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BIRMINGHAM



INSTITUTO NACIONAL  
DE ELECTRICIDAD Y  
ENERGÍAS LIMPIAS

# Mexico's energy system

Energy Storage Prioritisation in Mexico  
First workshop  
Cuernavaca, Morelos, México.

12 – 13 April, 2018

Project: **Energy Storage Prioritisation in Mexico**

# Content



- Energy reform
- Energy balance
- Energy demand
- Use of energy in household
- Sustainable housing programs



# Mexico is in transition



- In the past, Mexico's energy sector has been constituted with state-owned companies, as **monopolies** throughout the value chain:

- PEMEX for upstream, midstream and downstream oil and gas;
- Comisión Federal de Electricidad (CFE) for power generation, T&D and sales.



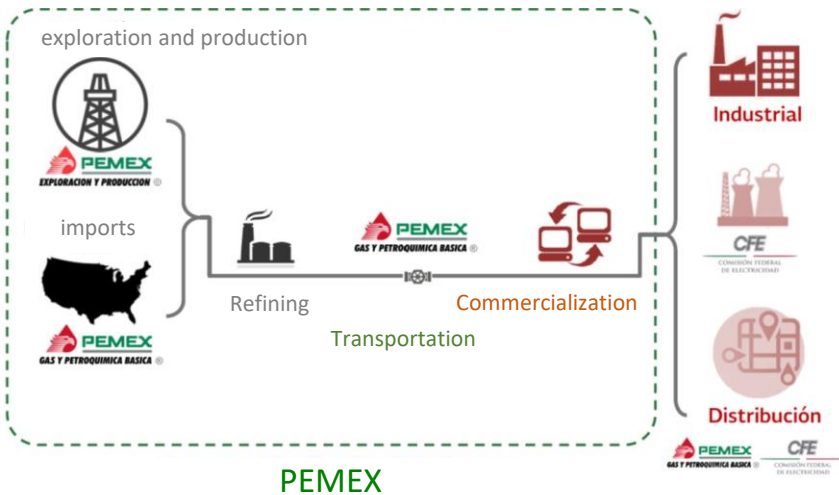
- **Energy reform** of Mexico started in 2013
- Transforming the country's **oil, gas** and **electricity** sectors

- A new regulatory and institutional **framework** has brought to:

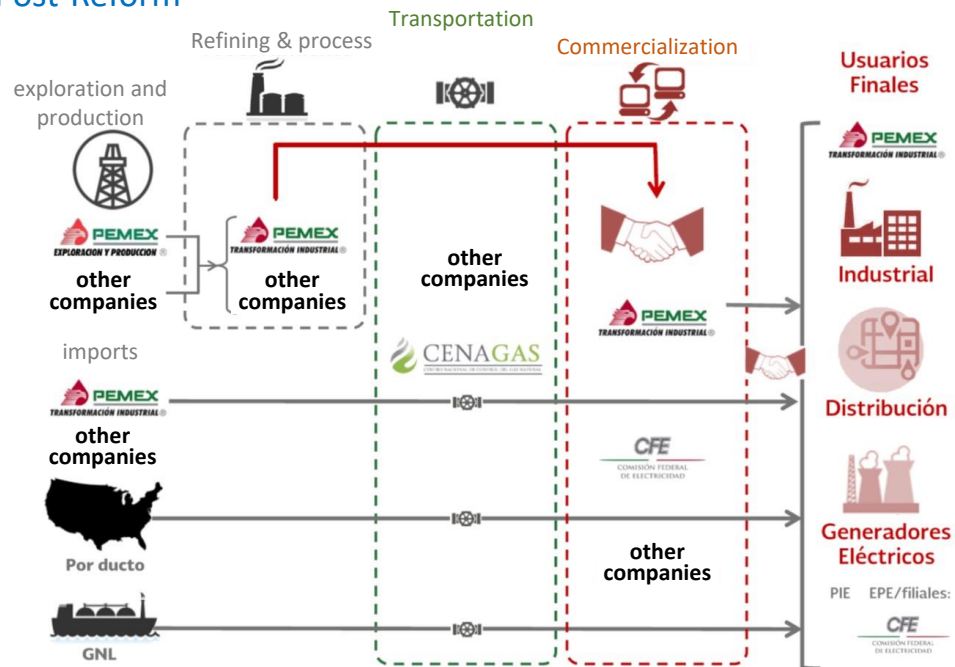
- ✓ Opening **competition** in all aspects of oil and gas supply, and power generation.
- ✓ **Modernize** Pemex and CFE as Enterprises of the State.
- ✓ Attracting **capital and technology** to areas that are in need of renewal.
- ✓ Promote **development** with social responsibility and protect the environment.

# Mexico is in transition

## Pre-Reform



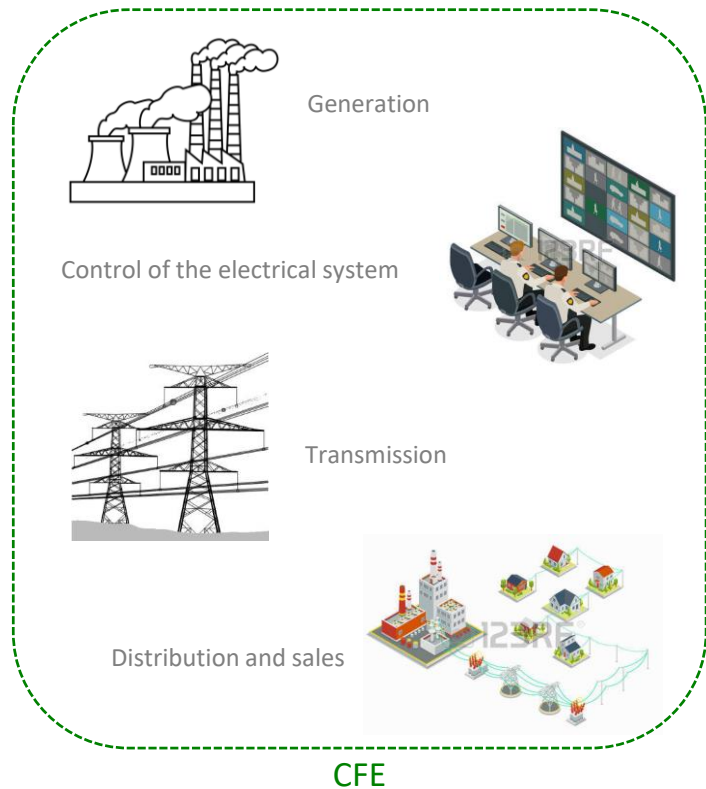
## Post-Reform



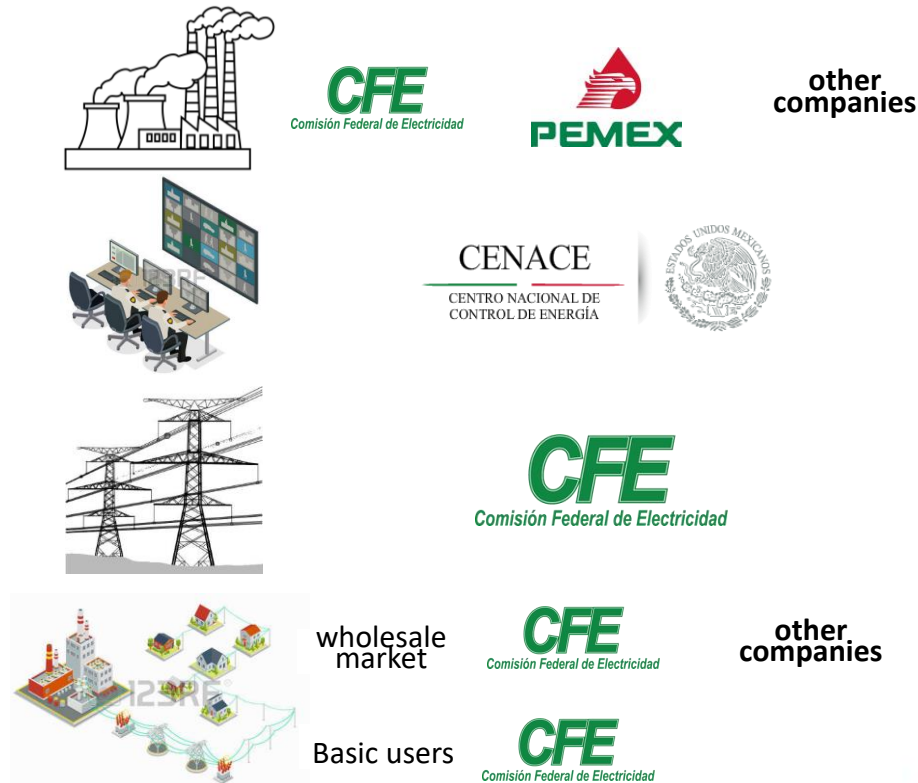
# Mexico is in transition



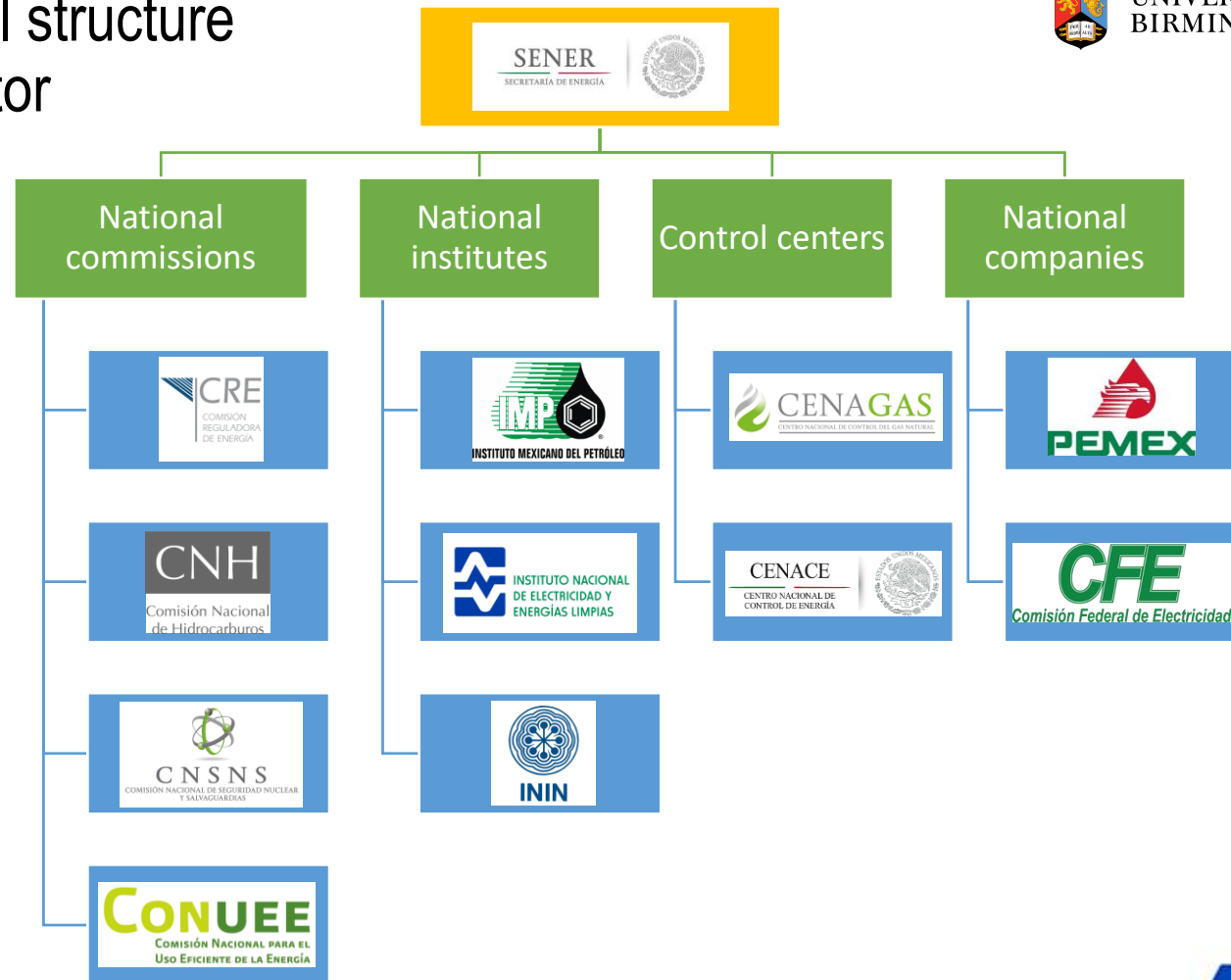
## Pre-Reform



## Post-Reform



# Organizational structure of energy sector



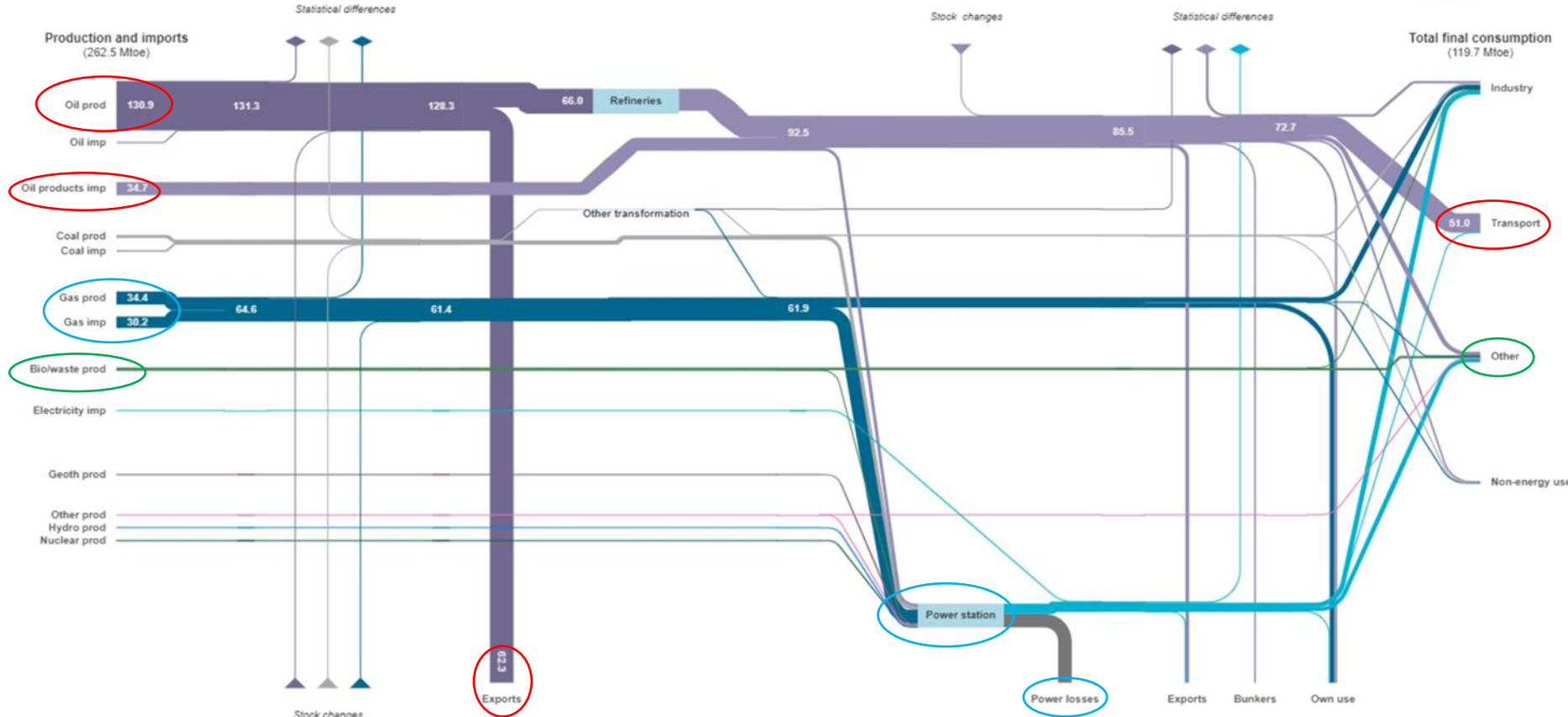
# Mexico energy balance 2015



## Mexico

BALANCE (2015)

Millions of tonnes of oil equivalent ▼



# United Kingdom energy balance 2015

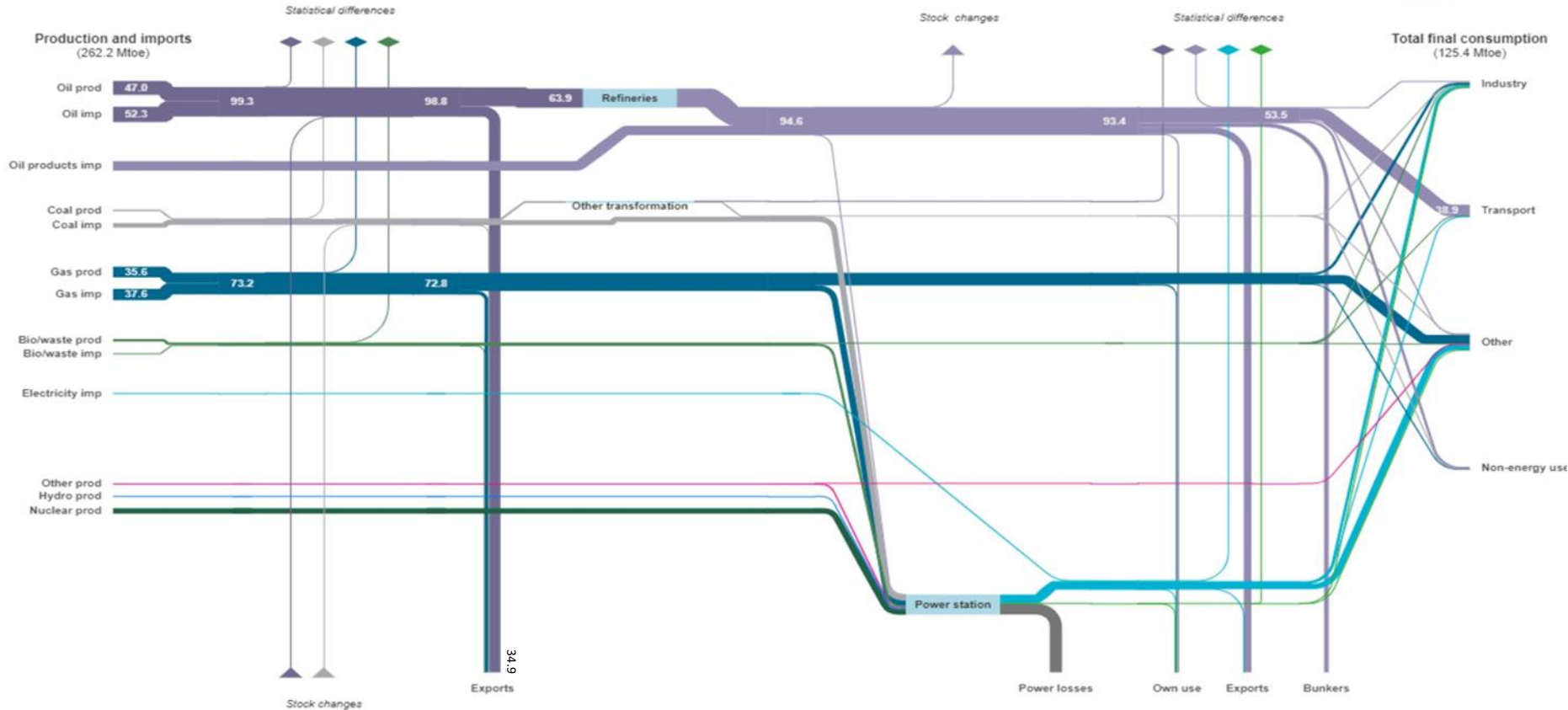


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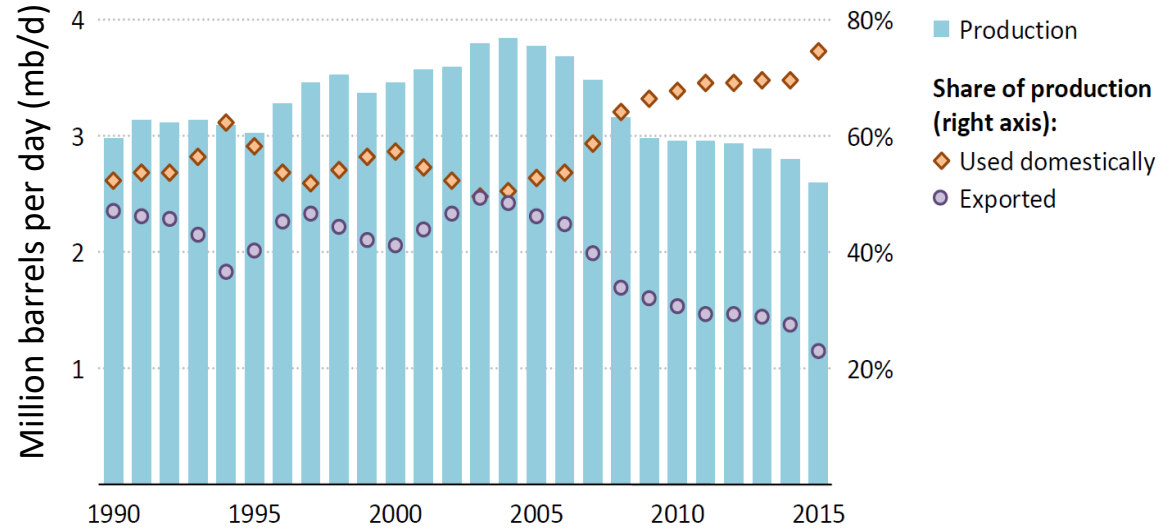
United Kingdom  
BALANCE (2015)

Millions of tonnes of oil equivalent ▼

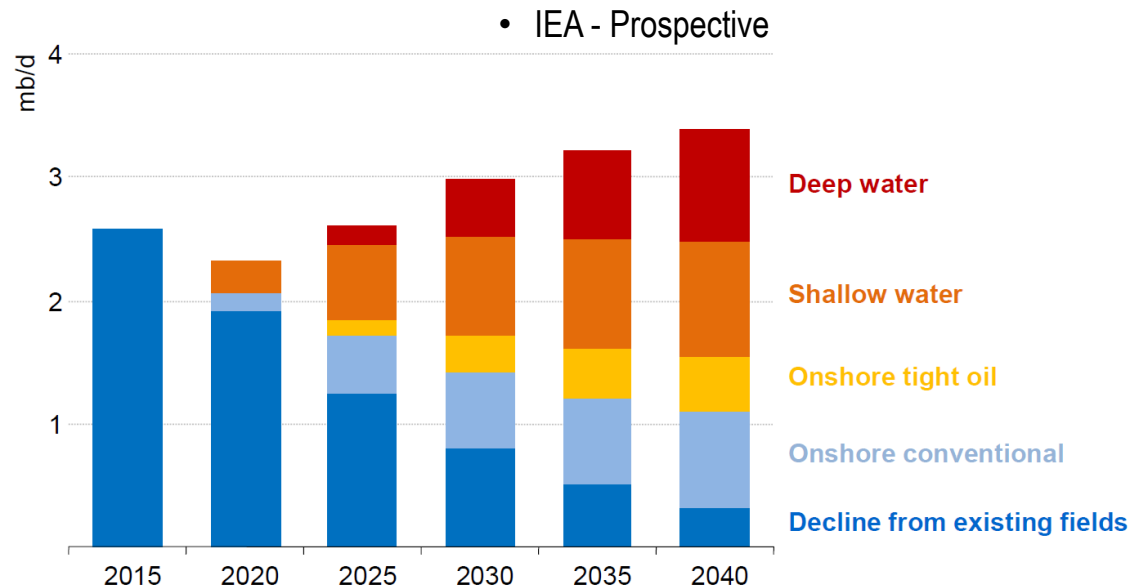




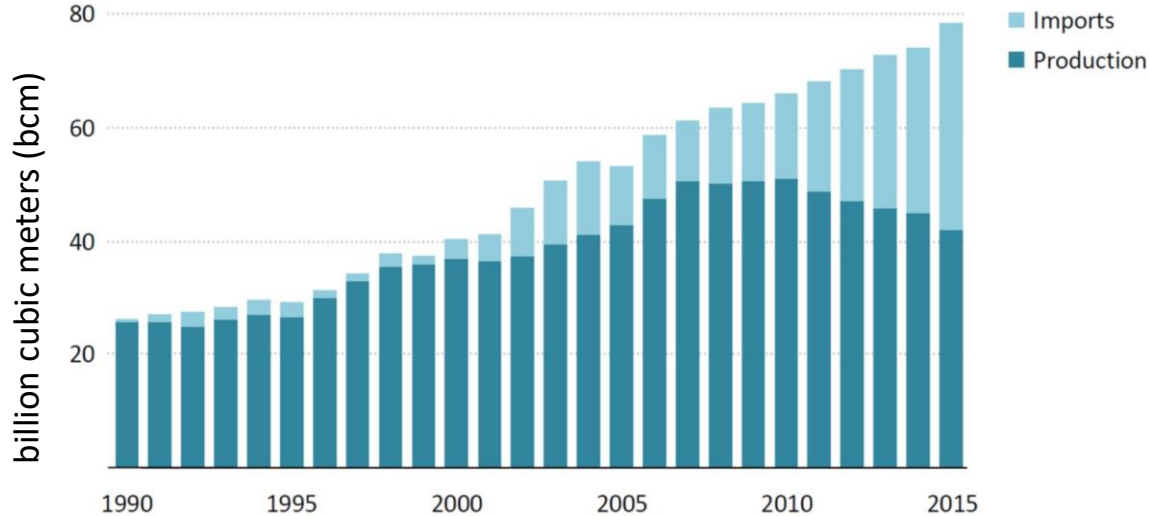
# Crude oil production and exports



# Crude oil

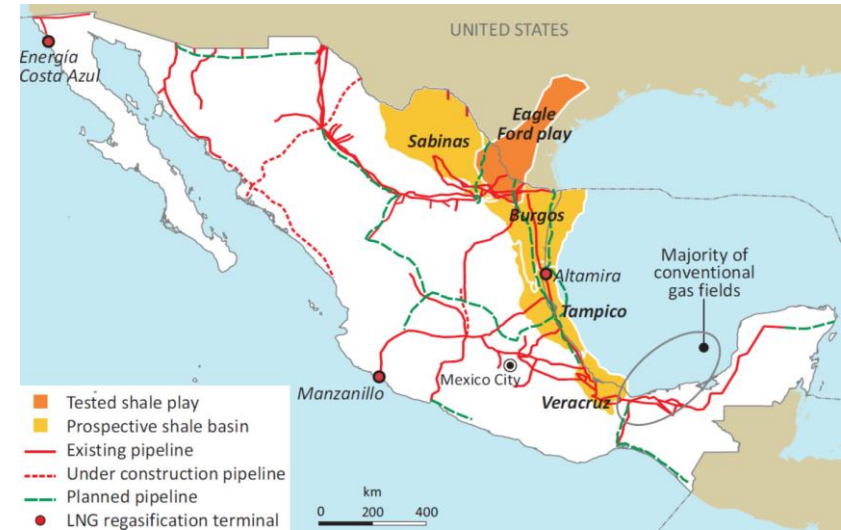
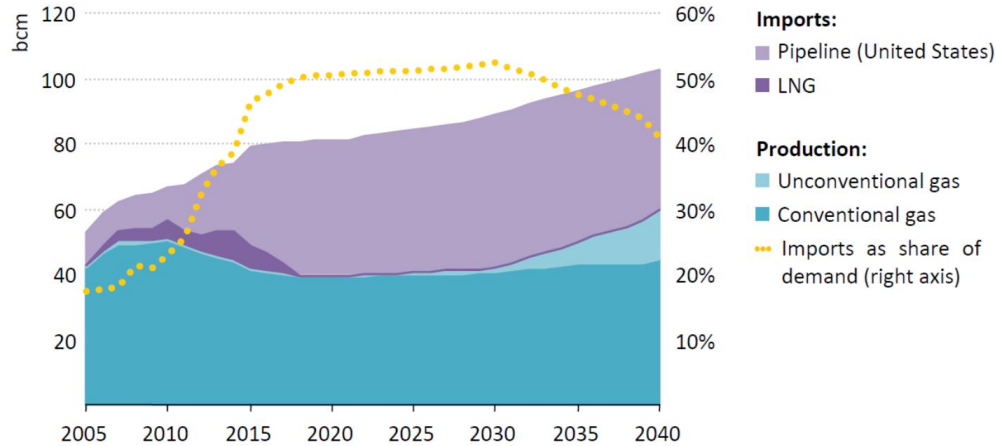


# Natural gas production and imports

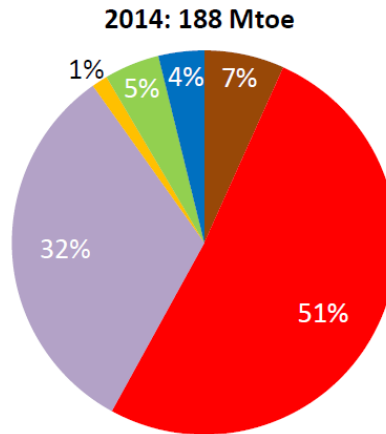
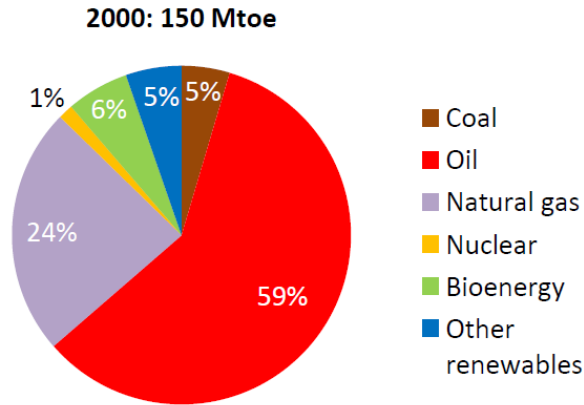


# Natural gas production and imports

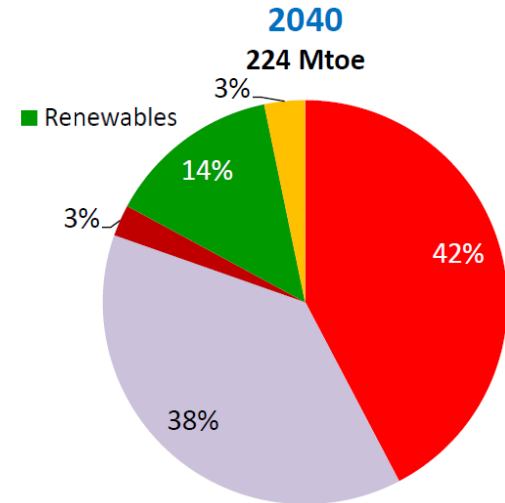
- IEA - Prospective



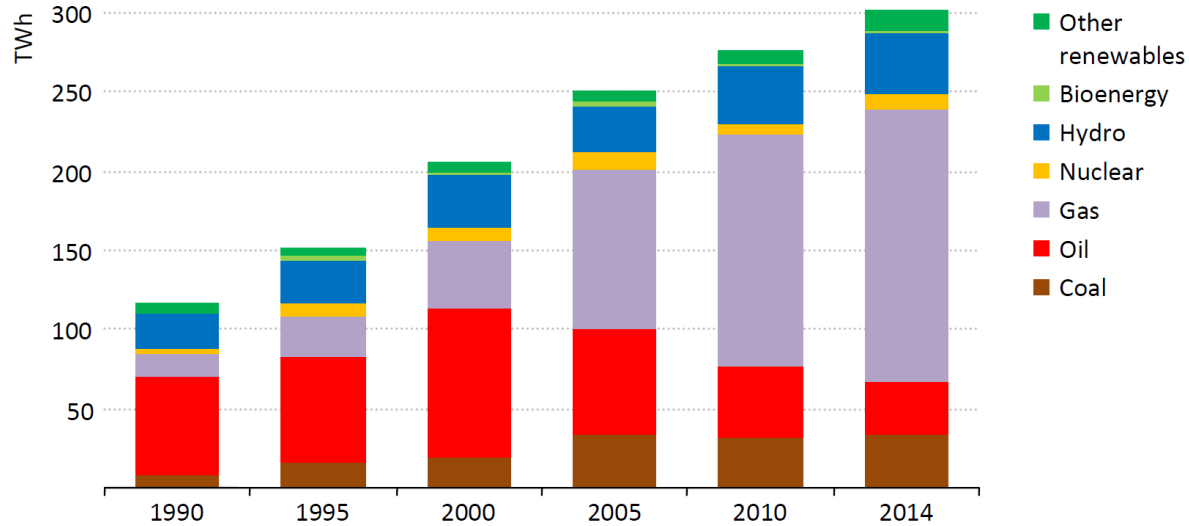
# Primary energy demand by fuel



- IEA - Prospective



# Electricity generation by fuel

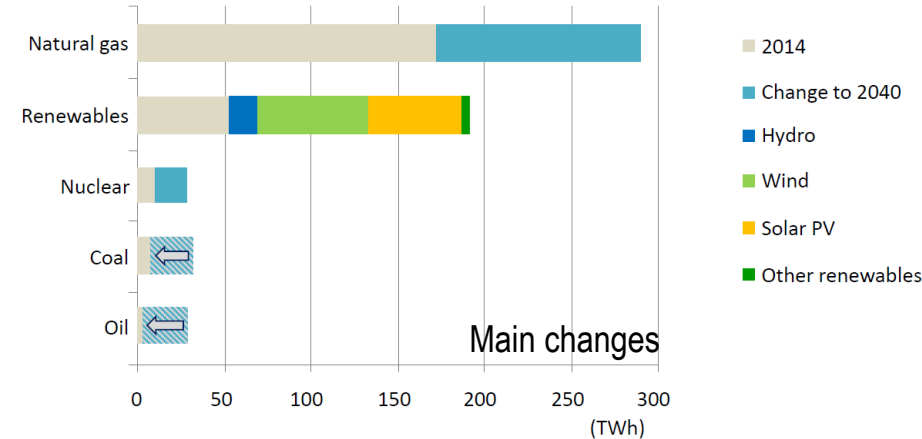
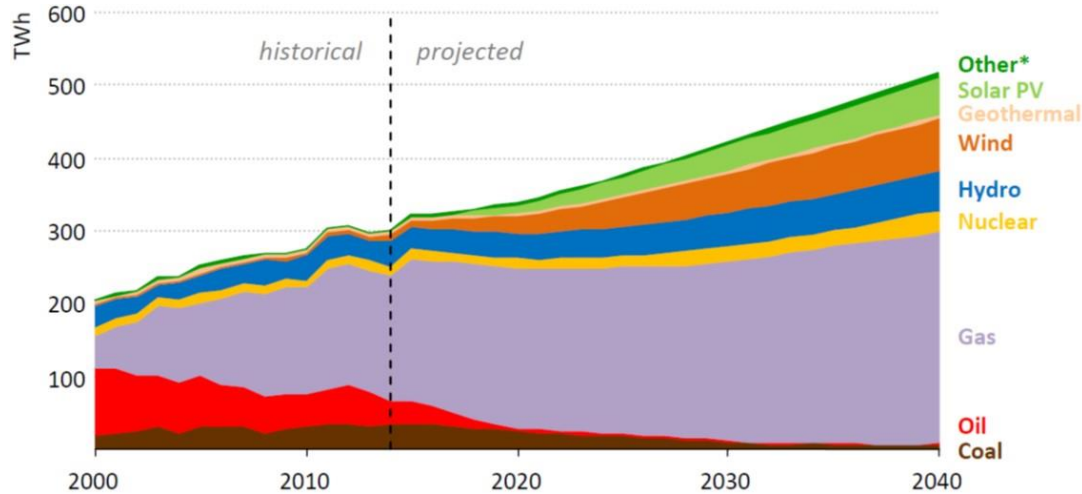


# Electricity generation by fuel

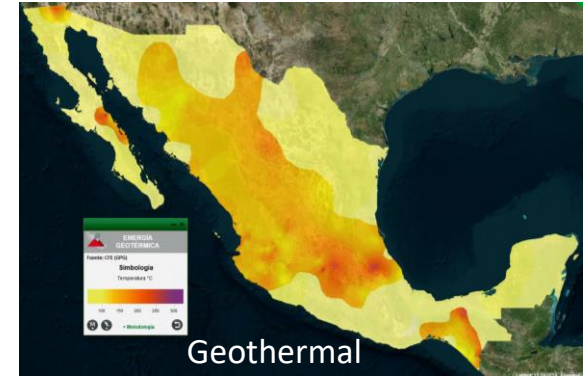
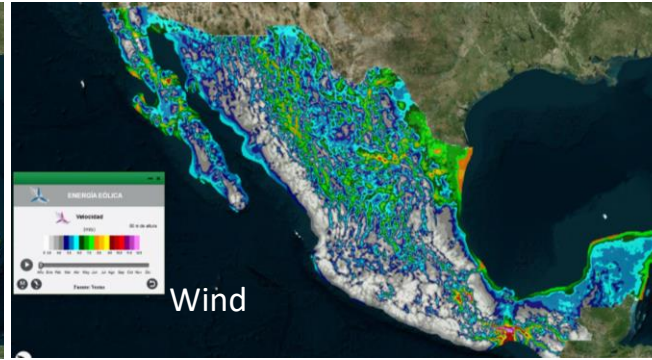
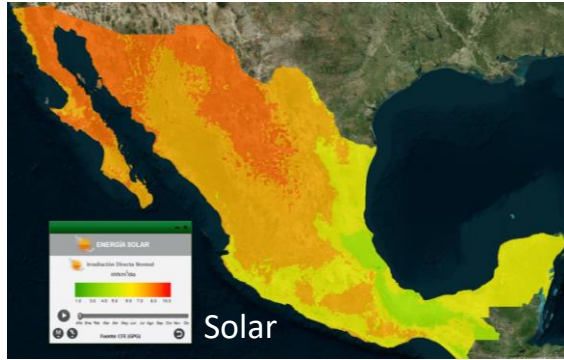
• IEA - Prospective



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# Potential of renewable energy

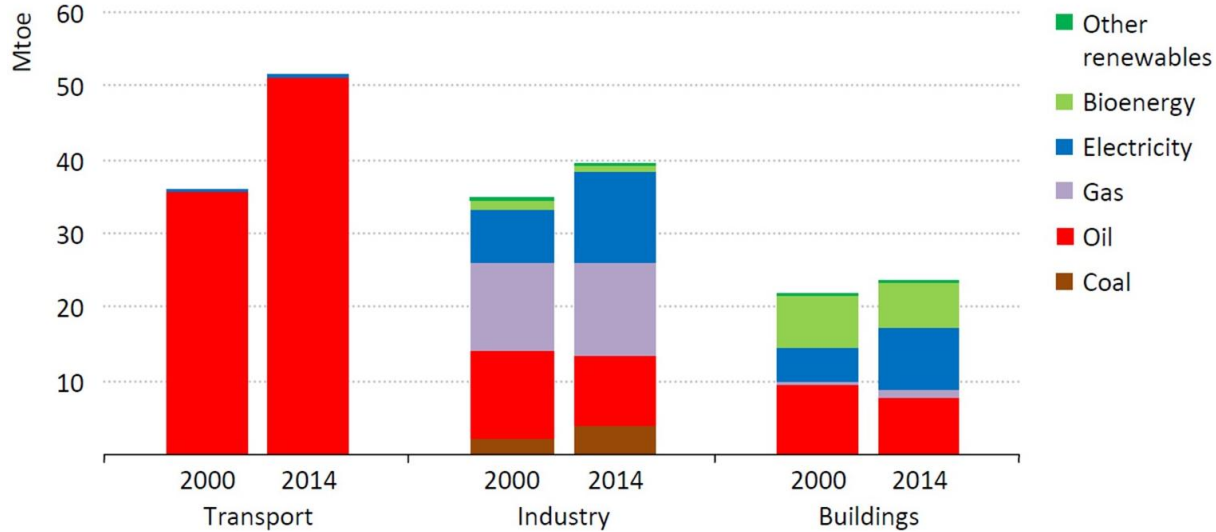


	Hydro	Geo	Wind	Solar	Bio
Power generation potential (GWh/y)					
Proved	4,920	2,610	25,104	25,052	3,326
Probable	23,028	45,207			680
Possible	44,180	52,013	87,600	6,500,000	11,485
Estimation of installable capacity (GW)					
Proved	1.2	0.3	7.7	11.7	0.5
Probable	2.6	5.7			0.1
Possible	6.3	7.4	50.0	5,000.0	3.6





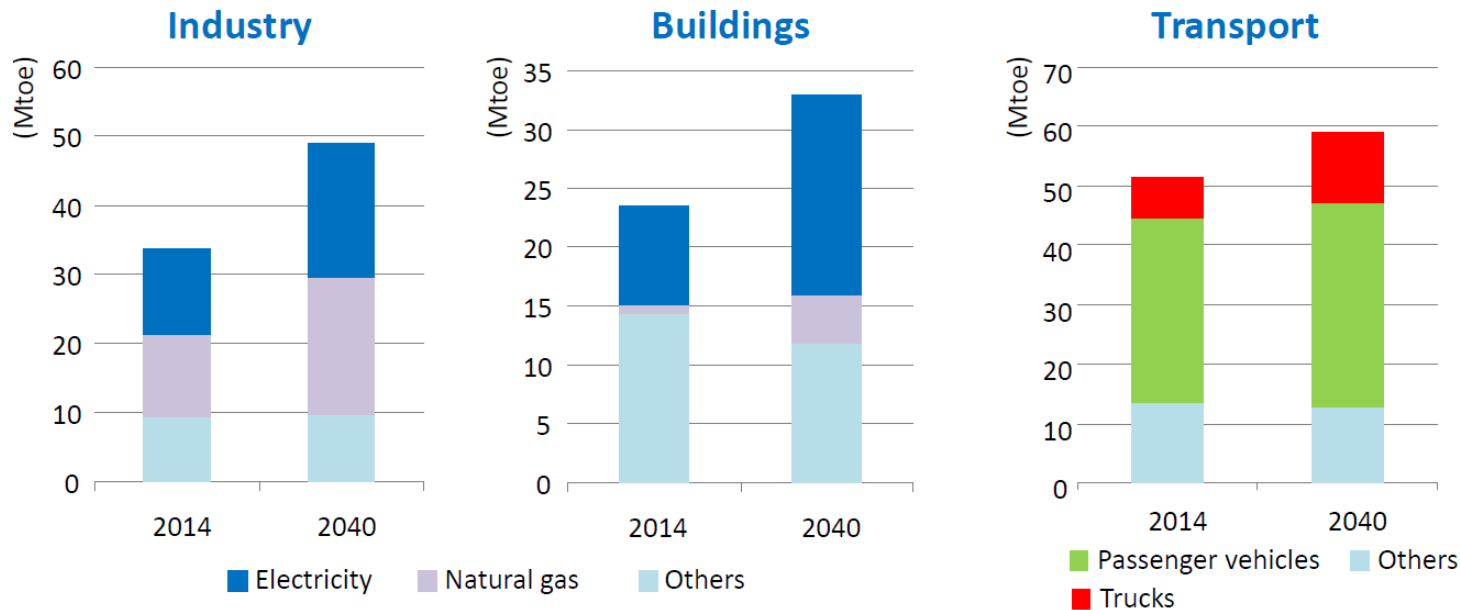
# Final energy demand by sector



# Final energy demand by sector



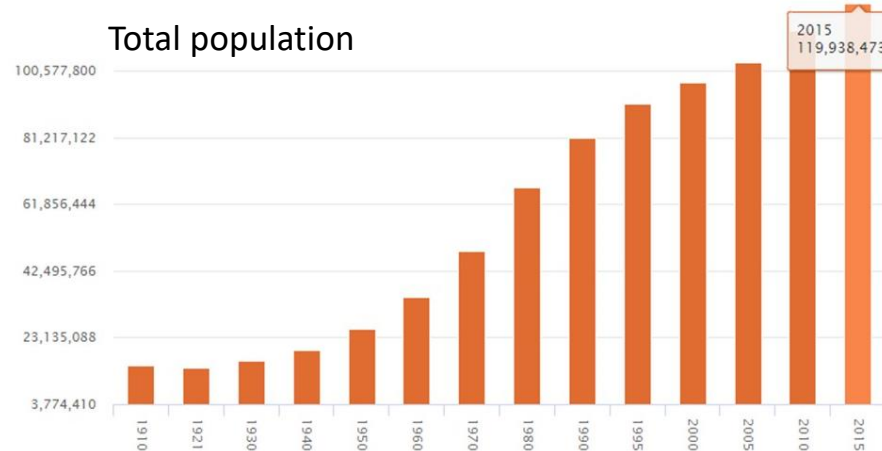
- IEA - Prospective



# Buildings sector

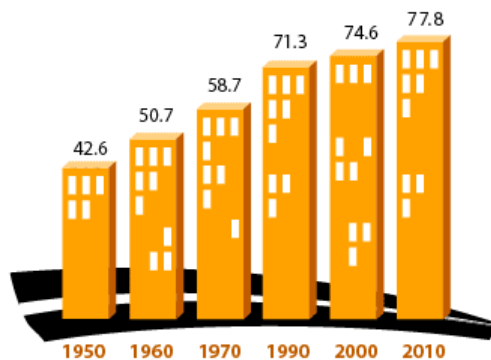


## Total population



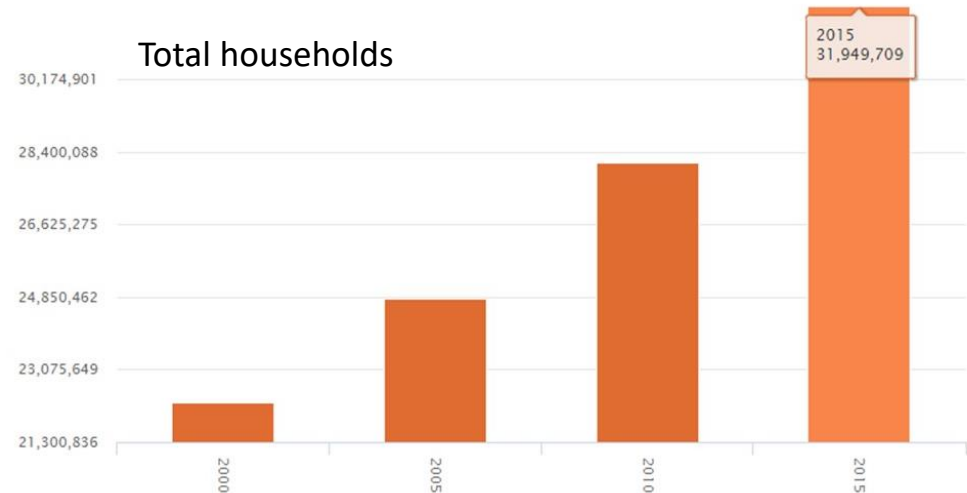
Source: INEGI. ([link](#))

## percentage of urban population



Source: INEGI ([link](#)).

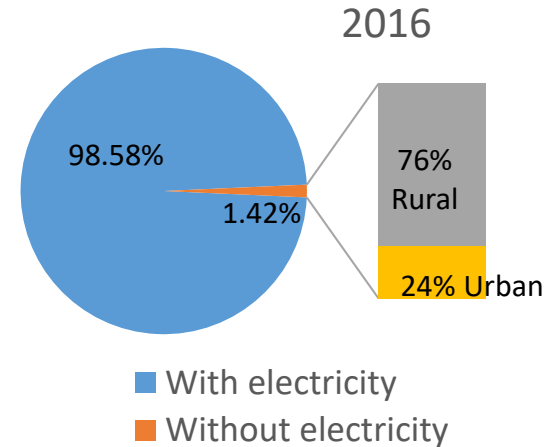
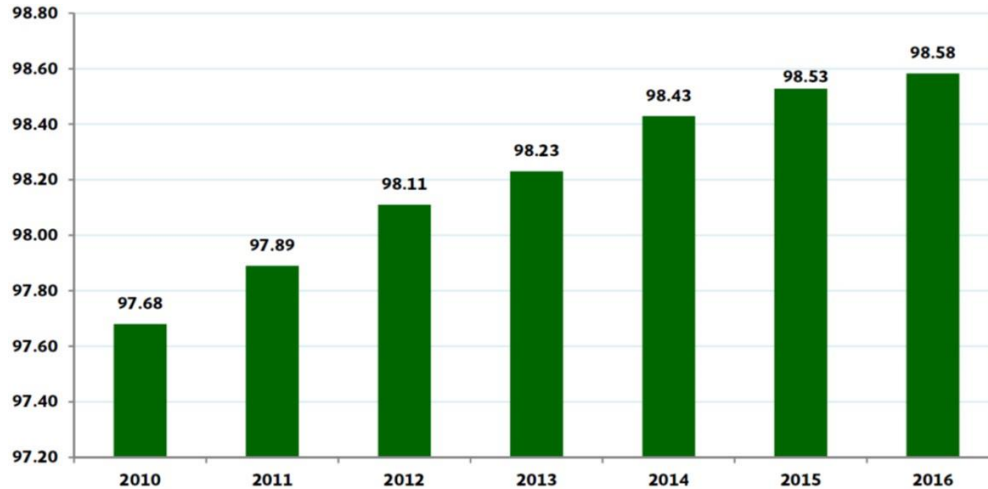
## Total households



# Electrification level

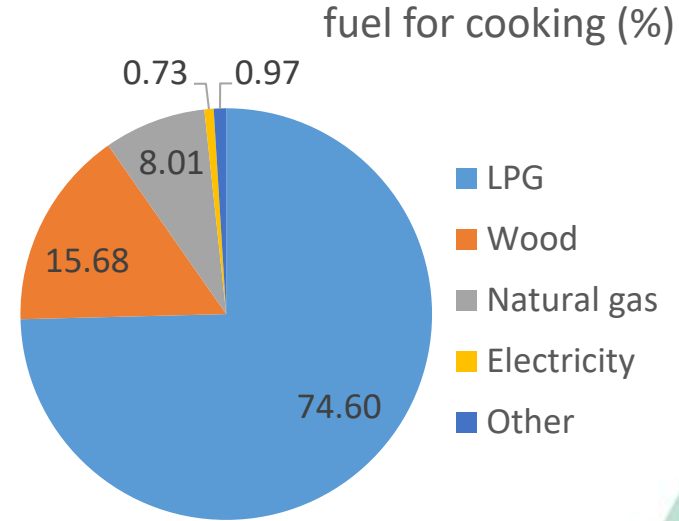
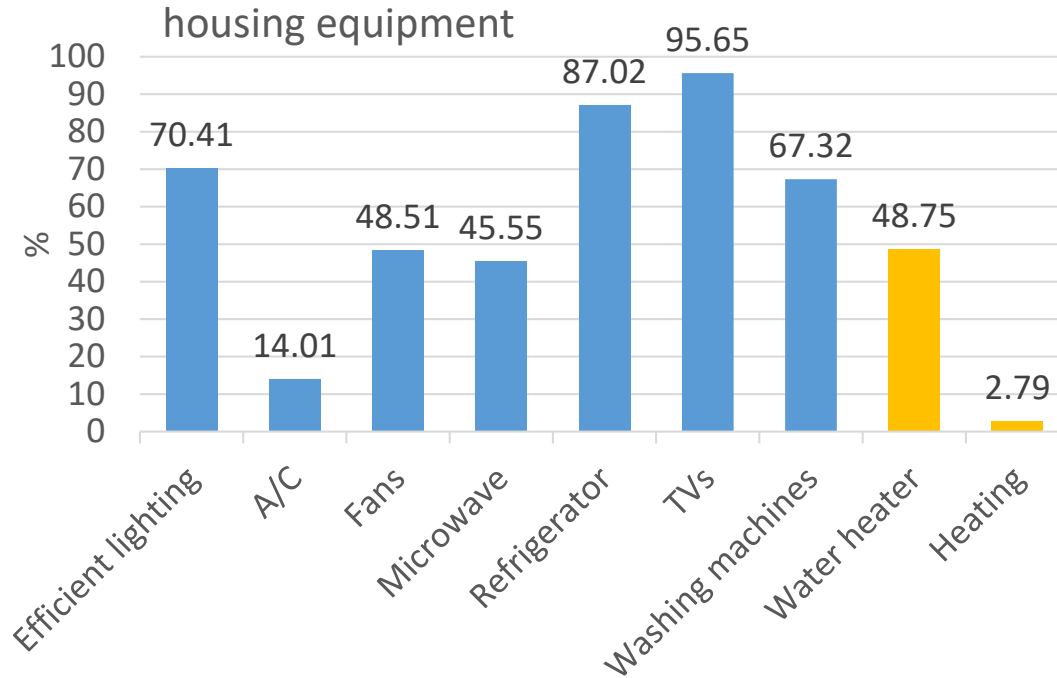


percentage of the population with electricity



Source: Informe pormenorizado sobre el desempeño y las tendencias de la industria eléctrica nacional 2016, SENER. ([link](#))

# Energy in household



# Rural household- Uses of wood



## Cook



## Water Heating



## Space Heating



# Rural household- Uses of electricity (when it is available)



## Inefficient lighting



Ecolight solution <https://www.youtube.com/watch?v=CaxRCJLi7Sw>

## Refrigeration of food



## Appliances



## Space comfort



## Water pumping



# Mexico's push for sustainable housing



- Mexico has some programs for sustainable housing of the most vulnerable parts of the population.
  - ✓ CONAVI (National Housing Commission) and INFONAVIT (National Housing Fund for Private Sector Workers) started in 2007 as a joint effort to foster the construction of houses with energy-efficient and water-saving technologies (**eco-technologies**), and renewable energy solutions, like solar water heaters.
  - ✓ INFONAVIT's **Green Mortgage** program now accounts for 70% of all mortgages in the country, while CONAVI's *Esta es tu casa* (**This is your house**) subsidy programme for low-income home buyers has, since 2012, included sustainability and criteria in its selection process. INFONAVIT's **Hipoteca Verde** has provided an average of 376 000 green mortgages annually since 2011. CONAVI made 210 000 subsidies available between 2015 and 2016.
- Both programmes are credited with stimulating demand for low-energy consumption appliances and enabling low and middle-income households to access modern home designs that have reduced energy bills.
- They have also raised general public awareness of the importance of reducing energy and water consumption.



El INFONAVIT promueve el otorgamiento de créditos ya sea para vivienda nueva o usada, ya sea de un desarrollo habitacional, también de un particular. Así mismo, mediante la Hipoteca Verde y en apoyo a la economía familiar así como el cuidado de la naturaleza, facilita el acceso a eco-tecnologías para asegurar ahorros de agua, luz y gas.





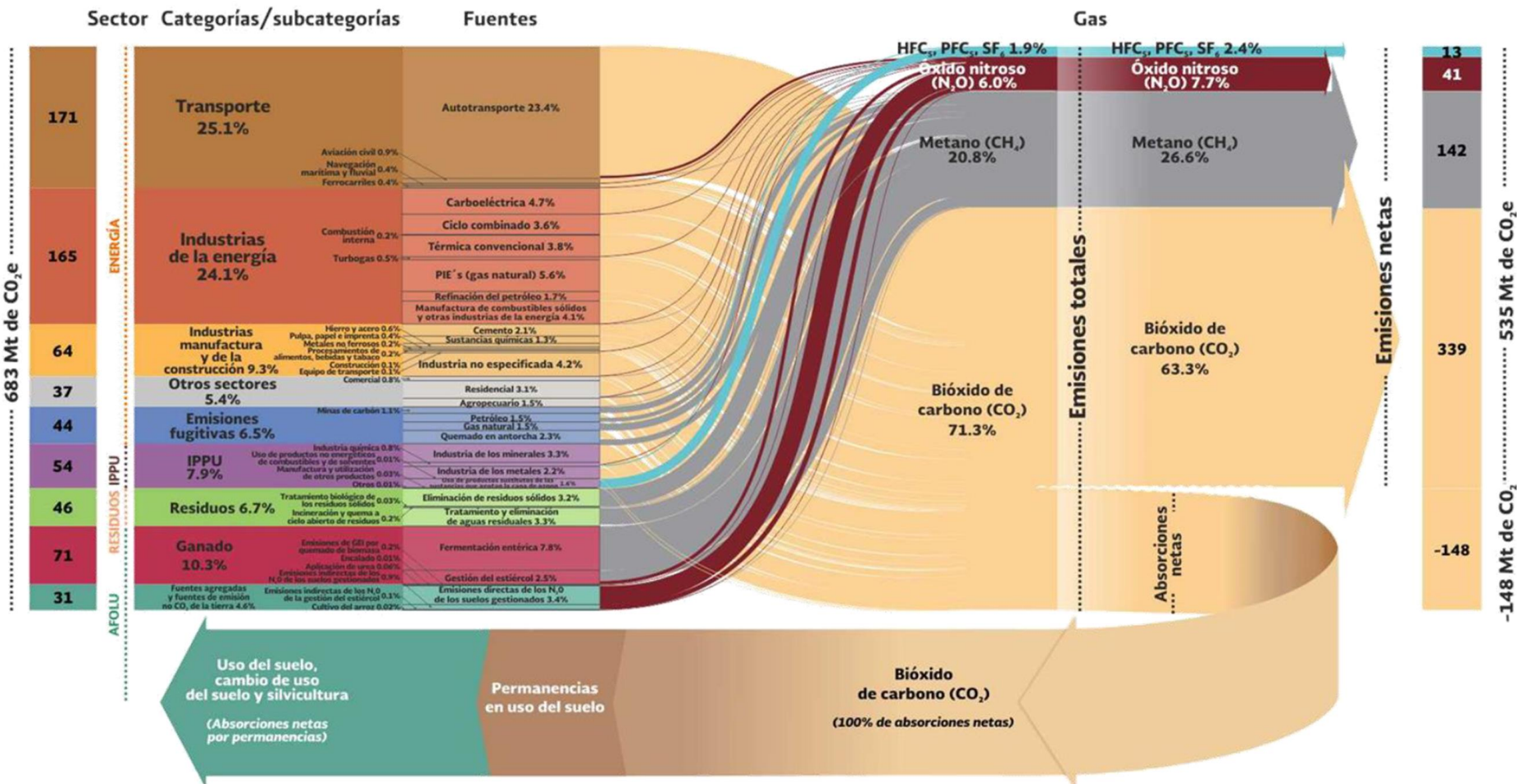
# CO2 emissions



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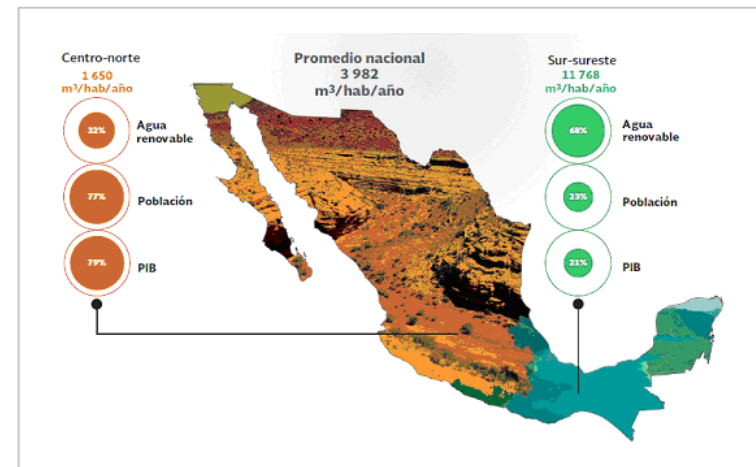
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- Mexico was the first country to submit to the United Nations Framework Convention on Climate Change a **Sustainable Housing Nationally Appropriate Mitigation Actions** (NAMA) in 2012, with support from a variety of national and international actors.
- This expresses its ambitions and goals regarding the reduction of greenhouse-gas emissions in residential buildings through affordable solutions for low-income households.
- According to estimates by the Mexican government, implementing the NAMA would eliminate approximately 2 million tonnes of CO<sub>2</sub>-eq emissions a year, equivalent to 0.5% of national energy-related CO<sub>2</sub> emissions in 2014.
- The **ECOCASA Programme**, launched by the government in 2013, became the first pilot programme under the NAMA, providing housing developers with attractive loans if they offered designs that resulted in greenhouse-gas (GHG) emission reductions of at least 20% (compared to a determined baseline).
- Passive design solutions qualified as well as traditional ones (solar water heaters and insulation) for low- and middle-income households.
- The programme has so far awarded ECOCASA credits of approximately \$200 million to 20 000 households and has already built more than 16 000 houses (of a total of 27 600 planned), which are expected to reduce an estimated 630 000 tonnes of CO<sub>2</sub> over the 40 year life of the houses (Sociedad Hipotecaria Federal, 2016).

# Other issues that should be kept in mind

- Social acceptance
- Insecurity
- Other people's priorities (water, food, health, social security, family expenses)



[http://www.dof.gob.mx/nota\\_detalle.php?codigo=5339732&fecha=08/04/2014](http://www.dof.gob.mx/nota_detalle.php?codigo=5339732&fecha=08/04/2014)

# End of presentation

Annexes



# Sankey

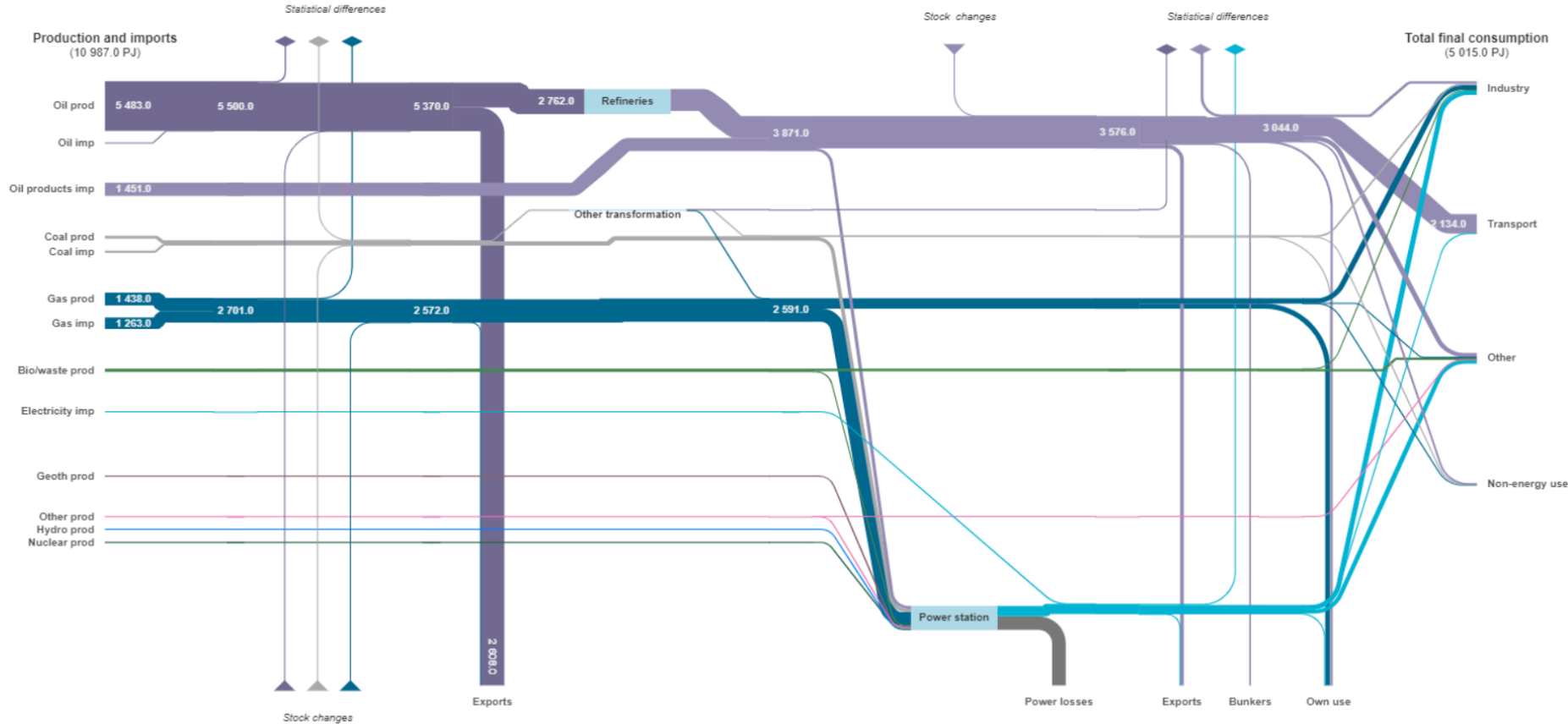
Mexico

BALANCE (2015)

Petajoules ▼



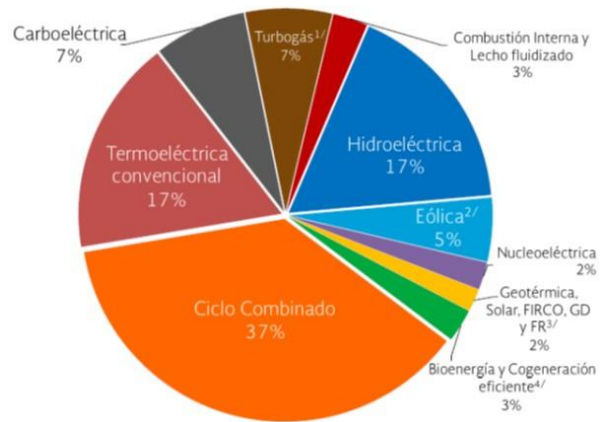
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# Power sector

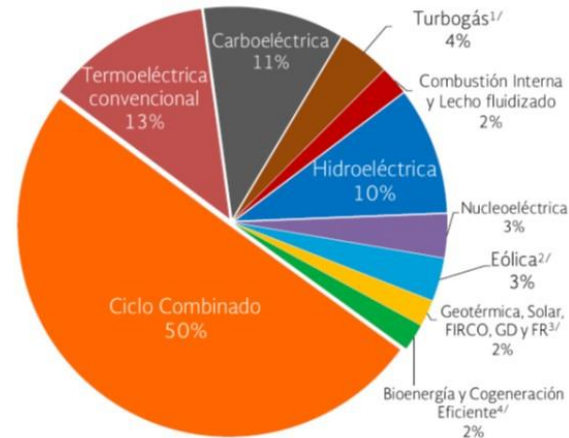


## Capacity



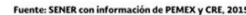
73.5 GW en 2016

## Generation

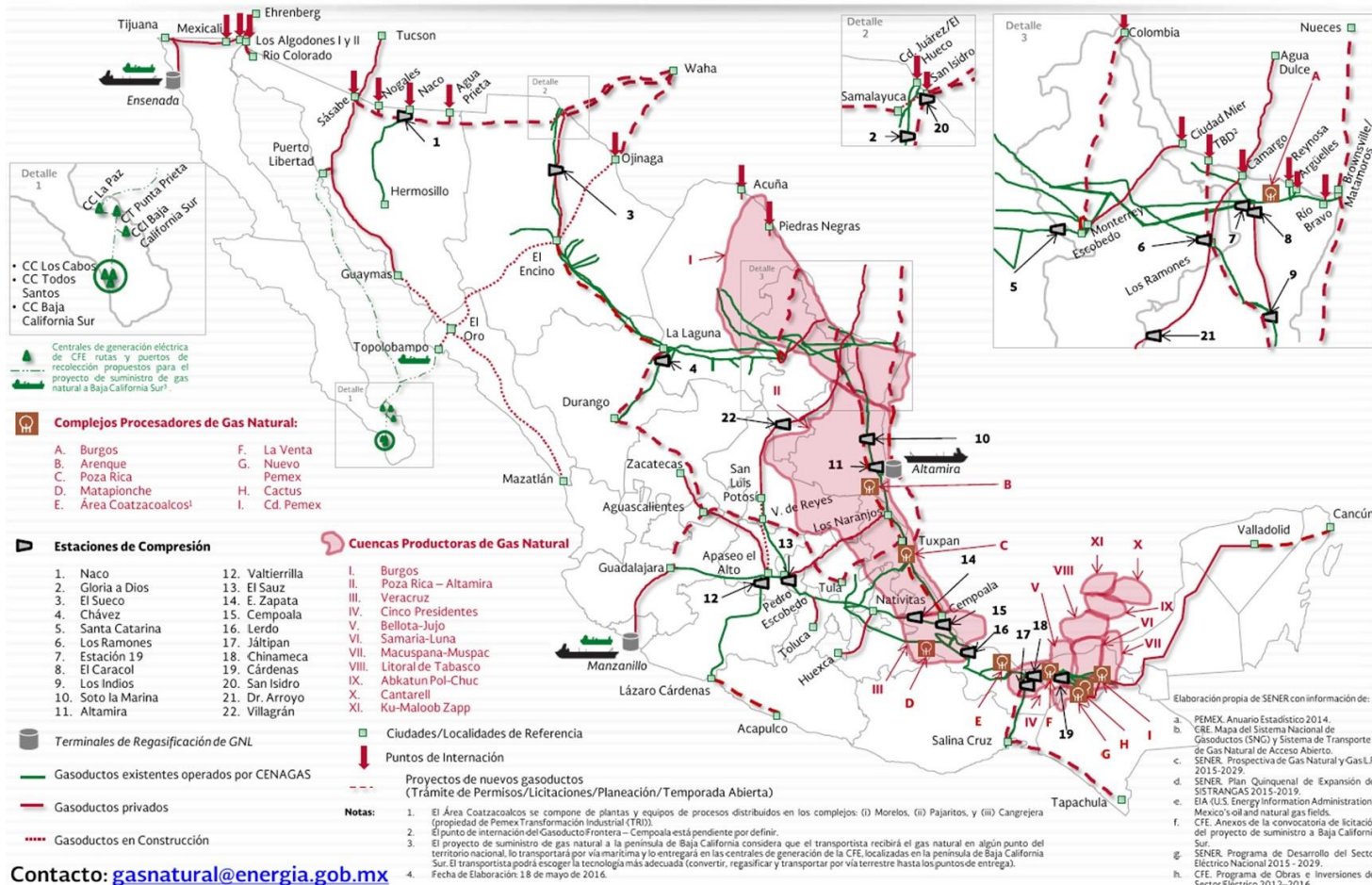


73.5 GW en 2016





# Infraestructura Nacional de Gas Natural (2016)





# Sistema Eléctrico Nacional

## 2016

**CENACE**  
CENTRO NACIONAL DE  
CONTROL DE ENERGÍA



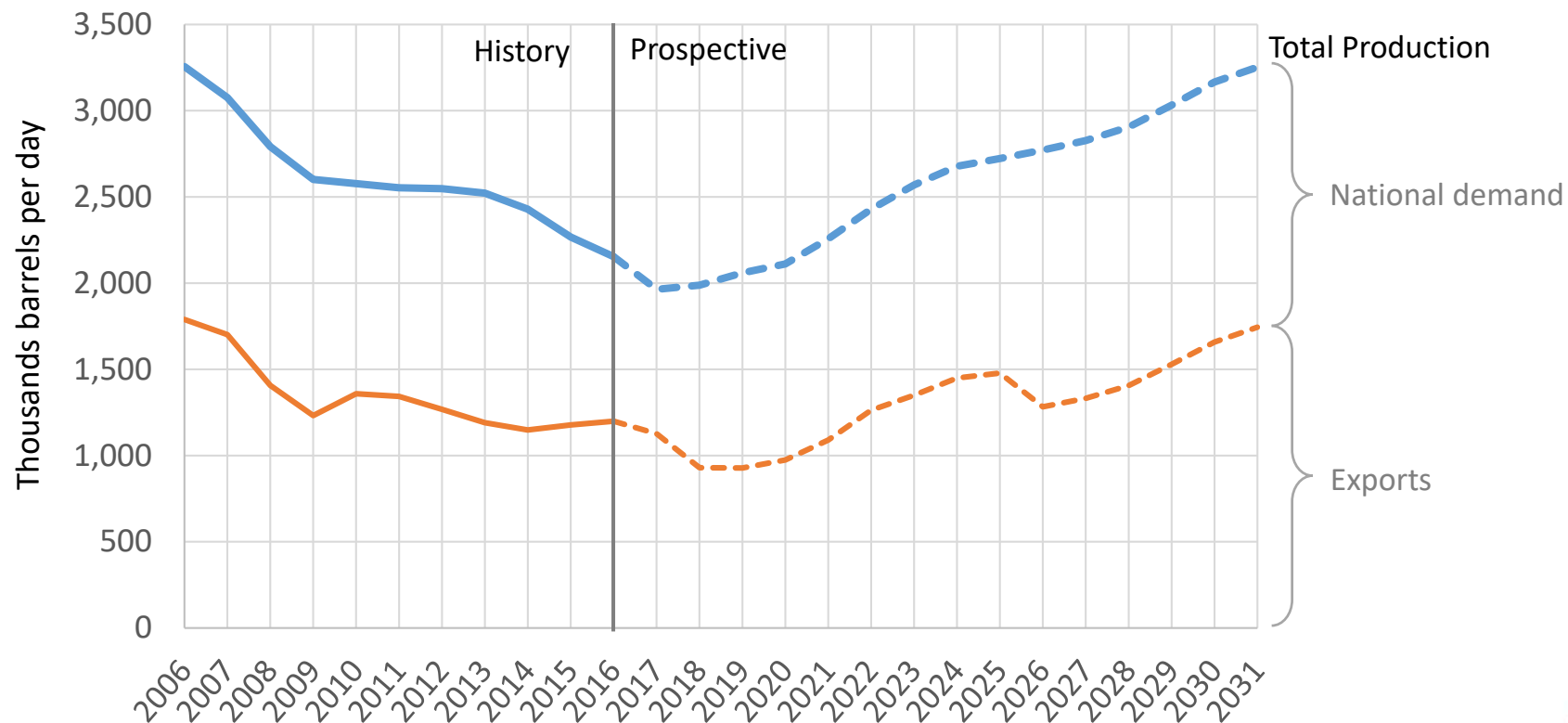
# Commercial energy balance



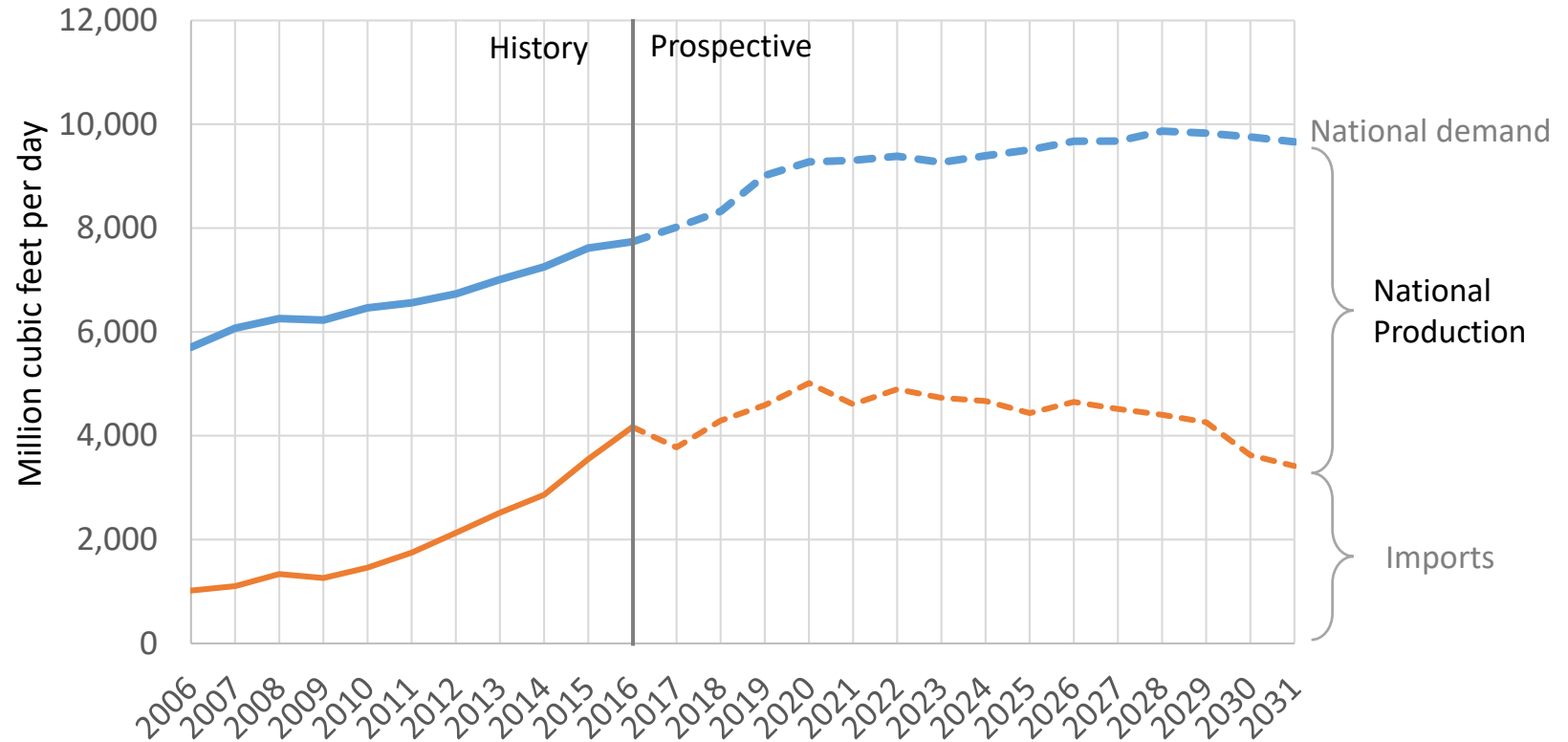
- Sustainability and climate change considerations are prominent in Mexico's energy policy.
- Mexico was among the first nations to submit a climate pledge in the run-up to COP21, and was among the countries that pushed hardest for a climate change agreement in Paris.
- It has legislated to adopt a binding climate target: the second country in the world to do so.
- With institutional changes that help promote clean energy, Mexico is embarked on a course towards a considerably more sustainable and efficient energy system in the future.



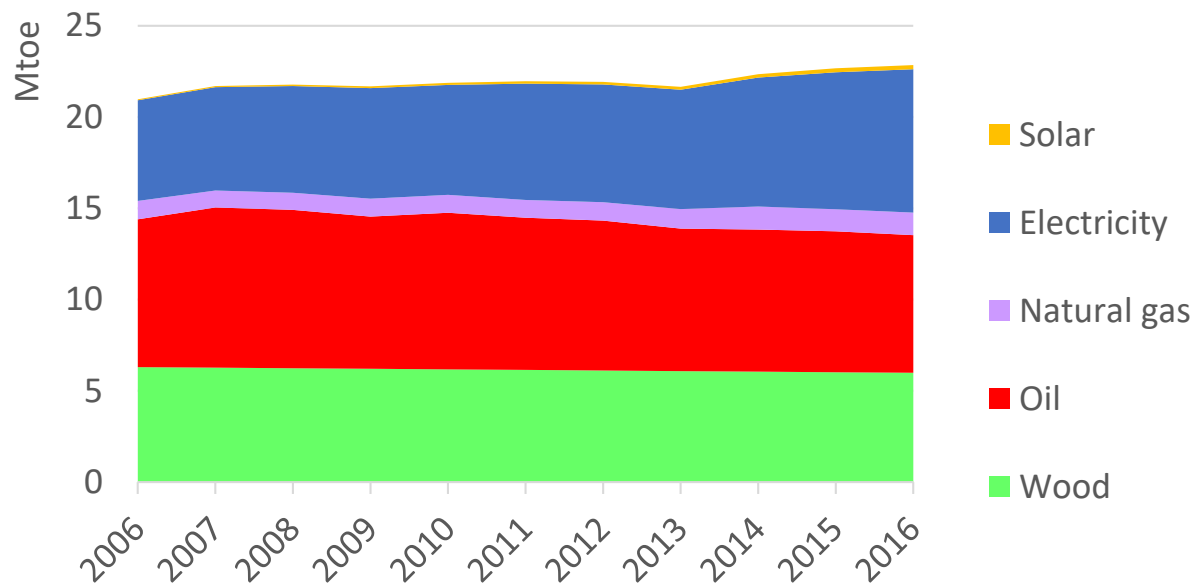
# Crude oil



# Natural gas



# Buildings sector



Source: Balance Nacional de Energía 2015, SENER. ([link](#))

# ¿Cómo se determinan los indicadores de carencia social?

## Acceso a los servicios básicos en la vivienda

Agua



Se obtiene de un pozo, río, lago, arroyo, pipa, o por acarreo de otra vivienda, de la llave pública o un hidratante

x

Drenaje



No se dispone de drenaje, o el desagüe va a dar a un río, lago, mar, barranca o grieta

x

Electricidad



No se dispone del servicio

x

Combustible para cocinar



Leña o carbón sin chimenea

x

Todo el hogar es carente si la vivienda presenta alguno de estos elementos