AC Transmission PPTN: Evaluation Updates

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ESPWG/TPAS
May 10, 2018, KCC

Review Process

- March 30, 2018: posted draft SECO report and preliminary evaluation results. Written comments welcomed throughout the review process
- April 5, 2018: ESPWG/TPAS, summary of the review schedule
- April 6, 2018: review results with all developers in the same meeting
- April 19, 2018: review results with all developers in the same meeting
- April 30, 2018: ESPWG/TPAS
- May 10, 2018: ESPWG/TPAS
- May 22, 2018: ESPWG/TPAS
- June 20, 2018: Business Issue Committee (advisory vote)
- June 21, 2018: Operating Committee (for information, not required by Tariff)
- June 26, 2018: Special Management Committee (advisory vote)
- July 2018: draft report delivered to NYISO Board

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Agenda

- Responses to Comments
- Evaluation Updates
- Next Steps

Responses to Questions and Comments

Review of Questions and Comments

- All written comments received from stakeholders by May 3, 2018 were posted
- NYISO reviewed and considered these comments, and will continue to consider and incorporate them into the draft report

Responses to Comments

- **Selection should not be based upon the Clean Energy Standard (CES).**

  NYISO Response:

  - NYISO reviewed the assumptions and scenarios with stakeholders at the November 7, 2017 ESPWG/TPAS meeting. The projects were evaluated in baseline as well as different scenarios that assist in understanding the overall performance of the projects under various conditions.
  - One of the scenarios modeled achievement of the CES and retirement of aging generation. This scenario evaluated the project performance under different system conditions.

Responses to Comments

- **How was the 5% synergy savings amount developed?**

  NYISO/SECO response:

  - The synergies were derived by evaluating the average cost of individual cost components of the projects to estimate potential cost savings assuming one Developer was awarded both Segment A and B.
  - These cost components include items such as Labor & Equipment, Matting, Materials, Contractor Mobilization/Demobilization, Project Management, Field Construction Management and Inspection Staffing, Incumbent Utility PM and Project Oversite, Site Facilities, Material Handling & Storage, Design Engineering, LiDAR, Geotech, Testing & Commissioning of T-Line and Equipment, Contractor Warranties / LOCs, Legal Fees, and Contractor Markup.
  - Each of these items were assessed for economy of scale, utilization of resources, equipment and materials, duplication of services, and replication of engineering designs to estimate the potential savings.

Responses to Comments

- **Projects to rebuild the Rotterdam substation over gas pipelines should be rejected.**
  - NYISO/SECO response: Relocation of the gas pipelines is a feasible way to mitigate this risk. This was considered as a minor risk in the draft SECO report. The independent cost estimates include the cost for relocation.

Responses to Comments

- **The installation costs for concrete monopoles are overstated.**
  - NYISO/SECO/Kenny response: Kenny managed installation of more than 3,000 concrete poles, and applied the same methodology in many projects. There is significantly more work involved than just the crane used to set the concrete poles. The unit cost used for the concrete poles includes the following work not usually required on steel pole installations: offloading, traffic control, crawler crane, additional matting and construction roads, QA/QC, and additional labor.

Responses to Comments

- **What is the methodology used to estimate the tower structure foundation?**
  - NYISO/SECO response: Proposed foundation design was evaluated for adequacy, and then the independent cost estimates were developed based on the proposed design. No attempt was made to optimize the various design proposals.

EMF

- **How does the double-circuit design in T027 mitigate the EMF issue?**
  - NYISO/SECO response: The electromagnetic fields from all the lines on the ROW interact with each other. Vertical line spacing, height above ground, and the phasing configuration associated with the double-circuit design has an EMF emission cancelling effect.

Evaluation Updates

Ranking Process

- **Inputs included for consideration**
  - Total performance of each project in each metric
  - Risks associated with each project
  - Inputs from stakeholders and DPS
- **Two-step ranking**
  - Step 1: Tiered ranking of individual projects in each segment
  - Step 2: Ranking of Segment A and B combinations

Ranking Process (continued)

- **Step 1: Tiered Ranking**
  - Each project in each segment was first analyzed individually
  - Each project in the same segment was then compared against each other to identify the major performance differences and risks as distinguishing factors
  - Projects in each Segment were ranked in three tiers: Tier 1 being the most favorable and Tier 3 being the least
- **Step 2: Combination Ranking**
  - Combinations involving the Tier 3 projects not considered due to low performance and/or high risks
  - Remaining combinations evaluated based on all the metrics
  - Both synergies and interaction between projects considered

Tiered Ranking: Segment A

Project ID	Independent Cost Estimate: 2018 $M	Independent Duration Estimate: Months	Incremental Central East Voltage Transfer Limit	Operability	Propriety Rights	Expandability	PSC Criterion: Replacement of Aging Infrastructure	Risks			Tiered Ranking
								Overall Visual Impact	Easement Needed to Mitigate EMF (acres)	Other Risks Including Siting	
T018	520	52	Low	Breaker-and-a-half 345 kV Rotterdam substation, foundations and sturctures beyond NESC standard, low N-1-1 performance	-	-	-	Medium structure height increase	24	-	2
T021	498	52	Low	Breaker-and-a-half 345 kV Princetown substation, low N-1-1 performance	Non-utility propoerty needed for Princetown substation, but with an option to purchase	Property available to expand the Princetown substation	No upgrades at Rotterdam substation	High structure height increase, more structures, less impact to agriculture due to monopoles	24	-	2
T025	861	54	Highest	Breaker-and-a-half 345 kV Rotterdam substation, ring-bus 345 kV Princetown substation, low N-1-1 performance	-	-	-	Low structure height increase	76	Potential mitigation for clearance and corona issues, hardware replacement for insulation, siting and permitting risks	3
T026	489	52	Lowest	Breaker-and-a-half 345 kV Rotterdam substation, low N-1-1 performance	-	-	-	Low structure height increase	24	-	3
T027	741	55	High	breaker-and-a-half 345 kV Rotterdam substation, breaker-and-a-half 345 kV Princetown substation, best N-1-1 performance	-	All projects allow one more 345 kV line to be added within existing ROW, but double-circuit design tends to maxmize the Central East transfer capability	More replacement due to double-circuit design, rebuild of Edic - New Scotland 345 kV line #14 for 6.3 miles, terminal upgrades at Marcy and Edic 345 kV substations	High structure height increase, 6 miles of lattice tower removed, less impact to agriculture due to monopoles	0	-	1
T028	512	52	Low	breaker-and-a-half 345 kV Rotterdam substation, ring-bus 345 kV Princetown substation, low N-1-1 performance	-	-	-	Low structure height increase	24	-	2
T031	570	52	Low	Breaker-and-a-half Princetown substation looping in all 345 kV lines, straight-bus at Rotterdam substation, no bus reconfiguration at New Scotland, new tower contigency created south of Princetown, low N-1-1 performance	Non-utility propoerty needed for Princetown substation	-	Rebuild of Edic - New Scotland 345 kV line #14 for 20 miles	Low structure height increase, more sturctures, more impact to agriculture, 20 miles of lattice tower removed	24	Property acqucition for Princetown substation	2

Tiered Ranking: Segment B

Project ID	Independent Cost Estimate: 2018 $M	Independent Duration Estimate: Months	Incremental UPNY-SENY Thermal Transfer Limit	Operability	Propriety Rights	Expandability	PSC Criterion: Replacement of Aging Infrastructure	Risks		Tiered Ranking
								Overall Visual Impact	Other Risks Including Siting	
T019	445	49	Higher with series compensation, but similar to others if bypassed	Foundations and sturctures beyond NESC standard	-	-	Churchtown 115 kV substation rebuild, terminal upgrades at New Scotland and Roseton substations	Medium structure height increase	Risk of SSR due to 50% series compensation	3
T022	357	47	-		-	-	Less 115 kV upgrades between Churchtown and Pleasatn Valley	Medium structure height increase	-	2
T023	390	49	-		-	-		High structure height increase	-	3
T029	387	49	-	Improved N-1-1 performance due to Middletown upgrades	-	-	Middletown upgrades, Churchtown 115 kV substation rebuild	Low structure height increase	-	1
T030	406	49	-	Improved N-1-1 performance due to Middletown upgrades	-	-	Middletown upgrades, Churchtown 115 kV substation rebuild	Low structure height increase	-	1
T032	502	51	-	-	-	Transformers could be added to connect the Knickerbocker 345kV and 115 kV switching stations	-	Low structure height increase, more structures, more impact to agriculture, two-pole configuration with triple circuits	Operation and maintenance comlexity due to triple-circuit design	3

Summary of Combination Evaluation

Project ID	Independent Cost Estimate: 2018 $M (1)	Independent Duration Estimate: Months (2)	UPNY-SENY Incremental Thermal Transfer Limit: MW (3)	Central East Incremental Voltage Transfer Limit: MW	UPNY-SENY Cost/MW: $M/MW (3)	Central East Cost/MW: $M/MW	Baseline Production Cost Savings: 2018 $M	Baseline Production Cost Savings /Capital Cost	CES Production Cost Savings: 2018 $M	CES Production Cost Savings /Capital Cost	System CO2 Emission Reduction: 1000 tons (4)	Performance: 20-Year Incremental Flow on UPNY-SENY + Central East: GWh (4)	Operability		Expandability		Property Rights		PSC Criterion: Aging Infrastructure		Tiered Ranking	
													Seg A	Seg B	Seg A	Seg B	Seg A	Seg B	Seg A	Seg B	Seg A	Seg B
T018+T022	877	52	1,519	425	0.23	1.22	236	0.3	830	0.95	4,686	86,987	Good	Good	Good	Good	Good	Good	Good	Fair	2	2
T018+T029	907	52	1,401	425	0.28	1.22	236	0.3	830	0.92	4,686	86,987	Good	Excellent	Good	Good	Good	Good	Good	Good	2	1
T018+T030	926	52	1,535	425	0.26	1.22	236	0.3	830	0.90	4,686	86,987	Good	Excellent	Good	Good	Good	Good	Good	Good	2	1
T021+T022	812	52	1,519	350	0.22	1.35	199	0.2	714	0.88	7,298	78,917	Good	Good	Good	Good	Good	Good	Good	Fair	2	2
T021+T029	885	52	1,401	350	0.28	1.42	196	0.2	707	0.80	8,235	77,865	Good	Excellent	Good	Good	Good	Good	Good	Good	2	1
T021+T030	904	52	1,535	350	0.26	1.42	196	0.2	707	0.78	8,235	77,865	Good	Excellent	Good	Good	Good	Good	Good	Good	2	1
T027+T022	1098	55	1,326	825	0.27	0.90	331	0.3	1129	1.03	9,429	133,565	Excellent	Good	Excellent	Good	Good	Good	Excellent	Fair	1	2
T027+T029	1072	55	1,326	825	0.28	0.85	331	0.3	1129	1.05	9,429	133,565	Excellent	Excellent	Excellent	Good	Good	Good	Excellent	Good	1	1
T027+T030	1090	55	1,470	825	0.26	0.85	337	0.3	1108	1.02	10,184	135,044	Excellent	Excellent	Excellent	Good	Good	Good	Excellent	Good	1	1
T028+T022	869	52	1,519	400	0.23	1.28	221	0.3	840	0.97	4,056	74,942	Good	Good	Good	Good	Good	Good	Good	Fair	2	2
T028+T029	854	52	1,427	400	0.26	1.22	221	0.3	840	0.98	4,056	74,942	Good	Excellent	Good	Good	Good	Good	Good	Good	2	1
T028+T030	873	52	1,569	325	0.25	1.50	205	0.2	704	0.81	5,901	68,551	Good	Excellent	Good	Good	Good	Good	Good	Good	2	1
T031+T022	927	52	1,519	400	0.23	1.43	206	0.2	570	0.61	8,814	73,429	Good	Good	Good	Good	Fair	Good	Excellent	Fair	2	2
T031+T029	957	52	1,427	400	0.27	1.43	206	0.2	570	0.60	8,814	73,429	Good	Excellent	Good	Good	Fair	Good	Excellent	Good	2	1
T031+T030	976	52	1,569	400	0.26	1.43	206	0.2	570	0.58	8,814	73,429	Good	Excellent	Good	Good	Fair	Good	Excellent	Good	2	1

Notes:
1. With 30% contingency rate, with 5% synergy if from same developers, and without cost for Rock Tavern and Shoemaker-Sugarloaf upgrades
2. Max of Segment A and Segment B
3. UPNY-SENY N-1 optimized thermal transfer
4. CES + Retirement w/o National CO2

ICAP Evaluation Framework

- Utilize the NYISO's Optimizer tool to estimate the long-term procurement cost savings in the Capacity Market associated with proposed AC Transmission projects
- Construct study cases, using combinations of Tier 1 and Tier 2 projects and the associated transfer limit impacts
- Run Optimizer for sample of years during 2023-2042 study period (*i.e.,* 2025, 2030, 2035, and 2040)
- Utilize Optimizer output to construct ranges of Capacity Market benefits for the 20-Year study period
- The Capacity Market Benefit metric is not to be utilized in the AC Transmission Public Policy evaluation process to differentiate among projects, but to demonstrate the significant economic benefits associated with the broad range of projects proposed

Transfer Limit Impacts

- Identified increases in emergency transfer limits across key interfaces for representative Tier 1 and 2 projects
- For the UPNY-SENY interface, increases ranged from 1,150 MW to1,400 MW
- For the Zone F to Zone G interface, increases ranged from 1,275 MW to 1,325 MW
- For the UPNY-Con Ed interface, increases ranged from 225 MW to 350 MW

Annual Procurement Savings

- Calculated annual procurement savings for NYCA, A-F, and G-K for each study year (*i.e.,* 2025, 2030, 2035 and 2040) for each case studied
  - Results are presented are in "nominal" dollars
- These annual savings estimates are strictly attributable to the increase in transfer limits (and do not reflect any escalation of the generator Net Cost of New Entry (CONE) curves or a discount factor)
- NYCA annual savings ranged from $79M to $86M across the four study years and cases studied, with an average savings of $80M
- A-F annual increases were less than $9M, with an average increase of $4M
- G-K annual savings ranged from $79M to $90M, with an average savings of $84M

Base Time-Series of NYCA Savings

- Calculated average Capacity Market procurement cost savings across the four study years and assigned those average savings to each year over the full 20-year study period
- Escalated annual savings to account for increases in Net CONE based on 2018/2019 escalation factor (*i.e.*, 1.92%)
- Derated the escalated annual savings to estimate the net present value of the savings (2018$), using 6.99% (*i.e.,* same discount rate used in production cost analysis)

Alternate Time-Series of NYCA Savings

- Base Time-Series assumes that Capacity Market prices converge to Net CONE by 2023 (*i.e.*, at the start of the study period)
- NYISO constructed an alternate time-series of capacity procurement savings that reflects a longer glide-path to that condition; a straight-line trajectory reaching convergence between Capacity Market prices and the Net Cone in 2042 (*i.e.*, at the end of the study period)
  - Current total NYCA procurement costs in the NYISO's Capacity Market are approximately 1/3 of total costs that would be incurred, should prices be set at the Net Cone
  - Alternate time-series increases by approximately 3% per year, the % of Net Cone utilized in calculating change in procurement costs; from 47% in 2023 to 100% in 2042)
- Both approaches reflect a path towards Net Cone pricing as the NYCA system's capacity/load balance tightens through the study period

Example of Base and Alternate Time-Series

Study Year	NYCA Average Savings	Net Cone Escalation	Discount Rate	Base Time Series of Savings	Price Convergence Discount	Alternate Time Series of Savings
2023	$83	1.92%	6.99%	$65	47%	$31
2024	$83	1.92%	6.99%	$62	50%	$31
2025	$83	1.92%	6.99%	$59	53%	$31
2026	$83	1.92%	6.99%	$56	55%	$31
2027	$83	1.92%	6.99%	$54	58%	$31
2028	$83	1.92%	6.99%	$51	61%	$31
2029	$83	1.92%	6.99%	$49	64%	$31
2030	$83	1.92%	6.99%	$46	67%	$31
2031	$83	1.92%	6.99%	$44	69%	$31
2032	$83	1.92%	6.99%	$42	72%	$30
2033	$83	1.92%	6.99%	$40	75%	$30
2034	$83	1.92%	6.99%	$38	78%	$30
2035	$83	1.92%	6.99%	$36	81%	$29
2036	$83	1.92%	6.99%	$35	83%	$29
2037	$83	1.92%	6.99%	$33	86%	$28
2038	$83	1.92%	6.99%	$31	89%	$28
2039	$83	1.92%	6.99%	$30	92%	$27
2040	$83	1.92%	6.99%	$28	95%	$27
2041	$83	1.92%	6.99%	$27	97%	$26
2042	$83	1.92%	6.99%	$26	100%	$26
			Net Present Value	$852		$589

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20-Year Capacity Procurement Savings

- NYISO developed a range of Capacity Market benefits based on the range of transfer limit increases modeled and the two sensitivities which project the pace at which Capacity Market prices will converge to the Net CONE
- In this manner, the net present value of Capacity Market procurement costs for the NYCA are estimated to decrease in the range of $550M to $850M for all combinations of Tier 1 and Tier 2 projects for the 20-year study period

Next Steps

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Next Steps

- Please provide additional comments to PublicPolicyPlanningMailbox@nyiso.com by May 14, 2018
- Written comments will be posted on NYISO website
- NYISO will release updated draft AC Transmission Public Policy Transmission Planning Report with ranking and selection recommendation

Questions?

We are here to help. Let us know if we can add anything.

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- 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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