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Introduction to ISO-NE Forward Capacity Market (FCM) Pay-For-Performance (PFP)

A Training Module From "Introduction to Wholesale Electricity Markets" (WEM 101)

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For More Detailed Information

- See Market Rule 1, Section 13

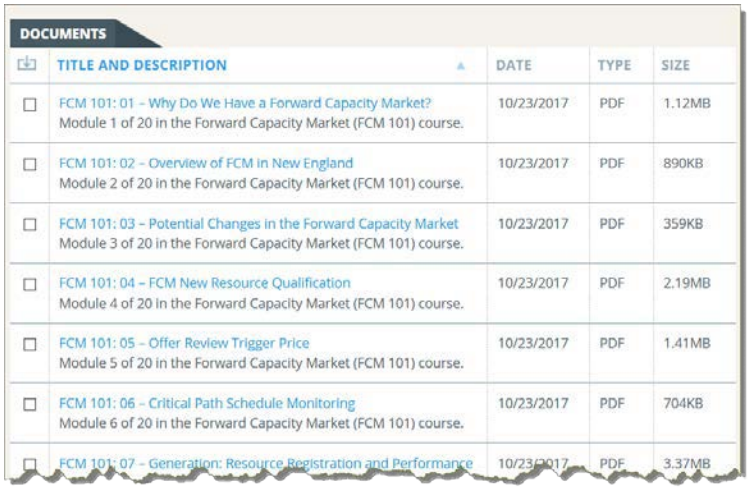
  Official rules (the Tariff)

- FCM Market Information

  Includes all the relevant information regarding auctions, deadlines, etc.

- Forward Capacity Market (FCM 101) Training Materials

  Full FCM training session



Forward Capacity Market
Pay-for-Performance (PFP) Basics

Beginning June 2018 – Capacity Commitment Period #9

Monthly Capacity Market Settlement

Monthly capacity payment (credit or charge)
is based on the sum of these two payment streams

Capacity Payment =

Base payment + Performance payment

- Paid for by demand (load)
- Based on capacity supply obligation (e.g., at FCA price)
- Never negative

- A transfer between suppliers
- Based on system conditions and resource performance during a scarcity condition
- May be negative, zero, or positive

Pay-for-Performance is a Two-Settlement Construct

- Base payment (credit only)
  - Payment for CSO obtained via FCA, annual reconfiguration auction (ARA), etc.
  - *You are selling forward*
- Performance payments (credit or a charge)
  - *You are buying back in the delivery period during scarcity conditions*
- Sum of the two may be positive or negative:
  - If your resource *over* performs, you will get an additional *credit*
  - If your resource *under* performs, you will get an additional *charge*

NOTE: This charge may be greater than the base payment

Pay-for-Performance: A Paradigm Change

- By assuming a CSO, you essentially assume responsibility for a share of the system requirement during scarcity conditions
- This is reflected via balancing ratio (Br)
  - Example: With 30,000 MW of CSO in system, if your resource has 300 MW of CSO, your resource is responsible for one percent (1%) of system requirement during a scarcity condition

$$\textit{Balancing Ratio} = \frac{\textit{[Load (Energy) + Reserve Requirements]}}{\textit{Total CSO}}$$

- During **low-load periods** the balancing ratio during a scarcity condition will be lower (e.g., 0.65)
- During **high-load periods** the balancing ratio during a scarcity condition will be higher (e.g., 0.90)

What is a Capacity Scarcity Condition?

- A scarcity condition is any five-minute interval when system cannot meet reserve requirement – *the system is deficient in reserves*
- For Pay-for-Performance (PFP) purposes, this is a deficiency of:
  - 10-minute non-spinning reserve (TMNSR), and/or
  - 30-minute operating reserve (TMOR)
- When system is deficient in reserves, the Reserve-Constraint Penalty Factor (RCPF) for the reserve type deficiency will set the real-time reserve clearing price
  - RCPF TMNSR = $1,500/MWh
  - RCPF TMOR = $1,000/MWh

Reserves: Background

Reserves can be *created* by re-dispatching system

- *Fast* moving resources can be dispatched down – creating reserve capability
- At the same time, *slow* moving resources can be dispatched up – providing energy in lieu of the *fast* resources

This is not optimal dispatch for energy; hence shorthand phrase *re-dispatch*

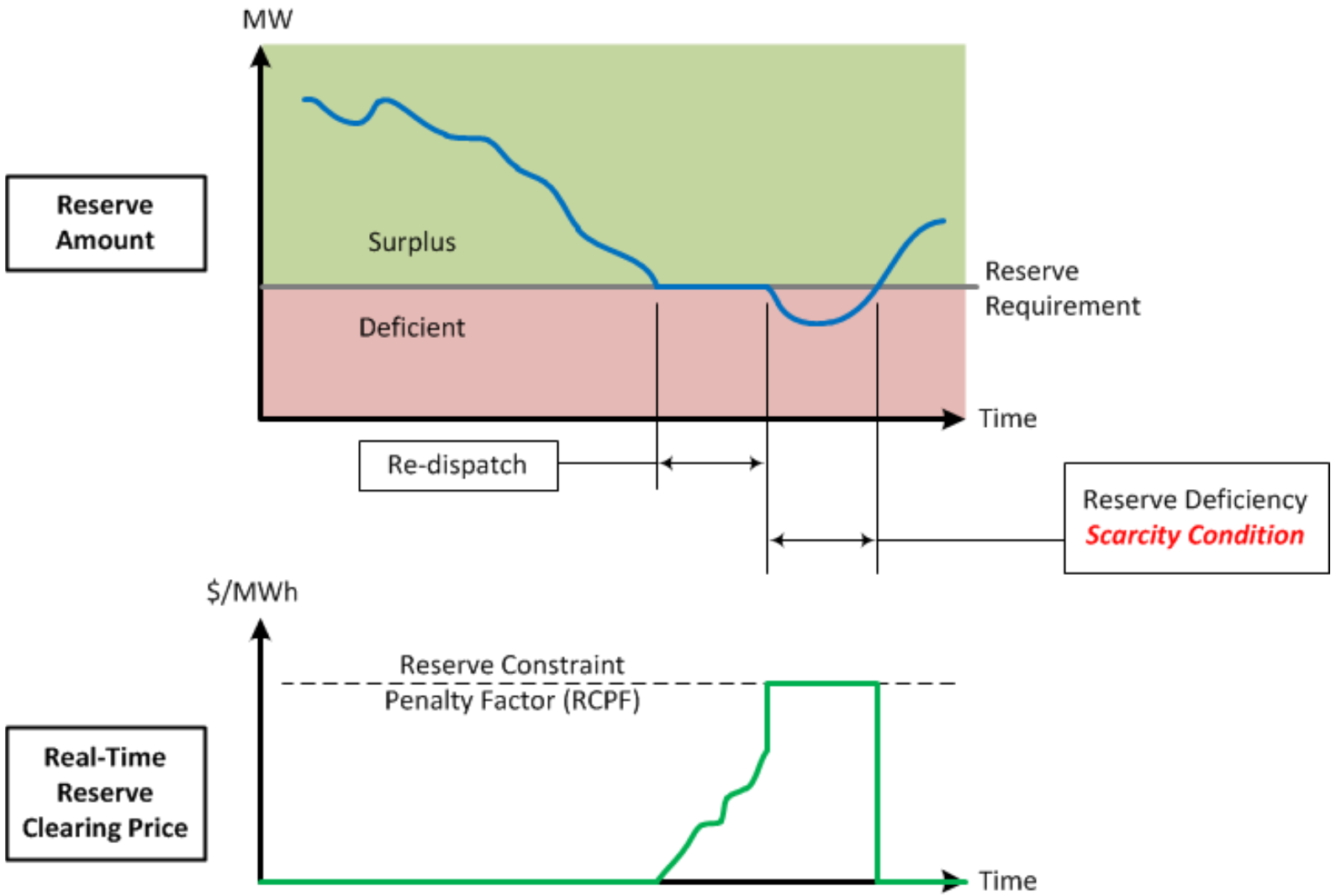
When system is re-dispatched, the real-time reserve clearing price will be greater than zero

- Reflecting *opportunity cost* for those resources backed down
- Real-time reserve clearing price is zero when there are more reserves than required

Reserves: Background, *continued*

- There is a limit on how much reserves can be created by re-dispatching the system; *there's only so much re-dispatching that can be done*
- When this limit is reached the algorithm stops re-dispatching and sets the real-time reserve clearing price equal to RCPF value
- A scarcity condition occurs when the real-time reserve clearing price is set equal to the RCPF (for TMNSR and/or TMOR) and this price is also included in the energy price – ***This is when the PFP settlement provisions kick in***

Re-Dispatch and Reserve Deficiency



Pay-for-Performance: The Concept

- The idea behind PFP is to make it look, from a supplier's perspective, like a very high-priced energy-only market
  - Where prices can reach several thousand dollars per MWh
  - A high-priced energy-only market where suppliers get paid for the energy and reserves they actually provide
- During a scarcity condition the energy prices will include RCPF values
  - Let's assume that the energy price during a scarcity condition is $450/MWh and there is a deficiency of TMOR; in this case the RCPF ($1,000/MWh) for TMOR is also included in the energy price
  - Total price paid for providing energy in this example is $1,450/MWh

Pay-for-Performance: The Concept, *continued*

- During a scarcity condition suppliers will also be evaluated for their contribution during scarcity condition
- For every MWh provided (via energy and/or reserves) during a scarcity condition they will receive an *additional* performance payment
- The rate for this payment is the performance payment rate (PPR) and is $2,000/MWh for the commitment period beginning June 2018
  - This rate increases in later commitment periods

Pay-for-Performance: The Concept, *continued*

To summarize:

- From a suppliers perspective, the *value* of delivering during a scarcity condition is sum of the *energy and reserve payment rate* (we assumed $1,450/MWh) and the *performance payment rate* ($2,000/MWh) or ***$3,450/MWh***

Similar to a high priced energy-only market, you get paid for what you actually deliver during the scarcity event

Pay-for-Performance: The Concept, *continued*

Who is paying what?

- Load is paying for energy and reserves
- Performance payment is an exchange between suppliers
  - Some resources will over perform and some will under perform
  - We collect money from those that under perform and use that money to pay those that over perform
  - The rate charged the under performers and credits to the over performers is the same; the performance payment rate ($2,000/MWh)

What Does It Mean To Have a CSO with Pay-for-Performance?

PFP is a two-settlement construct

- **Forward Sale**: CSO x Price

  (you sold obligation forward, you are due a credit)
- **Delivery**: Performance payments *(more on next slide)*

  (During a scarcity condition you "buy back" your obligation via performance payments)
  - Actual amount delivered by your resource may be greater than or less than your balancing ratio adjusted forward sale (i.e., CSO amount)
  - Reminder: You are responsible for a share of system requirement during a scarcity condition; ***not*** a fixed MW amount

Delivery: Performance Payments

Delivery Charge = PPR x Br x CSO

- Delivery charge is the *buyback*

Delivery Payment = ACP X PPR

- Actual capacity provided (ACP); the energy and/or reserves ***actually*** provided during scarcity condition

Performance Payment = delivery payment + delivery charge

Performance Payment = (PPR x ACP) – (PPR x Br x CSO) = PPR x (ACP – Br x CSO)

Observations
A resource *without* a CSO has no forward payment but will get a delivery payment **Performance Payment = PPR x (ACP – Br x CSO) = PPR x ACP**
A resource *with* a CSO is settled against its share of the system requirement **Performance Payment = PPR x (ACP – Br x CSO)**

A Few Notes on PFP Settlement

- Capacity market is settled monthly
- Performance payments are based on the resource's score during (any) scarcity conditions that occur within the month (i.e., any five-minute interval that is a scarcity condition)
- A resource's monthly performance payment is the sum of a resource's score in all (if any) five-minute intervals that are also scarcity conditions, multiplied by the performance payment rate

For examples that follow, we will assume there is one full continuous hour of scarcity conditions (12, five-minute intervals) in the month

Example #1 – Low Load Condition

Calculate base payment and performance payments

– For a resource with a CSO of 300 MW (ignore energy/reserves market profits)

Base payment = $5.00/kW-mo. x 300 MW = $1,500,000/mo.

System variables:

- Balancing ratio (Br) = 0.65
  (a function of system load during scarcity condition)
- Performance payment rate (PPR) = $2,000/MWh

Resource variables:

- CSO = 300 MW (or 300 MWh for a full hour)
- Actual capacity provided (ACP) = 240 MW
  (what was actually provided during scarcity condition)

For a full hour of scarcity conditions:

Performance payment = PPR x (ACP – Br x CSO)

= $2,000/MWh x (240 MWh – 0.65 x 300 MWh) = **$90,000** for this month

Example #2 – High Load Condition

Calculate base payment and performance payments
– For a resource with a CSO of 300 MW (ignore energy/reserves market profits)

Base payment = $5.00/kW-mo. x 300 MW = $1,500,000/mo.

System variables:

- Balancing ratio (Br) = **0.90 (this is the only difference from Example #1)**
- Performance payment rate (PPR) = $2,000/MWh

Resource variables:

- CSO = 300 MW (or 300 MWh for a full hour)
- Actual capacity provided (ACP) = 240 MW

For a full hour of scarcity conditions:

Performance payment = PPR x (ACP – Br x CSO)

= $2,000/MWh x (240 MWh – 0.90 x 300 MWh) = **($60,000)** for this month

What if in the same month there was one full hour of scarcity at low load (Example #1) and one full hour of scarcity at high load (Example #2)?

Example #3 – High Load Condition; No CSO

Calculate base payment and performance payments
– For a 300 MW resource without a CSO (ignore energy/reserves market profits)

Base payment = $5.00/kW-mo. x **0** MW = **$0/mo.**

System variables:

- Balancing ratio (Br) = 0.90
- Performance payment rate (PPR) = $2,000/MWh

Resource variables:

- CSO = 0 MW
- Actual capacity provided (ACP) = 240 MW

For a full hour of scarcity conditions:

Performance payment = PPR x (ACP – Br x CSO)

= $2,000/MWh x (240 MWh – 0.90 x 0 MWh) = **$480,000** for this month

Does it matter in this case (without a CSO) whether it is a high or low load condition?

Questions