Overview of the Forward Capacity Market (FCM) Settlement

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Course Objective

- To provide a high level understanding of the Forward Capacity Market (FCM) Settlement

At the Completion of this Course, Attendees Will:

- Have a high level understanding of the FCM settlement process
- Know the bill line items for the FCM settlement
- Understand how FCM resources are paid
- Understand how FCM resources are measured for performance
- Have a high level understanding of the allocation of charges for the FCM
- Have appendix information as further reference material

Before We Get Started…

Market Rule References

- Throughout this presentation, relevant ISO NE Tariff and Market Rule 1 references are identified in the footer of each slide:

(ISO NE Tariff, Section 1 – General Terms & Conditions; Section III - MR 1 - 13.7.2)

Overview of FCM Settlement

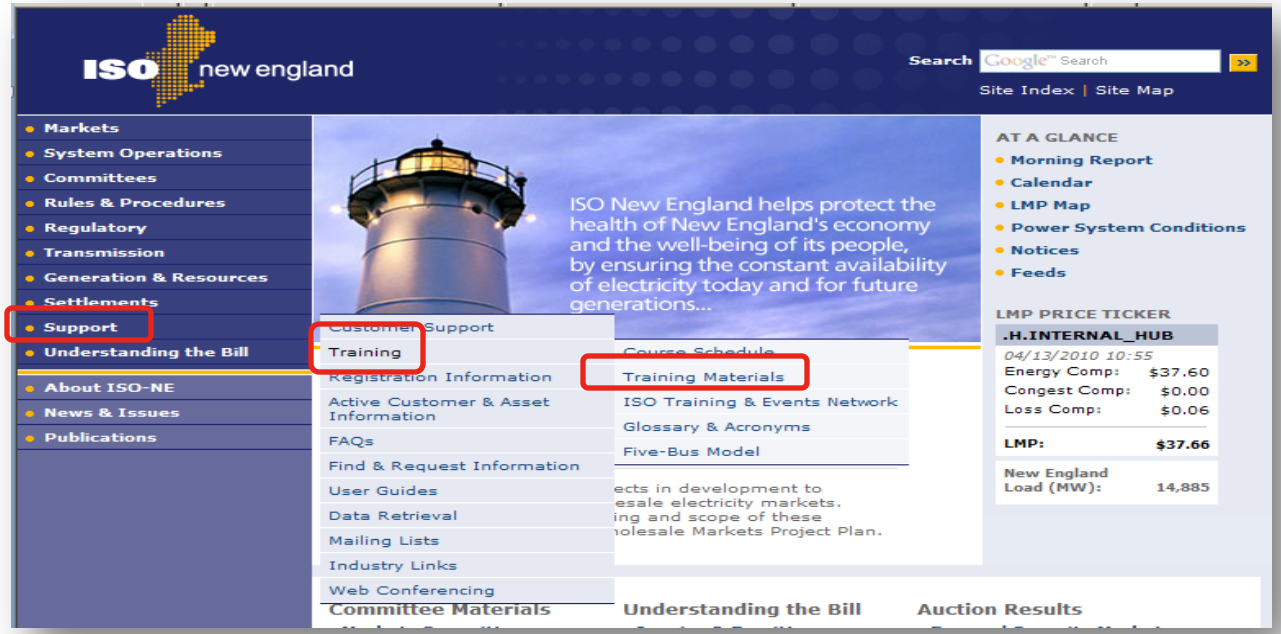
Example Assumptions in this Presentation

- FCM settlement examples throughout this presentation are for illustrative purposes only
- Are based on Market Rules effective at the time of the presentation
- Credit and performance examples consist of:
  - A single Capacity Zone
  - A single Lead Market Participant, with three obligated resources:
    - One Non-IPR generating resource (100% ownership)
    - Two demand resources: one active RTDR and one passive On-Peak (100% ownership)
- Charge examples consist of:
  - A single Load Serving Entity, with a single load asset

Overview of FCM Settlement

FCM 101 Training Materials

- For a more detailed look at the FCM settlement calculations please refer to the Forward Capacity Market (FCM 101) Training available on ISO New England's website at:
  Support > Training > Training Materials > Forward Capacity Market



Overview of FCM Settlement

Clearing Prices vs. Payment Rates

Clearing Price

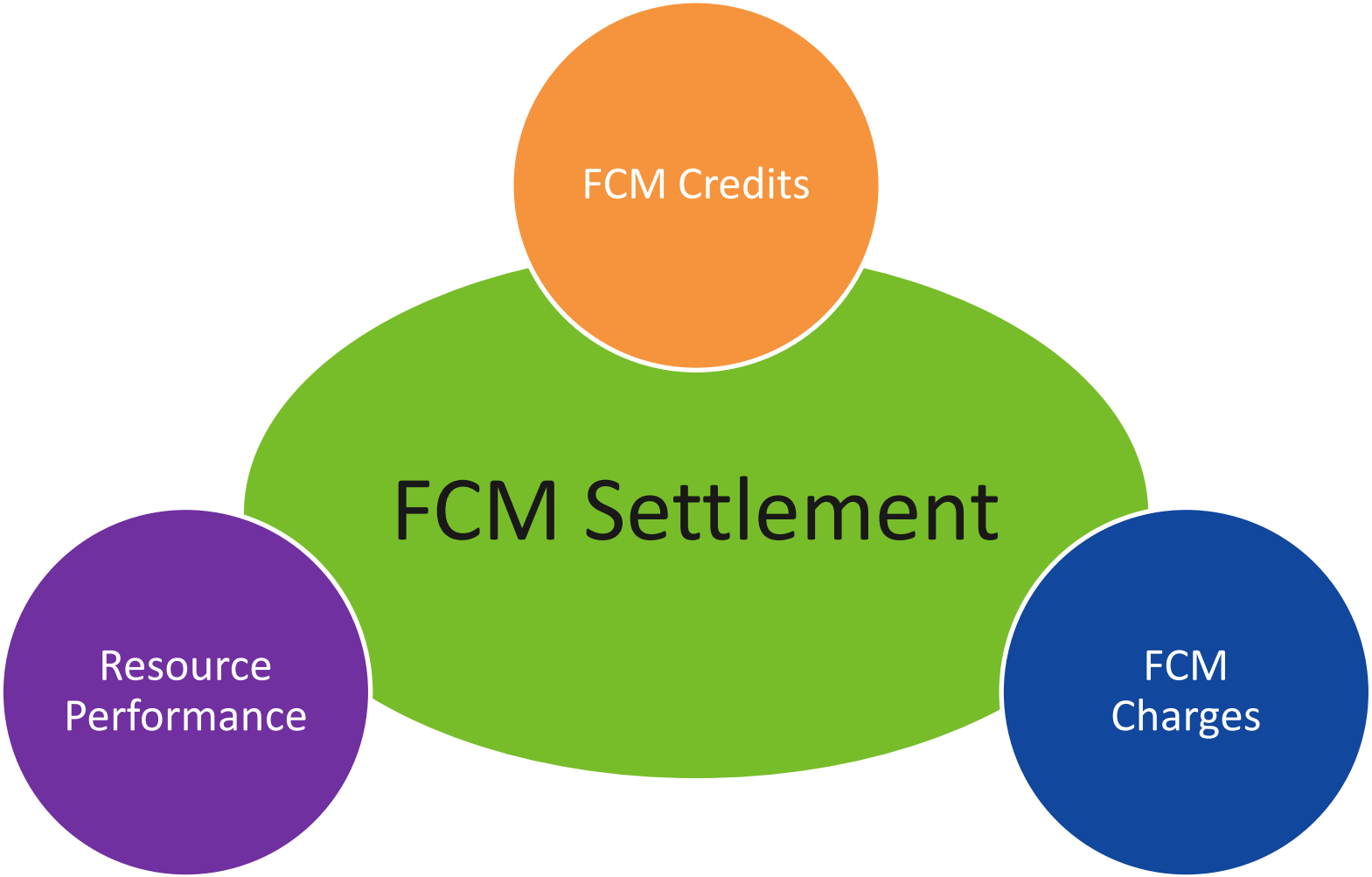
- Auction Clearing Price (FCA or RA)
- "…as adjusted pursuant to Section III.13.2.7.3(b)…" reflects the Clearing Price adjusted for the price collar ($3.119 in the second FCA)

Payment Rate

- FCA Clearing Price (Ex. $3.60, FCA 2)
- FCA Clearing Price adjusted for the price collar (Ex. - $3.119, FCA 2)
- Multiyear Rate
- Self-Supply Rate ($0.00)
- RA Clearing Price
- Bilateral Price

Overview of FCM Settlement

Major FCM Settlement Components



Overview of FCM Settlement

Non-Hourly Services Bill Timing

- Capacity Supply Obligations (CSO) received in the FCM are for each month of a Capacity Commitment Period (CCP)
- Therefore, the FCM Settlement is a monthly settlement, which will be included in the Non-Hourly Services Bill each month:

Obligation Month	Initial Non-Hourly Services Bill	Final Non-Hourly Services Bill (DRP Process)
August 2011	September 12, 2011	January 16, 2012
September 2011	October 17, 2011	February 13, 2012
October 2011	November 14, 2011	March 12, 2012
November 2011	December 12, 2011	April 16, 2012

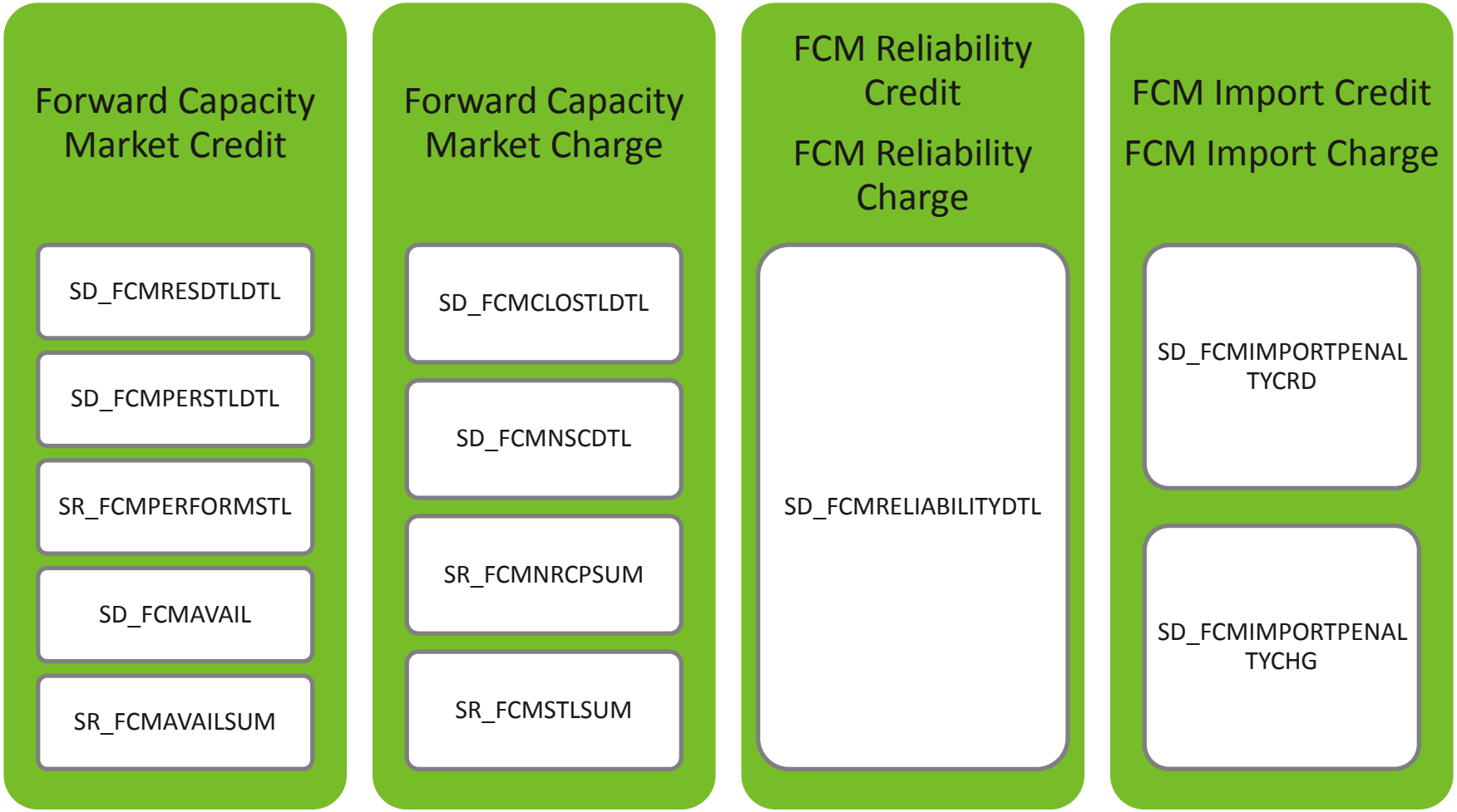
Overview of FCM Settlement

FCM Bill Invoice Line Items

- The following are FCM line items that may appear on a Bill Invoice:
  - Forward Capacity Market Credit
  - Forward Capacity Market Charge
  - FCM Reliability Credit
  - FCM Reliability Charge
  - FCM Import Penalty Credit
  - FCM Import Penalty Charge

Overview of FCM Settlement

FCM Financial MIS Reports to Bill Invoice Line Items Map



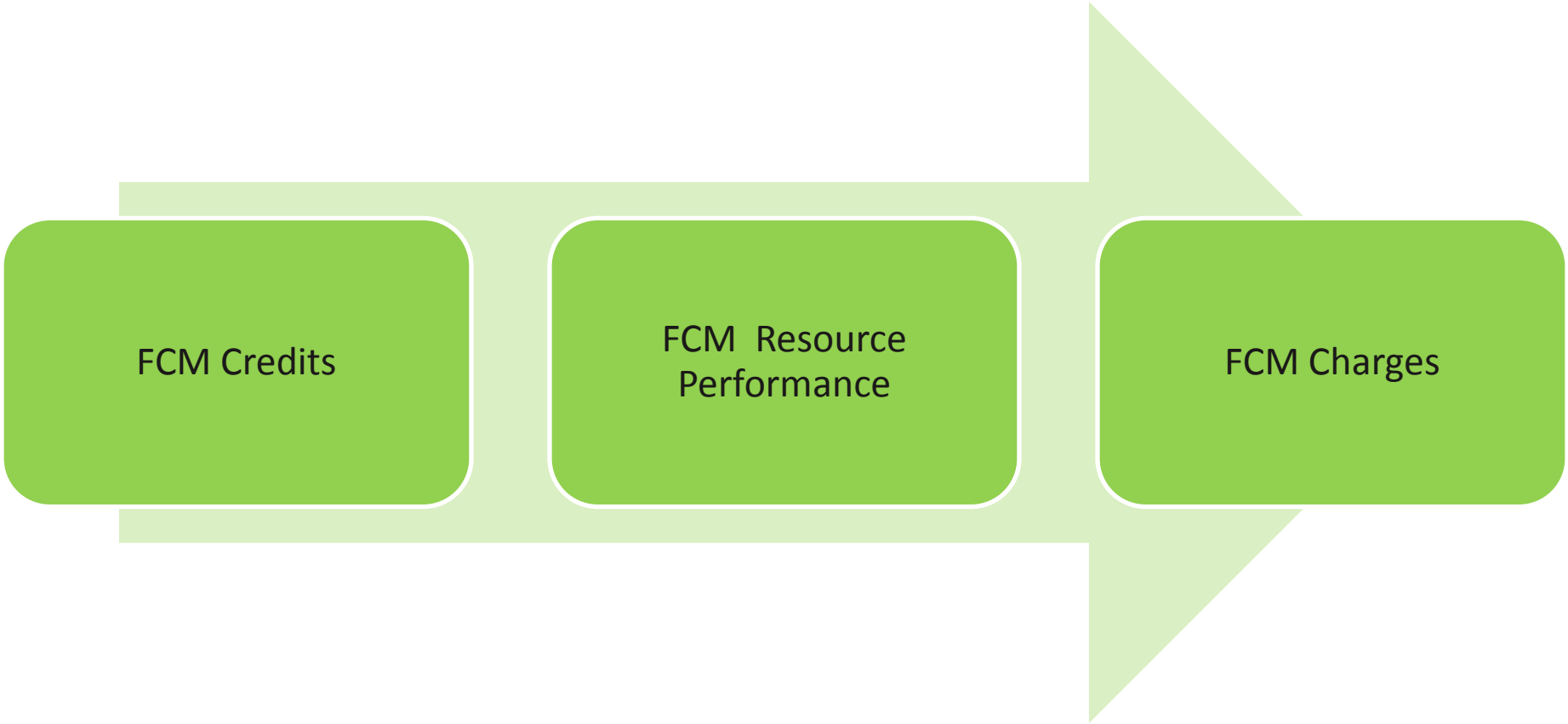
Overview of FCM Settlement

FCM Non-Financial MIS Reports

Forward Capacity Market Credit	Forward Capacity Market Charge	Web Posted Reports	Special Reports
SD_FCMPREAVAIL	SD_FCMPRECAPREQ	WW_FCMHOURLYPER	SP_FCMANNUALPEAK
SD_MONTHLYEPOH	SD_FCMMTHREQLAOWNER	WW_FCMMONTHLYPER	SP_PEAKCONTRIBUTION
SR_ANNUALEPOH	SD_FCMCARDNCBA	WW_FCMSEASONALPEAKHOUR	SP_PEAKCONTRIBUTIONDLY

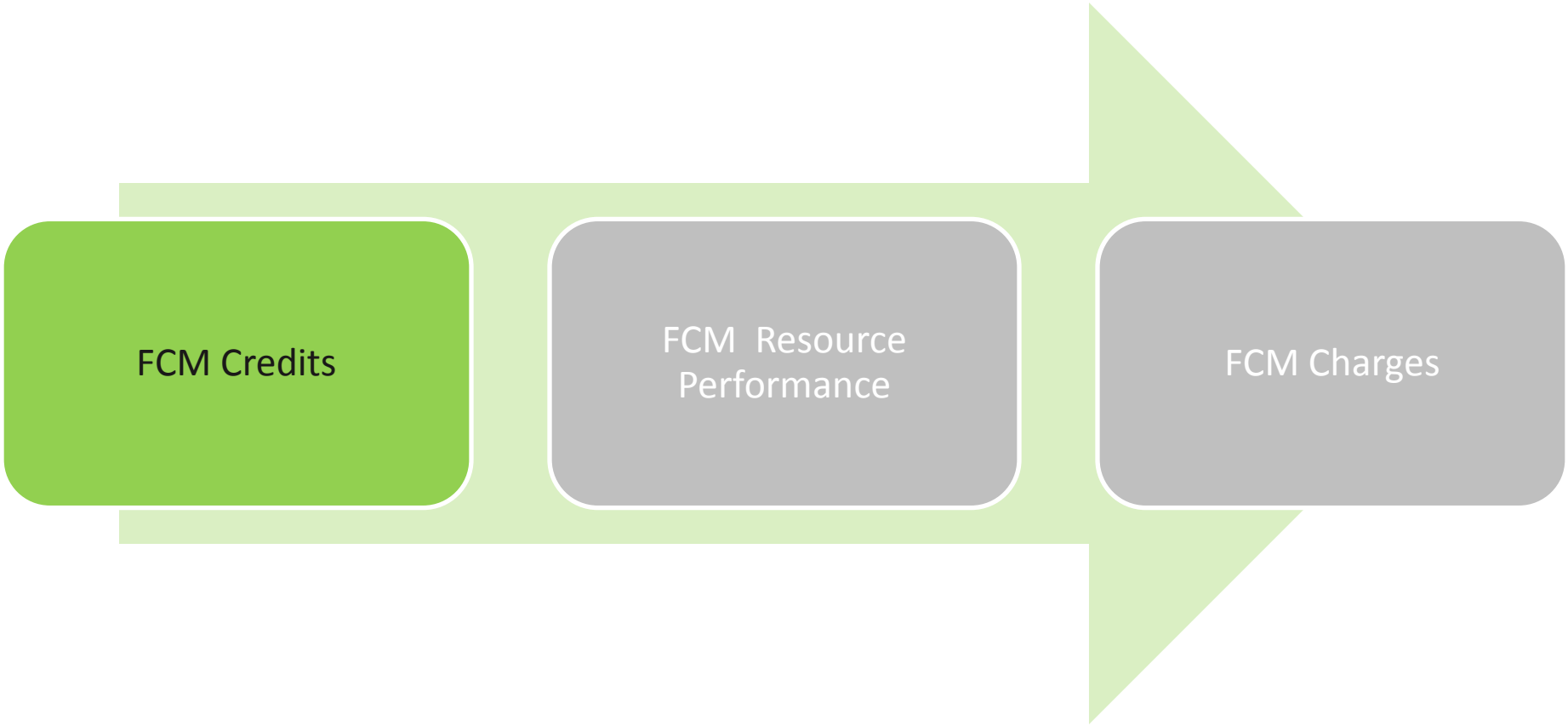
Course Outline

FCM Settlement Process



FCM Settlement

FCM Credits



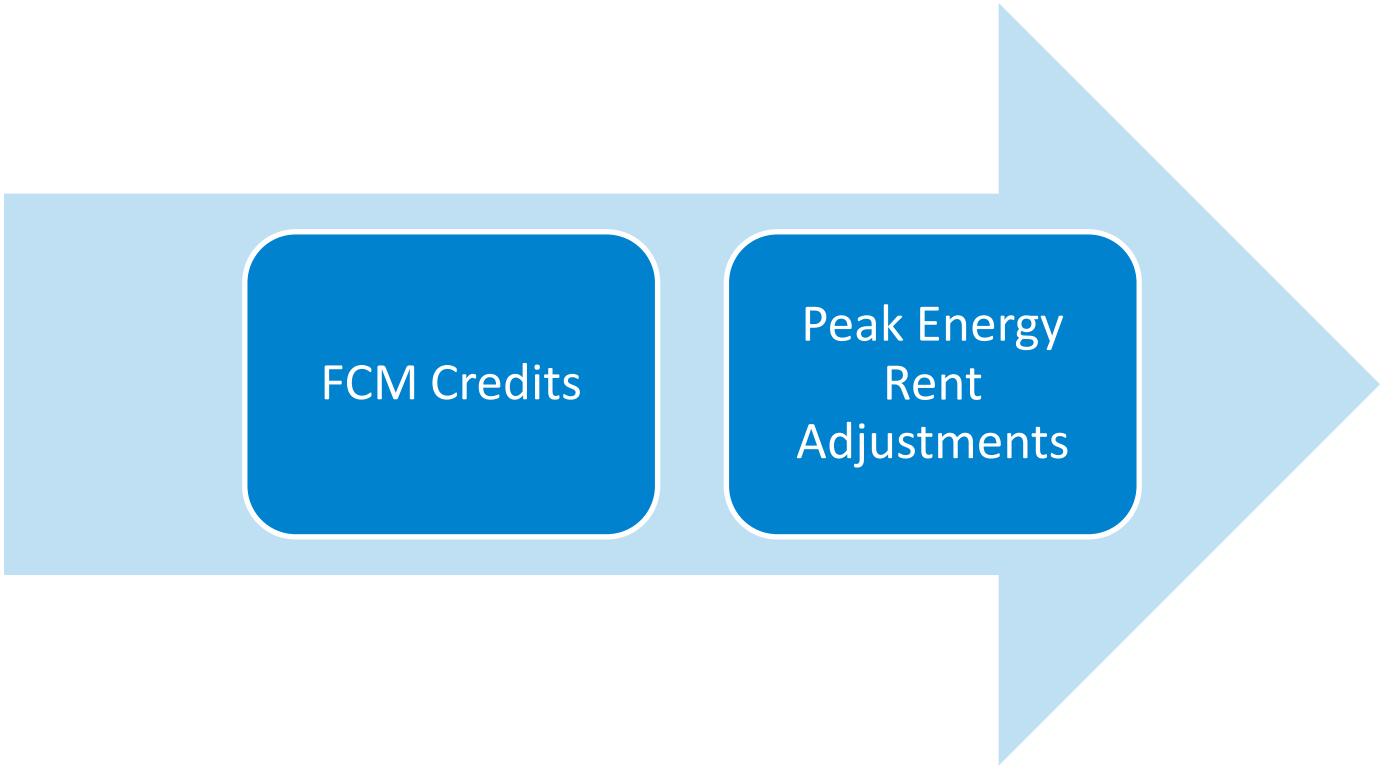
FCM Settlement

Section Objectives – FCM Credits

- At the end of this section, you will be able to:
  - Understand how FCM Credits for obligations obtained through a **FCA** are calculated
  - Determine the credit/charge applicable to obligations acquired or shed through a **reconfiguration auction** or **CSO bilateral**
  - Understand the concepts for calculating **hourly and monthly Peak Energy Rent (PER)**
  - Have a high-level understanding of how a **PER adjustment** for a Resource is calculated

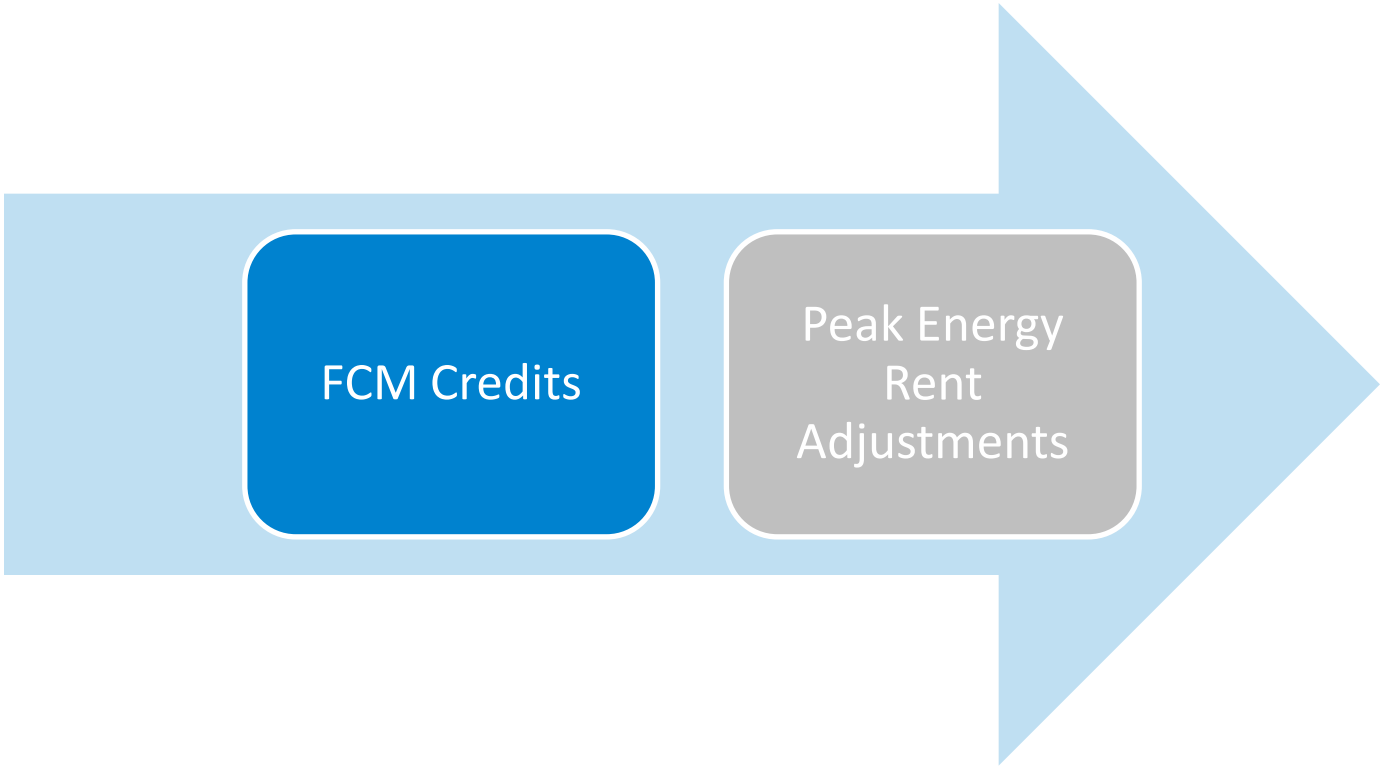
FCM Credits

Section Components



FCM Credits

Section Components



FCM Credits

What are FCM Credits?

- Compensation or charges to Resources based on activity for the obligation month from:
  - FCM Primary Auction (FCA)
  - Reconfiguration Auctions
  - CSO Bilateral Transactions
- Including:
  - Credits for resources Retained for Reliability
  - Payment rate adjustments for multi-year obligations

FCM Credits

What are the Primary Inputs to Calculate FCM Credits?

- CSO MW (individual components)
- Payment rates associated to each CSO component or transaction
- Multiple obligations can be obtained through the same process:
  - Various types of obligations from the FCA with associated payment rates (e.g., self-supply, multi-year commitments, Real-Time Emergency Gen)
  - Multiple bilateral transactions for an obligation month
  - Multiple reconfiguration auctions for an obligation month
    - Up to three (3) annual
    - Monthly

FCM Credits

How is the FCM Credit Calculated?

- Sum of the product of each CSO multiplied by the associated payment rate

FCM Credit =
SUM[(FCA CSO x Payment Rate x 1000) +
(ARA CSO x ARA Clearing Price x 1000) +
(MRA CSO x MRA Clearing Price x 1000) +
(Bilateral CSO x Bilateral Payment Rate x 1000)

- Calculation is the same for all Resource types
  - Generator
  - Import
  - Demand

FCM Credits

What is Proration?

- When the FCA ends at the floor price, New England has "Surplus" capacity, therefore the ISO has purchased capacity that exceeds the Installed Capacity Requirement (ICR)
- To account for the excess capacity purchased, the ISO prorates the FCA Clearing Price (a.k.a. price proration)
- Once the FCA is complete, each Lead Market Participant will have an opportunity to prorate the MWs of an obligation instead of the clearing price (a.k.a. MW proration)
- Affect of this decision is that the MW of an obligation will decrease and the payment rate will be set at the FCA clearing price without the price collar adjustment

FCM Credits

Generating Resource Example

Generating Resource R1 / Qualified Capacity = 200 MW

FCA New = 30 MW Existing = 150 MW Self-Supply = 20 MW	CSO = 200 MW
Proration New = 27 MW Existing = 135 MW Self-Supply = 20 MW	CSO = 182 MW
Annual Reconfiguration Auction Shed 40 MW	CSO = 142 MW
Monthly CSO Bilateral Acquire 50 MW	CSO = 192 MW

FCM Credits

Generating Resource Example (cont.)

CSO Component Source	CSO Component MW *(A)*	Payment Rate ($/kW-mo) *(B)*	CSO Component Credit *(A x B x 1000)*
FCA – New Capacity*	27	$3.600	$97,200.00
FCA – Existing Capacity*	135	$3.600	$486,000.00
FCA – Self-supply	20	$0.00	$0.00
Annual RA (shed)	(40)	$1.00	($40,000.00)
Monthly CSO Bilateral (purchase)	50	$3.50	$175,000.00
Totals	**192**		**$718,200.00**

* Prorated

FCM Credits

Demand Resource Example

Demand Resource RTDR R2 / Qualified Capacity = 8 MW

FCA New = 4 MW	CSO = 4 MW
Annual Reconfiguration Auction 2 MW Transfer (Acquired)	CSO = 6 MW
Monthly Reconfiguration Auction 1.25 MW Transfer (Acquired)	CSO = 7.125 MW
Monthly CSO Bilateral Acquire 0.75 MW	CSO = 8 MW

FCM Credits

Demand Resource Example (cont.)

CSO Component Source	CSO Component MW *(A)*	Payment Rate ($/kW-mo) *(B)*	CSO Component Credit *(A x B x 1000)*
FCA – New Capacity	4.000	3.119	$12,476.00
Annual RA (Acquired)	2.000	1.50	$3,000.00
Monthly RA (Acquired)	1.250	1.00	$1,250.00
Monthly CSO Bilateral (Purchase)	0.750	2.00	$1,500.00
Totals	**8.000**		**$18,226.00**

Note that this Resource did not prorate the MW from the FCA

FCM Credits

How are FCA Multiyear Obligations Compensated?

- New capacity resources clearing an FCA may elect to have the CSO and capacity clearing price apply for up to four (4) additional CCPs
- Initial year of the multiyear commitment will be the base year (no adjustment made)
- Payment rate associated with such an election will be indexed to the Handy-Whitman Index of Public Utility Construction Costs in each subsequent year

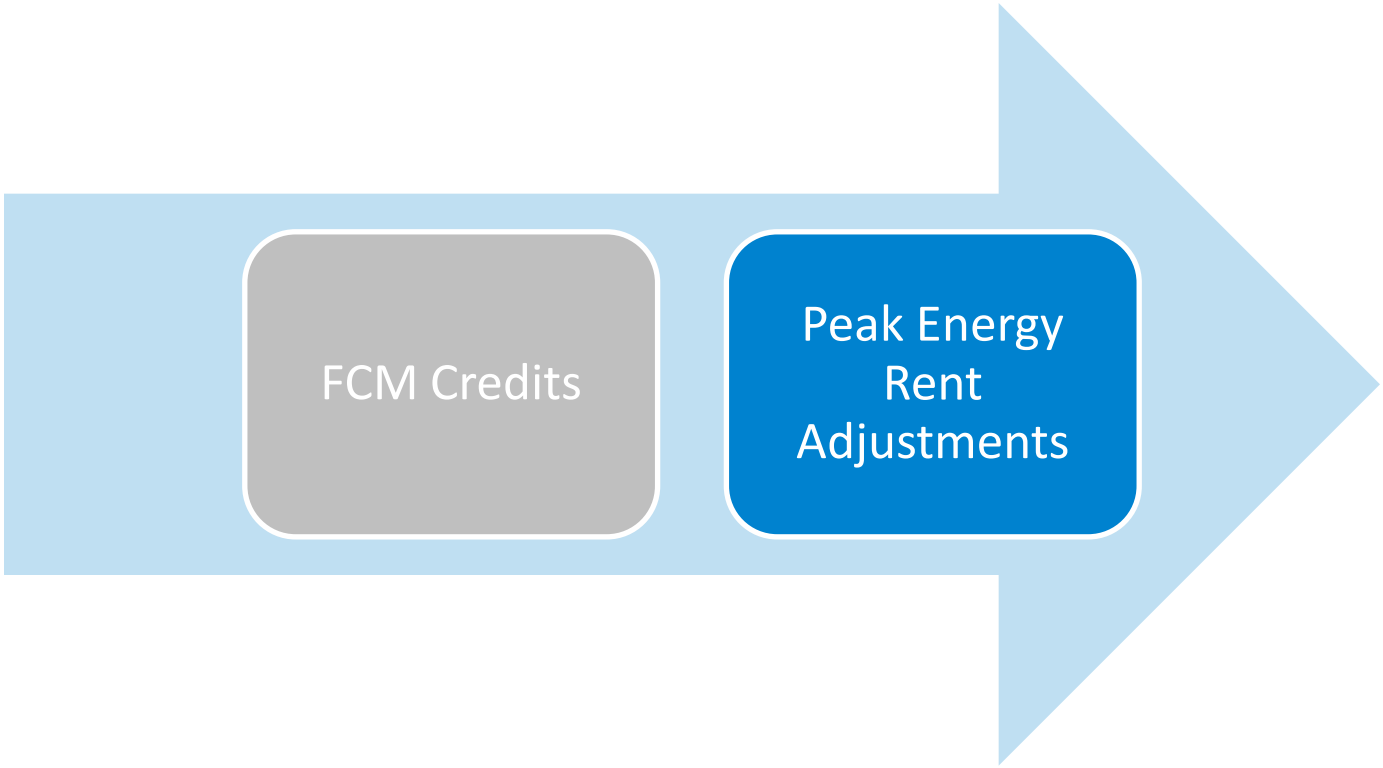
FCM Credits

What about Resources Retained for Reliability?

- Credits to resources retained for reliability will be paid for their CSO at the FCA clearing price in the "routine" monthly settlement
- **Resources not subject to a cost-of-service agreement** will receive a credit for the difference between the resource delist price at which the resource was retained, and the FCA Clearing Price
- **Resources subject to a cost-of-service agreement** will be credited the difference between the cost-of-service contract rate and the FCA Clearing Price
- Costs of reliability credits are charged to Regional Network Load customers, in the reliability region(s) receiving the reliability benefit

FCM Credits

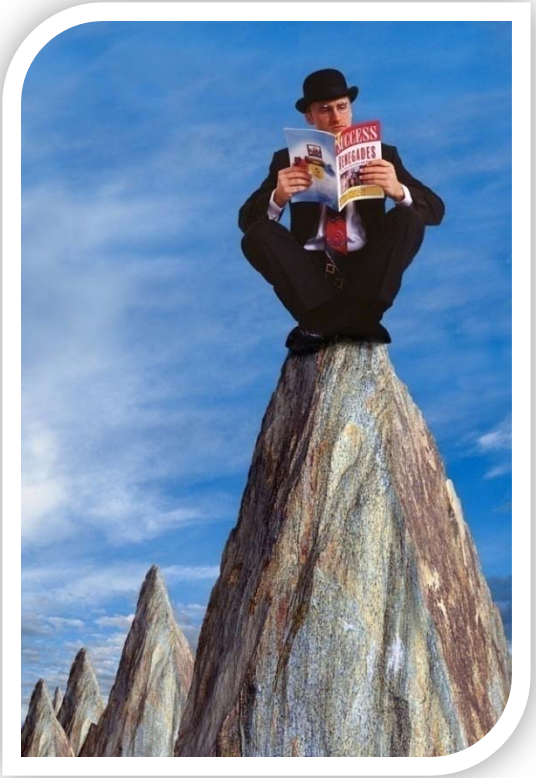
Section Components



Peak Energy Rent Adjustments

What is Peak Energy Rent (PER)?

- An adjustment to reflect revenues earned during high priced hours in the Energy markets
- Based on operating parameters for a proxy unit (heat rate, availability factor) and Real-Time Energy market LMPs



Peak Energy Rent Adjustments

Who is subject to PER Adjustments?

- Obligated generating and import resources are subject to PER adjustments, except for:
  - Self-Supply CSO MWs
  - New generating capacity resources that are not commercial due to a planned transmission facility not being in service
- Demand resources are not subject to PER adjustments

(MR 1. Section III.13.7.2.7.1, III.13.7.1.1.3(h) & (i), III.13.7.2.7.1)

Peak Energy Rent Adjustments

How are the PER values calculated?

- An Hourly PER value is calculated for every hour where the LMP exceeds a strike price in each Capacity Zone:
  - Any positive differences between the LMP and strike price are multiplied by a scaling factor, which is the actual hourly integrated load divided by the Summer 50/50 Predicted Peak Forecast

Hourly PER = (LMP – Strike Price) x Availability Factor x Scaling Factor

- A Monthly PER rate is calculated as the sum of the Hourly PER values in the month in each Capacity Zone:

Monthly PER = SUM(Hourly PER)

Peak Energy Rent Adjustments

How is Peak Energy Rent Calculated? (cont.)

- Average Monthly PER rate is calculated based on the monthly rates from the 12 months prior to the Obligation Month

Average Monthly PER = Average(Monthly PER)

Example: June's PER Rate = Average (12 Months of Monthly PER)
Where the 12 months used are June of the prior year through May of the current year

- Average Monthly PER rate is used to calculate the PER Adjustment
- A PER CSO is calculated for each obligated resource as the sum of the resource's CSO less self-supply CSO

PER CSO = Resource CSO - Self-Supply CSO

Peak Energy Rent Adjustments

How is a resource's PER Adjustment Calculated?

- Resource's PER CSO is multiplied by the average monthly PER to obtain the monthly PER adjustment

PER Adjustment = (PER CSO x Average Monthly PER) x 1000

CSO Component Source	CSO Component MW
New Capacity	27
Existing Capacity	135
Self-Supply	20 (not included)
Annual RA	(40)
Monthly Bilateral	50
PER CSO	**172**

Average monthly PER Rate = $0.171 / kW-month

PER adjustment =
172 MW x $0.171 x 1000 =
$29,412.00

Peak Energy Rent Adjustments

Peak Energy Rent Cap

- The PER adjustment is subject to an overall cap, which is not discussed in this presentation

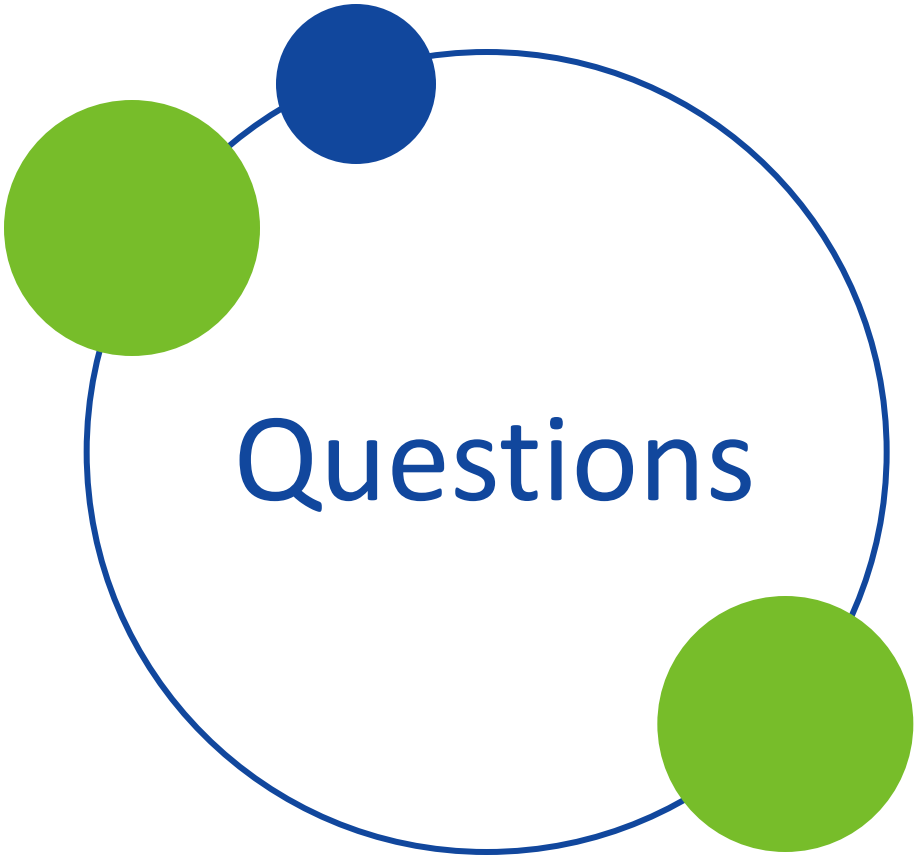
PER Cap = FCA Payment + ((ARA CSO + MRA CSO + IBT CSO) x FCA Clearing Price As Adjusted for the Collar)

For more details on the PER adjustment cap, please go to the Forward Capacity Market (FCM 101) Training material posted on ISO New England's website at:
Support > Training > Training Materials > Forward Capacity Market

Section Review

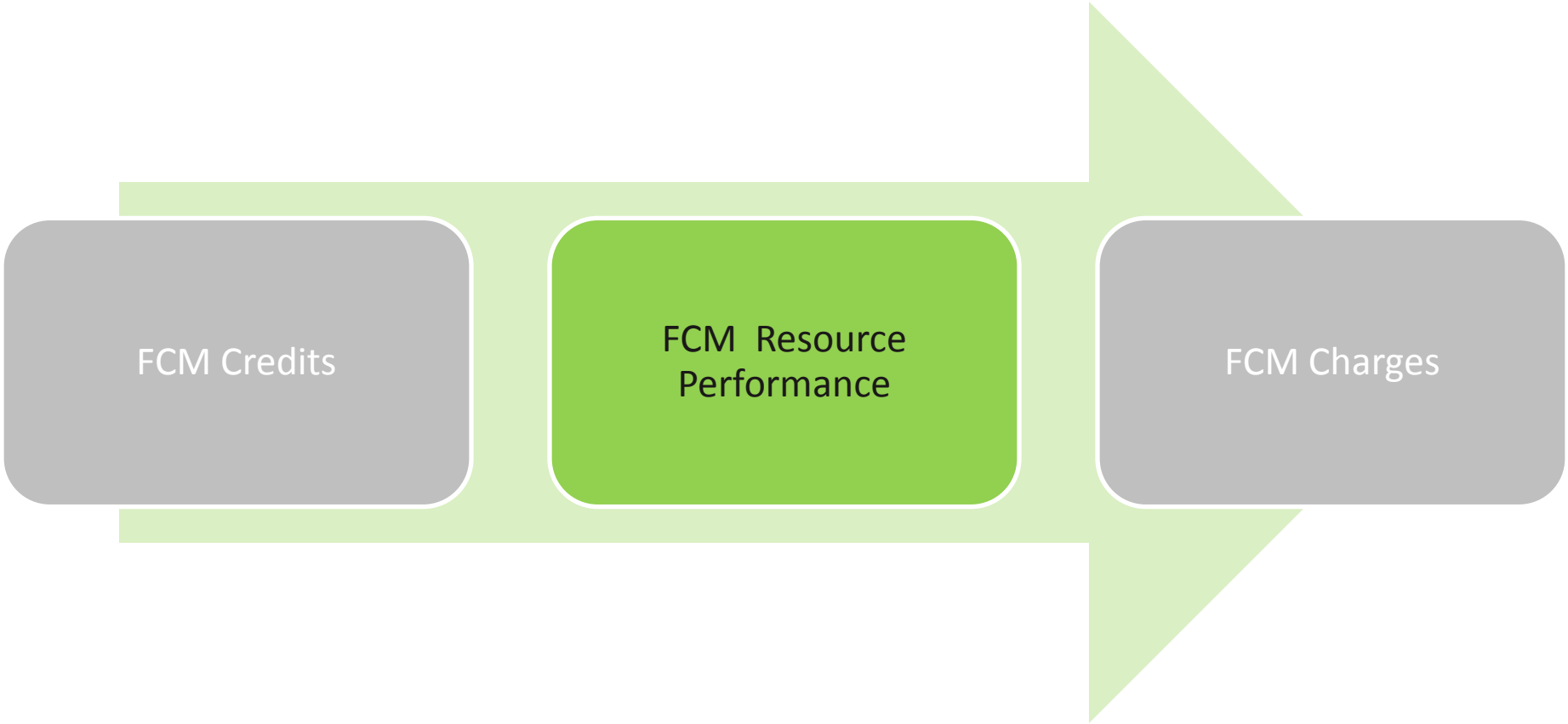
FCM Credits

- Topics discussed in this section:
  - ✓ Calculation of the FCM credit for obligations obtained through a **FCA**
  - ✓ How the credit or charge applicable to obligations acquired or shed through a **reconfiguration auction or CSO Bilateral** are calculated
  - ✓ The concepts for calculating **hourly and monthly PER**
  - ✓ How a **PER adjustment** for a resource is calculated



FCM Settlement

FCM Resource Performance



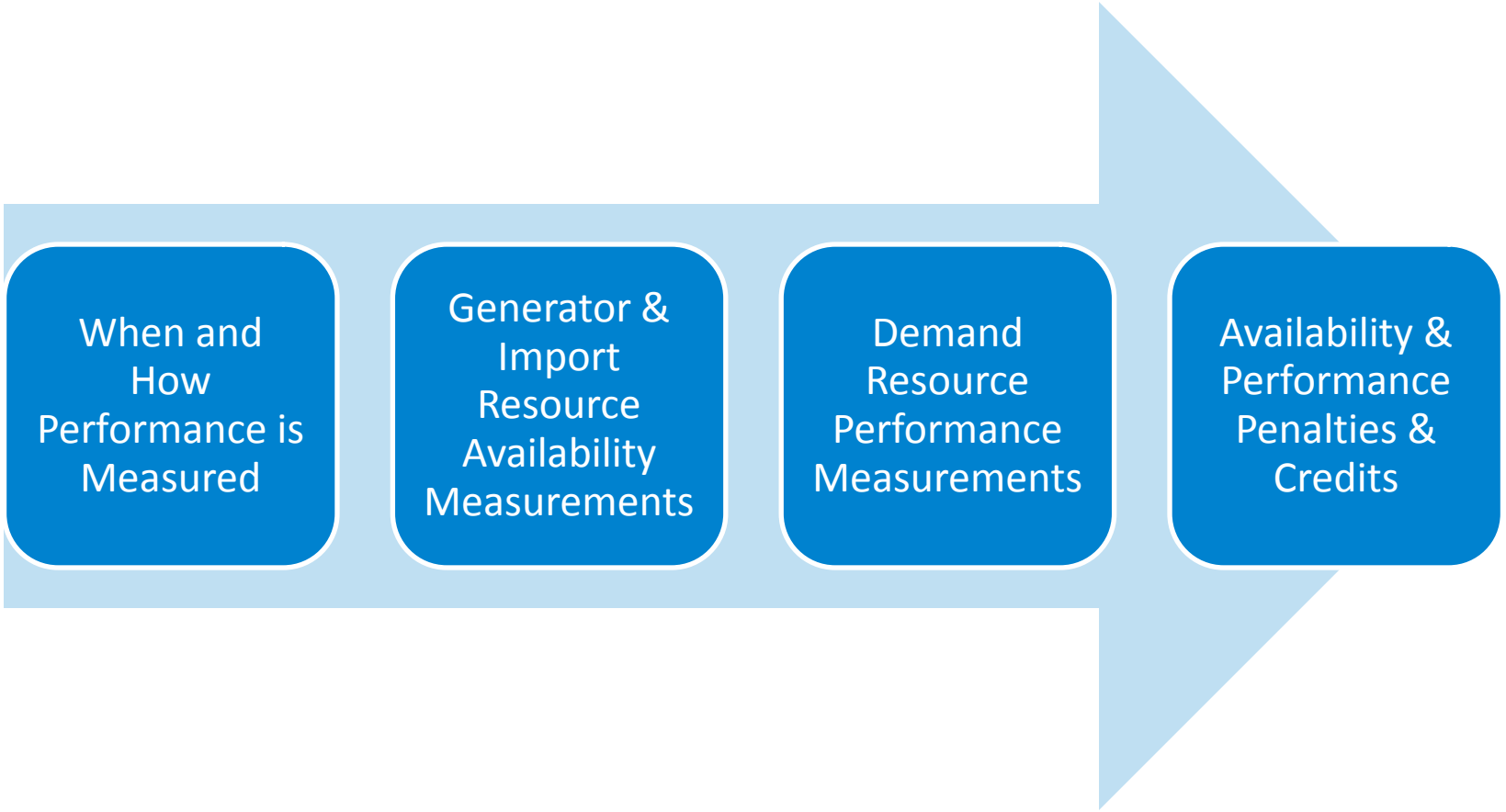
Section Objectives

FCM Resource Performance

- At the end of this section, you will be able to:
  - Describe when performance is measured for generator, import and demand resources
  - Define a Shortage Event and understand how the length of Shortage Events is determined
  - Understand the concept of generator and import resource availability scores and how availability can be adjusted
  - Understand passive resource performance and active demand resource dispatch deviations and the impact they have on overall performance
  - Describe the concept of availability and performance penalty and credit calculations

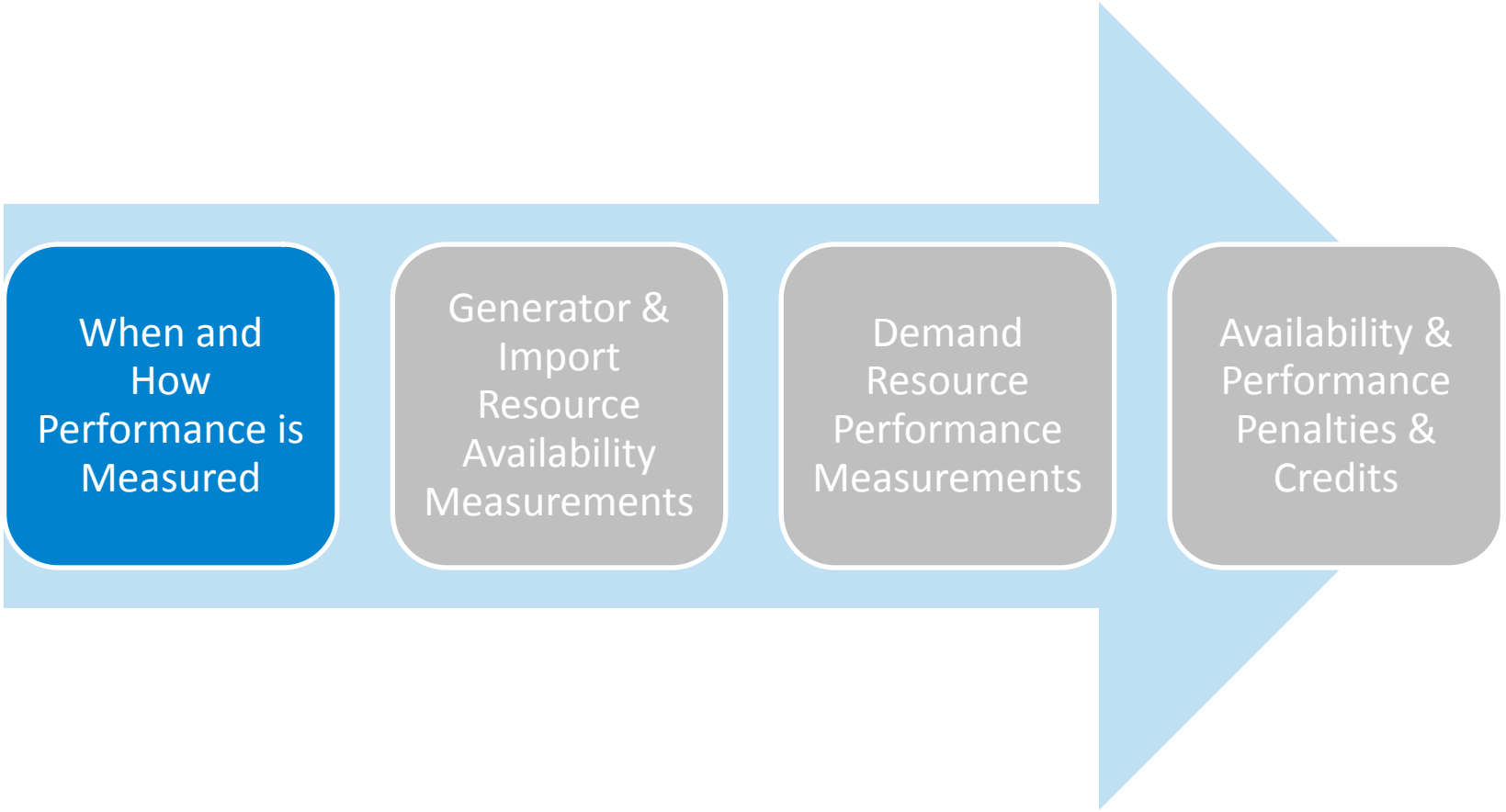
FCM Resource Performance

Section Components



FCM Resource Performance

Section Components



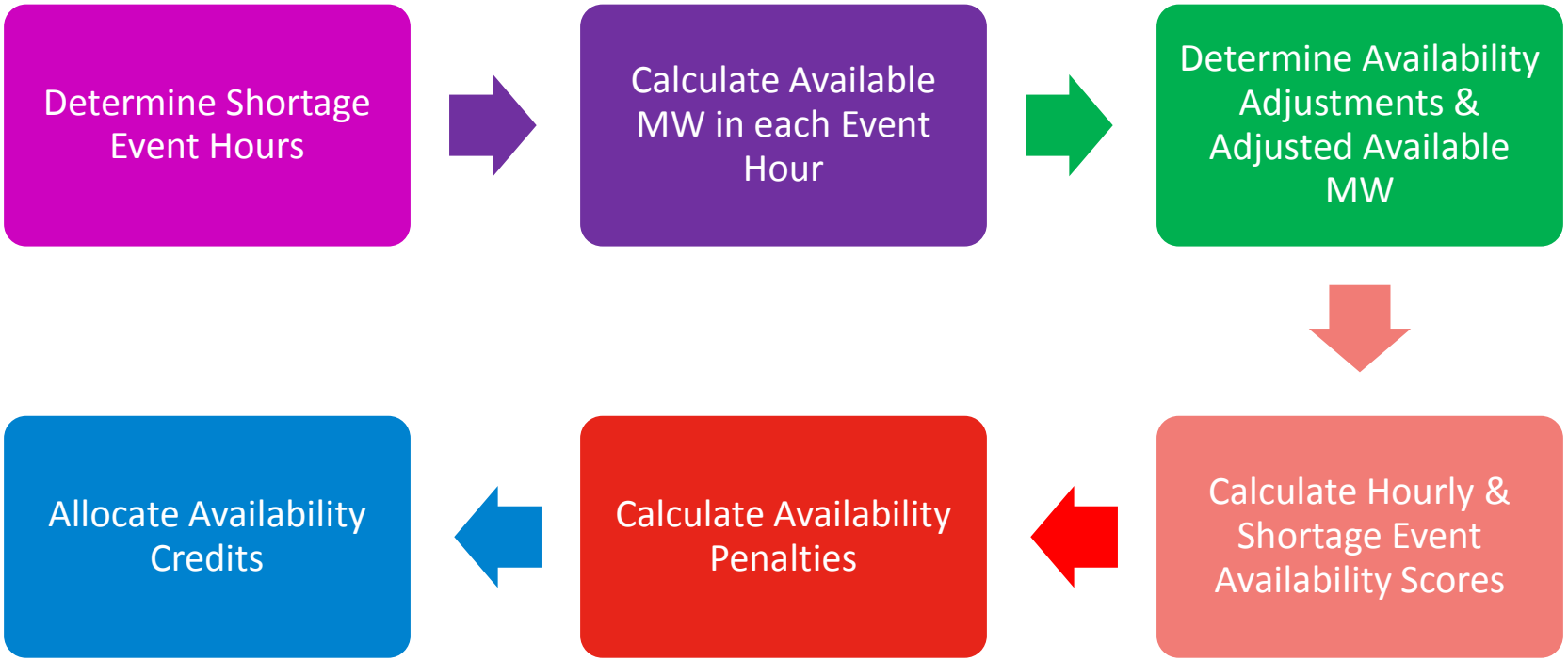
FCM Resource Performance

What is Resource Performance? When is it Calculated?

- A measurement to ensure all resources with a CSO are delivering the obligated capacity during appropriate system hours
- Generating and import capacity resources are measured during Shortage Events
- Demand resources are measured during Seasonal Performance Hours or Dispatch Events
- Resource performance measurements will be based on asset to resource relationships as of the 1st of a settlement month

FCM Resource Performance

Generator & Import Resource Availability Process



FCM Resource Performance

What is a Shortage Event?

Determine Shortage Event Hours

- A **Shortage Event** may be either system-wide or may be limited to an Import Constrained Capacity Zone
- A system-wide Shortage Event reflects a shortage of operating reserves:
  - Defined as 30 or more consecutive minutes of system Reserve Constraint Penalty Factor (RCPF) activation (a.k.a. Total 10)
  - RCPF reflects two values:
    - Penalty when reserve shortage cannot be met by the system
    - Cap on the re-dispatch cost of reserves that the system will allow before going short of reserves
  - An Export Constrained Capacity Zone is excluded from the Shortage Event if there are OP4 or OP7 actions declared for any other Capacity Zone, but not in the Export Constrained Capacity Zone

FCM Resource Performance

What is a Shortage Event? (cont.)

Determine Shortage Event Hours

- An Import-Constrained Capacity Zone Shortage Event can also occur when there are:
  - 30 or more consecutive minutes of OP4, actions 6, 12, or 13; or any OP7 actions within the Capacity Zone;
  - The actions were called based on adequacy and not security;
  - And, the actions have not been declared in any other Capacity Zone
- No Import-Constrained Capacity Zones have cleared in at least the first five FCAs

FCM Resource Performance

What is a Shortage Event? (cont.)

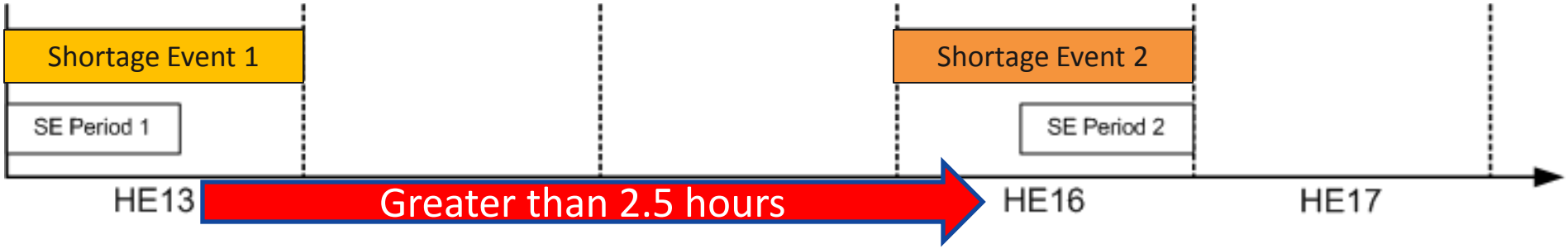
Determine Shortage Event Hours

- Discrete Shortage Events, are those events separated by at least 2.5 hours
- In cases where the Shortage Event criteria were met again before 2.5 hours have passed, the periods would be aggregated together to create one discrete Shortage Event:
  - Duration of a Shortage Event is the total of the minutes of all of the associated periods that comprise the Shortage Event.
- No more than two Shortage Events per Capacity Zone will be valid each day
- Shortage Events will be associated to the day and/or month in which they began

FCM Resource Performance

Shortage Event Example 1

Determine Shortage Event Hours

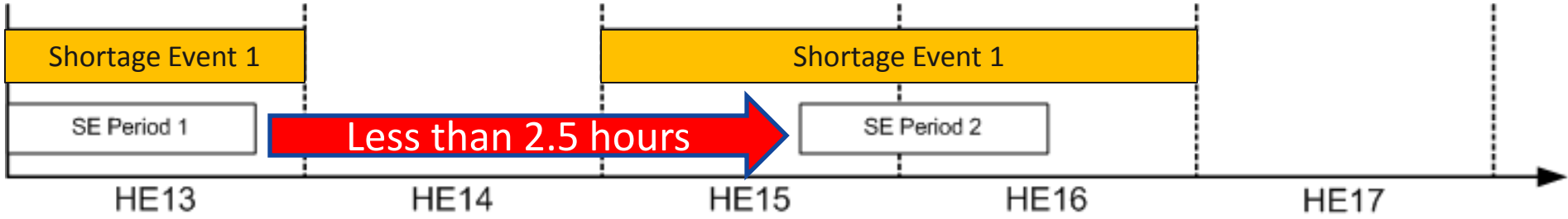


- There are two periods in which the Shortage Event criteria have been met:
  - Separated by more than 2.5 hours
  - Treated as two discrete Shortage Events
    - Duration of SE Period 1 and therefore Shortage Event 1 is 30 minutes in HE13
    - Duration of SE Period 2 and Shortage Event 2 is 30 minutes in HE16

FCM Resource Performance

Shortage Event Example 2

Determine Shortage Event Hours



- There are two periods in which the Shortage Event criteria have been met:
  - Separated by less than 2.5 hours
  - Treated as one discrete Shortage Event
  - Duration of the Shortage Event is based upon the two SE Periods:
    - SE Period 1 is 45 minutes in HE13
    - SE Period 2 is 20 minutes in HE15 and 30 minutes in HE16
    - The total Shortage Event duration is 95 minutes (45 + 20 + 30)

FCM Resource Performance

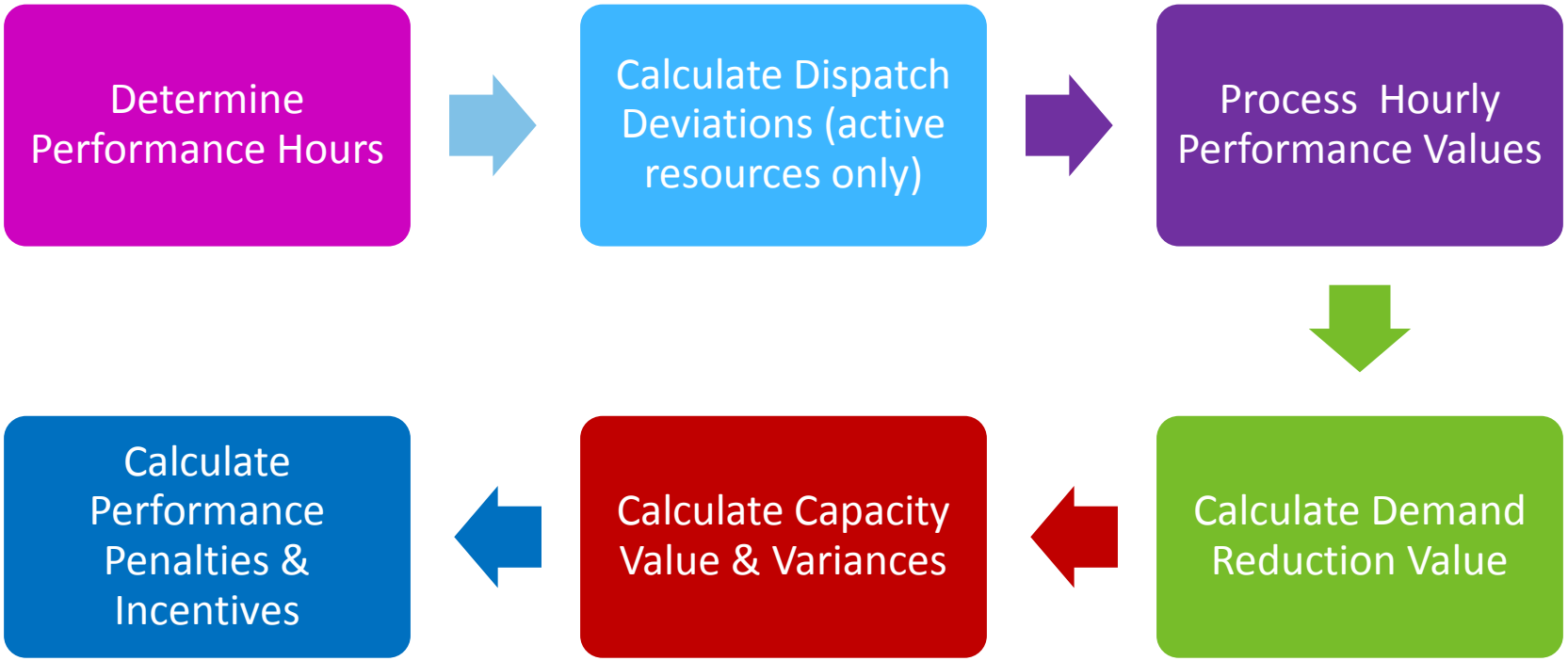
What is the Performance Measurement for Demand Resources?

- Demand resources with a capacity value less than their CSO are assessed a performance penalty
- Demand resources with a capacity value greater than their CSO are eligible to receive a performance incentive:
  - If the total pool penalties assessed are less than incentives earned:
    - Incentives are pro-rated to equal the total penalties
  - If total pool penalties assessed are greater than incentives paid:
    - The excess penalties collected are refunded to load (adjustment to Net Regional Clearing Price CZ)

$$Capacity\ Value_{Resource} = DRV \times RM\ Factor \times T\&D\ Loss\ Factor$$

FCM Resource Performance

Demand Resource Performance Process



FCM Resource Performance

What are Seasonal Performance Hours for Demand Resources?

Determine Performance Hours

- Active Demand Resources (RTDR, RTEG):
  - Are measured during dispatch hours in each month (a.k.a. event hours)
- Passive Demand Resources (OP, SP):
  - Are measured in seasonal performance hours during seasonal performance months:
    - Summer – June, July & August
    - Winter – December & January

Active Demand Resources	Passive Demand Resources
Real-Time Demand Response Event Hours	On-Peak Hours
Real-Time Emergency Event Hours	Seasonal Peak Hours

- On Peak Hours are defined in ISO NE Tariff, Section I – General Terms & Conditions

(ISO NE Tariff, Section 1 – General Terms & Conditions; MR 1. III.13.1.4.4)

FCM Resource Performance

How are Seasonal Peak Hours Communicated?

Determine Performance Hours

- ISO will calculate Seasonal Peak Hours for the five performance months only:
  - June, July, August, December, and January
- ISO will publish a Seasonal Peak Hour Report on its website, identifying the Seasonal Peak Hours in the month and each hour's status:
  - **Preliminary Status:** Combination of Settlement and Operation load data
  - **Final Status:** Only Settlement load data
- Location of report: Markets > Other Markets Data > Forward Capacity Market > Reports (Seasonal Peak Hour Data)
- Posting will occur no later than 17:00 on the first business day after the close of the Obligation Month

FCM Resource Performance

What are Dispatch Event Hours?

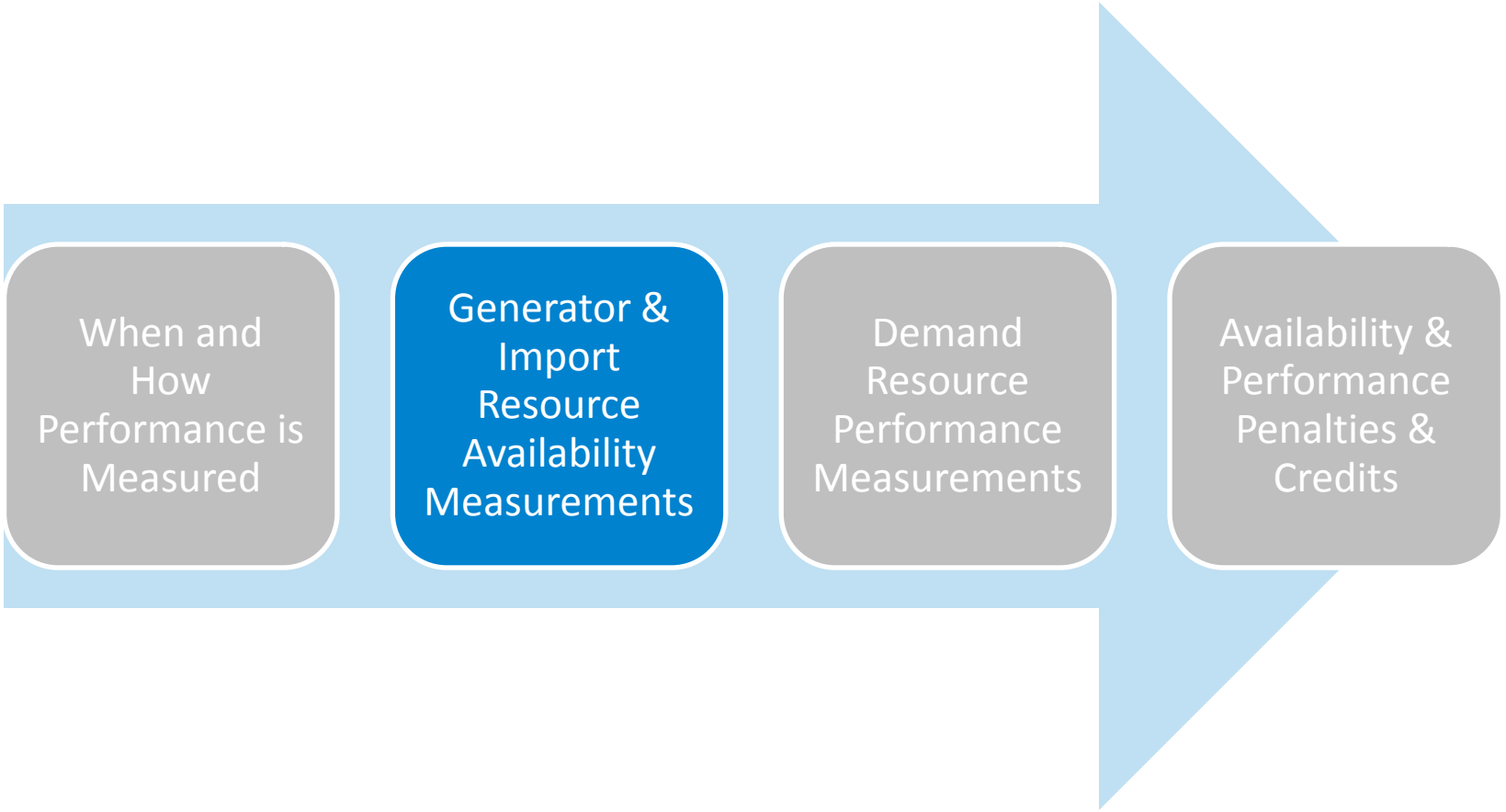
Determine Performance Hours

- Any hour or portion of an hour in which Active Demand Resources are dispatched in a zone to a MW level > 0 (increase or decrease of desired MW reduction).
- Dispatch Instructions will be sent to DDEs and the DDEs are responsible for the dispatch of assets associated with the dispatched Demand Resource:

Key Point: All assets associated to a demand resource are evaluated in every dispatch segment and/or event hour, therefore assets that are not asked to interrupt by the DDE and use more load than normal, will impact the resource's overall performance.

FCM Resource Performance

Section Components



FCM Resource Performance

Available MW: Generating Capacity Resource

Calculate Available MW in each Event Hour

- For each Non-IPR generating resource and import resource that has a CSO; hourly available MW will be determined for all hours in which a Shortage Event occurred:
  - Hourly available MW calculation allows for resources to be considered partially available during the Shortage Event.
  - Hourly available MW are reduced by the hourly integrated delivered MW associated with export external transactions.
- Intermittent Power Resource (IPR) performance is not evaluated during Shortage Events:
  - Resource availability is incorporated into the Qualified & CSO MW for all IPR resources

FCM Resource Performance

Available MW: Generating Capacity Resource (cont.)

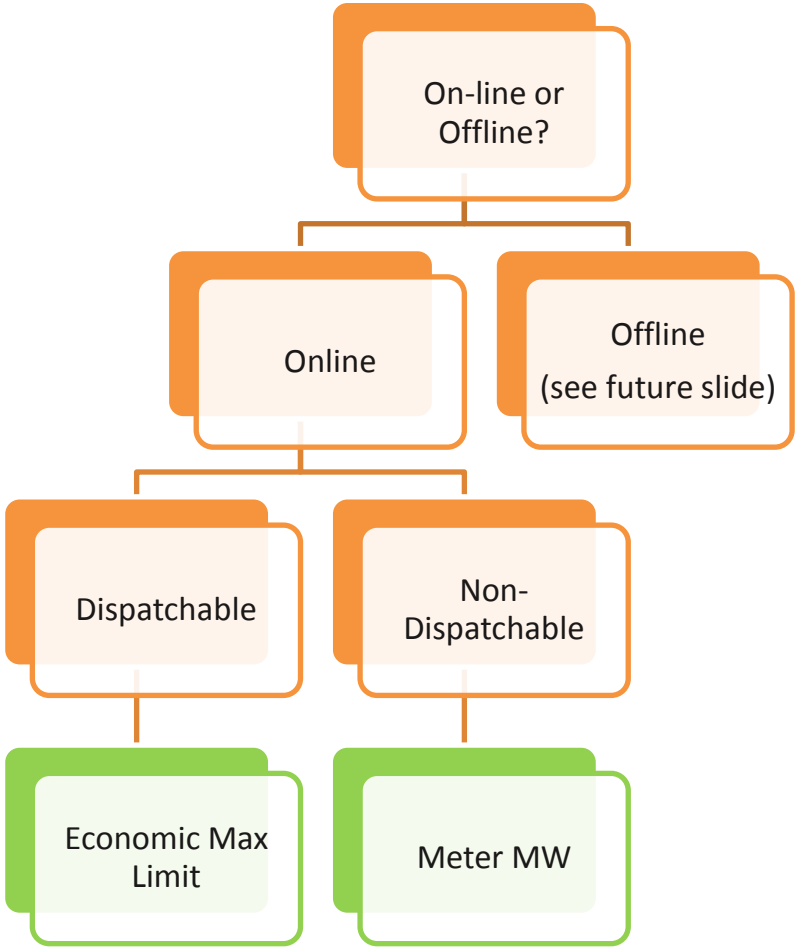
Calculate Available MW in each Event Hour

- Online Available resources are those that have a positive metered output for the hour
  - Including resources that are forced offline or that come online within the hour
  - Online resource can be either dispatchable or non-dispatchable
- Offline Available resources are those not committed for:
  - ISO-NE transmission problem
  - A denied self-schedule
  - Offline due to ISO dispatch to stay offline (following ISO dispatch instructions)
  - Certain other exceptions as detailed in Market Rule 1

FCM Resource Performance

Available MW: Generating Capacity Resource (cont.)

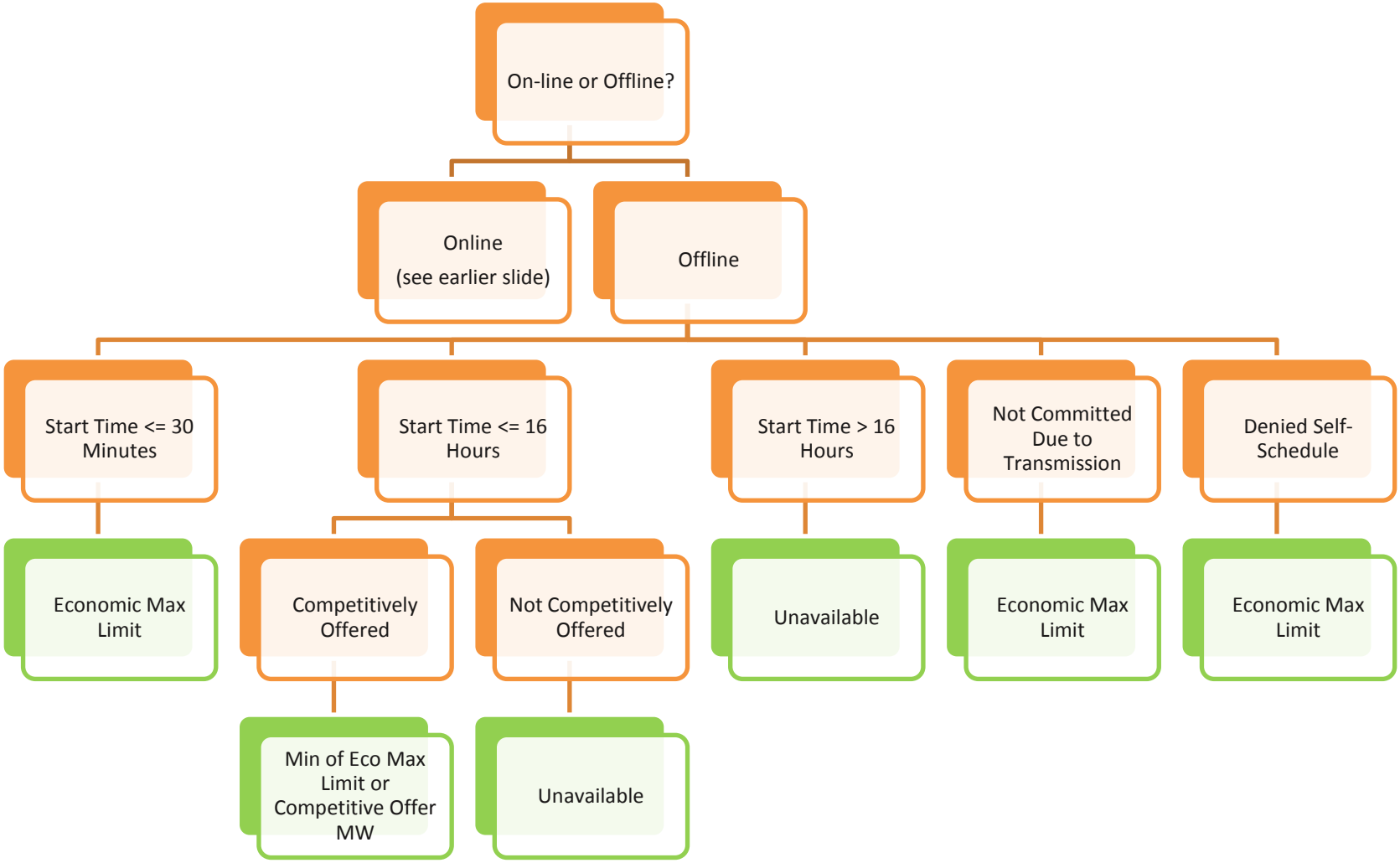
Calculate Available MW in each Event Hour



FCM Resource Performance

Available MW: Generating Capacity Resource (cont.)

Calculate Available MW in each Event Hour



FCM Resource Performance

Available MW: Generating Capacity Resource (cont.)

Calculate Available MW in each Event Hour

- New generating capacity resources that have completed construction but are not commercial because planned transmission facilities are not in service will be exempt from availability penalties

FCM Resource Performance

Available MW: Import Capacity Resource

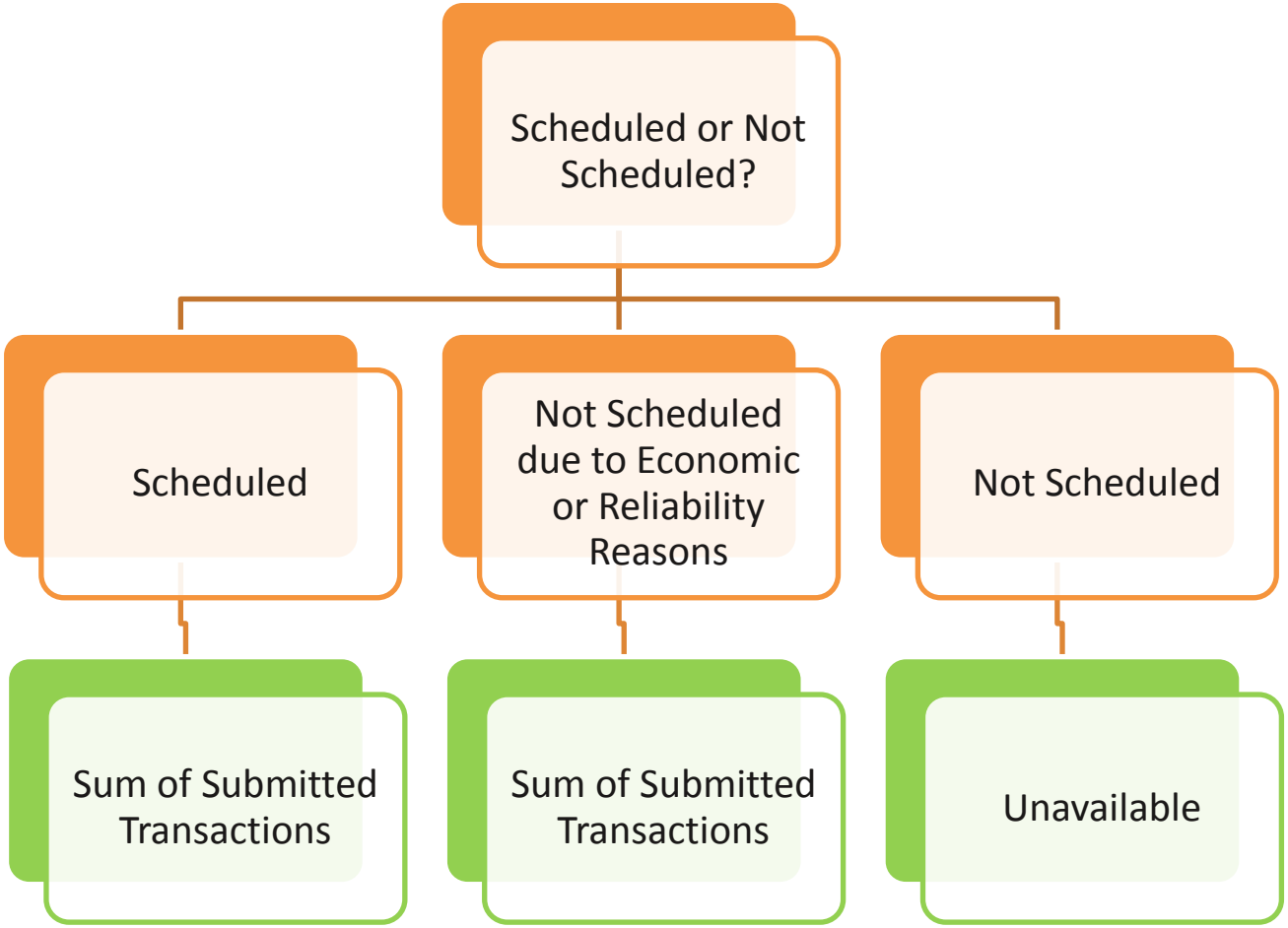
Calculate Available MW in each Event Hour

- An import capacity resource is considered available if the transaction is submitted into both the Day-Ahead and Real-Time Markets for all hours of the day and follows ISO dispatch instructions:
  - In addition, the external transaction must have been properly submitted into the source control area
- Import resource transactions can be:
  - Scheduled
  - Not Scheduled

FCM Resource Performance

Available MW: Import Resources (cont.)

Calculate Available MW in each Event Hour



FCM Resource Performance

Availability Adjustments

Determine Availability Adjustments & Adjusted Available MW

- Hourly available MW will be adjusted in each shortage event hour by the following adjustments:
  - Non-IPR generation resources:
    - Confirmed Supplemental Availability Bilaterals
    - Exempt Outages
  - Import resources backed by a single external unit:
    - Exempt Outages
- The ISO provides resource preliminary availability scores, not including adjustments, during the Obligation Month:
  - Approximately three days after each shortage event.
- Final availability scores, including availability adjustments, will be calculated in the billed FCM settlement.

FCM Resource Performance

Supplemental Availability Bilateral

Determine Availability Adjustments & Adjusted Available MW

- A Supplemental Availability Bilateral is a settlement mechanism that transfers available MW between two generating resources:
  - Supplementing resource must be designated prior to Day-Ahead deadline for operating day
  - Shortage event hours only and must be confirmed by the other party
  - Not a physical transfer, and does not transfer CSO
- In order to be included in the initial settlement:
  - Submitted and confirmed no later than 12:00 pm on the second business day after the end of the Obligation Month
- In order to be included in the resettlement:
  - Submitted and confirmed up to 101 days after the first day of the month following the Obligation Month

FCM Resource Performance

Exempt Outages

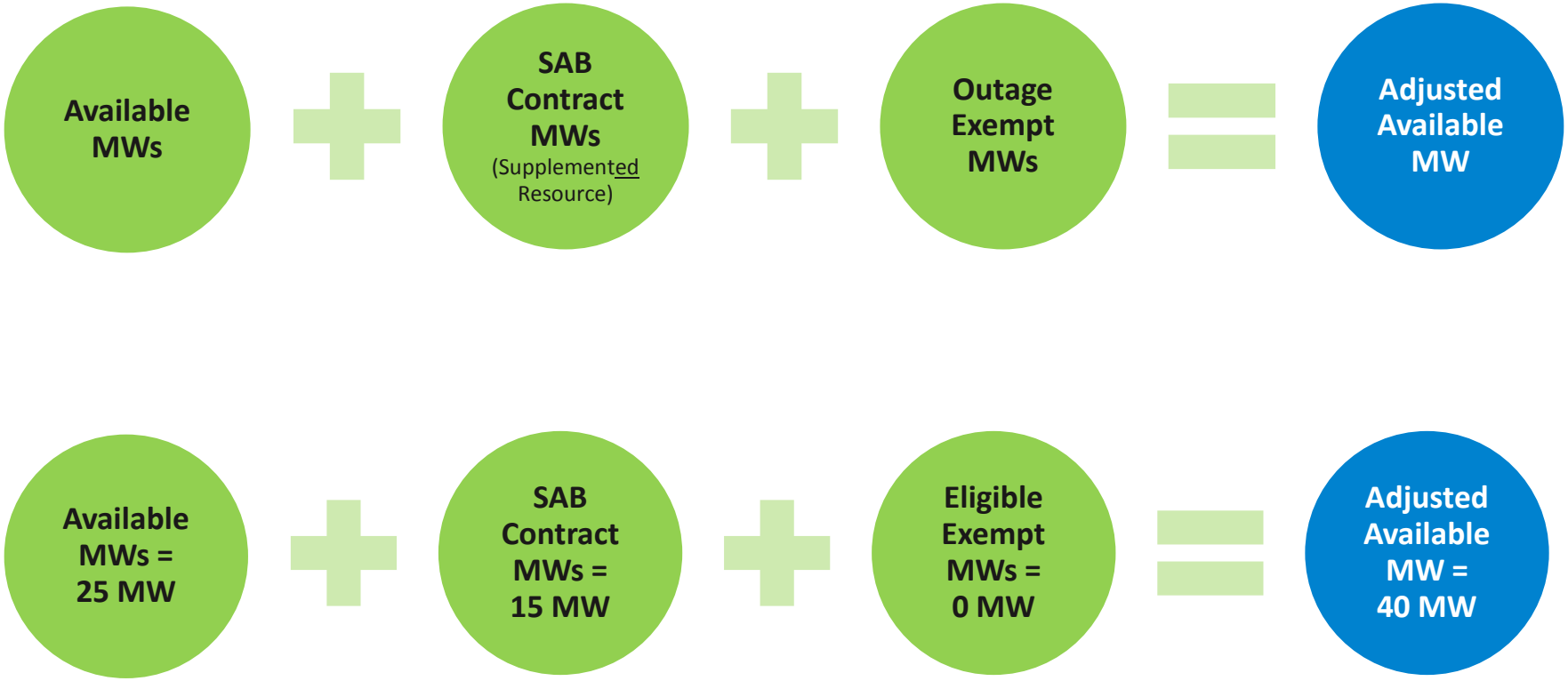
Determine Availability Adjustments & Adjusted Available MW

- Outages become exempt and eligible as adjustments to shortage event availability scores if:
  - Outage is planned, has been submitted to the ISO, approved by the ISO, and is in the Annual Maintenance Schedule (OP-5 Outage Scheduling)
  - Designated as "exempt" in the outage submittal process
  - Exempt outage allotment hours are greater than zero at the time of the shortage event
- Annual & major maintenance period exempt outage allotment hours can be found at Markets > Other Markets Data > Forward Capacity Market > Relevant Documentation
- Updates to exempt outage allotment hours are communicated via settlement reports:
  - Annually – SR_ANNUALEPOH
  - Monthly – SD_MONTHLYEPOH

FCM Resource Performance

Adjusted Available MW: Supplemented Resource

Determine Availability Adjustments & Adjusted Available MW



FCM Resource Performance

Hourly & Shortage Event Availability Scores

Calculate Hourly & Shortage Event Availability Scores

- An hourly availability score is calculated for all hours in which a Shortage Event occurred, which is based upon performance across the entire hour for each generating* and import resource that has a CSO:

Hourly Availability Score = Minimum of [[(Hourly Available MW + Hourly Availability Adjustment MW) / Capacity Supply Obligation], 100%)

- A Shortage Event availability score is calculated for each discrete Shortage Event as the sum of the time-weighted hourly availability scores for all hours associated to the Shortage Event:

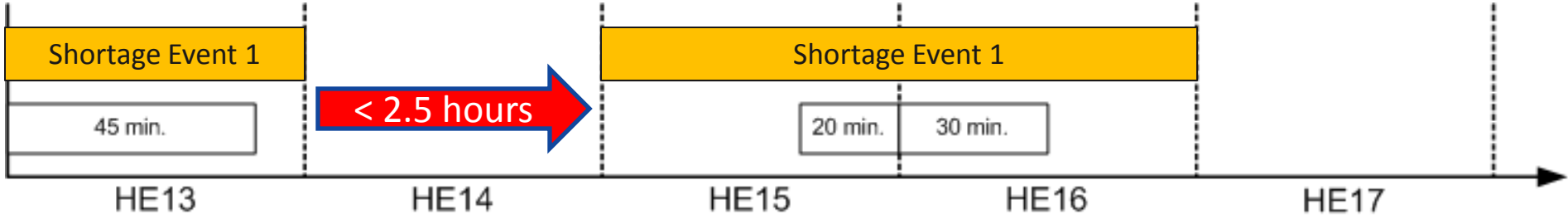
Shortage Event Availability Score = Sum of [Hourly Availability Score x Hourly Shortage Event Duration / Total Shortage Event Duration]

*Except those Resources that are not able to achieve commercial operation due to planned transmission facility not being in service

FCM Resource Performance

Hourly Availability Score Example

Calculate Hourly & Shortage Event Availability Scores



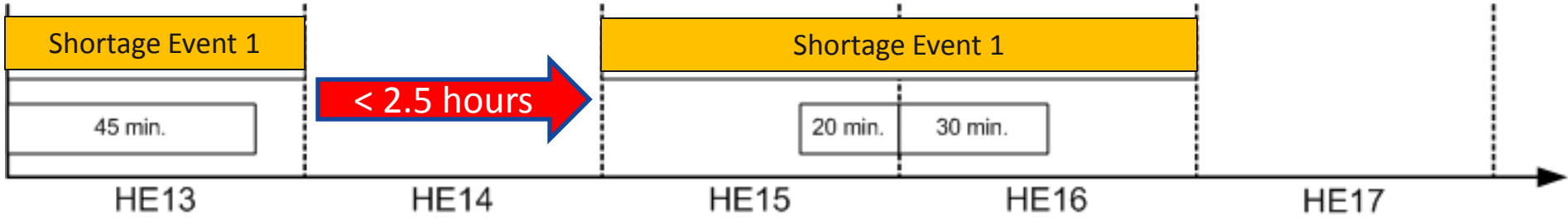
The availability score is computed based upon hourly available MW in HE13, HE15 and HE16:

Event Number	Hour Ending	Available MW *(A)*	CSO *(B)*	Hourly Availability Score *MIN (A/B, 100%)*
1	1300	195	195	100%
1	1500	200	195	100%
1	1600	100	195	51%

FCM Resource Performance

Shortage Event Availability Score Example

Calculate Hourly & Shortage Event Availability Scores

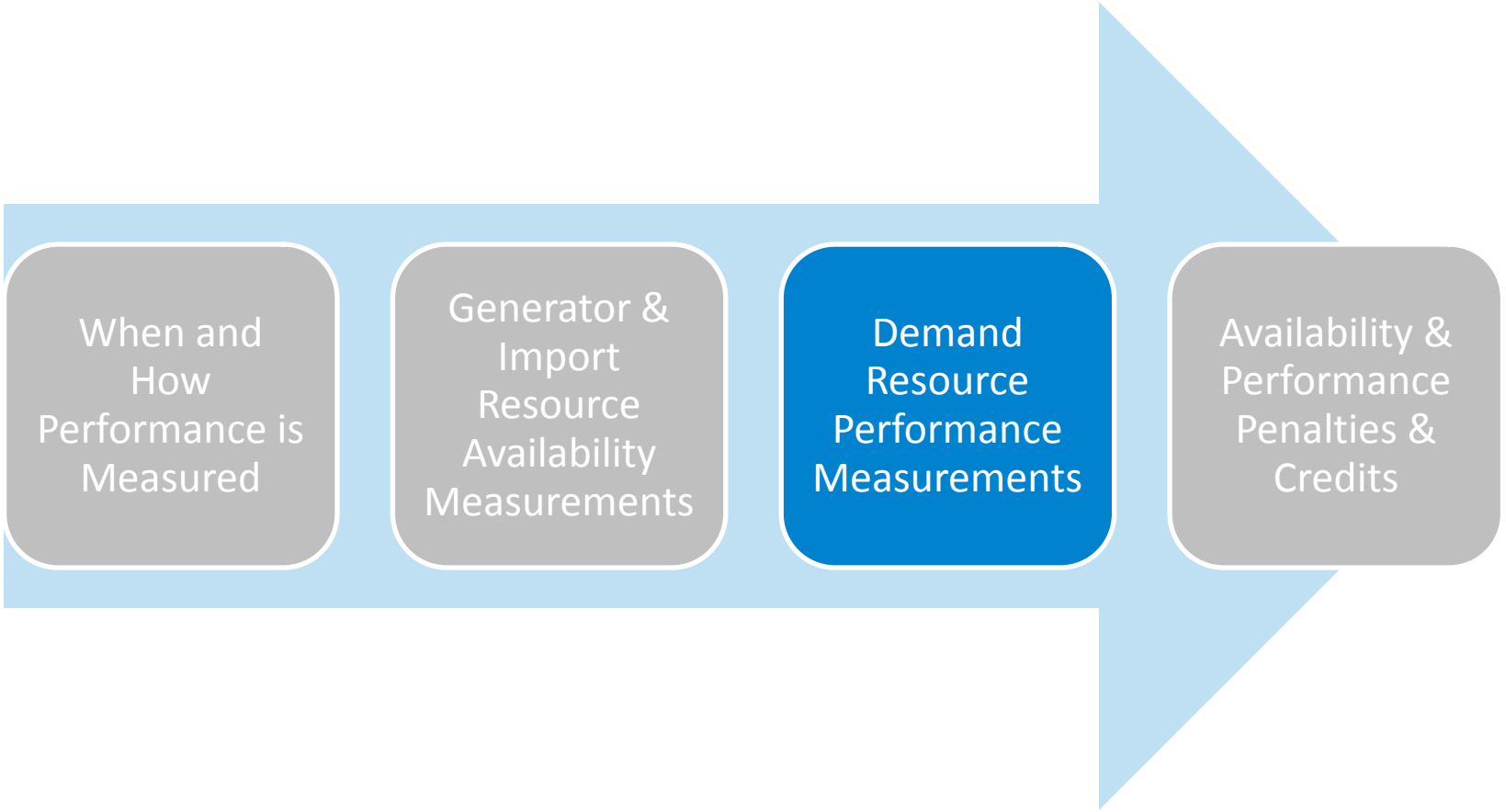


The Shortage Event availability score is a time-weighted average of the hourly scores in each hour associated with the Shortage Event:

Hour Ending	**Shortage Event Duration** *(A)*	**Hourly Availability Score** *(B)*	**Contribution to Event Score** *[A x B / Event Duration]*
1300	45 minutes	100%	47%
1500	20 minutes	100%	21%
1600	30 minutes	51%	17%
Event 1	**95 minutes**		**85%**

FCM Resource Performance

Section Components



FCM Resource Performance

How is a Demand Resource Asked for Relief?

- Active demand resources are instructed to provide relief via a dispatch instruction for a specific MW amount via a Remote Terminal Unit (RTU)
- A dispatch instruction will communicate:
  - Dispatch MW (amount of MW of relief to provide)
  - Dispatch Time (time instruction was issued)
  - Effective Time (time resource is expected to attain dispatch MW)
  - Audit Indicator (only when resource is being audited)
- A dispatch instruction can:
  - Require a demand resource to reduce some or all of its Net CSO
  - There can be multiple dispatch instructions during an hour or an event (a.k.a. dispatch segment)

FCM Resource Performance

What is a Dispatch Segment?

Calculate Dispatch Deviations (active resources only)

- Dispatch segments are records formulated from dispatch instructions containing data points necessary to complete a demand resource's performance evaluation
- A dispatch segment consists of the following data points:

Resource ID	Issue Time	Segment Begin Time	Segment End Time	Segment Minutes	Segment Dispatch MW	Integrated Segment Dispatch MW	H/E Dispatch MW	Interrupted MW	Dispatch Deviation

**Examples showing dispatch segment calculations are provided in the *Forward Capacity Market (FCM 101)* training available on ISO New England's website: Support > Training > Training Materials > Forward Capacity Market

FCM Resource Performance

What is the DRV of a Demand Resource?

Calculate Demand Reduction Value

- **Demand Reduction Value (DRV)** – The quantity of reduced demand, measured at the end-use customer produced by a demand resource in a month:
  - **Monthly DRV (mDRV)** is calculated during performance months:

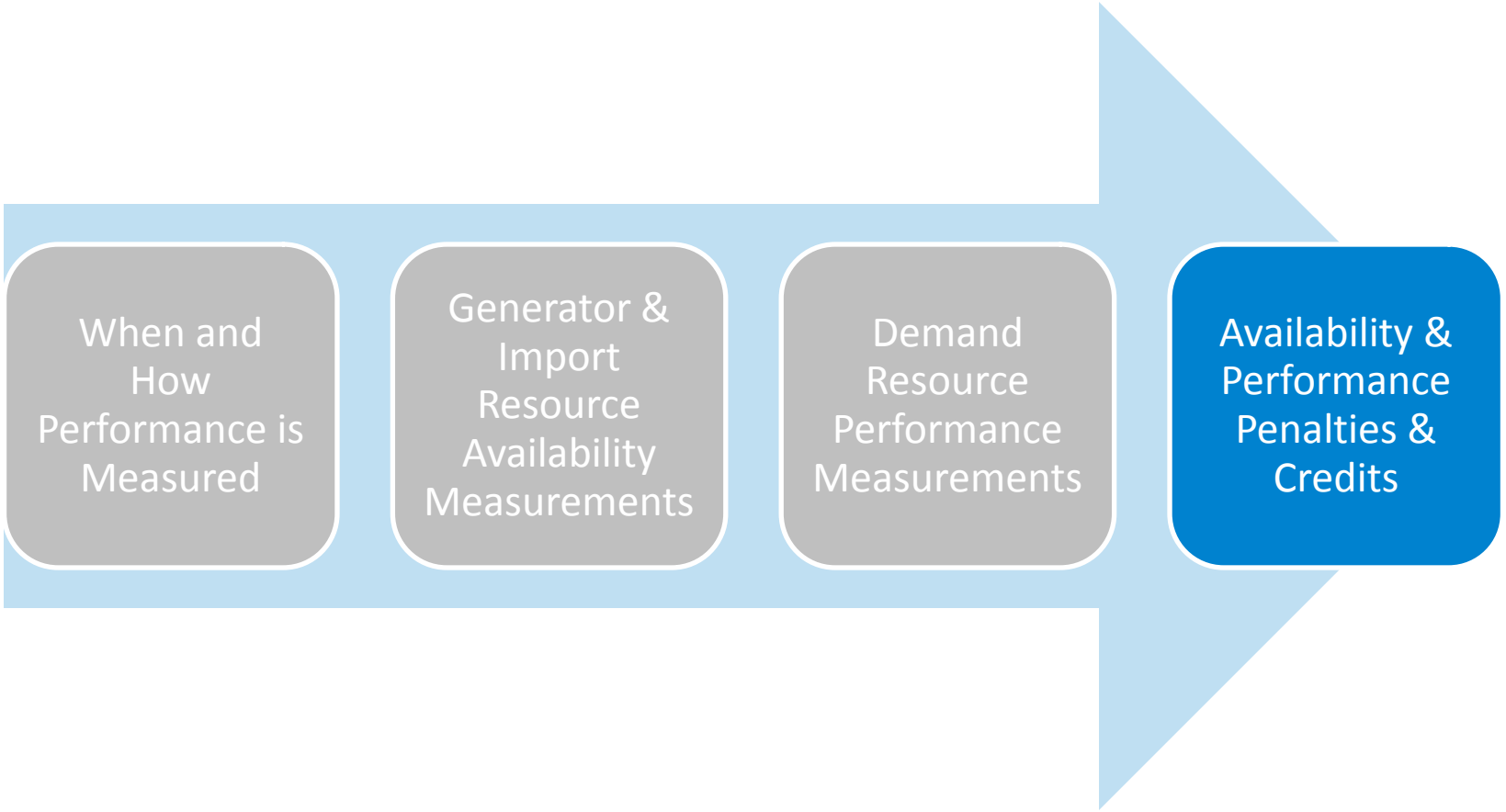
$$Monthly\ DRV_{Active} = AVERAGE(Hourly\ Performance\ Values_{Month})$$

$$Monthly\ DRV_{Passive} = AVERAGE(Load\ Reduction_{Performance\ Hours,\ Month})$$

  - **Seasonal DRV (sDRV)** is calculated during non-performance months and used as a resource's DRV value in that month

FCM Resource Performance

Section Components



FCM Resource Performance

Shortage Event Availability Penalty

Calculate Availability Penalties

- Each resource's Shortage Event availability penalty is based on the resource annualized forward capacity payment, its Shortage Event availability score and the Shortage Event penalty factor (PF):
  - PF is 5% for events lasting 5 hours or less
  - And increased by 1% for each additional hour of the event

Shortage Event Penalty =
Annualized Forward Capacity Payment x PF x
(100% - Shortage Event Availability Score) x -1

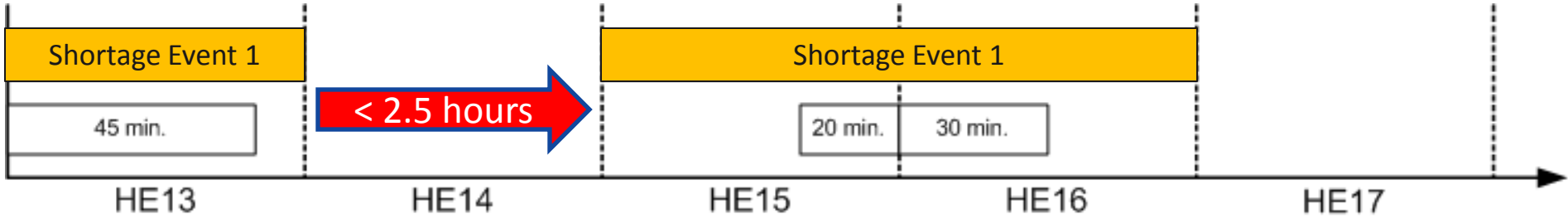
  - Resource Annualized Forward Capacity Payment

Annualized Forward Capacity Payment =
CSO x Capacity Clearing Price (adjusted for Price Collar) x 12

FCM Resource Performance

Shortage Event Availability Penalty Example

Calculate Availability Penalties



- Using Shortage Event availability score from earlier example:
  - Penalty factor = 5% (Shortage Event is less than the 5 hour criterion to increase this factor)
  - Shortage Event availability score = 85%
  - FCA annualized payment = $9,945,000
- Shortage Event availability penalty is calculated as:

  = $9,945,000 x 5% x (100% - 85%) x -1

  = (**$74,587.50**)

FCM Resource Performance

Availability Penalty Capping

Calculate Availability Penalties

- There are three layers of capping which are applied to Shortage Event availability penalties:
  - Daily availability cap = 10% of the annualized FCA payment
  - Monthly availability cap = 2.5 X annualized FCA payment / 12
  - CCP Cap = annualized FCA payment - annualized PER adjustments

**Examples showing availability penalty caps are provided in the *Forward Capacity Market (FCM 101)* training available on ISO New England's website: Support > Training > Training Materials > Forward Capacity Market

FCM Resource Performance

Availability Credits

Allocate Availability Credits

- Availability credit pool of money equals the total capped monthly availability penalties assessed for each Capacity Zone
- Availability credits are distributed to resources that were available during Shortage Events
- Availability credits are allocated based on each resource's pro-rata share of the total Capacity Zone hourly available MW in the Obligation Month

Total Capacity Zone Availability Credits =
Total Availability Credits x Sum of Resource Hourly Available MWs/Total Hourly Available MWs in the Capacity Zone

FCM Resource Performance

Eligibility for Availability Credits

Allocate Availability Credits

- A resource must be:
  - A non-IPR generating or import resource with
    - CSO MW, and
    - Hourly available MW during a Shortage Event
    - Resources with self-supply obligations are included
  - A non-IPR generating resource designated as a supplemental capacity resource during a Shortage Event through a supplemental capacity bilateral transaction

Resources without a CSO, that did not indicate they would be a supplemental capacity resource are ineligible for availability credits

FCM Resource Performance

Demand Resource Penalty & Incentive Rate

Calculate Performance Penalties & Incentives

- Penalty and incentive rate for demand resources is the Adjusted FCA Category clearing price from the associated CCP** [adjusted for multi-year obligations (MRECO)]
- FCA categories for the purpose of determining a performance rate are:
  - Non-RTEG: resources that are On-Peak, Seasonal Peak or Real-Time Demand Response
  - RTEG: resources that are Real-Time Emergency Generation

**Examples showing MRECO calculations are provided in the *Forward Capacity Market (FCM 101)* training available on ISO New England's website: Support > Training > Training Materials > Forward Capacity Market

FCM Resource Performance

Demand Resource Performance Example Assumptions

- Obligation Month is August 2011 (summer performance month)
- Active RTDR resource CSO = 8.000 MW
- Passive On-Peak resource CSO = 2.000 MW
- Gross-up factors:
  - Reserve Margin = 14.5% for a gross-up factor = 1.145
  - T&D Loss Margin = 8% for a gross-up factor = 1.080
- Total Net CSO MW of active resource = 6.500 MW
- August 10th - OP 4 day, where RTDR was dispatched in Real-Time
- Pool performance penalties assessed > pool performance incentives earned

FCM Resource Performance

Example: RT Dispatch Instructions for RTDR R2

Calculate Dispatch Deviations (active resources only)

On August 10th, RTDR were dispatched in the hours beginning 1500, 1600, and 1700.

The resource received the following dispatch instructions:

Issue Time	Begin Time	End Time**	RTDR R2 Dispatch MW
14:30	15:00	15:30	4.500
15:00	15:30	16:45	5.500
16:15	16:45	17:00	6.500
17:00	17:00	17:30	4.500
17:30	17:30	18:00	3.500
18:00	18:00		0.000

**End Time is for Settlements' use only and will not appear on a dispatch instruction

FCM Resource Performance

Example: Dispatch Segments for RTDR R2

Calculate Dispatch Deviations (active resources only)

As a result of RTDR dispatch instructions, the following dispatch segments were calculated:

Segment Begin Time	Segment End Time	Segment Minutes	Segment Dispatch MW	Integrated Segment Dispatch MW	H/E Dispatch MW	Interrupted MW	Dispatch Deviation
15:00	**15:30**	30	**4.500**	2.250			
15:30	16:00	30	**5.500**	2.750	5.000	4.750	-0.250
16:00	**16:45**	45	5.500	4.125			
16:45	**17:00**	15	**6.500**	1.625	5.750	5.650	-0.100
17:00	**17:30**	30	**4.500**	2.250			
17:30	**18:00**	30	**3.500**	1.750	4.000	3.750	-0.250

FCM Resource Performance

Example: Hourly Performance Values for RTDR R2

Process Hourly Performance Values

- Using the dispatch segments and response for RTDR R2, the hourly performance values are calculated
- RTDR R2 Net CSO = 6.500 MW

Performance Value =
Net CSO x (1 + (Hourly Dispatch Deviation MW / HE Dispatch MW))
HE 16:00 = 6.5 x (1 + (-0.25 / 5.00)) = 6.5 x 0.9500 = 6.175

Hour End	H/E Dispatch MW	Interrupted MW	Dispatch Deviation	Hourly Performance Value
16:00	5.000	4.750	-0.250	6.175
17:00	5.750	5.650	-0.100	6.387
18:00	4.000	3.750	-0.250	6.094

FCM Resource Performance

Example: Monthly DRV Value for RTDR R2

Calculate Demand Reduction Value

Using the calculated hourly performance values (this is the only event in the month), the monthly DRV is calculated:

$$Monthly\ DRV_{Active} = AVERAGE(Hourly\ Performance\ Values_{Month})$$

Hour End	H/E Dispatch MW	Interrupted MW	Dispatch Deviation	Hourly Performance Value
16:00	5.000	4.750	-0.250	6.175
17:00	5.750	5.650	-0.100	6.387
18:00	4.000	3.750	-0.250	6.094
Monthly DRV			**AVG(6.175, 6.387, 6.094)**	**6.219**

FCM Resource Performance

Example: Capacity Value & Variance for RTDR R2

Calculate Capacity Value & Variances

Using the calculated monthly DRV, a capacity value and a capacity variance is calculated:

$$\text{Capacity Value}_{\text{No DG Based Assets}} = \text{mDRV} \times \text{RM Factor} \times \text{T\&D Loss Factor}$$
$$6.219 \times 1.145 \times 1.08 = 7.690$$

DRV (A)	Reserve Margin Factor (B)	T&D Loss Factor (C)	Capacity Value (A x B x C)
6.219	1.145	1.080	7.690

$$\text{Capacity Variance} = \text{Capacity Value} - \text{CSO}$$
$$7.690 - 8.000 = -0.310$$

Capacity Value (A)	CSO (B)	Capacity Variance (A - B)
7.690	8.000	-0.310

(MR 1. Sections III.13.7.1.5.1 & III.13.7.2.7.5.1)

FCM Resource Performance

Example: Performance Penalty for RTDR R2

Calculate Performance Penalties & Incentives

Because RTDR R2 had a negative capacity variance, the resource will be assessed a performance penalty, calculated as:

Performance Penalty = Negative Capacity Variance x FCA Category Clearing Price x 1000
-0.310 x 3.119 x 1000 = -$967.26

Capacity Variance (A)	FCA Category Clearing Price ($/kW) (B)	Penalty $ (A x B x 1000)
-0.310	$3.119	-$967.26

FCM Resource Performance

Example: Monthly DRV for OP R3

Calculate Demand Reduction Value

- The customer submits 125 MW of load reduction
- There are 23 performance days in August for a total of 92 performance hours

Monthly DRV =
Total Load Reduction or DG Output / Monthly Performance Hours
MPV = 125.000 / 92 = 1.358

Load Reduction MW (A)	Performance Days in Month (B)	Performance Hours per Day (C)	Monthly Performance Hours (D)	Monthly DRV (A / D)
125	23	4	92	1.358

FCM Resource Performance

Example: Capacity Value & Variance for OP R3

Calculate Capacity Value & Variances

Using the calculated monthly DRV, a capacity value and a capacity variance is calculated:

Capacity Value = mDRV x RM Factor x T&D Loss Factor
1.358 x 1.145 x 1.08 = 1.679

DRV (A)	Reserve Margin Factor (B)	T&D Loss Factor (C)	Capacity Value (A x B x C)
1.358	1.145	1.080	1.679

Capacity Variance = Capacity Value - CSO
1.679 - 2.000 = -0.321

Capacity Value (A)	CSO (B)	Capacity Variance (A - B)
1.679	2.000	-0.321

(MR 1. Sections III.13.7.1.5.1 & III.13.7.2.7.5.1)

FCM Resource Performance

Example: Performance Penalty for OP R3

Calculate Performance Penalties & Incentives

Because OP R3 had a negative capacity variance, the resource will be assessed a performance penalty, calculated as:

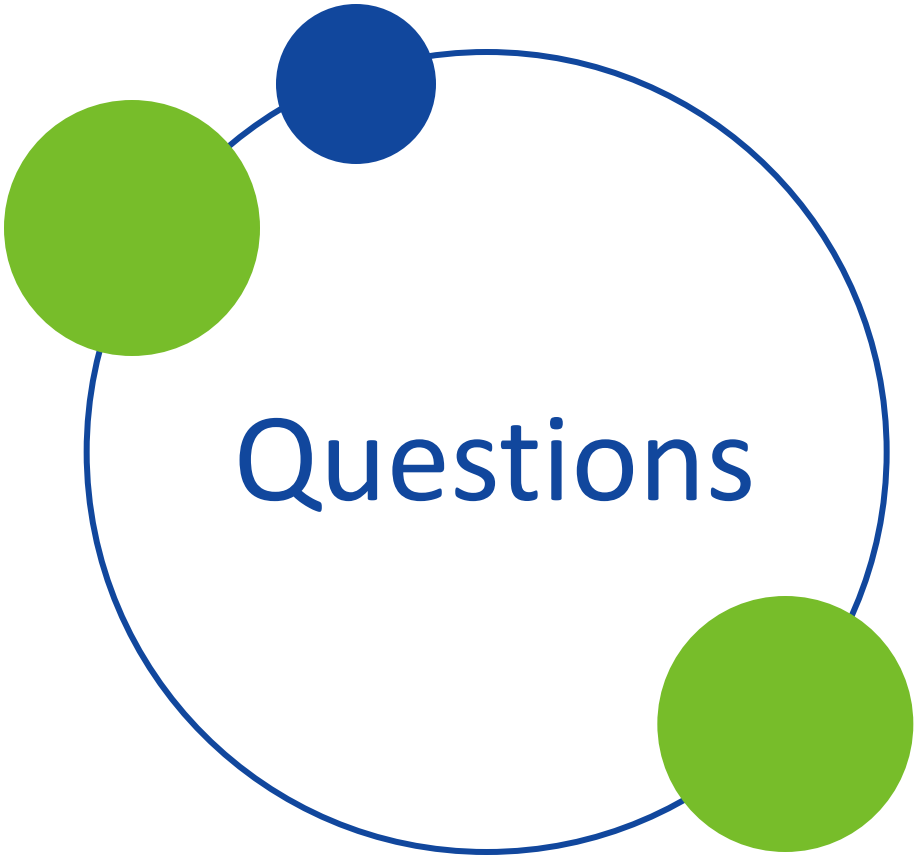
Performance Penalty = Negative Capacity Variance x FCA Category Clearing Price x 1000
-0.321 x 3.119 x 1000 = -$1,001.20

Capacity Variance (A)	FCA Category Clearing Price ($/kW) (B)	Penalty $ (A x B x 1000)
-0.321	$3.119	-$1,001.20

Section Review

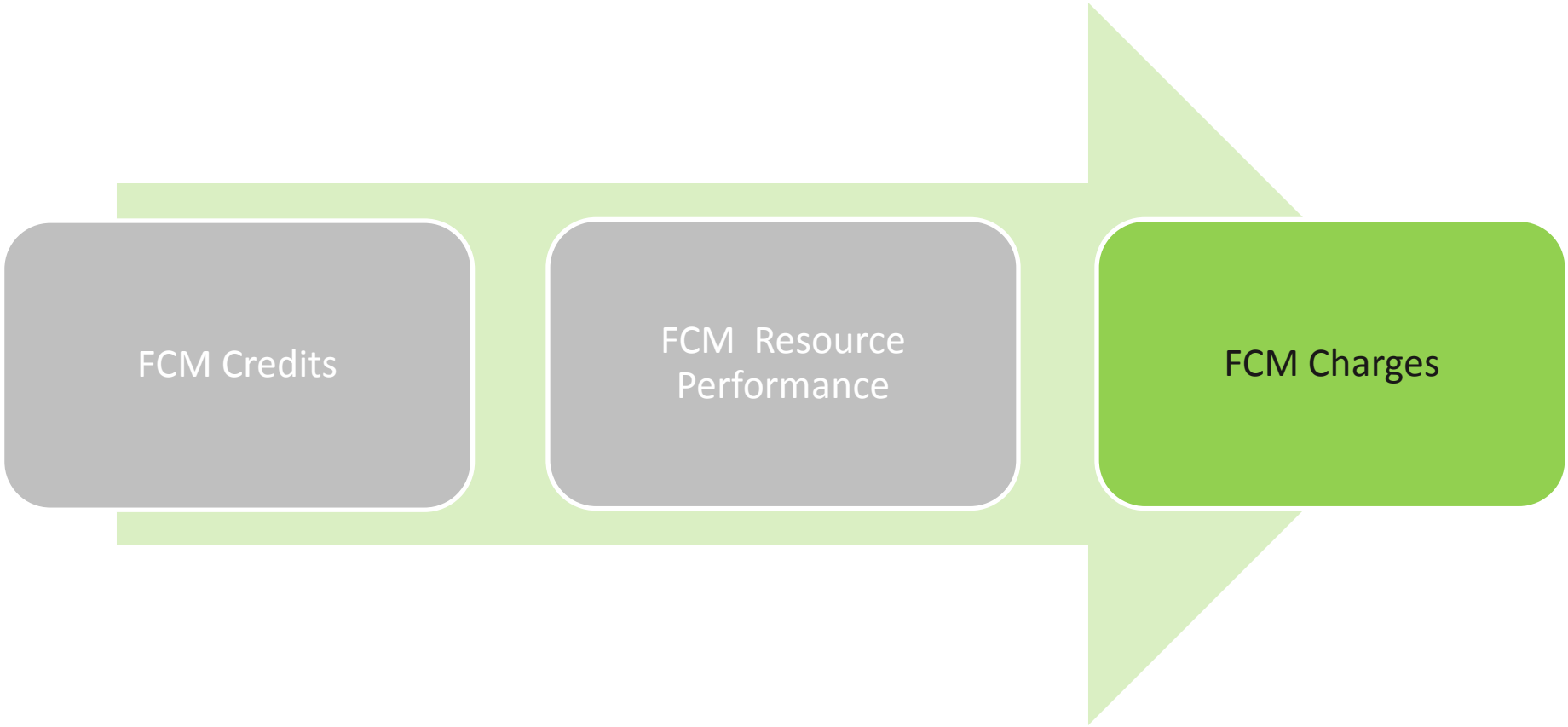
FCM Resource Performance

- Topics discussed in this section:
  - ✓ Describe when performance is measured for generating, import and demand resources
  - ✓ Define a Shortage Event and understand how the length of Shortage Events is determined
  - ✓ Understand the concept of generator and import resource availability scores and how availability can be adjusted
  - ✓ Understand passive resource performance and active demand resource dispatch deviations and the impact they have on overall performance
  - ✓ Describe the concept of availability and performance penalty and credit calculations



FCM Settlement

FCM Charges



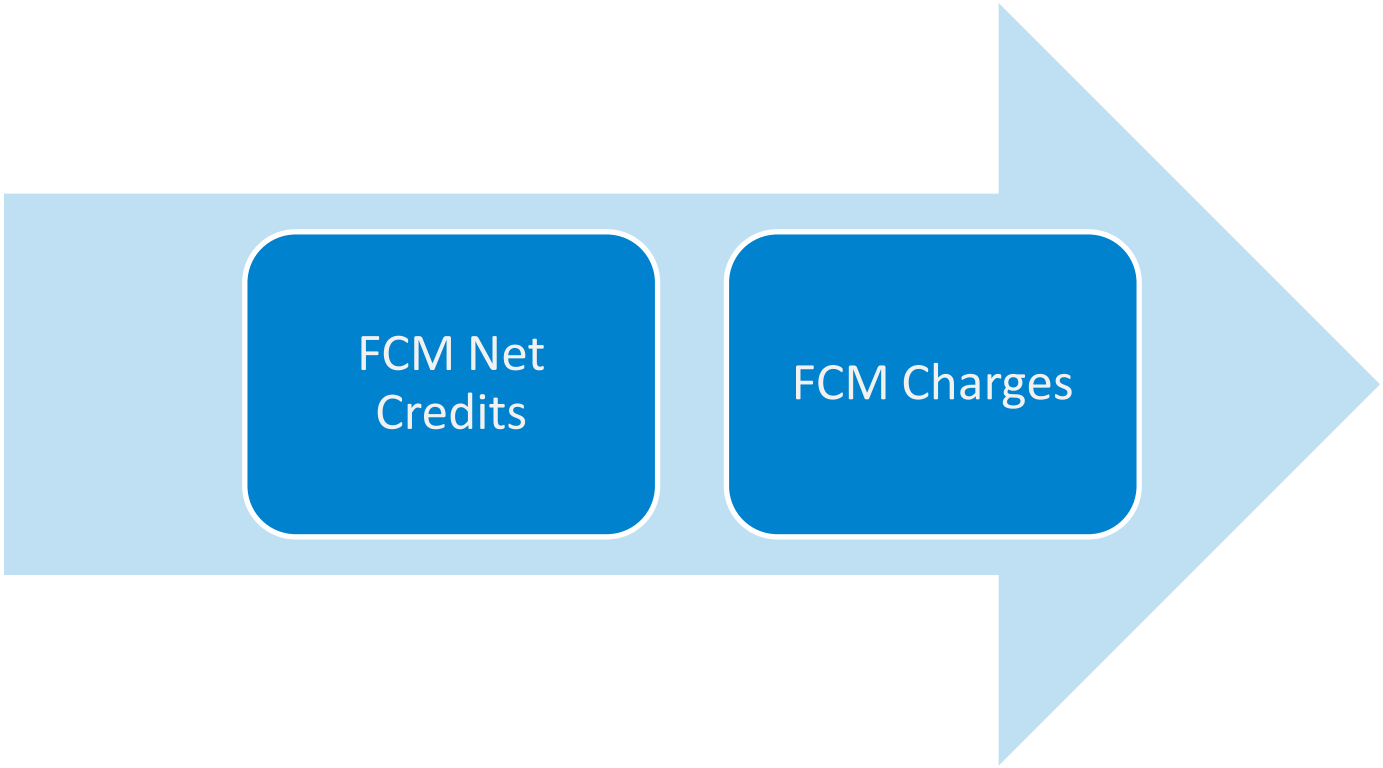
Section Objectives

FCM Charges

- At the end of this section, you will be able to:
  - Describe what the inputs are for the FCM net credits calculation
  - Describe what the Net Regional Clearing Price
  - Explain how capacity requirements are determined
  - Calculate Capacity Load Obligation
  - Calculate FCM charges

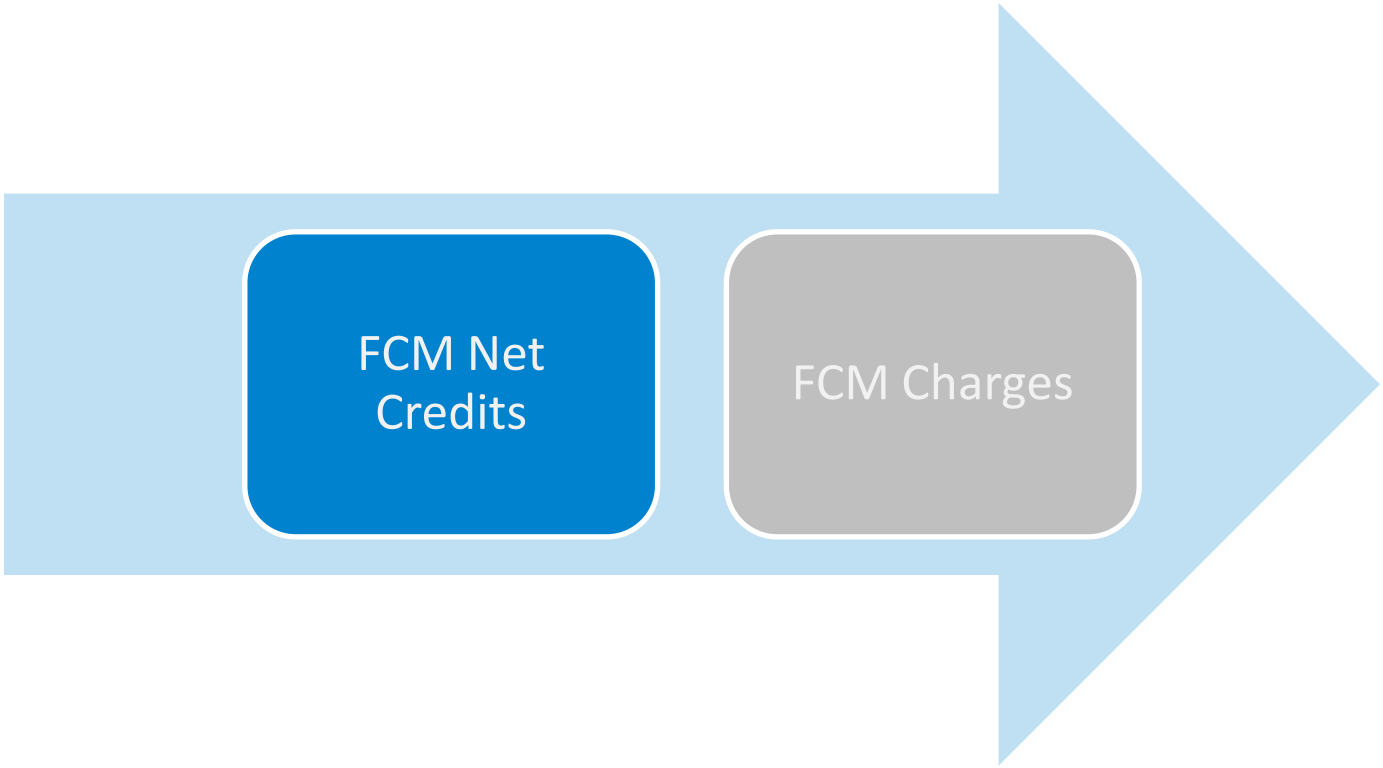
Section Components

FCM Charges



Section Components

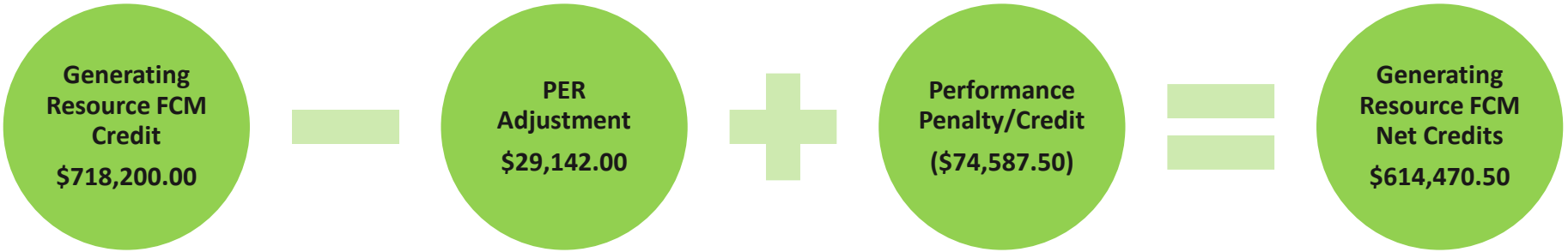
FCM Charges



FCM Charges

Example: Net FCM Credits for Generating Resource

Assume that a customer has the two resources we have seen in our examples. The FCM credit line item discussed in the overview will be net of any PER adjustments, performance penalties or performance incentives/credits



Net FCM credits for the generating resource =

$718,200.00 - $29,142.00 + ($74,587.50) =

$614,470.50

FCM Charges

Example: Net FCM Credits for Demand Resource

Net FCM credits for the demand resource =

$18,226.00 + (-$967.26) =

$17,258.74

FCM Charges

Example: FCM Credit Bill Line for the Customer

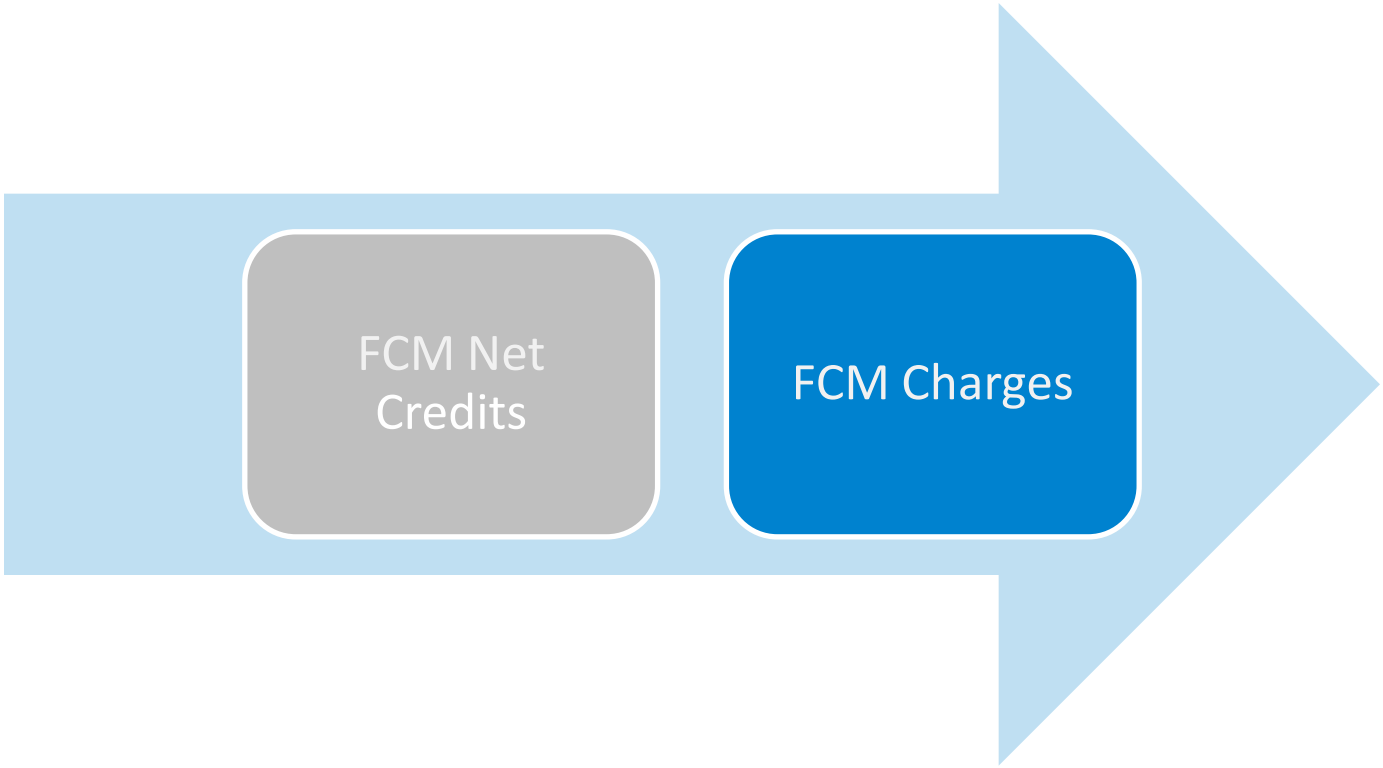
Net FCM credits for the demand resource =

$614,470.50 + $17,258.74 =

$631,729.24

Section Components

FCM Charges



FCM Charges

What are FCM Charges and Who Pays the Costs?

- Allocation of FCM credits paid
- Customers with Capacity Load Obligation (CLO) pays for the total CSO purchased for an Obligation Month
- Total FCM credits reflect adjustments for PER, demand resource performance penalties in excess of performance incentives and charges and credits associated with capacity exports through import constrained zones (not applicable for the first 5 CCPs)
- Charge calculations include:
  - Net Regional Clearing Price per Capacity Zone
  - Impacts of Capacity Load Obligation Bilateral transactions
  - Impacts of Self-Supply designations

FCM Charges

What is the Net Regional Clearing Price?

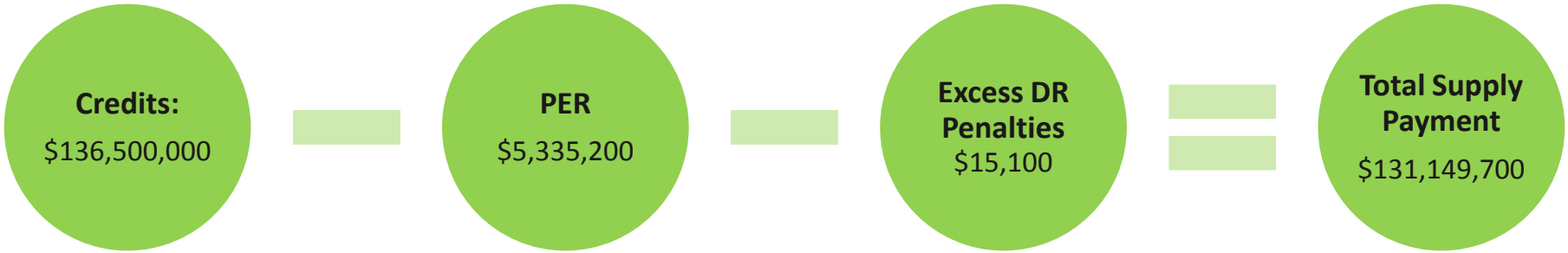
- Net Regional Clearing Price (NRCP) is used to allocate FCM charges
- NRCP is calculated as:
  - Sum of total credits made to resources, divided by the total CSO MWs less self-supply MWs:

Net Regional Clearing Price = Total Capacity Credits /
(Total Capacity Supply Obligation MW – Self Supply MW) / 1000

FCM Charges

Example: Net Regional Clearing Price

- One capacity zone (Rest of Pool)
- Total FCA credits = $136,500,000
- PER adjustment = $5,335,200
- Excess DR penalties = $15,100.00
- Total CSO = 32000 MW
- Total self-supply = 800 MW



FCM Charges

Example: Net Regional Clearing Price (cont.)

Net Regional Clearing Price =
$131,149,700 / 31200 =
$4.2035 per kW-month which is
$4,203.50 per MW-month

FCM Charges

What are the Details of the FCM Charge Allocation?

- Each load asset is assessed a share of the FCM charges
- A capacity requirement is calculated for each load asset
- A load asset's capacity requirement is based on consumption during the prior calendar year's peak load hour
- This value is known as a load asset's Peak Contribution Value

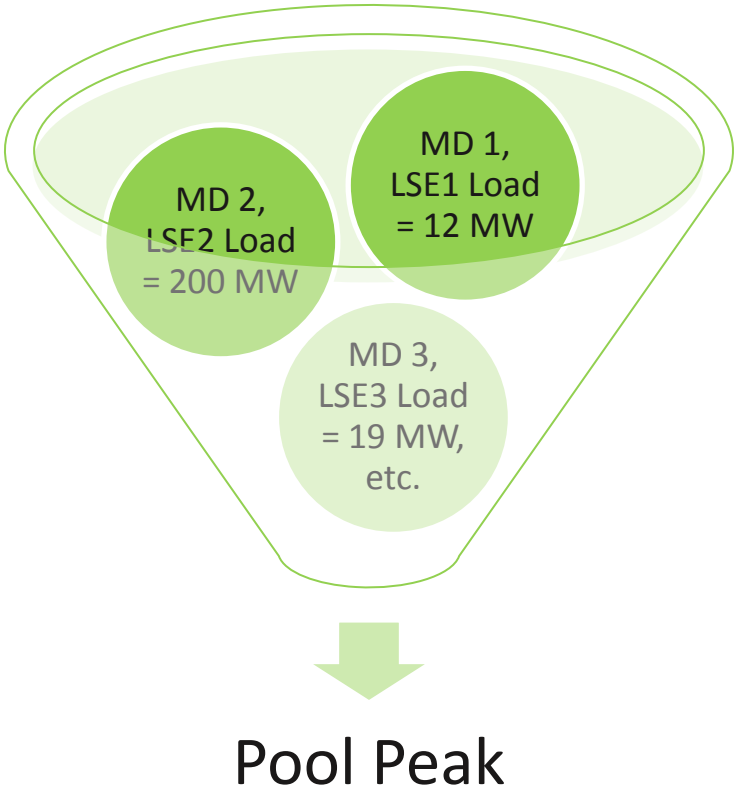
FCM Charges

What is the Peak Contribution Value?

- Each year, prior to the start of the CCP, the ISO identifies the day and hour of the pool peak load from the prior calendar year
  - June 1, 2011 CCP uses the 2010 calendar year peak
- Amount of load consumption is captured for each metering domain on that peak day and hour
- Metering domain host utility assigns a "Coincident Peak Contribution Value" to each load asset in the metering domain
  - Adjusted for load shifting

FCM Charges

What is the Peak Contribution Value? (cont.)

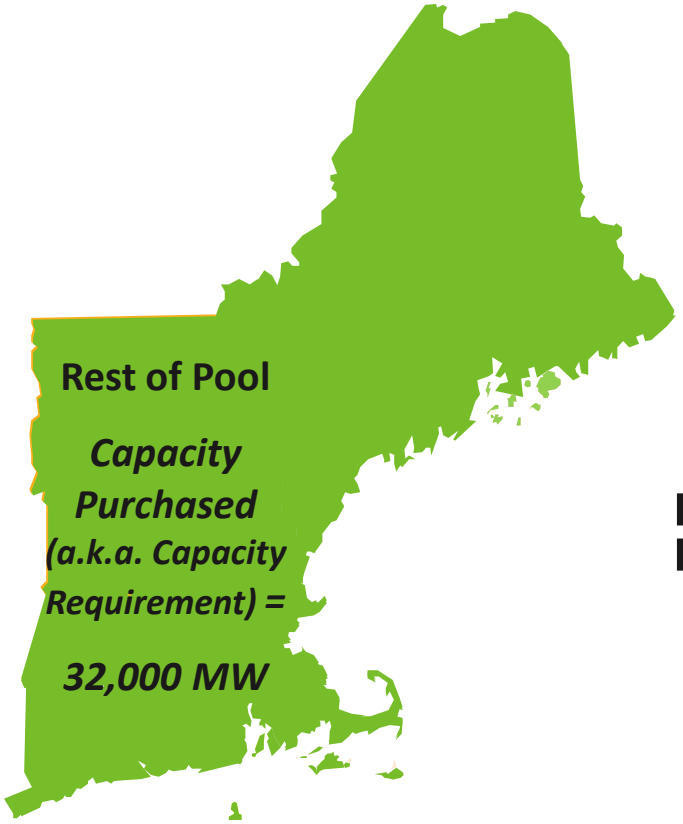


- Peak Contribution Values:
  - MD1, LSE1 = 12 MW
  - MD2, LSE2 = 200 MW
  - MD3, LSE3 = 19 MW
- Peak Contribution Values are submitted for each load asset daily by assigned meter readers
  - Peak Contribution Values may be adjusted for load shifts, or load gains/losses in the metering domain

FCM Charges

What is the Capacity Requirement?

- Pool Capacity Requirement is the pool Peak Contribution Value, adjusted to reflect the actual purchase of CSO:



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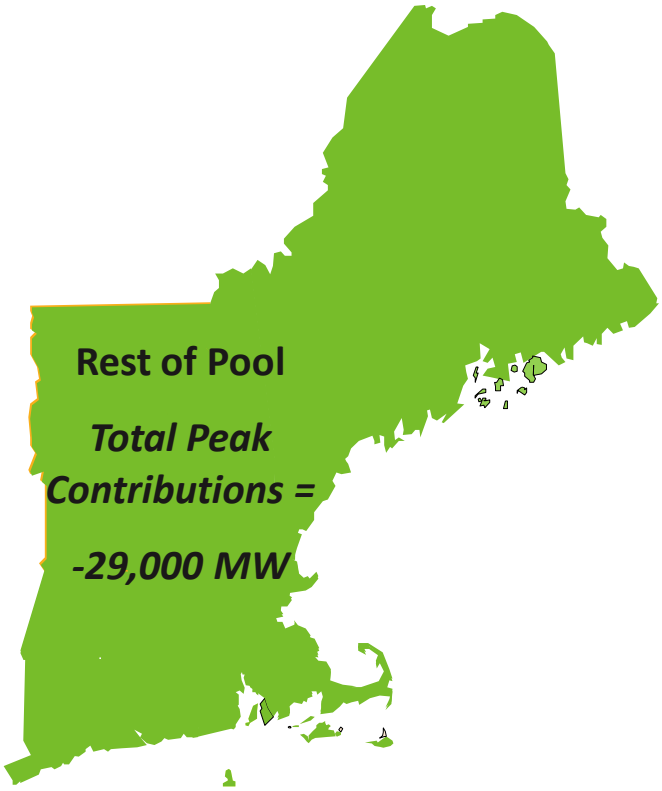
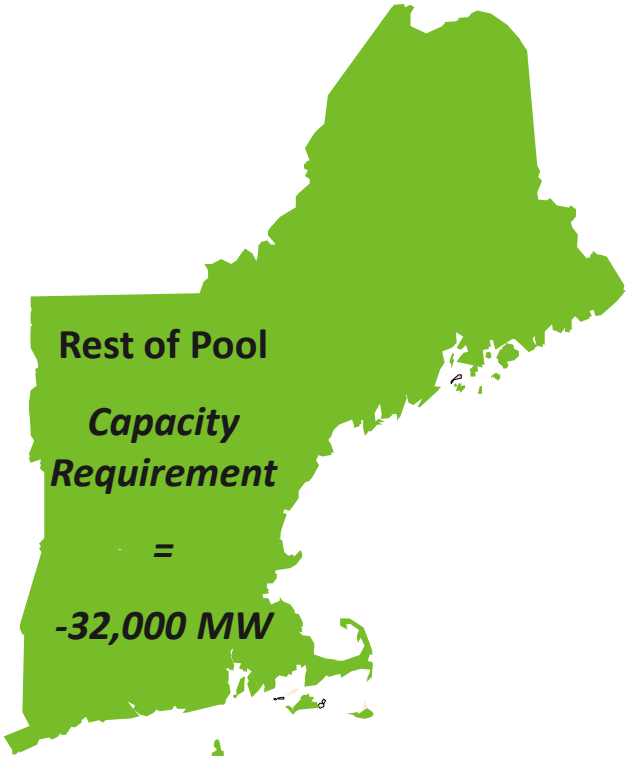


FCM Charges

Example: Capacity Requirement – Single Capacity Zone

- When there is only one Capacity Zone, the Capacity Requirement is set to match the capacity purchased



	Rest-of-Pool (MW)
System-wide Peak Contribution Values	-29,000
System-wide Capacity Supply Obligation x -1	-32,000
Capacity Requirement	**-32,000**

FCM Charges

Calculation of Customer Capacity Requirement

- After calculating the pool Capacity Requirement, the ISO calculates each load serving entity's Capacity Requirement
- Each load asset's Peak Contribution values are used
- A customer Capacity Requirement is calculated based on ownership in load assets
  - Ownership shares on each day is used

Customer Capacity Requirement = Customer Share Peak Contribution Value / Total Peak Contribution x Pool Capacity Requirement

FCM Charges

Example: Customer Capacity Requirement

Load Asset Avg. Peak Contribution Value	Customer Ownership Share	Customer Share of Peak Contribution
-200	50%	-100

		MW
A	Customer Average Peak Contribution	-100
B	Capacity Zone Peak Contribution Value	-29,000
C	Capacity Zone Requirement	-32,000
	LSE Capacity Requirement *(A / B x C)*	-110

Average for the Month

-100 / -29,000 x -32,000 =

0.00344 x -32,000 = -110 MW

FCM Charges

How is a Capacity Load Obligation Calculated?

- Customer capacity requirement can be adjusted by:
  - Hydro-Quebec Interconnection Capacity Credits
  - Capacity load obligation bilateral contracts
  - Self-Supply MWs
- Adjustments may cause a customer's capacity load obligation to be a positive value, resulting in a credit (payment)

FCM Charges

Capacity Load Obligation Bilateral Contracts

- A Capacity Load Obligation Bilateral transfers the capacity requirement between two customers on monthly boundaries:
  - Not a physical transfer
  - Must be confirmed by the other party
- To be included in the initial settlement:
  - Submit prior to or during the obligation month
  - Submitted and confirmed no later than 12:00 p.m. on the second business day after the end of the obligation month
- To be included in the resettlement:
  - Submit after the bill is issued
  - Submitted and confirmed up to 101 days after the first day of the month following the obligation month

FCM Charges

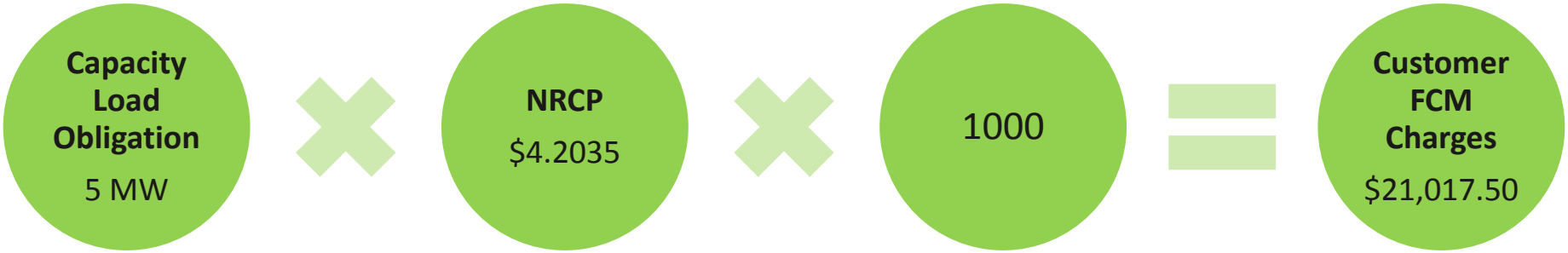
Example: Customer Capacity Load Obligation

Note that this customer has a *positive* Capacity Load Obligation, which will result in a credit (payment)

FCM Charges

Example: Customer FCM Charges & FCM Charge Bill Line Item

- FCM Charges are calculated as the product of a customer's Capacity Load Obligation and the Net Regional Clearing Price



Customer FCM Charges =
5 x $4.2035 x 1000 =
$21,017.50

Section Review

FCM Charges

- Topics discussed in this section:
  - ✓ What the inputs are for the FCM net credits calculation
  - ✓ What the Net Regional Clearing Price is
  - ✓ How capacity requirements are determined
  - ✓ How to calculate capacity load obligation
  - ✓ How to calculate FCM charges

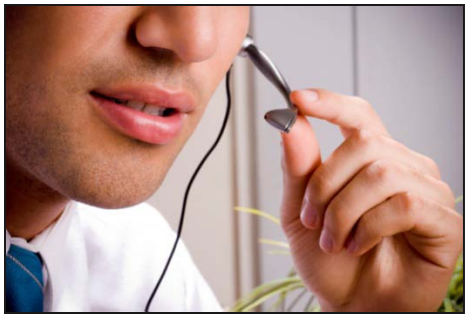
We've Reached the FCM Settlement Finish Line!

Course Review

Overview of FCM Settlement

- ✓ A high level understanding of the FCM settlement process
- ✓ The bill line items for the FCM settlement
- ✓ How FCM resources are paid
- ✓ How FCM resources are measured for performance
- ✓ How FCM charges are allocated

If You Have Questions
Contact Customer Support Services



Contact Information:

Customer Support Hotline: 413-540-4220*

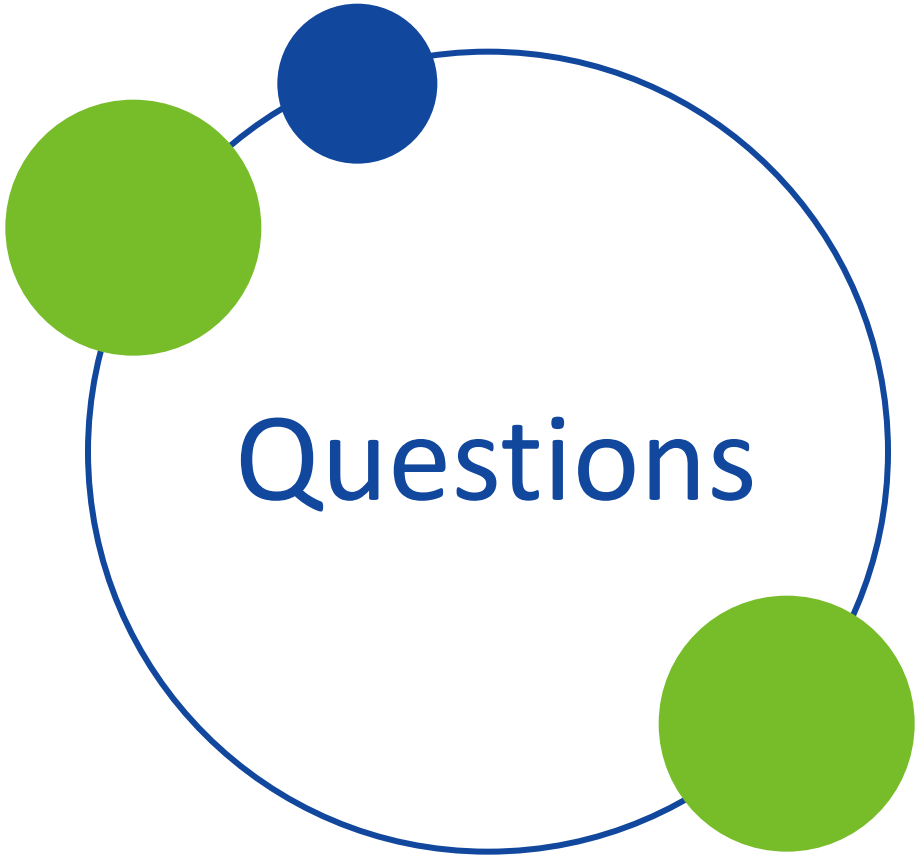
E-mail: custserv@iso-ne.com

Fax: 413-535-4156

*Note: Recorded and monitored conversations

Regular Business Hours

Monday - Friday, 7:30 A.M. to 5:30 P.M. Eastern Time



Appendix Material

Appendix Material

- Capacity Zones in FCM
- External Transaction Penalties in FCM
- FCM Settlement Timeline
- FCM Settlement Validation Tools

Capacity Zones in FCM

Overview of FCM Settlement

Capacity Zones

- Certain calculations only occur when there is more than one Capacity Zone**:
  - Capacity Transfer Rights (CTRs)
  - Capacity Exports through Import Constrained Zones (CETICZ)
- Capacity Zones by Commitment period:
  - 2011/2012 – Rest-of-Pool
  - 2012/2013 – Rest-of-Pool, Maine
  - 2013/2014 – Rest-of-Pool, Maine
  - 2014/2015 – Rest-of-Pool

**Multiple Capacity Zone calculations are provided in the *Forward Capacity Market (FCM 101)* training available on ISO New England's website:
Support > Training > Training Materials > Forward Capacity Market

External Transaction Penalties in FCM

External Transaction Penalties

What are External Transaction Requirements?

- Energy associated with Import Capacity Resources must be offered into the Day-Ahead and Real-Time energy markets:
  - The total transactions must equal the Import Capacity Resource CSO
  - Must be offered for every hour of each Operating Day in the month
  - At the same external interface as the Import Capacity Resource
  - Exceptions for VJO and NYPA Import Capacity Resources
- Priced transactions must be competitively offered at or below the highest of:

Offer Threshold Price for the Operating Day	Offer Threshold Price for day prior to the Operating Day	NYISO DA Location-Based Marginal Price for the Hour (Imports on NY interfaces only)

(MR 1. Section III.13.6.1.2.1)

External Transaction Penalties

What Import Capacity Resource Validations are done by the ISO?

- Failure to Offer Competitively (Daily):
  - In each hour, if either the Day-Ahead or Real-Time energy offer by an Import Capacity Resource is priced greater than the applicable offer Threshold Price, a penalty is assessed for the Operating Day
- Failure to Offer (Hourly):
  - In each hour, if the total amount of energy offered from all External Transactions associated with the Import Capacity Resource is less than the CSO, a penalty is assessed
- Failure to Deliver (Hourly):
  - In each hour, if the total amount delivered from a RT External Transaction is less than the energy requested, a penalty will be assessed

External Transaction Penalties

Import Capacity Resource Penalties

- Daily penalty is the sum of the (Daily Failure-to-Offer plus Daily Failure-to-Offer Competitively plus Daily Failure-to-Deliver penalties)
- Total penalty cap for an Operating Day will not exceed the product of the Resource CSO and the interface Capacity Clearing Price, divided by the number of days in the month

External Transaction Penalties

Allocation of Penalties Collected

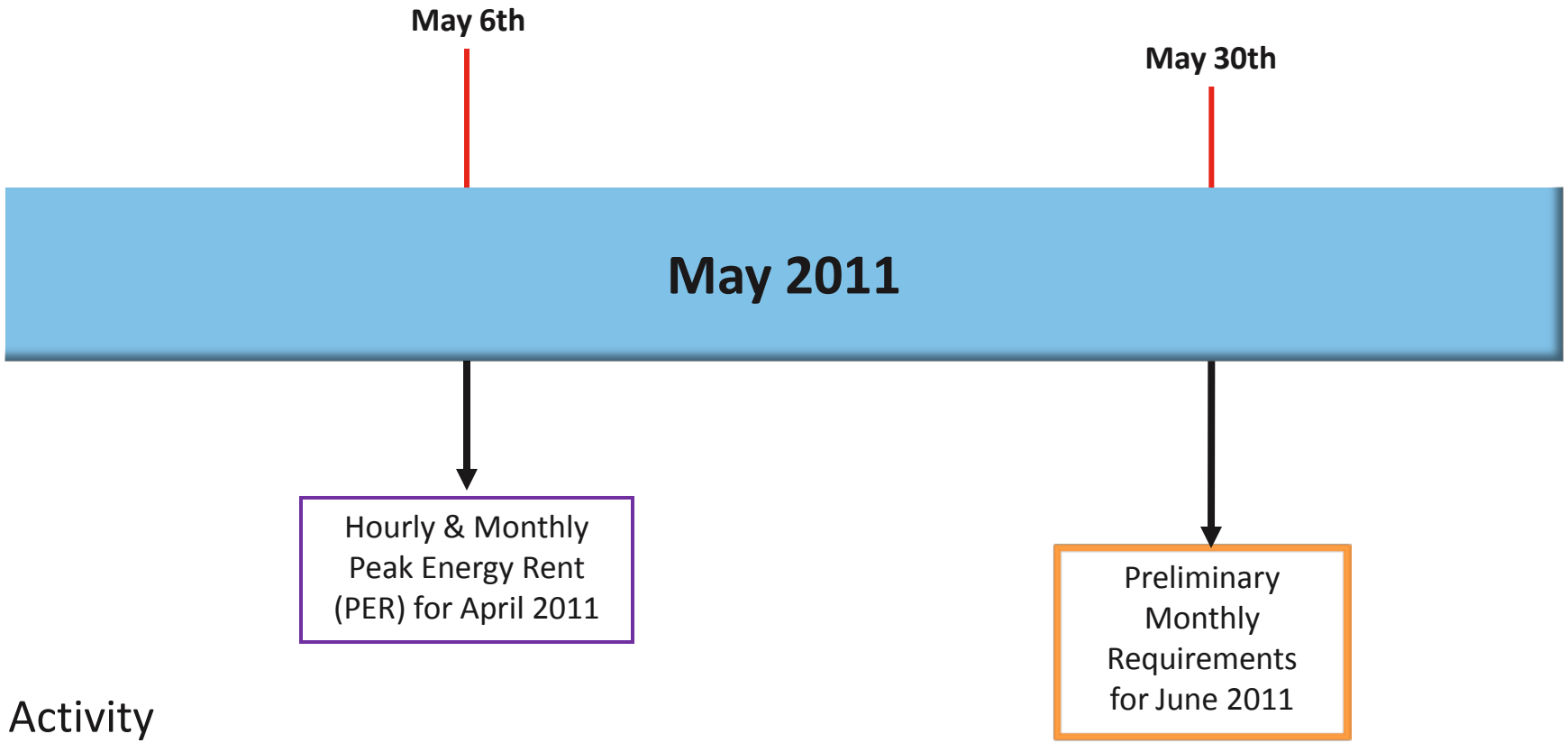
- Total penalties assessed in an Obligation Month shall be allocated to market participants based on their pro-rata share of negative Capacity Load Obligation

FCM Settlement Timeline

FCM Settlement Timeline

The Month Prior to Obligation Month

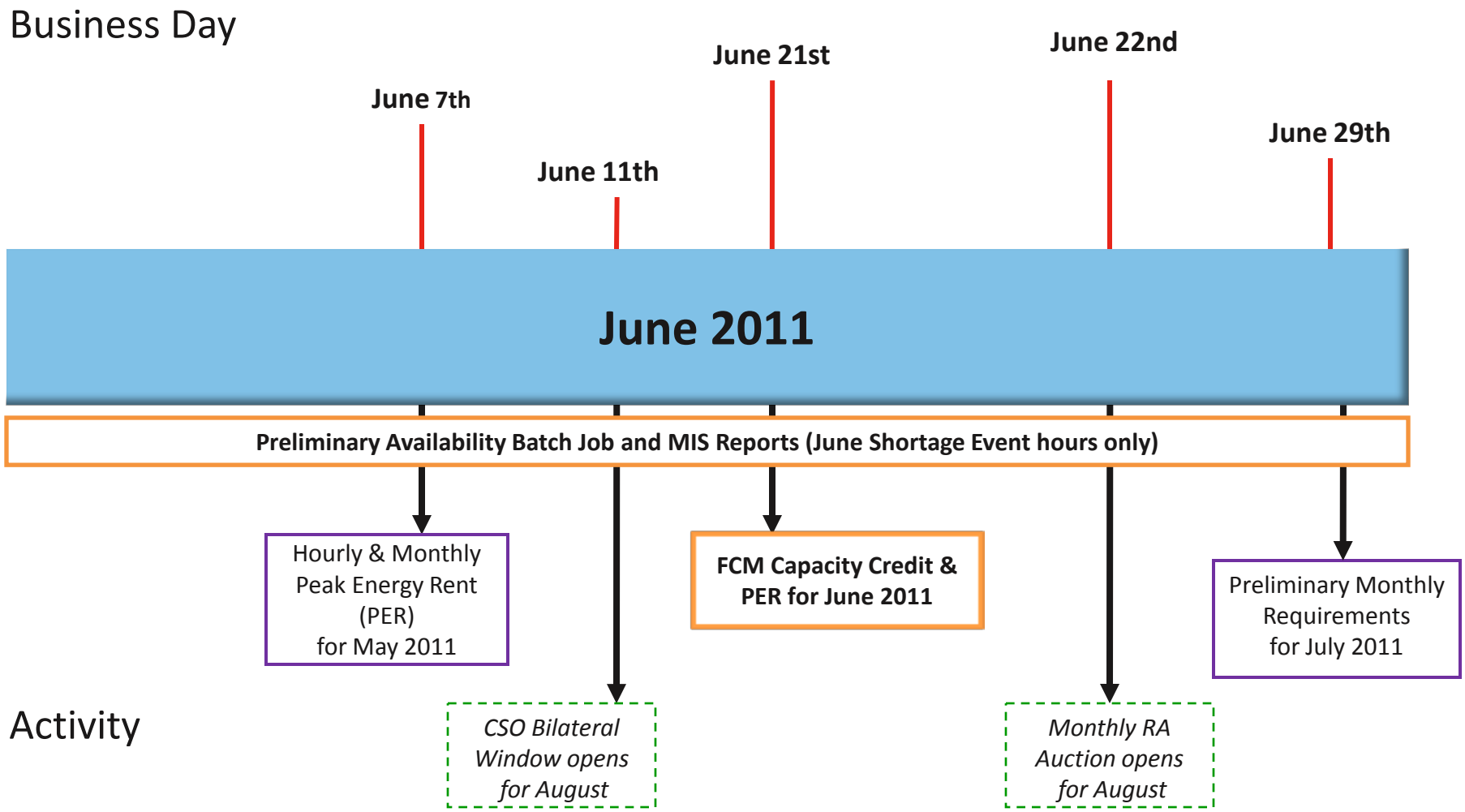
Business Day



Activity

Forward Capacity Market Settlement Timeline

The Obligation Month



Forward Capacity Market Settlement Timeline

The Month Subsequent to the Obligation Month

Business Day

July 1st

July 5th

July 7th

July 8th
(June Bill-July 11th)

July 13th

July 20th

July 22nd

~ July 28th

July
2011

Preliminary Availability (July Shortage Event hours only)

Seasonal Peak Hours for June 2011

Equivalent Planned Outage Hours for June 2011

Hourly & Monthly Peak Energy Rent (PER) June 2011

FCM Settlement for June 2011

External Transaction Penalties for June 2011

CSO Bilateral Window opens for September

FCM Capacity Credit & PER for July 2011

Preliminary Monthly Requirements for August 2011

Monthly RA Auction opens for September

Activity

FCM Settlement Validation Tools

FCM Settlement Validation Tools

- Located on ISO New England's Home Page
- Navigate to the *Understanding the Bill* heading (see next slide) for:
  - Invoice & Remittance Advice Item Descriptions
    - Includes Calculation Summaries for all FCM Settlement Calculations (current versions also included in this appendix)
  - MIS Report Descriptions, Templates & Samples
    - Explains what is on each MIS report
  - Sample Invoices & Remittance Advice