

CARIS 2011

Generic Solutions

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NYISO Recommendations for CARIS 2011 Generic Solution

- ◆ Generic Resource Block Sizes
- ◆ Generic Solution Cost Estimates
- ◆ Capital Recovery Factor

Transmission Block Sizes

Location	Line System Voltage (kV)	Block Ampacity (Amp)	Block Capacity (MVA)
Zone A-J	345	1673	1000*

*Note – As appropriate, solution size will be matched to sistered circuit size.

Generation Block Sizes

Plant Location	Plant Block Size Capacity (MW)
Zone A-K	500

Demand Response Block Sizes

Location	Block Size (MW)	Portfolio Type
Zone A-K	100	Energy Efficiency
Zone A-K	100	Demand Response

Order of Magnitude Unit Pricing Elements

Transmission	Generation	Demand Response
Transmission Line Cost per Mile	Plant Costs	Energy Efficiency Programs
Substation Terminal Costs	Generator Lead Cost per Mile	Demand Response Programs
System Upgrade Facilities	Substation Terminal Costs	
	System Upgrade Facilities	
	Gas Line Cost per Mile	
	Gas Regulator Station	

2011 CARIS Generic Solution Cost Estimates

◆ Transmission Solutions

- *Increase 2009 CARIS transmission cost/mile high and midpoint estimates for Upstate*
- *Updated Transmission cost estimates for 345 kV underground and for 345 kV terminal connection and system upgrade costs for NYC*

Transmission Generic Solution Order of Magnitude Unit Costs

Upstate Zones A-G

		Transmission				Substation	
Cost Range	Location	Line System Voltage (kV)	Block Capacity (MVA)	Construction Type	Transmission Cost (\$M/Mile)	Line Terminal Addition per Substation (\$M)	System Upgrade Facilities (\$M)
High	Zone A-G	345	1000	Overhead	\$7.3	\$9	\$9
Mid	Zone A-G	345	1000	Overhead	\$5.	\$6	\$6
Low	Zone A-G	345	1000	Overhead	\$2	\$3	\$3

2009 NYC Transmission Cost

Cost Range	Location	Transmission				Substation	
		Line System Voltage (kV)	Block Capacity (MVA)	Construction Type	Transmission Cost (\$M/Mile)	Line Terminal Addition per Substation (\$M)	System Upgrade Facilities (\$M)
High	Zone H-J	345	1000	Undergrd	\$25	\$40	\$50
Mid	Zone H-J	345	1000	Undergrd	\$20	\$25	\$30
Low	Zone H-J	345	1000	Undergrd	\$15	\$10	\$10

2011 NYC Transmission Cost

Cost Range	Location	Transmission				Substation	
		Line System Voltage (kV)	Block Capacity (MVA)	Construction Type	Transmission Cost (\$M/Mile)	Line Terminal Addition per Substation (\$M)	System Upgrade Facilities (\$M)
High	Zone H-J	345	600	Undergrd	\$30	\$30	\$30
Mid	Zone H-J	345	600	Undergrd	\$27	\$25	\$20
Low	Zone H-J	345	600	Undergrd	\$24	\$ 20	\$10

Proposed 2011 CARIS Generic Solution Cost Estimates

◆ **Generation Solutions and Sources***

- *Utilize 2010 DC Reset Cost 500 MW combined cycle estimates for Zones F and J*
- *For Zone G cost estimates use average of the Zones F and J cost estimates*
- ◆ [*http://www.nyiso.com/public/webdocs/committees/bic_icapwg/meeting_materials/2010-05-21/S_L_Demand_Curve_Review_5_21_10.pdf](http://www.nyiso.com/public/webdocs/committees/bic_icapwg/meeting_materials/2010-05-21/S_L_Demand_Curve_Review_5_21_10.pdf)
- ◆ Link for the update. (Look under the “Reference Documents, 2011-2014 Demand Curve reset”):
- ◆ [*http://www.nyiso.com/public/markets_operations/market_data/icap/index.jsp](http://www.nyiso.com/public/markets_operations/market_data/icap/index.jsp)

Generic Generation Solution - Order of Magnitude Unit Costs

GENERATOR COST PER UNIT - 2010 DC Reset Cost Estimates (\$ M)						
	Size	Combined Cycle	EPC Costs*	Non-EPC Costs**	Total	Unit Cost \$/kW
UPSTATE (Capital - F)	547 MW	2 X 2 X 1 7FA.05	\$613	\$149	\$762	\$1,393
Zone G	547 MW	2 X 2 X 1 7FA.05	\$719	\$169	\$888	\$1,623
DOWNSTATE (NYC - J)	547 MW	2 X 2 X 1 7FA.05	\$825	\$188	\$1,013	\$1,853

*EPC (Engineering, Procurement and Construction) costs include equipment, construction, testing, and contingency components.

** Non-EPC costs include owner's costs, financing, and working capital and inventories components.

2009 CARIS Generation Cost Estimates

GENERATOR COST PER UNIT - 2009 PRICE LEVEL (\$ M)										
	DESCRIPTION	REFERENCE USED	MATERIAL	LABOR		SUBTOTAL DIRECT COST	PROJECT INDIRECTS	LAND AND PERMITTING	TOTAL WITH PROJECT INDIRECTS	UNIT COST
				GENERIC	ADJUSTED FOR ZONE		20%			\$/kW
UPSTATE	250 MW	GENERIC 2 X 2 X 1 7EA + SCR (\$ 938/KW DIR)	\$173	\$61.5	\$99.6	\$273	\$55	\$0.2	\$327.3	\$1,309
DOWNSTATE	250 MW	GENERIC 2 X 2 X 1 7EA + SCR (\$ 938/KW DIR)	\$173	\$61.5	\$150	\$323	\$65	\$12	\$399.6	\$1,598
LONG ISLAND	250 MW	GENERIC 2 X 2 X 1 7EA + SCR (\$ 938/KW DIR)	\$173	\$61.5	\$149.2	\$322	\$64	\$1.4	\$388.1	\$1,552

2011 vs. 2009 CARIS Generic Generation Solution - Order of Magnitude Unit Costs

Cost Range	Plant Location	Plant Block Size Capacity (MW)	2011 Plant Cost per Block Size* (\$M)	2009 Plant Cost per Block Size (\$M)
High	Zone A-F	500	\$850	\$831
Mid	Zone A-F	500	\$696	\$681
Low	Zone A-F	500	\$543	\$531
High	Zone G	500	\$994	\$911
Mid	Zone G	500	\$811	\$751
Low	Zone G	500	\$628	\$591
High	Zone H-J	500	\$1139	\$1,098
Mid	Zone H-J	500	\$926	\$892
Low	Zone H-J	500	\$712	\$686

* Costs are based on a 547 MW block size.

Proposed 2011 CARIS Generic Solution Cost Estimates

◆ 2011 Demand Side Solutions

- *Update 2009 CARIS Demand Response cost estimates*
- *Update 2009 Energy Efficiency cost estimates*

2011 vs. 2009 CARIS DR and EE Generic Solution - Order of Magnitude Unit Pricing

Cost Range	Location	Demand Side Block Size (MW)	Portfolio Type	2011 Total Portfolio Cost (\$M)	2009 Total Portfolio Cost (\$M)
High	Zone A-G	100	Energy Efficiency	\$280	\$420
Mid	Zone A-G	100	Energy Efficiency	\$225	\$280
Low	Zone A-G	100	Energy Efficiency	\$170	\$140
High	Zone A-G	100	Demand Response	\$56	\$160
Mid	Zone A-G	100	Demand Response	\$45	\$110
Low	Zone A-G	100	Demand Response	\$33	\$50
High	Zone H-J	100	Energy Efficiency	\$350	\$570
Mid	Zone H-J	100	Energy Efficiency	\$280	\$380
Low	Zone H-J	100	Energy Efficiency	\$210	\$190
High	Zone H-J	100	Demand Response	\$68	\$210
Mid	Zone H-J	100	Demand Response	\$55	\$140
Low	Zone H-J	100	Demand Response	\$41	\$70
High	Zone K	100	Energy Efficiency	\$285	\$390
Mid	Zone K	100	Energy Efficiency	\$228	\$260
Low	Zone K	100	Energy Efficiency	\$170	\$130
High	Zone K	100	Demand Response	\$86	\$270
Mid	Zone K	100	Demand Response	\$70	\$180
Low	Zone K	100	Demand Response	\$52	\$90

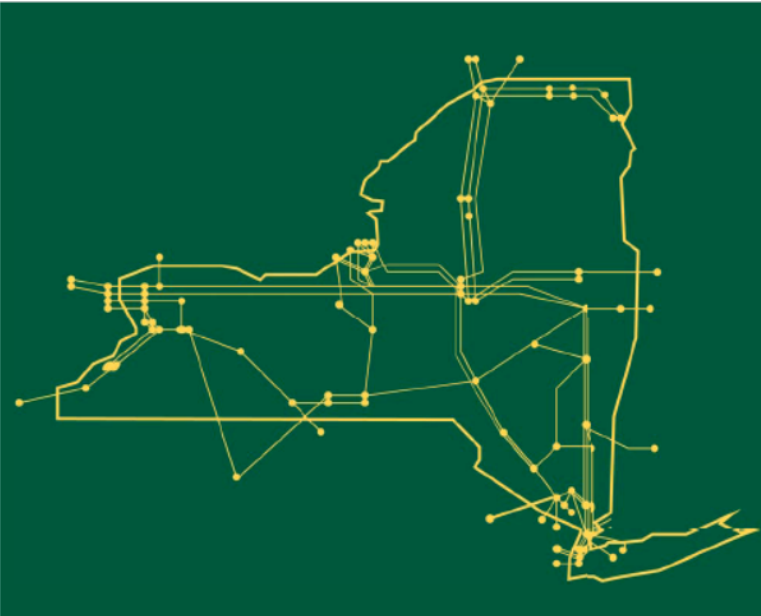
Capital Recovery Factor

- ◆ *Will be used to calculate the benefit/cost ratio based on the first ten years of the 30-year period.*
- ◆ *Capital Recovery Factor = $0.16 \times (1 + 1/(1 + r) + 1/(1 + r)^2 + 1/(1 + r)^3 + \dots + 1/(1 + r)^9)$, where r denotes the discount rate.*
- ◆ *Capital Recovery Factor = $0.16 \times (1 + 1/1.074 + 1/1.074^2 + 1/1.074^3 + \dots + 1/1.074^9)$ = 1.185.*

Capital Recovery Factor cont.

- ◆ **Generic carrying charge rate of 16%**
 - *The 16% carrying charge rate (continue to use the 2009 CARIS rate) reflects generic figures for a return on investment, federal and state income taxes, property taxes, insurance, fixed O&M, and depreciation (assuming a straight-line 30-year rule).*
- ◆ **Discount rate of 7.4% (for PV analysis)**
 - *NYTO's reported weighted average cost of capital weighted by the 2010 sendout energy.*

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