

Mexican Energy Conference 2006 Renewable Energy in Mexico

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Topics to be covered



1. Power generation with renewable energy

- a) Public service
- b) Self supply

2. Energy Policy

- a) Regulatory framework
- b) Fiscal incentives
- c) Renewable energy legislation
- d) Transmition Infraestructure in Oaxaca CDM Projects



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Power Generation with Renowable Energy



- Mexico has a little over 12,000 MW of installed capacity based on renewable energy:
 - ✓ 11,545 MW dedicated to public service (CFE and LFC),
 - 504 MW installed under cogeneration and self-support schemes
 - 18 MW in isolated systems.





- **23%** of installed capacity in CFE and LFC is based on renewable energy.
- _ 13 % of the power generated in 2005 for public service was generated with renewable energy.

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	Hydro:	10,545 MW			
	Geothermal:	960 MW			
	Wind:	2 MW			
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Power Generation for Self Supply



- In addition to CFE and LFC power plants, the Energy Regulatory Commission (CRE) has granted 80 permits to projects operating with renewable energy, with a total capacity of 1,774 MW.
- 64 of these projects are in operation, with a total installed capacity of 552 MW.

Authorized capacity for cogeneration and selfsupply generation plants operating with renewable energy



Energy source	In operation	Under development	Total
Hydraulic Energy	76.5	95.2	171.7
Wind	-	1076.2	1076.2
Biomass	454.9	40.0	494.9
Biogas	20.3	10.6	30.9
Total	551.7	1,222.0	1773.7

Authorized capacity for cogeneration and self-supply (MW)

Hydroelectric Generation Public Service

COMISION REGULADORA DE ENERGIA

- CFE and LFC have 73 hydroelectric plants in operation, with 10,545 MW of total installed capacity (55 in CFE and 18 in LFC).
- ✓ 46 of these plants, with a total of 365 MW, are small units with 30 MW or less.
- Hydroelectric plants account for 9.6% of total energy production.



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Huites, Sin.



Hydroelectric Generation Public Service



- In addition, CFE have plans to install at least 3000
 MW of additional hydroelectric capacity.
- El Cajon hydroelectric plant, located in Nayarit, is under construction with 750 MW of installed capacity. Start-up is scheduled for early 2007.
- CFE will soon begin the tender of La Parota, a new hydroelectric plant located in Guerrero, with 900 MW of total installed capacity and La Yesca, located in Jalisco, with 750 MW.





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Plant	Location	Capacity (MW)	Start-up	
El Cajón	Nayarit	750	2007	
La Parota	Guerrero	900	2011	
La Yesca	Jalisco	750	2011	
La Villita - cap. increase	Michoacán	400	2012	
Infiernillo - repowering	Chiapas	200	2012	
TOTAL		3,000		

CFE's hydroelectric plants under construction or programmed for licitation

Mini-hydraulic Generation Self Supply



- There are ten small hydroelectric plants in operation, with 76 MW of total installed capacity.
- Six more projects have been authorized and are under development, with a total of 95 MW.



Chilatán, Jal.

Mini-hydraulic Generation Permits Granted by CRE



Small hydroelectric plants in operation or under development

Company	Location	Permit Number	Capacity (MW)
PAPELERA VERACRUZANA CERVECERIA CUAUHTEMOC-MOCTEZUMA MINAS SANLUIS COMPAÑIA INDUSTRIAL VERACRUZANA HIDROELECTRICIDAD DEL PACIFICO (Trojes) HIDROELECTRICAS VIRITA COMPAÑÍA DE ENERGIA MEXICANA – ATEXCACO MEXICANA DE ELECTROGENERACION - TACOTAN PROVEEDORA DE ELECTRICIDAD DE OCCIDENTE (Chilatlán) ENERGIA NACIONAL	VERACRUZ VERACRUZ DURANGO VERACRUZ JALISCO VERACRUZ PUEBLA JALISCO PUEBLA	20/AUT/95 E/114/AUT/98 E/115/AUT/98 E/137/AUT/99 E/147/AUT/99 E/150/AUT/99 E/193/AUT/2001 E/204/AUT/2003 E/265/AUT/2003	1.26 6.00 2.14 3.25 9.15 5.73 21.00 6.48 19.00 2.50
TOTAL IN OPERATION			76.51
GENERADORA ELECTRICA SAN RAFAEL MEXICANA DE HIDROELECTRICIDAD MEXHIDRO ELECTRICIDAD DEL ITSMO MEXICANA DE ELECTROGENERACION - TRIGOMIL PROVEEDORA NACIONAL DE ELECTRICIDAD HIDROELÉCTRICA CAJÓN DE PEÑA	VERACRUZ GUERRERO OAXACA JALISCO JALISCO JALISCO	E/121/AUT/98 E/130/AUT/99 E/146/AUT/99 E/203/AUT/2001 E/242/AUT/2003	28.08 30.00 20.00 10.88 5.00 1.20
TOTAL UNDER DEVELOPMENT			95.16

Geothermal Generation Public Service

- CFE has now 960 MW of installed capacity from four geothermal fields.
- Geothermal plants generate 3.3% of the total electric energy production.

CFE's geothermal plants in operation

Plant	Location	Capacity (MW)
Cerro Prieto	Baja California	720
Tres Vírgenes	Baja Calif. Sur	10
Los Azufres	Michoacán	190
Los Humeros	Puebla	40
TOTAL		960

CFE has programmed to increse capacity in Cerro Prieto (100 MW) and Los Humeros (25 MW) in 2010.



Comision Reguladora De Energia

Cerro Prieto, B.C.



Cerro Prieto, B.C.



Los Azufres, Mich.

Wind Generation Public Service



- CFE has a small wind farm located in La Venta, Oaxaca, with 7 turbines and a total capacity of 1.575 MW.
- ✓ It also has a wind generator located in Guerrero Negro, Baja California Sur, with a capacity of 0.6 MW.



La Venta, Oax.



Guerrero Negro, B.C.S.

Wind Generation Public Service



- Recently, CFE opened for bid the installation of 85 MW of wind capacity in La Venta, Oaxaca under the scheme of financed public work.
- ∠ ∠a Venta II wind farm is expected to begin operation by the end of 2006.
- ✓ This year CFE will bid La Venta III as Independent Power Producer with 100 MW capacity to be in operation by 2008.



Under the same scheme, CFE had programmed four more tenders for La Venta IV, V, VI and VII, with 100 MW each – all are expected to begin operation between 2009 and 2012.

Wind Generation Self Supply

- CRE has granted eight additional permits to install a total wind capacity of 1076 MW for self supply purposes:
 - 716 MW in Oaxaca and



Apasco, Coah.

Company	Location	Permit Number	Capacity (MW)
FUERZA EOLICA DEL ISTMO	OAXACA	E/070AUT/98	150.0
BAJA CALIFORNIA 2000	BAJA CALIF.	E/71/AUT/98	60.0
EDF ENERGIES NOUVELLES	OAXACA	E/201/AUT/2001	180.0
FUERZA EOLICA DE BAJA CALIFORNIA	BAJA CALIF.	E/214/EXP/2002	300.0
PARQUES ECOLOGICOS DE MEXICO	OAXACA	E/215/AUT/2002	102.5
EOLIATEC DEL ISTMO	OAXACA	E/322/AUT/2005	163.7
VIENTOS DEL ISTMO	OAXACA	E/404/AUT/2005	120.0
TOTAL UNDER DEVELOPMENT			1076.2

Wind plants in operation or under development



Biomass Generation Self Supply

- Sugarcane industry has a total installed generation capacity of 426 MW operating with bagasse in 48 mills. However, existing plants are old and inefficient.
- Recently, the Commission granted a permit for 40
 MW of additional capacity
- In addition, two paper mills have a permit from CRE to cogenerate steam and electricity with biomass, one with bagasse (10MW) and the second incinerating black liquor (10 MW).
- Three more permits are in operation based on biogas from landfills (18.2 MW) and a fourth one using biogas from the industrial process (1 MW).
- One more project is under development, and has been authorized to generate power using biogas produced by anaerobic fermentation of cow manure (10.6 MW).









Biomass generation – Permits Granted by CRE



Plants operation gith biomass in operation or under development

Company	Location	Permit Number	Capacity (MW)
48 PERMISOS ANTIGUOS			432.1
KIMBERLY-CLARK DE MÉXICO BSM ENERGÍA DE VERACRUZ	VERACRUZ VERACRUZ	E/177/AUT/2000 E/340/AUT/2005	10.0 12.8
TOTAL IN OPERATION			454.9
PIASA COGENERACIÓN	VERACRUZ	E/338/COG/2005	40.0
TOTAL UNDER DEVELOPMENT			40.0

Biogas generation – Permits Granted by CRE



Plants operation gith biogas in operation or under development

Company	Location	Permit Number	Capacity (MW)
SERVICIOS DE AGUA Y DRENAJE DE MONTERREY SERVICIOS DE AGUA Y DRENAJE DE MONTERREY BIOENERGIA DE NUEVO LEON CONSERVAS LA COSTEÑA Y JUGOMEX	NUEVO LEON NUEVO LEON NUEVO LEON EDO. DE MÉXICO	E/56/AUT/97 E/59/AUT/97 E/217/COG/2002 E/297/COG/2004	9.2 1.6 10.6 1.0
TOTAL IN OPERATION			22.4
TRATIMEX	HIDALGO	E/220/COG/2002	10.6
TOTAL UNDER DEVELOPMENT			10.6

Thermosolar Generation – Public Service



- CFE plans to bid this year the installation of a new hybrid power plant (combined cycle + thermosolar) under the financed public work scheme.
- The plant will be located in Agua Prieta, Son., with 240 MW of thermal capacity, and 30 MW of thermosolar capacity.
- The project will receive a grant of 40 million dollars from the Global Environment Fund (GEF).



Photovoltaic cells



- ✓ During the last decade, installation of new photovoltaic cells had an average growth of 8.9% per year.
- From 1993 to 2004, photovoltaic installed capacity increased from 7.1 MW to 18.1 MW.



Photovoltaic installed capacity

Energy Policy



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- The Energy Regulatory Commission (CRE) has fostered the development of new regulatory schemes that encourage specific applications of renewable energy.
- On September 7th, 2001, new regulatory measures were published in the "Diario Oficial de la Federación" with the purpose of encouraging the development of generation projects based on renewable energy sources with intermittent availability, such as solar and wind.
- On February 26th, 2004, a modification of the Interconnection Contract Model was published, to include hydroelectric projects where the operator has no control of the rate of water extraction.
- On January 30th, 2006, a new modification was published, to include the methodology for recognition of plant capacity.

Regulatory framework



- The main elements of this new regulatory scheme are the following:
 - ✓ Generated energy is dispatched whenever available;
 - Excess energy generated at any given time may be "accumulated" within CFE and "withdrawn" when required, even in different time periods;
 - Energy exchange will take place at tariff prices at the interconnection point;
 - At the end of the year, excess energy accumulated in the system can be sold to CFE at 85% of the short-term generation cost;



- The monthly average of the energy generated during peak demand period in working days (one hour period in case of wind and three hour period in case of small hydro) is recognized by CFE as plant capacity;
- The monthly combined peak demand of the associated charges is compared with this recognized capacity to determine CFE's capacity charges;
- Ancillary services are paid in terms of the energy generated and not in terms of the installed capacity;
- Wheeling charges are paid in terms of the transmitted energy and not in terms of reserved capacity.

Fiscal incentives



- On December 1st, 2004 a modification of the Income Tax Law (ISR) was published in the "Diario Oficial de la Federación".
- According to the new fraction XII of Article 40, ISR tax payers that invest in machinery and equipment for power generation based on renewable sources may deduct up to 100% of the total investment in a single year.
- In order to avoid using this as a loop-hole to avoid taxes, this law establishes the obligation to maintain the acquired machinery and equipment in operation for a minimum period of five years.

Renewable energy legislation



- On April 19th, 2005, an initiative for renewable energy was presented to Congress. This initiative is currently under discussion in the Energy Commission of the Lower House.
- The law will require the installation of at least 3,600 MW of new generation capacity powered by renewable sources between the date of approval and the last day of 2012.
- This capacity will include plants dedicated to public service as well as those installed for self-supply from renewable sources based on wind, solar, geothermal, biomass, wave energy, and small hydro of less than 30 MW or the re-vamping of existing hydroelectric installations of greater than 30 MW.

Renewable energy legislation



- ✓ This initiative contemplates the following:
 - The Ministry of Energy will elaborate a Renewable Energy Program and coordinate its execution. This program must establish specific objectives and goals;
 - Excess power generated from renewable sources and delivered to the public network should be paid as a percentage of the short-term generation cost;
 - The Regulatory Commission of Energy should establish specific norms, regulations and contract models for power generated from renewable sources, including the methodology for the recognition of capacity;
 - A trust fund for the promotion of renewable energy sources will be established. This fund will be coordinated by the Ministry of Energy and resources for this fund will be allocated by Congress in the Federal Budget.

Wind potential in Oaxaca



Oaxaca's eolic potential Wind speed distribution

- ✓ The state of Oaxaca has an estimated wind potential of over 10,000 MW.
- As mentioned before, in the following years CFE plans install six plants with a total capacity of 585 MW
- CRE has granted five generation permits with a total capacity of more than 700 MW







 According to a recent communication from the Mexican Association of Wind Energy (AMDEE), its member companies have plans to install 3,200
 MW of wind capacity in Oaxaca in the following decade.



Transmission Limitations



- Existing transmission infrastructure in the region is very limited and does not allow the evacuation of the electric power that will be generated by the selfsupply capacity that have been authorized by the CRE in the southern part of Tehuantepec's Isthmus.
- This certainly imposes a big constrain for the additional capacity contemplated by the AMDEE associates
- According to CFE, a new 400 KV power line with a transmission capacity of at least 1000 MW is required for for that purpose.



Open Season



- ✓ With its budgetary constrains, CFE cannot commit public funds for the construction a a new transmision line if there are not firm commitments of the permit holders to install the appoved generating capacity.
- On the other hand, the permit holders cannot close the deals with their associates and banks if the transmission capacity is not guaranteed by CFE.
- To get around this bottleneck, CRE, CFE and the SENER are, at the present time, carrying out an Open Season to determine the transmission capacity that private generators are willing to reserve under firm bases in order to allow CFE to justify the construction of the new transmission infrastructure required to evacuate the renewable electric energy that will be generated in the region.

Open Season



- ✓ The Open Season started this month.
- CFE provided a cost estimate for the required infraestructure, assuming 1000 MW of new transmission capacity that could enter into operation in 2009.
- On March 17th a meeting was convened to give answer to the major questions raised by the participant companies, and the same day the first round of commitments was received, with a total of 2,565 MW reserved capacity for projects that are expected to enter into operation between 2008 and 2010.
- CFE has now to review its project and analyze wether any of the new generation projects may enter into operation before the new infraestructure is ready, utilizing the existing infraestructure.
- The Open Season must be closed by the end of April, to allow CFE to include the new transmission infraestructure in its budget request for 2007.



Thank you very much

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