

Energy transformation under the pressure of austerity: the case of Spain

Bruno Estrada López

Introduction

Energy transformation in Spain is facing serious challenges due to a number of factors. Although in the first decade of the millennium Spain has made significant progress in transforming its energy generation system away from fossil fuel based energy dependency towards renewable energy, this process has lost momentum and turned into its reverse. In this chapter we examine the background, the most important pressures and the most likely causes of this reversal. The first section delivers a diagnosis of the major problems and weaknesses of the current system of energy generation in Spain, based on the case of the electricity market. Section two examines distributional measures between different consumer groups to balance the effects of high electricity prices. Section three takes a look at the incentive system for renewable energy generation and its recent changes. In the fourth section we provide an overview of the effect of austerity policies, regulatory changes and their impact on clean energy investments. Section five provides an overview of the evolution of employment in the Spanish renewable energy sector.

Finally the author draws his conclusions on the effect of austerity policies and the related regulatory changes on the process of energy transformation in Spain.

1. The regulatory framework applicable to the electricity system in Spain

The Spanish energy sector is characterized by high vulnerability and several major weaknesses. The Royal Decree Law of the government (RDL 13/2012) that aimed to launch measures to balance cost and income deviations in the electricity and gas sector, identified the four most important ones, as follows:

- 1) The high costs of the system;
- 2) A high level of external dependence;
- 3) Uncertain access to resources and exposure to price volatility;
- 4) High environmental impacts of the energy cycle.

In the next sections we provide a more detailed analysis about these vulnerabilities.

1.1 High costs of the system

This section refers to the electricity market alone. The national prices of fuels are determined by international oil and gas product prices and by the taxes levied. I shall not refer here either to the renewable energy generated from biomass, the final use of which will be biofuels or energy for domestic uses (heating, refrigeration and production of warm water) and the generation of heat for industrial processes.

The prices of electricity, gas and other fuels increased over the 2002-2012 period by more than 80%, basically on account of the strong increase in the oil price, whereas the rise in the general Consumer Price Index over the same period was 30%. The significance of energy costs in the Spanish economy is evident when we bear in mind that energy production and imports represented 12.8% of GDP, according to the latest 'Input/Output tables' of the Spanish economy drawn up by the National Statistics Institute in 2007.

The current regulation of the Spanish Electricity Sector, in force since 1997 (LSE 54/97), has one of its principal supports in the electricity spot market, the design of which is somewhat peculiar: electricity prices are a combination of market and regulated prices, with the latter complementing the former. The electricity generation market is composed of several forms of electricity supply generated from plants characterised by very different technologies and costs.

The system does not adequately cover the costs of some necessary forms of electricity generating plant. For this there are several reasons, the main one being the limited availability of primary energy resources in Spain and the different balance between positive and negative externalities presented by every generation of technology. While in some cases the system fails to cover the costs of plants, in other cases, as we will see, it more than covers them.

According to this regulation, electricity consumers in Spain can buy electricity through either the Regulated Supply (only customers with a power set-up between zero and 10kW actually have the choice) or the Liberalized Supply.

Table 1 Electricity prices in Europe (2011; €/kWh without taxes)

Country	Less than 20 MWh	More than 20 MWh
Italy	0.240	0.102
Slovakia	0.196	0.102-0.09
Czech Republic	0.184	0.101-0.096
Ireland	0.165	0.076-0.068
Spain	0.164	0.075-0.05
Belgium	0.163	0.074-0.067
Germany	0.162	0.071-0.072
Sweden	0.160	0.071-0.067
Poland	0.154	0.076-0.078
The Netherlands	0.148	0.07-0.067
Greece	0.134	0.069-0.057
Denmark	0.108	0.079
Portugal	0.106	0.066-0.061
France	0.105	0.064-0.056
Finland	0.088	0.058-0.056

Source: Ministry of Industry, Energy and Tourism 2014.

Spanish electricity prices are in the medium-to-high band within the European Union. When the government recognizes that electricity prices are high in Spain, it is referring only to small consumers, as can be seen from Table 1. Most electricity consumers – 95.2% of them (almost 25 million to be precise) – have recourse to the Regulated Supply. The government fixes the rate for these consumers, called as Rate of Last Choice (TUR).

Only five companies, which are subsidiaries of the Five Big electricity companies in Spain (Endesa, Iberdrola, Union FENOSA, Hidrocantabrico and EON), are allowed by the government to commercialize their electricity using the Rate of Last Choice (TUR).

The prices for big consumers are lower, and very similar to the rest of European countries, due to the government concern that electricity should not be a factor that will adversely affect the competitiveness of Spanish companies.

Electricity systems using more than 10kW of power (fundamentally companies) are obliged to use the Liberalized Supply. These customers until now amounted to approximately 1,250,000. The government regulates only a part, approximately 30%, of electricity prices on the Liberalized Supply, the so-called Rate of Access. At the present time 27 companies have been authorized as suppliers; many of these are subsidiaries of the Five Big energy groups.

In October 2012 due to the rising prices of domestic electricity in a context of low wages and increasing unemployment, thousands of small consumers, approximately 400,000, previously in the TUR, decided to join together to form a Consumers' Association to participate in an energy auction. Should the price offered by the auction be more favourable than the TUR rate, the consumers will have to change their supplier company.

Two elements determine the price of electricity for the majority of consumers: the CESUR (Energy Contract for Supplier of Last Choice) quarterly auctions in the liberalised sector (production and marketing) and the additional costs of the part regulated by the government.

The most important problem is located in the CESUR auctions. These set an unrealistic level of electricity cost for certain installations because the lower-cost generation technologies (hydraulic and nuclear, with their investments having been written off) receive a 'shocking' premium, as stated by the National Association of Photovoltaic Energy Producers (ANPIER) (Energy News, 2014).

The price fixed by CESUR is determined by the production costs of the latest generating technology built into the system in order to be able to meet demand levels. In other words, if the latest technology meets 1% of expected demand and the cost of production is 50 euros/MWh, all the MW used for the rest of demand are paid at the rate of 50 euros/MWh, whatever the cost of generation may have been.

Most of the nuclear power plants in Spain belong to two electricity companies: Endesa (Asco I, 85% Asco II, 36% of Almaraz I and II, 72% Vandellos II, 1% of Trillo) and Iberdrola (Cofrentes, 28% Vandellos II, 53% of Almaraz I and II, 15% Asco II, 49% of Trillo). Gas Natural FENOSA have minority shareholdings in Trillo (34.5%) and Almaraz I and II (11%) and HidroCantabrico Energía in Trillo (15.5%).

The most important hydroelectric power plants belong to Iberdrola and, to a lesser extent, to Endesa.

This regulated pricing system – with partially liberalised costs and a premium for some technologies – has given rise to a piece of accounting nonsense known as “tariff deficit”, in other words, the difference between the electricity supply cost and the electricity tariff, which is lower in many cases. This “tariff deficit” has generated a “false” consumer debt with electricity companies totalling 26 billion euros. As a result of the financing needs due to the gap between cost and prices, electricity companies have issued debt. As price-setting is decided by Government, electricity companies have found a way to get the State to guarantee their debt. With such a high level of government liability linked to the energy sector, this sector was of necessity directly affected by the shockwaves of the Eurozone crisis. Correspondingly, austerity policies had a direct effect on the entire energy system, in terms of both the incentive and the redistribution mechanism.

1.2 Great external dependence

Analyzing the evolution of the Spanish current account balance over the last decade we note that the usual deficit is fundamentally caused by energy imports. It is the high external energy dependence of industrial activities and services – mostly in the transport sector – that explains the external structural imbalance of the Spanish economy, and not wages.

The Spanish balance between imports and exports of goods and services has usually been negative. The high surpluses linked to the tourist industry do not compensate for the balance of goods deficit. In any case, the coverage rate (export/import ratio) remains around 70%-80%; in other words, export incomes covered around 70-80% of import expenses. However the coverage rate dropped by almost 60% during the years of high economic expansion. How can this be explained taking into account export trends? The problem was not exports but imports. The dynamism of imports can be explained mostly by the need for energy goods. These grew at an average annual rate of 8.7% between 2000 and 2011 compared with 2.7% for non-energy goods.

According to Eurostat methodology, the Spanish external energy dependence index was 75.6% in 2011.

Although the trade deficit dropped by 33.6% in 2012, compared with 2011, it reached nearly 31 billion euros (3% of GDP) according to Spanish Central Bank figures. Nevertheless, energy imports continued to grow over the same period. Thus in 2012 energy imports increased to reach 18.4% of total imports with a value of 46.6 billion euros (150% of the total trade deficit). This means that the trade balance (without energy goods) shows a surplus.

Table 2 Energy imports/ total imports 2009-2012 (billion €)

	2009	2010	2011	2012
Total imports	206.1	240	263.1	253.4
Energy imports	23.6	30.5	38.9	46.6
% of total	11.4%	12.7%	14.8%	18.4%

Source: IEA 2014.

Energy imports, accounting for 4.6% of GDP, hinder the current account balance and, as a result, the ability of Spain to reduce its foreign debt, as indicated by the ECB in its monthly bulletin of January 2013 (ECB 2013). According to IMF calculations, stabilizing the level of foreign debt requires that the deficit in the current account balance should not exceed 2% of GDP. Therefore, a policy aimed at reducing the high energy dependence would reduce the trade deficit and external funding needs of the Spanish economy.

The reasons for the predominance of oil and gas in the Spanish energy supply, and the real causes of the lack of any real impetus for the transition towards renewable energies, are to be found also in the collusion of interests between a part of the dominant political class, regardless of their political orientation, and the energy oligarchies present in Spain over a period of several decades. It is striking to note the presence of numerous former government officials, starting with two former Prime Ministers and two former Ministers of Economy, from the last days of Franco up to the present, on the boards of directors of the main Spanish energy companies – companies whose profits, it should be remembered, depend on public regulations and investments. Ultimately, these companies depend on decisions that, actively or passively, have been taken by those politicians now placed on their boards of directors. See Appendix.

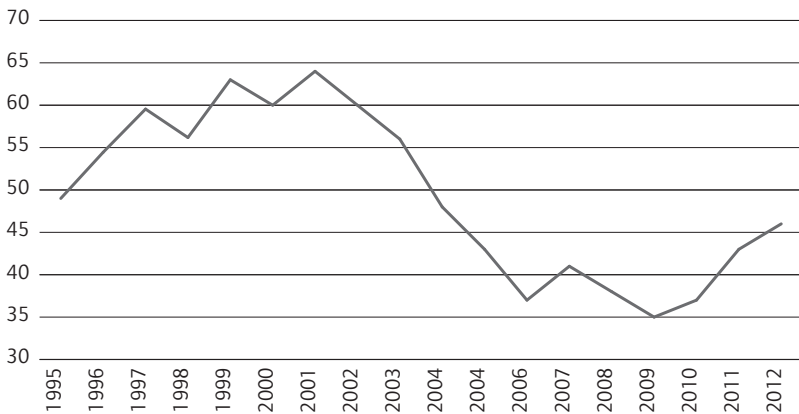
1.3 Uncertain access to resources and high volatility in energy prices

The high Spanish energy dependence on imported fossil fuels, and the limited Spanish ability to influence producing countries (the importers of petroleum products have a small relative size in the global scene) means that Spain experiences high uncertainty over energy resources and price variability resulting from changes in international oil prices.

Gas imports are an exception because since 1975 supply agreements between Spain (Enagas and then GasNatural) and Algeria (Sonatrach) have been reached for long periods of time. The 1975 agreement was for 20 years.

Algeria is the leading supplier of natural gas, accounting for 42.5% of Spanish gas imports in 2011. Figure 1 shows the significant decline of the weight of Algeria in Spanish gas imports in the early 2000s, from about 65% in 2001 to 35% in 2009, as a result of a policy of supply diversification to suppliers such as Nigeria, Qatar and Trinidad and Tobago. The recovery of Algeria's share of supplies in recent years is explained by the need to respect the long-term contracts and by commencement of the Medgaz submarine pipeline operation in 2011. This means a reduction in spot market purchases at lower prices.

Figure 1 Spanish imports of Algerian gas, 1995-February 2012
(% of total gas imports)



Source: IEA 2014.

Long-term contracts for gas supplies, aimed at ensuring security of supply for important consumers and for our electrical system have resulted in a rise in prices, i.e. the ‘tariff deficit’, as denounced by the Renewable Energy Foundation, which attributed these long-term contracts to the disastrous gas planning adopted in 2002.

1.4 High energy cycle environmental impacts

The high Spanish energy dependence on fossil fuels means that the carbon footprint of the country’s energy sector is very high. In 2007, according to the Sustainability Observatory, emissions of greenhouse gases (GHG) from energy processing accounted for 78.1% of Spain’s total emissions.

2. Measures to balance prices between different social groups

The pricing systems we have described result in a transfer of income from small consumers, who pay more for their electricity, to large consumers. While Spain is among the countries with a medium-to-high electricity price for small consumers, this picture changes dramatically when we look at large energy-intensive companies. For consumers of over 150,000 MWh electricity is cheaper in Spain than in any other country in Europe with the single exception of Bulgaria. This higher premium paid by small consumers is due both to the additional costs represented by fees defined by the government and to the design of a pricing system based on quarterly auctions that bring excessive rewards to some installations.

Expenditure on domestic energy in Spain is substantially lower than in the countries of central and northern Europe because, due to the different climatic conditions, people need to spend less on heating their homes. On average in the period 2006-2010 such spending represented only 5% of the annual net income of an average family, but this percentage is growing quite rapidly; in 2007 it was 4.3% and in 2010 5.8%. With the aim of protecting the most vulnerable groups among small consumers, the government, on 1 July 2009, agreed on the introduction of the Discount Rate (*Bono Social*) and the Social Tariff (*Tarifa Social*). In the case of the Social Tariff, the contracted power is free of charge. In the case of the Discount Rate the current rate was frozen at the time of commis-

sioning of the TUR (Last Choice Rate) until 2012. The Discount Rate is applicable for a period of two years. To continue to benefit from it, the beneficiary must continue to meet the qualifying conditions and, if this ceases to be the case, the company must be notified. The government estimated that about 5 million consumers would benefit from this arrangement. According to a study entitled 'Energy Poverty in Spain', conducted in the framework of the REPEX project, the number of people living in households suffering fuel poverty was about four million in 2010 (Herrero *et al.*, 2012). The updated data is expected to show a substantial increase in this respect. In order to define energy poverty, this study takes into consideration two criteria: households that spend more than 10% of their income on energy costs (5.2 million people in 2010); households that are unable to maintain their home at a suitable temperature (3.2 million people in 2010). Estimates made by consumer organizations calculate that savings on the electricity bill will be up to 20% as a result of the Discount Rate and the Social Tariff.

Four groups may qualify for the Discount Rates:

- A) Residential domestic customers with contracted power of less than 3 KW. The Discount Rate is automatically granted for this group.
- B) Pensioners with minimum benefit.
- C) Large families.
- D) Households in which all members are unemployed.

In the case of the last three groups, requests to access the Discount Rate must be submitted by letter. In all cases, the beneficiary must be covered under the TUR, must be a private individual, and the contract for which application for the Discount Rate is being requested must be his habitual place of residence.

As an effect of the crisis and increasing spread of unemployment and poverty, more and more households came under the scope of the Social Tariff, putting the redistribution system under pressure.

The Ministry of Industry decided at the time that the costs resulting from the freeze of these fees would be borne by the major electricity companies themselves. These companies decided to take the matter to court because they also had to pay the cost of the measures in favour of other companies.

The Supreme Court has recently decided that the electricity companies shall not be required to subsidise the Discount Rate. Yet it is not considered a measure that violates the Constitution and therefore both the Discount Rate as the Social Tariff will be maintained in existence. However, since the electricity companies are not required to bear the cost, the Ministry has already announced that part of the cost of the Discount Rate and the Social Tariff must be reflected in an increase of electricity prices. The Government has also stated its intention to restrict access conditions to the Discount Rate, by making eligibility means-tested at the level of the family.

3. Renewable energies in Spain: the incentive system

Renewable energy consumption in Spain in the first half of 2013 amounted, according to the Ministry of Industry, Energy and Tourism, to 15.6 % of total primary energy consumption.

Table 3 Renewable energy in total primary energy consumption (%)

	2008	2009	2010	2011	2012	2013 (first half)
renewable energy	7.6	9.3	11.1	11.6	12.4	15.6
hydropower	1.4	1.7	2.6	2	1.4	3.6
without hydropower	6.2	7.6	8.5	9.6	11	11.9

Source: Ministry of Industry, Energy and Tourism 2013.

However, in Spain the amount of primary energy derived from renewable energy sources is highly variable due to the importance of hydropower and the huge climate differences in the country from one year to another. As shown in Table 3, the increase in renewable energy, excluding hydropower, is significant in recent years but considerably less than with hydropower. In 2013 it reached 11.9%.

The National Energy Commission (NEC), a public regulatory although non-governmental body, considers that 'renewable energies reduce the market price of electricity in the peninsula'. Renewable energy associations claim that 'the wholesale electricity price rises with more conventional generation and drops when energy from more renewable sources is consumed. The deviation of the "tariff deficit" is much higher than the cost of renewable energy'.

The *Renewable Energy Foundation* reported that there were sharp increases in electricity prices, after Royal Decrees RDL 14/2010 and RDL 1/2012, which established the retroactivity of the new renewable energy prices, took effect. According to the National Energy Commission, these increases were due to the coal aids, auctions of last resort tariff, low electricity demand to capacity payments, overcapacity gas and costs incurred beyond the Spanish mainland.

However, the major electricity-generating companies have blamed ‘tariff deficit’ on the premiums awarded for renewable energies and have been pressing the government to modify the compensation for these energies. As a result of this pressure the government has adopted different reforms since 2009 which, while having reduced premiums for renewable energy, have put in question millions of euros in investment and thousands of jobs, and without having reduced the ‘tariff deficit’. Recent regulatory changes in the sector are reflected in laws and royal decrees with main objectives listed below.

- Establishing urgent measures to correct the tariff deficit in the electricity sector (Royal Decree-Law 14/2010).
- Measures to regulate the network connection facilities for small power electricity production (Royal Decree 1699/2011).
- The suspension of pre-allocation procedures and the suspension of economic incentives for new installations of electricity production from cogeneration sources of renewable energy and waste (Royal Decree-Law 1/2012).
- Measures adopted for correction of the deviation resulting from imbalances between the costs and income of the electricity and gas sectors and to transpose Directives on home electricity and gas and electronic communications markets (Royal Decree-Law 13/2012).
- Urgent measures on debt management were taken in the electrical system and the financial sector (Royal Decree-Law 2/2013).
- A corresponding law aimed to provide for urgent action to establish the financial stability of the electricity system (Royal Decree-Law 9/2013).

Most of these government interventions aimed at crisis management under short term pressures and did not reflect a longer term concept or vision, the latter one however seems to have a longer term negative effect on renewable energy generation.

4. Effects of the crisis and austerity on investment: changes in the regulatory framework

The Royal Decree Law of 9/2013 mentioned above that was aiming to restore financial stability in the electrical energy generation sector has radically altered the remuneration system for renewable energy premium. This measure signifies government endorsement of the objections submitted by the Five Big energy groups, namely placing the exclusive blame for the 'tariff deficit' on renewable energy. In reality the 'tariff deficit' reflects all price effects in the energy sector, including the (detrimental) effect of long-term gas contracts, the impact of social tariffs, the discounts provided for big industry, and the incentives for renewable energy.

According to the NEC report (CNE 2013), the decree introduces a more stringent compensation model for electricity facilities producing from renewable energy sources, co-generation and waste, but there is no evidence of a similar model elsewhere in the EU, or in other countries with systems of support to these energies.

The RDL 9/2013 aims to reduce profit margins in the industry, setting its reasonable pre-tax return 3 points above the interest rate of the ten-year State Bonds in secondary markets. In the judgment of the NEC this brings considerable uncertainty in relation to application to the approximately 60,000 existing facilities. The Association of Renewable Energy Producers considers that the retroactivity of these changes jeopardises the profitability of many already installed projects.

In the changes to the regulations on price increases there are two categories of subsidy, one relating to the investment and another to the activity of electricity production. The NEC warns that the return on the investment is liable to reach negative values, which 'could be considered incompatible with the design of a subsidy allegedly aimed at promoting the production of electricity from renewable sources'.

It is necessary to keep in mind that the government has recently abolished the NEC, incorporating some of its functions, albeit with less means, into a new Competition Commission which includes other regulated sectors, while other functions have been taken over by the Ministry of Industry, thereby reducing the powers of the independent regulator.

Regulatory uncertainty, alongside declining public support for renewable energy in Spain, has caused the biggest European drop in investment in 2012 in this sector. According to New Energy Finance Bloomberg (BNEF 2013), clean energy sector investment declined by 68% (i.e. 2200 million euros).

The 26 bn EUR ‘tariff deficit’ reflects the combined effects of the crisis and of an ill-designed price regulation that favours the influential Big Five energy groups and big industrial energy consumers. At a time when exploding social effects of the crisis are leading to a huge increase in social tariff claims and when the Spanish government needs to take up a 100 bn EUR bail-out framework from the European Stability Mechanism, it is no wonder that the 26 bn EUR state guarantee for the energy sector has come under pressure. The question that might be asked, however, is why the subsidy mechanism for renewables has to fall victim to the government’s consolidation effort.

5. Evolution of employment in the renewable energy sector

No official statistics on employment in renewable energy are available, since the Labour Force Survey contains no renewable energy subsector. Until 2011, the Institute for Energy Diversification and Saving (IDAE) of the Ministry of Industry funded studies on employment in different study and research institutes, such as ISTAS of CCOO, as well as industry associations. It is not currently possible to know the evolution of employment in the sector over the last two years, as the regulatory provisions governing renewable energy have undergone so many changes.

Data provided by the Association of Renewable Energy Producers (APPA) (see Table 4) show a loss of 20,000 jobs in 2009 and 2010 and a total of 111,455 workers directly or indirectly employed in 2010.

Table 4 Total employment in the renewable energy sector (2005-2010)

2005	2006	2007	2008	2009	2010
85,571	90,142	95,111	131,229	116,885	111,455

Source: APPA 2013.

APPA estimates that Spain would reach, by 2020, a volume of power generation from renewable sources of only between 12.6% and 17.1%, far below the 20% target set by the Renewable Energy Directive (2009/28/EC) and approved by the Spanish government in its own Renewable Energy Plan (PER) 2011-2020. For this reason, the European Commission has decided to send the Spanish government a reasoned opinion.

6. Author's evaluation of the regulatory review on renewable energy

The crisis and resulting drop in energy demand reduced the large profit margins enjoyed by the electrical companies whose main facilities are conventional generation (coal-fired, combined cycle, nuclear and hydroelectric). The context is thus one of increasing competition in an environment of declining demand.

Increasing competition in renewable energy prices, despite reductions in premiums and government commitments to domestic coal-burning to maintain employment in coal mining, have called into question much of the potential capacity offered by electrical plants based on a gas-fuelled combined cycle.

During the first quarter of 2013 combined-cycle plants of major electrical companies worked to only 10% of capacity. Several facilities have questioned the viability of this form of generation given the prices they are obliged to pay to buy natural gas as a result of long-term supply agreements with Algeria. The result of this situation is that Spain has begun to re-export the Algerian gas since 2011, after liquefying it. In the first quarter of 2013 gas exports increased by 18% to 260 million cubic metres.

Endesa has already launched several collective redundancies within its combined-cycle plants. As they do not come into operation due to the lower price of renewable energy, the goal of this company is to cut by 10% its workforce of 10,500.

The pressure exerted on the government by major conventional companies (Endesa, Gas Natural, Iberdrola) – it is worth remembering that there are several former heads of government and former finance ministers on their boards – has led in Spain, since 2009, to the dismantling of the promotion model of renewable energies. Not only does this result in greater energy vulnerability, but renewable energy production has been the only effective tool for reducing energy imports, the high energy intensity of the Spanish economy and CO₂ emissions.

The current lack of government commitment to renewables has reached such a level that the European Commission has opened a file to reprimand Spain – and Italy as well – for failing to notify measures transposing Directive 2009/28/EC on renewable energy which has been planned to implement the goal of achieving a 20% share of renewables in final energy consumption in 2020.

The European Commission itself has published a report, commissioned from the consultancy Ecofys, which concludes that Spain would reach only between 12.6% and 17.1% of power generation from renewable sources, far short of the 20% proposed by the Commission and included in Spain's own Renewable Energy Plan 2011-2020 (CEER 2013).

The reversal in energy policy driven by the Spanish government has not only reduced the premiums available for renewables, but has also generated legal uncertainty in investors, which is calling into question the millions of euros already invested and thousands of jobs.

There is thus little expectation of any significant reduction in Spain's current economic dependence on fossil fuels; CO₂ reductions are also far below original estimates.

Spain also risks losing its position of technological leadership in the generation of electricity from solar energy that has in the past allowed major Spanish companies to position themselves in markets such as USA, Algeria, UAE and South Africa.

The case of Spain shows that the effects of the crisis and austerity policies combined with a malfunctioning regulatory system can lead to a deconstruction of support for renewables and derail a previously successful energy transformation process.

References

- APPA (2013) Study of the Macroeconomic Impact of Renewable Energies in Spain, Madrid, Asociación de Empresas de Energías Renovables. http://www.appa.es/descargas/Study_2013_English.pdf
- BNEF (2013) New investment in clean energy fell 11% in 2012, London, Bloomberg New Energy Finance. <http://about.bnef.com/press-releases/new-investment-in-clean-energy-fell-11-in-2012-2/>
- CEER (2013) Status review of renewable and energy efficiency support schemes in Europe, Brussels, Council of European Energy Regulators. http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Electricity/Tab2/C12-SDE-33-03_RES%20SR_25%20June%202013%20revised%20publication_0.pdf
- CNE (2013) Informe sobre los resultados de la liquidación provisional N° 14 de 2012 y verificaciones practicadas: sector eléctrico, Madrid, Comisión Nacional de Energía. http://www.cne.es/cne/doc/publicaciones/IAP_Liqui_Ele_24042013.pdf
- ECB (2013) Monthly Bulletin January 2013, Frankfurt, European Central Bank. <https://www.ecb.europa.eu/pub/pdf/mobu/mb201301en.pdf>
- Energy news (2014) Renewable associations explain that only 9% out of the electricity bill pays premiums to the sector. <http://www.energynews.es/english/renewable-associations-explain-that-only-9-out-of-the-electricity-bill-pays-premiums-to-the-sector/>
- IEA (2014) Energy Supply Security 2014, Paris, International Energy Agency. https://www.iea.org/media/freepublications/security/EnergySupplySecurity2014_Spain.pdf
- Ministry of Industry, Energy and Tourism (2013) La energía en España 2013, Madrid. http://www.minetur.gob.es/energia/balances/Balances/LibrosEnergia/Energia_en_espana_2013.pdf
- Ministry of Industry, Energy and Tourism (2014) Tarifas eléctricas 2014, Madrid. <http://www.minetur.gob.es/energia/electricidad/tarifas/Paginas/index.aspx>
- Tirado Herrero S., López Fernández J.L. and Martín García P. (2012) Pobreza energética en España: potencial de generación de empleo directo de la pobreza derivado de la rehabilitación energética de viviendas, Madrid, Asociación de Ciencias Ambientales.

All links were checked on 4 May 2015.

Appendix

Members of the boards of directors and advisors at Spanish energy companies linked to political parties

Company	Spanish Socialist and Workers' Party (PSOE)	People's Party (PP)	PNV (Basque Nationalist Party) and CiU (Convergence and Union)
REPSOL	<ul style="list-style-type: none"> - Paulina Beato (former president Red Electrica and CAMPSA when it was public company) - Luis Carlos Croissier (former Minister of Industry) 		<ul style="list-style-type: none"> - Mario Fernandez Pelaz (former Vice-President PNV) - Jon Imaz is the president of Petronor (former Secretary at PNV) - Artur Carulla, is linked to CiU, owner of the nationalist magazine, ARA
Natural Gas	<ul style="list-style-type: none"> - Felipe Gonzalez (former Prime Minister) - Narcis Serra (former deputy Prime Minister) - Rafael Villaseca (former president of INISEL) 	<ul style="list-style-type: none"> - Nemesio Fernandez-Cuesta (former state secretary at the Ministry of Industry) 	
ENDESA	<ul style="list-style-type: none"> - Pedro Solbes is CEO of Enel, owned by Endesa. (former Minister of Economy) - Elena Salgado is advisor at Chilectra, Chilean subsidiary (former Minister of Economy) 	<ul style="list-style-type: none"> - Jose Maria Aznar (former Prime Minister) 	<ul style="list-style-type: none"> - Miquel Roca Junyent (former General Secretary of CiU)
IBERDROLA	<ul style="list-style-type: none"> - Braulio Medel President of Unicaja Bank 	<ul style="list-style-type: none"> - Jose Luis Olivas, President of Bancaja (former president of Valencia regional government; and of Banco de Valencia) - Juan Miguel Aynat (former president of Bancaja) 	<ul style="list-style-type: none"> - Ricardo Alvarez Isasi, Board member of the Basque Energy Board, appointed by the PNV

Company	Spanish Socialist and Workers' Party (PSOE)	People's Party (PP)	PNV (Basque Nationalist Party) and CiU (Convergence and Union)
ENAGAS	<ul style="list-style-type: none"> - Miguel Angel Lasheras (former board member at the National Electric Regulatory Commission) - Ramón Perez Simarro (former state secretary of Energy at the Ministry of Industry) - Dionisio Martínez Martínez (former undersecretary of Finance with the UCD, and former head of the Spanish tobacco state monopoly with PSOE) 		
CEPSA (under control of an Abu Dhabi Fund)			<p>Centre Democratic Union (UCD) in late Francoism</p> <ul style="list-style-type: none"> - Carlos Perez de Bricíos (former minister of Industry) - Juan Manuel Otero, board member until 2012, (former minister with UCD) - Carlos Borbón de las Dos Sicilias, Infante of Spain