Updating and Extending the 2015 CARIS Database for Specific Project Evaluation

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DRAFT – FOR DISCUSSION PURPOSES ONLY

Update and Extension of CARIS Phase 1 Database for CARIS Phase 2

- **NYISO must update and extend the CARIS 1 database for Phase 2 studies**
  - ***Economic Planning Process Manual, Section 3.1***
  - ***CARIS 1 Base Case (2015-2024) updated and extended until 2034 for a 20-year study period***
- **CARIS 2 Base Case to be utilized in evaluation of specific Regulated Economic Transmisison projects**
  - ***Also available for use in optional Additional CARIS Studies***
- **Assumptions and preliminary results reviewed and comments addressed with ESPWG on July 5th**

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Database Update and Extensions

- **Forecasts**
  - *2016 Gold Book Forecast*
  - *Updated Fuel Price Forecast based upon EIA's 2016 Annual Energy Outlook*
  - *SO_x and NO_x emission allowance values updated; CO_2 unchanged*
- **Transmission and Generating Capacity**
  - *System topology consistent with 2016 Reliability Needs Assessment*
  - *Generating capacity updated based on 2016 Gold Book and study inclusion rules*
  - *No generic capacity additions required to maintain target reserve proxy*

***Summer DMNC from 2016 Gold Book**

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Major NYCA Generation Database Updates

- **Additions**
  - *CPV Valley*
- **Removals**
  - *Dunkirk 2, 3 and 4 refueling*
  - *Huntley 67&68*
  - *Fitzpatrick*
  - *Ginna*
- **Updates**
  - *Sithe Independence*

***Summer DMNC from 2016 Gold Book**

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Major NYCA Transmission Updates

- **Additions**
  - *Packard-Sawyer 77&78 1.5% Series Reactor*
  - *Rochester-Area Upgrades (GRTA)*
  - *Leeds-Hurley 21% Series Compensation*
- **Removals**
  - *Staten Island Un-bottling Project Phase 2*
- **Updates**
  - *Central East Voltage Collapse Transfer Limit*

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Con Ed/PSEG Wheel Agreement Cancellation

- **PJM/NYISO Interchange being modeled consistent with 2016 RNA topology**
- **PAR ABC**
  - ***Hard limit is from 0MW to 200MW into NY***
- **PAR JK**
  - ***Hard limit is from 0MW to 200MW into NY***
- **Ramapo schedule**
  - ***Hard limit is 1000MW into PJM***
  - ***Hard limit for PAR JK grouped with 5018 is 480MW into NY***
  - ***80% of RECO load served through 5018 line***

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20-Year Representative System

- **No need to add generic capacity to maintain Target Reserve Proxy**
  - ***Model assumptions consistent with 2016 RNA, with load forecasts extended out to 2034***
- **NYISO will track resolution of transmission security violations identified in 2016 RNA**
  - ***Solutions may need to be captured in a subsequent update to the CARIS 2 Base Case***
  - ***Any updates will be reviewed with ESPWG and BIC prior to any evaluation of projects proposed for cost recovery in CARIS 2***

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CARIS Phase 2 Assumption Matrix

Parameter	Modeling for 2015 CARIS 1 Base Case	Modeling for 2016 CARIS 2 Base Case
Peak Load	Based on 2015 Load & Capacity Data Report ("Gold Book") Baseline Forecast of Non-Coincident Peak Demand, including Energy Efficiency, Distributed Generation, and Other Behind-the-Meter Impacts (Table I-2b). The impact of Solar PV is captured in the Other Behind-the-Meter Impacts	Based on 2016 Load & Capacity Data Report ("Gold Book") Baseline Forecast of Non-Coincident Peak Demand, including Energy Efficiency, Distributed Generation, and Other Behind-the-Meter Impacts (Table I-2b). The impact of Solar PV is captured in the Other Behind-the-Meter Impacts
Load Shape Model Energy Forecast	2002 Load Shape. Based on 2015 Load & Capacity Data Report ("Gold Book") Energy Forecast Baseline Forecast of Annual Energy, including Energy Efficiency, Distributed Generation, and Other Behind-the-Meter Impacts (Table I-2a). The impact of Solar PV is captured in the Other Behind-the-Meter Impacts	2002 Load Shape. Based on 2016 Load & Capacity Data Report ("Gold Book") Energy Forecast Baseline Forecast of Annual Energy, including Energy Efficiency, Distributed Generation, and Other Behind-the-Meter Impacts (Table I-2a). The impact of Solar PV is captured in the Other Behind-the-Meter Impacts
Load Uncertainty Model	Only Base Level Forecast utilized; the impact of energy or peak forecasts may be utilized in scenarios	Same
Generating Unit Capacities	Updated to reflect 2015 Gold Book winter and summer DMNC values	Updated to reflect 2016 Gold Book winter and summer DMNC values
New Units	Updated as per 2015 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.1.1 and procedures)	Updated as per 2016 Gold Book (Application of inclusion rules identified in Reliability Planning Process Manual, Section 3.1.1 and procedures). Consistent with 2016 RNA.
Wind Resource Modeling	Units and capacities updated as per 2015 Gold Book. Wind resources are modeled based on unit capacities and synthesized wind shapes developed as part of 2010 Wind Study.	Units and capacities updated as per 2016 Gold Book. Wind resources are modeled based on unit capacities and synthesized wind shapes developed as part of 2010 Wind Study.

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CARIS Phase 2 Assumption Matrix (cont.)

Parameter	Modeling for 2015 CARIS 1 Base Case	Modeling for 2016 CARIS 2 Base Case
Non-NYPA Hydro Capacity Modeling	Updated as per 2015 Gold Book; unit output is modeled consistent with historic levels.	Updated as per 2016 Gold Book; unit output is modeled consistent with historic levels.
Special Case Resources	Not utilized in MAPS production cost modeling; incorporated in ICAP Metric calculation	Same
EDRP Resources	N/A for production cost modeling	Same
External Capacity – Purchases and Wheel-Throughs	Flows across schedulable and non-schedulable transmission lines are based on economics.	Same
Retirements	Updated as per 2015 Gold Book (Application of inclusion rules; specific assumptions concerning mothball announcement post-CRP; units with completed studies indicating that the unit is required for reliability are retained in the Base Case; units whose studies are pending are retained in the Base Case; others are excluded from the Base Case)	Updated as per 2016 Gold Book.
Generator Outages	Scheduled to levelize reserves.	Same
Gas Turbines Ambient Derate	Modeling utilizes summer and winter DMNC ratings for all units.	Same
Environmental Modeling Externalities Allowances	Allowance costs based on projected RGGI costs. SO_2 and NO_x Allowance Prices reflect new CSAPR markets. SO_2 based on CSAPR price ($100 / Ton) decreased 10% until 2017, at which point Phase II will increase price by 25% and decrease thereafter at 20% per annum. Annual ($100 / Ton) and Ozone Season NO_x ($125 / Ton) follow same trend as SO_2 Allowance Prices. Detailed allowance costs are provided in the 5/4/15 ESPWG meeting materials. National CO2 program in 2020.	Allowance costs based on projected RGGI costs. Due to regulatory uncertainties, CO_2 price forecasts have not been updated. National CO_2 program in 2024. SO_2 projected at $5/ton nominal through study period, reflecting current lower prices (even with MATS implementation in April 2015). Annual NO_x costs lower to reflect recent price reductions and higher Ozone Season NO_x allowance costs due to the new Ozone NAAQS regulations. Detailed allowance costs provided with the July 5, 2016 ESPWG meeting materials.

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CARIS Phase 2 Assumption Matrix (cont.)

Parameter	Modeling for 2015 CARIS 1 Base Case	Modeling for 2016 CARIS 2 Base Case
Commitment and Dispatch Options Operating Reserves	Each Balancing Authority commits to serve its own load, firm transactions, and potential transfers Hurdle rates – flat Operating Reserves as per NYCA requirements.	Same Hurdle rates unchanged from CARIS 1. Same
Fuel Price Forecast	Annual bases updated to more heavily weight recent trends (2012-0.100, 2013-0.325, 2014-0.575). Seasonality and spikes based on five-year history (2010-2014). Fuel oil and coal price forecasts are developed utilizing the EIA's annual forecast of national delivered prices. Regional bases are derived using EIA Form 923 data. The seasonality for fuel oils is based on an analysis of New York Harbor Ultra-Low Sulfur Diesel (ULSD) prices. Coal has no seasonality. Illustrative fuel costs are presented in the 5/4/15 ESPWG meeting materials.	Annual bases updated to more heavily weight recent trends (2013-0.100, 2014-0.325, 2015-0.575). Seasonality and spikes based on five-year history (2011-2015). Fuel oil and coal price forecasts are developed utilizing the EIA's annual forecast of national delivered prices. Regional bases are derived using EIA Form 923 data. The seasonality for fuel oils is based on an analysis of New York Harbor Ultra-Low Sulfur Diesel (ULSD) prices. Coal has no seasonality. Illustrative fuel costs provided in the July 5, 2016 ESPWG presentation.
Cost Curve Development (including heat rates and emission rates)	Unit heat rates (and emission rates) developed from vendor supplied data, USEPA CAMD fuel input and emissions data matched with NYISO production data for NYCA and USEIA production data for non NYCA units.	Same
Local Reliability Rules	List and develop appropriate nomograms. Fuel burn restrictions, operating restrictions and exceptions, commitment/dispatch limits	Same
Energy Storage Gilboa PSH Lewiston PSH	Scheduling checked to conform to historical operations.	Same

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CARIS Phase 2 Assumption Matrix (cont.)

Parameter	Modeling for 2015 CARIS 1 Base Case	Modeling for 2016 CARIS 2 Base Case
Transmission System Model		
Power Flow Cases	As per CRP.	Updated to reflect Leeds-Hurley Series Compensation.
Interface Limits Monitored/ contingency pairs Nomograms Joint, Grouping Unit Sensitive Voltage	Data from the results of internal and external planning studies; vendor-supplied data; operational voltage studies; operational limits; transfer limit analysis for critical interfaces. Athens SPS in service through June 1, 2024.	Updated to reflect Leeds-Hurley Series Compensation and CPV Valley. Athens SPS in service through June 1, 2024.
New Transmission Capability	Updated as per 2015 Gold Book (Application of base case inclusion rules)	Updated as per 2016 Gold Book (Application of base case inclusion rules)
Internal Controllable Lines (PARs,DC,VFT)	Optimized in simulation,	Same
Neighboring Systems		
Outside World Area Models Fuel Forecast	Power flow data from CRP, “production” data developed by NYISO with vendor and neighbor input. Fuel forecasts developed utilizing same methodology as NYCA fuel forecasts.	Same
External Capacity And Load Forecast	Neighboring systems modeled consistent with reserve margins in the RNA/CRP analysis. Neighboring systems data reviewed and held at required reserve margin.	External systems updated with projects under construction. Minimum reserve margin maintained for neighboring systems. Load and capacity of external areas fixed for 2025-2034.

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CARIS Phase 2 Assumption Matrix (cont.)

Parameter	Modeling for 2015 CARIS 1 Base Case	Modeling for 2016 CARIS 2 Base Case
System representation in Simulation	HQ modeled as fixed hourly schedule, synchronized with all other external injections. Full Representation/Participation NYISO ISONE IESO PJM Classic & AP,AEP,CE,DLCO, DAY, VP Proxy Bus Injection: HQ-NYISO, HQ-NE-ISO, NB-NEISO, HQ - IESO Transmission Only/Zeroed Out: MECS,FE,SPP, MAR, NIPS,OVEC,TVA, FRCC,SERC,ERCOT,WECC	Same
External Controllable Lines (PARs,DC,VFT, Radial lines)	Ramapo "wheel" reflects current updated protocols, tariff and market operations, including NYISO Technical Bulletins and inter-control area operating agreements. 61% of Interchange Schedules across NY-PJM AC ties flow across Ramapo PARS. In addition, 80% of RECO load is served across Ramapo PARS. Norwalk (-200MW, +200MW) L33,34 (-300MW, +300MW) PV20 (0MW, +150MW) Neptune (0MW, +660MW) CSC (0MW, +330MW) CSC and Neptune optimized subject to "cost of use" HTP (0, 660) Linden VFT (-315,315)	Ramapo "wheel" reflects 2016 RNA topology. ABC PAR (Hard limit is from 0MW to 200MW into NY) JK PAR (Hard limit is from 0MW to 200MW into NY) Ramapo schedule (Hard limit is 1000MW into PJM; Hard limit for PAR JK grouped with 5018 is 480MW into NY;80% of RECO load served through 5018 line) Norwalk (-200MW, +200MW) L33,34 (-300MW, +300MW) PV20 (0MW, +150MW) Neptune (0MW, +660MW) CSC (0MW, +330MW) CSC and Neptune optimized subject to "cost of use" HTP (0, 660) Linden VFT (-315,315)

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BIC Review and Comment

- **NYISO reviewed with ESPWG CARIS 2 model assumptions and updates from CARIS 1**
  - ***Minor comments received and addressed***
- **CARIS procedures require BIC's review and comment on updated and extended CARIS 2 database**
  - ***Ensures potential project beneficiaries have timely access to Base Case assumptions and model results***
  - ***Any subsequent updates to CARIS 2 Base Case would necessitate further discussion at ESPWG and an additional review at BIC***
- **No governance action is required by BIC**

***Summer DMNC from 2016 Gold Book**

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- ***Maintaining and enhancing regional reliability***
- ***Operating open, fair and competitive wholesale electricity markets***
- ***Planning the power system for the future***
- ***Providing factual information to policy makers, stakeholders and investors in the power system***

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