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Renewable Energy: The Future of Biofuels

Biofuels/Solar/Wind Mexico

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Regulatory Framework

- Law on the Promotion and Development of Bioenergy (February 2008)
- Regulations of the Law on the Promotion and Development of Bioenergy (June 2009)
  - Note: the Law and Regulations followed a study commissioned in 2006 by the Secretariat of Energy of Mexico (SENER), sponsored by the Inter-American Development Bank (IDB) and the GTZ (German Technical Cooperation)
  - "Potential and Feasibility of the Use of Bioethanol and Biodiesel for Transportation in Mexico"
- Articles 178 and 179 of the Law for Sustainable Rural Development
  - Limits: Food Security and Sovereignty
- Regulatory Agencies
  - Inter-Secretariat Commission for the Development of Biofuels
  - Secretariat of Energy (SENER)
  - Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)
  - Secretariat of Environment and Natural Resources (SEMARNAT)
  - Secretariat of the Economy (SE)
  - Secretariat of Finance and Public Credit (SCHP)

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Ethanol & Biodiesel

Potential, but Limited Usage

- Third largest agricultural producer in Latin America
- Less than 5% of total current energy demand satisfied through bioenergy
- Mexican Energy Reform promotes renewable energy goals
  - 35% of domestic energy from renewable sources by 2025
  - Reduce GHG emissions by 30% by 2020
  - "Clean Energy Certificates": 5% usage by 2018; increases thereafter

Ethanol – Few Production Facilities

- "Plan" to introduce 5.6% to 5.8% ethanol blend in gasoline
- Pilot projects: 6% ethanol
- Replacement for MTBE
- Blending not allowed in major population areas
  - Mexico City, Monterrey, Guadalajara
- 475 Million Gallons (demand); 66 Million Gallons (local production)
- Importation of ethanol from the United States
  - Currently around 20 Million Gallons imported
- Uncertainty about importation of ethanol from the U.S. in the future

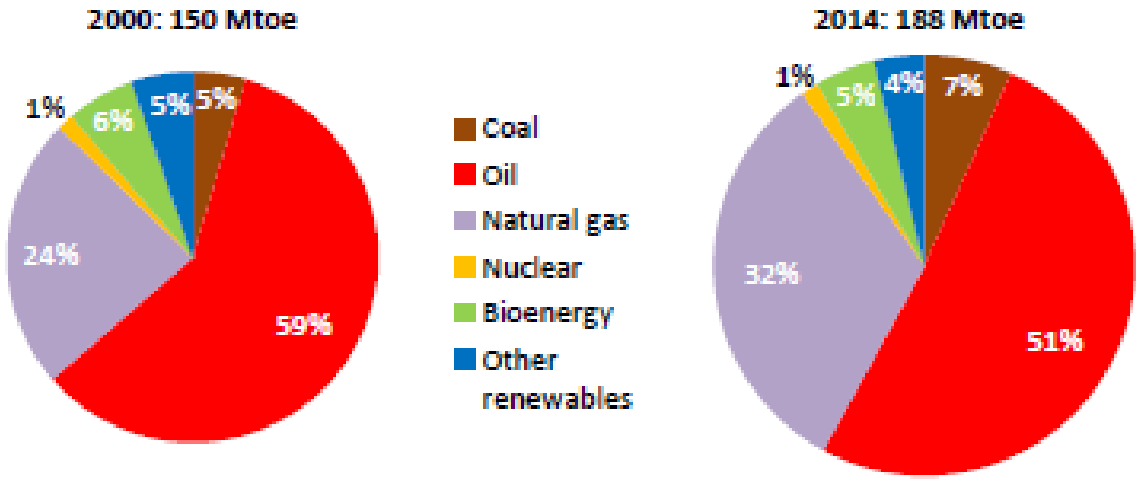
Ethanol & Biodiesel

Biodiesel – Limited Success on Industrial Scale Facilities

- Six industrial biodiesel production plants
  - States of Chiapas, Michoacán and Nuevo Leon
  - Process palm oil, *jatropha*, castor oil, WVO, animal tallow
  - Operations began in 2004; several plants have closed
- Challenges include transport, quality standards, funding

Biofuels: Current Usage

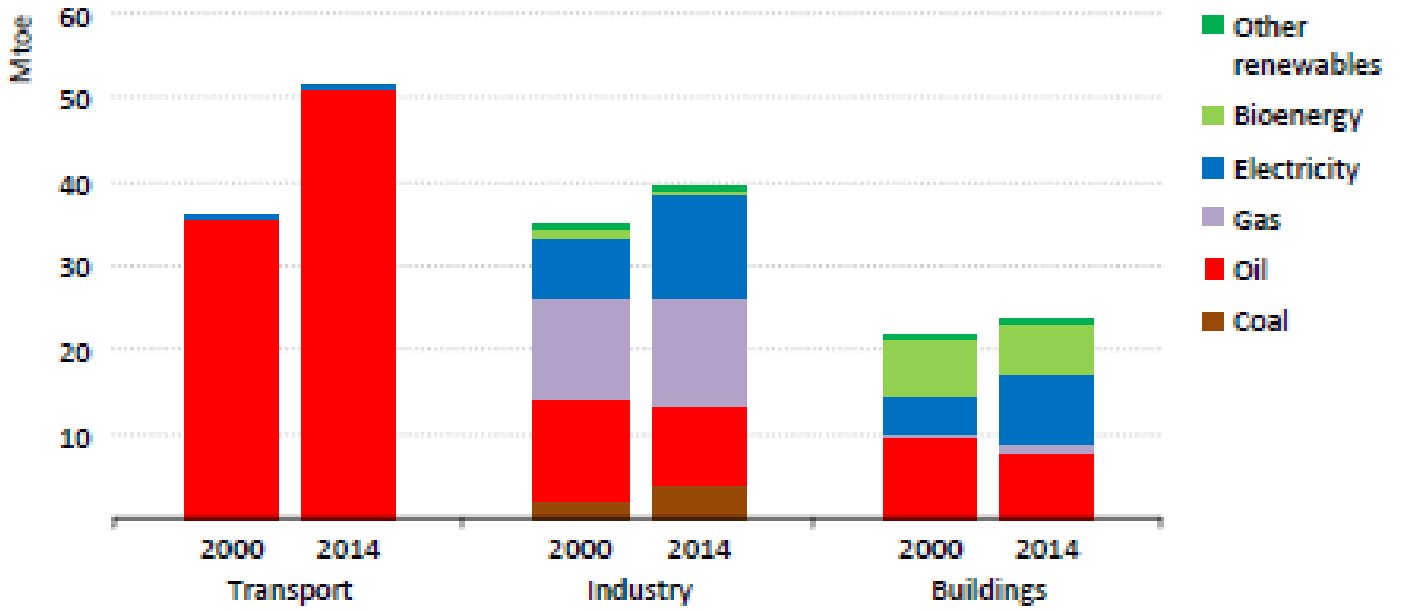
Figure 1.2 ▻ Primary energy demand by fuel



Gas is rapidly expanding its role, but oil remains the dominant force in Mexico's primary energy mix

Biofuels: Current Usage

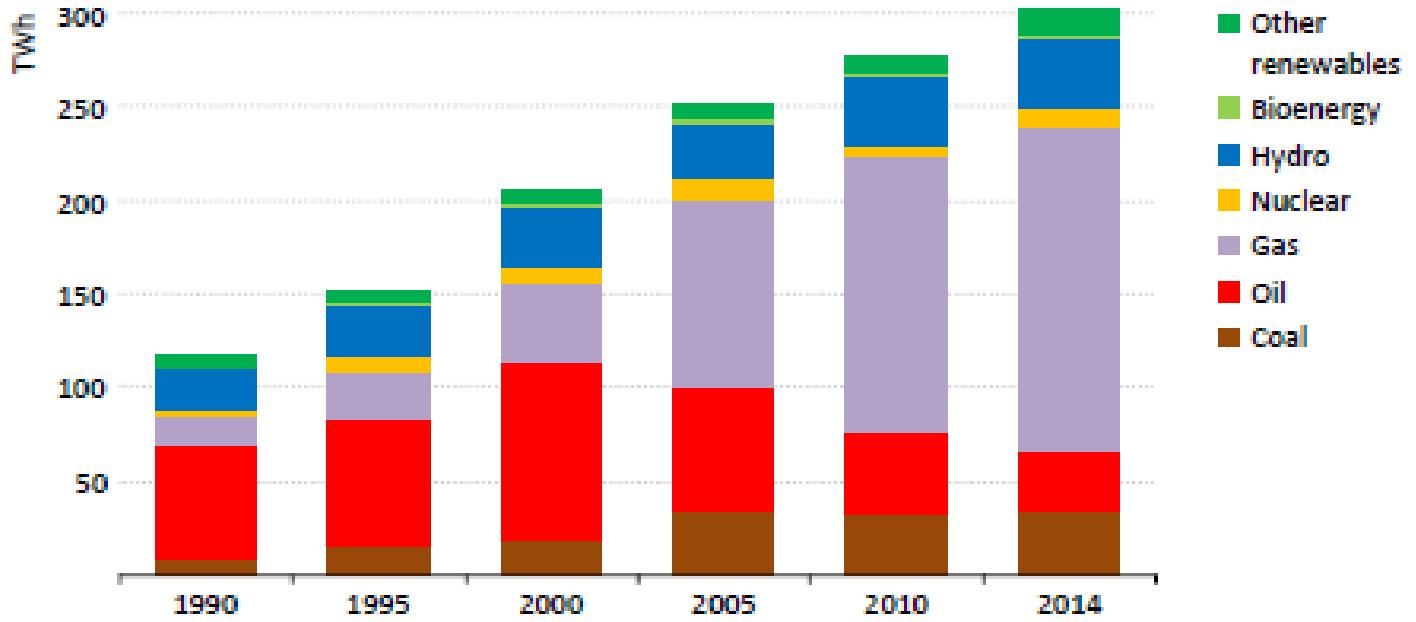
Figure 1.3 ▷ Energy demand by fuel in selected end-use sectors



The oil-dominated transport sector is growing fast and has by far the largest share of final energy consumption in Mexico

Biofuels: Current Usage

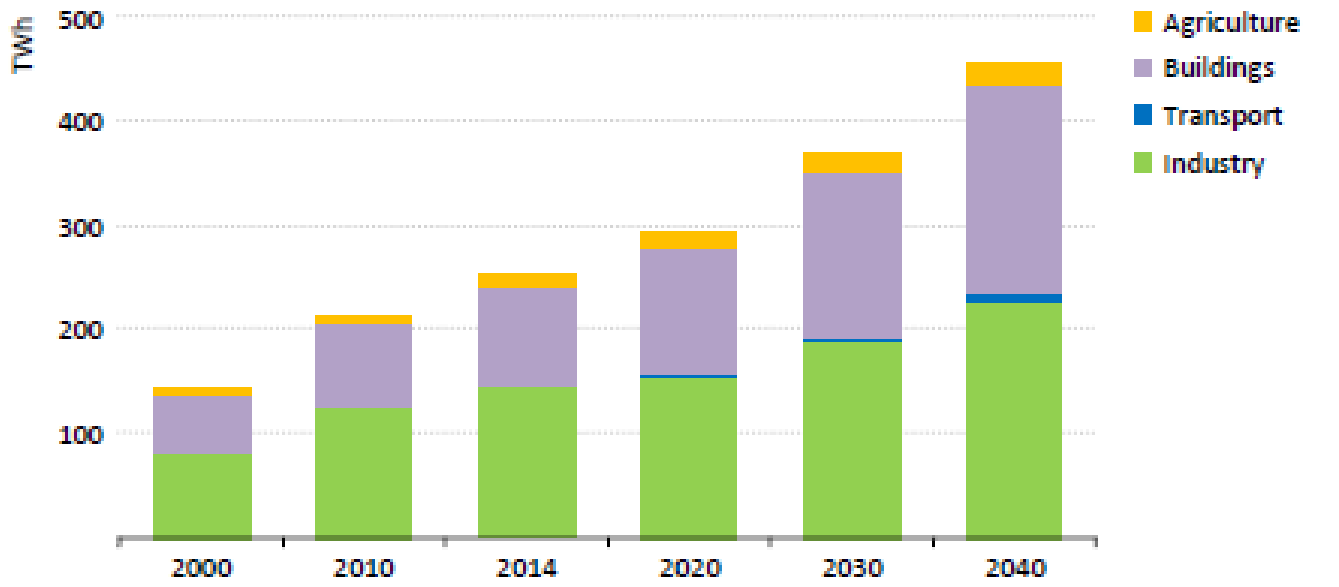
Figure 1.4 ▷ Electricity generation by fuel



Notes: TWh = terawatt-hours. Other renewables include geothermal, solar PV and wind.

Biofuels: Projected Usage

Figure 2.4 ▻ Electricity demand by sector in Mexico in the New Policies Scenario



Industry remains the largest electricity user in Mexico in the New Policies Scenario, although buildings sector demand rises more quickly

Note: TWh = terawatt-hours.

Biofuels: Projected Usage

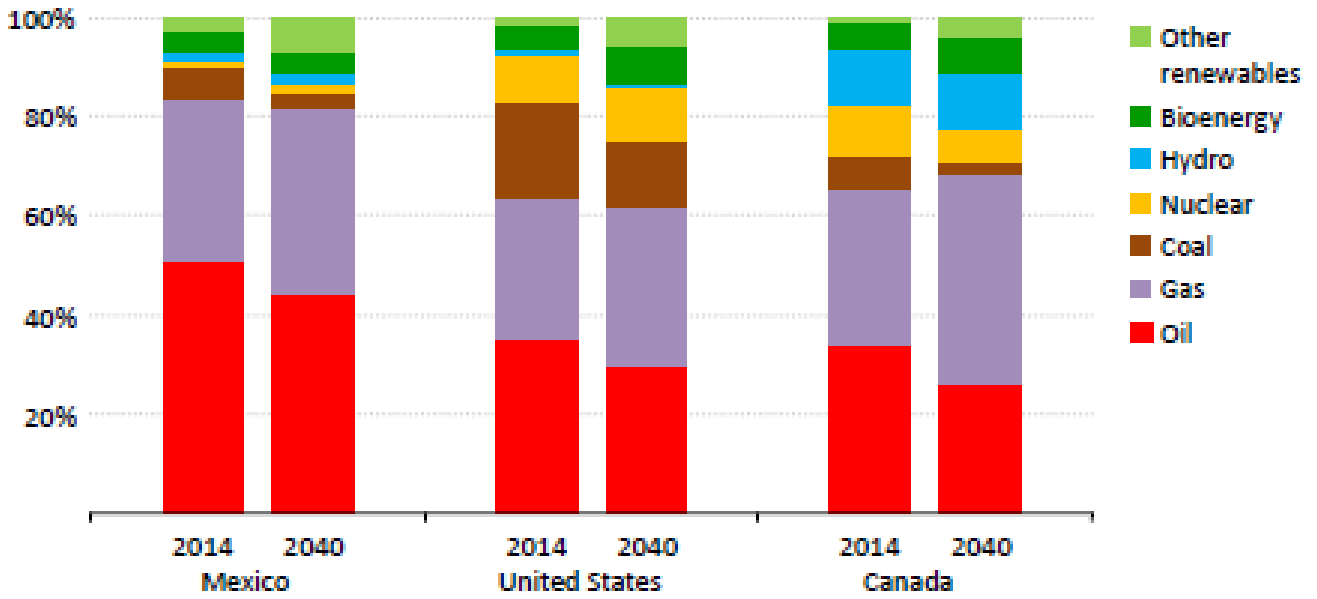
Table 2.4 ▷ Primary energy demand by fuel in Mexico in the New Policies Scenario (Mtoe)

						Shares		CAAGR*
	2000	2014	2020	2030	2040	2014	2040	2014-2040
Fossil fuels	131	170	168	176	186	90%	83%	0.4%
Oil	89	96	91	95	95	51%	42%	-0.1%
Natural gas	35	61	68	74	86	32%	38%	1.4%
Coal	7	13	10	7	6	7%	3%	-3.1%
Renewables	17	16	19	25	31	9%	14%	2.7%
Hydro	3	3	3	4	5	2%	2%	1.4%
Bioenergy	9	9	9	9	9	5%	4%	0.6%
Other renewables	5	4	7	12	17	2%	8%	5.9%
Nuclear	2	3	3	5	7	1%	3%	4.2%
Total	150	188	190	206	225	100%	100%	0.7%

* Compound average annual growth rate.

Biofuels: Projected Usage

Figure 2.10 ▻ Primary energy mix in Mexico and selected countries in the New Policies Scenario



Mexico's energy mix becomes more diverse, but is still more oil-dependent in 2040 than the United States or Canada are today

Note: Other renewables include geothermal, solar PV, concentrating solar power and wind.

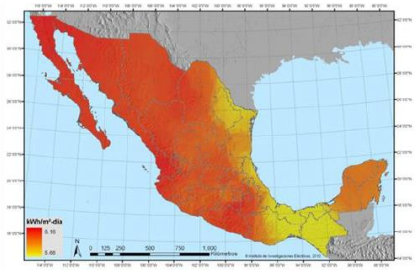
Solar, Wind, Geothermal, Hydro: Clean Energy Potential in Mexico

Clean Energy Goals:

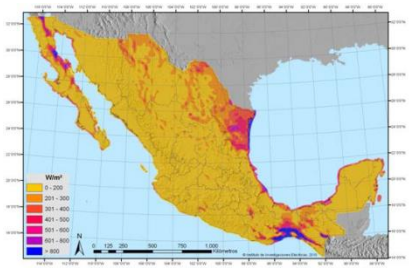
35% in 2024, 40% in 2035 and 50% in 2050

	Installed Capacity 2° semester 2014 (MW)	Renewable Energy Potential			
		Actual Generation Year 2013 (% of total GWh)	Actual Generation + Proven Resources	Actual Generation + Proven Resources +Probable Resource	Actual Generation + Proven Resources +Probable Resources +Possible Resource
Wind	1,900	1.4%	5.3%	5.3%	34.8%
Geothermal	823	2.0%	2.2%	22.5%	40.0%
Solar	64	0.01%	0.6%	0.6%	2,189.4%
Mini Hydro	419	0.5%	1.7%	9.5%	24.4%
Total	**3,206**	**4.0%**	**9.9%**	**37.9%**	**2,288.6%**

Solar Resources



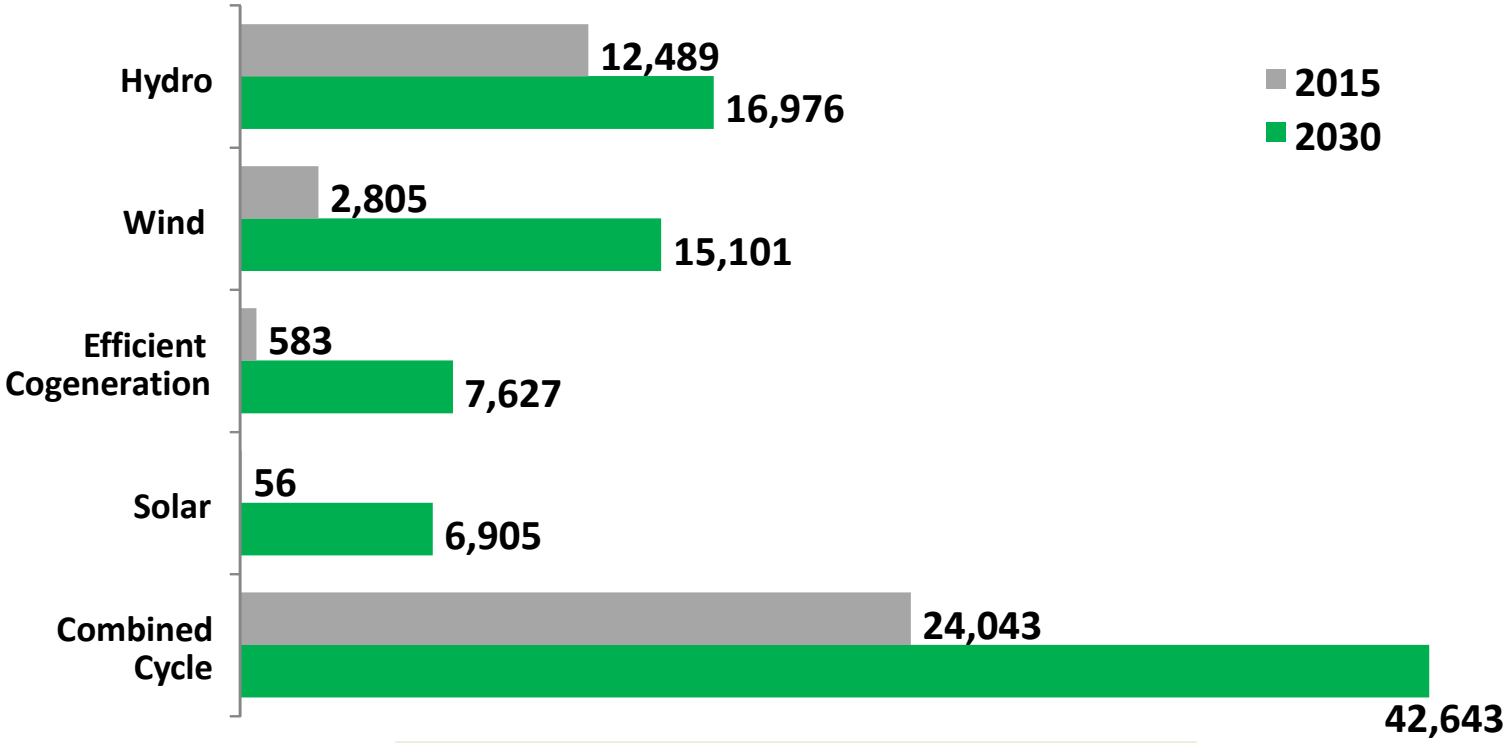
Wind Resources



Geothermal resources

Solar, Wind, Geothermal, Hydro: Cleaner Energy for the Future

Principal Increases in Capacity (MW)



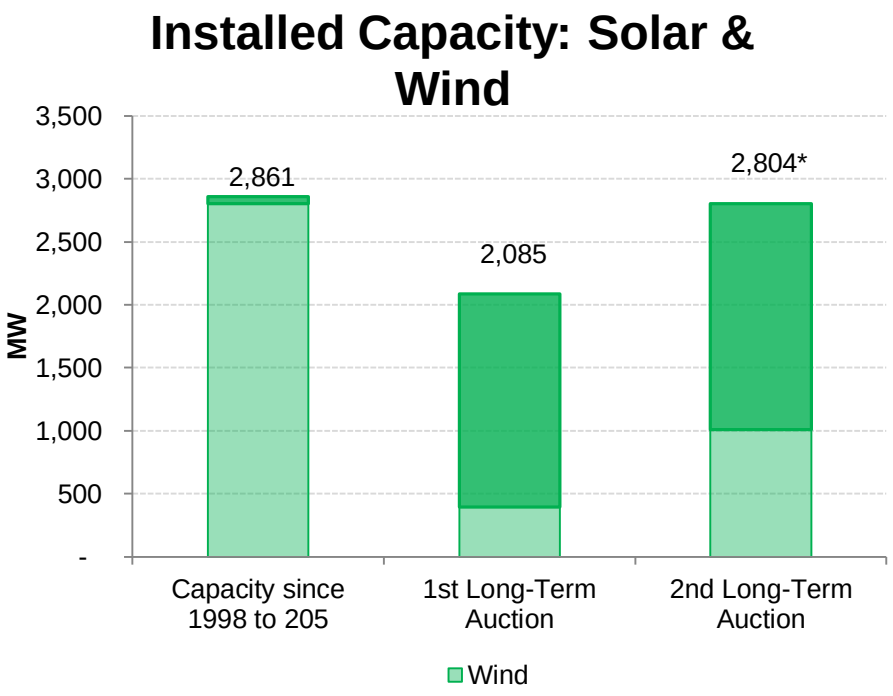
- **Tripled** Clean Energy
- **Increased 75%** Combined Cycle

Solar, Wind, Geothermal, Hydro: Renewables Auctions

Historical Context

Clean Energy: Solar & Wind

Assigned Capacity



Auctions

The First Auction acquired solar and wind capacity equal to 73% of the amount installed in the previous 18 years.

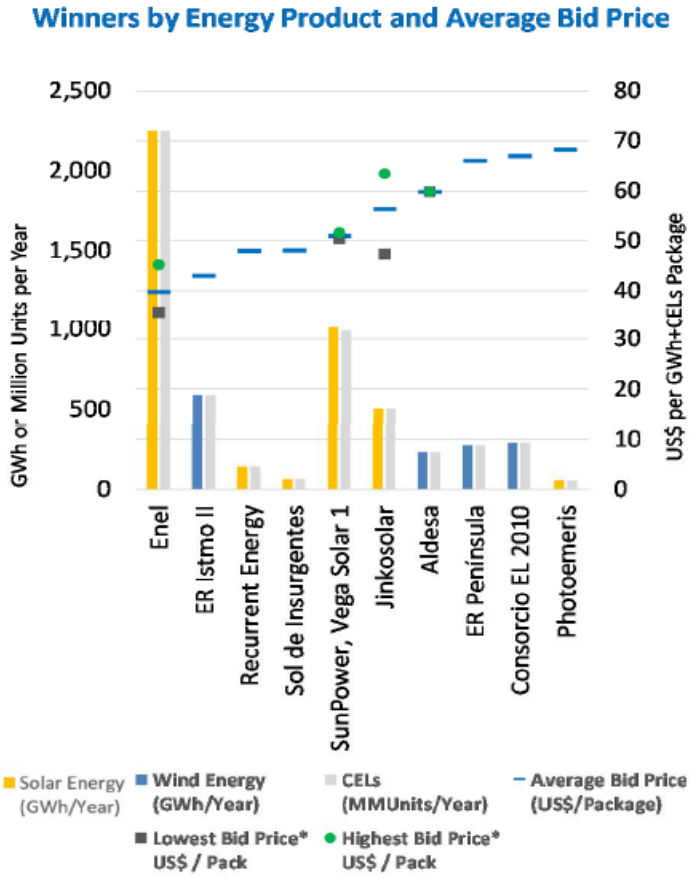
CECs covered 1.9% of annual energy consumption.

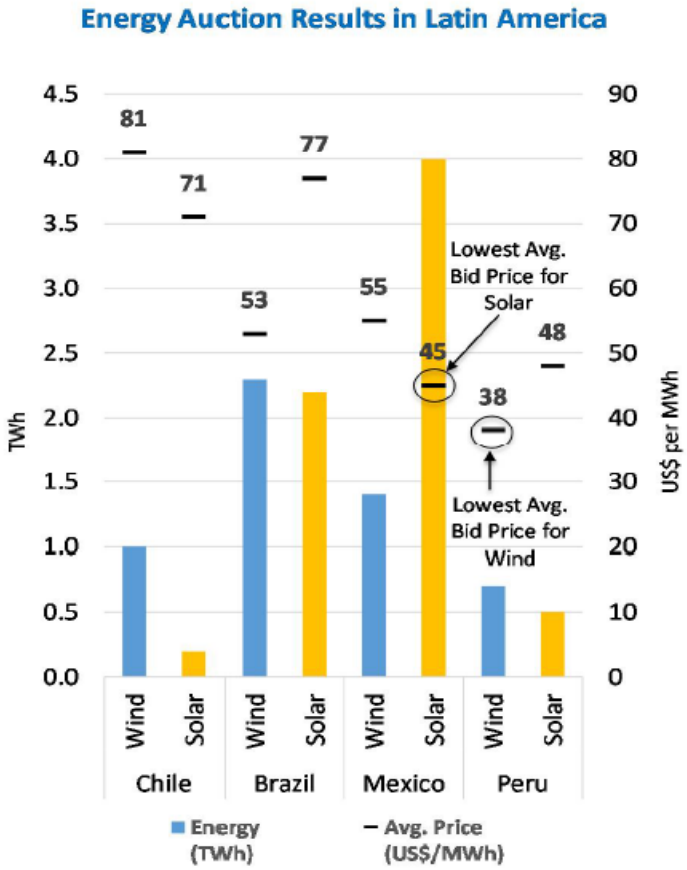
The Second Auction acquired solar and wind capacity equal to 98% of the amount installed in the previous 18 years.

CECs covered 3.2% of annual energy consumption.

Solar, Wind, Geothermal, Hydro: Renewables Auctions

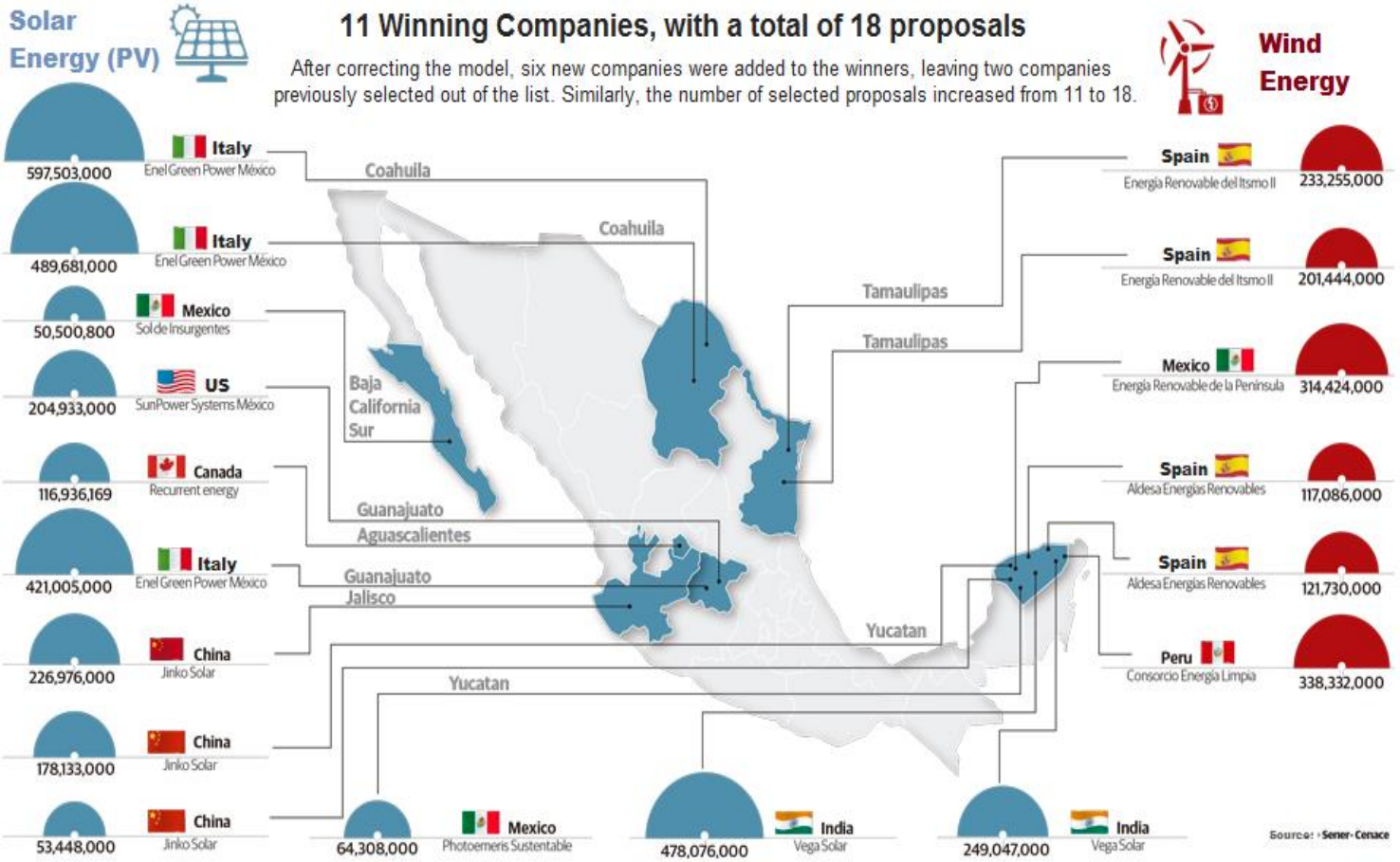
First Auction - CENACE





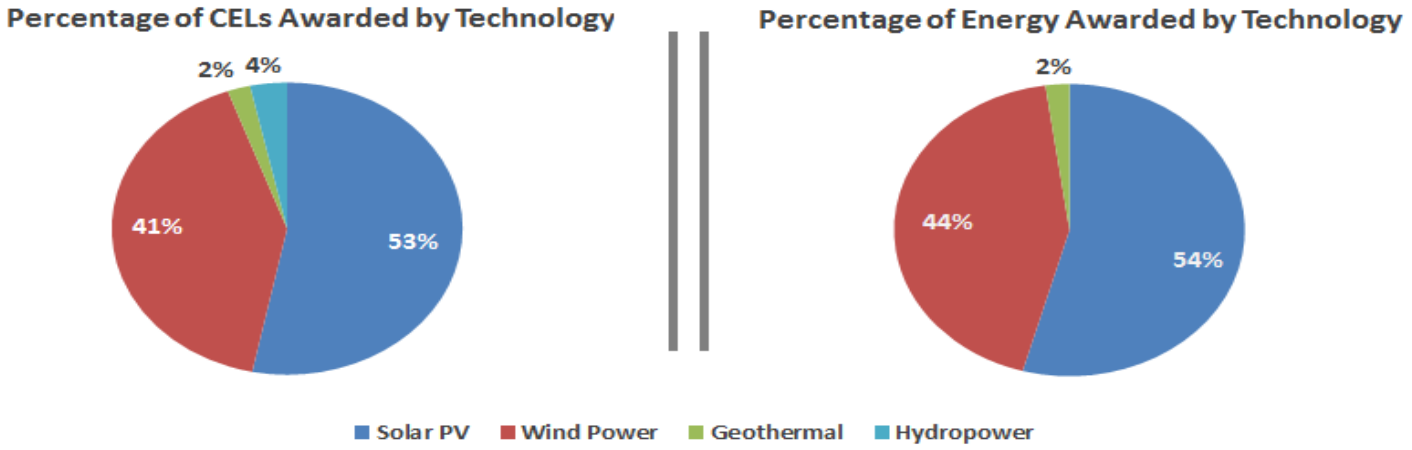
Solar, Wind, Geothermal, Hydro: Renewables Auctions

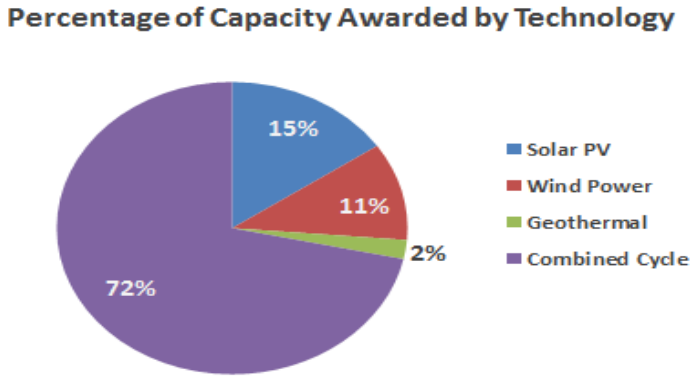
First Auction - CENACE



Solar, Wind, Geothermal, Hydro: Renewables Auctions

Second Auction - CENACE





Solar, Wind, Geothermal, Hydro: Renewables Auctions

Second Auction - CENACE

	Winning Company	CELs	Energy (MWh)	Capacity (MW-year)
1	**Alten Energías Renovables** México Cuatro SA de CV	812,417	722,044	75
2	AT Solar *(JV of **Acciona Energía** and **Tuto Energy**)*	478,260	478,261	29
3	**Bluemex Power** 1 SA de CV	249,982	249,982	0
4	Comisión Federal de Electricidad (**CFE**)	198,764	198,764	400
5	Consorcio **ENGIE** Solar Trompezon	338,851	342,630	0
6	Consorcio **Fotowatio**	779,161	779,162	0
7	Consorcio Guanajuato	146,957	146,958	12
8	Consorcio SMX	285,606	278,358	10
9	**Enel Green Power** México S de RL de CV	399,129	399,130	0
10	Energía Renovable de la Península SAPI de CV *(**Vive Energía** and **Envision Energy**)*	0	0	30
11	Energía Sierra Juarez Holding S de RL de CV *(Owned by **IEnova** and **Intergen**)*	117,064	114,116	0
12	Eólica de Oaxaca SAPI de CV	818,264	818,265	0
13	Frontera México Generación S de RL de CV	0	0	475
14	Generadora Fénix SAPI de CV *(**Mota-Engil** and **SME**)*	314,631	0	0
15	Green Hub S de RL de CV *(subsidiary of **Grenergy**)*	72,919	72,919	10
16	HQ Mexico Holdings S de RL de CV	252,444	252,445	18
17	Kamet Energía México	353,466	353,466	0
18	**OPDE**	289,509	289,509	0
19	Parque Eólico El Mezquite SAPI de CV (**Banco Santander**)	774,938	820,636	77
20	Parque Eólico Reynosa III, SAPI de CV (**Invatán-México**)	1,613, 416	1,613,417	0
21	Quetzal Energía México SAPI de CV	393,611	393,611	0
22	Tractebel Energía de Altamira S de RL de CV (**Engie**)	223,010	223,011	22
23	**X-Elio** Energy SL	363,136	363,137	30

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Robert J. Downing has 30 years' experience in international business transactions and is Board Certified in International Law by The Florida Bar. He focuses on energy, infrastructure, finance, and project development in Latin America. Since joining Greenberg Traurig, a substantial part of his practice has been devoted to the Mexican Energy Reform in the power sector. Prior to joining the firm, Robert was Associate General Counsel at Duke Energy International, a subsidiary of Duke Energy, the largest electric utility in the United States. He worked throughout Latin America. He previously served as Senior Attorney at the Cisneros Group, a Venezuelan conglomerate with global operations. He holds an LL.M. in Energy, Environmental and Natural Resources Law.

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