SECRETARÍA DE ENERGÍA

SENER

CONUEE
Comisión Nacional para el Uso Eficiente de la Energía

National Program for Sustainable Use of Energy

Executive Summary

Vivir Mejor

The National Program identifies opportunities to achieve optimal energy efficiency and obtain substantial savings for the country in the medium and long term

- The Law for Sustainable Use of Energy (Published in November of 2008) mandated the elaboration of the National Program for Sustainable Use of Energy (Published in November of 2009).

- The National Program defines a comprehensive strategy to **address and capture the impact through actions identified in the final energy consumption**, giving priority to sectors that represent most of the potential impact.

- The National Program focuses on strategies for sustainable use of energy in the **final consumption.**

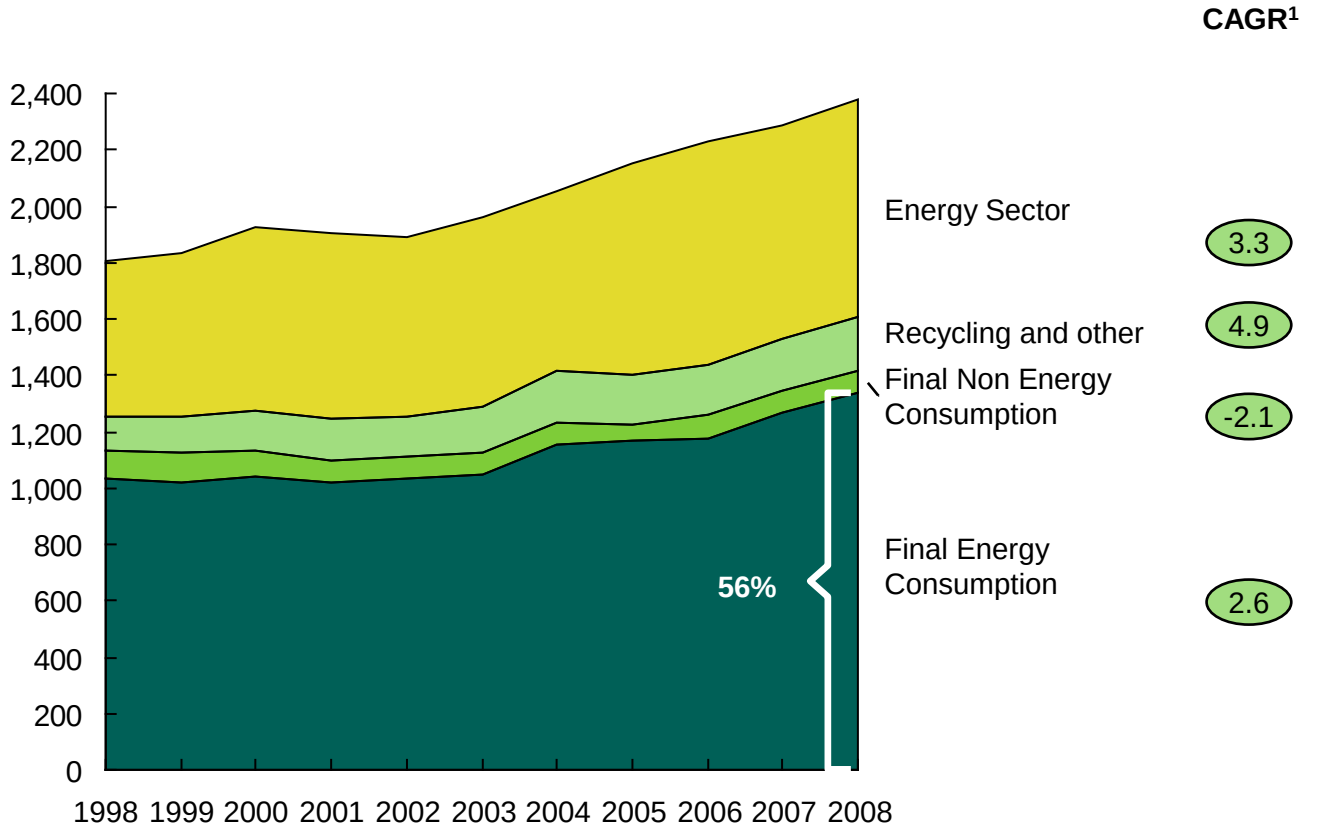
- In 2008, the final consumption of energy accounted for 56% of the overall national energy consumption. Over 90% of this consumption was concentrated in the transport, industrial, residential and commercial sector.

- By 2030, it is estimated that end use of energy consumption will be:
  - 50% Transport
  - 30% Industry
  - 15% residential, commercial and public sectors

In 2008, 56% of domestic consumption of energy was focused on final consumption

National energy consumption, historical

TWh



- Final energy consumption represented 56% of national energy consumption
- Final consumption presented a CAGR of 2.6% during the period (1998-2008), however, growth was faster in recent years
- The focus of the effort is centered on final consumption by complementing the National Energy Strategy

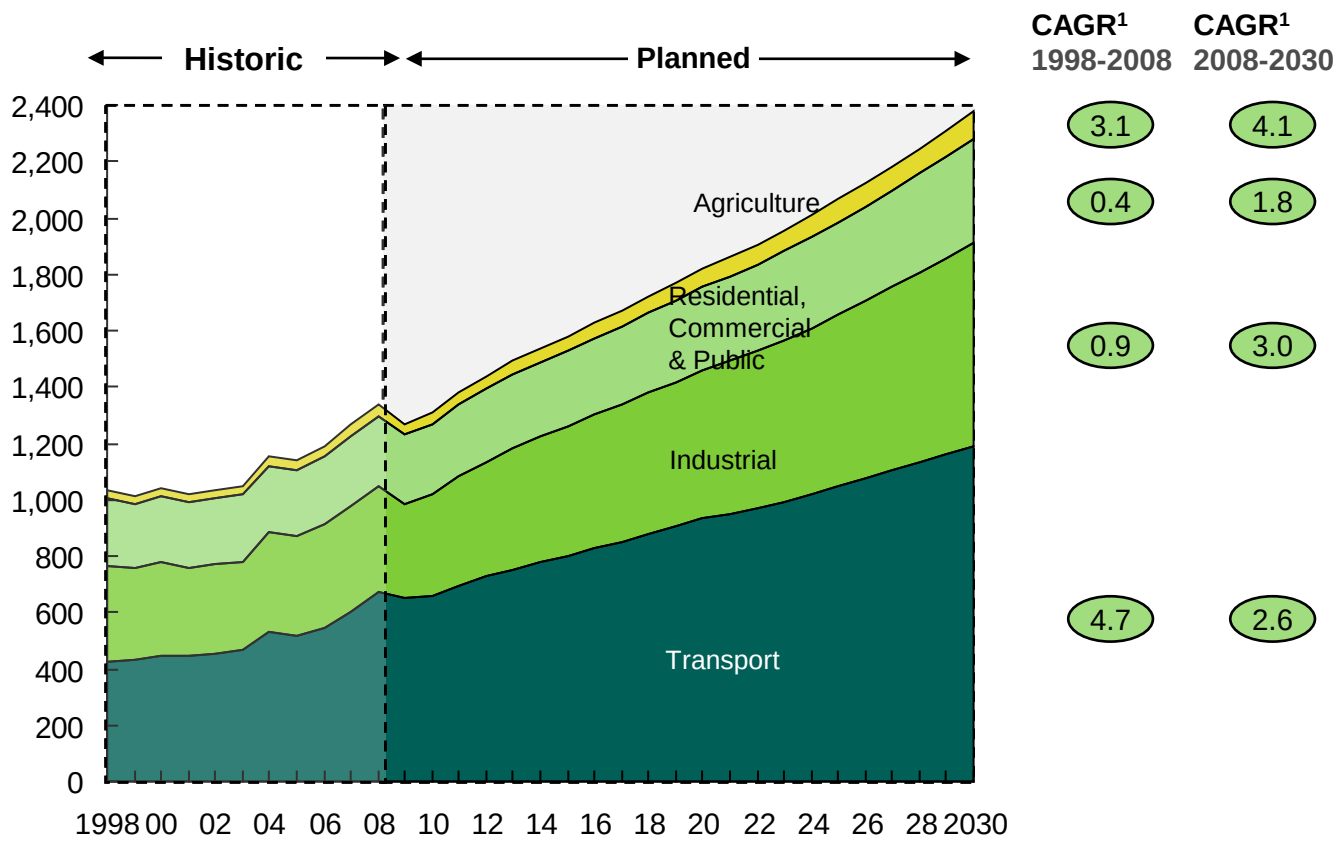
1 Compound annual growth rate

Source: Balance Nacional de Energía 2008

In 2008, over 90% of final energy consumption was concentrated in the transport, industrial, residential and commercial sectors

Final Energy Consumption by sector

TWh



- It is estimated that by 2030 the most representative sectors will be:
  - Transport (50%)
  - Industrial (30%)
  - Residential, commercial & public (15%)
- The sectors with the higher growth rate are industrial, agricultural and transport
- It is expected that total consumption continues to grow at a similar rate to the GDP (2.8%)

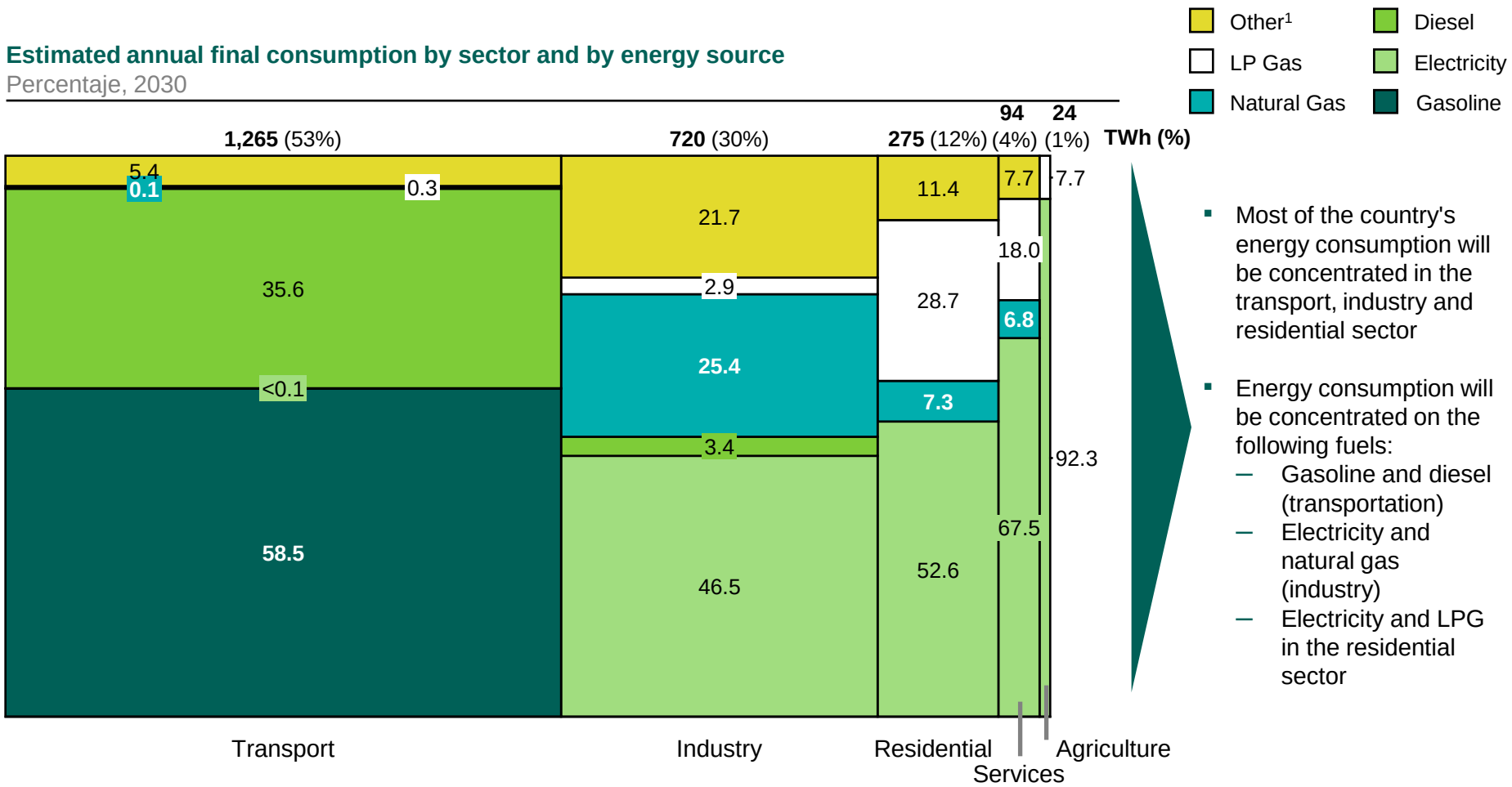
1 Compound annual growth rate

Source: Balance Nacional de Energía, CFE, SENER, IMP, análisis de CONUEE

By 2030, final consumption of energy will be mainly driven by gasoline, electricity and diesel

Estimated annual final consumption by sector and by energy source

Percentaje, 2030

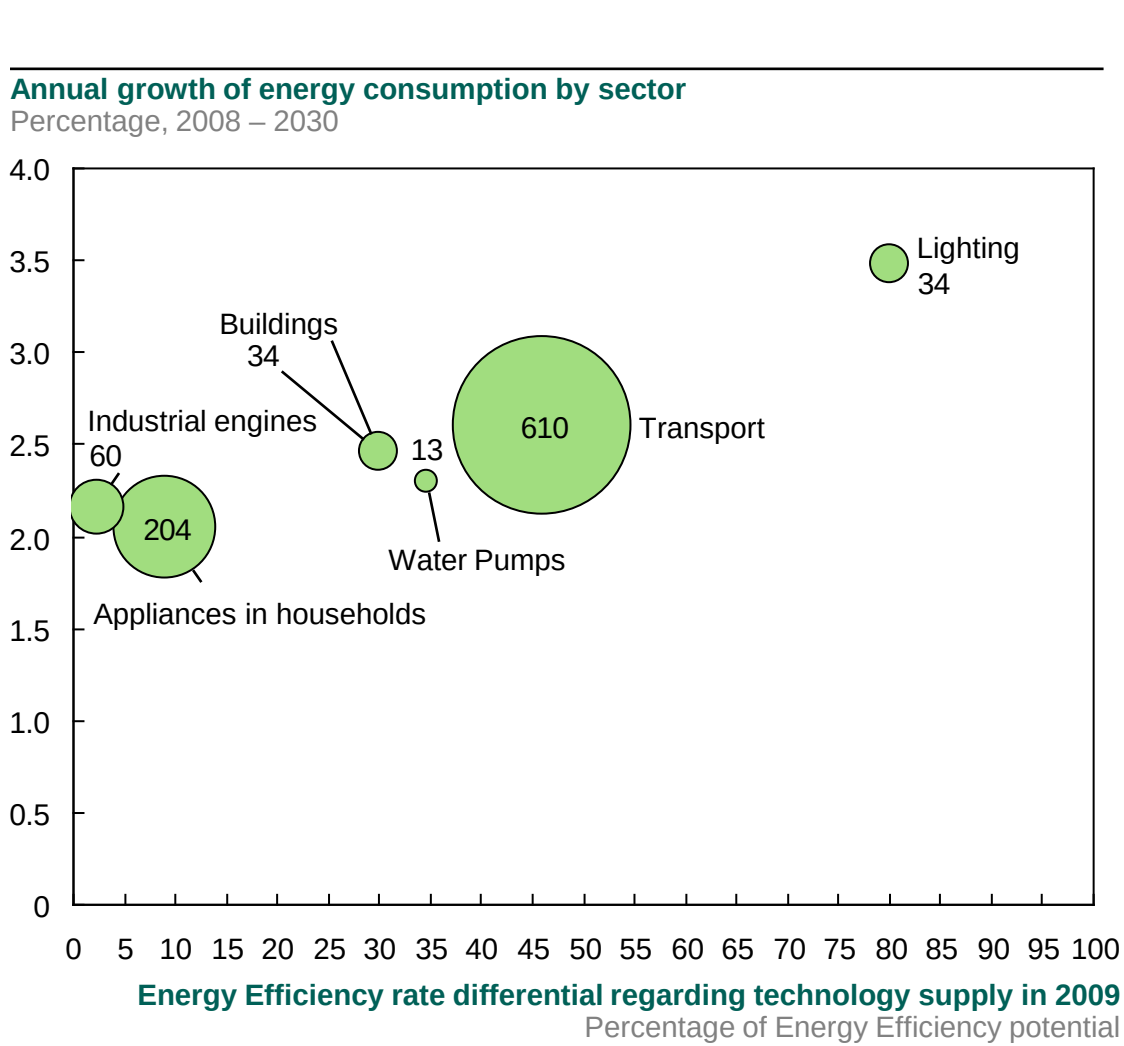


- Most of the country's energy consumption will be concentrated in the transport, industry and residential sector
- Energy consumption will be concentrated on the following fuels:
  - Gasoline and diesel (transportation)
  - Electricity and natural gas (industry)
  - Electricity and LPG in the residential sector

1 Fuels for each sector are grouped into the "other" parameter are:
Transportation: jet fuel (99%), fuel (1%)
Industrial: coal (51%), fuel (8%), petroleum coke (37%), wood (4%)
Residential: wood (100%)
Services: wood (100%)

Source: CFE, SENER, IMP, CONUEE's review.

Energy efficiency potential by sector regarding energy consumption growth and technology supply 2008-2013



- Transport is an area of opportunity with high energy consumption and high energy efficiency rate.
- Although energy consumption in lighting is low against other sectors, it is the area of opportunity with highest range of potential in efficiency gains.

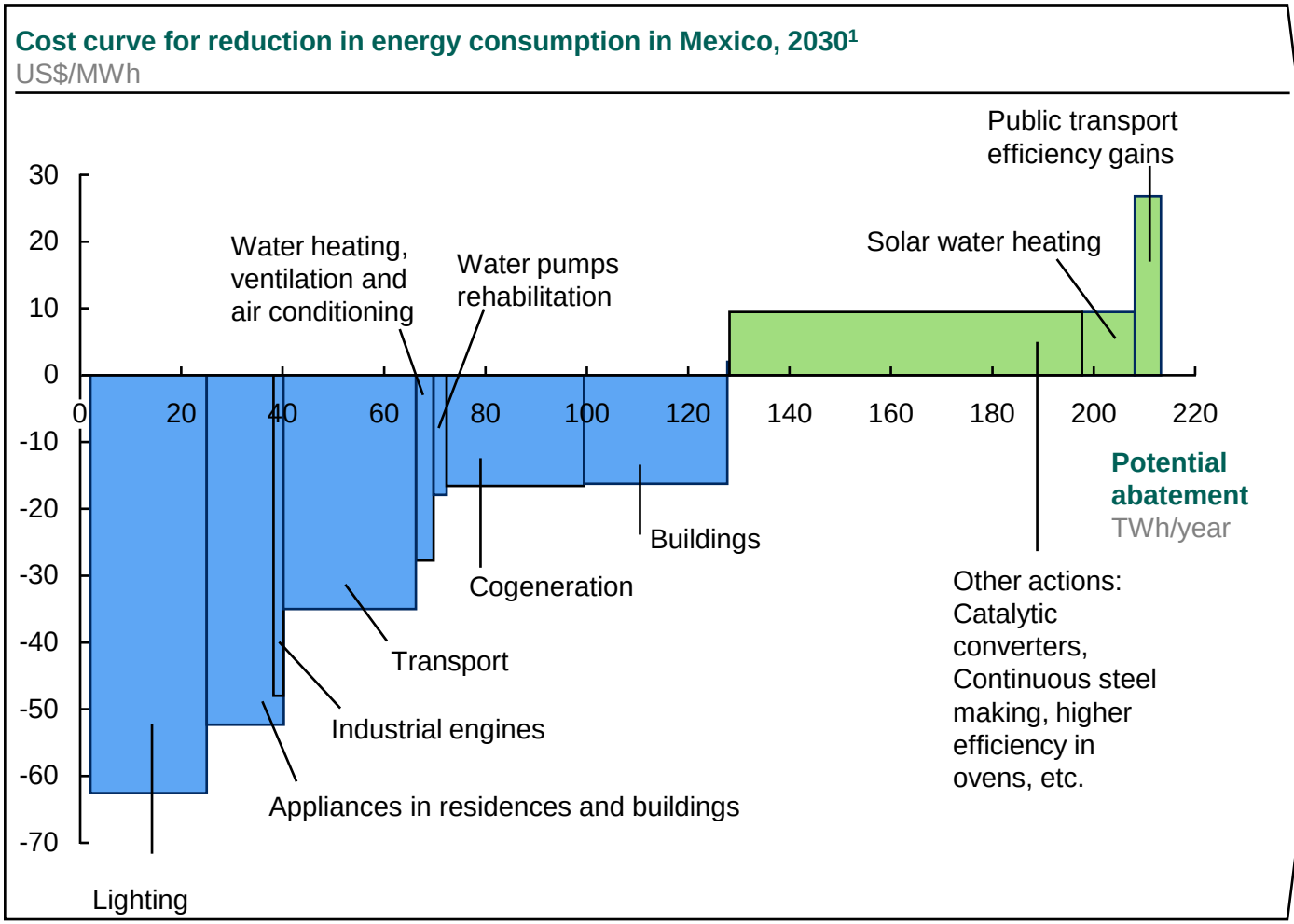
7 cost-effective areas of opportunities to increase energy efficiency

The program focuses in 7 cost-effective areas of opportunities to increase energy efficiency and reduce energy consumption in the medium and long term.

- **Transport.** It addresses the energy consumption of motor transportation, both light[1] and medium[2], as well as heavy weight.
- **Lighting.** Includes lighting across the residential, commercial, industry and services sectors, as well as the Federal Government, State governments and local governments.
- **Appliances in households.** It is related to the energy consumption from the end use electric, electronic and equipment in households, including air conditioning, refrigerators, ventilation and water heating.
- **Cogeneration.** Identifies the potential energy savings in industries with high potential for cogeneration.
- **Buildings.** Addresses opportunities for energy savings resulting from improvements in construction.
- **Industrial engines.** It is related to the energy consumption in three-phase engines under 75 HP, because this kind represent the vast majority of the industrial engines in the country.
- **Water pumps.** Includes energy consumption for agriculture and local government ‘s water pumps.

1 lightl - includes all types of cars (compact, subcompact and medium).
2 medium - including light trucks and passenger load (utility vehicles, pickups and light trucks).

Abatement cost curve for energy consumption helped to identified the 7 areas of opportunity which are PRONASE´s main goal



Selected areas of opportunity

- 7 areas of opportunity were identified as the National Program main goal:
  - Lighting
  - Transport
  - Appliances in households
  - Cogeneration
  - Buildings
  - Industrial Engines
  - Water pumps
- All areas of opportunity, which represent 60% of the energy efficiency potential, have a negative cost. (i.e., Annual investment in year 2030 is lower than the income for energy savings)

1 Considering the cost curve for the reduction in Green House Effect Emissions for main fuels.

Source: McKinsey GHG abatement cost curve V 2.0, CONUEE's review.

INTERNATIONAL EXPERIENCE

The actions in energy efficiency worldwide focus on two types actions:

1. Promoting technological change

- The establishment of regulatory frameworks that foster the adoption of energy efficiency measures.
- The use of economic incentives[3] to influence technology choices among end users of energy (including subsidies to low income households), favoring efficient technologies and penalizing inefficient ones.
- Promoting high-efficiency technologies through certification, in order to generate greater awareness among the population and to spread the availability of improved technologies.

2. **Promoting behavior change in the end-user.** It highlights specific efforts to capture energy efficiency measures driving a change of behavior by:

- The dissemination of best practices through information campaigns focused on relevant groups.
- The use of economic and non-economic incentives to encourage the adoption of habits aimed for sustainable use of energy.

3 For example, support has been granted for the replacement of inefficient technologies, tax incentives to encourage the supply and demand of efficient equipment, financing of projects classified as DSM.

CURRENT NATIONAL CONTEXT

Actions in the past to capture energy efficiency opportunities in Mexico have had 4 main goals:

1. To support low income groups

2. To define standards for equipment and systems (standardization)

3. To promote technological change through economic incentives

4. Changing patterns of behavior.

5. Others.

- Actions within the Federal Government through a “Protocol of specific actions to improve energy efficiency in buildings, vehicles and installations”.
- Some of these programs have proved very successful, as the replacement program for appliances, which has managed to replace more than 100 thousand equipment (refrigerators and air conditioning) Nation wide.

National Program´s main objectives and strategies for Energy Efficiency

	Objective	Strategy
Transport	1. Increase in fuel efficiency in transport	1.1 Improvement of new vehicles 1.2 Improvement of vehicles handling and driving
Lighting	2. Increase the number of efficient lamps for lighting	2.1 To assure the change of technology to increase energy efficiency in lighting
Appliances in households	3. Increase the number of efficient electronic devices at home	3.1 Improvement of efficiency in new electronic devices on the market 3.2 Substitution of inefficient devices 3.3 Better consumption practices
Cogeneration	4. Increase cogeneration capacity	4.1 Promote cogeneration among industries with high energy consumption
Buildings	5. Reduction of energy consumption for air conditioning	5.1 High thermal resistance roofs in new buildings
Industrial engines	6. Increase the efficiency of industrial engines with the highest energy consumption	6.1 Improvement of new engines on the market 6.2 Substitution of inefficient engines
Water pumps	7. Increase the efficiency in water pumps systems	7.1 Rehabilitation of existing systems

Lines of action

Based on analysis of the objectives and strategies of the 7 areas of opportunity for energy efficiency, there have been identified 26 lines of action which are divided by:

1. **Public sector guidelines** (guidelines for the adoption of efficient technologies, programs information and disseminating of best practices, among others)

2. **Programs for end users** (such as Standardization and support of low income groups)

3. **Best practices for sustainable use of energy** (i.e. promotion campaigns, new professionals and experts)

National Program´s 26 specific lines of actions for the 7 areas of opportunity

	Public Sector (PS) [4] Guidelines	Programs for end users	Best practices for sustainable use of energy
Transport	1. To apply new efficiency standards to Public Sector´s transport and automobiles	2. New Norms of efficiency for new light and medium weight vehicles 3. New Norm of efficiency for new heavy vehicles 4. To publish mechanic and environmental standards to authorize the use of old imported vehicles	5. To promote the best practices for vehicles use
Lighting	6. Speed up implementation of efficient illumination in PS 7. Speed up implementation of efficient illumination in public street lights	8. New Norm of consumption efficiency for illumination 9. To support low income house holds for the acquisition efficient light bulbs	10. Promote the use of high efficiency light bulbs
Appliances in households	N/A	11. To implement the program and the campaign to certify new electric devices for energy efficiency 12. Actualize Norms for energy efficiency on refrigerators and water heating systems 13. Continue the homologation of existing norms 14. Continue with the promotion of solar water heating 15. Continue with the support to low income households for the substitution of refrigerators and air conditioning systems 16. New Norm to foment the moderate use of air conditioning systems	N/A
Cogeneration	N/A	17. Campaign to promote the cogeneration highlighting the benefits and the viability of projects for industries with high energy consumption including PEMEX and CFE (State monopolies in energy)	N/A
Buildings	18. Incorporate solar reflectance standards in new buildings of the Public Sector.	19. Foment the incorporation of high thermal resistance roofs standards in the construction licensing of the local governments for: – New non residential buildings – New residential buildings in regions of high average on temperature 20. To foment the coverage of Green mortgages 21. To promote the best practices for high thermal resistance roofs and the use of air conditioning buildings	22. To develop a certification for the estimated energy consumption of new buildings
Industrial Engines	N/A	23. Actualize the Norm of energy efficiency standards for three-phase engines 24. To foment the substitution of three-phase engines	N/A
Water pumps	N/A	25. To reinforce the program of support for the rehabilitation of agricultural water pump systems 26. To establish a program of support for the rehabilitation of local government´s water pump systems	N/A

Note: N/A means “No appliance”
4 Federal, State and Local governments.

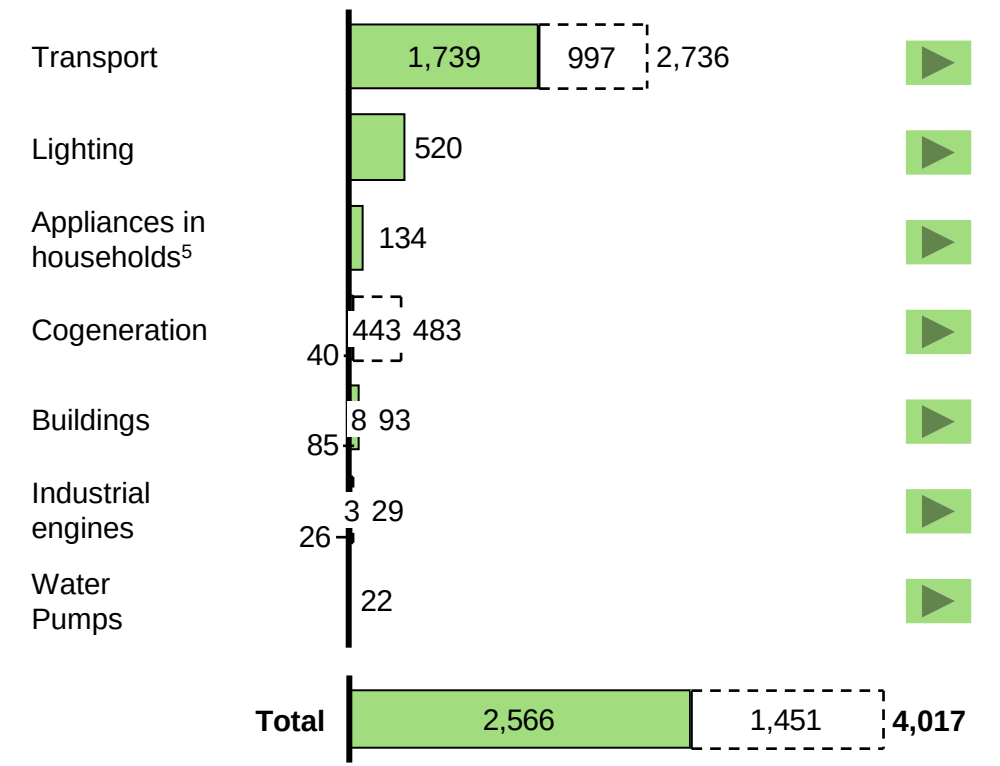
Sustainable use of energy potential

It is expected that the lines of action once fully implemented will give as result an added national energy savings of:

- **43 TWh in year 2012**, where the reduction in consumption from lighting will be the main driving factor with 40% of the savings
- **4,017 TWh in year 2030**
- **16,417 TWh in year 2050**

Energy savings are focus overall in lighting and transport

Potential reduction in added final consumption in 2030
TWh



% of reduction in consumption
2030

- 18 a 26
- 52
- 10
- No data
- 15 a 16
- 2
- 12
- 12 a 18

- Transport and lighting catch the highest reduction in energy consumption
- Reduction of energy consumption in 2030:
  - Lighting (52%)
  - Transport (18-26%)
  - Buildings (15-16%)

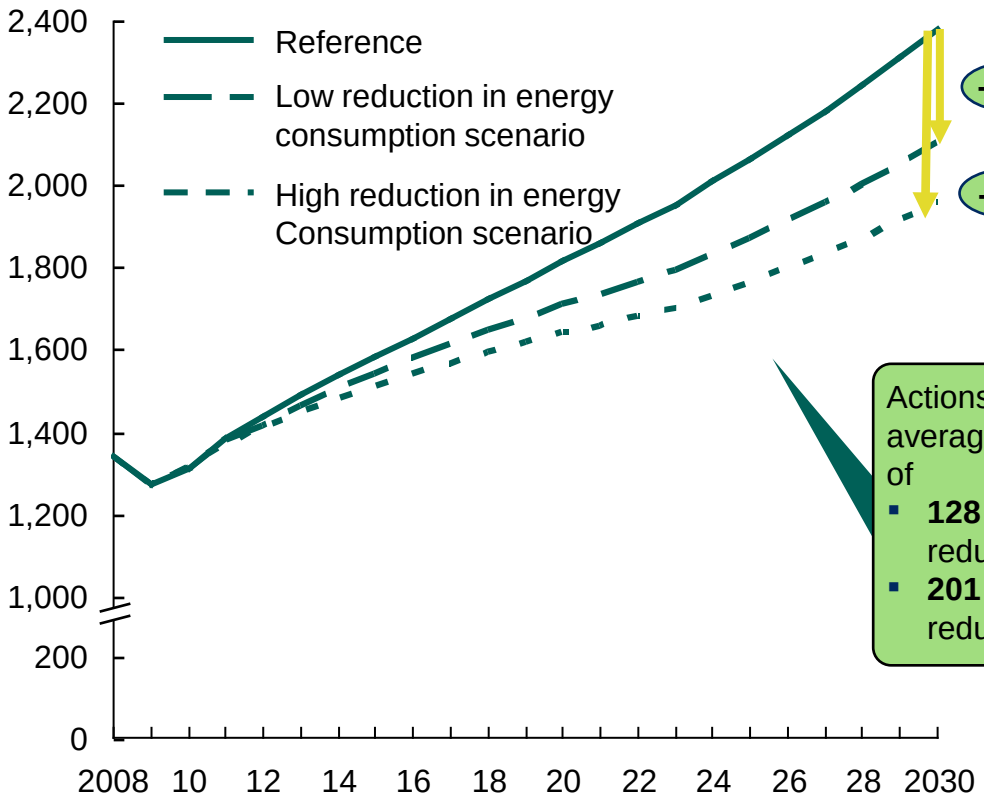
5 Refrigerators, water heating, air conditioning for rooms and central type.

Notes:

- **Lighting:** Considers a Norm in 2012 that reduces the sales of incandescent and fluorescent low efficiency light bulbs
- **Transport**: It has a great potential depending on effectively applying the policy to restrict the energy consumption of used imported cars
- **Appliances in households:** Includes the implementation of a new Norm to limit the sale of low efficiency refrigerators and water heating devices
- **Cogeneration:** It is considered that PEMEX will self supply its energy in 2012, legal frame improvements could bust capture additional potential
- **Buildings:** Considers a higher use of cool roof materials in new residences in high average temperature regions
- **Industrial Engines**: Considers a program of substitution for high efficiency equipment
- **Water Pumps:** It is considered a rehabilitation program for agriculture and local governments' water wells 60% become efficient in 2030

Benefits from new policies in energy efficiency will reach an added 4,017 TWh in 2030, equivalent to 3 full years of national energy consumption at today's rate

Potential reduction in energy consumption after the National Program
TWh

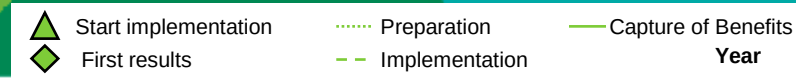


	Energy savings in 2030 TWh	Added Energy savings in 2030 TWh
Low reduction in energy consumption scenario	-12%	2,566
High reduction in energy Consumption scenario	-18%	4,017

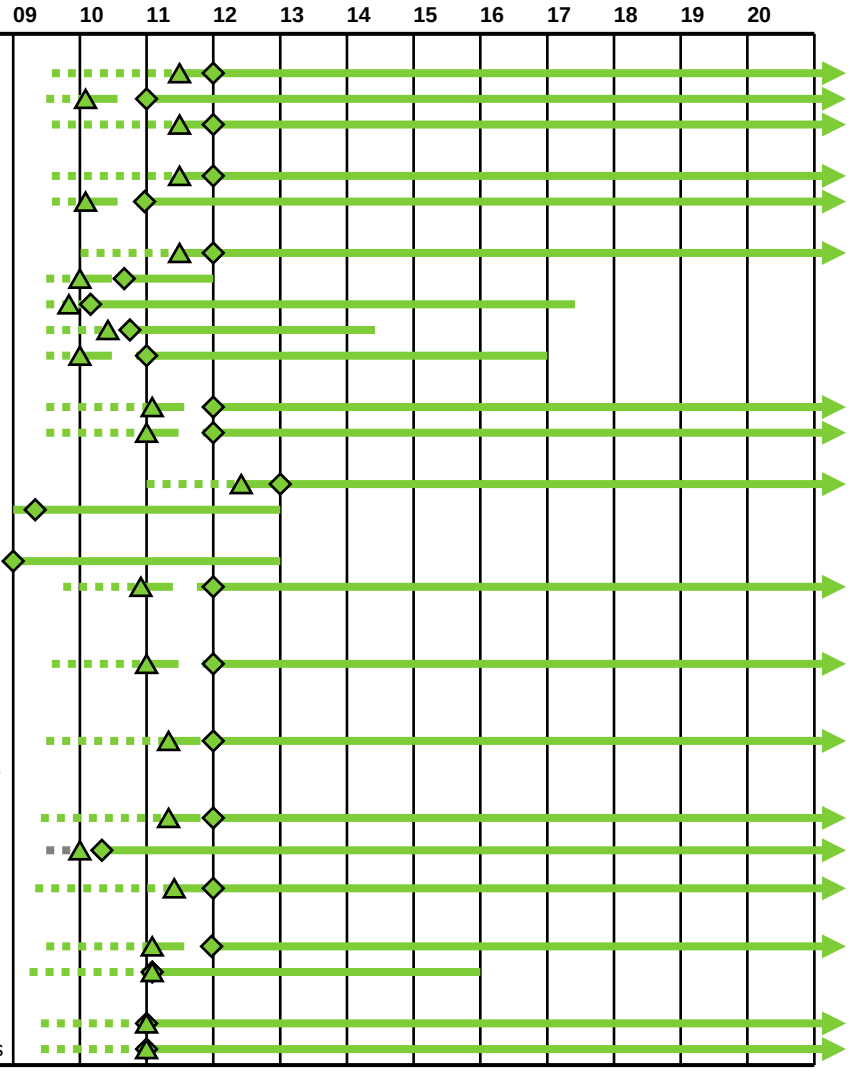
Actions are translated in average energy savings of
- **128 TWh** in the low reduction scenario
- **201 TWh** in the high reduction scenario

- Programmed actions have a potential reduction in energy consumption of 4,017 TWh from 2010 to 2030
- Energy consumption could reach ~18% in 2030 in the high reduction scenario
- Opportunity areas with higher potential of reduction in energy consumption are:
  - Transport
  - Lighting
  - Cogeneration

Actions time line



Actions



Transport

- New Norms of efficiency for new light and medium weight vehicles
- To apply new efficiency standards to Public Sector´s transport and automobiles
- To publish mechanic and environmental standards to authorize the use of old imported vehicles
- New Norm of efficiency for new heavy vehicles
- To promote the best practices for the use of vehicles

Lighting

- New Norm of consumption efficiency for lighting
- Speed up implementation of efficient lighting in Public Sector
- To support low income house holds for the acquisition efficient light bulbs
- Promote the use of high efficiency light bulbs
- Speed up implementation of efficient street lighting

Appliances in households

- To implement the program and the campaign to certify new appliances for energy efficiency
- Actualize Norms for energy efficiency on refrigerators and water heating systems
- Continue the homologation of existing norms
- Continue with the support to low income households for the substitution of refrigerators and air conditioning systems
- Continue with the promotion of solar water heating
- New Norm to foment the moderate the temperature in air conditioning systems

Cogeneration

- Campaign to promote the cogeneration highlighting the benefits and the viability of projects for industries with high energy consumption including PEMEX and CFE (State monopolies in energy)

Buildings

- Foment the incorporation of high thermal resistance roofs standards in the construction licensing of the local governments for new non residential buildings and new residential buildings in regions of high average on temperature
- To foment the coverage of Green mortgages
- To promote the best practices for high thermal resistance roofs and the use of air conditioning in buildings
- To develop a certification for the estimated energy consumption of new buildings

Industrial Engines

- Actualize the Norm of energy efficiency standards for three-phase engines
- To foment the substitution of three-phase engines

Water pumps

- To reinforce the program of support for the rehabilitation of agricultural water pump systems
- To establish a program of support for the rehabilitation of local government´s water pump systems