



# How the Free Energy Market Affects the Mexican Society

Daniel Chacón

Iniciativa Climática de México

# Clean Energy: Where we are and where we go

TECHNOLOGY/SOURCE	2014				2015			
	Installed Capacity (MW)	Installed Capacity, %	Gross Generation, GWh	Gross Generation, %	Installed Capacity, MW	Installed Capacity, %	Gross Generation, GWh	Gross Generation, %
Hydroelectric	12,428.71	18.96%	38,822.36	12.87%	12,488.50	18.35%	30,891.54	9.98%
Wind	2,036.42	3.11%	6,426.25	2.13%	2,805.12	4.12%	8,745.15	2.83%
Geothermal	813.40	1.24%	5,999.65	1.99%	925.60	1.36%	6,330.98	2.05%
Sugar cane bagasse	599.18	0.91%	1,220.76	0.40%	670.18	0.98%	1,187.26	0.38%
Photovoltaic	114.16	0.17%	135.49	0.04%	170.24	0.25%	190.26	0.06%
Biogas	85.26	0.13%	191.33	0.06%	80.80	0.12%	203.57	0.07%
Hybrid	0.06	0.00%	0.11	0.00%	0.05	0.00%	0.05	0.00%
Cogeneration	558.65	0.85%	2,892.01	0.96%	583.05	0.86%	3,795.22	1.23%
Nuclear	1,400.00	2.14%	9,677.20	3.21%	1,510.00	2.22%	11,577.14	3.74%
Black Liquor	25.50	0.04%	10.15	0.00%	25.50	0.04%	27.36	0.01%
Regenerative braking	7.00	0.01%	-	0.00%	6.61	0.01%	3.60	0.00%
<b>SUBTOTAL CLEAN ENERGIES</b>	<b>18,068.34</b>	<b>27.57%</b>	<b>65,375.31</b>	<b>21.68%</b>	<b>19,265.65</b>	<b>28.31%</b>	<b>62,952.13</b>	<b>20.34%</b>
<b>FOSSIL ENERGIES</b>	<b>47,469.95</b>	<b>72.43%</b>	<b>236,171.67</b>	<b>78.32%</b>	<b>48,778.39</b>	<b>71.69%</b>	<b>246,600.66</b>	<b>79.66%</b>
<b>TOTALS</b>	<b>65,538.29</b>	<b>100.00%</b>	<b>301,546.98</b>	<b>100.00%</b>	<b>68,044.04</b>	<b>100.00%</b>	<b>309,552.79</b>	<b>100.00%</b>

**Energy Transition Law (ETL)**

**35% @ 2024**

**30% @ 2021**

**25% @ 2018**



# ETL Results: Energy and CELs Auctions

**5,000 megawatts by 2019**  
**6,600 million USD**

**1<sup>a</sup>. Long term auction**

2180 megawatts by 2018  
47.7 USD/MWh average price  
2,600 million USD.

**2<sup>a</sup>. Long term auction**

2871 megawatts by 2019  
33.47 USD/MWh  
4,000 million USD.

# Mexico's Electricity Industry in the Previous 70 Years

- State monopoly for the whole electricity value chain
- Two state companies: *Luz y Fuerza del Centro* and *Comision Federal de Electricidad (CFE)*
- Until 1992, no regulation at all. In 1992 the Energy Regulatory Commission was created with little power
- Electricity Planning was conducted by CFE and economically supported by the Treasure Ministry
- Electricity was considered strategic for the State and as a “Public Service”

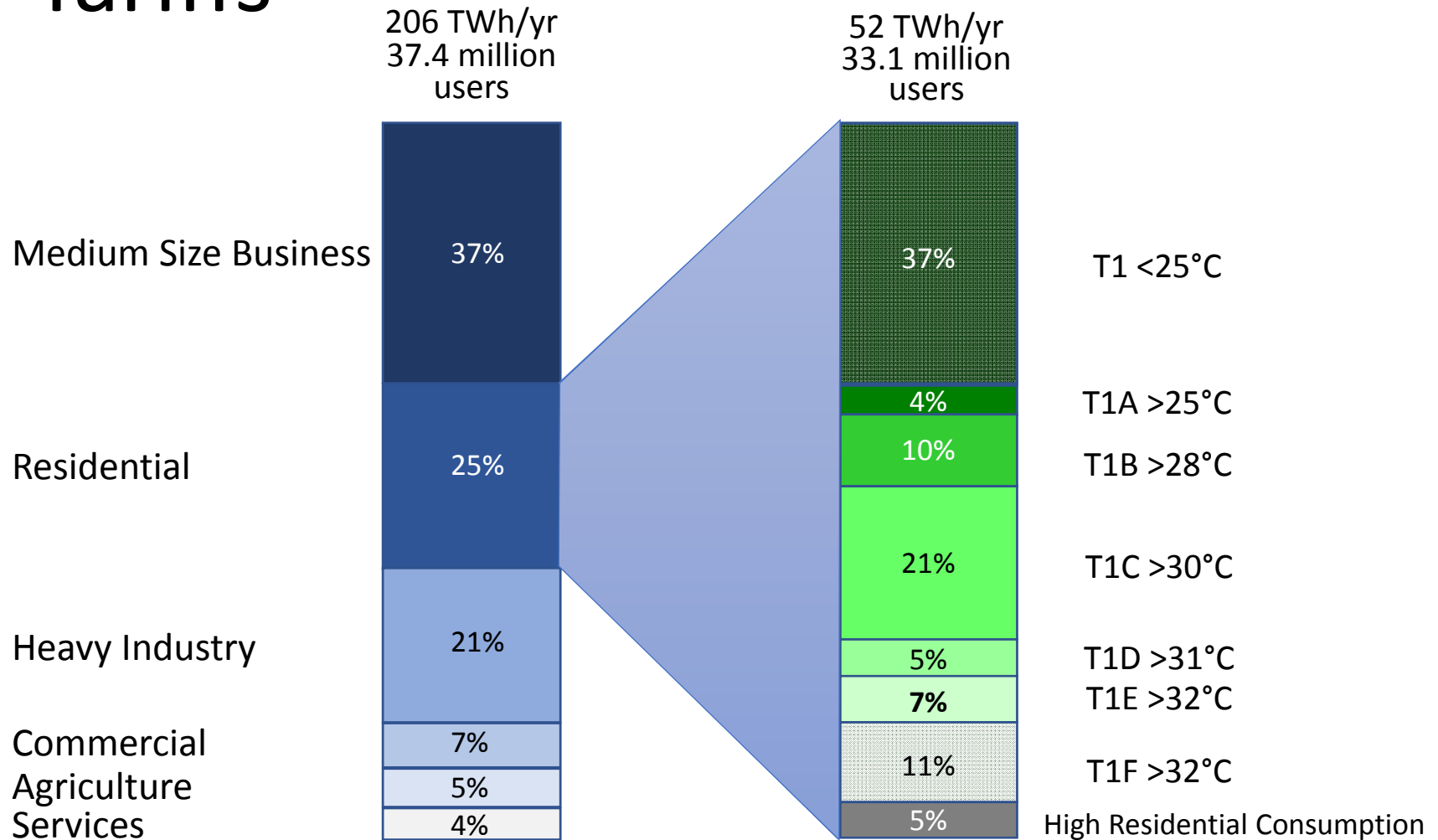
# Tariffs under the Monopoly

- As a public service, electricity tariffs were set up by the Treasury Ministry
- Little or no cost considerations were taken into consideration for the tariff set up.
- Electricity subsidies were introduced in 1970 for: residential, water irrigation, and public services (potable water pumping)
- Subsidies were increased over the years as a way to placate politically strong groups, grant political supporters, avoid political risk with adversaries... and as way to alleviate poverty
- At the beginning, subsidies were provided by CFE in exchange to fiscal obligations. Later, when funds were insufficient, by CFE debt.

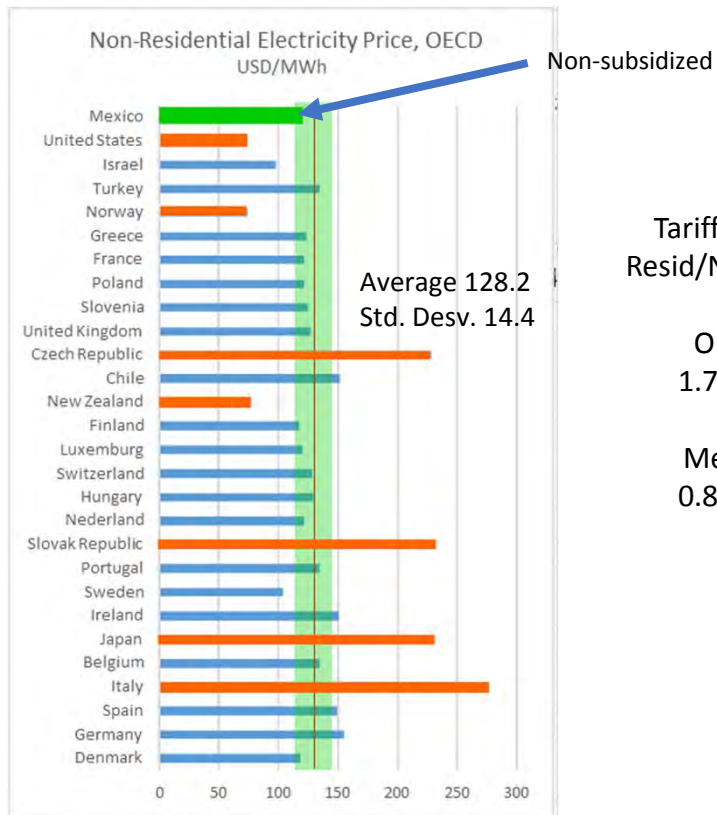
# Industrial and Commercial Tariffs

- Industry and Commerce (I&C) do not enjoy subsidies.
- Tariff for I&C were –more or less- set up taking costs into account with a plus, as a way to compensate subsidies.
- I&C tariffs have been traditionally high compared to United States tariffs. Private sector always has complained about this subject.
- I&C tariffs were one of the drivers for the energy reform in the electricity sector

# Consumption and Residential Tariffs



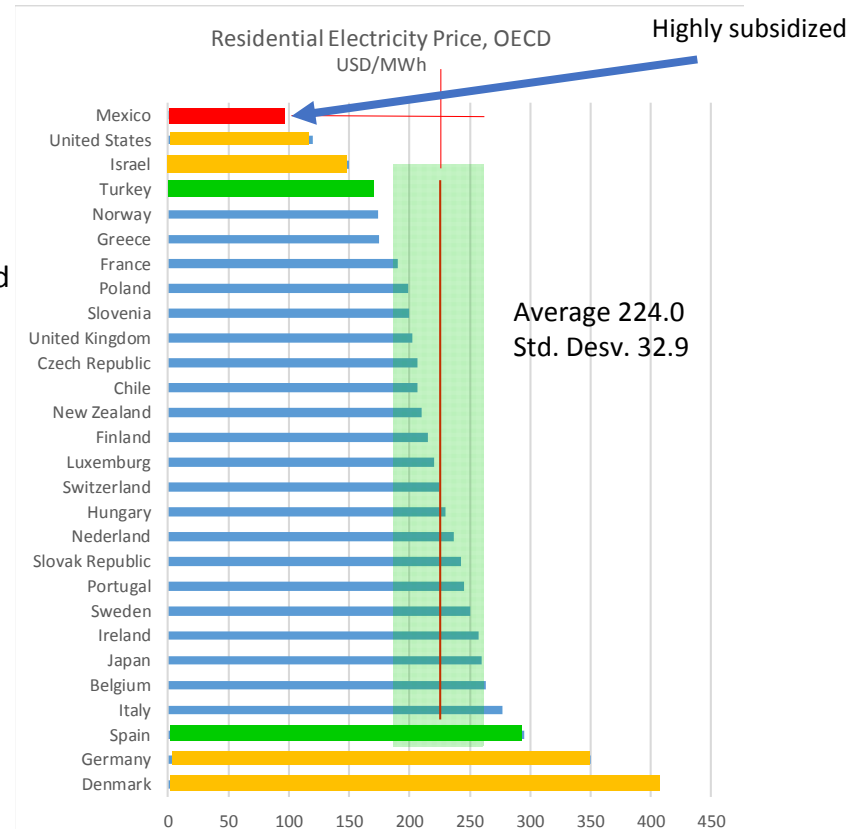
# Residential and Non-Residential Tariffs in OECD Countries



Tariffs Ratio  
Resid/Non-resid

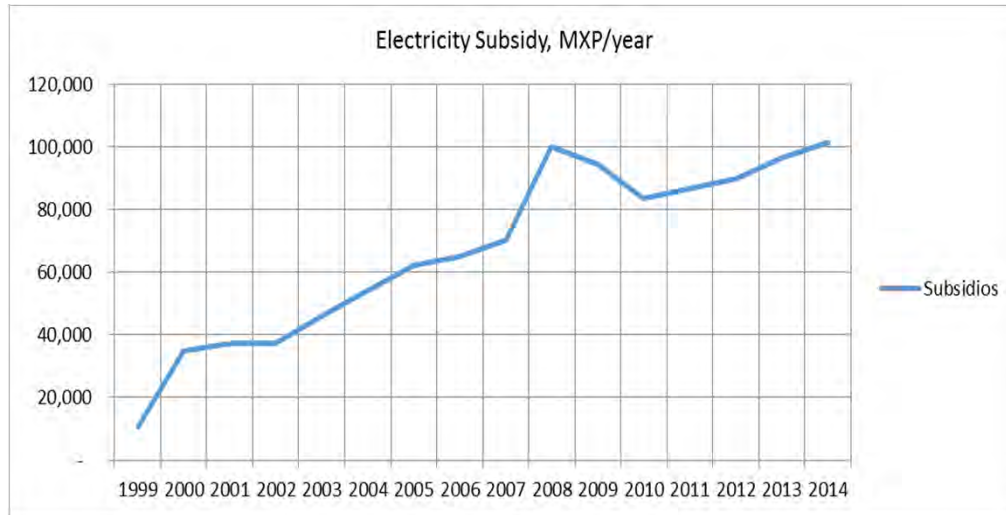
OECD  
1.7 : 1.0

Mexico  
0.8 : 1.0

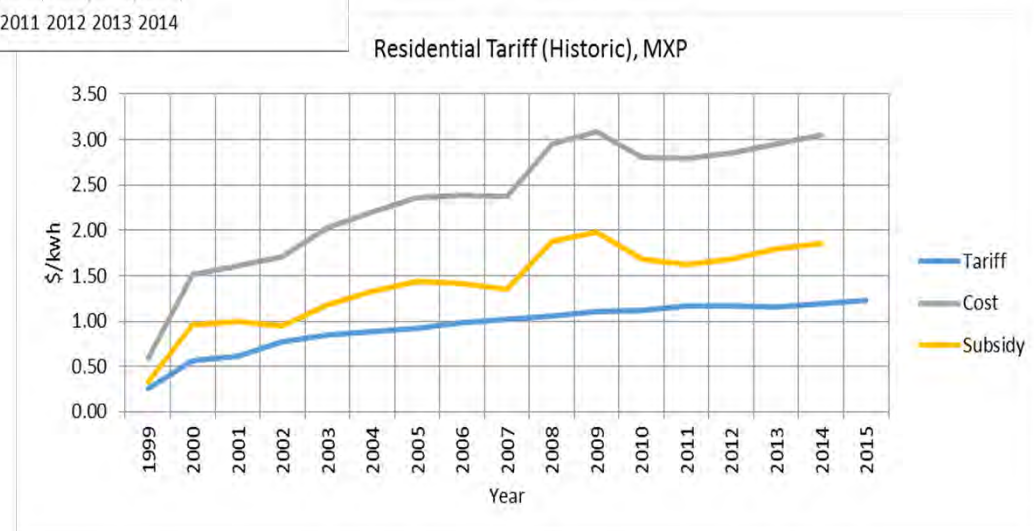




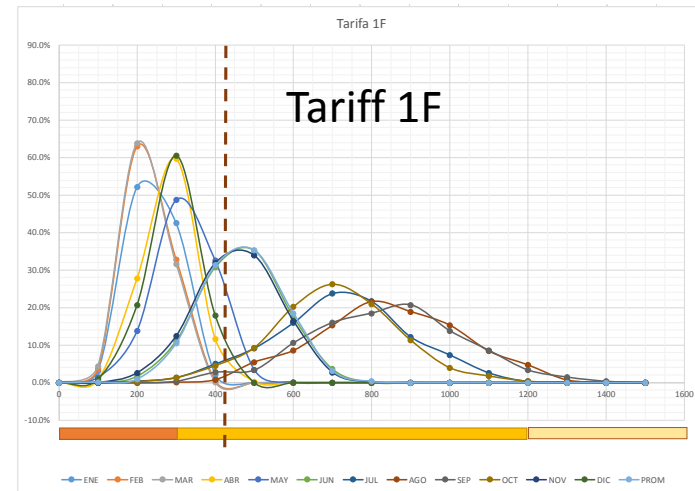
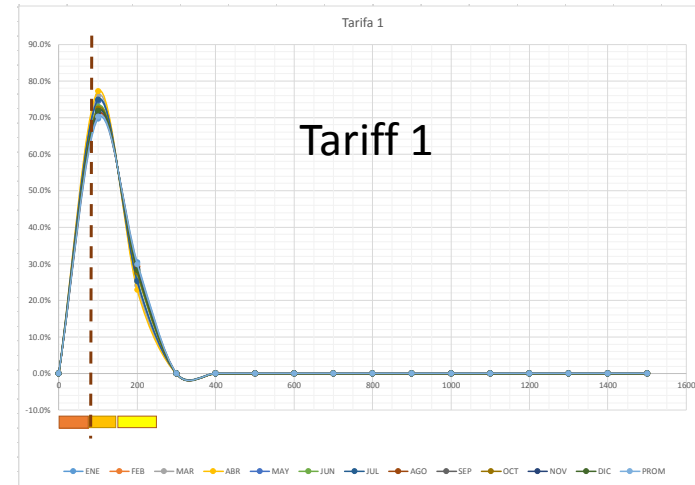
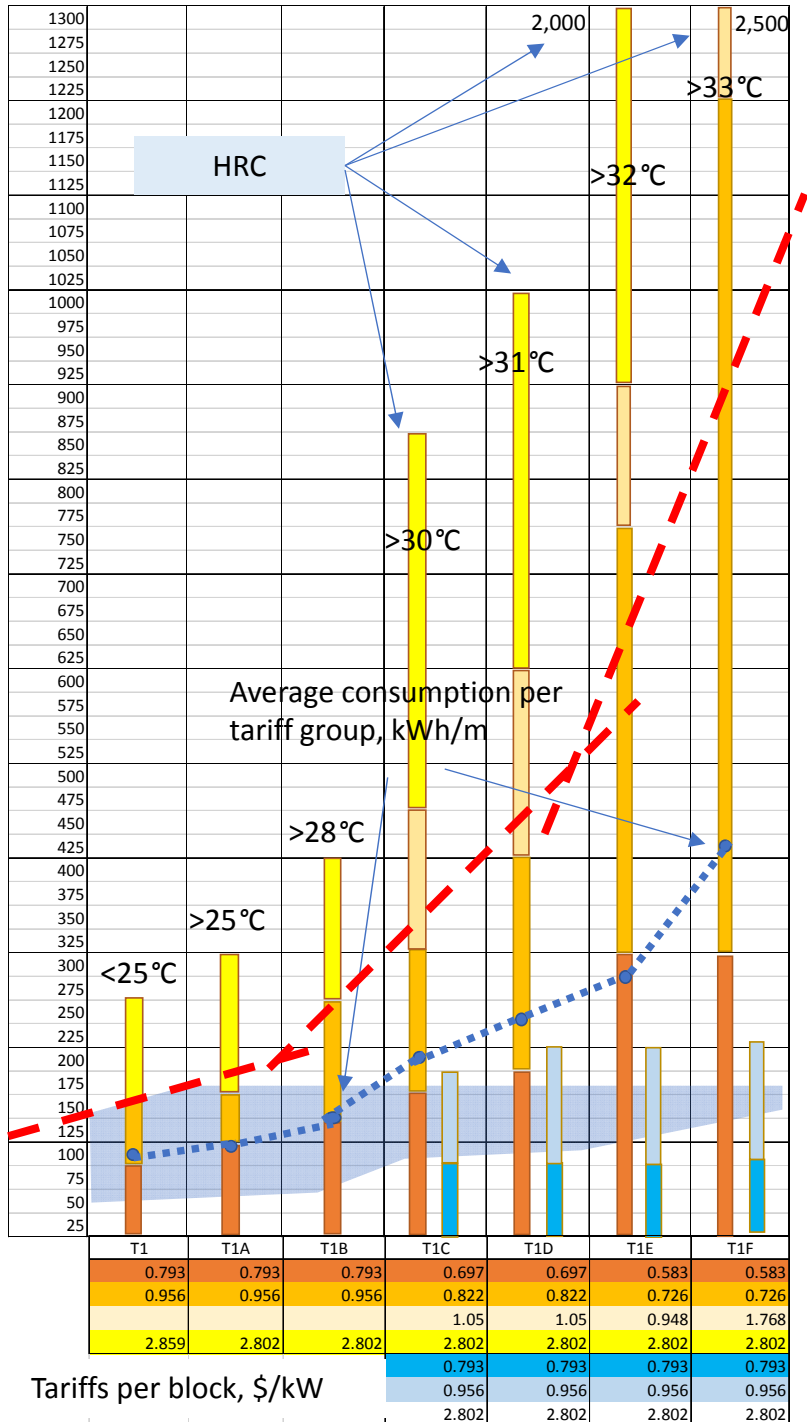
# Subsidy for Residential Electricity



However, despite the high electricity subsidy, there are 12 million houses in “*energy poverty*”



# Domestic Tariffs Structure

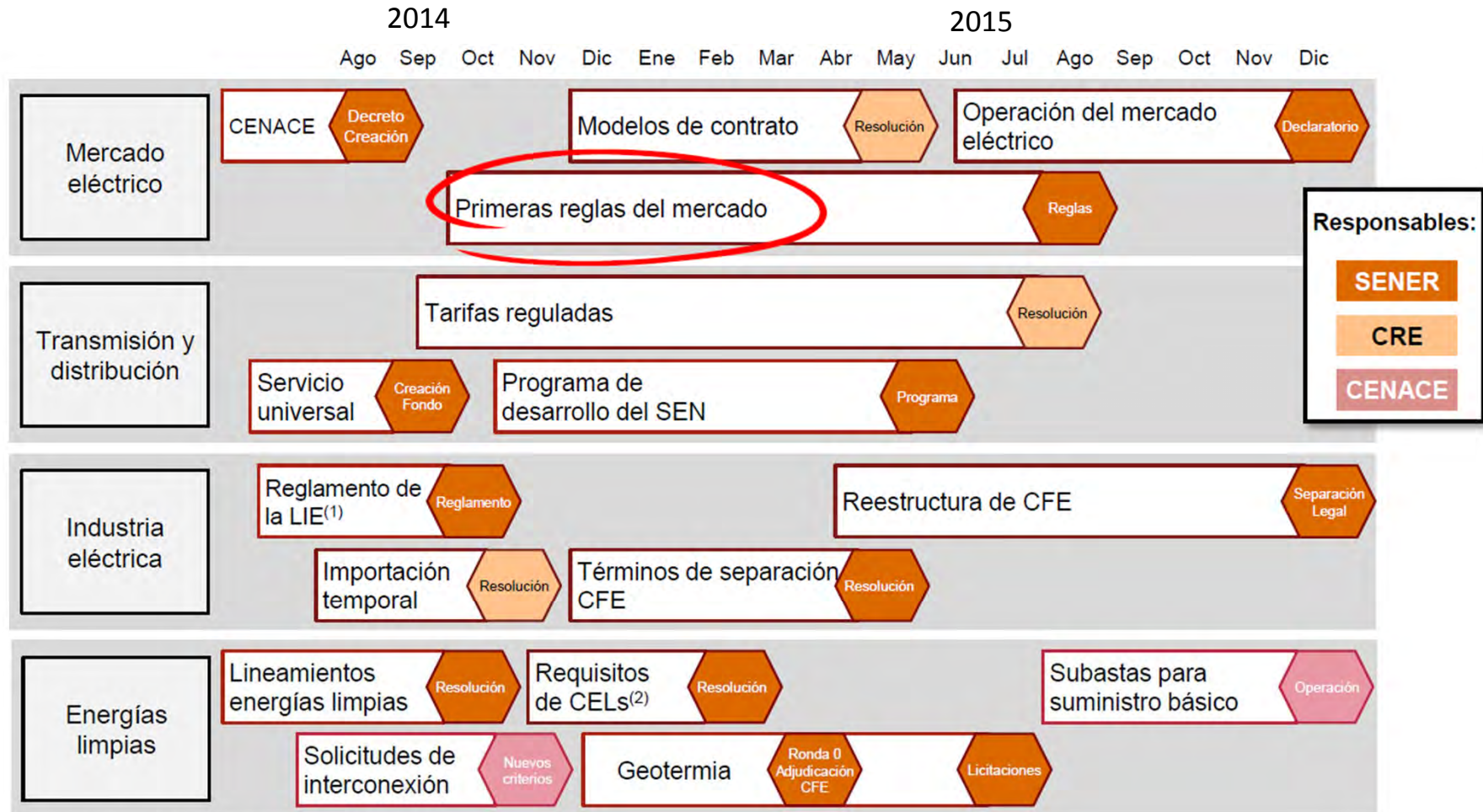


# Market Approach

- Non discriminated access
- Independent transmission provider
- Flexible transmission service with tradable congestion revenue rights
- Transmission pricing reform
- Open and transparent energy spot markets; day ahead and real time markets for energy and ancillary services
- Congestion management through location marginal pricing
- Market monitoring
- Others

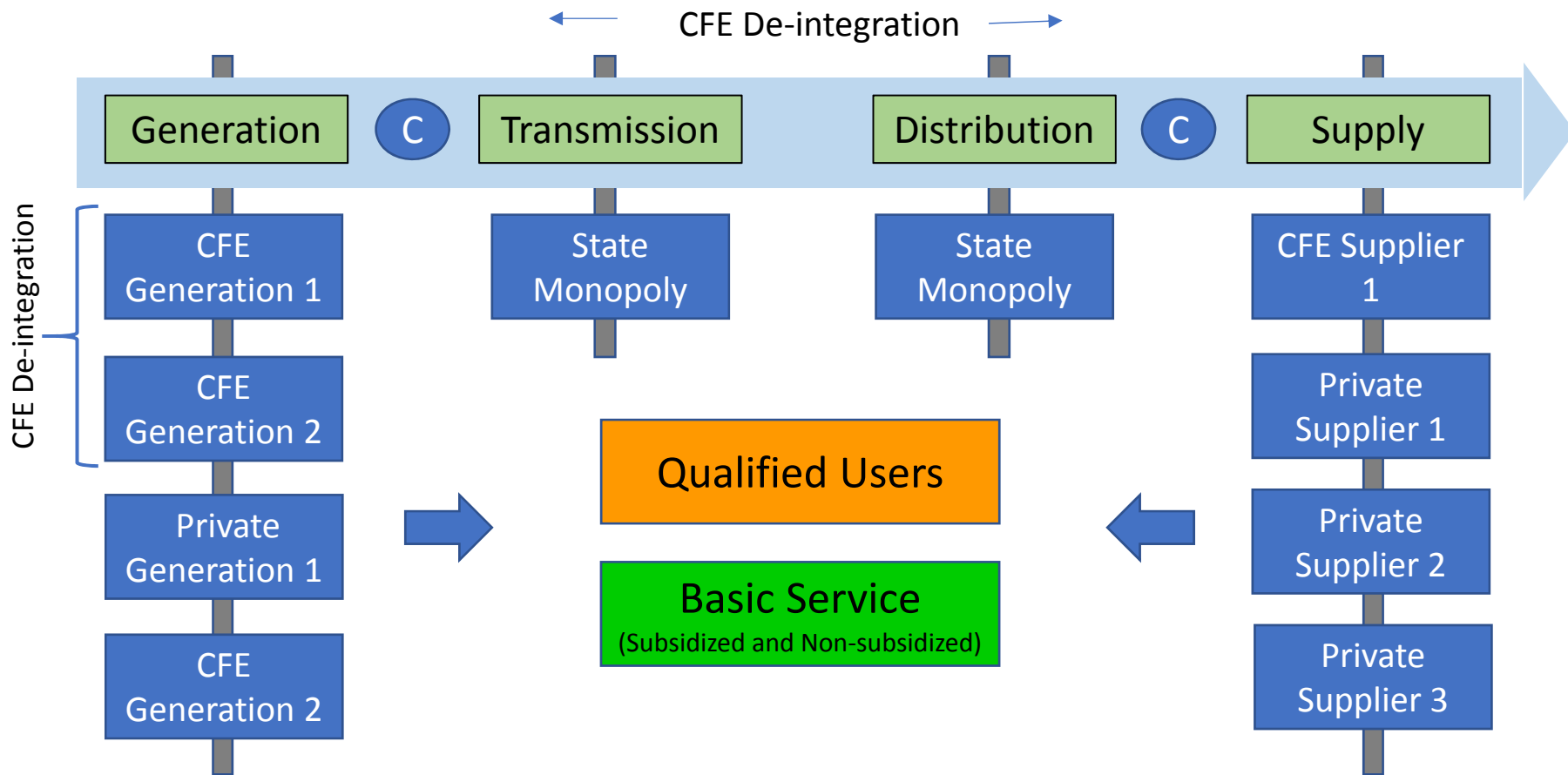


# Roadmap to Market

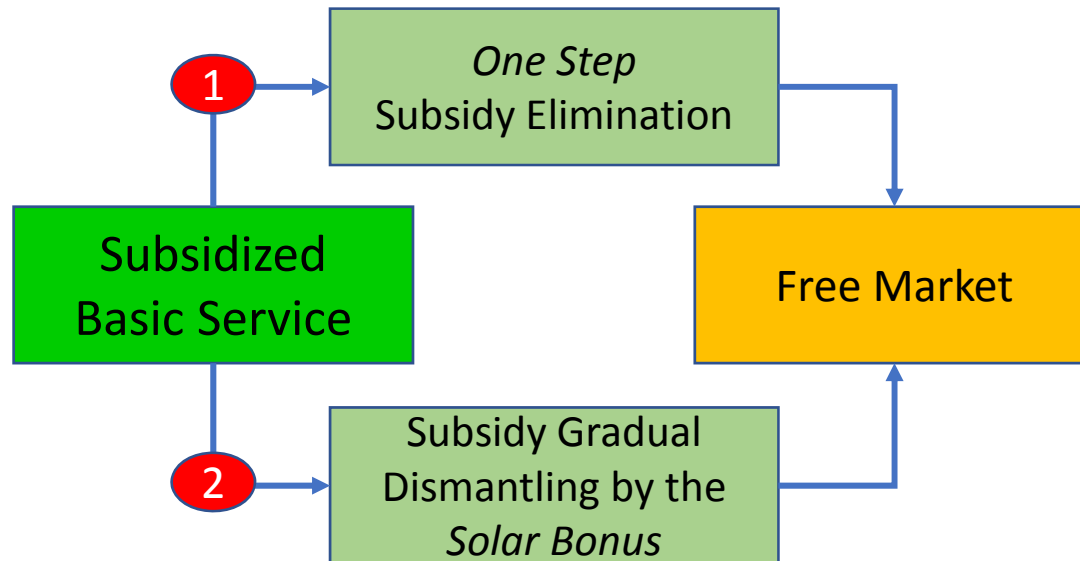


(1) LIE: Ley de la Industria Eléctrica  
 (2) CEL: Certificado de Energía Limpia

# New Market Structure



C = Commercial agent



# Path Towards Residential Free Market

## Path 1:

### Pros:

- *Immediate Results*

### Cons:

- *Social rejection*
- *High Political Cost*
- *Low added value to the economy*
- *No Co-benefits*
- *Keeping up the status quo (outdated)*

## Path 2:

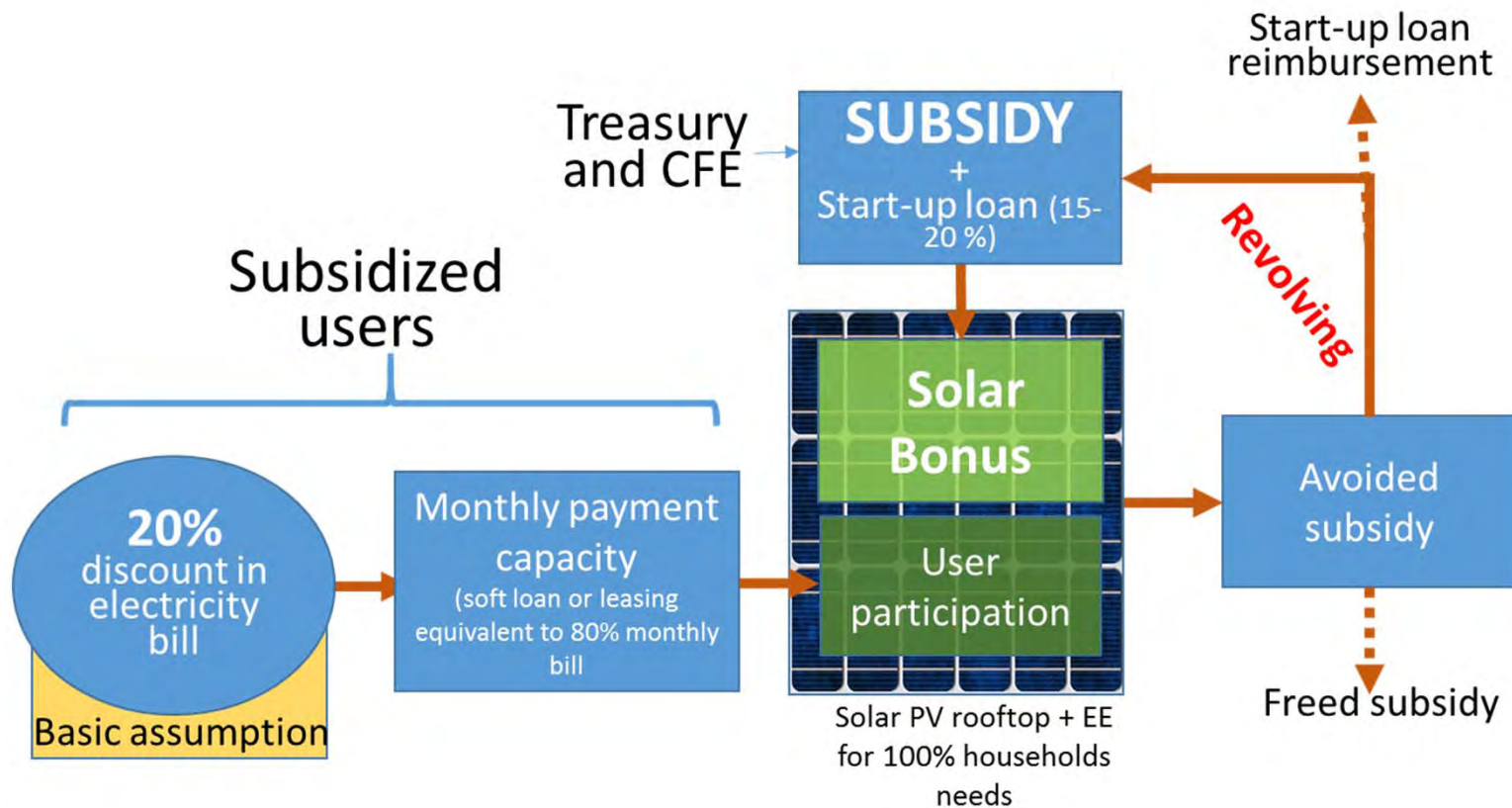
### Pros:

- *Social acceptance*
- *Low or no political cost*
- *High value added to the economy*
- *Substantial co-benefits*
- *Following worldwide energy trends*

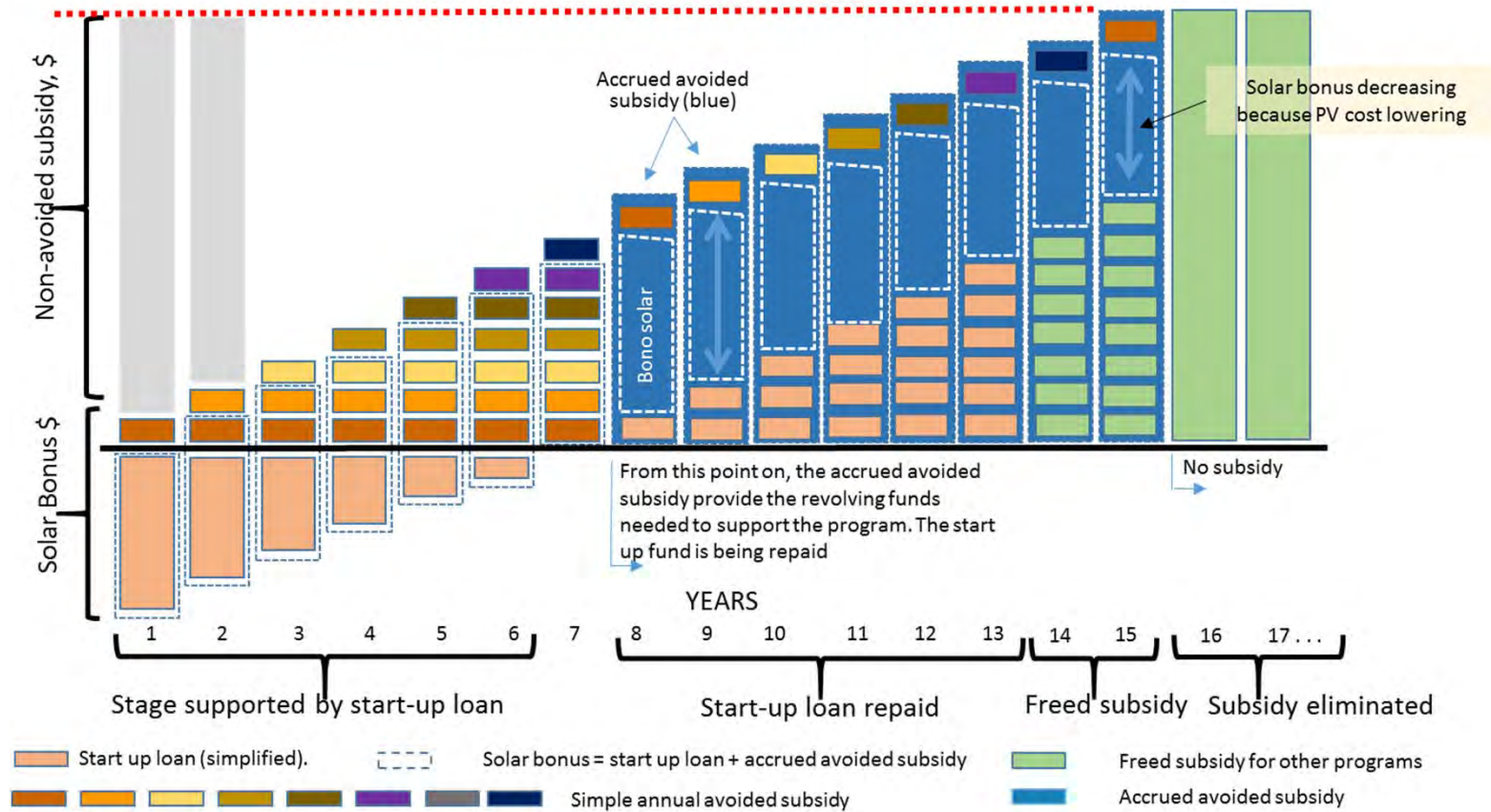
### Cons:

- *Stepwise steps to results*

# Solar Bonus as a way for subsidy elimination

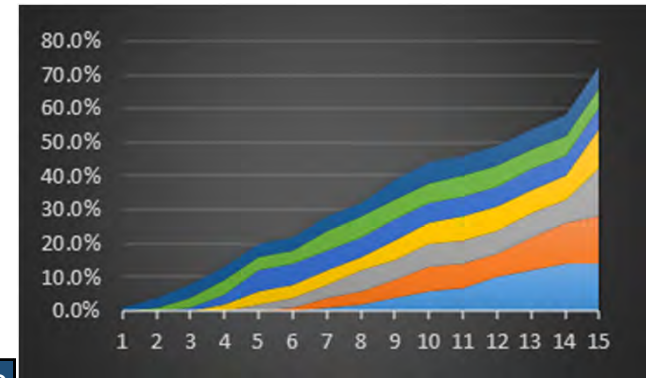


# Solar Bonus Financial Mechanism



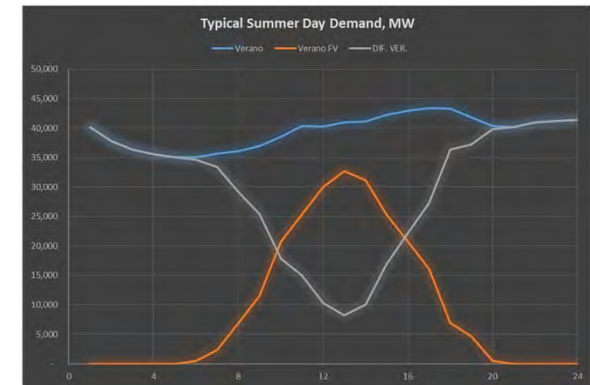


# 70% Coverage by 2031



Number of CELs, million	444.9
Avoided emissions at period end, MtonCO2eq/yr	23.58
Users into the program	25,147,850
Acumulated capacity, GW	28.7
Generation at period end, TWh/yr	45.5
Total Investment, M\$	<b>527,966</b>
Solar Bonus	<b>314,770</b>
Investments by users	213,196
Bridge loan	67,495
Available Subsidy for Investment, M\$	<b>316,072</b>
<b>NPV</b> for Government @ 20 yr period. M\$ at a reference rate of : 3%	<b>159,679</b>
<b>IIR</b> : Internal Rate of Return for Government, %	<b>10.9%</b>
<b>PB</b> : Payback Period for Government, yr	<b>15.74</b>

<b>27,787</b>	Million USD
<b>16,566</b>	
<b>11,220</b>	
<b>3,552</b>	



IIR: Average IIR for Government by Tariff Groups, %	<b>T1: 24%</b>	<b>T1A: 16%</b>	<b>T1B: 14%</b>	<b>T1C: 8%</b>	<b>T1D: 6%</b>	<b>T1E: 7%</b>	<b>T1F: 6%</b>
IIR: Average IIR for Households by Tariff Groups, %	<b>T1: 20%</b>	<b>T1A: 23%</b>	<b>T1B: 22%</b>	<b>T1C: 20%</b>	<b>T1D: 21%</b>	<b>T1E: 23%</b>	<b>T1F: 24%</b>
Weighted Avg LCOE for PV+EE for Users per Tariff, USD/MWh	30.48	34.32	28.45	33.03	32.33	28.44	29.79



**DANKE SCHÖN**