State Energy Planning Board Study: NYISO Input and Reliability Analysis

Aug 11, 2009

Contents

I. Background

By Executive Order, Governor David A. Paterson created the State Energy Planning Board (SEPB) in April 2008. The Governor charged the Board with analyzing a broad range of matters related to the State's energy systems, including, but not limited to, the reliability of delivery networks for electricity, natural gas and petroleum products and the interrelated effects of New York's production and use of energy on the State's economy, environment and transportation systems. The Governor's 2009 Energy Plan (Plan) will contain policies, programs and strategies that will address these matters over the 2009 through 2018 planning horizon.

As part of the Energy Plan, an extensive, multi-part computer modeling effort was undertaken to assess the effects of policies and programs recommended for adoption on a range of factors relevant to decision-makers. Among them are: the cost of electricity and capacity; forecasted changes in the electricity and natural gas systems including the transfer capabilities of the transmission grid, and emission levels of greenhouse gases and other pollutants.

The NYISO supported the State's development of the computer modeling effort by providing several technical white papers and reviewing the model assumptions and results.

Based on the results of the Energy Plan assessment, assumptions regarding the retirement or repowering of existing generating units and the installation of new units were made by the SEPB Working Group to meet the future capacity needs of the state and the environmental objectives. The NYISO performed a reliability study using the GE Multi-Area Reliability Simulation (MARS) program version 2.92. The Reliability Study was conducted to verify that the SEPB's assumed capacity modifications would not result in the violation of the Loss of Load Expectation (LOLE) criterion of once in 10 years (or 0.1 per year) as established by the Northeast Power Coordinating Council (NPCC) and the New York State Reliability Council (NYSRC). That criterion establishes that the resources available on the electric system in New York should be sufficient such that the probability of an unplanned outage on the bulk power grid is never greater than once in ten years.

II. Integrated Planning Model Analysis

To support the State's Integrated Planning Model (IPM) analysis, the NYISO performed the following tasks:

1. Provided to the State technical white papers in October and November 2008.
2. Provided forecasting and other modeling assumptions used in the development of the 2009 Reliability Needs Assessment and 2009

Installed Reserve Margin.

3. Reviewed and provided comments to the SEPB Working Group's Assumption Matrix attached in Appendix A.

4. Reviewed and provided comments on the SEPB Working Group's transmission topology included in Appendix B.

5. Reviewed the SEPB Working Group's results from the IPM model and raised concerns regarding the fuel pricing, imports and exports, capacity levels, environmental allowances and emission levels.

6. Reviewed and provided comments on the first draft of the State Energy Planning Board preliminary assessment.

III. Reliability Assessment

A. Process

In order to assess the reliability of the capacity retirements/additions resulting from the IPM study, the NYISO modeled the SEPB Working Group's capacity recommendations in MARS and calculated the LOLE. The SEPB Working Group developed two IPM base case models (Reference Cases). The first utilized the load forecast that was used in NYISO RNA study. This load forecast is based on achieving 30% of the Energy Efficiency Portfolio Standard (EEPS) and is referred to as the "SEPB RNA Case". The second reference case model's load forecast assumes that the full EEPS is achieved and is referred to as the "SEPB 15 x 15 Case". Since this case assumes a lower load forecast than the "SEPB RNA Case", it also assumes approximately 1,500 MW less capacity. The recommended capacity modifications for these two base (reference) cases are included as Exhibit C-1 in Appendix C.

Four study years (2009, 2012, 2015 and 2018) were evaluated in MARS to determine the NYCA and Zonal LOLEs for each base case model.

The following two scenarios were also evaluated for each of the two base cases:

1. Addition of Nuclear Capacity Upstate
2. 30% Renewable Portfolio Standard

More details regarding the development of the models for the Reliability Assessment are included in Appendix C.

B. Results

1. Base Models (Reference Cases)

   No LOLE violations of 0.1 or greater occurred for all study years for both base cases provided that the assumed load forecast is achieved. However, if the full 15 x 15 load forecast is not achieved, an LOLE violation may occur for the "SEPB 15 x 15 Case". It was found that utilizing the higher load forecast from the "SEPB RNA Case" in the "SEPB 15 x 15 Case", an LOLE violation of 0.102 would occur in NYCA in 2012 and would increase to 0.627 by 2018.

2. Scenarios
   i. Upstate Nuclear Addition
      a. A scenario of adding 1,600 MW of generic nuclear power upstate in 2018 was evaluated for each of the base cases. This capacity addition was modeled by prorating the increase among the existing upstate nuclear facilities.
      b. "SEPB RNA Case"
         i. In addition to the 1,600 MW upstate nuclear addition, this scenario also included the following capacity modifications as compared to the base "SEPB RNA Case":
            1. Retiring of SA Carlson 27 MW in 2012
            2. Retiring of Roseton 1 and 2 1,144 MW in 2018
            3. Shifted 20 MW of Wind Addition from 2012 to 2015

         ii. A NYCA LOLE violation of 0.276 would occur in 2018. An LOLE violation in Zones I and J would also occur. Two additional runs were completed to determine the impact of retiring the Roseton units. If both Roseton units are kept in-service, the NYCA LOLE reduces to 0.02. Retiring only one of the units result in a NYCA LOLE of .071. This indicates that the addition of the nuclear capacity upstate is not sufficient to offset the retirement of both Roseton 1 and 2 units.

      c. "SEPB 15 x 15 Case"
         i. In addition to the 1,600 MW upstate nuclear addition, this scenario also includes the following retirements as compared to the base "SEPB 15 x 15 Case":
            1. East River Units 6 and 7,314 MW in 2015
         ii. No LOLE violations occur through out the study period due to the low load forecast. A

second case was run using the load forecast used in the “ SEPBRNA Case” which is based on achieving only 30% of EEPS. For this condition, an LOLE violation of 0.103 occurs in 2012 and increases to 0.87 in 2018.

ii. Scenario 2- 30% Renewable Portfolio Standard
This scenario is similar to Scenario 1 with the following major differences:

a. Only Roseton 1 unit is retired
b. 3,543 MW of additional wind capacity located upstate is included.

This scenario was only run for the “SEPB RNA Case”. It was found that no LOLE violations occur over the study period.

IV. Summary

The NYISO worked closely with the SEPB’s Working Group to support their effort to address the future energy needs for the State. NYISO shared their technical expertise, provided input on the SEPB Working Group’s model assumptions and commented on the results. NYISO also completed a Reliability Assessment analysis in order to determine the impact of the recommended capacity modifications on the reliability of the system.

Reliability Assessment Summary

	LOLE Results
SEPB RNA Case	No violation
SEPB 15 x 15 Case	No violation if full 15 x 15 EEPS is achieved. A violation in 2012 may occur if only 30% of the EEPS is achieved.
Scenario 1: Upstate Nuclear	SEPB RNA Case: A violation occurs in 2018 if both Roseton Units are retired. No violation occurs if at least one Roseton unit remains in-service. SEPB 15 x 15 Case: No violation if full 15 x 15 EEPS is achieved. A violation in 2012 may occur if only 30% of the EEPS is achieved.
Scenario 2: 30% Renewable Portfolio Standard	No violation

Appendix A: IPM Model Input Assumption Matrix

Model Input	Proposed Info. Source(s)	State of Consensus	Input Status
Cost & performance of new generation	➢ EIA Annual Energy Outlook (2008) plus regional multipliers ➢ NETL assumptions for carbon capture/sequest.	➢ Consensus ➢ Consensus	➢ To ICF 8/13/08 ➢ To ICF 8/13/08
Firmly planned capacity Additions/Retirements	➢ NYISO 2009 RNA base case assumptions ➢ ICF's latest data for other regions. NYISO providing NERC CP-8 as reference	➢ Consensus. Market solutions excluded. ➢ Consensus	➢ To ICF 8/13/08 ➢ To ICF 9/2/08
Cost and performance of pollution controls	➢ EIA Annual Energy Outlook (2008) plus ICF refinements	➢ Consensus	➢ To ICF 8/13/08
Regional peak and load requirements	Initial ~10 years ➢ NYISO 2009 RNA base case assumptions ➢ Latest PJM and ISONE projections ➢ ICF load forecasts for remainder of the country Later run years ➢ Extend NYISO, ISONE, and PJM growth rates into later years ➢ ICF load forecasts for remainder of the country	➢ Consensus ➢ Consensus ➢ Consensus. Includes partial achievement of Energy Independence and Security Act ➢ Consensus ➢ Consensus Includes partial achievement of Energy Independence and Security Act	➢ To ICF 8/13/08 ➢ To ICF 8/13/08 ➢ Being developed ➢ To ICF 8/13/08 ➢ Being Developed

Model Input	Proposed Info. Source(s)	State of Consensus	Input Status
Transmission constraints	➢ NYISO updated values for NY and neighboring areas ➢ Firmly planned changes in NYISO 2009 RNA base case assumptions ➢ ICF's latest data for other regions. NYISO providing NERC CP-8 as reference	➢ Consensus ➢ Consensus ➢ Consensus	➢ To ICF 8/19/08 ➢ To ICF 8/19/08 ➢ To ICF 9/2/08
Installed reserve margins and locational requirements	➢ NYSRC IRM study 2008 (15% State; 80% NYC; 94% LI) ➢ Other regions: ISOs or equiv.	➢ Consensus ➢ Consensus	➢ To ICF 8/13/08 ➢ To ICF 8/13/08
Fuel Price Forecasts	➢ EEA Henry Hub natural gas under 3-P scenario ➢ ICF to use transportation adders for natural gas for each modeled zone ➢ EEA WTI (June 2008) ➢ ICF to convert WTI to refined product prices at NY Harbor and Gulf Coast ➢ ICF to use transportation adders for refined products at each modeled zone	➢ Consensus ➢ Consensus ➢ Consensus ➢ Consensus ➢ Consensus ➢ Consensus	➢ Being Developed ➢ Loaded in IPM ➢ To ICF 8/13/08 ➢ Factors loaded in IPM ➢ Loaded in IPM ➢ Loaded in IPM

Model Input	Proposed Info. Source(s)	State of Consensus	Input Status
	➢ Coal price forecasts from ICF		
Renewable Portfolio Standards	➢ Current RPSs in Northeast and Mid-Atlantic are met ➢ Wind gets capacity payment for 20% of nameplate ➢ Limit wind to 10% of regional capacity	➢ Consensus ➢ Consensus	➢ Loaded in IPM ➢ Loaded in IPM
RGGI	➢ 10-state RGGI program in place	➢ Consensus	➢ Loaded in IPM
Clean Air Interstate Rule	➢ Guidance from DEC = use old CAIR policy assumptions	➢ Consensus	➢ Loaded in IPM
Mercury	➢ NY unit-level Hg MACT program ➢ Other state-specific Hg rules ➢ Federal Hg MACT in model run year 2015	➢ Consensus	➢ Loaded in IPM ➢ Loaded in IPM ➢ Loaded in IPM
Model run years	➢ 2009 (2008-10); 2012 (2011-13); 2015 (2014-16); 2018 (2017-19); 2021 (2020-22): 2024 (2023-25)	➢ Consensus	➢ To ICF 8/19/08
Proxy for reliability related run times for key generators	➢ NYISO provided typical weather-normalized data.	➢ Consensus.	➢ To ICF 9/3/08

Appendix B: Transmission Topology

ICF INTERNATIONAL

NYSERDA IPM® Reference Case Assumptions:

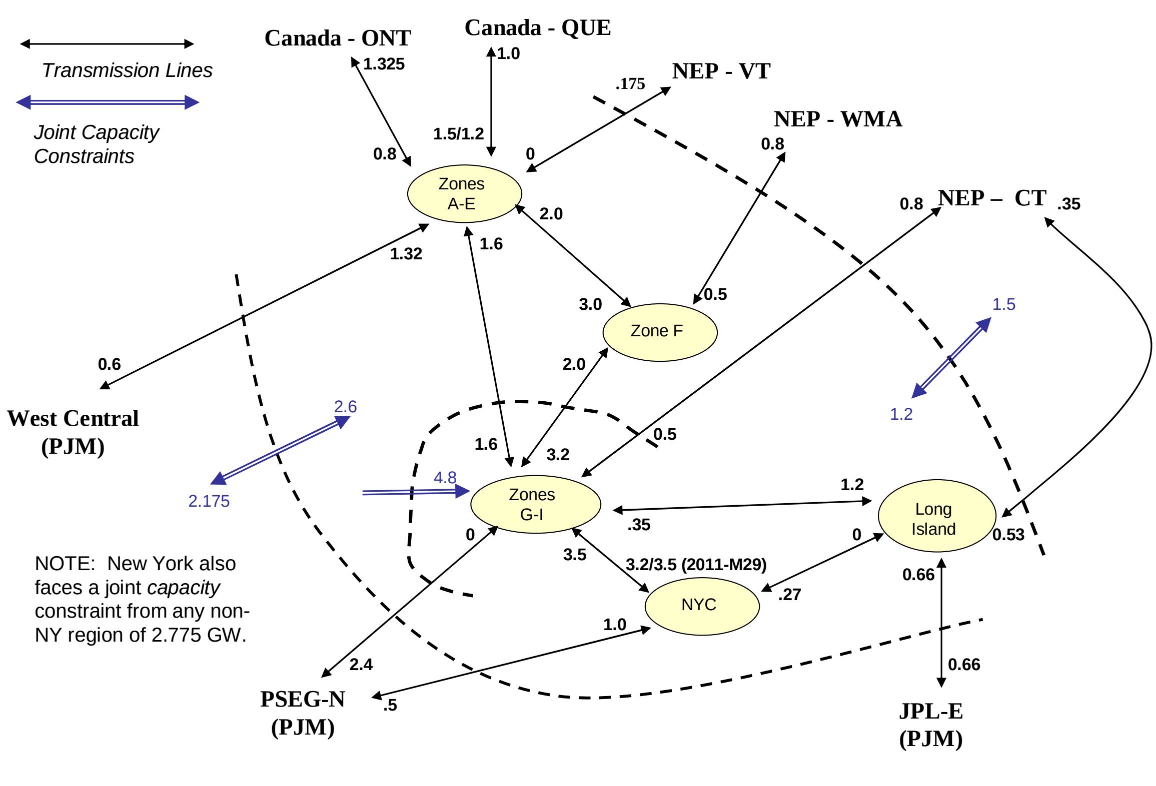
Northeast Regional Transmission Capabilities

Prepared for:
NYSERDA for State Energy Plan

Prepared by:
ICF International

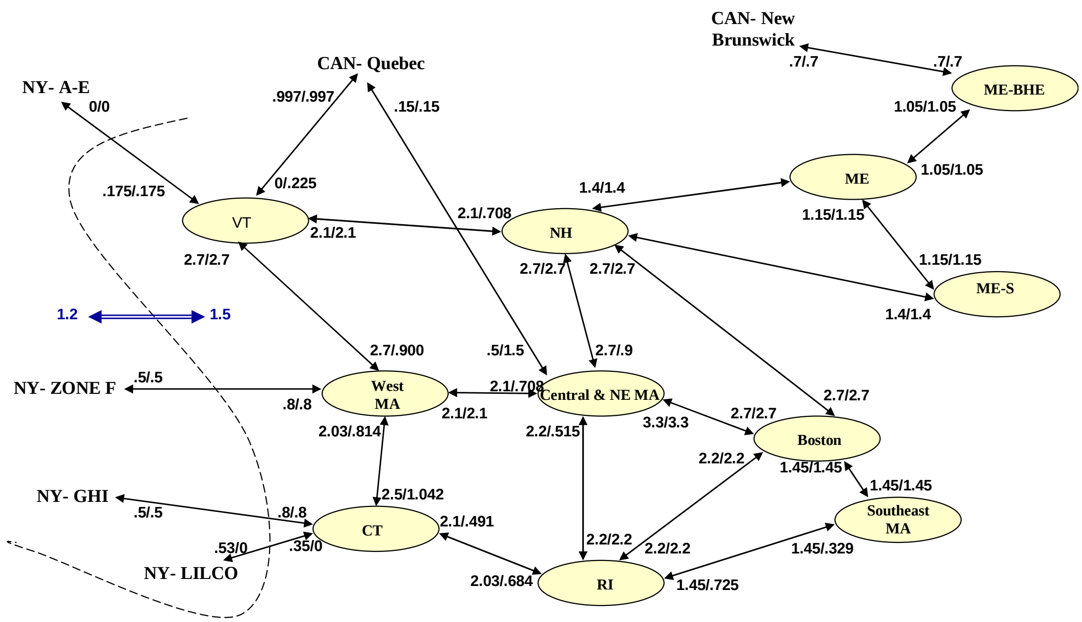
September 8, 2008

Transmission – NY (Energy/Capacity in GW)



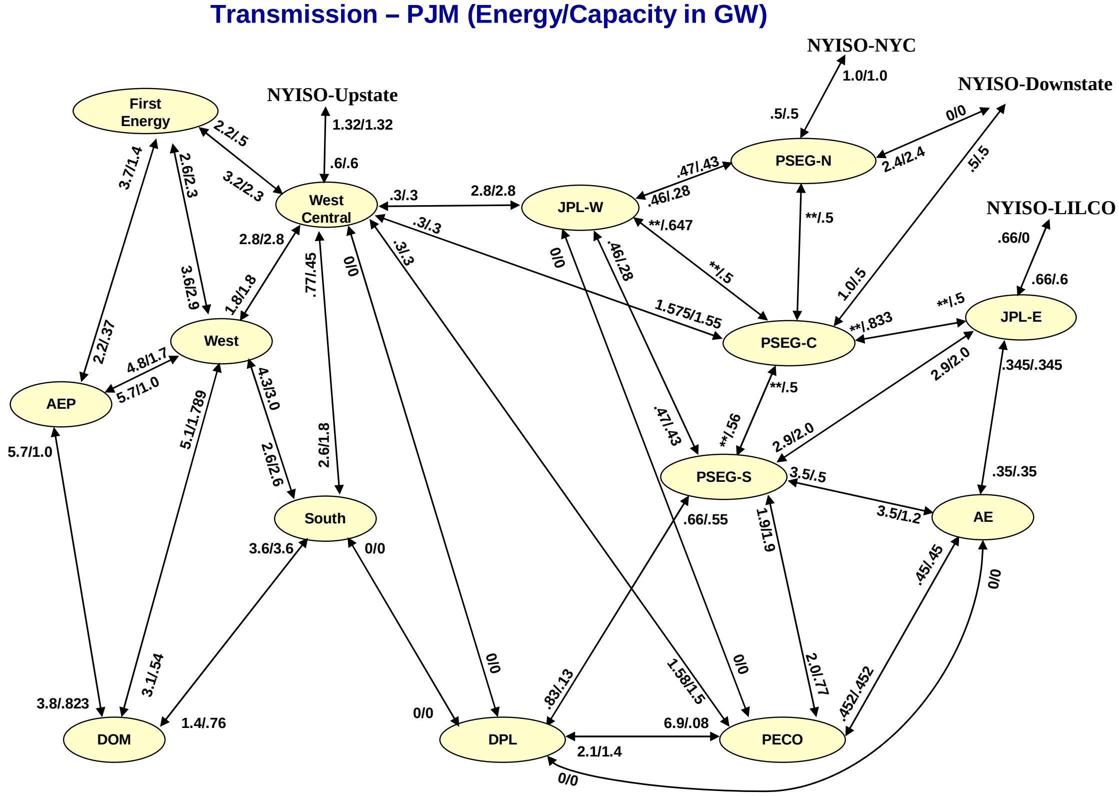
NOTE: New York also faces a joint *capacity* constraint from any non-NY region of 2.775 GW.

Transmission – NEPOOL (Energy/Capacity in GW)



Note: Red numbers indicate post 2015 values.

Transmission – PJM (Energy/Capacity in GW)



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Appendix C: NYISO Reliability Assessment

I. MARS Base Case Models

A. Model Assumptions

1. Study Period

   The Reliability Study looks out over a 10 year period from 2009 to 2018. The years studied include 2009, 2012, 2015 and 2018.

2. Base Model

   A base model was created by modifying the 2009 Installed Reserve Margin (IRM) model. Modifications to this one year IRM model are necessary in order to include known changes that will take place over the planning period as determined in the 2009 Reliability Needs Assessment (RNA) Base Case. This base model was used as the starting point for creating the two study cases being evaluated. The following modifications were made based to the 2009 Reliability Needs Assessment (RNA) Base Case:

   i. The following generation additions and uprates which were included in the Base Case of the 2009 RNA were added:
      a. Empire Generating (Besicorp) 660 MW
      b. Blenheim-Gilboa Unit 1 30 MW
      c. Blenheim-Gilboa Unit 2: 30 MW
      d. Nine Mile Point Unit 2: 168 MW

   ii. The following generator retirements which were included in the Base Case of the 2009 RNA were included:
      a. Poletti 890.7 MW

3. The transfer limits used in the Base Case of the 2009 RNA were included.

4. All external area loads and capacity data were held constant through out the study period.

B. SEPB RNA Case

1. Load Forecast

   The "SEPB RNA Case" utilizes the load forecast used in the 2009 RNA Base Case. This load forecast is based on achieving 30% of the Energy Efficiency Portfolio Standard (EEPS) as shown in Table 1.

Table 1: 2009 RNA Base Case Load Forecast (MW) (*Per 2009 RNA Report Table 3-1*)

	2009	**2012**	**2015**	**2018**
2009 RNA Base Case	34,059	34,586	35,029	35,658

2. Capacity Modifications

Exhibit C-1 includes the capacity modifications provided by the SEPB Working Group for inclusion in the reliability analysis. The generic capacity additions shown as being located in multiple zones were entered into MARS by prorating the values across the zones based on the existing generator capacity type located in those zones. The amount of generic capacity included in each zone is also shown in Exhibit C-1.

Table 2 below summarizes the total capacity changes by generator type as compared to the base model for the "SEPB RNA Case".

Table 2: Capacity Assumptions for the SEPB RNA Case

Generator Type	**SEPB RNA Case Capacity Change as Compared to the Base Model (MW)**
Combined Cycle	1,081
Coal	-55
Combustion Turbine	-129
Hydro	191
Landfill Gas	122
Nuclear	106
Oil/Gas	-1,115
Wind	3,603
Overall Total	**3,804**

C. SEBP 15 x 15 Case

Load Forecast

The "SEPB 15 x 15 Case" utilizes the load forecast used in Scenario 2 of the 2009 RNA. This load forecast is based on achieving 100% of the EEPS as shown in Table 3.

Table 3: 2009 RNA Scenario 2 Load Forecast (MW) (*Per 2009 RNA Report Table 3-1*)

	2009	**2012**	**2015**	**2018**
2009 RNA Scenario 2	33,704	32,722	31,227	32,209

1. Capacity Modifications

Exhibit C-1 includes the capacity modifications provided by

SEPB Working Group for inclusion in the reliability analysis. The generic capacity additions shown as being located in multiple zones were entered into MARS by prorating the values across the zones based on the existing generator capacity type located in those zones. The amount of generic capacity included in each zone is also shown in Exhibit C-1.

Table 4 below summarizes the total capacity changes by generator type as compared to the Base Model for the "SEPB 15 x 15 Case".

Table 4: Capacity Assumptions for SEPB 15 x 15 Case

Generator Type	**SEPB 15 x 15 Case Capacity Change as Compared to the Base Model (MW)**
Combined Cycle	-76
Coal	-55
Combustion Turbine	-129
Hydro	191
Landfill Gas	122
Nuclear	106
Oil/Gas	-1,573
Wind	3,603
Overall Total	**2,189**

II. MARS Results

A. <u>Base Model</u>

For comparison purposes, Table 5 below provides the LOLE results for the Base Model for each NY zone and for the overall NY Control Area (NYCA) for each study year. This is based on the 2009 RNA Base Case load forecast (achieving 30% EEPS) and the capacity values.

Table 5: Base Model LOLE

Zone	Base Model As Found w/ 30% EEPS 2009	2012	2015	2018
A	0.0	0.0	0.0	0.0
B	0.0	0.0	0.0	0.003
C	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.001
F	0.0	0.0	0.0	0.0
G	0.0	0.0	0.0	0.001
H	0.0	0.001	0.0	0.001
I	0.001	0.008	0.02	0.079
J	0.001	0.009	0.022	0.091
K	0.001	0.0	0.0	0.001
NYCA	0.001	0.010	0.024	0.096

B. SEPB RNA Case

Table 6 below provides the LOLE results for the base "SEPB RNA Case". The resultant LOLE criterion of 0.1 per year is not violated for any area for any study year. Therefore, the SEPB assumed capacity modifications will not negatively impact the State's reliability provided that 30% of the EEPS is achieved. In fact the SEPB capacity modification assumptions improves the LOLE for Zones I, J and NYCA.

Table 6: SEPB RNA Case LOLE

Zone	SEPB RNA Case 2009	2012	2015	2018
A	0.0	0.0	0.0	0.0
B	0.0	0.0	0.0	0.004
C	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.002
F	0.0	0.0	0.0	0.0
G	0.0	0.0	0.0	0.001
H	0.0	0.0	0.0	0.0
I	0.0	0.002	0.007	0.028
J	0.0	0.003	0.007	0.03
K	0.001	0.0	0.0	0.0
NYCA	0.001	0.003	0.008	0.032

C. SEPB 15 x 15 Case

Table 7 below provides the LOLE results for the base "SEPB 15 x 15 Case". Even though there is less capacity assumed for this case, the lower load forecast is sufficient enough such that the LOLE drops as compared to the base model or the base "SEPB RNA Case".

However, if the 15 x 15 load forecast is not achieved, reliability violations may occur as early as 2012 for this given capacity condition. Table 8 shows the results based on using the capacity assumptions for the "SEPB 15 x 15 Case" but only achieving the 30% of the EEPS as assumed it the "SEPB RNA Case". This shows that the LOLE would exceed 0.1 by 2012 and would exceed 0.6 by 2018. The primary differences impacting these LOLE results is that the "SEPB 15 x 15 Case" retires nearly 1,000MW more and installs nearly 500MW less in fossil fuel plants than the "SEPB RNA Case". This will result in a much lower reliable system if the loads aren't sufficiently reduced to offset this lack of generation capacity.

Table 7: SEPB 15 x 15 Case LOLE

	SEPB 15 x 15 Case			
Zone	**2009**	**2012**	**2015**	**2018**
A	0.0	0.0	0.0	0.0
B	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0
G	0.0	0.001	0.0	0.0
H	0.0	0.0	0.0	0.0
I	0.0	0.006	0.0	0.001
J	0.0	0.005	0.0	0.001
K	0.0	0.0	0.0	0.0
NYCA	0.001	0.007	0.0	0.001

Table 8: 30% EEPS and SEPB 15 x15 LOLE

	w/ 30% EEPS Load Forecast and SEPB 15 x 15 Capacity			
Zone	**2009**	**2012**	**2015**	**2018**
A	0	0	0	0
B	0	0.006	0.01	0.026
C	0	0	0	0
D	0	0	0	0
E	0	0.001	0.003	0.009
F	0	0	0	0
G	0	0.033	0.07	0.203
H	0	0.001	0.001	0.001
I	0	0.096	0.213	0.589
J	0	0.081	0.181	0.523
K	0.001	0.001	0.001	0.003
NYCA	0.001	0.102	0.23	0.627

D. Scenario 1- Upstate Nuclear Addition

A scenario of adding 1,600 MW of generic nuclear power upstate in 2018 was evaluated. This capacity addition was modeled by prorating the increase among the existing upstate nuclear facilities and adding the capacity increase to the existing units per Table 9.

Table 9: Upstate Nuclear Capacity Addition

Nuclear Unit	Existing Summer Capacity	Capacity Addition	New Summer Capacity
Ginna	580	267	847
Nine Mile Pt Unit 1	690	318	1,008
Nine Mile Pt Unit 2	1,305	600	1,905
Fitzpatrick	902	415	1,317
Total	**3,477**	**1,600**	**5,077**

1. <u>SEPB RNA Case- Upstate Nuclear Scenario</u>
   Exhibit C-2 includes the capacity modifications provided by SEPB Working Group for inclusion in the reliability analysis. In addition to the 1,600 MW upstate nuclear addition, this scenario also includes the following changes as compared to the base "SEPB RNA Case":

   i. Retiring of SA Carlson 27MW in 2012
   ii. Retiring of Roseton 1 and 2 1144MW in 2018
   iii. Shifted 20MW of Wind Addition from 2012 to 2015

   Table 10 shows the LOLE results for the SEPB RNA Case- Upstate Scenario and indicates that a NYCA LOLE violation of 0.276 would occur in 2018. An LOLE violation in Zones I and J would also occur. This indicates that the addition of the nuclear capacity upstate is not sufficient to offset the retirement of the Roseton 1 and 2 units located downstate due to transmission limitations.

Table 10: SEPB RNA Case – Upstate Nuclear Scenario LOLE

	SEPB RNA Case- Upstate Nuclear Scenario			
Zone	**2009**	**2012**	**2015**	**2018**
A	0.0	0.000	0.000	0.0
B	0.0	0.000	0.000	0.002
C	0.0	0.000	0.000	0.0
D	0.0	0.000	0.000	0.0
E	0.0	0.000	0.000	0.001
F	0.0	0.000	0.000	0.0
G	0.0	0.000	0.000	0.084
H	0.0	0.000	0.000	0.0
I	0.0	0.002	0.007	0.255
J	0.0	0.003	0.007	0.223
K	0.001	0.000	0.000	0.0
NYCA	0.001	0.003	0.008	0.276

Two additional runs were completed to determine the impact of retiring the Roseton units. If both Roseton units are kept in-service, the NYCA LOLE reduces to 0.02. If only one unit is retired, the resulting NYCA LOLE would be .071.

2. SEPB 15 x 15 Case- Upstate Nuclear Scenario

Exhibit C-2 includes the capacity modifications provided by SEPB Working Group for inclusion in the reliability analysis. In addition to the 1,600 MW upstate nuclear addition, this scenario also includes the retirement of East River Units 6 and 7 (314MW) in 2015 as compared to the base “SEPB 15 x 15 Case”.

Table 11 shows the LOLE results for the SEPB 15 x 15 Case- Upstate Scenario. No LOLE violations would occur through out the study period due to the low load forecast.

Table 11: SEPB 15 x 15 Case- Upstate Nuclear Scenario LOLE

Zone	SEPB 15 x 15 Case- Upstate Nuclear Scenario			
	2009	2012	2015	2018
A	0.0	0.000	0.000	0.0
B	0.0	0.000	0.000	0
C	0.0	0.000	0.000	0.0
D	0.0	0.000	0.000	0.0
E	0.0	0.000	0.000	0
F	0.0	0.000	0.000	0.0
G	0.0	0.001	0.000	0.001
H	0.0	0.000	0.000	0.0
I	0.0	0.006	0.000	0.003
J	0.0	0.005	0.000	0.003
K	0.001	0.000	0.000	0.0
NYCA	0.001	0.007	0	0.004

A second case was run using the load forecast used in the “SEPB RNA Case” which is based on achieving only 30% of EEPS. Table 12 includes the results of this case which shows that a NYCA LOLE violation of 0.103 would occur in 2012 and increases to 0.87 in 2018.

Table 12: 30% EEPS and SPEB 15 x 15 Case - Upstate Nuclear Scenario LOLE

Zone	SEPB 15 x 15 Case- Upstate Nuclear Scenario w/ 30% EEPS Load Forecast			
	2009	2012	2015	2018
A	0.0	0.000	0.000	0.0
B	0.0	0.006	0.014	0.003
C	0.0	0.000	0.000	0.0
D	0.0	0.000	0.000	0.0
E	0.0	0.001	0.004	0.001
F	0.0	0.000	0.000	0.0
G	0.0	0.033	0.121	0.204
H	0.0	0.001	0.002	0.0
I	0.0	0.096	0.427	0.812
J	0.0	0.080	0.385	0.763
K	0.001	0.001	0.002	0.0
NYCA	0.001	0.103	0.461	0.87

As shown in the base "SEPB 15 x 15 Case", if the full EEPS load forecast is not achieved, a resource adequacy violation would occur. The increase in the NYCA LOLE from .627 in the base "SPEB 15 x 15 Case" to 0.87 in this scenario indicates that adding 1,600 MW nuclear capacity upstate is not sufficient enough to offset the retirement of the East River units located downstate.

E. Scenario 2- 30% Renewable Portfolio Standard

Exhibit C-3 includes the capacity modifications provided by SEPB Working Group for inclusion in the reliability analysis. This scenario is similar to Scenario 1 with the following major differences:

i. Only Roseton 1 unit is retired
ii. 3543 MW of additional wind capacity located upstate is included.

This scenario was only run for the "SEPB RNA Case". As shown in Table 13, it was found that no LOLE violations would occur. No further study was completed for this scenario.

Table 13: 30% Renewable Portfolio Standard Scenario LOLE

Zone	SEPB RNA Case- 30% RPS			
	2009	2012	2015	2018
A	0.0	0.000	0.000	0.0
B	0.0	0.000	0.001	0.001
C	0.0	0.000	0.000	0.0
D	0.0	0.000	0.000	0.0
E	0.0	0.000	0.000	0
F	0.0	0.000	0.000	0.0
G	0.0	0.000	0.000	0.003
H	0.0	0.000	0.000	0.0
I	0.0	0.002	0.007	0.059
J	0.0	0.002	0.007	0.061
K	0.001	0.000	0.000	0.0
NYCA	0.001	0.003	0.008	0.068

III. Summary

A. Base Cases

1. The capacity modifications as recommended by SEPB through out the study period for the two base cases would not result in an LOLE violation of once in 10 years provided that the corresponding load forecast is achieved. However, if the full energy portfolio standard load forecast is not achieved, then a violation may occur in the "SEPB 15 x 15 Case" starting in year 2012.

B. Scenario Cases

1. The capacity modifications provided for the SEPB RNA Case- Upstate Nuclear scenario would result in an LOLE violation in 2018 if both Roseton Units are retired. This violation is eliminated if only one unit is retired. No LOLE violation occurs for the SEPB 15 x 15 Case- Upstate Nuclear scenario if the full EEPS is achieved. However, a violation may occur in 2012 if the full load reduction is not achieved.

2. The capacity modifications provided for the SEPB 15 x 15 Case- 30% RPS scenario resulted in no LOLE violations through out the study period.

Exhibit C-1: Base Case Capacity Modifications

State Energy Planning Board Study
Capacity Modifications Entered into MARS

Landfill Gas

RNA Case and 15 x 15 Case Generic Capacities per SEPB	2009	2012	2015	2018
Zone A-E	18.0	53.0	20.0	0.0
Zone F	5.0	16.0	6.0	0.0
Zone G-I	1.0	0.0	0.0	0.0
Zone K	1.0	2.0	0.0	0.0

UNT-MXCP	Zone	Existing Capacity	Prorated Additions	Revised Total	Prorated Additions	Revised Total	Prorated Additions	Revised Total
JAN	A	16.2	4.4	20.6	13.0	33.5	4.9	38.4
JAN	B	11.4	3.1	14.5	9.1	23.6	3.4	27.0
JAN	C	29.1	7.9	37.0	23.3	60.3	8.8	69.0
JAN	D	4.8	1.3	6.1	3.8	9.9	1.4	11.4
JAN	E	4.8	1.3	6.1	3.8	9.9	1.4	11.4
	Total Zone A-E	**66.3**	**18.0**	**84.3**	**53.0**	**137.3**	**20.0**	**157.3**
MAY	A	15.9	4.1	20.0	12.0	31.9	4.5	36.5
MAY	B	11.0	2.8	13.8	8.3	22.1	3.1	25.2
MAY	C	33.9	8.7	42.6	25.5	68.1	9.6	77.7
MAY	D	4.8	1.2	6.0	3.6	9.6	1.4	11.0
MAY	E	4.8	1.2	6.0	3.6	9.6	1.4	11.0
	Total Zone A-E	**70.4**	**18.0**	**88.4**	**53.0**	**141.4**	**20.0**	**161.4**
JAN	F	8.4	5.0	13.4	16.0	29.4	6.0	35.4
MAY	F	8.7	5.0	13.7	16.0	29.7	6.0	35.7
JAN	H	0.0	1.0	1.0				
MAY	H	0.0	1.0	1.0				
	Total Zone G-I	**0.0**						
JAN	K	1.8	1.0	2.8	2.0	4.8		
MAY	K	1.8	1.0	2.8	2.0	4.8		

Existing Capacities are per the 2009 RNA MARS Model

Hydro

RNA Case and 15 x 15 Case Generic Capacities per SEPB	2009	2012	2015	2018
Zone A-E	25.0	75.0	59.0	0.0
Zone F	5.0	13.0	14.0	0.0

UNT-MXCP	Zone	Existing Capacity	Prorated Additions	Revised Total	Prorated Additions	Revised Total	Prorated Additions	Revised Total
JAN	A	0.2	0.0	0.2	0.0	0.2	0.0	0.2
JAN	B	56.1	1.9	58.0	5.8	63.8	4.5	68.3
JAN	C	115.0	3.9	118.9	11.8	130.8	9.3	140.1
JAN	D	75.1	2.6	77.7	7.7	85.4	6.1	91.5
JAN	E	483.4	16.6	500.0	49.7	549.6	39.1	588.7
	Total Zone A-E	**729.8**	**25.0**	**754.8**	**75.0**	**829.8**	**59.0**	**888.8**
MAY	A	3.2	0.1	3.3	0.4	3.8	0.3	4.1
MAY	B	32.1	1.5	33.6	4.4	38.0	3.5	41.5
MAY	C	72.0	3.3	75.3	9.9	85.2	7.8	93.0
MAY	D	71.0	3.3	74.3	9.8	84.0	7.7	91.7
MAY	E	366.9	16.8	383.7	50.5	434.2	39.7	473.9
	Total Zone A-E	**545.2**	**25.0**	**570.2**	**75.0**	**645.2**	**59.0**	**704.2**
JAN	F	449.2	5.0	454.2	13.0	467.2	14.0	481.2
MAY	F	392.2	5.0	397.2	13.0	410.2	14.0	424.2

Existing Capacities are per the 2009 RNA MARS Model

Wind

RNA Case Generic Capacities per SEPB	2009	2012	2015	2018
Zone A-E	1368.0	1389.0	565.0	53.0
Zone F	34.0	100.0	34.0	

	Zone	Existing Capacity	2009 Prorated Additions	2009 Revised Total	2012 Prorated Additions	2012 Revised Total	2015 Prorated Additions	2015 Revised Total	2018 Prorated Additions	2018 Revised Total
JAN	A	121.4	136.6	258.0	138.7	396.8	56.4	453.2	5.3	458.5
JAN	C	212.2	238.9	451.1	242.6	693.7	98.7	792.4	9.3	801.6
JAN	D	513.3	577.8	1091.0	586.7	1677.7	238.6	1916.3	22.4	1938.7
JAN	E	368.4	414.7	783.0	421.0	1204.1	171.3	1375.3	16.1	1391.4
	Total Zone A-E	**1215.2**	**1368.0**	**2583.2**	**1389.0**	**3972.2**	**565.0**	**4537.2**	**53.0**	**4590.2**
JAN	F	0.0	34.0	34.0	100.0	134.0	34.0	168.0		

15 x 15 Case Generic Capacities per SEPB	2009	2012	2015	2018
Zone A-E	1368.0	928.0	1027.0	53.0
Zone F	34.0	100.0	34.0	

	Zone	Existing Capacity	2009 Prorated Additions	2009 Revised Total	2012 Prorated Additions	2012 Revised Total	2015 Prorated Additions	2015 Revised Total	2018 Prorated Additions	2018 Revised Total
JAN	A	121.4	136.6	258.0	92.7	350.7	102.6	453.3	5.3	458.6
JAN	C	212.2	238.9	451.1	162.1	613.2	179.4	792.6	9.3	801.8
JAN	D	513.3	577.8	1091.0	391.9	1483.0	433.8	1916.7	22.4	1939.1
JAN	E	368.4	414.7	783.0	281.3	1064.3	311.3	1375.6	16.1	1391.7
	Total Zone A-E	**1215.2**	**1368.0**	**2583.2**	**928.0**	**3511.2**	**1027.0**	**4538.2**	**53.0**	**4591.2**
JAN	F	0.0	34.0	34.0	100.0	134.0	34.0	168.0		

Existing Capacities are per the 2009 RNA MARS Model

Exhibit C-2: Scenario 1 Capacity Modifications

Nuclear

RNA and 15 x 15 Case Generic Capacities per SEPB Upstate Firm Nuclear Scenario

	2009	2012	2015	2018
Zone A-E				1600.0

	Zone	Existing Capacity*	2009 Prorated Additions	2009 Revised Total	2012 Prorated Additions	2012 Revised Total	2015 Prorated Additions	2015 Revised Total	2018 Prorated Additions	2018 Revised Total
JAN	A	0.0								
JAN	B- Ginna	583.4							266.9	850.3
JAN	C- Nine Mile Pt 1	692.8							317.0	1009.8
JAN	C- Nine Mile Pt 2	1318.0							603.0	1921.0
JAN	C- Fitzpatrick	903.1							413.2	1316.3
JAN	D	0.0								
JAN	E	0.0								
	Total Zone A-E	**3497.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1600.0**	**5097.3**

	Zone	Existing Capacity*	2009 Prorated Additions	2009 Revised Total	2012 Prorated Additions	2012 Revised Total	2015 Prorated Additions	2015 Revised Total	2018 Prorated Additions	2018 Revised Total
MAY	A	0.0								
MAY	B- Ginna	580.1							267.0	847.1
MAY	C- Nine Mile Pt 1	690.0							317.5	1007.5
MAY	C- Nine Mile Pt 2	1304.7							600.4	1905.1
MAY	C- Fitzpatrick	901.9							415.1	1317.0
MAY	D	0.0								
MAY	E	0.0								
	Total Zone A-E	**3476.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1600.0**	**5076.7**

* Existing capacity values include Uprates identified in Base Cases

Wind

RNA Case Generic Capacities per SEPB Upstate Nuclear Scenario

	2009	2012	2015	2018
Zone A-E	1368.0	1366.0	588.0	53.0
Zone F	34.0	100.0	34.0	

	Zone	Existing Capacity	2009 Prorated Additions	2009 Revised Total	2012 Prorated Additions	2012 Revised Total	2015 Prorated Additions	2015 Revised Total	2018 Prorated Additions	2018 Revised Total
JAN	A	121.4	136.6	258.0	136.4	394.5	58.7	453.2	5.3	458.5
JAN	C	212.2	238.9	451.1	238.6	689.7	102.7	792.4	9.3	801.6
JAN	D	513.3	577.8	1091.0	576.9	1668.0	248.3	1916.3	22.4	1938.7
JAN	E	368.4	414.7	783.0	414.1	1197.1	178.2	1375.3	16.1	1391.4
	Total Zone A-E	**1215.2**	**1368.0**	**2583.2**	**1366.0**	**3949.2**	**588.0**	**4537.2**	**53.0**	**4590.2**
JAN	F	0.0	34.0	34.0	100.0	134.0	34.0	168.0		

Existing Capacities are per the 2009 RNA MARS Model

Exhibit C-3: Scenario 2 Capacity Modifications

State Energy Planning Board Study
Generic Capacity Modifications Entered into MARS
30% RPS Scenario

Landfill Gas

RNA Case Generic Capacities per SEPB 30% RPS	2009	2012	2015	2018
Zone A-E	19.0	53.0	19.0	0.0
Zone F	5.0	16.0	6.0	0.0
Zone G-I	1.0	0.0	0.0	0.0
Zone K	1.0	2.0	0.0	0.0

UNT-MXCI	Zone	Existing Capacity	Prorated Additions	Revised Total	Prorated Additions	Revised Total	Prorated Additions	Revised Total
JAN	A	16.2	4.6	20.8	13.0	33.8	4.6	38.4
JAN	B	11.4	3.3	14.7	9.1	23.8	3.3	27.0
JAN	C	29.1	8.3	37.4	23.3	60.7	8.3	69.0
JAN	D	4.8	1.4	6.2	3.8	10.0	1.4	11.4
JAN	E	4.8	1.4	6.2	3.8	10.0	1.4	11.4
	Total Zone A-E	**66.3**	**19.0**	**85.3**	**53.0**	**138.3**	**19.0**	**157.3**
MAY	A	15.9	4.3	20.2	12.0	32.2	4.3	36.5
MAY	B	11.0	3.0	14.0	8.3	22.3	3.0	25.2
MAY	C	33.9	9.1	43.0	25.5	68.6	9.1	77.7
MAY	D	4.8	1.3	6.1	3.6	9.7	1.3	11.0
MAY	E	4.8	1.3	6.1	3.6	9.7	1.3	11.0
	Total Zone A-E	**70.4**	**19.0**	**89.4**	**53.0**	**142.4**	**19.0**	**161.4**
JAN	F	8.4	5.0	13.4	16.0	29.4	6.0	35.4
MAY	F	8.7	5.0	13.7	16.0	29.7	6.0	35.7
JAN	H	0.0	1.0	1.0				
MAY	H	0.0	1.0	1.0				
	Total Zone G-I	**0.0**						
JAN	K	1.8	1.0	2.8	2.0	4.8		
MAY	K	1.8	1.0	2.8	2.0	4.8		

Existing Capacities are per the 2009 RNA MARS Model

Hydro

RNA Case Case Generic Capacities per SEPB 30% RPS	2009	2012	2015	2018
Zone A-E	32.0	75.0	52.0	0.0
Zone F	7.0	13.0	12.0	0.0

UNT-MXCI	Zone	Existing Capacity	Prorated Additions	Revised Total	Prorated Additions	Revised Total	Prorated Additions	Revised Total
JAN	A	0.2	0.0	0.2	0.0	0.2	0.0	0.2
JAN	B	56.1	2.5	58.6	5.8	64.3	4.0	68.3
JAN	C	115.0	5.0	120.0	11.8	131.9	8.2	140.1
JAN	D	75.1	3.3	78.4	7.7	86.1	5.4	91.5
JAN	E	483.4	21.2	504.6	49.7	554.3	34.4	588.7
	Total Zone A-E	**729.8**	**32.0**	**761.8**	**75.0**	**836.8**	**52.0**	**888.8**
MAY	A	3.2	0.2	3.4	0.4	3.8	0.3	4.1
MAY	B	32.1	1.9	34.0	4.4	38.4	3.1	41.5
MAY	C	72.0	4.2	76.2	9.9	86.1	6.9	93.0
MAY	D	71.0	4.2	75.2	9.8	84.9	6.8	91.7
MAY	E	366.9	21.5	388.4	50.5	438.9	35.0	473.9
	Total Zone A-E	**545.2**	**32.0**	**577.2**	**75.0**	**652.2**	**52.0**	**704.2**
JAN	F	449.2	7.0	456.2	13.0	469.2	12.0	481.2
MAY	F	392.2	7.0	399.2	13.0	412.2	12.0	424.2

Existing Capacities are per the 2009 RNA MARS Model