2015 CARIS 1 Preliminary Generic Solutions Result

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KCC

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Three Studies

- **Study # 1: Central East – New Scotland Pleasant Valley**
- **Study #2: Central East**
- **Study #3: Western 230 kV System**

Production Cost Savings (2015-2024, 2015 $M)[1]

	Ten-Year Production Cost Savings ($M)			
	Transmission Solution	Generation Solution	Demand Response Solution	Energy Efficiency Solution
Study 1: Central East-New Scotland-Pleasant Valley	306	133	81	2,289
Study 2: Central East[2]	262	47	40	1,163
Study 3: Western 230kV System	199	187	29	1,055

[1] Energy Efficiency impacts include Production Cost Savings due to load reductions

[2] Relieving Central East congestion would increase New Scotland to Pleasant Valley congestion

Transmission Solutions

- **Study #1: Central East – New Scotland Pleasant Valley**
  - ***Edic - New Scotland - Pleasant Valley (345 kV)***
- **Study #2: Central East**
  - ***Edic - New Scotland (345 kV)***
- **Study #3: Western 230 kV System**
  - ***Niagara-Gardenville (230 kV)***

Transmission Solutions

- **Description and Transfer Limit Impact**

Line Name	Voltage	Conductor Size	Length in Miles	CE Voltage	UPNY/SENY Thermal Limit	Dysinger East Thermal Limit (NTC)
Edic - New Scotland- Pleasant Valley	345kV	2 - 1590 ACSR	150	703	1172	N/A
Edic - New Scotland	345kV	2 - 1590 ACSR	85	580	N/A	N/A
Niagara-Gardenville	230kV	1192.5 ACSR	35	N/A	N/A	629

- **Cost Data**
  - ***Generic per Mile Cost Data Based Upon review of Cost Data submitted in PSC AC Transmission Proceeding***
  - ***230 kV Cost Data approximately 30% below 345 kV estimates***

Transmission Solutions

- **345 kV**

Cost Range	Line System Voltage (kV)	Construction Type	Project Cost ($M/Mile)
High	345	Overhead	6.0
Mid	345	Overhead	4.5
Low	345	Overhead	3.2

- **230 kV**

Cost Range	Line System Voltage (kV)	Construction Type	Project Cost ($M/Mile)
High	230	Overhead	4.3
Mid	230	Overhead	3.2
Low	230	Overhead	2.3

Generation Solutions

- **Unchanged from 2013 CARIS**
- **Combined-Cycle Unit**
  - ***1 x 1 x 1 SGT6-5000F(5)***
    - **1x1x1 refers to one combustion turbine exhausting into one heat recovery steam generator supplying steam to one steam turbine generator.**
  - ***330 MW***
- **Operating characteristics and cost data presented in 2013 Demand Curve Reset report[1]**
  - ***Cost data escalated from $2013 to $2015***

[1]Independent Study to Establish Parameters of the ICAP Demand Curve for the New York Independent System Operator, August 2, 2013, NERA

Generation Solutions

- **Description**

Line Name	Size	Location
Edic - New Scotland- Pleasant Valley	4 - 330 MW	Pleasant Valley
Edic - New Scotland	2 - 330 MW	New Scotland
Niagara - Gardenville	2- 330 MW	Gardenville

- **Cost Data**

Generation Solution	Cost Range	$/KW
New Scotland (Capital) / Gardenville (West)	High	$1,669
	Mid	$1,335
	Low	$1,002
Pleasant Valley (Hudson Valley/Dutchess County)	High	$1,848
	Mid	$1,478
	Low	$1,109

  - ***High/low cost estimates +/- 25% of Mid-level cost.***

Energy Efficiency / Demand Response Solutions

- **Energy Efficiency (EE)**
  - ***Followed procedure for siting EE solutions in load zones***
  - ***Adjusted load shapes to reflect EE implementation***
- **Demand Response (DR)**
  - ***DR solutions match EE solutions (MWs, zones)***
  - ***Peak 100 hours reduced to reflect DR implementation***
  - ***DR is modeled as distributed generation***

Energy Efficiency/ Demand Response Solutions

Study Case	Load Zone	EE-MW
Central East-New Scotland-Pleasant Valley	F	200
	G	200
	H	0
	I	0
	J	800
Central East	F	200
	G	200
	H	0
	I	0
	J	200
Niagara-Gardenville	A	200
	B	200
	C	200

Energy Efficiency Solutions

- **Generic cost estimates derived from DPS Final Generic Environmental Impact Statement for REV (14-M-0101) and Clean Energy Fund (14-M-0094).**
- **Mid-level costs calculated as average of low and high cost estimates**
- **No zonal differentiation**
- **Total costs are a multiple of program costs.**

Demand Response Solutions

- **Generic cost estimates derived from DPS Final Generic Environmental Impact Statement for REV (14-M-0101) and Clean Energy Fund (14-M-0094).**
  - ***Limited cost-range presented (approx. $620K / MW)***
- **High and low estimates +/- 25% of Mid costs.**
- **No zonal differentiation**
- **Do not include any payments for participation in the NYISO's Demand-Side programs (i.e., as a Special Case Resource or Emergency Demand Response Provider)**

EE/DR Generic Costs

Range	Demand Response Implementation Coasts($/kW)
Low	$490
Mid	$620
High	$770

Range	Energy Implementation Coasts($/kW)
Low	$1,740
Mid	$1,920
High	$2,100

Cost Summary (across all solution types)

Generic Solution Cost Summary ($M)			
Studies	Study 1: Central East-New Scotland-Pleasant Valley	Study 2: Central East	Study 3: Niagara-Gardenville
Transmission			
Substation Terminals	Edic to New Scotland to Pleasant Valley	Edic to New Scotland	Niagara to Gardenville
Miles	150	85	35
High	900	510	150
Mid	675	383	113
Low	480	272	80
Generation			
Substation Terminal	Pleasant Valley	New Scotland	Gardenville
# of 330 MW Blocks	4	2	2
High	2,439	1,102	1,102
Mid	1,951	881	881
Low	1,464	661	661
DR			
Zone	F , G and J	F ,G and J	A, B, and C
# of 200 MW Blocks	6	3	3
High	924	462	462
Mid	744	372	372
Low	588	294	294
EE			
Zone	F , G and J	F , G and J	A, B, and C
# of 200 MW Blocks	6	3	3
High	2,520	1,260	1,260
Mid	2,304	1,152	1,152
Low	2,088	1,044	1,044

Benefit/Cost Analysis

- **Benefit/Cost ratio is calculated as the ratio of Present Value of Production Cost Savings to the Present Value of Solution Costs**
- **Present Value of Production Cost Savings is the Present Value of the savings calculated over the Study Period using a discount rate of 6.819%**
  - ***Discount rate is equal to an average of the Transmission Owner's Weighted Average Cost of Capital (WACC) as the discount rate (weighted by 2014 load)***

Benefit/Cost Analysis

- **For the Transmission and Generation Solution Costs, Overnight Costs are multiplied by a Capital Recovery Factor (CRF)**
  - ***Assumes a levelized generic carrying charge of 16.26% for transmission and generation solutions and a discount rate of 6.819%, resulting in the CRF of 1.19***
- **Feasibility of the solution is not evaluated**
- **On-going fixed operation and maintenance costs, return on investment, federal and state income taxes, property taxes, insurance, and depreciation are captured by the CRF**

Solution Benefits (2015 $M)

		Cost Category		
CE-NS-PV	Solution	Low	Mid	High
	Transmission	306	306	306
	Generation	133	133	133
	Demand Response	81	81	81
	Energy Efficiency	2289	2289	2289
CE	Solution	Low	Mid	High
	Transmission	262	262	262
	Generation	47	47	47
	Demand Response	40	40	40
	Energy Efficiency	1163	1163	1163
West	Solution	Low	Mid	High
	Transmission	199	199	199
	Generation	187	187	187
	Demand Response	29	29	29
	Energy Efficiency	1055	1055	1055

Solution Costs(2015 $M)

		Cost Category		
	Solution	Low	Mid	High
CE-NS-PV	Transmission	480	675	900
	Generation	1464	1951	2439
	Demand Response	588	744	924
	Energy Efficiency	2088	2304	2520
		Cost Category		
	Solution	Low	Mid	High
CE	Transmission	272	383	510
	Generation	661	881	1102
	Demand Response	294	372	462
	Energy Efficiency	1044	1152	1260
		Cost Category		
	Solution	Low	Mid	High
West	Transmission	80	113	150
	Generation	661	881	1102
	Demand Response	294	372	462
	Energy Efficiency	1044	1152	1260

Benefit-Cost Ratios

	Solution	Cost Category		
		Low	Mid	High
CE-NS-PV	Transmission	0.54	0.38	0.29
	Generation	0.08	0.06	0.05
	Demand Response	0.14	0.11	0.09
	Energy Efficiency	1.10	0.99	0.91
	Solution	Cost Category		
		Low	Mid	High
CE	Transmission	0.81	0.58	0.43
	Generation	0.06	0.04	0.04
	Demand Response	0.14	0.11	0.09
	Energy Efficiency	1.11	1.01	0.92
	Solution	Cost Category		
		Low	Mid	High
West	Transmission	2.09	1.49	1.11
	Generation	0.24	0.18	0.14
	Demand Response	0.10	0.08	0.06
	Energy Efficiency	1.01	0.92	0.84

Demand $ Congestion(2015-2024, 2015 $M)

		Base Case Demand $ Congestion	Demand $ Congestion Change	Congestion Relieve(%)
TRANSMISSION SOLUTIONS				
Study 1: CE-NS-PV	Edic-New Scotland-Pleasant Valley	$5,366	($2,734)	-51%
Study 2: CE	Edic-New Scotland	$4,958	($2,262)	-46%
Study 3: WEST	Niagara-Gardenville	$375	($340)	-91%
GENERATION SOLUTIONS				
Study 1: CE-NS-PV	Pleasant Valley	$5,366	($236)	-4%
Study 2: CE	New Scotland	$4,958	$97	2%
Study 3: WEST	Gardenville	$375	$680	181%
DEMAND RESPONSE SOLUTIONS				
Study 1: CE-NS-PV	F (200), G(200), J(800)	$5,366	($145)	-3%
Study 2: CE	F (200), G(200), J(200)	$4,958	($56)	-1%
Study 3: WEST	A (200), B(200), C(200)	$375	$53	14%
ENERGY EFFICIENCY SOLUTIONS				
Study 1: CE-NS-PV	F (200), G(200), J(800)	$5,366	($848)	-16%
Study 2: CE	F (200), G(200), J(200)	$4,958	($432)	-9%
Study 3: WEST	A (200), B(200), C(200)	$375	$825	220%

Additional Metric: Generator Payment Change (2015-2024, 2015 $M)

		GENERATOR PAYMENT	IMPORT PAYMENT	GENERATOR + IMPORT PAYMENT
TRANSMISSION SOLUTIONS				
Study 1: CE-NS-PV	Edic-New Scotland-Pleasant Valley	$420	($18)	$402
Study 2: CE	Edic-New Scotland	$319	($34)	$285
Study 3: WEST	Niagara-Gardenville	$0	$21	$21
GENERATION SOLUTIONS				
Study 1: CE-NS-PV	Pleasant Valley	$117	($174)	($57)
Study 2: CE	New Scotland	($10)	($74)	($84)
Study 3: WEST	Gardenville	($357)	($207)	($564)
DEMAND RESPONSE SOLUTIONS				
Study 1: CE-NS-PV	F (200), G(200), J(800)	($37)	($18)	($55)
Study 2: CE	F (200), G(200), J(200)	($7)	($9)	($16)
Study 3: WEST	A (200), B(200), C(200)	($38)	($9)	($47)
ENERGY EFFICIENCY SOLUTIONS				
Study 1: CE-NS-PV	F (200), G(200), J(800)	($2,237)	($337)	($2,574)
Study 2: CE	F (200), G(200), J(200)	($1,090)	($181)	($1,271)
Study 3: WEST	A (200), B(200), C(200)	($1,547)	($217)	($1,764)

Additional Metric: Load Payment Change (2015-2024, 2015 $M)

		LOAD PAYMENT	EXPORT PAYMENT	LOAD + EXPORT PAYMENT
TRANSMISSION SOLUTIONS				
Study 1: CE-NS-PV	Edic-New Scotland-Pleasant Valley	$72	$100	$172
Study 2: CE	Edic-New Scotland	$42	$91	$133
Study 3: WEST	Niagara-Gardenville	($177)	$15	($162)
GENERATION SOLUTIONS				
Study 1: CE-NS-PV	Pleasant Valley	($472)	$274	($198)
Study 2: CE	New Scotland	($232)	$175	($57)
Study 3: WEST	Gardenville	($844)	$189	($655)
DEMAND RESPONSE SOLUTIONS				
Study 1: CE-NS-PV	F (200), G(200), J(800)	($142)	$18	($124)
Study 2: CE	F (200), G(200), J(200)	($54)	$12	($42)
Study 3: WEST	A (200), B(200), C(200)	($51)	$8	($43)
ENERGY EFFICIENCY SOLUTIONS				
Study 1: CE-NS-PV	F (200), G(200), J(800)	($3,403)	$377	($3,026)
Study 2: CE	F (200), G(200), J(200)	($1,674)	$207	($1,467)
Study 3: WEST	A (200), B(200), C(200)	($1,956)	$103	($1,853)

Additional Metric: Loss Payment Change (2015-2024, 2015 $M)

		LOSS PAYMENT
TRANSMISSION SOLUTIONS		
Study 1: CE-NS-PV	Edic-New Scotland-Pleasant Valley	$0
Study 2: CE	Edic-New Scotland	($35)
Study 3: WEST	Niagara-Gardenville	$30
GENERATION SOLUTIONS		
Study 1: CE-NS-PV	Pleasant Valley	($7)
Study 2: CE	New Scotland	$48
Study 3: WEST	Gardenville	$2
DEMAND RESPONSE SOLUTIONS		
Study 1: CE-NS-PV	F (200), G(200), J(800)	($3)
Study 2: CE	F (200), G(200), J(200)	($1)
Study 3: WEST	A (200), B(200), C(200)	$1
ENERGY EFFICIENCY SOLUTIONS		
Study 1: CE-NS-PV	F (200), G(200), J(800)	($75)
Study 2: CE	F (200), G(200), J(200)	($18)
Study 3: WEST	A (200), B(200), C(200)	$125

Additional Metric: NYCA Emission Change (2015-2024, 2015 $M)

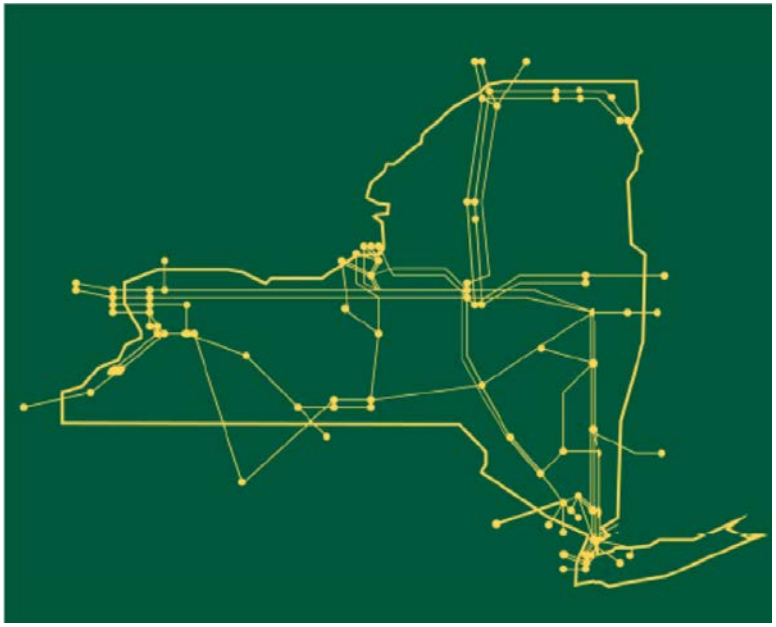
Study	Generic Solutions	SO2		CO2		NOX	
		Tons	Cost($M)	1000Tons	Cost($M)	Tons	Cost($M)
	Transmission						
Study 1: CE-NS-PV	Edic-New Scotland-Pleasant Valley	9,423	$0.8	2,026	$21.0	3,431	$0.3
Study 2: CE	Edic-New Scotland	7,549	$0.6	1,877	$18.6	3,338	$0.3
Study 3: WEST	Niagara-Gardenville	(8,878)	($0.5)	(4,562)	($46.3)	(1,327)	($0.1)
	Generation						
Study 1: CE-NS-PV	Pleasant Valley	(2,075)	($0.1)	2,465	$27.4	(4,707)	($0.5)
Study 2: CE	New Scotland	(1,601)	$0.0	1,487	$14.3	(2,145)	($0.2)
Study 3: WEST	Gardenville	(16,942)	($1.1)	(692)	($6.4)	(7,642)	($0.6)
	Demand Response						
Study 1: CE-NS-PV	F (200), G(200), J(800)	(283)	$0.0	(598)	($5.7)	(799)	($0.1)
Study 2: CE	F (200), G(200), J(200)	(95)	$0.0	(237)	($2.3)	(321)	$0.0
Study 3: WEST	A (200), B(200), C(200)	(234)	$0.0	(207)	($1.8)	(186)	$0.0
	Energy Efficiency						
Study 1: CE-NS-PV	F (200), G(200), J(800)	(2,253)	($0.1)	(16,914)	($149.4)	(6,623)	($0.6)
Study 2: CE	F (200), G(200), J(200)	(342)	$0.0	(8,066)	($72.1)	(2,643)	($0.2)
Study 3: WEST	A (200), B(200), C(200)	(11,193)	($0.9)	(11,520)	($104.6)	(6,826)	($0.7)

Additional Metric: TCC Change (2015-2024, 2015 $M)

		TCC PAYMENT**
TRANSMISSION SOLUTIONS		
Study 1: CE-NS-PV	Edic-New Scotland-Pleasant Valley	($780)
Study 2: CE	Edic-New Scotland	($635)
Study 3: WEST	Niagara-Gardenville	($238)
GENERATION SOLUTIONS		
Study 1: CE-NS-PV	Pleasant Valley	($111)
Study 2: CE	New Scotland	$54
Study 3: WEST	Gardenville	$37
DEMAND RESPONSE SOLUTIONS		
Study 1: CE-NS-PV	F (200), G(200), J(800)	($67)
Study 2: CE	F (200), G(200), J(200)	($25)
Study 3: WEST	A (200), B(200), C(200)	$14
ENERGY EFFICIENCY SOLUTIONS		
Study 1: CE-NS-PV	F (200), G(200), J(800)	($328)
Study 2: CE	F (200), G(200), J(200)	($149)
Study 3: WEST	A (200), B(200), C(200)	$172

TCC PAYMENT is equal to NYCA-Wide Congestion Rent, which is calculated as **(Demand Congestion Cost + Export Congestion Cost) - (Supply Congestion Cost + Import Congestion Cost)

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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