

COMMONWEALTH OF MASSACHUSETTS

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The Clean Peak Energy Standard

Draft Regulation Summary
August 7, 2019 & August 9, 2019

Overview

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3. Clean Peak Seasons
4. Seasonal Peak Periods
5. Clean Peak Certificates
6. Program Metrics
7. Program Design
8. Anticipated Implementation Schedule

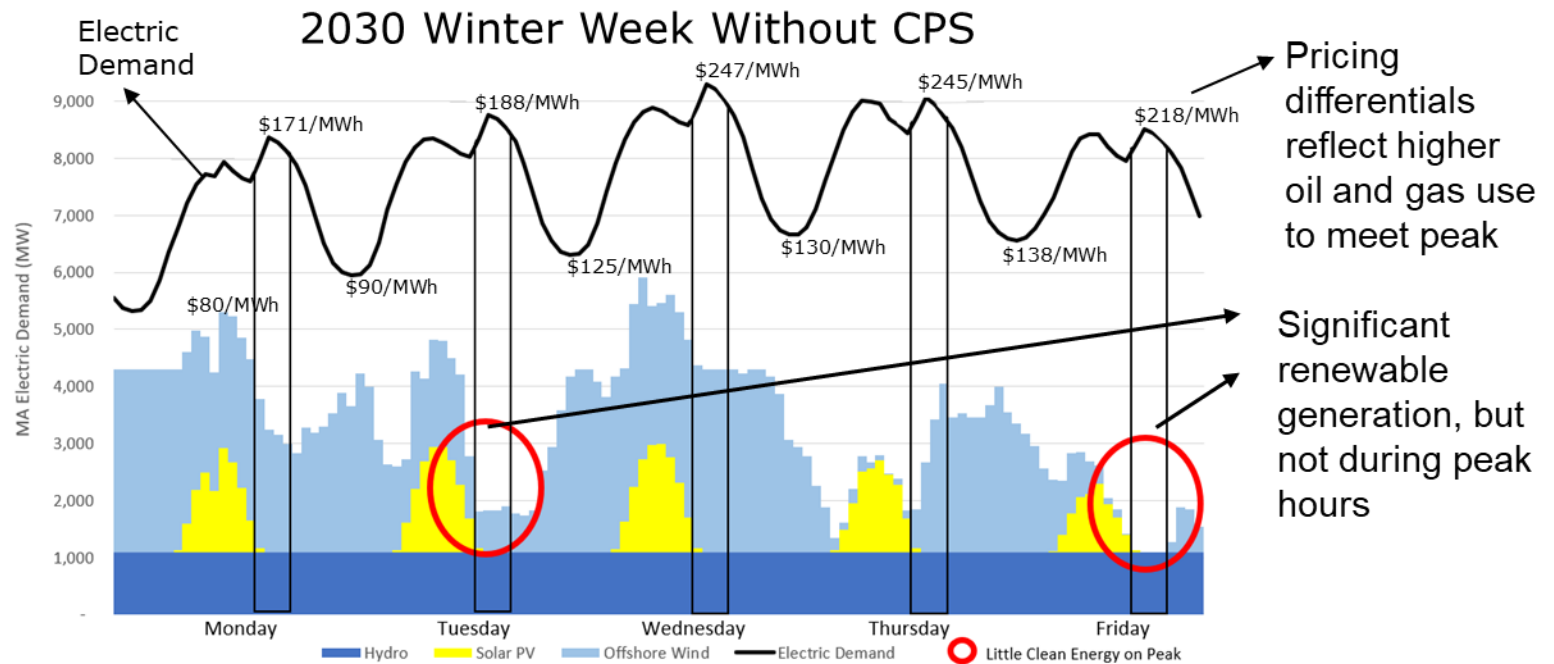
Background: Clean Peak Standard

- Originally proposed in the Governor's 2018 Environmental Bond Bill, the Clean Peak Energy Standard (CPS) was part of An Act to Advance Clean Energy and signed into law in August 2018
- The CPS is a market mechanism designed to shift clean energy to peak and reduce demand at peak, thereby decreasing emissions and costs
- Clean Peak Resources are defined in statute to include:
 - New renewables,
 - Existing renewables that pair with new energy storage,
 - New energy storage that charges primarily from renewables, and
 - Demand response resources
- Any eligible resource that generate, dispatch or discharge energy during a Seasonal Peak Period will generate Clean Peak Energy Certificates (CPECs)
- CPECs can be sold to retail electricity suppliers, which are required to purchase a certain amount each year to meet the minimum standard obligation

MA will be first in the nation to approve and implement a CPS

Background: Status Quo Challenge to Resolve

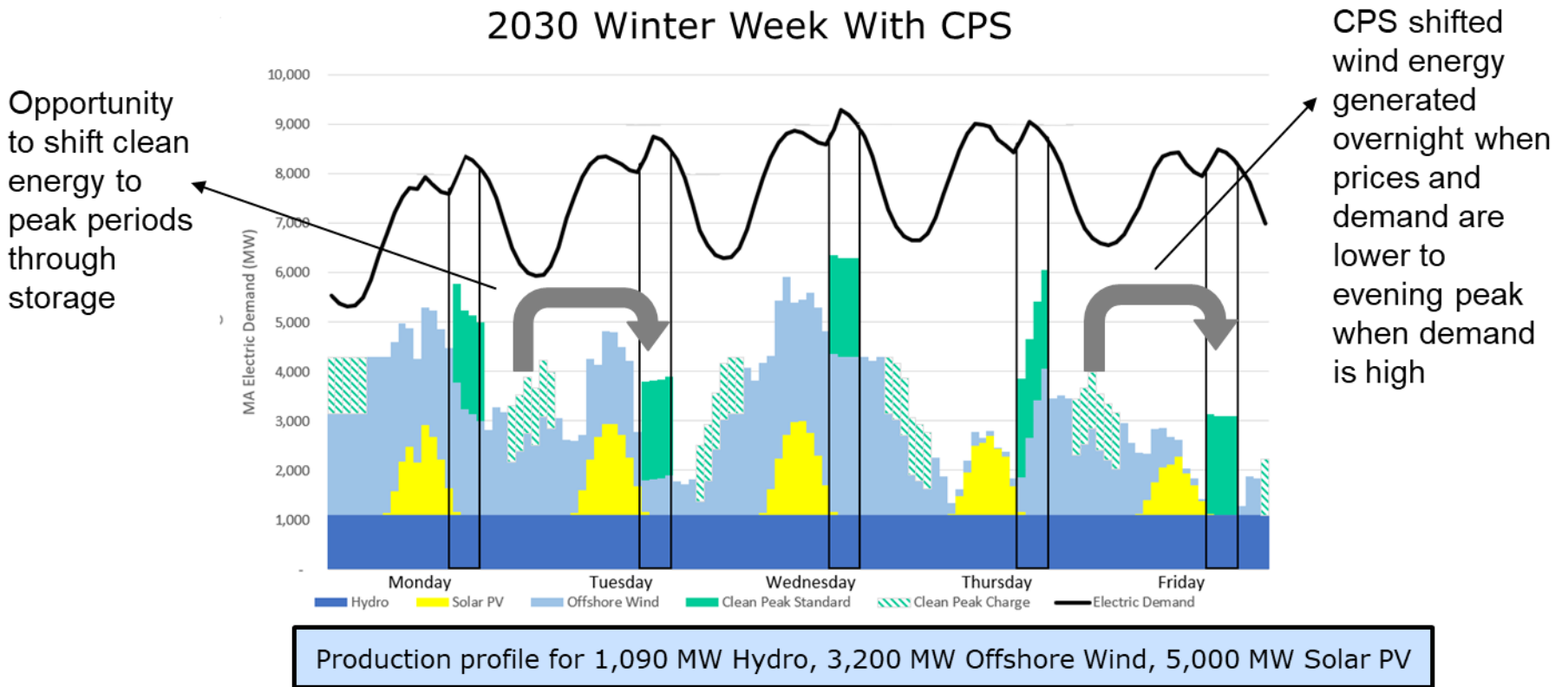
- By 2030, Massachusetts will have a substantial amount of clean energy, however that generation will not necessarily coincide with our peak demands. The highest cost and emissions hours are not being addressed.
- As a result, without a policy to address peak periods, Massachusetts will remain dependent on gas and oil generation to meet our peak demand, resulting in high costs and emissions, despite our substantial investment in clean energy resources



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

Background: Clean Peak As A Solution

- The CPS will send a market signal to clean energy generation to invest in storage technologies to deliver energy to load users to reduce demand during peak periods, thereby reducing the emissions and costs associated with these periods



Background: Program Development

- DOER is responsible for:
 - Establishing the eligibility criteria to qualify;
 - Establishing the four Seasonal Peak Periods in which resources must operate;
 - Setting an Alternative Compliance Payment rate and procurement processes to establish Clean Peak Certificate values;
 - Establishing annual compliance requirements;
- Program development included extensive stakeholder outreach:
 - DOER released stakeholder questions, hosted stakeholder meetings, and presented a straw proposal of the CPS
 - DOER received broad support on the structure and design
 - Stakeholders included; Utilities, competitive suppliers, trade organizations, developers, ISO-NE, environmental groups, and market traders
- DOER and consultant team modeled program to refine size and costs:
 - Modeled program participant economics, level of development in response to program, program costs and benefits

Background: Program Structure

- The CPS program structure is consistent with DOER's other portfolio standards
 - Qualified **Clean Peak Resources** are eligible to generate **Clean Peak Energy Certificates (CPECs)** during **Seasonal Peak Periods**
 - Multipliers align CPEC generation with policy objectives
 - The **minimum standard obligation** is applied to all retail electricity suppliers and is set as a percentage of total retail sales
 - Annual obligation on suppliers must increase by at least 0.25% per year, by statute
 - Retail load served under contracts executed prior to 1/1/19 is exempt from obligation
 - **Alternative Compliance Payment** rate creates a cost cap and helps establish market value for CPECs

Eligible Resources: Project Eligibility Criteria

- 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
- Resource performance must be directly measurable and verifiable

Municipal Lighting Plants Are Exempt

- Per the Statute*, municipal lighting plants are exempt from the Clean Peak Energy Standard
- This means:
 1. MLPs do not have a compliance obligation
 2. Resources in MLP territories are ineligible to participate

* M.G.L. c. 25A, § 17 describes the Clean Peak Energy Standard “minimum percentage of kilowatt-hours sales to end-use customers in the commonwealth”, the minimum annual increase of percent of sales (0.25%), the co-generation of CPECs and RECs, DOER’s promulgation requirements for the regulation, and in d), states that “this section shall not apply to municipal lighting plants.”

Eligible Resources: New RPS Class I

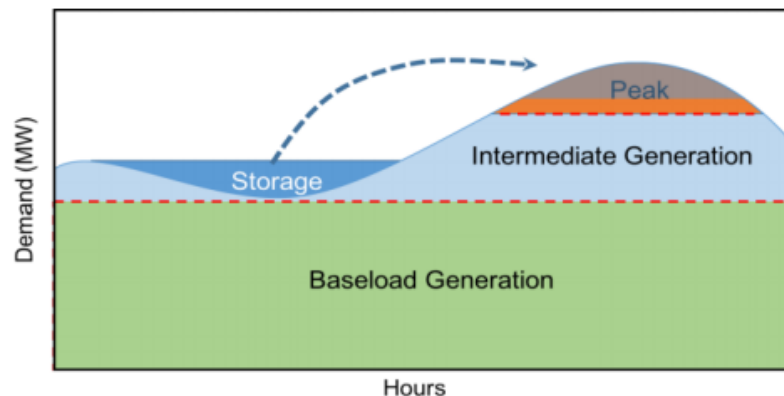
- New RPS Class I in operation after 1/1/2019 are eligible to qualify and participate
- Upon qualifying a new RPS Class I, all electricity delivered by the resource during Seasonal Peak Periods will be eligible to generate CPECs
- New RPS Class I resources which receive a contract as a result of state policy will be subject to the Existing or Contracted Resource Multiplier discussed in the CPEC section below
 - Note, any paired storage will not be subject to the Existing or Contracted Resource Multiplier

Eligible Resources: Existing Class I/II Renewables Paired with Storage

- RPS Class I/II resources in operation prior to 1/1/2019 are eligible to qualify and participate **if** they pair new Qualified Energy Storage Systems with their resource
 - The Qualified Energy Storage System paired with the resource must be at least:
 - 25% of the nameplate power of the facility; and
 - Have a minimum 4-hour duration of storage
- RPS Class I/II resources in operation prior to 1/1/2019 will be subject to the Existing or Contracted Resource Multiplier discussed in the CPEC section below
 - Note, the paired storage will not be subject to the Existing or Contracted Resource Multiplier

Eligible Resources: Qualified Energy Storage Systems

- "Energy storage system", as defined in section 1 of chapter 164 of Massachusetts General Law
- Commenced commercial operation or provided incremental new capacity at an existing storage system after 1/1/2019
- Operates primarily to store and discharge "renewable energy", as defined in section 1 of chapter 164 of Massachusetts General Law



Energy storage will play a critical role within the CPS.

Eligible Resources: Qualified Energy Storage Systems

- Options for a resource to demonstrate it serves to primarily store and discharge renewable energy will include:
 - Co-Location with an RPS Class I/II resource
 - Operational or contractual pairing with a non-co-located RPS Class I/II resource
 - Charging coincident with designated Qualified Energy Storage System charging periods given the following:

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

Hours when renewables are at their highest percent of the generation mix. If storage is charging during these hours and discharging during peak, they are shifting renewable energy

- Operational schedule in the Qualified Energy Storage System Interconnection Service Agreement demonstrating resolution of intermittency-based power issues

Eligible Resources: Demand Response Resource

- Demand Response Resource
 - Must be able to measure and verify the reduction in demand for CPEC generation
 - May be an aggregate of multiple technologies and multiple locations
 - May include energy storage, electric vehicle charging infrastructure, and all other responsive electric loads for which the response can be measured and verified
- Per statute, must be reduction in demand/ consumption; generation is not eligible

Clean Peak Seasons

- The statute requires that daily time windows be established for each of the four annual seasons for when net demand of electricity is the highest
- Stakeholders suggested matching seasons with weather and peak demands instead of strictly following the meteorological seasons
- The DOER has established the CPS seasons as:
 - Spring: March 1 – May 14
 - Summer: May 15 – September 14
 - Fall: September 15 – November 30
 - Winter: December 1 – February 28

Establishing Seasonal Peak Periods

- DOER will establish the Seasonal Peak Periods in advance of the year in which they will be applied and publish them at same time as establishing the annual minimum standard percentage requirement
- Seasonal Peak Periods are required, by statute, to be at least 1 hour and no more than 4 hours each weekday, excluding holidays and are set for each of the Clean Peak Seasons
- DOER will review and potentially revise the Seasonal Peak Periods at least once every five years

Analysis Used to Establish Seasonal Peak Periods

- Analyzed the time of each daily peak demand in ISO-NE for the past 7 years
 - Winter; very predictable and very consistent time of daily peak electricity demand
 - Summer; fairly predictable with a broad time window of when peak occurs
 - Spring; least predictable and lowest peaks
 - Fall; low peaks
- Established Seasonal Peak Periods that:
 - Capture majority of historic peaks
 - Focus on capturing higher demand peaks over lower demand daily peaks
 - Give recent data more weight than older years as load profiles have shifted

Valuing the Seasons

- **Summer**

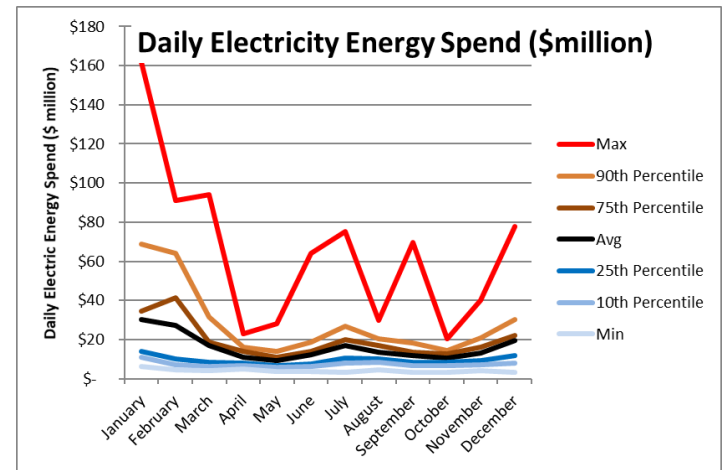
- Highest daily peaks
 - Drives capacity, transmission and distribution costs
- Second highest energy spend
- Second highest emissions generation per MWh

- **Winter**

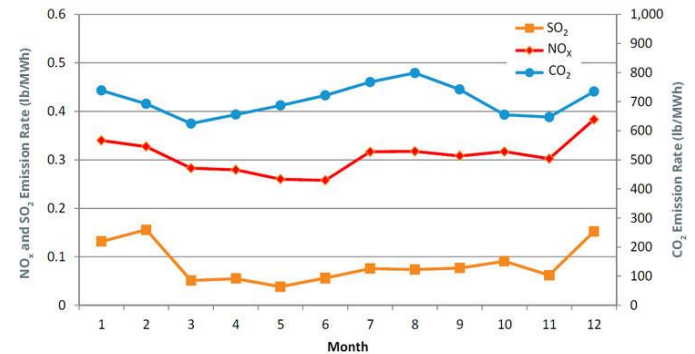
- Highest energy spend
- Highest emissions generated per MWh

- **Spring and Fall**

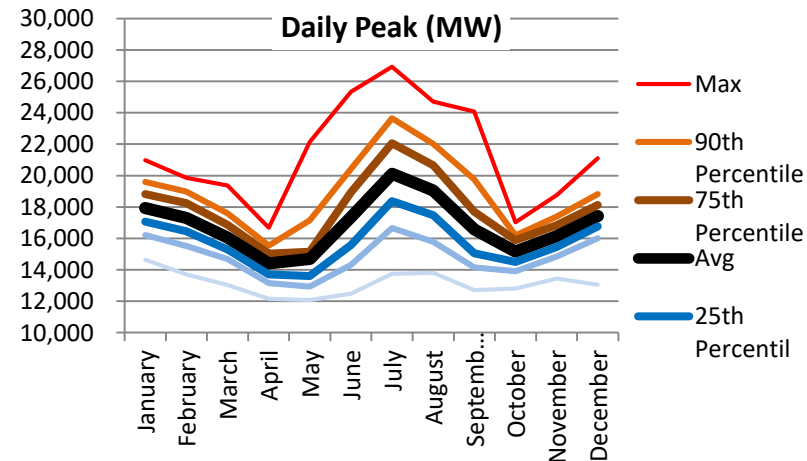
- Lower demand & emissions



2016 New England System Monthly Average NO_x, SO₂, and CO₂ Emission Rates (lb/MWh)



Source: ISO New England, 2016 New England Electric Generator Air Emissions Report (January 2018)

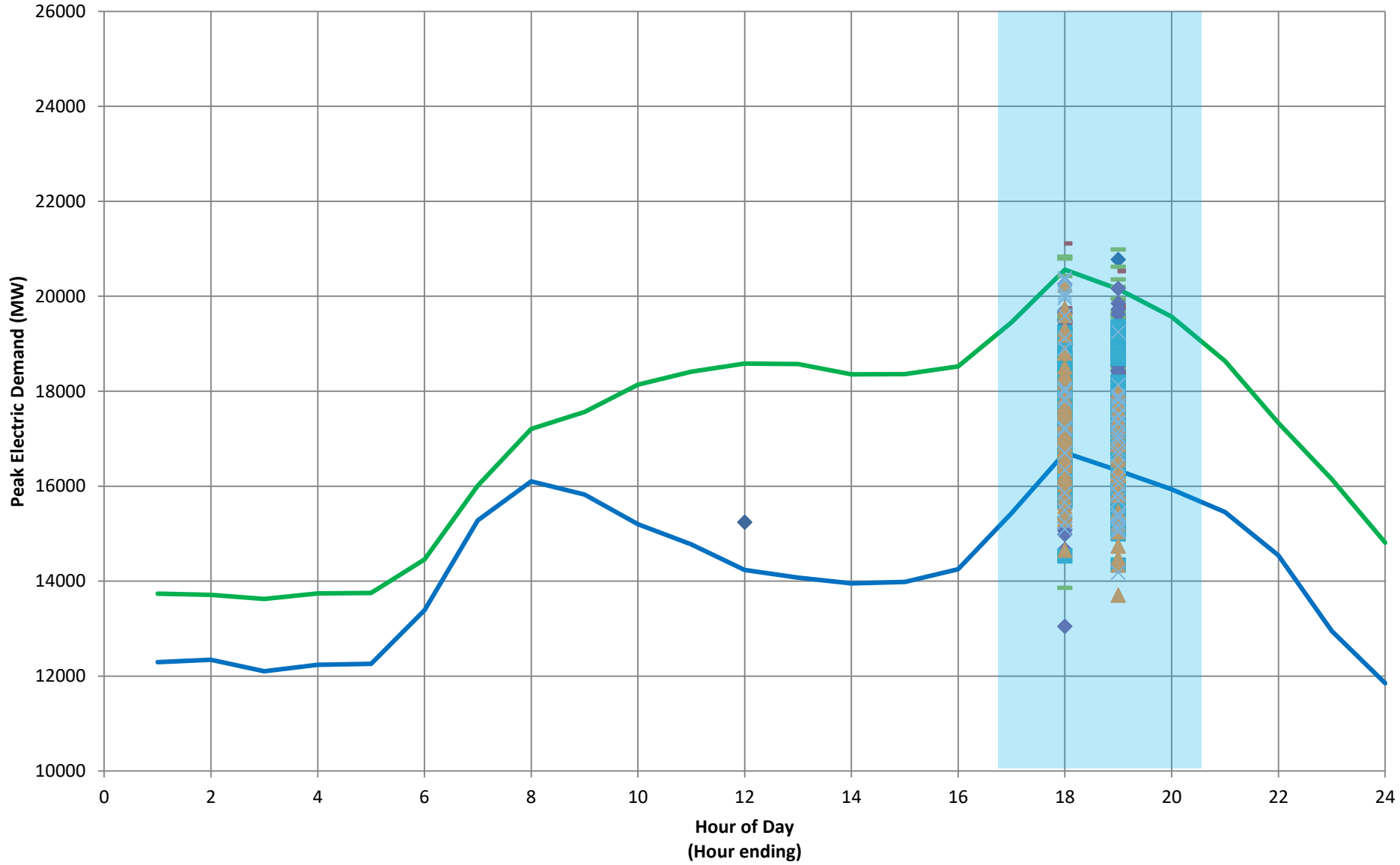


Seasonal Peak Periods

- The DOER establishes the following initial Seasonal Peak Periods, with each totaling 4 hours:
 - Winter: 4pm – 8pm
 - Spring: 5pm – 9pm
 - Summer: 3pm – 7pm
 - Fall: 4pm – 8pm

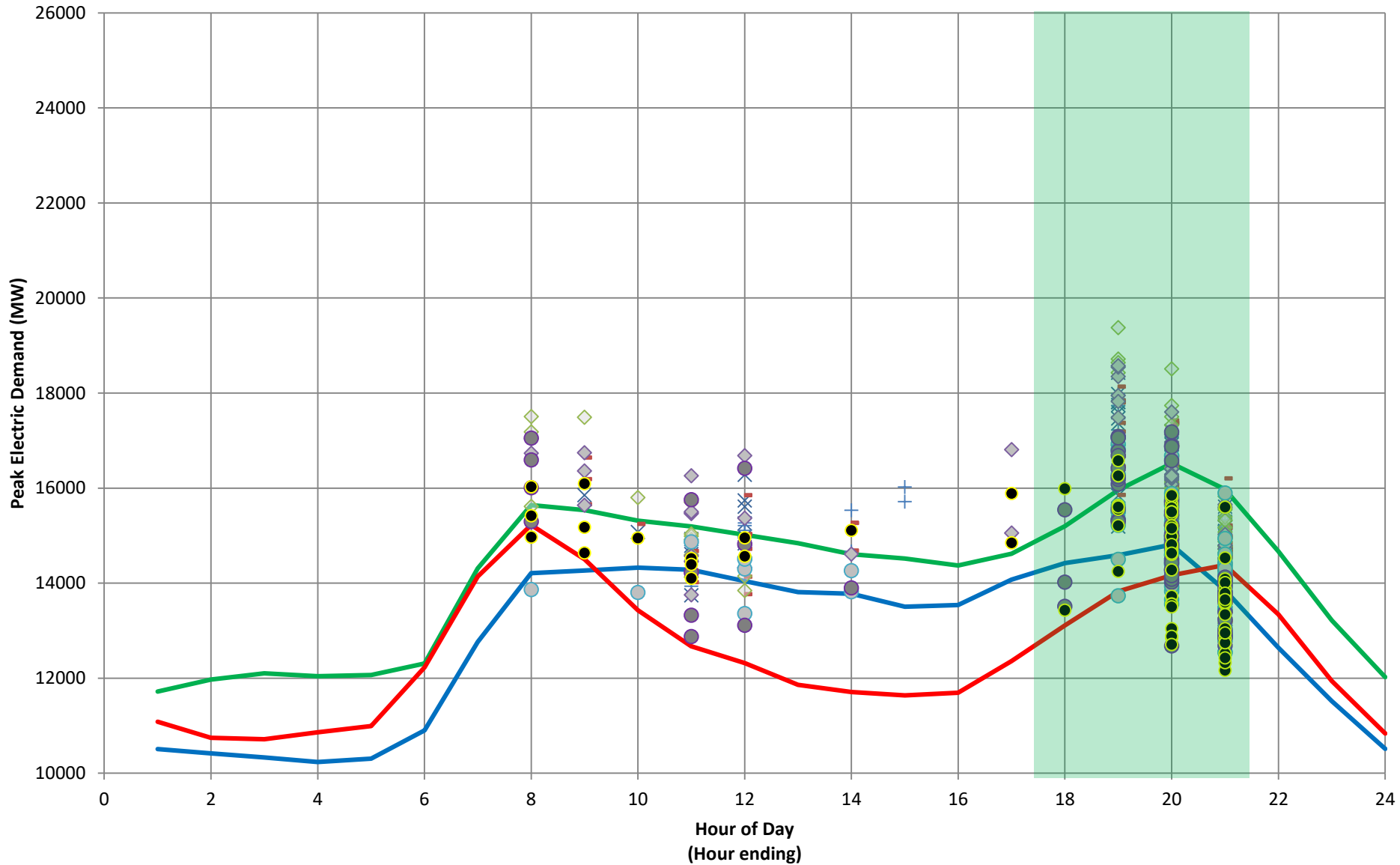
	HE1	HE2	HE3	HE4	HE5	HE6	HE7	HE8	HE9	HE10	HE11	HE12	HE13	HE14	HE15	HE16	HE17	HE18	HE19	HE20	HE21	HE22	HE23	HE24
January																								
February																								
March																								
April																								
Until May 14																								
May 15 on																								
June																								
July																								
August																								
Until Sept 14																								
Sept 15 on																								
October																								
November																								
December																								

Winter (Dec 1 to Feb 28) Daily Peak Demand



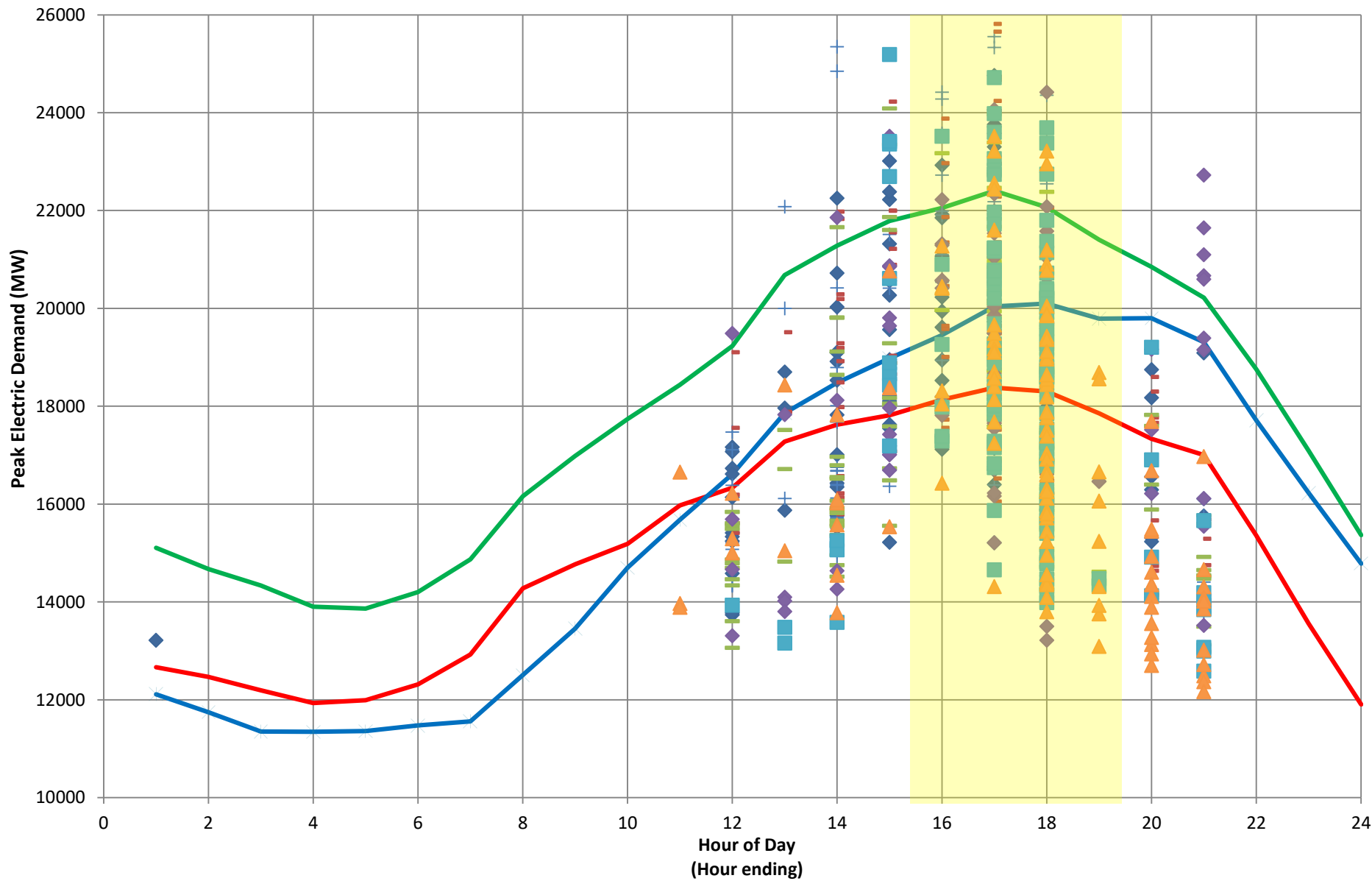
◆ 2011
 + 2012
 - 2013
 - 2014
 ◆ 2015
 ■ 2016
 ▲ 2017
 × 2018
 — System Load 1/21/19, Snowy Day
 — System Load 1/15/19, Typical Day

Spring (Mar 1 to May 14) Daily Peak Demand



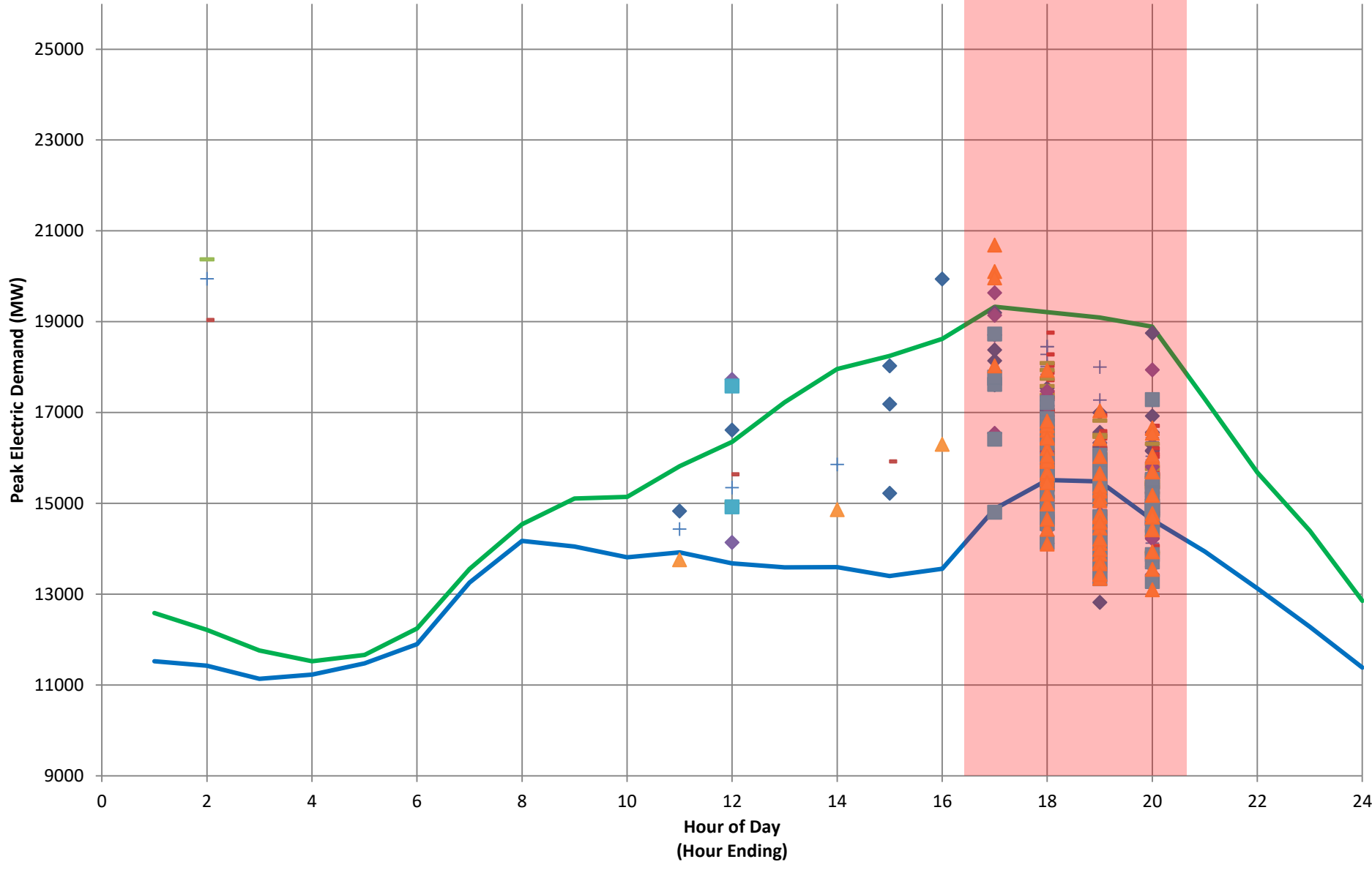
× 2011
 + 2012
 - 2013
 ◇ 2014
 ◇ 2015
 ● 2016
 ● 2017
 ● 2018
 — System Load 3/15/17
 — System Load 4/3/18
 — System Load 3/27/19

Summer (May 15 to Sept 14) Daily Peak Demand



◆ 2011
 + 2012
 - 2013
 - 2014
 ◆ 2015
 ■ 2016
 ▲ 2017
 — System Load 6/19/18
 — System Load 9/3/18
 — System Load Data 7/5/18

Fall (Sept 15 to Nov 30) Daily Peak Demand



◆ 2011 + 2012 - 2013 - 2014 ◆ 2015 ■ 2016 ▲ 2017 — System Load 11/27/18, Typical Day — System Load 9/27/17

Clean Peak Certificates: CPEC Generation

- 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

CPEC Multipliers

- DOER is proposing the use of “multipliers” to align generation of CPECs with time periods and resource attributes of highest impact
 - Multipliers adjust the number of CPECs a resource receives for each MWh of energy generated during the peak
- **Seasonal Multiplier**
 - Summer/Winter **3x**, Spring/Fall **1x**
- **Actual Monthly System Peak Multiplier**
 - **15x** for performance coincident with highest single hour of demand in the month
- **Resilience Multiplier**
 - **1.5x** provided to resources which increase energy resilience to outages
- **Existing and State Contracted Resource Multiplier**
 - **0.1x** applied to existing and state contracted renewable resources
- Future Consideration: Distribution Circuit Multiplier

CPEC Multipliers: Core Design – Seasonal Multiplier

- Adjusts the number of CPECs generated by season, where Summer/Winter receive the highest multiplier and Spring/Fall receive a lower multiplier
- Summer electricity demand is the highest peak of the year and drives infrastructure costs for Generation, Transmission, and Distribution
 - As such, Summer Peaks have the highest multiplier, **3x**
- Winter electricity demand incurs the highest energy costs and the highest emissions rate plants
 - As such, Winter Peaks have the highest multiplier, **3x**
- Spring and Fall peaks cause ramping requirements, but otherwise are relatively inconsequential
 - Spring and Fall Peaks have the lowest multiplier, **1x**

CPEC Multipliers: Core Design – Actual Monthly System Peak Multiplier

- Increases the number of CPECs generated during the Actual Monthly System Peak, a time which incurs substantial cost and typically higher emissions
- The Hour of Actual Monthly System Peak is what infrastructure needs to be sized to so targeting it targets the system cost drivers
- The Actual Monthly System Peak Multiplier is retrospective multiplier for performance coincident with the preceding month's Hour of Actual Monthly System Peak
- Retroactive application of the multiplier will incent project owners to 'chase the peak' and will increase likelihood that resources operate at times where they can provide the highest value
- The initial Actual Monthly System Peak Multiplier is **15x**

CPEC Multipliers: Core Design – Resilience Multiplier

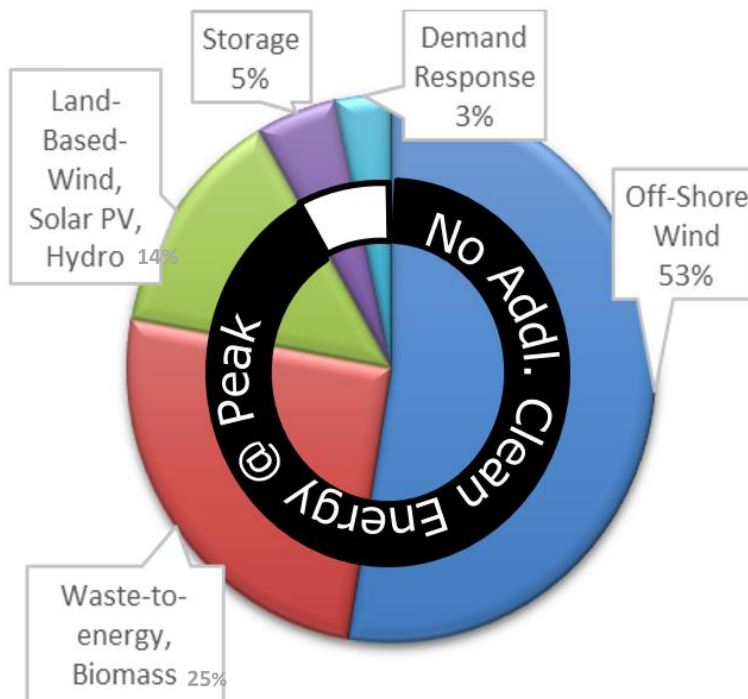
- Increases the number of CPECs generated by a Resilient Resource, which provides a resilience benefit by enabling provision of electric service to a load during external outage conditions
 - A Resilience Resource must have an RPS eligible resource onsite which can continue to generate electricity through an external outage
- DOER seeks to improve the energy resilience of the Commonwealth, and some peak demand reduction technologies can enable resilient provision of electricity
- Resilient resources will receive a Resilience Multiplier on daily CPEC generation
- The initial Resilience Multiplier is **1.5x**

CPEC Multipliers: Core Design – Existing and Contracted Resource Multiplier

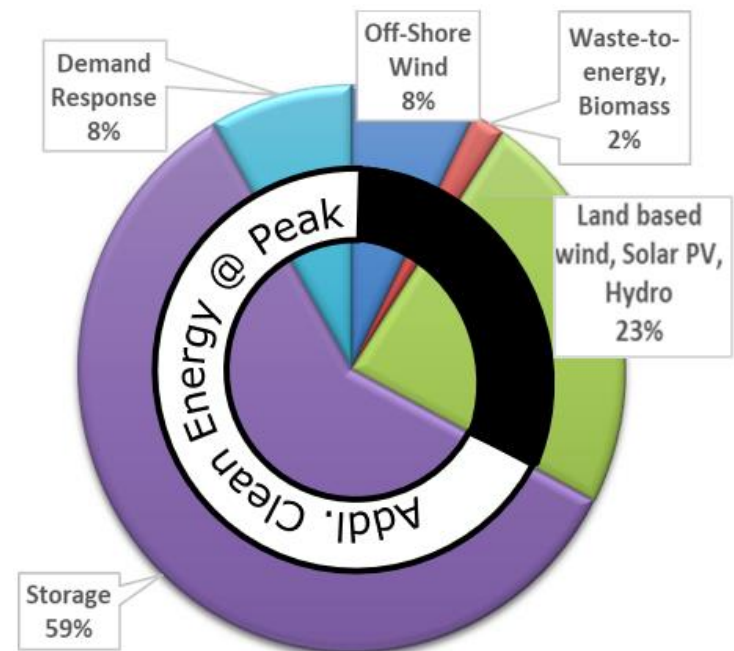
DOER is assigning a multiplier of **0.1x** to existing and state contracted renewable resources in order to:

- Incent these resources to change how they operate, instead of paying more for the same resource performance
- Avoid saturating the market with existing resources and suppressing price signals to invest in storage
- Ensure these resources have a market signal to pair with storage and shift their energy generation

CPS Resource Mix Without this Multiplier



CPS Resource Mix With this Multiplier

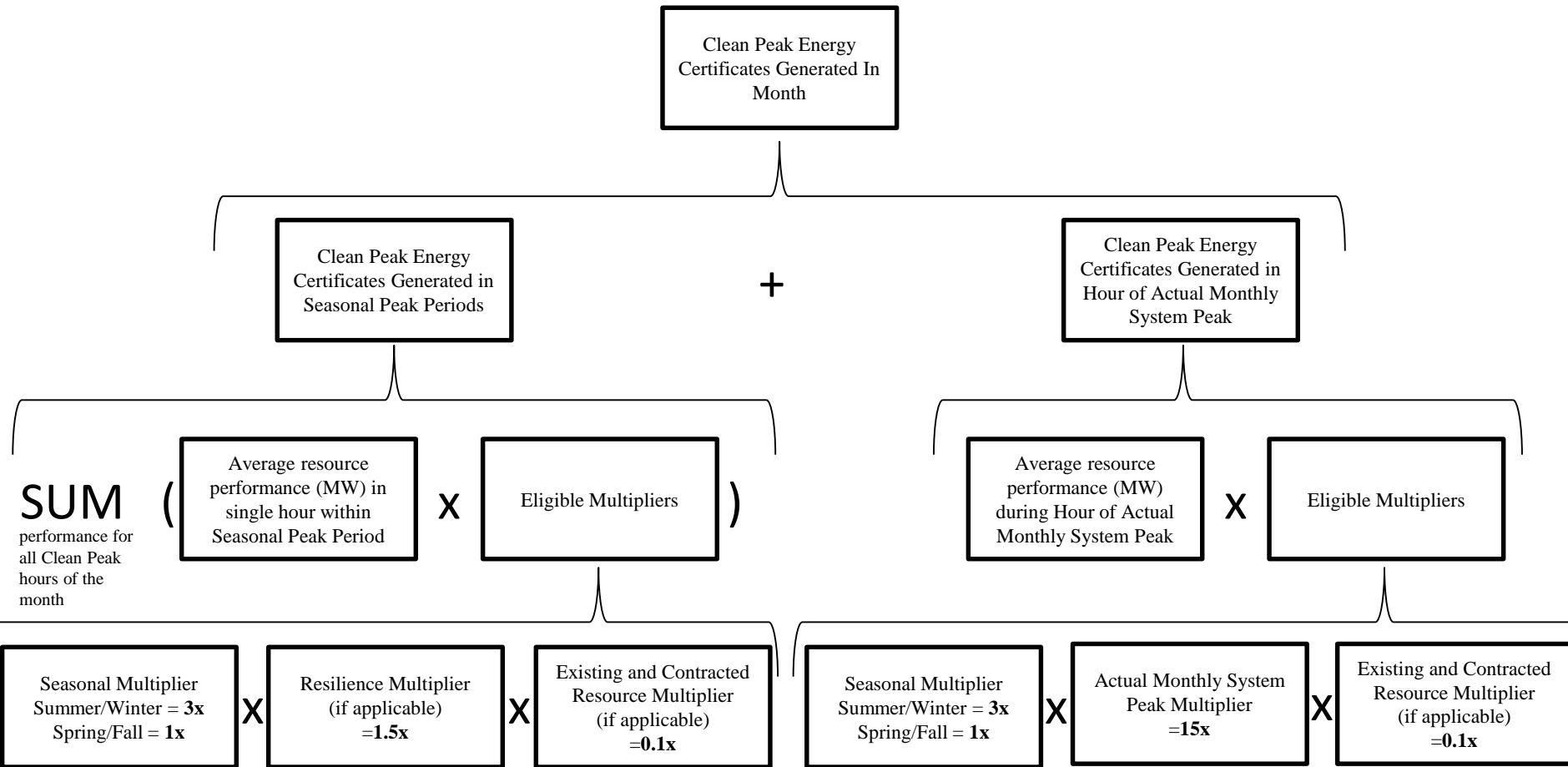


*Note that storage performance will be treated separately, and maintain a multiplier of 1X

CPEC Multipliers: Future Consideration – Distribution Circuit Multiplier

- DOER & Utilities plan to establish a circuit specific multiplier to account for distribution specific locational values
- Each Distribution Circuit has a unique load profile and particular needs which may enable capital investment deferral or mitigation
- DOER does not intend to include any Distribution Circuit multipliers at program outset, but to work with the Distribution Companies to determine whether and where appropriate multipliers may reflect locational values in the future
 - Distribution Company owned CPS resources would not be eligible for the Distribution Circuit Multiplier
- DOER still considering Distribution Circuit Multiplier values

Clean Peak Certificates: CPEC Generation



Note: Resilience Multiplier and Distribution Circuit Multiplier (if enacted) are not included in Actual Monthly System Peak CPEC calculation

Example CPEC Generation

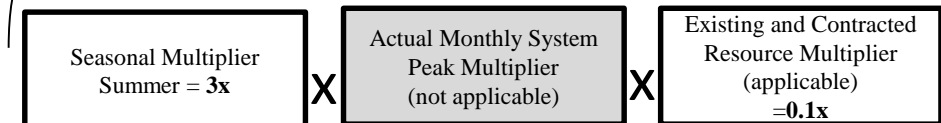
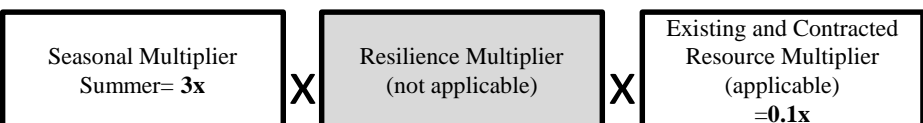
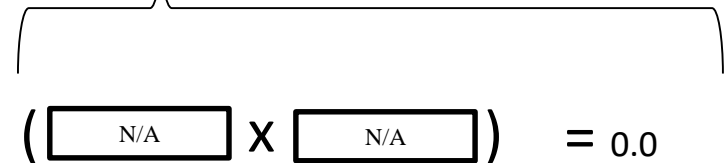
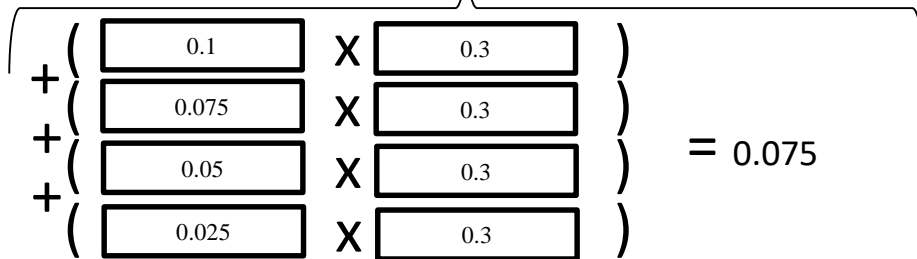
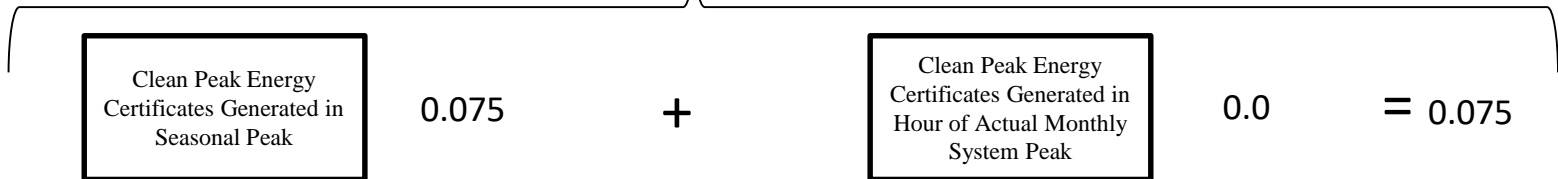
SMART Solar Resource on a Typical August Day

- Seasonal Peak Period for a week-day in August is 3pm – 7pm
 - The day does not include the month's peak
 - The resource has a contract through SMART and is subject to the Existing and Contracted Resource Multiplier.

	3-4pm	4-5pm	5-6pm	6-7pm
Resource Output	100 kW	75 kW	50 kW	25 kW

Clean Peak Energy
Certificates Generated In
Day

= 0.075 CPECs generated



Example CPEC Generation

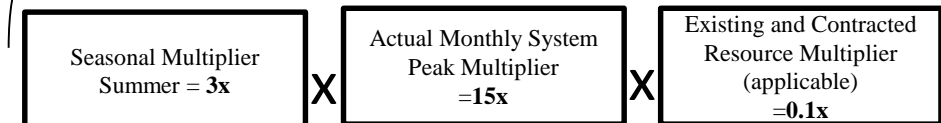
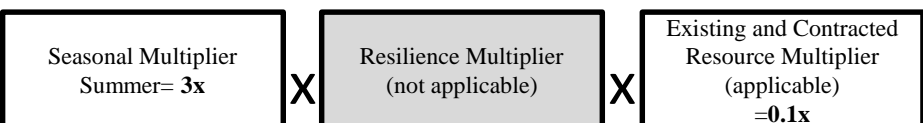
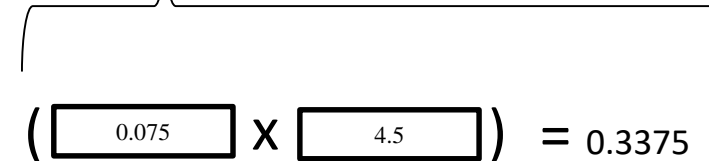
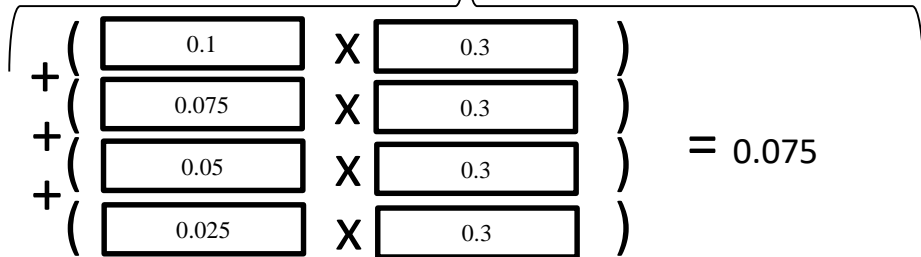
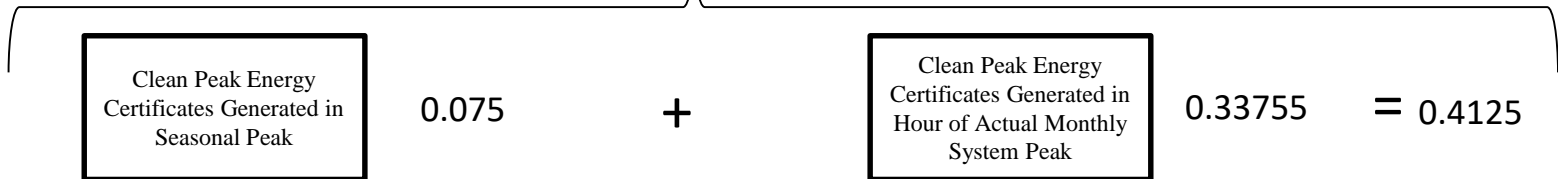
SMART Solar Resource on an August Peak Day

- Seasonal Peak Period for a week-day in August is 3pm – 7pm
 - The day includes the month's peak (Actual Monthly System Peak Multiplier applied) at HE19 (4-5pm window)
 - The resource has a contract through SMART and is subject to the Existing and Contracted Resource Multiplier.

	3-4pm	4-5pm (Actual Peak)	5-6pm	6-7pm
Resource Output	100 kW	75 kW	50 kW	25 kW

Clean Peak Energy
Certificates Generated In
Day

= 0.4125 CPECs generated



Example CPEC Generation

SMART Solar Plus Storage Resource on a Peak Day

- Seasonal Peak Period for a week-day in August is 3pm – 7pm
 - The day includes the month's peak (Actual Monthly System Peak Multiplier applied) at HE19 (4-5pm window)
 - The Solar has a contract through SMART and is subject to the Existing and Contracted Resource Multiplier.
 - The Solar & Storage are configured as Resilient Resource and subject to the Resilience Multiplier

	3-4pm	4-5pm	5-6pm	6-7pm
Resource Output	100 kW + 50 kW (Solar) (ESS)	75 kW + 75 kW (Solar) (ESS)	50 kW + 100 kW (Solar) (ESS)	25 kW + 125 kW (Solar) (ESS)

Clean Peak Energy
Certificates Generated In
Day

0.14625 PV CPECs
4.95 ES CPECs

Clean Peak Energy
Certificates Generated in
Seasonal Peak

0.1125 PV CPECs
1.575 ES CPECs

+

Clean Peak Energy
Certificates Generated in
Hour of Actual Monthly
System Peak

0.03375 PV CPECs
3.375 ES CPECs

$$\begin{aligned}
 &+ \left(\begin{array}{l} 0.1 \\ 0.075 \\ 0.05 \\ 0.025 \end{array} \times \begin{array}{l} 3 \times 1.5 \times 0.1 = 0.45 \\ 3 \times 1.5 \times 0.1 = 0.45 \\ 3 \times 1.5 \times 0.1 = 0.45 \\ 3 \times 1.5 \times 0.1 = 0.45 \end{array} \right) \\
 &= 0.1125 \text{ PV CPECs}
 \end{aligned}$$

$$\begin{aligned}
 &+ \left(\begin{array}{l} 0.05 \\ 0.075 \\ 0.1 \\ 0.125 \end{array} \times \begin{array}{l} 3 \times 1.5 = 4.5 \\ 3 \times 1.5 = 4.5 \\ 3 \times 1.5 = 4.5 \\ 3 \times 1.5 = 4.5 \end{array} \right) \\
 &= 1.575 \text{ ES CPECs}
 \end{aligned}$$

$$\left(0.075 \times 3 \times 15 \times 0.1 = 0.45 \right) = 0.03375 \text{ PV CPECs}$$

$$\left(0.075 \times 3 \times 15 = 45 \right) = 3.375 \text{ ES CPECs}$$

CPEC Procurement

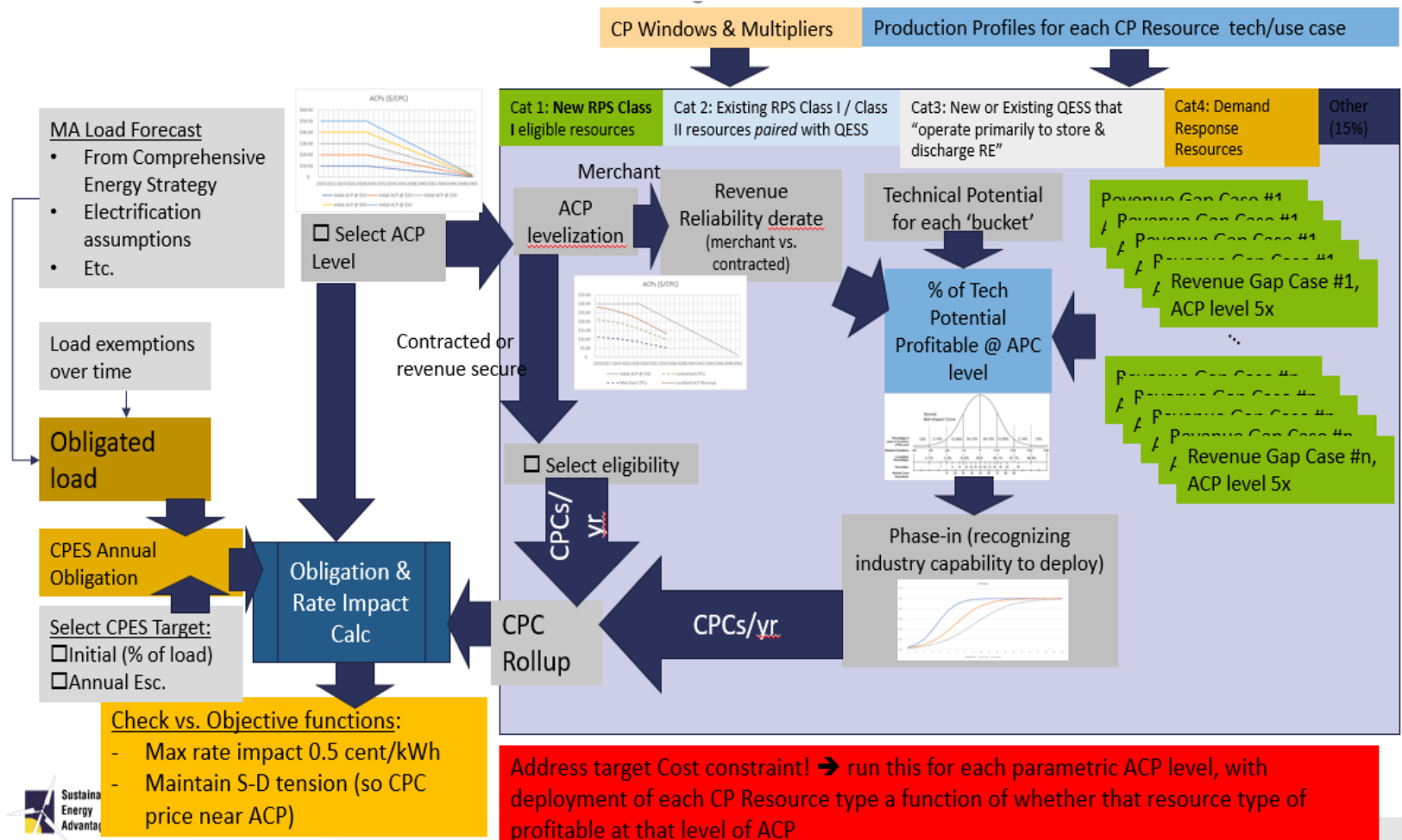
- The statute allows DOER to include a process for the EDCs to competitively procure CPECs through long term contracts
- DOER will collaborate with the EDCs to develop a request for proposals for long term contracts which may include but is not limited to:
 - A percentage of total annual market obligation
 - Proposal requirements
 - Length of contract terms
 - A model contract
- Long term contracts will:
 - Provide revenue certainty for projects
 - Reduce financing costs of CPS resources
 - Increase market participation at a lower cost to ratepayers

Program Metrics: Reporting Requirements

- Each qualified Clean Peak Resource must provide hourly interval data for the entire preceding month
- The hourly interval data must be submitted monthly to the entity designated by DOER as the independent verifier of all metered data
- DOER is working on metering requirements
 - DOER may establish different metering requirements depending on: Project size, Project Technology, etc.
- MassCEC will be the sole metering and data verification provider, utilizing its Production Tracking System (PTS) to support the Clean Peak Standard
 - The PTS will likely provide the CPS application portal as well
- MassCEC report monthly on the preceding month's total CPEC production and Hour of Actual Monthly Peak
- All of this reported data will go to NEPOOL GIS to mint CPECs

Program Design: Analysis

- Created market model for eligible resources based on their pro-formas
- Model adjusts resource deployment according to gap-analysis and CPS pricing
- Calculates maximum program cost to ratepayers
- Compare program benefits to costs



Program Design: Annual Program Requirements

- DOER and consultant team did extensive modeling to set Obligation level and Alternative Compliance Payment (ACP) rate
 - Modeled program participant economics, development in response to program, program costs and benefits
- Set obligation and ACP rate to keep ratepayer cost under \$0.005/kWh, proposing:
 - An **annual obligation increase of 1.5%**, reaching 16.5% by 2030
 - **ACP rate of \$30**, declining after first 10 years to \$0 in 2051

Year	ACP Rate (\$)	Forecasted Load (TWh)	Minimum Standard (%)	Compliance Obligation (TWh)	Forecasted Peak Demand (MW)	Clean Peak Target (MW)	Clean Peak Target (% of Peak)
2020	\$30	45.2	1.5%	0.4	11,591	100	1%
2021	\$30	44.8	3.0%	1.3	11,682	300	3%
2022	\$30	44.6	4.5%	2.0	11,773	450	4%
2023	\$30	44.6	6.0%	2.7	11,864	800	7%
2024	\$30	44.8	7.5%	3.4	11,955	1,050	9%
2025	\$30	45.3	9.0%	4.1	12,045	1,200	10%
2026	\$30	46.2	10.5%	4.8	12,136	1,450	12%
2027	\$30	47.4	12.0%	5.7	12,227	1,700	14%
2028	\$30	48.6	13.5%	6.6	12,318	2,000	16%
2029	\$30	50.0	15.0%	7.5	12,409	2,400	19%
2030	\$28.64	51.9	16.5%	8.6	12,500	2,750	22%

Program Design: Cost Benefit Analysis

- CPS provides cost and emissions savings to ratepayers
- Net ratepayer savings after year 4
- \$710 million and 560K metric tons CO₂ savings in the first ten years

Year	ACP Price (\$)*	Max Ratepayer Cost (\$/kWh)	Max Ratepayer Cost (\$ Million/yr)	Ratepayer Savings (\$ Million/yr)	Net Ratepayer Savings (\$ Million/yr)	Emissions Savings (metric tons CO ₂ /yr)
2020	\$ 30.00	\$0.0005	(\$13)	\$5	(\$8)	1,026
2021	\$ 30.00	\$0.0009	(\$40)	\$8	(\$32)	1,482
2022	\$ 30.00	\$0.0014	(\$58)	\$15	(\$43)	4,696
2023	\$ 30.00	\$0.0018	(\$73)	\$52	(\$20)	16,011
2024	\$ 30.00	\$0.0023	(\$85)	\$98	\$13	29,816
2025	\$ 30.00	\$0.0027	(\$98)	\$151	\$52	46,038
2026	\$ 30.00	\$0.0032	(\$114)	\$201	\$87	61,566
2027	\$ 30.00	\$0.0036	(\$133)	\$249	\$116	76,109
2028	\$ 30.00	\$0.0041	(\$153)	\$308	\$155	94,193
2029	\$ 30.00	\$0.0045	(\$178)	\$355	\$177	108,622
2030*	\$ 28.64	\$0.0047	(\$194)	\$404	\$210	123,572
TOTAL			(\$1,138)	\$1,848	\$710	563,359

*After first 10 years, ACP rate will decline to keep program cost below \$0.005 per kWh

Anticipated Implementation Schedule

- Q3 2019
 - Stakeholder presentation and Q&A
- Q4 2019
 - Draft regulation filed
 - Public hearings on draft regulation; written comments due
 - Technical Bulletin issued to set 2020 obligation
- Q1 2020
 - Amended regulations to Joint Committee on Telecommunications, Utilities, and Energy (TUE) for comment
 - Final regulations filed