PAPER TITLE:

The public promotion of renewable energies sources in the electricity industry from the Transaction Costs perspective. The Spanish case.

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Abstract:
In this work we use the concepts of the Transaction Costs Theory (TCE) to explain the performance of different public devices to promote renewable energies in electricity industry. There are three instruments with such common character of promotion: feed-in tariffs (FIT), bidding instruments (BI) for the assignment of long-term purchase contracts and exchangeable quotas (EQ). By an early start continuous & generous feed in tariff policy in RES promotion, Spain is showed as a RES politic success story. From our point of vu this success is mainly explained by as trade off between Stability and Flexibility in the use of Spanish FIT.

Keywords: transaction cost; feed in tariff; energy policy, renewable energy
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JEL Codes : L54 :

1.- **Introduction**

Since the nineties, governments have developed voluntary renewable energy Sources (RES) development policies with the aim of preserving a set of collective goods, climate stability, local environment and energy security. The objectives of the policy became ambitious in the field of electric production, which is the main field of their development besides that of biofuels: if we take the case of the European Union members, the share of "new"renewables in the electricity production must increase from 1% to 8% of the total electricity production in average if the voluntary objectives adopted by the 2001 directive on renewable promotion (European commission, 2001) are reached. The adopted policies are based on subsidisation of investments, or of production by these technologies when they are near to commercial maturity.

Government support is necessary for Renewable Energy Sources in Electricity (RES-E) because, although desirable from a social welfare perspective, their private costs are not competitive in power generation systems dominated by large electricity generation plants. Three reasons account for the bias against RES-E in the electricity market: (i) environmental costs are not adequately internalized for conventional electricity generation technologies; (ii) the absence of scale effects on costs, due to the small size of the plants[1], and (iii) the random nature of their intermittent production of some major sources of RES (wind power, mini-hydraulic) which creates negative externalities.

[1] This character could be discussed for certain RES-E technologies, as the biomass electricity which could benefit from the scale economies in the supply of the biomass up to a certain size.

Following failed attempts using systems of voluntary purchases of green electricity by consumers, as well as direct investment subsidies, demand-side strategic deployment policies have emerged as the preferred instrument in most countries. By imposing obligations to purchase RES electricity or to meet a RES-E quota on a clearly specified type of agents, these policies are designed to allow demand-side forces to determine the allocation of RES-E production subsidies to pre-commercial and commercial RES-E technologies. There are three instruments with such common character: feed-in tariffs (FIT), bidding instruments (BI) for the assignment of long-term purchase contracts and exchangeable quotas (EQ)[2].

One of the most interesting cases is the Spanish one, because has been one of the countries where major success has had the politics of support and promotion of the RES-E based on a mechanism of FIT. This success, nevertheless, has not taken place equally for the different sources of renewable energies, being the wind energy the one that has presented a major grade of development and the photovoltaic and mini-hydroelectric those who less have fulfilled the targets of growth. This development of the wind energy has supposed that, in 2003, Spain was the second country of the world (after Germany) in installed power (6202 MW) and one of the first potency in the construction and operation of wind farms. Nevertheless, at present, the retribution mechanism of RES-E has suffered a significant transformation since it has been passing to a less and less regulated system trying a major participation of the producers of in the spot wholesale-market.

[2] Let us note that some instruments are well known under other generic names such as the Renewable Portfolio Standards in the USA and Canada. But in fact it is not a category of instruments. On the twenty RPS existing in 2004 in the USA, half are in the categories of the bidding, and only seven develop quota with exchange of certificates. It exists also RPS based on voluntary commitment of the electricity public utilities, as it is the case of the British Columbia RPS (Berry and Jaccard, 2001)

In this work we use the concepts of the Transaction Costs Theory (TCE) to explain the performance of different public devices to promote renewable energies in electricity industry and we will analyse the causes that explain the success of FIT device in Spain. To reach our target, the order of this paper will be the following one. In the second section it is analyzed the attributes of transactions associated with the development of RES-E production. This will serve us to understand better the characteristics, advantages and pitfalls, of the different devices to promote RES-E production, in the third section. In the fourth section, we will describe the institutional framework in which they have taken place the promotion of the renewable energies in Spain. We will analyse the success of the Spanish model from the point of view of TCE in fifth section. The paper closes with the main conclusions.

2.- **The attributes of transactions associated with development of RES production**

According to the framework introduce by Finon & Perez (2007), from the Transaction Cost Economics perspective, RES-E instruments can be interpreted as a governance structure shaping transactions between the public authority (government or a regulator), the RES-E producers and the obligated buyers. The main aim of this contractual scheme is to provide guarantee on the long-term support to attract investors. The TCE also shed light on the government and the RES-E producer relational contracting, given the evolving costs of new equipments on the one hand, and the political risk of discretionary changes on the other.

2.1. The theoretical framework of transaction cost economics

The choice of an appropriate governance structure to shape transactions between different parties is in the central focus of TCE. Bounded rationality and opportunism[3] are the behavioural hypotheses which explain the need of protection in order to invest in specific equipments. Specific investments are made as they create more value than the alternative solutions of generic equipments which sell their production in spot transaction on a market. Specific investments generate surplus of economic value in comparison to their next profitable utilization, a surplus named "quasi-rent" by Williamson (1985). Rationale inherent in TCE is that performance depends on the fitness of governance structure to the real features of the transactions studied. The choice of a governance structure responds to an efficiency criterion i.e. attaining the minimum costs for transaction and production. That means that a point of compromise must be found between investment safeguard and the incentive intensity which drive production costs minimization and innovation.

Seminal authors have noted two attributes of transactions - the transaction-specificity of assets and its differentiated nature (physical specificity, site specificity, dedicated specificity, temporal specificity) as the decisive factors in the choice of governance structures (Williamson 1996; Milgrom et Roberts, 1992). Transaction-specificity is associated with the mutual dependency between parties. It opens the door for opportunistic behaviour of parties least committed in the transaction. Transactions requiring an investment must be made through contracts in order to protect investors against opportunistic behaviour by other parties. In a context of uncertainty, contracts are necessarily incomplete, and hence opened to the risk of opportunism. If the investing party faces in a lock-in situation whereby there is weak possibility to redeploy

[3] : Self-interested behaviour unconstrained by morality and mutual confidence as Williamson defined it.

the equipment for other uses, they are subjected to the risk of "hold-up". This hold-up problem can be described as one in which each party is exposed to the risks of being forced to accept disadvantageous terms, after having sunk its investment. Without a safeguard, the risk to be expropriated from the quasi-rent deters investment.

Therefore, the higher the level of specificity on transactions, the more the governance structure should controls the rights, obligations and procedure; the choice has to be made between a number of governance structures between hierarchy and markets, including different types of contracts. In brief, the more complex the nature of transaction and contracting process, and the higher the uncertainties over required performance the more likely governance structures lead to hierarchical forms.

2.2. General characters of a RES-E regulation.

Analysis of the choice of regulatory instruments designed to promote the RES-E development for the supply of collective goods relies on the same concepts as the analysis carried out in TCE terms by Goldberg (1976) on regulations for the control of natural monopolies in public utility industries[4]. He introduces the concept of "regulatory contract" in order to explain that the contractual delegation of responsibilities to public utility monopolies with an operational supervision by a regulator is more feasible and efficient than to operate a franchise bidding solution for the monopoly. [5]

[4] From the TCE perspective, the government's choices of governance structures for different types of policy transactions (regulatory, procurement, redistribution, sovereign, judiciary and infrastructure transactions) could be analyzed in relation to the attributes of the transactions (Williamson, 1999).

[5] Franchise Bidding is the market solution proposed by Demsetz (1968) in order to suppress the ex-post control on the franchised monopoly by a regulator and the classical regulatory capture problem. Demsetz demonstrates that the selection of franchise contracts by bidding under the criteria of price and quality of service proposed to consumers would be sufficient, as consumers can thereafter negotiate with the successful utilities individually.

The regulatory contract gives an obligation to a set of agents (the electricity suppliers in most of the cases[6]) for purchasing RES-electricity from new RES-E plants. The regulatory contract function is to create safeguards to the RES producers and obligated buyers in order to help the realisation of RES-E investment by the former and to organise *de jure* or *de facto* for the latter, the recovery or the compensation of the extra-cost in the tariffs or prices paid by all the electricity consumers. [7]

The regulatory contract between the public authority and the obligated purchasers specifies partly the contractual relation between RES-E producers and purchasers (reducing the freedom of parties to define their contractual arrangement in volume and price). Moreover the regulatory contract also defines pricing conditions of grid connections for the plants to be built in remote areas. In liberalised electricity systems, it also defines the economic responsibility of balancing costs supported by the electricity system operator for the real time electricity balancing to weakly programmable production by intermittent renewable sources.

In terms of designing a RES-E regulation for establishing indirect subsidisation of production via the setting of purchase obligations, the government has a choice between three instruments: FIT, BI and EQ. Each corresponds to a specific regulatory contract

[6] The obligation is defined in relation to the distribution grid operators. In the monopoly regime they are the local, regional or national monopoly suppliers. In the market regime they are the incumbent suppliers which keep the ownership of the distribution networks. The obligation of purchase could be placed on the electricity consumers (as in the Netherlands for instance), but in fact it is only symbolically, given that as consumers they must delegate their obligation to their supplier or distributor in order to simplify the transactions, at the exception of some very few large consumers.

[7] The payment of the extra-costs of new RES-E productions is shared by the whole of the electricity consumers. If electricity price increases are kept to an acceptable degree (between 0.1 to 0.3 c€/kWh in the European countries to compare to an average final price of 7-10 c€/kWh), this allows an amplification of the support to new RES-E projects.

between public authority, obligated purchasers and developers[8]. FIT obliges electricity distributors (or the incumbent suppliers in a spatial area) to purchase electricity from any new RES-E plant in their service area and pay a minimum guaranteed tariff per kWh that is fixed over a long period of time. BI selects by auctions RES-E projects and obliges local electricity distributors (or the incumbent supplier in the market regime) to buy electricity from the successful plants by a long term contract on the basis of bid price in the reference design (or the marginal price in some countries). EQ introduces future obligatory targets for electricity suppliers to buy either green electricity directly from the RES-E producers, or green certificates issues to RES-E producers, targets being defined in terms of a percentage of their electricity deliveries. RES-E project risks for the investor-producer are significant and various. In table 1, we show the national Choices and changes between devices to promote RES-E around the world.

Table 1 National Choices and changes between institutional devices for the promotion of RES-E

Feed-in tariffs (or assimilated)	**Bidding (Contracts with pay-as-bid rule)**	**Exchangeable quotas (Vertical integration or long-term contracts or ROCs)**
Germany (since 1995) **France** (since 2001) Spain (since 1995) Portugal (since 2001) Ireland (since 2004) Denmark (with de-fiscalization) Netherlands(with de-fiscalization)	**UK** (1991-2001) **France** (1996-2000) Ireland (1995-2003)	USA (seventeen states with RPS* since 1999) **UK** (since 2002) Italy (since 2002) Belgium (since 2003) Provinces in Australia Austria (minihydro) Candidates: Sweden, Denmark, Netherlands

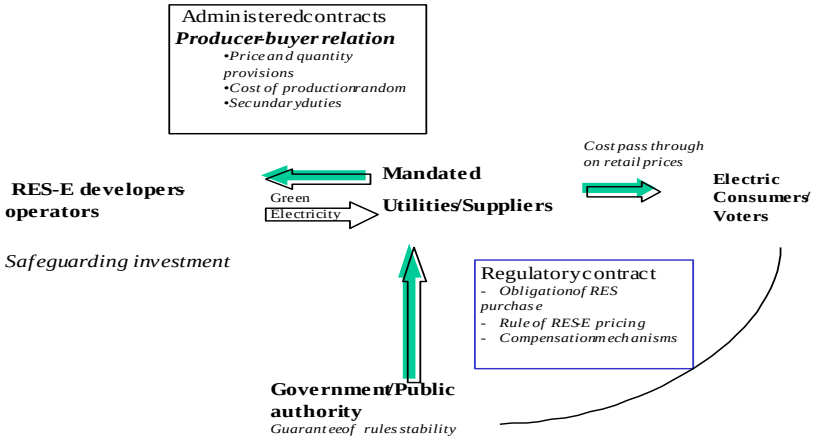
*A number of Renewable Portfolio Standards do not include the possibility to exchange certificates

RES-E project risks for the investor-producer are significant and various. In order to characterise the trilateral relation of a RES-E regulation, we must distinguish investors-

[8] In order to simplify the analysis we ignore regulation based on voluntary agreements of purchase green electricity by electricity distributors, large consumers or households. This instrument has high transaction costs (negotiation, ex-post renegotiation) because of the weakness of the properties rights, which are not compensated by significant economic benefits in development of RES-E plants for the developers, if it is applied without other significant supports as tax credit.

purchasers transactions and regulatory transactions. In figure 1 we illustrated this trilateral relation.

Figure 1: General governance structure for promotion of RES-E



Source Finon & Perez (2007)

The investor-purchaser relations

Here, transaction costs are borne mainly by the developer-operator of the project: search costs of projects, preparation and negotiation costs, permission costs, and monitoring costs. They also include costs of establishing the financing contract with lenders, which are much lower if the project is bankable with long term contracts and if the investment safeguards are perceived as credible.

It is noteworthy that for a given instrument, private transaction costs also depend upon the electricity regime. Therefore, it is the costs associated with transactional complexity inherent to the physical transactions associated with any electricity sales in liberalised industries. For the intermittent RES-E production by wind power or mini-hydraulic plants, transaction costs are amplified because this production generates a problem of instantaneous adjustment of physical supply to the quantities that must be contractually

provided to the purchasers. This is not a marginal effect: the external cost associated to wind power which generates at a cost of around 60 €/MWh is estimated at around 3 €/MWh (Holtinen, 2004).

The regulatory contract

At the level of the regulatory contract between public authority, producers-investors and obligated buyers, the TCE perspective casts light on the "credibility" of new regulation in its institutional environment. That is, the guarantee that these regulations will not deviate from their course or prove abortive, in the line of Levy and Spiller's comparative work on reforms in public service industries in different countries (Levy and Spiller, 1994). With the RES-E instruments, RES-E generation investments are strongly specific to the regulatory contract which gives concrete expression of the policy of promotion of green electricity production. Consequently, the realisation of RES-E installations depends heavily on the credibility of the public authority's long-term commitment, regardless of which among the three regulatory instruments is selected. The public authority is not committed in the regulatory contract as much as the developers-operators who invest money in RES-E projects; this opens the door to discretionary changes in the contract.

TCE suggests a general need for stability in any long term contracts, through making them incomplete with clauses of price flexibility and provisions for renegotiation, such that contracts can resists to changes in the contractual environment (Williamson, 1985). Incompleteness of a RES-E regulatory contract results from both the complexity of the environment in which it is formulated, and uncertainties over the future course including that of the learning effects. It results also from the endogenous evolution of the technologies by the help of the learning stimulated by the support. Flexibility of the

regulatory contract is, however, an important issue to allow durability of the instrument and maintain an environment favourable to investment in new RES-E installations

3. - The features of the governance structures of promotion of the RES-E.

We consider now the features of the different governance structures, the content of the contractual relations between the actors and the methods of safeguarding investments.

3.1. - The regulatory contract

In a FIT system, the main elements in price and quantity are completely defined by the regulatory contract, contrary to the two other instruments (Langniss, 2001). The regulatory contract compels the regional distributors or the incumbent suppliers to buy the electricity of new RES-E plants developed in their area at an administered price much higher than the wholesale price of the so-called "grey" electricity. The feed-in tariffs are defined for different technologies and different project size (wind power plants by size level, by location on shore/off shore, mini-hydraulic, sewage gas, landfill gas, etc) and guaranteed for a long period of 15-20 years. The tariff levels are adapted to each technology according to their respective degree of competitiveness.

In terms of governance structure, the obligated agent acts as an agent of the public authority assigned to purchase the green electricity produced by new RES-E plants in its area. The solution that governs transactions between producers and purchasers offer the maximum clarity and simplicity whereby the regulatory contract defines much of each arrangement (Langniss, 2001). This allows reduction of all transaction costs for the setting up and following up of the producer-buyer transaction. Each producer-buyer contract is defined *ex ante* in price for any produced quantity. With regard to volumes, the purchase obligation implies the obligated companies do not know *a priori* the quantities that they should take in future. It implies also that in real time, they must

assume the balancing costs related to the random nature of the production of the RES-E plants in wind power and mini-hydraulic plants.

In the monopoly regime, the extra-cost of RES-E purchases is recovered by passing it to the retail tariffs; this ensures the indirect subsidisation by all electricity consumers. In the market regime, if the incumbent suppliers who bear the obligation are in competition, there are two options. Cost recovery is made through a special fund financed by a tax on every kWh transported and thus passed mechanically to all consumers on an equal basis as in France and Spain. An alternative solution is a mechanism of cost compensation between obligated regional companies, generally the incumbent suppliers, who do not bear the same burden because of spatial differences in the installations of RES-E capacities in their respective geographic area as in Germany.

In the bidding system, the auctions are organized to gain the possibility to establish a long term contract with a mandated buyer. So the regulatory contract is quite similar to the precedent device. It links the public authority and the mandated buyers and defines the terms of the second contract between the latter and the RES-E producers: obligation to the local networks (distributors) or suppliers to buy RES-E producers; rule of definition of the contractual price in pay-as-bid for a specified long period (10 to 15 years); implicit obligation to assume the balancing costs in random production.

In comparison to the previous device, the price in the producer-buyer contract is not defined in advance by the regulatory contract. The structure of governance should give clear and stable information to the players concerned about the successive date of auctioning, the rule of price definition and the composition of technological bands. This institutional device is not complete if it does not include incentives on developers who have been selected to realize their proposed equipment, because they could tend to abandon their project when meet difficulties. On the side of the mandated purchasers,

the purchase obligation is compensated either by its cost passthrough in the tariffs when the industry is in monopoly regime, or by the repayment of the overcosts by a special fund abounded either by a tax on every transported kWh in competitive regime.

In the system of EQ, the regulated contract is weakly coercive and let important margins of choice to the mandated purchasers and to the producers. The obligation concerns an increasing amount of wholesale electricity purchases to be covered by RES-E production, contracts or green certificates. The mandate of RES-E purchasers is defined ex ante in quantity, but not in price. It does not concern RES-E electricity produced by a particular unit as it is in the provision of the two other devices. A type of agents, generally the suppliers of electricity, is imposed to have a precise proportion of green electricity in relation to their sales to one precise date. An incentive to respect the quota is given by the threat of a penalty.

This regulatory governance structure presents some specificity. It does not framed the mandated purchasers to establish only one type of contractual arrangements with the RES-E producers, but it lets them the possibility to choose between the certificates market, the contract and the vertical integration. It does not specify as well the contractual elements in period, or in price, or in quantity. In the transaction associated to the green electricity, the device dissociates the electricity and the environmental good, the sale of this one being made under the form of the green certificates. Finally, it does not dissociate the technologies, what drives the purchasers to encourage the most mature techniques.

Concerning the financial compensation of the purchasers submitted to the quotas, it is not designed at all as in the precedents devices. There is not rule of compensation in the electric industries under market regime. The players report their over costs of RES-E purchasers on their electricity retail sales. The logic behind this design is the pressure of

the competition between market players with identical obligations to respect quotas, given the fact that they are supposed to be price takers on the respective markets of electricity and green certificates.

3.2. -The protection of RES-E investors

In the FIT system, with the regulatory imposition of a contract with an obligation of purchase, a guaranteed level of the purchase price, and those on a period lasted beyond the pay back time; it is the most protective conditions for the producers, all risk of hold up being suppressed by these conditions form the buyer's part. No negotiation is necessary for the sale of electricity, for search of buyers and setting up of the contracts. So the inherent costs to the FIT device are very weak for the RES-E producers. The contractual relation, when is clarified, only deals with secondary duties: the costs of adjusting to the system, the settlements, the measurement system and the technical specifications.

The FIT system most directly exposes the RES-E producers to the regulatory risk, given that there is no need for private contracts. This risk lies from eventual discretionary changes of tariffs and purchase obligation for existing facilities and those in development. The initial political commitment to tariff stability for a 15 to 20 year time span is not a sufficient safeguard by itself. In some countries, private contracts between investor-producers and obligated purchasers add a complementary protection for the investors for a minimum contractual period covering part of the pay-out time of the equipment, as it is the case in Spain (Dinica, 2006). But as shown in the Spanish example, the time span of the contract (five years) tends to be much shorter than needed for the capital cost recovery.

In the bidding system, the bidding costs in the call of tenders are heavy for the developers. These ex-ante transaction costs are integrated in the price proposed in the investor's bid, but they will be only recoverable if the tender is selected. To the inverse, the ex-post costs are reduced by the regulatory contract that specifies the contractual period, the rules of price definition for all the period of contract. Moreover, the responsibility of the balancing adjustments is reported on the mandated buyer.

Besides the ex-ante transaction costs, a last transactional obstacle exists: the timing of the successive rounds of the call of tenders is not clear, because the government is not forced to open them and could postpone them for limiting the cost of the policy. Conditions of the next call of offers could also be changed. The stability of the formal process of selection and its regularity could reduce the information costs. These shortcomings of incentives affect the efficiency of this institutional device while discouraging the potential candidates to enter into the expensive and risky tendering process.

In the EQ device, the suppliers who are mandated to respect a quota of RES-E certificates must fill this obligation without compensation of the costs of it. They are incited to control the costs of respecting quotas and the associated risks. They can choose between the recourse of the market of green certificates, the joint purchase of electricity and certificates by long term contracts of green electricity and the self-production. A last solution is to pay for the penalty for the non respected quantity (penalty that acts as a limit to their marginal cost).

As this device does not offer formal protection to the investors, it introduces a strong bilateral dependence: the relations between RES-E producers and purchasers constitute the essential of the governance structure in this case. The management of this dependence pushes to vertical integration or quasi-vertical integration via long term

contracts. Mitchell and Connors (2004) show that in the British experience started in 2002, the five main suppliers (supporting 90% of the quotas) develop themselves the new RES-ES units to follow the increase of their quotas.

3.3. -The performances of the three hybrid governance structures

The choice of a regulation has been made by governments to frame the transactions associated to the supply of a set of collective goods on the basis of new productions in RES-E. The objective of the public authority is to encourage the development of the RES-E units by private agents with the support of subsidies on the RES-E (FIT and bidding system), or by the constraint of quota put on suppliers. But the public authority will give importance also to other factors as the control of the collective costs or the development of a national industry among others.

The control of the collective cost will result in the research of incentive to reach efficiency by the choice of a device including elements of competition or by rule of rent restrictions. In the FIT, if one hand side it is the device which shows the least transaction costs, and have been considered very effective especially for wind energy in some countries: Spain, Denmark and Germany (seen table 2).

Table 2 : Disparities of wind power installed capacities within the European union (at the beginning of 2004)

Countries	Installed Capacity in kW per 1000 inhabitants
Denmark	586,8
Germany	178,1
Spain	162,7
The Netherlands	57,6
Austria	51,2
Luxembourg	50,3
Ireland	50,1
Sweden	44,8
Greece	37,1
Portugal	30,1
Italy	15,7
Great Britain	10,9
Finland	9,8
Belgium	6,8

France	4,3
Sources : Percebois (2004) la promotion des énergies renouvelables : prix garantis ou marché de certificats verts ?, Cahiers du CREDEN	

But it is also the least auspicious to the control of the collective cost for two reasons: the absence of limits on the capacities to install in this protective framework and the limits of the incentives to control the costs. In the other two devices, the public authority control the quantities to be developed on one side and, the competition for gaining contracts or the best purchase opportunities submitted to the quotas, has a function as incentive on cost reduction.

The FIT system is the most favourable to stimulate the technical progress by pushing the innovation process and the learning of the nascent national constructors. As the rent of the producer investors is large, it could be shared with the fabricants. Being in position to benefit from the rent increase will result from the incremental innovation to be introduced by these latter ones. It is not a coincidence that Germany, Denmark and Spain posse the first three industries of wind power equipment.

Public authority can establish the tariffs to a high level at the first stage of the RES-E life cycle but incompleteness of the regulatory contract in the FIT system can be organised in order to limit the future producers' technological rent by renegotiation of tariffs; for that purpose a deadline or a target of installed RES-E capacity can be defined, beyond which the tariffs will be recalculated. The pricing can be conceived with an ex-post adaptation rule in relation to the learning factor and technical progress effect. In this sense, by providing different levels per technology, FITs promote different types of technologies while the others devices prioritise the cheapest technologies[9].

[9] Del Rio and Gual (2005) points out that cost inefficiency of FIT diminishes when it is adjusted to different technology cost reductions.

Finon and Pérez (2007) indicate that, between the three types of hybrid governance structure associating a regulatory contract and developer-mandated purchaser contracts, the performances and the shortcomings of each are clearly identifiable according to the target to reach (see table 3).

Table 3: Comparison of performances of the three-hybrid governance

	Feed-in tariffs		**Bidding**		**Exchangeable Quotas**	
	Ex ante	*Ex post*	*Ex ante*	*Ex post*	*Ex ante*	*Ex post*
Transactional efficiency & Investment protection	++	-	-	++	+	+/-
Cost control	+/0	+	++	0	++	++
Technical progress & Industrial policy	++		- *(Best available per technology band)*		-- *(The most mature technique)*	

Finon & Perez (2007).

4. - The Spanish case from 1986 to 2004: Constant Legislative incentives for RES promotion via generous "feed-in tariff".

In this section we are going to describe the legislative and institutional frame in which they have taken place the promotion of the renewable energies in Spain. The data on trends in RES-E deployment shows that wind experienced an impressive growth that, nevertheless, has not taken place for all the types of renewable.

4.1. – Precedents: from nuke to RES

Spain political support to promotion of energy sources development is not very new. National Energy Programs (PEN) were a classical tool in Spain to define the energy policy from the energy crisis of the seventies. The PEN, approved by the parliament, are institutional productions approved by the Parliament and they stipulate the anticipated demand, the sources of the production and the nature of the investments which will have to be carried out to face the demand.

The Spanish policy energy changed the emphasis from a policy directed to the implantation of the nuclear energy in the eighties, to other one whose target is the promotion of the renewable energies in the horizon of the year 2010.

The last PEN is different and emphasis the renewable promotion according to new public concern about environmental issues. In 1991, the new National Energy Plan (PEN) included a 1991–2000 Energy Saving and Efficiency Plan, setting overall targets for energy production from renewable energy sources to 1.1 Mtoe/year by 2000, increasing renewable electricity production to 4.2 TWh / year and thermal energy to 0.5 Mtoe, comprising 35 % increase from biomass, 9 % from small hydro, a planned target for solar collector area for 2000 of 400,000 m^2/year and installed wind capacity of 168 MW.

4.2. - The Spanish FIT device in RES promotion

On the economic ground, the far more generous and stable governmental support for renewable energy in Spain is connected to the feed-in tariff system that was made the major pillar of its renewable energy policy. By an early start continuous & generous feed in tariff policy in RES promotion, Spain is showed as a RES politic success story.

The introduction of feed-in tariffs for various classes and capacities of technologies followed the period of planning that had started out back in 1986. In 1986, the ‘First Renewable Energy Plan’ presented targets for production from renewable energy and targets for private and public investments in renewable energy systems. This change of orientation in the Spanish national energy policy will be the reasons for the requests of the operators to be compensated and they have received large among of money according to costs for transition to competition policies.

Between 1980 and 1994, the market introduction of RES-S, was supported for governmentally guaranteed purchase for individual projects (only a specified target group defined in the RD 82/1980 Energy Conservation Law) a third-party financing by IDAE and investment subsidies. From 1994, through the so-called 'Royal Decree 2366, the RES-E device was set up in the definition on the mandated contractual purchase of electricity by the companies and of the rules of buy-back tariffs definition. The average tariff to be paid by distribution companies was based on avoided costs of generation, transport and distribution. Average feed-in rates to be paid for electricity from biomass were around 6.5 Eurocents/kWh, 7.4 eurocents/kWh for wind power, PV and small hydro projects. As Dinica (2006) points out, in this period the FIT was quite small and the price risk very high because, although purchase price was guaranteed in the law, no level of details on the design of price and its evolution was specified.

Motivated by the liberalization of the sector from the LSE 97, the politics of RES-S promotion faces something more towards market rules but trying to support certain regulative stability. RD 2818/98 enabled renewable energy producers to choose either high fixed feed-in tariffs or a system of lower premium price on top of the market price[10]. Reformulation in 1997 ensured a payment equivalent to 80%–90% of the retail rate (almost 8 US cents/kWh) to wind energy producers; price support was to be revised periodically[11]. In 1999, the Spanish government adopted the Promotion Plan of Renewable Energies ('Plan de Fomento de las Energías Renovables en España'), calling for a doubling of the share of renewable energy in the primary energy supply quota

[10] Thus, the RES-E device was integrated by the law of liberalization of the electric industry of 1997. It is integrated in the particular regulatory niche of the "system of independent production" created beside the new regulatory system of "ordinary" electricity competition. This RD supported the obligation of purchase of decentralised production by the large regional producer-distributors that can be reinforced by direct subsidies on the investment and tax subsidies at the central and provincial level (for example the Galice Region where more half of the capacity of windpower is developed).

[11] Both updated annually since 1999 by the Government in line with the variation in the average electricity sale price, and revised every 4 years.

from 6 to 12%. The main areas considered by the plan were biomass, wind, hydropower, solar and urban solid waste.

By 2000, the premium tariff amounted to about 3 Eurocents/kWh for most renewable sources and even 36 Eurocents/kWh for small-scale solar plants (Sijm, 2002:12). The fixed feed-in tariffs were in the range 6.05-6.85 Eurocents/kWh for technologies other than solar PV, which received 39.6 for installations below 5kW and 21.6 for larger installations. Tariffs were specified for plants < 50 MW. The RES-E system has got a significant efficiency in terms of installation (with 8000 MW installed in windpower between 1995 and 2004). The combination of good wind locations with generous FITs led to profitability of investments[12].

This device has been occasionally criticized like too expensive by electric industry because of high tariffs of purchase. The cost of RES-E support for the consumers increased from 270 M€ in 1998 to 620 M€ in 2003 (4% of the total electricity sector turnover) and involves a cost of 0.26 €cents/kWh for consumers (compared to a final electricity price of 3.02 €cents/kWh). The comparison of different studies realized for Del Río and Gual (2005) conclude that in other countries, where the deployment of RES-E has been very effective, have offered similar levels of support. On the other hand, in their work show that the FIT under RD2818 has led to significant environmental benefits and does not represent an excessive consumer cost in relative terms.

In March 2004, new feed-in tariffs regulations were adopted (RD 436/2004), giving renewable energy producers two remuneration options: sell output to the distributor at regulated (feed-in) tariff; or sell output directly in the market at the market price plus an

[12] Del Rio and Gual (2005) indicate that the granting of generous FITs is not sufficient to increase RES-E deployment, due to barriers unrelated to support as administrative procedures, grid connection, ignorance about technologies, etc. Nevertheless, They would be the cases of PV, solar thermal, biomass and small hydro.

incentive and premium, as well as a capacity payment. The changes from 1997, in which renewable energy producers could voluntarily choose a support system related to market prices, must be seen in connection with Spain's gradual turn to less government intervention in the market mechanism, in the mood of the new electricity directive imposed by the EU.

This RD tries to reach also another two targets. Firstly, the stability of the system of compensation from a lasting and transparent regulation, indexing the system of premiums to the new methodology of calculation of the of reference electricity fee that the RD 1432/2002 has provided. Secondly, to increase the profitability of those renewable energies that have not been developed since it was foreseen such as the photovoltaic or the biomass.

The 2004 changes have given new incentives for using the option of offering wind power directly to the spot market, with the clear intention to 'reduce administrative intervention in the setting of the prices as well as to allocate better and more efficiently the costs of the system' (EWEA, 2005:). Until this change in policy, most producers had chosen the fixed tariff system, simply because it provided a better deal and less uncertainty over future income. The higher spot prices in Spain by 2005, due to low precipitation and reduced hydropower in the market, led many producers to accept higher risks and choose the spot-market option instead. Nevertheless, by keeping the fixed feed-in tariff option intact, Spanish policymakers showed that they would not surrender to policies that could jeopardise rapid market diffusion.

5.- The success of the FIT device from the point of view of TCE

In this section, we analyze the factors that explain the success of the FIT device from the point of view of TCE. This success of the FIT in Spain for the wind power is

explained by the particular characteristics of this mechanism announced in section 3 and 4. However, there are some particular facts of the Spanish case which enables us to better understand the correct operation of the model and their credibility for the implied agents. These elements made it possible to exceed the principal weakness of the mechanism in connection with safety to recover the investments, i.e., the regulating risk. Initially and, on a purely general basis, we can stress that the maximum solution that governs transactions between producers and purchasers offer the clarity and simplicity. The transaction costs of Spanish FIT works because the support system was very simple and regulation required practically no bureaucracy to be implemented. However, we consider that the principal reasons which explain the success of the policy of promotion of RES-E are the stability and the flexibility of the mechanism in the circumstances which took place in Spain. The stability of the mechanism is explained as well by economic reasons and political terms.

In the early 90's, Spiller and others[13] have worked on an application and an extension of the new institutional economics framework of North (1991) & Williamson (1985, 1996) under conditions of credible market reforms. In this framework proposed by Spiller, the credibility of network industries reforms is defined as the capacity to provide solely competitive stability of commitments, and it depends on the design of the Regulatory Instruments and the nature of the institutional environment which is given in the short run.

In other Works, Perez (2002, 2005), Glachant & Perez (2007) develop the basic Transaction Cost Economics' *ex ante ex post* contractual problem applied t reforms: in fact, Spiller's model is logically flawed by the impossibility to guarantee a perfect

[13] Spiller (1993), Levy and Spiller (1994 and 1996) on telecommunications reform, Guasch and Spiller (1999) on reforms to various network industries in Latin America; Spiller and Savedoff (1999) on reforms to water distribution sectors; Spiller and Martorell (1996), Bergara, Heniz, and Spiller (1998), Holburn and Spiller (2002) on electricity reform.

regulatory contract *ex ante*. This classical contractual problem introduces the necessity of an *ex post* set of solutions, but also of a room for flexibility in case of unanticipated events. This need of flexibility to correct imperfections of the initial agreement raises the question of the trade off logic between commitment and flexibility. In our perspective, this trade off has to be managed by the Regulatory Instruments[14].

In Spain the use of flexibility within the stable framework of the FIT system has been achieved properly and produced the global credibility of the device. An internal characteristic ensures also its credibility by getting flexible from a rule of annual adjustment of the premiums of feed-in tariffs compared to the wholesale price and by the relatively short duration of purchase obligation (5 years instead of 12 or 15 years in other countries), which facilitates the flexibility of the device. The arrival of a new government in 2004 also led to a revision of the device to improve its foreseability for the RES-E investors. The stability of the mechanism in the long-term was ensured by the attribution of rents to the incumbents. FIT did not attract real hostility from the electric companies because the mode of regulation allows the pass-through of all the overcosts on the electric prices and tariffs. It was not called in question during the right-wing government period between 1996 and 2004. This stability is based on the agreement of the large companies and their principal ally, the Ministry for industry.

5.1. - The stability of FIT device in Spain

We propose to interpret this continuous legislative production and the stability of the device related to the modification's capacities let to the main agents involved in the process. Those main actors involved in the process are: Central Government,

[14] As Perez (2005) has shown, a special attention has to be paid in the credibility definition of the network reforms as the "capacity to guarantee the stability of commitments while allowing the necessary evolution of the rules of the game, if this flexibility will not be the expression of stakeholders' opportunistic behaviour".

Governments of Spain's Autonomous Regions, Electric Companies and RES-E manufacturing industry.

Stability explained by economics rent sharing

The agreement of large companies is explained for two reasons. Firstly the policy of RES-E promotion compensates for the impossibility of carrying out nuclear investments since the end of eighties, and is perceived as recourse to respect the objectives of the Spanish climate policy. Secondly the device is coherent with the usual rent mechanisms in the Spanish electric market: indeed the revenues are collected by the RES-E producers who are mainly the subsidiaries of the 4 major electricity operators, which themselves benefit from considerable rents of the electric system (stranded costs, price making on the wholesale electric market).[15]

Other important fact that affects the stability of the device emerges from the creation of a RES-E manufacturing industry. This new industry which emerges from the creation of a RES-E manufacturing industry limits the possibility of change of the device towards a new one which would leave less rent and create less opportunities of industrial development, as it is also the case in Germany. It is followed from there that the passage to the device of the quotas which was discussed in Germany in 2000 and will be again is not discussed in Spain, despite the European procedure of harmonization which aims at a unification of the RES-E devices between country.

[15] According to Eikeland & Sæverud (2006), among incumbent energy producers, both major national companies Endesa and Iberdrola are now investing intensively in renewable energy. Iberdrola, Spain's second largest energy company, has become the biggest owner of wind farms in the world (more than 3,000 MW), with the Navarre Company EHN wind-power developer currently taking third place (IEA, 2005:113). Endesa, with its installed capacity of more than 1,100 MW, was by June 2005 the owner of around 20% of total installed wind-power capacity in Spain. Hence, Spain's renewable policies seem to be more about additional opportunities than the redistribution of resources among national actors. This is of course connected to the gap between growing energy demands (nearly 6% growth per year in recent years) and poor domestic supply situation (OECD 2004:45). Unlike the UK, Spain does not have a strong domestic fossil fuels industry that might feel threatened by strong support schemes for competing energy sources. Spain's small oil and gas industry contributes less than 1% to domestic demand for each of these fuels (IEA, 2005:22).

The Spanish institutional environment thus creates an effective incentive structure for the developers of RES-E by insuring a stability corrected by an adaptability of the device in place. However it is not a sufficient condition to prevent a change of policy. In Denmark where a significant industry of construction of wind mills was developed under the effect of a generous policy combining buyback tariffs and defiscalisation of green electricity, the right wing government arrived in 2002 decided to stop the subsidization for new projects.

Stability explained by political structures

The 1978 Spanish Constitution, while reserving for the state exclusive rights over general economic planning and legislation governing the energy system, gave the country's 17 Autonomous Regions far larger leeway than before in developing administrative procedures and planning provisions related to, among other matters, the environment (IDAE, 1999). The Constitution recognises the right of the autonomous communities to have financial autonomy 'for the development and enforcement of their authority'. These communities receive revenues directly and indirectly from central government sources as well as from their own local taxes, special levies and loans. Several of Spain's Autonomous Regions have been highly aware of the opportunities of wind power in terms of regional industry policy and employment. According to Del Guayo (2001), there exists a tension between the local authorities and the central government aiming to the increase in the delegations of sovereignty towards the local level. Article 149 of the Spanish Constitution of 1978 establishes a framework of 32 exclusive competences of the central government[16].

[16] This framework seems to be very favourable in terms economic and electricity regulation to the central government.

Table 4 : Exclusive competences of the Spanish State in economic legislation
Art. 149.1.10: international taxes for import and export and external trade.
Art, 149.1.11: Monetary systems, foreign currencies, change. Economic basis of loans, Bank system and insurances.
Art. 149.1,13: Bases and coordination of general economic planification.
Art. 149.1.14: State Finances and State debts.
Art. 149.1.21: Train and transportation system for more than one autonomous Community; the global framework of communication, post and telecoms as Air, underwater, and radio Networks.
Art. 149.1.22: Public authorisation for building electricity production or transportation systems who implies and effect in more than one autonomous Community.
Art, 149.1.23 : Fundamental legislation on environmental protection. The autonomous Communities have the right to issue more legislation on only additional requirement.
Source : Bon- Moderne (1981).

This article results in to leave only little place to the autonomous communities in the management of Spanish electricity sector. Those have a competence only in three cases: the management of the complaints of the consumers at the local level; the introduction of additional local taxes relating to provisions of environmental protection; and finally, right to follow a regional policy of energy promotion in agreement with the national energy plan (PEN). For RES promotion the later point is crucial, because it leave option open to local authorities to build and operate a RES strategy.

Basically in term of institutional environment in the Northian sens, Spain has a hybrid system of government centralization and a sort of limited federalism (Weingast, 1995), the government has important means in industrial policies and decision making in regulatory design in strategic sectors such as the whole regulation of electricity industry and regulation; it can legislate by decree. The regionalization of the political institutions acts in an asymmetrical way onto the reinforcement of public policies defined at the central level: it does not allow the reduction of policies initiated by the central level, but authorizes the increase in public commitment and regulatory support by the Provinces (Perez, 2002).

It should be noted that the Spanish Provinces have a right to veto any change of policy of RES-E promotion to ensure by a right registered in the Spanish constitution of 1978. Their powers on economic and industrial issues allow them to animate local economic activities. It was the case of the Galice and Navarre (see appendix 1) for the development of a local manufacturing industry of windmills, which have use subsidies conditioned to the development of local employment.

6. Conclusions

In this paper we have demonstrated that the Transaction Cost framework allow to understand and classify the public devices used to promote RES-E technologies. We have also shown that the great empirical success of the wind power generation installation in Spain can be understood according to this analytical perspective.

Last but not least, we have explained how the Spanish experiment is therefore credible for private investors buy achieving a good balance between the necessary stability of public commitment in the promotion of renewable on the one hand, and by its ability to manage room for adaptation and flexibility in a non opportunistic way. Reaching this trade off in the end of our analyse one of the main reason of the Spanish success. However, we see the latest evolution of the Spanish regulation (ref) as the next big challenge this FIT device will be required to pass to really be a major stake in the economics and management of network industry for the next decade.

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Appendix 1

The Navarra example

The Navarra example is striking; more than 45% of total energy production in 2003 came from wind power. In return for authorisation of wind-farm projects, local governments have often required that developers keep a large share of investments in the local economy and contribute to local employment. The success of Navarra in coupling environmental and industrial affairs serves as an example to yet other regions seeking to emulate the model in order to attract industrial investments based on wind power. Aggregated to the national level, the sum of regional success stories had by 2003 created a sizeable wind-power industry with more than 47,000 jobs (12,000 direct and 35,000 indirect). Spain is now home to the world's second-largest manufacturer of wind turbines, Gamesa; and is the currently largest wind-park developer and constructor in the world (EHN, incorporated in 2004 into the Acciona Group), with up to 500 smaller companies supplying components.

Eikeland & Sæverud (2006)