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# **Renewable Energy Alternatives: Bio-fuels, Solar Energy and Wind Power**

**Odón de Buen**  
MEXICO

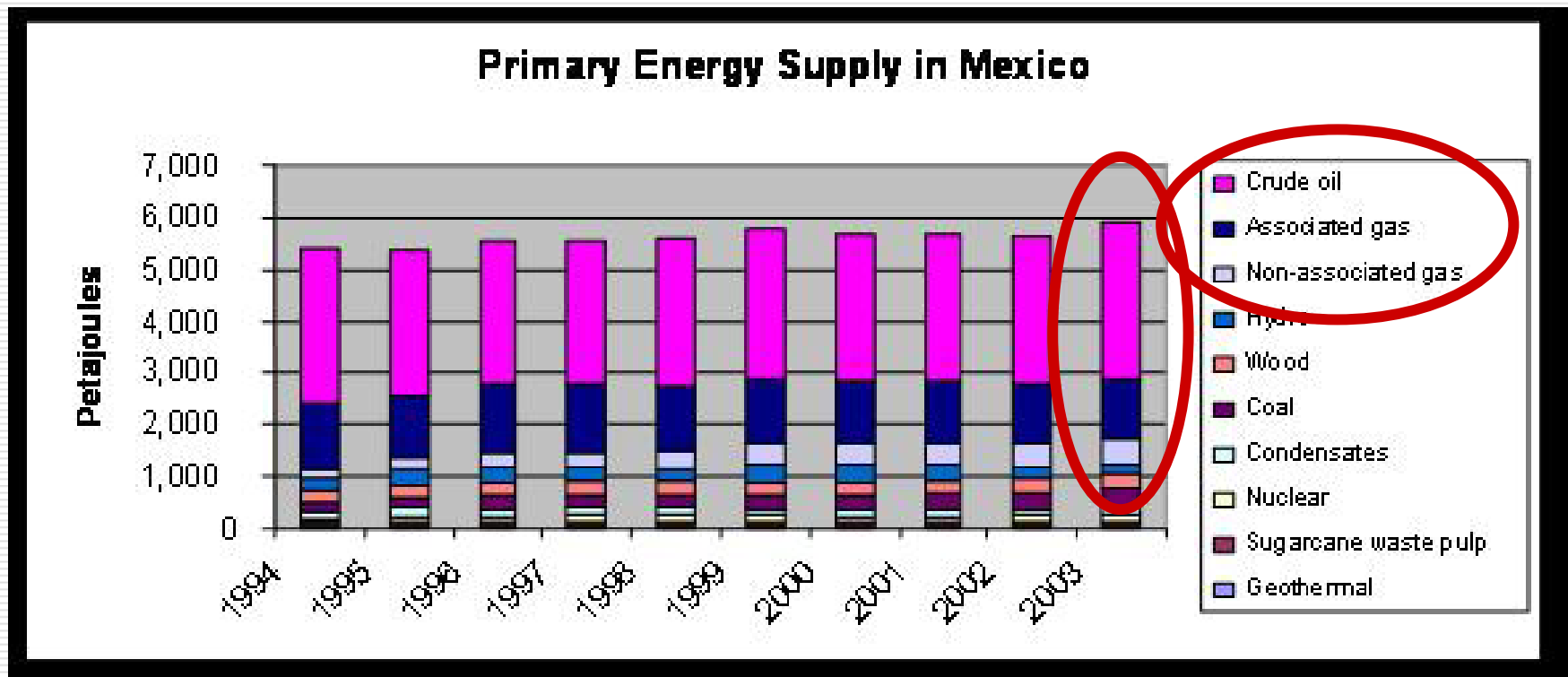
# Mexico and hydrocarbons

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- Mexico is one of the most important oil producers in the world, with an average daily production of 3.8 barrels of oil
  - However, the country's oil abundance – among other reasons - has led to a limited use of renewable-energy resources
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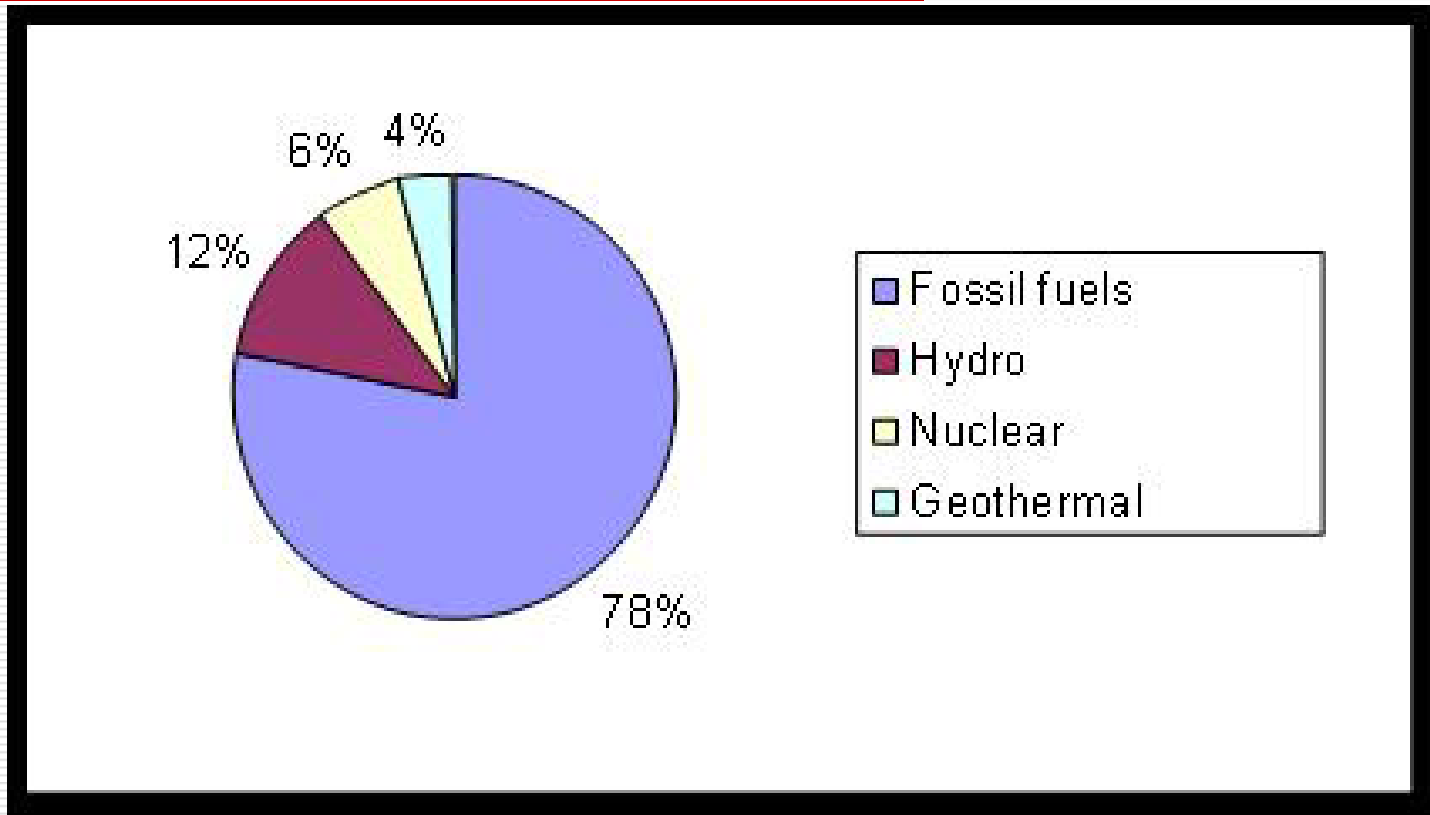
# Mexico is highly dependent on hydrocarbons...

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# ... and power generation is also dominated by hidrocarbons

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Power generation by source, 2005

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# There is an environmental mandate for alternatives

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- "...the federal government also has to...establish those dispositions to be observed for the sustainable use of energy resources"
    - **General Law for Ecological Balance and Environmental Protection**
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# Mexico possesses considerable RE resources (1)

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- **Solar**. More than half of the national territory presents an energy density of **5kWh per square meter**.
  - **Wind**. NREL estimates show that the region of “La Ventosa” in the state of Oaxaca has a potential of more than **33,000 MW** in a 7,000 km<sup>2</sup> area
  - **Small hydro**. Estimated potential is more than **11,500 MW**, including generation plants of more than 200 MW.
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# Mexico possesses considerable RE resources (2)

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## □ Bioenergy.

- A potential between 3,035 PJ/year and 4,550 PJ/year
  - 54% to 81% of present primary energy supply
- **Up to 54% of potential comes from forest products**
  - Up to 11.3 million hectares in energy forest-plantations
- **26% from agro-fuels**
- **0.6% municipal waste**

- ## □ Geothermal. CFE has established that Mexico has a geothermal electricity generation potential of more than **2,000 MW**.
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# Bioenergy



# Bioenergy in Mexico

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- **About 8 % (408 PJ) of total energy consumption is in the form of bioenergy**
    - Wood is used by 25 million people in the rural areas for cooking and small enterprises
    - Bagasse is used in sugarmills
  
  - **Present patterns of use have disadvantages**
    - A large potential is not being used
    - Use is very inefficient
    - There are negative environmental impacts
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# Bioenergy has many benefits (1)

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- **Jobs**
  
  - **Environmental services**
    - Control soil erosion and loss
    - Water flow regulation
    - Habitat for wildlife
      - Forests
    - Helps reduce CO2 emissions and increase its capture
  
  - **Not necessarily in competition with food production**
    - Helps reduce economic risks
  
  - **It doesn't represent a technological problem**
    - But there are niches for technological development
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# Bioenergy has many benefits (2)

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- **Energy diversification**
    - Reduce energy supply risks
  
  - **Economy**
    - Cheaper energy alternatives
      - When more the 30% of gasoline is being imported
  
  - **Economic activity**
    - In production, distribution and end use.
  
  - **About 50% of present energy use could be supplied with different kinds of bioenergy**
    - As fuels, heat or electricity.
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# Barriers to bioenergy are mostly cultural and institutional

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- ❑ **Policy makers relate it with poverty, not with progress**
  - ❑ **Energy policy dominates environmental and rural development policies**
  - ❑ **A public monopoly on fuel supply and distribution doesn't help**
    - Natural institutional resistances by powerful groups
  - ❑ **Subsidies either...**
    - Gasoline, electricity
  - ❑ **Lack of information on resources**
    - We don't know what we have
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# Policy initiatives: Bioenergy

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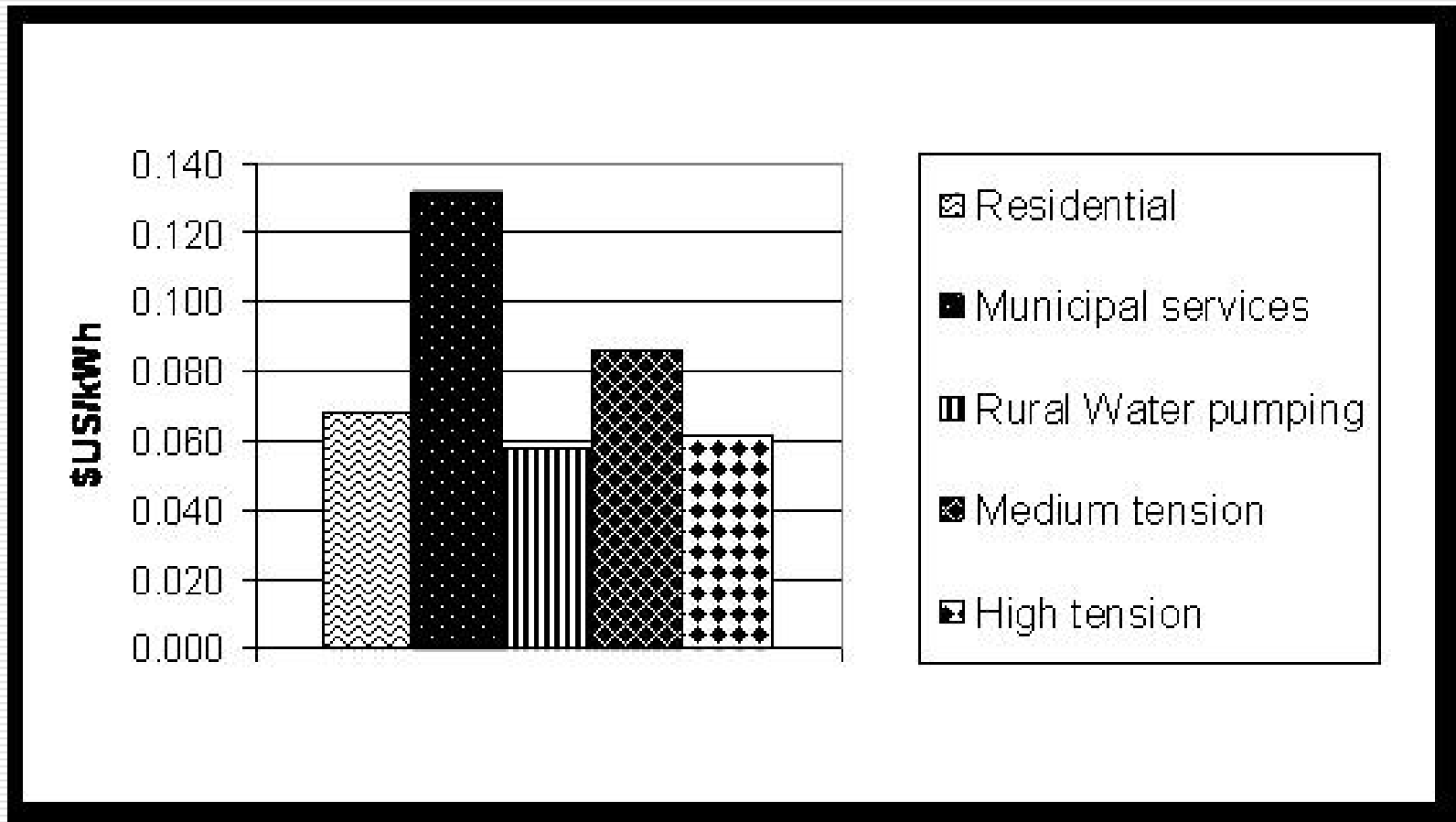
- **A proposed law focused on mandating 10% of ethanol in gasoline in particular**
    - Not really to promote bioenergy in general
  
  - **It has strong backing by agrobusiness**
    - Sugarcane and corn
  
  - **PEMEX just says someone has to pay the costs of the needed infrastructure**
  
  - **It is not a very clear law**
    - As it brings in energy and environmental policy
  
  - **It is still alive**
    - It has gone back to the lower house
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# Power Production

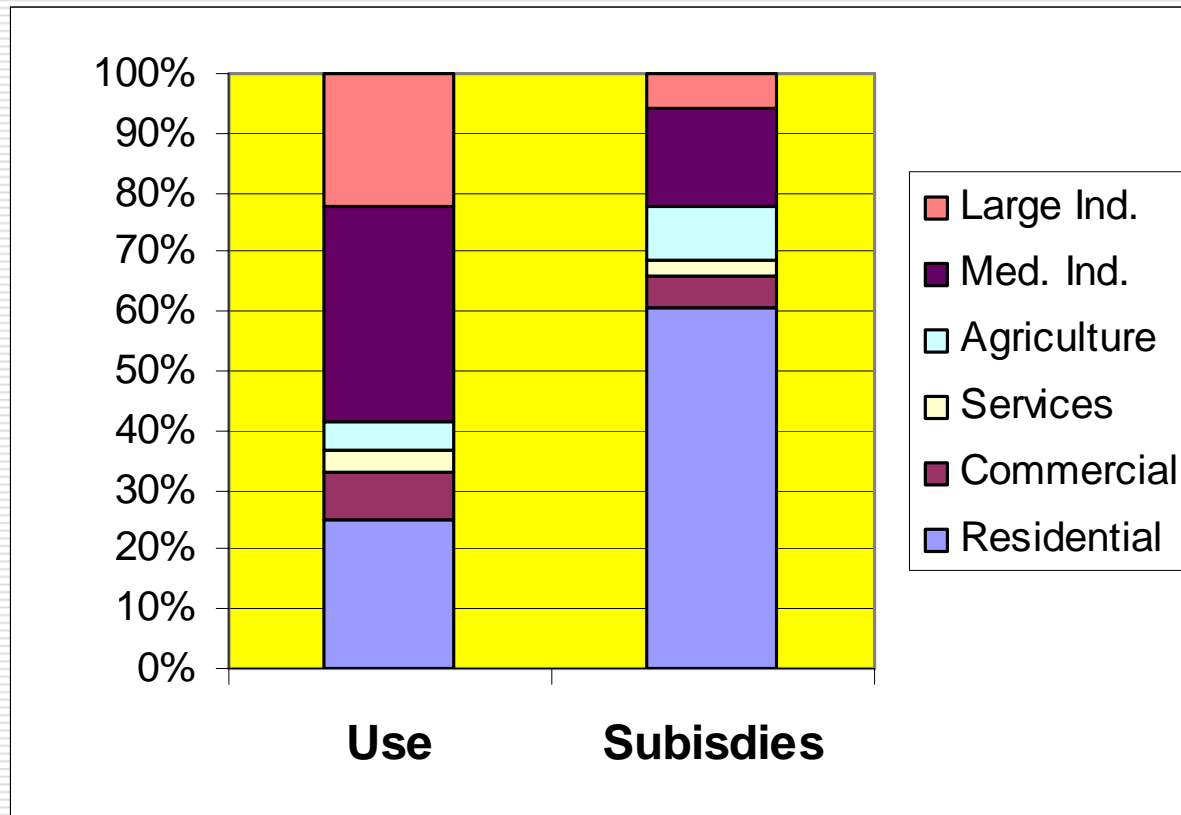
# The majority of electricity end-users are subsidized

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# Subsidies are mainly for the residential sector

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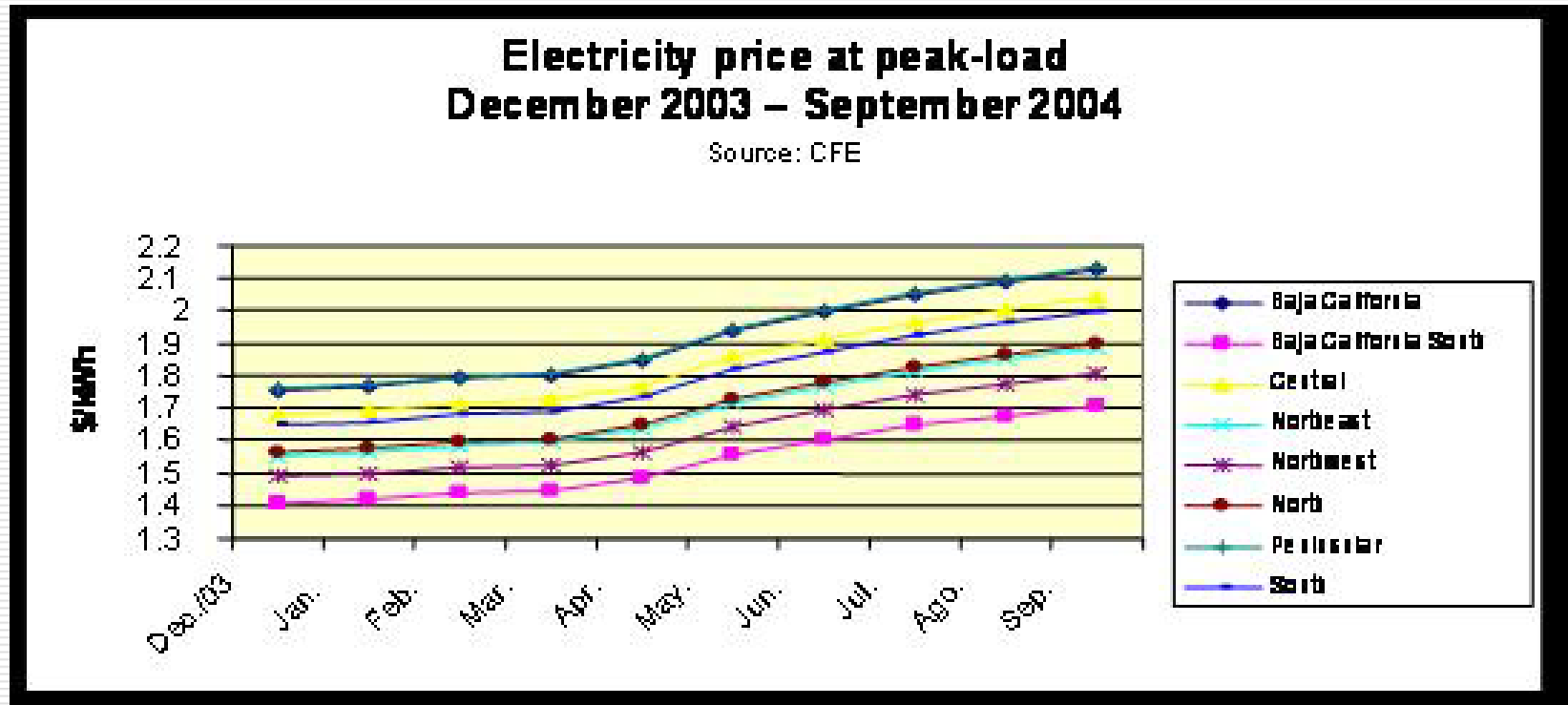
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**Total subsidies are close to US\$7.5 Billion**



# But increasing hourly rates have favoured self-supply projects

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# There are rules that make self-supply ER projects feasible

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- **In 2001 CRE established regulatory instruments which incentivated RE projects through self-supply**
    - Takes advantage of the differentiated costs and rates
  
  - **This allows the licensees:**
    - Capacity support by the utility
    - Power exchanges with the utility, based on hourly rates
  
  - **There was a legal interpretation problem regarding back-up power**
    - Increasing costs in more that 30%
  
  - **A new version of the rules recognizes the capacity contribution of the ER plants**
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# There is great interest by the private sector...

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## Permits for renewable-energy power-generation plants

<i>Status</i>	<i>No</i>	<i>Capacity (MW)</i>	<i>Generation (GWh- año)</i>	<i>Average capacity (MW)</i>
In operation	9	72	4,900	8.1
Under construction	15	1,240	357	82.1
<b>TOTAL</b>	<b>24</b>	<b>1,312</b>	<b>5,257</b>	<b>43.0</b>

As of May 1st, 2006

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# ...but nothing is happening

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- According to CRE, total capacity of permits granted for renewable-energy generation plants “under construction” totalize 1,240 MW.
  
  - The plants are not actually being built
    - 85% of this capacity is placed in wind-energy projects as self-supply
  
  - Developers are waiting for CFE to define an arrangement to build transmission lines for them.
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# However, CFE has plans for wind capacity

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- According to the Electricity Sector Outlook 2004-2013, CFE estimates the installation of more than 450 MW in three generation plants located in La Ventosa, Oaxaca.
  - CFE is already in the construction stage of La Venta II generation plant, which will have an installed capacity close to 90 MW.
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# There is a policy initiative for Renewable Energy

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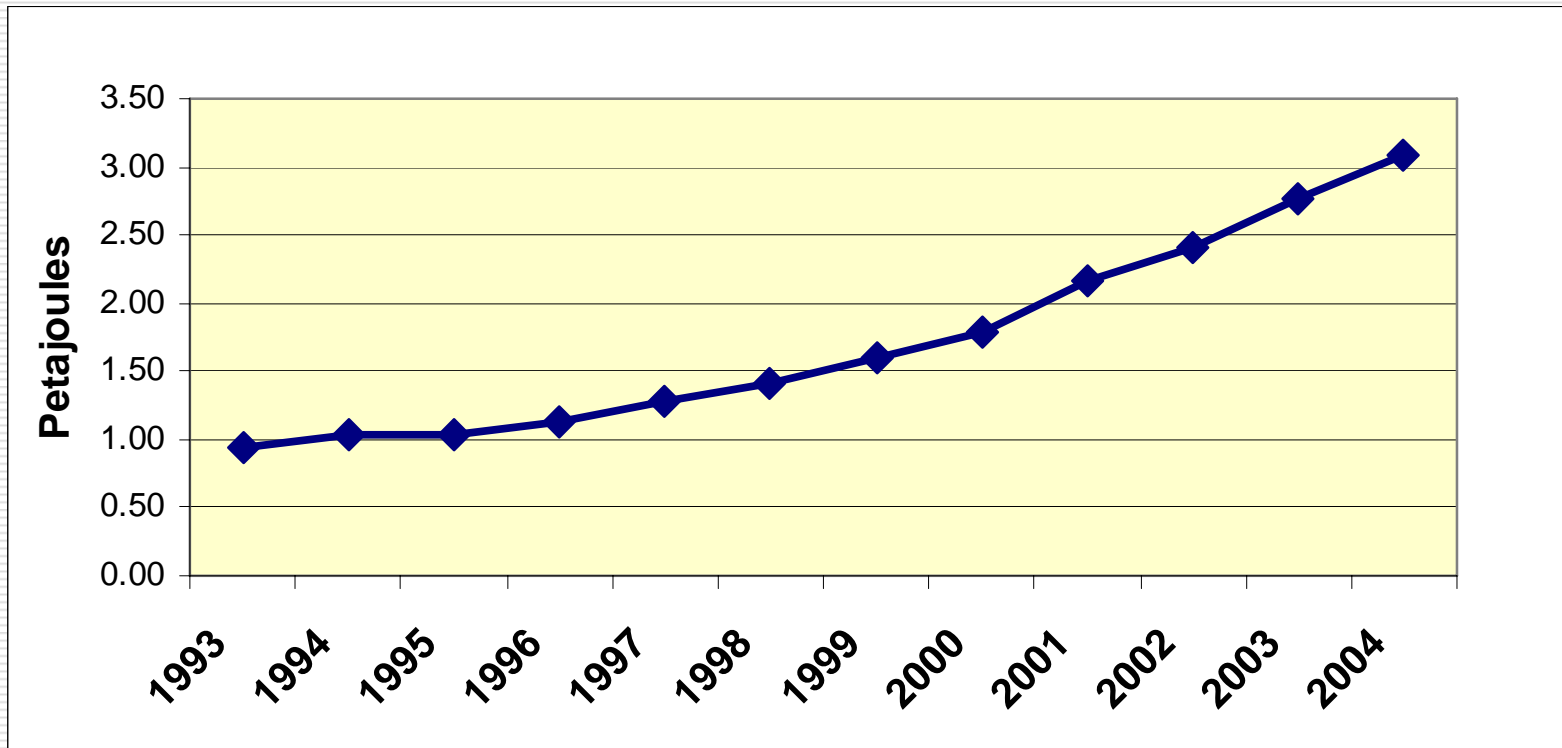
- **A proposed law to give incentives to RE power generation**
  
  - **Developed by the Ministry of Energy**
    - As a complement of a GEF project
    - Did not follow international best practices
      - Open access, non-dispatchability
  
  - **It has not had strong industry support**
    - Political support was poorly built
    - RE industry is very little, anyway
      - And they are more concerned about other issues
  
  - **It is “frozen” in the Senate**
    - On ideological and legal grounds
      - It attempted to bypass the Electricity Law
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# **Solar Water Heating**

# Solar water heating supply in México has grown steadily

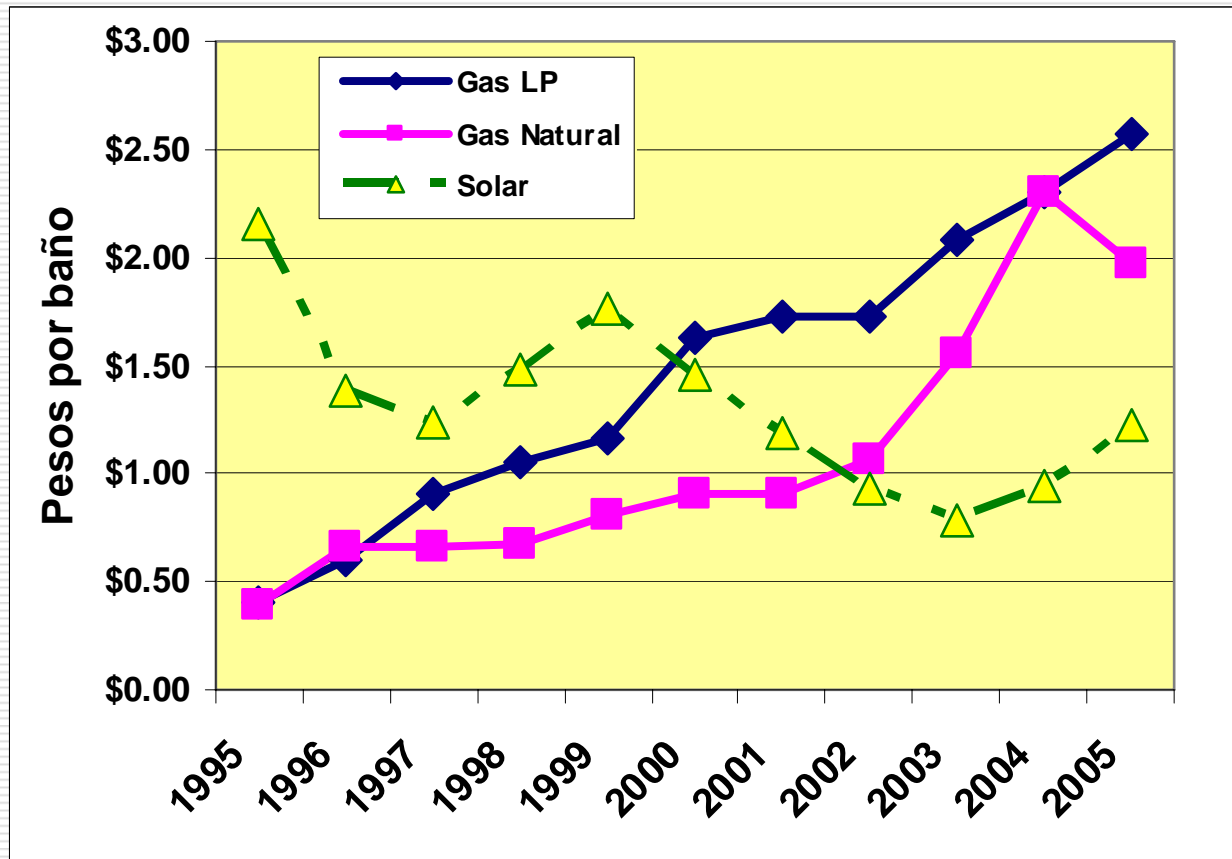
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# The cost of a single hot shower in México has become competitive

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# The future of solar water heating in México

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- **Installed capacity just over 700 thousand square meters**
    - With an estimated 10% yearly growth
    - Mostly for pools and hotels
  
  - **It is economically feasible**
    - As long as interest rates remain low
  
  - **There are policy initiatives**
    - A mandated 30% of heat supplied in new buildings in Mexico City
    - A voluntary product-standard
  
  - **But industry has to mature**
    - Manufacture, distribution, installation and after-purchase services.
    - Testing laboratories, specialized plumbers
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# Conclusions (1)

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- **Mexico has an enormous RE potential**
    - About as large as present energy use
  
  - **Its development could have many benefits**
    - Economic and environmental
  
  - **Subsidies for energy use could be used to promote alternatives**
    - 7.5 US\$ Billion per year just for electricity
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# Conclusions

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- ❑ **But barriers remain**
    - Mainly cultural and institutional
  
  - ❑ **So policy initiatives don't get the attention and support they deserve**
  
  - ❑ **Mexican society should get more involved**
    - Supported by well documented facts, not just opinions loaded with ideology
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