2019 CARIS 1 Primary and Additional Metrics

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Production Cost Savings(2019 $M)

Study	Ten-Year Production Cost Savings ($M)			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	115	103	17	1,061
Study 2: Central East-Knickerbocker	117	110	17	1,061
Study 3: Volney Scriba	22	137	9	530

Study	2019-2023 Production Cost Savings ($M)			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	86	46	9	542
Study 2: Central East-Knickerbocker	86	51	9	542
Study 3: Volney Scriba	12	54	4	272

Study	2024-2028 Production Cost Savings ($M)			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	29	57	8	519
Study 2: Central East-Knickerbocker	31	59	8	519
Study 3: Volney Scriba	10	83	4	258

NEW YORK INDEPENDENT SYSTEM OPERATOR

Energy Efficiency Solution Cost Updates

- Base generic cost estimates derived from TO filings at the NYSDPS for their Utility Energy Efficiency Programs
  - Case No. 15-M-0252, Clean Energy Dashboard Scorecard Report
- Both Incentives & Services and Program Implementation costs are included
- Weighted cost estimates by each utility's share of zonal peak loads
- High/low estimates +/- 25% of mid-level costs

Energy Efficiency Solution Cost Updates

Zone	Cost Range	M$/per 100 MW
F	Low	368
	Mid	490
	High	613
G	Low	349
	Mid	465
	High	581
J	Low	589
	Mid	785
	High	981

Preliminary Solution Benefit-Cost Analysis

Benefit-Cost Analysis

- **Present Value of Production Cost Savings is calculated over the Study Period using a discount rate of 7.08%**
  - Discount rate is equal to an average of the Transmission Owners' Weighted Average Cost of Capital (WACC) (weighted by 2018 load (GWh))
- **For the Transmission and Generation Solution Costs, Overnight Costs are multiplied by a Capital Recovery Factor (CRF)**
  - Assumes a levelized generic carrying charge of 16% for transmission and generation solutions and a discount rate of 7.08%, resulting in the CRF of 1.16
- **Benefit/Cost Ratios are reported for each solution, based upon 10 years of projected NYCA-wide Production Cost Savings (the primary CARIS metric) compared to the estimated 10 years of project costs**

Solutions Costs(2019 $M)

Study	Mid–Range Solution Costs ($M)			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	591	695	270	2,525
Study 2: Central East-Knickerbocker	634	782	270	2,525
Study 3: Volney Scriba	70	608	50	955

Solutions Costs(2019 $M)

Study	Low–Range Solution Costs ($M)			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	394	522	203	1,894
Study 2: Central East-Knickerbocker	423	585	203	1,894
Study 3: Volney Scriba	46	458	38	716

Solutions Costs(2019 $M)

Study	High–Range Solution Costs ($M)			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	739	869	338	3,156
Study 2: Central East-Knickerbocker	792	979	338	3,156
Study 3: Volney Scriba	87	759	63	1,194

Ratio of Production Cost Savings to Solutions Costs for Transmission Solutions

Study	2019-2023			2024-2028		
	High	Mid	Low	High	Mid	Low
Study 1: Central East	0.20	0.25	0.37	0.09	0.12	0.18
Study 2: Central East-Knickerbocker	0.20	0.25	0.37	0.09	0.11	0.16
Study 3: Volney Scriba	0.24	0.30	0.44	0.28	0.35	0.52

Ratio of Production Cost Savings to Solutions Costs

Study	Mid–Range Solution			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	-	0.15	0.06	0.42
Study 2: Central East-Knickerbocker	-	0.14	0.06	0.42
Study 3: Volney Scriba	-	0.23	0.18	0.55

Ratio of Production Cost Savings to Solutions Costs

Study	Low–Range Solution			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	-	0.20	0.08	0.56
Study 2: Central East-Knickerbocker	-	0.19	0.08	0.56
Study 3: Volney Scriba	-	0.30	0.24	0.74

Ratio of Production Cost Savings to Solutions Costs

Study	High–Range Solution			
	Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	-	0.12	0.05	0.34
Study 2: Central East-Knickerbocker	-	0.11	0.05	0.34
Study 3: Volney Scriba	-	0.18	0.14	0.44

Demand Congestion (2019$M)

Study	Base Case Demand Congestion	Ten-Year NYCA Demand Congestion Change (2019 $M)			
		Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	4,324	(786)	22	(19)	(220)
Study 2: Central East-Knickerbocker	4,324	(780)	(3)	(19)	(220)
Study 3: Volney Scriba	4,324	-	251	(2)	(109)

Study	Base Case Demand Congestion	2019-2023 NYCA Demand Congestion Change (2019 $M)			
		Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	3,434	(627)	1	(16)	(169)
Study 2: Central East-Knickerbocker	3,434	(627)	(26)	(16)	(169)
Study 3: Volney Scriba	3,434	14	133	(1)	(94)

Study	Base Case Demand Congestion	2024-2028 NYCA Demand Congestion Change (2019 $M)			
		Transmission Solution	Generation Solution	Demand Response	Energy Efficiency
Study 1: Central East	890	(160)	21	(3)	(51)
Study 2: Central East-Knickerbocker	890	(153)	23	(3)	(51)
Study 3: Volney Scriba	890	(13)	118	(1)	(14)

CARIS 1 Additional Metrics

- **Per Attachment Y, Section 31.3.1.3.5**
- **LBMP Load Costs**
  - Change in total load payments
  - Total load payments include the LBMP payments (energy, congestion and losses) paid by electricity demand (load, exports)
- **Generator Payments**
  - This metric measures the change in generation payments by measuring only the LBMP payments (energy, congestion, losses)
  - Thus, total generator payments are calculated for this information metric as the sum of the LBMP payments to NYCA generators and payments for net imports

CARIS 1 Additional Metrics

- **Reduction in Losses**
  - This metric calculates the change in marginal losses payments. Losses payments are based upon the loss component of the zonal LBMP load payments.
- **TCC Payments**
  - The TCC payment metric is calculated as the change in load payments minus the sum of the generator payments and the net import payments. This is not a measure of the Transmission Owners' TCC auction revenues.
- **Emission Costs**
  - This metric measures the change in the total cost of emission allowances for CO_2, NO_X, and SO_2, emissions on a zonal basis. Total emission costs are reported separately from the production costs. Emission costs are the product of forecasted total emissions and forecasted allowance prices.

Additional Metrics(2019-2028, 2019$M)

Solution type	Study	Load Payments	Generator Payments	TCC Payments	Loss Payments
Study 1	Transmission	215	233	(212)	(25)
	Generation	(117)	(88)	(26)	17
	Demand Response	(69)	(51)	(15)	(3)
	Energy Efficiency	(1316)	(1165)	(99)	(64)
Study 2	Transmission	264	271	(206)	(16)
	Generation	(109)	(61)	(38)	(17)
	Demand Response	(69)	(51)	(15)	(3)
	Energy Efficiency	(1316)	(1165)	(99)	(64)
Study 3	Transmission	(54)	384	(432)	13
	Generation	(228)	122	(319)	55
	Demand Response	(29)	(23)	(5)	(1)
	Energy Efficiency	(612)	(562)	(43)	(12)

Additional Metrics(2019-2028, 2019$M)

Study	NYCA CO_2 Emission Change							
	Transmission Solution		Generation Solution		Demand Response Solution		EE Solution	
	Tons	Cost ($M)	Tons	Cost ($M)	Tons	Cost ($M)	Tons	Cost ($M)
Study 1: Central East	455	3	1,319	8	(173)	(1)	(11,177)	(61)
Study 2: Central East-Knickerbocker	650	4	1,149	7	(173)	(1)	(11,177)	(61)
Study 3: Volney Scriba	163	1	1,718	10	(77)	(0)	(5,234)	(29)

Additional Metrics(2019-2028, 2019$M)

Study	NYCA NO_X Emission Change							
	Transmission Solution		Generation Solution		Demand Response Solution		EE Solution	
	Tons	Cost ($M)	Tons	Cost ($M)	Tons	Cost ($M)	Tons	Cost ($M)
Study 1: Central East	381	0	738	0	(221)	(0)	(4,043)	(0)
Study 2: Central East-Knickerbocker	465	0	462	0	(221)	(0)	(4,043)	(0)
Study 3: Volney Scriba	(387)	0	632	0	(66)	(0)	(1,567)	(0)

Additional Metrics(2019-2028, 2019$M)

Study	NYCA SO_2 Emission Change							
	Transmission Solution		Generation Solution		Demand Response Solution		EE Solution	
	Tons	Cost ($M)	Tons	Cost ($M)	Tons	Cost ($M)	Tons	Cost ($M)
Study 1: Central East	2,071	0	615	0	6	0	(153)	(0)
Study 2: Central East-Knickerbocker	2,189	0	563	0	6	0	(153)	(0)
Study 3: Volney Scriba	203	0	(303)	(0)	(52)	(0)	(14)	(0)

Additional Capacity Metric: ICAP Costs

- Per Attachment Y, Section 31.3.1.3.5.6
- Calculate the NYCA MW impact of the generic solution on LOLE
- Forecast the installed capacity cost per megawatt-year point on the ICAP demand curves in Rest of State and in each locality for each planning year
- There are two variants for calculating this metric, both based on the MW impact
  - For Variant 1, the ISO measured the cost impact of a solution by multiplying the forecast cost per megawatt-year of Installed Capacity (without the solution in place) by the sum of the megawatt impact
  - For Variant 2, the cost impact of a solution is calculated by forecasting the difference in cost per megawatt-year of Installed Capacity with and without the solution in place and multiplying that difference by fifty percent (50%) of the assumed amount of NYCA Installed Capacity available

Capacity Metric

Study	Solution Type	Y2028 MW Impact(MW)				ICAP Savings (2019 $M)	
		J	G-J	K	NYCA	Variant 1	Variant 2
Study 1	Transmission	-	-	-	-	-	-
	Generation	54	81	29	220	66	524
	Demand Response	122	182	66	493	149	1,158
	Energy Efficiency	142	212	77	574	173	1,345
Study 2	Transmission	-	-	-	-	-	-
	Generation	54	81	29	220	66	524
	Demand Response	122	182	66	493	149	1158
	Energy Efficiency	142	212	77	574	173	1345
Study 3	Transmission	-	-	-	-	-	-
	Generation	54	81	29	220	66	524
	Demand Response	30	44	16	120	36	288
	Energy Efficiency	36	54	19	145	44	347

Feedback/Comments?

- Email additional feedback to: CYang@nyiso.com

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