

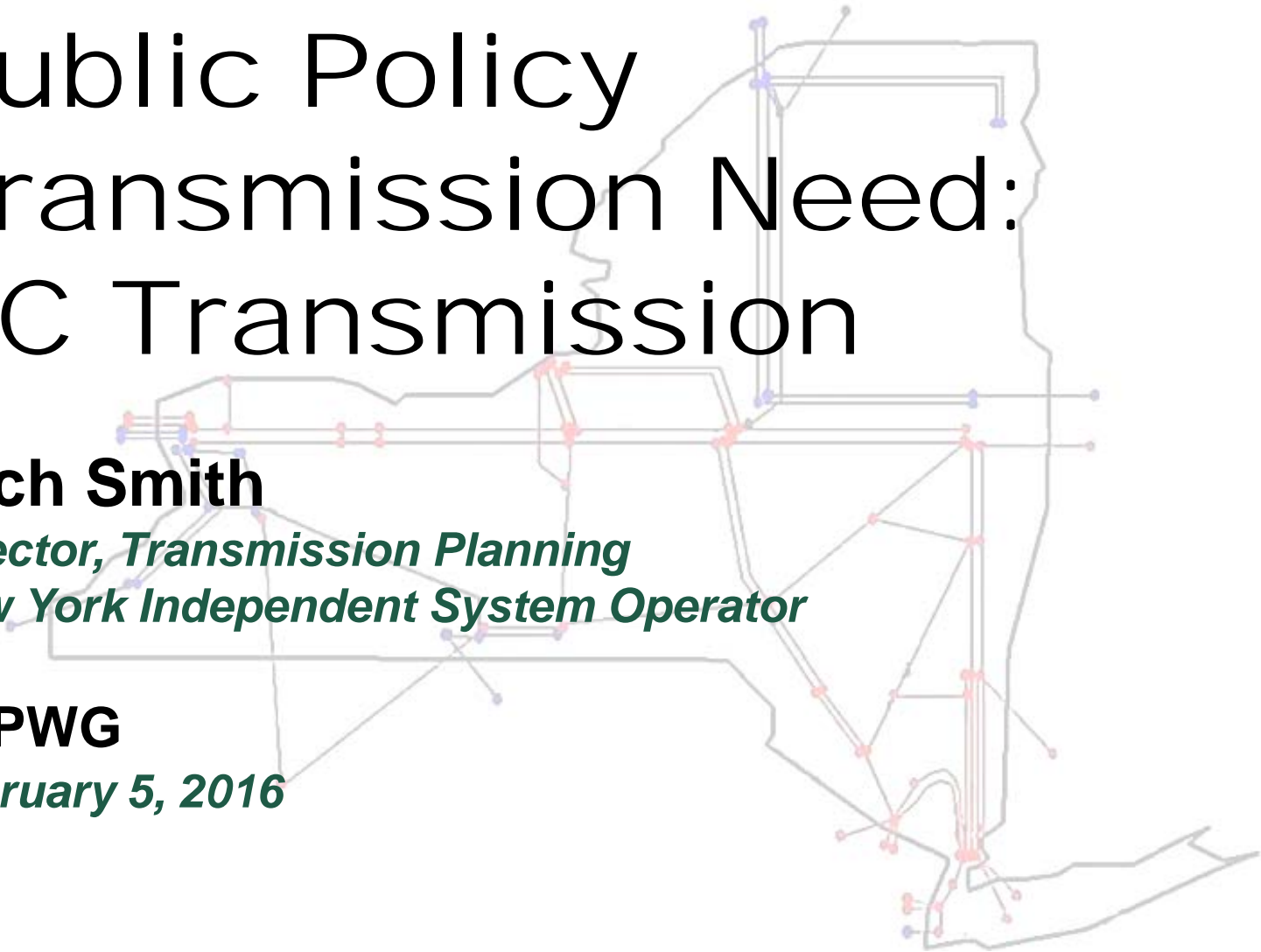
Public Policy Transmission Need: AC Transmission

Zach Smith

*Director, Transmission Planning
New York Independent System Operator*

ESPWG

February 5, 2016



Public Policy Process

1. NYISO invites proposed transmission needs driven by public policy requirements
2. PSC identifies Public Policy Transmission Needs (PPTN)
3. NYISO solicits solutions (transmission, generation, and demand-side)
4. NYISO performs viability and sufficiency assessment
5. PSC determines whether or not there is a continued need for transmission
6. NYISO evaluates transmission solutions if PSC determines there is a continued need
7. NYISO Board may select the more efficient or cost effective transmission solution

Background

- ◆ On August 1, 2014, NYISO issued a letter inviting stakeholders and interested parties to submit proposed transmission needs driven by Public Policy Requirements.
- ◆ NYISO submitted the proposed needs to the PSC on October 3, 2014.
- ◆ On November 12, 2014, the PSC published a SAPA notice with a comment period through December 29, 2014.

PSC Determination of a Need

- ◆ On September 22, 2015, DPS staff issued a final report in the PSC AC Transmission proceedings (13-E-0488) recommending new transmission facilities across Central East and UPNY/SENY interfaces.
- ◆ On October 7, 2015, the PSC published a SAPA Notice of Proposed Rulemaking regarding the AC Transmission recommendation.
- ◆ On December 17, 2015, the PSC issued an order addressing Public Policy Requirements and identifying the AC Transmission PPTN.

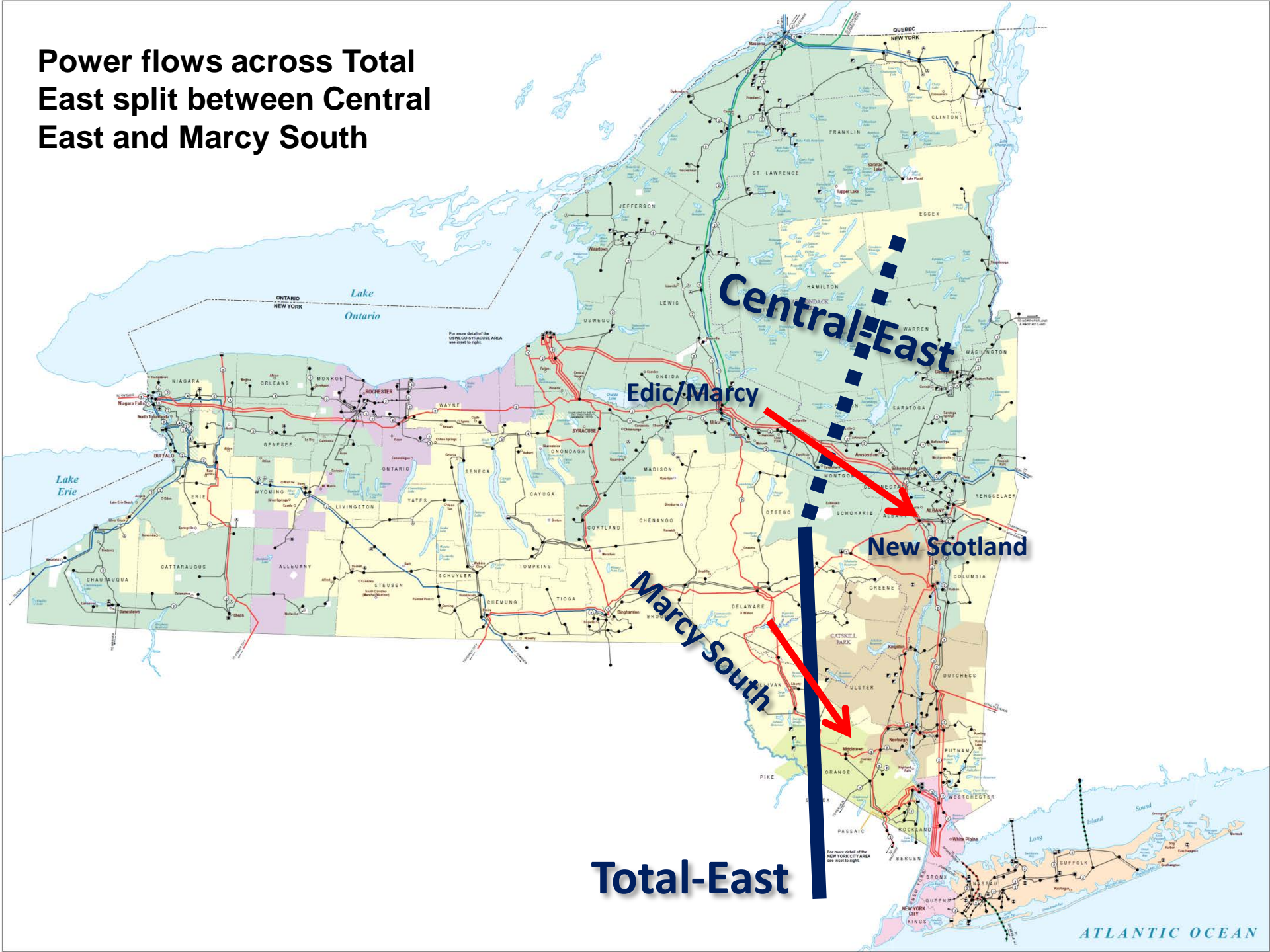
AC Transmission PPTN

- ◆ Segment A (Central East)
 - *New Edic/Marcy to New Scotland 345 kV line*
 - *Decommission Porter to Rotterdam 230 kV lines*
 - *345 kV connection to Rotterdam*

- ◆ Segment B (UPNY/SENY)
 - *New Knickerbocker to Pleasant Valley 345 kV line*
 - *Rock Tavern substation terminal upgrades*
 - *Shoemaker – Sugarloaf 138 kV line*

- ◆ See PSC Order for full descriptions

Power flows across Total East split between Central East and Marcy South



Total-East

Central-East

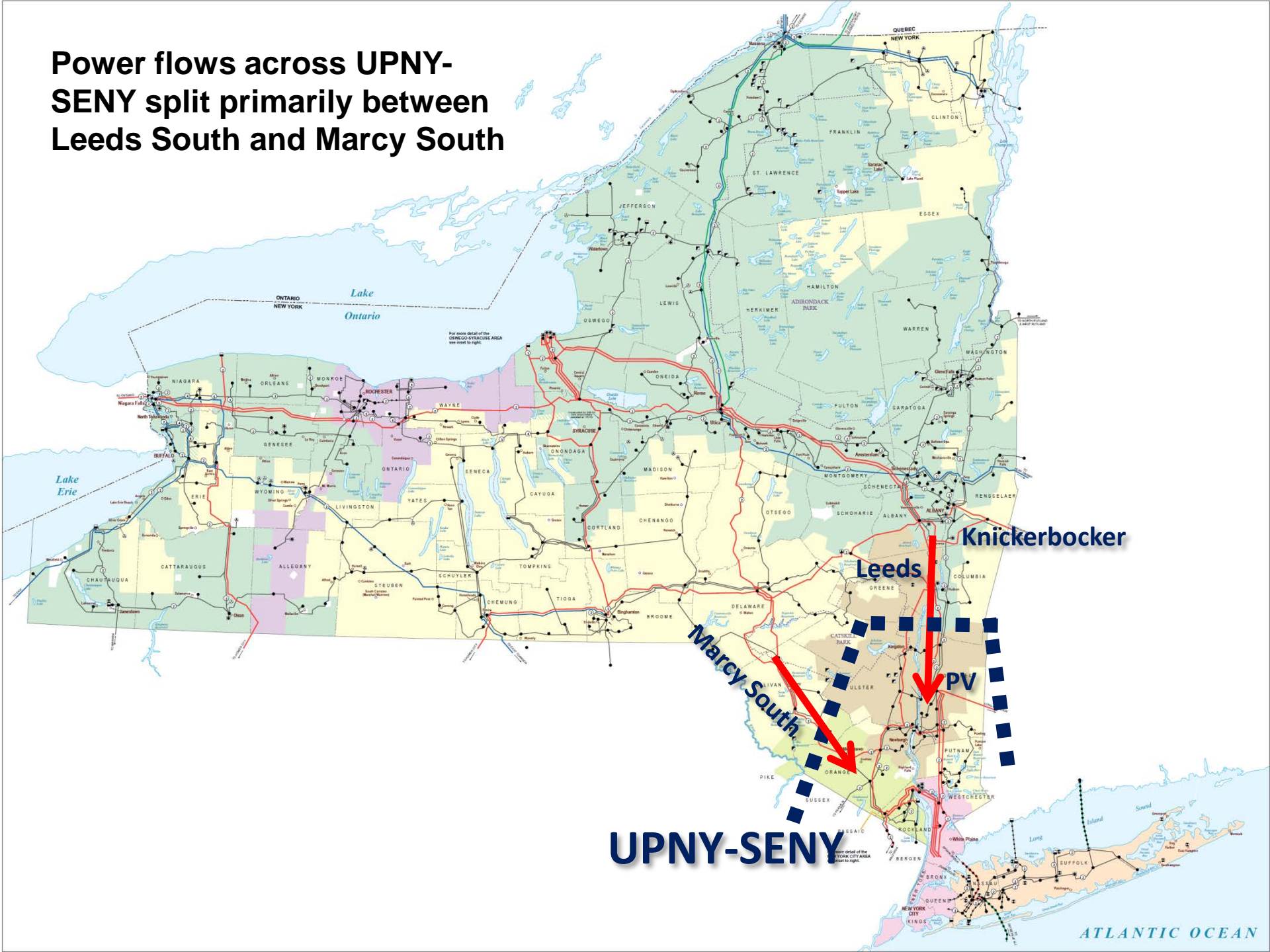
Edic/Marcy

New Scotland

Marcy South

ATLANTIC OCEAN

Power flows across UPNY- SENY split primarily between Leeds South and Marcy South



Knickerbocker

Leeds

Marcy South

PV

UPNY-SENY

ATLANTIC OCEAN

Sufficiency Criteria

- ◆ For all solution types
 - *For Segment A, increase Central East normal transfer limit by at least 350 MW*
 - *For Segment B, increase UPNY/SENY normal transfer limit by at least 900 MW*
 - *Minimize acquisition of property for substations*
- ◆ For transmission solutions
 - *Must meet Segment A and Segment B descriptions, including no Hudson River crossing*
 - *No significant acquisition of new permanent rights-of-way*

Sufficiency Base Case

- ◆ Same base case as that used in the PSC AC Transmission proceeding
- ◆ 2014 NYISO Comprehensive Reliability Plan baseline representation for 2019 includes:
 - *Transmission Owner Transmission Solutions (TOTS)*
 - *125-MW New York City DR/EE/CHP program*
 - *Proposed CPV Valley Energy Center generation project*

Sufficiency Baseline Limits

- ◆ Central East
 - *Normal Transfer Limit: 2,725 MW (voltage)*
 - *Contingency: Marcy South tower (40&41)*
- ◆ UPNY/SENY
 - *Normal Transfer Limit: 5,113 MW (thermal)*
 - *Limiting Element: Leeds – Pleasant Valley*
 - *Limiting Contingency: Common-tower loss of CPV – Rock Tavern and Coopers Corners – Rock Tavern (Tower 34&42B)*
- ◆ See attached October 8, 2015 AC Transmission Technical Conference presentation

Baseline Cases

- ◆ Powerflow base cases and auxiliary files are available for Developers, subject to submitting a [CEII request](#)
 - *Question 2: Checkbox “Power flow, dynamics, and/or short circuit databases other than Interconnection Study Databases”*
 - *Question 11: “AC Transmission Public Policy Transmission Need baseline cases and auxiliary files”*
- ◆ CEII files will be provided via the NYISO ePlanning system

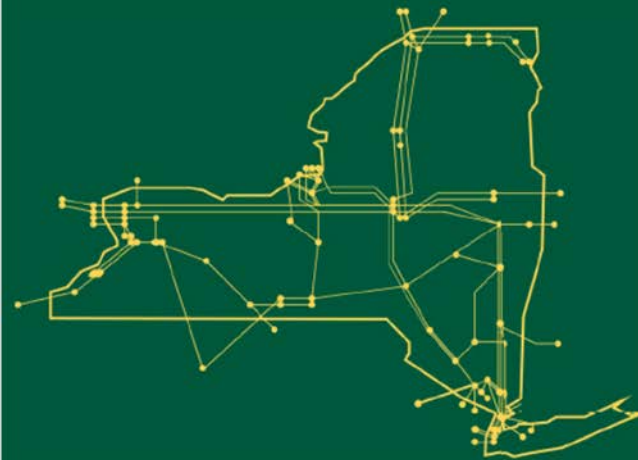
Selection Evaluation Criteria

- ◆ All metrics defined by the tariff will be applied, as well as the following PSC-defined criteria:
 - *NYISO will consider each project's proposed in-service year in its evaluation*
 - The longer a project is in-service, the greater congestion relief
 - Project schedule must be realistic
 - *Evaluation will favor transmission solutions that result in upgrades to aging infrastructure*
 - *The percentage rates proposed by Developers to account for contingencies and revenue requirements will not be used as distinguishing factors between projects. The NYISO will evaluate costs based on raw construction costs.*

Next Steps

- ◆ February 29: NYISO solicits Public Policy Transmission Projects and Other Public Policy Projects
 - *Solicitation window: 60 days*
 - *Developer qualification information: submit no later than 30 days after the solicitation for solutions*
- ◆ NYISO conducts Viability & Sufficiency Assessment of all proposed projects
- ◆ NYISO to design more granular cost allocation among downstate entities

The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.



www.nyiso.com

ATTACHMENT
OCTOBER 8, 2015
AC TRANSMISSION TECHNICAL
CONFERENCE PRESENTATION

AC Transmission Cases: Updated Powerflow Analysis

Zach Smith

*Director - Transmission Planning
New York Independent System Operator*

**New York State Public Service Commission
AC Transmission Technical Conference**

*October 8, 2015
Albany, NY*

Background

- ◆ **PSC requested that the NYISO perform powerflow analysis of the 22 portfolios of projects proposed in the AC Transmission proceeding. Initial results were presented at the July 20, 2015 Technical Conference.**
- ◆ **Following completion of the initial analysis, the developer of CPV Valley generation facility announced that construction will commence.**
- ◆ **DPS requested that the NYISO re-evaluate the portfolios considering the effects of the CPV Valley facility.**

Scope of Updated Analysis

- ◆ **Thermal transfer limits (N-1)**
 - *UPNY-SENY*
- ◆ **Voltage transfer limits (N-1)**
 - *Central East*
- ◆ **Transmission security (N-1-1)**
 - *Measured impact on generation-to-load balance for Southeast New York*

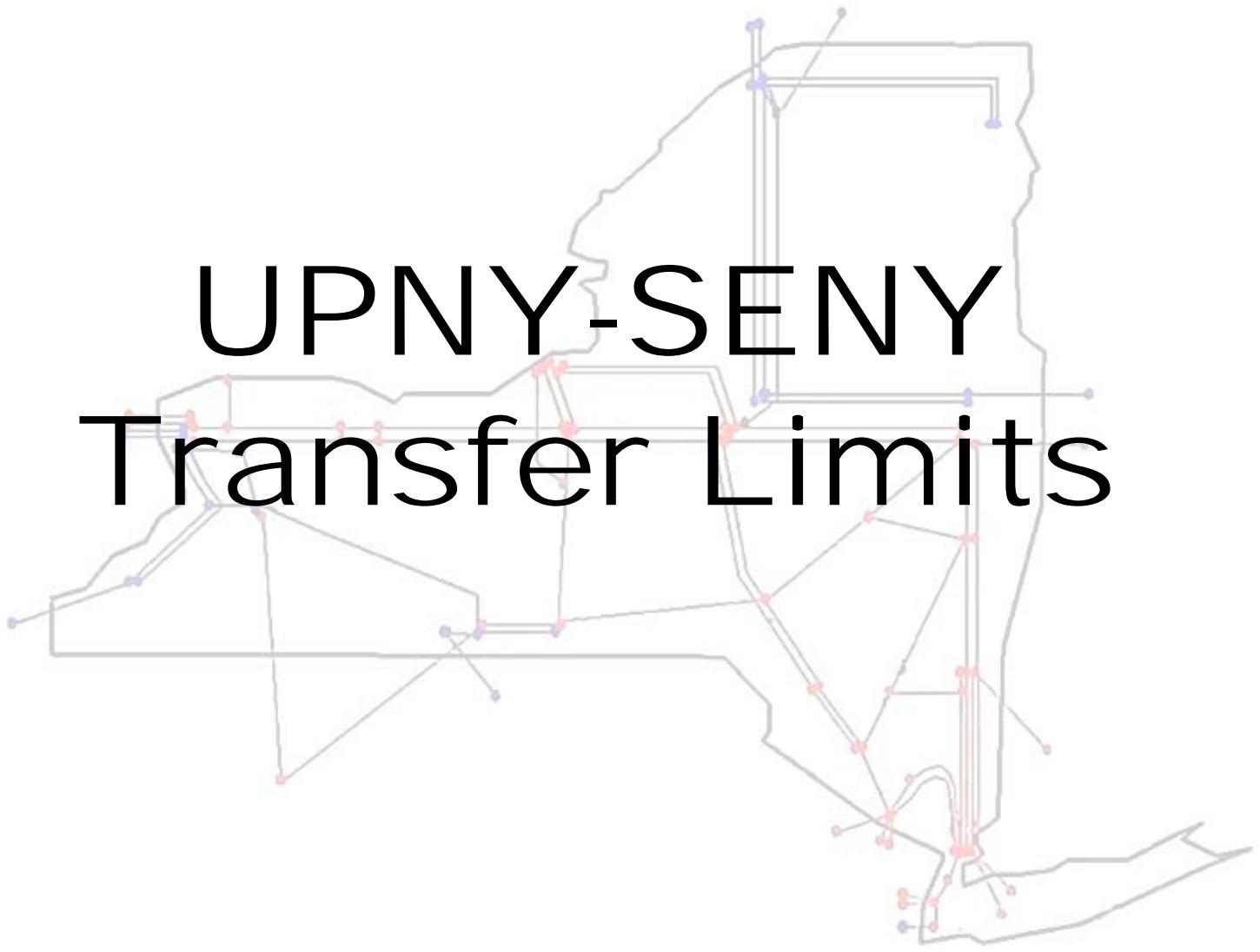
System Representation

- ◆ **2014 NYISO Comprehensive Reliability Plan baseline representation for 2019 includes:**
 - *Transmission Owner Transmission Solutions (TOTS)*
 - Marcy South Series Compensation
 - Second Rock Tavern – Ramapo 345 kV line
 - Staten Island Unbottling project
 - *125-MW New York City DR/EE/CHP program*
 - *Proposed CPV Valley Energy Center generation project*

Powerflow Model

- ◆ **Model of the Eastern Interconnection electric grid**
- ◆ **Snapshot in time**
 - *A single NYCA-wide generator dispatch to secure all bulk power transmission facilities simultaneously for the forecasted peak demand hour*
- ◆ **Baseline peak load forecast for 2019**
 - *“50/50” forecast: 50% chance of exceeding that load level*
 - *Forecast statewide coincident peak = 35,454 MW*
 - NYISO 2014 *Load & Capacity Data Report* (the “Gold Book”)

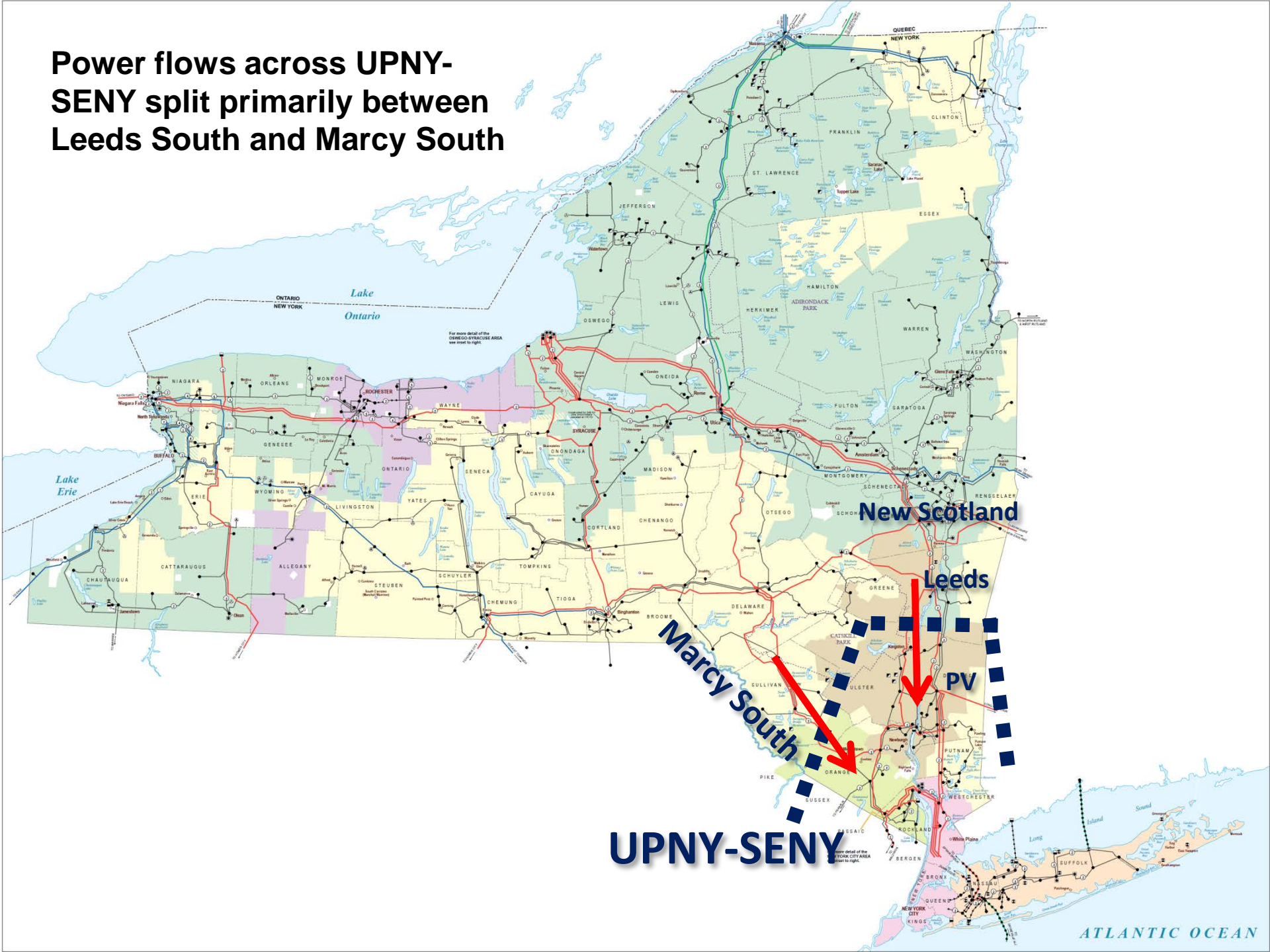
UPNY-SENY Transfer Limits



UPNY-SENY Interface

- ◆ **UPNY-SENY** represents the collection of transmission on which power flows from Upstate New York to Southeast New York
 - *Marcy South: Two 345 kV lines from Utica to south of the Catskills*
 - *Leeds South: Three 345 kV lines from Athens south to Kingston and Pleasant Valley, plus underlying 115 kV lines*
 - *Pleasant Valley-Long Mountain: One 345 kV line from Connecticut to Pleasant Valley*

Power flows across UPNY- SENY split primarily between Leeds South and Marcy South



UPNY-SENY

New Scotland

Leeds

Marcy South

PV

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Thermal Transfer Limits

- ◆ **Power flow across an interface is increased by uniformly increasing upstream generation and uniformly decreasing downstream generation.**
- ◆ **The thermal ratings of transmission lines are monitored while simulating design contingency events.**
- ◆ **N-1 thermal transfer limits are calculated in accordance with NYSRC Normal Transfer Criteria and the NYISO Planning Transfer Capability Methodology.**
 - *Not intended to determine the maximum transfer capability, but provides consistent measure of changes to interface transfer limits.*

UPNY-SENY: Base Case NTC

- ◆ **Normal Transfer Criteria (NTC) Limit: 5113 MW**
- ◆ **Limiting Element: Leeds – Pleasant Valley (“PV”) @ LTE rating**
 - *Athens Special Protection System (SPS) allows Leeds-PV to be secured to higher short term emergency (STE) rating if Athens generation can be backed down AND if the contingency is the parallel circuit*
 - *Athens SPS agreement calls for the retirement of the SPS following installation of a permanent solution*
- ◆ **Limiting Contingency: Common-tower loss of CPV – Rock Tavern and Coopers Corners – Rock Tavern (Tower 34&42B)**
 - *Athens SPS does not apply. Leeds-PV must be secured to the long term emergency (LTE) rating.*

UPNY-SENY: Base Case ETC

- ◆ **Emergency Transfer Criteria (ETC) Limit:**
 - *5319 MW*
- ◆ **Limiting Element:**
 - *CPV – Rock Tavern*
- ◆ **Limiting Contingency:**
 - *Coopers Corners – Rock Tavern*

UPNY-SENY: Base Case

Normal Transfer Criteria

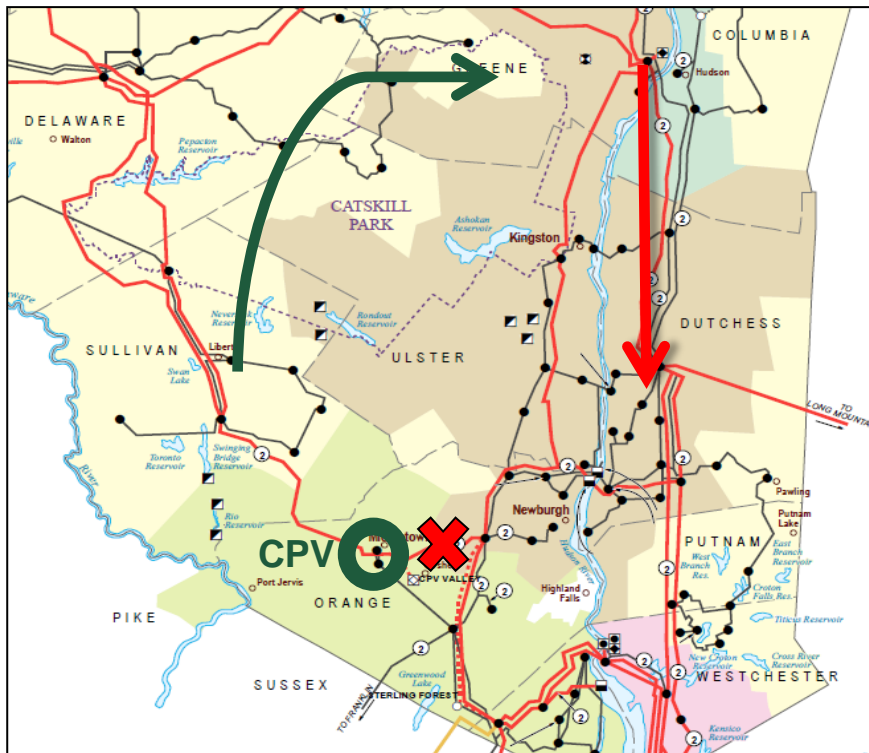
Limit: Leeds – PV 345 kV

Contingency: Tower 34&42B

Emergency Transfer Criteria

Limit: CPV – Rock Tavern 345 kV

Contingency: Coopers Corners – Rock Tavern

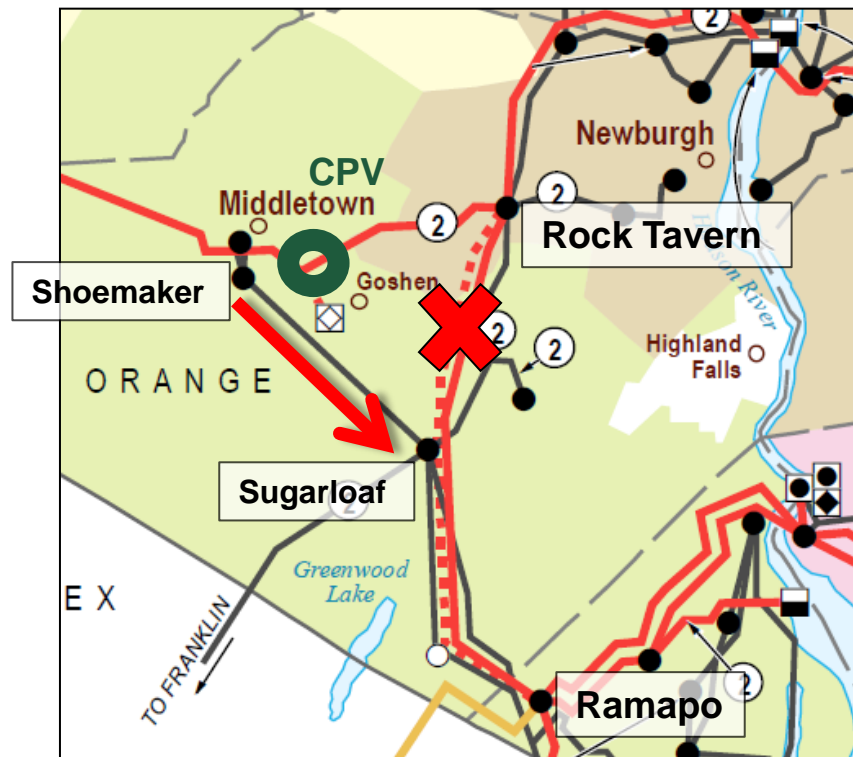


Additional Upgrades

- ◆ **Preliminary analysis identified two transmission limitations that were common to nearly all proposed projects:**
 - *Rock Tavern 345 kV terminal equipment*
 - *Shoemaker – Chester – Sugarloaf 138 kV line*
- ◆ **CPV – Rock Tavern 345 kV and Coopers Corners – Rock Tavern 345 kV**
 - *Limiting for loss of the parallel circuit*
 - *Circuit rating limited by terminal equipment at Rock Tavern*

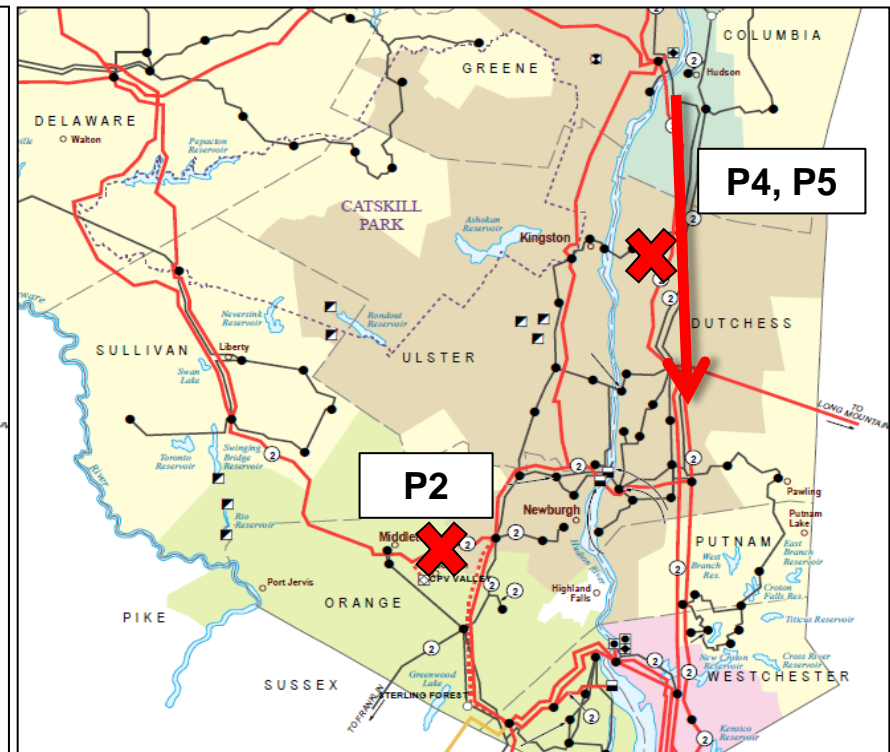
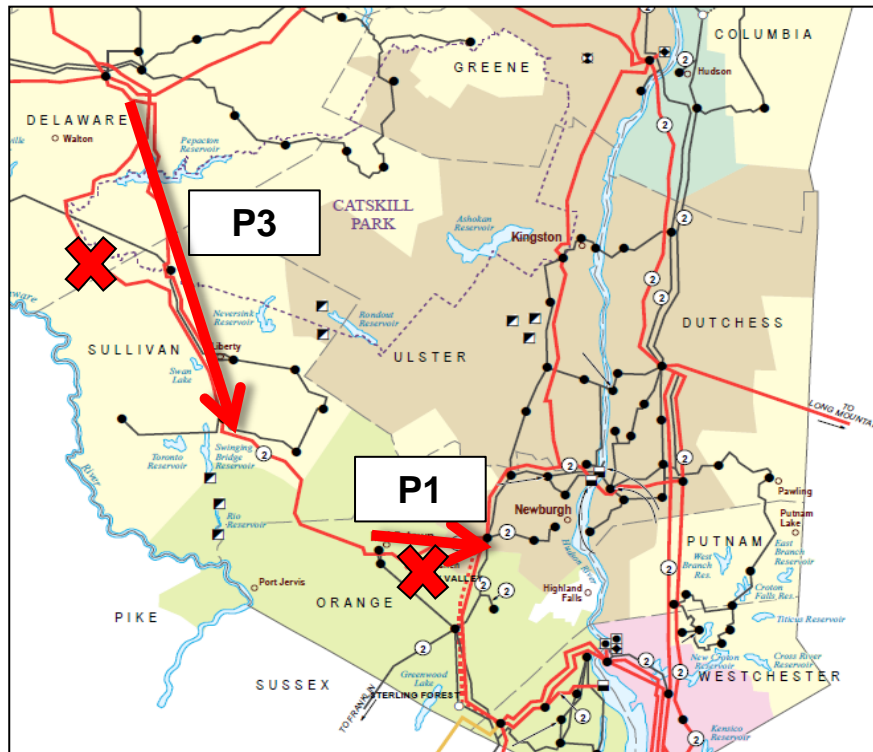
Additional Upgrades

- ◆ **Shoemaker – Chester – Sugarloaf 138 kV**
 - *Limiting for loss of Rock Tavern – Ramapo 345 kV tower*
 - *Carries roughly 5% of the UPNY-SENY flow*
 - *Loss of line would cause cascading on 345 kV system*



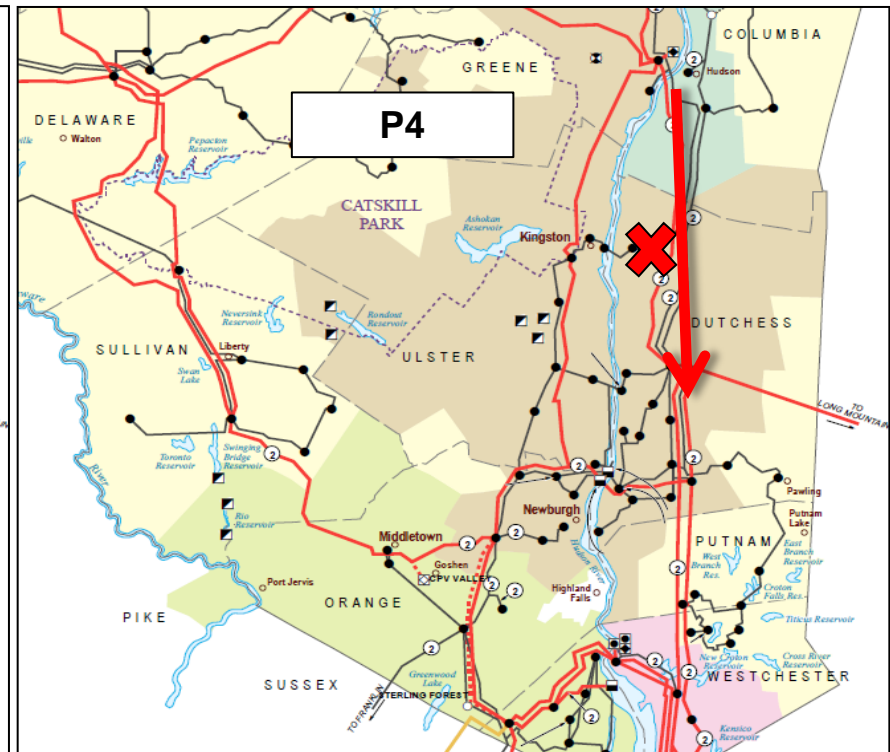
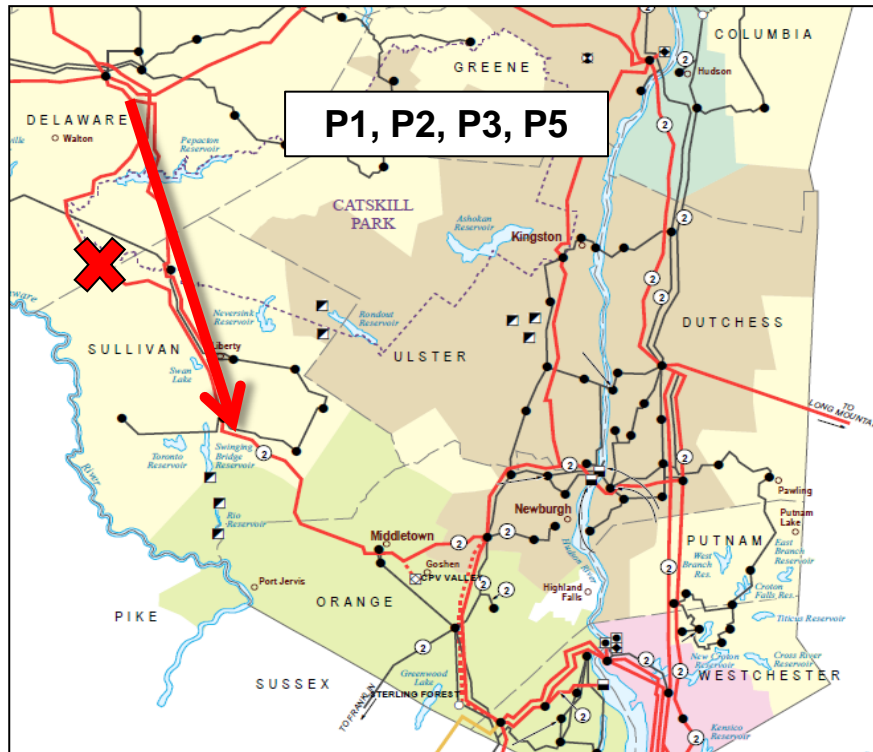
UPNY-SENY: NAT NTC

Portfolio	UPNY-SENY Normal Transfer Criteria	Delta	Limiting Element (LTE rating)	Contingency
P1 - NAT	7219	2106	CPV – Rock Tavern	CC – Rock Tavern
P2 - NAT	6823	1710	Leeds – PV	Tower 34&42B
P3 - NAT	7251	2138	Fraser - CC (new)	Fraser - CC
P4 - NAT	6576	1463	Leeds – PV	Athens - PV
P5 - NAT	6637	1524	Leeds – PV	Athens - PV



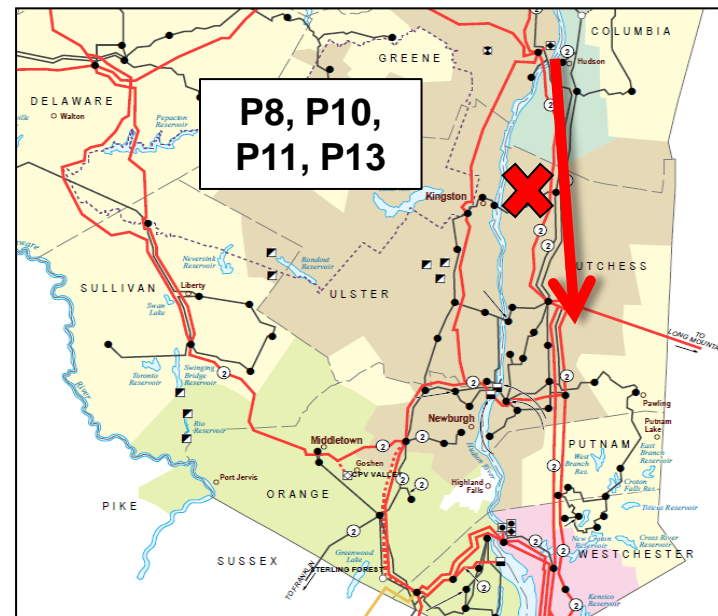
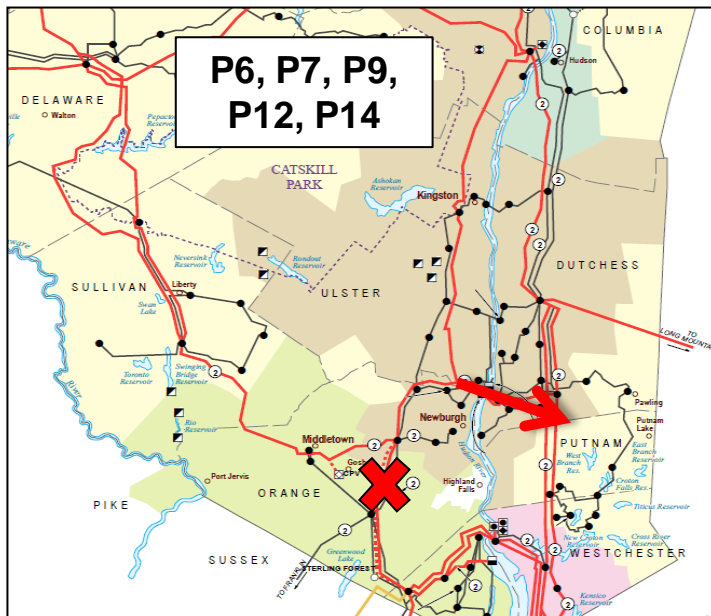
UPNY-SENY: NAT ETC

Portfolio	UPNY-SENY Emergency Transfer Criteria	Delta	Limiting Element (STE rating)	Contingency
P1 - NAT	7704	2385	Fraser – CC	Marcy – CC
P2 - NAT	7590	2271	Fraser – CC	Marcy – CC
P3 - NAT	7028	1709	Fraser - CC (new)	Fraser - CC
P4 - NAT	7546	2227	Leeds – PV	Athens - PV
P5 - NAT	7420	2101	Fraser - CC (new)	Fraser - CC



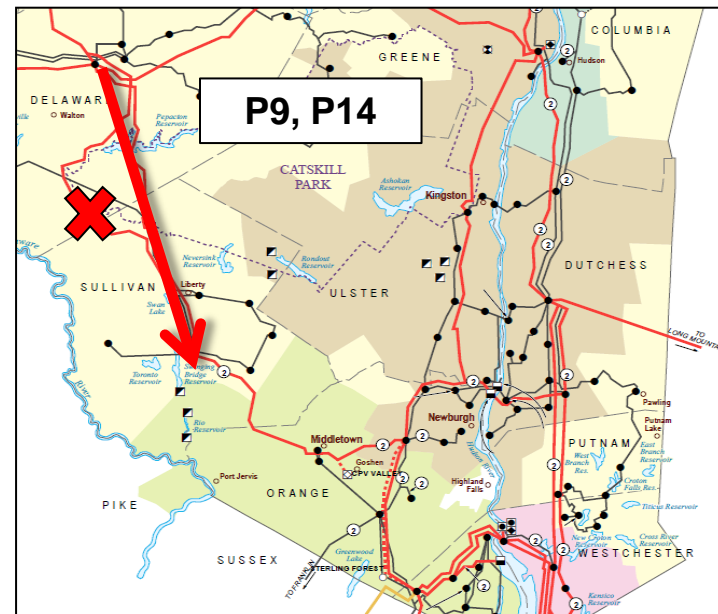
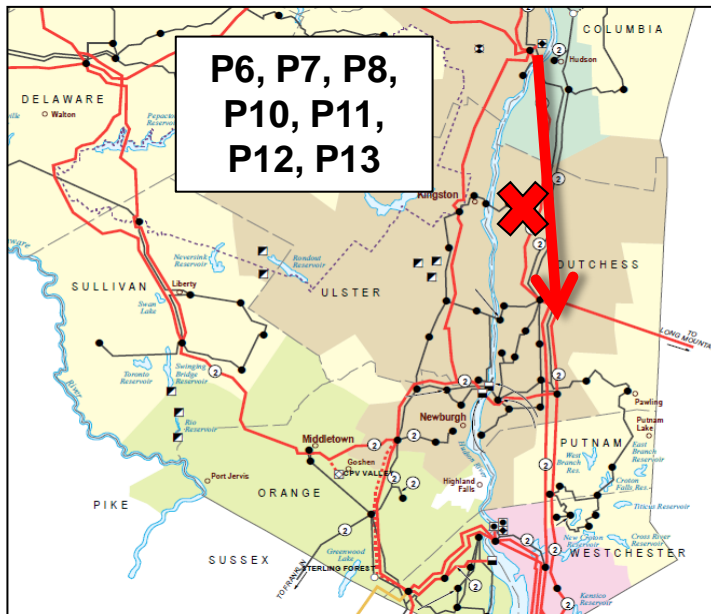
UPNY-SENY: NYTOs NTC

Portfolio	UPNY-SENY Normal Transfer Criteria	Delta	Limiting Element (LTE rating)	Contingency
P6 - NYTO	6031	918	Roseton - E.Fishkill	Tower: Rock Tavern - Ramapo
P7 - NYTO	5465	352	Roseton - E.Fishkill	Tower: Rock Tavern - Ramapo
P8 - NYTO	4783	(330)	Leeds – PV	Athens - PV
P9 - NYTO	6151	1038	Roseton - E.Fishkill	Tower: Rock Tavern - Ramapo
P10 - NYTO	6319	1206	Leeds – PV	Athens - PV
P11 - NYTO	6052	939	Leeds – PV	Athens - PV
P12 - NYTO	5545	432	Roseton - E.Fishkill	Tower: Rock Tavern - Ramapo
P13 - NYTO	4784	(329)	Leeds – PV	Athens - PV
P14 - NYTO	6249	1136	Roseton - E.Fishkill	Tower: Rock Tavern - Ramapo



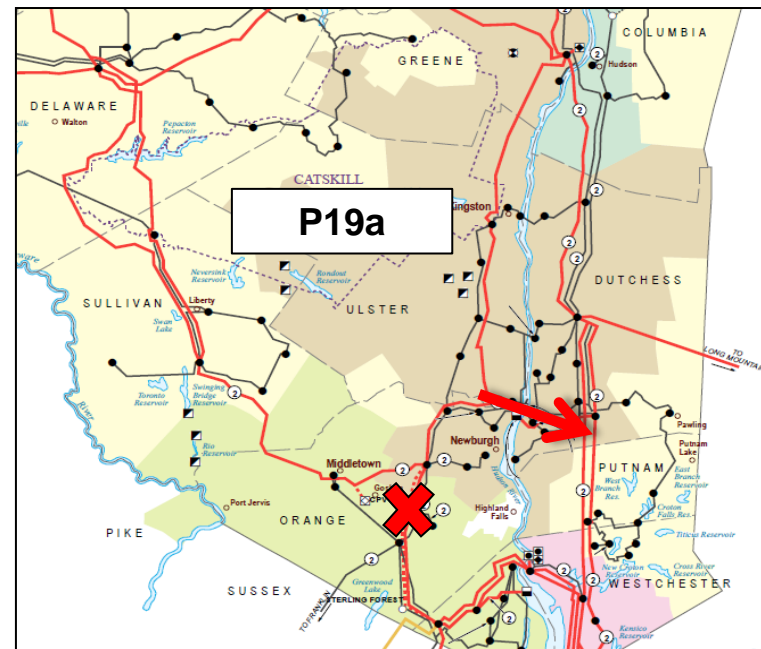
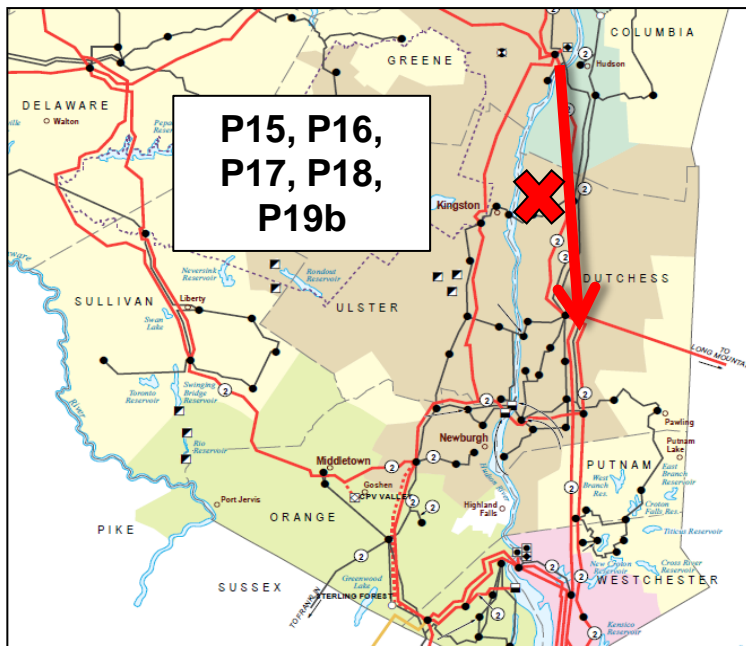
UPNY-SENY: NYTOs ETC

Portfolio	UPNY-SENY Emergency Transfer Criteria	Delta	Limiting Element (STE rating)	Contingency
P6 - NYTO	7005	1686	Leeds – PV	Athens - PV
P7 - NYTO	6723	1404	Leeds – PV	Athens - PV
P8 - NYTO	5555	236	Leeds – PV	Athens - PV
P9 - NYTO	7410	2091	Fraser – CC	Marcy – CC
P10 - NYTO	7226	1907	Leeds – PV	Athens - PV
P11 - NYTO	6940	1621	Leeds – PV	Athens - PV
P12 - NYTO	6660	1341	Leeds – PV	Athens - PV
P13 - NYTO	5534	215	Leeds – PV	Athens - PV
P14 - NYTO	7605	2286	Fraser – CC	Marcy – CC



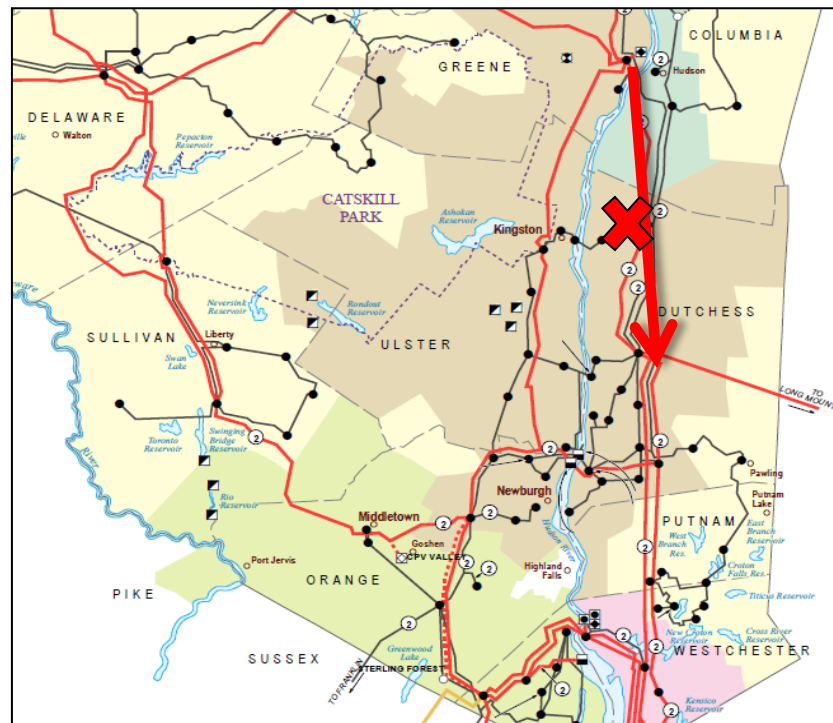
UPNY-SENY: NextEra NTC

Portfolio	UPNY-SENY Normal Transfer Criteria	Delta	Limiting Element (LTE rating)	Contingency
P15 - NextEra	6543	1430	Leeds – PV	Athens - PV
P16 - NextEra	6344	1231	Leeds – PV	Athens - PV
P17 - NextEra	6402	1289	Leeds – PV	Athens - PV
P18 - NextEra	6221	1108	Leeds – PV	Athens - PV
P19a - NextEra	6074	961	Roseton - E.Fishkill	Tower: Rock Tavern - Ramapo
P19b - NextEra	4663	(450)	Leeds – PV	Athens - PV



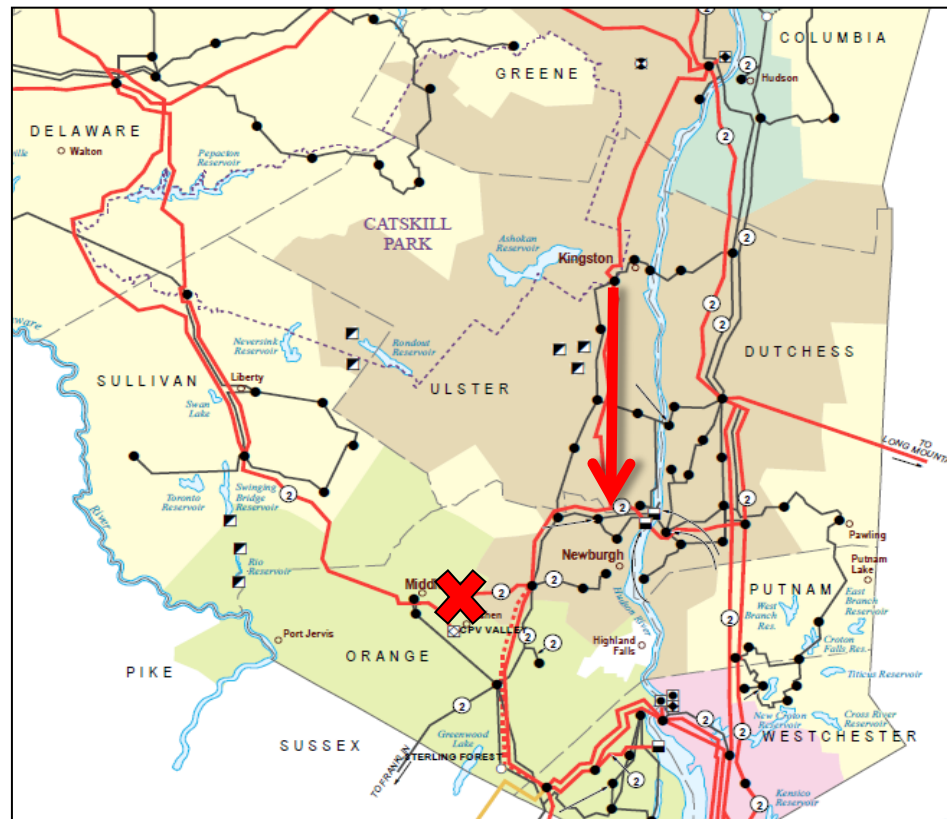
UPNY-SENY: NextEra ETC

Portfolio	UPNY-SENY Emergency Transfer Criteria	Delta	Limiting Element (STE rating)	Contingency
P15 - NextEra	7523	2204	Leeds – PV	Athens - PV
P16 - NextEra	7318	1999	Leeds – PV	Athens - PV
P17 - NextEra	7398	2079	Leeds – PV	Athens - PV
P18 - NextEra	7181	1862	Leeds – PV	Athens - PV
P19a - NextEra	7066	1747	Leeds – PV	Athens - PV
P19b - NextEra	5455	136	Leeds – PV	Athens - PV



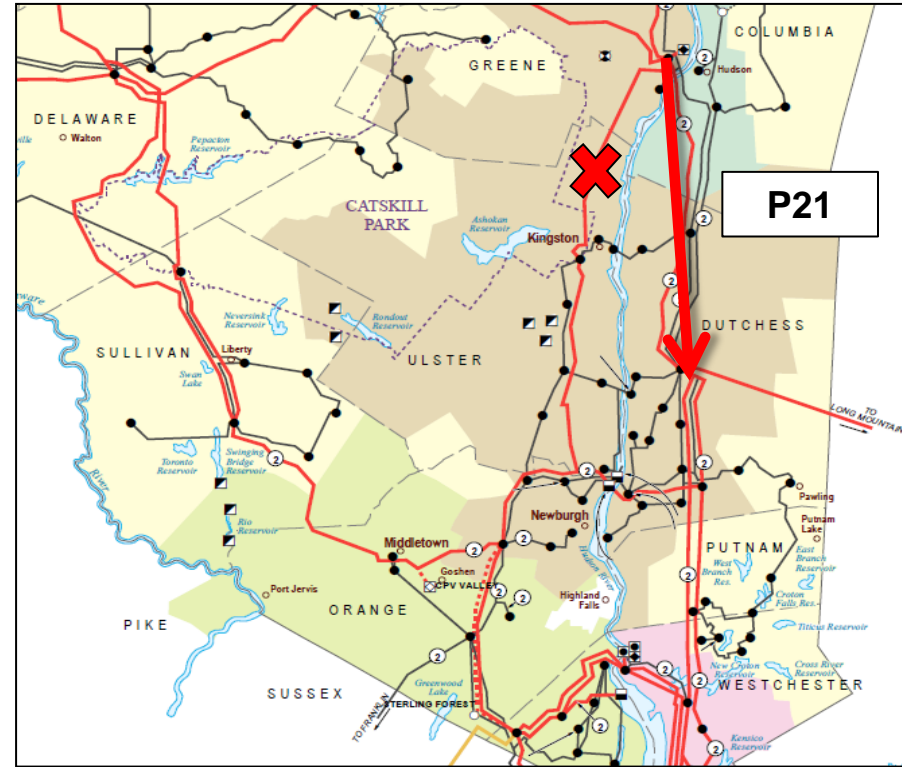
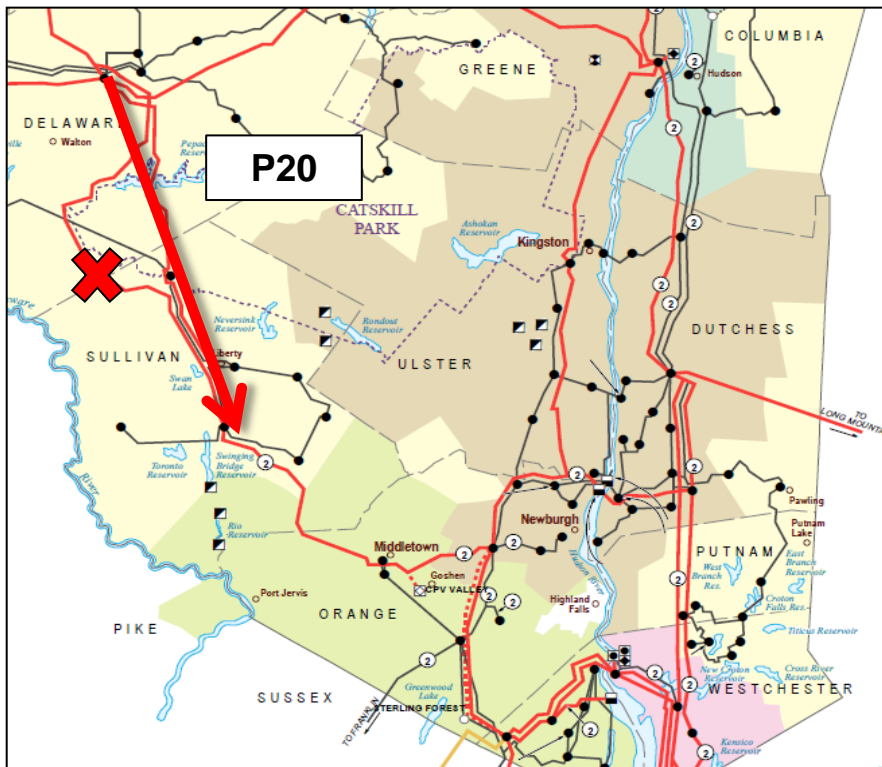
UPNY-SENY: Boundless NTC

Portfolio	UPNY-SENY Normal Transfer Criteria	Delta	Limiting Element (LTE rating)	Contingency
P20 - Boundless	5800	687	Hurley – Roseton	T 34&42B
P21 - Boundless	5718	605	Hurley – Roseton	T 34&42B

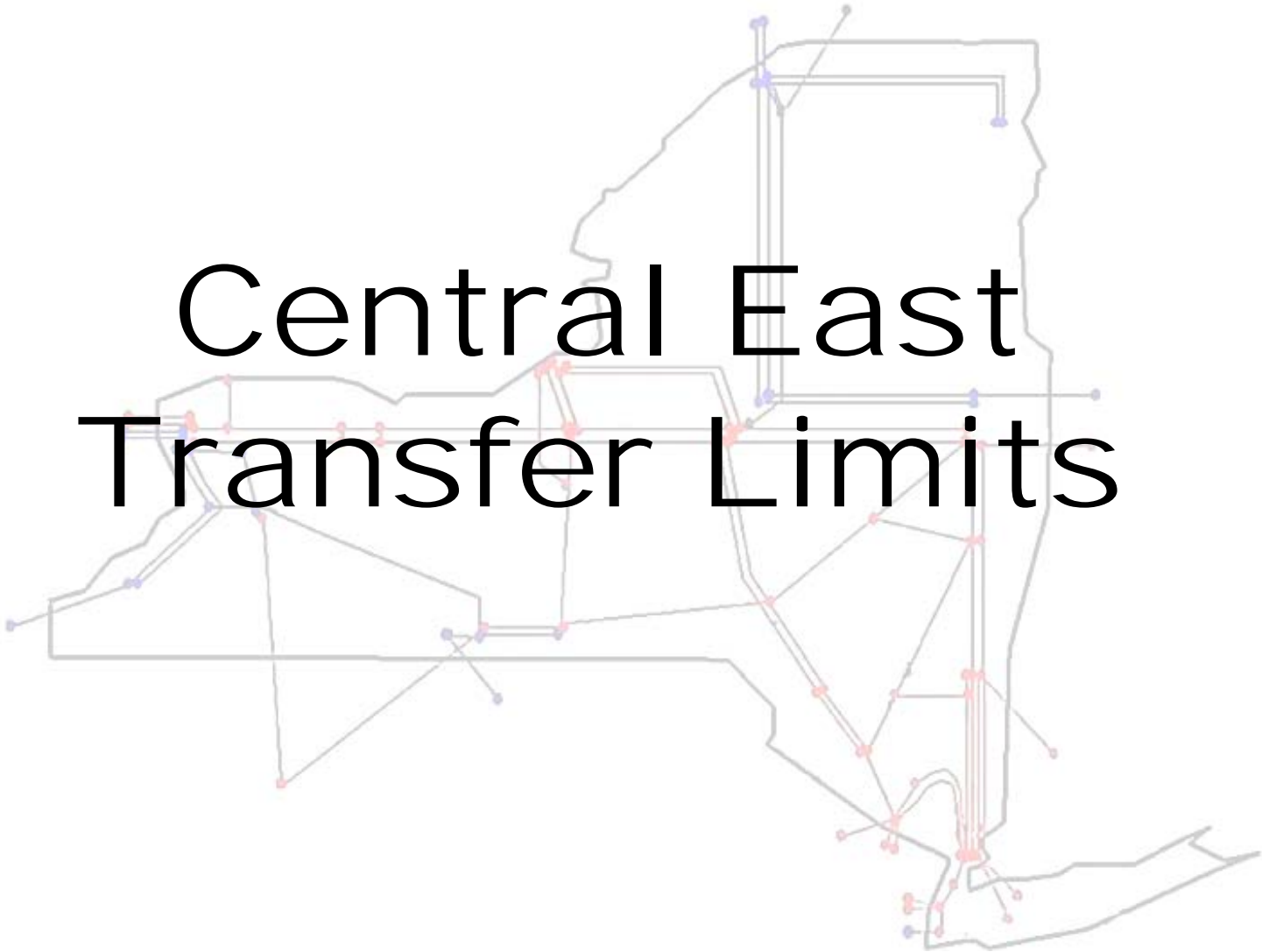


UPNY-SENY: Boundless ETC

Portfolio	UPNY-SENY Emergency Transfer Criteria	Delta	Limiting Element (STE rating)	Contingency
P20 - Boundless	7072	1753	Fraser – CC	Marcy – CC
P21 - Boundless	6752	1433	Leeds – PV	Leeds – Hurley



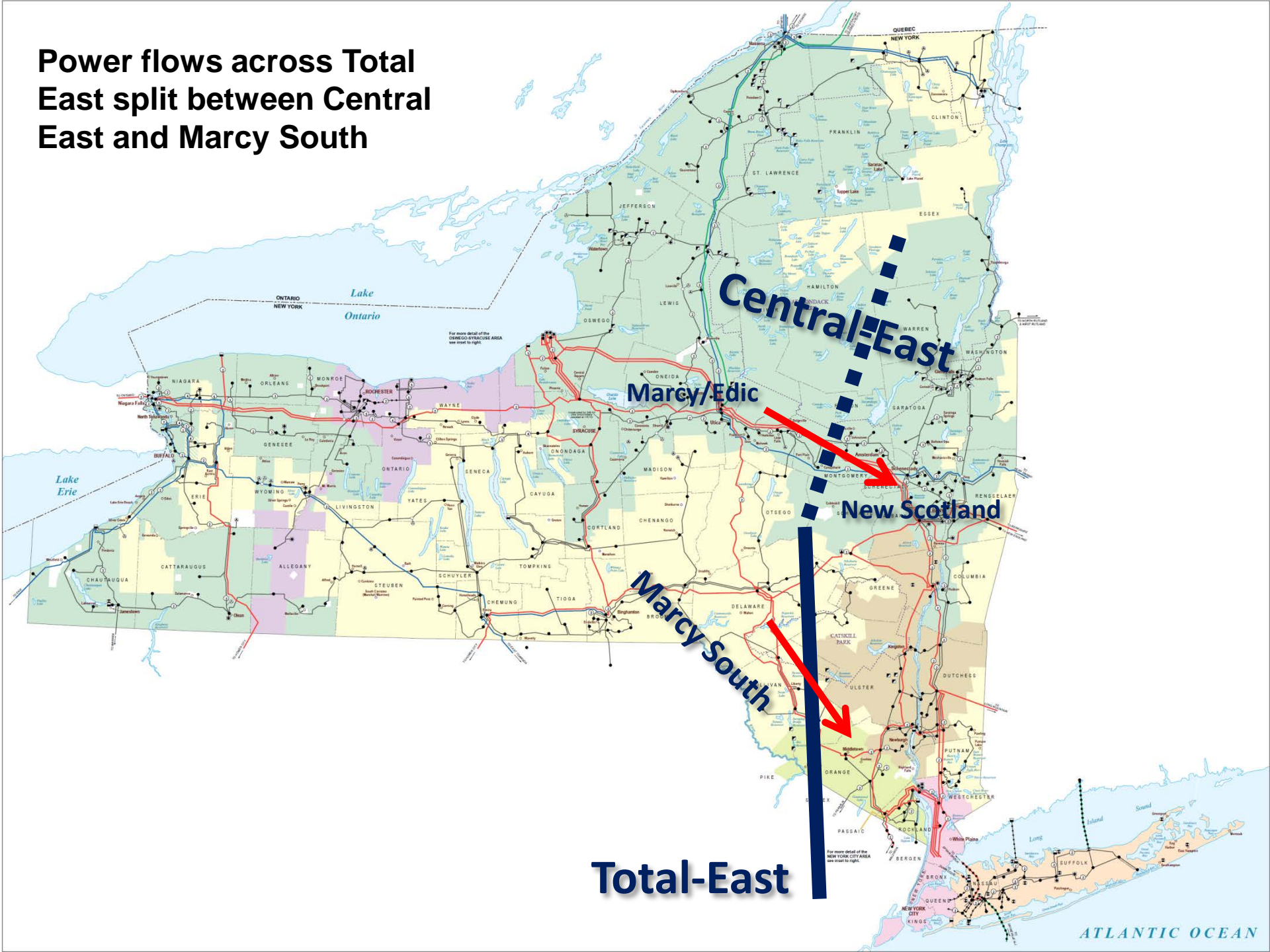
Central East Transfer Limits



Central East & Total East Interfaces

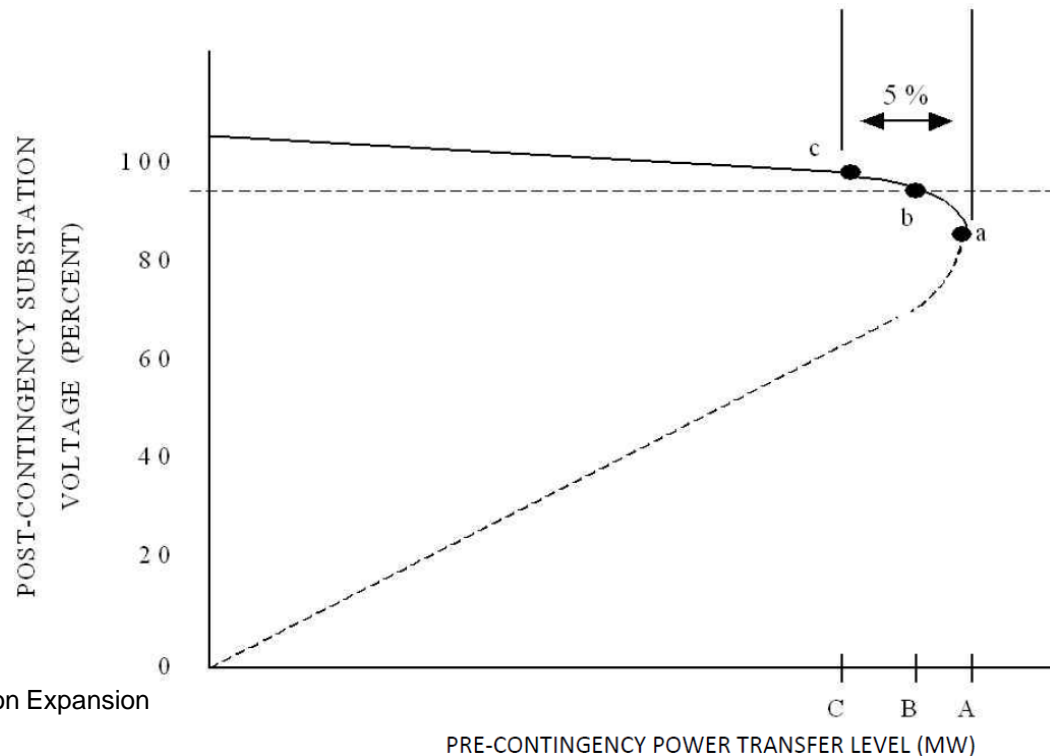
- ◆ **Central East interface is a subset of the Total East interface.**
 - *Central East is the transmission from Utica to Albany*
 - *Total East includes Central East plus all other transmission from west to east in New York*
- ◆ **Central East is typically voltage limited, therefore voltage limits were the focus of the re-evaluations.**

Power flows across Total East split between Central East and Marcy South



Voltage Transfer Limits

- ◆ **Uses same method as thermal analysis, monitoring voltages of bulk power stations for pre-contingency and post-contingency conditions.**

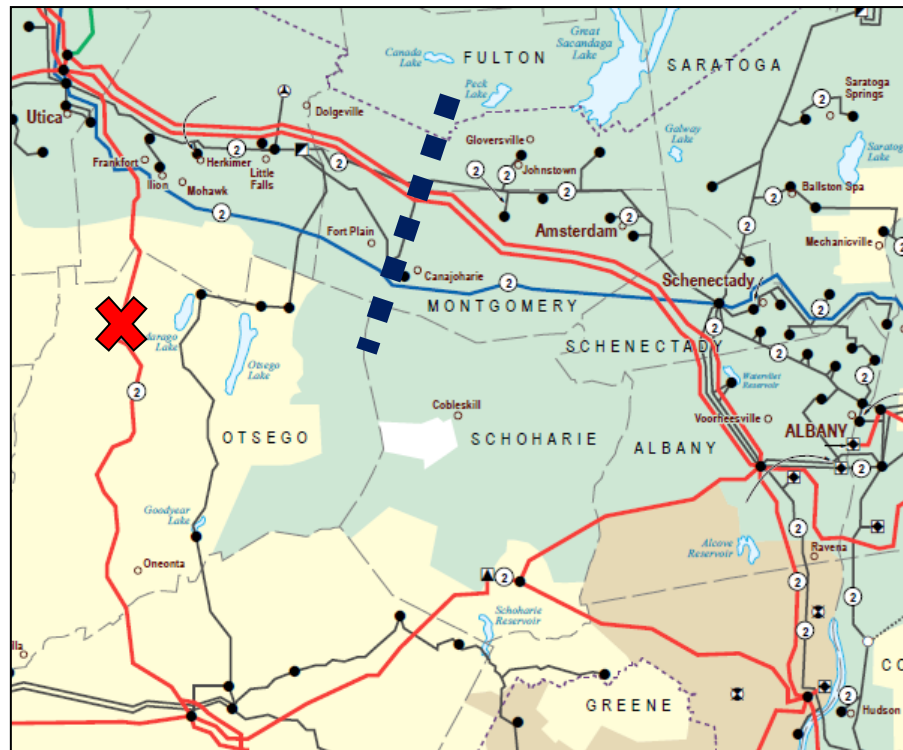


Source: NYISO Transmission Expansion Interconnection Manual

PRE-CONTINGENCY POWER TRANSFER LEVEL (MW)

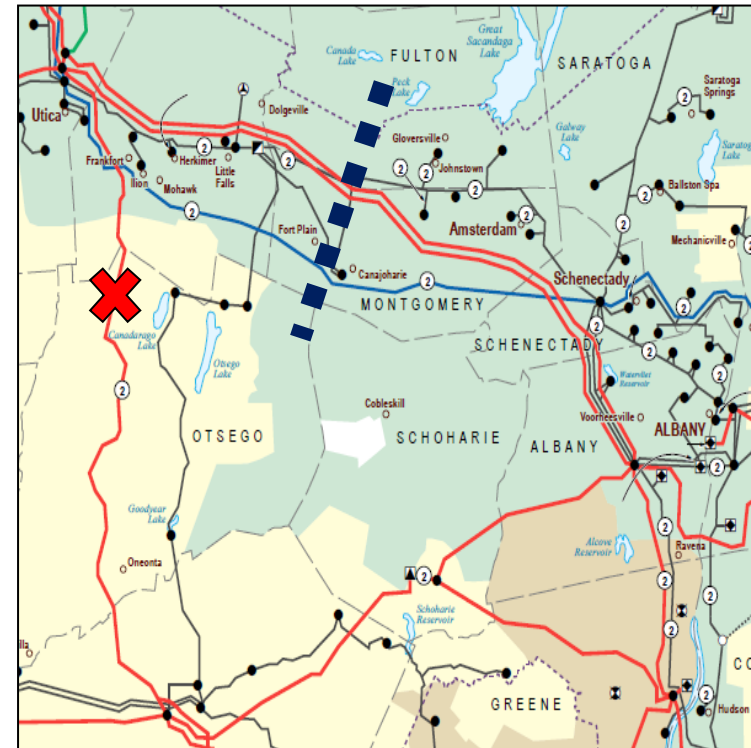
Central East: Base Case voltage

- ◆ **Base Case limit: 2725 MW**
- ◆ **Limiting Contingency: Marcy South tower (40&41)**



Central East voltage results

	Central East	Delta	Contingency
P6 - NYTO	2825	100	Marcy South tower (40&41)
P7 - NYTO	2750	25	Marcy South tower (40&41)
P9 - NYTO	2775	50	Marcy South tower (40&41)
P11 - NYTO	3100	375	Marcy South tower (40&41)
P12 - NYTO	3100	375	Marcy South tower (40&41)
P14 - NYTO	3100	375	Marcy South tower (40&41)
P19a - NextEra	2825	100	Marcy South tower (40&41)
P20 - Boundless	2700	(25)	Marcy South tower (40&41)
P21 - Boundless	2700	(25)	Marcy South tower (40&41)



A faint, light-colored map of New York State is overlaid with a complex network of lines and nodes representing the transmission system. The lines are thin and grey, connecting various nodes. Some nodes are colored in blue, red, and purple, indicating different types of substations or critical points in the network. The map shows the state's outline and major geographical features like the Hudson River and the Erie Canal.

Southeast New York Transmission Security (N-1-1)

N-1-1 Criteria

- ◆ **Starting from an all-facilities-in-service base condition (N), system performance is evaluated for one contingency event (N-1) followed by another contingency event (N-1-1).**
- ◆ **Design requirement by NERC, NPCC, and NYSRC.**
 - *NPCC and NYSRC are more stringent: All design contingencies are evaluated and virtually no load shedding is allowed*
- ◆ **A reliability violation is identified when any allowable re-dispatch of the system cannot alleviate a thermal overload.**
 - *If overloads occur, system is dispatched to minimize overloads*

N-1-1 Methodology

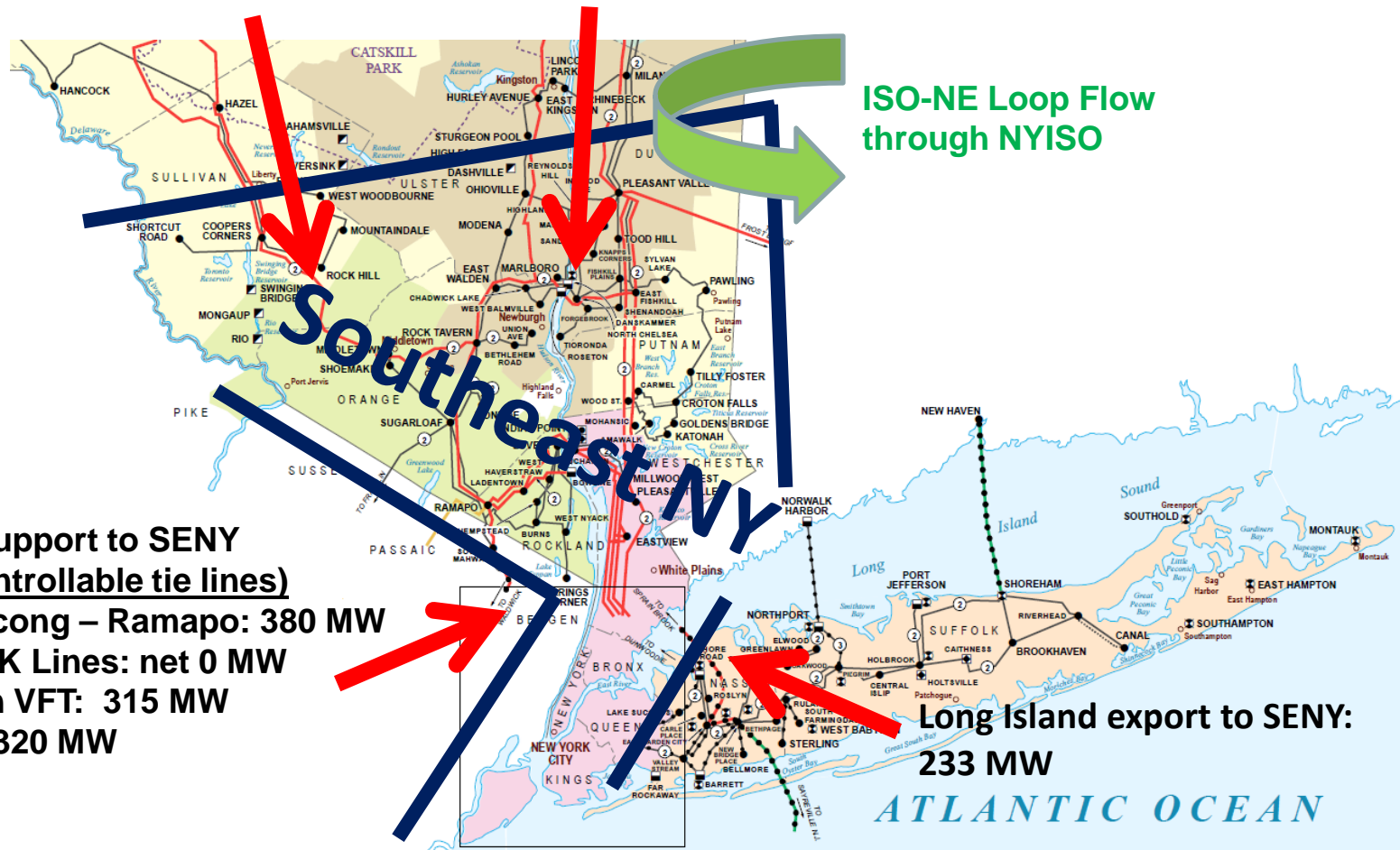
- 1. N-1: Loss of any critical generator, transmission circuit, transformer, series or shunt compensating device, or HVDC pole.**
- 2. Any generation and power flow adjustments inside the NYCA that can be made within 30 minutes are applied to secure the system for the next contingency.**
- 3. N-1-1: Loss of any critical design contingency, including multiple lines on a common tower or a stuck breaker.**

Southeast NY

- ◆ **One large load pocket**
 - *Zones G through J plus Rockland Electric (RECO) load*
 - *RECO is served by the PJM market but electrically radial to NYISO. Power to serve RECO must flow across NYISO transmission system in SENY.*
- ◆ **Load + Losses = Generation + Imports**
- ◆ **Load + Losses:**
 - *17,518 MW forecast Summer 2019 peak*
- ◆ **Generation:**
 - *14,763 MW planned capacity in 2019*
- ◆ **Difference is made up with imports**
 - *Upstate NY (UPNY-SENY interface)*
 - *Long Island*
 - *PJM*

Factors on SENY Limitations

Distribution of flow between Marcy South and Leeds South paths



ISO-NE Loop Flow through NYISO

PJM support to SENY
(all controllable tie lines)

Hopatcong – Ramapo: 380 MW

ABC-JK Lines: net 0 MW

Linden VFT: 315 MW

HTP: 320 MW

Long Island export to SENY:
233 MW

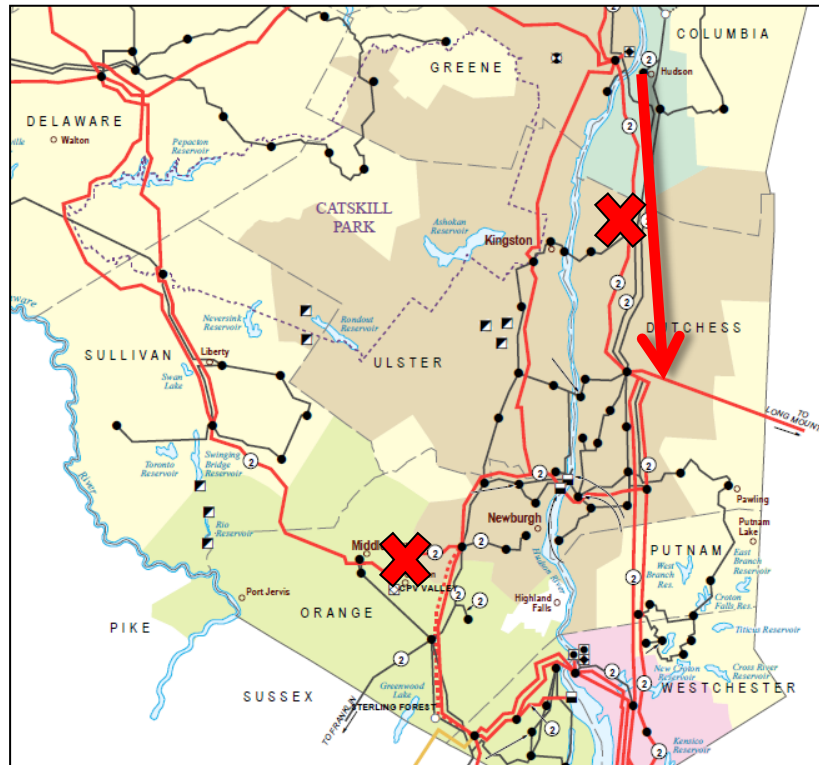
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Applying N-1-1 to SENY

- ◆ **Load + Losses = Generation + Imports**
- ◆ **Generation maximized in SENY subject to transmission constraints**
- ◆ **Imports from PJM and Long Island held constant**
 - *The only path for power to flow is across UPNY-SENY*
- ◆ **Representative load modeled at Sprainbrook is increased until thermal overload occurs under N-1-1 conditions**
 - *NYCA-wide generation dispatch is optimized with an objective to avoid overloads (i.e. transfer as much power as possible)*
- ◆ **Difference in representative load between pre-project and post-project cases represents the increased transfer capability provided by the project**

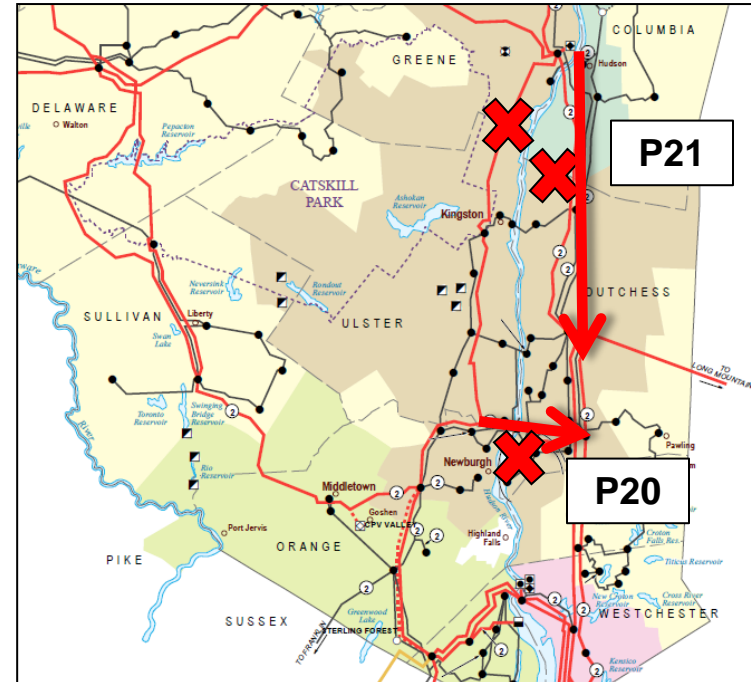
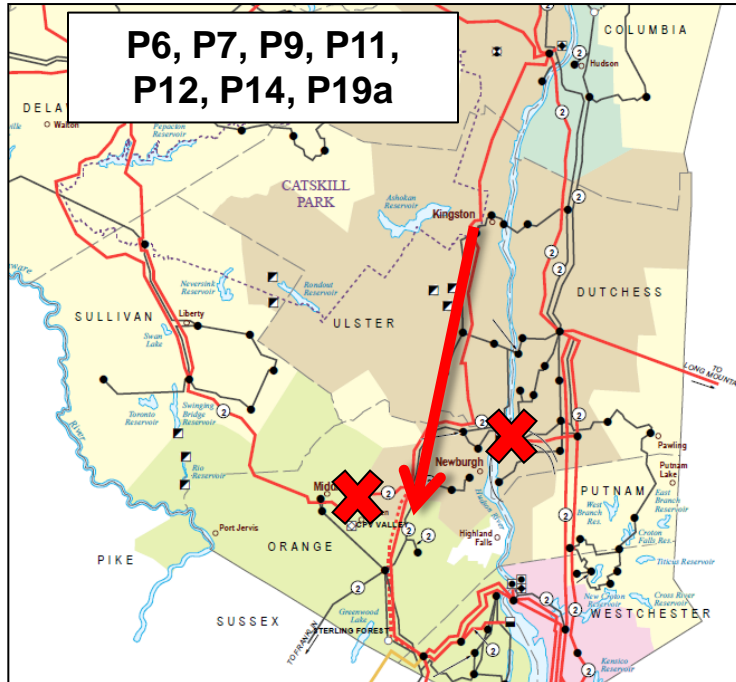
N-1-1 Results: Base Case

- ◆ Limiting Element: Leeds – Pleasant Valley (“PV”)
- ◆ First Contingency: Athens – PV
- ◆ Second Contingency: Common-tower loss of CPV – Rock Tavern and Coopers Corners – Rock Tavern (Tower 34&42B)

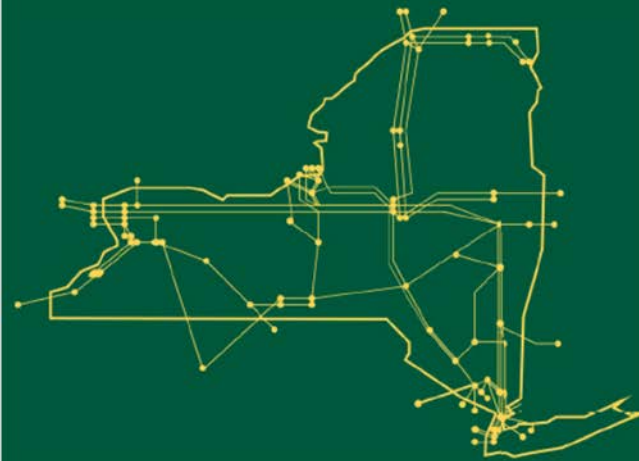


N-1-1 Results

Portfolio	Delta (MW)	Limiting Element	First Contingency	Second Contingency
P6 - NYTO	791	Roseton - Rock Tavern	Roseton - E Fishkill	T 34&42B
P7 - NYTO	392	Roseton - Rock Tavern	Roseton - E Fishkill	T 34&42B
P9 - NYTO	970	Roseton - Rock Tavern	Roseton - E Fishkill	T 34&42B
P11 - NYTO	794	Roseton - Rock Tavern	Roseton - E Fishkill	T 34&42B
P12 - NYTO	635	Roseton - Rock Tavern	Roseton - E Fishkill	T 34&42B
P14 - NYTO	973	Roseton - Rock Tavern	Roseton - E Fishkill	T 34&42B
P19a - NextEra	860	Roseton - Rock Tavern	Roseton - E Fishkill	T 34&42B
P20 - Boundless	365	Roseton - W Fishkill 345 #2	Roseton - E Fishkill	Pre-Contingency
P21 - Boundless	283	Leeds - PV	Leeds - Hurley	Athens - PV 345



The New York Independent System Operator (NYISO) is a not-for-profit corporation responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, conducting comprehensive long-term planning for the state's electric power system, and advancing the technological infrastructure of the electric system serving the Empire State.



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