Forward Capacity Auction 11 Transmission Transfer Capabilities & Capacity Zone Development

Planning Advisory Committee

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Topics

- Forward Capacity Auction 11 (FCA-11, Capacity Commitment Period 2020-2021) Zone Formation
- Transfer Limit Summary

Background

- In November 2015, in preparation for the Capacity Zone formation process for FCA-11, the Planning Advisory Committee engaged in comprehensive discussion of the zone formation process and the expected direction of zone preparations for FCA-11
- Four presentations made at November 2015 PAC relative to capacity market
  - Historical Development — link to presentation
  - Current Process — link to presentation
  - Review of Determination for FCA 10 — link to presentation
  - New England Power System in 2020 — link to presentation
- The Scope of Work for the FCA-11 transfer capability and zone formation process was presented at the January 2016 PAC

  http://www.iso-ne.com/static-assets/documents/2016/01/a9_fca_11_zonal_interfaces.pdf

FCA-11 CAPACITY ZONE FORMATION

Proposed Potential Zonal Construct for FCA-11

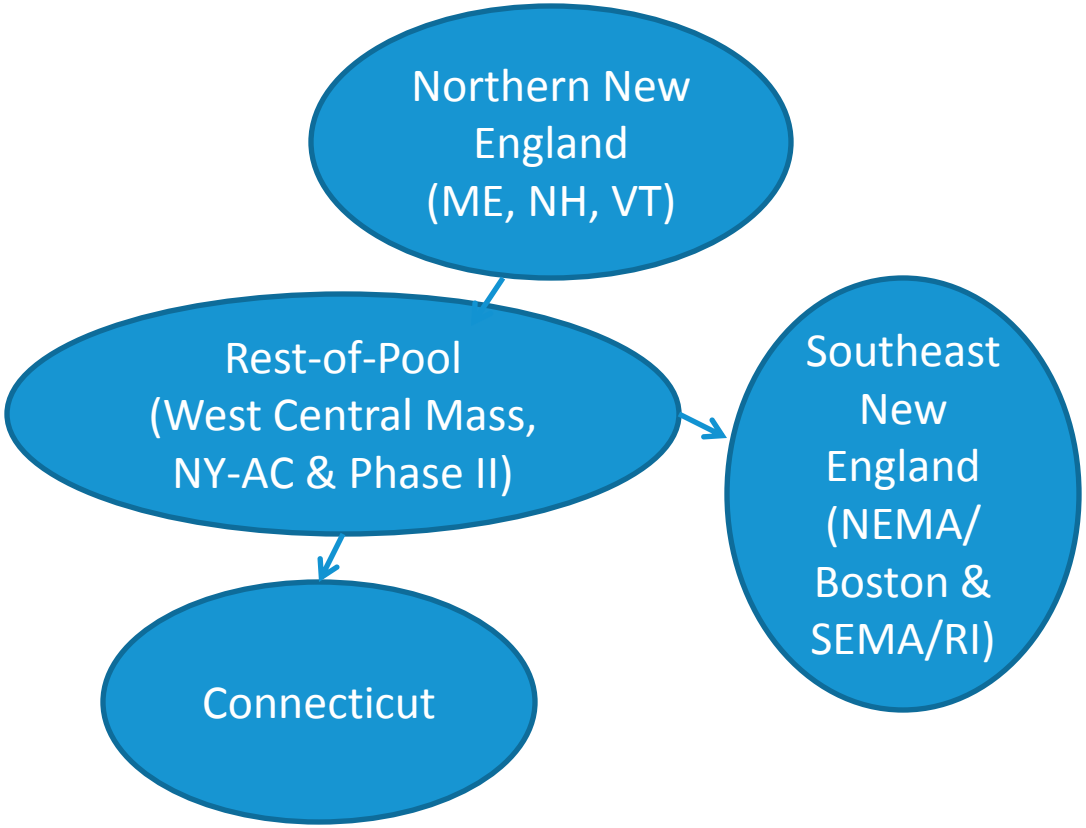
- The potential Capacity Zone construct for FCA-11 is unchanged from the proposed construct in FCA-10
  - Newly certified transmission caused no significant change in the boundaries associated with the transmission system's ability to reliably transfer energy in the planning horizon
  - No significant change in appropriate zonal boundaries due to resource retirements or resource additions in FCA-10

Transmission Transfer Capabilities

- Capacity Zone boundary transfer capabilities
  - Further details are provided later in this presentation

FCA-10 Transfer Capabilities (MW)		FCA-11 Transfer Capabilities (MW)	
Southeast New England Import N-1	5,700	Southeast New England Import N-1	5,700
Southeast New England Import N-1-1	4,600	Southeast New England Import N-1-1	4,600
Connecticut Import N-1	2,950	Connecticut Import N-1	3,400
Connecticut Import N-1-1	1,750	Connecticut Import N-1-1	2,200
North-South N-1	2,675	North-South N-1	2,725

Proposed Potential Zonal Construct for FCA-11



Note that zones are modeled in the FCA only if the objective criteria in Market Rule 1, Section 12 is triggered

TRANSFER LIMIT SUMMARY

North-South Interface: Transfer Capability - Updated

- The Northern New England-Scobie + 394 stability transfer limit has been updated to include the Greater Boston upgrades

https://smd.iso-ne.com/operations-services/ceii/pac/2016/03/a2_fca11_zonal_boundary_northern_new_england_scobie_394_transfer_limits.pdf

- With NNE-Scobie + 394 at the margined limit of 3,200 MW, the following elements are simultaneously at 100% of their Long Term Emergency (LTE) ratings, post contingency…..
  - 230 kV Line O215 from North Litchfield-Tewksbury
  - 230/115 kV Transformer T2 at Tewksbury
- …at the following level of North-South Transfer Capability

North-South Transfer Capability (N-1)	2,725 MW[1]

1. The FCA-10 value for the North-South transfer capability was 2,675 MW

Transfer Capability Updates Due to Connecticut Upgrades

- The Transmission Certifications for FCA-11 were presented at the January Reliability Committee

  http://www.iso-ne.com/committees/reliability/reliability-committee/?eventId=128730

- It was noted at the January Planning Advisory Committee (PAC) that not all of the components of the Greater Hartford/Central Connecticut and Southwest Connecticut projects were included in the Network Model for FCA-11

  http://www.iso-ne.com/static-assets/documents/2016/01/a9_fca_11_zonal_interfaces.pdf

- At the January PAC, stakeholders asked if there was any benefit to the Connecticut import capability from those portions of the projects that were certified

Transfer Capability Updates Due to Connecticut Upgrades, continued

- The Proposed Plan Application analyses for the Greater Hartford/Central Connecticut project included evaluations of the transfer capabilities after the addition of the project

  https://smd.iso-ne.com/operations-services/ceii/rc/2015/03/a3_1_swct_ghcc_lvl3_ppa_ghcc_sis.pdf

- The ISO has reviewed the projects that were certified for FCA-11 and has found that sufficient components of the Greater Hartford/Central Connecticut project have accepted certifications to support the adoption of the post-project transfer limits

Connecticut Import Transfer Capability (N-1)	3,400 MW
Connecticut Import Transfer Capability (N-1-1)	2,200 MW

FCA-11 Base Internal Interface Limits

Single-Value, Summer Peak,[1] Non-Firm, Transmission Interface Limits for Use in Subarea Transportation Models										
Interface	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Orrington South Export	1325	1325	1325	1325	1325	1325	1325	1325	1325	1325
Surowiec South	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Maine-New Hampshire	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Northern New England-Scobie + 394	3100	3100	3100	3100	3200[c]	3200	3200	3200	3200	3200
North-South	2100	2100	2100	2675[a]	2725[c]	2725	2725	2725	2725	2725
East-West	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
West-East	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
Boston Import (N-1)	4850	4850	4850	5700[a]	5700	5700	5700	5700	5700	5700
Boston Import (N-1-1)	4175	4175	4175	4600[a]	4600	4600	4600	4600	4600	4600
SEMA/RI Export	3400	3400	3400	3400	3400	3400	3400	3400	3400	3400
SEMA/RI Import (N-1)	-	-	1280[b]	1280	1280	1280	1280	1280	1280	1280
SEMA/RI Import (N-1-1)	-	-	720[b]	720	720	720	720	720	720	720
Southeast New England Import (N-1)	-	-	-	5700[a]	5700	5700	5700	5700	5700	5700
Southeast New England Import (N-1-1)	-	-	-	4600[a]	4600	4600	4600	4600	4600	4600
Connecticut Import (N-1)	2950	2950	2950	2950	3400[d]	3400	3400	3400	3400	3400
Connecticut Import (N-1-1)	1750	1750	1750	1750	2200[d]	2200	2200	2200	2200	2200
SW Connecticut Import (N-1)	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
SW Connecticut Import (N-1-1)	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300

Notes are discussed on the following pages

Base Internal Interface Limits, continued …

Notes to table on Slide 11

1. Limits are for the summer period, except where noted to be winter
   - The limits may not include possible simultaneous impacts, and should not be considered as “firm”
   - For the years within the FCM horizon (CCP 2020-21 and sooner), only accepted certified transmission projects are included when identifying transfer limits
     - Accepted certified transmission projects presented to the Reliability Committee at their January 20, 2016 meeting
   - For the years beyond the FCM horizon (June 1, 2021 and later), proposed plan approved transmission upgrades are included according to their expected in-service dates

Base Internal Interface Limits, continued …

Notes to table on Slide 11

a) Greater Boston Upgrades
   - The certification of this project to be in service by June 2019 has been accepted by ISO New England

b) In response to the Brayton Point retirement, the following Rhode Island area facilities are now planned to be upgraded (and are certified to be in service by the start of CCP-9)
   - The V148N 115 kV line from Woonsocket to Washington
   - West Farnum 345/115 kV autotransformer (already in service)
   - Kent County 345/115 kV autotransformer (already in service)

c) Northern New England Scobie + 394
   - Stability limit has been updated

d) Greater Hartford/Central Connecticut Upgrades
   - The certification of a significant portion of this project to be in service by June 2019 has been accepted by ISO New England

EXTERNAL INTERFACES

FCA-11 Transmission Upgrade Certifications

- As previously noted, not all of the components of the Greater Hartford/Central Connecticut and Southwest Connecticut projects were included in the Network Model for FCA-11
  - In particular, elements of the Southwest Connecticut project that would be relevant to the transfer capability evaluation for Cross Sound Cable were not yet certified
- When the certifications of these projects are accepted for inclusion in the FCM Network Model, the Cross Sound Cable (CSC) capacity import capability will be re-evaluated
  - There is no change in this interface transfer capabilities for FCA-11

FCA-11 External Interface Import Capability

Single-Value, Summer Peak,[1] Non-Firm, Transmission Interface Limits for Use in Subarea Transportation Models

Interface	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
New Brunswick-New England (energy import capability)[2]	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
New Brunswick-New England (capacity import capability)	700	700	700	700	700	700	700	700	700	700
HQ-New England (Highgate) (energy import capability)[3]	217	217	217	217	217	217	217	217	217	217
HQ-New England (Highgate) (capacity import capability)	200	200	200	200	200	200	200	200	200	200
HQ-New England (Phase II) (energy import capability)[4]	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
HQ-New England (Phase II) (capacity import capability)	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
Cross-Sound Cable (CSC) (energy import capability)[5]	330	330	330	330	330	330	330	330	330	330
Cross-Sound Cable (CSC) (capacity import capability)	0	0	0	0	0	0	0	0	0	0
New York-New England (energy transfer capability)[6]	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
New York-New England (capacity transfer capability)	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400

These values may be updated based on updated transfer analysis after the Southwest Connecticut upgrades

Notes are discussed on the following pages

External Interface Import Capability

Notes to table on Slide 16

1. Limits are for the summer period
   - The limits may not include possible simultaneous impacts, and should not be considered as “firm” (the bases for these limits are subject to more detailed review in the future)
2. The electrical limit of the New Brunswick-New England (NB-NE) Tie is 1,000 MW
   - When adjusted for the ability to deliver capacity to the greater New England Control area, the NB-NE transfer capability is 700 MW
     - This is because of downstream constraints; in particular Orrington South
3. The capability for the Highgate facility is listed at the New England AC side of the Highgate terminal

External Interface Import Capability, continued …

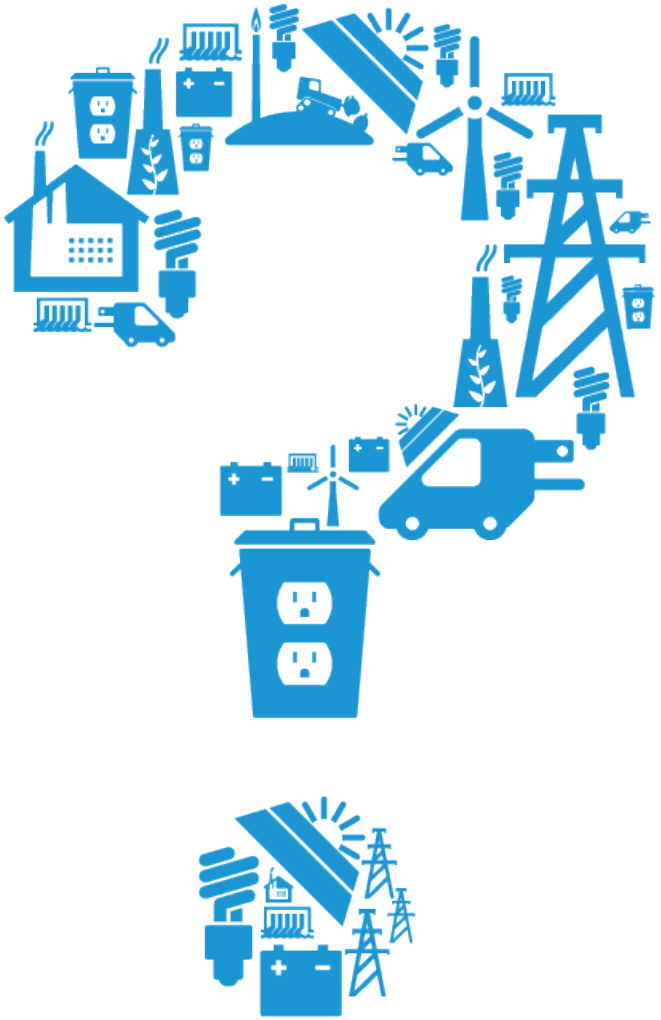
Notes to table on Slide 16

4. The Hydro-Quebec Phase II interconnection is a DC tie with equipment ratings of 2,000 MW. Due to the need to protect for the loss of this line at full import level in the PJM and NY Control Areas' systems, ISO-NE has assumed its transfer capability for capacity and reliability calculation purposes to be 1,400 MW
   - This assumption is based on the results of loss-of-source analyses conducted by PJM and NY
5. Import capability on the Cross Sound Cable is dependent on the level of local generation
6. New York interface limits
   - These are without CSC and with the Northport Norwalk Cable at 0 MW flow
   - Simultaneously importing into NE and SWCT or CT can lower the NY-NE capability (very rough decrease = 200 MW)

Next Steps

- Present final potential Capacity Zone boundary construct for FCA-11
  - March 2016 Reliability Committee

Questions



APPENDIX
METHODOLOGY FOR MODELING CAPACITY ZONES IN FCM

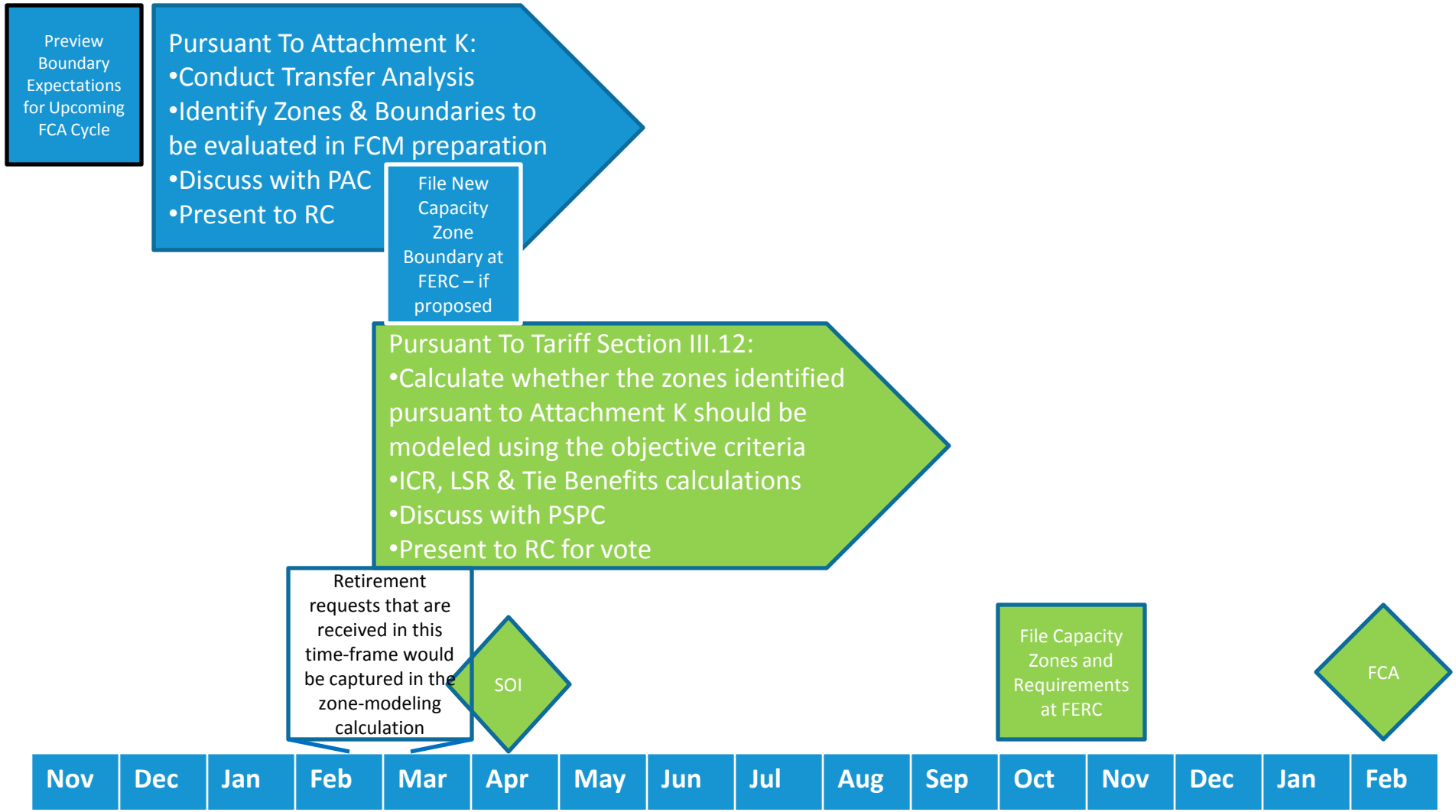
Developing Zonal Boundaries for the FCM

- Included in Attachment K of the Open Access Transmission Tariff:
  - Annual Assessment of Transmission Transfer Capability
    - Each year, the ISO shall issue the results of the annual assessment of transmission transfer capability, conducted pursuant to applicable NERC, NPCC and ISO New England standards and criteria and the identification of potential future transmission system weaknesses and limiting facilities that could impact the transmission system's ability to reliably transfer energy in the planning horizon.
    - Each annual assessment will identify those portions of the New England system, along with the associated interface boundaries, that should be considered in the assessment of Capacity Zones to be modeled in the Forward Capacity Market pursuant to ISO Tariff Section III.12.

Zone Formation: A Two Step Process

Step ONE	Step TWO
Identify the potential zonal boundaries and associated transfer limits to be tested for modeling in the FCM	Use objective criteria to determine whether or not the zone should be modeled for the Capacity Commitment Period
	Import-constrained zone Trigger to model the zone is based on the quantity of surplus resources in the zone above the zonal requirement Export-constrained zone: Trigger to model the zone is based on the quantity of existing and proposed new resources compared with the maximum capacity capability in the zone Zones that are neither import- or export-constrained are collapsed into the rest-of-pool zone

Zonal Modeling Timeline



**This illustration reflects potential timeline change proposals associated with the Retirement Reforms project.*