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The Spanish Turn against Renewable Energy Development

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Abstract: In this study, we focus on the case of Spanish energy policy and its implications for sustainable energy development. In recent years, Spanish legislation has changed dramatically in its approach to sustainable energy sources. This change is despite EU and international efforts to increase energy efficiency, and to accelerate the transition to renewable energy sources (RES) in order to reduce greenhouse gas emissions. Based on the socio-technical transitions literature, this paper assesses the role of the new legislation in this altered scenario, and analyzes the evolution of energy production in Spain in the EU context. The results are triangulated with two expert assessments. We find that Spanish energy policy is responding to the energy lobby's demands for protection for both their investment and their dominant position. This has resulted in a reduction in the number of investors combined with a lack of trust in both local and foreign investors in the sustainable energy sector, affecting also social innovations in energy transitions. We conclude that Spain is a particular case of concomitance between the energy sector and political power which raises concern about the viability of a higher level of energy sovereignty and the achievement of international commitments regarding climate change.

Keywords: power sector; green energy; climate change; emissions reduction; sustainability transition; energy policy; Spain

1. Introduction

There is increased public awareness of the diminishing capacity of the environment to assimilate the impacts of human activity, and increased demands for environmental sustainability [1,2]. At the institutional level, concern over climate change is reflected in support for energy policies and international legal requirements such as the Kyoto Protocol, and the shift in focus from mitigation to adaptation [3]. EU environmental policy [4–12], apart from prioritizing energy efficiency in all energy domains, is aimed at achieving a 20% reduction in greenhouse gas emissions (from 1990 values) by 2020, and an increase in RES to 20% of gross final energy consumption [13–18].

However, while there is some convergence in how EU countries are responding to climate risks, and to the energy challenge in particular [19–24], states' environmental and energy policies combined with their individual market characteristics are continuing to shape the particularities of how policy innovation, adoption, and implementation within countries is taking place [25–29]. In response to this heterogeneity, there is a considerable body of recent research that is devoted to understanding this socio-technical transition phenomenon, and especially from a multi-level perspective (MLP) [30–37]. Although research on understanding innovation systems is not new and since the first pioneering works [38,39] and the first formulations of National Innovation Systems [40,41] there have been further developments towards technological [42], sectoral [43], regional [44], and district [45] innovation systems, see [46] for a review, the present paper highlights the MLP to offer a descriptive model of transition dynamics. A MLP structures the analysis at three heuristic levels—socio-technical regime, niche, and landscape [30,31]. 'Regime' refers to the dominant cognitive, regulatory, and normative structures that have emerged around a technology. 'Niche' defines the protected space that allows a specific technological innovation to develop. 'Landscape' captures the exogenous context of a socio-technical system. A recent development in the innovation systems literature is the focus on the functioning of innovation systems [47–50], described in this paper as the functional approach (FA). We consider this combination of approaches as meaningful and useful for our analysis. The study is relevant also because, to date, the case of Spain has received little academic attention apart from the significant contributions by Dinica [51–53] especially concerning wind energy.

Therefore, the objective of this work is to answer the question: To what extent can the recent turn in renewable energy development in Spain—which can be seen as misaligned with EU energy policy—be understood as a return to working with incumbent regimes through the protection of vested political interests? To achieve our objective, following a discussion of our theoretical approach on the functions of innovation systems (Section 2), we describe the materials and methods used in the analysis in Section 3, and analyze the evolution of the Spanish energy system in Section 4. We focus in particular on the role of the legal framework (Section 4.1) and market evolution (Section 4.2) based on two expert assessments (Section 4.3). Section 5 discusses the results in a socio-technical transitions framework, and the paper concludes in Section 6.

2. The Functional Approach

The main idea underlying the FA is that a well-functioning innovation system requires the performance of a number of key activities. If these important activities take place, innovation output increases. Many studies focus on how innovation systems function [54–58]. Most of these case studies are related to specific technological trajectories, and the focus often is on emerging technologies, and therefore, on the formative stages of innovation systems. Here, we focus on three of the functions in [50] which influence the direction of search, market evolution and competition, and legitimation/counteraction of resistance to change. Influence over the direction of search refers to those factors that affect sectoral activities in relation to how they are performed, or their range, and can be related to new knowledge developments or new regulation. Market evolution and competition capture the uncertainty related to many aspects of market evolution and competitors' performance, standards setting, and articulation of demand. Finally, legitimation/counteraction of resistance to change refers to the degree of legitimation required by the industry to achieve the legal status to allow the delivery of goods and services to the community. It includes consideration of the means of production of a good or service (i.e., consideration of environmental impact, etc.).

In line with the FA, if the main goal of an innovation system, wanted or unwanted by the actors, is the development, diffusion, and utilization of innovations [59], the degree to which these goals are fulfilled can be assessed by analyzing the system functions [58,60]. The FA provides higher flexibility to recognize and analyze the opportunities and constraints imposed by a given innovation system. As different agents and actors can adopt different roles it is important to retain flexibility in the main functions rather than in categories of agents.

Functional analysis derives from the technological innovation systems and sectoral innovation systems approaches, and the literature proposes some lists of functions [60–62]. In what follows, we consider three functions taken from [59] which we consider are the most relevant for our analysis of the evolution of renewable energy development. Therefore, we exclude from our analysis the functions of: knowledge development and diffusion, entrepreneurial experimentation, and resource mobilization.

2.1. *Influence on the Direction of Search*

New knowledge development, new regulation, and changes to markets or competitors, are all factors that affect activities in sectors in terms of how activities are performed, or the range of activities that are performed. The range of opportunities is often much broader than the resources available for their development which requires choices to be made. As already suggested, the factors that influence this process choice are many and varied, and taken together determine where efforts should be directed.

2.2. Market Evolution and Competition

A clear variable in the performance of any sector is the evolution of the market and the competition. Uncertainty prevails over several aspects even if the focus is on a mature sector such as the energy sector where standards are established, and demand is articulated. New sources of energy or more efficient technologies may emerge, new regulation (or absence of regulation) and the performance of competitors are all factors that require reactions from the agents in the sector in order to enable progression.

2.3. Legitimation/Counteracting Resistance to Change

Like any public activity, industry activity requires a certain degree of legitimation, to achieve legal status and qualification to deliver goods and services to the community. This legitimation affects both the goods and the services offered, and also (and increasingly) the means of their production and transformation (efficiency, environmental impact, etc.). In mature industries, the fact that the society in which the sector activity develops also evolves, can produce tensions that require improvements or transformations within the industry. In this process of assessing the cost to the focal society of an industrial activity, and the benefits it might bring, the status or legitimation of the sector can be modified and may affect other functions (e.g., resources mobilization, market evolution, etc.)

It is worth mentioning that one limitation of applying only a partial FA is that we obtain only a partial view of the development of renewables in Spain. However, analysis of all the functions is beyond the scope of this research.

3. Materials and Methods

At a theoretical level, this paper builds on a socio-technical transitions approach to assessing the role of new energy and environmental legislation in Spain, to analyze the evolution of energy production in Spain in the EU context, with a special focus on the different sources that feed the energy mix. We start by identifying and analyzing relevant legislation affecting the energy sector in Spain, and the period previous to the change in policy.

We analyze the evolution of the market in order to assess the energy contribution from RES to total final energy consumption and electricity consumption. We exploit the 2015 SHARES Tool [R1] ([R1] http://ec.europa.eu/eurostat/web/energy/data/shares), developed by EUROSTAT which calculates the share of energy from renewable sources according to European Directive 2009/28/EC which is the source of the graphs in Figures 1, 2, 3, 4 and 6.

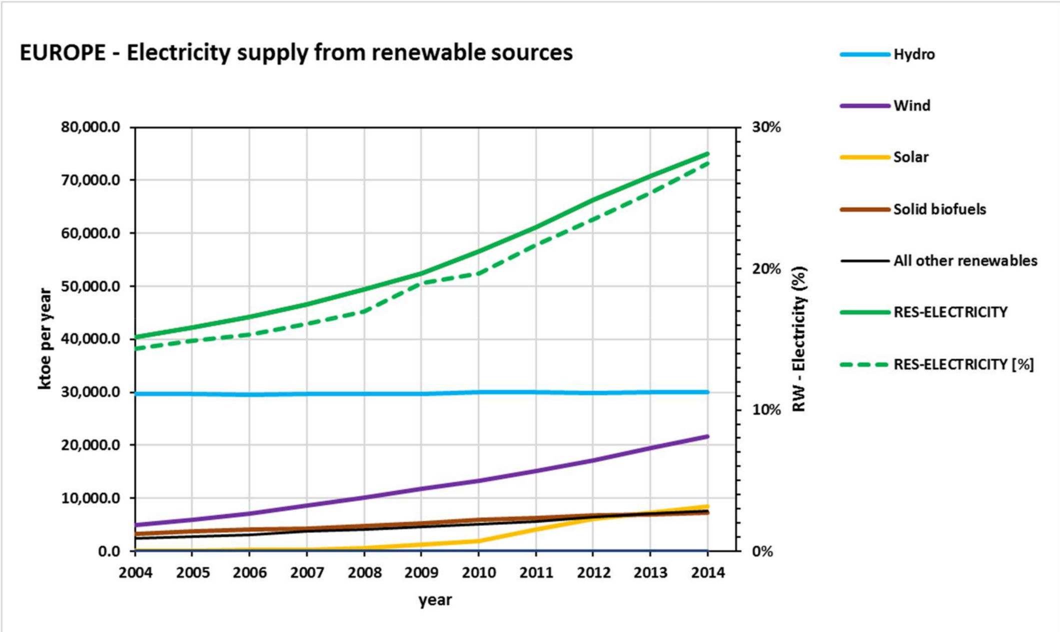

Figure 1. Contribution of the different renewable energy resources for electricity supply in Europe (2004–2014).

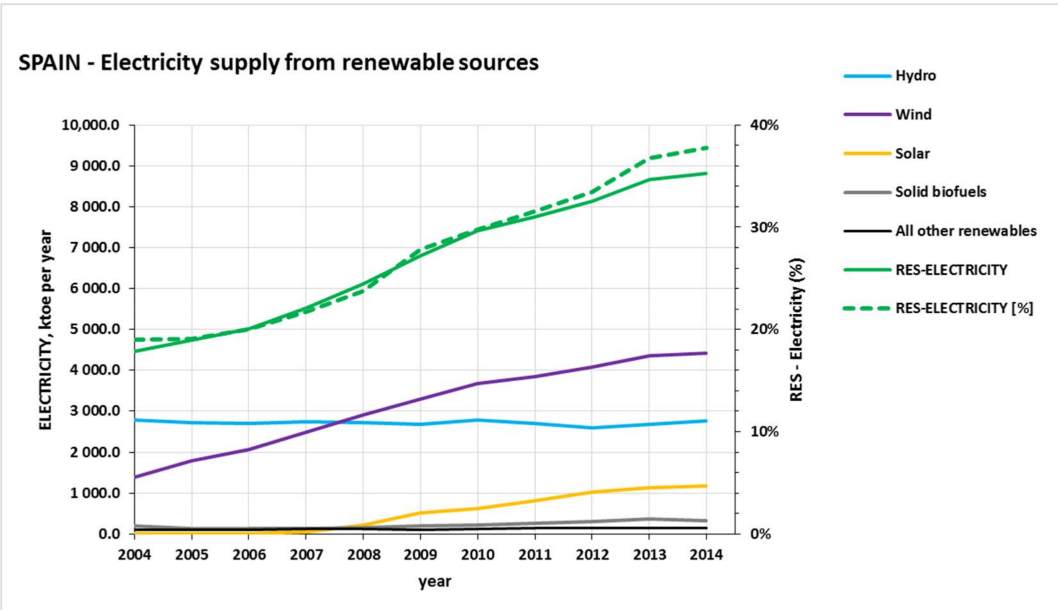

Figure 2. Contribution of the different renewable energy resources for electricity supply in Spain (2004–2014).

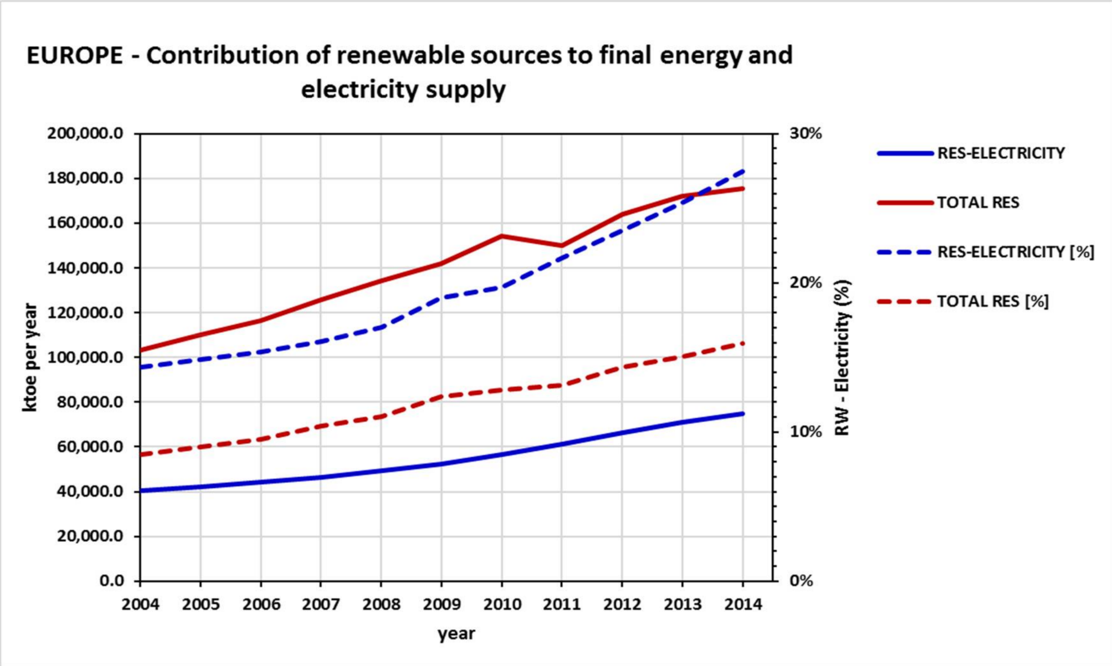

Figure 3. Contribution of renewable energy resources for electricity supply and total final energy supply in Europe (2004–2014).

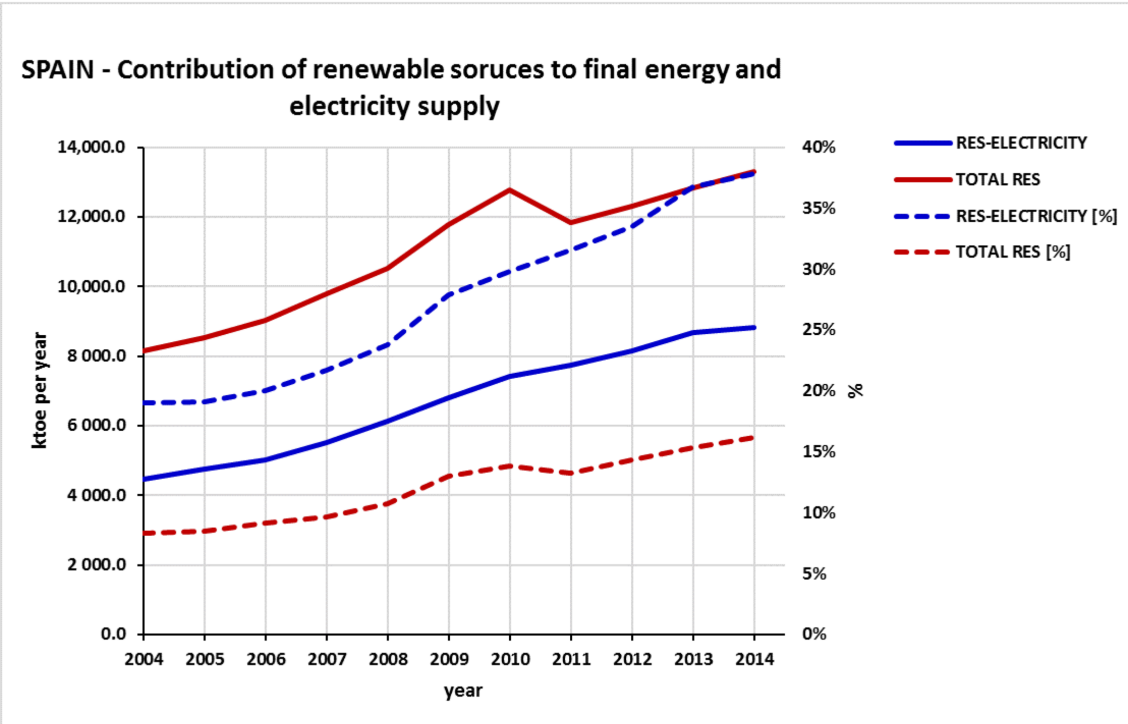

Figure 4. Contribution of renewable energy resources for electricity supply and total final energy supply Spain (2004–2014).

Subjects for the semi-structured interviews with expert informants were contacted by e-mail and selected based on their expert profiles. Attached to the e-mail was a letter in PDF form, and a questionnaire in Word format. Interviewees were asked to respond to the questionnaire and fill in the responses on a computer before returning it as an attachment. The questionnaire covered the main energy policy, legislation and market topics:

(Q1) In your opinion, how would you describe the recent evolution of Spanish energy policy?
(Q2) To what extent would you say that the current Spanish energy policy is aligned with the energy policy of the European Union?
(Q3) To what extent would you say that Spain's current energy policy will allow it to respond to its international commitments on climate change?
(Q4) More specifically, what opinion, in terms of your kindness and opportunity, do you deserve the following laws?

   (Q4a) Royal Decree-Law 9/2013, of July 12, which adopts urgent measures to guarantee the financial stability of the electricity system.
   (Q4b) Law 24/2013, of December 26, of the Electricity Sector.
   (Q4c) Royal Decree 900/2015, of October 9, which regulates the administrative, technical and economic conditions for the supply of electric energy with self-consumption and production with self-consumption.

(Q5) Apart from the three indicated laws, is there any other law that you consider relevant for the present analysis?
(Q6) For each of the energy sources that we name below, and based on your level of technological development or for another reason that you indicate, do you consider that protective measures are required for the following sources of energy? Biomass/Coal/Wind/Natural gas/Geothermal/Hydraulics/Marin/Nuclear/Oil/Solar (photovoltaic)/ Solar thermal
(Q7) To what extent would you say that the current legislation favors / harms the development of the following sources of energy in Spain? Biomass/Coal/Wind/Natural gas/Geothermal/Hydraulics/Marin/Nuclear/Oil/Solar (photovoltaic)/ Solar thermal
(Q8) What kind of actions do you think should be taken with respect to the following energy sources? Biomass/Coal/Wind/Natural gas/Geothermal/Hydraulics/Marin/Nuclear/Oil/Solar (photovoltaic)/ Solar thermal
(Q9) How do you assess the current electricity supply system in Spain?
(Q10)What changes could improve the electricity supply system in Spain?
(Q11)Please indicate below any other comments that I would like to make regarding the present investigation.

We wrote to 17 experts, both from universities and from the private sector but only two of them agreed to participate. As interviewees responded in Spanish in a word document sent by e-mail there was no need to transcribe to select relevant fragments and translate them into English. The two experts who agreed to respond to the questionnaire were an academic with a strong reputation in environmental law (I1), and an industrial and mechanical engineer and director of a photovoltaic (PV) energy company (I2). In the following sections, I1 and I2 refer to the respective interviewees, and R1–R11 refer to the question responses.

4. Results

To identify the extent to which the recent turn in renewable energy development in Spain can be explained by Spain's administration policy and regulations, in this section we analyze recent legislative changes and energy market evolution, and combine the results with the information provided by the two expert informants which allows triangulation of our results.

4.1. Influence on the Direction of Search

Spanish energy policy in the first decade of the 2000s has moved from strong economic support for new facilities based on their environmental benefits, and clear compensation criteria and regulatory guarantees which provide security for investment [63–65], to a less ambitious policy following the economic crisis. This later policy is characterized by reduced remuneration for both existing and new facilities, increased uncertainty related to complex technical criteria, and no guarantee of mid-term regulatory stability in what can be understood as a change to the regime. This revised policy also does not take account of the environmental benefits of renewable energy over conventional energy sources (I1-R1).

> *The [63–65] could have been the beginning of the take-off of a Spanish photovoltaic industrial sector with a great future; in 2009 we have manufacturers of all the necessary components, engineering, universities specialist, etc. Both the industrial sector and citizens have opted to invest in this type of energy. In 2008 we are among the world leaders in a sector with great capacity and growth thanks to the development of own technologies. [However] Instead of taking advantage of this historical situation, years later these regulations will be modified retroactively which will bankrupt the investing citizens, and close down 90% of Spanish companies in the sector by paralyzing the domestic market to the point of making it disappear. Only the companies able to export will survive. These Royal Decree are the origin of what could have been a success story in our country and which has ended in a scam involving more than 50,000 Spaniards and the publication of a series of later Royal Decrees.* (I2-R5)

The first change to Spanish national legislation regarding sustainable sources of energy was in July 2013 with an important reform to the so-called tariff deficit [66]. The rules of the game changed which led to numerous small private investors being bankrupted. One expert described this legislation as "*Timely but bad*" (I1-R4a), while the other said that "*This national legislation has generated bankruptcy in the market for PV (photovoltaic) plants that has finally been acquired mainly by financial entities and groups*" (I2-R4a). This interviewee went on: "*Although not all is bad news, Spanish power companies have beaten all historical profits records between 2009 and 2015, according to their own data*" (I2-R5).

At the end of 2013, the Spanish government adopted a legislative package which among other things, anticipated a review of the support for RES, a reduction in remuneration for transmission and distribution activities, and increased network access tariffs for consumers [67,68]. It was described by an interviewee as a "*timely but not a good law, as it does not protect the investor in renewables and does not include environmental protection among the criteria applicable to their remuneration*" (I1-R4b).

Finally, and after several contested drafts, in October 2015 new legislation was passed [69] which imposed additional fees to discourage the use of batteries or other storage systems by households and small companies that produced their own (mainly solar) electricity and were connected to the national power grid. This new legislation is seen as threatening renewable energy developments and energy sovereignty in Spain. It was described by one of our experts as "*necessary to regulate the issue but not good because it does not promote self-consumption*" (I1-R4c), while the other stated that "*All the necessary obstacles are introduced via regulation, so that only a few can comply with the law; this regulation definitely removes any possibility of Spaniards taking advantage of the sun, even in the absence of legislative assistance*" (I2-R4c).

4.2. Market Evolution and Competition

Market evolution in both Europe and Spain has been affected by a change in the landscape, i.e., the 2008 economic crisis. This affected the energy sector in several ways, and especially the demand side and investments in plant. This section provides an overview of those trends:

In Figures 1, 2, 3, 4 and 6 it should be noted that:

- Energy units are ktoe (thousands of tons of oil equivalent, 1 tep = 4.1868·1010 joule)
- Hydro excludes pumping.

- Solar includes solar PV and solar thermal generation.
- Other renewables includes electricity generation from gaseous and liquid biofuels, renewable municipal waste, geothermal, and tide, wave, and ocean.
- RES-ELECTRICITY (in ktoe) is electricity from renewable sources
- RES-ELECTRICITY (%) is the ratio of RES-ELECTRICITY to total electricity consumption as a percentage.
- TOTAL RES (in ktoe) is total final energy consumption from renewable sources
- TOTAL RES (%) is the ratio of TOTAL RES-ELECTRICITY to total final energy consumption as a percentage.

Figure 1 shows that in Europe (EU28), the growth in electricity production from RES since 2009 is due mainly to wind and solar sources. Wind electricity generation has grown almost continuously over the whole period, with solar electricity generation taking off in 2010. Other RES of electricity remained stable over the period analyzed.

Figure 2 depicts the case of Spain, and shows the contribution of wind and solar renewable sources to growth in electricity production from RES after 2008. Growth in wind electricity generation was fairly continuous up to 2013 but shows almost no growth in 2014. Solar electricity generation took off in 2008 and shows a decline at the end of the period. The remaining RES electricity generation is mostly stable during the whole period with the exception of hydroelectric which shows some slight variations over the period.

Figure 3 shows that in total final energy supply for Europe, the contribution of RES in 2014 (16%) almost doubled in relative terms over 2004 (8.9%) values.

For total final energy supply for Spain, Figure 4 shows that the contribution of RES in 2014 (16.2%) was almost double in relative terms, the 2004 (8.5%) value. We observe a significant peak in total RES contribution in 2010 due mainly (see Figure 5) to the considerable PV installations made in 2008, and the significant wind power installed in 2007–2009.

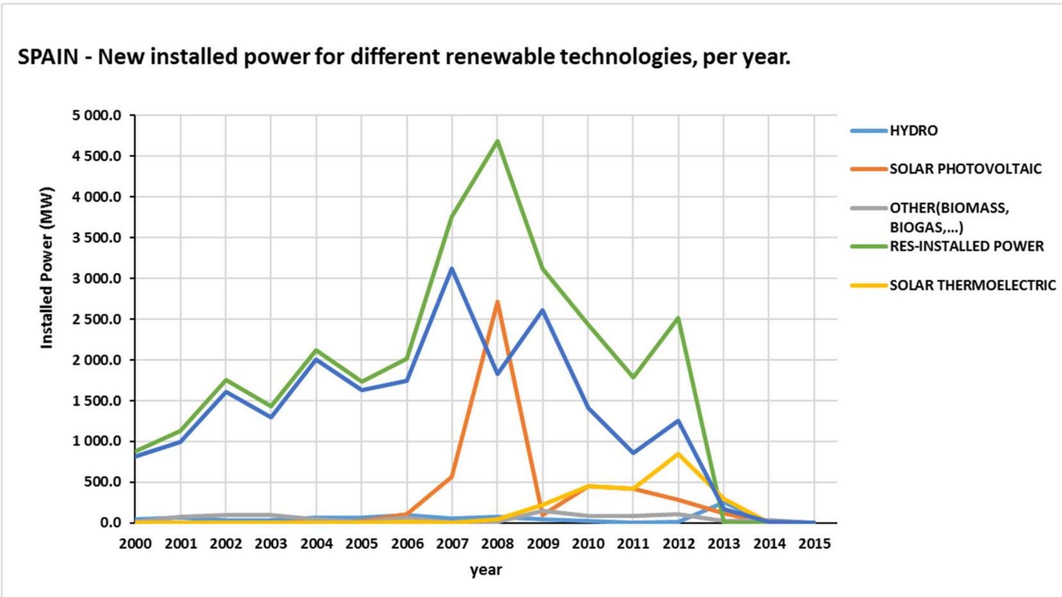

Figure 5. Yearly installed electric power for the different renewable energy resources in Spain (2000–2015). The graph in Figure 5 is based on data from the Instituto para la Diversificación y Ahorro de la Energía (IDAE) [R2]. Figure 5 shows the evolution from 2000 to 2015 of new annual installed nominal power for the different renewable technologies. [R2] http://informeestadistico.idae.es/t10.htm.

Figure 5 shows that there was a reduction in annual RES installed power during the economic crisis (2008–2012), and a sharp drop in annual RES installed power due to legislation changes (2012–2014) which eliminated the economic incentives for producing electricity from RES.

Figure 6 shows that RES-ELECTRICITY (ktoe) doubled over the period; since total electricity supply (consumption) in 2014 is slightly lower than the 2004 value, this works to magnify the growth in the contribution of RES-ELECTRICITY (%) (in relative terms).

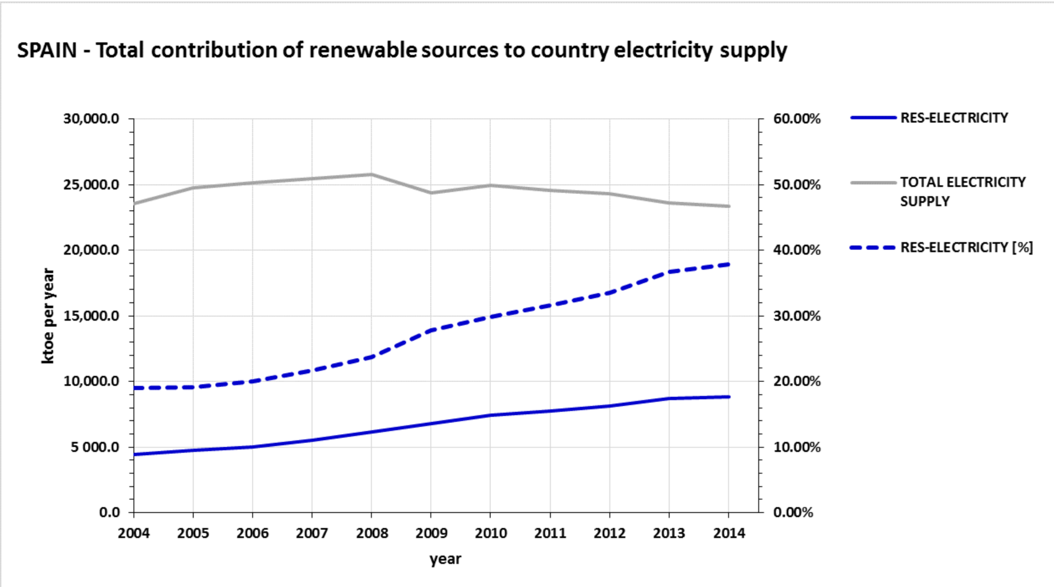

Figure 6. Contribution of the different renewable energy resources for electricity supply in Spain (2004–2014).

4.3. Legitimation/Counteracting Resistance to Change

The case of Spanish energy policy seems to be a case of transition in the mid-2000s from a policy aligned to EU policy, to one of protecting the niche development of RES technologies, to a scenario of lobby born socio-technical regime changes to abort these developments. In this section, based on the evidence presented above and information from our interviews, we describe the struggle between change and resistance.

The interviews show that Spanish energy policy has become reactionary and conservative toward certain RES, and is becoming more remote from EU policy. It is "*very aggressive towards the generators of renewable electricity accessible to small and medium companies and exclusively focused on the protection and maintenance of the market in the hands of large electric corporations*" (I2-R1). "*Spanish policy is not in line with European Union policy, as renewable energy is the central element of the EU energy policy and it is considered justified to promote it economically in the long term because of its environmental benefits, and to reduce energy dependence. However, currently in Spain this long term vision does not exist and the only concern is for the [. . .] short term*" (I1-R2). This also reflects the incoherence between political discourse and policy: "*political discourse attempts to align itself with that of the European Union, legislation and facts are contrary to European directives, both in energy generation and energy saving*" (I2-R2).

Regarding the extent to which current Spanish energy policy is allowing a response to international commitments on climate change, one interviewee told us "*I do not think that international commitments on climate change can be met*" (I1-R2).

When asked about protection, the responses of our experts differed. One believed that all RES protection measures are needed (I1-R6) while the other commented in relation only to PV that niche protection was no longer necessary: "*It is not necessary, at the moment it is competitive with the prices of the electric companies without aid, and this is the reason why the current regulation of self-consumption PV* *has introduced taxes and complications in the regulation that compensate for the lack of competitiveness of the electricity distribution companies*" (I2-R6).

When asked about the energy sources favored by the regulatory system in Spain only coal was mentioned, and by one interviewee. However, the other stressed that the criteria used to judge the effect of the regulation should not be renewable vs. non-renewable but rather whether the investment needed is modest or large. If there is a need for major investment then oligopolistic companies will be protected, and no further regulation will be required (or lobbied for). However, if a small investment is enough to threaten the status quo, then there will be demands for legislation to put a stop to these efforts. One of our experts said that:

> *The classification of renewable and non-renewable energy is an important concept for the medium-term planning of the Spanish or European Union energy system but it does not correctly reflect or define the positions that face the different actors currently in Spain. We can check the aggressiveness of electricity companies with photovoltaic self-consumption, which is not the case with nuclear, coal, natural gas (combined cycle power plants), wind power, or hydropower. What is the difference? The last two are also renewable. The difference is investments, large corporations prefer sources in which a large investment is needed which excludes small investors or companies. Wind and hydro are renewable but on a small scale are not profitable, only large facilities within the reach of very few companies or investors can achieve competitive costs. Photovoltaic has no scale effect, it is equally efficient for 100 W and for 1 MW, it is accessible with very small investments and is also delocalized. These characteristics are not the most adequate for the business model of the electricity companies and this is the main reason justifying their rejection. (I2-R7)*

When asked about the actions required in relation to different sources of energy our interviewees responded as follows:

- Biomass: "*Promote, which in our case would not hamper its competition with distribution companies*" (I2-R8);
- Coal: "*Reconvert to another type of energy generation depending on the possibilities of the area. In any case, do not import coal*" (I2-R8);
- Wind: "*Facilitate entry of competition into generation*" (I2-R8);
- Natural gas: "*Close the excess [installed power] and whoever decides to build [new infrastructure should] assume the costs. We have an excess of installed power that we, citizens, are paying for when being stopped. It is an intolerable protectionism and discriminatory for renewables*" (I2-R8);
- Geothermal: "*I do not have information. If it is competitive it should have no difficulties*" (I2-R8);
- Hydroelectric: "*Same rules as with other renewables. It is the renewable source that has the greatest environmental impact and which has a better image, the majority in the hands of the big companies that have received it cheap or for free, a very important instrument to manipulate the market of the electric pool [...] little to do since there is no possibility of any competition. It should be state-owned, just as originally*" (I2-R8);
- Tidal/wave: "*I do not have information.*" (I2-R8);
- Nuclear: "*Do public audits and do not do business with security. The problem of nuclear is the price, no new plants are installed as the cost of kWh generated is more expensive than from other sources, including solar PV. It is not a security problem; it is simply cost. In Spain, it is economical for the electricity companies since the consumers pay them, the electricity companies get it for free [...] that is to say, the cost of the kWh of a Spanish nuclear is related to operation and maintenance since the other costs are paid. In addition, the external costs arising from the treatment of radioactive waste are costs borne by the state, in short, a good business for the electricity companies and bad business for the citizen. Besides, there is the risk of an accident, it's absurd*" (I2-R8);
- Oil: "*Reduce oil imports as much as possible and promote a change to other indigenous and renewable sources. Oil is close to not being competitive as a source of energy for transport or electricity generation, in addition to the problems of climate change*" (I2-R8);

- Solar (photovoltaic): "*Allow and facilitate free installation connected to the grid or isolated. A solar equipment manufacturer pays its corresponding VAT and the owner is entitled to benefit from its operation without having to pay a third party*" (I2-R8);
- Solar thermal: "*To promote its implementation, it is profitable, does not need aid*" (I2-R8).

In relation to the current electricity supply system in Spain, both our experts agreed that is "*fine*" or even "*of good quality*" but also "*more expensive than it should be*" because:

> *"Competition improves markets, the Spanish electricity system has no competition, nor does it admit that a consumer can produce part of its energy. Without competition, no improvement is possible. It is curious that we are discussing that the electricity companies collected 3000 million more for a cost labelled 'Costs of transition to the market of the competition' and that even so, we cannot compete freely with a PV system in our houses.*
>
> *Former Minister Nadal justified the so-called 'Tax on the Sun' as solidarity to avoid raising the price for those unable to install solar panels in their homes. If I buy a solar installation paying a 21% VAT, I pay taxes, how can you justify charging a tax for the generation of 1 kW produced from my solar panel, which passes through my cable and feeds my refrigerator? What will I be fined for using a solar panel in my house? It looks like a fiction, but it's Spain."*

5. Discussion

As the above evidence suggests, Spanish national legislation regarding sustainable sources of energy has undergone radical changes in relation to the promotion of renewables. Spanish energy policy has moved from strong economic support in the mid-2000s for new facilities based on their environmental benefits, to a policy characterized by reduced remuneration for both existing and new facilities, making self-consumption more difficult, and increasing uncertainty related to complex technical criteria and lack of guarantees of mid-term regulatory stability [70]. For instance, in its 2016 report, the Frankfurt School of Finance & Management, ([71], p. 19) claims that "*There is a lack of investor confidence in a number of significant countries because of past political events or energy policy decisions, from Ukraine to Spain, and Argentina to Greece*" and ([71], p. 25) "*Spain, scene of particularly painful retroactive revenue cuts imposed by the government during the 2011–14 period, and the end of all support for new projects, saw investment of just $573 million in 2014. This was marginally up on the previous year but miles below the $23.6 billion peak of 2008*". This legislation ignores the environmental benefits compared to conventional energy sources. Thus, Spanish energy policy has diverged from EU energy and environmental policy, and there is incoherence between Spanish political discourse and Spanish policy. We have presented the energy market evolution in Europe and Spain, and the effects of this policy change during the transformation of the landscape which was the result of the 2008 economic crisis. In Spain in particular, the new policy has had an effect on energy sector new investment as indicated by ([72], p. 22) "*Spain's wind energy sector recorded its lowest-ever annual growth in 2011 according to the Spanish Wind Business Association. A total of 1903 MW is currently registered but is still waiting to begin operations, and around half of pipeline capacity will have problems in being built. The current stagnation in the market, as a result of heavily reduced subsidies in recent years, signals poor growth prospects in the short to medium term*". We have highlighted the changes to legislation, and the evolution and ultimate collapse of investment in RES (annual RES installed power) in Spain from 2013. However, other factors might affect, for instance if the wind-rich sites (above 12 m/s annual average) in Spain have been almost exhausted by 2008–2009 [53], it could partially explain the evolution of the contribution of wind renewable sources to growth in electricity production from RES after 2008.

Following a context of protection for niche RES technology developments especially PV, the change in legislation during the early 2000s can be understood only as a reactionary move to protect the well-established electric oligopoly which is lobbying at the political level to maintain the status quo. This type of strategy which can include various distinctions such as instrumental, discursive, material, and institutional forms of power, has been reported within the MLP, for the case of the UK [73]. We showed that although renewables no longer need a protected space for niche developments, they do need a fair framework in order to strengthen the key processes (functions) of their innovation system [74,75]. All these developments have taken place despite EU and international efforts to increase energy efficiency and accelerate a transition to RES in order to reduce greenhouse gas emissions. A similar strategy has been observed in the UK [73] in Germany [76] and also Japan [77]. In the Spanish case, those changes were introduced during a time of economic crisis and contraction in demand. As [77] suggests, energy policy under Rodriguez Zapatero's mandate was directed more towards nurturing protected niches, whereas (see [51,52] for a more in-depth description of the political context until 2010) with Rajoy, it turned into working with incumbent regimes as established socio-technical regimes seeking self-reproduction through vested political interests. It remains to be seen what will happen when demand recovers. In the meantime, the image and legitimation of the energy sector is being eroded and bringing about change as more of the population realize how these changes will affect other functions (e.g., resource mobilization, market evolution, etc.).

Although it seems clear that the purpose of this legislation was to revert or at least severely limit the growth and expansion of RES, especially for small 'prosumers' (i.e., producers and consumers of renewable energy [78]) there is also evidence that there is resistance to this new legislation both from the regions and from citizen's initiatives. Firstly, two years after the Spanish Government prohibited the shared self-consumption [69], the constitutional court partially gave the reason to the Generalitat de Catalunya, which in February 2016 appealed part of the articles of the RD for invasion of competences, and has declared several of the articles null, opening the door to shared self-consumption in residential buildings, housing developments, etc., in all Spain [79]. Secondly, renewable energy supplying cooperatives (REScoops) that collectively own renewable energy production facilities and supply this to their members [80] have shown dramatic increases in membership. Take for instance Som Energia SCCL, which has been defined as collective and *politically motivated renewable energy projects* by [81], and was established in 2010, it has grown from 17,000 members in late 2014 to 45,000 in early 2018 [81,82].

Further research on the Spanish case should analyze the effect of this policy on the resilience of REScoops and on how citizens cope with energy transition and the adoption of renewable energy in Spain. In fact, the 265% increase in Som Energia SCCL membership over four years can be seen as citizenry reaction to the government's return to working with incumbent regimes through the protection of vested political interests, as the classic 'union make force'.

Further research must also consider frequent cases of 'revolving doors', i.e., the movement of personnel between roles as legislators and regulators on the one hand, and members of the industries affected by the legislation and regulation, which in the case of the Spanish energy sector involves as many as 26 cases [83], or the way consumers have to pay the failure of carbon capture and storage investments, such as in Castor [84]. It will be interesting to discover whether instead of it being States that choose their energy strategies depending on their pattern of industry-state interaction, at least in the case of Spain, it becomes patterns of industry-ruling party interaction that best explain so-called 'institutional capacity' [77].

6. Conclusions

Drawing on a multi-level perspective and a functional approach to the study of socio-technical transitions we focused in this paper on the case of Spanish energy policy, and its implications for sustainable energy development. In line with the socio-technical transitions literature, we analyzed the evolution of energy production, and assessed the role of new legislation in this changed scenario, triangulating the results with expert assessments. Our results show that, in recent years, Spanish legislation on sustainable sources of energy has changed the socio-technical regime dramatically. These changes have resulted in less ambitious policy during the economic crisis, characterized by increased hurdles for small investors in PV, and general uncertainty based on complex technical criteria and lack of guarantees of mid-term regulatory stability. All of this is considered a threat to renewable energy developments and energy sovereignty in Spain fueled by the resistance and resilience of fossil fuel regimes. To reverse this adverse renewable technologies situation, higher economic support, regulatory stability, social innovations and a 'prosumers' facilitating policy are needed. We can finally answer our research question affirmatively, this is to say that the recent turn in renewable energy development in Spain, besides being misaligned with EU energy policy, can be understood as a return to working with incumbent regimes through the protection of vested political interests.

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