



Figure 2.4 Sample Map of Power Plant Sites and Transmission Lines in Honduras (Source: ENEE)

GENERACION DE ENERGIA ELECTRICA

PERIODO 2005 - 2006

TIPO DE PLANTA	2005		2006		Variación	
	Energía GWh	Porcentaje %	Energía GWh	Porcentaje %	Energía GWh	Porcentaje %
<b>TOTAL GENERAL</b>						
<b>Total</b>	<b>5,551.1</b>	<b>100.0</b>	<b>5,947.7</b>	<b>100.0</b>	<b>396.6</b>	<b>7.1</b>
Generación ENEE	1,653.0	29.8	2,002.5	33.7	349.6	21.1
Energía Comprada	3,902.0	70.4	3,945.0	66.3	42.9	1.1
Energía Inadvertida	1.1	0.0	11.5	0.2	10.4	954.2
Venta Energía Internacional	-3.9	-0.2	-11.3	-0.2	-7.4	188.7
<b>SISTEMA INTERCONECTADO NACIONAL</b>						
<b>Total</b>	<b>5,551.1</b>	<b>100.0</b>	<b>5,947.7</b>	<b>100.0</b>	<b>396.6</b>	<b>7.1</b>
Hidráulica Estatal	1,646.5	29.7	1,938.3	32.6	291.7	17.7
Térmica Estatal	6.4	0.1	64.3	1.1	57.8	899.6
Energía Comprada	3,902.0	70.3	3,956.4	66.5	54.4	1.4
▶ <i>Renovable</i> <sup>1</sup>	147.5	0.0	231.6	3.9	84.0	57.0
▶ <i>Térmica</i>	3,754.5	1.0	3,724.9	62.6	-29.6	-0.8
Venta Energía Internacional	-3.9	0.0	-11.3	-0.2	-7.4	188.7

<sup>1</sup> Incluye Biomasa

CAPACIDAD INSTALADA EN EL SISTEMA  
PERIODO 2005-2006

TIPO DE PLANTA	2005		2006		Variación	
	Potencia kW	Porcentaje %	Potencia kW	Porcentaje %	Potencia kW	Porcentaje %
<b>Total</b>	<b>1,526,799</b>	<b>100.0</b>	<b>1,548,009</b>	<b>100.0</b>	<b>21,210</b>	<b>1.4</b>
<b>Hidráulica Estatal</b>	<b>464,400</b>	<b>30.4</b>	<b>464,400</b>	<b>30.0</b>	<b>0</b>	<b>0.0</b>
<b>Térmica Estatal</b>	<b>124,600</b>	<b>8.2</b>	<b>124,600</b>	<b>8.0</b>	<b>0</b>	<b>0.0</b>
Motores Diesel	91,600	6.0	91,600	5.9	0	0.0
Turbina de Gas	33,000	2.2	33,000	2.1	0	0.0
<b>Plantas Privadas</b>	<b>937,799</b>	<b>61.4</b>	<b>959,009</b>	<b>62.0</b>	<b>21,210</b>	<b>2.3</b>
<b>Hidráulica</b>	<b>14,699</b>	<b>1.0</b>	<b>38,471</b>	<b>2.5</b>	<b>23,772</b>	<b>161.7</b>
<b>Térmica</b>	<b>923,100</b>	<b>60.5</b>	<b>920,538</b>	<b>59.5</b>	<b>-2,562</b>	<b>-0.3</b>
Motores Diesel	823,800	54.0	821,238	53.1	-2,562	-0.3
Turbina de Gas	39,500	2.6	39,500	2.6	0	0.0
Biomasa	59,800	3.9	59,800	3.9	0	0.0

PLAN DE EXPANSIÓN DE GENERACIÓN

2008 - 2022

ADICIÓN DE PLANTAS AL SISTEMA (MW)																
PROYECTOS	Tecnología	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Asignación de Eneesa	Motores diesel	28.0														
Antihom	Motores diesel	30.0														
Buzier	Motores diesel	30.0														
Copacado	Hidro	4.0														
Puñá Blanca	Hidro	0.0														
Recosaba Biomasa	Biomasa	3.2														
Trinasa	Carbón	100														
Cosca	Carbón	150														
Mangungu I	Hidro	1.2														
Matapu I	Hidro	1.0														
Río Oro	Hidro	1.2														
Mesaka	Hidro	1.1														
Losenerg	Biomasa	10.0														
San Juan	Hidro		0.1													
Tanguari	Hidro		3.4													
Proyeo 80 (Renovable)	Renovable			80												
Motores diesel media vel.	Motores diesel			230												
Planta carbón (Proyeo 7)	Carbón				300											
Talabón	Hidro					20										
Palanca 3	Hidro						100									
Tumbalá	Hidro						100									
Llanitas	Hidro						98									
Flisatuy	Hidro							173								
Palanca 2	Hidro								200							
<b>TOTAL</b>		<b>79.1</b>	<b>265.3</b>	<b>9.5</b>	<b>310</b>	<b>0</b>	<b>300</b>	<b>30</b>	<b>358</b>	<b>173</b>	<b>100</b>	<b>500</b>	<b>300</b>	<b>270</b>	<b>200</b>	<b>0</b>

RETIRO DE PLANTAS (MW)																
PROYECTOS	Tecnología	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Seven Valley	Motores diesel	10														
Santa Fe	Motores diesel	5														
Palca	Motores diesel	20.0														
Cosca	Motores diesel	80.0														
Lufesta 1	Turbina de gas	40.0														
Reserva de Emergencia	Motores diesel				20											
La Puente Colorado	Turbina de gas						10									
La Puente General	Turbina de gas						15									
Antihom	Motores diesel							30								
Buzier	Motores diesel							30								
Lufesta 3	Motores diesel							210.0								
Roarua	Motores diesel							200.0								
Proyeo 2	Motores diesel								80.0							
Lufesta 2	Motores diesel								80.0							
<b>TOTAL</b>		<b>0</b>	<b>15</b>	<b>146.6</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>0</b>	<b>33</b>	<b>0</b>	<b>0</b>	<b>470</b>	<b>140</b>	<b>0</b>	<b>0</b>	<b>0</b>

Tecnología	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Motores diesel	28.0													
Motores diesel	30.0													
Motores diesel	30.0													
Motores diesel	30.0													
Hidro	6.0													
Hidro	0.0													
Biomasa	3.2													
Carbón	100													
Carbón	150													
Hidro	1.2													
Hidro	1.0													
Hidro	1.2													
Hidro	1.1													
Biomasa	10.0													
Hidro		6.1												
Hidro		3.4												
Renovable			80											
Motores diesel			230											
Carbón				300										
Hidro					20									
Hidro								100						
Hidro								100						
Hidro								98						
Hidro									173					
Hidro													270	
Hidro													200	
<b>TOTAL</b>	<b>79.1</b>	<b>265.3</b>	<b>9.5</b>	<b>310</b>	<b>0</b>	<b>300</b>	<b>20</b>	<b>358</b>	<b>173</b>	<b>100</b>	<b>500</b>	<b>300</b>	<b>270</b>	<b>200</b>

PROYECCIÓN DE DEMANDA DE ENERGÍA ELÉCTRICA  
SISTEMA CENTRAL INTERCONECTADO - ENEE

**2007 - 2021**

CONCEPTO	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>VENTAS BRUTAS</b>															
RESIDENCIAL	1,542,764	2,295,266	2,248,260	2,428,894	2,579,898	2,755,937	2,933,352	3,111,178	3,292,528	3,477,789	3,672,502	3,876,537	4,089,028	4,309,996	4,542,717
COMERCIAL	1,039,129	1,207,168	1,242,263	1,382,626	1,478,846	1,578,246	1,681,931	1,791,444	1,906,944	2,028,239	2,156,279	2,291,179	2,432,726	2,581,264	2,840,875
CONSUMIDORES INDUST. MEDIANOS	969,844	107,368	794,844	521,442	393,046	344,478	313,176	289,688	269,088	252,767	238,474	226,630	216,930	209,171	199,462
CONSUMIDORES INDUST. GRANDES	140,244	91,239	62,572	3,912,519	3,004,894	1,977,002	1,207,224	1,262,343	1,403,390	1,569,547	1,875,507	2,295,448	2,871,438	3,613,393	4,597,762
OTROS (E.A. N. A.P.)	389,888	489,432	422,622	485,428	489,392	519,888	551,887	583,939	622,118	663,366	712,246	769,485	835,146	915,146	997,460
ENERGÍA NO FACTURADA A ENEE	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800
VENTAS NETAS INTERIORES (ENEE)	4,078,919	5,009,972	5,068,796	5,064,276	5,031,288	4,987,957	4,945,654	4,894,268	4,843,442	4,792,912	4,743,065	4,693,789	4,645,162	4,597,666	4,550,721
Porcentaje de crecimiento	61.7%	8.4%	1.2%	7.2%	7.2%	7.2%	6.9%	6.7%	6.5%	6.4%	6.2%	6.0%	5.8%	5.6%	6.1%
<b>VENTAS INTERNACIONALES</b>															
VENTAS TOTALES ENEE	4,078,919	5,009,972	5,068,796	5,064,276	5,031,288	4,987,957	4,945,654	4,894,268	4,843,442	4,792,912	4,743,065	4,693,789	4,645,162	4,597,666	4,550,721
VENTAS MECO	140,719	148,162	152,289	157,463	162,587	168,660	174,733	180,806	186,880	192,953	199,026	205,100	211,173	217,246	223,320
VENTAS ELÉCTRICAS	112,801	118,538	119,798	123,102	126,801	130,146	133,736	137,528	141,387	145,345	149,415	153,589	157,869	162,251	166,849
VENTAS TOTALES INTERNAS	5,128,298	5,331,189	5,382,947	5,275,381	5,197,936	5,148,443	5,077,990	5,011,941	4,948,901	4,888,366	4,829,694	4,772,173	4,716,619	4,662,567	4,610,271
Porcentaje de crecimiento	9.2%	8.1%	7.2%	7.1%	7.0%	6.9%	6.7%	6.6%	6.4%	6.3%	6.1%	6.0%	5.9%	5.8%	6.0%
<b>DEMANDA BRUTA</b>															
% de generación local	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%	22.0%
% de generación conectada en ventas	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%
Potencia	1,533,038	1,907,654	1,948,732	1,729,813	1,768,624	1,646,488	1,611,689	1,564,294	1,516,311	1,468,328	1,420,345	1,372,362	1,324,379	1,276,396	1,228,413
<b>CONSUMO ENEE (BRUTAS)</b>	6,440,107	8,072,666	7,226,332	7,823,844	8,220,112	8,616,946	9,013,781	9,410,615	9,807,450	10,204,284	10,601,119	11,000,000	11,398,881	11,797,762	12,196,643
Porcentaje de crecimiento	6.7%	7.4%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%
<b>CONSUMO MECO</b>	102,708	107,624	107,409	108,801	110,193	111,585	112,977	114,369	115,761	117,153	118,545	119,937	121,329	122,721	124,113
<b>CONSUMO ELÉCTRICAS</b>	119,237	123,868	124,168	125,624	126,980	128,336	129,692	131,048	132,404	133,760	135,116	136,472	137,828	139,184	140,540
<b>CONSUMO TOTAL</b>	6,662,052	7,162,897	7,437,849	8,116,774	8,442,072	8,848,869	9,248,844	9,649,814	10,050,789	10,451,764	10,852,739	11,253,714	11,654,689	12,055,664	12,456,639
7.2%	7.2%	6.6%	8.5%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%
<b>DEMANDA BRUTA</b>															
FACTOR DE CARGA	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%	65.2%
DEMANDA ENEE	118.9	129.2	129.7	129.2	128.9	128.9	128.9	128.9	128.9	128.9	128.9	128.9	128.9	128.9	128.9
Porcentaje de crecimiento	6.7%	7.4%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%	6.2%
DEMANDA MECO	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3	22.3
DEMANDA ELÉCTRICAS	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1
DEMANDA TOTAL	1,189.9	1,294.9	1,280.9	1,402.1	1,371.4	1,362.9	1,352.7	1,342.1	1,331.5	1,320.9	1,310.3	1,300.0	1,289.6	1,279.2	1,268.8
7.2%	7.2%	6.6%	8.4%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%	8.2%

## Projected Demand Growth

- Percent increase from 2007 to 2021
  - Between 5.8 and 9.2 percent, per year
- Total demand
  - 1,170 MW to 2,575 MW

## Phase 1: Research Biogas

- **Gasifier technology**
  - Capacity – input requirements and output capability
  - Costs
  - Crop / feedstock used
    - Land and water use
  - Examples / case studies
- **Microturbines** that use biogas
  - Cost, capacity (kW, MW?), emissions
- Larger and/or **traditional turbines** that use biogas?

## Phase 1: Research Biodiesel

- Research biodiesel
  - See previous slide
- Also, “gensets” typically burn diesel
  - Diesel genset – generator set
- **For both (biogas and biodiesel)**
  - preliminary findings for **Friday April 11**
  - “final” findings for next Tuesday, April 15

## Phase 2: Modeling Needs

- Develop alternative expansion plans using PowerPlan
  - Start with existing ENEE expansion plan
    - Model replacing some generators in the current expansion plan with biomass technology
    - Model *more* demand growth, to be met with biomass
  - Vary amounts of biomass technology, along with existing technologies and PPAs
  - Model with different price assumptions for buying oil on the international market

## Phase 1 & 2: Modeling Needs

- Develop a Power Flow model
  - Able to meet Friday?

## Phase 2: Modeling Needs

- Output of alternative expansion plans
  - Cost, Reliability, Emissions...
  - Oil/petroleum used
  - Required new transmission lines?
  - ...

## Analysis Iteration

- Use the expansion plan to recommend amounts of biogas and biodiesel
- Use knowledge of these technologies to determine the crop requirements for the recommended amount of biomass use
- Iterate....
  - Acreage required to grow crops for desired biomass generation
  - ...

# Sign-up

- Phase 1 – biogas and biodiesel
  - Biogas → 4 volunteers to organize selves
  - Biodiesel → 4 volunteers to organize selves
- Phase 2 – PowerPlan expansion plans
  - Organize next Tuesday