

Guatemala - Approximate Operating Margin Data

Operating Margin Data:

Name	Technology	Fuel Type	GWh	MW Installed	Effective MW	Year Online
El Canada	hydro	RE	13.0	41.6	40	Nov-03
Electrogeneracion	IC Motor	bunker	3.9	15	15	Nov-03
Amatex	IC Motor	bunker	14.8	10	10	Jun-03
Arizona	IC Motor	bunker	561.4	167	160	May-03
Calderas	geothermal	RE	32.7	5	4.5	Dec-02
Matanzas	hydro	RE	62.4	12	12	Jul-02
San Isidro	hydro	RE	0.7	3.5	3.4	Jul-02
Las Vacas	hydro	RE	79.9	40	38	May-02
Pasabien	hydro	RE	42.8	12	12	Jun-00
Poza Verde	hydro	RE	36.3	8.1	8	May-00
La Esperanza	IC Motor	bunker	740.0	126	124	May-00
San Jose	steam turbine	coal	892.1	142	128.9	Jan-00
Zunil	geothermal	RE	162.3	24	22	1999
Secacao	hydro	RE	97.7	15.5	13.5	1998
Genor	IC Motor	bunker	156.3	42.4	41.6	1998
Las Palmas	IC Motor	bunker	460.9	66.8	65	1998
Sistema Michatoya	hydro	RE	29.3	6.7	1	1997
Concepcion	bagasse	RE	107.7	27.5	27.5	1996
La Union	bagasse	RE	122.4	29.5	29.5	1996
Madre Tierra	bagasse	RE	42.6	19	19	1996
Magdalena	bagasse	RE	64.5	15.4	15.4	1996
Pantaleon	bagasse	RE	144.3	38.5	38.5	1996
Santa Ana	bagasse	RE	110.5	33.8	33.8	1996
Lagotex	IC Motor	bunker	102.1	20	20	1996
Tulula	bagasse	RE	9.6	19	16.5	1996
Rio Bobos	hydro	RE	43.6	10	10	1995
Sidegua	IC Motor	bunker	86.9	44	36	1995
Generadora Progreso	IC Motor	bunker	33.7	22	21	1993
PQPC	IC Motor	bunker	444.8	114	110	1993
GGG Stewart + Stevenson	Gas Turbine	diesel	12.8	51	23	1992
GGG Gas 4	Gas Turbine	diesel	16.0	33	27	1989
Esc. Gas 5	Gas Turbine	diesel	6.4	41	15	1985
Chixoy	hydro	RE	1229.2	300	275	1983

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Aguacapa	hydro	RE	260.8	90	75	1982
Chichaic	hydro	RE	2.7	0.6	0.5	1979
GGG Gas 2	Gas Turbine	diesel	22.5	23	17	1978
Esc. Vapor 2	steam turbine	bunker	0.1	53	24	1977
Esc. Gas 3	Gas Turbine	diesel	9.2	25	17	1976
Esc. Gas 4	Gas Turbine	diesel	0.0 *	*		1976
Jurun Marinala	hydro	RE	207.9	60	60	1970
Esc. Gas 2	Gas Turbine	diesel	0.0 *	*		1968
El Porvenir	hydro	RE	15.3	2	2	1968
Esclavos	hydro	RE	51.1	14	13.5	1966
Santa Maria	hydro	RE	19.8	6	6	1966
GGG Gas 1	Gas Turbine	diesel	2.7	11	8	1964
Esc. Vapor 4	steam turbine	bunker	0.0	13	11	1961
Esc. Vapor 3	steam turbine	bunker	2.8	13	11	1959

Source: DGE, 2003 data

Bunker	2608	40%
Diesel	70	1%
Hydro	2193	33%
bagasse	592	9%
geothermal	195	3%
coal	892	14%
Total	6559	

6549

Guatemala - Build Margin 20% Recent Additions

Build Margin - 20% Of Recent Additions:

Name	Technology	Fuel Type	GWh	Cum Gen	% of capacity
El Canada	hydro	RE	13.0	13.02	0.2
Electrogeneracion	IC Motor	bunker	3.9	16.91	0.3
Amatex	IC Motor	bunker	14.8	31.70	0.5
Arizona	IC Motor	bunker	561.4	593.1	9.1
Calderas	geothermal	RE	32.7	625.8	9.6
Matanzas	hydro	RE	62.4	688.2	10.5
San Isidro	hydro	RE	0.7	688.9	10.5
Las Vacas	hydro	RE	79.9	768.8	11.8
Pasabien	hydro	RE	42.8	811.7	12.4
Poza Verde	hydro	RE	36.3	848.0	13.0
La Esperanza	IC Motor	bunker	740.0	1588.0	24.3
San Jose	steam turbine	coal	892.1	2480.0	38.0
Zunil	geothermal	RE	162.3	2642.4	40.5
Secacao	hydro	RE	97.7	2740.1	41.9
Genor	IC Motor	bunker	156.3	2896.4	44.3
Las Palmas	IC Motor	bunker	460.9	3357.3	51.4
Sistema Michatoya	hydro	RE	0.0	3357.3	51.4
Concepcion	bagasse	RE	107.7	3465.0	53.0
La Union	bagasse	RE	122.4	3587.5	54.9
Madre Tierra	bagasse	RE	42.6	3630.1	55.6
Magdalena	bagasse	RE	64.5	3694.6	56.6
Pantaleon	bagasse	RE	144.3	3838.9	58.8
Santa Ana	bagasse	RE	110.5	3949.4	60.5
Lagotex	IC Motor	bunker	102.1	4051.5	62.0
Tulula	bagasse	RE	9.6	4061.1	62.2
Rio Bobos	hydro	RE	43.6	4104.6	62.8
Sidegua	IC Motor	bunker	86.9	4191.6	64.2
Generadora Progress	IC Motor	bunker	33.7	4225.3	64.7
PQPC	IC Motor	bunker	444.8	4670.0	71.5
GGG Stewart + Steve	Gas Turbine	diesel	12.8	4682.9	71.7
GGG Gas 4	Gas Turbine	diesel	16.0	4698.9	71.9
Esc. Gas 5	Gas Turbine	diesel	6.4	4705.3	72.0
Chixoy	hydro	RE	1229.2	5934.6	90.8

Guatemala - Build Margin 20% Recent Additions

Aguacapa	hydro	RE	260.8	6195.4	94.8
Chichaic	hydro	RE	2.7	6198.0	94.9
GGG Gas 2	Gas Turbine	diesel	22.5	6220.6	95.2
Esc. Vapor 2	steam turbine	bunker	0.1	6220.6	95.2
Esc. Gas 3	Gas Turbine	diesel	9.2	6229.9	95.4
Esc. Gas 4	Gas Turbine	diesel	0.0	6229.9	95.4
Jurun Marinala	hydro	RE	207.9	6437.7	98.6
Esc. Gas 2	Gas Turbine	diesel	0.0	6437.7	98.6
El Porvenir	hydro	RE	15.3	6453.1	98.8
Esclavos	hydro	RE	51.1	6504.2	99.6
Santa Maria	hydro	RE	19.8	6524.0	99.9
GGG Gas 1	Gas Turbine	diesel	2.7	6526.7	99.9
Esc. Vapor 4	steam turbine	bunker	0.0	6526.7	99.9
Esc. Vapor 3	steam turbine	bunker	2.8	6529.5	100.0
Esc. Vapor 3	steam turbine	bunker	2.8	6532.3	100.0
Total GWh			6532.31		
20% Threshold			1306.46		
Actual Threshold			1587.99		
Total Bunker			1034.65		
Total RE			271.81		

Note: Since the 20% most recent plants are greater (in MWh) than the 5 capacity additions, this formula is used to determine the build margin.

Combined Margin Calculation

CEF Calculation Operating Margin:

	Annual Generation GWh/yr (GEN)	Average Plant Efficiency* % (PE)	Actual Fuel Consumption TJ/year (F)	IPCC 1996 Inventory Workbook Carbon Content tC/TJ (COEF)	Emissions tCO2/yr (TEM)	CEF t CO2/MWh (EF_OM)
Bunker - Internal Combustion	2,607.68	30%	31,292.15	21.1	2,420,969.18	
Diesel - Gas Turbine	69.74	25%	1,004.28	20.2	74,384.03	
Coal - steam turbine	892.06	35%	9,175.52	25.8	868,003.76	
Total (TGEN)	3,569.49				3,363,356.97	0.942

(symbol for PDD, Methodology and MP)

CEF Calculation Build Margin:

	Annual Generation GWh/yr (GEN)	Average Efficiency* % (PE)	Actual Fuel Consumption TJ/year (F)	IPCC 1996 Inventory Workbook Carbon Content tC/TJ (COEF)	Emissions tCO2/yr (TEM)	CEF t CO2/MWh (EF_BM)
Bunker - Internal Combustion	1,034.65	30%	12,415.79	21.1	960,568.50	
RE	271.81	N/A	-	0	-	
Total	1,306.46				960,568.50	0.735

(symbol for PDD, Methodology and MP)

Combined Margin CEF (EF): 0.839

* - Plant efficiency data taken from validated PDD of Candelaria Hydro Project in Guatemala.

<u>Input data:</u>		
CEF	0.839	t CO2/MWh
EL (in)	30	GWh
TGEN	6549	GWh
EF (in)	unknown	t CO2/MWh
EL (out)	427	GWh
EF (out)	0.839	t CO2/MWh

<u>Adjustments:</u>		
Ussing a low EF (in) (0,001)	0.784	t CO2/MWh
Ussing a high EF (in) (0,999)	0.789	t CO2/MWh
Max range of impact on CEF	0.005	t CO2/MWh
In %	0.55%	
Import is therefore negligible.		

Output:

Combined Margin CEF corrected for export: 0.784 = 0,588-(427/6545)*0,588

The import and export formula is used in the AI Gallo methodology. We calculated the impact of imported capacity with a very low CEF (0,001) and a very high CEF (0,999). The impact is less than 1% and therefore negligible and left out of the formula.

t CO₂/MWh

Rio Hondo Emission Reductions

Output Calculations:

	MWh	CEF	Emission Reductions
	130,000.00	0.784	101,928.28
Total	130,000.00		101,928.28

Revenue Calculations:

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Net Generation (MWh) or Production Volume	0	?	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000
Total ER (ton CO ₂ e)	-	101,928	101,928	101,928	101,928	101,928	101,928	101,928	101,928	101,928
								7 years and Up to 2012		
							Total tons	713,498		Total tons

Rio Hondo Emission Reductions

2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000
101,928	101,928	101,928	101,928	101,928	101,928	101,928	101,928	101,928	101,928	101,928	101,928
10 years				Up to 14 years				21 years			
1,019,283				Total tons 1,426,996				Total tons 2,140,494			