Analysis of the Energy Sector in Spain and future perspectives

Special focus in the Power and Natural Gas sectors

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Finance Major

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1. Introduction

The total consumption of energy has been decreasing since the beginning of the financial crisis, even though the economic situation in Spain has recovered. In 2013[1], the total consumption fell a 6% compared to 2012. The main driver of this diminution of total consumption is the critical economic situation in Spain during the last 6 years, weighting the most the reduction in industrial activities in this period.

Since the appearance of the renewable energies in the sector, they have gained market share every year, establishing as an important activity in Spain. The country, which presents numerous sunny periods during all the seasons of the year, good wind conditions in many parts of the territory and many Hydroelectric Power centres built since Franco's dictatorship period, has available renewable energy assets to further develop the sector. In fact, in 2013 the renewable energy sector provided 14,2% of the total supply of energy in Spain, gaining 7,5% more market share than in 2012.

Regarding regulatory issues, it's remarkable to mention the main changes undertaken in the Power Sector. First, the *Ley del Sector Eléctrico*, which promotes the effective competition in the Power sector, improving the position of customers facilitating both available information for them and the processes to change of supplier, which leads to a general improvement in the commercial part of it. Apart from that, it has been also implemented in this sector potential cost reduction measures that have given the consumers a new and important role to contribute on it, by which they can collaborate to improve the economic situation of the country through their own consumption and investment. Moreover, and the most important one, the government has approved new measures to guarantee the financial stability of the Power system, with a new payment regime for the Power generation centres using renewable energies, cogeneration and treating residues, as well as some additional payment principles regarding the transport and distribution of Power energy.

The Energy sector as a whole has also experienced the implementation of some remarkable regulatory issues during the last years. In 2013, the *Ley de creación* was approved by Comisión Nacional de los Mercados y la Competencia, and it conglomerates different functions to preserve the correct development of the different markets in Spain.

[1] All year references in this thesis refer to the year-end i.e. 2013 means 31st December of 2013 (if not, it will be properly stated).

Spain is totally compromised in the energy efficiency objectives fixed by the European Union for 2020, and has created legal tools to assess it. The main objective of the EU is to reduce the total consumption of Primary[2] Energy up to 20% in the Community countries.

The environment continues to be a major player in the Energy sector not only in Spain but also in all the countries in the World. Spain approved in 2013 a new law dealing with industrial emissions, and has had a big impact in the sector in 2014. It was also approved the PIMA plans and the CLIMA projects, which promotes the preservation of the environment making special attention to the climate change.

R&D activities in the sector were included in the Plan Estatal de Investigación Científica y Técnica y de Innovación for the period 2013-2016, a national plan approved by the Spanish Government in order to promote and coordinate the different actions undertaken in this field. This plan is coordinated within the Strategic Energy Technology Plan (SET Plan) launched by the European Commission, whose objective is to accelerate the development and implementation of low-carbon technologies with competitive costs. The European Energy Research Alliance (EERA) is the main tool of the SET Plan to promote the research and development of this type of technologies. Nowadays, Spain is represented in 7 of these industrial European initiatives.

Spain is currently facing a strong economic development and recovery, and during 2014 the Spanish Government has been encouraging this trend in order to totally recover a healthy economic environment able to further develop the country and fix solid bases for the growth and the competitiveness. Due to that, and since the Energy sector is one of the main drivers for this national objective, the current Government (*Partido Popular*) stresses the importance of optimizing the use of basic resources, increasing the competitiveness of the markets, improving the security of the distribution and assuring a sustainable state both economic and environmental. Thus, new regulatory issues will be implemented primarily focused on energy efficiency, the better competitiveness of renewable energies in the market and the accomplishment of the different environmental standards fixed by the EU.

[2] Primary energy is an energy form found in nature that has not been subjected to any conversión or transformation process.

2. Body

2.1. International situation and perspectives

Since 2008 until now, the developed countries have made important economic adjustments due to the economic crisis and the global uncertainty in the finance sector. However, global entities forecast growth consolidation in the European economies during the 2015, mainly due to the new investors' confidence in the economy and the better finance conditions in the continent.

2.1.1. The 3 main drivers of the present decade

As we can read in the World Economic Outlook posted by the International Energy Agency, the main indicators of energy consumption continue their positive trend. The impact of the energy price in the country economies is huge. Thus, even though the economic growth and the macroeconomic recovery are real, there is still uncertainty in the finance sector. Due to that, there is a European agreement to assess the development of three main drivers that appear to be decisive for the present decade:

- **New technological developments in the Oil sector**: new oil extraction techniques are being developed especially in the U.S., using the presence of light oil in compact formations or in deep waters, following the non-conventional gas channels and its conversion to liquids. It implies that in the following 10 years, OPEP distribution will be reduced and Brazil will become one of the main exporters of oil thanks to its discoveries off-shore, gaining three times more market share until 6 Mbd[3] in 2035 and covering its own needs until 2030.
- **Impact of energy price differences in the economic recovery and the industrial competitiveness**: currently, price differences are wide among the different countries in the World. In fact, gas prices in Europe are three times higher than in the U.S., as well as the electricity price, which is twice the price in Europe than in the U.S. Global entities remark that this difference will be maintained until the 2035, which may condition investment decisions of multinational companies, especially those ones intensive in terms of energy consumption. For this reason, the strong position of the U.S. makes experts expect large future revenues coming from exports of products related to those energy intensive industries. Due to that, Europe might experience market share reductions up to one third of the current one in sectors utilizing huge

[3] Million barrels of oil per day

quantities of energy, such as the construction sector, steel sector, paper sector, chemical sector, etc.

- **Improvement of the competitiveness through measures to increase the energy efficiency**: new developments regarding oil and gas extraction will be needed in order to maintain a sustainable situation due to the humongous demand coming from the emergent countries (with China, India and Middle East absorbing one third of the total use of energy in 2035 following the WEO estimations). However, this sustainability must be reached by looking for more efficient markets, competitive and interconnected and regulatory measures incentivizing the development of energy efficiency, where two thirds of its potential is still to discover.

2.1.2. World Energy Outlook 2014

The International Energy Agency, which promotes energy security amongst its member countries through collective response to physical disruptions in oil supply and provides authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond, writes every year a report in which the main objectives and drivers to the future development of the Energy sector is treated.

- An energy system under stress -

The IEA states there is a huge risk for the global energy system of falling short of the hopes and expectations placed upon it. There have been many factors that have arisen those concerns.

- Turmoil in parts of the Middle East (which remains the only large source of low-cost oil) has rarely been greater since the oil shocks in the 1970s.
- Conflict between Russia and Ukraine has reignited concerns about gas security supply, mainly in Europe.
- Nuclear power, which for some countries plays a strategic role in energy security, faces an uncertain future.
- Electricity remains inaccessible to many people, including two out of every three people in sub-Saharan Africa (which has been the regional focus in the WEO-2014).
- Environmental issues have incentivized climate negotiations, even though it is not encouraging: a continued rise in global greenhouse-gas emissions and stifling air pollution in many of the world's fast-growing cities.

Nevertheless, the last advances in technology and efficiency give reasons to be optimist, even though sustained political efforts will be essential to change energy trends for the better.

- Energy is the cause to, and also the answer of, some urgent problems -

IEA expects the global energy demand to grow by 37% by 2040, but the development path for a growing world population and economy is less energy-intensive than it used to be. The estimations assume global demand slows markedly, from above 2% per year over the last two decades to 1% per year after 2025, due to both price and policy effects, and a structural shift in the global economy towards services and lighter industrial sectors. The global distribution of this demand also changes, maintaining energy uses essentially flat in much of Europe, Japan, Korea and North America and rising consumption concentrated in the rest of Asia, Africa, Middle East and Latin America.

By 2040, world's energy supply mix is estimated to be divided into oil, gas, coal and low-carbon sources in equal parts. Policy choices and market developments that bring the share of fossil fuels in primary energy demand down are not enough to stem the stem in emissions of carbon dioxide (CO_2). This makes the Energy sector face a critical issue, knowing that the long-term average temperature is supposed to increase by 3.6 ºC. Thus, in order to keep the increase in temperature in a lower level of 2ºC, there cannot be emitted more than around 1,000 gigatonnes of CO_2 from 2014 onwards. Since this decrease of 1.6 ºC in global temperature is not easy to undertake, there will be a WEO Special Report to be released in mid-2015 in advance of the critical UN climate talks in Paris in order to better plan the program needed to asses the problem.

- Oil -

Oil consumption will switch of trend in the near future. For each barrel of oil no longer used in OECD countries, two barrels more will be used in the non-OECD. The use of oil in transport and petrochemicals mainly in emerging countries such as India and China drives this higher demand, from 90 million barrels per day in 2013 to 104 million barrels per day in 2040. Nonetheless, high prices and new policy measures will gradually constrain the pace of overall consumption growth.

Due to that, an estimated investment of $900 billion per year in upstream oil and gas development is thought to be needed by 2030s to meet this huge demand, but many experts keep reluctant to whether this investment will be forthcoming in time (especially once U.S. tight oil output levels off in the early 2020s and its total production eventually starts to fall back). Many factors are considered to contribute to this shortfall in investment below the levels required by the WEO:

- The complexity and capital intensity of developing the Brazilian deep-water fields for extraction.
- The difficulty of replicating the U.S. tight oil experience at scale outside North America.
- The unresolved questions over the outlook for growth in Canadian oil sands output.
- The sanctions that restrict Russian access to technologies and capital markets.
- The political and security challenges in Iraq.

Must be paid special attention to the situation in the Middle East nowadays, since there is an increasing reliance on the region for oil production growth, and especially Asian countries were supposed to take advantage of their proximity to it in order to import crude, since they will be importing two out of every three barrels of crude traded internationally by 2040.

- Natural gas -

Even though the demand of natural gas grows by more than half (the fastest rate among the fossil fuels), the flexible global trade in liquefied natural gas (LNG) offers a source of protection against the risk of supply disruption. China and Middle East push the global demand of gas, but it will also become the leading fuel in the OECD countries by 2030, mainly driven by the new regulatory measures pushed by the United States in order to limit sector emissions.

While gas production will increase everywhere (Europe is the main exception) and unconventional gas will account for almost 60% of the global supply growth, there still exist uncertainty whether gas can be available at price levels sufficiently attractive to consumers and sufficiently high to give the opportunity to invest in new gas-supply technologies.

- Coal -

Contrary to the other sources of Energy, coal supply is secure and abundant, but the main issue it will face will be political constrains regarding the reduction of CO_2 emissions. Even though the global demand of coal grows by 15% to 2040, almost two-thirds of the increase occurs over the next ten years of consumption.

China will demand almost 50% of the total coal until 2030, from when its total consumption will fall-back. On the other hand, demand in the OECD will decline, including the U.S., where coal use for electricity generation plunges by more than one-third. India will overtake the United States as the world's second-biggest coal consumer before 2020, and right after will surpass China as the largest importer[4]. Low prices in the coal market have put pressure on producers worldwide to cut costs, but both the demand growth stated before and the

[4] Note that largest importer does not mean largest consumer

shedding of high-cost capacity are expected to support a sufficient increase in price to attract new investment.

Regarding the supply, China, India, Indonesia and Australia alone will account for over 70% of global coal output by 2040.

The future of the coal sector goes through the adoption of high-efficiency coal-fired generation technologies and the better capture and storage of carbon in the long term. That will ensure a smoother transition to a low carbon power system.

- Prices and policies have to be right to get more efficiency into the mix -

Energy efficiency is the perfect tool to deal with high-energy demand and to mitigate impact of price disparities between regions. The transport sector is in the front line on efficiency policies, with more than three-quarters of global car sales now subject to efficiency standards. Apart from reducing energy-import bills and pollution, efficiency measures can help to better address competitive disadvantages in energy-intensive industries due to the high prices in both natural gas and electricity.

On the other side, fossil-fuel subsidies totalled $550 billion in 2013 (more than four-times those to renewable energy) and are holding back investment in efficiency and renewables.

- A complex set of elements in decision-making on nuclear power -

Many countries are committed to cut the nuclear power generation, but policies concerning this type of energy still remain an essential feature in most national energy strategies for the future. Following the scenario stated by the IEA in the WEO 2014, global nuclear power capacity will increase by almost 60%, form 392 GW in 203 to over 620 GW in 2040. However, it will just own a 12% of global electricity generation share in this same year.

The growth of the nuclear energy is centred in markets where electricity is supplied at regulated prices. In 2040, China will account for 45% of the total growth, while India, Korea and Russia collectively will make up to 30% of it. UK will generate 16% more nuclear energy than currently, generation will rebound in Japan (although not to the levels prior to the accident at Fukushima) and will fall by 10% in the European Union.

Despite the many negative effects the nuclear power may present, it also presents many positive characteristics that can convince countries to maintain it as a future option of energy source:

- Nuclear power can contribute to the reliability of the power system where they increase the diversity of power generation technologies in the system.
- For countries importers of energy, nuclear energy can reduce their dependence on foreign supplies.
- It can also reduce/limit the exposure of countries to fuel price movements in international markets.

Regarding environmental issues, nuclear power is one of the few options available to reduce carbon-dioxide emissions with a sufficient supply of energy for the current and future demand. Assuming the scenario in 2040 presented in the WEO 2014, annual emissions avoided thanks to nuclear power will reach almost 50% in Korea, 12% in Japan, 10% in the United States, 9% in the European Union and 8% in China. The cost implied in expanding the nuclear capacity of the different countries will obviously depend on the mix and the costs of the fuels it displaces at the time of displacement, but it ranges from very low levels to over $80/tonne.

The depreciation of the current nuclear plants will make retire almost 200 of the 434 operational reactors, with the majority of them being retired in Europe, the United States, Russia and Japan. The challenge is how to replace this shortfall in generation especially in the most affected continent with less energy resources available: Europe.

Finally, the most challenging and critical aspect of nuclear power is the public concern about it. Thus, population must be heard and concerns addressed.

2.1.3. Demand and production of energy

Global demand of energy worldwide continues increasing in a constant pace since 2010. In fact, the demand grew 2% in 2013, a similar growth than in the previous 2 years. Energy consumption in the no-OCDE countries represents 56% of the total, being greater than the one from OCDE countries since 2008 mainly due to the strong economic growth they have experienced[5].

It is still important the increase in consumption of Asia-Pacific countries, which increased 5% in 2012, 5,4% in 2011 and 8,5% in 2010. Whereas in the United States it decreased 2,5%, 0,7% and increased 3,5% respectively, in China it increased 7,6%, 8,6% and 11,2% and in India 5,3%, 4,5% and 5,7% respectively. That made the weight of Asia-Pacific area in total consumption to increase a lot, gaining a 40,5% of the total market share in 2013 (from its 15,8% in 1980).

2.1.3.1. Oil

[5] In 2013 the consumption of no-OCDE countries grew 2,8%, whereas the one from OCDE countries grew 0,9%

Oil consumption also continues increasing year per year, with an increase of 1,1% in 2013. Although the consumption decreased in OCDE and UE, the emergent countries' demand continues growing, 2,9% in 2013. The most important countries driving this demand were China, India and Middle East. Asia-Pacific region consumed 33,8% of the global oil supplied, a huge value compared to North America (24,5%) and UE (14,5%).

Proved reserves *(thousand million barrels)*	1993	2003	2012	2013
North America	120,5	225,8	229,9	229,6
South&Central America	80,7	100,4	328,6	329,6
Europe & Eurasia	78,3	115,5	147,4	147,8
Middle East	661,9	745,7	808,7	808,5
Africa	61,2	106,2	130,6	130,3
Asia Pacific	38,8	40,5	42,1	42,1
Total World	**1041,4**	**1334,1**	**1687,3**	**1687,9**

Table 2.1.1.: Proved reserves of Oil (Source: BP Statistical Review of World Energy)

Production *(thousand barrels daily)*	2007	2008	2009	2010	2011	2012	2013
North America	13631	13156	13444	13843	14323	15543	16826
South&Central America	7322	7394	7348	7367	7448	7274	7293
Europe & Eurasia	17840	17617	17812	17758	17452	17184	17226
Middle East	25305	26417	24726	25761	27980	28484	28359
Africa	10274	10268	9907	10163	8580	9349	8818
Asia Pacific	8011	8103	8025	8404	8266	8370	8232
Total World	**82383**	**82955**	**81262**	**83296**	**84049**	**86204**	**86754**

Table 2.1.2.: Production of Oil (Source: BP Statistical Review of World Energy)

Consumption *(thousand barrels daily)*	2007	2008	2009	2010	2011	2012	2013
North America	25109	23860	22957	23510	23329	22948	23292
South&Central America	5661	5881	5913	6155	6306	6478	6775
Europe & Eurasia	20082	20013	19181	19087	19009	18636	18645
Middle East	6755	7206	7508	7767	8004	8353	8526
Africa	3068	3235	3306	3479	3374	3519	3624
Asia Pacific	26079	25952	26246	27803	28912	29997	30469
Total World	**86754**	**86147**	**85111**	**87801**	**88934**	**89931**	**91331**

Table 2.1.3.: Consumption of Oil (Source: BP Statistical Review of World Energy)

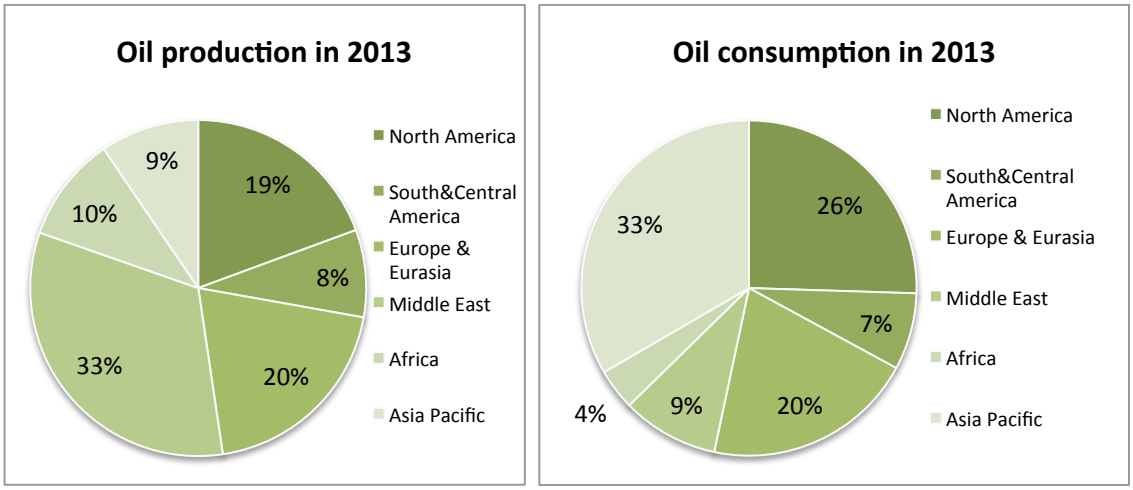

Fig. 2.1.1.: Production and consumption distribution of Oil in 2013 (Source: BP Statistical Review of World Energy)

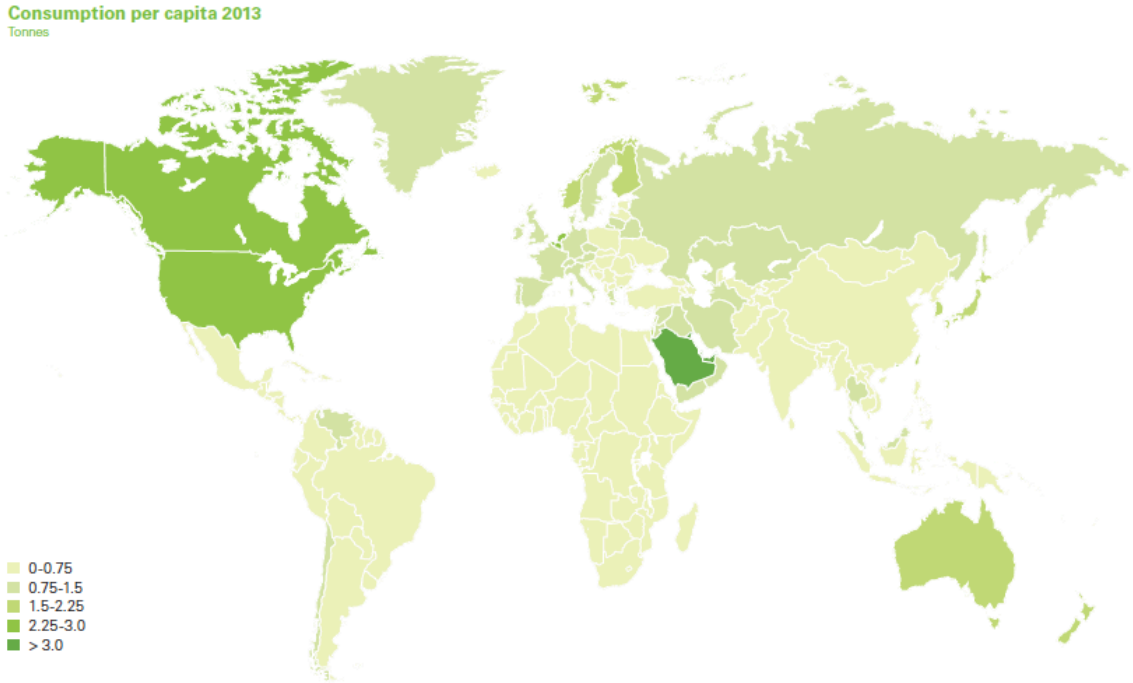

Fig. 2.1.2.: Consumption per capita 2013 (Source: BP Statistical Review of World Energy)

European consumption *(thousand barrels daily)*	2007	2008	2009	2010	2011	2012	2013
Light distillates	3683	3481	3405	3350	3125	3002	2941
Middle distillates	7583	7802	7532	7548	7524	7413	7439
Fuel oil	1611	1545	1378	1256	1189	1060	957
Others	3212	3145	2979	2950	2878	2728	2749
Total Europe	**16089**	**15973**	**15294**	**15104**	**14716**	**14203**	**14086**

Table 2.1.4.: European consumption of different kinds of Oil products (Source: BP Statistical Review of World Energy)

Spot crude prices *(US dollars per barrel)*	Dubai	Brent	Nig. Forc.	WTI
1976	11,63	12,8	12,87	12,23
1977	12,38	13,92	14,21	14,22

1978	13,03	14,02	13,65	14,55
1979	29,75	31,61	29,25	25,08
1980	35,69	36,83	36,98	37,96
1981	34,32	35,93	36,18	36,08
1982	31,8	32,97	33,29	33,65
1983	28,78	29,55	29,54	30,3
1984	28,06	28,78	28,14	29,39
1985	27,53	27,56	27,75	27,98
1986	13,1	14,43	14,46	15,1
1987	16,95	18,44	18,39	19,18
1988	13,27	14,92	15	15,97
1989	15,62	18,23	18,3	19,68
1990	20,45	23,73	23,85	24,5
1991	16,63	20	20,11	21,54
1992	17,17	19,32	19,61	20,57
1993	14,93	16,97	17,41	18,45
1994	14,74	15,82	16,25	17,21
1995	16,1	17,02	17,26	18,42
1996	18,52	20,67	21,16	22,16
1997	18,23	19,09	18,33	20,61
1998	12,21	12,72	12,62	14,39
1999	17,25	17,97	18	19,31
2000	26,2	28,5	28,42	30,37
2001	22,81	24,44	24,23	25,93
2002	23,74	25,02	25,04	26,16
2003	2678	28,83	28,66	31,07
2004	33,64	38,27	38,13	41,49
2005	49,35	54,52	55,69	56,59
2006	61,5	65,14	67,07	66,02
2007	68,19	72,39	74,48	72,2
2008	94,34	97,26	101,43	100,06
2009	61,39	61,67	63,35	61,92
2010	78,06	79,5	81,05	79,45
2011	106,18	111,26	113,65	95,04
2012	109,08	111,67	114,21	94,13
2013	105,47	108,66	111,95	97,99
2014	46,34	53,7	63,28	51
February 2015	56,15	63,98	-	56,71

Table 2.1.5.: Spot crude prices (Source: BP Statistical Review of World Energy, Bloomberg and Yahoo Finance)

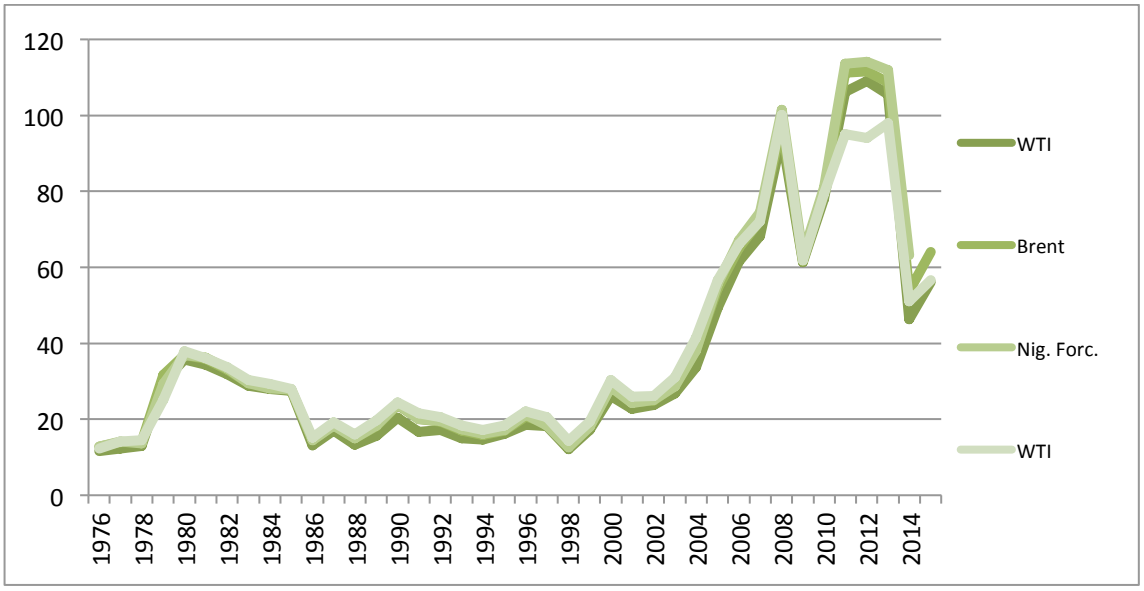

Fig. 2.1.3.: Spot price evolution (Source: BP Statistical Review of World Energy, Bloomberg and Yahoo Finance)

Refinery capacities *(thousand barrels daily)*	2011	2012	2013
Belgium	823	786	810
France	1610	1639	1520
Germany	2077	2097	2061
Greece	495	498	498
Italy	2311	2200	2062
Netherlands	1276	1274	1274
Norway	316	316	316
Russian Federation	5589	5785	6027
Spain	**1416**	**1537**	**1537**
Sweden	434	434	434
Turkey	613	613	613
United kingdom	1787	1526	1526
Other Europe & Eurasia	5515	5221	5209
Total Europe & Eurasia	**24262**	**23926**	**23887**

Table 2.1.6.: Refinery capacities (Source: BP Statistical Review of World Energy)

Trade movements *(thousand barrels daily)*	2011	2012	2013
Imports			
US	11338	10587	9792
Europe	12208	12488	12637
Japan	4494	4743	4530
Rest of World	26120	26930	28713
Total World	**54160**	**54748**	**55672**
Exports			
US	2495	2682	3271
Canada	2798	3056	3276
Mexico	1487	1366	1335
S. & Central America	3755	3830	3707
Europe	2053	2174	2399

Formet Soviet Union	8569	8285	8632
Middle East	19687	19581	19439
North Africa	1945	2596	2207
West Africa	4637	4557	4453
Asia Pacific	6088	6299	6480
Rest of World	646	322	473
Total World	**54160**	**54748**	**55672**

Table 2.1.7.: Trade movements of Oil (Source: BP Statistical Review of World Energy)

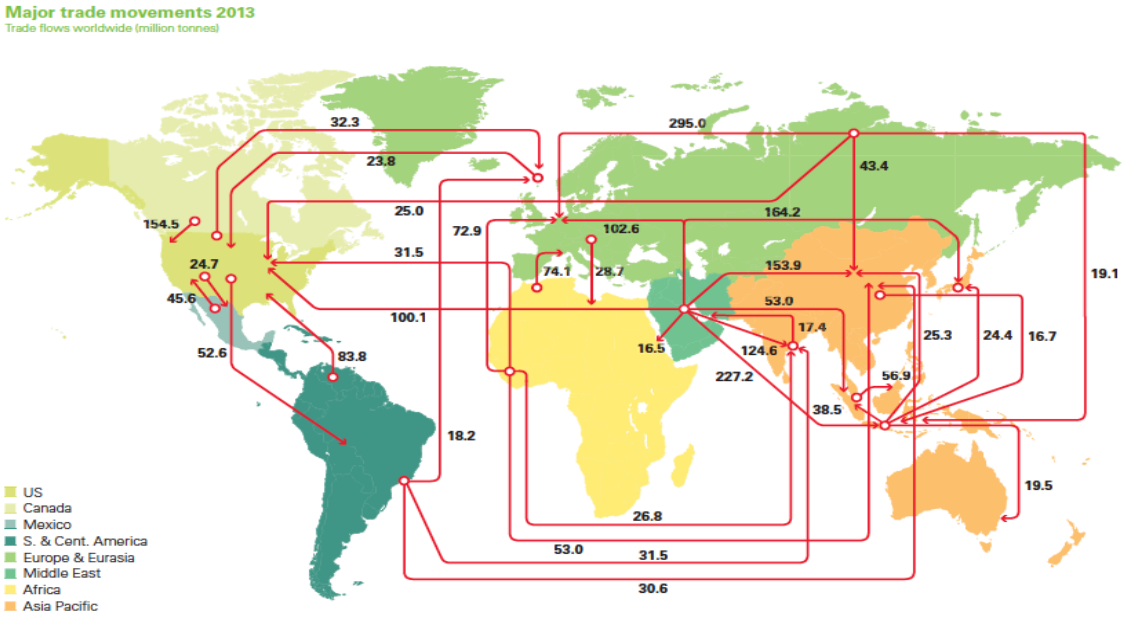

Fig. 2.1.4.: Major trade movements of Oil in 2013 (Source: BP Statistical Review of World Energy)

2.1.3.2. Natural gas

Natural gas consumption increased 1,1% in 2013, recovering the growing trend from the period previous to the economic crisis. This evolution was mainly due to the American and Asian demand, especially coming from China. Thus, the commercialization of natural gas by ship is increasing every year.

Proved reserves *(Trillion cubic metres)*	1993	2003	2012	2013
North America	8,8	7,4	11,1	11,7
South&Central America	5,4	6,8	7,7	7,7
Europe & Eurasia	40,5	42,7	56,5	56,6
Middle East	44,4	72,4	80,3	80,3
Africa	10	13,9	14,4	14,2
Asia Pacific	9,3	12,5	15,3	15,2
Total World	**118,4**	**155,7**	**185,3**	**185,7**

Table 2.1.8.: Proved reserves of Natural Gas (Source: BP Statistical Review of World Energy)

Production *(Billion cubic metres)*	2007	2008	2009	2010	2011	2012	2013
North America	781,9	800,8	807,4	821,1	866,5	894,2	899,1

S. & Central America	162,3	163,2	158,5	163,2	167,4	174,3	176,4
Europe & Eurasia	1042,1	1074,4	954,8	1026,9	1034,2	1028,1	1032,9
Middle East	370,9	400,3	420,3	478,9	524,8	545,5	568,2
Africa	205	212,6	200,4	214,3	211,2	216,3	204,3
Asia Pacific	400,5	417,2	439,6	486,4	483,6	484,9	489
Total World	**2962,7**	**3068,5**	**2981**	**3190,8**	**3287,7**	**3343,3**	**3369,9**

Table 2.1.9.: Production of Natural Gas (Source: BP Statistical Review of World Energy)

Consumption *(Billion cubic metres)*	2007	2008	2009	2010	2011	2012	2013
North America	813,9	821,5	816,1	849,6	870,6	902,9	923,5
S. & Central America	142,8	143,7	138,6	148	151,9	162,3	168,6
Europe & Eurasia	1128	1133,5	1048,2	1127,4	1099,3	1082,6	1064,7
Middle East	315,7	347,4	356,5	385,8	402,8	412,9	428,3
Africa	96,2	101,3	100,1	107,9	114,8	123	123,3
Asia Pacific	457,8	480,3	497,9	562,1	593,6	627,1	639,2
Total World	**2954,4**	**3027,7**	**2957,4**	**3180,8**	**3233**	**3310,8**	**3347,6**

Table 2.1.10.: Consumption of Natural Gas (Source: BP Statistical Review of World Energy)

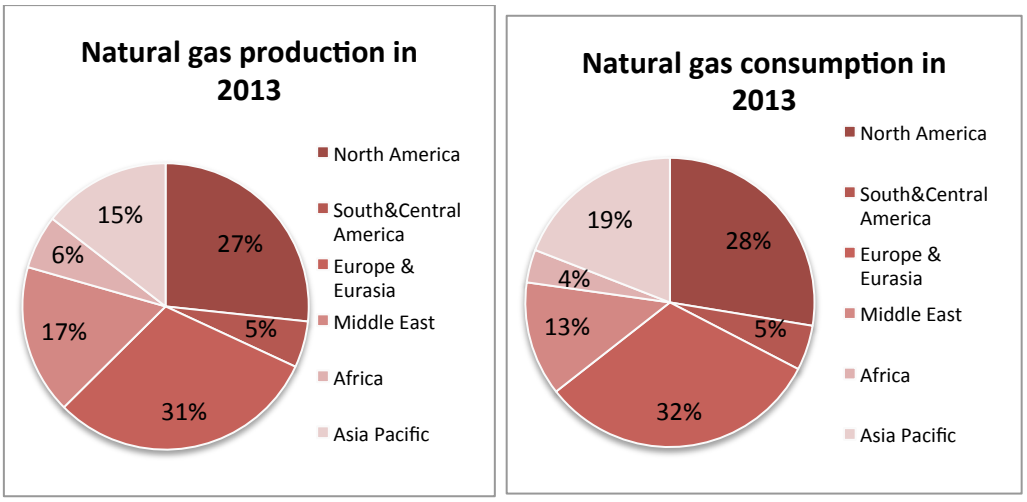

Fig. 2.1.5.: Production and consumption distribution of Natural Gas in 2013 (Source: BP Statistical Review of World Energy)

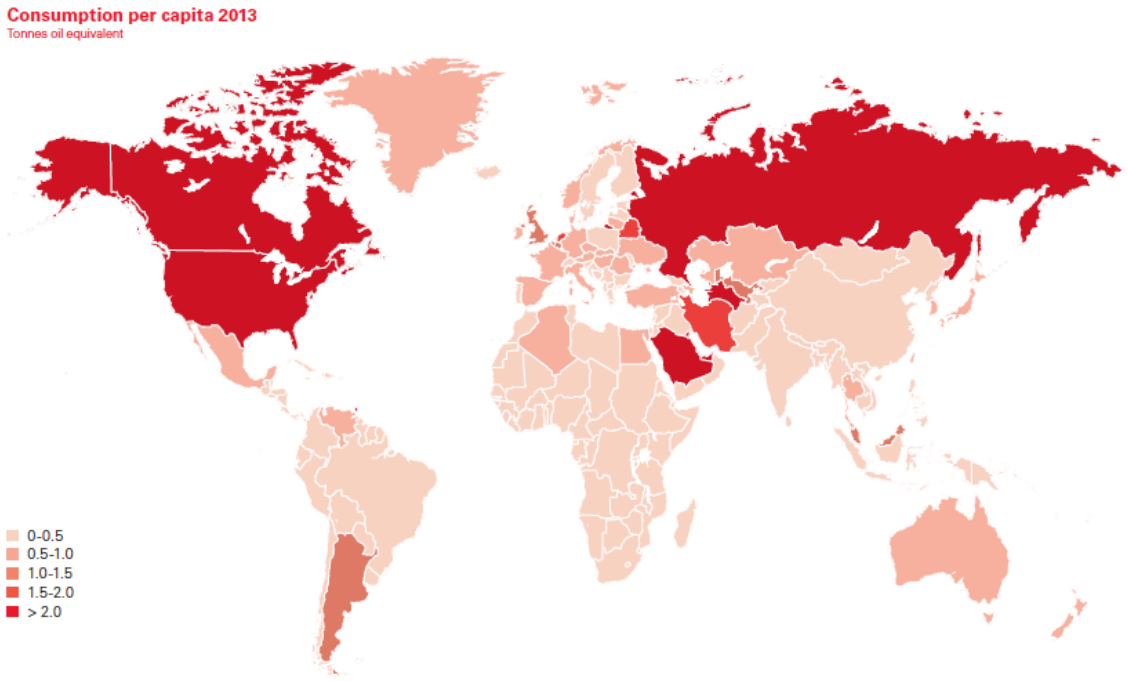

Fig. 2.1.6.: Consumption per capita 2013 (Source: BP Statistical Review of World Energy)

Prices *(US dollars per million Btu)*	LNG Japan cif	Average German Import Price	UK (Heren NBP Index)	US Henry Hub	Canada (Alberta)
1984	5,1	4			
1985	5,23	4,25			
1986	4,1	3,93			
1987	3,35	2,55			
1988	3,34	2,22			
1989	3,28	2		1,7	
1990	3,64	2,78		1,64	1,05
1991	3,99	3,19		1,49	0,89
1992	3,62	2,69		1,77	0,98
1993	3,52	2,5		2,12	1,69
1994	3,18	2,35		1,92	1,45
1995	3,46	2,39		1,69	0,89
1996	3,66	2,46	1,87	2,76	1,12
1997	3,91	2,64	1,96	2,53	1,36
1998	3,05	2,32	1,86	2,08	1,42
1999	3,14	1,88	1,58	2,27	2
2000	4,72	2,89	2,71	4,23	3,75
2001	4,64	3,66	3,17	4,07	3,61
2002	4,27	3,23	2,37	3,33	2,57
2003	4,77	4,06	3,33	5,63	4,83
2004	5,18	4,32	4,46	5,85	5,03
2005	6,05	5,88	7,38	8,79	7,25
2006	7,14	7,85	7,87	6,76	5,83

2007	7,73	8,03	6,01	6,95	6,17
2008	12,55	11,56	10,79	8,85	7,99
2009	9,06	8,52	4,85	3,89	3,38
2010	10,91	8,01	6,56	4,39	3,69
2011	14,73	10,48	9,04	4,01	3,47
2012	16,75	11,03	9,46	2,76	2,27
2013	16,17	10,72	10,63	3,71	2,93
2014	15,62	9,83		3,48	2,83
March 2015	14,28	8,27		2,83	2,51

Table 2.1.11.: Natural Gas prices (Source: BP Statistical Review of World Energy, Bloomberg and Yahoo Finance)

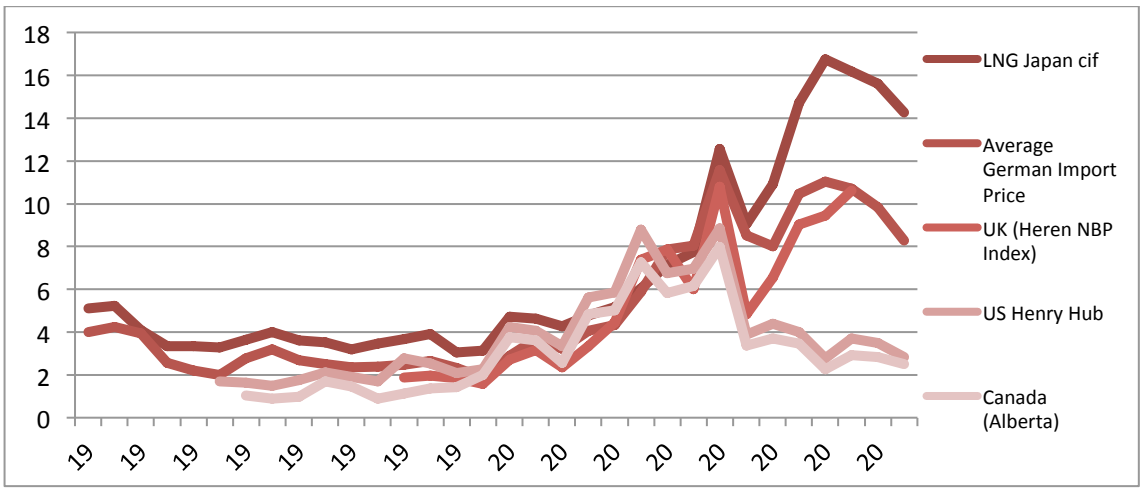

Fig. 2.1.7.: Natural Gas price evolution (Source: BP Statistical Review of World Energy, Bloomberg and Yahoo Finance)

Trade movements by pipeline *(Billion cubic metres)*	2013
Imports	
North America	123,3
S. & Central America	18,6
Europe	397,1
Formet Soviet Union	84,2
Middle East	25,1
Africa	6,4
Asia Pacific	55,9
Exports	
US	44,4
Canada	78,9
Mexico	<0,05
S. & Central America	18,6
Europe	194,4
Eurasia	279,9
Iran	9,4
Qatar	19,9
Africa	36,6
Asia Pacific	28,5

Table 2.1.12.: Trade movements by pipeline (Source: BP Statistical Review of World Energy)

Trade movements as liquefied natural gas *(Billion cubic metres)*	2013
Imports	
North America	11,6

S. & Central America	19,6
Europe & Eurasia	51,5
Middle East	4,5
Asia Pacific	238,1
Exports	
US	0,1
S. & Central America	25,4
Europe & Eurasia	23,1
Oman	11,5
Qatar	105,6
United Arab Emirates	7,4
Yemen	9,6
Asia Pacific	95,9
Africa	46,5

Table 2.1.13.: Trade movements as LNG (Source: BP Statistical Review of World Energy)

Gas trade in Europe *(Billion cubic metres)*	2012				2013			
	Pipeline imports	LNG imports	Pipeline exports	LNG exports	Pipeline imports	LNG imports	Pipeline exports	LNG exports
France	32,3	10,3	1,2	0,2	30,5	8,7	1,1	0,6
Germany	83,5		12,5		95,8		15,1	
Italy	55,4	7,1	0,1		51,6	5,5	0,2	
Netherlands	20,9	0,8	48,6		21,5	0,8	53,2	0,2
Norway			107,6	4,8			102,4	3,8
Spain	**13,3**	**20,4**	**0,7**	**1,2**	**15,3**	**14,9**	**0,9**	**2,6**
Turkey	27,4	7,7	0,6		38,2	6,1	0,6	
United kingdom	27,7	13,7	12		41,9	9,3	8,9	
Other Europe	101,9	8,2	10,5	1,6	102,2	6,1	11,9	1,6

Table 2.1.14.: Gas trade in Europe (Source: BP Statistical Review of World Energy)

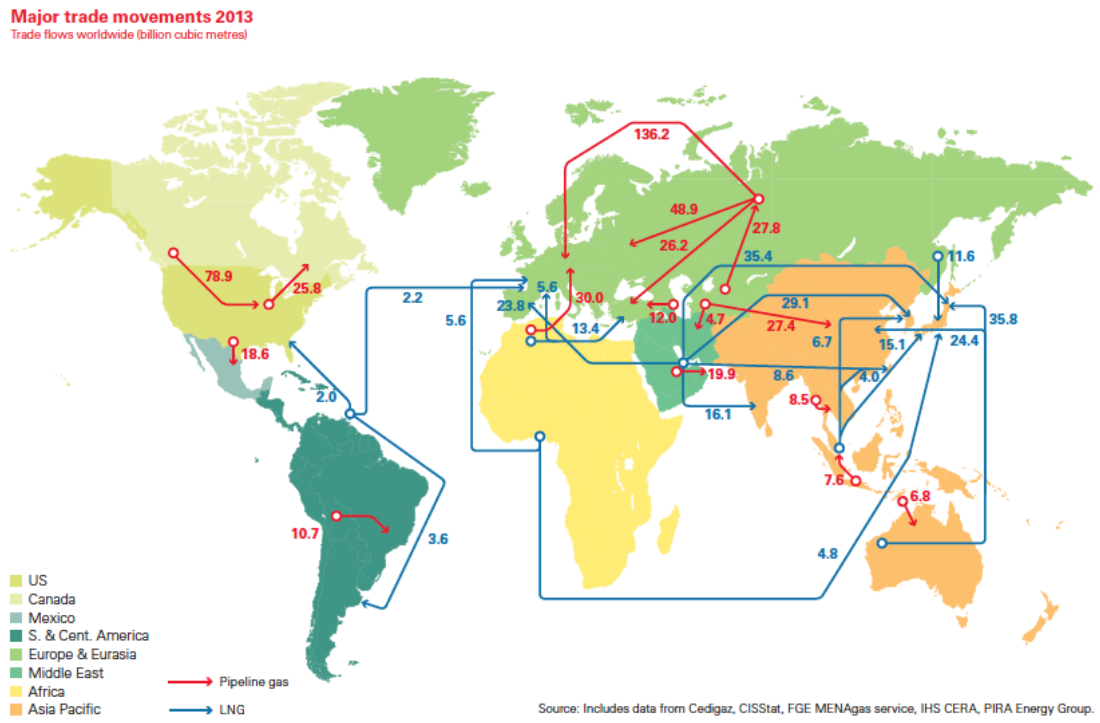

Fig. 2.1.8.: Major trade movements of Gas in 2013 (Source: BP Statistical Review of World Energy)

2.1.3.3. Coal

Coal consumption grew 2,8% in 2013, maintaining its continuous growth since 1999[6]. There have been many geographic differences, with the recuperation in the OCDE (but not in the UE) and with the growth of the other parts of the world in the constant pace preserved in the last 10 years (mainly due to the constant growth experienced in China and India).

Proved reserves 2013 *(Million tonnes)*	Anthracite and bituminous	Sub-bituminous and lignite	Total
North America	112835	132253	245088
South&Central America	7282	7359	14641
Europe & Eurasia	92557	217981	310538
Middle East & Africa	32722	214	32936
Asia Pacific	157803	130525	288328
Total World	**403199**	**488332**	**891531**

Table 2.1.15.: Proved reserves of different coal types in 2013 (Source: BP Statistical Review of World Energy)

Production *(Million tonnes oil equivalent)*	2007	2008	2009	2010	2011	2012	2013
North America	630,7	639,2	580	594	600,9	561,2	545,6
S. & Central America	52,5	54,3	52,2	52,7	59,8	63,2	62
Europe & Eurasia	450,2	457,5	426,9	435,3	455,4	469	450,2
Middle East	1	1	0,7	0,6	0,6	0,7	0,7
Africa	141,9	144,4	143,2	147,9	144,6	148,1	147,2
Asia Pacific	1936	2029,8	2153	2317,3	2506,5	2620	2675,7

[6] Not taking into account its stabilization in 2009

Total World	**3212,3**	**3326,2**	**3356**	**3547,8**	**3767,8**	**3862,2**	**3881,4**

Table 2.1.16.: Production of Coal (Source: BP Statistical Review of World Energy)

Consumption *(Million tonnes oil equivalent)*	2007	2008	2009	2010	2011	2012	2013
North America	616,7	603,8	529,3	562,1	531,4	470,5	488,4
South&Central America	22	23,5	22	25,4	27,4	27,6	29,2
Europe & Eurasia	534,6	522,6	472,2	485,9	504,1	524,3	508,7
Middle East	9,5	9	8,9	8,8	8,9	9,7	8,2
Africa	98,2	105	99,6	99,4	96,3	95,9	95,6
Asia Pacific	1923,2	1998,4	2107	2287,5	2462,2	2595,7	2696,6
Total World	**3204,2**	**3262,3**	**3239**	**3469,1**	**3630,3**	**3723,7**	**3826,7**

Table 2.1.17.: Consumption of Coal (Source: BP Statistical Review of World Energy)

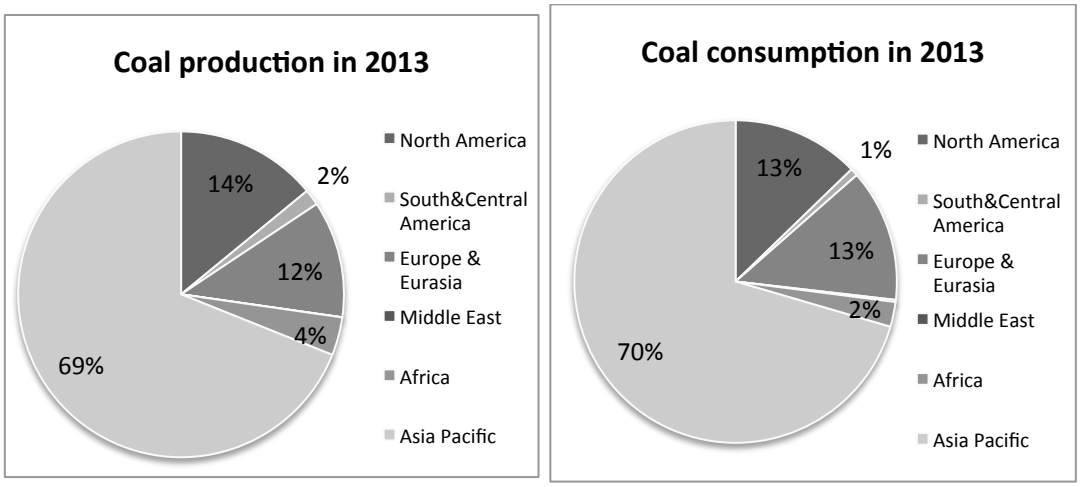

Fig. 2.1.9.: Production and consumption distribution of Coal in 2013 (Source: BP Statistical Review of World Energy)

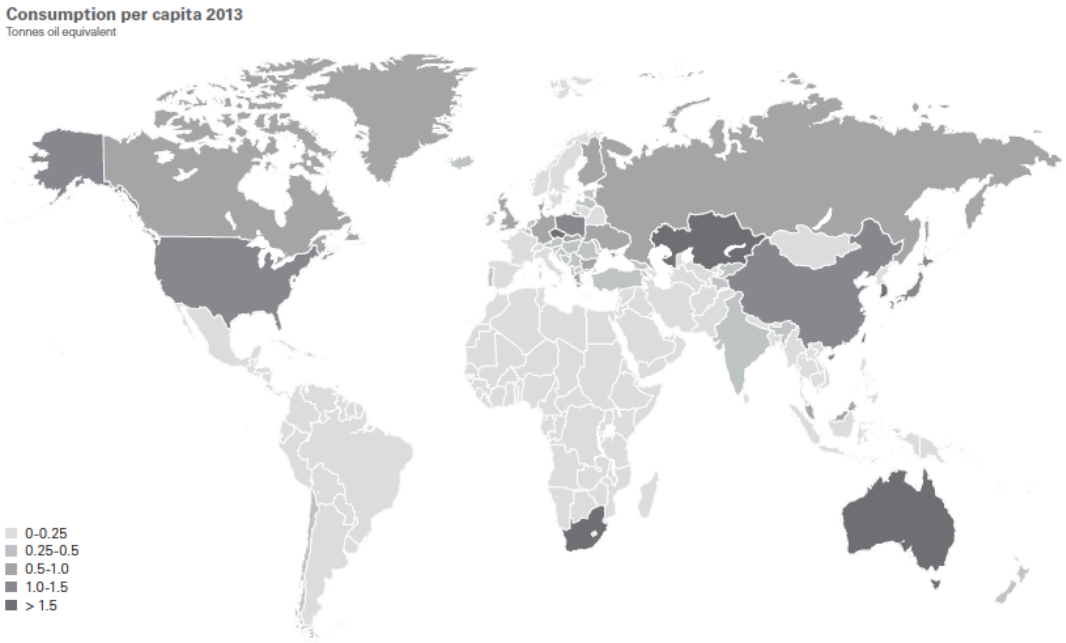

Fig. 2.1.10.: Consumption of Coal per capita in 2013 (Source: BP Statistical Review of World Energy)

Prices *(US dollars per tonne)*	Northwest Europe marker price	US Central Appalachian coal spot price index	Japan cooking coal import cif price	Japan steam coal import cif price	Asian marker price
1993	33,68	29,85	55,26	45,71	
1994	37,18	31,72	51,77	43,66	
1995	44,5	27,01	54,47	47,58	
1996	41,25	29,86	56,68	49,54	
1997	38,92	29,76	55,51	45,53	
1998	32	31	50,76	40,51	29,48
1999	28,79	31,29	42,83	35,74	27,82
2000	35,99	29,9	39,69	34,58	31,76
2001	39,03	50,15	41,33	37,96	36,89
2002	31,65	33,2	42,01	36,9	30,41
2003	43,6	38,52	41,57	34,74	36,53
2004	72,08	64,9	60,96	51,34	72,42
2005	60,54	70,12	89,33	62,91	61,84
2006	64,11	62,96	93,46	63,04	56,47
2007	88,79	51,16	88,24	69,86	84,57
2008	147,67	118,79	179,03	122,81	148,06
2009	70,66	68,08	167,82	110,11	78,81
2010	92,5	71,63	158,95	105,19	105,43
2011	121,52	87,38	229,12	136,21	125,74
2012	92,5	72,06	191,46	133,61	105,5
2013	81,69	71,39	140,45	111,16	90,9

Table 2.1.18.: Coal prices (Source: BP Statistical Review of World Energy, Bloomberg and Yahoo Finance)

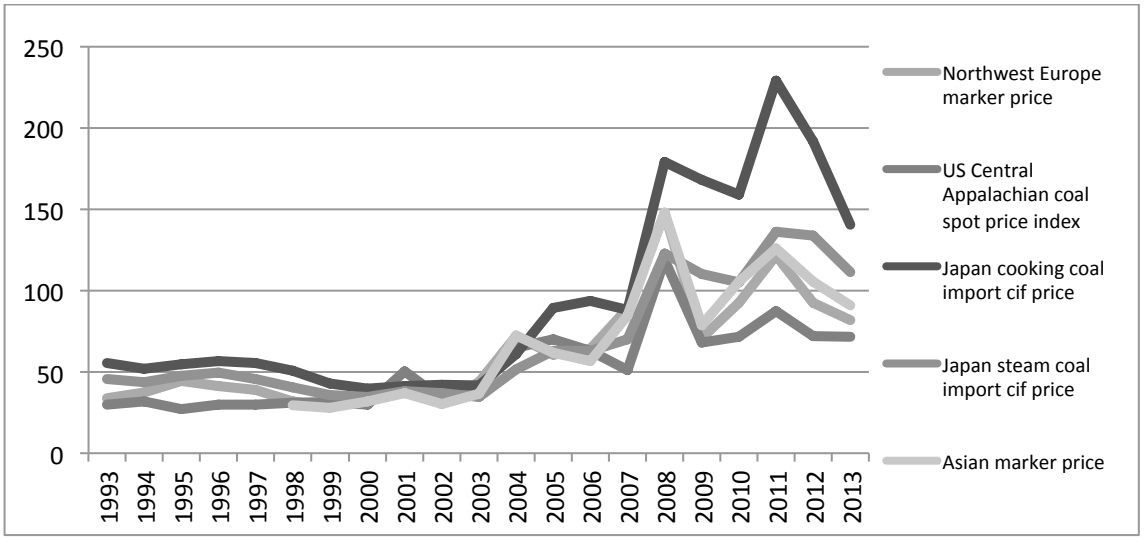

Fig. 2.1.11.: Coal price evolution (Source: BP Statistical Review of World Energy, Bloomberg and Yahoo Finance)

2.1.3.4. Nuclear power

Nuclear power consumption grew smoothly in 2013, 0,6% after the decrease in the previous two years (due to the decrease experienced in Japan after Fukushima).

Consumption *(Million tonnes oil equivalent)*	2007	2008	2009	2010	2011	2012	2013
North America	215,4	215,4	213	213,8	211,9	206,9	213,7
South&Central America	4,4	4,8	4,7	4,9	4,9	5	4,7
Europe & Eurasia	275,9	276,5	265,1	272,9	271,5	266,7	263
Middle East						0,3	0,9
Africa	2,7	3,1	3,1	2,9	3,2	2,8	3,1
Asia Pacific	123,3	119,6	128,1	131,7	109,2	78,2	77,8
Total World	**621,7**	**619,4**	**614**	**626,2**	**600,7**	**559,9**	**563,2**

Table 2.1.19.: Consumption of Nuclear power (Source: BP Statistical Review of World Energy)

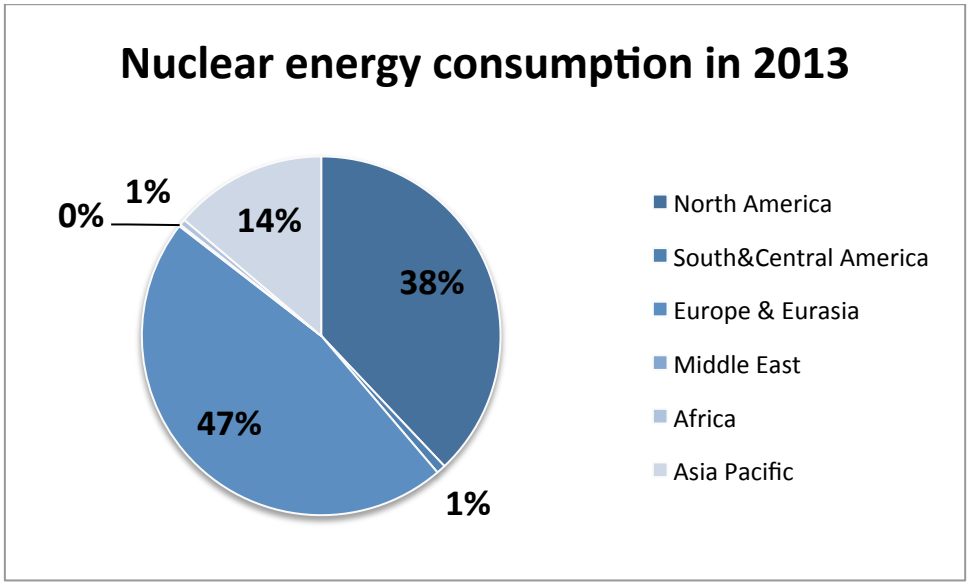

Fig. 2.1.12.: Nuclear energy consumption in 2013 (Source: BP Statistical Review of World Energy)

2.1.3.5. Hydroelectricity

Hydroelectricity consumption grew 2,7% in 2013.

Consumption *(Million tonnes oil equivalent)*	2007	2008	2009	2010	2011	2012	2013
North America	146,3	152,2	151,4	147,2	166,3	156,2	156,3
South&Central America	152,4	153,5	158,1	158,7	168,1	164,3	158,1
Europe & Eurasia	180,1	182,8	184,6	197,7	179	191,2	201,3
Middle East	6,3	3,2	2,8	4	4,3	4,9	5,7
Africa	21,5	22	22,4	24,5	24,1	25,5	25,7
Asia Pacific	193,7	214,4	218,5	251,8	254	291,5	308,7
Total World	**700,3**	**728,1**	**737,8**	**783,9**	**795,8**	**833,6**	**855,8**

Table 2.1.20.: Consumption of Hydroelectricity (Source: BP Statistical Review of World Energy)

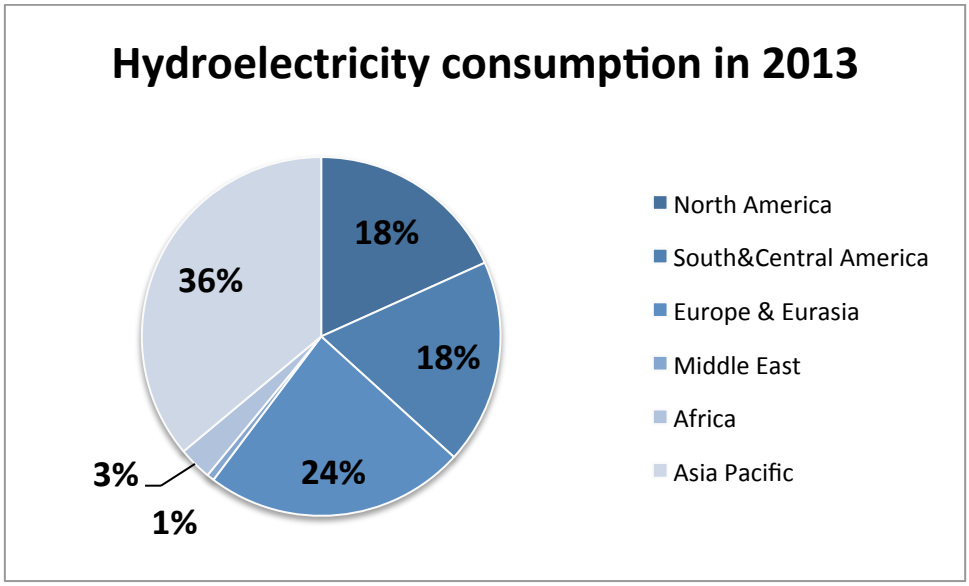

Fig. 2.1.13.: Hydroelectricity consumption in 2013 (Source: BP Statistical Review of World Energy)

2.1.3.6. Other renewable

Other renewable energy consumption (those different to the hydroelectric one) grew strongly in 2013 up to 16%, standing out solar energy (58% growth) and wind power (18% growth) mainly due to the strong support of governments.

Consumption *(Million tonnes oil equivalent)*	2007	2008	2009	2010	2011	2012	2013
North America	29,7	34,3	39,3	45,4	51,3	57	65,4
South&Central America	8,2	9	10	11	12,9	14,7	18,3
Europe & Eurasia	48,3	54,7	61,4	71,2	85,9	101,8	115,5
Middle East			0,1	0,1	0,1	0,2	0,2
Africa	0,8	0,9	1,1	1,3	1,3	1,4	1,7
Asia Pacific	21,4	24,8	30,6	39	53,4	65,7	78,2
Total World	**108,4**	**123,7**	**142,5**	**168**	**204,9**	**240,8**	**279,3**

Table 2.1.21.: Consumption of other renewable energy (Source: BP Statistical Review of World Energy)

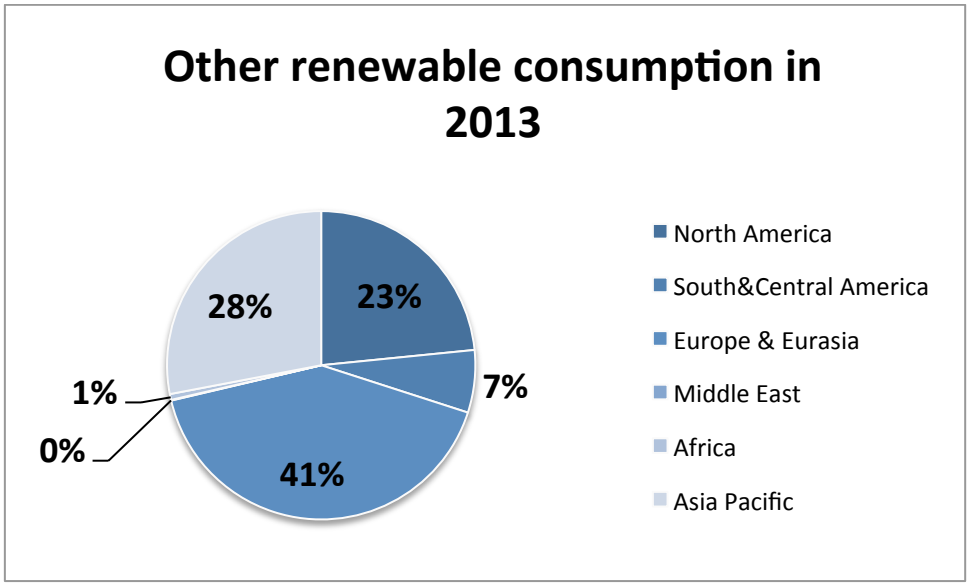

Fig. 2.1.14.: Other renewable consumption in 2013 (Source: BP Statistical Review of World Energy)

2.1.4. Energy intensity

Energy intensity is a measure of the energy efficiency of a nation's economy. It is calculated as units of energy per unit of GDP. High energy intensities indicate a high price or cost of converting energy into GDP. Low energy intensity indicates a lower price or cost of converting energy into GDP.

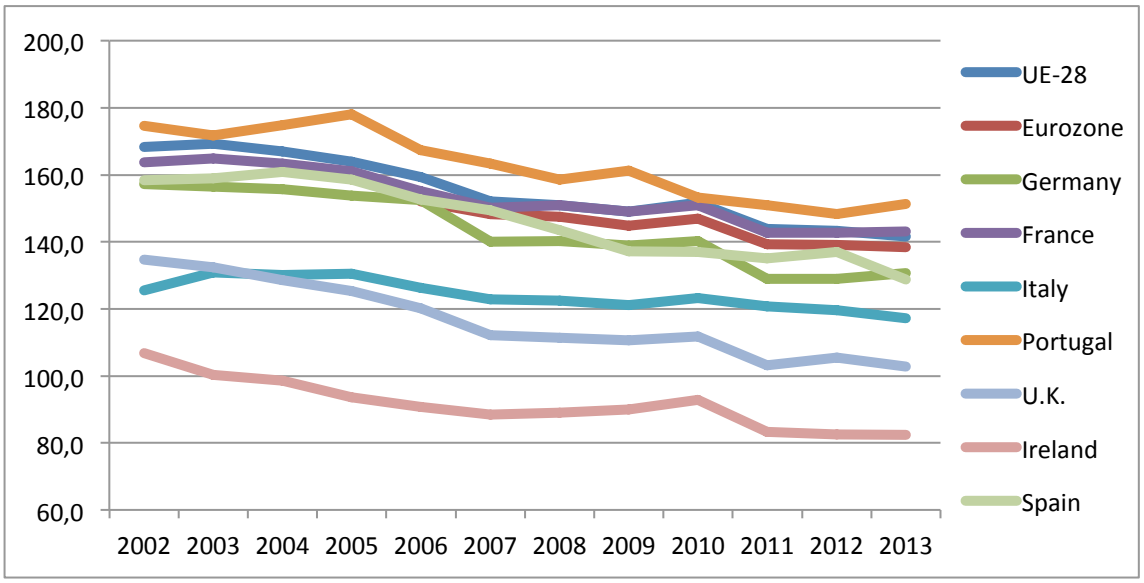

Fig. 2.1.15.: Energy intensity evolution in Europe (Source: EUROSTAT)

We can see that Eurozone and UE-28 intensity is way above the most powerful economies in Europe. That is mainly due to the high levels we can see in other non as developed countries as the ones in the graph (in fact, Poland's energy intensity for 2013 was 294,7).

2.2. Energy in Spain

The final energy consumption in 2013 was of 85436 kilo-tonnes of oil equivalent (Ktoe), a 4% less than in 2012. This evolution was mainly due to the economic situation and the consumers structure, since climate and labour conditions have been similar both years.

By sectors, after the better global situation experienced after 2010, industrial demand of energy has decreased in the last 3 years mainly due to the decrease of industrial activity. In the residential and service sectors, demand has also decreased.

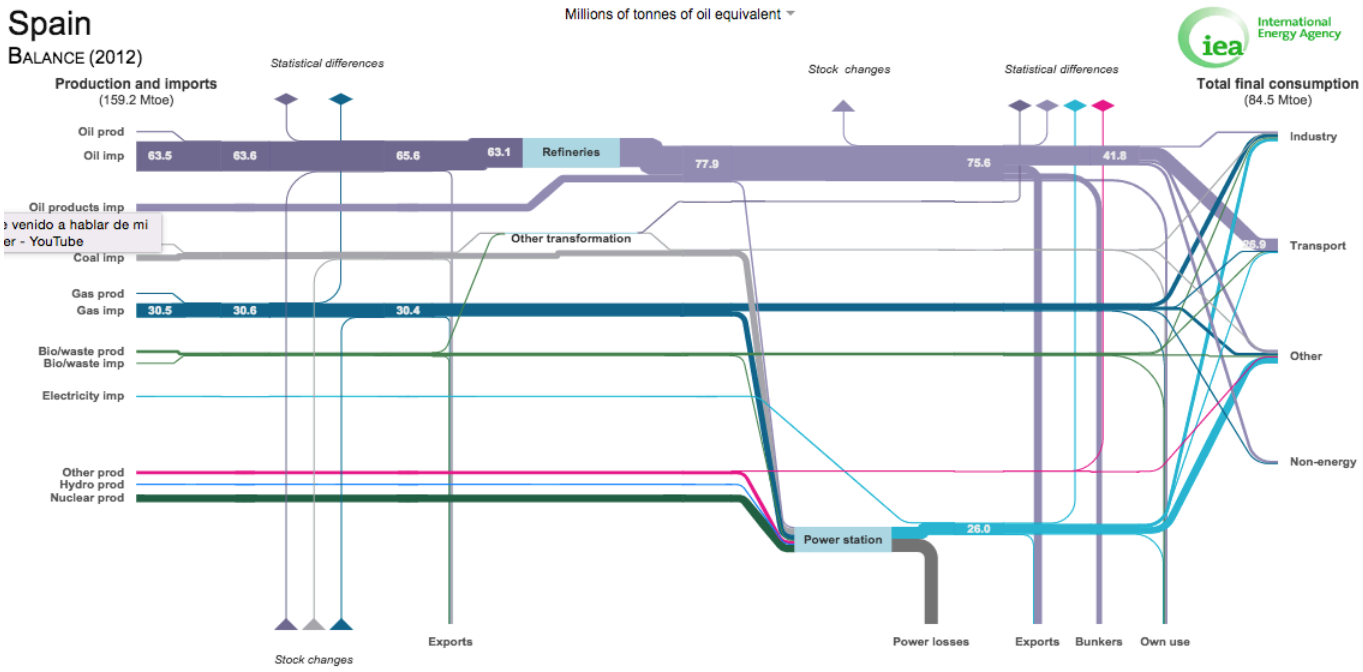

Fig. 2.2.1.: Spanish Balance of energy production and consumption (Source: IEA)

The Balance of energy production and consumption in Spain, even though it is from 2012, has not changed in the last 2 years. Total final consumption among the different sectors was 31% Industry, 16% Commercial, 18% Residential and 35% Transport. As we can see, imports are greater than own production, thus making Spain a dependant country in terms of energy. There are a few properties that must be pointed out:

- Oil consumption weight is the greatest in transport, thus explaining the huge dependence and consumption transport has in this kind of energy source.
- Power losses account for approximately half of the production, making power efficiency a potential driver of development in the future.
- A big weight of coal and gas is directed to electricity creation, but an increase in nuclear production may make the total balance more efficient.
- In industry, gas and electricity play an important role, whereas oil is not as important as the other two.

Final Energy consumption *(KTEP)*	2012	2013	% change
Coal	1233	1369	11,0%
Gas from coal	274	263	-4,0%
Oil products	39917	39061	-2,1%
Gas	14632	14653	0,1%
Electricity	20661	19952	-3,4%
Renewable energies	6273	5329	-15,0%
Total energy uses	**82990**	**80627**	**-2,8%**
Non-energy uses			
Oil products	5626	4358	-22,5%
Natural gas	355	451	27,0%
Total final uses	**88971**	**85436**	**-4,0%**

Table 2.2.1.: Final energy consumption in Spain (Source: IEA)

The demand in transport continued decreasing year after year since its first decrease in 2008. Final electricity demand decreased 3,4% in 2013. Natural gas consumption, on the other hand, increased 0,1% mainly due to the increase in activity of many industrial sector that are intensive in gas consumption. Petrol consumption decreased 2,1% and renewable energies consumption also decreased due to the decrease in biofuels, driven by changes in regulation.

Primary Energy consumption *(KTEP)*	2013	2013	% change
Coal	15510	10531	-32,1%
Oil	53978	52934	-1,9%
Natural gas	28184	26077	-7,5%
Nuclear	16019	14785	-7,7%
Hydro	1767	3163	79,0%
Eloic, Solar and geothermal	6679	7665	14,8%
Biofuels & waste	7558	6383	-15,5%
Non- waste renewable	176	160	-9,1%
Import-export electricity	-963	-579	-39,9%
Total	**128908**	**121119**	**-6,0%**

Table 2.2.2.: Primary energy consumption in Spain (Source: IEA)

Spain's production of Primary Energy *(KTEP)*	2013	2013	% change
Coal	2462	1688	-31,4%
Oil	145	385	165,5%
Natural gas	52	50	-3,8%
Nuclear	16019	14785	-7,7%
Hydro	1767	3163	79,0%
Eolic, solar and geothermal	6679	7665	14,8%
Biofuels & waste	6244	6014	-3,7%
Total	**33368**	**33750**	**1,1%**

Table 2.2.3.: Primary energy production in Spain (Source: IEA)

The total consumption of primary energy in Spain was 121119 Ktep in 2013, a decrease of 6% compared to 2012 values. The most important change in 2013 was the different structure of power generation. Furthermore, coal generation fell after two years increasing, and there was an important increase in hydro, eolic and solar production. In terms of primary energy sources, it is important to mention the following points:

- The total coal consumption was 10531 Ktep, a 32,1% decrease to 2012. This decrease was mainly due to the change in structure in electricity generation, since the production of electricity was not made using big amounts of coal anymore.
- Oil consumption was 52934 Ktep, a 1,9% decrease to 2012 (similar also to oil products consumption). That decrease was not as big as the coal one since the weight of oil in electricity generation is not as big either. Nevertheless, it also decreased due to the substitution of oil by gas in electricity generation in the Balearic Islands.
- Natural gas demand was 26077 Ktep, a decrease of 7,5%, getting a new energy share of 22% (as we can see in the graph below). That decrease is mainly due again to the different electricity generation structure.
- Renewable energies consumption has increased a lot, mainly due to hydroelectricity, eolic and solar energies contributions.
- Thanks to the favourable rain episodes in 2013, hydroelectricity generation increased 79% in 2013, after two years of very low contributions.
- Nuclear energy production fell 7,7%, mainly due to the closure of the Sta. Mª de Garoña nuclear plant.

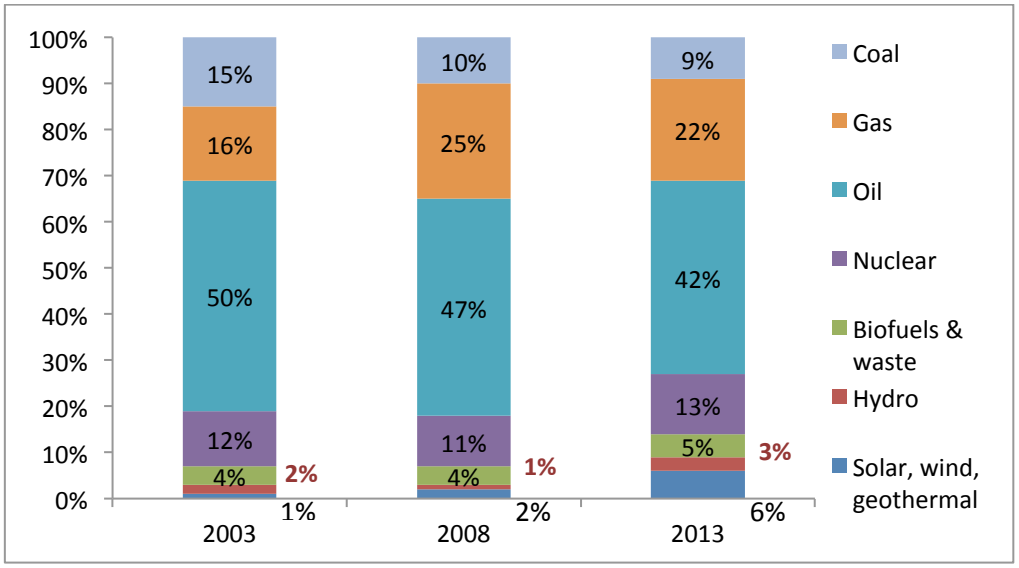

Fig. 2.2.2.: Total primary energy supply (Source: IEA)

As we can see in this graph, the total primary energy supply has changed a lot among the different periods, gaining a greater share renewable energies and nuclear generation and falling oil, gas and coal consumption. Nonetheless, Spain is still a major consumer of energy in Europe and among the IEA countries, as we can see in the following table (with special weight in Oil and other types of energy consumption).

Spain compared to IEA countries	Rank	IEA average
Share of coal in TPES[7]	20th highest	20%
Share of oil in TPES	7th highest	35%
Share of gas in TPES	15th highets	26%
Share of nuclear in TPES	10th highest	10%
Shares of biofuels in TPES	18th highest	5%
Share of hydro in TPES	11th highest	2%
Other in TPES	2nd highest	2%

Table 2.2.4.: Spain comparison among other iEA countries (Source: IEA)

Spain is still a huge importer of energy and its position is weak in the energy market. It has to control its main contracts with major external suppliers of energy in order to get better energy intensities and efficiency.

Fossil fuel production and import dependency	Value	Main imports
Crude oil production	0,4 Mt	Mexico 15%, Saudi Arabia 14% and Russia 14%
Crude oil net imports	57,9 Mt	
Production of oil products	60,5 Mt	
Oil products net imports	31,5 Mt	US 14%, Portugal 10% and Italy 10%
Gas production	0,1 bcm	
Gas net imports	29,9 bcm	Algeria 53%, France 12% and Qatar 10%
Coal production	2,5 Mt	Indonesia 25%, Colombia 18% and Russia 17%
Coal net imports	13 Mt	
Energy self sufficiency	29%	IEA average: 73% IEA median: 46%

Table 2.2.5.: Fossil fuel production and import dependency in Spain (Source: IEA)

[7] Total Primary Energy Supply

2.3. Power sector

2.3.1. Regulatory framework and market design

Spain was one of the first countries to embark on the power sector liberalisation process in 1998. A big change in legislation happened between 1996 and 1997, where the EU Electricity Market Directive was transposed into the Electric Power Law (Law 54/1997). The path of this liberalisation was ahead of the EU market directive in many aspects, including opening all market sectors to competition, legal unbundling and the introduction of a sectoral regulator called the National Energy Comission (CNE).

The National Energy Comission experienced a reinforcement of mandate in 2005 and is in charge of the regulation of interconnections, certification of origin for renewables, remuneration of transmission and distribution activities, among others. Nonetheless, CNE is just an advisory but has nothing else of power than its consulting role. That is why the Ministry of Energy of Spain (MINETUR) must approve all regulatory decisions before being undertaken.

Although Spain is considered to contain a liberalized market, the reality is that the liberalisation resulted in a hybrid power sector that includes both regulated activities, such as transmission and distribution, and liberalised activities, such as generation and retail. Red Eléctrica de España (REE) currently operates transmission system, and it has been like this since its formation in 1985.

Since January 1st of 2003, all the consumers can get energy for their own consumption in the liberalised market. In order to get the energy, there are the following options:

- Choose a commercial company. There is a toll to access the network where they can get the energy from the liberalised market. In this case, both the contract of access and the supply will be done through the commercial company with which the consumer has established the contract.
- As Direct Market Consumers, accessing directly to the production market. If the consumer wants to get the energy through the existent options (diary market, physic bilateral contract), he/she will have to previously subscribe in the Registro Administrativo de Distibuidores, Comercializadores y Consumidores Directos en Mercado as a direct market consumer.

2.3.1.1. Access tolls

As it is written in the 17th article of the Lay 54/1997, 27th November, access tolls will be unique in the whole national territory and will not include any taxes. Furthermore, it will take into account power-line levels and power and scheduled consumptions.

Access tolls' structure can be obtained in the Real Decreto 1164/2001, 26th October, where access tariffs as well as energy distribution are established, taking into account the regulation also established in the 5th Orden ITC/1723/2009, 26th June, regarding access tariffs 2.0A. The basic conditions of contracts are established in the 2001's Real Decreto, and are completed by the Real Decreto 1955/2000 and Real Decreto 1435/2002.

Additionally, the actual schedule of the tariffs is contained in the Orden ITC/2794/200, 27th September.

Access tolls	
Low voltage tariffs (U<= 1 kV)	**High voltage tariffs (U>1 kV)**
Tariff 2.0 A: simple tariff (1 or two periods and power contracted <= 10 kW)	
Tariff 2.1 A: simple tariff (1 or two periods and power contracted >10 kW but <= 15 kW)	Tariff 3.1 A: specific tariff (3 periods and power contracted <= 450 kW)
Tariff 3.0 A: general tariff (3 periods)	Tariff 6: general tariffs for high voltage (6 periods and 5 voltage scales)

Table 2.3.1..: Electricity access tolls in Spain (Source: CNE)

The tariffs of the access tolls are obtained by a binomial formula that include a power factor, an active energy factor and, if it is the case, a reactive energy factor:

- **Power factor:** for every tariff period, the consumer will contract a specific power during one year. The result of power tariff will be the sum of multiplying every power chargeable for its respective power factor. The chargeable power will be determined by the power contracted in every tariff period and, depending on the tariff, the real power consumed in the chargeable period considered.
  In the access tolls 2.0 DHA and 2.1 DHA of two periods, it exists just one power factor.
- **Active energy factor:** it will be the sum of multiplying the energy consumed and measured by the counter in every tariff period by its respective energy price. The active energy factor will be charged monthly, including the consumed energy of each month for each tariff period.
- **Reactive energy factor:** it will be chargeable for any tariff except from the 2.0 A one. It will be applied at any tariff period but not at the 3 (3.0A and 3.1A) and at the 6; and

will be applied when the consumption of reactive energy is over 33% of the active consumption during the considered period and will only affect those excesses.

2.3.1.2. Market design

The Spanish power market was created in 1998, January 1st. The market framework makes possible to trade in an official organised market (day-ahead and intra-day spot market) and also to trade outside of it (bilateral contracts between producers, retailers and their consumers, including both financial contracts and distribution and power plants capacity auctions). The final objective of this market design is to give different trading possibilities on equal conditions and at a right price.

The responsible of the day-ahead and intra-day markets is Operador del Mercado Ibérico de la Energía – Polo Español S.A. (OMEL), and its main duties are the settlement and communication of payment obligations and collection rights deriving from the energy contracted. The intra-day market consists of 6 sessions where all agents who have participated in the daily market or executed a bilateral contract can participate (always respecting the limitations set by the system operator in order to avoid constraints).

When the daily market is over, the system operator previously introduced studies the technical viability of the operation schedule in order to maintain the security and reliability of the supply. If the security is not accomplished after adding the schedule form the daily market and the one from the bilateral contracts, then the system operator modifies the production units' schedule in order to solve it.

In order to improve security of supply and economic efficiency, Spain and Portugal launched on 1 July 2007 the all-Iberian electricity market (MIBEL). A common price for electricity for both countries applies when the interconnection capacity allows it. When not, the market is split into 2 price zones. MIBEL has the advantage that enables any consumer in the Iberian zone to acquire electricity under a free competition regime, from any generator or retailer in Spain or Portugal.

MIBEL has also future market. There, the Portuguese market operator OMIP lists standardised contracts. Currently, just baseload contracts are traded and the daily settlement price normally corresponds to the price in the last trade made in the market. The energy that is acquired in the futures market can be both physically settled (in the spot market) or financially settled.

Regarding generating plants in Spain, just those plants with an installed capacity greater than 50 MW are required to make offers through a market operator. On the other hand, smaller

plants (capacity between 1 MW and 50MW) may opt to make offers on it, but it is not mandatory. Generators can sell their net electricity production to the system at either the Royal Decree tariff (indexed to the average or reference tariff of the Spanish system) or at the pool price, plus certain premiums and incentives.

New forms of market participation are under development. Since June 2007, auctions on virtual power plants have been held quarterly mainly to make generation markets more competitive and to promote long-term contracts. Under this scheme, Iberdrola and Endesa are obliged to auction off a part of their existing capacity to other firms. This auction provides winner the option to purchase electricity during peak or base hours at a predetermined price, up to the capacity they have paid for.

2.3.2. Basics about the electricity market in Spain

Legal and commercial structure in the Spanish electric system is based in two different activities: partially liberalised activities (generation and commerce) and regulated activities (transport and distribution) as mentioned above.

Any agent in similar conditions can undertake liberalised activities to any commercial activity. On the other hand, regulated activities are generally resulted by a natural monopoly (in transport and distribution), which requires an authorization and the supervision of administrative entities.

An important part of the generation is undertaken by a regulated regime. Generation that have government benefits (such as renewables and cogeneration) are subjected to a regulatory regime similar to the one in transport and distribution in order to get those benefits. National coal plants are also subjected to a specific regulatory regime. Finally, generation in the Balearic and Canary Islands are also regulated.

The term “electricity market” refers to the group of liberalised activities and is formed by two main sectors:

- Retail market to
- Wholesale market

2.3.2.1. The wholesale market: MIBEL

The wholesale market is formed by a series of markets where “market agents” (producers, distributors, marketers and qualified consumers) buy and sell electricity. Products are extremely diverse, with different schedules and maturities.

Those markets can be bilateral markets (where the parties negotiate directly between them) or organised markets (where parties negotiate through a society, similarly to the stock market). Must be remarked the Operador del Mercado Ibérico Español (OMIE) where short-term products are negotiated and the OMIP where long-term products are negotiated. The geographical domain of those two markets is Spain and Portugal, which are integrated in the same wholesale electricity market, known as MIBEL.

From all the organised markets stands out the diary market regulated by the OMIE. Its price is the market price. Its importance comes from its high liquidity, since there exist a group of obligations and incentives that motivate all sellers to present their offers in this market. In the diary market, the agents present their sell-offers (generation) or their buy-offers (demand or pumping) for each of the 24h of the following day. Each offer must consist of a quantity (MWh) and a price (€/MWh). Each entity can present up to 25 offers for each hour. The market fixes a price that guarantees that all the sell-offers accepted have a price equal or lower than the fixed-price, all the buy-offers accepted have a price equal or higher than the fixed-price and that the total quantity of buy-offers accepted are equal to the total quantity of sell-offers accepted. Additionally, the market has some complex conditions with the aim to avoid that generating plants have peak demands in both high and low terms, which could be unsustainable and cause a market crash. All offers are traded at the price fixed for that hour. This system is called “marginal” and is running in almost all liberalised markets.

This system is called marginal because it induces the generators to offer its marginal cost of production. This cost can be approximated usually to the variable cost of the generator. In a nuclear reactor this cost is very low (due to the low cost of the nuclear fuel) but it is also low its offer. On the other hand, coal and natural gas generators must face higher prices in terms of fuel, and that is why their offer is also higher. Additionally, the high cost to stop and start up a nuclear reactor also contributes to its low offer. National coal plants are offered through Red Eléctrica de España with those offers established by the Ministry of Industry. Regarding renewable and cogeneration, they must present its offers as everyone else, even though they will receive a specific extra-revenue by the Administration. Eolic and Solar often set their offers at a price of 0€/MWh.

Intra-day markets have a regulation really similar to the diary market one. There are sic sessions during the day that permit the adjustment of the errors of demand forecasting and deviations in generation forecasting.

The result of these markets is communicated to the System Operator, Red Eléctrica de España, for its execution. This execution might be physically impossible due to lack of capacity. The System Operator solves these issues modifying the supply of some generating groups, mandating them to supply the minimum quantity at the lowest cost possible. Additionally the System Operator needs to have generating reserves (generators whose production can increase and decrease fast if necessary) in order to face any contingencies (for example, the unexpected loss of a group of generators). All those services that run after the diary market and the intra-day market are called Service Adjustment. System Operator gets all these resources through the market, in which there is just one buyer (the System Operator) and those sellers who agree to give the enough resources needed for this Service Adjustment.

2.3.2.2. The retail market

There are a few consumers who buy the energy directly in the wholesale market. The majority of the consumers do it through marketers, which buy the energy in the wholesale market and transfer to it the regulated costs established by the Administration.

Thus, the bill is established by the sum of two clearly different concepts:

- Energy costs: include, apart from the energy cost, the Service Adjustment cost, capacity costs and others with significantly less weight.
- Regulated costs, also called access tolls: include network costs (transport and distribution), subsidies for renewable energies, annual payments of electricity deficit and other costs with less weight. They suppose more than half of the bill for an average domestic client.

Retail market fixes the energy costs, since regulated costs are fixed by the Administration. The marketer channels the different contacts between the client and the different agents, including the distributor that maintains and runs the electricity network that supplies the client, and which can be from the same market group of the marketer. Money coming from the clients goes to the "Liquidity System", a common place to group the money from which all agents are paid.

Actual legislation recognises two different types of clients:

- General clients, who can contract any marketer and who will establish the price and the payments conditions directly with the marketer.
- Small clients (power contracted < 10 kW), who can establish the "Precio Voluntario para el Pequeño Consumidor" (PVPC), translated to English as Voluntary Price for the

Small Consumer. This price is calculated with the average hourly prices weighted for every client consumption. Additionally, Service Adjustment cost is added. In case there is not a hourly counter for the client, a set of hourly prices published by Red Eléctrica de España will be applied.

2.3.3. Agents in the electricity market in Spain

Market agents are the different entities allowed to participate in the electricity market as sellers or buyers of electricity.

Electricity producers in ordinary regime

It is considered any physical or legal person who generates electricity, as well as builds, operates and maintains the production plants.

Electricity producers in special regime

Those producers whose energy source is a renewable or cogeneration energy of high efficiency, as well as self-producers, in cases where total power installed in plants is not higher than 50 MW.

Commercial agents

In Spain, there are more than 200 commercial companies in the liberalised market, but there are 5 main companies that contain 90% of the total sales in the retail market and almost 60% of sales in the wholesale market:

1. Iberdrola
2. Gas Natural Fenosa
3. Endesa
4. EDP – Energias de Portugal
5. E.ON

There exist two different types of commercial companies. On the one hand, the liberalised marketers, which sell the energy in a price fixed by themselves; and last-resource marketers designated by the Spanish government, which offer the last-resource tariff (TUR) and which prices are fixed by the Ministry of Industry.

Distributors

They distribute the electricity, as well as build, maintain and run the distribution assets.

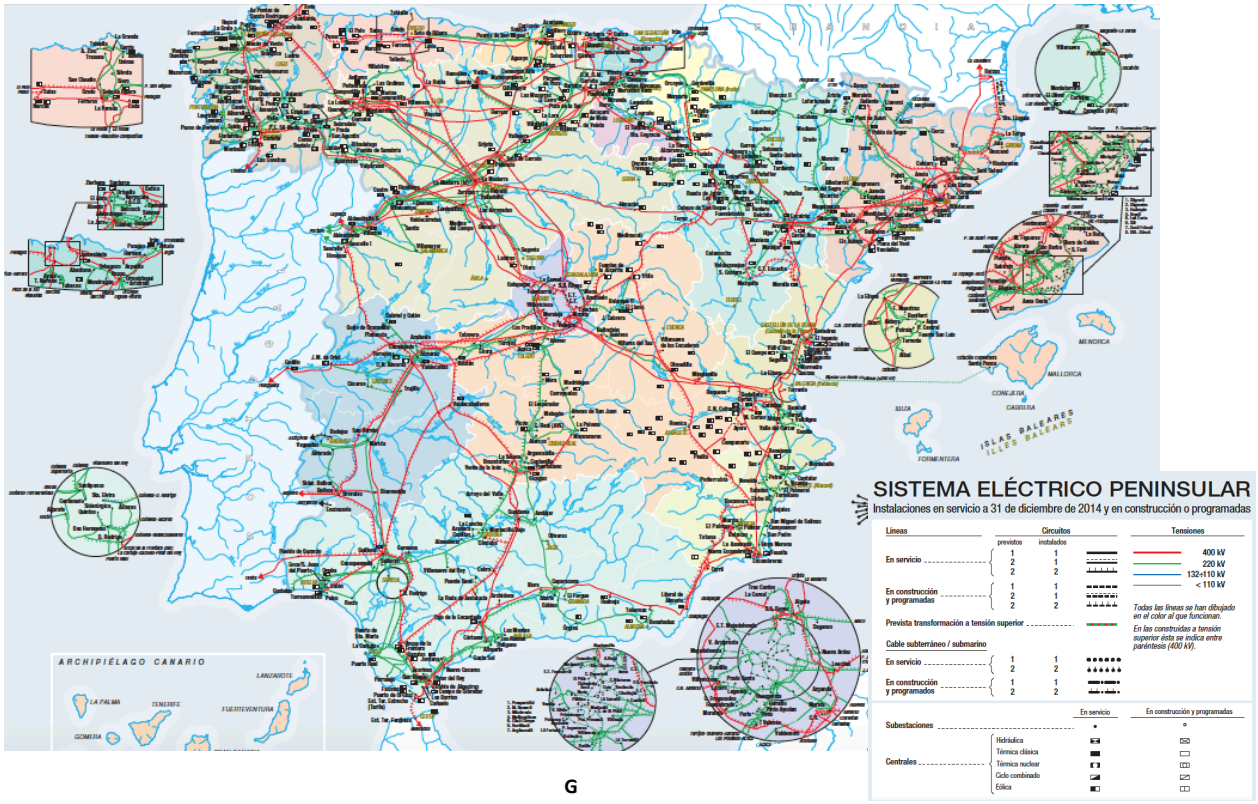

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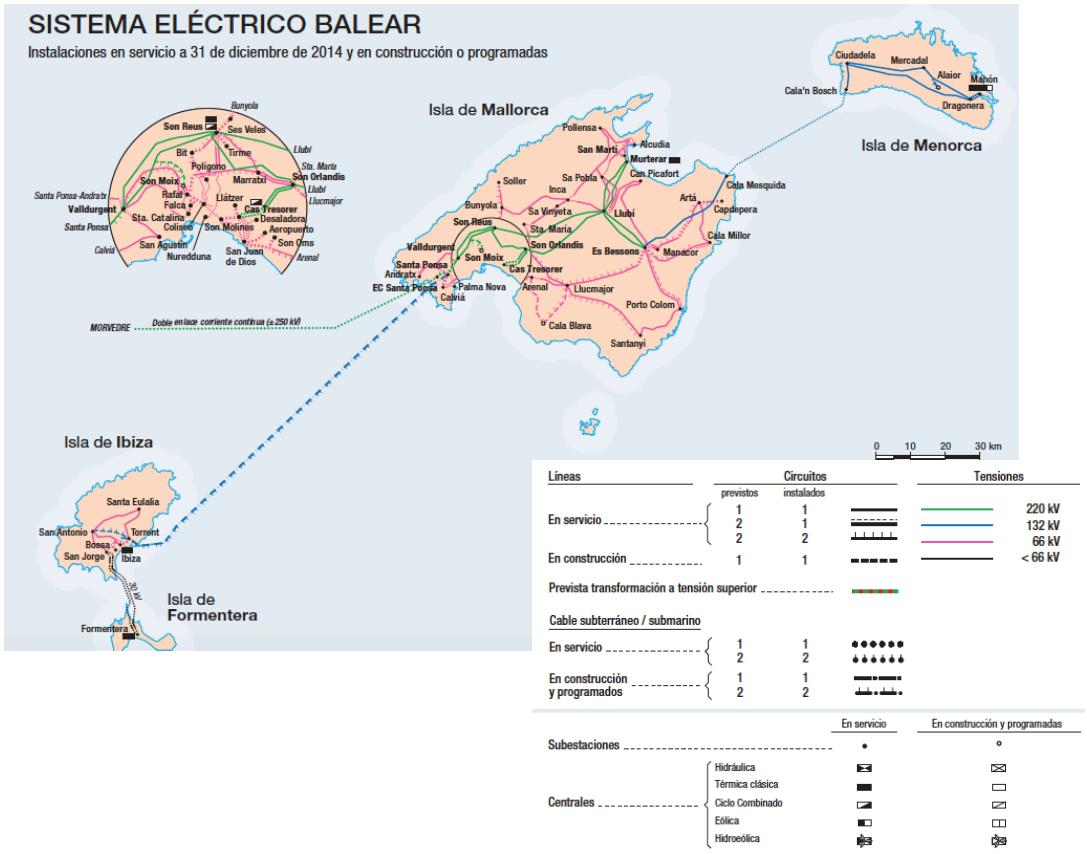
Fig. 2.3.1..: Spanish peninsular electric distribution system (Source: Red Eléctrica de España)



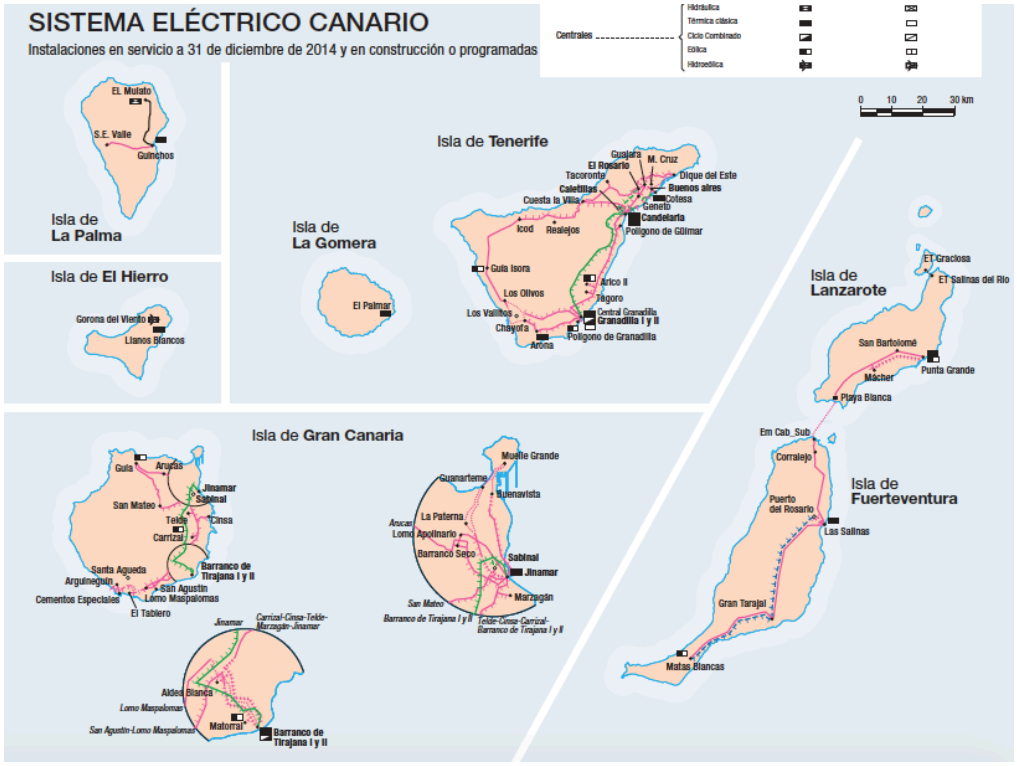


Fig. 2.3.1..: Spanish Islands electric distribution system (Source: Red Eléctrica de España)

Interlocutors

Interlocutors between producers in special regime and the electric market, interacting with the Market Operator, System Operator, CNE and distributors. Some of the most remarkable interlocutors in the liberalised market are Nexus Energía, Acciona, Céntrica, Wind to Market, Gnera Energía, Factor Energía and Gesternova. Las Resource marketers also give interlocution services to special regime producers.

Direct consumers

Directo or qualified consumers are those who can buy the electricity by other methods than the tariff consumer.

External agents

Any physical or legal person who buys or sells electricity from or to any other external system.

2.3.4. Electricity demand in Spain

Final electricity demand in 2013 was 232.008 GWh, which was 3,4% less than in 2012. In the peninsular Spanish, final demand was of 218.789 GWh, 3,5% less than in 2012, whereas net production increased 5,6%. In non-peninsular Spanish, final demand was 1,7% less than in the previous year, with the decrease in consumption distributed among the three non-peninsular territories as follows: Balearic Islands (-2,1%), Canary Islands (-1,2%) and Ceuta and Melilla (-

7,6%). The difference between demand and production can be explained by the less industrial activities in the country in the years after the credit crisis.

National final consumption *(GWh)*	2012	2013	% change
Peninsula	226796	218789	-3,53%
Non-peninsular	13452	13219	-1,73%
- Balearic Islands	*5199*	*5087*	*-2,15%*
- Canary Islands	*7859*	*7768*	*-1,16%*
- Ceuta and Melilla	*394*	*364*	*-7,61%*
Total final consumption	**240248**	**232008**	**-3,43%**

Table 2.3.2..: National final consumption (Source: MINETUR)

Spain is a net exporter of electricity thank to its strong net of production and its important renewable energy generation plants. Special regime production (which contains all renewable and alternative energy generation) is important and is gaining importance year after year. Even though both losses in transport and distribution and consumption within the energy-generating sector are important, the global production allowed Spain to export 4,1% of its total energy production in 2012 and 2,6% in 2013. Moreover, it is important to remark that the Balearic Islands depend on the peninsula in order to supply it own demand of energy, and there exists a distribution network, which goes through the sea under the water, that connects both territories.

Production in the peninsula *(GWh)*	2012	2013	% change
Net production in ordinary regime	166444	149809	-10,0%
Net production in special regime	105752	111661	5,6%
Consumption in pumping	5023	5960	18,7%
Imports-exports	-11199	-6731	-39,9%
Peninsula-Balearic connection	-570	-1269	122,6%
Losses in transport-distribution/consumption in the energy sector	28607	28722	0,4%
Final consumption in the peninsula	**226796**	**218789**	**-3,5%**

Table 2.3.3..: Peninsular production (Source: MINETUR)

Regarding non-peninsular territories, Balearic Islands are the only one who needs supply from the peninsula, whereas Canary Islands and Ceuta and Melilla are self-sufficient. Special regime production is less important in those territories compared to the peninsula area, having a small participation in the Islands and a marginal one in Ceuta and Melilla.

Production in non-peninsular territories *(GWh)*	2012	2013	% change
Balearic Islands	5199	5087	-2,2%
Net production	5166	4290	-17,0%
Orindary regime	*4886*	*4016*	*-17,8%*
Special regime	*280*	*273*	*-2,5%*
Losses and energy sector consumption	538	471	-12,5%
Peninsula-Balearic connection	570	1269	122,6%
Canary Islands	7859	7768	-1,2%

Net production	8768	8726	-0,5%
Orindary regime	*8178*	*7861*	*-3,9%*
Special regime	*590*	*865*	*46,6%*
Losses and energy sector consumption	909	958	5,4%
Ceuta and Melilla	394	364	-7,6%
Net production	440	409	-7,0%
Orindary regime	*433*	*403*	*-6,9%*
Special regime	*7*	*7*	*0,0%*
Losses and energy sector consumption	46	45	-2,2%
Final consumption in non-peninsular territories	**13452**	**13219**	**-1,7%**

Table 2.3.4..: Non-peninsular production (Source: MINETUR)

2.3.5. Electricity offer in Spain

Gross electricity production in Spain was 285258 GWh in 2013, 4,1% less than the previous year. Generating structure shows a significant increase in renewable energy, hydroelectric, eolic, solar and biomass production. It is important to remark a 19,5% increase in the Eolic generation in 2013.

Nuclear production decreased 7,7% compared to 2012, mainly due to the closure of S.M. de Garoña plant, whereas the other production groups had high availability of energy. Coal electricity production increased significantly a 25,8% in 2013, with a global contribution in the electricity production of 14,5%.

Production with oil products, including the use of oil as fuel in plants where other sources of energy are used, decreased 25,8%, its total weight was 4,9% and it decreased significantly in the Balearic Islands mainly due to the increase in the supply coming from the peninsula. It decreased also the generation with gas (35,6%) and the production by cogeneration with gas (6,4%).

Consumption in the generation plants also decreased a 5,6% compared to 2012, mainly due to the smaller participation of fossil fuel plants and the increase in renewable energies.

Production by sources (GWh)	2012	2013	% change
PENINSULAR AREA	282335	271028	-4,0%
Ordinary Regime	173843	156375	-10,0%
Hydroelectric	*31921*	*63645*	*99,4%*
Pumping	*3617*	*4291*	*18,6%*
Thermal	*156074*	*122407*	*-21,6%*
Nuclear	*61470*	*56731*	*-7,7%*
Anthracite	*8415*	*3372*	*-59,9%*
Black lignite	*3022*	*2245*	*-25,7%*
Coal	*40220*	*31682*	*-21,2%*
Iron and steel gas	*780*	*1073*	*37,6%*
Natural gas	*40412*	*26038*	*-35,6%*

	Oil products	*1755*	*1266*	*-27,9%*
Special regime		108492	114653	5,7%
	Hydroelectric	*6393*	*7103*	*11,1%*
	Eolic	*49138*	*55404*	*12,8%*
	Photovoltaic	*7802*	*7858*	*0,7%*
	Thermal	*3773*	*4853*	*28,6%*
	Coal	*638*	*646*	*1,3%*
	Iron and steel gas	*137*	*122*	*-10,9%*
	Natural gas	*32508*	*30422*	*-6,4%*
	Oil products	*2406*	*2342*	*-2,7%*
	Biomass	*3396*	*3789*	*11,6%*
	Biogas	*866*	*907*	*4,7%*
	Urban solid waste renewable	*630*	*518*	*-17,8%*
	Urban solid waste non-renewable	*630*	*518*	*-17,8%*
	Other sources	*175*	*172*	*-1,7%*
NON-PENINSULAR TERRITORIES		15222	14230	-6,5%
Balearic Islands		**5506**	**4615**	**-16,2%**
Ordinary Regime		5219	4337	-16,9%
	Coal	*2779*	*2432*	*-12,5%*
	Oil products	*2052*	*1271*	*-38,1%*
	Natural gas	*388*	*634*	*63,4%*
Special regime		286	277	-3,1%
	Oil products	*4*	*4*	*0,0%*
	Urban solid waste renewable	*82*	*73*	*-11,0%*
	Urban solid waste non-renewable	*82*	*73*	*-11,0%*
	Eolic	*6*	*6*	*0,0%*
	Solar	*113*	*120*	*6,2%*
Canary Islands		**9242**	**9173**	**-0,7%**
Ordinary Regime		8635	8295	-3,9%
	Oil products	*8635*	*8295*	*-3,9%*
Special regime		607	877	44,5%
	Oil products	*2*	*240*	-
	Eolic	*328*	*357*	*8,8%*
	Solar	*277*	*280*	*1,1%*
Ceuta and Melilla		**474**	**442**	**-6,8%**
Ordinary Regime		466	435	-6,7%
	Oil products	*466*	*435*	*-6,7%*
Special regime		8	7	-12,5%
	Urban solid waste renewable	*4*	*3*	*-25,0%*
	Urban solid waste non-renewable	*4*	*3*	*-25,0%*
Gross production		297557	285258	-4,1%
Own consumption		10987	10370	-5,6%
Pumping consumption		5023	5960	18,7%
Imports-Exports		-11199	-6731	-39,9%
National demand		**270348**	**262197**	**-3,0%**

Table 2.3.5..: Production by sources in all Spain (Source: MINETUR)

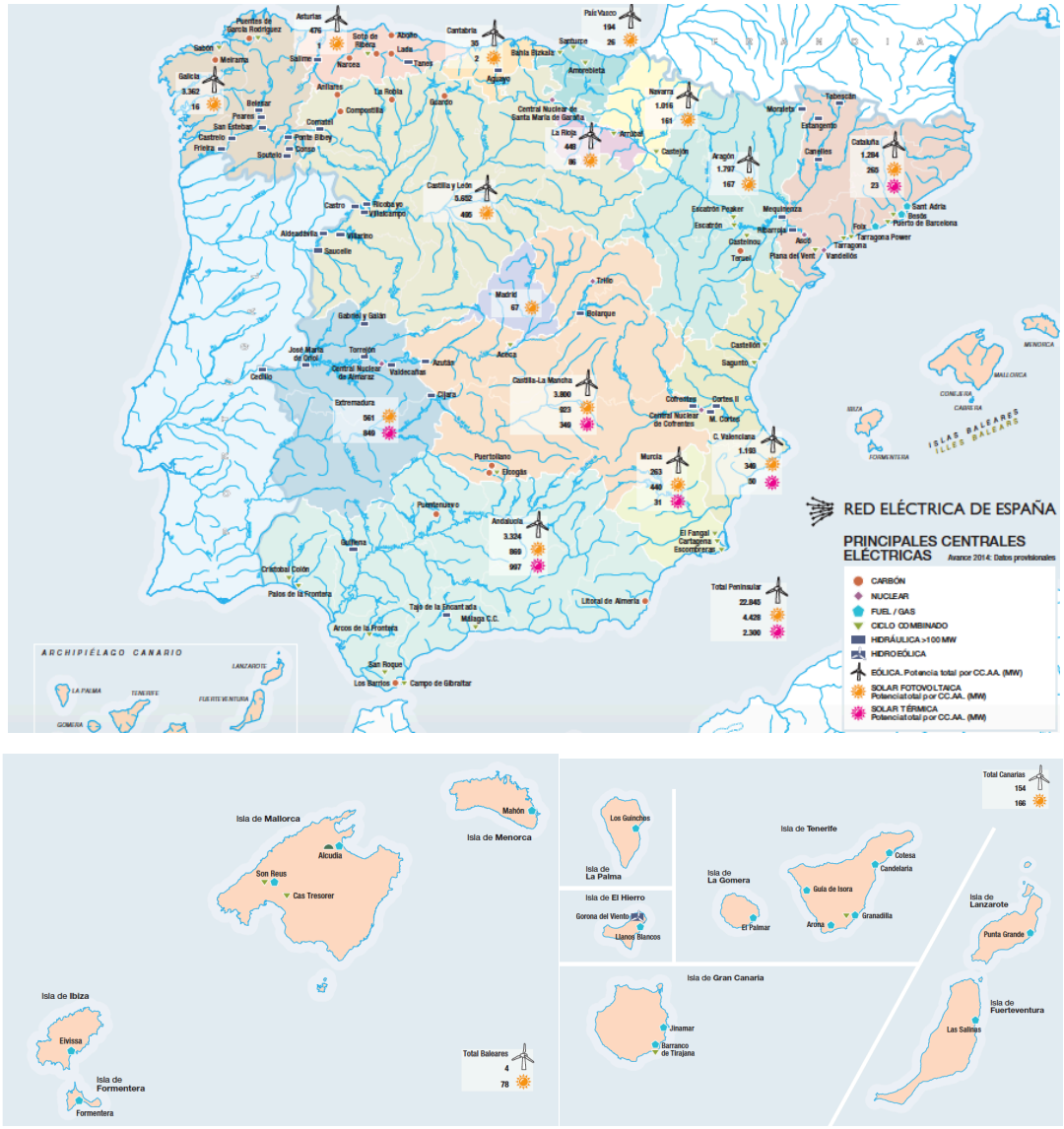


Fig. 2.3.3..: Production in Spain (Source: Red Eléctrica de España)

2.3.6. Market production evolution

Energy contracted in the diary market in Spain in 2013 increased up to 185.148 GWh in absolute value, an increase of 3,82% compared to 2012. The average price this year for the diary market was 44,26 €/MWh, which is a decrease of 6,29% compared to 2012.

Energy contracted in the intraday market in Spain in 2013 was 33.237 GWh in absolute value, a decrease of 29,09% compared to 2012. The average price this year for the intraday market was 44,97 €/MWh, which is a decrease of 5,45 % compared to 2012.

The final hourly average price in 2013 was 57,49 €/MWh, a decrease of 3,49% compared to the previous year. 80,13% of this price corresponds to the price in the diary market, corresponding the remaining to the intraday market, adjusted services and capacity payments.

Auctions made this year had a base price of 54,18 €/MWh the first semester and 47,58 €/MWh the fourth. Peak prices were between 61,15 and 57 €/MWh in the same periods.

2.3.7. Spanish competitiveness

Prices (€/kWh) without taxes, 1st semester 2013, for Industrial uses

Countries	Type of consumers						
	IA < 20 MWh	IB > 20 < 500 MWh	IC > 500 <2.000 MWh	ID > 2.000 < 20.000 MWh	IE > 20.000 < 70.000 MWh	IF > 70.000 < 150.000 MWh	IG >150.000 MWh
UE (28)	0,152	0,113	0,094	0,084	0,076	0,070	
Belgium	0,155	0,127	0,091	0,078	0,060	0,053	
Bulgary	0,104	0,092	0,080	0,069	0,061	0,055	0,055
Chech Republic	0,185	0,147	0,101	0,096	0,095	0,100	
Denmark	0,112	0,098	0,090	0,089	0,081	0,081	
Germany	0,169	0,106	0,086	0,076	0,070	0,064	
Estonia	0,098	0,090	0,084	0,077	0,070	0,061	
Ireland	0,184	0,157	0,133	0,113	0,102	0,090	
Greece	0,151	0,125	0,104	0,087	0,078	0,059	
Spain	0,223	0,143	0,117	0,100	0,082	0,066	0,054
France	0,102	0,090	0,077	0,067	0,061	0,057	
Croatia	0,126	0,112	0,094	0,081	0,063	0,062	
Italy	0,179	0,134	0,112	0,102	0,091	0,082	0,084
Ciprus	0,249	0,229	0,200	0,188		0,174	
Latvia	0,144	0,122	0,113	0,104	0,103	0,101	
Lithuania	0,145	0,129	0,123	0,119	0,126		
Luxemburg	0,150	0,111	0,094	0,072	0,061		
Hungary	0,107	0,102	0,090	0,088	0,090	0,093	0,090
Malta	0,290	0,200	0,180	0,160	0,150		
Holand	0,111	0,098	0,079	0,073	0,068	0,068	
Austria	0,124	0,106	0,087	0,077	0,067	0,062	
Poland	0,150	0,113	0,088	0,075	0,069	0,065	0,069
Portugal	0,128	0,115	0,102	0,091	0,080	0,075	
Rumania	0,118	0,106	0,090	0,076	0,067	0,068	
Slovenia	0,126	0,115	0,084	0,074	0,066	0,063	
Slovakia	0,202	0,148	0,124	0,114	0,102	0,097	0,100
Finland	0,089	0,083	0,068	0,064	0,052	0,052	
Sweden	0,148	0,089	0,080	0,068	0,062	0,054	
United Kingdom	0,142	0,125	0,112	0,103	0,103	0,103	0,097
Norway	0,079	0,083	0,081	0,063	0,051	0,042	
Montenegro	0,078	0,105	0,072	0,062		0,051	
Ex Yugoslavia	0,039	0,039	0,039	0,039	0,053	0,051	0,047
Serbia	0,065	0,071	0,057	0,049	0,048	0,045	
Turkey	0,097	0,094	0,089	0,085	0,077	0,075	0,075
Bosnia Herzegovina	0,113	0,089	0,065	0,065	0,046		0,056
Spain difference compared to the average (%)	**46,6%**	**26,2%**	**23,9%**	**19,2%**	**8,5%**	**-5,2%**	

Table 2.3.6..: Price of electricity for industrial uses (Source: MINETUR)

Prices (€/kWh) without taxes, 1st semester 2013 for Domestic uses

Countries	Type of consumers				
	DA <1.000 kWh	DB 1.000-2.500 kWh	DC 2.500-5.000 kWh	DD 5.000-15.000 kWh	DE >15.000 kWh
UE (28)	0,224	0,152	0,137	0,127	0,120
Belgium	0,219	0,174	0,158	0,142	0,124
Bulgary	0,080	0,078	0,077	0,077	0,078
Chech Republic	0,265	0,193	0,125	0,108	0,095
Denmark	0,154	0,154	0,130	0,112	0,112
Germany	0,260	0,170	0,149	0,138	0,135
Estonia	0,106	0,103	0,099	0,096	0,085
Ireland	0,481	0,232	0,195	0,172	0,152
Greece	0,166	0,109	0,117	0,117	0,098
Spain	0,292	0,191	0,175	0,153	0,141
France	0,218	0,120	0,101	0,089	0,078
Croatia	0,190	0,119	0,109	0,104	0,100
Italy	0,200	0,138	0,150	0,183	0,209
Ciprus	0,254	0,226	0,228	0,223	0,210
Latvia	0,097	0,108	0,114	0,117	0,120
Lithuania	0,117	0,115	0,113	0,110	0,104
Luxemburg	0,213	0,163	0,145	0,131	0,119
Hungary	0,130	0,112	0,106	0,101	0,106
Malta	0,371	0,190	0,162	0,171	0,314
Holand	0,314	0,160	0,132	0,116	0,093
Austria	0,214	0,159	0,141	0,128	0,118
Poland	0,148	0,120	0,116	0,109	0,108
Portugal	0,168	0,131	0,121	0,112	0,115
Rumania	0,092	0,091	0,089	0,088	0,085
Slovenia	0,158	0,132	0,118	0,109	0,099
Slovakia	0,225	0,157	0,138	0,122	0,107
Finland	0,221	0,145	0,110	0,095	0,079
Sweden	0,266	0,153	0,136	0,109	0,094
United Kingdom	0,194	0,180	0,166	0,150	0,135
Iceland	0,247	0,105	0,083	0,073	0,041
Norway	0,355	0,216	0,137	0,094	0,081
Montenegro	0,146	0,094	0,085	0,080	0,077
Ex Yugoslavia	0,039	0,039	0,039	0,039	0,039
Serbia	0,173	0,056	0,047	0,047	0,057
Turkey	0,119	0,119	0,119	0,118	0,119
Albania	0,096	0,096	0,096	0,096	0,096
Bosnia Herzegovina	0,194	0,078	0,069	0,063	0,060
Spain difference compared to the average (%)	**30,3%**	**25,6%**	**27,9%**	**20,5%**	**17,3%**

Table 2.3.7..: Price of electricity for domestic uses (Source: MINETUR)

As we can see in the tables above, Spanish electricity competitiveness is far below the average in Europe. Prices both in domestic and industrial uses are high compared to the other

European countries. Nonetheless, a more specific description must be made in order to fully understand the big picture.

In industrial uses, we can see that Spain loses all its competitiveness in low-demand power industries, while intensive industries in terms of electricity has a better competitiveness (since MWh greater than 70.000, Spain's electricity price is below the average in Europe). That reflects a critical fact in Spain. Since Spain has a huge portfolio of small and medium-size enterprises, those enterprises are trying to fight against other companies with the same characteristics in other countries in Europe. However, Spanish PYMES (Pequeñas y Medianas Empresas) are dealing with a greater energy cost than other companies in Europe. Thus, and also considering that small and medium-size companies do not gain huge margins and every cost is an important driver of profitability, Spain is not betting for its industrial development and is not helping them with this high electricity cost (main energy cost for the majority of companies in Spain).

Households have also to deal with high electricity prices. During the last years (and even after the financial crisis), electricity prices in Spain have increased a lot. That creates a really unstable environment in which citizens are the most harmed.

2.4. Natural gas sector

2.4.1. Regulatory framework and market design

Law of the Hydrocarbon sector 34/1988, 7th of October and its rules of development established a regulatory framework for the transport, distribution, storage, regasification and supply activities of all the different agents in the gas sector, according to the actually repealed European Directive 98/30/CE, 22nd of June, which fixed the rules about the interior market of natural gas and defined clearly the different functions and responsibilities of all the agents in the gas system.

Law 12/2007, 2nd July, which modified the precedent law 34/1998, 7th October, adapted it to the new European Directive 2003/55/CE, 26th June 2003, regarding the common rules about the internal market of natural gas and which repealed the European Directive 98/30/CE, modified the Chapter II of the law title IV, redefined the different activities subjected to the natural gas sector, established a legal and functional separation of the different network activities and removed the possible competition among distributors and marketers in the supply sector, with the aim of eliminating tariffs and the creation of the last resource tariff.

The 28th of October 2002, the ECO/2692/2002 order regulated the liquidation of obligations and the right of charge needed to remunerate the regulated activities. This function, initially a responsibility of the National Commission of Markets and Competition was transferred to the Ministerio de Industria, Energía y Turismo.

2.4.1.1. Last resource tariff

By the IET/2812/2012 order, 27th December, the formula to calculate the last resource tariff, previously published in the ITC/1660/2009 order, was modified by replacing the percentage of gas in the auction compared to the demand (0,5) by the percentage of real gas acquired in the auction.

In 2013 there were the typical auctions for the acquisition of gas destined to the last resource tariff. The auction for the base gas during the 1st of July until 31st December and for the winter gas during the 1st of November of 2013 until the 30th of March of 2014 was made the 18th of June. The final price for the base gas was 31,28 €/MWh and for the winter gas was 32,55 €/MWh. The auction for the supply of base gas for the period of January 1st until June 30th 2014 was made the 29th of October, with a final price of 30,99 €/MWh.

Auction date	Supply period	Base gas price (€/MWh)	Winter gas price (€/MWh)
16/6/09	1/07/2009 - 30/06/2010	16,18	
	1/11/2009 - 31/03/2010		19,77
16/6/10	1/07/2010 - 31/12/2010	21,67	
	1/11/2010 - 31/03/2011		24,44
26/10/10	1/01/2011 - 30/06/2011	21,3	
14/6/11	1/07/2011 - 31/12/2011	28,8	
	1/11/2011 - 31/03/2012		29,96
25/10/11	1/01/2012 - 30/06/2012	29,6	
19/6/12	1/07/2012 - 31/12/2013	33,5	
	1/11/2012 - 31/03/2013		30,75
30/10/12	1/01/2013 - 30/06/2013	30,48	

Table 2.4.1..: Auctions for winter and base gas since 2009 (Source: MINETUR)

2.4.1.2. Access tolls to third parties

The Real Decreto-Ley 13/2012 modified the article 92 of the Ley 34/1998, giving to the National Commission of Markets and Competition the power to establish the methodology to calculate access tolls and basic services canons. The actual toll structure was based with the Real Decreto 949/2001.

Tolls in 2013 were published by Orden IET/2812/2012, 27th December, including an increase of 1% for all the tolls, with 2 exceptions: the underground storage canon and the GNL storage toll remained constant.

Orden IET/2446/2013 established tolls in 2014, 27th December, including a linear increase of 2,3% for all the tolls, with just 1 exception: the underground storage canon.

2.4.2. Remuneration in the gas system regulated activities

Remuneration in the gas system regulated activities was established in the Ley 34/1998 and in the Real Decreto 949/2001 and was applied the first time in the ECO/301/2002 order, 15th February.

	2010	2011	2012	2013	2014	% change 2014-2013
Order	ITC/3520/2009	ITC/3354/2010	IET/3587/2011	IET/2812/2012	IET/2446/2013	
Distribution	1.322.704.684	1.481.257.170	1.519.541.278	1.467.092.105	1.502.238.949	2,40%
Transport	883.273.949	768.354.107	932.815.993	902.689.838	913.278.668	1,17%
Regasification plants	388.558.211	381.652.545	422.926.463	452.987.777	421.895.264	-6,86%
Underground storage	23.989.245	22.960.795	21.932.347	20.903.898	18.875.450	-9,70%
Total	**2.618.526.089**	**2.654.224.617**	**2.879.216.081**	**2.843.673.618**	**2.856.288.331**	**-1,85%**

Table 2.4.2..: Regulated remuneration evolution from 2010 until 2014 (Source: MINETUR)

2.4.2.1. Remuneration in regasification activities

The remuneration in regasification activities was established in the ITC/3994/2006 order, which determined that the financial remuneration of these plants had to be calculated using the net value of assets instead of the gross value, deducting each year the accumulated depreciation and amortization. The value of the assets is gotten from audited values, with the maximum values published. If the audited value is less than the one gotten applying unit values, the audited value will be increased by 50% the difference.

ITC/312/2011 order, 17th November, Annex I, published the new unit values of the regasification plants, calculated by the National Commission of Markets and Competition. Those new values are more detailed than the precedent ones.

In the Annex II of the same order, a detailed list of the different elements in each unit value is published in order to help auditors. Finally, Annex III publishes the useful life of each element and the Annex IV a table that sums up everything.

2.4.2.2. Remuneration in underground storage activities

The remuneration in underground storage activities was established in the ITC/3995/2006 order, 29th of December, and it fixed the base net value of the network, as well as the financial remuneration, which depended on the National Debt interest rate with a 10 year maturity plus 350 basic points.

IET(849/2012 order, 26th April, established a remuneration regime really similar to the one in the other gas system structures. It increased the maturity of investments' amortization from 10 to 20 years, which is better according to the real useful life of them. Furthermore, it reinforced the supervision of the Ministerio de Industria, Energía y Turismo regarding this kind of projects, giving them the power to make technical and economic audits even before its inclusion to the retributive regime. The aim of this order was to decrease the economic impact of the new underground storages, since they were supposed to increase substantially since the new amortization regime.

Some new orders, such as the IET/2805/2012 and the IET/2446/2013, modified in a way the 2006 one. Nevertheless, those changes did not affect the general structure of the remuneration for this kind of activity.

2.4.2.3. Remuneration for transport facilities established before January 1st 2008

Regarding gas pipelines and other auxiliary facilities established after the ECO/301/2002 order, the assets were valued according to the 2000 data updated in 2002.

The remuneration calculated with the old general methodology was updated annually with the following factor:

$$1 + \phi + IPH$$

where IPH is the semi-sum of IPC and IPRI variation and ϕ is the efficiency factor, valued at 0,85. These coefficients were also used to update investment, operational and maintenance values.

In 2013, due to the hard economic situation of the country, the IET/2812/2012 order, 27th December established a ϕ coefficient equal to zero. In 2014 the coefficient was 0,85 again.

2.4.2.4. Remuneration for transport facilities established after January 1st 2008

The Real Decreto12/2012, 30th March, established the suspension of the administrative authorisation for new gas transport pipelines, with the exception of pipelines with local influence, whose authorisation had to be done under a profitability study.

2.4.2.5. Remuneration of distribution activities

The initial remuneration of the enterprises operating before 202 was calculated depending on the investment volume. To this remuneration, there is added the result of a formula that multiplies the clients captured and the increment of sales by a coefficient. The final retribution is incremented multiplying it by $(1 + \phi + IPH)$ where IPH and ϕ are the same as defined before.

ECO/31//2004 order, 15th January, established that new distributors would be remunerated by previsions on sales and clients captured, and that remuneration would be adjusted afterwards.

ITC/3354/2010 order, 28th of December, modified the parameter IPH, using since then the value of October from the previous year.

In 2013, due to the hard economic situation of the country, the IET/2812/2012 order, 27th December established a ϕ coefficient equal to zero. In 2014 the coefficient was 0,85 again.

2.4.3. Agents in the Natural Gas market in Spain

2.4.3.1. Transport companies

Transport companies are the legal entities authorised to build, operate and maintain plants of regasification of liquid natural gas, and to transport and storage the natural gas. The companies authorised in December 31st of 2013 are:

- Enagas Transporte, S.A: is the main transport company in Spain (with a 90% market share).
- Enagás Transporte del Norte, S.A.
- Bahía de Bizkaia Gas, S.L. (BBG): company holding the regasification plant located in the Bilbao harbour.
- Planta de Regasificación de Sagunto, S.A. (SA-GGAS).
- Regasificadora del Noreste, S.A.
- Gas natural transporte, SDG S.L.
- Transportista Regional del Gas, S.L.
- Redexis Gas Transporte, S.L.
- Gas Extremadura Transportista, S.L.
- Gas Natural CEGAS, S.A.
- Gas Aragón, S.A.
- Gas Natural Andalucía SDG, S.A.
- Gas Natural Castilla-La Mancha, S.L.

2.4.3.2. Distribution companies

Distribution companies are authorised to build, operate and maintain plants of distribution destined to make the gas arrive to the consumption points. Distribution companies authorised in December 31st of 2013 are:

- Gas Natural Distribución, SDG, S.A.
- Gas Natural Castilla y León, S.A.
- Gas Navarra, S.A.
- Gas Natural Rioja, S.A.U.
- Gas Natural Castilla La Mancha, S.A.
- Gas Energía Distribución Murcia, S.D.G. S.A.
- Gas Galicia, S.D.G., S.A.
- Gas natural Anadalucía, S.A.
- Gas Natural Cegas, S.A.
- Distribución y Comercialización de Gas Extremadura, S.A.
- Redexis Gas Aragón, S.A.
- Distribuidora Regional del Gas, S.A.
- Redexis Gas Distribución, S.A.
- Redexis Gas Baleares, S.A.U.
- Naturgas Energía Distribución, S.A.
- Gas Directo, S.A.
- Tolosa Gasa, S.A.
- Gasificadora Regional Canaria, S.A.
- Madrileña Red de Gas, S.A.
- Gas Natural Madrid SDG, S.A.
- Inverduero Gas Distribución, S.A.

2.4.3.3. Marketers

Marketers are societies that access to third parties' plants and acquire natural gas to sell it to consumers, to other marketers or to international clients, as well as those societies that sell liquid natural gas to other marketers or to final consumers.

Spanish marketers are:

- Iberdrola, S.A.
- Naturgas Energía Comercializadora, S.A.U.
- Cepsa Gas Europe, S.A.U.
- Shell España, S.A.
- Carborex, S.A.
- Gas Natural Comercializadora, S.A.
- Gas Natural Servicios SDG, S.A.
- Endesa Energía, S.A.
- Unión Fenosa Gas Comercializadora, S.A.
- Shell Spain LNG, S.A.
- GDF Suez Energía España, S.A.U.
- Ingeniería y Comercialización de Gas, S.A.
- Hidrocantábrico Energía S.A.U.
- Bahía de Bizkaia Electricidad, S.L.
- Molgas Energía, S.A.
- Nexus Energía, S.A.
- Liquid Natural Gaz, S.L.
- Investigación Criogenia y Gas, S.A.
- ENERGYA VM Gestión de Energía S.L.
- Multiservicios Tecnológicos, S.A.
- Comercializadora Ibérica de Gas y Energía Eléctrica, S.A.U.
- E.ON Energía, S.L.
- Sonatrach Gas Comercializadora, S.A.U.
- E.ON Gneración, S.L.
- EDF Trading Limited.
- Galp Energía España, S.A.U.
- Axpo Iberia, S.L.
- Sampol Ingeniería y Obras, S.A.
- Gas Natural SUR, SDG, S.A.
- Iberdrola Generación, S.A.U.
- Iberdora Comercializadora de Último Recurso, S.A.U.
- Madrileña Suminsitro de Gas, S.L.
- Madrileña Suministro de Gas SUR, S.L.
- EDP Comercializadora de Último Recurso, S.A.
- Endesa Energía XXI, S.L.U.
- ENOI SPA

- Servigas S.XXI, S.A.
- Villarmir Energía, S.L.U.
- E.ON Global Commodities, S.E.
- Fertiberia, S.A.
- RWE Supply & Trading GmbH.
- Fortia Energía, S.L.
- EDP Energía Gas, S.L.
- Alpiq Energía España, S.A.U.
- Centrogas, GmgH.
- Orus Energía, S.L.
- On Demand Facilities, S.L.
- Petronavarra, S.L.
- Gasindur, S.L.
- Morgan Stanley Capital Group Inc.
- Morgan Stanley & Co International PIC.
- Statoil ASA.
- Factor Energía, S.A.
- Switch Energy, S.L.
- Solvay Energy Services, SAS.
- Capital Energy Read, S.L.
- Methane Logistics, S.L.
- Cepa COMERCIAL PETROLEO, S.A.
- Climdom Energy, S.A.U.
- Vitogas España, S.A.U.
- Eni Gas & Power España, S.A.U.
- Eni SPA.
- Noble Clean Fuels Limited.
- Merril Lynch Commodities (Europe) Limited.
- Total Gas & Power Limited.
- Gold Energy – Comercializadora de Energía, S.A.
- Repsol LNG Holding, S.A.
- Alpiq AG.
- Gasela GmbH.
- Compañía Española de Petróleos, S.A.U.
- Koch Supply & Trading SARL.
- Audax Energía, S.L.U.
- Gunvor Internacional B.V.
- Axegaz, S.A.S.

2.4.3.4. Technical manager of the system

The technical manager has the responsibility of operating and managing the Basic Network and the secondary transport networks defined by the law. In the same way, it has the responsibility of maintaining the system in good conditions to make it operate correctly.

In July 2nd of 2012, ENAGÁS TRANSPORTE, S.A.U. and ENAGÁS GTS, S.A.U. were created, and the last one is the technical manager of the system.

2.4.4. Natural Gas demand in Spain

Total consumption of Natural Gas in Spain was 303.278 GWh in 2013, 7,5% less than in 2012. Final demand in industry increased significantly, whereas domestic-commerce consumption decreased a lot. Natural Gas market share in the primary energy balance was 21,4% in 2013, a less weight than the previous year.

Gas consumption was distributed among domestic-commerce consumption (21,1%) and industry market (34,6%), and the remaining gas was used as raw material to other purposes and in cogeneration of electricity.

Consumption in domestic, commerce and services sectors decreased 9,4% in 2013 mainly due to the decrease of activity in the sector. On the other hand, industrial consumption increased substantially mainly due to the greater activity of gas intensive industries.

Natural Gas consumption for electricity generation purposes is estimated to be 107.591 GWh in 2013, a 35,5% in total, where 35,4% was used for cogeneration and the rest corresponds to electricity plants own consumption.

Gas demand *(GWh)*	2012	2013	Weight (%)	% change
Domestic-Commerce	70553	63896	21,1%	-9,4%
Industry	98191	105064	34,6%	7,0%
Raw material	4339	6260	2,1%	44,3%
Cogeneration	41899	38140	12,6%	-9,0%
Electricity generation	87546	69452	22,9%	-20,7%
Own consumption, losses and statistics differences	25254	20466	6,7%	-19,0%
Total Natural Gas	**327781**	**303278**	**100,0%**	**-7,5%**

Table 2.4.3..: Gas demand in Spain (Source: MINETUR)

2.4.5. Natural Gas offer in Spain

2.4.5.1. Origin of the resources

Since internal production is scarce, in 2013 the natural gas to internal consumption cameform imports and intercommunity commerce. Imports in 2013 were 375.421 GWh, a 1,1% less than in 2012.

Spain received that year natural gas coming from 11 different countries, with the special contribution of Argelia as the main importer (51% of the total). Nonetheless, the other countries have the weight of natural gas imported really diversified, giving Spain a better flexibility in terms of supply. Apart from Argelia, whose supply makes Spain dependant and put it in risk, the other countries do not represent a real risk for the Spanish supply of natural gas.

2013 was the first year since 2000 that NG imports were greater than LNG imports, having a 54% of the total external supply through the different international pipelines currently operating in Spain. The remaining 46% comes in liquid natural gas form (LNG) and goes to regasification plants. This change in import structure is mainly due to the new international connection through Almeria, operating since 2011.

Natural gas coming by ship has decreased in 63 ships (228 came in total in 2013), mainly due to the increase of pipelines and price differences, since prices in Japan, China, India, Brazil and Argentina are high compared to other markets.

Natural Gas imports	2011		2012		2013		% 2013-2012
(GWh)	Value	%	Value	%	Value	%	
Argelia GN	103970	36,9%	118638	40,6%	155338	51,2%	30,9%
Argelia GNL	43359		41658		36702		-11,9%
Qatar GNL	51540	12,9%	46181	11,6%	40639	10,2%	-12,0%
Oman GNL	1918	0,5%			2805	0,7%	
Nigeria GNL	74180	18,6%	59928	15,0%	37106	9,3%	-38,1%
Egypt GNL	25933	6,5%	7153	1,8%	464	0,1%	-93,5%
Norway GNL	13916	3,5%	19563	4,9%	13366	3,3%	-31,7%
France GN	25482	6,4%	35328	8,9%	44215	12,1%	25,2%
France GNL					1350		
Libia GNL	967	0,2%					
Trinity and Tobago GNL	27640	6,9%	27493	6,9%	22440	5,6%	-18,4%
U.S. GNL	1850	0,5%					
Peru GNL	21086	5,3%	28299	7,1%	16898	4,2%	-40,3%
Belgium GNL	2965	0,7%	7462	1,9%	2174	0,5%	-70,9%
Portugal GN	4485	1,1%	3225	0,8%	1924	0,5%	-40,3%
Total	**399291**		**394928**		**375421**		**-4,9%**

Table 2.4.4..: Natural gas imports in Spain (Source: MINETUR)

As we commented above, Spain is deeply dependant on Argelian supply of Natural Gas, followed by Nigeria and Qatar.

2.4.5.2. A big change in the market: Shale gas

Shale gas is natural gas trapped within shale formations. It has become an increasingly important source of natural gas, mainly in the United States, in the current century. At the

beginning of 2000, shale gas represented 1% of U.S. natural gas production, while nowadays represents 20% and estimations say it will be 46% in 2035.

This discovery has provoked a huge decrease in prices as well as a big increase in production. That is why R&D in the gas market has become an important driver of development.

2.4.5.3. Internal production

In 2013, Spain produced 644 GWh of natural gas, a 3,9% less than the previous year. This amount just represents 0,16% of the total national consumption. Thus, Spain is a huge dependant on Natural Gas imports in order to maintain its energy market.

Internal gas production	2012		2013		% change
	GWh	Million m3	GWh	Million m3	
El Romeral	82	9	125	12	52,4%
El Ruedo	13	1	63	6	384,6%
Marismas	5	0	5	0	0,0%
Poseidón	575	52	451	41	-21,6%
Total	**671**	**63**	**644**	**60**	**-4,0%**

Table 2.4.5..: Internal gas production (Source: MINETUR)

2.4.6. Price evolution

	Tariff T.1.				**Tariff T.2.**			
	T fixed		T variable		T fixed		T variable	
	T fixed (€/mes)	% change	cts/kWh	% change	T fixed (€/mes)	% change	cts/kWh	% change
1/1/10	3,90		4,289363		7,84		3,725163	
1/4/10	3,90	0,00%	4,444219	3,61%	7,84	0,00%	3,880019	4,16%
1/7/10	3,90	0,00%	4,759404	7,09%	7,84	0,00%	4,195204	8,12%
1/10/10	3,90	0,00%	4,694948	-1,35%	7,84	0,00%	4,130748	-1,54%
1/1/11	4,09	4,87%	4,875816	3,85%	8,33	6,25%	4,268716	3,34%
1/4/11	4,09	0,00%	5,105351	4,71%	8,33	0,00%	4,498251	5,38%
1/7/11	4,09	0,00%	5,427758	6,32%	8,33	0,00%	4,820658	7,17%
1/10/11	4,09	0,00%	5,500750	1,34%	8,33	0,00%	4,893650	1,51%
1/1/12	4,21	2,93%	5,513521	0,23%	8,62	3,48%	4,880021	-0,28%
1/4/12	4,35	3,33%	5,795555	5,12%	8,99	4,29%	5,130355	5,13%
1/7/12	4,35	0,00%	5,929151	2,31%	8,99	0,00%	5,263951	2,60%
1/1/13	4,30	-1,15%	5,750871	-3,01%	8,58	-4,56%	5,078971	**-3,51%**
1/1/14	4,38	1,86%	5,725877	-0,43%	8,88	3,50%	5,038477	**-0,80%**

Table 2.4.6..: Tariff in the last 5 years (Source: MINETUR)

Average price for domestic-commerce consumers *(Pressure < 4 Bar)*	D1 < 20 GJ/year	D2 20-200 GJ/year	D3 >200 GJ/year
2007	5,9947	5,0116	4,0986
2008	6,4118	5,2943	4,5068
2009	6,1305	4,9435	4,0776
2010	**5,8444**	**4,5895**	4,0809
2011	**5,8118**	**4,5600**	4,0809
2012	7,3600	5,6000	4,9413
2013	**7,2036**	5,8176	5,4576

Table 2.4.7..: Average price for domestic-commerce consumers (Source: MINETUR)

Average price for industrial consumers *(Pressure > 4 Bar)*	I1 <1.000 GJ/year	I2 1.000-10.000 GJ/year	I3 10.000-100.000 GJ/year	I4 100.000-1.000.000 GJ/year	I5 1.000.000-4.000.000 GJ/year	I6 >4.000.000 GJ/year
2007	3,1838	2,6312	2,5466	2,4109	1,9926	1,9717
2008	3,5570	3,1896	3,0015	2,8039	2,5605	2,4833
2009	4,4416	3,3764	2,9215	2,5175	2,3072	2,1021
2010	**4,0321**	3,4142	**2,8416**	**2,4832**	2,3243	**2,0178**
2011	**3,7688**	**3,8725**	3,1153	2,8383	2,6485	2,4504
2012	4,6845	4,6252	4,6252	3,3229	3,1419	**3,6200**
2013	4,8204	4,7412	3,8340	3,4308	3,2400	3,2220

Table 2.4.8..: Average price for industrial consumers (Source: MINETUR)

Prices have increased a lot during the last 5 years. The scarcity of resources plus the lack of internal production make Spain a huge dependant on imports and, then, a huge dependant on price volatility. However, in the last two years Spain has decreased its Natural Gas prices, even though past levels are very unlikely to appear again.

Domestic-commerce prices are substantially higher than industrial ones, mainly due to the demand. In 2010 and 2011, thanks to the shale gas revolution, prices dropped in both sectors, even though in 2013 and 2014 they continue to increase.

In 2012, industrial price for the highest demand (I6) appeared to be higher than for the lower level (I5), which means that supply of natural gas was cut.

2.5. Coal sector

2.5.1. Overview

Internal production *(thousands of tonnes)*	Anthracite	Coal	Black lignite	Total	% change
2009	4061	2891	2492	9445	-7,3%
2010	3209	2777	2444	8430	-10,7%
2011	2487	1775	2359	6621	-21,5%
2012	2258	1652	2275	6185	-6,6%
2013	747	1781	1827	4354	-29,6%

Table 2.5.1..: Internal production (Source: MINETUR)

National coal production decreased in 2013 around a 30% compared to 2012. Coal and anthracite decreased a 35,4% and black lignite a 19,7%.

Stock variation (thousands of tonnes)	Anthracite and Coal	Black lignite	Total	% change
2011	2692	21	2713	
2012	1623	-275	1348	-50,3%
2013	879	-324	555	-58,8%

Table 2.5.2..: Stock variation (Source: MINETUR)

This decrease is mainly due to the high volumes of inventories in Spain. Black lignite experienced a smaller decrease because of its better price margin, which makes it very competitive.

On the other hand, the current application of the Real Decreto 134/2010, 12th February, which aim was to increase the coal consumption to electricity generation purposes has not been successful.

Spain continues to be an important importer of Coal, even though in 2013 it decreased its external balance substantially (-37%), mainly in energetic coal (since it's the main import in Spain).

Imports - Exports *(thousands of tonnes)*	Anthracite and Coal	Energetic coal	Total	% change
2011	240	12419	14909	
2012	2260	18293	20553	37,9%
2013	2528	10427	12955	-37,0%

Table 2.5.3..: Import and exports of coal in Spain (Source: MINETUR)

Finally, gross internal consumption increased a lot until 2012 but in 2013 it decreased substantially, highlighting the fail after the application of the Real Decreto mentioned above.

Gross internal consumption *(thousands of tep)*	Value	% change
2011	12698	
2012	15510	22,1%
2013	10531	-32,1%

Table 2.5.4..: Gross internal consumption (Source: MINETUR)

2.5.2. Demand

Primary coal consumption decreased 32,1% in 2013. Consumption in the power sector decreased 29,8% (corresponding to coal and anthracite consumption) not only from internal

production but also from imports. Black lignite decreased 31,1%. Nonetheless, iron and steel gases increased 27,9% due to the greater activity in the iron and steel sector.

Coal consumption in electricity generation *(thousands of tep)*	Anthracite	Coal	Black lignite	Iron and steel gases	Total	% change
2011	3894	13916	2839	2603	10703	
2012	3991	18690	2203	2030	13039	21,8%
2013	1618	13487	1623	2598	9156	-29,8%

Table 2.5.5..: Coal consumption in electricity generation (Source: MINETUR)

Even though coal price has decreased in the last years, imports decreased 39% due to the fewer use in the power sector.

Final consumption of coal increased 8,36% in 2013. Iron and steel sector consumption increased 20,72% due to the recovery of the sector (which is the main consumer after the power sector) and it is the main driver of the increase in coal consumption in Spain.

Coal final consumption *(thousands of tonnes)*	Iron and steel sector		Cement		Rest of industries		Other uses		Total	
	ktep	% change	ktep	% change	ktep	% change	ktep	% change	ktep	% change
2009	913	-28,8%	17	-89,10%	237	-9,10%	242	-22,20%	1410	-30,00%
2010	1150	25,96%	23	35,29%	207	-12,66%	223	-7,85%	1603	13,69%
2011	1283	11,57%	164	613,04%	270	30,43%	198	-11,21%	1915	19,46%
2012	1076	-16,13%	9	-94,51%	238	-11,85%	183	-7,58%	1507	-21,31%
2013	1299	20,72%	9	0,00%	64	-73,11%	261	42,62%	1633	8,36%

Table 2.5.6..: Coal final consumption in Spain (Source: MINETUR)

2.5.3. Revenues and value of the production

In 2013, the average price for national coal (includes coal, anthracite and black lignite) that benefited public subsidies was 71,66 € per ton for coal with a Superior Calorific Power of 4352 Kcal/Kg, which supposes an increase of 12,6% compared to 2012 (62,65 €/tonnes). Expressed in cents per therm, it was 1,6467, an increase of 14,5%.

A decrease in calorific power in coal was the main driver of the increase in price per therm. In 2013, 3,74 millions of tonnes were supplied, from which 2,24 Mt were coal and anthracites and 1,5 Mt was black lignite. Supply to thermal plants decreased 45% in 2013.

Production value of coal for which the government paid subisdies, and acquired afterwards by electricity plants, was 268,18 millions of euros that, compared to the value in 2012 (425,25 millions of euros), implied a reduction of approximately 37% mainly due to the decrease in production and supply (6,3 millions of tonnes of supply in 2012 and 3,7 millions of tonnes in 2013).

To the previous value, subsidies must be added in order to cover differences between costs and revenues (38, 4 millions of euros in 2013) and also it must be added the 77,9 millions of euros received by HUNOSA from Presupuestos Generales del Estado. Thus, total revenues were 384,5 millions of euros in 2013 (35,2% less than in 2012).

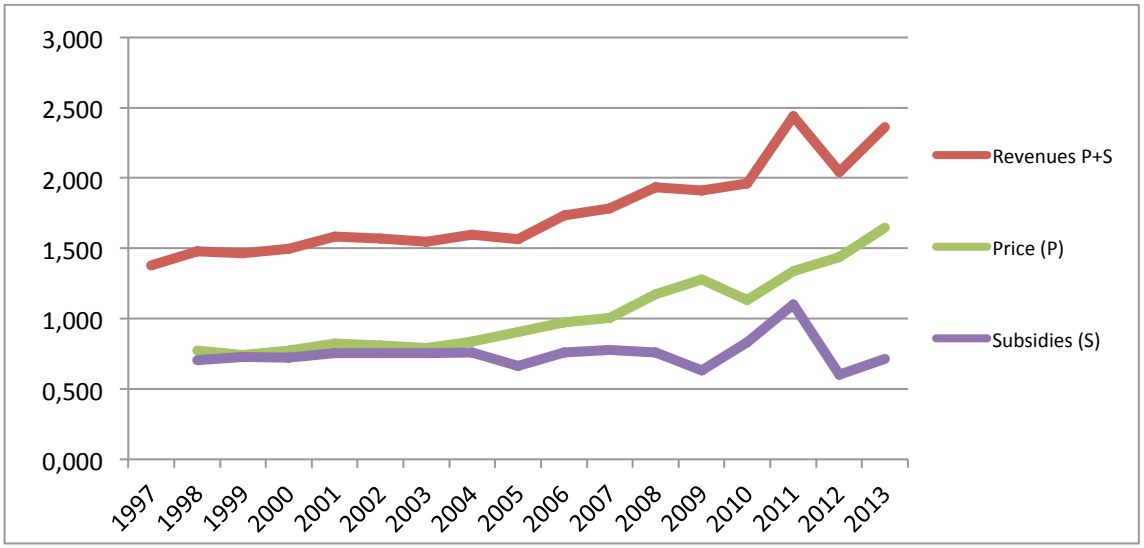


Fig. 2.5.1..: Average revenues of coal companies (cents/therm) (Source: MINETUR)

2.5.4. Labour

Workforce in 2013 in the coal sector included 3.308 employees, whereas in 2012 it was 3.407. That implies a decrease of around 3%, mainly due to the 2008 credit crisis.

Employees	2010	2011	2012	2013	% change 12/11	% change 13/12
Coal	2723	2329	2145	2117	-7,9%	-1,3%
Anthracite	1542	1325	1026	1018	-22,6%	-0,8%
Black lignite	329	309	236	173	-23,6%	-26,7%
Total	4594	3963	3407	3308	-14,0%	-2,9%

Table 2.5.7..: Employees in the coal sector (Source: MINETUR)

The most critical decrease in employment was in the black lignite sector, since it has decrease during 2 consecutive years with values higher than 20%. That is the main driver of the global decrease in labour, even though all three subsectors have decreased in terms of labour every year since 2010.

2.5.5. External commerce

Spain has been always a net importer of coal. However, sometimes coal imports are re-exported afterwards.

In 2013, net imports of coal and anthracite decreased 37,1%, from 20,9 millions of tonnes in 2012 to 13,15 millions of tonnes in 2013. The main reason for this huge decrease was the huge decrease of electricity generation using coal, since electricity companies received 11,7 millions of tonnes of coal in 2013 whereas in 2012 they received 15,9 millions of tonnes. Re-exportation accounted for 1,1 millions of tonnes in 2013, whereas in 2012 it was 2,1 millions of tonnes. The majority of these re-exportations where done in order to take advantage of empty ships departures.

Imports and exports *(million of tonnes)*	2010	2011	2012	2013	% change 12/11	% change 13/12
Coal imports	11971	15316	22414	13663	46,3%	-39,0%
Coal exports	1150	852	1861	708	118,4%	-62,0%

Net coal	10821	14464	20553	12955	42,1%	-37,0%
Anthracite imports	846	853	594	544	-30,4%	-8,4%
Anthracite exports	338	407	241	352	-40,8%	46,1%
Net anthracite	508	446	354	192	-20,6%	-45,8%
Total net imports	**11329**	**14910**	**20907**	**13147**	**40,2%**	**-37,1%**

Table 2.5.8..: Imports and exports in Spain (Source: MINETUR)

In terms of money, imports accounted for 1.876,86 millions of euros in 2012, where in 2013 it was 1.054,12 millions of euros. Average unit price for thermal coal decreased from 83,72 € per ton in 2012 to 77,15 € per ton in 2013, showing again the excess of production of the European market, where Spain, United Kingdom and Germany where the main buyers.

Average price of coal for electricity companies in 2013 was 58,34 € per ton (with an average PCI of 5.558 kcal/kg), whereas in 2012 it was 69,12 € per ton (average PCI 5.612 kcal/kg).

The origin of all these imports is mainly Colombia, Russia and South Africa. Some plants use Indonesian coal, but it is just a minority.

2.6. Oil sector

2.6.1. Demand

Oil products consumption was 54,6 millions of tonnes in 2013, a decrease of 8,9% compared to 2012. This was mainly due to the decrease in final consumption both in the transport sector and in raw materials. Electricity generation using oil has also decreased, even though the weight is not as important as the other two. Oil products demand in the transport sector (measured in tonnes of oil equivalent) decreased 3,4% in 2013, being the biggest fall since the credit crisis.

Oil products consumption *(thousands of tonnes)*	2012	2013	% change
Liquefied Petroleum Gas	1601	1588	-0,8%
Petrol	4920	4656	-5,4%
Kerosene	5277	5133	-2,7%
Diesel	29150	28224	-3,2%
Fuel	10157	8628	-15,1%
Others	8878	6412	-27,8%
Total	**59983**	**54641**	**-8,9%**

Table 2.6.1..: Oil products consumption (Source: MINETUR)

Industrial consumption has decreased a lot, mainly in fuels. In domestic consumption it has also decreased, mainly due to the decrease in economic activity in 2013.

In terms of products, must be highlighted the decrease of diesel oil (3,2% in 2013), mainly due to the decrease in transport during the year (even though the government pushed new regulatory measures to boost the sale of cars). Kerosene has also experienced a decrease of 2,7% in 2013. Petrol demand has also decreased (5,4%), mainly due to the switch of petrol vehicles to diesel vehicles. We can see this tendency in the following graph, showing as well that, even though diesel cars have increased in the last years, diesel consumption continues to fall following the trend since the credit crisis period.

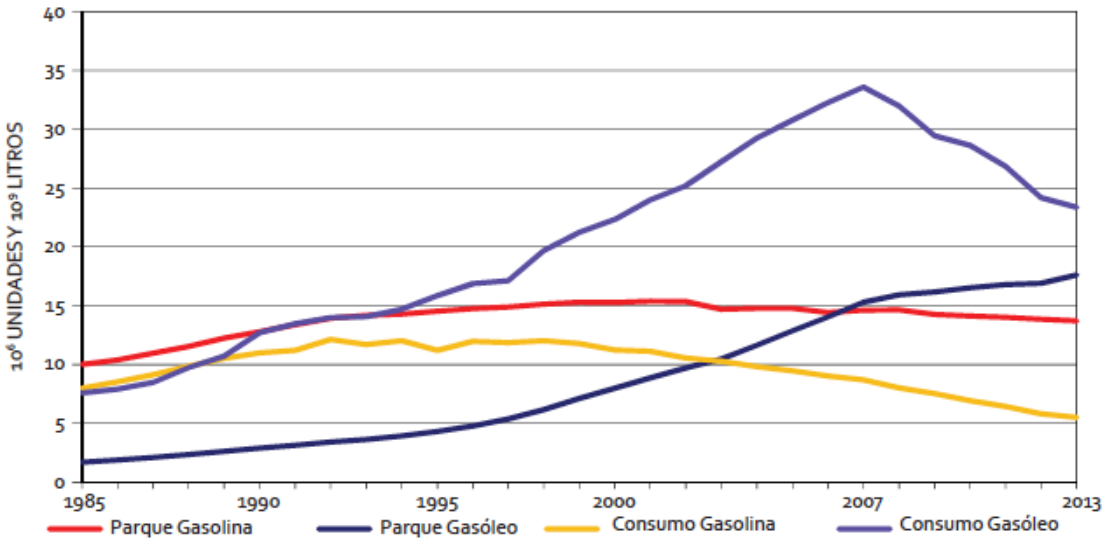


Fig. 2.6.1..: Diesel and petrol park and consumption (Source: MINETUR)

Regarding the sectors that use oil products to transform them to other types of energies, extra-peninsular systems have decreased their oil products demand for electricity generation in 2013, mainly due to the decrease in electricity demand and the use of natural gas to produce electricity in the Balearic Islands. Cogeneration using oil products has also decreased. Globally, oil products energy generation has a small weight, since it just supposes a 5% of the total national generating structure.

2.6.2. Offer

National oil production is not enough to cover all demand. In 2013, national production was 368.000 tonnes (2,7 millions of barrels), an increase of 158% compared to 2012. This huge increase is mainly due to the new production plant in Lubina-Montanazo in 2012, whose production supposes 80% of the total oil production in Spain.

Internal Oil production *(thousands of tonnes)*	2012	2013	Weight (%)	% change
Lora	7	5	1,4%	-28,6%
Boquerón	34	33	9,0%	-2,9%
Casablanca	42	36	9,8%	-14,3%
Rodaballo	0	1	0,3%	
Lubina	60	294	79,9%	390,0%
Total	**143**	**368**	**100,0%**	**157,3%**

Table 2.6.2..: Internal oil production (Source: MINETUR)

Actual production plants operating are: Lora (Burgos), Casablanca-Montanazo (Casablanca), Rodaballo, Angula-Casablanca (Boquerón) y Lubina-Montanazo (Lubina). These last 4 plants are located in the Mediterranean sea, close the Tarragona.

2.6.3. Oil imports

In 2013, imports decreased 1,6% with 57.872 kt. Mexico was the biggest supplier (15,4%), followed by Saudi Arabia, Russia and Nigeria. These 4 countries represent 56,7% of total imports in Spain.

OPEC[8] imports continued decreasing. In 2013, 29.964 kt were OPEC imports, representing 51,8% of total imports (whereas in 2012 it was 56,7%), boosting the diversification of imports.

2.6.4. Agents

2.6.4.1. Wholesale marketers of oil products

Those entities who commercialize oil products to distribute them in the retail market, according to the 42nd article of Ley 34/1998.

2.6.4.2. Retail distributors of oil products

It contains supply of fuels to vehicles in plants destined to this function, supply of fuels to be consumed in the same plant, kerosene supply for airplanes, fuel supply for ships and other kind of supplies destined to be consumed, according to the 43rd article of Ley 34/1998.

This activity can be done by any legal or physic entity.

[8] Organization of the Petroleum Exporting Countries

2.6.4.3. Wholesale Liquefied Petroleum Gas operators

Those entities that store, mix, transport or commerce in the LPG wholesale market, according to the 45th article of Ley 34/1998.

LPG wholesale operators the 31st of December 2013 are:

- Repsol Butano, S.A.
- CEPSA Comercial Petróleo, S.A.
- Atlas, S.A.
- Disa Gas, S.A.U.
- BP Oil España, S.A.
- GALP Energía España, S.A.
- Primagas Energía, S.A.U.
- Compañía de Gas Licuado Zaragoza, S.A.
- LPG Propano Iberia S.L.U.

2.6.4.4. Retail Liquefied Petroleum Gas operators

Those entities that store, mix, transport or commerce in the LPG retail market, according to the 46th article of Ley 34/1998.

LPG retail operators the 31st of December 2013 are:

- Repsol Butano, S.A.
- CEPSA Comercial Petróleo, S.A.
- Atlas, S.A.
- Disa Gas, S.A.U.
- Vitogas España, S.A.
- GALP Energía España, S.A.
- Primagas Energía, S.A.U.
- Gasindur, S.L.
- Naturgas energya Distribució, S.A.U.
- CH Gas, S.L.
- Virtus Energía, S.A.
- Iberpropano, S.A.
- Energia, Serveis i Noves Tecnologies, S.A.

2.6.5. LPG prices

LPG prices in January 2014	€/bottle (without taxes)	€/kg (without taxes)	Taxes	€/bottle	€/kg
Spain	14,46	1,157	21%	17,497	1,400
Portugal	23,58	1,814	23%	29,003	2,231
France	27,43	2,11	20%	32,806	2,524
Belgium	21,52	1,722	21%	26,039	2,084
United Kingdom	43,69	2,912	5%	45,875	3,058

Table 2.6.3..: LPG prices in january 2014 compared to other border countries (Source: MINETUR)

We can observe that Spain has a really competitive position in terms of LPG prices compared to the countries that are more close to its territory. That gives a tremendous advantage to Spain in this sector, even though it still depends a lot on imports and its national production is not as important as in other countries.

2.7. Nuclear sector

Spain has 7 nuclear plants operating, located in 5 different places, who suppose 7.894,8 MWe of power installed and who represent 7,3% of the total electricity power installed in the country.

In 2013, gross production of electricity with nuclear origin was 56.731 GWh, a 19,8% of the national gross production.

The power factor (relation between the electricity produced in a period of time and the electricity able to produce the system at nominal power during the same time period) was 87,54% in Spain and the availability factor (relation between the time the plants have been connected to the system and the total time) has been 88,45%.

Regarding the operating use authorised to run nuclear plants in 2013, the IET/1302/2013 order, 5th July, established the closure of the Santa María de Garoña plant. It must be said that the plant had to close fundamentally for legal reasons, since the security and the conditions of the plants were good to continue with the activity.

On the other hand, the nuclear plant Trillo has applied to renew its license for the following year, since its authorisation is close to expire.

Uranium storaged the 31-12-13 (Kg)

Reactor	In swimming pools	In the temporary warehouse
José Cabrera		95759
Sta. Mª de Garoña	420243	
Almaraz I	580348	
Almaraz II	547165	
Ascó I	499197	27975
Ascó II	516540	
Cofrentes	680139	
Vandellós II	463706	
Trillo	255722	215648

Table 2.7.1..: Uranium storage in Spanish nuclear plants (Source: MINETUR)

2.7.1. New security tests since the collapse of Fukushima plant

After the Fukushima Dai-ichi plant accident the 11/03/11, the European Union Council approved the 24/03/11 that all plants in the UE has to pass a number of stress tests in order to prove its security against natural phenomenon that might occur in extraordinary conditions, similar to the Fukushima one.

Thus, the Western Europe Nuclear Regulation Association prepared a proposal that included the 3 main fields that had to be analysed in order to preserve de security of the nuclear plants:

- Extreme external phenomenon.
- Loss of security functions.
- Severe accidents management.

This proposal was supported by the ENSREG, who advise the European Parliament and the UE Council, as well as it established the deadlines to present the results to the UE Council (deadline was June 2012).

The results were presented in public in the Nuclear Security Conference the 11th and 12th of June 2013.

3. Energy efficiency

To better look at the global Spanish energy efficiency, it is mandatory to take into account the energy intensity of the country, both for final and primary energy:

Energy intensity	Final energy/GDP (TEP/M€ in 2005[9])	% change	Primary energy/GDP (TEP/M€ in 2005)	% change
2000	114,8	1,6%	160,9	-0,2%
2001	116	1,0%	159,1	-1,1%
2002	114,4	-1,4%	159,3	0,1%
2003	117,1	2,4%	159,9	0,4%
2004	117,6	0,4%	162,1	1,4%
2005	116,6	-0,9%	159,5	-1,6%
2006	109,2	-6,3%	153,1	-4,0%
2007	108,2	-0,9%	150,6	-1,6%
2008	103,4	-4,4%	143,9	-4,4%
2009	99,7	-3,6%	137	-4,8%
2010	101,2	1,5%	137,1	0,1%
2011	98,3	-2,9%	136,4	-0,5%
2012	95,3	-3,1%	138,1	1,2%
2013	**92,6**	**-2,8%**	**131,3**	**-4,9%**

Table 3.1: Energy intensity in Spain (Source: IEA)

We can see that energy intensity has decreased since the economic crisis. That is mainly due to the better efficiency gained by most sectors in order to look for a better profitability, since energy costs are high enough to affect it in a huge way.

In 2013 the energy intensity value is the lowest in the last 13 years. It was gained thanks to the change in the electricity generation structure, the bigger participation of renewable energies and the better transformation efficiency gained thanks to the development of new technologies.

3.1. Energy efficiency analysis by sector[10]

Transport is the sector who has the biggest weight of energy consumption in Spain, with a 40% market share. Industrial sector is also important, even though not as much as the transport one (25%). Industrial sector has lost a lot of market share since the credit crisis in 2008, and has been established since then with very low values.

[9] Values referenced to 2005

[10] All information in this chapter is updated until 2012. No data was found from 2013 and 2014.

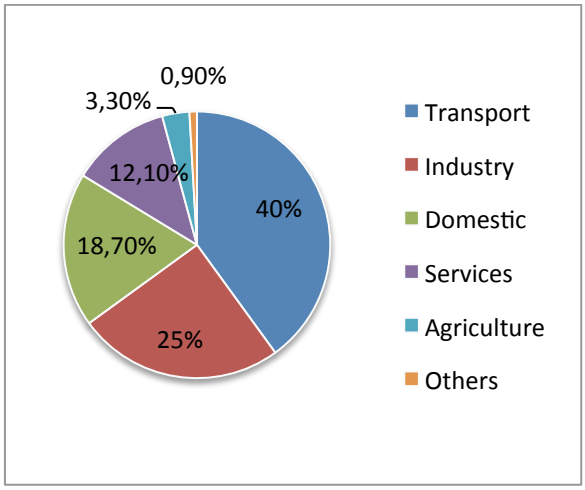


Fig. 3.1.1: Energy consumption by sectors (MINETUR)

Transport and industry have decreased their market share tremendously since the credit crisis. As we can see in the total energy demand tables above, Spain has decreased its value mainly due to the decrease of this two sector (which are experiencing a decrease on its activities).

3.1.1. Industrial sector

In the Spanish industry there are 5 sectors especially energy intensive: no-metal minerals, metallurgy, chemistry, food, drinks and tobacco and paper. Those 5 sectors absorb 76,4% of the total energy demand in Spain, whereas their contribution in the industrial GDP is relatively low (25,5%). This relationship is visible in the following graph, where metallurgic and no-metal minerals Energy Demand/GDP % values are higher than 7%.

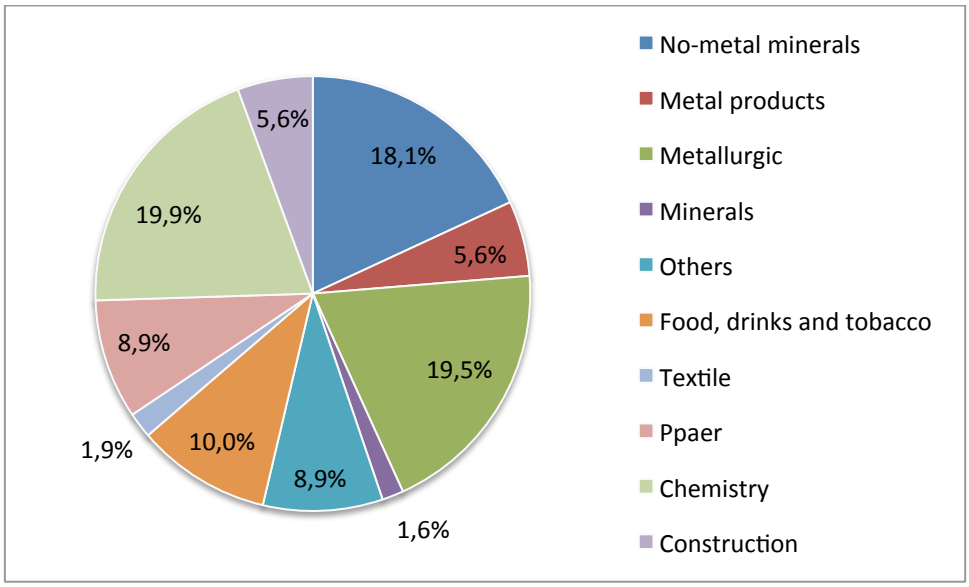


Fig. 3.1.1.1: Industrial sector consumption (MINETUR)

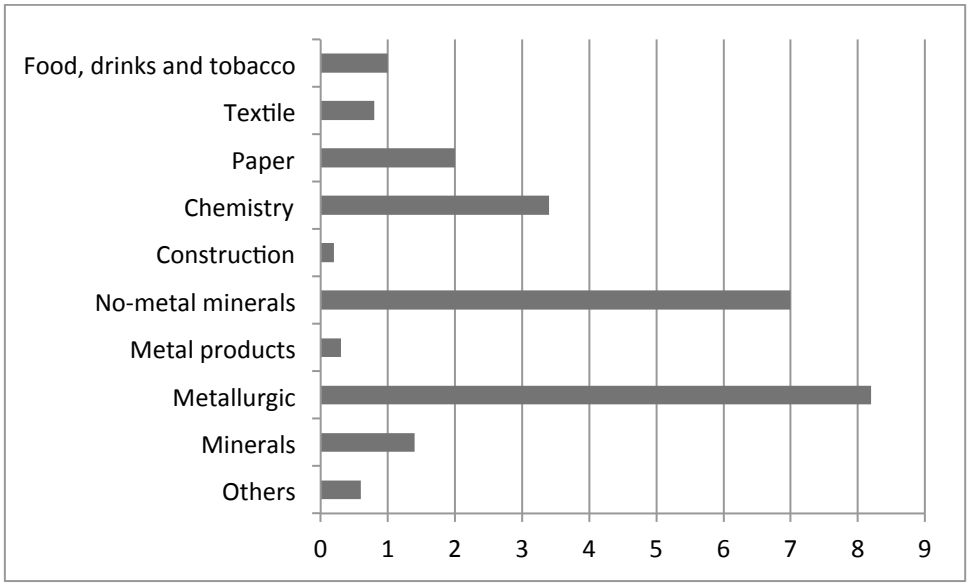


Fig. 3.1.1.2: Energy consumption/GDP in the industrial sector (MINETUR)

This fact explains the relatively high values in terms of energy intensity in the Spanish industry, as well as it explains the higher intensity in the manufacturing industry compared to other countries in Europe.

3.1.2. Transport sector

Transport sector, with a 40% share in final energy in Spain in 2012, keeps its position as the first consumption sector in Spain, even more than the industrial one. Nevertheless, since the beginning of the credit crisis, its demand has decreased year after year, with a total decrease of 4,7% of weight in the total demand (2008-2012 period). This decrease is mainly due to the petrol products demand, since it represents 75,4% of the total demand of the sector. Reductions in transport of goods is established as the main driver of this trend.

Electricity demand in this sector in 2012 decreased 7,4%. This demand is mainly located in the railway transport, which still represents a very marginal percentage of the total passengers and goods transport in Spain, with a 2,4% of this sector's total consumption. However, since the better efficiency perspectives in this sector are real, it is estimated a greater use of the railway transport, supported by the Plan de Acción de Ahorro y Eficiencia Energética 2011-2020, the Plan Estratégico para el Impulso del Transporte Ferroviario de mercancías en España, PEIT, Plan de Ahorro, Energética y Reducción de Emisiones en el Transporte y la Vivienda and the Plan de Infraestructuras, Transporte y Vivienda PITVI (2012-2014).

On the other hand, natural gas and biofuel have increase their demand, which is a good indicator of the government effort to reduce CO2 emissions and to contribute to the use of alternative energy sources.

3.1.3. Domestic sector

Domestic sector demand was 15.503 thousands tep in 2012. That means a 0,8% decrease compared to 2011, mainly due to the contraction of coal (-10,2%), oil (-5,3%) and electricity (-1,3%) demands, who represent almost 60% of the total demand of the sector.

This demand has a similar behaviour to the richness of Spanish households, as we can observe in the following graph, where *Renta Disponible Bruta por hogar* means gross available income per home, *Consumo Privado* means private consumption and *Consumo Energético por hogar* means Energy consumption per home:

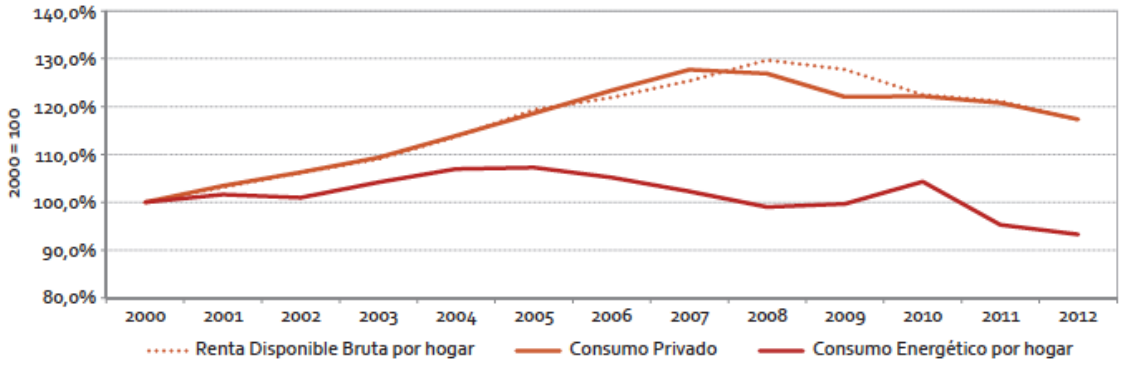


Fig. 3.1.3.1: Domestic sector historical consumption per home and private (MINETUR)

3.1.4. Service sector

Service sector reduced its demand 1,6% in 2012. Inside the sector, must be highlighted the offices and restaurants, with a huge weight in energy demand (54%) and a huge weight in this sector's GDP contribution (74%).

There is a huge factor differentiating the Spanish service sector and the average European, since in Spain this sector consumes more than the average in Europe. This can be explained by the fact that in Central and Northern European countries they cover the service sector consumption with cogeneration and district heating. Apart from that, the kind of service sector dominating in Spain are also high-consumers of energy.

Another important factor in Spain is the lighting of public places such as streets, parks, etc. There is a potential reduction of consumption if low-cost and more efficient systems were implemented (up to a 60-80% reduction).

4. Impact of the energy prices for small and medium size companies in Spain

4.1. Overview

According to the Directorio Central de Empresas (DIRCE), in 2013 there where 3.142.928 companies in Spain registered, from which almost 99,88% were small-medium size (3.139.106). Those small-medium size companies in Spain are categorized depending on the number of employees (from 0 to 249), and are nationally called PYMES (Pequeñas y Medianas Empresas).

The maximum number of PYMES registered was in 2007, but since the credit crisis period, PYMES have decreased both for the economic situation, which make them be unprofitable, or for financial distress problems.

The majority of the PYMES in Spain worked in the Service sector, representing almost 55,6% of the total number of companies. In the industry sector, where energy costs are an important driver of profitability, PYMES represent 99,6% of the total number of companies, and small companies represent 11,83% of the total number, far above the average weight small companies represent on the total number of companies (just 3,6%). That is why small size companies in the industrial sector are important to remark.

Entities without employees	Micro companies (1-9)	Small companies (10-49)	Medium companies (50-249)	PYMES (0-249)	Big companies (>250)
Industry	37,6%	48,0%	2,2%	99,6%	0,4%
Construction	59,4%	37,1%	0,3%	99,9%	0,0%
Commerce	49,7%	47,1%	0,4%	99,9%	0,1%
Other services	55,5%	40,6%	0,6%	99,9%	0,1%
Total	**53,5%**	**42,2%**	**0,6%**	**99,9%**	**0,1%**

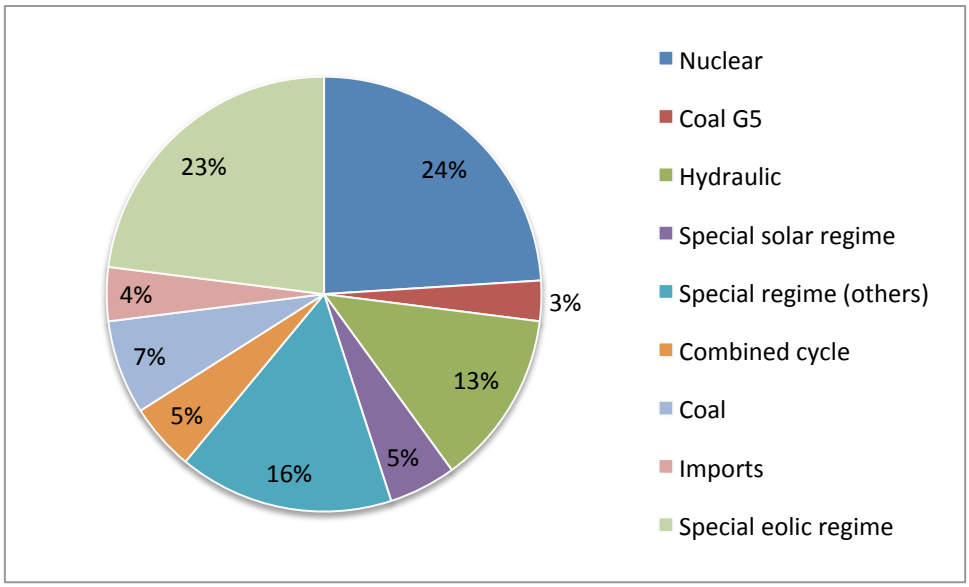
Even though in number of companies PYMES are positioned as a strong leader, we must also see at other economic variables in order to know the importance of this type of companies. In term of employees, PYMES had in 2013 a total of 62,8% of the total employed population in Spain, with still strengths more the importance of those companies for the national economy.

	Micro companies (1-9)	Small companies (10-49)	Medium companies (50-249)	PYMES (0-249)	Big companies (>250)	Total
Employees	4.090.402	2.356.800	2.057.700	8.504.902	5.029.600	13.534.502
%	30%	17%	15%	63%	37%	100%

4.2. The energy problem for small and medium size companies in Spain

The main energy used by PYMES in Spain is the electricity, and it is as well one of the key drivers for its profitability. That is why in this report we will focus our PYMES energy study on the electricity problematic.

In 2014, electricity prices for PYMES was structured as follows: 48% of the bill was due to the energy consumed, 47% of the bill was due to the power contracted and 5% was the electricity fee. We can see that this that better efficiency could be gained if the power contracted was more successfully attributed related to the needs of each PYME, since not all the power is often needed and it is an important weight on the total price paid.



As we can see in the graph above, the majority of the electricity used in PYMES in 2013 was originated in both Nuclear and Hydraulic sectors. Thus, those sectors' performance and prices will severally affect the competitiveness of those companies. Renewable energies are also important in terms of weight for PYMES, but their prices are still not as competitive as the ones coming from the wholesale market. As a matter of fact, in 2013 wholesale market prices were 50€/Mwh on average and renewable prices were 90€/Mwh for the eolic sector, 450€/Mwh for the solar sector and 200€/Mwh for thermal sector.

In order to better understand how the electricity price variations affect PYMES in Spain, we have to first know an important difference between PYMES and big companies: the tariffs charged to both types of companies are different. PYMES are charged with the domestic electricity prices (see values on the Power sector analysis done above) and big companies are charged with the industrial electricity prices (more competitive than the domestic ones. This

difference, as well as the different politic measures done in the last years in order to boost the Spanish productivity and competitiveness, which were mainly focus on reducing the industrial prices and increasing the domestic ones, are making the PYMES situation in Spain unsustainable.

	2003 S1	2003 S2	2004 S1	2004 S2	2005 S1	2005 S2	2006 S1	2006 S2	2007 S1
Domestic electricity price	0,0872	0,0872	0,0885	-	0,0900	0,0900	0,0940	0,0949	0,1004
% change		0,0%	1,5%		1,7%	0,0%	4,4%	1,0%	5,8%
Industrial electricity price	0,0528	0,0528	0,0538	-	0,0686	0,0686	0,0721	0,0763	0,0810
%change		0,0%	1,9%		27,5%	0,0%	5,1%	5,8%	6,2%
% difference	65,2%	65,2%	64,5%		31,2%	31,2%	30,4%	24,4%	24,0%

	2007 S2	2008 S2	2009 S2	2010 S2	2011 S2	2012 S2	2013 S2	2014 S2
Domestic electricity price	0,1004	0,1835	0,1828	0,1637	0,1674	0,1348	0,2500	0,2671
% change	0,0%	82,8%	-0,4%	-10,4%	2,3%	-19,5%	85,5%	6,8%
Industrial electricity price	0,0663	0,0917	0,0926	0,0980	0,1055	0,1120	0,1963	0,2201
% change	22,2%	38,3%	1,0%	5,8%	7,7%	6,2%	75,3%	12,1%
% difference	51,4%	100,1%	97,4%	67,0%	58,7%	20,4%	27,4%	21,4%

This table shows perfectly how PYMES were dramatically punished by the increase in prices during the after credit-crisis period. As we can see, the difference between domestic and industrial electricity prices was low before the credit crisis period (from 2005 to 2007). Nonetheless, once the credit crisis appeared, the power sector decided to face its profitability problems punishing the domestic electricity price with value far way above the industrial electricity price, pricing domestic electricity in the second semester of 2008 twice the price of the industrial one. We must also remember that big companies have economies of scale by which they gain competitiveness compared to small and medium companies, which is another factor that weakens more PYMES position on the panorama. Those factors provoked many PYMES to face even deeper profitability problems apart from the once implied by the consumption decrease in that period, making them be totally uncompetitive against big competitors in Spain or other international PYMES importing products in Spain. Thus, many PYMES had to declare bankruptcy and Spain faced a big decrease of PYMES during the after-crisis period. Representing more than 99% of the total companies registered in Spain, as well

as employing more than 60% of the total employed population in Spain, we can infer that Spain did not pursed the best strategy in order to boost its productivity and to help the country overcome the situation.

Nowadays, the strategy changed. Domestic electricity prices now represent even smaller values compared to the industrial one and make PYMES more competitive than before, even though survivors of the energy price punishment are still getting out the stress situation they suffered. This strategy is aligned to the Spanish objective to expand PYMES production and importance on its economy, although the solution may have come too late for some important players in the PYMES market.

4.3. Opportunities coming from a better energy framework for PYMES

There are three main aspect where a better energy framework for PYMES would favour their future development:

- Boost the bottom line: since energy costs will be reduced, they will have more cash available to invest in new projects or on its own company, getting the chance to expand their business and increase the bottom line values in the future.
- Tailoring products and services and aligning energy costs with the PYMES' business cycle: a better coordination of energy costs as well as an efficient tailoring on those products and services provided by energy companies may lead to a more efficient company structure.
- Help PYMES to attract customers: related to the first point, a fewer expenditure on energy consumption may lead to a higher investment on promotion, advertising, range of products, etc. that will definitely expand the business and give more opportunities to the companies.

Apart from these main point, the UNEP pointed out some other benefits coming from saving energy in small and medium size companies. Direct benefits were:

1. Reduced operating costs.
2. Reduced risks through decreased dependence on volatile and rising energy prices.
3. Increased energy security.
4. Improved reliability of equipment and manufacturing processes.
5. Better positioning in production chains.

On the other hand, there are some indirect benefits linked to energy efficiency measures in PYMES, such as:

1. Internal effects on the employees and their working environment.
2. External effect: by the improved image of a company's management.

Nonetheless, some PYMES do not want to improve its energy efficiency. Even though it may sound weird, there are many reasons that rationally explain that fact:

- Lack of knowledge and expertise in the area of energy efficiency.
- Lack of awareness about the benefits of energy efficiency.
- Poor use of information, tools and training available.
- Lack of financial and human resources.
- Poor long-term planning.
- Environmental behaviour is usually motivated by environmental legislation and public pressure.

That is why Spain must fight to solve those issues that make PYMES not be eager to pursue energy efficiency measures.

A better price tariff offer, as well as an improved efficiency on PYMES will definitely lead to a better competitiveness of these kind of companies, fundamental for the Spanish economy nowadays.

5. Energy intensive industrial sectors analysis

5.1. Overview

According to the research papers, the sector most affected by energy price changes are the energy intensive industrial sectors, such as the paper, plastic, glass, metal, rubber and vehicle sector. Due to that, we would like to study in this thesis the real impact of historical price changes taking into account periods before and after the credit crisis.

Since the electricity liberalisation happened at the end of the nineties, none-representative data regarding electricity prices appears before the 2000. That is why in our study we just considered the impact in the last 14 years (from 2000 to 2013). In order to value the effect of energy prices variance on those industries (and also the Spanish industry as a whole), we run a multiple linear regression, and we will explain the methodology below.

5.2. Methodology[11]

We took the data regarding the most representative economic variables for the following sectors, in order to have a representative sample of energy intensive sectors:

- Spanish industry
- Paper industry
- Chemical industry
- Rubber industry
- Plastic industry
- Glass industry
- Metal products
- Metal foundry
- Vehicle industry
- Vehicle's pieces industry

The most representative economic variables are the following:

- People employed
- Turnover
- Total revenues
- Total costs

[11] All data comes from INE website (Instituto Nacional de Estadística) and EUROSTAT

Since not all the different sectors need the same amount of each kind of energy, we have also studied which types of energy consumed each sector from 2000. After having the corresponding weights on each kind of energy (coal, oil, electricity and natural gas)[12], we took the average weight for all the historical data. This weight will be multiplied by the price changes in order to leverage the impact of each energy's price change on the multiple linear regression.

Then, we took all the price data that appears in this thesis on each sector analysis (coal, oil, power and natural gas) and we took the percentage changes for each year since 2000 until 2013. We must remark that the electricity prices taken were the industrial ones, since we consider that all the economic data is better represented by big companies rather than PYMES[13]. As we mention above, all energy price changes are multiplied by the weight each energy has on the sector in terms of historical consumption.

Finally, we take the economic variables as the dependant variable in the multiple linear regression and the x-values are all the energy prices variations weighted by the historical consumption of each sector.

We will consider a p-value below 0,05 (5%) as the limit to value the energy price change as representative for the economic variable. We will also consider values below 0,1 (10%) as remarkable and close to be representative (since historical data is not long enough and those values could better adjust if the sample were bigger).

5.3. Results analysis

5.3.1. Spanish industry

We can notice that the correlation coefficient is above 0,64 for all four economic variables, which means that the linear regression is quite important.

Apart from that, we can see that the strongest correlation is the electricity price change, since the p-value is below 5% on turnover, total costs and total revenues variables. That means that the electricity price change is representative and does affect to those economic variables in the Spanish industry. Nonetheless, the effect is positive for turnover and total revenues (two variables very linked) and negative in total costs and people employed. That means that a better perspective on energy prices will mean better industrial perspectives in Spain in terms

[12] Other types of energy are not considered due to the lack of historical information (renewable energies) or for lack of importance in terms of weight.
[13] Remember that PYMES are charges by domestic electricity prices.

of employment and costs (since the coefficient is negative in employment, meaning that an increase in electricity prices implies a decrease in employment, and is positive in costs, meaning that an increase in the electricity price implies an increase in costs), totally in accordance with what was stated in this thesis. On the other hand, when electricity price increase seems that affect positively both turnover and total revenues, and that can be explained by the fact that those periods where electricity price changes increased, the consumption also increased and the market was in an expansion period, even though the total profit was negatively affected by this price increase (since costs are negatively correlated with this increase as we explained before).

We must remark that people employed is not affected by any type of energy, and that natural gas is very close to be representative in total cost and revenues structure of Spanish industries according to our model.

5.3.2. Energy intensive industries

5.3.2.1. People employed

In terms of people employed, we can see that electricity plays an important role in paper, rubber, plastic, chemical products, glass, metal foundry and vehicle industries. People employed is a variable which indicates perfectly how the industry is performing, and since the electricity coefficient is negative in all cases, that means that an increase in the electricity price is directly translated to a decrease in employment in those industrial sectors.

Natural gas and coal have in two cases an either representative or close to be representative p-value in the model. Apart from that, the coefficient appears to be positive, meaning that an increase in coal and natural gas prices implies an increase in employment. It makes no sense at all and will be consider as outliers in our model, but further analysis may be needed to totally understand this behaviour.

5.3.2.2. Turnover

In this case, the model implies that electricity price increasing are directly translated into higher turnovers. Coal is representative in one case also with the same behaviour, while natural gas appears to be representative in some sectors with a negative coefficient. That may be explained by the fact that during periods where electricity and coal prices increased, those sectors were expanding and increasing their turnover fast. Nonetheless, natural gas price changes affected negatively to some sectors, decreasing the amount the turnover accounted during the 14-year period.

5.3.2.3. Total revenues

Total revenues had a similar behaviour than the turnover. That is perfectly explained by the existing relationship between both values, so the same analysis is made for this variable.

5.3.2.4. Total costs

This is the most critical variable in our model. Since costs are the closest variable to the energy price, its analysis will give us the better vision of how energy price changes truly affect the different energy intensive industrial sectors in Spain.

Our model is so clear regarding this variable. In almost all the sectors the electricity is a representative variable with a positive coefficient, meaning that a price increase in electricity implies an increase in costs. That gives a stronger reason to all the points stated in this document where the author assumed that a more competitive energy price framework in Spain would favour industry development, and thus the Spanish economy as a whole.

We can see in some cases that coal has the same behaviour as electricity, whereas natural gas has the opposite behaviour, but just in some sectors.

5.3.3. Conclusions

As we can see in the analysis above, the Spanish industry is strongly affected by energy price changes, mostly driven by electricity price changes (since this is the most consumed energy). This effect is very representative in both people employed and total costs. Those are the most important variables in order to look the industry performance, since revenues and turnover do not explain anything about the global structure of the sector.

A better energy price framework (positioning the electricity price framework as the most important one) in Spain may favour the development of the industry, favouring the most those energy intensive industries, and our model sustains this theory.

6. Future of the Spanish energy sector

The last credit crisis in 2008 generated not only an important atmosphere of distrust among investors, but also a more difficult access to primary resources. Due to that, a change of the energetic model was pursued during the following years after the credit crisis.

This change of model required a more efficient structure of consumption. Thus, economic and financial policies were designed in order to create the adequate conditions to develop new projects and technologies.

Even though during these years the European agreements have successfully established a more reliable network and have boosted investors' interest to invest on the sector, geopolitical tensions in energy-producer territories has generated a new atmosphere of distrust, thus creating instability in prices and access to the infrastructures. In fact, some countries, like China and India, have increased employment in the coal sector, making this sector less volatile and increasing coal availability in the market compared to other type of fossil fuels.

In Spain, this change of model was done in both production and consumption models. A National strategy was begun with the following main objectives:

- Secure the supply (in order to cover the demand).
- Environmental quality with the emissions.
- Energy and economic sustainability.

After looking at the situation and the main drivers to future development, different associations, including the well-known OPTI foundation, have established the main future drivers in order to develop the energy sector in a stable environment and assuring its future sustainability in the Spanish market.

6.1. Main drivers in the last 7 years

6.1.1. Road to the new energetic model

The main objective of this model is to secure the supply in order to cover all the necessities of the Spanish population. Even though during the last 7 years this objective has been perfectly accomplished and the energy network in Spain has become more competitive, further developments are needed, since demand is estimated to increase every year.

Insights in this new model will be exposed in the following points, but it must be highlighted that a global model must be built in order to keep the sector robust enough.

6.1.2. Network and demand management

Strategies of international collaboration and the investment efforts during the last years have boosted technologies regarding storage, renewable energies integration in the system and the integration of the electric vehicle in the urban mobility. That has contributed in a change in the network and demand management. The most important change in this management has been the inclusion of consumers on their own energy management. Electricity, for example, is not just a product consumed nowadays, it is a good from which different agents take profit.

A better demand management has to allow its consumers to adjust their power contracted to their real needs. Thus, a better forecasting of total and peak demand must be pursued and adopted in the system in order to make it more efficient. In Spain, a huge change was made in order to better allocate the energy supply to the real need of consumers. Intelligent counters of electricity consumption were installed in order to know the network conditions in real time.

Regarding network management, intelligent networks such as Smart Grids have allowed important reductions in huge investments made in the sector, in costs from errors in the system and in costs of production. Furthermore, this intelligent networks have increased the reliability of the system thanks to the auto-diagnose systems integrated on them by which errors and losses are better detected. Due to that, it is so important to further develop smart networks from which not only the consumer but also the producer will take profit and will gain more flexibility and a better individualized service.

Finally, we must also remark storage technologies. This technologies must be developed in order to storage the maximum amount of energy necessary to cover the demand in the more efficient way possible. During the last years, this technology has been one of the most important themes in all energy sectors, but there is still a huge path to walk in order to take the maximum profit of it.

6.1.3. Fossil fuel technologies

New technologies in extraction, transports and production of fossil fuels have increased the sustainability of the available deposits. Apart from that, exploratory surveys have increased 35% its accuracy, allowing to arrive to smaller size deposits and even deeper than before.

Natural gas demand has been established in a constant way, after the humongous increase at the beginning of the century. Apart from the developments in the natural gas sector, there

have also appeared new types of resources such as biogas and the vehicular natural gas as a more competitive resource in the transport sector.

Finally, we must not forget the huge efforts made in this sector's technologies regarding low-emissions of CO2.

6.1.4. Renewable energies

Renewable energies sector has been an important driver of economic growth and development in the last years, both for the increasing production and for the number of people it employs.

Nonetheless, big efforts and governmental action have been undertaken in the last years in order to maintain this situation. Due to the credit crisis, renewable energies sector faced problems to finance its activities, mainly because the profit periods were in the long-term and not in the short-term (and that is why investors were reluctant to risk their money on this kind of project in a period where the financial situation was uncertain.

Eolic energy is the most developed renewable energy in Spain, both for competitiveness and for capacity installed. It has covered in 2014 close to 30% of the national electricity demand. Solar energy was forced to stop its development after the credit crisis due to the decrease in political subsidies for the sector. Nonetheless, developments in technology have made it the second biggest renewable energy in Spain, covering almost 15% of the electricity demand. Finally, thermal energy has also gained importance, covering almost 5% of the demand.

6.1.5. Smart cities

The incorporation of renewable energies in buildings has grown in the last years, due to both new regulation and legislation in construction. That has lead a bigger interest in how to develop the future cities in a more efficient way, and locating the energy sector as the main driver to undertake this efficiency.

6.2. What to do in order to develop the energy sector in Spain for the near future

In order to develop the energy sector in the near future it is necessary to not only elaborate a national energetic frame, but also create an efficient industrial fabric. Thus, we have split those actions to be undertaken in 4 different blocks:

- Regulative actions
- Industrial fabric development actions
- Products and services development actions
- Broadcasting, education and consciousness actions

6.2.1. Regulative actions

- **Promote new regulative actions in order to promote energy efficiency:** energy efficiency is a fundamental factor in order to both reduce CO2 emissions and decrease energy dependence in fossil fuels, thus making the energy sector more secure. That point might include the future development of smart cities as well as the introduction of high-efficient technologies in productive equipment all over the territory.
- **Development of a national energetic frame:** with this new frame there are three clear objectives that must be accomplished. The first one, guarantee a save energy supply all over the country. The second one, improve the competitiveness of the sector, by which both industrial and service sectors will gain competitiveness compared to other European competitors. Third, gain a sustainable competitiveness with a sustainable environmental impact.

  Spain has been working on it during the last years, and some national Plans have been established or are under development in order to establish this new energetic frame, such as Plan de Energías Renovables 2011-2020, Planes de Acción 2008-2012 y 2011-2020 de la Estrategia de Ahorro y Eficiencia Energética en España (E4), Plan de Activación 2008-2011 and Planificación de las infraestructuras de transporte de gas y electricidad 2012-2020, among others.
- **New ways to finance the development of low-CO2 emission technologies:** CO2 emissions are an important driver for the future development of the sector, as it has been mentioned above. Due to that, in order to accomplish the limited emissions objectives established by the European Commission, and also under the current limited financing available for this kind of projects, new subsidies or alternative ways to finance those activities must be under study for the following years.

6.2.2. Industrial fabric development actions

- **Aids for the internationalization of the sector:** internationalization is an important driver not only for the energy sector but also for the industrial sector in Spain. In a global world where cost-saving and impact on different markets are as important as the productive activities of the company, establish operations abroad is mandatory for all companies who are eager to boost its competitiveness in the future.
- **High-qualified professionals:** Spain has been in the last 7 years a huge exporter of talent, since high-qualified students have not found any job-opportunities in the country and have travelled abroad in order to find them. Due to that, Spain is facing

nowadays a lack of high-qualified professionals by which energy companies sustain their business. That is why a national change must be made in order to keep this talent in the country and take profit of it in the national companies running in Spain.

6.2.3. Products and services development actions

- **The Spanish brand as a reference in renewable energy:** since Spain has a very important position in the renewable energy sector, it must preserve this reference position and further develop it in order to gain competitiveness in Europe and be able to export its capacity and its model to other countries in the future.
- **Electric vehicle:** Spain is an important producer of vehicles. Many international brands have their productive lines operating in Spain, and thanks to that Spain is a very important country in terms of vehicle technology. Mixing its competitiveness in this sector and its competitiveness in the renewable energy one, Spain could gain a leader position in electric vehicle production. Since Spain is not only a huge producer of vehicles but also a huge producer of parts for the vehicle (a totally separated industry but important for the technology they create), it has the perfect industrial mix to undertake it.
- **Incentives for companies in the energy sector:** new regulative actions must be undertaken in order to help companies in the sector to boost its competitiveness and take profit of all the other measures stated in this part of the thesis.

6.2.4. Broadcasting, education and consciousness actions

- **Educate the population:** as we have seen in many energy sectors such as the power and the nuclear ones, population is a very important factor due to its criticism and the consequent government actions. Due to that, a better education on energy must be undertaken in order to align the national objectives with the population. Employment, efficiency and price are established in this thesis as the main drivers to convince the Spanish inhabitants of the importance of the future development of the energy sector and the positive effects of this development to the country as a whole.
- **Energy saving:** technology is not the only factor important to reduce emissions and to make the energy more efficient. Final consumers are the ones who decide how to consume their own energy, and a better education in energy-saving strategies is vital in order to develop the future of the energy sector in Spain.

7. Conclusions

This thesis has been mainly focused on the Power and Natural Gas sectors in Spain, looking deeply in the market structure and the main economic values of them, as well as their evolution.

The liberalisation of the Spanish market has made it a more competitive market in terms of distribution and production offer, but not a competitive market in terms of price. In addition, the fact that Spain is established as a net importer of energy, has positioned the country as an inefficient country in terms of energy compared to other countries in Europe. Those properties, added to the critical moment the industry in Spain is facing since the credit crisis, have created a very unstable environment both for investors and consumers during the following years after the crisis.

Nonetheless, government efforts in order to stabilize the situation as well as the European regulative changes in the last years have made the situation less uncertain. Further development is needed in order to make not only Spain less dependant on imports, but also other countries in Europe where energy plays an important role in the economy.

The power sector has well-established agents on all its network. There is a competitive market in terms of production and electricity supply, even though the transport of this energy is a monopoly controlled by Red Eléctrica de España. Even though this monopoly would seem inefficient, has worked properly since the beginning of the 80's.

Although the peninsula seemed to have less alternatives in terms of switching the type of energy (from electricity to gas or to oil, for example), the Islands (Balearic and Canary) are two main points of importance due to the radical changes they have experience in the last 5 years regarding energy origins. As a matter of fact, the Balearic Islands base its electricity production on coal and oil products, but yearly variations on demand are seemed to be remedied by an increase in oil products consumption. It is important to remark as well that Especial Regime demand is highly supplied by the renewable energy sector in both territories. That is why those regions must be further studied in order to establish the most efficient solution for them.

The natural gas sector has also well-established agents on its network. Nonetheless, it has suffered drastic changes during the last 5 years mainly due to the shale gas revolution begun in the U.S. Spain, as a net importer of natural gas, has small bargaining power on the full chain, but international agreements and European actions can make its situation less uncertain. It

must be said as well that cogeneration is playing an important role nowadays, and Spain must be careful taking a competitive position on it.

On the other hand, the energy sector continues gaining importance for environmental issues, since this factor has been established as critical in the last years. New technologies, apart from looking for efficiency, are also incentivizing a fewer impact in the biosphere. Spain is a very remarkable exponent of this renewable energy trend, and since the beginning of the millennium it has fought to preserve a leader position on this market. Nowadays, the electric vehicle is being studied as a very sustainable alternative to the traditional fossil fuel vehicles in order to both prevent the impact on the environment and avoid the use of fossil fuels (thus making countries less dependant on fossil fuel imports). Spain, with a well-established network of vehicle production plants and huge R&D centres all around the country regarding car technology, can take advantage of its current competitiveness to become a leader and create value not only in GDP terms but also in employment, a very critical factor in the Spanish situation.

With our specific analysis, we have seen that the Spanish industry is negatively affected by energy price changes, with the power sector as the main driver of this effect. A better energy price framework will certainly favour the industry, and will also help those energy intensive sectors to further develop their operations. Regarding the PYMES analysis, we have seen that charging them with domestic electricity price has made them lose competitiveness against bigger players and other international PYMES. That is directly translated in a negative effect in the Spanish economy, since it is mainly sustained by those PYMES (more than 99% of total enterprises in Spain are PYMES). A better regulative situation and further study on how to develop those small and medium size companies will certainly help the Spanish economy to expand and gain competitiveness not only in Europe but also globally.

Last but not least, we have observed that the energy sector is strongly criticised by both media and inhabitants all over the world. A better education highlighting the importance of preventing the energy sector to collapse must be undertaken, since not only the Spanish economy is dependant on it (locating the industry as the weaker player of it), but also individual households whose monthly energy cost represents a huge part of their salary. That is why consciousness of both the importance of investment in the sector and the importance of self-awareness of individual consumption and actions must be established in the Spanish mentality.

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