Mexico's natural gas demand, energy reform and gas supply projects

Analítica Energética S.C.

Javier H. Estrada Estrada

December 3 - 4, 2014

Mexico's energy to GDP

GDP

- 2013 = 1.1%
- 2014 = 2.7%
- 2015 = 3.7% or ¿4.5%?
- 2018 > 5.0% ?

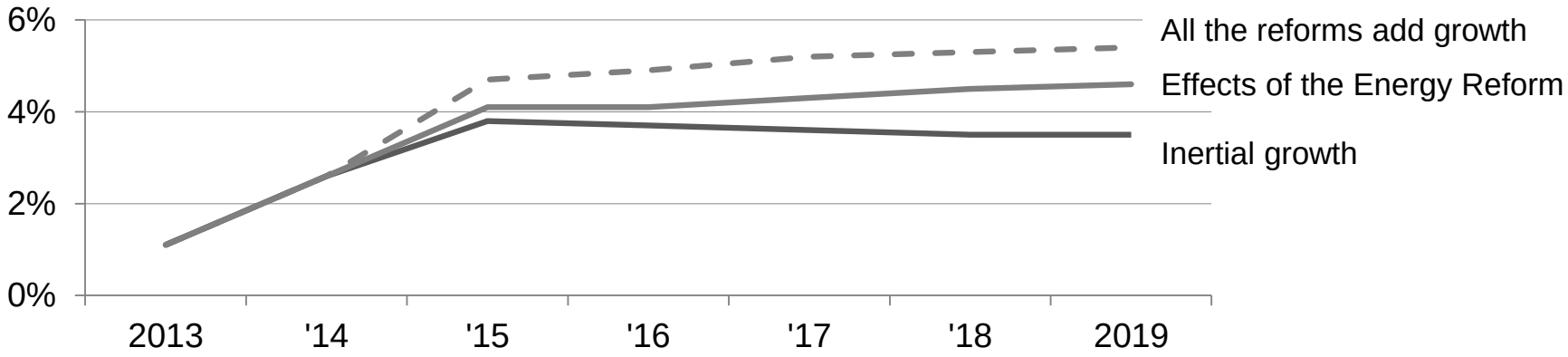
Uncertainties

- Success of 11 major reforms
- Energy prices & energy intensity
- Energy related investments
- Oil incomes (7.8% GDP in 2013)

Careful handling of

- National debt
- Exchange rate
- Interest rates
- Social interactions

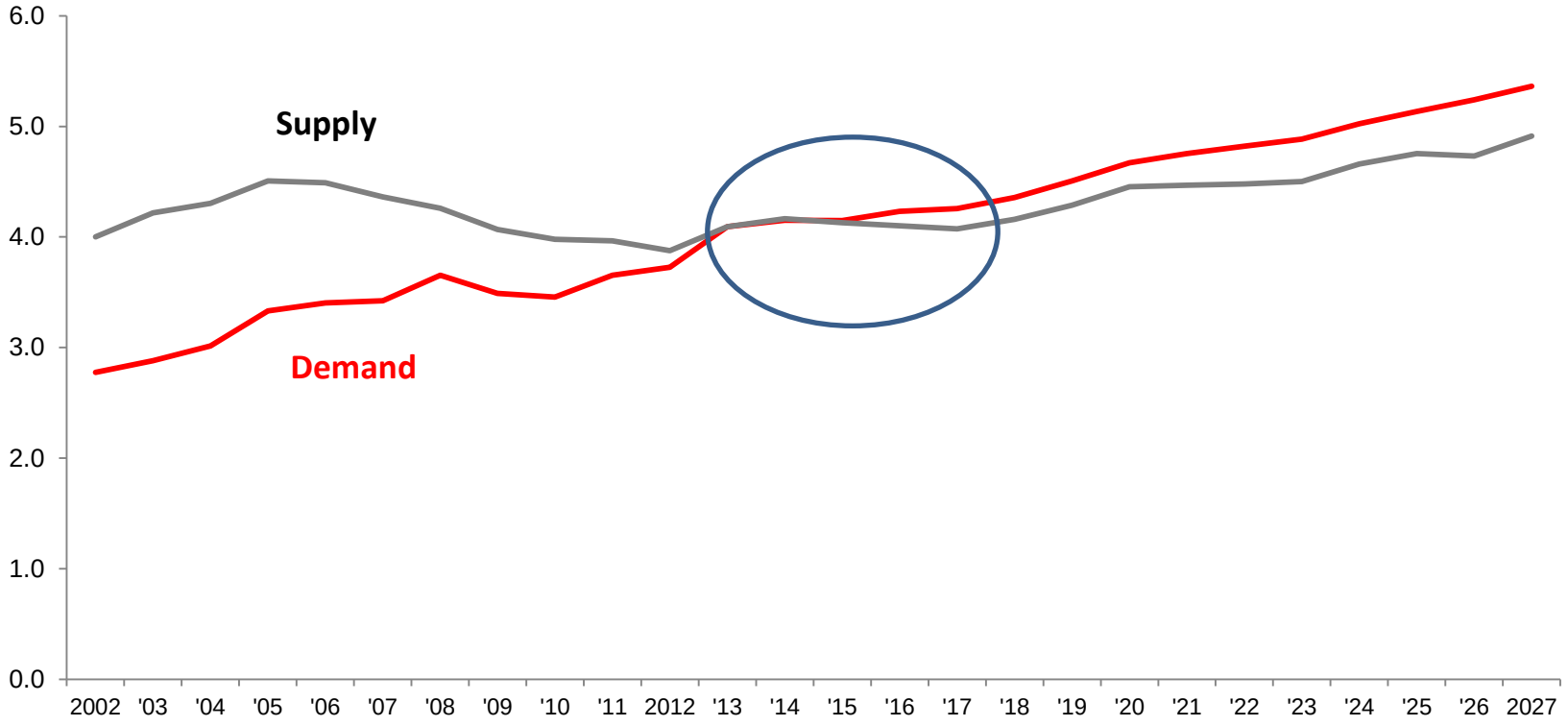
GDP* growth scenarios



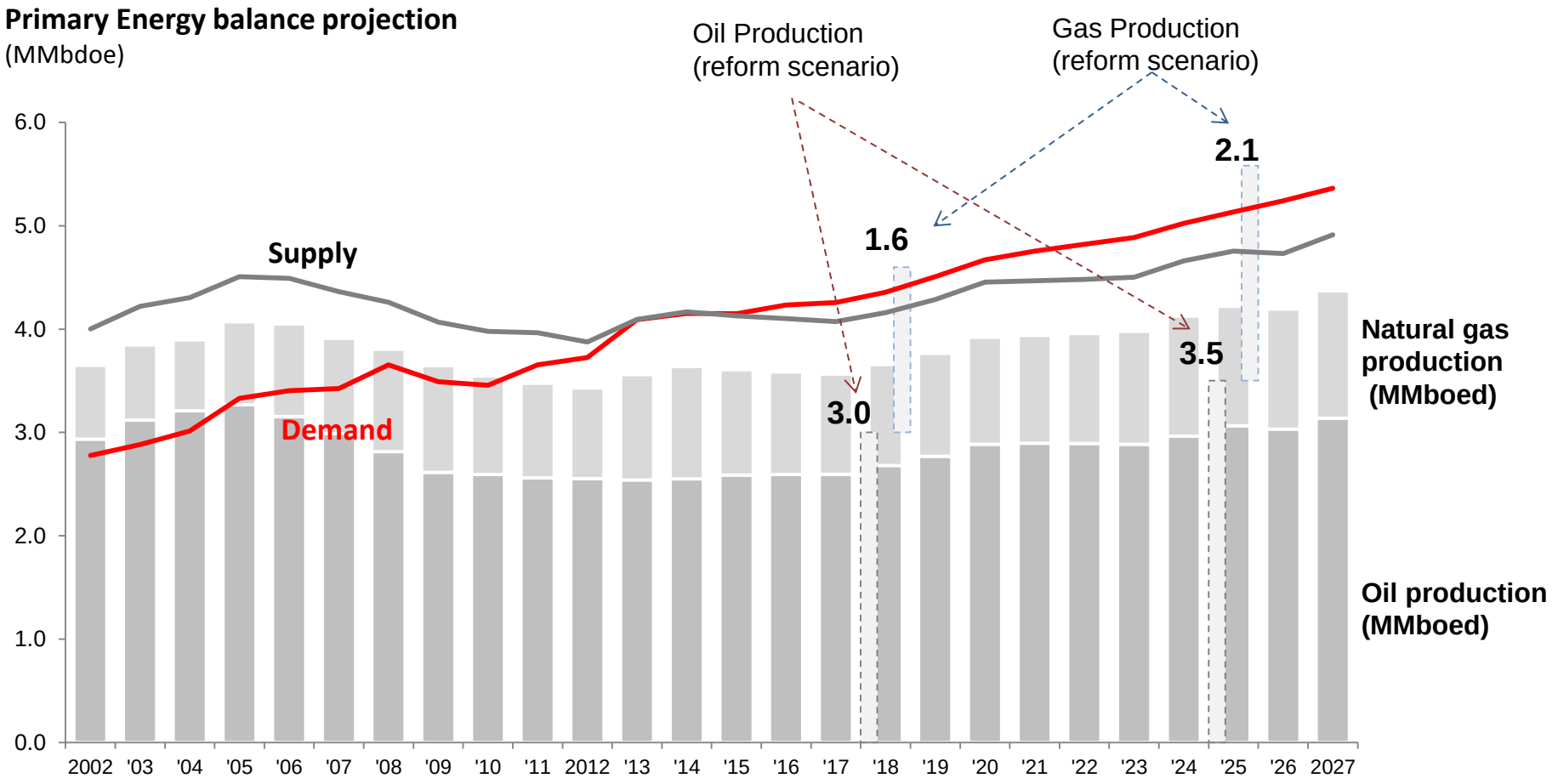
* Ministry of Finance (SHCP XII/2013). Reforms: energy, telecom, finances, tax

Risk of a deficitary energy balance (National Energy Strategy 2013-2027)

Primary Energy balance projection
(MMbdoe)



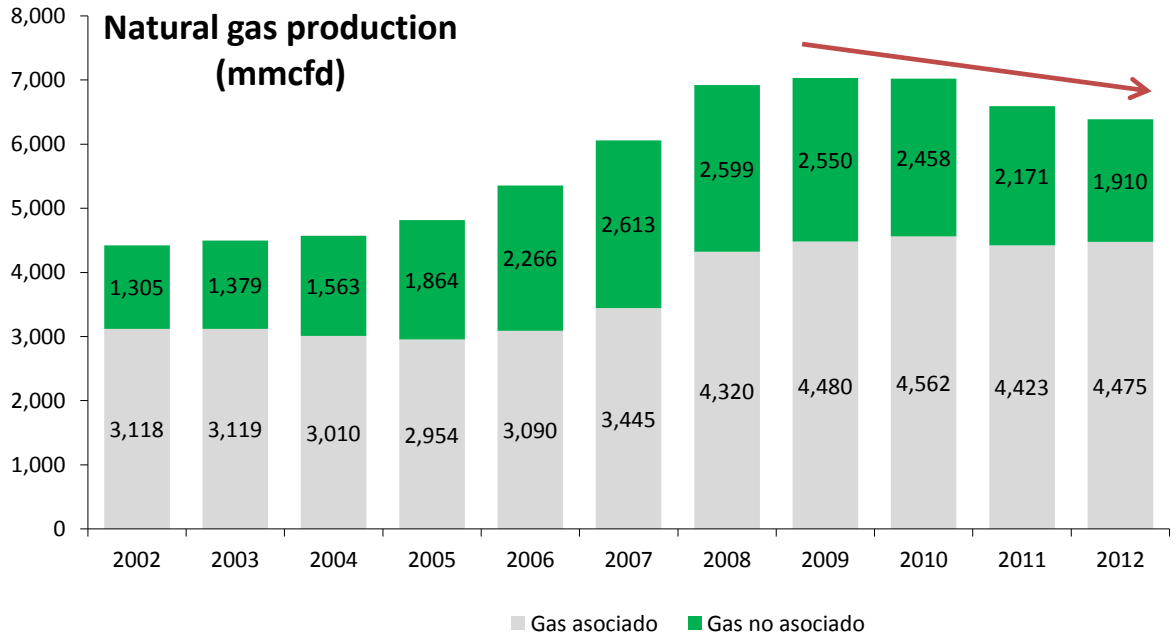
Need to increase the production of oil and gas

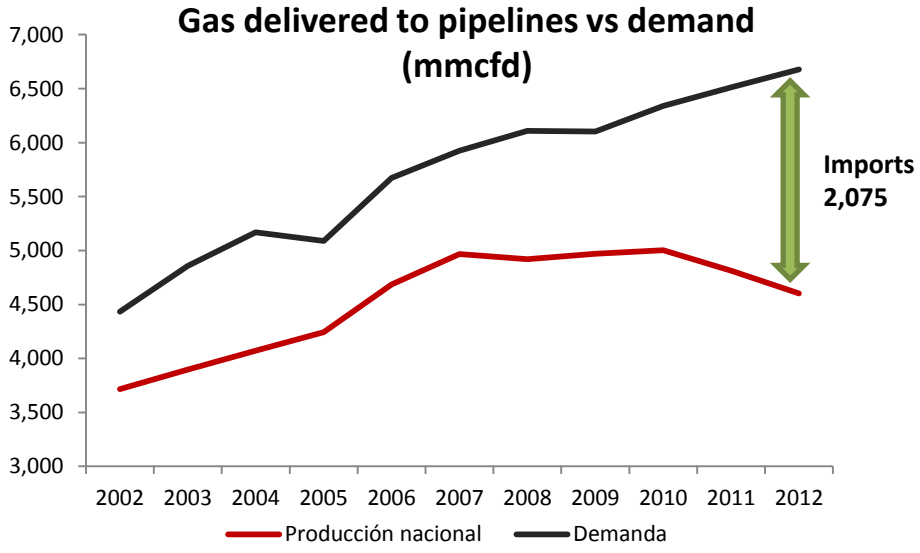


Source: SNER Prospectivas del Sector Energético 2013-2017 y National Energy Balance 2013.

Natural gas production (million cubic feet per day)

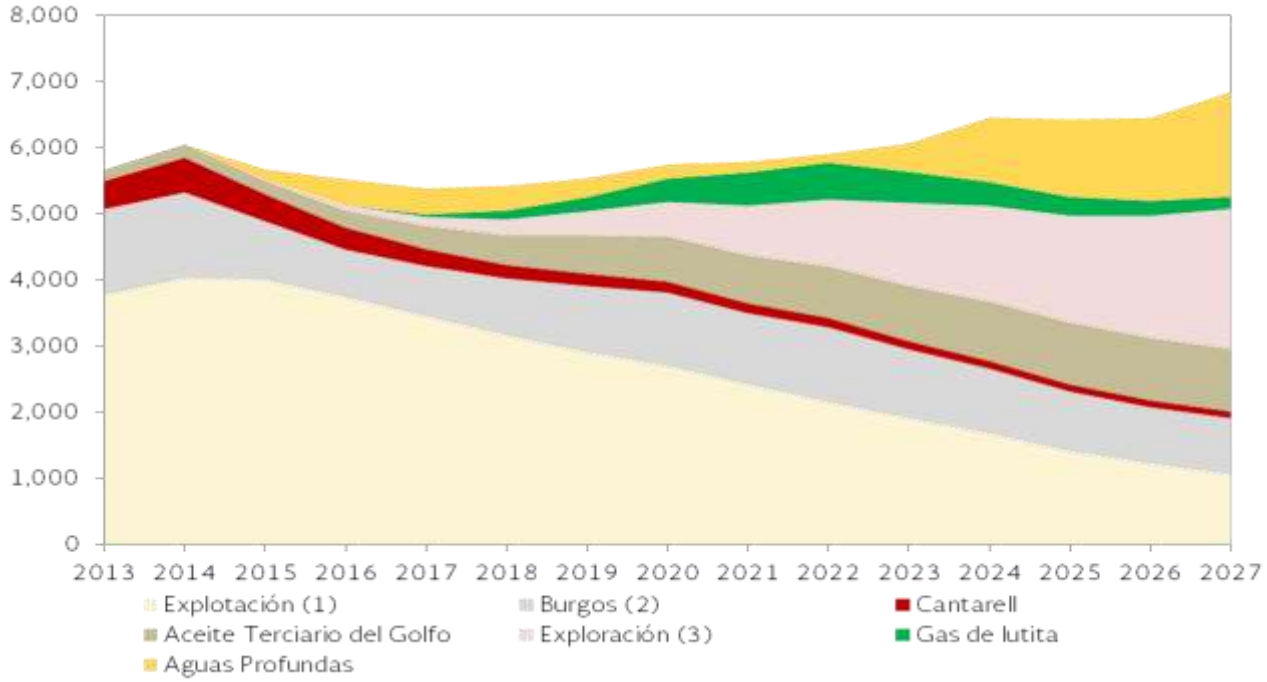
- During the last years gas production has shown a declining trend due to low gas prices.
- Lower prices yield lower returns for dry gas projects than the returns obtained from associated gas production or from crude oil projects.





- Historically the price of natural gas had a behavior similar to petroleum products.
- In recent years, the price of natural gas in North America has been de-linked from oil prices and it has declined to levels lower than the price of coal.

Natural gas production (forecast 2013) (high case - million cubic feet per day)



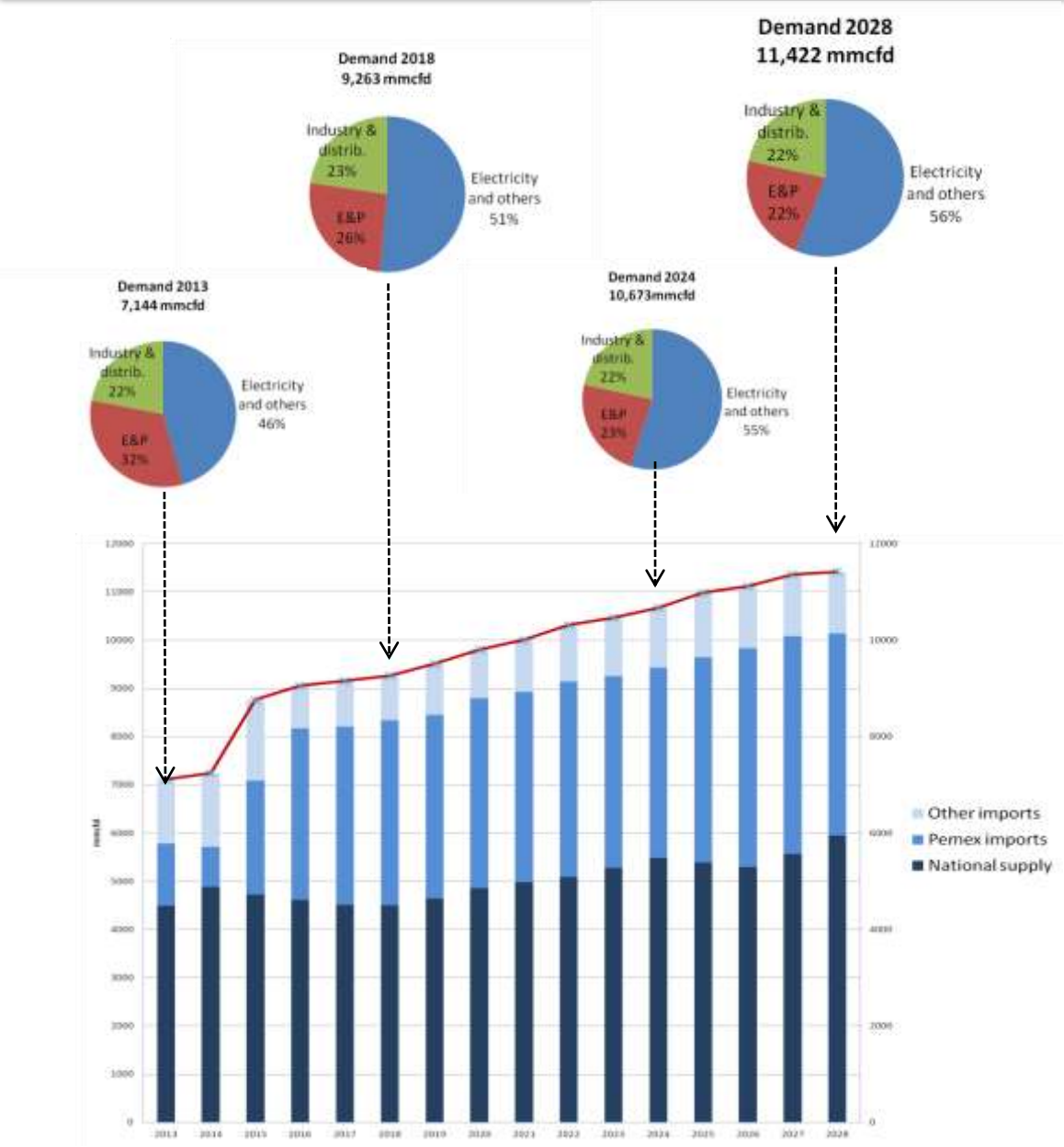
(1) Does not include Burgos, Cantarell and Aceite Terciario del Golfo

(2) Includes State Works Contracts that will transform into “Integral Contracts”.

(3) Does not include deep water nor exploration at Burgos and shale gas.

- Production at Burgos falls by 34% and Cantarell by 77%.
- Initial gas shale production starts in 2017 with 34 mmpcd, reaching 179 mmcfd in 2027.
- Deep water gas production starts around 2015-2017 with 153 mmcfd from Lakach. By 2023 the project Han produces 9 mmcfd. The projects Holok, Perdido and Tlancanán manage to produce 1,592 mmcfd in 2027.

Natural gas balance – Base case scenario 2013



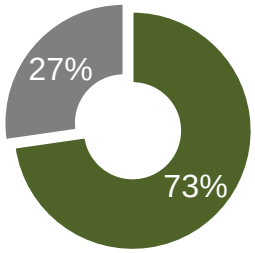
- Natural gas demand grows at 3.2% per year
- Power Generation in total gas demand passes from 46% in 2013 to 56% in 2028.
- Within the power sector gas consumption grows at 4.6% per year, representing 47% of the total primary energy consumption en 2012 and 72% en 2028.
- The base case scenario for domestic gas production before the Energy Reform shows an increase from 4.5 bcfd in 2013 to 6.0 bcfd in 2028.
- Imports increase from 2.7 bcfd in 2013 to 5.5 bcfd, mainly through Pemex

Programmed investments in energy infrastructure 2014-2018

Mexican pesos in trillions = 10^12

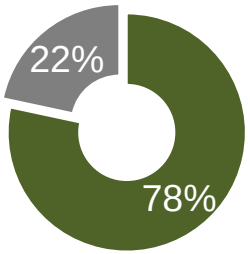
Equivalent in US dollars in billions = 10^9

1: Oil and gas E&P



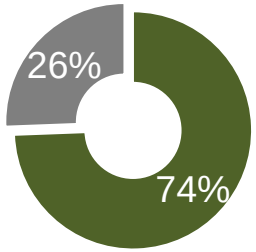
2.4 **185**

2: Process capacity to transform oil and gas



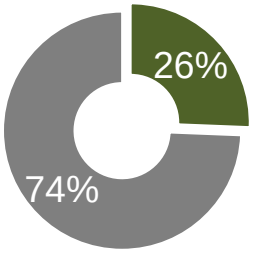
0.6 **49**

3: Petrochemicals



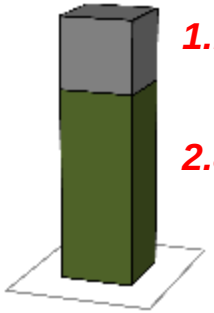
0.05 **4**

4: Fuel transportation and storage projects



0.2 **17**

Total expected investment **3.9*** **298***



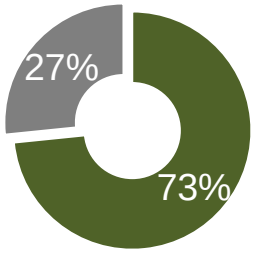
1.1 ***81***

2.8 ***217***

Private investment

Public investment

5: Electricity generation



0.3 **24**

6: Electricity transmission and distribution.

0.25 **19**

100% public investment

Source: National Infrastructure Program 2014-2018. * Numbers might not add due to rounding. Mx pesos 13 = 1 US$ for presentation purposes

Energy Reform

The Constitutional Articles 25, 27 and 28 were amended to make possible a substantial energy reform in Mexico. The key topics of change are defined in 21 “Transitories”.

To comply with the Constitutional mandate, the Federal Executive proposed nine initiatives:

Hydrocarbons	(Arts. 27, 28, Transtories 4, 5, 7, 8, 16)
Electricity	(Arts. 27,28 Transitories 4, 11)
Geothermal	(Art. 25, Transitories 11, 17, 18)
State Productive Enterprises	(Art. 28, Transtories 3, 20)
Federal Administration and regulators	(Art. 28, Transitories 10, 12, 13)
Oil and gas taxation	(Art. 27, Transitories 4, 5, 9, 11, 14)
Mexican Petroleum Fund	(Art. 28, Transitories 14, 15)
Budget	(Art. 27, Transitories 14, 21)
Safety & Environmental Protection	(Art. 25, Transitories 17, 19)

28 laws

- 9 new laws were created
- 12 existing laws were modified
- 7 laws on renewable energy will soon be presented by the Executive

Other s

- 8 enabling laws have been published
- Guidelines, procedures and standards are being prepared

Organizational change in the energy sector

Energy sector coordination

SENER
SECRETARÍA DE ENERGÍA

SEMARNAT

Regulatory agencies

CRE
COMISION REGULADORA DE ENERGIA

CONUEE
COMISIÓN NACIONAL PARA EL USO EFICIENTE DE LA ENERGÍA

CNH
Comisión Nacional de Hidrocarburos

ANSIPA:
National Agency for Industrial Safety and Environmental Protection in the Hydrocarbons Sector

State and private actors

IMP
INSTITUTO MEXICANO DEL PETRÓLEO

INSTITUTO DE INVESTIGACIONES ELECTRICAS

Instituto nacional de investigaciones nucleares

Research Institutes

CENACE

CENAGAS

System operators

PEMEX

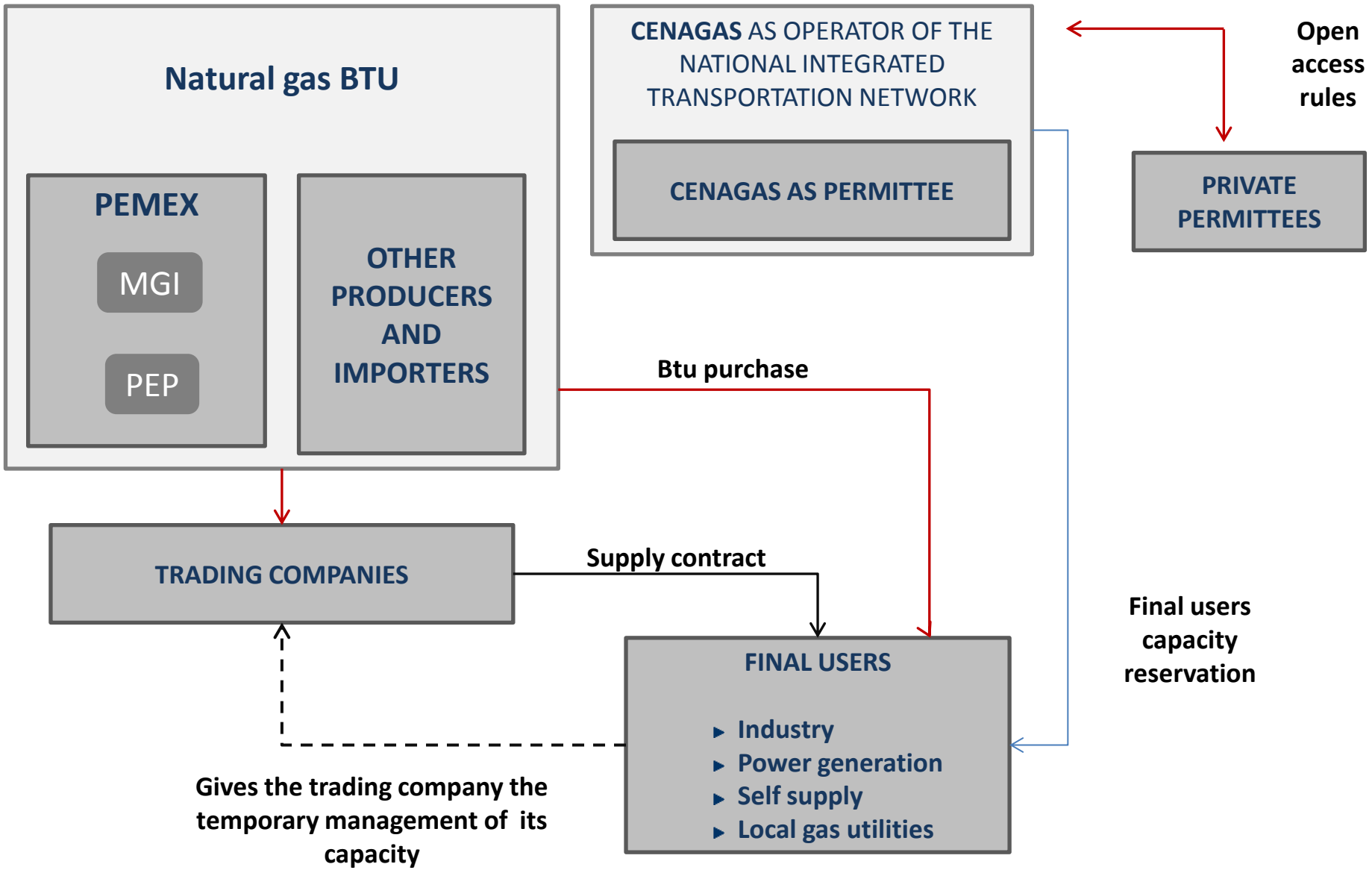
CFE
Comisión Federal de Electricidad

State productive companies

Oil, gas, electricity, renewable, transportation, distribution, refining, and others

Private companies

New natural gas market architecture



Oil and gas exploration and production

Asignments	SENER	▸ Gives PEMEX the right to E&P - based on the CNH's opinion
	CNH	▸ Approves the E&P plans
Contracts	CNH	▸ All contracts can be signed through tenders based on the criteria established by the Ministries of Energy and Finances. ▸ State Productive Companies (including PEMEX) and private companies can participate.
	SENER	▸ Establishes the Contract Model: Services, Profit sharing, Production sharing or License.

MINISTRY OF ENERGY	MINISTRY OF FINANCES	CNH
▸ Selects the areas with the support of the CNH	▸ Defines the fiscal terms of the tenders	▸ Defines the terms and conditions for the tenders
▸ Approves the 5 year plan for tenders	▸ Defines the varible to choose the winer	▸ Proposes the 5 years plan for the tenders
▸ Plans and announces the rounds of tenders	▸ Manages and audits the contracts	▸ Subscribes, manages and supervises the contracts

Round Zero: PEMEX share in E&P

Explotarion
Prospective Resouces

Production

2P reserves

It includes

- All producing fields and areas where there are commercial discoveries.
- The main producing areas are in the Southeast.
- Chicontepec, many areas with significant activity, maintaining the “Integral Services Contracts”.
- A minor share of shale resources.

Asignments granted on Agust 13, 2014

Type	Volume granted (mmboe)	Granted/ Applied (%)	Area Granted (Km2)	Reserves/Pro-duction (Years)
Reserves 2p	**20,589**	**100**	**17,010**	**15.5**
Prospective resources	**22,126**	**67**	**72,897**	**5.0***
Conventional	18,222	70.9	64.489	
Non-Conventional	3,904	51.6	8,408	

With this volume Pemex could produce 2.5 mmbd during 20.5 years.

Pemex: joint ventures

Pemex will put for tender several *Farm Outs* in fields and exploration areas that were assigned by the CNH

- The goal is to accelerate the development and to increase production.
- To have access to better practices and technologies.
- To liberate capacity and to reduce capital requirements.

Priority fields for immediate *Farm-outs*

- Fields that could have a significant impact in Mexico's oil and gas production.
- Fields that arise strong interest among possible partners.

Identified fields

- Mature fields that need to optimize the recovery factor and the rate of return.
- Groups of fields with extra heavy crude in offshore areas.
- Giant deep water gas fields.
- Crude oil discoveries in the Perdido Areas.

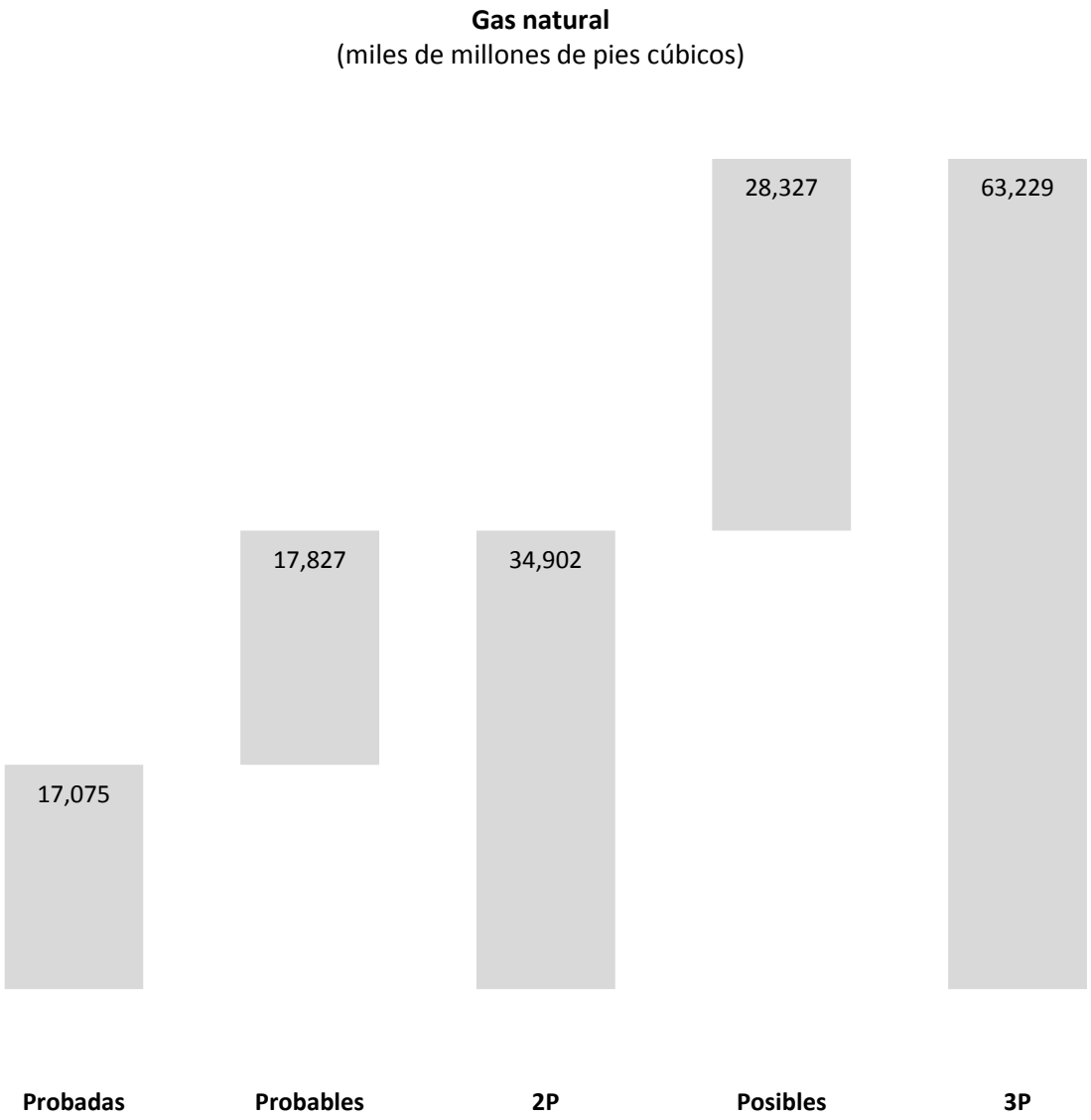
Migration from old contracts to new contracts and farm outs

The migration from older CIEP* and COPF* contracts to new contractual schemes, as well as the *farm out* proposed by Pemex will require large financial and operational capacities

Type	Stage	Area Km2	2P reserves mmboe	3P reserves mmboe	Investment mm US$
Migration from Asignments to Contracts	First (11 contracts)	11,440	569	1,083	11,380
Dic-14	Second (11 contracts)	8,626	1,639	3,439	32,780
Farm Outs Dic-15	(High Priority)	612	1,556	2,664	32,295
	TOTAL	**20,678**	**3,764**	**7,186**	**76,455**

* CIEP: Integral E&P contracts; COPF: Financed Public Works Contracts

Natural gas and liquids.
Remaining reserves at January 1st 2013



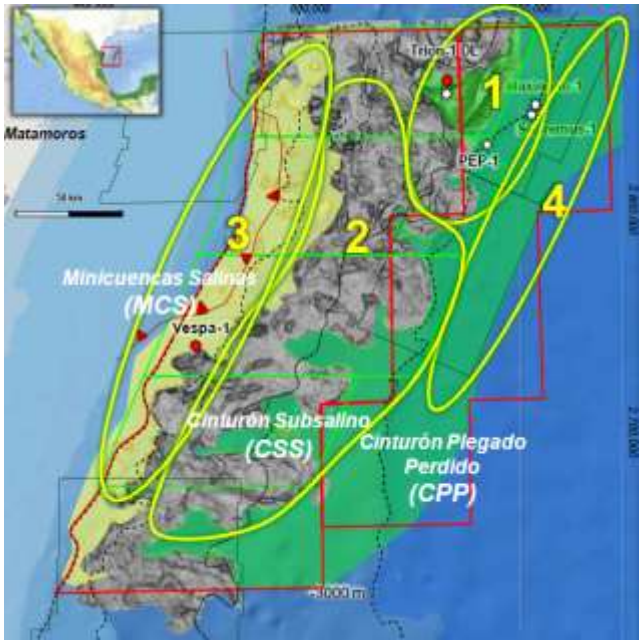
Large potential resources in deep water and non conventional areas

Prospective resources
(billion barrels of oil equivalent)

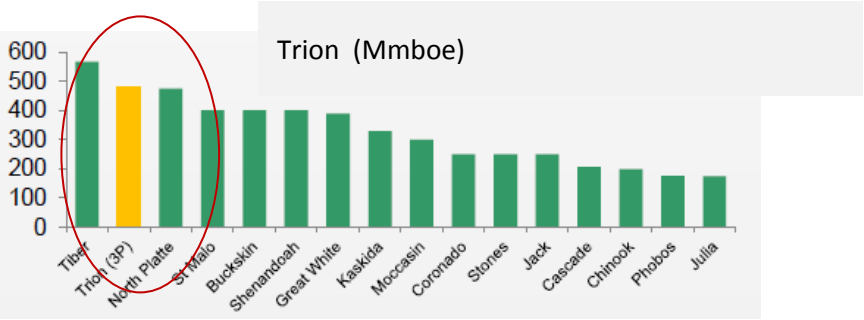
Area	Prod.	Reserves			Prospective resources	
		1P	2P	3P	Conv.	Non Conv.
Sureste	45.4	12.2	18.2	25.1	20.1	
Tampico Misantla	6.5	1.0	7.0	17.7	2.5	34.8
Burgos	2.3	0.4	0.6	0.8	2.9	15.0
Veracruz	0.7	0.2	0.2	0.2	1.6	0.6
Sabinas	0.1	0.0	0.0	0.0	0.4	9.8
Aguas profundas	0.0	0.1	0.2	0.7	26.6	
Plataforma Yucatán					0.5	
Total	**55.0**	**13.9**	**26.2**	**44.5**	**54.6**	**60.2**
		Development and production projects			Exploration projects	

Source: M.I. Gustavo Hernandez García "Oportunidades en Exploración y Producción de Hidrocarburos. Academia de Ingeniería AC. Junio 11, 2013.

Recent achievements in Deep Water E&P



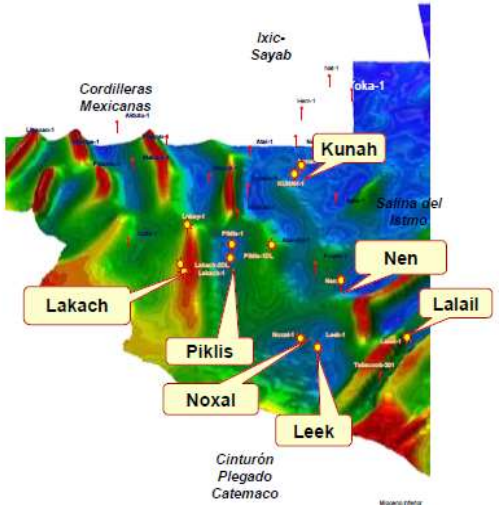
- Perdido area and Holok – Exploration wells PEP-1, Vespa-1, Ahawbil-1, Trion-1, Supremus-1.
- The last well in Perdido was Exploratus-1 with a water depth of 2,500 meters plus other 3,600 meters into the ground.
- The Maximino-1 well ratifies the existence of an active system with extra-light oil and gas.

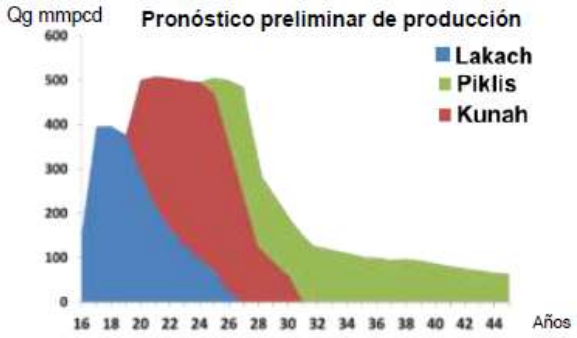


Source: Antonio Escalera "Potencial y Recursos Prospectivos en México". November 5, 2013

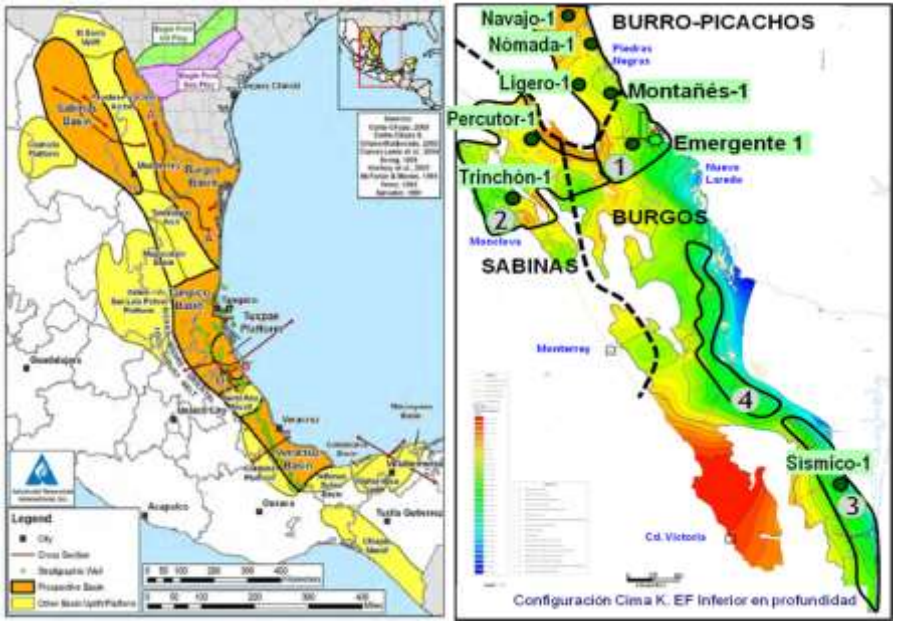
Recent achievements in Deep Water E&P

- First development wells in the Lakach field
  - 9 years to develop with marginal returns
  - Gas reserves 850 mmmcf, of which 75% are recoverable
  - 131 km northeast of Coatzacoalcos, Veracruz
  - Investments 2.5 mmm US$. First production in 2017 to reach 400 mmcfd
  - The project: six wells; subsea installations and two manifolds. Long tie back. Processing close to trunkline.
  - Other discoveries: Noxal, Lalail, Leek. Piklis (2P reserves: 791 Tcf), Nen (2P reserves: 442 Tcf) and Kunah (prospective resources = 1,800 Tcf)
  - 5.0 Tcf in non-associated gas reserves (3P) have been certified. Prospective resources = 5.5 to 16.5 Tcf.





Mexico's non conventional oil and gas



- Mexico's shale gas resources will play a key role to cover long term supply requirements.
- However, a careful approach as to the size and availability of these resources is required to calculate their development, investments and environmental conditions.
- Water resources in Mexico's northern states could slow down the initial projects.

Shale gas Play	US Estimates (EIA)[a]	Pemex estimates (ilower, central, upper)
Cretácico superior	507	54-106-171
Cretácico medio	8	0
Jurásico superior	166	95-190-285
TOTAL	681	150-297-459

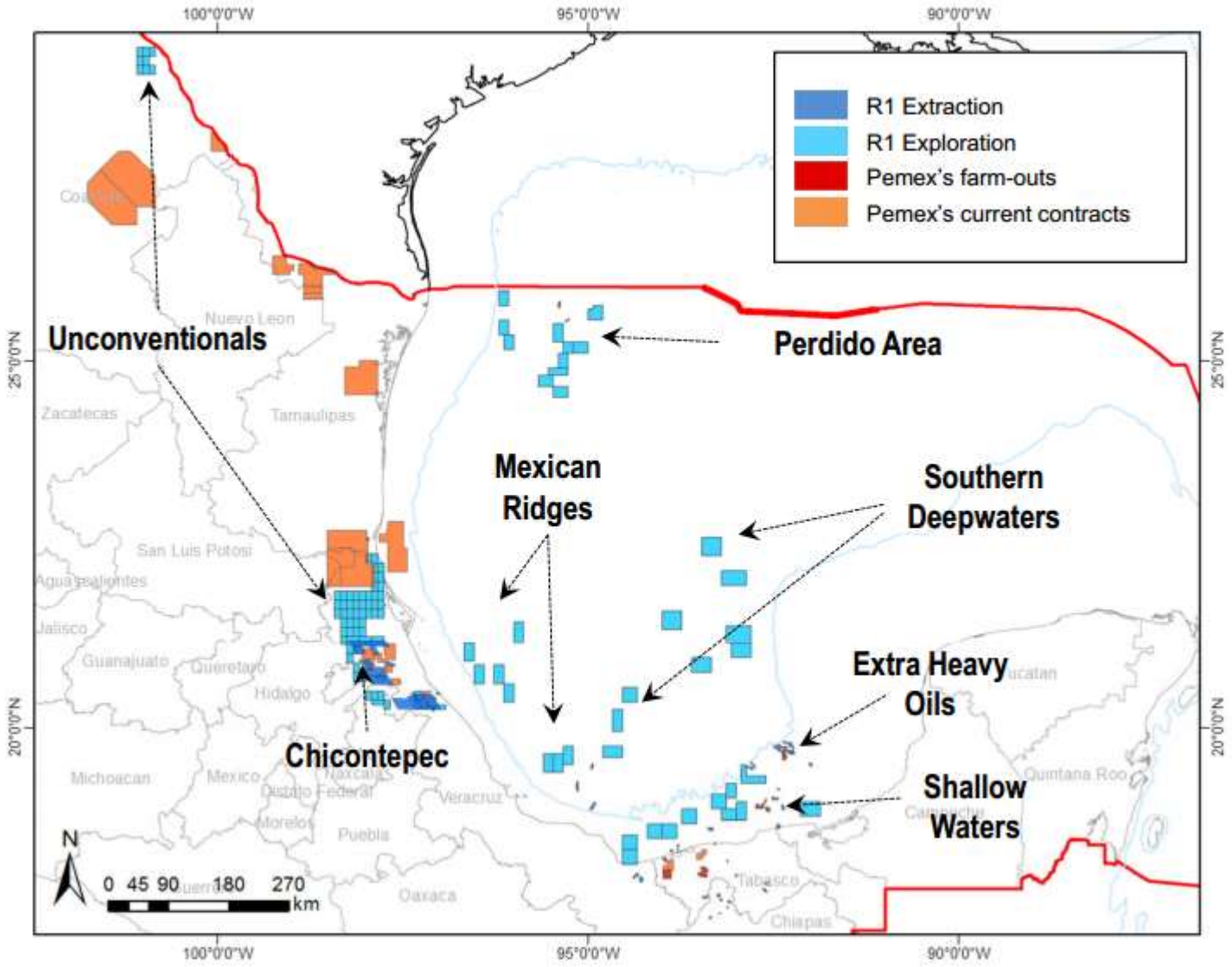
Regulations will play a key role in the development of shale resources

Round One

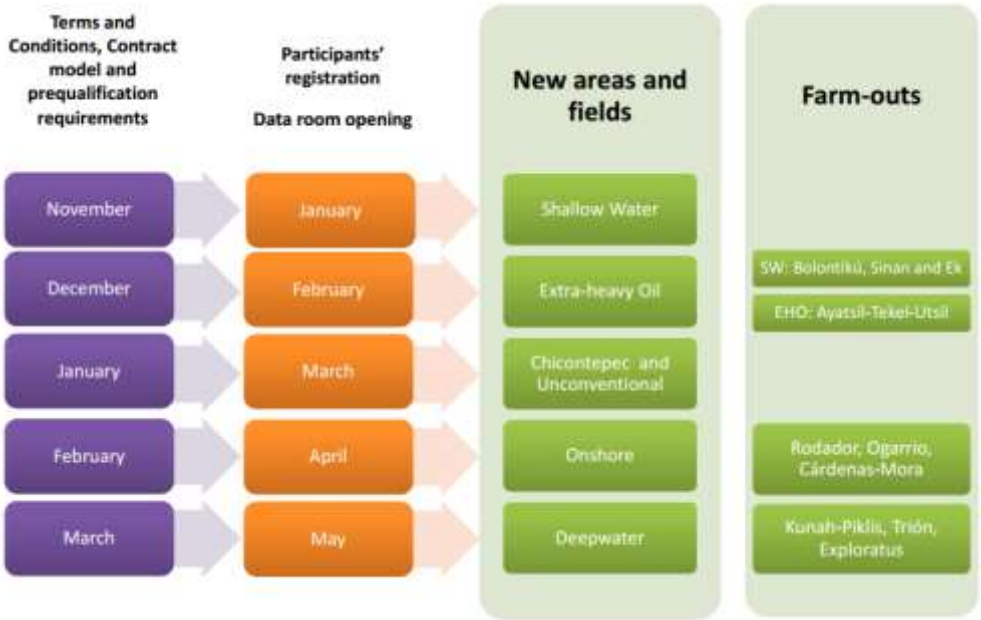
Area	Type	Volume (mmbpce)	Blocks / Fields
Deep water Perdido Area	Prospective Resource	1,591	11
Deep water south	Prospective Resource	3,222	17
Chicontepec and non-cenventionals	2P Reserves Prospective Resources	2,678 8,927	28 62
Land, shallow water and extra heavy crudes	2P Reserves Prospective Resources	1,104 724	32 11
Non conventional	Prospective Resources	142	8

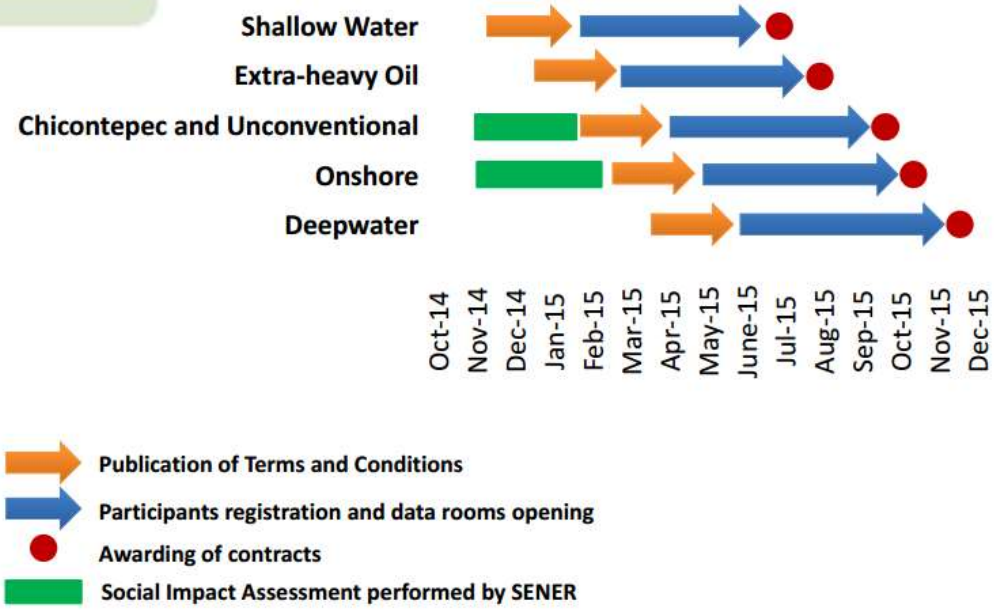
- The 11 areas for tenders in the Perdido area range from 224 to 409 km2. Eight of these areas are located in the Perdido Fold Belt.
- The blocks in the Cordilleras Mexicanas province have an area of 390-960 km2, depending on the maturity of exploration and ocean depth in the Gulf of Mexico.
- The contractual areas for non-conventional resources such as shale, have an extension between 112 km2 and 120 km2.

Round One areas



Schedule for tenders and Pemex *Farm Outs*





Present limitations in the natural gas grid

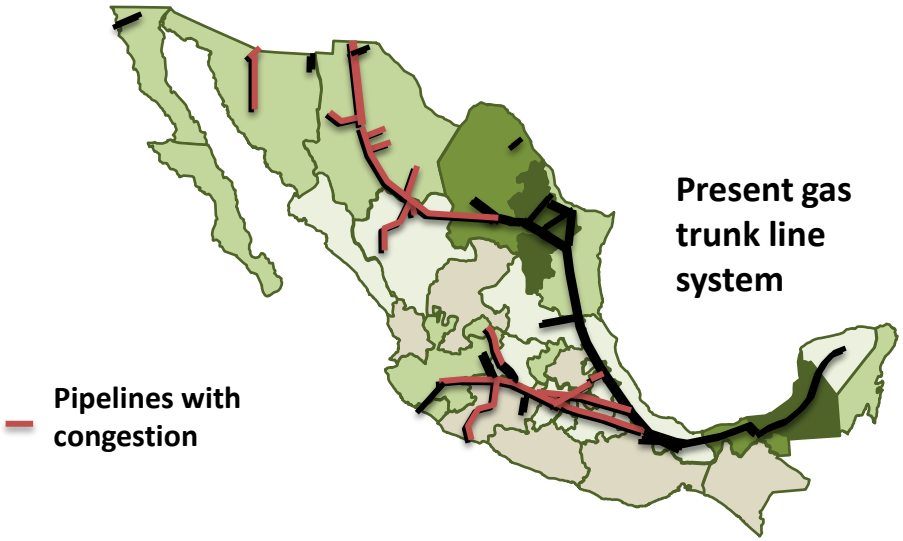
The trunk line system has shown several points of congestion that have restricted the supply of natural gas and its potential for growth.

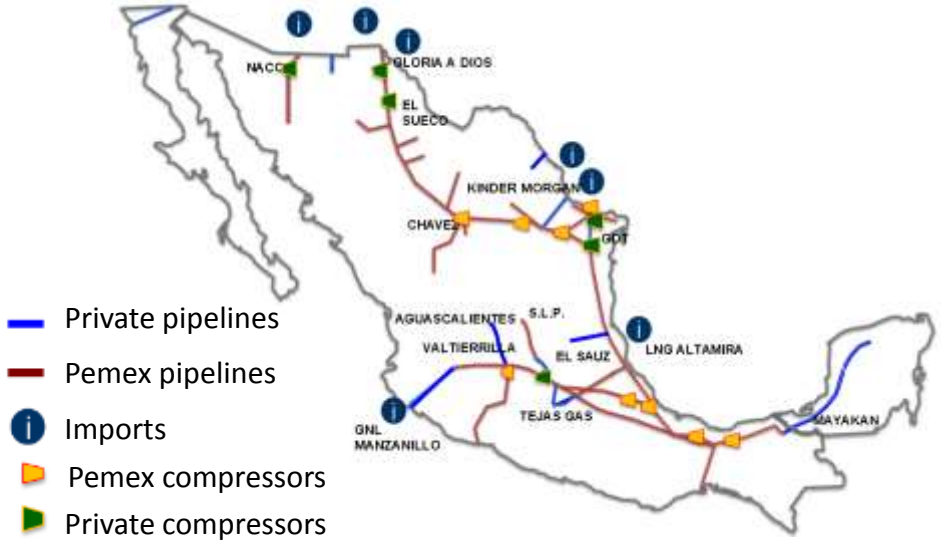
- Import increases
- Production declines in the south-southeast region
- Limited expansion of the national gas trunk line system

The consequences of these restrictions have been:

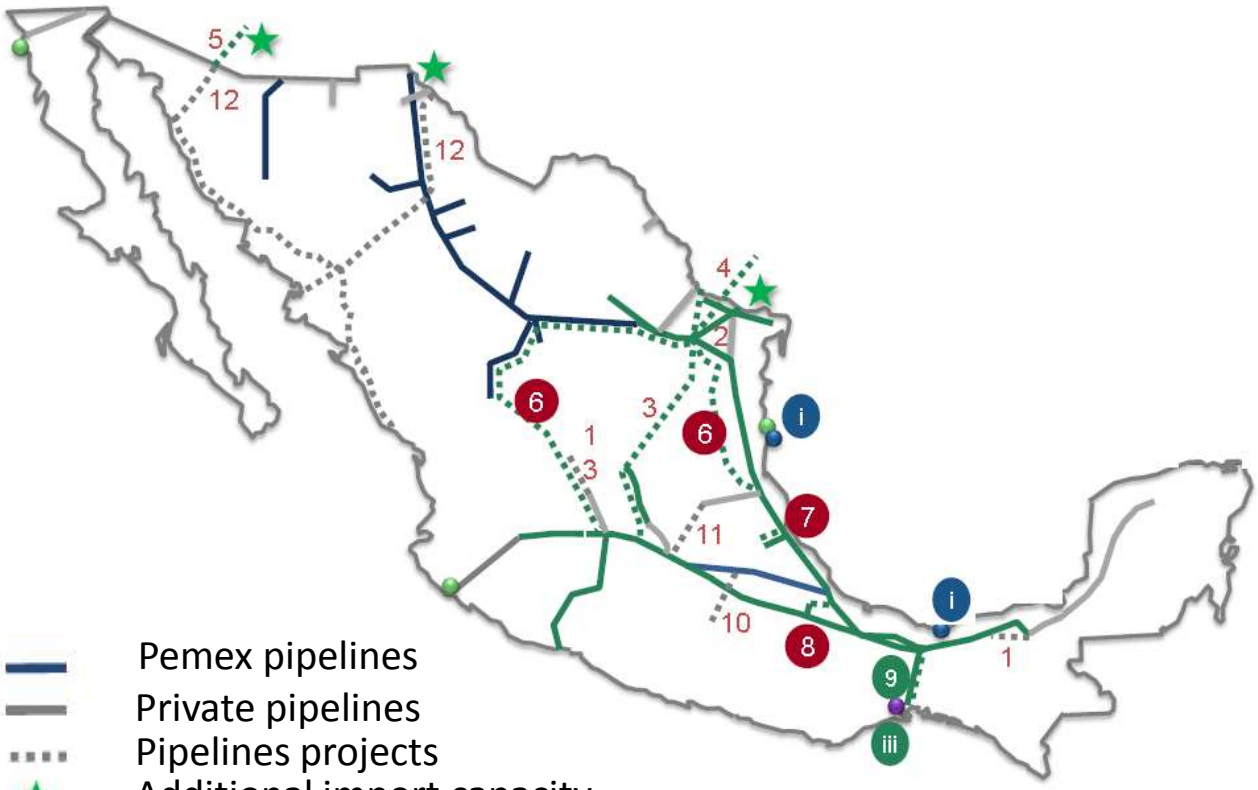
- Reduced consumption among industrial users
- Substitution by other more expensive and polluting fuels.
- In the power sector it was necessary to use other less efficient and more expensive fuels as well as imported LNG.

Transportation system 2013





Transportation system 2028



- Pemex pipelines
- Private pipelines
- Pipelines projects
- Additional import capacity
- LNG regasification
- Gas storage
- Liquefaction plant

Pipelines

1. Nuevo Pemex-Cd. Pemex
2. Los Ramones I
3. Los Ramones II
4. Agua Dulce-Frontera
5. Tucson-Sásabe
6. Northern Routes
7. Poza Rica-Punta Piedra
8. Matapionche-Medellín
9. Jáltipan-Salina Cruz
10. Morelos
11. Tamazunchale-El Sauz
12. North-Northeast
13. Aguascalientes-Zacatecas

- LNG storage Altamira.
- An additional storage container with a capacity of 3,200 mmcf to start operations in 2017.

Storage

- Salt cavern in Shalapa, Veracruz,
- Underground storage with 2,000 mmcf capacity, starting operations in 2016
- Liquefaction at Salina Cruz

Source: Jorge De la Huerta Moreno, “Proyectos de Infraestructura de Gas Natural”. Pemex-PGPB. May 2014

LNG liquefaction, regas and compressed gas plants

Existing LNG regasification plants			
	Regas capacity (mmcfd)	Storage capacity (mmcm)	Investment (mmus$)
Altamira	500 to 760	300	379
Ensenada	1,000 to 1,300	320	875
Manzanillo	500	300	783

LNG Salina Cruz

- PEMEX recently announced a liquefaction project for exports to Asia, with a regasification capacity of 250 mmcfd and an estimated value of US$ 6 million in investments. Deliveries starting in 2020.
- Gas from PEMEX's East coast fields through a new pipeline (Jaltipan-Salina Cruz across the Isthmus). The project is the second phase of the Transoceanic belt from Dos Bocas in Veracruz, to the refinery in Oaxaca.
- The project is still at an early stage of design and it will require ventures partners.

LNG vs. Compressed gas in Topolobampo

- The project will be based on supplies from new pipelines crossing from to Sinaloa. The plant is to initiate deliveries in 21017-2018. The National Infrastructure Program does not specify details such as economics, size, design, technology and site.
- The plant will supply Baja California South to replace the fuel oil and diesel used for power generation. This year the CFE should make a call for tenders for gas transportation from Topolobampo to La Paz. The estimated investment is $7,740 million pesos (US$ 600 million).

Potential natural gas distribution networks

- In 2013 the CRE completed three processes for public international tenders for the permits to distribute natural gas in the areas of Occidente, Veracruz and Morelia
- Many other populated cities have been identified as having the potential to conform a natural gas distribution area. The areas are expected to be announced from 2014.

Zona	Estados	Localidades	Kilómetros	Inversión*	Usuarios (miles)
Sonora-Chihuahua-Sinaloa	Sonora, Chihuahua y Sinaloa	17	952.7	412	476.3
Nuevo León-San Luis Potosí-Guanajuato	Nuevo León, San Luis Potosí y Guanajuato	7	99.5	43	49.5
Tabasco-Campeche-Yucatán-Quintana Roo	Tabasco, Campeche, Yucatán y Quintana Roo	9.0	1,057.0	435.0	502.8

Concluding remarks

- Mexico is struggling to increase its oil and gas production to remain a net energy exporter.
- The Energy Reform was needed to attract investments and to update the technologies in use.
- The Energy Reform is large and it covers all the sectors.
- Several State Agencies have been created.
- Natural gas demand is growing but the country is lagging behind in natural gas production.
- There are large 3P reserves and plenty of shale gas resources.
- Today the focus is on oil, while for gas the priority is placed on imports from the USA.
- Large investments in natural gas pipelines and other facilities are being made.
- There are three LNG regasification plants but the owners are considering the possibility to adapt them for liquefaction.
- Two sites are being evaluated to build natural gas liquefaction plants: Topolobampo and Salina Cruz. It is still too early to predict when and how are they are going to be built

javier.estrada@analiticaenergetica.com

55-5595-5358