

# PASO NORTE PIPELINE ELECTRIC POWER MARKET

## NATURAL GAS TRANSMISSION AND ELECTRICAL GENERATION INFRASTRUCTURE



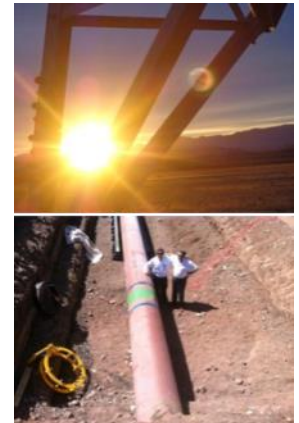
**CHIHUAHUA, CHIHUAHUA  
FEBRUARY 2018**



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# OPPORTUNITY OVERVIEW

**Generate electricity at competitive prices for the new Mexican Wholesale Electric Market taking advantage of competitive and specialized infrastructure and low cost shale natural gas from the U.S.A.**

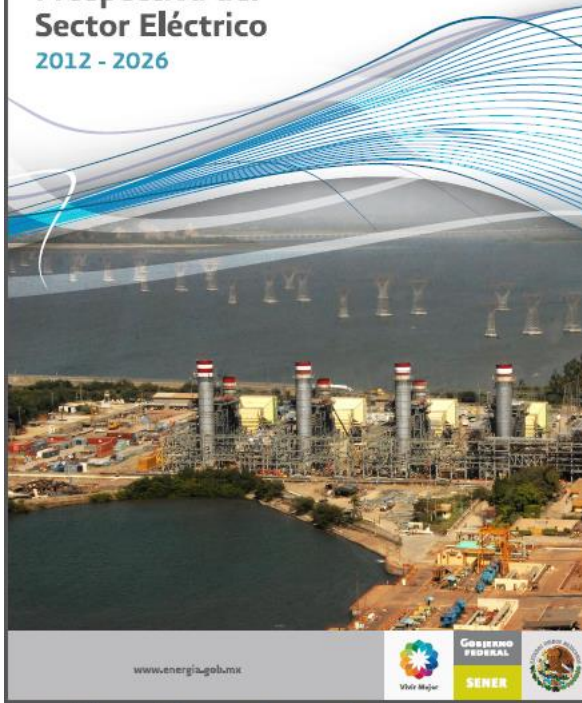




# ELECTRIC POWER GENERATION TRENDS IN MEXICO

# NEW ENERGY LAWS, ENCOURAGE PRIVATE SECTOR PARTICIPATION IN GENERATING ELECTRICITY

Prospectiva del  
Sector Eléctrico  
2012 - 2026

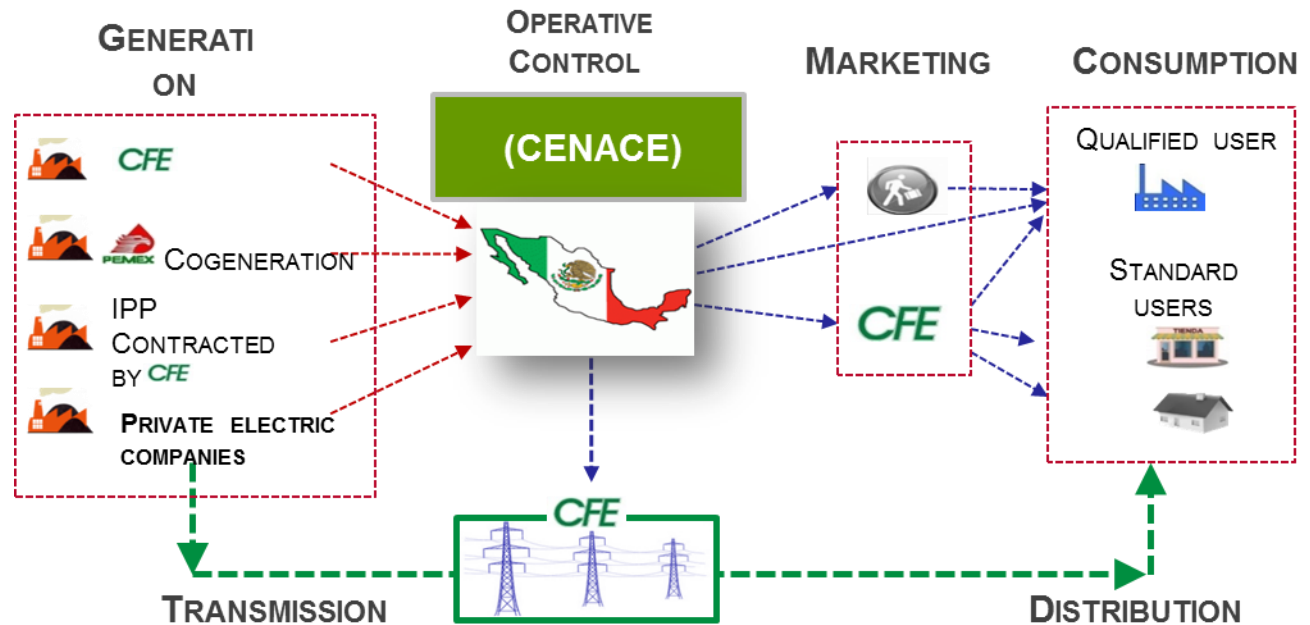


In December 2013 the Mexican Congress approved new energy reform allowing private companies to generate power and sell directly to qualified customers and the CFE.

<http://reformas.gob.mx/en/>



# The new Wholesale Electric Market is now in operation



Source: SENER. Prodesin 2015-2029



# ELECTRIC POWER PROJECTIONS 2017-2031

# Increased demand for electricity in Mexico

Mexico need to develop 40,000 megawatts in the following 15 years

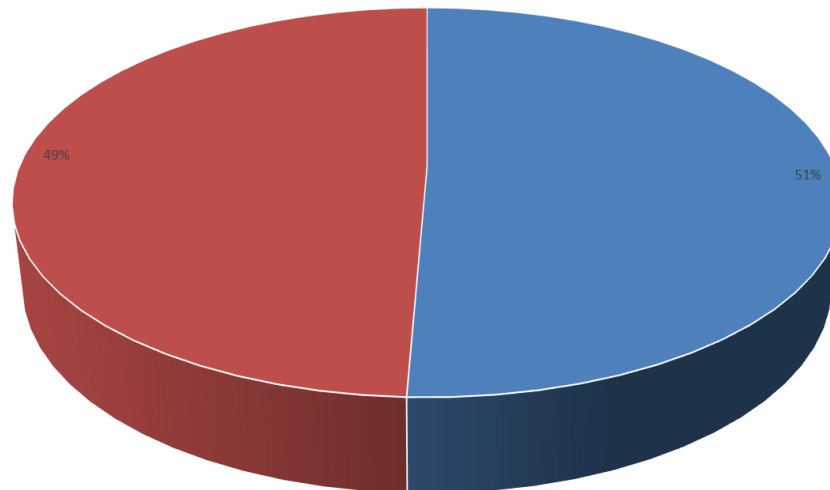


Source: SENER. Prodesin 2017-2031

# The Mexican Electric Power Generation capacity must be increased by 39,758 Megawatts form 2017 to 2031

## NEW GENERATION CAPACITY IN MEXICO 2017-2031

■ COMBINED CYCLE ■ OTHER



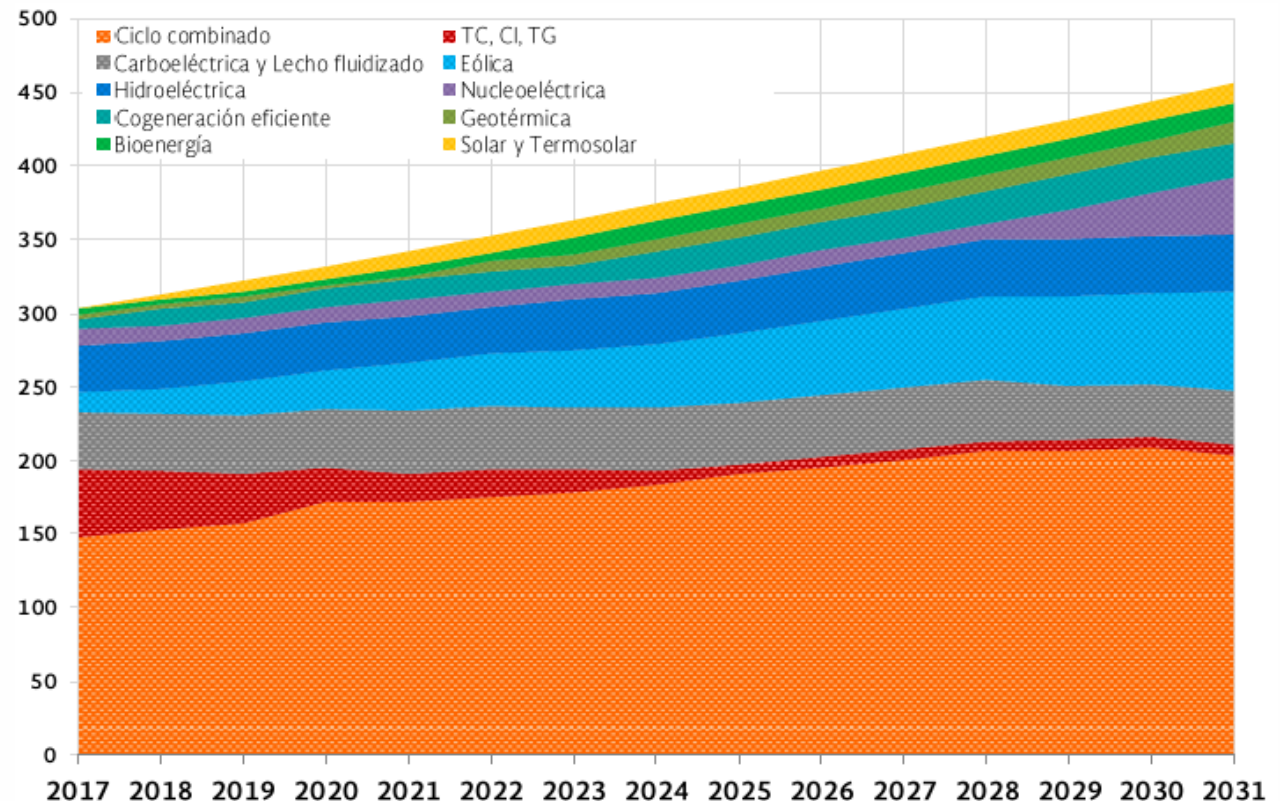
**20,138 Mega watts will be generated by  
combined cycle technology**



# Combined cycle will be the most important technology in Power Generation in Mexico.

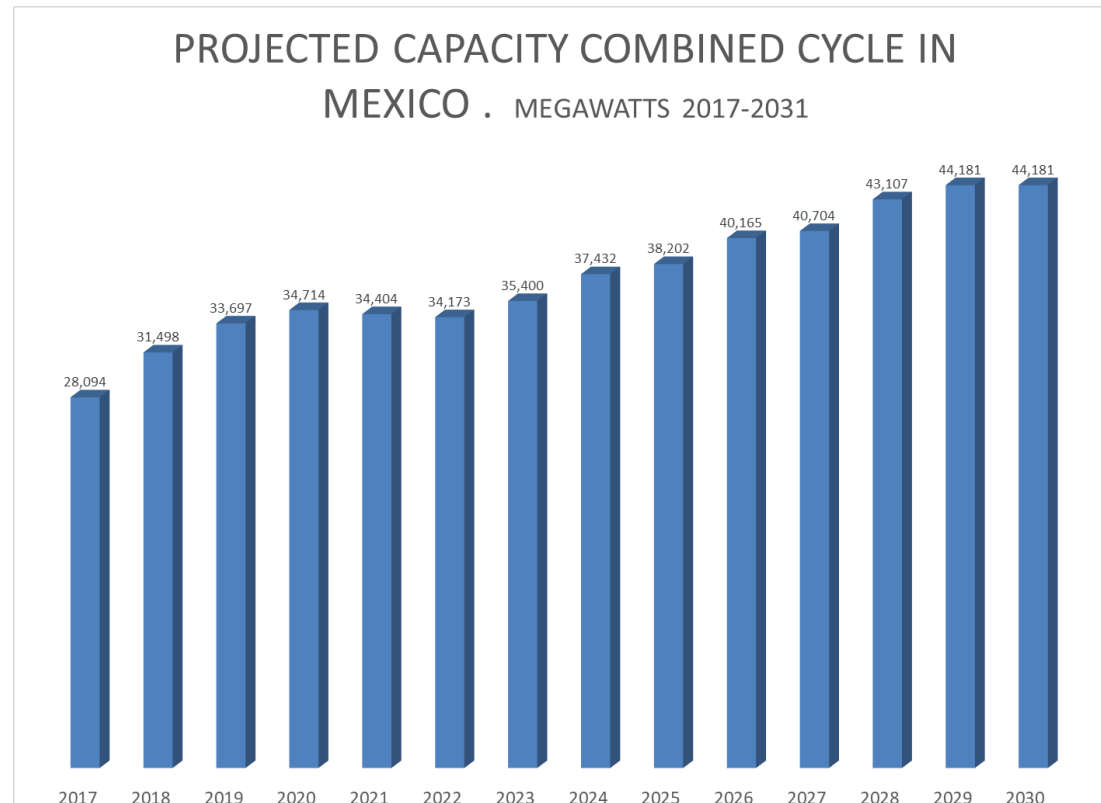


**GRÁFICO 4.5.4. EVOLUCIÓN DE LA GENERACIÓN DE ENERGÍA ELÉCTRICA 2017-2031**  
(Terawatt-hora)



Fuente: Elaborado por la SENER.

# Combined cycle power plants will grow from 27,274 Mwatts to 44,181 Mwatts



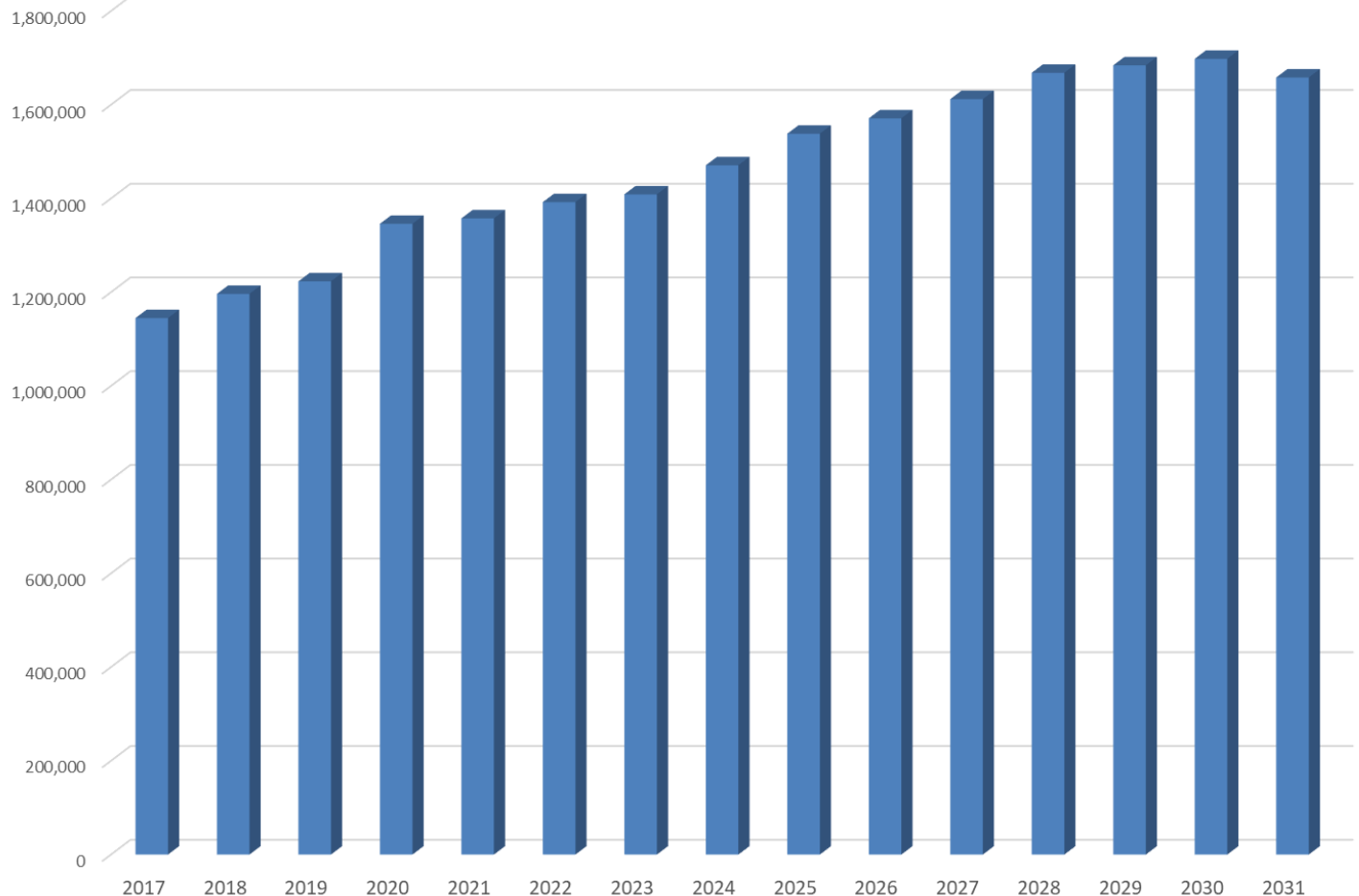
**Based on a typical 450 Mw plant, Mexico need to build 45 new combined cycle power plants**

**Source: PRODESEN 2017-2031**



# Natural gas demand for Power Generation will grow 44%

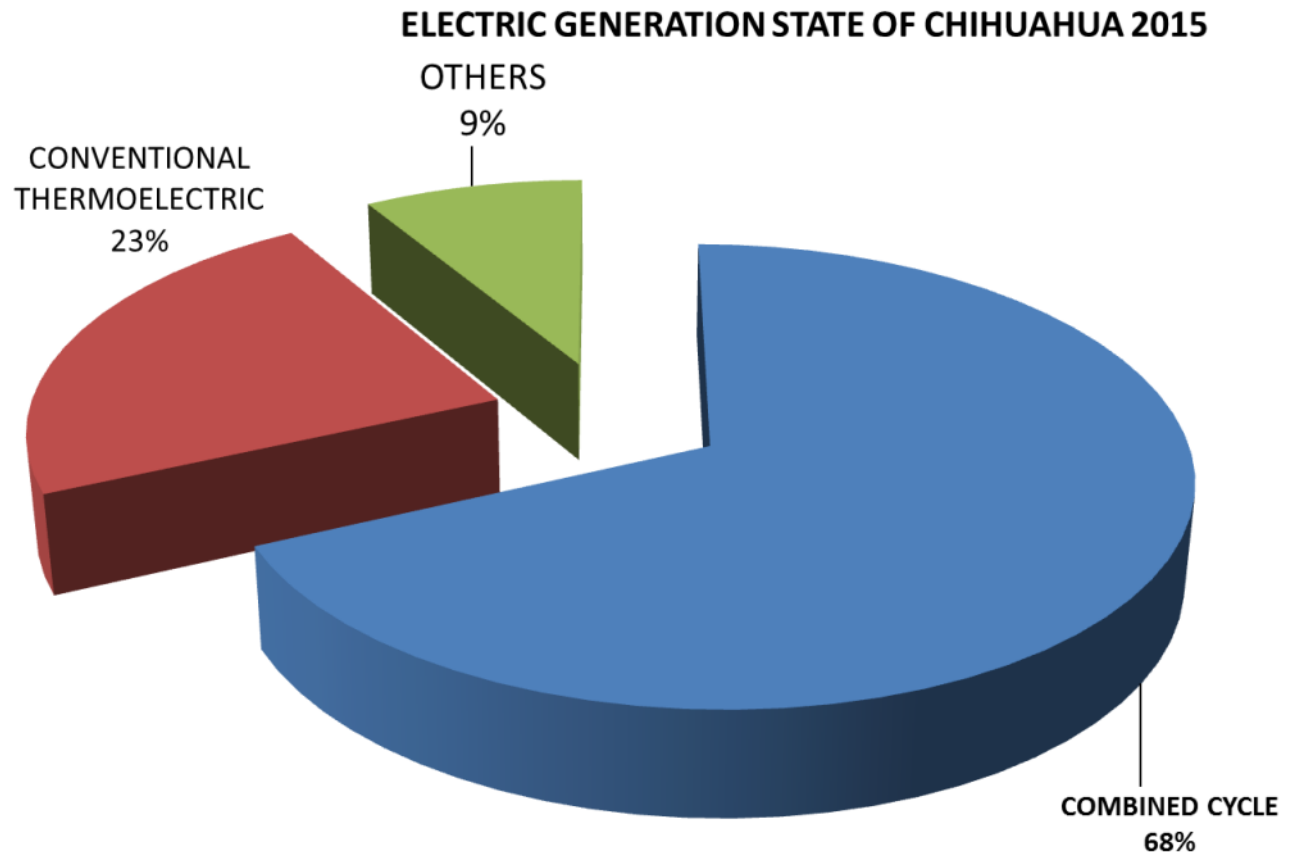
PROJECTED NATURAL GAS CONSUMPTION FOR POWER GENERATION





# POWER GENERATION IN CHIHUAHUA

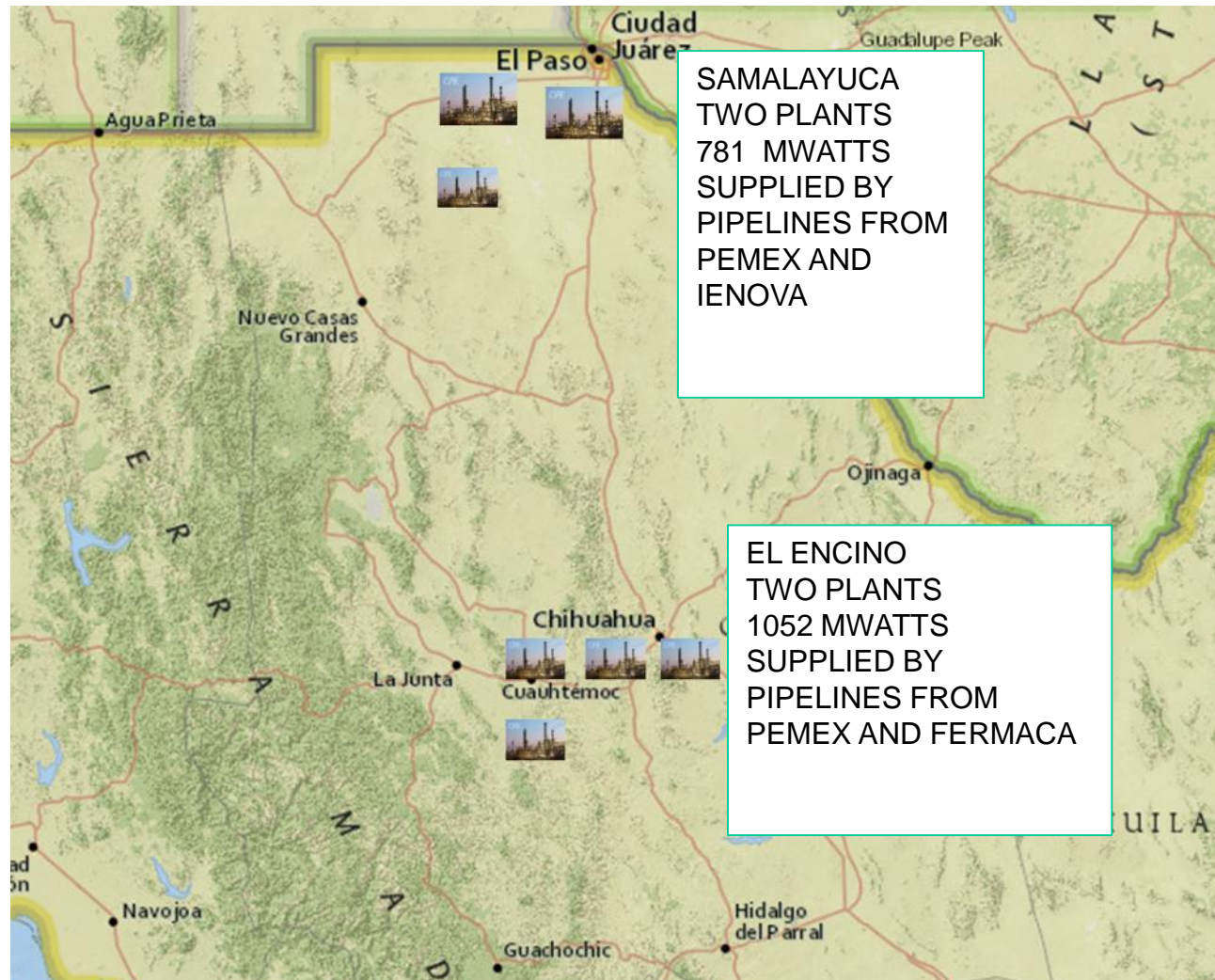
# The state of Chihuahua is generating now 2,768 Megawatts



Source: SENER. Prodesin 2015-2029



# Power generation in Chihuahua is concentrated in two Power Parks developed by CFE



Source: SENER. Prodesin 2015-2029

# The power generation in Chihuahua is projected to grow by 3740 Megawatts from 2015 to 2029

## New projected generating capacity by state

MAPA 4.1.1. CAPACIDAD ADICIONAL POR ENTIDAD FEDERATIVA  
(Megawatt)



Source: SENER. Prodesin 2015-2029





# COMBINED CYCLE ENERGY DEVELOPMENT IN MEXICO

**Mexico has a 17,249 MW combined cycle energy capacity, which is produced by private companies under contracts with CFE**

### Power Generation Summary. COMBINED CICLE

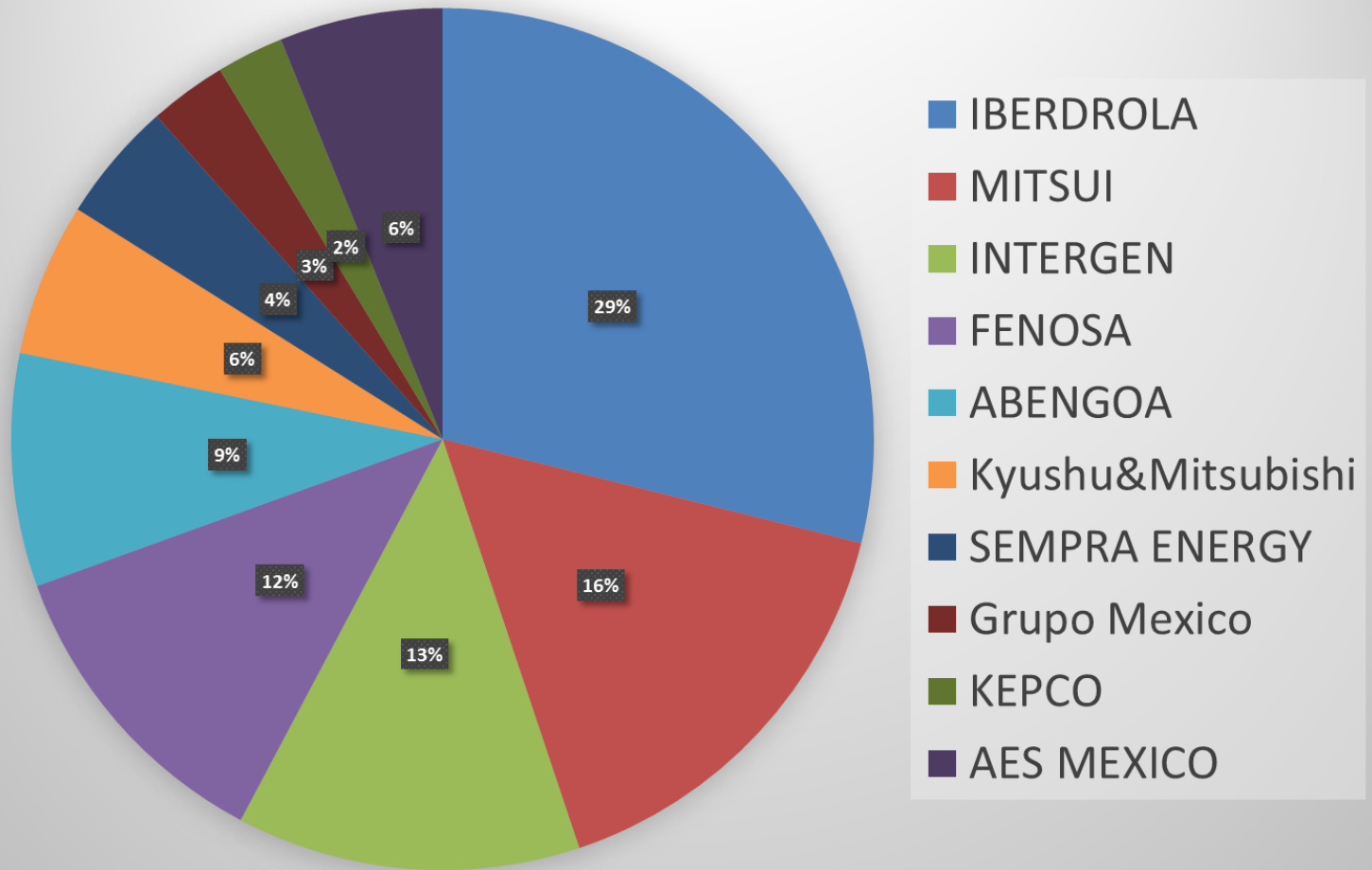
#### Natural Gas. Combined Cycle Power Plants

Company	Technology	Number of Power Plants	Capacity MW	Production Share %
IBERDROLA	Combined Cycle	6	4,981	29%
MITSUI	Combined Cycle	6	2,758	16%
INTERGEN	Combined Cycle	4	2,223	13%
FENOSA	Combined Cycle	5	2,020	12%
ABENGOA	Combined Cycle	4	1,509	9%
Kyushu&Mitsubishi	Combined Cycle	2	990	6%
SEMPRA ENERGY	Combined Cycle	2	780	5%
Grupo Mexico	Combined Cycle	2	500	3%
KEPCO	Combined Cycle	1	433	3%
AES MEXICO	Combined Cycle	3	1,055	6%
<b>Total</b>		<b>32</b>	<b>17,249</b>	<b>100%</b>

Source:

# Iberdrola and Mitsui produce nearly 50% of all the combined cycle energy in Mexico.





PRIVATE POWER GENERATION  
COMBINED CYCLE



Source: Direct Research

**In 2015 five new combined cycle power plants were bid by CFE with a combined capacity of 4 thousand MW.**

**Companies that won the 2015 CFE bid for the construction of Thermoelectric plants.**

Company	Thermoelectric plant	State	Date	Millions USD	MW
	CC Empalme II	Sonora	8-Oct-15	400	790
	CC Norte III	Chihuahua	9-Jan-15	1,500	924
	Empalme I	Sonora	31-Mar-15	477	770
	Valle de México	Edo. México	19-mayo. 2015	425	615
	Noreste	Nuevo León	22-Sep-15	374	850
<b>Total</b>				<b>3,176</b>	<b>3,949</b>

Source:

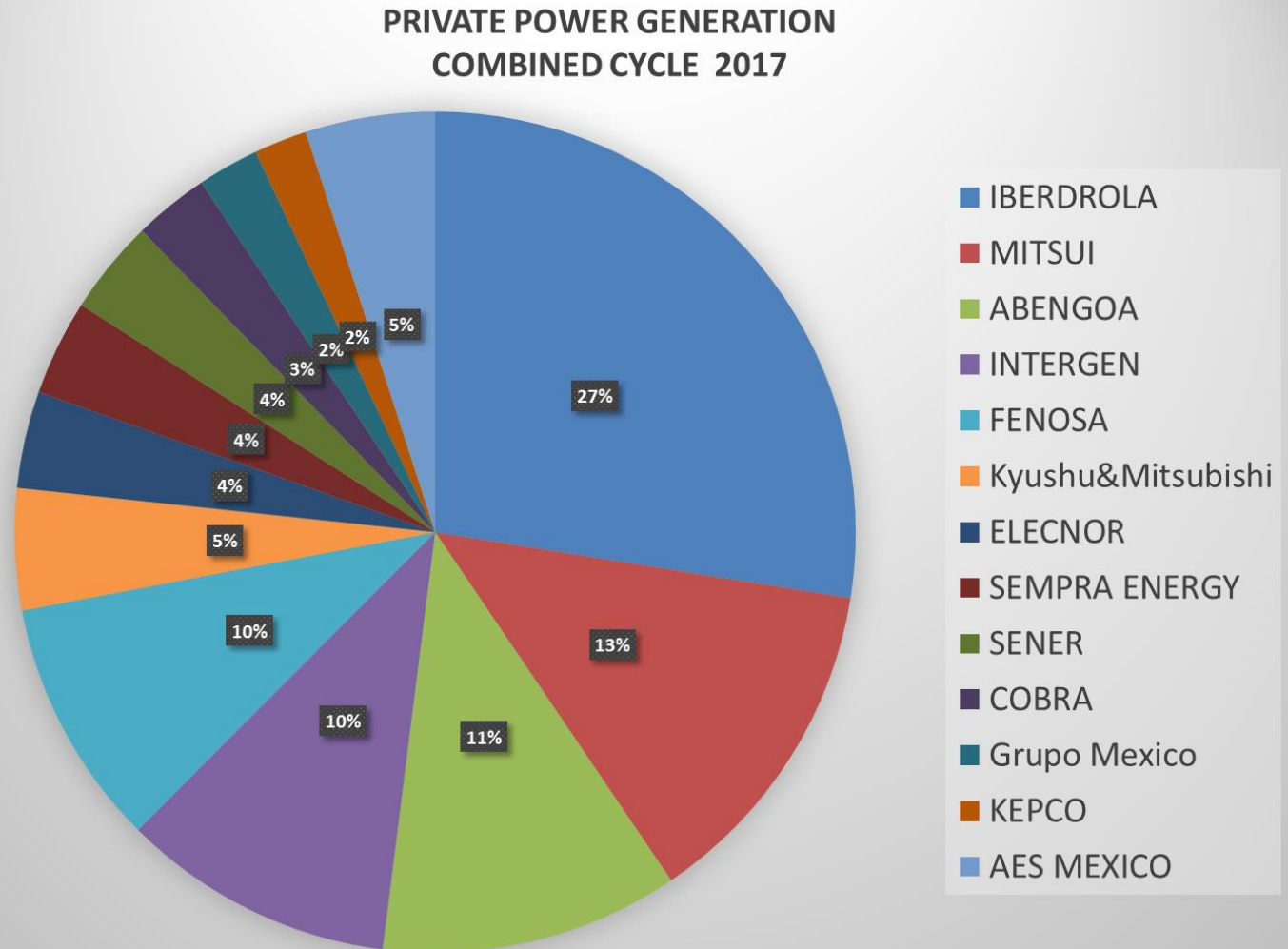


**21,000 MW production from private companies is estimated in Mexico, under contracts with CFE**

**COMBINED CYCLE TOTAL. FUTURE SITUATION**

IBERDROLA	5,831	28%	7
MITSUI	2,758	13%	6
ABENGOA	2,433	11%	5
INTERGEN	2,223	10%	4
FENOSA	2,020	10%	5
Kyushu&Mitsubishi	990	5%	2
ELECNOR	790	4%	1
SEMPRA ENERGY	780	4%	2
SENER	770	4%	1
COBRA	615	3%	1
Grupo Mexico	500	2%	2
KEPCO	433	2%	1
AES MEXICO	1,055	5%	3
<b>TOTAL</b>	<b>21,198</b>	<b>100%</b>	<b>40</b>

# Iberdrola, Mitsui and Abengoa will produce more than 50% of the combined cycle energy in México.



Source:

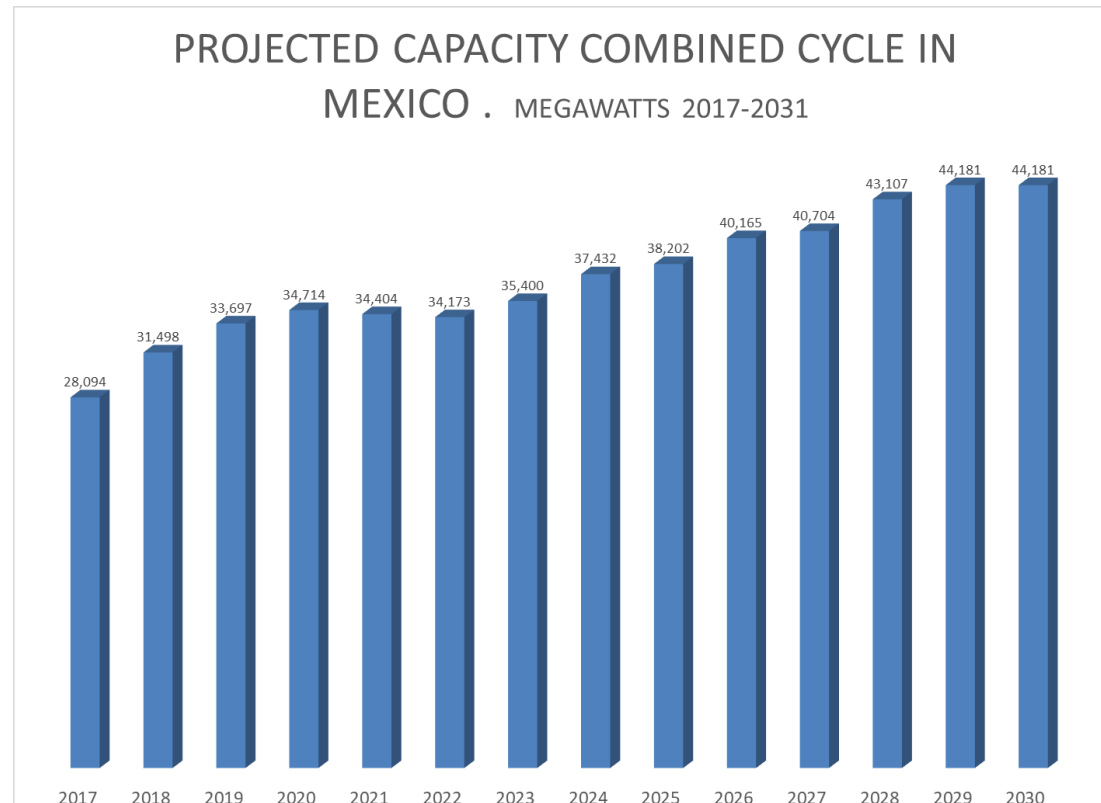


# Location of 40 combined cycle energy power plants by 2017.



Source:

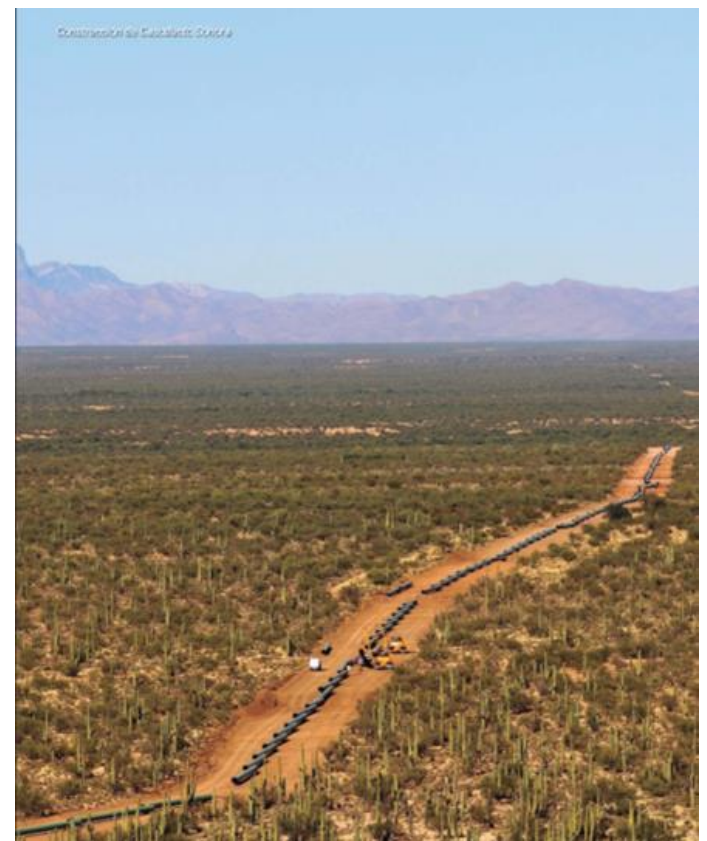
# Combined cycle power plants will grow from 27,274 Mwatts to 44,181 Mwatts



**Based on a typical 450 Mw plant, Mexico need to build 45 new combined cycle power plants**

**Source: PRODESEN 2017-2031**





# COMPETITIVE ENVIRONMENT

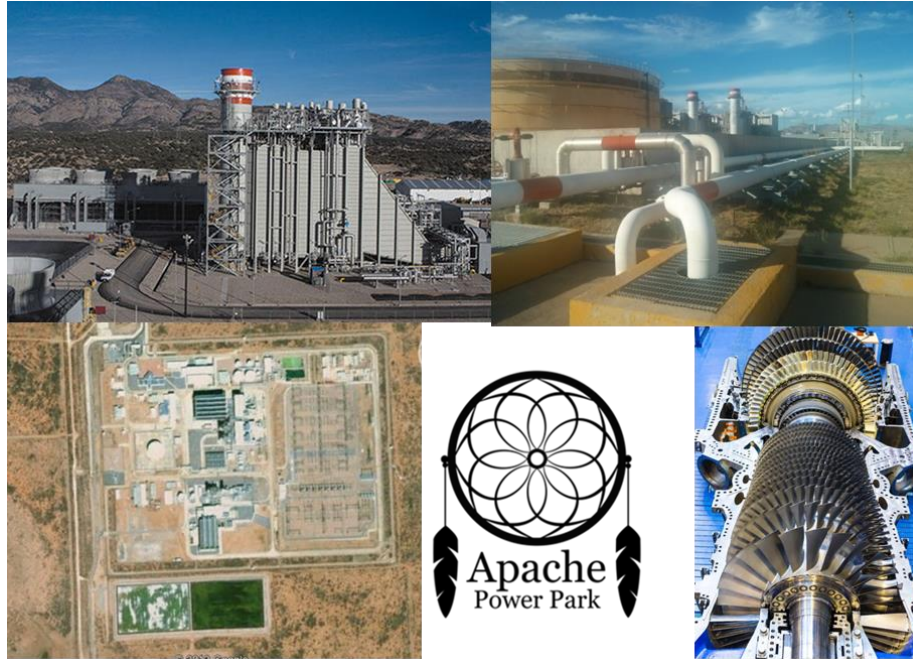
# Combined Cycle Power Generation in Mexico will depend on key elements

- LONG TERM SUPPLY OF NATURAL GAS
- COMPETITIVE PRICE OF NATURAL GAS
  - COMPETITIVE PRICE OF TRANSPORTATION OF NATURAL GAS
  - AVAILABILITY OF BASIC INFRASTRUCTURE
- ELECTRIC POWER TRANSMISSION LINES



The Apache Power Park and the Paso Norte Pipeline are planned to provide these advantages.





# APACHE POWER PARK

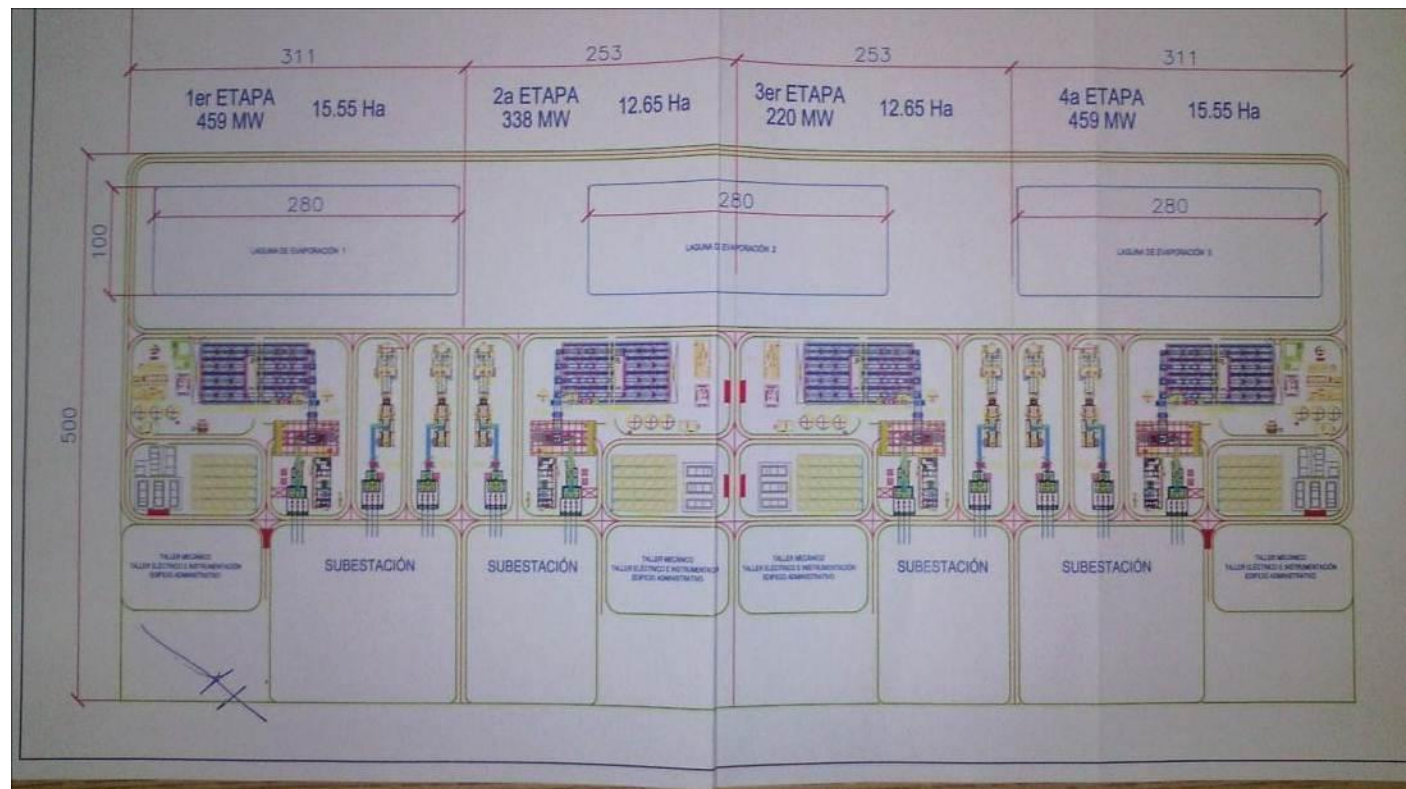
# APACHE POWER PARK

- Is a Private industrial site that will be designed with the support of the technical department of CFE that has identified the sites for all new power plants in North and Northwest Mexico
- The park will be oriented to receive different Power Plants from different generators in an planned environment
- The Park will be supplied with natural gas from the Paso Norte Pipeline.
- The park is estimated to generate up to 1,200 Megawatts in 5 years to supply the General and Wholesale Mexican Electric Market



# Preliminary design of the Apache Power Park

Four Power Plants with a global capacity of 1,476 Mwatts.



Preliminary design developed by CFE



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