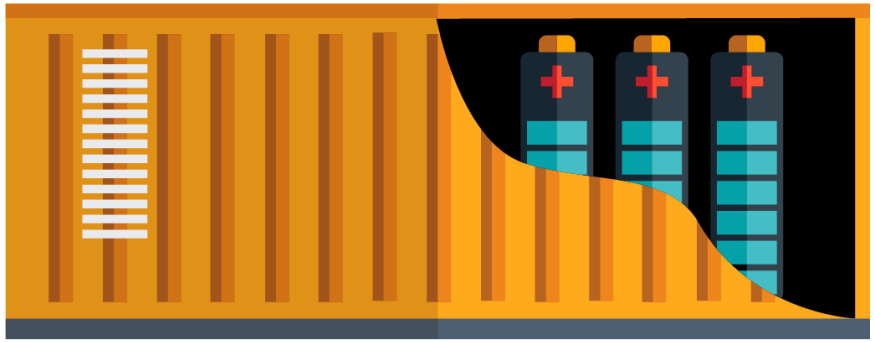
Process Motors

Heating and Cooling

- Manual or Automatic Load Drop
- Energy Management Systems
- Load Shedding Strategies
- Lighting Control Strategies
- Permitted Generation
- Batteries

Battery Storage

Program name	Program Type	Customer Obligation Hours	Notification lead time	Performance Season	Typical Curtailment Frequency	Administrator
Connected Solutions	Dispatch Dispatch	July-August Typically 4-6 pm OR 5-7 pm	Day Ahead	Summer (June-Sept)	30-60 calls per summer	Utility



BATTERY STORAGE

Pricing:
$200/kW in Massachusetts per summer

DCAMM - ENE51 – How to E

OSD OPERATIONAL SERVICES DIVISION

Contract User Guide for ENE51

Entities Eligible to Use the DCAMM Contract

- Cities, Towns, Districts, Counties
- Executive, Legislative & Judicial Branches
- Independent Public Authorities, Commissions & Quasi-Public Agencies;
- Public Libraries, School Districts & Charter Schools;
- Public Hospitals owned by Commonwealth;
- Public Institutions of Higher Education;
- Public Purchasing Cooperatives;
- Non-Profits engaged with Commonwealth

ENE51: Designated DCAMM Statewide Contract for Demand Response Services

UPDATED: 10/6/2020

Contract #:	**ENE51**
MMARS MA #:	**ENE51***
Initial Contract Term:	**October 1, 2020 –September 30, 2025**
Maximum End Date:	**September 30, 2027**
Current Contract Term:	**October 1, 2020 –September 30, 2025**
Contract Manager:	**Dave Lewis, 857-204-1472, Dave.Lewis@mass.gov**
UNSPSC Codes:	**83-10-19-02-0000 - Energy use reduction measures**

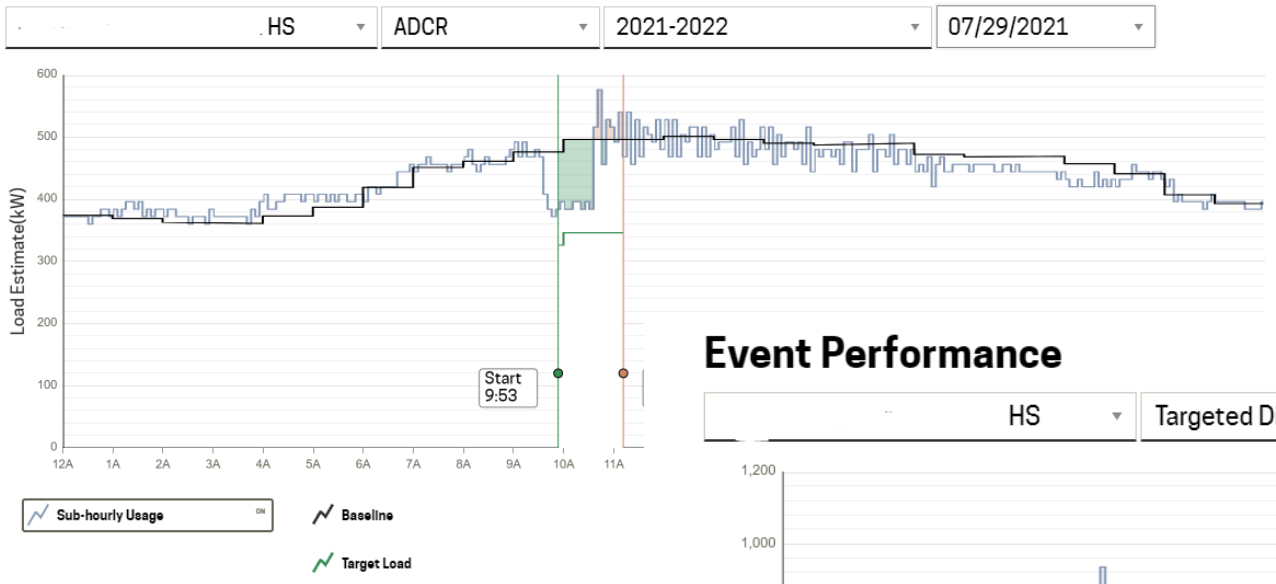
*The asterisk is required when referencing the contract in the Massachusetts Management Accounting Reporting System (MMARS).

Connected Solutions Enrollment:

Please enroll the [COMPANY] in the National Grid Connected Solutions Program pursuant to the terms and conditions of the ENE51designatedDCAMM statewide contract.

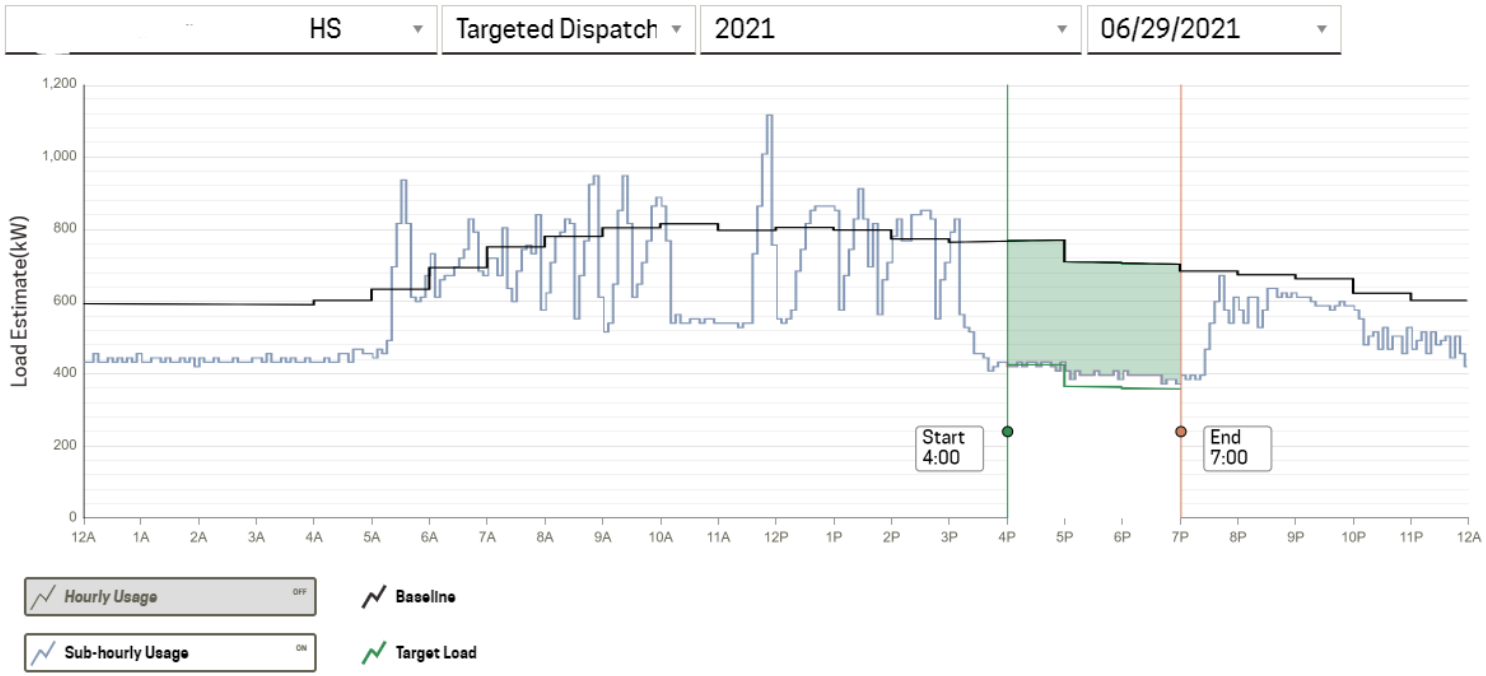
Case Study- High School in North Shore

Event Performance



Download Baseline

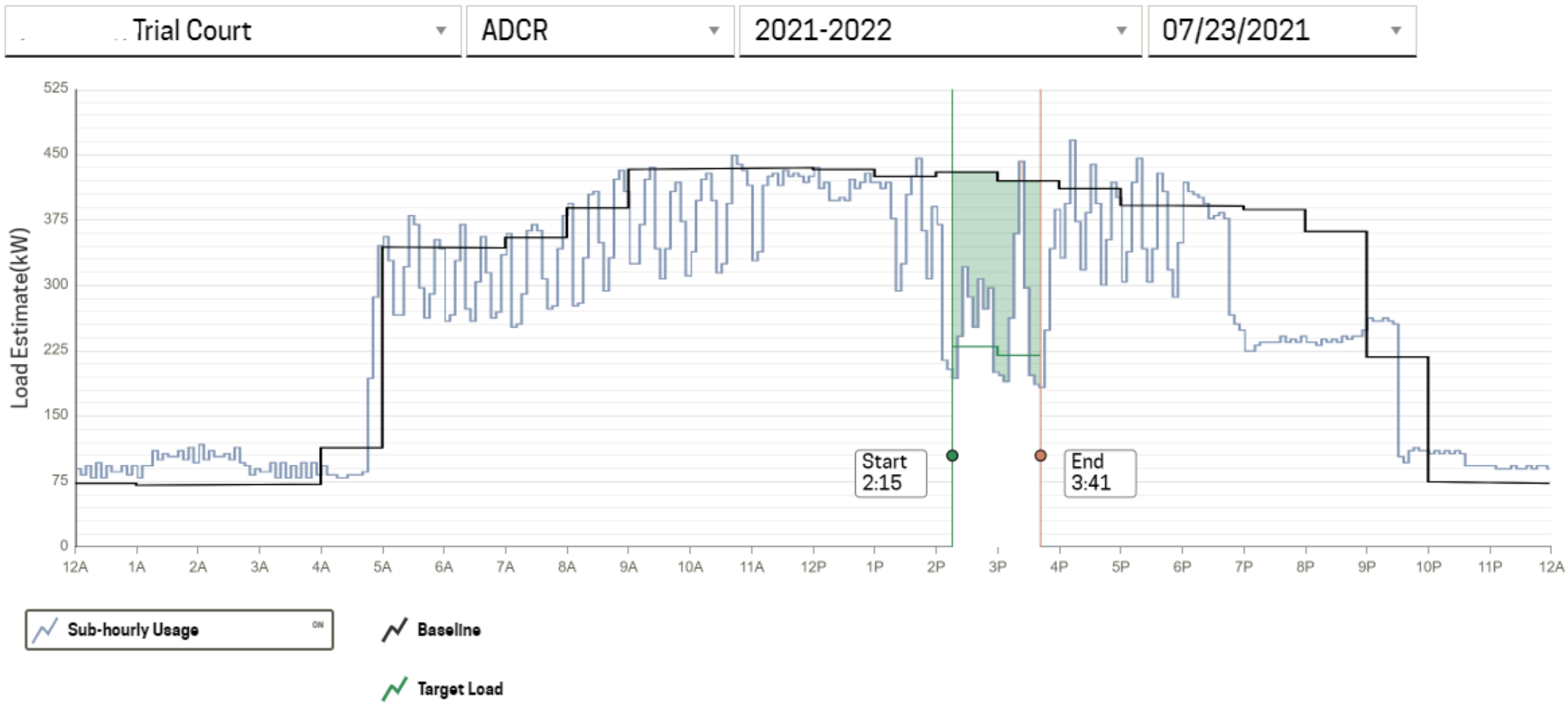
Event Performance



Download Baseline

Case Study- Trial Court in Southeastern MA

Event Performance



Energy is forever in motion.
At CPower, we never stop moving in our pursuit to help your organization master its energy spend.

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Addressing Peak Demand with the Clean Peak Energy Standard (CPS)

AMY MCGUIRE

DEPUTY DIRECTOR, DOER

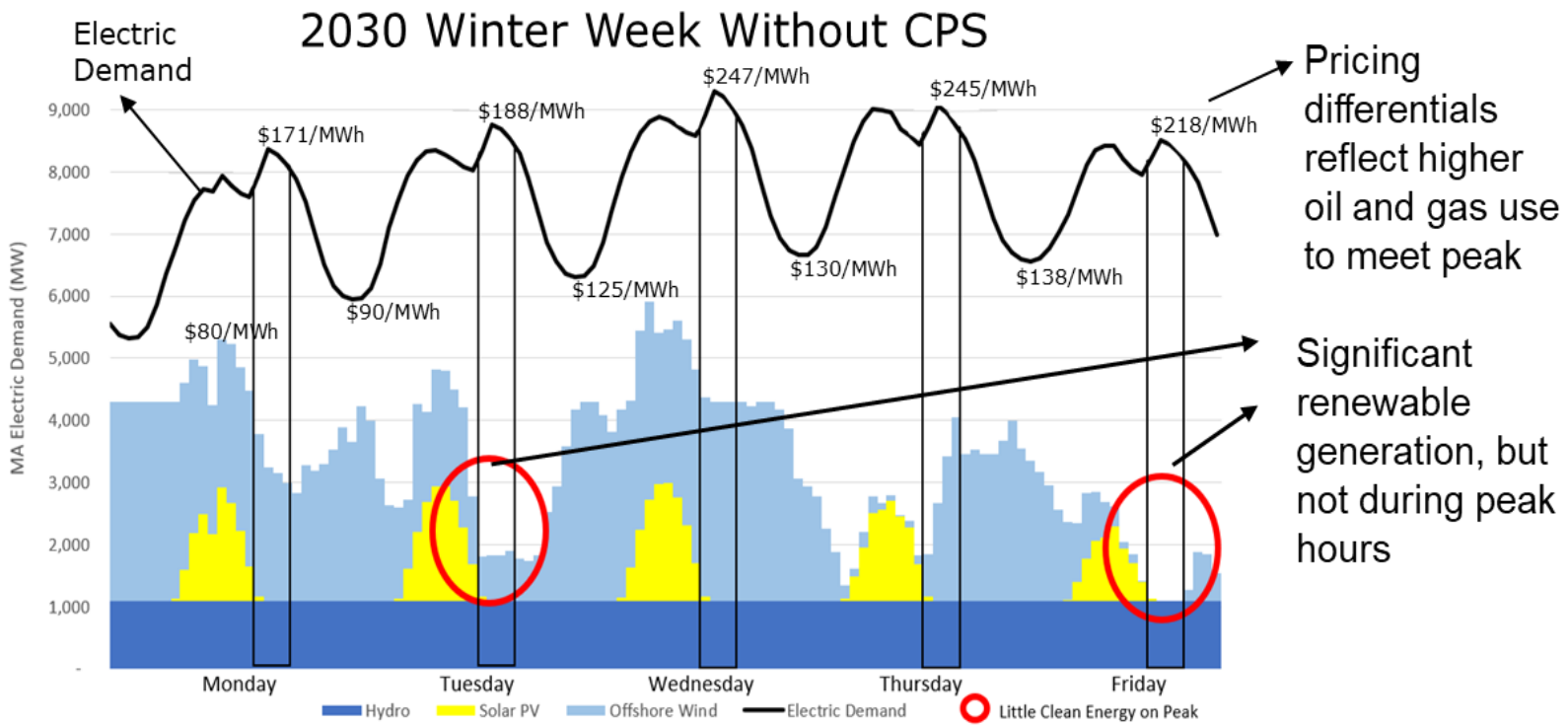
SEPTEMBER 21, 2021

Status Quo Challenge to Resolve

CPS designed to address the issue of peak demand

Continued renewable investment alone won't allow us to specifically target peak demand

CPS incentivizes investment in resources that can shift energy usage from the peak



Production profile for 1,090 MW Hydro, 3,200 MW Offshore Wind, 5,000 MW Solar PV

CPS Overview

Clean Peak Energy Standard (CPS) was Governor Baker's proposal in the Environmental Bond Bill in 2018 to enhance Massachusetts clean energy policies.

- Goals:
  - Reduce cost at peak demand
  - Reduce emissions
  - Continue clean energy growth

How it works?

- CPS creates a requirement on all electricity suppliers to purchase a certain amount of Clean Peak Energy Certificates (CPECs)
- Eligible resources that generate, dispatch or discharge energy during Seasonal Peak Periods and the Hour of Actual Monthly System Peak will generate CPECs
- An Alternative Compliance Payment (ACP) rate bounds the market price of CPECs

https://www.mass.gov/clean-peak-energy-standard

Eligible Resources

Four types of eligible resources:

1. **New RPS Class I** eligible resources in operation on or after 1/1/19
2. **Existing RPS Class I / Class II resources that are paired with a Qualified Energy Storage System**
3. **Qualified Energy Storage Systems** operating to primarily store and discharge renewable energy
4. **Demand Response Resources**

Resources must be interconnected with the Distribution System or Transmission System in the Commonwealth of Massachusetts. Resources interconnected with the Transmission System must be delivered to the Commonwealth of Massachusetts

Clean Peak Energy Certificates (CPECs)

A qualified Clean Peak Resource will generate Clean Peak Energy Certificates (CPECs) according to the performance of the Clean Peak Resource over the duration of the Seasonal Peak Period of a particular day, with appropriate multipliers applied

On a day which has the Actual Monthly System Peak, the performance of the resource in the Hour of Actual Monthly System Peak demand is used to calculate the number of additional CPECs

All CPECs are minted following the receipt and verification of the performance of qualified participating facilities for the month

CPECs are then available for revenue generation as a marketable commodity

Qualified Clean Peak Resources

Type	Technology	MA CPS Number	NEPOOL GIS ID	Plant - Unit Name	City/Town	Nameplate Capacity (MW)
RPS	Wind	12	CPS1002	Berkshire Wind 2	Lanesborough	4.6
DR	ESS	29	CPS1011	Encore Casino SMART battery (Encore ESS A)	Everett	2
DR	ESS	15	CPS1012	Encore Casino Merchant battery (Encore ESS B)	Everett	2
QESS	ESS	105	CPS1017	Brandeis Battery	Waltham	7
QESS	ESS	93	CPS1009	Blandford SMART battery	Blandford	3.9
RPS	ESS	113	CPS1024	Amesbury landfill SMART battery	Amesbury	1.6
RPS	Photovoltaic	111	CPS1022	Acushnet SREC II Solar	Acushnet	1.9
RPS	Photovoltaic	112	CPS1023	Turner Falls SREC II Solar	Montague	1.4
RPS	Anaerobic Digester	1	CPS1004	Greater Lawrence Sanitary AD	North Andover	3.2
QESS	ESS	69	CPS1006	Goodale Construction Battery	Oak Bluffs	0.3
QESS	ESS	54	CPS1007	UMass Amherst Battery	Amherst	1.3
QESS	ESS	114	CPS1018	UMass Dartmouth Battery	Dartmouth	0.5
QESS	ESS	53	CPS1019	Happy Hollow SMART ESS	Winchendon	3.3
QESS	ESS	75	CPS1008	Brockelman Road Solar 2 Storage	Lancaster	1
RPS	Anaerobic Digester	TBD	CPS1025	Rockwood Farm AD	Granville	0.45
RPS	Anaerobic Digester	TBD	CPS1026	Belden Farm AD	Hatfield	0.38
QESS	ESS	TBD	CPS1016	Shutesbury ESS	Shutesbury	2

https://www.mass.gov/doc/cps-qualified-units-list

Qualified Resources Snapshot

Resource diversity

- Range of technology within resource pool
  - Energy storage
    - Qualified Energy Storage System
    - Demand Response
  - RPS Class I/II
    - Solar PV
    - Land based wind
    - Anaerobic digestors
- Range of resource size from 0.3MW to 7MW

Geographic diversity with resources across the Commonwealth

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

Region	Quantity
Northeast	5
Southeast	3
Central	2
Western	7
TOTAL	17

Recent Program Updates and Near-Term Goals

Created pathways for participation for additional Demand Response Resources including:

- EVSE
- Electric water heaters
- Load curtailment
- Building thermal mass and thermal storage

Working to develop and implement an EDC CPEC Procurement process in order to:

- Spur new and incremental resource development
- Provide revenue certainty for early-stage resource development to enable financing
    - Decrease the risk of a new and illiquid market
    - Target resources which don't have existing policies which provide long-term revenue certainty
- Provide cost-effective CPEC supply

Relevance to State Entities

State entities are eligible

CPS is a revenue stream – for existing, upgraded, and new projects

CPS incents investments that can have other additional benefits

- Reducing demand charges
- Monetizing the resilience of paired solar plus storage systems
- Enabling the integration of additional clean, distributed energy resources
- Potentially avoiding or reducing interconnection upgrade costs for distributed energy resources
- Resolving power quality issues
- Preventing future curtailment

CPS enables state entities to *lead by example*