

# DOE-OE Energy Storage Technology Advancement Partnership (ESTAP) Webinar

## Massachusetts Clean Peak Standard

How it will affect renewable and battery storage  
value streams, projects, and markets

September 2, 2020



U.S. DEPARTMENT OF  
**ENERGY**



Sandia  
National  
Laboratories



**CleanEnergy**  
States Alliance

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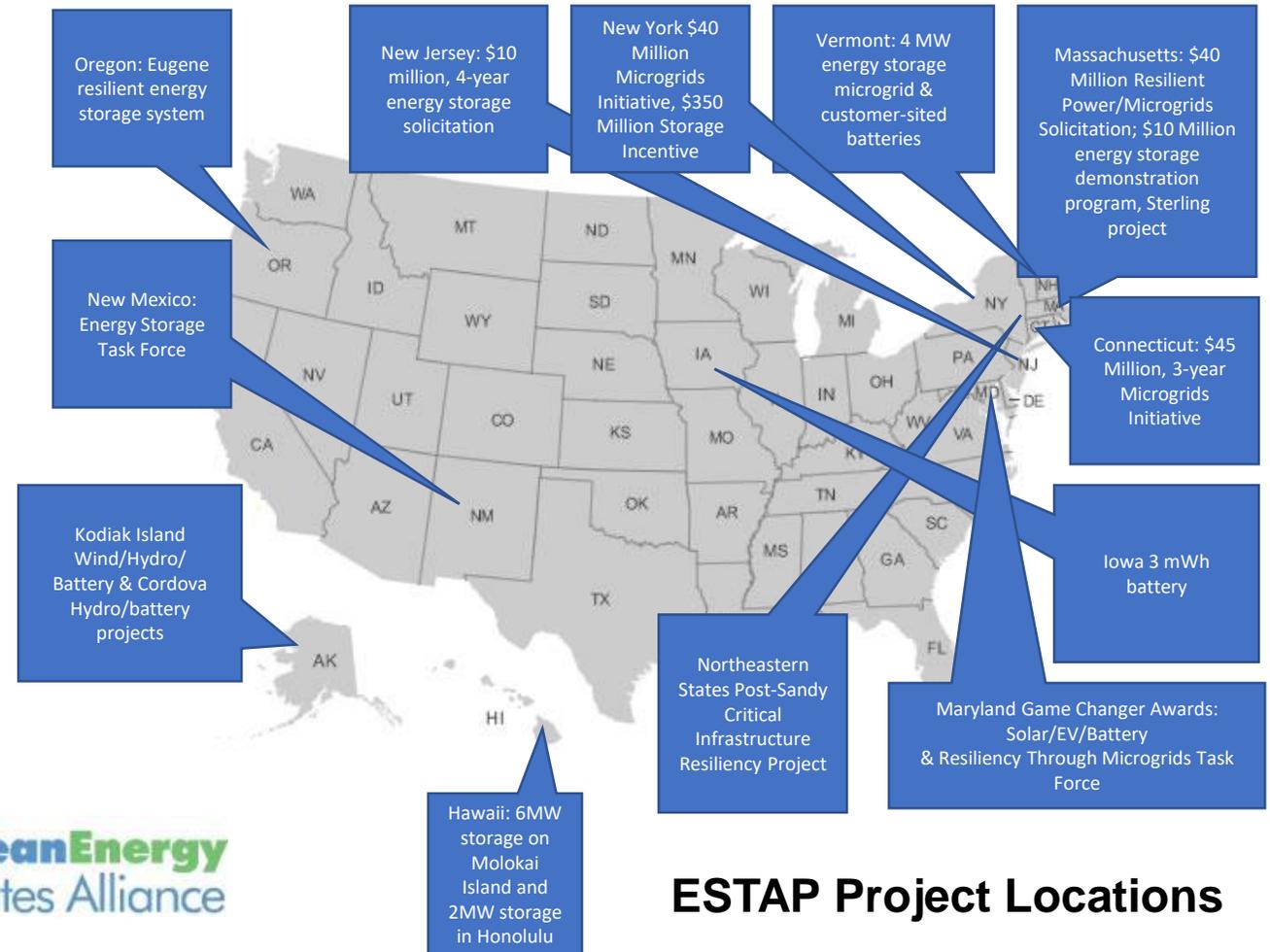
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# DOE-OE Energy Storage Technology Advancement Partnership

The **Energy Storage Technology Advancement Partnership (ESTAP)** is a US DOE-OE funded federal/state partnership project conducted under contract with Sandia National Laboratories.

## ESTAP Key Activities:

1. Facilitate public/private partnerships to support joint federal/state energy storage demonstration project deployment
2. Disseminate information to stakeholders
  - ESTAP listserv >5,000 members
  - Webinars, conferences, information updates, surveys.
3. Support state energy storage efforts with technical, policy and program assistance

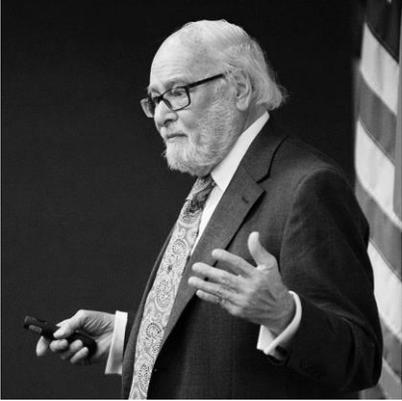


**ESTAP Project Locations**

# CleanEnergy States Alliance



# Thank You!



## **Dr. Imre Gyuk**

Director, Energy Storage Research,  
U.S. Department of Energy



## **Dan Borneo**

Engineering Project/Program Lead,  
Sandia National Laboratory



*And thank you to all of today's speakers!*



# Today's Webinar Speakers



**Mike Berlinski**  
Director – Emerging  
Technology,  
Customized Energy  
Solutions



**Nehal Divekar**  
Manager – Future  
Grids, Customized  
Energy Solutions



**Jim Kennerly**  
Senior Consultant,  
Sustainable Energy  
Advantage



**Todd Olinsky-Paul**  
Senior Project Director,  
Clean Energy States  
Alliance (moderator)



# The Massachusetts Clean Peak Energy Standard

How it will affect renewable and storage  
value streams, projects, and markets

September 2, 2020

# Agenda

1

**Introduction to Customized Energy Solutions and Sustainable Energy Advantage**

2

**Background on the MA Clean Peak Energy Standard**

3

**Analysis**

Energy Storage

Renewables

4

**Best Practices for a Clean Peak Standard**

5

**Questions & Answers**

# Introduction to Customized Energy Solutions and Sustainable Energy Advantage

# Customized Energy Solutions



## Customized Energy Solutions

Established in 1998, **Customized Energy Solutions (CES)** is a consulting and services company that assists clients in managing and staying ahead of the changes in the wholesale and retail electricity and natural gas markets. Serving hundreds of clients, Customized Energy Solutions offers best-in-class hosted energy market operations platforms and a wide spectrum of consulting services. CES is committed to promoting economic development through the advancement of transparent, efficient, and non-discriminatory wholesale and retail electricity and natural gas markets.

## Presence

Headquartered  
Philadelphia, PA



Over 175 Associates across 9 Regional offices in United States, Canada, India, Japan & Mexico.

## Resources

>11,000 MW assets under Active Management

>300 MW Energy Storage under Management

## Awards and Recognitions



Inc. 5000 – Eleven Time Honoree, Philadelphia 100 - 2001, 2004 – 2012, 2019  
 Best Places to work: 2014, 2016  
 2016 Energy Storage Association Brad Roberts Award Winner

## Clients

500+ Clients Worldwide



Our consulting services enable competitive suppliers, technology providers, marketers, utilities, and their customers to prosper through change, by turning knowledge into value

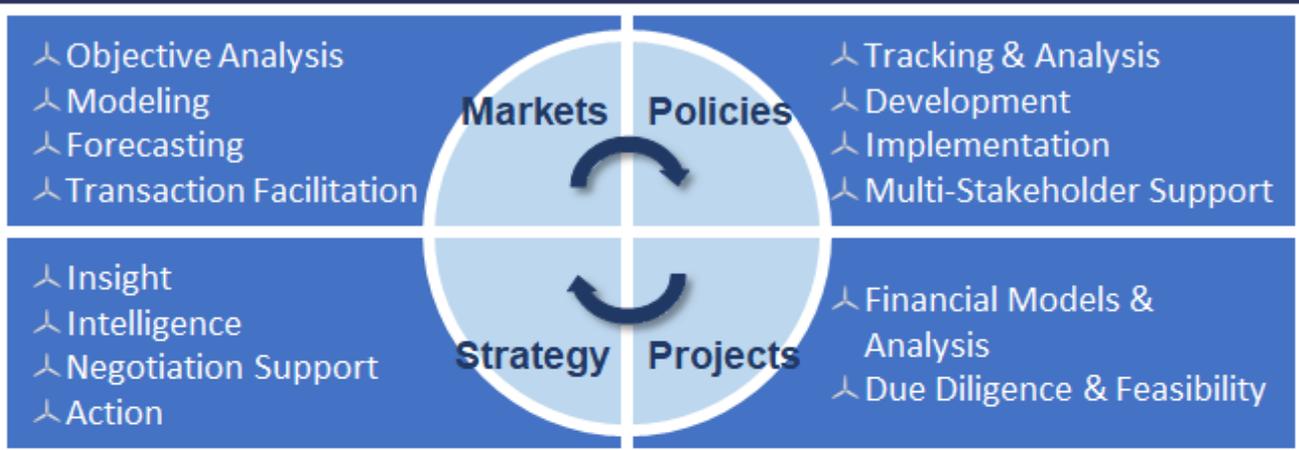
# CES Business Lines

Wholesale Services	Retail Services	Future Grid		Market Intelligence
<p>Dispatch      Settlements</p> <p>Scheduling    24 Hour Desk</p> <p>Monitoring    Market Optimization</p> <p>Bidding        DA / RT Strategies</p> <p>Telemetry</p>	<p>Market Entry   Pricing</p> <p>EDI/Billing     Headroom Analysis</p> <p>Forecasting    Managed Portfolio Services</p> <p>Scheduling</p> <p>Settlements</p>	<div style="background-color: #cccccc; padding: 5px; text-align: center;">Distributed Resource Integration</div> <p>Market Rules and Entry    Telemetry &amp; Resource Registrations</p> <p>Market Integration Consulting    Market Operations</p> <p>Revenue Modeling                  Scheduling, Dispatch and Control</p> <div style="text-align: center;"> </div> <p>Demand Response Mgmt      SecureNet Tracking Settlement</p> <p>CES GREEN</p>	<div style="background-color: #cccccc; padding: 5px; text-align: center;">Emerging Technologies</div> <p>StorageIQ</p> <p>Revenue Modeling</p> <p>Bid Advisory Services</p> <p>Energy Market Forecasts</p> <p>Market Sizing, Entry, Strategy</p> <p>Policy &amp; Research</p> <p>Technology Due Diligence</p> <p>Financial Services</p> <p>Microgrid Analysis</p> <div style="text-align: center;"> </div>	<p>Comprehensive Markets Coverage</p> <p>ISO Rules &amp; Reporting</p> <p>Market Rule Changes</p> <p>Regulatory Proceedings</p> <p>CES   MARKETIQ</p> <div> </div>
<div style="text-align: center;"> </div> <p>Congestion Management</p> <p>ARR Analysis</p> <p>FTR Analysis</p> <p>Congestion Analysis</p> <p>Power Flow Studies</p>	<div style="text-align: center;"> </div> <p>Renewable Management</p> <p>RPS Management</p> <p>Plant Registration</p> <p>REC Optimization</p> <p>Compliance</p>			<div style="border: 1px solid black; padding: 10px;"> <p style="font-size: small;">STATE OF CHARGE Massachusetts Energy Storage Initiative Study</p> <p style="text-align: center;">STATE OF CHARGE Massachusetts Energy Storage Initiative</p> </div>

CES was the lead consultant for the MA State of Charge report, we supported MassCEC on Solar + Storage for Manufacturers, and supported MA DOER on the CPS. We advise the Energy Storage Association on its wholesale electricity market policy efforts.

# Sustainable Energy Advantage, LLC

Consulting & advisory firm helping clients build renewable energy business, markets, policies and projects through analysis, strategy & implementation since 1998.



## Our Subscription Service Suite

### New England Renewable Energy Market Outlook (REMO)

- Detailed REC market fundamentals analysis, briefings, providing actionable information on New England's complex REC markets to support informed business decisions. Delivered 3x per year
- Since 2005



### Northeast Eyes & Ears

- We track it...now you can too.**
- Renewable Energy Regulatory Policy & Legislative Tracking & Analysis Service
- Extending & enhancing subscribers' busy users' government affairs / market intelligence functions
- New England: since 2007. New York: Since 2017.

### New York Renewable Energy Market Outlook (REMO)

- Bulletins, Topical Webinars, and detailed REC Market Fundamentals Analysis, providing subscribers with comprehensive & timely insight into New York's rapidly expanding / evolving renewables market.



### Massachusetts Solar Market Study

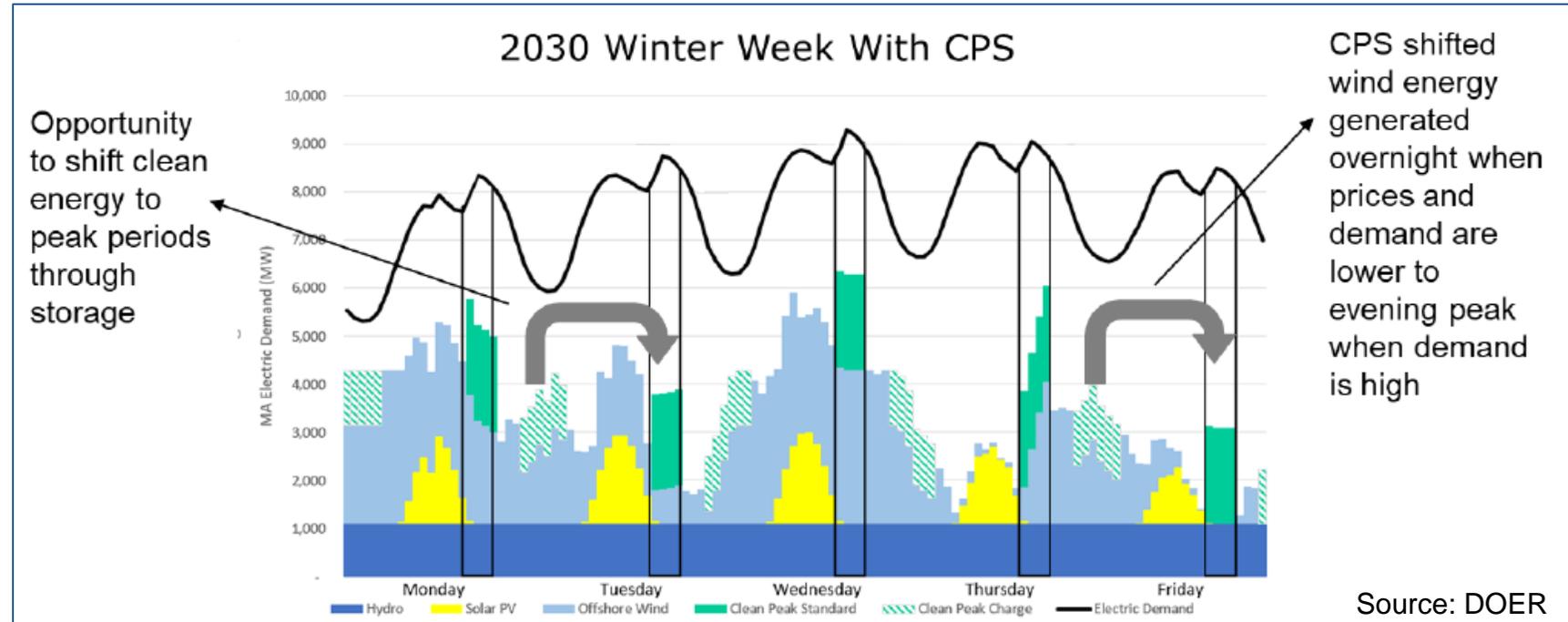
- In-depth analyses of the Massachusetts solar markets since 2014, focusing on solar renewable energy credit market and Solar Massachusetts Renewable Target (SMART) program

PJM... coming soon!

# Background on the MA Clean Peak Energy Standard (CPS)

# MA CPS Background

- Goals: reduce peak electricity demand, cut emissions, and lower ratepayer costs
- Design: like an RPS, but different
- History: March 2018 - August 2020
- Some details still TBD



## Massachusetts Clean Peak Standard: Market Model

Final Report  
August 27, 2019

PRESS RELEASE

8/04/2020

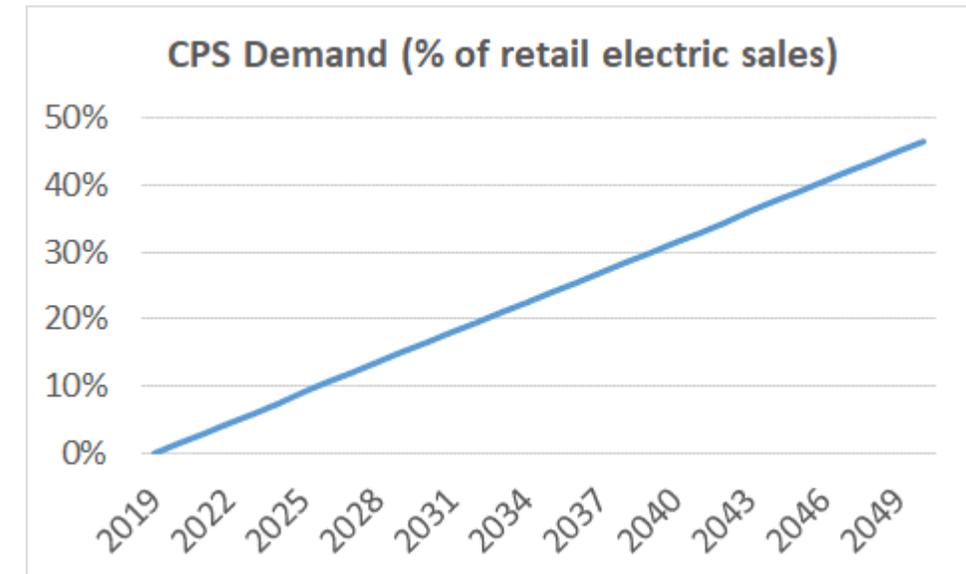
## Baker-Polito Administration Launches First-in-the-Nation Clean Peak Energy Standard

Program Will Promote Use of Clean Energy When Costly Electricity Demand is Highest

# MA CPS Program Details

- Seasonal, daily 4-hour windows (see table)
- Demand – LSEs must meet % of elec with clean peak energy (see graph)
  - For 2020, 1.5% of eligible retail sales (contracts executed or extended on or after January 1, 2020, MLPs exempt)
  - Annual obligation will increase by 1.5% per year
  - Through 2050
- Banking – LSEs can bank up to 30% a year for up to three years
- Procurement – EDCs to procure at least 30% of obligation

Season	Peak Season	Peak Period
Winter	12/1 to 2/28	4pm - 8pm
Spring	3/1 to 5/14	5pm - 9pm
Summer	5/15 to 9/14	3pm - 7pm
Fall	9/15 to 11/30	4pm - 8pm



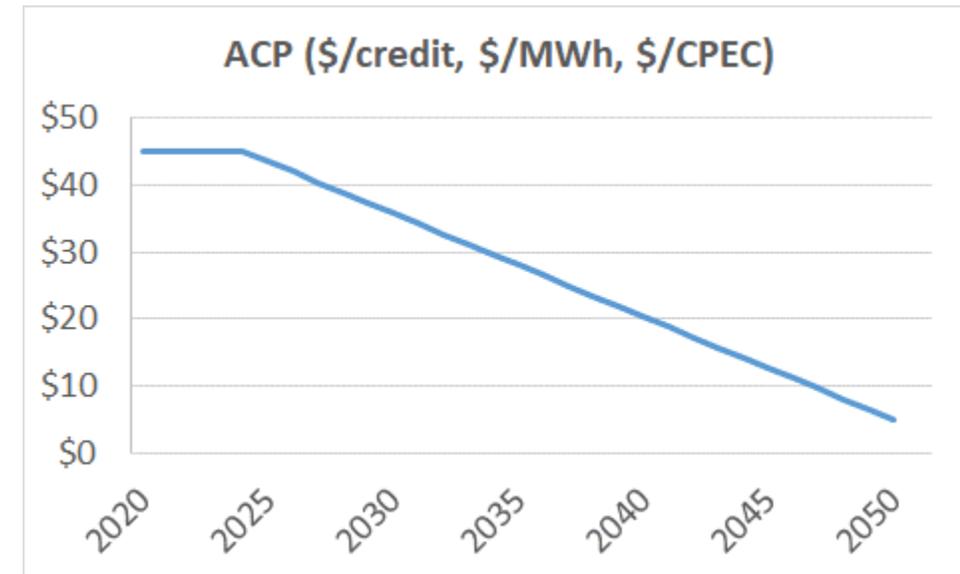
# MA CPS Program Details (continued)

- Supply – MA-based or -focused renewables, storage, and DR are eligible
  1. New Renewables – RPS Class I, COD >1/1/19
  2. Existing Renewables – RPS Class I/II, COD <1/1/19 – co-located with QESS, >=25% MW, >=4-hour duration
  3. Qualified Energy Storage Systems (QESS) – COD >1/1/19, that primarily charge from renewable energy:
    1. Co-Location with a qualified renewable resource, >=75% of the storage MW
    2. Contractual pairing with a qualified renewable resource
    3. Charging during high renewable energy periods (see table)
    4. Operational schedule in the ISA showing resolves power issues
  4. Demand Response – Generators ineligible; storage & EV OK, active DR programs OK

Clean Peak Season	Energy Storage Charging Windows	
	Wind-Based Charging Hours	Solar-Based Charging Hours
Spring	12am - 6am	8am - 4pm
Summer	12am - 6am	7am - 2pm
Fall	12am - 6am	9am - 3pm
Winter	12am - 6am	10am - 3pm

# MA CPS Program Details (continued)

- Multipliers
  - Multipliers adjust the number of CPECs for each MWh of energy generated during the peak period to align generation with time periods and resource attributes of highest impact
  - Seasonal – Summer/Winter – 4x, Spring/Fall – 1x
  - Monthly System Peak – 25x (for hour)
  - Resilience – 1.5x
  - Existing – 0.1x
  - Contracted – 0.01x
  - SMART ES Resource – 0.3x
- Certificate price based on market
- Alternative Compliance Payment (ACP) (see graph)
- Annual compliance reporting
- Metering requirements
- Levers to adjust program
- Periodic program review



# Analysis

# Energy Storage System for CPS

- Energy Storage System (ESS) is a versatile technology that is uniquely suited to drive the goals of the Clean Peak Standard
- ESS is a dispatchable resource and can therefore play an effective role in shifting clean energy to times of high demand on the grid
- To Qualify for CPS, ESS can be both in a standalone, physically paired or contractually paired configuration with certain restrictions on charging
- ESS can continue to participate in a variety of wholesale energy market value streams and yet continue to earn incremental revenues from the CPS
- ESS resources can use a variety of dispatch strategies to benefit from the CPS, depending on the level of financial incentives provided by Clean Peak Energy Certificates (CPEC)

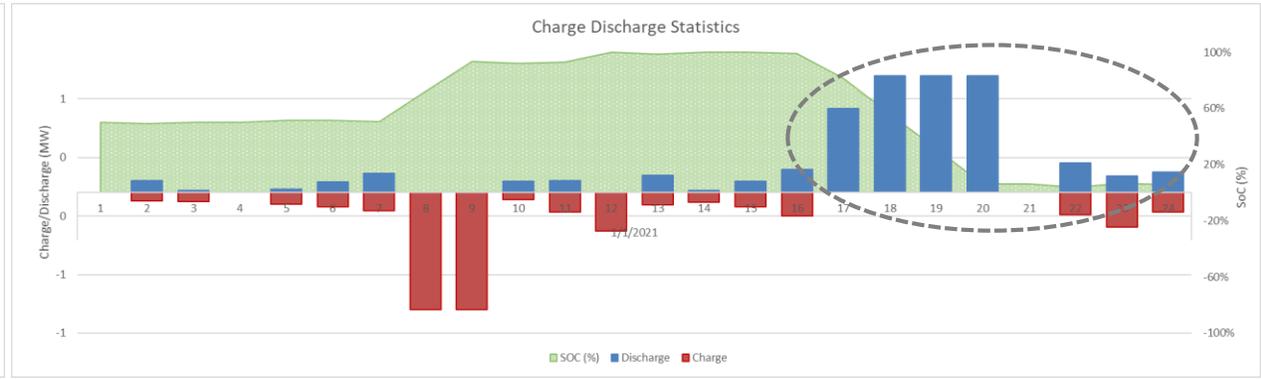
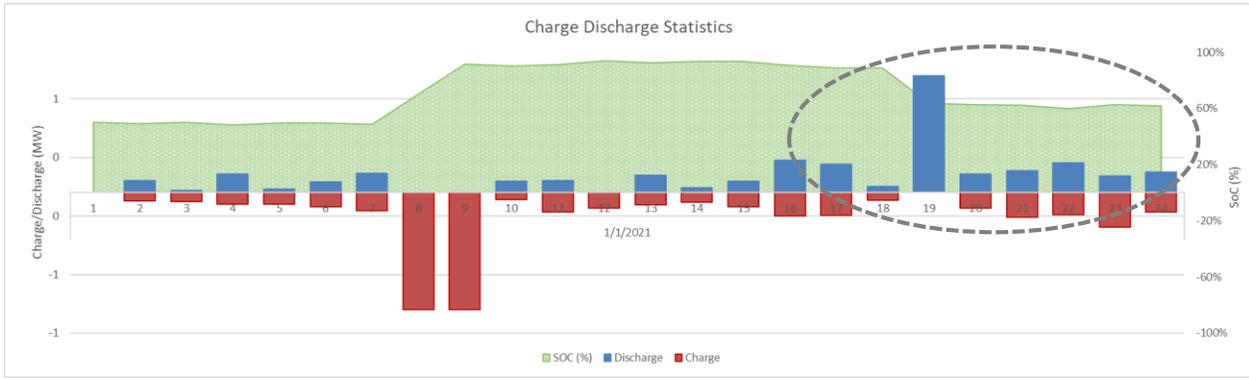
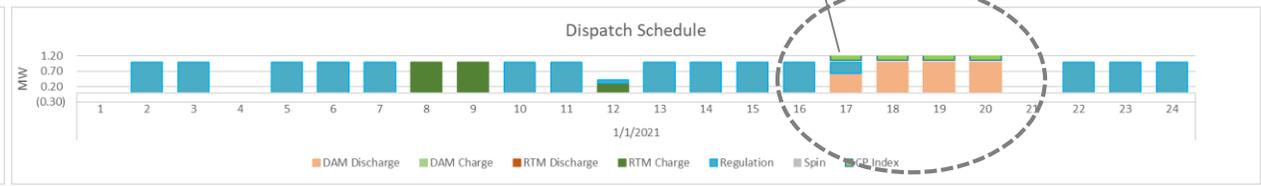
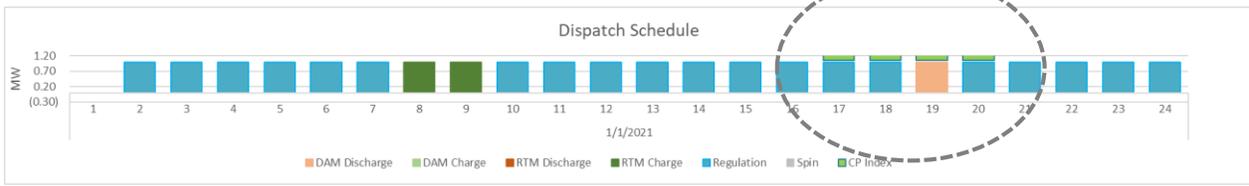
# Dispatch Strategy Options for QESS

**Dispatch Strategy I \***

Daily Clean Peak Period between HE16-HE19

**Dispatch Strategy II \***

The most profitable combination of market services to maximize revenues



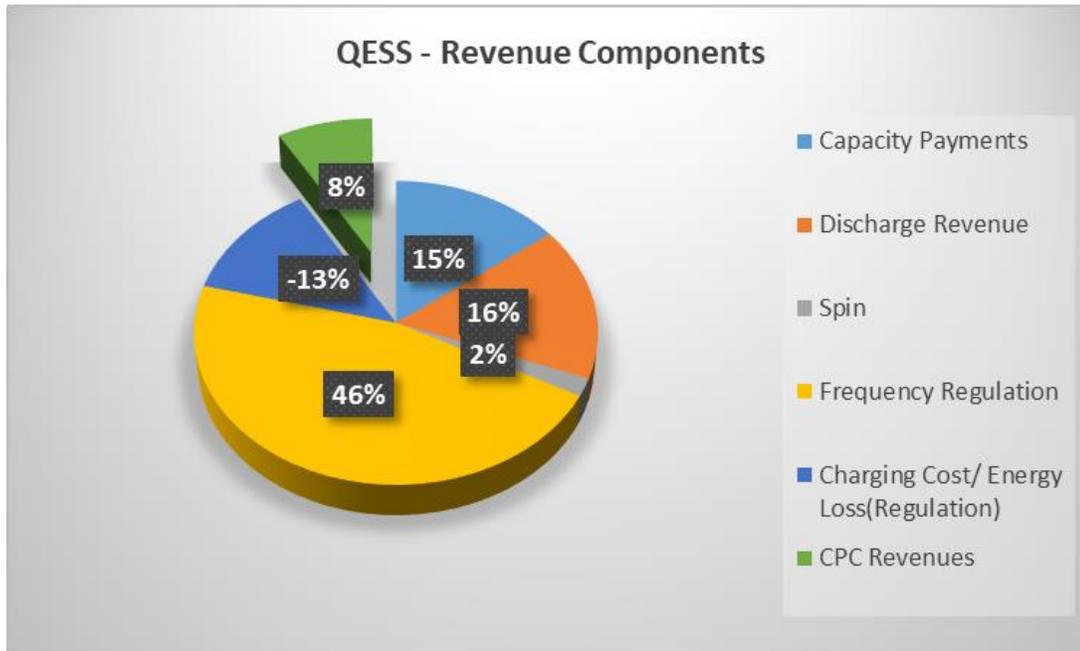
Dispatch Prioritized for Market Revenues  
(assuming total opportunity cost > \$45)

Dispatch Prioritized for CPS & Market Revenues  
(assuming \$45/Certificate, also the ACP)

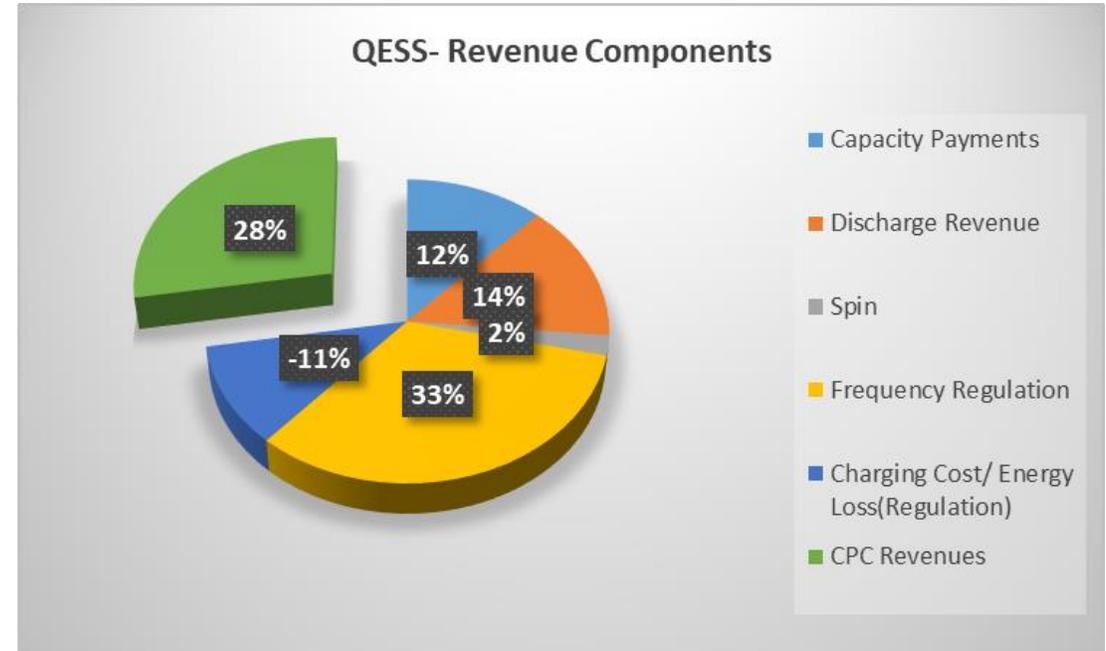
\* Sample dispatch day for a prototypical 1MW/4MWh ESS operating in Massachusetts

# Potential Contribution to Revenues

Dispatch Strategy I



Dispatch Strategy II



Prices of Clean Peak Energy Certificates (CPES) can have a significant impact to potential realizable revenues for a Qualified Energy Storage System

\* Sample single year revenue components for a prototypical 1MW/4MWh ESS operating in Massachusetts

# Illustrative Revenue Cases: New Renewables Online Post-1/1/2019 (“Category 1”)

RE Resource Type	Program Eligibility (Contracted or Merchant?)	Assumed Nameplate Capacity (MW <sub>AC</sub> )	Illustrative Value from CPEC @ 50% of ACP (assumed COD of 1/1/2021)	Scale of Near-Term Contribution to CPEC Market (qualitative)	Importance of CPS to Project Viability? (qualitative)
Land Based Wind (LBW)	Merchant, no reductive “multiplier” assumed	2 MW	Total Levelized CPEC Rev: <b>\$8.27/MWh</b>	Limited (most in-state development has moved toward DG solar)	Material source of value, but unlikely to influence operation
Offshore Wind (OSW)	Contracted, will receive 0.01x contracted “multiplier”	800 MW	Total Levelized CPEC Revenue: <b>\$0.10/MWh</b>	Substantial, but contribution to supply volume mitigated significantly by 0.01x contracted multiplier	De minimis (EDCs may not even attempt qualification)
DG Solar Not Paired w/QESS	SMART program tariff compensation, will receive 0.01x contracted “multiplier”	3 MW	Total Levelized CPEC Revenue: <b>\$0.04/MWh</b>	See above cell	See above cell

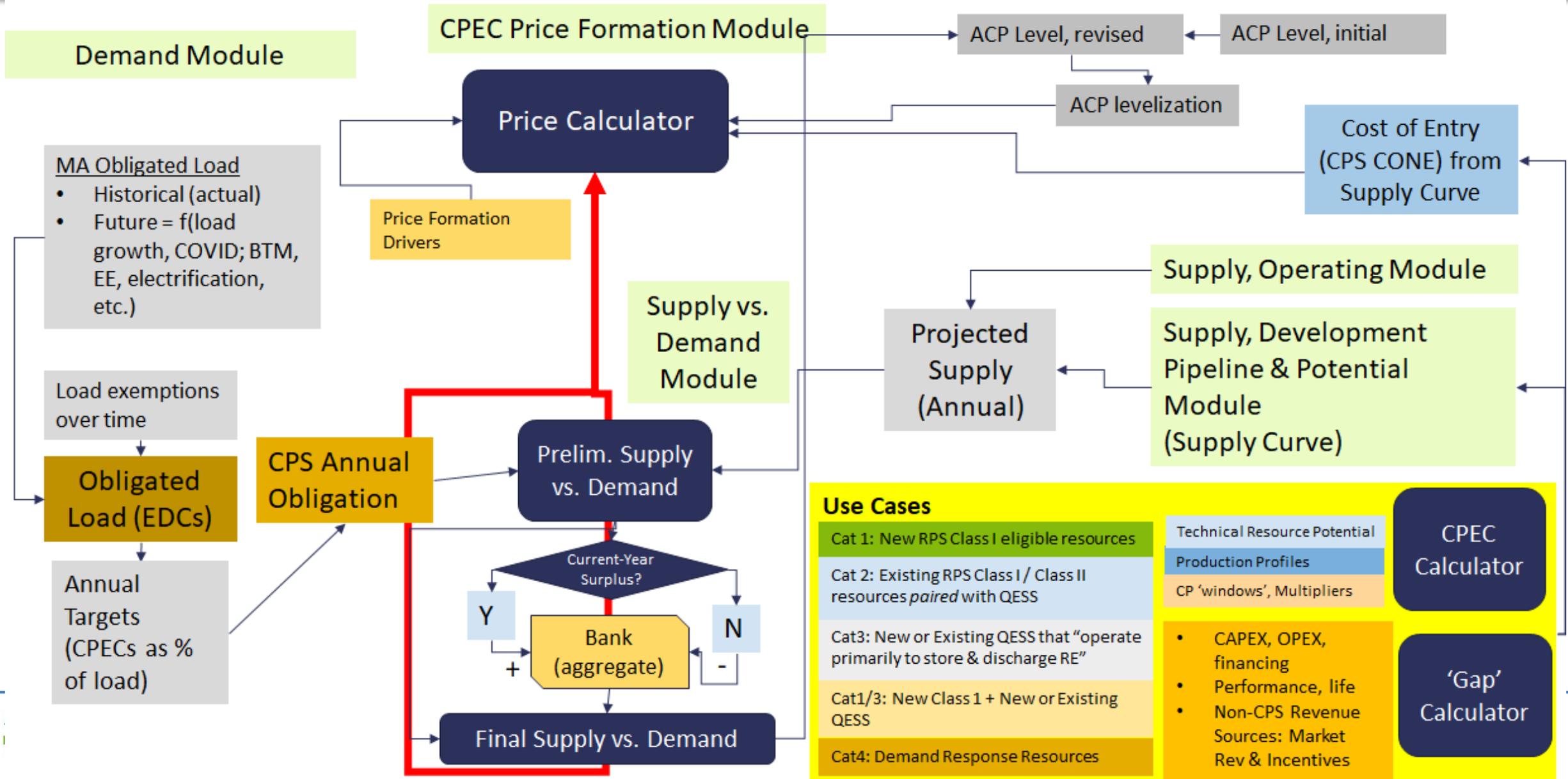
# Illustrative Revenue Cases: Existing RE As of 1/1/2019 Required to Physically Pair w/ESS (“Category 2”)

RE Resource Type	Program Eligibility (Contracted or Merchant?)	Assumed Nameplate Capacity (MW <sub>AC</sub> )	Illustrative Value from CPEC @ 50% of ACP (start date of 1/1/2021)	Scale of Contribution to CPEC Market (Qualitative)	Importance of CPS to project viability? (Qualitative)
DG Solar Paired w/QESS	Solar Carve-Out (SREC I) and Solar Carve-Out II (SREC II), will receive Existing (0.1x) “multiplier”	<ul style="list-style-type: none"> <li>3 MW Solar</li> <li>1.5 MW 4-hour duration storage</li> </ul>	Total Levelized CPEC Rev \$/MWh produced: \$17.03/MWh	Material (especially for demand charge management use cases), but not likely a major driver across the board	Relatively modest additional compensation relative to typical SREC compensation, but could have material influence on operations
LBW Paired w/QESS	Merchant, will receive Existing (0.1x) “multiplier”	<ul style="list-style-type: none"> <li>2 MW LBW</li> <li>0.5 MW 4-hour duration storage</li> </ul>	Total Levelized CPEC Rev \$/MWh produced: \$19.00	Unlikely to be as large as DG solar or OSW (is scaled to existing LBW fleet, which is more limited regionally than DG solar)	Could be highly valuable as additional revenue stream, and have significant influence over operations

# Illustrative Revenue Cases: New Renewables Physically (or “Virtually”) Paired with Energy Storage (“Category 1/3”)

RE Resource Type	Program Eligibility (Contracted or Merchant?)	Assumed Nameplate Capacity (MW <sub>AC</sub> )	Illustrative Value from CPEC @ 50% of ACP (start date of 1/1/2021)	Scale of contribution to CPEC market (qualitative)	Importance of CPS to project viability? (qualitative)
DG Solar Physically (or “Virtually”) Paired w/QESS	<ul style="list-style-type: none"> <li>• SMART solar capacity receives 0.01x contracted “multiplier”</li> <li>• Paired ESS receives 0.3x SMART ES “multiplier”</li> </ul>	<ul style="list-style-type: none"> <li>• 3 MW solar</li> <li>• 1.5 MW storage w/4-hour duration</li> </ul>	Total Levelized CPEC Revenue: <b>\$4.68/MWh</b>	Likely to be major contributor in near term (given substantial paired solar and ESS projects in IC queues)	Likely to influence operations to a moderate degree, but not central to value proposition
OSW “Virtually Paired” w/QESS	<ul style="list-style-type: none"> <li>• OSW receives contracted multiplier (0.01x)</li> <li>• “Virtually paired” Storage does not receive reductive “multiplier”</li> </ul>	<ul style="list-style-type: none"> <li>• 800 MW OSW,</li> <li>• 200 MW w/4-hour duration</li> </ul>	Total Levelized CPEC Revenue: <b>\$17.32/MWh</b> (but revenue assumed shared with storage resource due to “virtual pairing” arrangement)	Potentially major additional contributor (esp. as MA increases OSW procurements beyond 1,600 MW)	Could provide significant cost advantage if considered a part of combined resource/ESS bid in OSW procurements; operational impacts would depend on compensation under procurement

# MA CPS Market Model Structure – Simplified Overview



# Best Practices for Other States Considering a Clean Peak Standard

# Best Practices for Other States Considering a CPS

- Best to first identify program goals, and then balance supplier value and cost to load, and benefits
- Best to be clear on resource eligibility
- Important to identify revenue gap for suppliers to better estimate project development and participation
- Having levers to adjust program parameters will be helpful
- Good to be clear on who owns program attributes
- Good to be clear on ability to participate in multiple programs, from all programs' administrators

# Thank you!



**Customized  
Energy Solutions**

Analyze · Simplify · Implement



**Sustainable  
Energy  
Advantage, LLC**

**Mike Berlinski**

Director  
Emerging Technologies  
CES  
mberlinski@ces-ltd.com

**Nehal Divekar**

Manager  
Future Grid  
CES  
ndivekar@ces-ltd.com

**Jim Kennerly**

Senior Consultant  
  
SEA  
jkennerly@seadvantage.com

## Coming soon:

*Customized Energy Solutions & Sustainable Energy Advantage, Continuing Their Collaboration on MA Clean Peak Standard Analysis to Support the New CPS Market, Are Offering a **Two-Part MA Clean Peak Standard Webinar Series:***

Webinar 1: CPS Market Introduction & Early Insights  
*October 1, 2020, 12:30 pm ET*

Webinar 2: Preliminary CPS Market Analysis  
*November (date TBD)*

Email [info@seadvantage.com](mailto:info@seadvantage.com) for more information

*Save the Date!*



**Clean Peak Standard  
Market Fundamentals  
Analysis Service**  
Coming in December 2020

# This webinar was presented by the DOE-OE Energy Storage Technology Advancement Partnership (ESTAP)

**Dr. Imre Gyuk**

US DOE-OE

[imre.gyuk@hq.doe.gov](mailto:imre.gyuk@hq.doe.gov)

**Dan Borneo**

Sandia National Laboratory

[drborne@sandia.gov](mailto:drborne@sandia.gov)

**Todd Olinsky-Paul**

Clean Energy States Alliance

[todd@cleanegroup.org](mailto:todd@cleanegroup.org)

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# Upcoming Webinars

## **The Role of Hydropower in State Clean Energy Policy**

*September 8, 2-3 pm ET*

## **Power After Carbon: Findings and Insights for State Policymakers**

*September 9, 3-4 pm ET*

## **Innovative Pathways to Developing Solar+Storage in Low-Income Communities: Norfolk Solar's Qualified Opportunity Zone Fund**

*September 10, 1-2 pm ET*

## **Developing non-Lithium Ion Energy Storage Technologies to Support California's Clean Energy Goals**

*September 24, 2020, 2-3 pm ET*

## **An Introduction to Virtual Power Plants**

*September 28, 1-2pm ET*

Learn more and register at: [www.cesa.org/webinars](http://www.cesa.org/webinars)

