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October 24-26, 2023
Northampton, MA

How Various Capacity Auctions Work

Lesson 5A: Forward Capacity Auction (FCA)

Forward Capacity Market (FCM 101)

This presentation is based on the current information available for the rules as they are today. The information in this presentation may change based on upcoming decisions made regarding the future of FCA 19 and will be covered in future training.

Michael Schulze
Auction Analyst, System Operations and Market Administration

Some slides or portions of slides may be intentionally hidden in the printed and posted versions of this presentation.

Lesson 5: How Various Auctions Work

In this lesson, we will cover the various capacity auctions

- In Lesson 3, we covered the supply-side (how to qualify to participate; how to sell)
- In Lesson 4, we covered the demand-side (how demand is represented; how much is bought)
  - **Now, in Lesson 5, we will put these two together – how supply and demand meet**

Lesson 5A: Forward Capacity Auction (FCA)

- Review auction process, including descending clock auction, market clearing engine, and substitution auction, including a discussion as to why the FCA is so different from all other auctions

Lesson 5B: Reconfiguration Auctions and Annual Reconfiguration Transaction (ART)

- Annual reconfiguration auctions (ARAs) and ARTs – review the process, and highlight some of the differences between ARAs and FCA
- Monthly capacity transactions (both bilateral exchanges and monthly reconfiguration auctions) – review the process and highlight some of the differences between monthly transactions and ARAs

Topics

Forward Capacity Auction (FCA) Basics

- Descending Clock Auction (DCA)
- Market Clearing Engine (MCE)
- Substitution Auction (SA)

Forward Capacity Auction Mechanics

Objectives

- Identify auction process, including descending clock auction, market clearing engine, and substitution auction
- Recall why the Forward Capacity Auction (FCA) is different from other auctions

Common Acronyms

In Order of Appearance

FCA	Forward Capacity Auction
ARA	annual reconfiguration auction
ART	Annual Reconfiguration Transaction
DCA	descending clock auction
MCE	market clearing engine
SA	substitution auction
MOPR	Minimum Offer Price Rule

CSO	capacity supply obligation
IMM	internal market monitor
CCP	capacity commitment period
ORTP	offer-review trigger price
RTR	Renewable Technology Resource
SPR	Sponsored Policy Resource

A Note on Changes

On May 27, 2022, the Federal Energy Regulatory Commission issued an order accepting the ISO's buyer side market power review and mitigation reforms proposal. The proposal included a transition mechanism for FCAs 17 and 18, which is a graduated transition away from the existing Minimum Offer Price Rule (MOPR) construct. The Transition Mechanism:

- Restores the Renewable Technology Resource (RTR) exemption from the MOPR; and
- Eliminates test prices from substitution auction demand bids

This presentation focuses on the FCA and substitution auction mechanics in place for FCAs 17 and 18

- Future training materials will reflect FCA mechanics once the MOPR has been eliminated, which will first occur for FCA 19

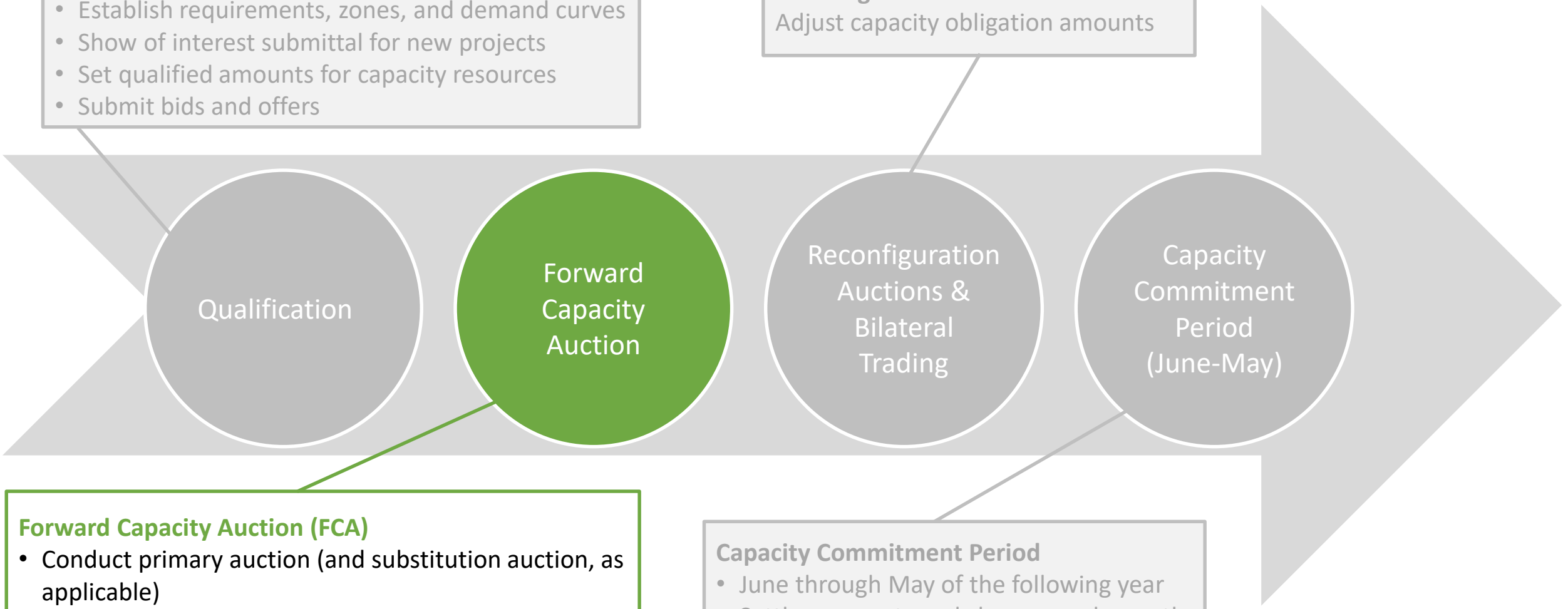
Forward Capacity Auction Basics

- Descending Clock Auction
- Market Clearing Engine
- Substitution Auction

Forward Capacity Market Process – What Are We Talking About in this Section?

Qualification
- Establish requirements, zones, and demand curves
- Show of interest submittal for new projects
- Set qualified amounts for capacity resources
- Submit bids and offers

Reconfiguration Auctions
Adjust capacity obligation amounts



Forward Capacity Auction (FCA)
- Conduct primary auction (and substitution auction, as applicable)
- Clear bids and offers (obligations obtained, or not)

Capacity Commitment Period
- June through May of the following year
- Settle payments and charges each month

Parts of Forward Capacity Auction

F C A

Descending Clock Auction (DCA)
Offer/bid collection device which essentially builds the supply curve

Market Clearing Engine (MCE)
Optimization algorithm that determines final capacity supply obligation (CSO) awards by clearing each resource within imposed limits and constraints

Substitution Auction (SA)
Secondary auction to facilitate transfer of CSOs from existing capacity resources, which commit to permanently exit ISO New England's wholesale markets, to new state-supported resources

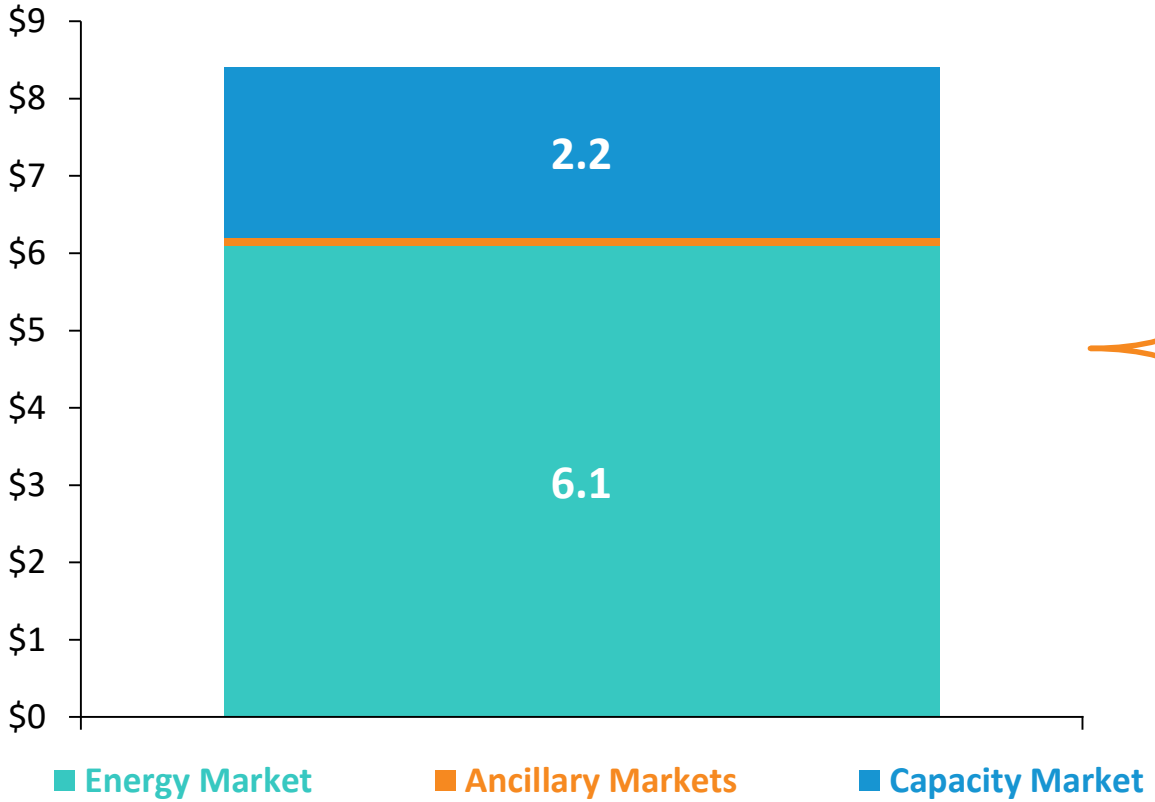
Forward Capacity Auction Basics

- Descending Clock Auction
- Market Clearing Engine
- Substitution Auction

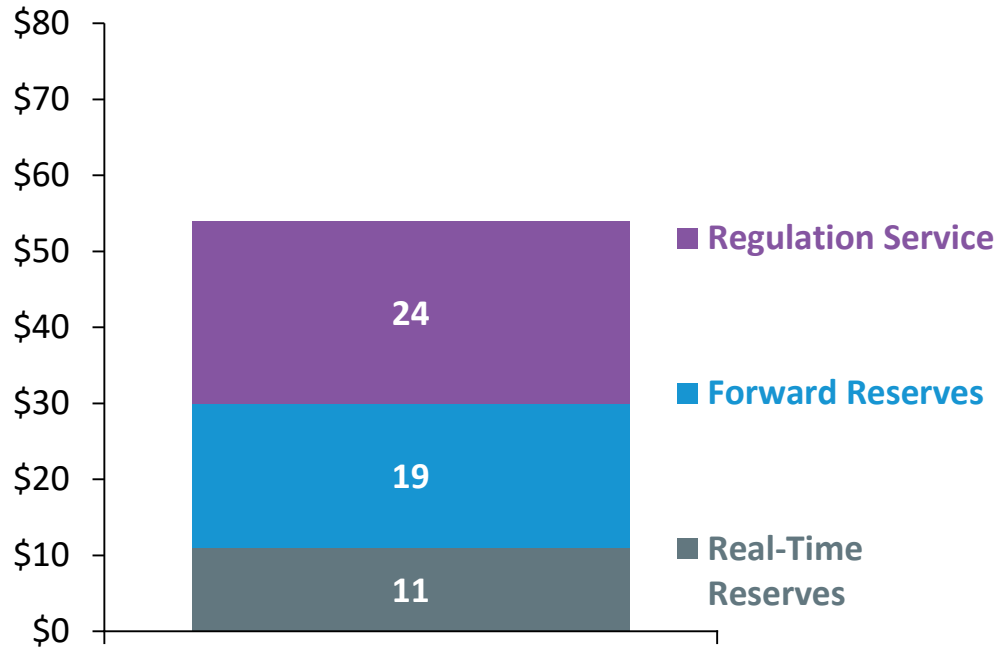
Recent Market Values

Anything noticeable about the capacity market?

Value of Wholesale Markets in 2021
(in $ Billions)



Ancillary Service Markets in 2021
(in $ Millions)



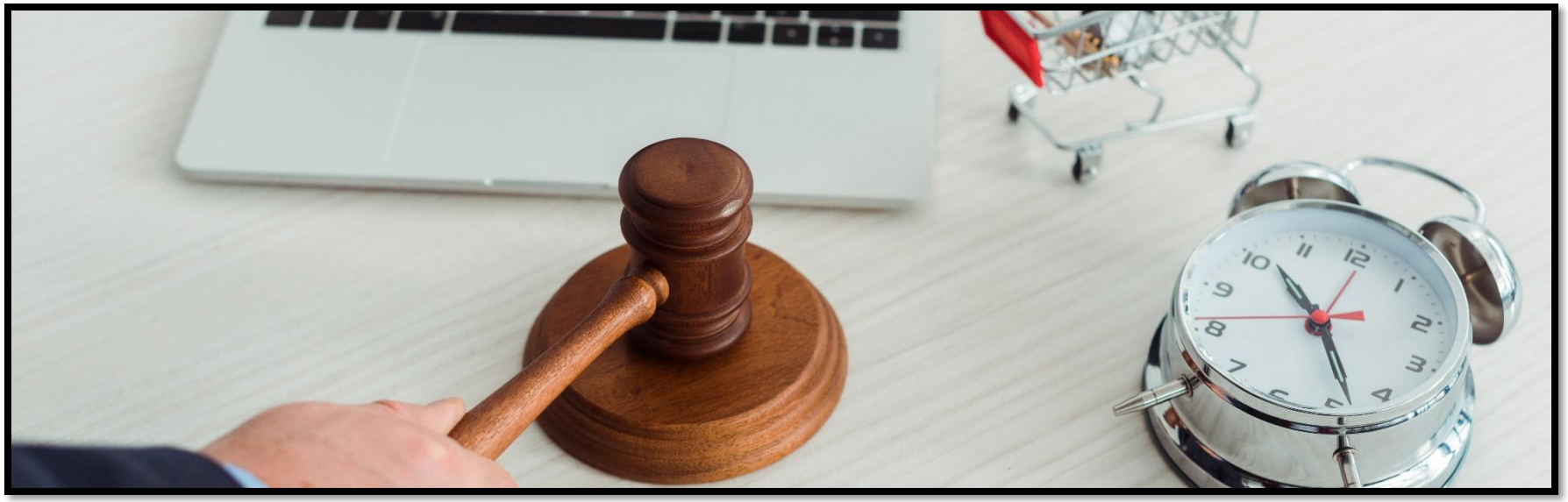
Source: ISO New England Internal Market Monitor
2021 Annual Markets Report

Descending Clock Auction

DCA

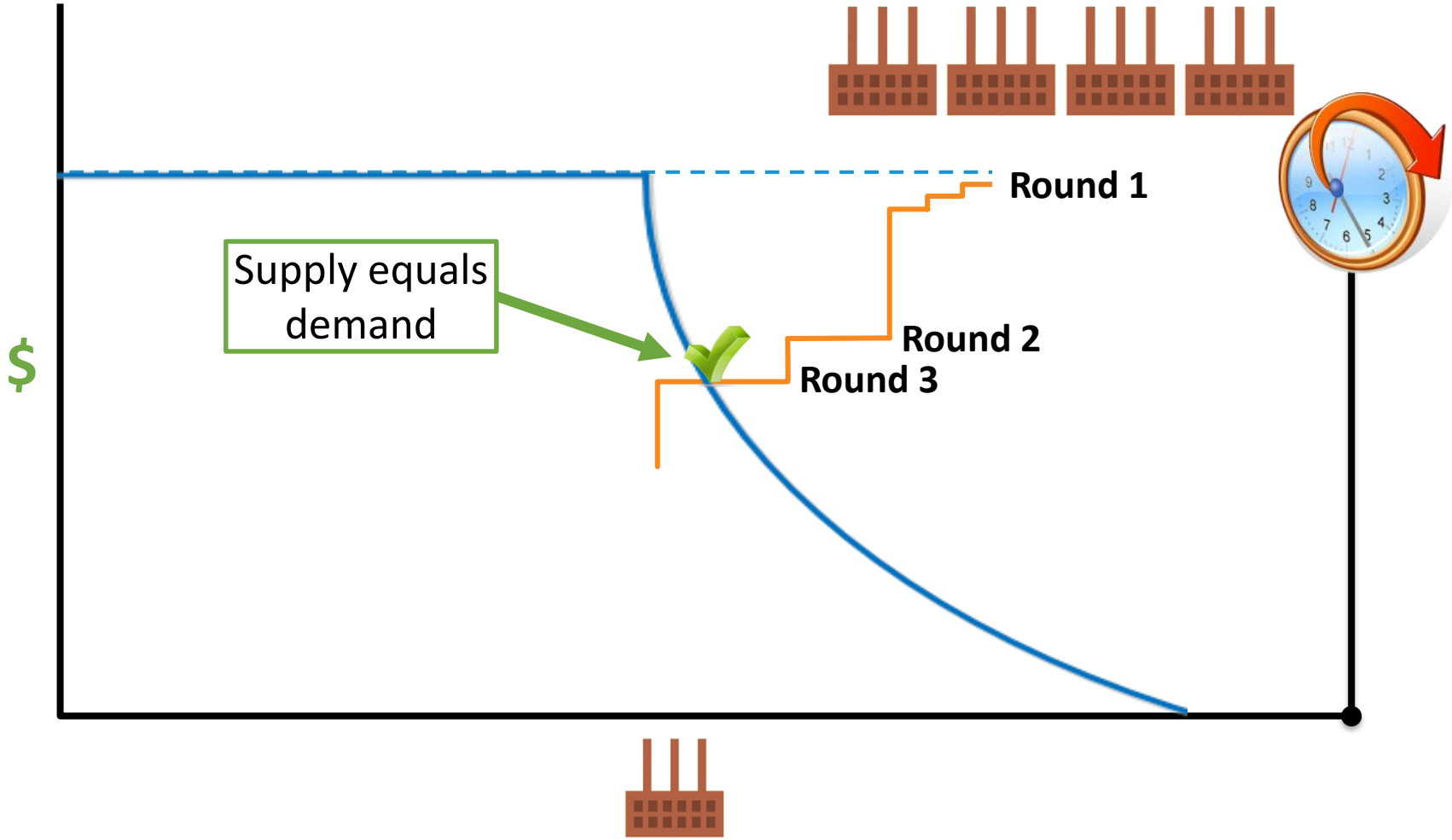
Only the Forward Capacity Auction uses a descending clock auction format

- Given the stakes involved, this format provides for more informed bidding and hence more efficient pricing outcomes



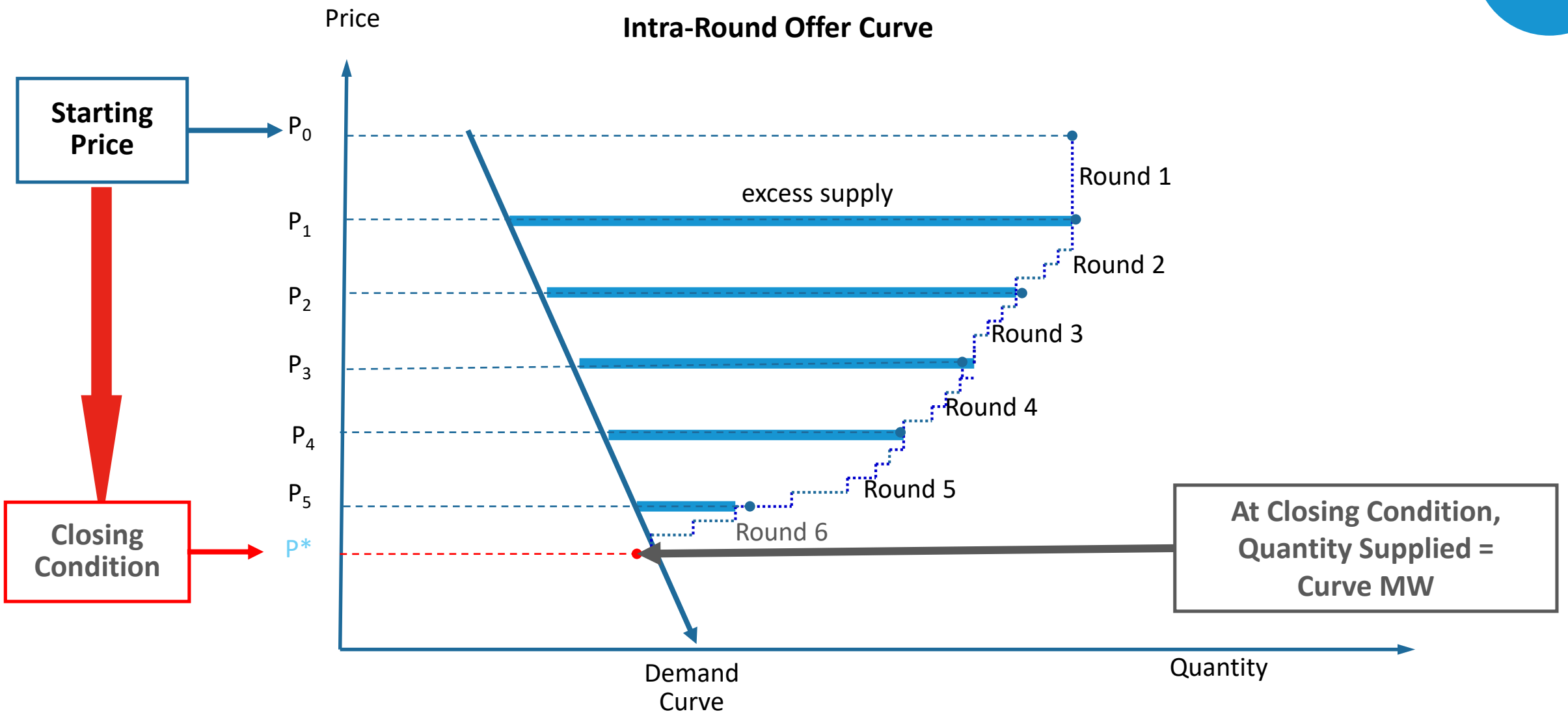
Supply and Demand Curve

DCA



Building Supply Curve with Descending Clock

DCA



Descending Clock Auction Example

DCA

Assumptions: Starting price = $15	
Existing capability	29,000 MW
Participating new capacity	4,000 MW
Total	**33,000 MW**

Round	Start-of-Round Price ($/kW-mo.)	End-of-Round Price ($/kW-mo.)	End-of-Round Resource Offers (MW)	End-of-Round Sloped Demand Curve (MW)	Excess Capacity (MW)
1					
2					
3					
4					
5					
6					

Demonstration of Descending Clock Auction

DCA

Why Use a Descending Clock Auction?

DCA

Descending clock auctions (DCAs) are:

- Fundamentally used to obtain lowest price when bidders are selling their product
- Transparent – participants choose to continue participating based on real-time information

DCA is a bid-collection process; technically DCA is a hybrid, sealed-bid within rounds

- DCA does not reveal precise price at which competitors submit final-and-best bids/offers (i.e., price they drop out of DCA process) – this helps limit potential (seller-side) market power
- DCA does not determine clearing price(s) or award capacity supply obligations (CSOs) to resources – that is performed by market clearing engine (MCE)

Other auction types:

- **Ascending clock auctions** – used in attempt to get the highest price
- **Sealed-bid auctions** – participants simultaneously submit bids

Forward Capacity Auction – Bids and Offers

Existing Capacity Resources

- Existing resources must participate, will be awarded a CSO, and paid the FCA clearing price (i.e., treated as price-takers) unless…
  - A delist bid is submitted (means to opt-out of FCA at a specified price)
- Delist bids will be reviewed for reliability impacts (and may be rejected if needed for reliability), and depending on price may undergo a price review by internal market monitor (IMM)

Recall: the term *delist bid* is slight misnomer – it is really a supply offer but the term is used to signify that it is from an existing capacity resource

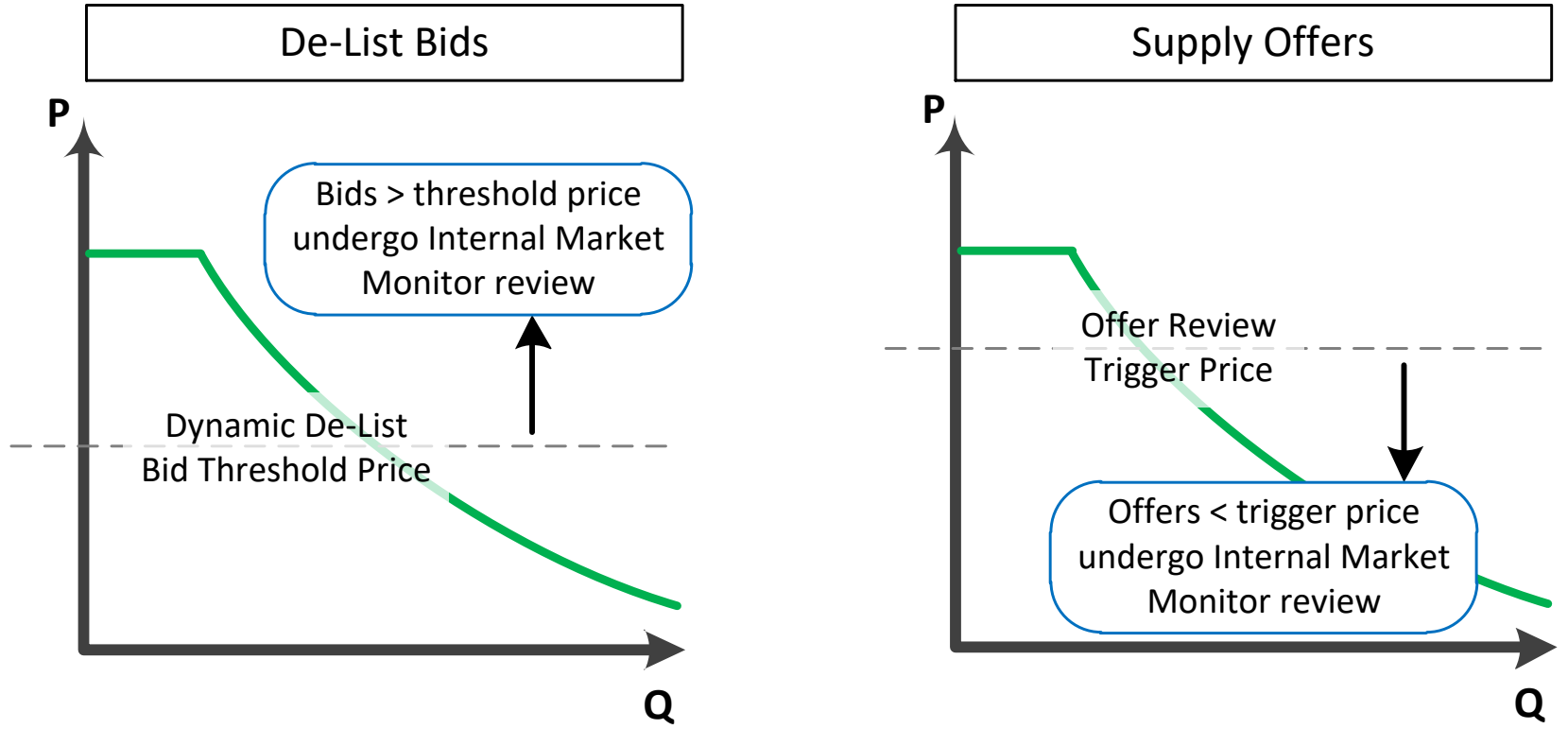
New Capacity Resources

- New resources are not required to participate, but must offer into each round to participate, and depending on price, may undergo a price review by internal market monitor (IMM)
- New capacity resources designated as an RTR are not subject to the MOPR and its related ORTPs
- Once cleared in FCA as new, resource will be considered an existing resource in next FCA

Recall: *new* means the capacity has never before cleared in an FCA (i.e., has never received a CSO in any prior FCA)

Market Power Concerns in Forward Capacity Auction

Recall: given the stakes involved, the internal market monitor (IMM) reviews bids and offers to mitigate any potential exercise of market power



Note: New capacity resources designated as a Renewable Technology Resource are not subject to the minimum offer price rule and its related offer-review trigger prices (ORTPs)

What is the Forward Capacity Auction (FCA)?

A. Descending Clock Auction (DCA)

B. Substitution Auction (SA)

C. Market Clearing Engine (MCE)

✓ D. All of the above

Q1 of 3

Questions

Forward Capacity Auction Basics

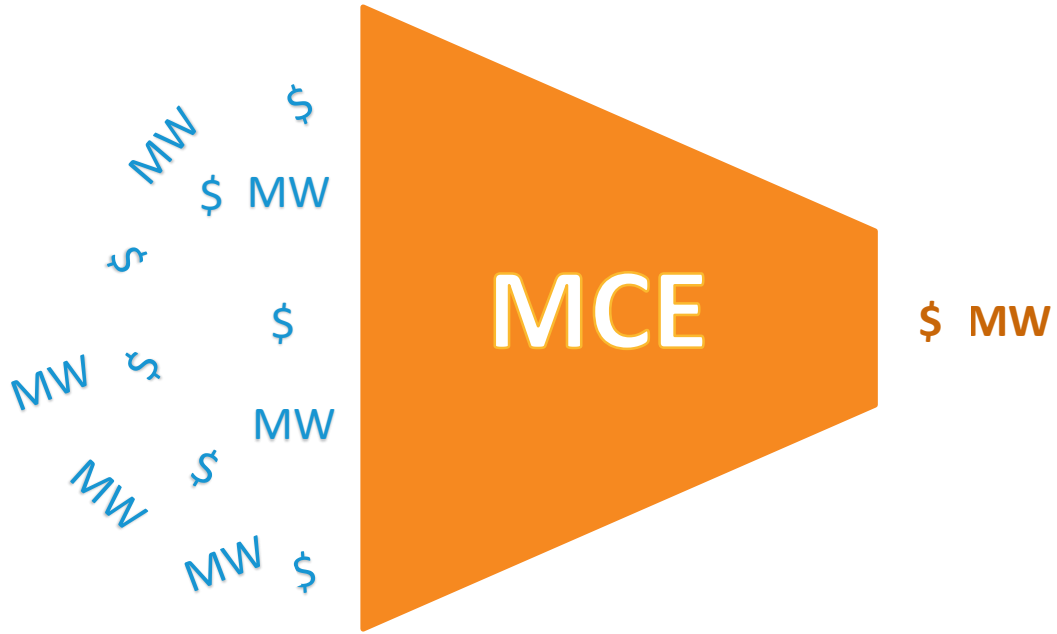
- Descending Clock Auction
- Market Clearing Engine
- Substitution Auction

What is the Market Clearing Engine?

MCE

Market clearing engine (MCE) is a complex software algorithm used to clear FCA

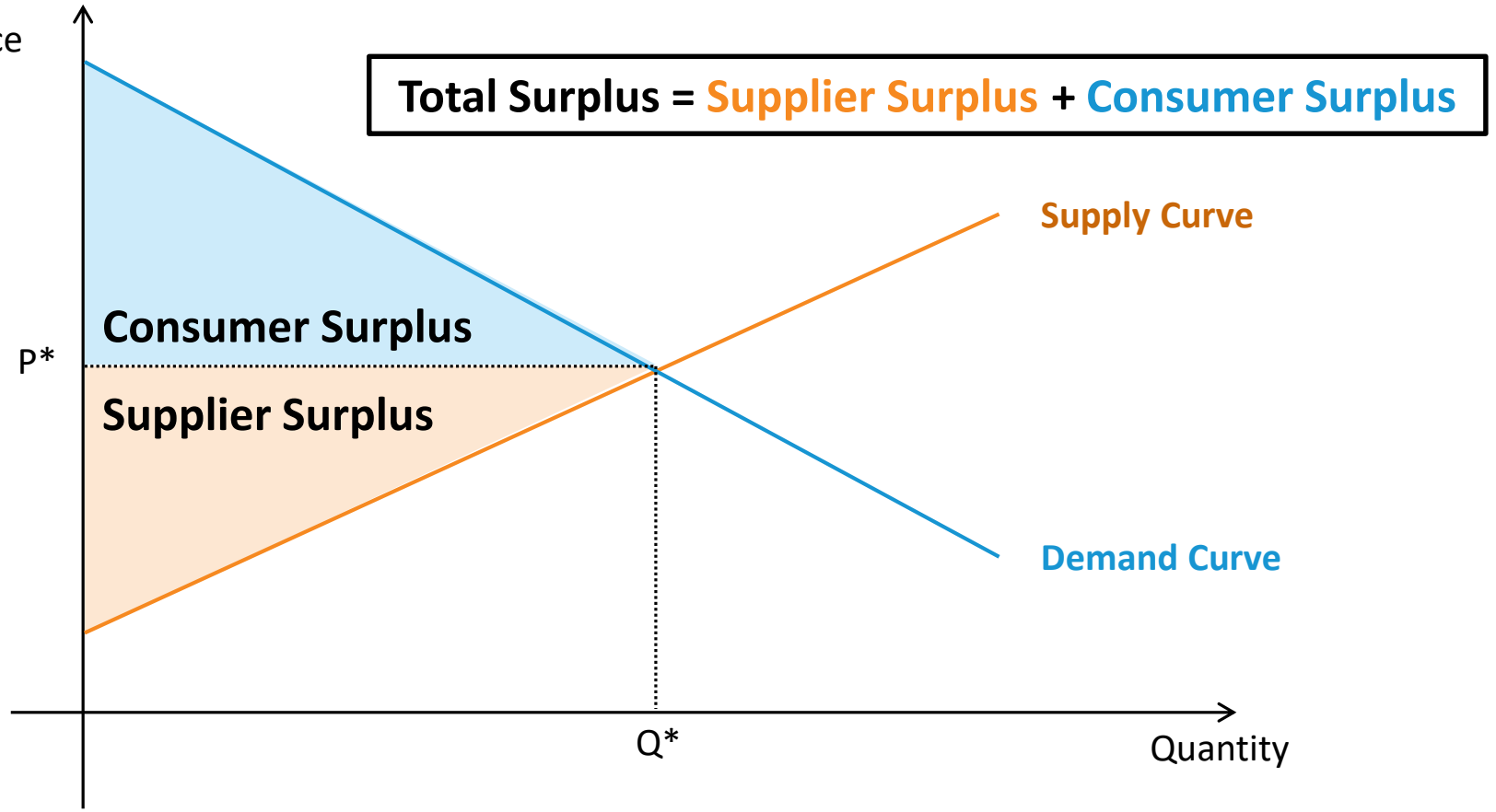
- Takes as inputs the final and best bid/offer prices of all potential capacity suppliers received via descending clock auction
- Determines best mix of bids and offers to clear to meet the demand
- Determines final clearing prices



Market Clearing Engine's Objective is to Maximize Social Surplus

Total Surplus = Social Surplus (Social Welfare)

MCE

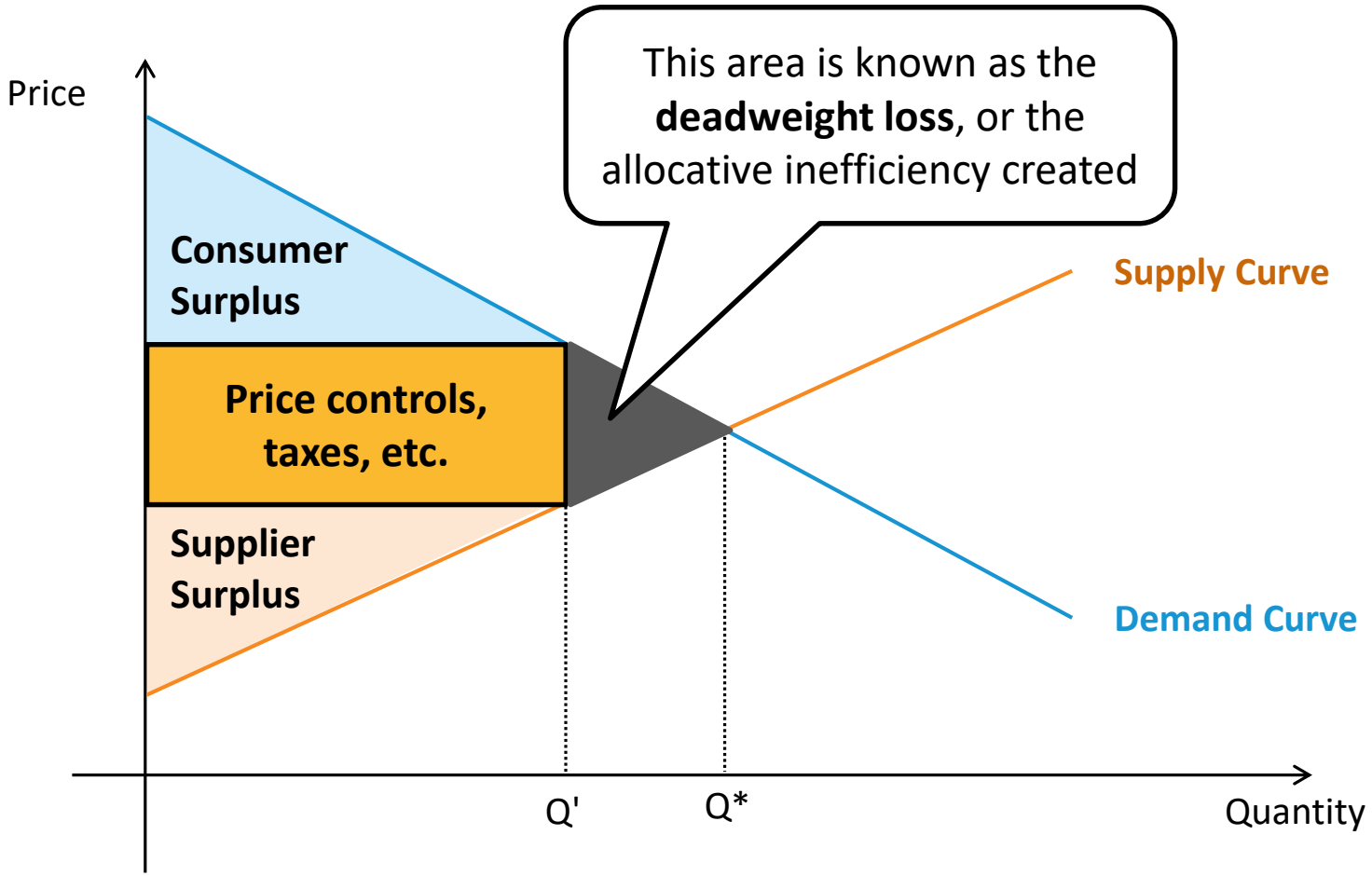


Total Surplus (Social Surplus) = Consumer Benefit - Supplier Cost

Understanding Deadweight Loss

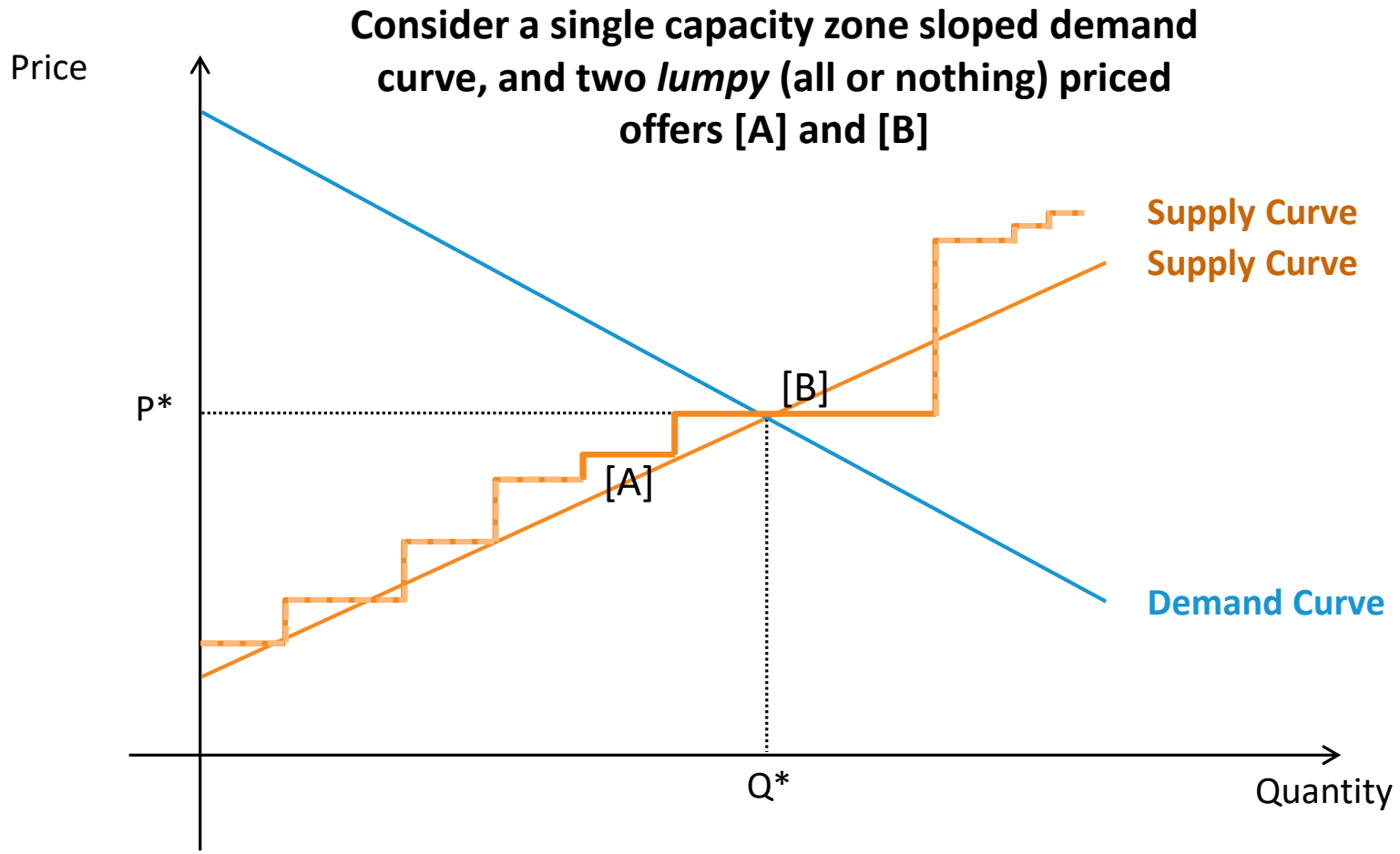
Deadweight Reduces Social Surplus

MCE



Deadweight Loss and Supply Offers

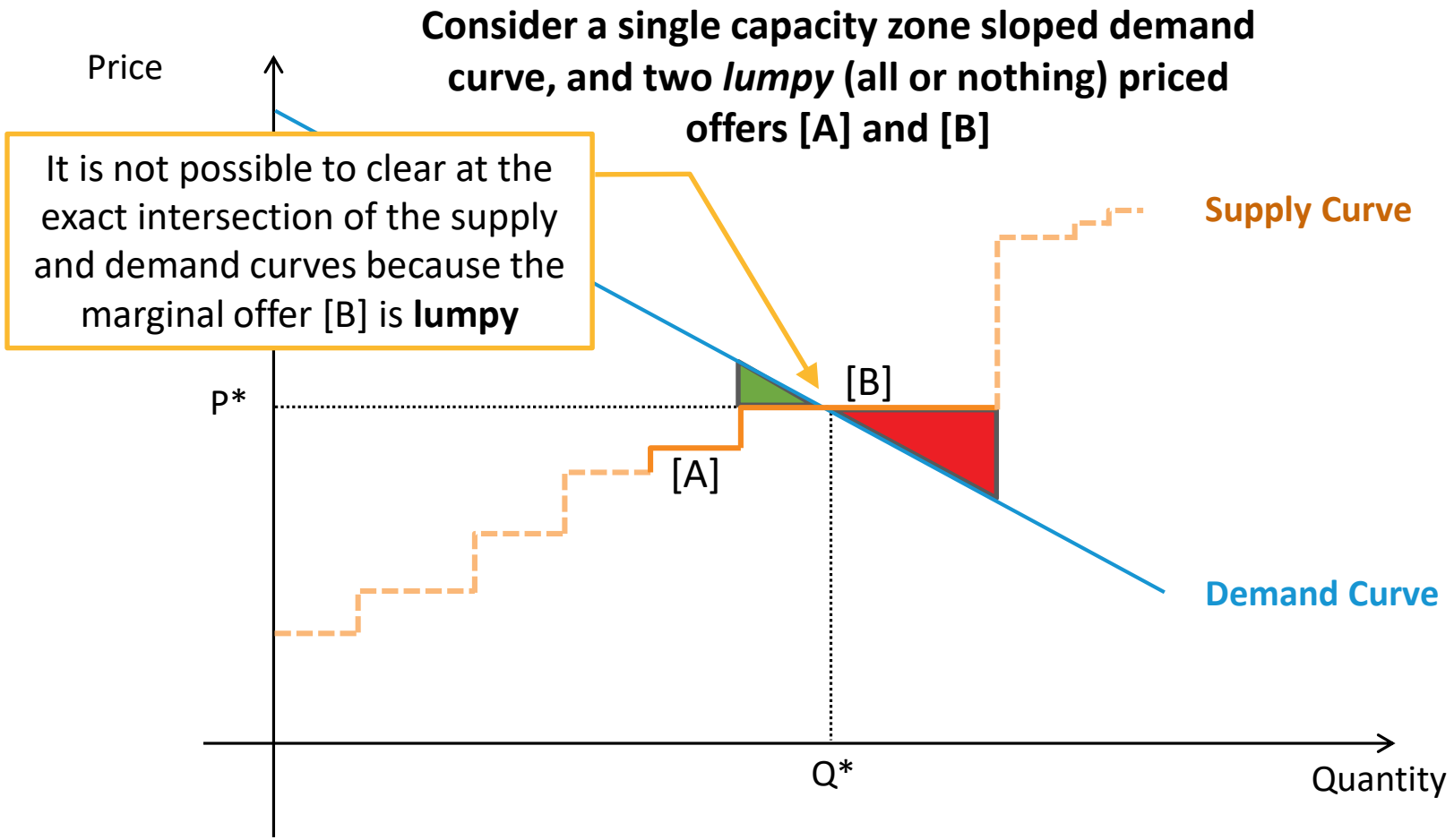
Example of Deadweight Loss from Lumpy Supply Offers



Market Clearing Engine Determines Which Lumpy Offers to Clear

Example of Deadweight

MCE



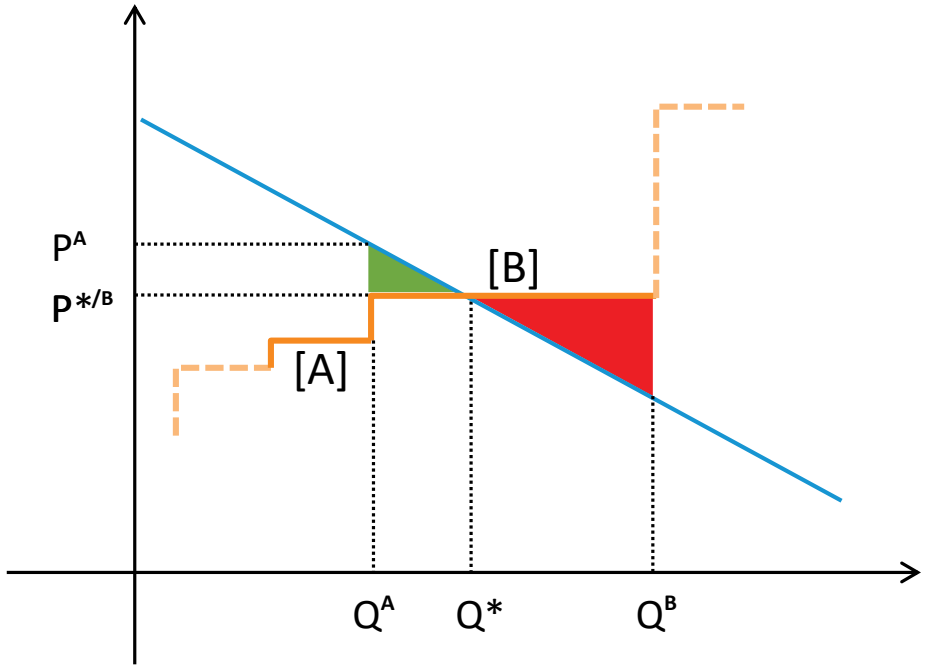
Maximizing Social Welfare

Minimizing Deadweight Loss

MCE

Engine is attempting to maximize social surplus by minimizing deadweight loss

- **Clear non-rationable supply segment [B]**
  Yields a lower clearing price and more capacity, but creates a deadweight loss (represented by red triangle)
- **Do not clear non-rationable supply segment [B]**
  Yields a higher clearing price and less cleared capacity, but also creates a deadweight loss (represented by green triangle)



The optimal choice in this example is to maximize social welfare by minimizing the deadweight loss – offer [B] would only clear if the green triangle (left) is larger than the red triangle (right)

Why is Market Clearing Engine Complex?

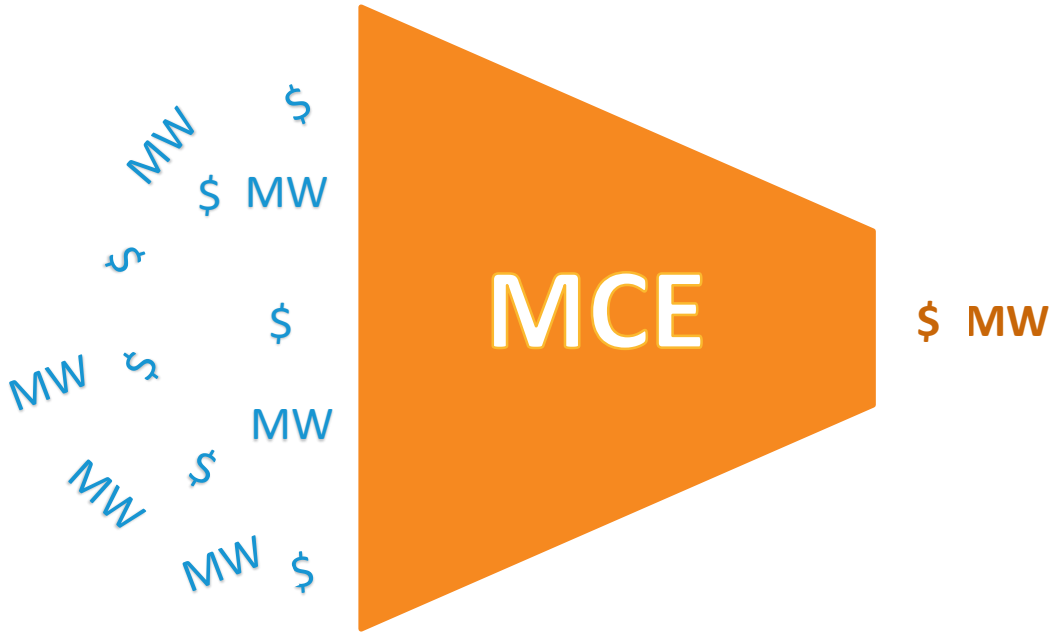
MCE

- Clearing engine is an optimization algorithm and it takes as given
  - Bid/offer prices and quantities (MW) from all resources
  - Zone and interface configuration
  - Demand curves and import interface limits
- Clearing engine also awards capacity supply obligations (CSOs) consistent with provisions in the tariff, including:
  - Tie-breaking rules when there are equal offer prices or in different zones
  - Accounting for resources retained for reliability

Market Clearing Engine Observations

MCE

- Clearing engine would be needed regardless of how bids and offers are collected, whether by the descending clock or a sealed-bid auction
- Market clearing engine (MCE) optimization software and algorithms are professionally audited by qualified outside (subject-matter) algorithm experts



Recent Forward Capacity Auction Results

Auction Results for FCA 13 through FCA 17 (2019-2023)

Results for all previous auctions can be found at About Us > Key Grid and Market Stats

Auction, Auction Date, Commitment Period	Total Capacity Acquired (MW)	New Demand Resources (MW)	New Generation (MW)	Clearing Price ($/kW-month)	Net ICR (MW)
FCA 13 in 2019 2022-2023	34,839	654	837*	$3.80	33,750
FCA 14 in 2020 2023-2024	33,956	323	335	$2.00	34,075
FCA 15 in 2021 2024-2025	34,621	170	950	System-wide: $2.611 NNE: $2.477 & SENE: $3.980	33,270
FCA 16 in 2022 2025-2026	32, 810	230	311	System-wide: $2.591 NNE: $2.531 & SENE: $2.639	31,645
FCA #17 in 2023 for CCP 2026/2027	31,370	2,940	619	$2.590	30,305

*Total includes new generation acquired in both the primary auction (783 MW) and substitution auction (54 MW)

See Press Release: New England's Forward Capacity Auction Closes with Adequate Power System Resources for 2026-2027

The FCM path of a non-intermittent generator …

Resource clearing the FCA

- Recall the path of the non-intermittent generator that was qualified for 180 MW
- It is located in rest of pool and cleared the FCA for its qualified amount, and receives the cleared MW (180) x clearing price ($2.001/kW-mo.)
- Starting point for this resource's FCM credit is $360,180 in each month of the capacity commitment period (CCP)
- Resource B did not clear this FCA

Resource A			
Event	**CSO**	**Rate**	**Credit/Charge**
FCA	180	2.001	360,180
ARA	-	-	-
MRA	-	-	-
Total	-		-

Resource B			
Event	**CSO**	**Rate**	**Credit/Charge**
FCA	-	-	-
ARA	-	-	-
MRA	-	-	-
Total	-		-

What determines the clearing price and capacity supply obligation (CSO)?

A. Descending Clock Auction (DCA)

B. Substitution Auction (SA)

✓ C. Market Clearing Engine (MCE)

D. All of the above

Q2 of 3

Questions

Forward Capacity Auction Basics

- Descending Clock Auction
- Market Clearing Engine
- Substitution Auction

Substitution Auction for Sponsored Policy Resources

- **Minimum offer price rule (MOPR):** requires new capacity resources to offer their capacity at prices that are at or above a price floor set for each type of resource (specifically the offer-review trigger price (ORTP))
  - MOPR does not allow resources receiving out-of-market revenue to reflect that support in their offer prices, unless the support is widely available to other market participants (to mitigate the potential exercise of buyer-side market power)
  - MOPR does not apply to Renewable Technology Resources (RTRs)
- **Secondary auction** held to accommodate the actions taken by New England states to procure certain resources outside of ISO New England's wholesale markets (i.e., those that are not likely to clear because of MOPR)
  - This secondary auction, called the **substitution auction (SA)**, facilitates the transfer of capacity supply obligations (CSOs) from existing capacity resources to new sponsored policy resources

What is a Sponsored Policy Resource?

A Sponsored Policy Resource (SPR) is a new capacity resource that:

- Receives a revenue source, other than revenues from ISO-administered markets, that is supported by a government-regulated rate, charge, or other regulated cost recovery mechanism, and;

- Qualifies as a renewable, clean, zero carbon, or alternative energy resource under a renewable energy portfolio standard, clean energy standard, decarbonization or net-zero carbon standard, alternative energy portfolio standard, renewable energy goal, clean energy goal, or decarbonization or net-zero carbon goal enacted by federal or New England state statute, regulation, or executive or administrative order and as a result of which the resource receives the revenue source

Substitution Auction is Conducted During Annual Forward Capacity Auction Process

Stage 1 – Primary Auction

Primary auction occurs first and considers the minimum offer price rules

- Capacity prices to be paid by ISO New England loads will be determined in primary auction

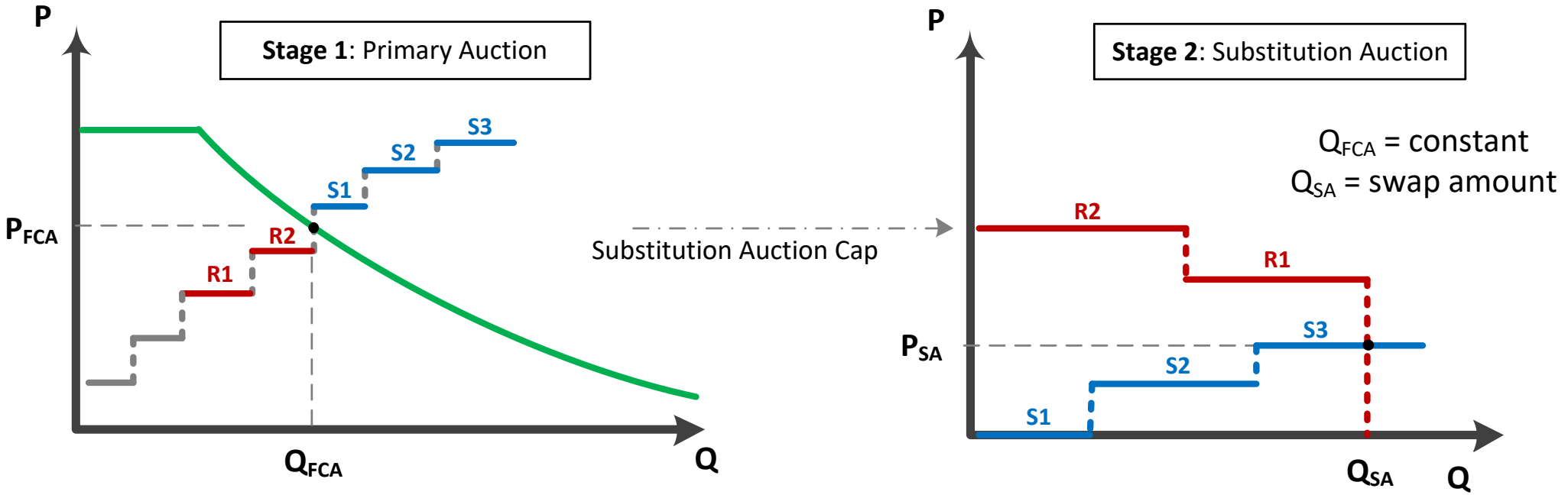
Stage 2 – Substitution Auction (SA)

Substitution auction (sealed-bid auction) immediately follows the primary auction

- **Demand:** Existing resources that have acquired CSO through primary auction will be permitted to offer a demand bid in the SA to shed that CSO, indicating a willingness to retire from all ISO New England markets at a certain price
  - New resources that obtain a CSO in primary auction may not participate in the substitution auction as demand
- **Supply:** The supply curve consists of capacity (sell) supply offers from sponsored policy resources that did not already obtain a CSO in the primary auction

The (sealed-bid) substitution auction matches the voluntary demand bids and supply offers – no capacity demand curve is used or necessary

Illustrative Example



Retirement delist bids (**R1** and **R2**) are in-rate and are awarded a CSO in the primary auction

Supply offers (**S1**, **S2**, and **S3**) from Sponsored Policy Resources (SPRs) did not clear (i.e., were not awarded a capacity supply obligation (CSO))

Because they have a CSO, **R1** and **R2** are included in the substitution auction as *lumpy* demand bids (will buy out of the CSO at the substitution auction clearing price)

Because they did not get a CSO, **S1**, **S2**, and **S3** may offer (again) into the substitution auction; these offers may be rationed

Substitution Auction Demand Bids

Another Means to Retire

Track 1	Track 2
A demand bid will be created for resources associated with a retirement delist bid	In all other cases, whether or not a delist bid has been submitted, participants may submit a demand bid for a resource

In all cases the existing resource:

- Must have been awarded a CSO (in-rate) in the primary auction
- Must have a capacity interconnection
- Cannot be designated as self-supply or part of a composite offer

Substitution Auction Specifics

Auction price boundaries: There is a price cap set equal to the primary auction clearing price, and a price floor set equal to negative one times the primary auction's starting price

Demand bids:

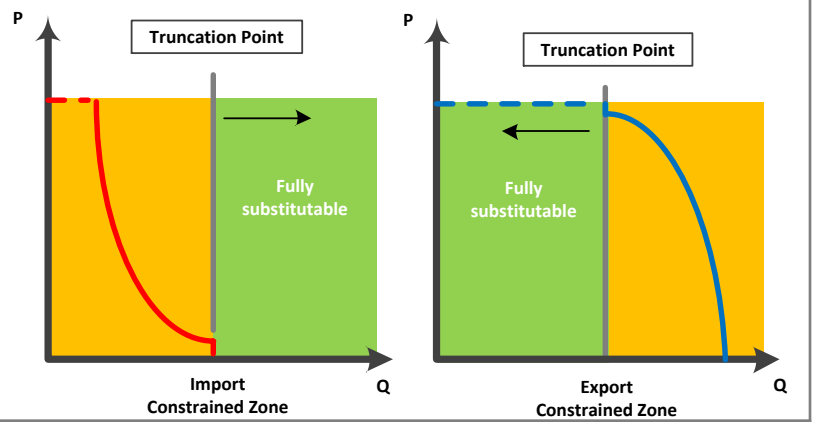
- May have a different price than delist bid (if a delist bid is used)
- Will be reviewed for local reliability impacts and may be rejected
- Are non-rationable (i.e., are *lumpy* and must clear in full or not at all)

Supply offers:

- May participate in composite offers as the summer resource
- Are rationable (i.e., a supply offer can partially clear)

Inter-zonal transfers of CSOs are allowed provided transfers do not shift total capacity amount in an:

- Import-constrained zone to left of truncation point
- Export-constrained zone to right of truncation point



For more information, view: Participate > Training > E-Learning Opportunities > FCM Substitution Auction (self-paced training)

Substitution Auction Outcomes

- Substitution auction (SA) accommodates entry of new subsidized resources while facilitating the exit of existing resources by transferring (substituting) the capacity supply obligation (CSO)
  - No impact on primary auction (total quantity is unchanged)
- Sponsored Policy Resources (SPRs) that clear in the secondary auction are awarded a CSO and will be treated as existing resources in the next FCA
  - Not subject to MOPR in next FCA
- Existing resources that clear in substitution auction will be able to shed their CSO **and** retire at a lower price than they received in primary auction and retain a one-time net payment equal to the difference between primary auction clearing price and substitution auction clearing price
  - Similar to a severance payment

The substitution auction is what type of auction?

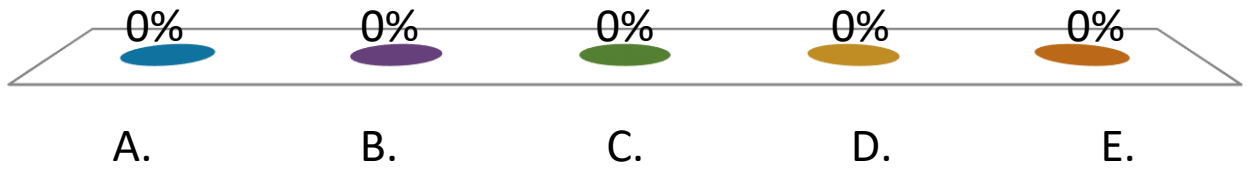
A. Descending Clock Auction (DCA)

✓ B. Sealed-bid auction

C. Dutch auction

D. Ascending Clock Auction

E. Hybrid (DCA & Sealed-bid)

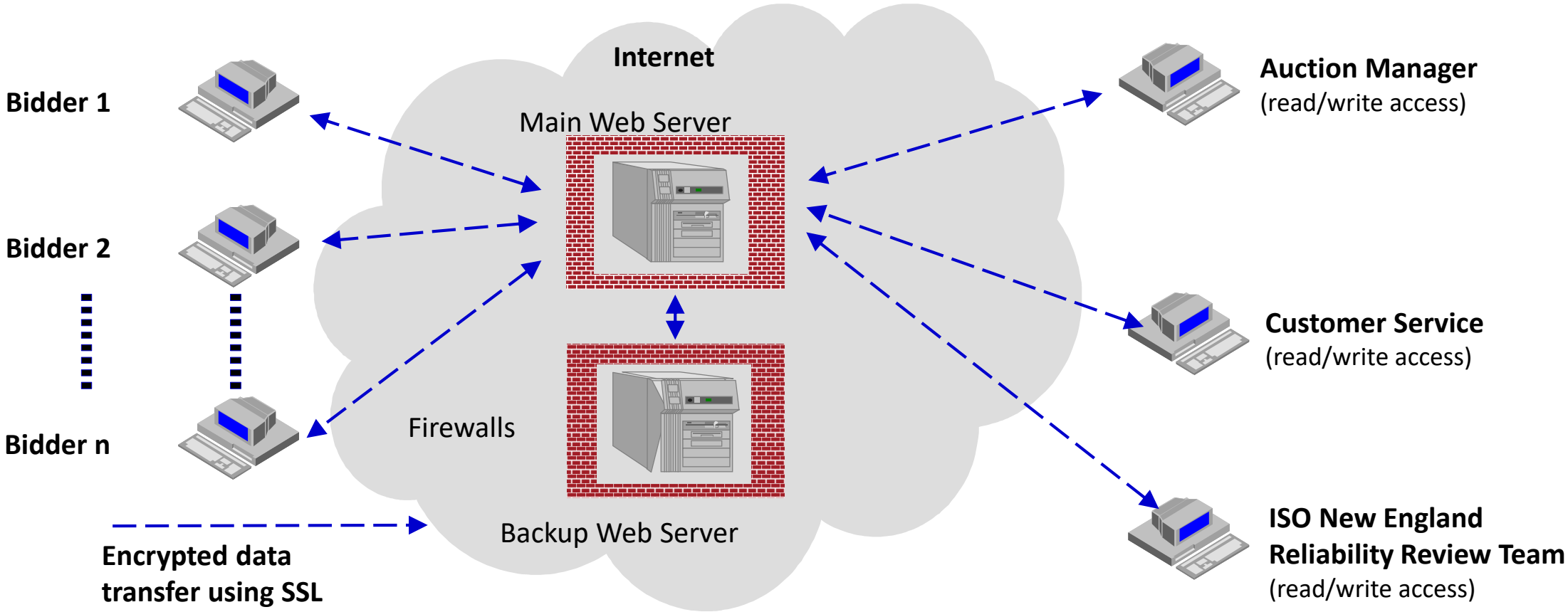


Q3 of 3

Questions

Forward Capacity Auction Mechanics

Auction Arrangements



Forward Capacity Auction Roles and Responsibilities

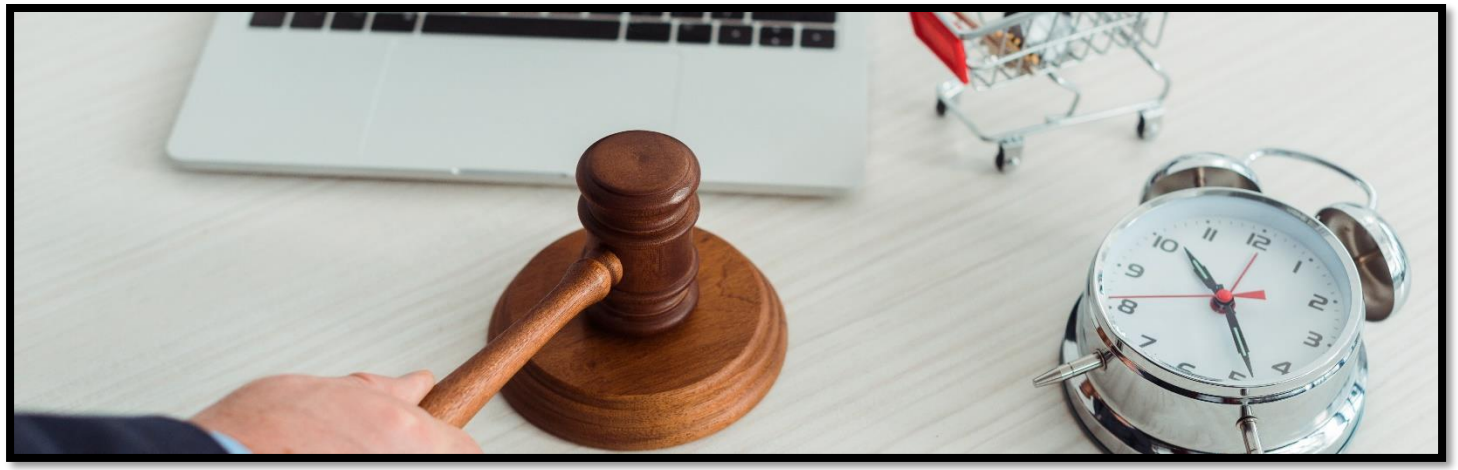
Auction Manager and ISO New England

- **Auction Manager:**

  Power Auctions LLC., responsible for administering the auction

- **ISO New England:**

  Responsible for assisting auction manager in administering the auction as well as performing reliability reviews on dynamic delist bids

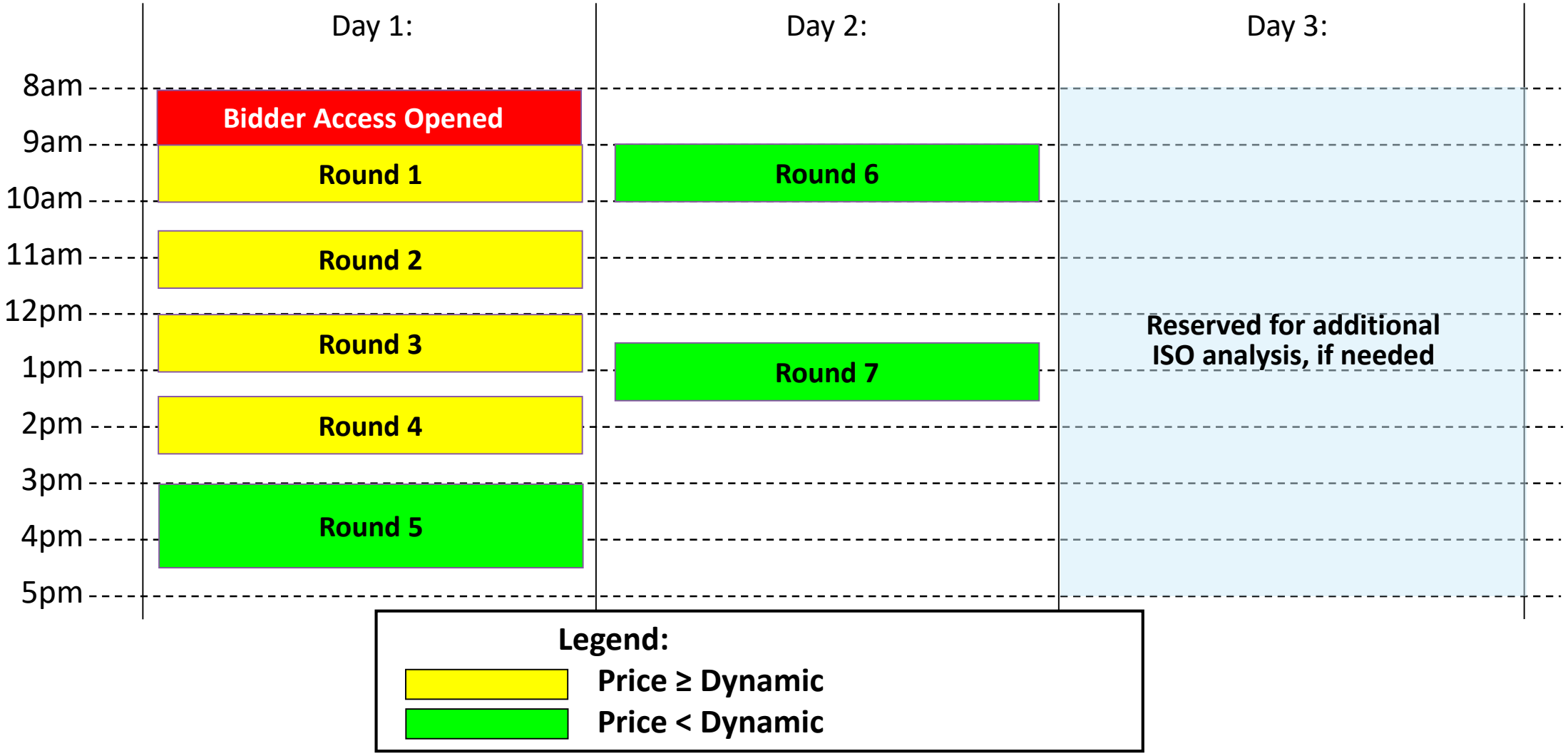


Forward Capacity Auction and Responsibilities

Authorized Individual

- Only individuals authorized by a bidder are allowed to submit offers and dynamic delist bids on its behalf
- Authorized individuals must have a valid digital certificate with correct access in order to participate in FCA
- It is highly recommended that authorized individuals new to FCA attend hands-on training
- Resource review and mock auction are held to provide authorized individuals an opportunity to utilize auction software prior to live auction

Example: Indicative Schedule



Forward Capacity Market (FCA 17) Result Report

Rest-of-Pool Capacity Zone

Round	System-Wide	Capacity Zone Rest-of-Pool	External Interface New York Cross Sound Cable	External Interface New York AC Ties	External Interface Phase I/II HQ Excess
Status		Closed	Closed	Closed	Closed
Round 1	$ 12.761 – $ 8.590		$ 12.761 – $ 8.590	$ 12.761 – $ 8.590	$ 12.761 – $ 8.590
Demand (Excess Supply)	30,132.532 MW (4,546.927 MW)		0.000 MW (No Excess Supply)	974.000 MW (1,099.366 MW)	399.000 MW (No Excess Supply)
Round 2	$ 8.590 – $ 5.590		$ 8.590 – $ 5.590	$ 8.590 – $ 5.590	$ 8.590 – $ 5.590
Demand (Excess Supply)	30,602.358 MW (4,036.211 MW)		0.000 MW (No Excess Supply)	974.000 MW (571.666 MW)	399.000 MW (No Excess Supply)
Round 3	$ 5.590 – $ 2.590				
Demand (Excess Supply)	31,370.172 MW (3,052.795 MW)				
Round 4	$ 2.590 – $ 2.000		$ 2.590 – $ 2.000	$ 2.590 – $ 2.000	$ 2.590 – $ 2.000
Demand (Excess Supply)	31,600.652 MW (No Excess Supply)		0.000 MW (No Excess Supply)	974.000 MW (No Excess Supply)	399.000 MW (No Excess Supply)

Shows results of each auction round

Notes:

- All Prices are in $/kW Month.
- All Excess numbers are calculated at the End-of-Round Price for a given Round. See User Guide for more information about Excess.
- An External Interface cannot close earlier than the associated Capacity Zone.

Summary: What to Remember About the Forward Capacity Auction

In this lesson, you learned:

- Concept behind descending clock auction
  - Unlike most auctions, here there is only one buyer and many sellers
- How the market clearing engine maximizes social surplus
  - Minimize deadweight loss when supply offers are ‘lumpy’
- Purpose of substitution auction
  - Accommodate new sponsored capacity without impacting the market
  - Total quantity remains constant; substitutes retirements with new capacity

Questions