LOCAL TRANSMISSION PLAN (LTP)

PRESENTATION TO NYISO / INTERESTED PARTIES

November 10, 2015

T&D Planning

PSEG LONG ISLAND

We make things work for you.

LTP Contents -- What's covered in this presentation

1. Overview of LIPA T & D
2. Issues Addressed in LTP
3. Planning Horizon of the LTP
4. Data and Models Used
5. Transmission Planning Studies

1. Overview of LIPA T&D

- Background
- Transmission System
- Current Initiatives

Background

- LIPA owns electric Transmission and Distribution (T&D) system on Long Island
- Acquired from LILCO in 1998
- Power Supply Agreement to meet capacity and energy needs for LIPA system with National Grid renewed in 2013, out to 2028
- Operation Service Agreement to manage electric operations for LIPA's system for 12 years starting January 2014 with PSEG Long Island.
- LIPA, by and through its agent, PSEG Long Island LLC, provides electric service to approximately 1.1 million LIPA customers
- LIPA service area includes Nassau County, Suffolk County, and the portion of Queens County known as the Rockaways, in the State of New York

Transmission System

- LIPA's transmission system is designed to provide adequate capability between generation sources and load centers. The Long Island Power Authority (LIPA) owns:
  - Over 1,370 miles of transmission and sub-transmission lines
  - Delivering power through 180 substations in its electric system
- Interconnections:
  - Two 345 kV
    - ✓ Con Ed: Y49 (NYPA) 637 MW, East Garden City to Sprain Brook
    - ✓ Con Ed: Y50 (LIPA/Con Ed) 653 MW, Shore Road to Dunwoodie
  - Three 138 kV:
    - ✓ ISONE: NNC (LIPA/NU) 428 MW, Northport to Norwalk Harbor
    - ✓ Con Ed: Lake Success to Jamaica (903) and Valley Stream to Jamaica (901), Total 286 MW wheel
  - Two HVDC:
    - ✓ PJM: Neptune 660 MW, Newbridge Road to Sayreville
    - ✓ ISO-NE: CSC 330 MW, Shoreham to New Haven

Current Initiatives

- Integrated Resource Plan
- REV: Utility 2.0 Solutions
  - South Fork RFP
  - Request for Information

Integrated Resource Plan

- PSEG Long Island's Integrated Resource Plan(IRP) which is underway considers, among many factors, existing generation and the transmission system, load forecasts, energy efficiency programs, demand control options, fuel supplies, technology options and costs, new generation sources, supply and demand mixes and the sensitivity of results to changes in major assumptions.

- The alternatives are evaluated from both a reliability & economic perspective. As such, the resources analyzed or identified by the Plan are determined in a neutral manner and will be without preference as to current ownership or financial interest by any particular entity, including PSEG Long Island or its affiliates. Nor will such considerations factor into any IRP study inputs, decisions or recommendations.

REV: Utility 2.0

- REV – Reforming the Energy Vision ("REV")
  - Promote more efficient use of energy, deeper penetration of renewable energy resources such as wind and solar, and wider deployment of "distributed" energy resources, such as micro grids, roof-top solar and other on-site power supplies, and storage
  - Promotes markets to achieve greater use of advanced energy management products to enhance demand elasticity and efficiencies.
- Utility 2.0
  - The PSEG Long Island Utility 2.0 Plan is part of a broader effort that includes enhanced planning processes being developed by PSEG Long Island, and State-level initiatives including the ongoing REV proceeding.
  - Utility 2.0 Plan proposes investments in advanced metering infrastructure and targeted demand reduction in specific load pockets to cost-effectively defer the need for power resources and, in some cases, transmission and distribution infrastructure.
  - PSEG Long Island will revisit the Utility 2.0 Plan annually, and, as these proceedings develop, will align our customers with New York's energy and environmental policy as appropriate.

REV Initiatives

- South Fork RFP
  - Issued in June 2015 – Solicits proposals to acquire sufficient local resources to meet peak load requirements in South Fork
- Request for Information
  - Request for Innovative Solutions to provide Transmission and Distribution system load relief
  - Input for the development of 2015 Renewable RFPs

https://www.psegliny.com/page.cfm/AboutUs/Proposals

2. Issues Addressed

- T&D Planning Criteria & Guidelines and Other References
- Major Key Factors

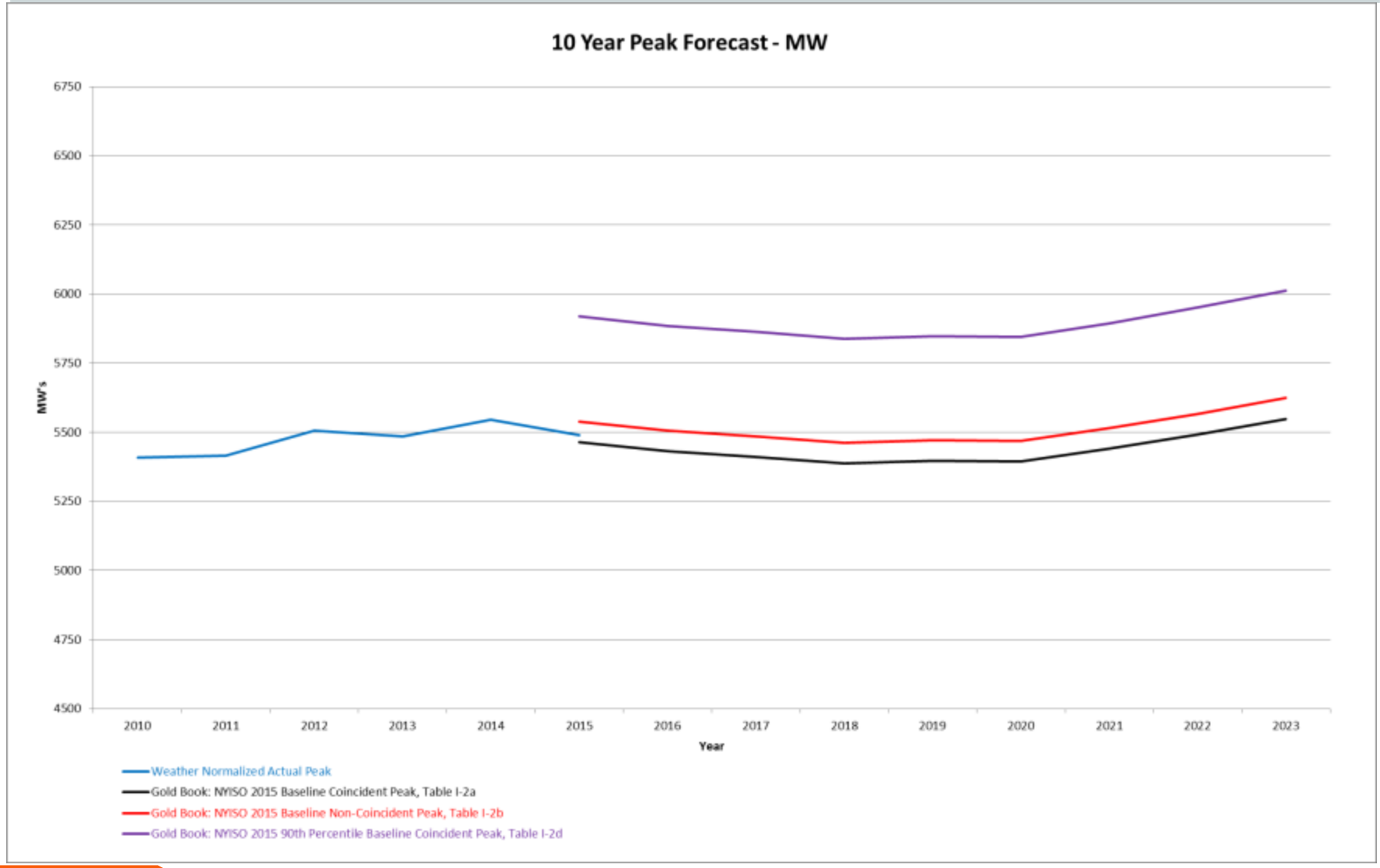
T&D Planning Criteria & Guidelines / Other References

- Planning Criteria : LIPA Transmission & Distribution Planning Criteria & Guidelines (http://www.lipower.org/pdfs/company/projects/energyplan10/energyplan10-e6.pdf)
- Integrated Resource Plan (https://www.psegliny.com/page.cfm/AboutUs/CurrentInitiatives/IRP)
- Reliability Improvement Projects (https://www.psegliny.com/page.cfm/AboutUs/CurrentInitiatives/ReliabilityProjects)

Major Key Factors (Examples)

- Load Growth
  - Organic Growth
  - Lump Load
- New Resources Addition
  - South Fork RFP (https://www.psegliny.com/page.cfm/AboutUs/Proposals/SouthFork)
  - Load Relief RFI (https://www.psegliny.com/files.cfm/RFI-loadrelief.pdf)
- Local Dispatch Guidelines
  - Gas Burn Reliability Rules & Transient Recovery Voltage
    - Alleviated by DRSS Phase II Project
  - Load Pockets
- Future Resources
  - Integrated Resource Plan
- Regulatory
  - Ensure that electric system will meet applicable reliability requirements (NERC/NPCC/NYSRC).
  - NERC Revised BES Definition

3. Planning Horizon



4. Data and Models Used

- Data Sources
- Models

Data Sources

- Load Forecast
- NYISO - The Major Source of Base Cases used in Modeling
  - Load Flow
  - Fault Duty
  - Stability
- Generator Owners/HVDC/FACTS Developers
  - MW/MVAR Capability
  - Modeling Characteristics
- Internal Sources
  - EMS Data – PI Historian
  - Equipment Characteristics (e.g., Engineering, Operations)

Models - Major Tools Used

- Thermal / Voltage Analysis
  - PSS/E™ :Siemens Power Technologies International's (PTI) Power System Simulator™; transmission system load flow; thermal, voltage under normal and contingency conditions
  - TARA : POWERGEM's steady-state power flow software tool with modeling capabilities and analytical applications that extend beyond traditional power flow solution.
  - MAPS™ : General Electric's (GE) Multi-Area Production Simulation
- Fault Duty
  - ASPEN™ : Advanced Systems for Power Engineering, Inc Short circuit analysis program Breaker fault duty analyses
- Stability
  - PSS/E™: PTI System Dynamic Simulation
  - Complex Load Model used for Transient Voltage Recovery Studies
- NERC/NPCC/NYSRC Planning Criteria
  - POWERGEM's TARA software as well as Siemens PSS/E™ is being used for NERC/NPCC/NYSRC Planning compliance studies including N-1-1 reliability analysis
- Other Programs
  - Python: Software language utilized for automation of various analysis and data management

5. Transmission Planning Studies

- Planning Process
- Study Overview
- Project Identification
  - 2015 FERC 715/ Gold Book
  - NYISO Interconnection Requests
  - Load Pockets – Projects
  - Compliance/N-1-1 Studies

Planning Process

- The planning process for the T&D System begins with the load forecast.
  - The load forecast at the system level is developed on both a weather-normalized and weather probabilistic basis.
  - Load forecasts are also developed for specific load pockets using system load data acquired by the Energy Management System (EMS) and other systems in LI T&D Operations
- Transmission System Studies: Identify transmission system limitations and recommend reinforcements for an area of the system.
  - Results in the development of major transmission capital projects.
- Load Level is a Critical Factor rather than a Year

Study Overview

- Short Term (6 months to 5 years)
  - System Operating Studies – (Summer, Winter, & extreme weather) Highlight current problems or deficiencies and anticipates conditions during the upcoming peak season
  - Operating Guidelines – Addresses very short term, temporary issues and provides Operations with solutions (i.e., DRSS, Generating unit outages, etc.)

- Mid- Range (5 to 10 years)
  - Area Studies – Studies of LIPA Load Pockets, other reinforcements
  - Mid-Range Studies identify requirements and corrective and/or preventive actions associated with system constraints over the next 10 years

Study Overview – Other Major Studies

- NYISO's System Reliability Impact Studies
  - Determine impact on the LIPA transmission system of proposed new generation or interconnections and recommend reinforcements to the system as required.
- Short Circuit Study
  - Ensure that there are no overstressed circuit breakers.
- Angular Stability Study
  - Ensures that electric system will meet system stability design criteria. Also studies with generation additions and/or major modifications to the transmission system.
- NERC Standards
  - Thermal/Voltage/Stability including extreme events
  - N-1-1 Assessment
- Voltage Recovery Evaluation:
  - Impact of load types and resource dispatch

Project Identification: 2015 FERC 715 Filing (NYISO 2015 Gold Book)

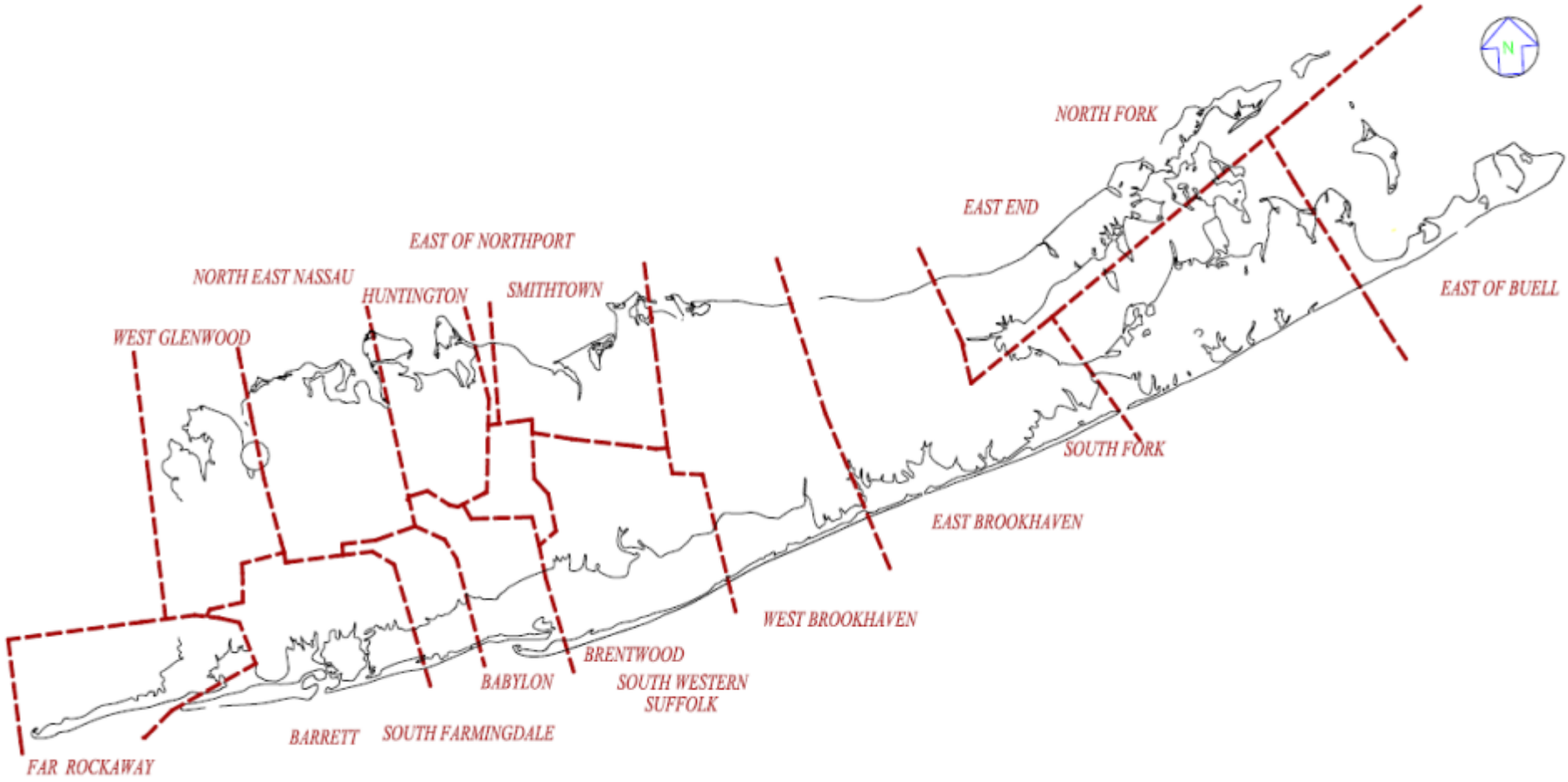
	Install Year
Firm Projects - 138 kV and Above	
• Holtsville DRSS – West Bus 138kV	In Service, 2014
• Randall Ave DRSS – Wildwood 138kV	In Service, 2015
Non-Firm Projects - 138 kV and Above	Install Year Proposed
• Kings Hwy - New 138kV Substation Tapping into Existing 138kV Circuit Pilgrim to West Bus	2017
• Riverhead to Wildwood – Upgrade from 69 kV to 138 kV operation	2023
Non-Firm Projects - 138 kV and Above Contingent on future generation resources	Install Year Proposed
• East Garden City to Valley Stream 2nd 138kV Circuit	2020
• Syosset to Shore Road New 138kV Circuit along with Phase Shifter	2020
• Riverhead to Canal 2nd 138 kV Circuit	2023
• Bellmore to Newbridge New 138kV Circuit along with Phase Shifter	2025
• Northport to Pilgrim New 138kV Circuit	2025

NYISO Interconnection Requests / Ongoing Effort

Queue Pos.	Owner/Developer	Project Name	Date of IR	SP (MW)	WP (MW)	Type/ Fuel	Location County/State	Z	Interconnection Point	Last Update	Proposed In-Service	Proposed COD
154	KeySpan Energy for LIPA	Holtsville-Brentwood-Pilgrim	8/19/04	N/A		AC	Suffolk, NY	K	Holtsville & Pilgrim 138kV	7/31/15	2017	
363	Poseidon Transmission 1, LLC	Poseidon Transmission	4/27/11	500	500	DC	NJ - Suffolk, NY	K	Werner - Ruland Rd. 230kV	5/31/15	2020/03	2020/06
401	Caithness Long Island II, LLC	Caithness Long Island II	3/22/13	764	807	CC-D	Suffolk, NY	K	Sills Road Substation 138kV	4/30/15	2018/04	2019/05
427	Island Park Energy Center, LLC	Island Park Energy Center CCPP	1/24/14	268	295	CT-NG	Nassau, NY	K	Barrett Power Station 138kV	11/30/14	2019/02	2019/05
428	Island Park Energy Center, LLC	Island Park Energy Center SCPP	1/24/14	262	252	CT-NG	Nassau, NY	K	Barrett Power Station 138kV	11/30/14	2017/02	2017/05
439	Boston Energy Trading	East Garden City-Valley Stream	5/9/14	TBD	TBD	AC	Nassau, NY	K	E. Garden City-Valley Stream 138kV	11/30/14	N/A	N/A
467	Invenergy Solar Development, LLC	Tallgrass Solar	12/22/14	25	25	S	Suffolk, NY	K	Ridge - Wildwood 69kV	5/31/15	2016/09	2016/11
473	Calverton Solar LLC	Calverton Solar	1/21/15	10	10	S	Suffolk, NY	K	Riverhead - Wildwood 69kV	8/31/15	2016/09	2016/09
477	Riverhead Solar Farm LLC	Riverhead Solar	2/18/15	20	20	S	Suffolk, NY	K	Edwards Substation 138kV	6/30/15	2016/10	2016/10
486	LI Energy Storage System	Buell Battery Storage	3/9/15	20	20	ES	Suffolk, NY	K	East Hampton Substation 69kV	5/31/15	2018/10	2018/10
487	LI Energy Storage System	Far Rockaway Battery Storage	3/9/15	20	20	ES	Suffolk, NY	K	Far Rockaway Substation 69kV	5/31/15	2018/10	2018/10
488	LI Energy Storage System	Glenwood Battery Storage	3/9/15	20	20	ES	Suffolk, NY	K	Glenwood Substation 69kV	5/31/15	2018/10	2018/10
489	LI Energy Storage System	Southampton Battery Storage	3/9/15	20	20	ES	Suffolk, NY	K	Southampton 69kV	5/31/15	2018/10	2018/10
492	Setauket Fuel Cell Park, LLC	Setauket Fuel Cell Park	3/23/15	19.6	19.6	FC	Suffolk, NY	K	Terryville Substation 69kV	8/31/15	2016/12	2016/12
493	EPCAL Fuel Cell Park, LLC	EPCAL Fuel Cell Park	3/30/15	19.6	19.6	FC	Suffolk, NY	K	Gruman Substation 69kV	8/31/15	2016/12	2016/12

Reference: NYISO Interconnection Queue 9/30/2015
http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Interconnection_Studies/NYISO_Interconnection_Queue/NYISO%20Interconnection%20Queue.xls

Long Island Load Pockets



Projects Being Considered

The following pages and descriptions represent study resultant projects that are currently under consideration and part of the on-going planning process, they are continually being reviewed, other options such as utility 2.0 solutions considered, and hence updated.

Therefore, the need, timing of, and the actual project recommendation to address any issue may not be as indicated.

Far Rockaway Load Pocket

NC 2015 Peak Load:	**235 MW**
Generation (MW):	
FPL FTU's	**108**
Total:	**108**

Key Items:
Must Run Generation

Projects Under Consideration

- Replace 33kV switchgear at Arverne -2016
- Replace 33 kV switchgear at Far Rockaway -2016

Barrett Load Pocket

NC 2015 Peak Load:	**754 MW**
Generation (MW):	
Barrett Steam	**391**
Barrett GTs	**259**
Freeport GTs	**99**
Total:	**749**

Key Items:

- **Con Ed Wheel -286 MW**
- **Freeport Generation**
- **Far Rockaway Generation**
- **Phase Shifter Operating Region**
- **Barrett Repowering**
- **Must Run Generation**

Projects Under Consideration

- Second East Garden City – Valley Stream 138 kV circuit – 2020
- Valley Stream 138kV bus re-configuration (Phase II) - 2020
- Barrett 138kV Bus Reconfiguration - 2024
- New Bellmore 138kV substation – 2025
- Bellmore – Newbridge 138kV circuit including PAR – 2025

West Glenwood Load Pocket

NC 2015 Peak Load:	**468 MW**
Generation (MW):	
Glenwood FTU's	**78**
Glenwood GT's	**113**
Trigen NDEC CC	**43**
Total:	**234**

Key Items:

Con Ed Wheel - 286 MW

Must Run Generation

Projects Under Consideration

- Reconductor 69 kV path between Valley Stream and Lake Success – 2018 - 2022
- New Syosset to Shore Rd Cable 138kV with Phase Shifter – 2020

North East Nassau Load Pocket

NC 2015 Peak Load:	**505 MW**
Generation (MW):	
Glenwood FTU's	**78**
Glenwood GTs	**113**
Grumman	**106**
Hempstead RR	**72**
Total:	**369**
Key Items:	
Must Run Generation	

Projects Under Consideration

- New 69 kV circuit between Ruland and Plainview - 2018
- Add new Nassau Hub 69 kV substation - 2019
- Add new 69kV, 27 MVAR Capacitor Bank at Brookville - 2020
- Reconductor Orchard – Locust Valley 69 kV - 2024

South Farmingdale Load Pocket

NC 2015 Peak Load:	**261 MW**
Generation (MW):	
Calpine CC	**77**
Total:	**77**

Key Items:

West Babylon GT

Must Run Generation

Projects Under Consideration

- New Berry St substation – 2016
- Reconductor Berry St – S. Farmingdale 69kV - 2017
- Reconductor Levittown – Plainedge 69kV – 2017
- Reconductor Sterling – Lindenhurst 69kV - 2023

Huntington Load Pocket

NC 2015 Peak Load: **102 MW**
Generation (MW):
Total: **0**

Key Items:
23kV load in Village

Projects Under Consideration

- Elwood Double Bus Tie – 2017
- Replace Elwood 138/69 kV Bank with 224 MVA Bank – 2023

Babylon Load Pocket

NC 2015 Peak Load:	**215 MW**
Generation (MW):	
West Babylon GT	**50**
Babylon RR	**14**
Pinelawn CC	**76**
Total:	**140**

Key Items:

Pilgrim Phase Shifter

Must Run Generation

Projects Under Consideration

- 23 kV projects from Brightwaters to Captree -2018

Brentwood Load Pocket

NC 2015 Peak Load:	**226 MW**
Generation (MW):	
NYPA GT	**45**
PPL FTUs	**91**
Total:	**136**

Key Items:

Pilgrim Phase Shifter

Must Run Generation

Projects Under Consideration

- Add new 27 MVAR Capacitor Bank at Deer Park – 2017
- New Kings Highway substation tapping into Pilgrim – West Bus 138kV – 2017
- Brentwood - Pilgrim 69-660 Line Termination Reconfiguration at Pilgrim – 2022
- Reconductor Brentwood – Deer Park 69kV – 2023
- Reconductor Brentwood – West Brentwood 69kV – 2023

Smithtown Load Pocket

NC 2015 Peak Load: 241 MW
Generation (MW):

Huntington RR	24
State College	47
Total:	71

Key Items:
- Northport Phase Shifter
- Must Run Generation - Holtsville GTs

Projects Under Consideration

- New 54 MVAR Cap Bank at Nesconset – 2016
- Reconductor Elwood - Pulaski 69kV – 2019
- Reconductor Port Jeff to Stony Brook 69 kV - 2019
- Reconductor Deposit – Indian Head 69kV – 2021
- Replace Elwood 138/69 kV Bank with 224 MVA Bank – 2023

South West Suffolk Load Pocket

NC 2015 Peak Load: **385 MW**
Generation MW):
Islip RR **9**
Total: **9**

Key Items:
Must Run Generation - Holtsville GTs

Projects Under Consideration

- 23 kV projects between Bayport and Fair Harbor – 2017-2020
- Add new 27 MVAR Capacitor Bank at Macarthur 69kV - 2017

West Brookhaven Load Pocket

NC 2015 Peak Load:	**490 MW**
Generation (MW):	
Caithness CC	**310**
Port Jefferson Units	**487**
Holtsville GTs	**513**
NYPA Holtsville	**136**
Total:	**1452**

Key Items:

- **Pilgrim Phase Shifter**
- **DRSS Phase II at West Bus**
- **Caithness 2 CC - 716MW**
- **Must Run Generation**

Projects Under Consideration

- Ridge Breaker and Switch – 2016
- Move Cap bank at Patchogue – 2018
- New Middle Island substation - 2018
- Reconductor Holbrook - Medford -West Yaphank 69-842/839/840 - 2019
- Reconductor Holtsville LNG - Holtsville 69-852 – 2019
- Reconductor Port Jeff - Stony Brook 69-877 – 2019
- Reconductor North Bellport- West Yaphank 69-849 - 2019
- Reconductor Holtsville GT - Holtsville LNG 69-856 - 2021
- Replace Holbrook Bank 2-2A 224 MVA – 2023

East Brookhaven Load Pocket

NC 2015 Peak Load:	**286 MW**
Generation (MW):	
Shoreham GTs	**150**
Wading River	**229**
Cross Sound Cable	**330(DC tie)**
LISF (BP Solar)	**32**
Total:	**741**

Key Items:

- **DRSS Phase II at Wildwood**
- **CSC Online, East End NC load**
- **Must Run Generation**

Projects Under Consideration

- Reconductor Eastport – Riverhead 69kV - 2017
- Wildwood 69kV Bus Reconfiguration - 2019
- Reconductor Moriches – South Manor 69kV - 2023
- Upgrade Wildwood – Riverhead from 69 kV to 138 kV – 2023
- Canal - Riverhead New Line and 224 MVA Bank - 2023

East End Load Pocket

NC 2015 Peak Load: 388/422 MW
(Normal/extreme weather)

Generation (MW):

East Hampton	25
Greenport	51
Southampton	8
Southold	13
Total:	97

Key Items:

- East End Generation
- D-VAR, DRSS Phase I Transient Voltage Recovery

Non-Firm Projects Under Consideration

- Dependent on South Fork RFP

Questions?

Document Posted on PSEG Long Island Web site

https://www.psegliny.com/page.cfm/AboutUs/CompanyProfile/DocumentLibrary

Questions?

Please send any comments you may have to

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