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BIOFUELS

DEVELOPMENT PERSPECTIVES IN MEXICO

**Undersecretariat for Energy Planning and Technology
Development
General Directorate for Research, Technology Development
and Environment**

ALMA SANTA RITA FEREGRINO

Miami, May 2008

A

Mexico: Energy policy and general overview

B

Biofuels policy

C

Actions for implementation

D

Conclusions



A

Mexico: Energy policy and general overview

A. Energy policy

- **Energy security**
- **Quality of energy supply**
- **Energy efficiency**
- **Diversification of primary energy sources and technologies**
- **Sustainable development**



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A. General overview

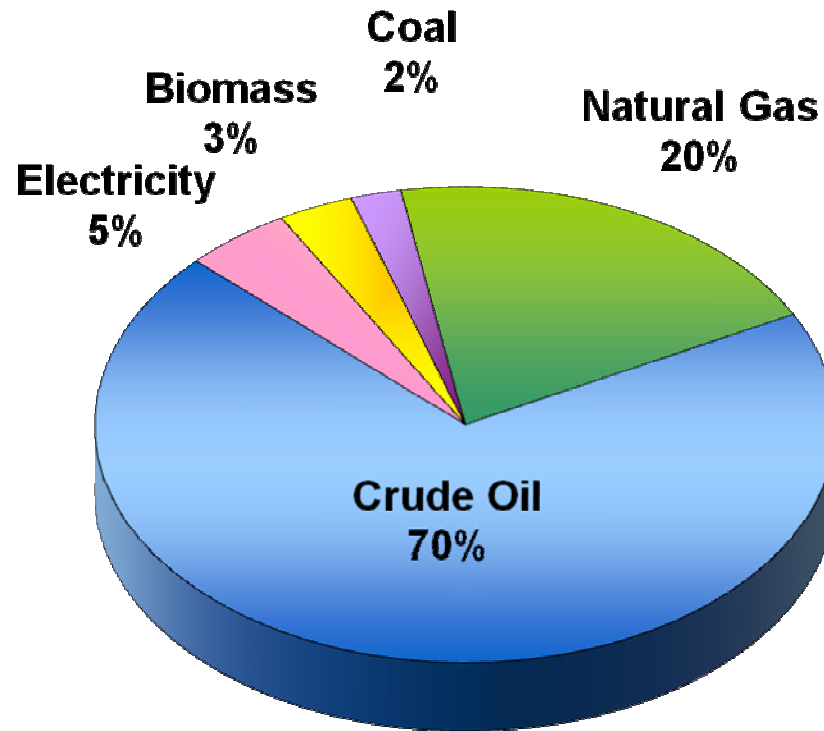
Primary energy production



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10,619 PJ in 2006



National energy consumption in 2006: 7,898 PJ

A. National market (transport sector)

23 million vehicles in Mexico



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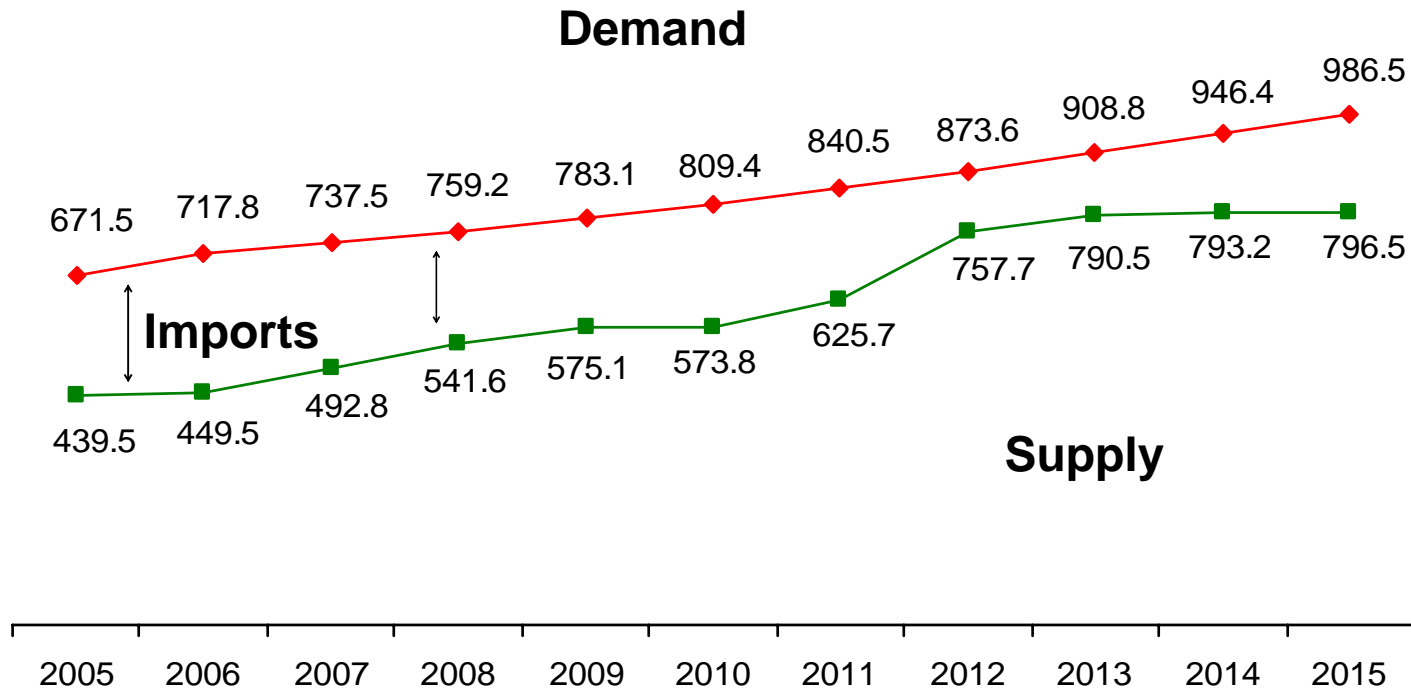
A. Gasoline supply and demand in the transport sector, 2005-2015



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Thousand Barrels Per Day



Source: Prospectiva de Petrolíferos 2006-2015. SENER.

A. General overview

Gasoline market in Mexico



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- Gasoline legal framework.
 - Oxygen blending in gasolines is mandatory in the metropolitan areas of Mexico City, Guadalajara and Monterrey.
 - The NOM-086-SEMARNAT-SENER-SCFI-2005 standard, published on January 30th 2006, stipulates an oxygen content for these areas of between 1 and 2.7% in weight.
 - For Premium unleaded the maximum oxygen content is 2.7% in weight.

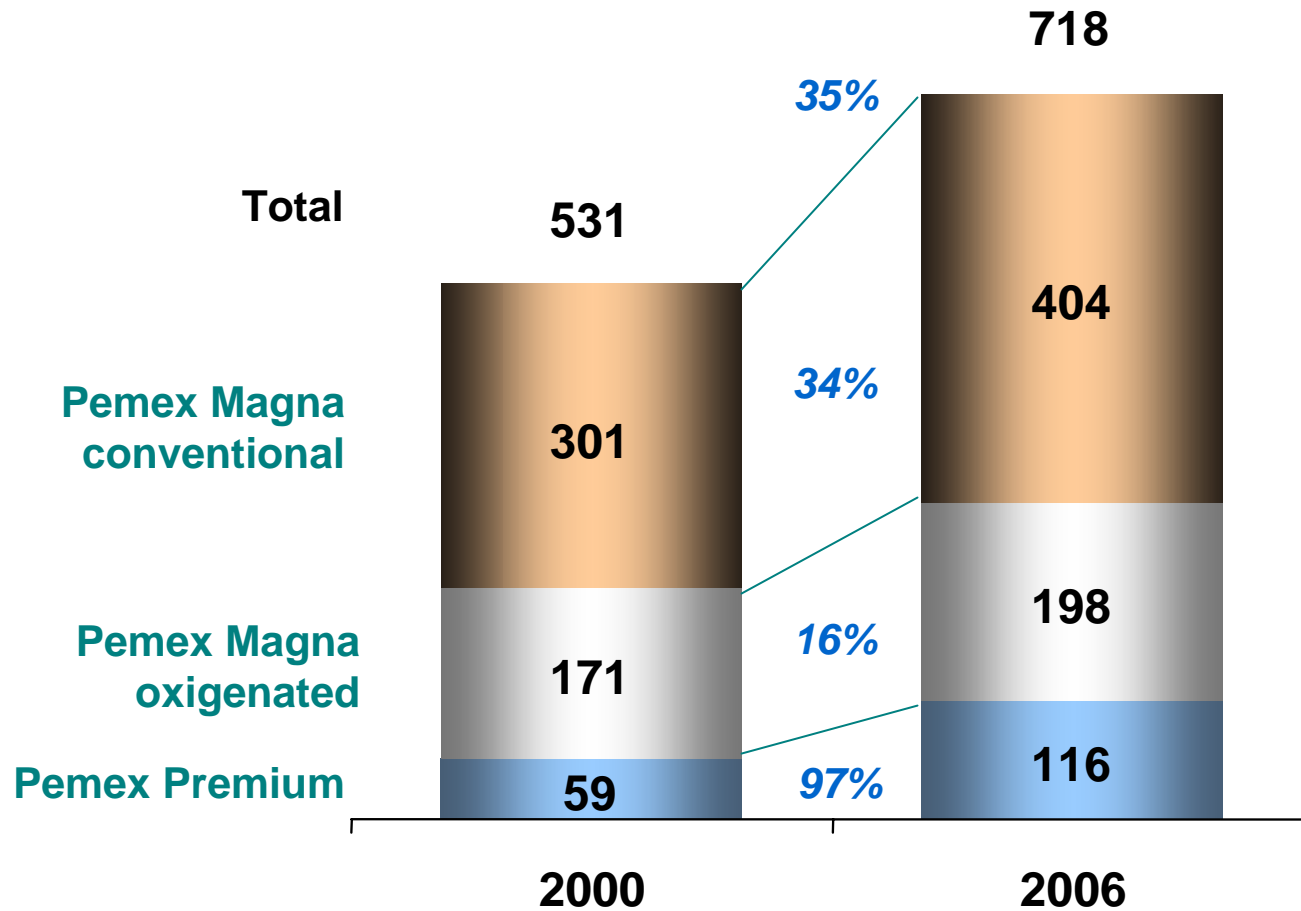
A. General overview

Gasoline sales in Mexico (thousand barrels per day)



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A. General overview

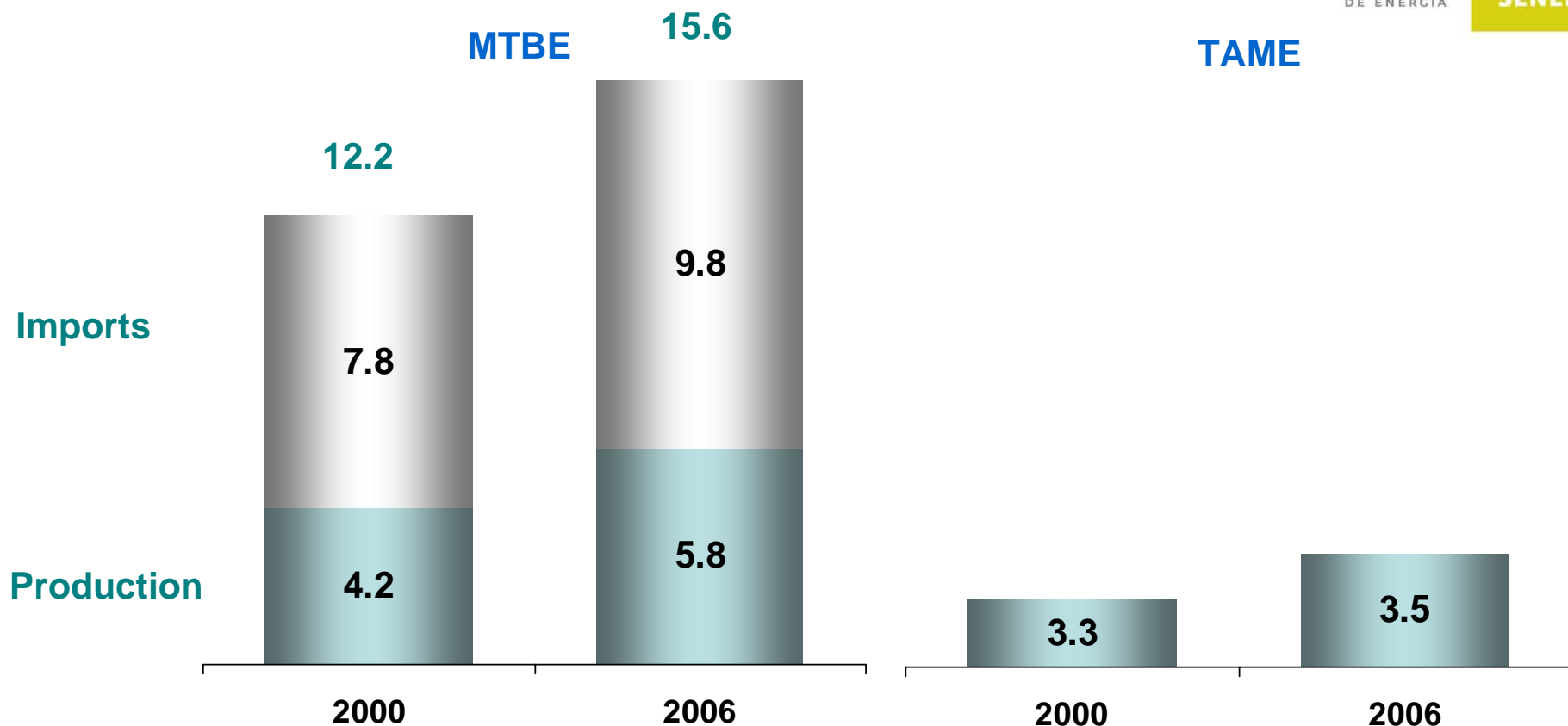
Production and imports of oxygenating agents

Methyl Tertbutyl Ether and Teramyl Methyl Ether (thousand barrels per day)



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Oxygenated gasolines formulated in Mexico use between 10 and 12 volume percent of MTBE and TAME.



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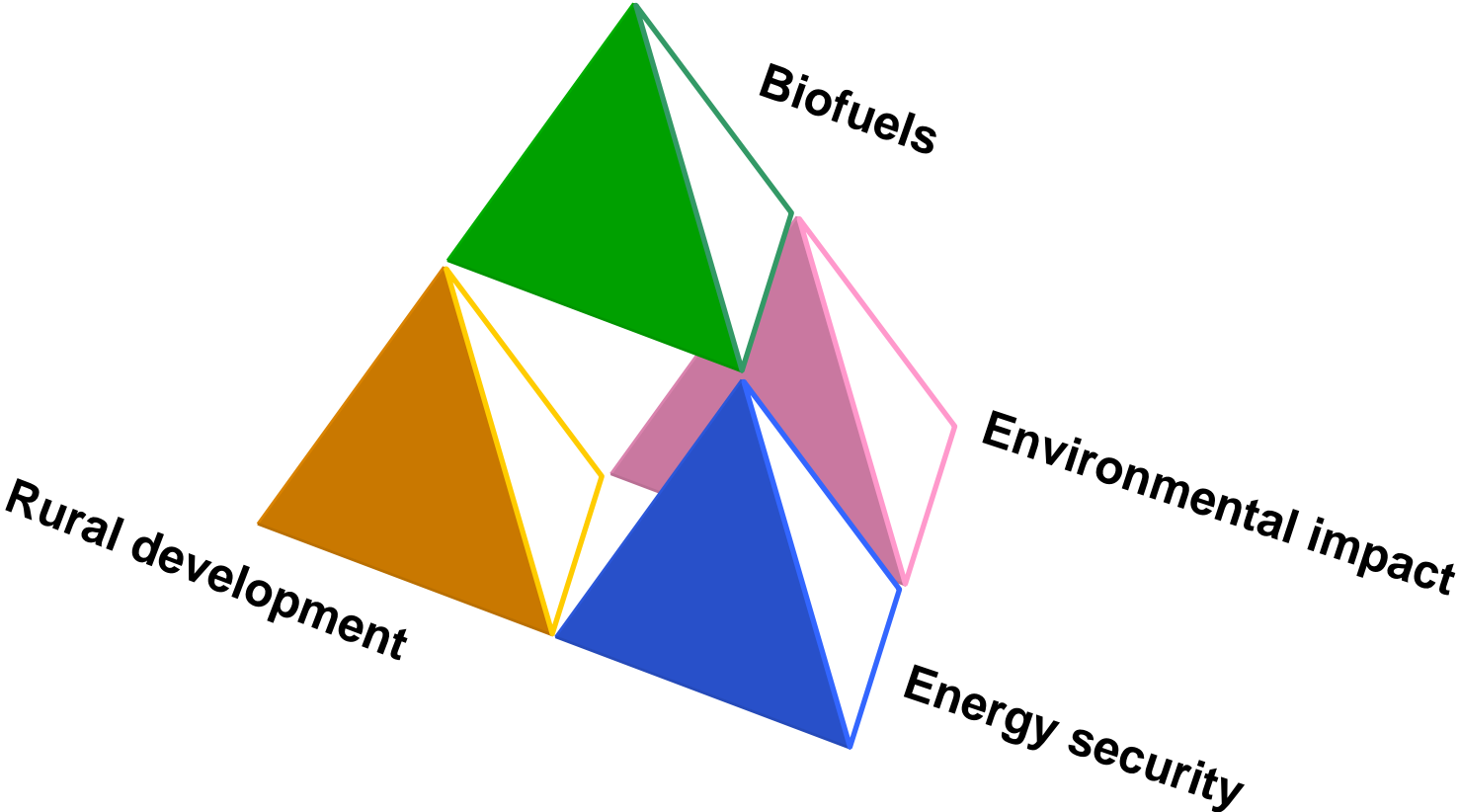
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B

Biofuels policy

B. Biofuels policy

Motivation for biofuels



B. Biofuels policy

Vision for 2012



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- The agriculture and energy economies have become integrated and the magnitude of the industry, the dominant conversion technologies and the type of crops required have been determined to allow the best conditions for the exploitation of resources and the best balance between energy, economy and carbon emissions.

B. Biofuels policy

Energy security

- Security in the supply of fuels for transport is guaranteed by the continuing efforts of PEMEX.
- The development of the biofuels industry is intended to promote energy security by diversifying energy sources, without risking the security of food supply in the country.



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B. Biofuels policy

Energy security

- PEMEX' economical viability is of prime importance to ensure security of fuel supply.
- PEMEX requires a legal framework that allows the company to increase its capabilities and incorporate new technologies and energy sources.



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B. Biofuels policy

Environmental impact

- Sustainable development is one of the main foundations of our energy policy, along with the ongoing search for energy systems compatible with the environment.
- These are included in the National Strategy for Climate Action and soon to be published Climate Change Special Program.
- New project development in Mexico is intended, applying for worldwide financing schemes and carbon markets.



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B. Biofuels policy

Rural development

- The development of the biofuels industry could extend the access to energy systems, create new jobs and increase income in the country's rural areas.
- Areas with low potential for food crop production could be suited for the growth of other biofuel producing species.
- A main objective of the biofuel policy in Mexico is to provide a means to increase the competitiveness and profitability of the Mexican agriculture sector, especially in areas with high and very high degrees of poverty.



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B. Biofuels policy

Feasibility Study SENER-BID-GTZ



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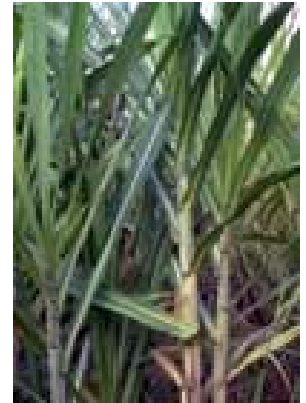
- The Mexican Ministry of Energy coordinated a feasibility study with the Inter-american Development Bank with the support of the German Technical Cooperation, to explore the feasibility of introducing biofuels into Mexico.
- Goal: to analyze the national feedstock situation and biofuels production capacity.
- The conclusions of the feasibility study have provided a general overview of the present situation in Mexico. Will be used as an input for further studies and activities.
- Can be downloaded from:
<http://www.energia.gob.mx/webSener/portal/index.jsp?id=167>

B. Biofuels policy

Bioethanol Feedstock

Feedstock analyzed :

- | | |
|-------------------|------------------|
| Sorghum | (Sorgo) |
| Corn | (Maíz) |
| Manihot esculenta | (Yuca) |
| Sugarcane | (Caña de azúcar) |
| Sugar beet | (Remolacha) |



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B. Biofuels policy

Biodiesel Feedstock



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Feedstock analyzed

Palm	(Palma de aceite)
Jatropha	(Jatropha)
Sunflower	(Girasol)
Rapeseed	(Canola)
Safflower	(Cártamo)
Soy beans	(Soya)

B. Biofuels policy

Analysis Criteria

- Different Technologies
- Cost
- Investment and jobs created
- Area of implementation
- GHG Emissions



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B. Biofuels policy

Feedstock Selected

Ethanol feedstock recommendation

Sugarcane for short-time implementation

sugar beet for medium- and long-term implementation

Biodiesel feedstock recommendation

Palm and Jatropha

for medium- and long-term implementation



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B. Biofuels policy

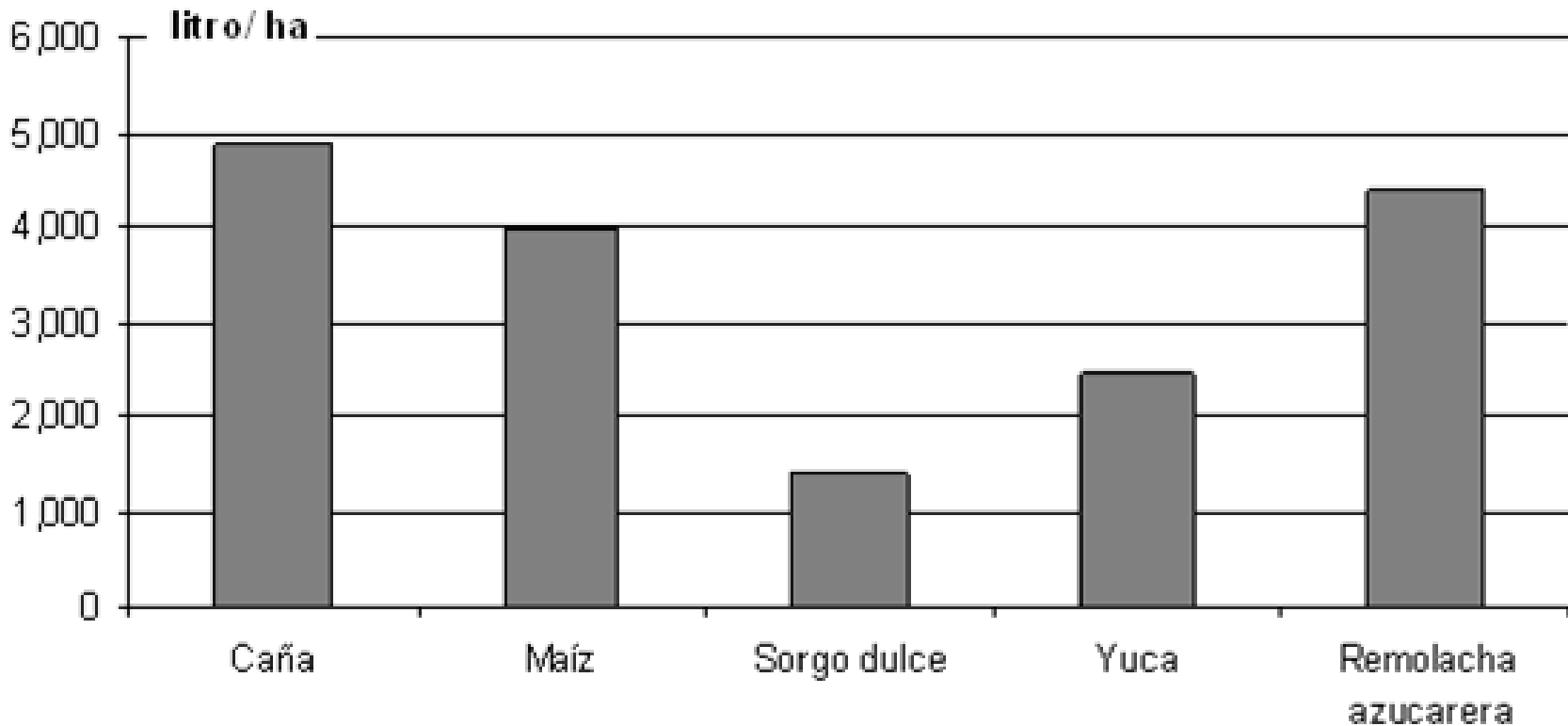
Biomass crops with potential for ethanol production



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Ethanol production per hectare



B. Biofuels policy

Plantation surface required



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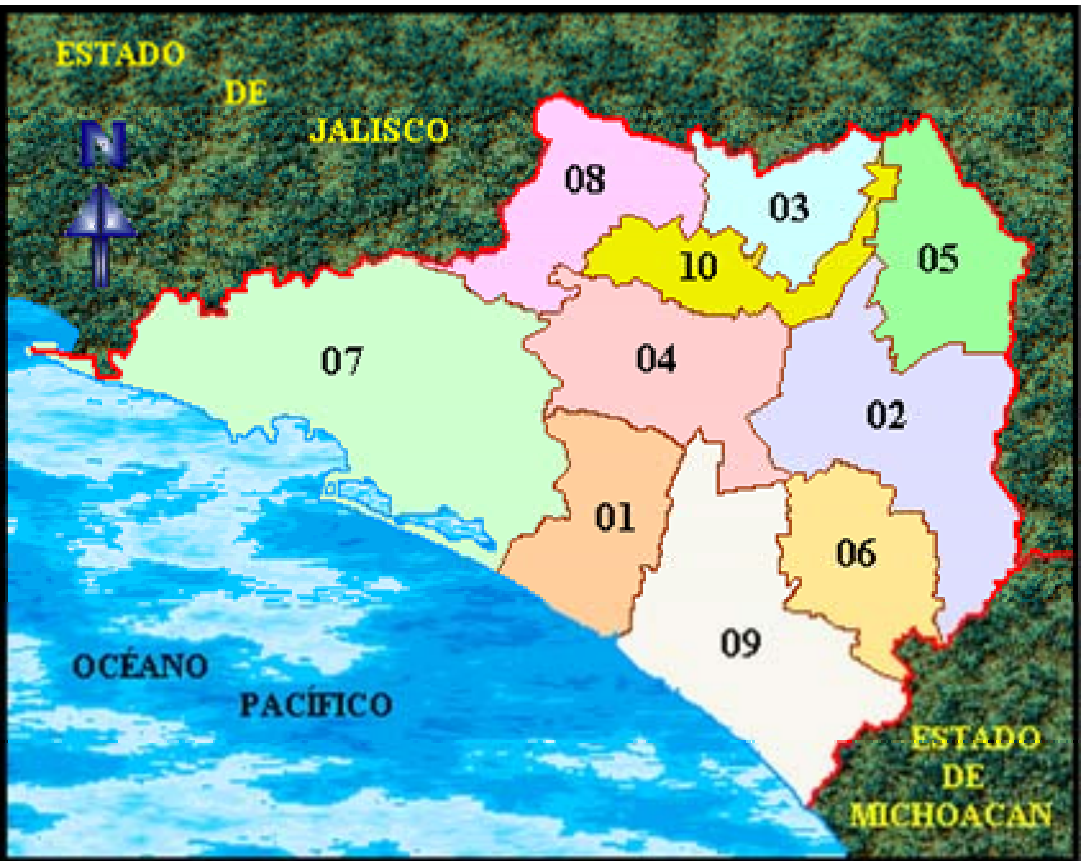
	Rendimiento [litros/ha]	Superficie agrícola requerida en 2014 [ha]			Superficie agrícola actual [ha]	Área potencial [ha]
		B-5	B-10	B-20		
Palma de aceite	3,390	304,881	609,762	1,219,524	15,000	2,500,000
Jatropha	730	1,415,717	2,831,434	5,666,868	n.s.	1,000,000
Girasol	665	1,554,095	3,108,190	6,216,381	900	n.s.
Canola / colza	619	1,669,585	3,339,171	6,678,341	10,050	n.s.
Cártamo	409	2,526,830	5,053,659	10,107,319	224,000	n.s.
Soya	289	3,576,032	7,152,065	14,304,129	110,000	> 1,000,000

Colima State Area



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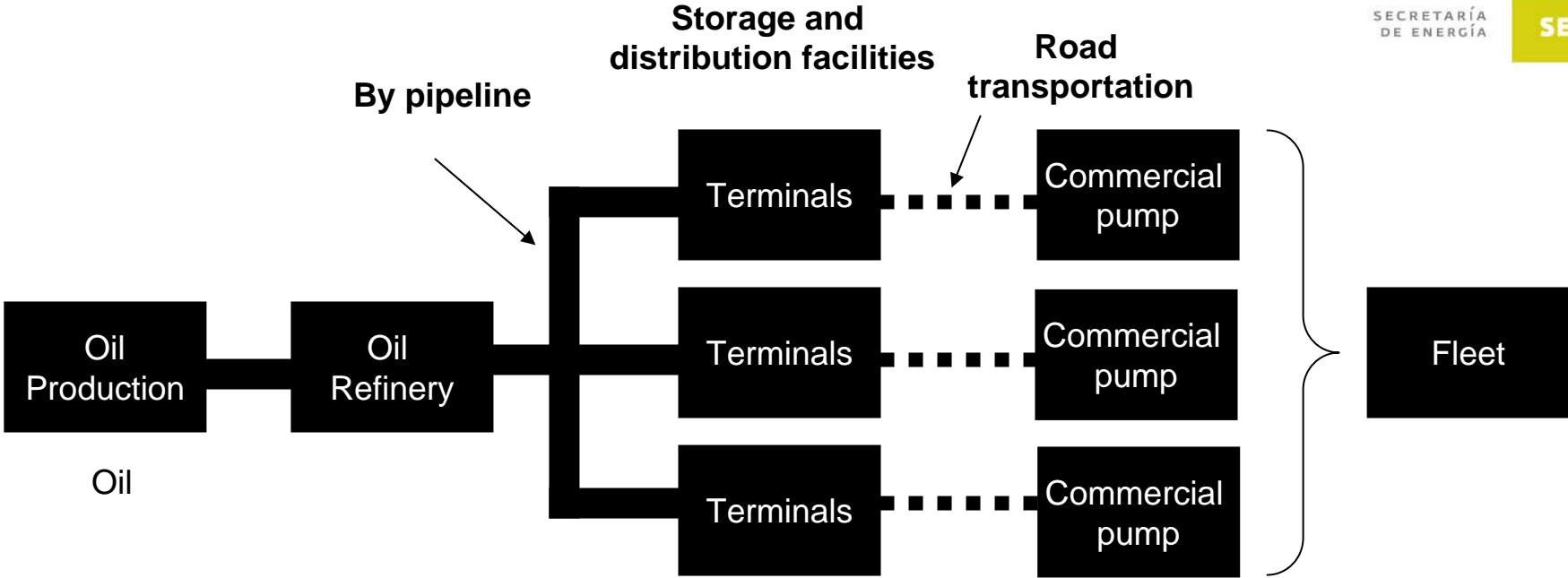
Area: 543,300 hectares

Fuel Production Supply Chain



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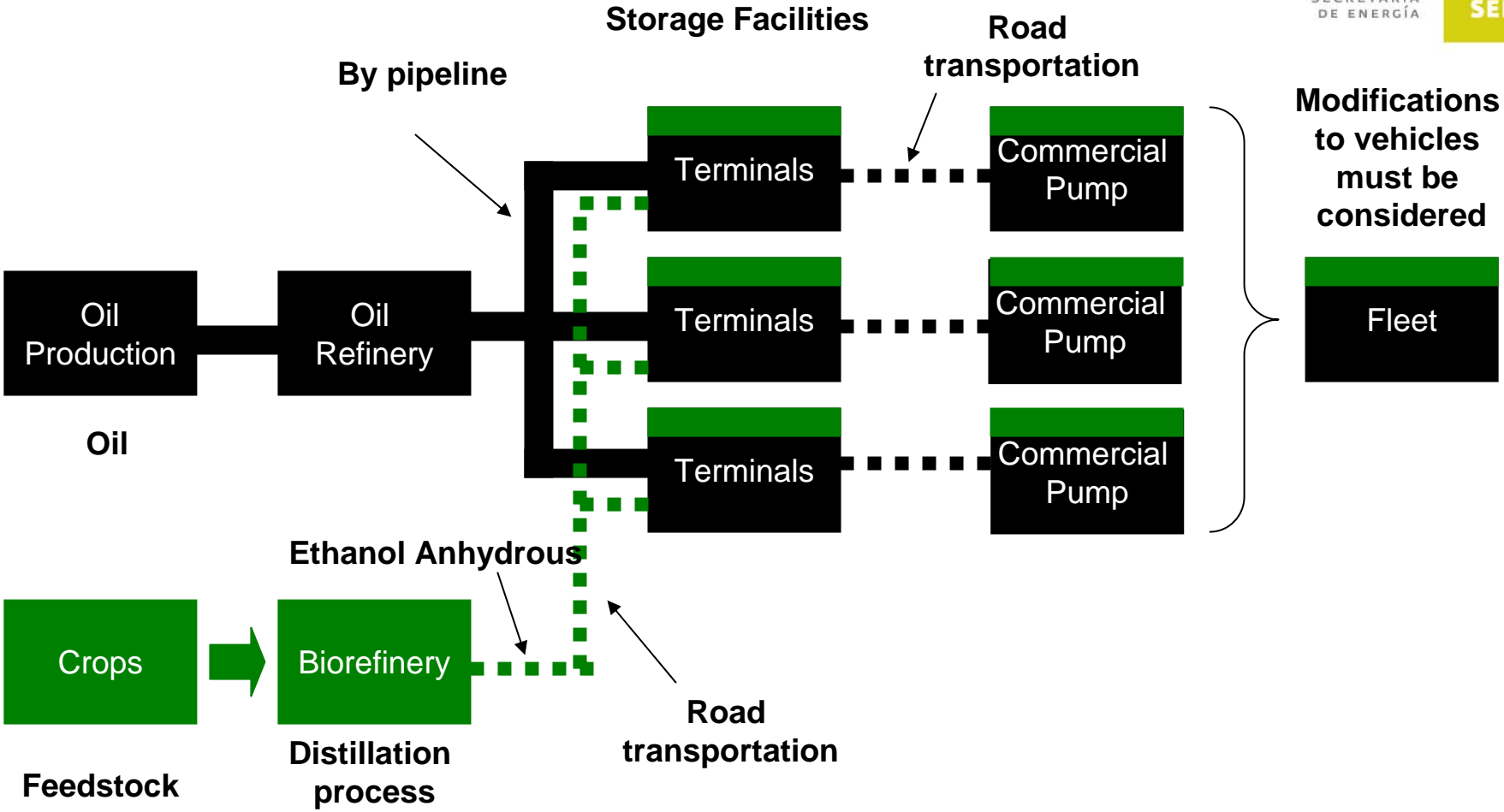
PEMEX produces non oxygenated fuels and MTBE or TAME oxygenated fuels

Fuel Production Supply Chain



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PEMEX National Storage Facilities



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● Storage and distribution terminals



Refineries



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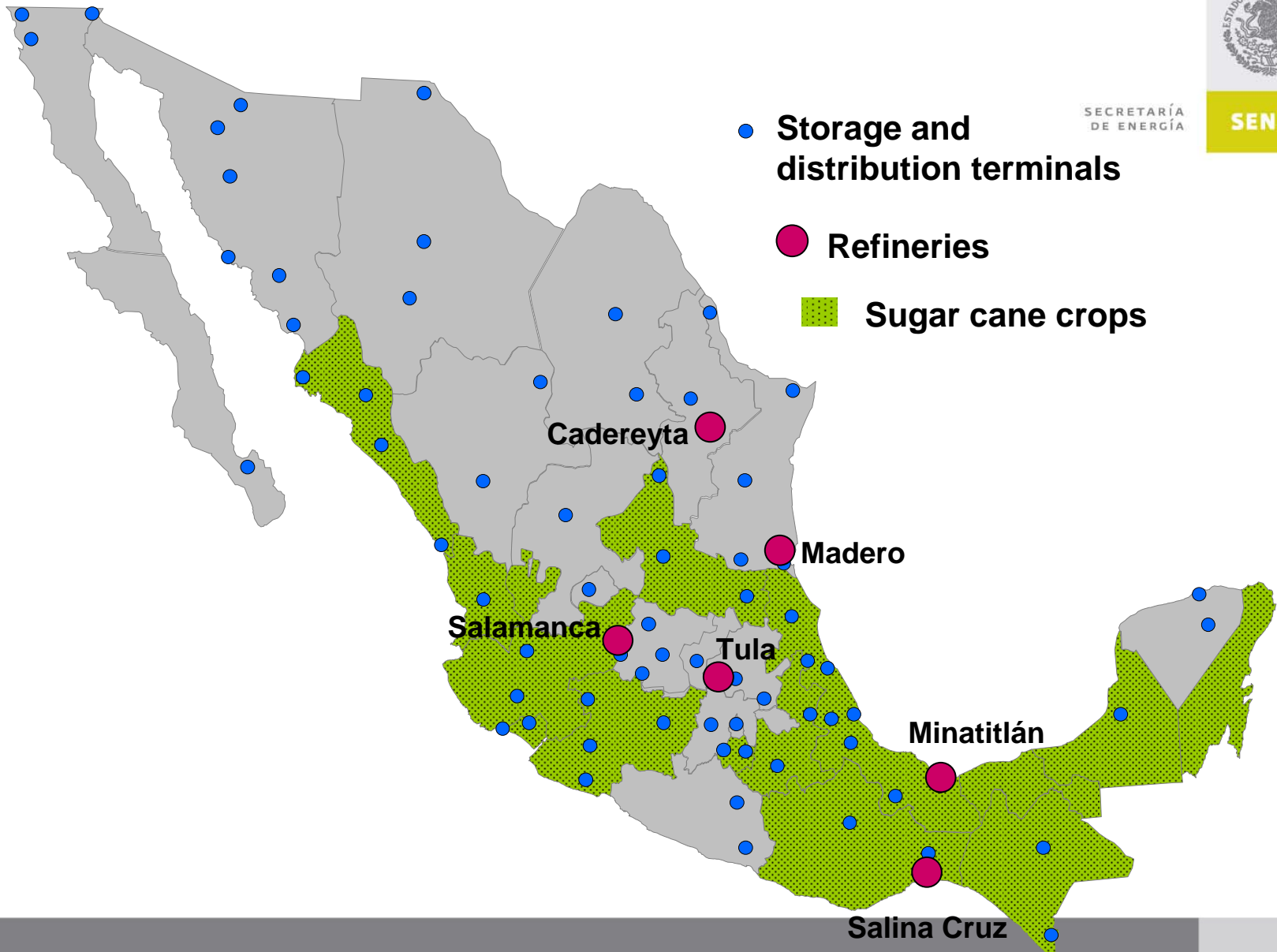


Sugar Cane Production



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B. Biofuels policy



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Law for the Promotion and Development of Biofuels

Approved on February 2008

Law for the Promotion and Development of Biofuels

OBJECTIVE

The promotion and development of biofuels to aid sustainable development and the diversification of energy sources, thereby also supporting Mexican agriculture, along the following guidelines:

- Promote the production of biofuel crops without risking security of food supply nor self sufficiency
- Develop production, commercialization and efficient use of biofuels to contribute to the reactivation of the rural sector.
- Promote regional development with special attention to the less privileged rural communities.
- Procure the reduction of toxic and greenhouse gas emissions to the atmosphere, using to that effect the international treaties to which Mexico is a party
- Coordinate actions between the Federal, State, Municipal and City governments, engaging both the social and private sectors, towards the development of biofuels.



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Inter-ministerial Commission



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INSTRUMENTS

The ministries integrating the Biofuels Commission will elaborate and implement the actions for the sustainable development of biofuel crops.



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- **The Federal Government will incentivize the production of biofuels and will coordinate actions with local governments to such effect.**
- **The Ministries, together with State and other local governments, will promote the creation of infrastructure for the production of biofuels**
- **The incentives will be directed at individuals that contribute to the biofuels industry and to infrastructure modernization, through the fabrication, acquisition, installation, operation or maintenance of biofuel producing equipment. As well, incentive policy will aid technology research focused at the reduction of contaminant emissions to the atmosphere, water, soil, sites, as well as technological innovations to biofuel producing installations.**



C

Actions for implementation

C. Actions for implementation

Interministerial strategy for biofuels



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- Under the Law of Promotion and Development for Biofuels the Federal government is responsible for the implementation of the Interministerial Strategy and the related programs:
 - Sustainable production of biofuels, and Scientific and technological development
 - Biofuels introduction to market
- Strategy is intended to promote the development of biofuels and their commercialization following sustainability guidelines and increasing competitiveness and profitability of the Mexican agriculture sector by means of scientific and technological development.

C. Actions for implementation

Strategic guidelines:

- Promote information.
- Promote research.
- Promote alliances for biofuel development.
- Give certainty to the market.
- Support implementation, increase in capabilities and production.



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C. Actions for implementation

Pilot project:

- Pilot test was designed to introduce ethanol anhydro in 2 service stations during a 42-day period.
- 16,000 barrels of unleaded regular gasoline base to be shipped and stored in two 8,000 barrel tanks in the storage and distribution terminal.
- Gasoline base to be mixed with 3,500 litres of ethanol per day at the terminal for its subsequent distribution and commercialization in two service stations at a rate of 60,000 litres per day.
- Pilot test intended to be performed at the end of the present year.

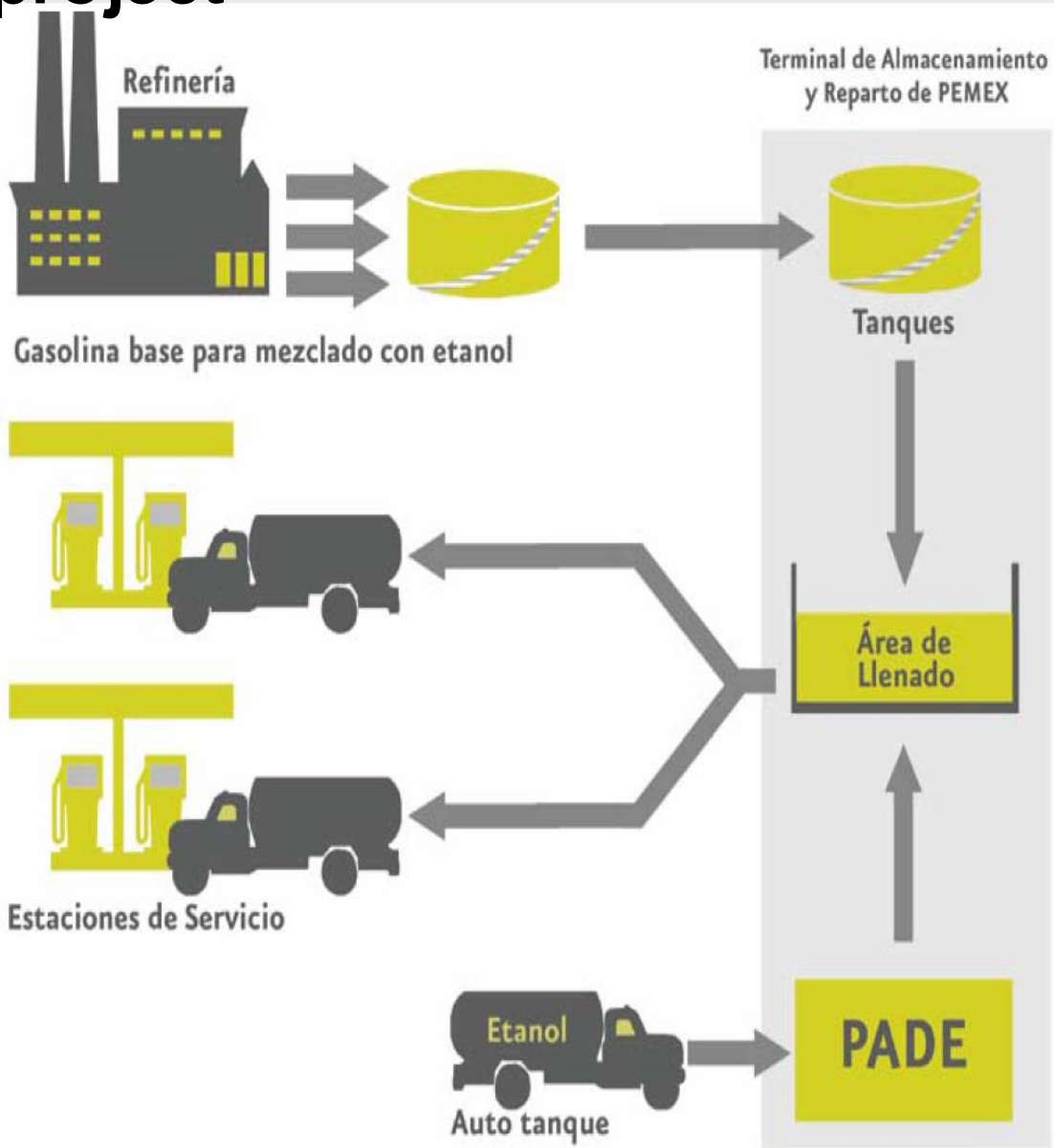


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C. Actions for implementation

Pilot project



C. Actions for implementation

- A first stage envisions the incorporation of ethanol into gasoline in the city of Guadalajara, as a result of the research work performed jointly by the Agriculture (SAGARPA) and Energy (SENER) ministries and considering the areas of opportunity provided by the agricultural potential of the area and the location of the infrastructure of the National Refinery System.
- Will begin with the production of approximately 3.0 million tons of biomass (sugarcane, sweet sorgum, sugar beet) to produce 200 million litres per year of ethanol to be mixed into gasoline for the city of Guadalajara.
- The state of Jalisco has 2 PEMEX storage and distribution terminals receiving different oil products from the Salamanca refinery



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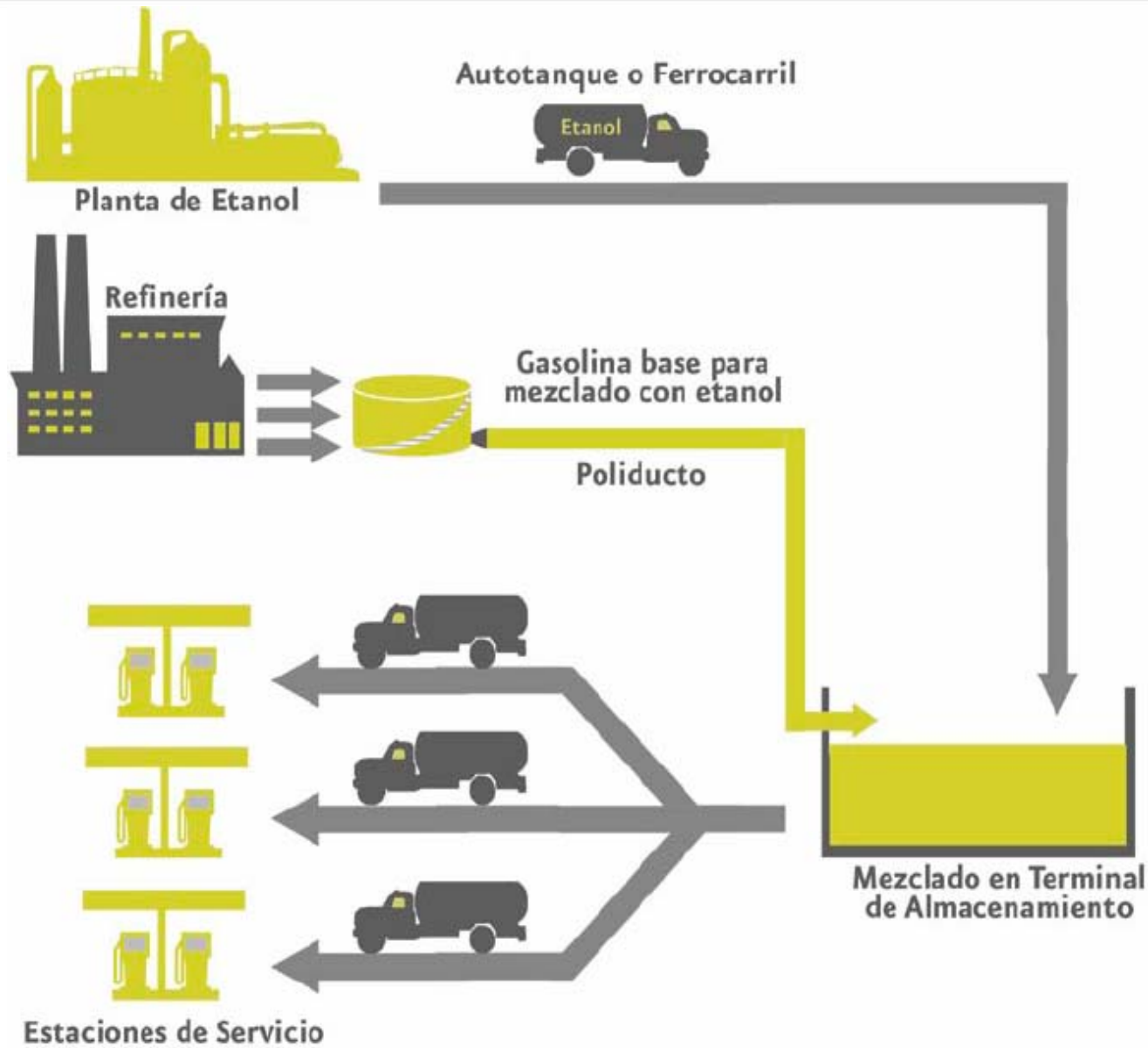
C. Actions for implementation

- The city of Guadalajara demanded 48,200 barrels per day of gasolines in 2006 and by 2010 such demand will increase an estimated 20%
- Guadalajara is regarded as a 'critical' zone by the NOM-086-SEMARNAT-SENER-SCFI-2005 standard (Specifications for fossil fuels for environmental protection), establishing the use of oxygenated fuels in certain areas of the country with high incidence of contaminants.
- 3,400 barrels per day of ethanol, or 200 million litres per year, are required to meet the 2% oxygen content requirement in the gasoline to be commercialized in the Guadalajara city area.



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C. Actions for implementation

Implementation proposal



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- Key conditions for an accelerated development of biofuels
 - Agriculture research to increase production per hectare and improve production economics.
 - Promote agricultural activity.
 - Provide certainty to the market.
 - Support the plantation of new types of feedstocks.
 - Establish working alliances between actors along the productivity chain.
 - Promote private investment in bioenergy feedstock production.

C. Actions for implementation

Considerations on the utilization of biofuels

- For the introduction of ethanol in gasolines:
 - Ethanol mixing requires the design of a new gasoline base with different vapour pressure parameters, with implications over the distillation temperatures and equipment.
 - Production of this gasoline base implies different distillation temperatures and modifications to refinery infrastructure and processes.
 - Transportation logistics will require substitution of pipeline movements for road or rail tanker haulage in some instances.
 - Storage tanks, mixing paraphernalia and receiving and shipping terminals will require an estimated investment of between 77 and 120 million USD/terminal.



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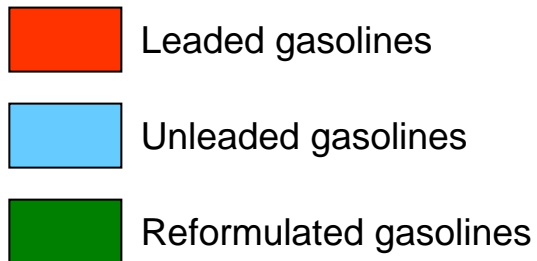
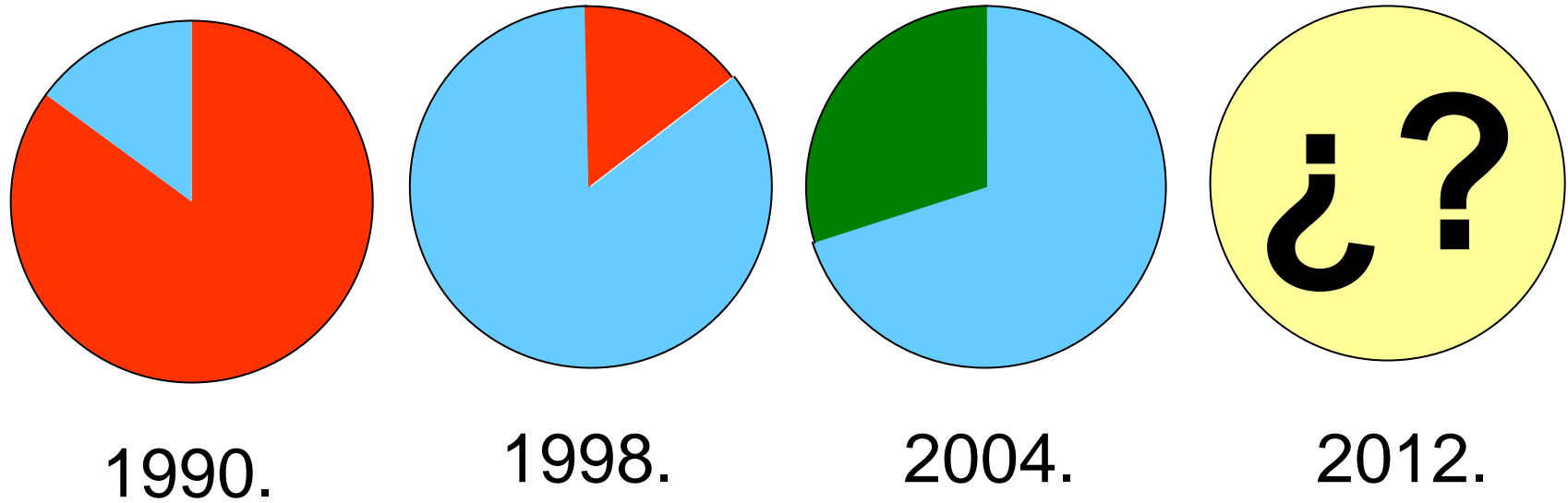
C. Actions for implementation

Evolution of transport fuels in Mexico



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Conclusions

D. Conclusions

- Biofuels are an opportunity to increase energy security, the diversification of energy sources and promotion of rural and agricultural sector development in Mexico.
- Much efforts are yet required to promote the increase of capabilities in the area of biofuels, including knowledge, technological integration, production chains, human and other resources, and to reduce the obstacles facing the different actors involved in the development of this industry.



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D. Conclusions



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- Clear policy guidelines need to be established for a coherent policy integrating the diverse elements taking part in the production, processing, distribution and utilization of biofuels:
 - Structure of the agricultural sector,
 - Food supply security,
 - Sustainable rural development,
 - Land use,
 - Water body use,
 - Environment,
 - Industrial processes,
 - Research and technology development.

D. Conclusions



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- International cooperation is a main strategy to minimize the learning process and accelerate the integration of biofuels into the energy matrix.
- Mexico has signed a Memorandum of Understanding with Brazil for collaboration on energy, main parts of which are R&D on biofuel feedstocks and their production chains as well as the analysis of their economical, social and environmental dimensions.

A series of seven vertical bars in different colors: red, pink, yellow, purple, green, and blue, arranged from left to right.

PROMéxico

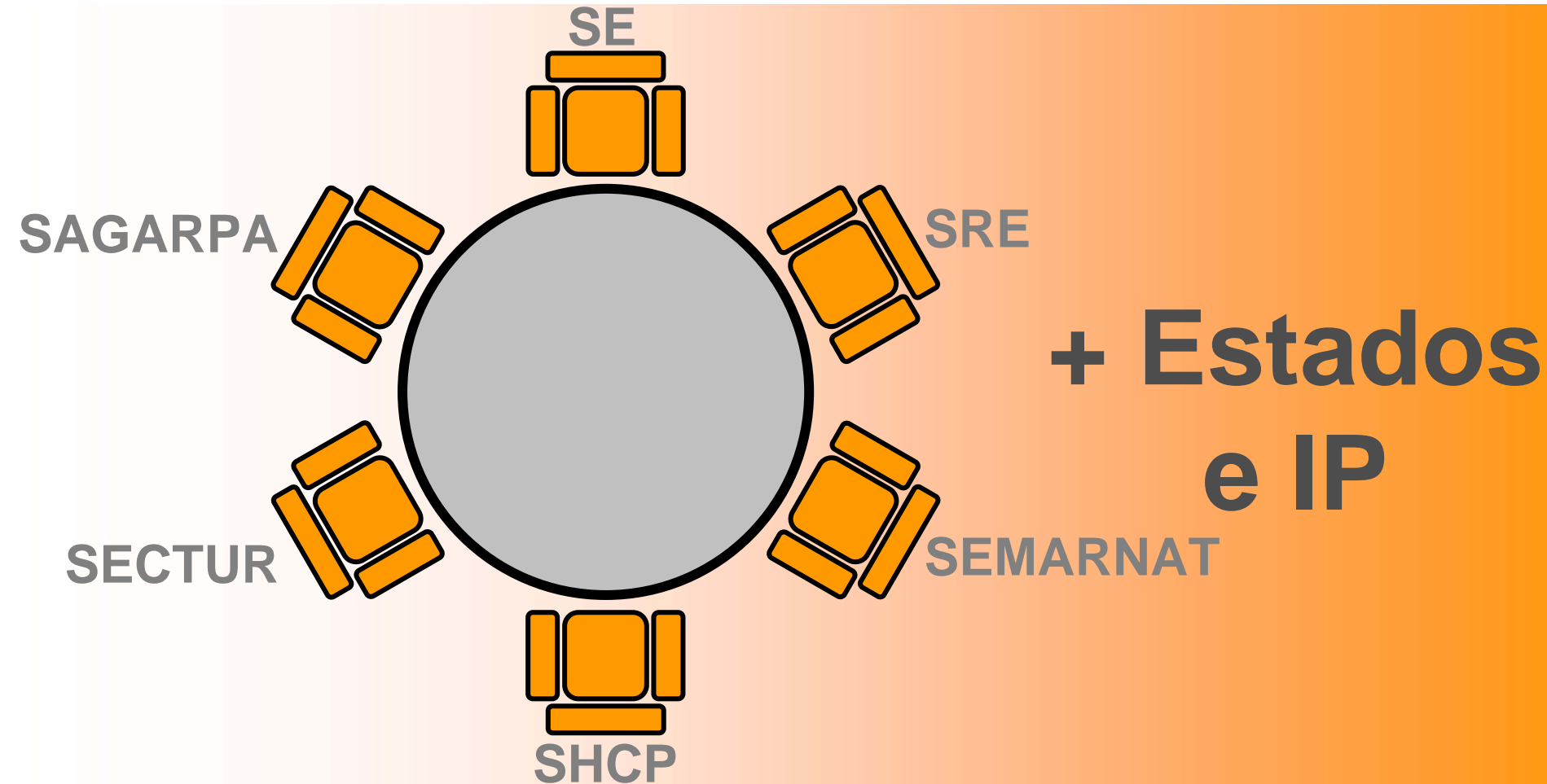
Inversión y comercio

ProMéxico



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