



DATE: September 15, 2014
TO: Capacity Performance Enhanced Liaison Committee
FROM: Monitoring Analytics
SUBJECT: Capacity Performance Product Assumptions

This memo includes Monitoring Analytics assumptions about the costs of annual firm gas service, five day firm gas service and adding dual fuel oil burning capability. The associated costs will be used by Monitoring Analytics in simulations of capacity market outcomes based on various capacity market designs.

Cost of annual gas Firm Transportation Service (FTS)

The cost to secure around the clock (a-t-c) firm transportation of natural gas from a pipeline is a function of the volume of gas required. More efficient generators burn less gas per MW of capacity output and therefore have a lower FTS cost per MW.

Table 1 shows the cost of firm transportation service in \$/MW-day by unit heat rate and cost per Dth of firm transportation service. For example, the cost of firm annual transportation service for a unit with a heat rate of 10.000 and a firm gas transportation cost of \$.75/Dth is \$180 per MW-day.

Table 1 Capacity Equivalent of Annual a-t-c Natural Gas Firm Transportation Service (bold indicates input variable)

Unit Heat Rate (MBtu/MWh)	Firm Transportation required/MW of generating capacity (Dth/day)	Cost of Annual Firm Transportation Service (\$/MW-day)		
		Firm Gas Transportation cost (\$/Dth)		
		\$0.55	\$0.65	\$0.75
6.500	156.0	\$85.8	\$101.4	\$117.0
7.000	168.0	\$92.4	\$109.2	\$126.0
7.500	180.0	\$99.0	\$117.0	\$135.0
8.000	192.0	\$105.6	\$124.8	\$144.0
10.000	240.0	\$132.0	\$156.0	\$180.0
11.000	264.0	\$145.2	\$171.6	\$198.0
12.000	288.0	\$158.4	\$187.2	\$216.0
13.000	312.0	\$171.6	\$202.8	\$234.0

Cost of five day gas Firm Transportation Service

Table 2 shows the cost to secure firm natural gas transportation for delivery for five days, assuming that the service costs: \$ 750,000 premium/(50,000 mcf/day × 5 days × 1.03 MBtu/mcf) = \$ 2.91/MBtu

Table 2 Capacity Equivalent of 5-day call for Natural Gas Firm Transportation Service (bold indicates input variable)

Unit Heat Rate (MBtu/MWh)	Price of a 5-day call (\$/Mbtu)	Firm Transportation required/MW of generating capacity for a 5-day a-t-c call (Dth/5-day period)	Firm Tran. Serc. cost of 5-day call (\$/MW-day)
6.500	\$2.91	780.0	\$6.22
7.000	\$2.91	840.0	\$6.70
7.500	\$2.91	900.0	\$7.18
8.000	\$2.91	960.0	\$7.65
10.000	\$2.91	1,200.0	\$9.57
11.000	\$2.91	1,320.0	\$10.52
12.000	\$2.91	1,440.0	\$11.48
13.000	\$2.91	1,560.0	\$12.44

Cost of providing dual fuel capability to a generator

The cost for an existing single fuel unit to install the necessary equipment to burn oil including the burners, control system, and fuel infrastructure required to burn oil as an alternative to natural gas varies with unit type.

Table 3 shows the cost to retrofit No. 2 oil, dual fuel capabilities for several combustion turbine (CT) technology types.

Table 3 CT Fuel Oil Conversion Capital Costs

CT Technology	GE Frame 5	GE Frame 6	GE Frame 7B	GE Frame 7EA	GE Frame 7FA	Previous CONE CT	Current CONE CT
CT Capacity (MW)	26.3	38.34	56.5	83.5	171.7	343.4	420.111
Oil Tank Capacity (Gallons)	200,000	300,000	500,000	600,000	1,100,000	2,200,000	2,600,000
Total Project Cost (\$/MW)	\$168,300.83	\$140,762.75	\$104,192.01	\$81,329.38	\$52,297.83	\$40,865.53	\$37,700.77
APIR Cost Based on 30-Year CRF	\$49.34	\$41.26	\$30.54	\$23.84	\$15.33	\$11.98	\$11.05
APIR Cost Based on 5-Year CRF	\$167.38	\$139.99	\$103.62	\$80.88	\$52.01	\$40.64	\$37.49

Table 4 shows the cost to retrofit No. 2 oil, dual fuel capabilities for three different combined cycle (CC) technology types.

Table 4 CC Fuel Oil Conversion Capital Costs

CC Technology	2 on 1 GE	2on 1 GE	2on 1 GE
	Frame 7EA	Frame 7FA.04	Frame 7FA.05
		Previous	Current
		CONE	CONE
CC Unfired Duct Burner Capacity (MW) At %9 F	233.5	519.9	610.9
Oil Tank Capacity (Gallons)	1,200,000	2,200,000	2,600,000
Total Project Cost (\$/MW)	\$55,927.25	\$26,992.16	\$25,927.57
APIR Cost Based on 30-Year CRF	\$16.40	\$7.91	\$7.60
APIR Cost Based on 5-Year CRF	\$55.62	\$26.84	\$25.79