

# 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	



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



## 2011 CARIS Generic Solution Cost Estimates

#### Transmission Solutions

- Utilize 2009 CARIS transmission cost 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**

				Substation				
Cost Range	Location	Line System Voltage (kV)	Block Ampacity (Amp)	Block Capacity (MVA)	Construction Type	Transmiss ion Cost (\$M/Mile)	Line Terminal Addition per Substation (\$M)	System Upgrade Facilities (\$M)
High	Zone A-G	345	1673	1000	Overhead	\$5	\$9	\$9
Mid	Zone A-G	345	1673	1000	Overhead	\$3.50	\$6	\$6
Low	Zone A-G	345	1673	1000	Overhead	\$2	\$3	\$3



#### **2009 NYC Transmission Cost**

				Substation				
Cost Range	Location	Line System Voltage (kV)	Block Ampacity (Amp)	Block Capacity (MVA)	Construction Type	Transmissio n Cost (\$M/Mile)	Line Terminal Addition per Substation (\$M)	System Upgrade Facilities (\$M)
High	Zone H-J	345	1673	1000	Undergrd	\$25	\$40	\$50
Mid	Zone H-J	345	1673	1000	Undergrd	\$20	\$25	\$30
Low	Zone H-J	345	1673	1000	Undergrd	\$15	\$10	\$10

#### **2011 NYC Transmission Cost**

				Substation				
Cost Range	Location	Line System Voltage (kV)	Block Ampacity (Amp)	Block Capacity (MVA)	Construction Type	Transmission Cost (\$M/Mile)	Line Terminal Addition per Substation (\$M)	System Upgrade Facilities (\$M)
High	Zone H-J	345	1673	1000	Undergrd	\$30	\$30	\$30
Mid	Zone H-J	345	1673	1000	Undergrd	\$27	\$25	\$20
Low	Zone H-J	345	1673	1000	Undergrd	\$24	\$ 20	\$10



# Proposed 2011 CARIS Generic Solution Cost Estimates

- Generation Solutions
  - Utilize 2010 DC Reset Cost Estimates for Zones F and J
  - For Zone G cost estimates use average of the Zones F and J cost estimates



# **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)									
	DESCRI PTION	REFERENCE USED	MATERIAL	L	ABOR	SUBTOTAL DIRECT COST	PROJECT	LAND AND PERMITTIN G	TOTAL WITH PROJECT INDIRECTS	UNIT COST
				GEN ERIC	ADJUST ED 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

		Plant Block Size	2011 Plant Cost per	2009 Plant Cost per Block Size
Cost Range	Plant Location	Capacity (MW)	Block Size* (\$M)	(\$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**

#### Demand Response Solutions

- Utilize 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

<b>Cost Range</b>	Location	Demand	Portfolio Type	2011 Total	2009 Total Portfolio
		Response Block		Portfolio Cost (\$M)	Cost (\$M)
		Size (MW)			
High	Zone A-G	100	Energy Efficiency	\$525	\$420
Mid	Zone A-G	100	Energy Efficiency	\$350	\$280
Low	Zone A-G	100	Energy Efficiency	\$175	\$140
High	Zone A-G	100	Demand Response	\$160	\$160
Mid	Zone A-G	100	Demand Response	\$110	\$110
Low	Zone A-G	100	Demand Response	\$50	\$50
High	Zone H-J	100	Energy Efficiency	\$713	\$570
Mid	Zone H-J	100	Energy Efficiency	\$475	\$380
Low	Zone H-J	100	Energy Efficiency	\$238	\$190
High	Zone H-J	100	Demand Response	\$210	\$210
Mid	Zone H-J	100	Demand Response	\$140	\$140
Low	Zone H-J	100	Demand Response	\$70	\$70
High	Zone K	100	Energy Efficiency	\$488	\$390
Mid	Zone K	100	Energy Efficiency	\$325	\$260
Low	Zone K	100	Energy Efficiency	\$163	\$130
High	Zone K	100	Demand Response	\$270	\$270
Mid	Zone K	100	Demand Response	\$180	\$180
Low	Zone K	100	Demand Response	\$90	\$90



#### **Capital Recovery Factor**

- Will be used to calculate the benefit/cost ratio based on the first ten years of the 30year period.
- Capital Recovery Factor = 0.16 x (1 + 1/(1 + r) + 1/(1 + r)<sup>2</sup> + 1/(1 + r)<sup>3</sup> + ..... 1/(1 + r)<sup>9</sup>), 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 straightline 30-year rule).
- Discount rate of 7.4%
  - NYTO's reported weighted average cost of capital weighted by the 2010 sendout energy.



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