Agenda Item 4.1.1

PSPC Meeting 273

March 11, 2010

Tie Benefit Study Results for the Year 2013/14

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Outline

- Study Scope
- High Level Description
  - Use GE MARS
  - “At Criteria”
  - Modeling Inter-Area transmission constraints only
- Study Assumptions
  - Interconnected Systems
    - Four areas modeled
    - Reserve sharing among areas
    - Implement Emergency Operating Procedures (EOP) after interconnection assistance
    - Aggregate subareas and EOP steps
  - Neighboring and New England Areas
  - Interconnection Diagram
- Preliminary Study Results
  - Total Tie Benefit
  - Allocation of Total Tie Benefit to Individual Neighboring Areas

Study Scope

- To calculate Tie Benefit values from neighboring Control Areas to New England for the year 2013/14 according to Section 12.9 of Market Rule 1
  - Total Tie Benefits available to New England
  - Tie Benefits associated with each neighboring Control Area

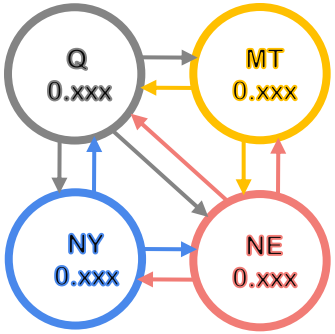
High Level Description of the Process

- Calculate Tie Benefit values through probabilistic method
  - Using multi-area probabilistic simulation model, GE MARS
- Evaluate under “At Criterion” conditions for all interconnected Areas
  - All Areas are brought to 0.1 days/year simultaneously while interconnected to each other.
- Inter-Area transmission constraints are modeled, while internal constraints within each Area are eliminated by adding resources where needed
- Calculate the Tie Benefit contributions of each neighboring Areas in a consistent manner.
  - If the sum of the tie benefits from the individual neighboring Areas is not equal to the total amount of tie benefits, then each of the neighboring Area’s tie benefits will be adjusted based on the ratio of the individual Area tie benefit to the sum of the tie benefits.

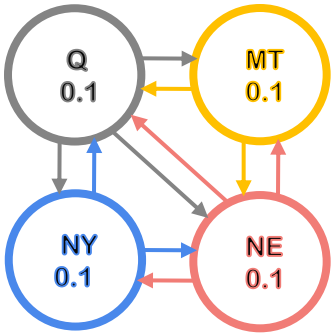
Study Methodology

– Calculation of Total Tie Benefits, TB_{Total}

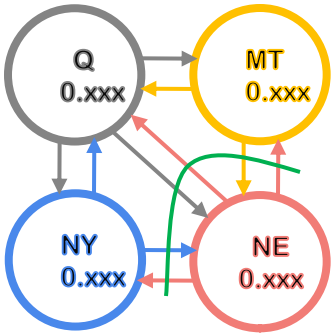
Step 1: Interconnect New England, Quebec, New York and Maritimes systems and calculate each Control Area's risk index ($LOLE_{interconnected}$).



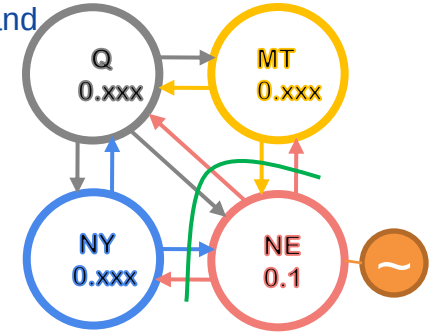
Step 2: Bring each Control Area's risk index to the 0.1 days/year level simultaneously, by adjusting the resources/load in each Control Areas.



Step 3: Reduce the total transfer capabilities of the interconnections from neighboring Areas to allow for only firm capacity import, and calculate the New England risk index ($LOLE_{NE\text{-}w/oNY\&HQ\&MT}$). $LOLE_{NE\text{-}w/oNY\&HQ\&MT}$ > 0.1 days/year.



Step 4: Bring New England Control Area's risk index, $LOLE_{NE\text{-}w/oNY\&HQ\&MT}$, back to the 0.1 days/year, by adding unforced resources to New England

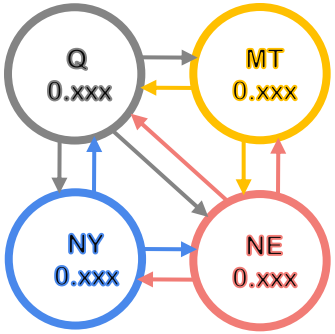


Step 5: The total tie benefits from neighboring Areas, TB_{Total} equals to the amount of resources added to New England in Step 4.

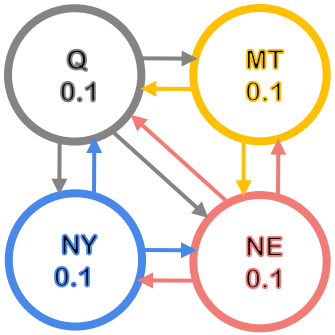
Study Methodology

– Calculation of New York Tie Benefit, TB_{Tie_NY}

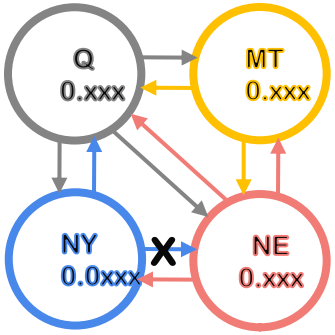
Step 1: Interconnect New England, Quebec, New York and Maritimes systems and calculate each Control Area's risk index ($LOLE_{interconnected}$).



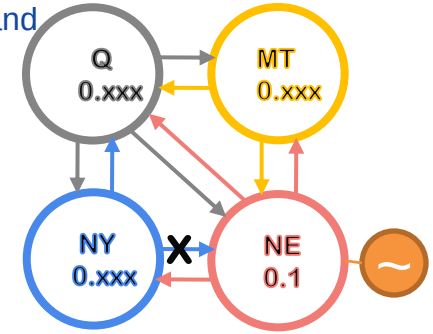
Step 2: Bring each Control Area's risk index to the 0.1 days/year level simultaneously, by adjusting the resources/load in each Control Areas.



Step 3: Reduce the transfer capabilities of the interconnections (All AC lines and Cross Sound Cable) from New York to New England to allow for only Firm capacity import, and calculate the New England risk index ($LOLE_{NE\text{-}w/oNY}$). $LOLE_{NE\text{-}w/oNY}$ > 0.1 days/year.



Step 4: Bring New England Control Area's risk index, $LOLE_{NE\text{-}w/oNY}$, back to the 0.1 days/year, by adding unforced resources to New England

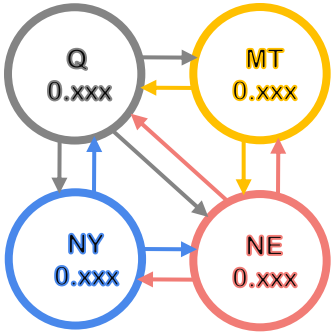


Step 5: The tie benefit contribution of the interconnections from New York to New England (TB_{Tie_NY}) equals to the amount of resources added to New England in Step 4.

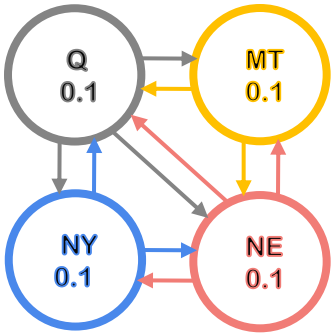
Study Methodology

– Calculation of Maritimes Tie Benefit, TB_{Tie_MT}

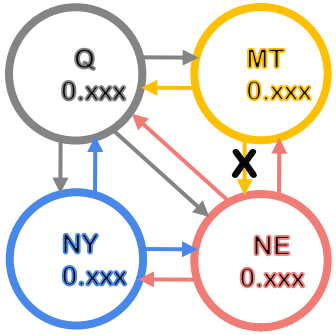
Step 1: Interconnect New England, Quebec, New York and Maritimes systems and calculate each Control Area's risk index ($LOLE_{interconnected}$).



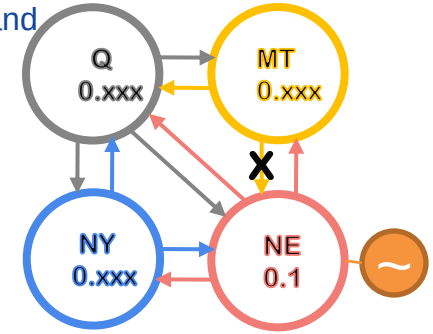
Step 2: Bring each Control Area's risk index to the 0.1 days/year level simultaneously, by adjusting the resources/load in each Control Areas.



Step 3: Reduce the transfer capabilities of the interconnections from Maritimes to New England to allow for only Firm capacity import, and calculate the New England risk index ($LOLE_{NE\text{-}w/oMT}$). $LOLE_{NE\text{-}w/oMT}$ > 0.1 days/year.



Step 4: Bring New England Control Area's risk index, $LOLE_{NE\text{-}w/oMT}$, back to the 0.1 days/year, by adding unforced resources to New England

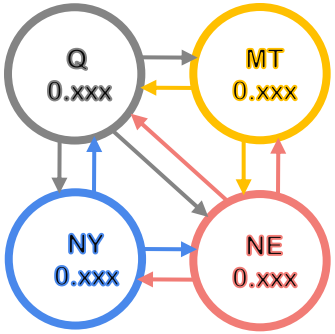


Step 5: The tie benefit contribution of the interconnections from Maritimes to New England (TB_{Tie_MT}) equals to the amount of resources added to New England in Step 4.

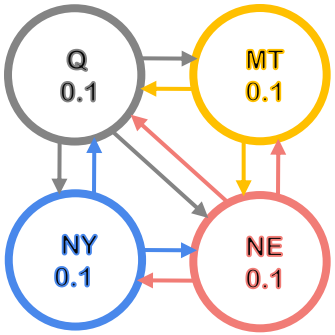
Study Methodology

– Calculation of Quebec Tie Benefit, TB_{Tie_Q}

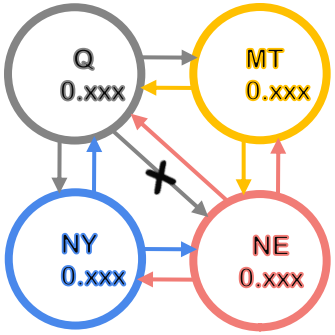
Step 1: Interconnect New England, Quebec, New York and Maritimes systems and calculate each Control Area's risk index ($LOLE_{interconnected}$).



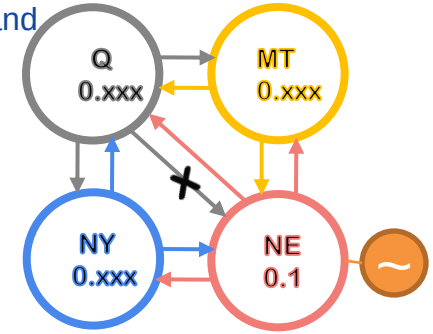
Step 2: Bring each Control Area's risk index to the 0.1 days/year level simultaneously, by adjusting the resources/load in each Control Areas.



Step 3: Reduce the transfer capabilities of the interconnections from Quebec to New England to allow for only Firm capacity import, and calculate the New England risk index ($LOLE_{NE\text{-}w/oQ}$). $LOLE_{NE\text{-}w/oQ}$ > 0.1 days/year.



Step 4: Bring New England Control Area's risk index, $LOLE_{NE\text{-}w/oQ}$, back to the 0.1 days/year, by adding unforced resources to New England



Step 5: The tie benefit contribution of the interconnections from Quebec to New England (TB_{Tie_Q}) equals to the amount of resources added to New England in Step 4.

Study Assumptions – Interconnected Systems

- Areas modeled: New England, New York, Maritimes and Quebec
- Interconnection topology between systems and modeling techniques are consistent with NPCC studies
  - Reserve sharing among Areas
  - Assumed load relief from Emergency Operating Procedures (EOP) of each Area implemented after interconnection assistance
- Simplification to speed up calculation process without sacrificing calculation accuracy:
  - Subareas in each system are aggregated to as few subareas as possible
  - Assumed load relief EOP are aggregated to as few steps as possible

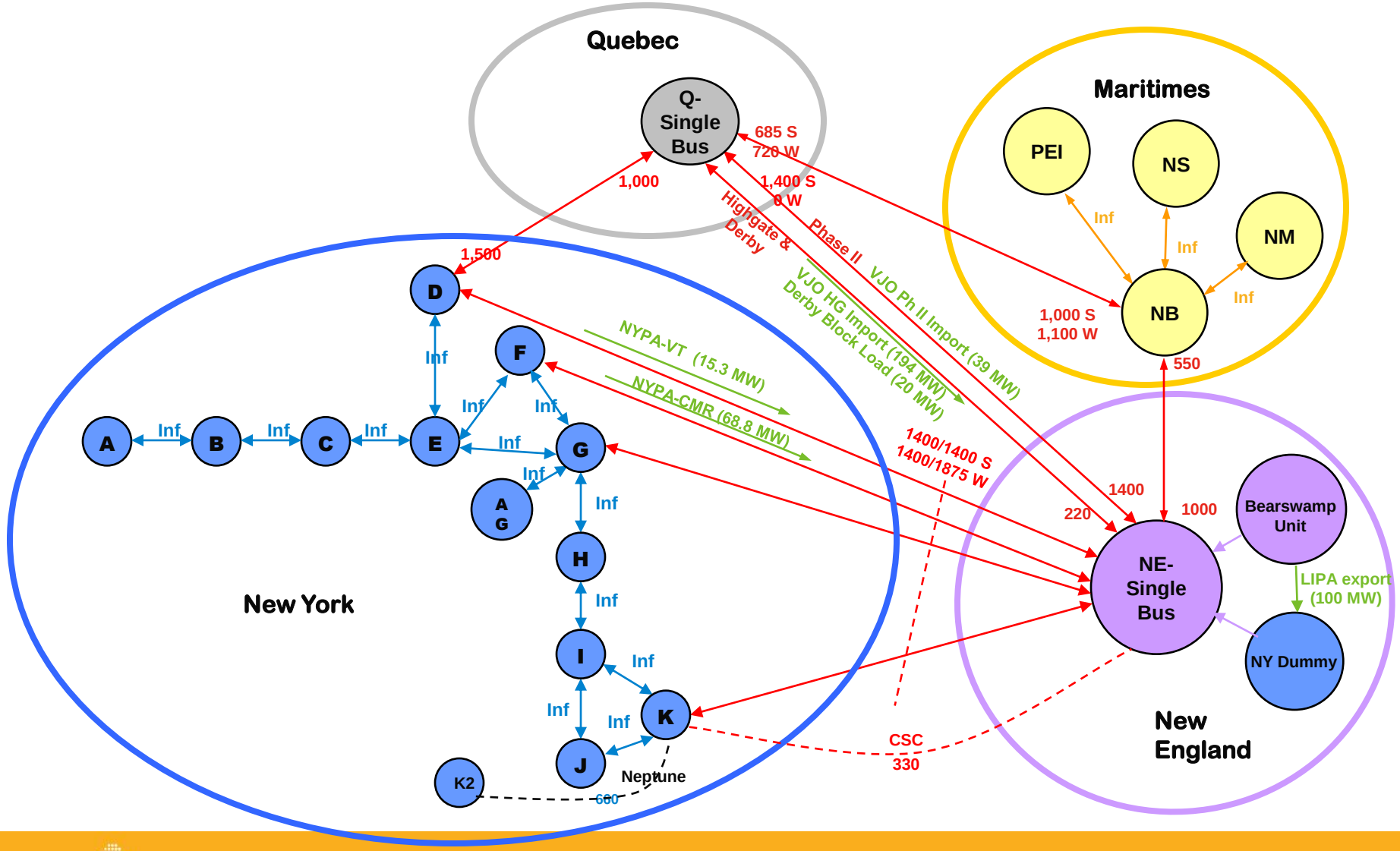
Study Assumptions – Neighboring Areas

- Maritimes
  - MARS database received in February, 2009
- Quebec
  - MARS database received in February, 2009
  - Load forecast per latest Hydro-Québec Strategic Plan 2009-2013 (August 2009)
- New York
  - MARS database received in January 2010
  - Other assumptions are based on NYISO's 2009 Gold Book (Version 2 - Released August 2009)
    - Future additions and retirements
    - Load forecast

Study Assumptions – New England

- Consistent with the assumptions used for 2013/14 FCA ICR calculation
- Resource assumptions based on Existing Qualified Resources for 2013/14 except:
  - Only grandfathered imports are modeled (consistent with ICR calculation)
  - VJO import to reflect value of the firm contract (consistent with ICR calculation)
    - 194 MW through Highgate
    - 20 MW through derby line
    - 39 MW through HQ phase II
  - Real-Time Emergency Generator demand resources are derated based on their availability factors, and modeled as EOP resources. (In ICR calculation, the full amount of RTEG with forced outage rates are modeled).

Study Assumptions – Interconnection Diagram



Preliminary Study Results

- Total Tie Benefits from New York, Quebec and Maritimes
  TB_{Total} = 1700 MW
- Tie Benefit associated with New York
  TB_{Tie_NY} = 190 MW
- Tie Benefit associated with Maritimes
  TB_{Tie_MT} = 570 MW
- Tie Benefit associated with Quebec
  TB_{Tie_Q} = 900 MW

Allocation of Total Tie Benefit to Individual Neighboring Areas

- Since the sum of the tie benefits from the individual neighboring Areas is not equal to the total tie benefits calculated, each of the neighboring Area's tie benefits will be adjusted based on the ratio of the individual Area tie benefit to the sum of the tie benefits.

Individual tie benefit from simulation			
Sum	Tie-NY	Tie-MT	Tie-HQ
(D)=(A) +(B)+(C)	(A)	(B)	(C)
1660	190	570	900
Total Tie Benefit from simulation (E)			1700
Adjusted Individual tie benefit contribution			
Total Adjusted TB	Tie-NY (A1)	Tie-MT (B1)	Tie-HQ (C1)
(A1)+(B1)+(C1)	(A1)=(E)*(A)/(D)	(B1)=(E)*(B)/(D)	(C1)=(E)*(C)/(D)
1700	194	584	922

Breakdown of Quebec Tie Benefits

- Tie Benefit Contribution from HQ Phase II : 895 MW
- Tie Benefit Contribution from Highgate : 6 MW

Allocation of Total Adjusted Quebec Tie Benefit to HQ-Phase II and Highgate

- Since the sum of the tie benefits from HQ Phase II and Highgate (901 MW) is not equal to the total Quebec tie benefits calculated (922 MW), and the Highgate tie is maximized in terms of transfer capability usage, only the HQ Phase II tie benefits would be adjusted.
  - HQ Phase II tie benefits adjustment = 922 MW – 6 MW = 916 MW

Control Area	Summer (MW)	Winter (MW)
Québec - Phase II	916	916
Québec - Highgate	6	6
Maritimes	584	584
New York	194	194
Total	1,700	1,700

Comparisons of 2013/14 with Results from Previous Years

2013/14 Tie Benefit Study		
	Calculated MW	Adjusted MW
Total	1700	1700
New York	190	194
Maritimes	570	584
Quebec	900	922

2012/13 Tie Benefit Study		
	Calculated MW	Adjusted MW
Total	1665	1665
New York	125	136
Maritimes	560	609
Quebec	845	920

2011/12 Tie Benefit Study		
	Calculated MW	Adjusted MW
Total	1800	1800
New York	160	173
Maritimes	660	716
Quebec	840	911