

# Electrical Energy Sector

Buenos Aires, 21 September 2016

---

The electricity sector grew during the 2000s, albeit at a slower pace than in the 1990s, while continuing to be heavily reliant on oil and gas since 60% of generating capacity is thermal

---

The freezing of tariffs from 2002 discouraged investment and led to a marked deterioration of the sector's infrastructure, although it proved possible to meet peak demand by operating with practically no reserve margin.

---

Despite the regulatory framework of the post-privatisation 1990s being maintained, there was increasing state intervention in the sector, both through investment in generation and in various mechanisms to offset increased operating costs due to greater use of liquid fuels, including heavy subsidies to consumers in the Buenos Aires Metropolitan Area

---

Actions were taken to normalise the sector, such as gradual increases in tariffs, calls for the private sector to invest in generation and tax incentives for energy from renewable sources to diversify the base

---

Argentina has a good chance of achieving a 20% contribution from renewable energy by 2025, as was shown by the keen interest aroused by the first call for tenders, thanks to its geophysical conditions, although the cost and terms of financing remain an obstacle

# Contents

- 1 The electricity sector holds up well in recessions but is overly dependent on natural gas for generation
- 2 The freezing of tariffs discouraged investment and led to the system's operating without a margin of reserve and with high variable costs
- 3 The government is looking to normalise the sector by increasing tariffs, calling for tenders to increase capacity and betting on energy from renewable sources

# Installed power stands at 32,630 MW

## Around 1,100 additional MW in thermal equipment on trial

- Generators are concentrated mainly in Greater Buenos Aires, Buenos Aires Province and the Litoral region with 44.4% of the total, followed by the Comahue region with 19,2%.

### Installed power by region as at 30 April 2016 in MW

Source: BBVA Francés Research based on data from CAMMESA (*Compañía Administradora del Mercado Mayorista Eléctrico*, the administrator of the wholesale electricity market).

Region	Steam Turbine ST	Gas Turbine GT	Combined Cycle CC	Diesel Engine DI	Biogas BG	Thermal TH	Nuclear NU	Solar SOL	Wind WD	Hydroelectric HYD	TOTAL
Cuyo	120	90	374	0	0	584	0	8	0	1072	1664
Comahue	0	209	1282	68	0	1559	0	0	0	4692	6250
NOA	261	1012	829	282	0	2384	0	0	50	217	2651
Centro	200	511	534	101	0	1346	648	0	0	918	2912
BAS-GBA-LIT	3870	1995	6020	534	17	12436	1107	0	0.25	945	14488
NEA	0	46	0	277	0	323	0	0	0	2745	3068
Patagonia	0	195	188	0	0	383	0	0	137	519	1039
Generación Móvil	0	0	0	558	0	558	0	0	0	0	558
<b>TOTAL</b>	<b>4451</b>	<b>4057</b>	<b>9227</b>	<b>1820</b>	<b>17</b>	<b>19572</b>	<b>1755</b>	<b>8</b>	<b>187</b>	<b>11108</b>	<b>32630</b>
% share TH	23%	21%	47%	9%	0%	100%					
% share TOTAL						60%	5%	0%	1%	34%	100%

### Power put in place and on trial by region as at 30 April 2016 in MW

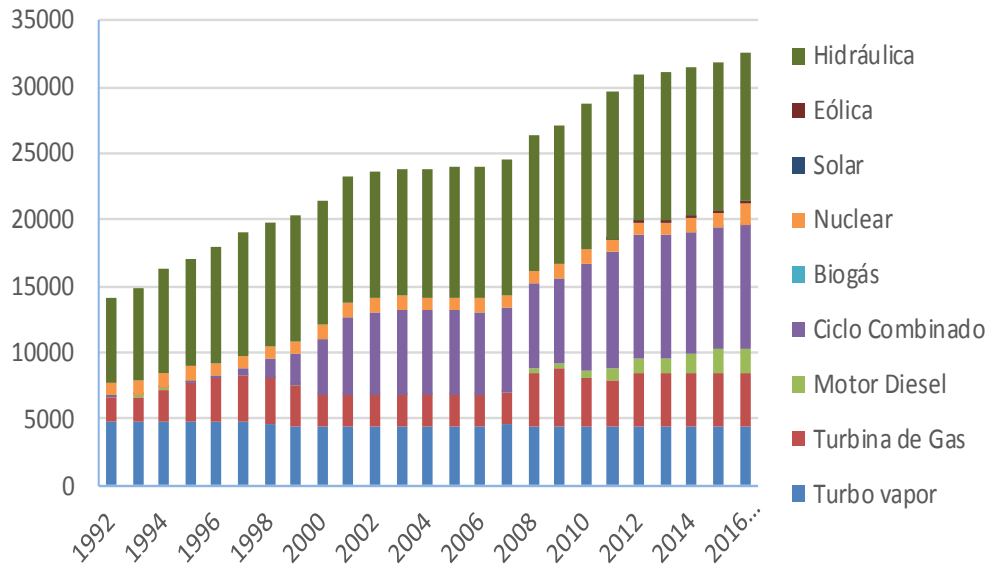
Source: BBVA Francés Research based on data from CAMMESA.

Region	Steam Turbine ST	Gas Turbine GT	Diesel Engine DI	Combined Cycle CC	Biogas BG	Thermal TH	Nuclear NU	Solar SOL	Wind WD	Hydroelectric HYD	TOTAL
LIT	0	524.5	0	0	0	524.5	0	0	0	0	524.5
BAS	0	563.8	0	0	0	563.8	0	0	0	0	563.8
<b>Total</b>	<b>0</b>	<b>1088.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1088.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1088.3</b>

# The power and energy generated are heavily dependent on oil and gas

**Installed power as at December of each year (MW)**

Source: BBVA Francés Research based on data from CAMMESA.



60% of generating capacity is thermal (using natural gas or fuel oil), 34% hydro and 5% nuclear.

The rate of growth of installed power during the 1990s was 5.3% YoY (1993-2002), whereas in 2002-2016 the rate fell to 2.3% YoY

There was also a difference in the source of this investment in power stations, which in the 2000s came practically exclusively from public sources

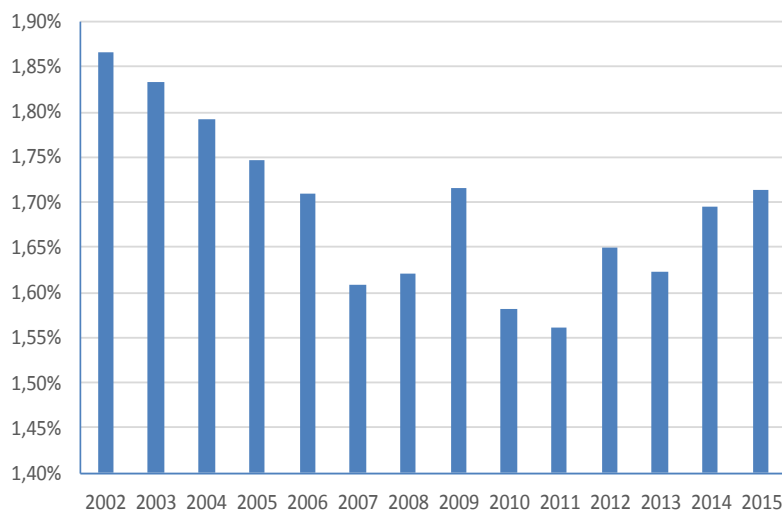
# The relative weight of the electricity sector declined in the 2000s

Although demand for electricity grew by an average of nearly 4% p.a.

- In the National Accounts the electricity sector is presented together with natural gas distribution and water supply. In 2015, its contribution to GDP fell slightly from 1.86% to 1.7%
- Growth in demand for electricity in the 2000s was less than that seen in the 1990s, with an arc elasticity to GDP of around 1.
- However, in the past four years, with GDP stagnating and demand for electricity increasing due to the freezing of tariffs, we see an uptick in elasticity to values in excess of 1.5

## Contribution of Electricity, Gas and Water / GDP (%)

Source: BBVA Francés Research based on data from INDEC (*Instituto Nacional de Estadística y Censos*, the national statistics institute).



## Elasticity of Demand for Electricity/GDP

(Cumulative growth per period)

Source: BBVA Francés Research based on data from CAMMESA and INDEC.

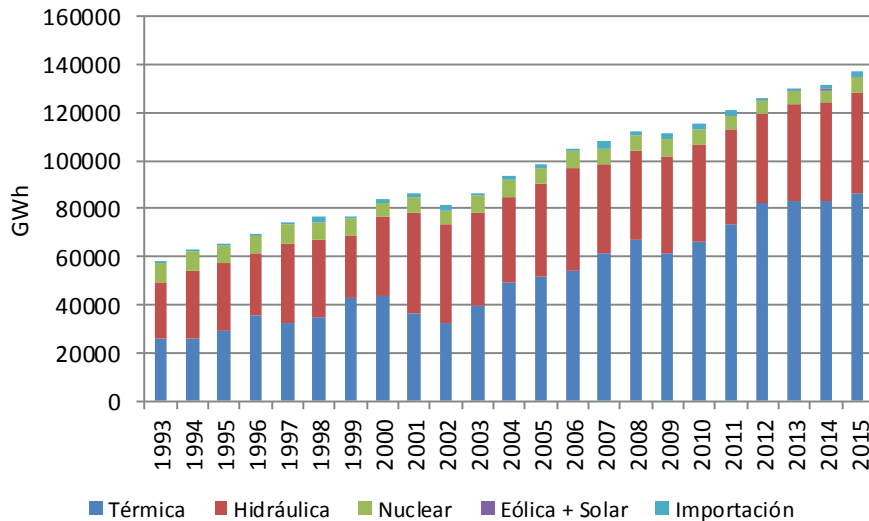
Period	Growth %		Elasticity
	Demand for Electricity	Constant GDP	
1994-1992	15.6%	11.9%	1.3
1998-1995	20.0%	18.5%	1.1
2008-2002	38.1%	58.5%	0.7
2011-2009	8.9%	17.1%	0.5
2013-2012	3.0%	2.3%	1.3
2015-2014	4.3%	2.4%	1.8

# Electricity generation followed a growth trend even in years of moderate recession

- Average growth in the period 2003-2015 reached 3.9% YoY, whereas in the previous decade (1993-2001) it had been 4.9% YoY. We have omitted 2002 in view of the profound crisis which caused demand for electricity to fall sharply, unlike in lesser recessions.
- In 2015 growth was 4.5% YoY, while in the first quarter of 2016 demand increased by 2.4% YoY despite the decline in economic activity
- The summer months are those placing the biggest demands on the system, due to the use of air conditioning, and in 2016 a new record was set.

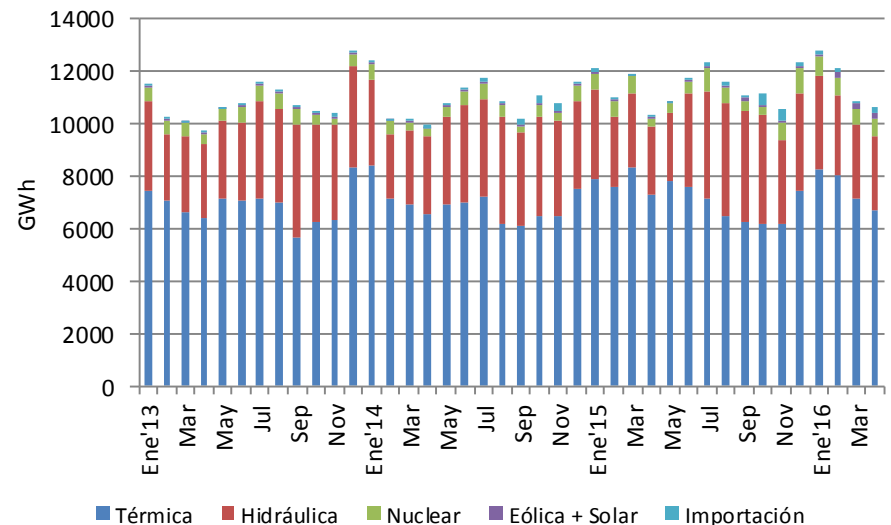
## Annual Generation of Electrical Energy

Source: BBVA Francés Research based on data from CAMMESA.



## Monthly Generation of Electrical Energy

Source: BBVA Francés Research based on data from CAMMESA.

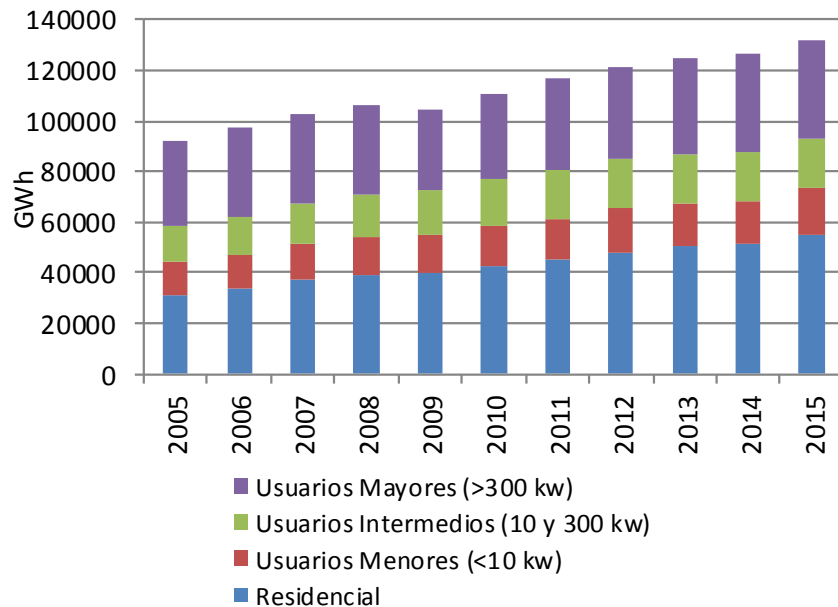


## ... driven by rising energy demand, except for 2002 and 2009

The growth in demand is identical to that in generation, since there is no possibility of storage

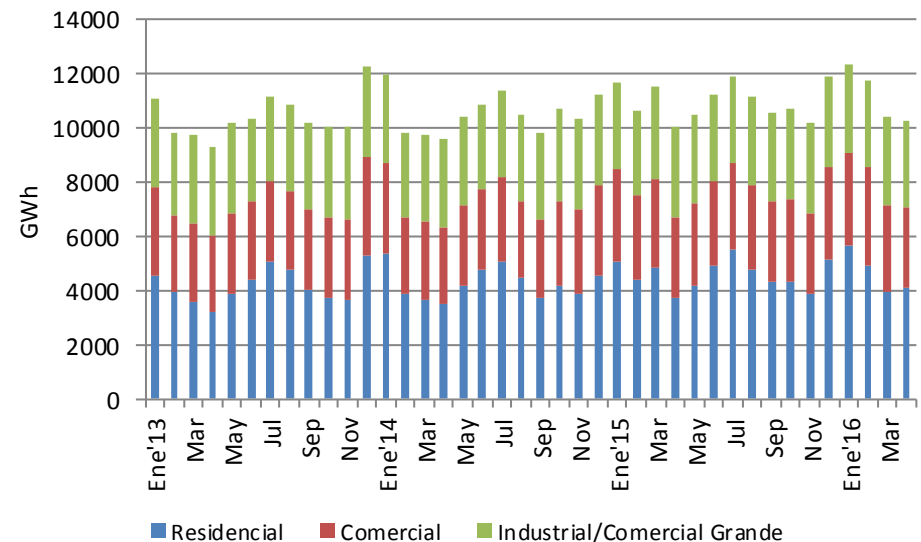
### Annual Demand for Electrical Energy for commercial and residential users

Source: BBVA Francés Research based on data from CAMMESA.



### Monthly Demand for Electrical Energy

Source: BBVA Francés Research based on data from CAMMESA.



Exports played a marginal role, since the possibilities of generating surpluses were exhausted, while imports met occasional peaks in demand in the summer.



# Following the wave of privatisations, the regulatory framework divides the sector into three, with different price regulation regimes

## Generation

- Over 100 companies operating. Originally these private companies operated in a market with free prices and big incentives to improve efficiency given that the price was fixed by the generation cost of the latest equipment dispatched (ordered by degree of efficiency from least to most).

## Transport and Distribution

- In transport, there is a high-voltage company (Transener), medium and low-voltage and substations in operation.
- Distribution is done by different firms in each geographical area.
- The regulatory authority fixes the margins and aggregate distribution and transport values for a certain period at public hearings.

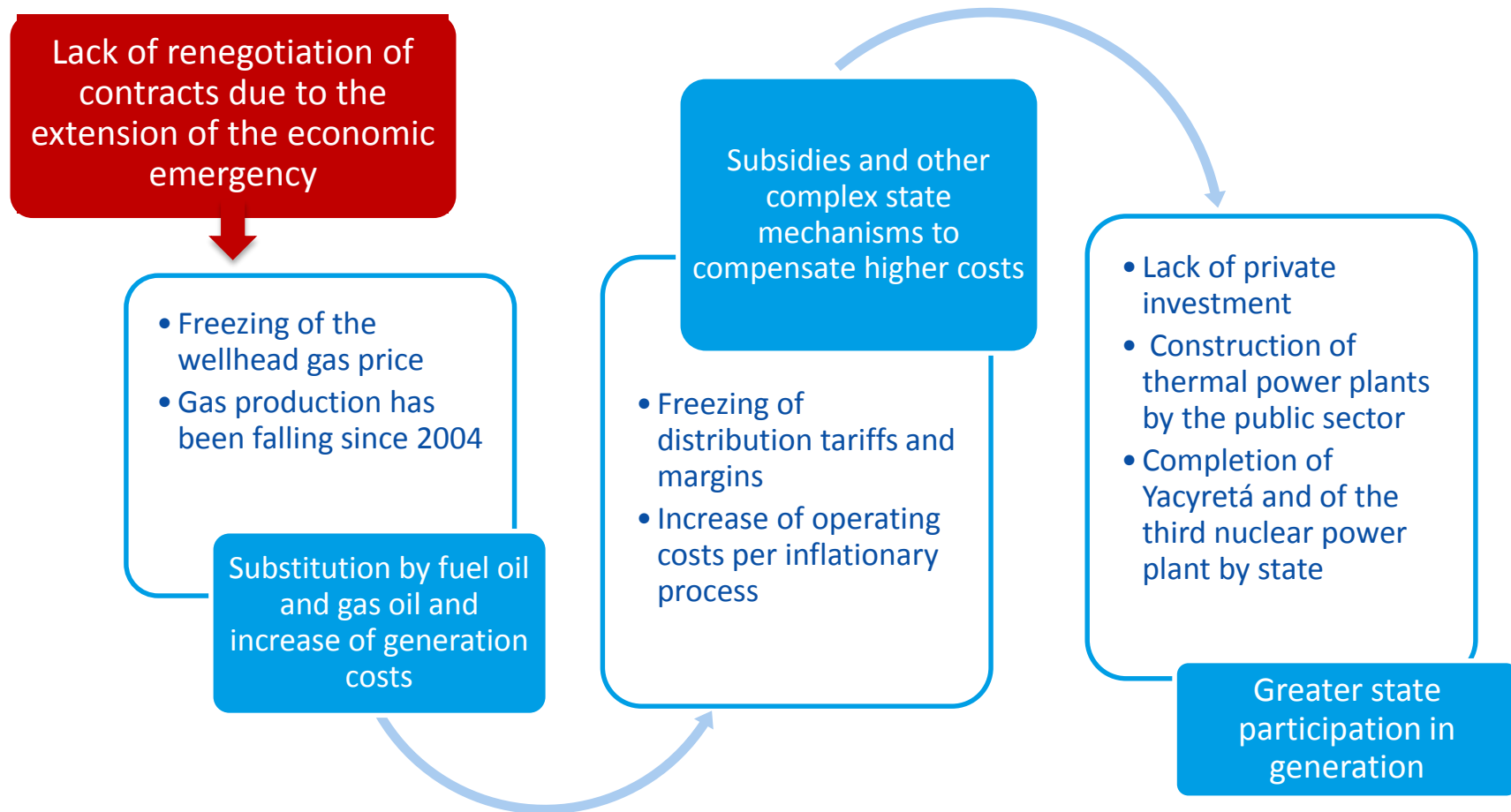
## Charges

- In January 2002, the Executive Power endorsed the Ley de Emergencia, by which it weighted electricity charges at 1 peso per dollar and revoked the provisions on price adjustments and indexing mechanisms provided in the contracts.
- Successive extensions of the Ley de Emergencia implied a "tariff abnormality" (freezing, partial compensations, etc.) as the contracts of public service companies were never renegotiated as was originally envisaged.

# Contents

- 1 The electricity sector holds up well in recessions but is overly dependent on natural gas for generation
- 2 The freezing of tariffs discouraged investment and led to the system's operating without a margin of reserve and with high variable costs
- 3 The government is looking to normalise the sector by increasing tariffs, calling for tenders to increase capacity and betting on energy from renewable sources

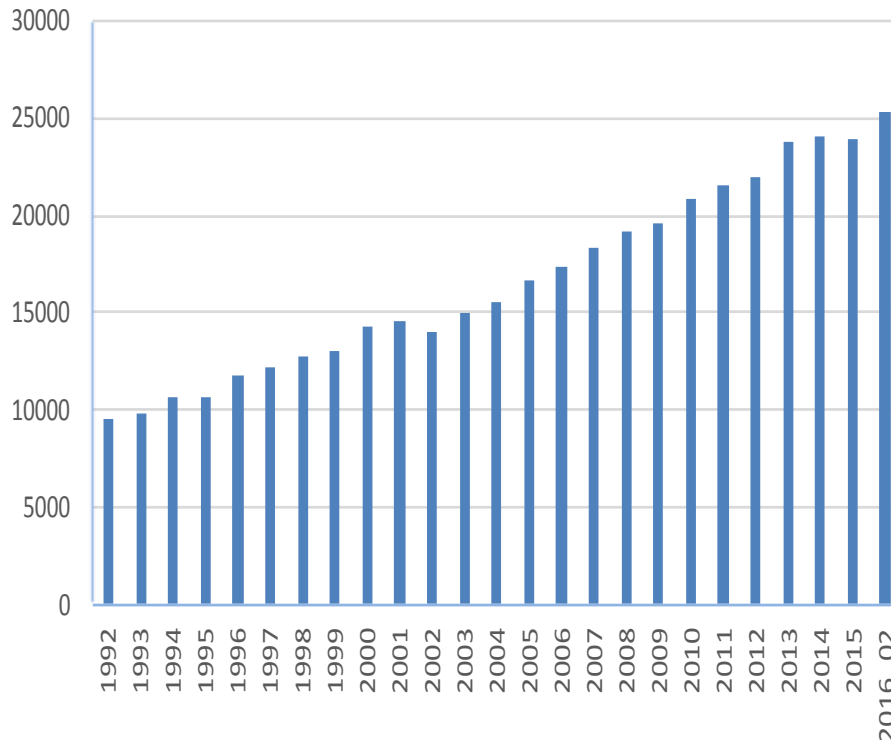
# “Tariff abnormality” led to a fall in investments and a shortfall in the energy balance



## During the 2000s it proved possible to meet peaks in demand, but with no margin of reserve

### Annual Gross Power Peaks

Source: BBVA Francés Research based on data from CAMMESA.



### Low private investment in the sector due to lack of price incentives

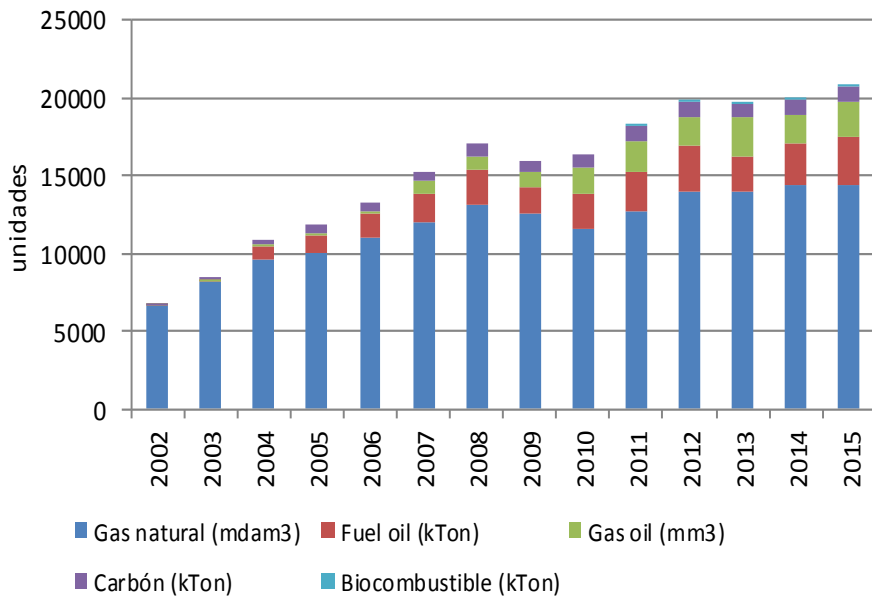
- The scant margin of reserve at times of peak consumption requires a more active policy of incorporating additional generating capacity to be adopted in order to give the system greater depth
- Average investment per user in the period 2003-15 was between US\$38 and US\$40, while in the period 1992-2002 it was US\$80 a year

# Shortages of natural gas led to replacement by liquid fuels

- The decline in domestic production of natural gas led to increasing use of fuel oil (steam turbines) and gas oil (gas turbines), which increased generating costs and the need to import from Bolivia, and LPG
- Households demand growing volumes of natural gas for heating in winter and the substitution process becomes more intense.

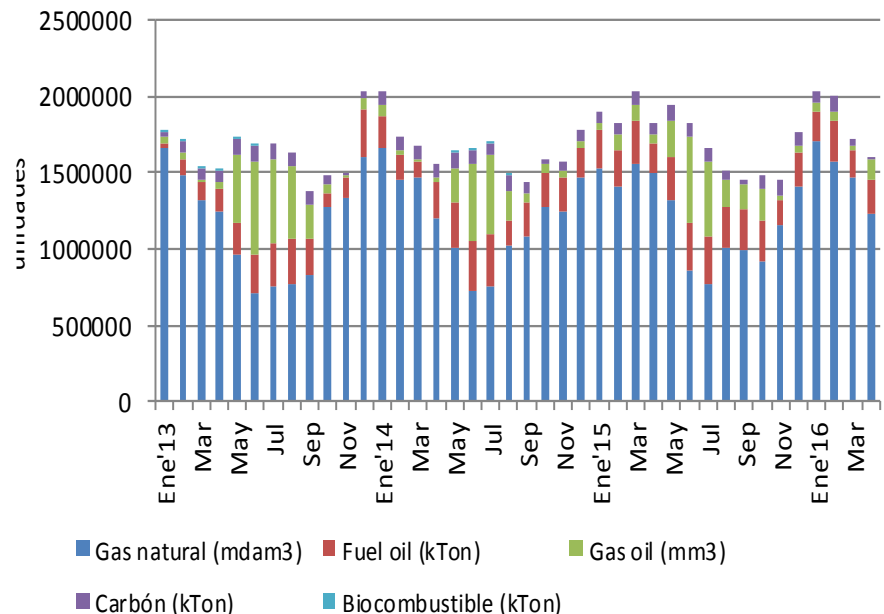
## Annual Fuel Consumption

Source: BBVA Francés Research based on data from CAMMESA.



## Monthly Fuel Consumption

Source: BBVA Francés Research based on data from CAMMESA.



# The average price in the spot market increased by 1,600% from 2003 to 2015, 2.2 times the inflation rate

## Monomic Price

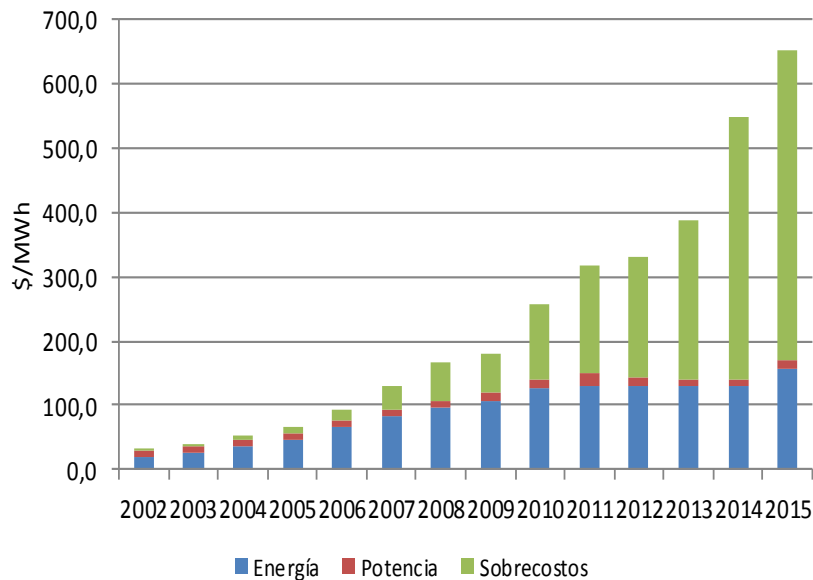
1) Energy, which after 2012 remained practically unchanged as a result of the maintaining of the wellhead gas price

2) The cost of power made available

3) The so-called "transitory dispatch cost overrun" shows the higher cost the plants incur to produce with liquid instead of gas fuels due to the lack of supply, which is exacerbated in the winter months due to their greater need for heat

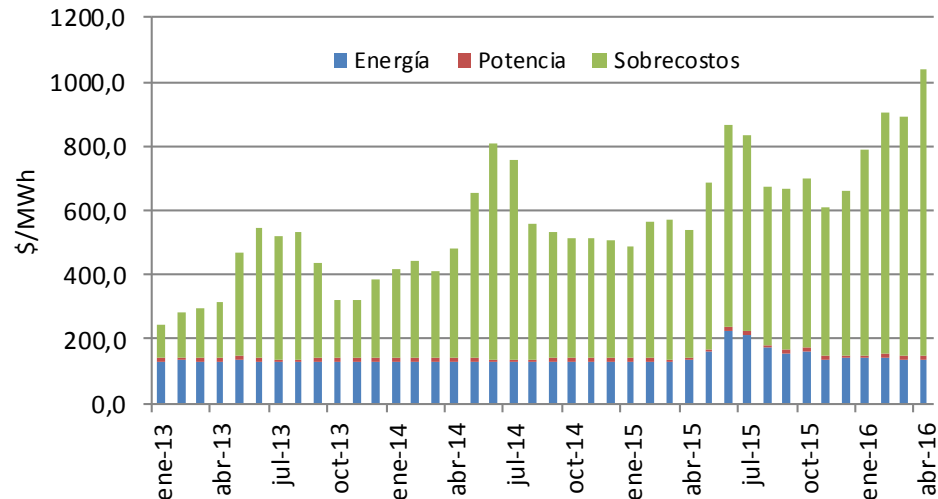
### Annual Average Monomic Price - Spot Market

Source: BBVA Francés Research based on data from CAMMESA.



### Monthly Average Monomic Price - Spot Market

Source: BBVA Francés Research based on data from CAMMESA.



# Contents

- 1 The electricity sector holds up well in recessions but is overly dependent on natural gas for generation
- 2 The freezing of tariffs discouraged investment and led to the system's operating without a margin of reserve and with high variable costs
- 3 The government is looking to normalise the sector by increasing tariffs, calling for tenders to increase capacity and betting on energy from renewable sources

## The schedule of problems to be solved

- The electricity market in the 2000s operated under a regime characterised by:

High levels of consumption subsidies, particularly in the Buenos Aires metropolitan area (4.1% of GDP in 2015)

Generation and transport costs assumed practically in full by the State, given that the price signals were not encouraging the private sector as they were getting dearer

Growing deterioration of the distribution system leading to an increase in average cuts in days of peak energy consumption



# Degraded infrastructure and heavy subsidies compelled the government to declare the “Electrical Emergency”

## Electrical emergency declared

### In transition

- Agreements to adjust tariffs
- Elimination of the PUREE energy efficiency programme
- Savings Plan to be kept in place
- Cessation of transfers to utilities Edenor and Edesur to finance infrastructure



## Tariff overhaul process

- ENRE (the National Electricity Regulator) must establish the entire tariff table for Edenor and Edesur
- Define expected service levels and determine the costs associated with their attainment.
- Hold public hearings for the approval of the RTI (*Revisión Tarifaria Integral* or Tariff Overhaul)



## New tariffs come into force



## End of the electricity emergency



# Tariff adjustment: reduce unfair tax subsidies and provide incentives for private investment

The residential tariff in the Buenos Aires Metropolitan Area, which is far below the cost of generation, encouraged the intensive use of electrical appliances

- Sharp provisional adjustment to tariffs in the Buenos Aires Metropolitan Area, with subsidies for the most vulnerable segments being retained in April 2016. The Supreme Court endorsed the increase, but without pronouncing on the basic question and relying only on the plaintiffs' lack of standing to seek preventive measures nationwide. The public hearings of October on the RTI should finally confirm the increases.
- These still represent only about 40% of the cost of generation, so increases will have to continue in subsequent years.

## Edenor - Residential tariffs

Source: BBVA Francés Research based on ENRE data.

Consumption kw /h per 2 months	\$ per kw /h		Growth %
	Previous tariff	New tariff	
Up to 300 fixed charge	4.46	14.43	223.5%
Up to 300 variable charge	0.081	0.556	586.4%
301-650 fixed charge	16.29	54.46	234.3%
301-650 variable charge	0.042	0.446	961.9%
651-800 fixed charge	18.96	66.14	248.8%
651-800 variable charge	0.045	0.469	942.2%
801-900 fixed charge	20.07	72.29	260.2%
801-900 variable charge	0.047	0.48	921.3%
901-1000 fixed charge	21.57	81.16	276.3%
901-1000 variable charge	0.048	0.496	933.3%
1,001-1,200 fixed charge	24.22	115.65	377.5%
1,001-1,200 variable charge	0.1	0.557	457.0%
>1,200 fixed charge	26.14	131.64	403.6%
>1,200 variable charge	0.104	0.586	463.5%

## Edesur - Residential tariffs

Source: BBVA Francés Research based on ENRE data.

Consumption kw /h per 2 months	\$ per kw /h		Growth %
	Previous tariff	New tariff	
Up to 300 fixed charge	4.44	15.94	259.0%
Up to 300 variable charge	0.082	0.577	603.7%
301-650 fixed charge	16.2	60.14	271.2%
301-650 variable charge	0.043	0.459	967.4%
651-800 fixed charge	18.83	71.68	280.7%
651-800 variable charge	0.046	0.479	941.3%
801-900 fixed charge	20.1	76.76	281.9%
801-900 variable charge	0.048	0.492	925.0%
901-1000 fixed charge	20.35	84.34	314.4%
901-1000 variable charge	0.048	0.502	945.8%
1,001-1,200 fixed charge	25.48	133.32	423.2%
1,001-1,200 variable charge	0.101	0.589	483.2%
>1,200 fixed charge	27.51	145.43	428.6%
>1,200 variable charge	0.101	0.588	483.4%

# Increase generating capacity with private investment

1,917 MW of generating capacity will be added by February 2018

Putting the construction of thermal power stations out to tender

Requirements to be considered:

- Private financing
- Pricing of contracts awarded: resolved in a transparent and competitive process
- Greater efficiency: the new power stations must contribute to reducing the risks of power outages and operating costs of the system

20 bids accepted to start staggered works

- Bids were accepted for 1,917 MW of a total of 6,611 MW offered:
  - 4 bids for 455 MW to come on stream by February 2017
  - 5 bids for a total of 327 MW to be operational by July 2017
  - 11 bids by February 2018 with a total of 1,134 MW.
- Average price per unit of generation selected, US\$21,830/MW month, 32% below that contracted by the previous administration.
- Investment estimated at US\$1.53 billion.
- Contracts awarded to 10 existing operators and 4 new investors
- Bids selected cover needs of specific nodes which improve the quality and security of the grid and consume less fuel

# Diversify the energy base using energy from renewable sources as a driver

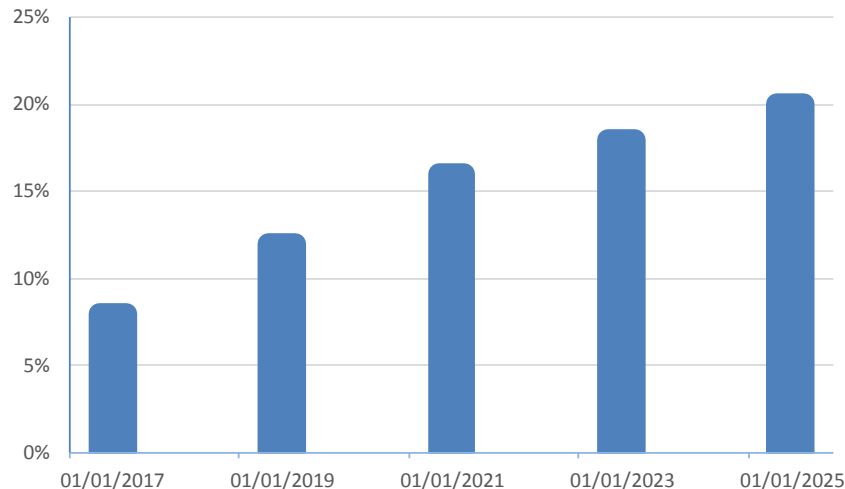
Law 27191/15 contains amendments to Law 26190 (promoting the use of energy from renewable sources)



Main tax advantages: accelerated depreciation for Tax on Profits, early reimbursement of VAT and exemption from tax on distribution of dividends and profits.

## Timetable for Participation of Energy from Renewable Sources

Source: BBVA Francés Research



Aim to attain a 8% contribution from renewable energy sources by the end of 2017

Between 2018 and 2025, gradual incorporation, reaching 20% contribution from renewable energy sources by the end of 2025.

The maximum limit established for hydroelectric power stations to qualify for the advantages of the Law is 50 MW.

# High potential for energy from renewable sources



## Geophysical conditions

- Winds in excess of 6 metres per second in 70% of the country. In Patagonia 9-12 metres per second
- Large number of annual hours of sunshine



## Financing

- Interest rates still high relative to the rest of the region (7% vs.4%)
- Terms less than 10-12 years even from multilateral sources
- Tax or grid access incentives
- Inefficient



# Renewable Energy: numerous options

Renewable (non-fossil) sources sustainable in the short, medium and long term are: wind, solar thermal, solar photovoltaic, geothermal, tidal, wave- and current-based, hydro, biomass, landfill gas, sewage treatment plant gas, biogas and biofuel.

Advantages in wind and solar energy, but there are also opportunities for other alternative sources that present excellent conditions

## Wind Power Projects

Source: BBVA Francés Research based on information from newspapers.

Stage	Number	MW
Construction started	15	900
Awaiting approval	17	1000
Under study	40	5000

Country's high potential reflected in the keen interest shown by private investors, who for wind power alone have projects for US\$6.9 billion in portfolio.

The first 32 projects, which are at an advanced stage, involve investment of US\$3.8 billion.

# Keen interest in the first call for tenders for renewables

## Tendering conditions

- Award of 1,000 MW on 12 October 2016:
  - 600 MW wind-based
  - 300 MW solar
  - 65 MW from biomass
  - 20 MW from micro-hydro projects
  - 15 MW from biogas
  - Volume of power to be supplied by the bidder is fixed and purchased by CAMMESA as the wholesale market operating authority.
  - Storage contract signed in November 2016 for 20 years

## 123 proposals for 6,000 MW

- Total investment proposed US\$10 billion:
  - Northwest 32 projects for a total of 1,980 MW
  - Buenos Aires with 17 projects for 1,207 MW
  - Patagonia, with 15 projects for 1,085 MW.
- Interest shown by investors from Argentina, Europe and the United States
- Creation of between 5,000 and 6,000 new jobs.

## Economic and environmental benefits

- Currency savings since imports of consumables for generating electricity will be reduced by around US\$300 million.
- Reduction of around two million metric tons a year in greenhouse gas emissions.

# Main challenges facing the electricity sector

## Generating sector

- Incorporation of new power stations with capacity of around 1,000 MW a year to meet the growing demand with more efficient machinery making for cheaper energy
- Move towards parity of oil and gas import prices (domestic prices currently higher than international ones) to reduce the cost of generation and avoid onerous tariff increases.
- Diversify the energy base with renewable energy equipment, with alternative supply capability in case of emergency

## Transport sector

- Incorporation and improvement of high voltage grids and supply sub-stations

## Distribution sector

- Continue bringing tariffs into line with generating costs, gradually phasing out subsidies (with the exception of vulnerable segments) and providing genuine income to attract private investment.
- Gradual improvement of distribution networks to reduce annual average outages.
- Greater forward macroeconomic visibility to reduce Argentina's risk premium and thus benefit all segments.



# Electrical Energy Sector

Buenos Aires, 21 September 2016