2019-2028 CRP: Peaker Scenario

Assessing DEC's Draft NOx Limits Rule for Simple Cycle and Regenerative Combustion Turbines ('Peaker Rule')

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Background

DEC Proposed Rule

- New York State Department of Environmental Conservation (DEC) has initiated a process to develop a regulation to limit nitrogen oxide (NOx) emissions from simple cycle combustion turbines ("Peaking Units")
- In June 2018 DEC posted a "Stakeholder Draft" outlining a proposed rule prior to initiating formal rulemaking ("the peaker rule")
  - On February 27, 2019 DEC issued a draft regulation, with comments due on May 20, 2019
- Changes between the Stakeholder Draft and proposed regulations did not affect the NYISO's Peaker Scenario analysis
- The draft regulation proposes new NOx emission limits for Peaking Units during the summer ozone season:
  - By May 1, 2023, Peaking Units would have to achieve 100 ppm NOx
  - By May 1, 2025, Peaking Units would have to achieve 25 ppm NOx for gaseous fuels and 42 ppm NOx for oil or other liquid fuel

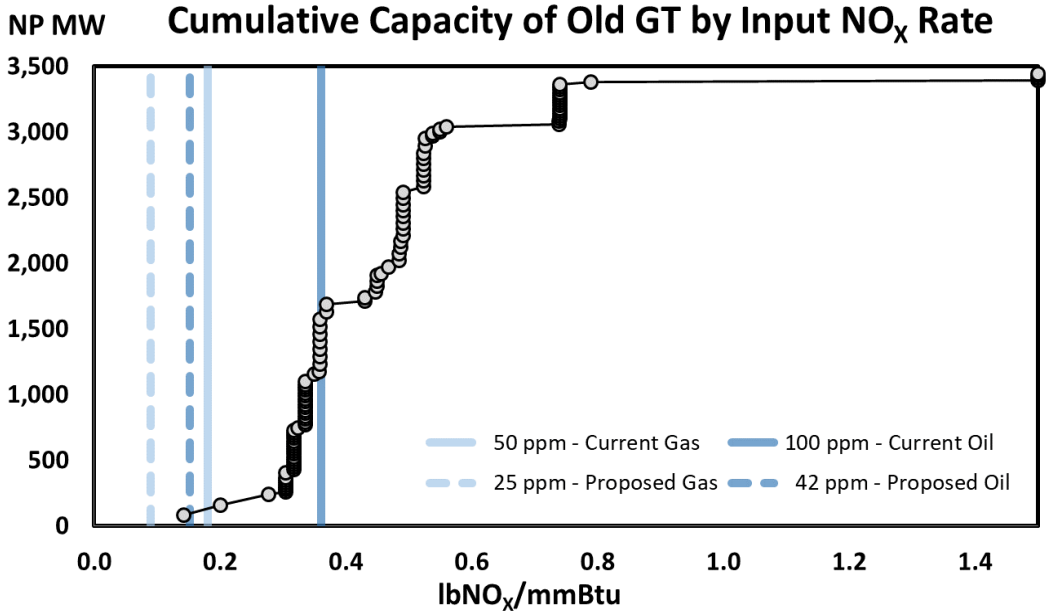
Other Draft Provisions

- Affected generators must file a compliance plan and may comply by deactivating prior to their applicable compliance date (*i.e.,* by May 1, 2023 or May 1, 2025) NYISO will consider generators' compliance plans in the development of the 2020 Reliability Needs Assessment base case
- The NYISO may designate certain units as needed for reliability through its deactivation process with a two-year extension (through 2025 or 2027) and a potential additional two-year extension (through 2027 or 2029) if resources or projects have been selected but not completed
    - Following a generator's submittal of a complete Generator Deactivation Notice to the NYISO, a Generator Deactivation Assessment will be performed to determine if units are needed for reliability

Peaking Units Affected by the Rule

Key Aspects of DEC's Draft Rule

- Beginning on May 1, 2023:
  - 100 ppm limit on all peakers during ozone season only
- Beginning on May 1, 2025:
  - 25 ppm for gas peakers
  - 42 ppm for oil peakers



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Summary of Generation Removed for this Scenario Assessment

- Approximately 3,300 MW nameplate generation could be impacted by this proposed regulation
  - As compared with the 2018-2019 RPP assumptions
- The NYISO assumed no retrofit or replacement and modeled all Peaking Units deactivated
- The table below summarizes the total MW removed from the models considering peaking and coal units (2018 GB values) that were not already in an IIFO, mothballed, or retired status in the 2018 CRP base case

		Removed in 2023 & 2024 (starting 2021 for coal)			Additional MW removed starting 2025 (throughout the study period)			Total Removed by 2025		
		Name Plate	ICAP	DMNC	Name Plate	ICAP	DMNC	Name Plate	ICAP	DMNC
Coal	Zone A & C	810	840	840	0	0	0	810	840	840
Peaking Units	Zones A-I	132	107	107	0	0	0	132	107	107
	Zone J	1,066	841	846	692	582	585	1,758	1,423	1,431
	Zone K	1,039	960	968	406	389	389	1,445	1,349	1,357
							Total (including Coal)	4,145	3,719	3,735
							Total Peaking Units Only	3,335	2,879	2,895

CRP Scenario Background

- In anticipation of DEC's formal rulemaking, the NYISO initiated a study to assess impacts of the potential regulation in coordination with Con Edison and PSEG-LI
  - Based off the June "Stakeholder Draft"
- The CRP base cases are used as a starting point for the scenario evaluations, as follows:
  - The 2018 RNA Base Cases were updated for the CRP
  - These models are based on the 2018 Gold Book and 2018 FERC 715 filing (*i.e.*, the 2018-2019 RPP assumptions)
  - The CRP scenario study years are 2023 through 2028
- Resource adequacy and transmission security assessments were performed

2018-2019 RPP: Major Assumptions

Additions

- CPV Valley, 680 MW (Zone G, 2019)
- Cricket Valley, 1020 MW (Zone G, 2020)
- Bayonne II, +120 MW (Zone J, 2019)
- Western NY PPTP (2022)

Deactivations

- Indian Point Energy Center Units 2 and 3 (2020 and 2021)

Changes from the 2018 RNA to the CRP cases

Changes from the 2018 RNA to CRP Base Case	Zone	ΔMW DMNC	Notes
Add back Pilgrim I and II	K	+90	Rescission of GDA Notice (Nov 2018)
Remove Cayuga II	C	-140	ICAP Ineligible Forced Outage as of 7/1/2018
Add back Selkirk I and II	F	+360	Rescission of GDA Notice (Dec 2018)
ConEdison's B3402 & C3403 345 kV cables out of service	J	-	Long-term unavailability
By-pass the Series Reactors on 71, 72, M 51, M52 for summer (with Y49, 41, 42, SR in service)	J	-	After Indian Point 2 and 3 Deactivations (2020 and 2021)
J to K (Jamaica ties) emergency limit represented in the MARS topology changed from 235 MW to 320 MW	J to K	+85*	Due to addition of Rainey-Corona 345/138 kV PAR; target I/S summer 2019

DMNC: Dependable Maximum Net Capability
*85 MW is the increase in the MARS transfer limit on Jamaica ties

Resource Adequacy

Loss of Load Expectation (LOLE) Results

NYCA Coincident Peak Load	Study Year	CRP Base	Peaker Scenario	Peaker Scenario + AC Transmission *(Jan 2024)*	Peaker Case + ConEd and LIPA's TS CompMW addition *(tested 640/620 MW)*
32,857	2019	0.01	0.01	0.01	0.01
32,629	2020	0.00	0.00	0.00	0.00
32,451	2021	0.01	0.01	0.01	0.01
32,339	2022	0.01	0.01	0.01	0.01
32,284	2023	0.01	0.09	0.09	0.04
32,276	2024	0.01	0.09	0.07	0.04
32,299	2025	0.01	0.33	0.21	0.04
32,343	2026	0.01	0.36	0.23	0.04
32,403	2027	0.01	0.36	0.24	0.04
32,469	2028	0.01	0.38	0.26	0.06

- **2023: LOLE increased from 0.01 to 0.09 days/year; *i.e.,* roughly 25 MW away from the 0.1 days/year criterion violation**
- **2025: Criterion violation observed through 2028**
- **AC Transmission (T027+T019, in-service by January 2024) lowered the NYCA LOLE, but did not bring it below the criterion**
- **If generation additions and/or load reductions are used to fully address load pocket issues, LOLE criteria would be met**

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Resource Adequacy Compensatory MW

- **Resource Adequacy compensatory megawatt amounts are determined by adding generic "perfect capacity" resources to zones (or combination of zones) to address the shortfall**
  - "Perfect capacity" is capacity that is not derated (*e.g.*, due to ambient temperature or unit unavailability), not subject to energy duration limitations, and not tested for transmission security or interface impacts. Actual resources would need to be larger in order to achieve the same impact as perfect-capacity resources.
- **The compensatory MW additions are not intended to represent specific solutions, as the impact of specific solutions can depend on the type of the solution and its location on the grid**
- **Resource needs could potentially be met by combinations of solutions including generation, transmission, energy efficiency, and demand response measures**
- **No transmission constraints within Zones J or K are modeled in MARS**

Example of J and K combinations of Compensatory MW

Study Year	Peaker Scenario NYCA LOLE	100% J	75% J	25% K	Total	50% J	50% K	Total	25% J	75% K	Total	100% K
2025	0.33	850	600	200	800	400	400	800	250	650	900	∞
2026	0.36	900	600	200	800	400	400	800	250	700	950	∞
2027	0.36	900	600	200	800	400	400	800	250	700	950	∞
2028	0.38	1,100	750	250	1,000	500	500	1,000	300	850	1,150	∞

Study Year	Peaker Scenario + AC Transmission NYCA LOLE	100% J	75% J	25% K	Total	50% J	50% K	Total	25% J	75% K	Total	100% K
2025	0.21	600	400	150	550	250	250	500	150	400	550	550
2026	0.23	650	450	150	600	300	300	600	150	450	600	600
2027	0.24	650	450	150	600	300	300	600	150	450	600	650
2028	0.26	850	550	200	750	350	350	700	200	550	750	950

*No power flow and topology impact assessments evaluations were performed for these scenarios

Individual Zonal Compensatory MW

Zonal compensatory MW peaker scenario cases

Study Year	Peaker Scenario NYCA LOLE	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I	Zone J	Zone K
2023	0.09	-250	-250	-300	-300	-300	-300	-300	-50	-50	-50	-50
2024	0.09	-200	-200	-250	-250	-250	-250	-250	-50	-50	-50	-50
2025	0.33	∞	∞	∞	∞	∞	∞	∞	1,150	1,150	850	∞
2026	0.36	∞	∞	∞	∞	∞	∞	∞	1,200	1,200	900	∞
2027	0.36	∞	∞	∞	∞	∞	∞	∞	1,250	1,250	900	∞
2028	0.38	∞	∞	∞	∞	∞	∞	∞	∞	∞	1,100	∞

Zonal compensatory MW Peaker Rule with AC Transmission (starting Jan 2024) project cases

Study Year	Peaker Scenario + AC Transmission NYCA LOLE	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I	Zone J	Zone K
2023	0.09	-250	-250	-300	-300	-300	-300	-300	-50	-50	-50	-50
2024	0.07	-650	-650	-950	-950	-950	-950	-950	-350	-350	-300	-250
2025	0.21	∞	∞	∞	∞	∞	∞	∞	950	950	600	550
2026	0.23	∞	∞	∞	∞	∞	∞	∞	1,050	1,050	650	600
2027	0.24	∞	∞	∞	∞	∞	∞	∞	1,150	1,150	650	650
2028	0.26	∞	∞	∞	∞	∞	∞	∞	∞	∞	850	950

Notes:
EZR - Exceeds Zonal Resources: more than the total available capacity would have to be removed

∞ - Either a large or no amount of capacity added in the zone can bring NYCA LOLE below 0.1

- negative values are for those peaker scenario study years with LOLE still below the criterion, and the values represent the MW that can be removed from each zone before NYCA LOLE reaches 0.1 days/year

Resource Adequacy Observations

- **There are various zonal combinations that can bring the NYCA LOLE below its 0.1 days/year criterion**
- **The needs could potentially be met by combinations of solutions including generation, transmission, and load reduction (energy efficiency, demand management, etc.) measures**
  - The deficiency could not be reasonably addressed with compensatory MW placed in zones A through I, as the compensatory MW become less effective toward the outer years
  - The optimal combination of compensatory MW from a resource adequacy perspective is approximately 1,000 MW split 50/50 between J and K. This amount reduces to 700 MW with the implementation of the AC Transmission projects.
  - Adding resources (generation additions or load reduction) to represent the minimum compensatory MW identified by ConEdison (*i.e.,* 640 MW) and PSEG-LI (*i.e.,* 620 MW) for local transmission security brought the NYCA LOLE well below its criterion
  - Upgrading the transmission path from UPNY-SENY all the way into Zones J and K (*i.e.,* UPNY-ConEd, Dunwoodie-South) would most likely only marginally bring the NYCA LOLE at or below 0.1 criterion, and would still not address the local transmission constraints identified in J and K

ConEdison's Transmission Security Analysis Presentation

(posted as a separate file)

PSEG-LI's Transmission Security Analysis Presentation

(posted as a separate file)

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NYISO Transmission Security Analysis

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Transmission Security BPTF Study Scope

- **Study comprised of N-1 and N-1-1 steady state analysis (thermal and voltage)**
  - NYISO evaluated BPTF facilities; the Transmission Owners evaluated their non-BPTF transmission systems
- **NYISO evaluated Summer 2023 and 2028 statewide coincident baseline peak load forecast**
  - While the DEC rule is for year 2025, as a conservative assumption the NYISO used the readily available Year 2028 RNA base case representation as a proxy for year 2025. This case has the same transmission representation as year 2025, but with a higher NYCA load level (~170 MW increase)
- **Con Edison and PSEG-LI used local non-coincident load values for their assessments**

ConEdison / PSEG-LI Transmission Security Evaluations Summary

- As noted in their presentations, Con Edison and PSEG-LI observe criteria violations on their non-BPTF transmission system and have identified compensatory MW values to resolve these violations (Con Edison ~ 660 MW and Long Island ~ 620 MW)
  - Compensatory MW:
    - Are illustrative of potential solutions.
    - Are dependent on the location in the electric system and can be a combination of transmission, generation, and load reduction.
    - Are not subject to energy duration limitations
    - Typically use generic power factors (e.g., 95% leading/lagging)
- NYISO observed BPTF thermal criteria violations influenced by the Greenwood/Fox Hills 138 kV TLA, Long Island load pockets, as well as additional overloads in SENY
  - No BPTF thermal criteria violations were influenced by the Astoria East/Corona 138 kV TLA
- If the local violations identified by ConEdison and PSEG-LI are addressed by generation additions or load reductions, the NYISO that the observed violations on the BPTF system are resolved

BPTF Violations Influenced by Greenwood/Fox Hills TLA

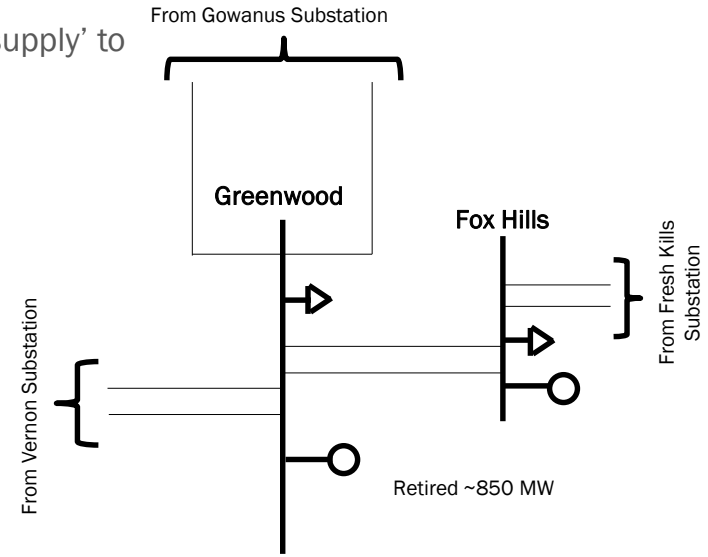
- **Greenwood/Fox Hills TLA is observed to have N-0 violations**
  - Influences the loading on 345 kV elements that provide 'supply' to the TLA
- **Thermal criteria violations are observed only in 2025**

N-1 Thermal Violations

Element	Year
Goethals - Gowanus (26) 345 kV	2025
Goethals - Gowanus (25) 345 kV	2025

N-1-1 Thermal Violations

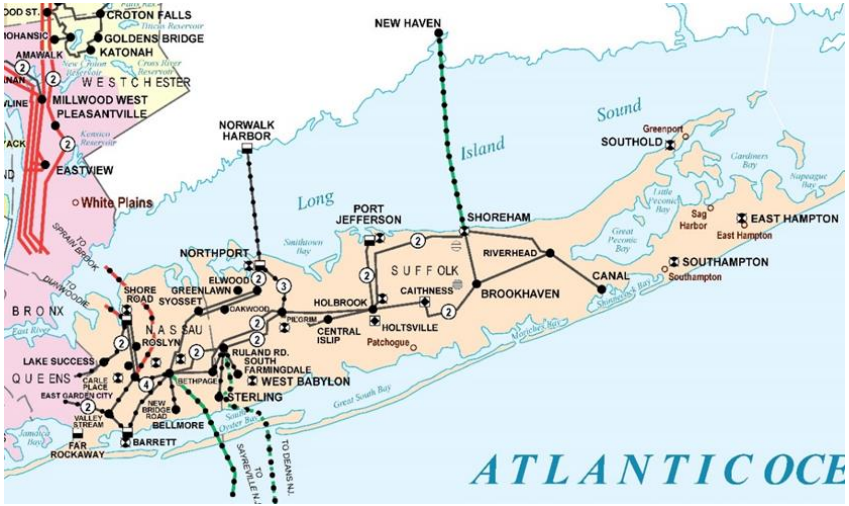
Element	Year
Goethals - Gowanus (#25) 345 kV	2025
Goethals - Gowanus (#26) 345 kV	2025
Gowanus 345/138 2TR	2025
Gowanus 345/138 14TR	2025
Fresh Kills 345/138 TA1	2025
Fresh Kills 345/138 TB1	2025



Greenwood / Staten Island Transmission Load Area

BPTF Thermal Violations in Long Island

- **Thermal criteria violations are observed in Years 2023 and 2025 under N-1-1 analysis**
  - The NYISO analysis of the BPTF at the statewide coincident peak load level shows no N-1 thermal violations for years 2023 or 2025



Element	Year
Sprainbrook - East Garden City (Y49) 345 kV	2025
Dunwoodie - Shore Rd. (Y50) 345 kV	2025
Valley Stream - East Garden City (262) 138 kV	2025
Freeport - Newbridge (461) 138 kV	2025
Pilgrim - Hauppauge (871) 138 kV	2025
Brookhaven - Sills Rd (887) 138 kV	2025
Brookhaven - Edwards Ave (864) 138 kV	2023/2025
Edward Ave - Riverhead (893) 138 kV	2023/2025
Riverhead - Wildwood (890) 138 kV	2023/2025
Elwood - Greenlawn (673) 138 kV	2025
Northport - Pilgrim (677) 138 kV	2025
Northport - Pilgrim (672) 138 kV	2025
Northport - Pilgrim (679) 138 kV	2025
Shore Rd 345/138 Bank #1	2025
Shore Rd 345/138 Bank #2	2025
Glenwood - Shore Rd (366) 138 kV	2025

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Other Transmission Security Violations

- **Additional overloads in SENY were observed in the NYISO analysis**
  - All violations are resolved with the addition of the AC Transmission projects

Additional SENY N-1-1 Violations

Element	Year
Buchanan 345/138 kV (TA5)	2025
Lovett 345/115 kV	2025
Lovett – Buchanan South (Y88) 345 kV	2025
Ladentown – Lovett (Y88) 345 kV	2025
Athens – Pleasant Valley (91) 345 kV	2025
Leeds – Pleasant Valley (92) 345k kV	2025

CRP Scenario Conclusions

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Scenario Conclusions: ConEdison

- **Transmission Security around ConEdison TLAs**
  - Astoria East/Corona 138kV TLA
    - *Comprised of feeders from:*
      - Hell Gate – Astoria East 138 kV feeders 34051 and 34052
      - Jamaica – Corona 138 kV PAR controlled feeders 18001 and 18002
      - Astoria Annex – Astoria East 345/138 kV PAR controlled feeder 34091
      - Rainey – Corona 345/138 kV PAR controlled feeder 36187
    - *Results in a 220 MW deficiency starting in 2023*
      - Duration of the MW deficiency is 14 hours
  - *East 75th Area Station*
      - Results in a 20 MW deficiency starting in 2023

Scenario Conclusions: ConEdison

- **Transmission Security around ConEdison TLAs**
  - Greenwood/Fox Hills 138kV TLA
    - *Comprised of feeders from:*
      - Gowanus – Greenwood 345/138 kV PAR controlled feeders 42231 and 42232
      - Vernon – Greenwood 138 kV feeders 31231 and 31232
      - Fresh Kills – Willowbrook - Fox Hills 138 kV feeders 29211 and 29212
    - Results in a 420 MW deficiency starting in 2025
    - Duration of the MW deficiency is 15 hours

Scenario Conclusions: PSEG-LI

- **Transmission Security around Long Island Load Pockets**
  - East End and South Western Suffolk Load Pockets
    - Results in a 320 MW deficiency starting in 2023
    - Results in a 560 MW deficiency starting in 2025
      - Duration of the MW deficiency is 15 hours
  - Barrett Load Pocket
    - Results in a 60 MW deficiency starting in 2025
      - Duration of the MW deficiency is 6 hours

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Scenario Conclusions: Compensatory MW

- **The needs could potentially be met by combinations of solutions including generation, transmission, and load reduction (energy efficiency, demand response, etc.) measures**
  - At least 700 MW of compensatory MW necessary between J and K to meet LOLE criteria, assuming AC Transmission is completed on schedule
  - Approx. 660 MW (240 MW in 2023, 420 MW in 2025) total compensatory MW necessary in ConEdison system
  - Approx. 620 MW (320 MW in 2023, 300 MW in 2025) total compensatory MW necessary in LIPA system
- **The local needs can be addressed by a combination between local transmission, resource additions, and load reductions; however, due to the resource adequacy need, local transmission alone cannot fully solve the BPTF and non-BPTF needs**
  - Upgrading the transmission path from UPNY-SENY all the way into Zones J and K would most likely only marginally bring the NYCA LOLE at or below 0.1 criterion, and would still not address the local transmission constraints identified in J and K

Operational Considerations*

- Off-Peak Maintenance conditions
- Operating Reserve
- Black Start
- Auxiliary Power
- Emergency Generation
- Transient Voltage Recovery

**As described in ConEdison's and PSEG-LI's presentations*

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