Gas Turbines

Proposed BARCT Cost Effectiveness @ 2 ppmv
Incremental Cost Effectiveness with SCR

Unit Rating Profile (MW)	2000/2005 BARCT Level (lbs/mmscft)	PWV ($M)	Emission Reduction from 2000/2005 BARCT (tpd)	CE for 2014 BARCT ($/ton)
(a)	(b)	(c)	(e)	(f)
59	62.27	15.7	0.210	8,210
46	62.27	12.6	0.310	4,472
30	62.27	8.9	0.200	4,851
23	62.27	7.2	0.140	5,631
83	62.27	4.8 (d)	0.600	870
No Turbines/Duct Burners = 21 **No of Cogen Units = 12**		**Total PWV = $97.68 M**	**Total Reductions = 4.14 tpd**	**Average CE = 2,692 $/ton (g)**

(a) All gas turbines and all SCRs at the refineries were installed ≥ 25 years ago

(b) 2000/2005 BARCT Level from Table 1 of Rule 2002

(c) PWV = (0.2372 x MW) + 1.7376

(d) Costs for additional SCR catalysts to get from 10 ppmv to 2 ppmv

(e) Emission Reduction = Emissions @ 2000/2005 BARCT Level – Emissions @ 2 ppmv
     where Emissions @ 2000-2005 BARCT Level = 2011 Fuel Gas Usage (mmscft/yr) x 62.27 (lb/mmscft)
          Emissions @ 2 ppmv = 2011 Emissions x (2 ppmv / 2011 NOx Level in ppmv)

(f) CE = PWV/Emission reductions from 2000-2005 BARCT = (c)/(e x 365 x 25)

(g) CE (DCF Method) = $2692 per ton. CE (LCF Method) = $4500 per ton for 25 years life and 4% interest rate

FCCUs

Proposed BARCT Cost Effectiveness @ 2 ppmv
Incremental Cost Effectiveness with SCR or LoTOx
(Summary from January 22, 2014 WGM)

Equipment	2005 BARCT Level	Incremental PWV ($M)	Incremental Emission Reduction from 2005 BARCT Level (tpd)	CE for 2014 BARCT ($/ton)
	(a)	(b)	(c)	(d)
FCCUs with SCR	85% reduction	13	0.43	3,444
FCCUs with LoTOx	85% reduction	- 14	0.43	- 3,521

(a) 2005 BARCT level from Table 3 of Rule 2002

(b) Incremental difference in costs of control equipment for 85% reduction and control equipment for 2 ppmv

(c) Incremental emission reductions = Emissions @ 2005 BARCT – Emissions @ 2ppmv

(d) CE = (b)/(c*365*25) for DCF method. For LCF, CE = $5,700 -$5,900 per ton