2017 CARIS Phase 1 Report

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NEW YORK INDEPENDENT SYSTEM OPERATOR

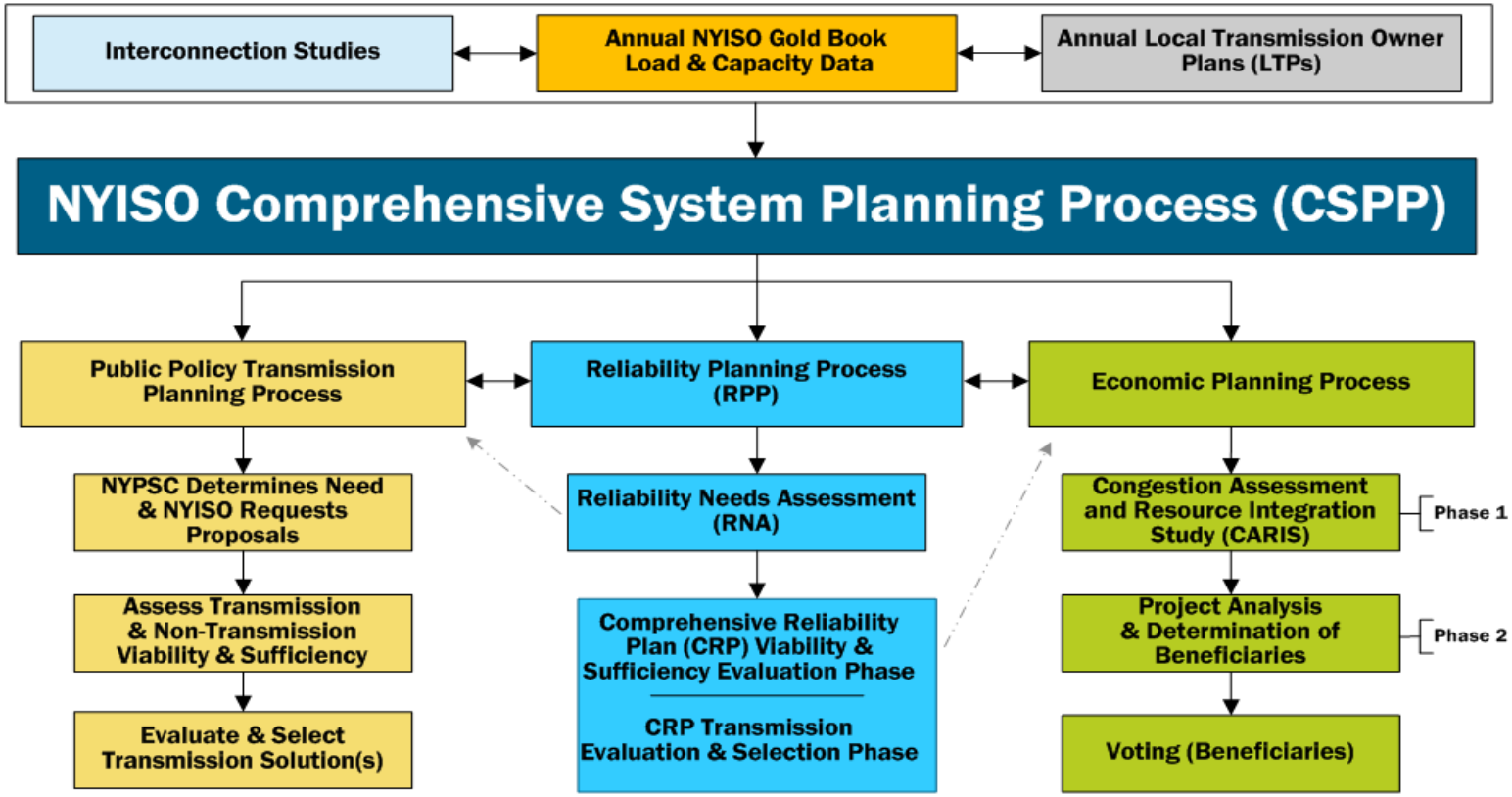
Topics

- Background and Objectives of NYISO's Economic Planning Process ("Congestion Asesssment and Resource Integration Studies", or CARIS)
- 2017 CARIS Phase 1 Development
- 2017 CARIS Phase 1 Results
- Next Steps

Comprehensive System Planning Process (CSPP)

- ***Reliability Planning Process***
  - Reliability Needs Assessment (RNA)
  - Comprehensive Reliability Plan (CRP)
- ***Economic Planning Process***
  - Phase 1 – Study Phase
  - Phase 2 – Project Phase
- ***Public Policy Transmission Planning Process***

NYISO CSPP



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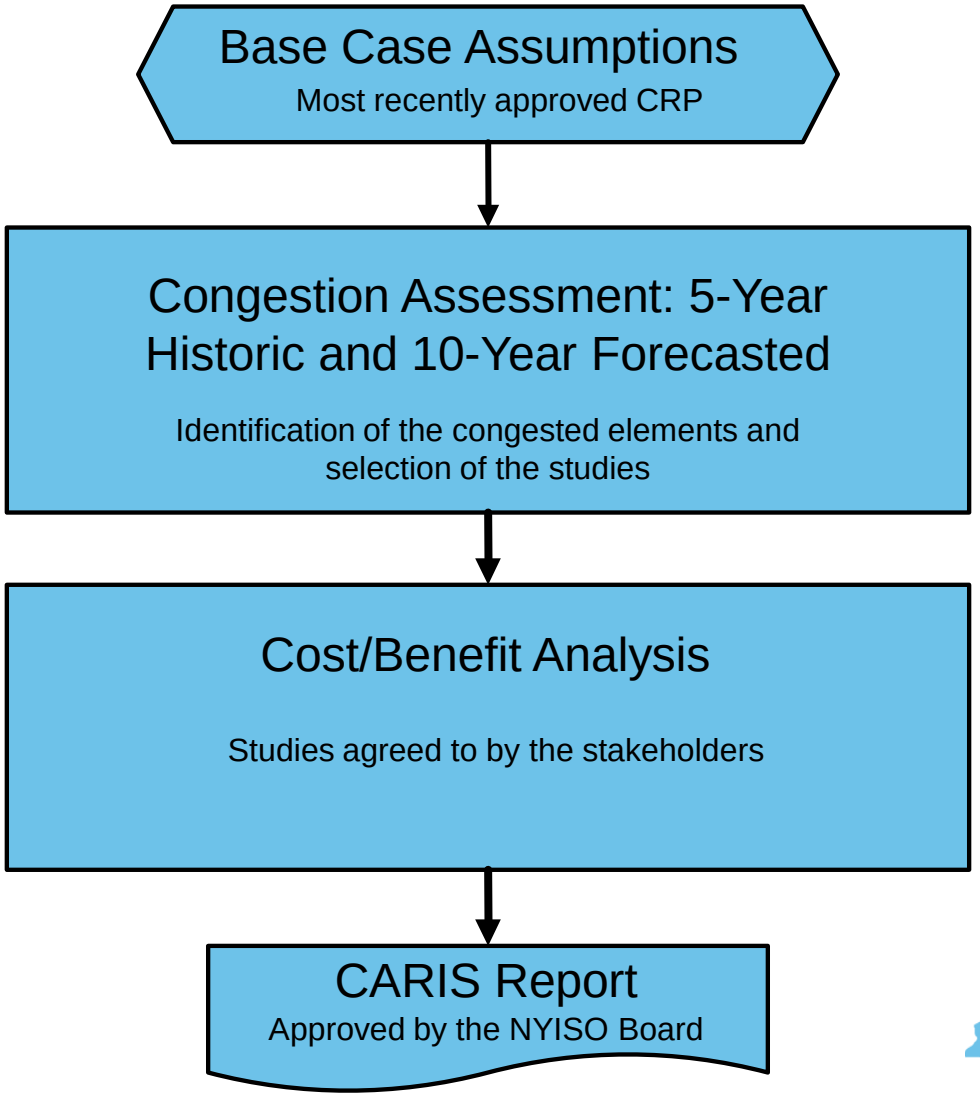
CARIS Phase 1 Objectives

- **Identify and report congestion**
  - 5-year “historic” congestion
  - 10-year “projected” congestion
- **Provide information to stakeholders, developers & other interested parties**
  - Select top congested transmission elements
  - Project benefits of relieving the most congested elements or groupings using generic solutions
  - Identify factors that produce or increase congestion

CARIS Phase 1 Process



CARIS Phase 1 Development

- **Starting point for 2017 CARIS Phase 1 Base Case was the 2016 CRP**
- **Base case assumptions were developed for the Study Period (2017-2026) pursuant to CARIS procedures and in collaboration with stakeholders at ESPWG**
  - 2017 Gold Book Load and Capacity Forecasts
  - Fuel price and emission cost forecast were locked down as of August 15, 2017
  - Transmission model from the 2016 CRP with actual operating limits
  - Resource changes were implemented pursuant to base case inclusion screening rules

CARIS Phase 1 Development

"Business as Usual" (BAU) Case	
Modeling Updates	**Resource Assumptions**
Seasonal (Winter) bypass of Marcy South Series Compensation (MSSC)	Indian Point Energy Center, FitzPatrick and Ginna are modeled as in-service
Terminal upgrade on Stolle-Gardenville 66 line	Greenidge 4, Cayuga 1&2 are modeled as in-service
Clay-Pannell 345 kV lines PC1 and PC2 terminal upgrades	CPV Valley, Bayonne Expansion Project are modeled as coming on-line in 2018, Cricket Valley Energy Center in 2019
Conforming PJM/NYISO modeling to current JOA	Four new wind farms are modeled as in-service in Upstate New York

System Resource Shift Case
Indian Point Energy Center is modeled as retired
All New York Coal Plants are modeled as retired
Implementation of Clean Energy Standard by 2026 4.6 GW of On-Shore Wind 10.8 GW of Utility-Scale Solar 0.25 GW of Off-Shore Wind Load Forecast reduced by 10.5 TWh due to Energy Efficiency

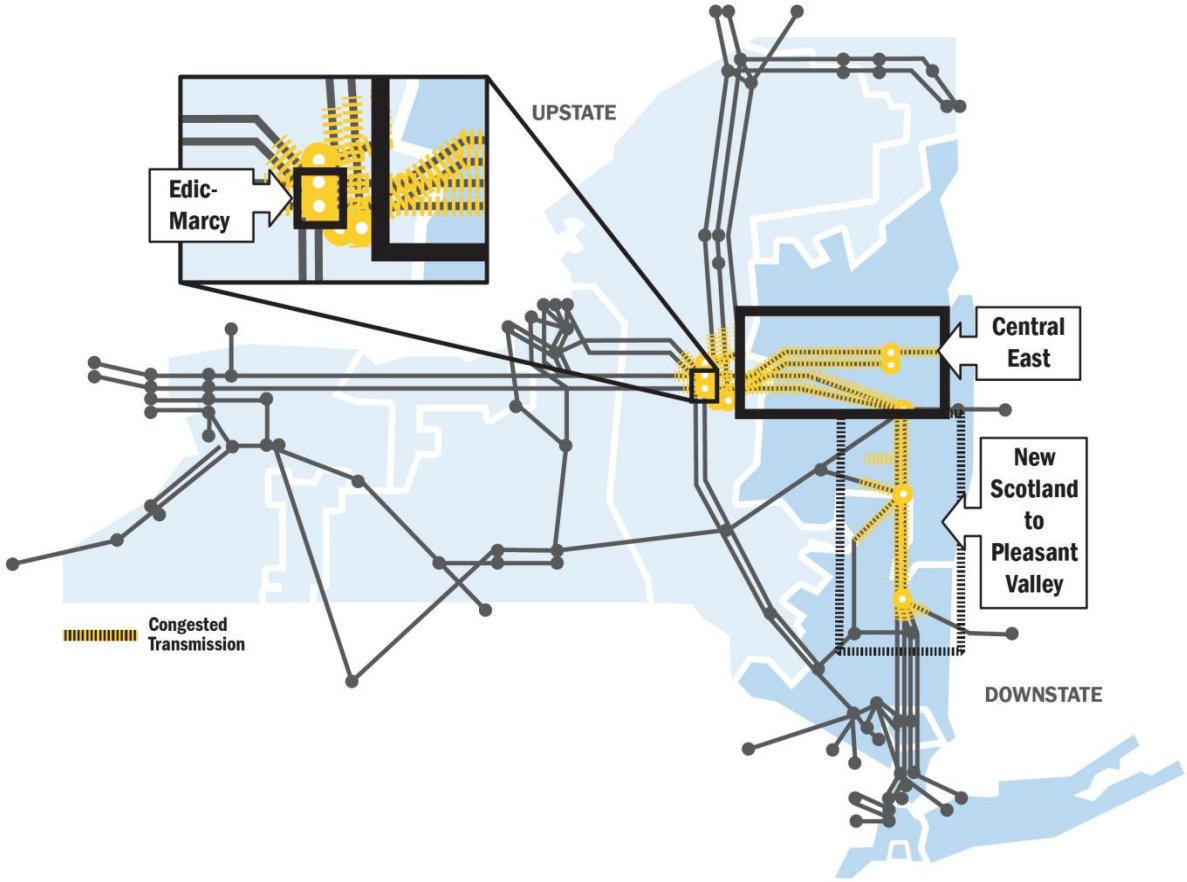
CARIS Phase 1: Selection of Studies

- **Rank and group elements based on five-year historic and 10-year projected Demand$ Congestion**
  - Historic Demand$ Congestion data drawn from NYISO's posted congestion reports
  - Forecasted Demand$ Congestion estimated using General Electric's Multi-Area Production Simulation (MAPS) software
- **Select three study areas based on potential ten-year projected production cost savings**

Historic and Projected Demand$ Congestion ($M)

Constraint Group (Nominal $M)	Historic					Projected									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
CENTRAL EAST	$255	$1,089	$1,136	$915	$641	$115	$210	$311	$335	$398	$315	$167	$269	$205	$215
DUNWOODIE TO LONG ISLAND	$266	$307	$155	$138	$164	$25	$21	$31	$37	$43	$45	$49	$47	$52	$53
LEEDS PLEASANT VALLEY	$137	$138	$42	$111	$63	$2	$2	$3	$2	$3	$1	$0	$1	$4	$4
GREENWOOD	$72	$96	$13	$19	$31	$12	$28	$27	$23	$25	$21	$22	$24	$27	$30
PACKARD HUNTLEY	$0	$5	$7	$41	$54	$35	$20	$29	$34	$26	$32	$18	$28	$14	$17
EGRDNCTY 138 VALLYSTR 138 1	$8	$14	$20	$18	$8	$9	$11	$13	$16	$18	$18	$19	$20	$19	$24
NIAGARA PACKARD	$3	$21	$18	$22	$44	$4	$1	$2	$3	$3	$4	$1	$4	$2	$1
EDIC MARCY	$1	$0	$7	$0	$32	$28	$8	$7	$7	$3	$5	$0	$3	$0	$1
DUNWOODIE MOTTHAVEN	$22	$18	$40	$2	$2	$0	$0	$1	$0	$1	$1	$1	$2	$2	$2
NEW SCOTLAND LEEDS	$9	$27	$9	$32	$13	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
SHORE_RD 345 SHORE_RD 138 1	$4	$36	$12	$27	$2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
RAINEY VERNON	$10	$31	$1	$7	$8	$0	$0	$1	$1	$1	$1	$1	$1	$1	$1
MOTTHAVEN RAINEY	$5	$0	$0	$0	$3	$0	$0	$0	$1	$4	$7	$6	$7	$7	$9
E179THST HELLGT ASTORIAE	$11	$16	$3	$3	$3	$0	$0	$0	$0	$1	$2	$2	$2	$2	$2
STOLLE GARDENVILLE	$0	$0	$0	$7	$8	$3	$2	$5	$2	$2	$4	$3	$3	$2	$2
DYSINGER EAST	$3	$8	$14	$5	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
W49TH_ST 345 SPRNBRK 345 1	$1	$4	$21	$0	$1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
HUNTLEY GARDENVILLE	$0	$8	$6	$3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
EGRDNCTY 345 EGRDNCTY 138 1	$1	$4	$5	$5	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
LEEDS HURLYAVE	$0	$9	$2	$0	$2	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GLENWD 138 SHORE_RD 138 1	$8	$4	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
MOSES PORTER	$0	$1	$1	$2	$1	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

2017 CARIS Groupings



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2017 CARIS 1 - Six Studies

BAU Case

Study 1: Central East-Edic-Marcy

Study 2: Central East

Study 3: Central East-New Scotland-Pleasant Valley

Edic-Marcy Relaxed

Study 4: Central East-New Scotland-Pleasant Valley

System Resource Shift Case

Study 5: Central East-New Scotland-Pleasant Valley

Edic-Marcy Relaxed

Study 6: Central East-New Scotland-Pleasant Valley

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Ten-Year Demand$ Congestion for the Six CARIS Studies ($2017M)

Study 1: Central East-Edic-Marcy
Demand$ Congestion: 2,023 ($2017M)

Study 2: Central East
Demand$ Congestion: 1,966 ($2017M)

Study 3: Central East-New Scotland-Pleasant Valley
Demand$ Congestion: 1,983 ($2017M)

Study 4: Study 3 with Edic-Marcy relaxed
Demand$ Congestion: 2,596 ($2017M)

Study 5: Study 3 under System Resource Shift Case
Demand$ Congestion: 3,384 ($2017M)

Study 6: Study 5 with Edic-Marcy relaxed
Demand$ Congestion: 4,130 ($2017M)

Project Benefits

- Implement transmission, generation, demand response and energy efficiency generic solutions for all six studies
  - Feasibility of each solution is not evaluated
- Estimate the potential benefits associated with relieving congestion for each solution type using GE-MAPS production cost simulation software
- Per the NYISO's Tariff, benefits are limited to NYCA-wide Production Costs Savings for the purpose of assessing project economics

Four Generic Solutions for the Six CARIS Studies

Generic Solutions						
Studies	**Central East-Edic-Marcy (Study 1)**	**Central East (Study 2)**	**Central East-New Scotland-Pleasant Valley (Study 3)**	**Central East-New Scotland-Pleasant Valley (Study 4)**	**Central East-New Scotland-Pleasant Valley (Study 5)**	**Central East-New Scotland-Pleasant Valley (Study 6)**
TRANSMISSION						
Transmission Path	Marcy-New Scotland	Edic-New Scotland	Edic-New Scotland-Pleasant Valley	Edic-New Scotland-Pleasant Valley	Edic-New Scotland-Pleasant Valley	Edic-New Scotland-Pleasant Valley
Voltage	345 kV	345 kV	345 kV	345 kV	345 kV	345 kV
Miles	85	85	150	150	150	150
GENERATION						
Unit Siting	New Scotland	New Scotland	Pleasant Valley	Pleasant Valley	Pleasant Valley	Pleasant Valley
# of 340 MW Blocks	2	2	4	4	4	4
DEMAND RESPONSE						
Location (# of Blocks)	F(1), G(1) and J(1)	F(1), G(1) and J(1)	F(1), G(1) and J(4)	F(1), G(1) and J(4)	F(1), G(1) and J(4)	F(1), G(1) and J(4)
Total # of 200MW Blocks	3	3	6	6	6	6
ENERGY EFFICIENCY						
Location (# of Blocks)	F(1), G(1) and J(1)	F(1), G(1) and J(1)	F(1), G(1) and J(4)	F(1), G(1) and J(4)	F(1), G(1) and J(4)	F(1), G(1) and J(4)
Total # of 200MW Blocks	3	3	6	6	6	6

Ten-Year Production Cost Savings for the Six CARIS Studies ($2017M)

Study 1: Central East-Edic-Marcy	
Solution	**Production Cost Savings ($2017M)**
Transmission	149
Generation	84
Demand Response	27
Energy Efficiency	845

Study 2: Central East	
Solution	**Production Cost Savings ($2017M)**
Transmission	124
Generation	84
Demand Response	27
Energy Efficiency	845

Study 3: Central East-New Scotland-Pleasant Valley	
Solution	**Production Cost Savings ($2017M)**
Transmission	185
Generation	152
Demand Response	55
Energy Efficiency	1,696

Study 4: Study 3 with Edic-Marcy relaxed	
Solution	**Production Cost Savings ($2017M)**
Transmission	197
Generation	159
Demand Response	54
Energy Efficiency	1,728

Study 5: Study 3 under System Resource Shift Case	
Solution	**Production Cost Savings ($2017M)**
Transmission	298
Generation	204
Demand Response	55
Energy Efficiency	1,689

Study 6: Study 5 with Edic-Marcy relaxed	
Solution	**Production Cost Savings ($2017M)**
Transmission	319
Generation	211
Demand Response	56
Energy Efficiency	1,700

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Project Costs

- Generic Solution Costs are simplified values developed using low, mid and high unit cost estimates for each solution type
- Transmission costs were drawn from cost estimates submitted in the NYSDPS's AC Transmission proceeding and other third-party sources.
- Generator costs were for a combined cycle unit as presented in 2016 Demand Curve Reset study
- Energy Efficiency costs were based upon the cost data presented in the DPS Final Generic Environmental Impact Statement for REV (14-M-0101) and Clean Energy Fund (14-M-0094)
- Demand Response costs were developed based on Commercial System Relief Program filings by NY utilities

Benefit/Cost Analysis

- **Present Value of Production Cost Savings is calculated over the Study period using a discount of 6.99%**
  - Discount rate is equal to an average of the Transmission Owner's Weighted Average Cost of Capital (WACC) (weighted by 2016 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 15% for transmission and generation solutions and a discount rate of 6.99%, resulting in the CRF of 1.09
- **Benefit/Cost Ratios are reported for each solution, based upon 10 years of projected NYCA-wide Production Cost Savings (CARIS's primary metric) compared to the estimated 10 years of project costs**

Generic Solutions Benefit/Cost Ratios (Low, Mid and High Cost Estimates)

Study	Solution	Cost Category		
		Low	Mid	High
Study 1: Central East-Edic-Marcy	Transmission	0.46	0.32	0.25
	Generation	0.09	0.07	0.06
	Demand Response	0.11	0.08	0.07
	Energy Efficiency	0.77	0.70	0.64
Study 2: Central East	Transmission	0.38	0.27	0.21
	Generation	0.09	0.07	0.06
	Demand Response	0.11	0.08	0.07
	Energy Efficiency	0.77	0.70	0.64
Study 3: Central East-New Scotland-Pleasant Valley	Transmission	0.32	0.23	0.17
	Generation	0.08	0.06	0.05
	Demand Response	0.07	0.06	0.04
	Energy Efficiency	0.65	0.59	0.54
Study 4: Study 3 with Edic-Marcy relaxed	Transmission	0.34	0.24	0.19
	Generation	0.08	0.06	0.05
	Demand Response	0.07	0.06	0.04
	Energy Efficiency	0.66	0.60	0.55
Study 5: Study 3 under System Resource Shift Case	Transmission	0.52	0.36	0.28
	Generation	0.10	0.08	0.06
	Demand Response	0.07	0.06	0.04
	Energy Efficiency	0.65	0.59	0.54
Study 6: Study 5 with Edic-Marcy relaxed	Transmission	0.56	0.39	0.30
	Generation	0.11	0.08	0.06
	Demand Response	0.08	0.06	0.05
	Energy Efficiency	0.65	0.59	0.54

Additional Benefit Metrics

- **Additional benefit metrics report the change between the generic solution-case value and the base case value over the ten–year study period**
  - For 2017 CARIS Phase 1, these include changes to generator payments, load payments, TCC payments, losses costs, ICAP costs and emissions
  - Informational-only

Additional Benefit Metrics

Study	Solution	LOAD PAYMENT	NYCA LOAD PAYMENT	EXPORT PAYMENT	GENERATOR PAYMENT	NYCA GENERATOR PAYMENT	IMPORT PAYMENT	TCC PAYMENT	LOSSES COSTS
TRANSMISSION SOLUTIONS									
Study 1: Central East-Edic-Marcy	MARCY-NSL	$490	$328	$162	$499	$384	$115	($307)	($112)
Study 2: Central East	EDIC-NSL	$201	$127	$74	$263	$217	$46	($266)	($150)
Study 3: Central East-New Scotland-Pleasant Valley	EDIC-NSL-PV	$293	$207	$86	$302	$213	$89	($253)	($245)
Study 4: Study 3 with Edic-Marcy relaxed	EDIC-NSL-PV	$416	$282	$134	$469	$373	$96	($409)	($195)
Study 5: Study 3 under System Resource Shift Case	EDIC-NSL-PV	$444	$370	$74	$644	$528	$116	($554)	($187)
Study 6: Study 5 with Edic-Marcy relaxed	EDIC-NSL-PV	$578	$468	$110	$784	$637	$147	($656)	($145)
GENERATION SOLUTIONS									
Study 1: Central East-Edic-Marcy	New Scotland	($30)	($62)	$32	($33)	$32	($65)	$2	$12
Study 2: Central East	New Scotland	($30)	($62)	$32	($33)	$32	($65)	$2	$12
Study 3: Central East-New Scotland-Pleasant Valley	Pleasant Valley	($194)	($269)	$75	($140)	$30	($170)	($18)	($45)
Study 4: Study 3 with Edic-Marcy relaxed	Pleasant Valley	($163)	($239)	$76	($127)	$32	($159)	$9	($52)
Study 5: Study 3 under System Resource Shift Case	Pleasant Valley	($175)	($283)	$108	($100)	$82	($182)	($33)	($48)
Study 6: Study 5 with Edic-Marcy relaxed	Pleasant Valley	($131)	($223)	$92	($63)	$95	($158)	($29)	($53)
DEMAND RESPONSE SOLUTIONS									
Study 1: Central East-Edic-Marcy	F(200) G(200) J(200)	($32)	($33)	$1	($18)	($8)	($10)	($11)	($2)
Study 2: Central East	F(200) G(200) J(200)	($32)	($33)	$1	($18)	($8)	($10)	($11)	($2)
Study 3: Central East-New Scotland-Pleasant Valley	F(200) G(200) J(800)	($74)	($77)	$3	($42)	($25)	($17)	($27)	($4)
Study 4: Study 3 with Edic-Marcy relaxed	F(200) G(200) J(800)	($80)	($83)	$3	($46)	($29)	($17)	($28)	($6)
Study 5: Study 3 under System Resource Shift Case	F(200) G(200) J(800)	($73)	($77)	$4	($38)	($24)	($14)	($33)	($1)
Study 6: Study 5 with Edic-Marcy relaxed	F(200) G(200) J(800)	($80)	($84)	$4	($44)	($31)	($13)	($32)	($4)
ENERGY EFFICIENCY SOLUTIONS									
Study 1: Central East-Edic-Marcy	F(200) G(200) J(200)	($1,128)	($1,274)	$146	($994)	($819)	($175)	($105)	($67)
Study 2: Central East	F(200) G(200) J(200)	($1,128)	($1,274)	$146	($994)	($819)	($175)	($105)	($67)
Study 3: Central East-New Scotland-Pleasant Valley	F(200) G(200) J(800)	($2,287)	($2,551)	$264	($1,967)	($1,639)	($328)	($243)	($170)
Study 4: Study 3 with Edic-Marcy relaxed	F(200) G(200) J(800)	($2,238)	($2,493)	$255	($1,922)	($1,612)	($310)	($246)	($166)
Study 5: Study 3 under System Resource Shift Case	F(200) G(200) J(800)	($2,270)	($2,575)	$305	($1,921)	($1,620)	($301)	($285)	($161)
Study 6: Study 5 with Edic-Marcy relaxed	F(200) G(200) J(800)	($2,262)	($2,544)	$282	($1,911)	($1,611)	($300)	($297)	($159)

Ten-Year Change in Load Payments, Generator Payments, TCC Payments and Losses Costs ($2017M)

Additional Benefit Metrics

Study	Solution	SO_2		CO_2		NO_X	
		Tons	Cost ($2017M)	1000 Tons	Cost ($2017M)	Tons	Cost ($2017M)
TRANSMISSION SOLUTIONS							
Study 1: Central East-Edic-Marcy	MARCY-NSL	1,663	$0	(130)	$1	1,054	$0
Study 2: Central East	EDIC-NSL	3,168	$0	203	$4	1,431	$0
Study 3: Central East-New Scotland-Pleasant Valley	EDIC-NSL-PV	3,569	$0	(575)	$2	1,253	$0
Study 4: Study 3 with Edic-Marcy relaxed	EDIC-NSL-PV	2,078	$0	(673)	$1	564	$0
Study 5: Study 3 under System Resource Shift Case	EDIC-NSL-PV	31	$0	(3,842)	($13)	334	$0
Study 6: Study 5 with Edic-Marcy relaxed	EDIC-NSL-PV	(1)	$0	(3,955)	($15)	344	$0
GENERATION SOLUTIONS							
Study 1: Central East-Edic-Marcy	New Scotland	(359)	$0	460	$3	837	$0
Study 2: Central East	New Scotland	(359)	$0	460	$3	837	$0
Study 3: Central East-New Scotland-Pleasant Valley	Pleasant Valley	(429)	$0	1,558	$12	2,070	$0
Study 4: Study 3 with Edic-Marcy relaxed	Pleasant Valley	(408)	$0	1,555	$10	2,147	$0
Study 5: Study 3 under System Resource Shift Case	Pleasant Valley	600	$0	1,947	$15	2,910	$1
Study 6: Study 5 with Edic-Marcy relaxed	Pleasant Valley	682	$0	1,451	$11	2,774	$0
DEMAND RESPONSE SOLUTIONS							
Study 1: Central East-Edic-Marcy	F(200) G(200) J(200)	15	$0	(220)	($1)	(105)	$0
Study 2: Central East	F(200) G(200) J(200)	15	$0	(220)	($1)	(105)	$0
Study 3: Central East-New Scotland-Pleasant Valley	F(200) G(200) J(800)	32	$0	(484)	($2)	(399)	$0
Study 4: Study 3 with Edic-Marcy relaxed	F(200) G(200) J(800)	(55)	$0	(489)	($2)	(424)	$0
Study 5: Study 3 under System Resource Shift Case	F(200) G(200) J(800)	(12)	$0	(533)	($2)	(606)	$0
Study 6: Study 5 with Edic-Marcy relaxed	F(200) G(200) J(800)	(36)	$0	(574)	($2)	(645)	$0
ENERGY EFFICIENCY SOLUTIONS							
Study 1: Central East-Edic-Marcy	F(200) G(200) J(200)	(41)	$0	(7,551)	($30)	(1,970)	$0
Study 2: Central East	F(200) G(200) J(200)	(41)	$0	(7,551)	($30)	(1,970)	$0
Study 3: Central East-New Scotland-Pleasant Valley	F(200) G(200) J(800)	(165)	$0	(15,861)	($61)	(4,633)	$0
Study 4: Study 3 with Edic-Marcy relaxed	F(200) G(200) J(800)	(681)	$0	(16,422)	($65)	(4,854)	$0
Study 5: Study 3 under System Resource Shift Case	F(200) G(200) J(800)	(420)	$0	(15,618)	($60)	(4,855)	$0
Study 6: Study 5 with Edic-Marcy relaxed	F(200) G(200) J(800)	(419)	$0	(16,012)	($62)	(4,993)	$0

Ten-Year Change in NYCA CO_2, SO_2 and NO_X Emissions ($2017M)

Additional Benefit Metrics

ICAP MW Impact

Study	Solution	ICAP Impact (MW)			
		J	G-J	K	NYCA
Study 1: Central East-Edic-Marcy	Transmission	14	24	8	61
	Generation	74	126	40	313
	Energy Efficiency	131	222	71	552
	Demand Response	130	221	70	548
Study 2: Central East	Transmission	14	24	8	61
	Generation	74	126	40	313
	Energy Efficiency	131	222	71	552
	Demand Response	130	221	70	548
Study 3: Central East-New Scotland-Pleasant Valley	Transmission	14	24	8	61
	Generation	100	171	54	424
	Energy Efficiency	324	549	175	1,362
	Demand Response	334	567	181	1,408
Study 4: Study 3 with Edic-Marcy relaxed	Transmission	14	24	8	61
	Generation	100	171	54	424
	Energy Efficiency	324	549	175	1,362
	Demand Response	334	567	181	1,408
Study 5: Study 3 under System Resource Shift Case	Transmission	19	30	12	99
	Generation	31	49	19	162
	Energy Efficiency	551	874	341	2,897
	Demand Response	562	891	348	2,954
Study 6: Study 5 with Edic-Marcy relaxed	Transmission	19	30	12	99
	Generation	31	49	19	162
	Energy Efficiency	551	874	341	2,897
	Demand Response	562	891	348	2,954

ICAP $ Impact

Study	Solution	ICAP Saving ($2017M)	
		V1	V2
Study 1: Central East-Edic-Marcy	Transmission	11	136
	Generation	60	662
	Energy Efficiency	106	1,065
	Demand Response	105	1,058
Study 2: Central East	Transmission	11	136
	Generation	60	662
	Energy Efficiency	106	1,065
	Demand Response	105	1,058
Study 3: Central East-New Scotland-Pleasant Valley	Transmission	11	136
	Generation	81	851
	Energy Efficiency	261	2,206
	Demand Response	270	2,253
Study 4: Study 3 with Edic-Marcy relaxed	Transmission	11	136
	Generation	81	851
	Energy Efficiency	261	2,206
	Demand Response	270	2,253
Study 5: Study 3 under System Resource Shift Case	Transmission	16	185
	Generation	26	294
	Energy Efficiency	455	3,059
	Demand Response	464	3,100
Study 6: Study 5 with Edic-Marcy relaxed	Transmission	16	185
	Generation	26	294
	Energy Efficiency	455	3,059
	Demand Response	464	3,100

2017 CARIS 1 Scenarios

- **NYISO/ESPWG selected six scenarios to study in order to:**
  - Identify factors that might produce or increase congestion
  - Address effects of changes in variables used in base case assumptions
- **Simulations performed to show change in congestion and other metrics for the Study Period**

2017 CARIS 1 Scenarios

Scenario	Description
Higher Load Forecast	Higher Growth Rate (net increase of 5 TWh from base forecast)
Lower Load Forecast	Lower Growth Rate (net decrease of 5 TWh from base forecast)
Higher Natural Gas Prices	Derived from 2017 EIA AEO High Forecast
Lower Natural Gas Prices	Derived from 2017 EIA AEO Low Forecast
National CO_2 Program	RGGI Carbon pricing applied to Non-RGGI states
Public Policy (SRS/Transmission)	Selected project for Western NY Public Policy Transmission Need (PPTN) and generic segments A and B for AC Transmission PPTN under the System Resource Shift Case (Achievement of "50 by 30" objectives by 2026 - Energy Efficiency, Solar, On-Shore and Off-Shore Wind / retirement of NYCA Coal Units / retirement of IPEC)

Constraints	Scenarios: Change in 2026 Demand$ Congestion from Base Case ($2017M)						
	High Load Forecast	Low Load Forecast	High Natural Gas Prices	Low Natural Gas Prices	National CO_2 Program	System Resource Shift Case	Public Policy (SRS / Transmission)
Central East-Edic-Marcy	(16)	17	197	(53)	(31)	424	168
Central East	(17)	17	197	(54)	(32)	425	169
Central East-New Scotland-Pleasant Valley	(17)	18	197	(54)	(32)	451	167

Key Findings: BAU Case

- The results are consistent with prior CARIS studies
- Solutions studied offered a measure of congestion relief and production cost savings
- Transmission projects studied did not result in B/C ratios in excess of 1.0, based on generic cost estimates and production cost savings only.

Key Findings: System Resource Shift Case

Additional 28 TWh of renewable resources in 2026 vs. BAU

Curtailment of Solar and Wind resources – 1.2 TWh, reduction in nuclear output – 0.7 TWh in 2026

SRS vs. BAU

Central East-New Scotland-Pleasant Valley solution produced higher production cost savings (by 61%) and higher Demand$ Congestion savings (by 79%)

Congestion across Central East-New Scotland-Pleasant Valley is $450M higher in 2026 vs. BAU

Net Imports decrease by 14 TWh vs. BAU – NY exports a portion of increased renewable generation

Key Findings: SRS/PP Scenario (2026)

Additional transmission helps unbottle 0.5 TWh of renewable energy vs. SRS

Output from upstate nuclear units increases by 0.4 TWh vs. SRS

SRS with PP vs. SRS

Reduction of higher congestion observed in SRS at the Central East-New Scotland-Pleasant Valley corridor by $284M

Reduction of 1.6 TWh in output from gas-fired generation in Zones F-K vs. SRS

Overall net imports increase by less than 0.3 TWh (as exports decrease) vs. SRS

Spillage Understated in CARIS Study

- Spillage of solar and wind resources in SRS and Public Policy Scenario is due to constraints on bulk-power system and is not reflective of transmission limitations present on lower-voltage system (e.g.,115 kV system in upstate zones)
- Spillage identified can be considered a lower bound and would only be exacerbated should lower-voltage system be monitored and secured

CARIS Phase 2 Objectives

- **Evaluate specific projects designed to reduce congestion identified in CARIS Phase 1**
  - Production costs savings must exceed project costs over first ten years of operation
  - Sum of LBMP savings (for zones with savings) over first ten years of operation must exceed project costs
  - Cost allocation and cost recovery through the NYISO tariff for qualified transmission projects that receive 80% vote of the identified beneficiaries
- **Perform Additional CARIS Studies for all interested parties and for all solution types**

Stakeholder Engagement

- 2017 CARIS 1 Kick-Off at June 22nd ESPWG meeting
  - Reviewed key assumptions
- Reviewed draft results at August 28th ESPWG meeting
- Reviewed updated results at October 26th, November 17th and January 12th ESPWG meetings
- Reviewed draft Report at February 7th ESPWG and February 22nd Joint ESPWG/TPAS meetings
- Reviewed final Report at March 1st Joint ESPWG/TPAS meeting

Next Steps

- Post Comments from Independent Market Monitor
- Bring 2017 CARIS Phase 1 Report to Management Committee on March 28, 2018
- Present 2017 CARIS Phase 1 Report to NYISO Board
- Post Board-approved Report on NYISO Website
- Conduct Public Information Session
- If requested by a Market Participant, then proceed with CARIS Phase 2 consistent with procedures

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability
- 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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