

**The transactional efficiency and the public promotion of the renewable
energies in the electric industry:
The choice between structures of hybrid governance.**

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Summary

By the recourse to the Williamson' and Goldberg's transactional analysis, this paper compares the relative efficiency of three institutional devices which has been recently implemented by some countries to promote renewable energies in electricity generation. These devices are identified as structures of hybrid governance because they are composed of two complementary contracts articulated around an obligation of purchases imposed upon some electricity market players. This contractual duality puts first in relation the public authority mandated by the citizens-consumers and the mandated purchasers (generally the electricity suppliers); then it puts in relation these ones and the producers which are candidates to invest in renewable energy sources (RES). For that one identifies the attributes of the transactions that are framed by these contracts and one analyzes the sensitivity of the three governance structures to the risk of holdup which are the guaranteed feed-in tariffs, the bidding system for long-term contracting and the exchangeable quotas system. One compares the performances of these three devices by reference to three criteria: the transactional efficiency in relation with the protection of the investments in renewables on the long term, the control of the collective cost and rents allowed by these mechanisms, and finally their capacity to stimulate technical progress and to sustain an industrial policy in RES equipment fabrication. This paper shows that none of the three devices proposes an optimal solution in each of these dimensions and that, according to the relative importance of the criteria, it exists an adapted structure of governance.

Since the nineties, the governments have developed voluntary policies of development of renewable energies in the goal of preservation of a set of collective goods composed by the climate stability, the local environment and the energy security. In the domain of the electric production that is the main domain of their developments besides the biofuels, they adopted policies based on subsidization of either the investments, or the kWh produced by these technologies when they are near of the commercial maturity. Devices of direct or indirect subsidies are necessary because the units of Renewables Energy Sources in Electricity (RES-E) are not competitive in relation to the large units of electricity generation that are the dominant techniques for three reasons (i) their relative commercial immaturity, (ii) the absence of scale effects on the costs of transaction and production, due to their small size which limits savings on the costs of preparation and realization, and (iii) the random character of their intermittent production with difficult programming of the production from some technologies (windpower, mini-hydraulic).

After having drawn the lessons of the experiences of voluntary purchases of green electricity to frame the RES-E investments by the market, as well as the one of the direct subsidies to the investment, the European countries and a large number of states in the United States and in Australia skipped to one of the three types of institutional mechanisms by organizing an indirect subsidization of the production. These three devices have in common an obligation of purchase of some precise green electricity productions the well identified agents. They rest then either on guaranteed buy-back tariffs in the long term, either on a system of auctions for the assignment of long term purchase contracts at the proposed price (pay-as-bid), either on the system of quotas of green certificates with exchangeability of them. These three mechanisms constitute different structures of hybrid governance that articulate on one hand a regulatory contract between the public authority and the mandated purchasers, and on the other hand contracts binding the mandated purchasers and the producers who invest in RES-E units.

The object of the analysis is the choice between these devices by the problematics of the New Institutional Economy. They can be articulated around two complementary perspectives. The first, in the line of Williamson's developments [1985, 1996] and of the concepts of the Transaction Costs Theory (TCT), analyzes the essential features of the two types of transaction that the structure of governance of the promotion of the RES-ES must manage. The second that we develop in Finon & Perez [2004b] deal with the embeddedness of these governance structures in the different institutional environments and its effect on the institutional credibility of each of them. While adopting the perspective developed in the institutional analysis of North [1990] and Levy & Spiller [1994], one can indeed analyze the devices for the promotion of the RES-ES in term of institutional credibility. If one dissociates the two perspectives as we do here, it comes down to make the hypothesis of a stability of the RES-E regulations, and that this stability assures their credibility, to refer to an element of the discussion developed in this second perspective.

The comparison of the incentive devices in the terms of the TCT adds to the assessment of the economic and social efficiency of these instruments of policy in terms of private and collective costs. Taking in consideration the transaction costs in the institutional arrangements that are supposed to reduce the risks for the developers by sharing them between the contractors is essential since the impact of transaction costs is as important on the choices between types of assets by the potential investors as the anticipated production costs and risks. Here, in relation to the decision of investment in RES-E, each hybrid structure of governance

setting up by the States exhibit specific qualities in term of guarantees offered to the developers of projects for the limitation of the volume-risk and price-risk, and for making profitable the projects by the earnings subsidized by the mandated purchasers and indirectly by the consumers of electricity.

Therefore the goal of the paper is to explain the principles of selection between the devices combining regulation that organizes the relation investors-mandated purchasers and institutional arrangement between them. The selection is between the institutional solutions that the public authority, the investors and the purchasers choose in order to secure the investments in RES-E and to frame the transactions to protect the investors against the risks of opportunism of the buyers of RES-E electricity or the State that wished to promote the development of these renewable energies and can change the regulation in the future. In this setting, the determining parameters of the ordering of the devices of promotion of the RES-ES concern three points: first the performance in terms of installation of new units that is linked to make secure the transactions; then the control of the collective cost with limitation of producers' rent and diminution of the costs of the new units, but which can affect the quantity of facilities to be installed ; and finally, the stimulation of the technological learning and the development of an industrial policy in fabrication of RES-E units.

In the first part, one analyzes the attributes of the transactions for the supply of collective goods by the development of the RES-E that are going to condition the choice of the type of RES-E regulation. In a second part, one defines the features of each of the three structures of hybrid governance between which the public authority can choose. In the third part, one compares the advantages and drawbacks of these three structures and one shows that according to the hierarchy of public objectives, a preferable governance structure exists.

1. The attributes of the transactions associated to the development of RES production

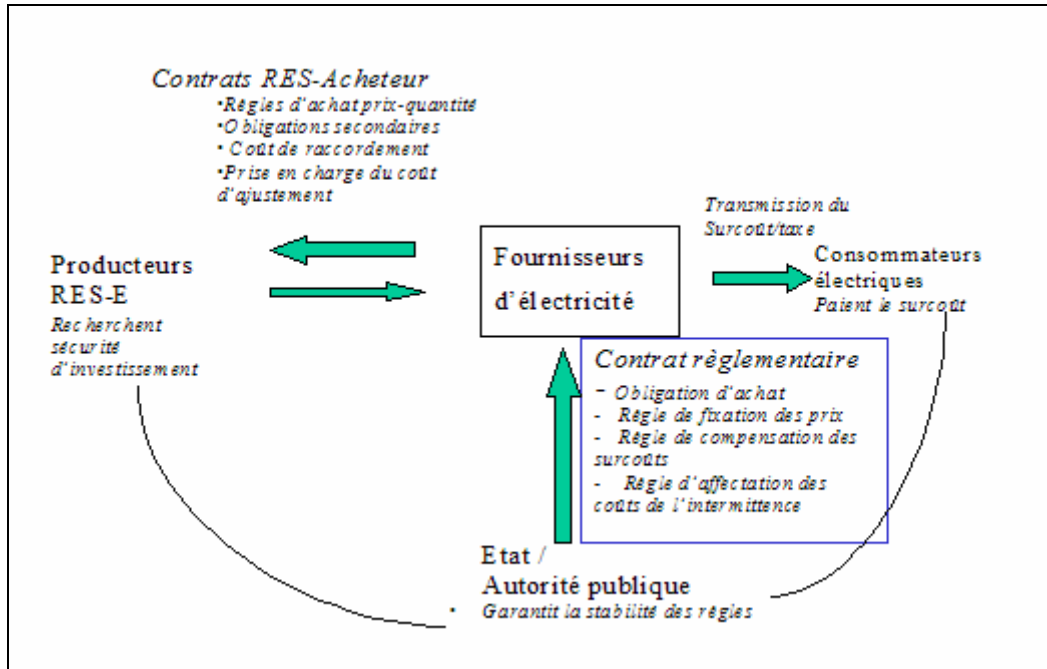
The TCT takes in account the attributes of the transactions to explain and to determine the institutional arrangement to keep. The authors note the different shapes of specificity of assets to the transaction (in particular specificity of site, of competences, temporal specificity), but also the uncertainty, the complexity and the mesurability of the performances within the transaction. One knows that the main determinant of the institutional arrangements in an uncertain environment and in presence of externalities is the constitution of specific assets [Williamson 1996, Masten and Saussier, 2002]. The empirical studies also show that the frequency, the complexity and the externalities surrounding some transactions condition the choice of the institutional arrangements. Generalizing this analysis to the choices of governance structures by the governments to lead tutelary policies, Williamson (1999) analyzes the characters of the associated political transactions to explain the choice of those between public bureaucracy and market, while passing by regulation and contract (by delegation).

To identify the transactions organized around the promotion of the RES-ES, one distinguishes four groups of agents involved in several types of transaction between them around the promotion of the RES-ES:

- the public authority that take on the governmental engagement to provide a set of collective goods by the development of the RES-E production,
- the citizens-consumers of electricity who mandate the government to fight against the climatic change and to assure the long term energy security by developing the RES-E,

- the agents on which are going to carry either an obligation of purchase green electricity, or to respect a quota of physical or contractual RES-E and green certificates,
- and the producers candidates to the investment in RES-E.

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



The transactions associated to the RES-E production between these agents are set at two levels:

- at the level of the definition of the public policies, the political transactions concern the supply of a set of collective goods by the promotion of the RES-ES under the responsibility of the government elected by the citizens-consumers. These transactions drive to the setting up of the device for stable indirect subsidization of the RES-E production. It is to this political transaction level that the public authority preferred regulation to market, given the limitations of the direct purchases of green electricity by green marketing to boost investment in RES-E for providing this set of collective goods. Regulation is also preferred to the public bureaucracy because of the institutional environment (cultural reluctance of public power companies to develop the decentralized generation before the market reforms in the nineties, unfit with the ruling principles of the sector after the reforms). It is also at this level that, once the choice of regulation has been done between the different modes of governance, the public authority must choose between the three institutional devices which correspond to a regulatory contract between the public authority and the mandated purchasers.
- At the second level, the transactions concern relations between the producers who invest in RES-E units and the purchasers of their green electricity: the investors refers to the regulation set to define the contractual arrangements with the mandated purchasers in order to secure their investment and to fin lenders to establish a contract of project financing. In the case of the quotas system, the transactions are more complex to this level because the system dissociates the green electricity in two goods, the undifferentiable electricity and the green certificates, that means the property rights on the environmental good that are exchanged between green producers and

purchasers submitted to the quotas expressed in terms of quantities of green certificates to own.

For these two intricate transactions, the specificity of assets and other transactional attributes (uncertainty, externalities) play to various degrees.

1.1. The specificity of RES-E assets to the political transaction

The asset in RES-E production is strongly specific of the political transaction associated to the promotion of green electricity production and the stability of the regulatory set that organizes the incentives to invest in RES-E units. They rest on techniques that, as underlined already, are penalized by their commercial immaturity, their overcosts inherent to the absence of scale economies, and the intermittence of their production. In the line of second best environmental policies, the objective of installed capacities in RES-E are in principle supposed to equalize the overcost of the marginal units (i.e. the marginal cost of pollution reduction) and the value of the marginal benefit (i.e. the avoided damage if one only considers the preservation of environmental goods). This is how the environmental quasi-rent is created by the new RES-E units whose overcost is lower than the social value of the avoided damage (without speaking of the social value of the increase in energy security).

The RES-E regulation must allow to compensate in a steady way the overcost of production of the kWh of the new RES-ES units on one sufficiently long period to assure the recovery of the investment. Their realization is strongly dependent of the credibility of the long term commitment of the public authority in each of the three regulation devices. The opportunism of the governments, notably in case of electoral change, or the discretionary and non foreseeable amendments of the rules of the device create a risk of expropriation of the former investments or in progress, and this risk can be strongly deterrent to investment in RES-E. The absence of long-term predictability of the policies or the possible limits of the safeguards offered by the Constitution, the law or the decrees can cause the mistrust of the candidates to invest [Finon, Perez, 2004b]. But it is important to distinguish the stake of stability of the indirect subsidy rules to the production for the RES-E units constructed in a set of regulation rules on the one hand, and the interest of the indefinite upholding of this institutional device whereas the technological costs decrease under the learning effect, or the political changes could alter the weighting of social preferences around environmental goods on the other hand. It is on the first stake that is played the credibility of a regulation to be able to invest.

1.2. The specificity of the RES-E asset to the transactions between producers-investors and purchasers

At the second level of the transactions, those between producers RES-E and the purchasers of RES-E electricity, the asset specificity depends on the institutional rules of mandated purchase of electricity that ensue from the regulation and the legal rules of network access that condition the geographical specificity of assets.

1.2.1. The different configurations of the geographic specificity of RES-E assets

The institutional environment of the electric industries conditions the geographic specificity of the RES-E units and determine the safeguard rules of the investment in RES-E. Thus, in the previous set of the regulated monopoly that does not allow purchasers to access to the network and to choose the producers and therefore to differentiate the product by the

character of its production process, there exists a geographic specificity of the active RES-ES. Indeed, RES-E producers are forced to sell to the electric utility which is in monopoly in the area where is located their units. They are therefore greatly exposed to the risk of holdup, what leads the public authority to impose a purchase obligation and the payment of a administered price to the utilities in counterpart of the pass through of the subsidised green kWh (i.e. the difference between this price and the price of the wholesale electricity market) in their retail tariffs.

The reforms of market liberalization change the deal. The adoption of the provision of third party access that fundamentally modifies the property rights on the physical network capacities erases the supply monopoly and suppresses the geographic specificity of the RES-E asset. RES-E producer henceforth could reach voluntary purchasers. Consequently a regulatory or legislative decision is necessary so that the production of the RES-E unit is removed by the local or regional distributor-supplier and is paid according to a administered tariff. As this supplier has now some competitors in its area of service, this obligation that makes him support some charges must be imposed in counterpart of compensation for the overcost of these buy-back tariffs, as it is the case of Germany since 1995 and France since 2000. But the obligation can be just as well carried indirectly by all suppliers in competition on the basis of their sale if the mandate of purchase of the green electricity is imposed to the system operator which uniformly resales it to these supplier at an averaged price (case of Denmark).

1.2.2. The consequences of the temporal specificity

A second type of asset specificity concerns some RES-E technologies (wind, mini-hydraulic) i bound on the one hand by the intermittence of their production, that means the weakly programmable character due to the meteorological risk and, on the other hand, by the non-storability of electricity. The meteorological risk which superposes itself to the operational risk all production equipment obliges that the RES-E producers which are engaged in contractual sales search for compensatory electricity in real time to balance their contractual load. The intermittence of the production poses the problem of the instantaneous adjustment of the offer to the quantities that must be provided to the purchasers and that are specified contractually.

Under the regime of the regulated monopoly, this problem was settled by the purchase obligation of the monopoly that conducted the set of the real time balancings of which those due to the intermittence. On the liberalized markets where the RES-E production is treated a priori like a normal production on the wholesale markets, the market players must announce several hours in advance to the system operator the quantities that they will produce or buy. The costs of technical adjustment by the system operator which are associated to every unbalance are not regrouped anymore and mutualized, as in the previous situation of the monopoly. The market logic leads to individualize in real time the responsibility of the actors committed in bilateral or multilateral transactions, despite the necessity of general stability of the system. Therefore they bear the responsibility of the instantaneous balance between the injection of their production on the electric grid and the off-takes by their purchasers. In the liberalized electric industries, one floor of the organized markets, the intra-daily market of balancing, is dedicated to gather the offers of increase or instantaneous reduction of the injections of the producers (or conversely of the big purchasers' off-take) in order to allow the system operator to assure the balance of the system in quasi-real time. But the price of balancing doesn't reflect the cost marginal of adjustment, because the market rules gives to it

the function to dissuade producers and purchasers to be in transactional unbalance in real time. Also the mutualisation of the costs of adjustment due to the intermittence of the RES-E production is no more possible without dedicated market rules.

If the priority of RES-E promotion does not balance the objective of efficiency of the electric markets, the organization of these markets can be defined in the ignorance of the peculiarity of the weakly programmable production of the ENR units, as we could observe in the UK in 2001 when the new market rules (the NETA) were implemented (Mitchell, Connors, 2004). It depends on two particular rules: the delay between the gate closure and the realization of the transactions, and then the prices of the adjustments that the system operator calculate for balancing the shifts between the producer's offer of quantity and the realization. In first place the delay for the gate closure is chosen large by precaution (three hours and half in Great Britain in 2001), what creates a recurrent risk of shift between the announced production of the RES-E units and the one that will be achieved. In second place the general objective of electric market efficiency that leads the electricity regulator to limit the load unbalances leads the regulator to define price incentives for the producers to self balance the load in real time between their production and their contractual sales, what explains the distance of balancing prices with the actual average costs of the adjustments of which are jointly responsible the RES-E producers.

Because of the difficulties to foresee their production three hours in advance, RES-E producers undergo thus a penalty beyond the reality of the overall costs of rebalancing that they cause. There is therefore in this case monopolization of the quasi-rent of the RES-E production by the delay of closure of the market. This market rule can entail such a loss of value of this production that it can deter to invest in RES-E (Mitchell, Connors, 2004; Menanteau, Finon, 2004).

Therefore the temporal specificity creates uncertainty and generates a transactional complexity. It obliges one or the other contractual part to commit to assume *ex ante* the risk of production to suppress the risk of holdup which result of the weakly programmable character of the RES-E production and to avoid the overcosts of complementary electricity purchase (or sales) in real time. When it is not the mandated purchaser who is designated by the RES-E regulation to assume the cost of the adjustment, it is a factor that contributes to search for a long contractual relation, because the long term contract permits to designate the agent who carries the balancing cost and to share the associated risk.

1.3. The treatment of externalities of RES-E

The externalities appears to the two levels.

- To the level of the political transaction, there is the contribution to the preservation of the collective goods that justifies the RES-E policy, i.e. the avoided damage by the production of RES-E in terms of risk of climate change and other local environmental impacts as well as the improvement of the energy security. It is completed by the advantages of energy security and in the dynamic effects led on the progress of the technical RES-E and on the upstream development of an equipment industry. These externalities are difficult to be managed on a market basis. The internalisation of the environmental costs or the advantages of security by a pigouvian tax is difficult to manage, due to a lack of fine and non-disputable assessment of the avoided damages and the indirect security advantages. They are also dependent of the transaction costs and of the uncertainties attached to the

political process of definition of the collective preferences on the value attached to the respective collective goods.

- To the level of the mandated transaction producers-purchasers, the RES-E production affects the coordination of the overall electric fluxes, that, as it has just been seen, creates the temporal specificity of assets. This externality requires the continuous adjustments of the system equilibrium and the definition of a rule of bearing the balancing costs either on the producer or on the mandated purchaser.

1.4. The transactional uncertainties

One must also note the importance of transaction uncertainties, which are common or specific to the two transactional levels. They are of various types:

- at the first level, the regulatory uncertainty that is determined by the conditions of stability of the political transaction ;
- commonly at the first and second levels, the technological uncertainty on the cost of investment of the units and on their performances : this uncertainty holds to the youth of the techniques and the associated risk is traditionally carried by the producer-investor; but it can be more easily assumed in a device granting the environmental quasi-rent to the producers-investors;
- at the second level, the operating risk due to the meteorological uncertainty that can be assumed by the producer, but that is reported on the mandated purchaser in the most favorable devices ;
- at the second level again, the local and administrative risk for the construction license of the RES-E units because of problems of acceptability raised by their visual impacts, which increase the costs and the risks of preparation of projects,;
- at the second level finally, the price and volume risks for the producer-investor, that the regulated device must clearly place on the mandated purchaser under legal conditions of cost compensation .

The hybrid structure of governance that will be introduced should take therefore in account the original shapes of the asset specificities, the uncertainty that there corresponds and the management of the externalities. These are them that orient the choices of most efficient institutional arrangements. The characterization of the attributes of transactions now permits to analyze the different structures of governance and to determine which is the most efficient for offering the guarantees necessary to the investors while limiting the risk of an excessive appropriation of the quasi-pension by one of the parties. Three elements are going to influence the efficiency of every device and the size of the costs of transaction partners mainly:

- the content of the contractual relations between public authority and mandated purchaser, that can be going as far as determining the relation in quantity and in price between the producers-investors and the purchasers,
- when, at the second level, the agents have the possibility to choose between different types of arrangements between producers RES and obligated purchasers (it is the case of the quotas system), the securization of the investments allowed by each of these arrangements,
- inside these institutional arrangements, the possibility of mutualization of the balancing costs for the productions weakly programmable in liberalized electric industries.

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

We consider now the features of the governance structures and more especially, the content of the contractual relations between the actors, the methods of safeguarding investments and finally the ways of cost mutualization bound to the real time adjustment of the contractual supply of intermittent RES-E producers. One successively considers the relations between public authority and mandated purchasers in the three concurrent devices (feed-in tariffs, bidding and exchangeable quotas), then those between RES-E producers and mandated purchasers.

We show that, in the cases of the feed-in tariffs and of bidding, the risk of holdup does not play in the relation RES-E producers-mandated purchasers when the contract is nearly defined in a complete way by the regulated contract which emanates from the political transaction. In these two cases, the regulatory contract looks like the "administered contract" in the sense of Goldberg [1976] that, in the industries of public service, bind the authority of regulation and the enterprise in natural monopoly while organizing and standardizing all contracts between this one and the electricity consumers. This administered contract imposes him a supply obligation and redistributive principles in pricing rules downstream, but these pricing rules guarantee cost recovery and just and reasonable conditions of return on assets which eases investment in production and distribution networks. Here the contract we name "regulatory contract" is supposed to create favourable conditions permitting the realization of investment in RES-E.

Conversely, we show that, in the system of the quotas, the regulated contract is alleviated and let choice to different institutional arrangements, between market and hierarchy: in other words the relations between producers RES-E - purchasers constitute the essential of the hybrid governance structure in this case. However, we will see that this possibility of choice is marked by a strong bilateral dependence pushing to vertical integration or quasi-integration via long term contracts. We show these organizational forms do not eliminate completely the solutions of recourse to the spot market of the green certificates or to the payment of the penalty for non-respect of the quota. These last two elements permit the adjustments of the agents submitted to the quotas to respect them, or for producers RES-E to find complementary outlets of their production. For the first ones the penalty also acts as a limit to their marginal cost for respecting the quotas.

Table 1. Comparison of the features of three hybrid structures of governance

	Regulatory Contract	Contract Producers - Mandated purchasers
Feed-in tariffs by technologies	<ul style="list-style-type: none"> - Obligation of purchase on the distributors-suppliers - Administered prices - Balancing cost for random production carried by the mandated buyer - Compensation of buyer's overcost 	<ul style="list-style-type: none"> - When it exists, only secondary duties¹
Bidding by Technology bands	<ul style="list-style-type: none"> - Obligation of purchase on the distributors-suppliers - Balancing cost for random production 	<ul style="list-style-type: none"> - Competition for candidates selection - Selection based mainly on price criteria p - Definition of the contractual price by

	<ul style="list-style-type: none"> carried by the mandated buyer - Bid for long term contracts 1 - Compensation of overcosts 	<ul style="list-style-type: none"> <i>pay-as-bid</i> rule - Secondary duties
Exchangeable Quotas With no technology bands	<ul style="list-style-type: none"> - Definition of property rights (type of RES technologies) - Level of Quotas on suppliers - Penalties - No regulatory rule of carrying the cost of intermittence - No compensation of buyback overcosts 	<ul style="list-style-type: none"> - Choice between three types of arrangements : <ul style="list-style-type: none"> - Market (Green certificates) - Long term contract - Vertical integration - Coût d'adaptation à l'aléa météo sur le producteur ou sur l'acheteur - <i>Secondary duties</i>

2.1. The arrangement between the public authority and the mandated purchasers

The relation between the public authority and the obligated purchaser specifies a set of contractual parameters of the relation producers RES-E & purchasers which is supposed to give guarantees to the two parties in order to help the realization of RES-E investment by the first ones and to organize *de jure* or *de facto* the passthrough of the purchase obligation cost in the tariff or price paid by all the electricity consumers.

2.1.1. The regulatory contract in the system of the feed-in tariffs

In the feed-in tariffs system, the regulatory contract mandates the regional distributors or suppliers to buy the electricity of the RES-E units at an administered price which is much higher than the wholesale price. The guaranteed prices are defined for a given technology and the announced price are guaranteed on a period of 10-15 years, for every unit installed according to the level of this price signal. This principle permits to discriminate between the RES-E technologies, the levels of tariffs being adapted to each one according to their respective degree of maturity.

In the former monopoly regime the overcost of the mandated purchase of RES-E are compensated by its pass-through in the tariffs, that organizes the ultimate subsidization by all the electricity consumers. In the market regime in which the suppliers who support the obligation are in competition, the overcost compensation is an important provision of the regulatory contract: the re-payment is made by a special fund financed by a tax on every transported kWh which is itself passed mechanically to all the consumers.

The mandate is defined in advance in price. The obligation of purchase makes that the mandated enterprises do not know a priori what quantities they should take in the future. In real time they have to assume the adjustments of delivery in relation to the random character of the production (wind, mini-hydraulic) of RES-E units that concern them. So the producer-buyer relation is already so codified by the regulatory contract that the purchases have not to be formalized in a formal contract, except for the technical conditions and the mode of settlement.

In this governance structure, the risk of opportunism of the public authority exists, consisting mainly in discretionary decisions to review the tariffs for the existing facilities, or for those in construction. The risk of opportunism could also lie in the complete revision of the regulatory contract but this change could not affect the former producers-investors if it maintains the former arrangement for them in terms of guarantees on the off-take and the prices. The

change of the RES –E regulation only affects the investment of constructors of RES-E units when they have been dimensioned in relation to optimistic anticipations of the market development directly linked to the level of incentives created by the feed-in tariffs system.

2.1.2. The regulatory contract in the bidding system

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. 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 electricity produced in their area ; 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 which is necessitated by the random production ; compensation of the overcosts by a special fund abounded by a tax on the transported kWh. We note also the mode of selection by technology bands (windpower by power level, mini-hydraulic, sewage gas, landfill gas, etc.). In comparison to the previous RES-E regulation, the price in the producer-buyer contract is not defined in advance by the regulatory contract, but it defines the rule of the definition of the contractual price ². It can also include a rule of cost cap by technology for the selection of contracts RES-E producers-buyers, that imposes to developers to candidate at a price level not to overcome.

On the side of the mandated purchaser, 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 régime.

The regulatory contract should give clear informations to the players which are directly concerned by the opportunities to invest, i.e. the investor candidates in different directions for limiting the organization cost of the innovation process and incite the selected candidates to realize their projects. Firstly the structure of hybrid governance should include clear and stable information on the successive date of auctioning, the rule of price definition and the composition of technological bands. Referring to the British experience of the Non Fossil Fuel Obligation from 1991 to 2000 (Mitchell, 2000), one observes that the successive calls of tenders have taken place at moments decided by the public authority without long anticipatory possibility, although they came within a policy based on a long-term objective of capacity installation at a specified horizon (2000 in a first step, and then 2005). So it was for the evolution of technological bands. This refrained a lot the developers' strategies.

Secondly the institutional device is not complete if it does not include incentives on developers who have been selected to realize their proposed equipment. They could play indeed on the year of realization by postponing it, that allowed them to bet on the technical progress in the next years because they could have underestimated their price in order to be selected. But they tend to abandon their project when they meet the first difficulty. The incentive could be a penalty to incite the candidates who have been selected to bid at a reasonable price to concretize their project of installation. It does not exist in the UK bidding system and a large number of selected project have not been realized (Mitchell and Connors, 2004).

2.1.3. The regulatory contract in the device of the exchangeable quotas

² Other pricing rule could be contemplated such as the marginal price , but the choice of pay –as-bid allows to limit rent and is considered to be socially more efficient.

In the system of exchangeable quotas, the regulated contract is weakly coercive and let important margins of choice to the mandated purchasers and to the producers. 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 provisions of the two other devices for the RES-E units on the territory of regional distributors or suppliers with large remaining segment of captive customers. The obligation concerns an increasing amount of wholesale electricity purchases to be covered by RES-E production, contracts or green certificates. A type of agents, generally the suppliers of electricity, are 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.

An important principle is the clarity of the property rights assigned by the regulatory device to producers RES-E to permit the exchange toward the buyers submitted to quotas. The public authority must assure the predictability of the device to guarantee the durability of these rights. For that purpose it is necessary that the regulation is established for a long period of 15 to 20 years for securing the investors, that the quota is increasing for a long time beyond the first ten years to create a demand of certificates that maintains the market price of the certificates, that the trajectory of quota increase is defined to this horizon and is not revised downwards, that finally the composition of the basket of eligible technologies is only reviewed for exceptional and legitimate reasons. All addition or modification in the regulatory RES-E portfolio alters the property rights and has an effect of decrease on the price of the certificates.

Concerning the financial compensation of the purchasers submitted to the quotas, it is not designed at all as in the preceding devices. There is no rule of compensation in the electric industries under market regime. The players report their overcost of RES-E purchases on their electricity retail sales. The logic behind this design is twofold: the competitive equity between market players which have to support identical obligations and the pressure of the competition to incite to limit their expenses to respect the quotas, given the fact that they are supposed to be price takers on the respective markets of electricity and green certificates.

One will note that, contrary to the two other devices, the regulatory governance structure presents three specificities.

- It does not frame 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, nor in price, nor in quantity; the investor must negotiate one or several contracts, the purchasers offering different contractual periods that depends on the price that they accept to pay.
- In the transactions 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 constitute. But it is also true that the agents can choose to integrate the two transactions while passing contract for one good with an integrated price.
- Finally it does not dissociate the technologies, what drives the purchasers to encourage the most mature techniques.

Two institutional rules have for function to enforce the regulatory contract. In the first place a system of penalty is established to incite the purchasers submitted to the quotas to respect them, but also to preserve them to hire too expensive efforts. The payment of the penalty is

full of discharge, so that their marginal costs to respect the quota do not overcome the level of the penalty. But, to avoid an important flight in the respect of the quotas by the payment of the penalty, the public authority could also create a supplementary incentive by redistributing the fruit of the collected penalties between the agents that respected their quotas on the basis of their certificates, as it does in the UK in the Renewable Obligation adopted in 2001. This provision can be very efficient because it comes down to make subsidize those that respect the quota by the competitors who do not respect them. In second place a framing of the market prices of the certificates by a price ceiling and price floor is destined to limit the volatility of this market and there to facilitate the recourse to this market for the RES-E purchasers. With these two elements, the actors benefit from interval of reference prices to invest or to commit them selves in long-term deals of green electricity.

2.2. The organization of relations between investors and mandated purchasers

The costs of transactions between producer-investor and mandated purchasers are going to depend on the adopted regulatory system, each one determining contractual relations between RES-E producers and mandated buyers. In good reasoning it would be necessary a priori to consider the two contracting parties, but, given the reality of the device, it is only necessary in the system of the exchangeable quotas, because it is the only case in which a contract in quantity and in price is not imposed to the mandated purchaser. Therefore in our successive treatment of the three devices, we only consider the developers in the first two devices because they are the only ones submitted to the risk of hold up in these settings.

2.2.1. The protection of RES-E investors in the feed-in tariffs system

In the system of guaranteed purchase tariffs, the contractual setting which governs the transactions between developers and purchasers offers clarity and simplicity to the green producers-investors. One owes to Langniss [2001] to have underlined that these transactions rest completely on the regulatory contract that, set at the first level, founds the commitment of the public authority. The first permits to reduce all transaction costs for its setting up and its follow-up. There is not any producer-purchaser coordination by the prices and the quantities to the point that often there is not any explicit contracts [Langniss, 2001], as the German and Spanish experiences show. In terms of governance structure, the regional distributor or supplier acts like an agent of the public authority assigned to remove the green electricity produced in its zone while repaying itself by cost pass through in the tariffs or by subsidies financed by a general tax on kWh .

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 risks of hold up being suppressed by these conditions from the buyers' part. The device also suppresses contractor's research since the legislative setting imposes the purchase of RES-E electricity to the regional distributor of network exercising its activity on the area of service of the RES-E producer. 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 feed-in tariffs device are very weak for the RES-E producers. The contractual relation, when it is clarified, only deals with secondary duties: the costs of adjusting to the system, the settlements, the measurement system and the technical specifications.

Because of the purchase obligation, the contractual arrangement has not even to include the responsibility of the risk adjustment. The investment securization includes the acceptance of

of the balancing costs and risks inherent to the random RES-E production by the mandated buyer. This institutional solution is easy to be accepted when, after the reform of liberalization, the mandated purchaser retained its partial or total monopoly in the retail sales; as in Germany. Another easy configuration is the case of power industries where the purchase obligation is put on the system operator which has in charge the balancing of the system

Finally in this governance structure, the risk of hold-up only resides in the regulatory contract, the stability of the device can be put in question for the RES-E assets realized under the incentive of this setting. The risk is placed either on the level of the purchase tariffs announced, either on the device himself that can be replaced by another, except if, in this radical change, the replacement is conditioned to the maintenance of the previous rules for these units.

2.2.2. The protection of the RES-E investor in the bidding system

In this system, the bidding costs in the call of tenders are heavy for the developers. These ex-ante transaction costs concern the costs of preparation and follow-up of the projects, then, after their selection, the administrative costs of licensing and the setting up of the contract. These costs could be high, given the small size of the RES-E projects and the absence of scale economies. They are integrated in the price proposed in the investor's bid, but they will only be recoverable if the tender is selected and thereafter if the selected candidate succeeds in installing its equipment to control the investment cost.

To the inverse, the ex-post costs are reduced by the regulatory contract that specifies the contractual period (15 years generally), as well as the rule of definition of the kWh price for all the period of the contract (generally the rule of pay-as-bid with an indexation on the inflation rate), what requires no surveillance, nor renegotiation, nor flexibility of the contractual provisions. Besides the RES-E producers' responsibility required by the intermittence is limited. The responsibility of the balancing adjustments is reported on the mandated buyer. The transactional complexity is strongly reduced.

Besides the ex-ante transaction costs, a last transactional obstacle, just evoked, exists. The timing of the successive rounds of the calls for tenders is not clear, because the government is not forced to open them, while it could postpone them for limiting the cost of the policy. Conditions of the next call of offers could also be changed [Van Djik et al, 2003]. For this reason it suppress the incentives for the developers and the emerging equipment manufacturers to program a set of successive projects in order to organize the learning process. The stability of the formal process of selection and its regularity could reduce the information costs, because the modalities of selection and the results constitute sources of information on the conditions of selection for the new calls for tenders[Mitchell, 2000], this possibility of learning is thwarted by the discretionary character of the definition of the conditions of the successive call for tenders (opening date, content in technologies, rule of selection). 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. They prefer to move toward conventional projects of electricity generation whose realization will be less uncertain.

2.2.3. The issue of the bilateral dependence in the exchangeable quotas system

The suppliers who are mandated to respect a quota of RES-E certificates must fill this obligation without compensation of the cost of it. As they have to satisfy the same quotas under the pressure of the competition they are incited to control the costs of respecting quotas

as the associated risks. They have the choice between: the recourse to the market of the green certificates, the joint purchase of electricity and certificates by long term contracts of green electricity, the self-production by the own units that they would install . A last resort solution is to pay for the penalty (the buy out price) for the non respected quantity in the quotas, penalty that acts as a limit to their marginal costs.

Contrarily to the two previous devices that impose a contract in price and quantity in a formal way (system of call of offers) or casual (tariffs of purchase), the contractual solutions are let to the free choice of the mandated players and evidently to the free choice of the producers. As the quotas system does not offer formal protection to the investors, it introduces a strong bilateral dependence. On one hand, the investors take the investment risk opposite to suppliers submitted to the quotas whose objective is to fill their obligation while minimizing their costs and their risks. On their side the suppliers are exposed to the risk of blackmail of investors in RES-E, and resorting exclusively to the spot market of the green certificates does not offer them a transactional security.

a. The difficulties of framing RES-E transactions by the certificates market

As all instruments of environmental policies based on property rights allocation and market mechanisms, the inherent risk to the systems of exchangeable quotas depends on the size of the market of the certificates and therefore of the number of actors (purchasers and sellers) concerned by this policy, with all risks of price volatility that it includes. One can facilitate the exchanges of green certificates by creating an organized market, but the exchanges will remain on narrow national markets while waiting for possible and hypothetical regional markets, what will result in a price volatility. Besides, the future price of the certificate is affected by a number of uncertainties: uncertainty coming from the discretionary possibilities of modification in the RES-E portfolio of eligible technologies (the addition of a technique will lower the prices because it increases the quantity of available certificates), uncertainty on the market players' behavior with the possibility of banking of the certificates (up to 25% of the certificates generated on a year) which can reduce the liquidity of the market. The addition of a price floor and a price ceiling to limit the volatility of the certificate market or the suppleness permitted by the borrowing of certificates is probably an element that can encourage the partial recourse in this market.

As the incentives drive the mandated purchasers as well that the producers to protect themselves mutually from the risk of holdup by long term contracts or the vertical integration, it reduces as much the liquidity and the depth of the market while maintaining this volatility. Also the vocation of the certificates market should intrinsically remain limited to the search of flexibility by the operators supporting the quotas, or to the need of those too small to enter into long term arrangement with RES-E producers.

Of the investors side, the recourse to the certificates market to frame the transactions on the production of a new unit is highly risky. They must try to protect investment against the risk of volatility and to avoid opportunism (active or passive) of the purchasers part. For the investors who must sell the green electricity like a joint product (normal electricity sale on one hand and green certificates on the other), the price risk on the green certificates is coupled with the risk on the wholesale electricity market. Therefore RES-E investors have a double interest to negotiate contracts with buyers submitted to quotas. These contracts define a guaranteed price of the green kWh that includes the two aspects of this product, the electricity and the certificate. This price will be defined by reference to the complete costs of new RES-E units and not on the market prices of certificates.

Of the buyers side, the respect of the quotas without rule of compensation for the overcost of the green electricity (in fact the purchase cost of the certificates) is a powerful incentive to avoid opportunism on the respect of the quotas. Given that they are in competition to sell electricity, the suppliers of electricity submitted to the quotas are incited to respect them to the least cost while limiting the short and long term risks. Therefore they meet the investors' interest while also trying to frame their green electricity purchases by long term contracts or by installing themselves the ENR units that they need to respect their quota increase, as one observes it in the current experience. So in Texas the system of the Renewable Portfolio Standard that is in place since 1999 shows a massive recourse to the contract of long term. (Langniss and Wiser, 2003).

In the same way the first lessons of the British experience started in 2002 show on its side that the five main suppliers who supports 90% of the quotas develop themselves the new RES-ES units to follow the increase of their quotas (Mitchell and Connors, 2004). One also observes that the small-sized suppliers submitted to the obligation prefer flexibility and prefer to limit the period of their contractual arrangements, because they bet that the prices of the green certificate can decrease in the future when the quota stops to increase and that the demand of property rights will not grow anymore after eight years (2010). In this context that results from this buyers' passive opportunism, the investments can be made difficult, what would create tensions on the certificates market. It causes pressures on the public authority for a rectification of the "regulated contract" in maintaining the growth of the quota (1% per year) beyond this horizon in order to make the anticipations of certificate price increase [Mitchell and Connors, 2004].

b. The choice of the vertical or quasi-vertical integration

When the RES-E producers-investors have found a counterpart the definition of the contractual structure must aim at the price stability at a level which allows to compensate the RES-E overcost, and in conditions to share the technological risk and the cost of the intermittence for the weakly programmable RES production. While referring to the RPS experience of Texas, one notes that it is a relation of guaranteed price which is instituted between each RES-E producer and a distributor, but it is a negotiated relation, and the meteorological risk is borne by the buyer. (By comparison, in the recent Renewables Obligation in the UK, this risk is borne by the producer). Another provision sets the technological risk on the producer-investor, making him to bear all exceeding investment expenses, penalizing him for construction delays and for operating failures other than the meteorological risks (Langniss et Wiser, 2003). It is therefore possible to maintain contractual incentives to good operational performances, even if the meteorological risk is borne by the buyer.

But the long term contract is not the only solution, if one also considers the financing conditions of the investment. Long term contract is associated to a classic project financing contract guaranteed on the future cash flow and backed to a securing purchase contract. It is generally more expensive, because presenting transaction costs and risks superior to those of a loan guaranteed on the borrower's assets. The big-sized suppliers would be able to get these conditions of loan if they develop themselves these RES-E projects. It is the reason for which, since 2002, in the Renewable Obligation in UK, the RES-E projects are developed by the big suppliers themselves or their specialized subsidiaries in the organizational frame of vertical integration.

c. The management of the meteorological risk: an incentive to contractualize

For RES-E penalized by meteorological risk, the absence of purchase obligation in this RES-E device reinforces the incitement of the producers to contractualize. While being located in an environment of competitive electricity markets, the responsibility of the balancing cost will depend upon the institutional arrangement chosen by the producer-investor to sell its RES electricity, or by the buyer submitted to quotas :

- . If this one decides to respect its quota only by buying the certificates, he lets *de facto* the responsibility of the balancing costs and risks to the "green" producer. The uncertainty bound to the intermittence is supported therefore completely by producer RES-E, as it is the case of the British device.
- . If the mandated buyer chooses vertical integration to respect its increasing RES-E quota (in general by the creation of subsidiary dedicated to this activity), it bears the balancing costs resulting from the intermittence of the production.
- . If the arrangements chosen by the mandated buyer are long term contracts with RES-E producers, the risk sharing between the two actors can be negotiated. The purchaser who buys the physical electricity and the green certificates at the same time assumes the costs imposed by the market rules to the intermittent productions. The green producer is thus as protected against the meteorological risk as he would be in the two other devices (guaranteed tariffs or bidding system).

Thus, the system of the exchangeable quotas introduces a fundamental risk and that drives directly to operate in vertical integration or by long term contracts to limit the costs of risk management. The free choice of the institutional arrangement by the developer and the purchaser takes all its interest since the risk of holdup in relation to the RES-E investment or to the respect of the quota varies extensively from an arrangement to another. The risk is high if the producer-investor rests on the sale of green certificates and electricity on the market; so it is for a supplier submitted to the quotas to resort to such purchases. That leads to choose the contract or the vertical integration. The market of certificates only intervenes as means of adjustment. The prices of the long term contracts are determined in an independent way of the certificates by referring to the costs of the RES-E units to be installed and assuring a to the investor, as it is the case in Texas [Langniss and Wiser, 2003]. This determinism is reinforced by the transaction costs resulting from the weak programmability of the RES-E production.

To conclude on the features of the three devices, it is important to underline the major differences between them. In the case of the feed-in tariffs system and the bidding system, the risk of holdup plays does not exist at the level of the relation producers-purchasers which is already codified by the regulatory contract. In the quotas system, the regulatory contract is open, what obliges the two types of agents to search for an arrangement that protects them from the risk of holdup. This flexibility has a cost: the presence of a strong bilateral dependence. The management of this dependence pushes to vertical integration or quasi-vertical integration via long-term contracts. However this vertical integration is not complete, the recourse to the market of the certificates or the payment of the penalty offer a flexibility.

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 hierarchy of the underlying objectives --stability of the climate, quality of air, energy security, promotion of a national industry of RES-E equipment - and their balancing with the control of their collective cost are never formulated clearly because they cannot be so. But, despite this difficulty to define to hierarchize and to rationalize them in terms of monetized advantages, the selection of the RES-E regulatory device by the public authority depends nevertheless on its implicit hierarchy of objectives and criteria.

Table 2. National Choices between institutional devices for the promotion of RES-E

Feed in tariffs (or assimilated)	Bidding (Contracts and pay-as-bid rule)	Exchangeable quotas
Germany (since 1995) France (since 2001) Spain (since 1995) Portugal (since 2001) Ireland (since 2004)	UK (1991-2001) France (1996-2000) Ireland (1995-2003)	USA (Twenty states with RPS : Texas, etc) (since 1999) UK (since 2002) Italy (since 2002) Belgium (since 2003)
Denmark (with defiscalisation) Netherlands(with defiscalisation)		Provinces in Australia Austria (minihydro) Candidates: Sweden, DK, NL

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 productions (feed-in tariffs, contractual price in “pay-as-bid” in the bidding system), or by the constraint of quota put on suppliers. But the public authority will attach more importance either to the performance of installation of RES-E capacities, or to the control of the collective cost promotion of the RES-E, or to the stimulation of the learning process and the development of a national industry. The control of the collective cost will result in the research of incentives to productive efficiency by the choice of a device including elements of competition (biddings, selection of contracts by buyers in the quotas system) or by rule of rent restrictions (for example the cost cap in the former British bidding systems). 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 hierarchy of the objective between transactional efficiency, control of the collective cost and rent, and promotion of the national industry and clean technology innovation.

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	++	- <i>Regulatory risk</i>	-	++ <i>Protection by the contract</i>	+	+ <i>LT Contract ou Vertical integration</i>
Cost control	+/0	+	++	0	++	++

Technical progress & Industrial policy	++	- <i>(The best available by technology band)</i>	-- <i>(The most mature technique)</i>
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3.1. Transactional efficiency and investment protection

These two complementary characters will determine the performances of installation of RES-E units. The hybrid governance structures must not have some excessive transaction costs for the preparation of the projects and the progress of the contracts. They must limit the ordinary risks of investment (technological risk, volume risk and price risk), but also to protect against the risks of hold up in the regulatory contract and in the producer-buyer contract.

Concerning the first problem, the system of bids is the more penalizing insofar as it could not allow to recover the preparation costs in case of project failure. Concerning the second problem, every RES-E promotion regime is submitted to the requirement of long-term predictability of the governance structure. The three devices offer guarantees of different nature for the investors. In the feed-in tariffs, even though there is a political engagement of stability of the tariff on 15 years for the projects in case of device change, the real guarantees lie in the institutional environment and in the legal features of this one, notably the dissuasive character of appeal to administrative or civil courts [Levy & Spiller 1994, Finon & Perez 2004b]. In the bidding and the quotas systems, the guarantees lie in the existence of the private contracts between producers and mandated buyers (or the recourse to the vertical integration), these private contracts being guaranteed otherwise by the civil courts. However, in the quotas system, the private contracts can be weakened by the changes of rules (composition of the portfolio of eligible technologies), or even by the disappearance of the device that would suppress the rights of property on the environmental goods. Therefore it is in this setting that the investor is therefore the most exposed to the discretionary risk, because the least change of composition of the renewables portfolio weakens the perspectives of repayment and profitability of the new assets. The comparison of the performances of the feed-in tariffs and the bidding system before the adoption of the quotas systems in some European countries shows the efficiency of the first, as far as this only performance is concerned.

Table 3 : Comparison of windpower installations under feed-in tariffs or by bidding system in Europe on 1990-2000

<i>Incentives</i>	Countries	Capacity end 2000	Addition in 2000
Bidding	United Kingdom	409	53
	Ireland	118	45
	France	79	56
	TOTAL	606	154
Feed-in tariffs	Germany	6113	1668
	Denmark	2402	872
	Spain	2297	555
	TOTAL	10812	3095

Source : WindPower Monthly, *The Windindicator* (<http://www.wpm.co.nz>), mai 2001.

In each hybrid governance structure, the credibility of the regulatory contract for the investor ensue from its stability, but also from its flexibility under the effects of tension that the RES-E diffusion can create. These tensions can be originated by the growth of the collective cost in case of success in terms of installations and in the system of the feed-in tariffs the swelling rents given to developers under the learning effect and the cost decrease of new units (Cf. the controversy on the German RES-E tariffs analyzed by Laufer, 2004). Conversely the device can be put politically in question if too restrictive rules of the regulatory contract which could be destined to limit the developers' rent curb the development of RES-E facilities by deterring potential candidates to invest, as it is the case of the system of the bids if the public authority imposes a cost stern cap (cf. the case of the former British NFFO analyzed in Mitchell, 1999)

The system of the feed-in tariffs can preserve its political acceptability by a codification of the adaptability of the tariffs in the regulatory contract; it defines for a new unit the decrease of the tariff after the amortization period, and by the next units the successive decrease of the tariff for each RES-E technology. Concerning the two other devices one underlined that their adaptability has not the same positive effects. In the bidding system they add transaction costs for the bids and limit the learning effects. In the quotas system it creates risk of value loss on assets. The problem lies in the fact that the adaptations are discretionary in these two systems, the codification of evolutionary rules seems much less feasible than in the feed-in tariffs system.

3.2. Control of collective cost and rents

In the three devices, there is always a way by which the market operates and the competition exists. The more the public authority wishes a control of the collective costs, the more the selected device will put in work some competition inside the structure of governance.

In the system of feed-in tariffs, the competition is virtual: the producer-investor search to maximize its surplus by lowering its costs by reference to the feed-in tariff as if it referred to a competitive market price vis-à-vis of which it would be price-taker. But, if one hand side it is the device which shows the least transaction cost, this device 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 limit the costs. The developers can certainly put in competition the constructors of equipment but they are not excluded as they would be on a competitive market if they do not succeed in tightening to the maximum their costs and their margins.

In the two other devices, the public authority controls the quantities to be developed on one side and the competition for gaining contracts with mandated buyers has also a function of incentives on cost reduction. In the bidding system the public authority fixes the target of capacity to 10 years (or more) as the one of the successive rounds by technology; it can therefore adjust it according to the collective cost limit to not overcome. It could also decide to slow down the process for the same goal. Otherwise the developers are in competition to have a long term contract on each technological band under the price limit of the cost cap. In the quotas system, the public authority fixes the trajectory of increasing quotas on a long-term horizon and there is a double competition, the one of the producers-investors and the one of the purchasers submitted to the quotas that look for the best purchase opportunities in terms of costs and risk. Moreover they can refer themselves on the penalty that is a means of collective cost control by offering a way of evasion if the marginal cost of quotas respect are too high.

Concerning the control of operating cost, the two first governance structure have the same, the fact that the RES-E producer are not paid if it does not produced because there is not a double structure of price. In the system of the quotas where the contractual arrangement has a double structure of price with fixed and variable terms, the incentives to good operating performances of exploitation are given by the structure of the contracts (possibility of penalty, etc).

3.3. Promotion of the national industry

The system of feed-in tariffs is the most favorable device to a stimulation of the technical progress by pushing the innovation process and the learning of the nascent national constructors. As the rent of the producers-investors is large, it could be shared with the fabricants. Being in position to benefit from the rent increase which will result from the incremental innovation to be introduced by these latter ones, the producers-investors can share the rent with them and allow investment in R&D and incorporation of new knowledge. Feed-in tariffs allow the sharing of the environmental quasi-rent with the manufacturers of equipment by establishment of partnership relation between developers and national constructor. That happened in Germany, in Denmark and in Spain that possess the first three industries of windpower equipment. One will note that the public authority can establish the tariffs to a high level at the first stage of the RES-E life cycle in order to encourage such partnerships. But the balance is delicate to maintain because, at one time, the incorporation of innovations and the increasing returns of adoption helping, the supplement of quasi-rent that the producers can clear on their new units become an undue rent on the profits of the innovation more than a support to the innovation. It is the moment to make the tariffs decrease or to shift to another device.

The two other devices are little favourable to the technical progress and the development of national industries because they let little rent to the developers given the pressure of the competition to be selected by the public authority or the mandated purchasers to gain contract [Finon and Menanteau, 2003]. So it is not a coincidence if One can note the absence of RES-E equipment industries or national manufacturers, notably in wind equipment in Great Britain and United States. It is also fact that after the first stage of a RES-E life cycle, this objective losses its interest once the technological maturity stage approaching. The investors in one country can henceforth prefer to benefit from the performance of the best available technology by buying the facilities to the most efficient foreign enterprises.

4. Conclusion

The analysis of the choice of public policy instruments led in the terms of transaction costs economics introduces an aspect ignored by the traditional approaches of Public Economics. By centering on the risk of expropriation of the investors and the guarantees that it must get by the contract or by the credibility of the regulation, this type of approach permits to put in evidence the advantages and the shortcomings of the concurrent regulatory devices that the Public Economics approach does not see.

The policies of preservation of a set of collective goods by the promotion of the RES-E that are more expensive in terms of private costs that the conventional means in electricity generation require to resort to a hybrid governance structure combining regulatory contracts and contractual arrangements. This one is going to rest on an obligation of purchase imposed to a certain type of agent, generally the electricity wholesaler, by the regulatory contract. The

analysis of the attributes of transactions to explain the choice of governance structures to be done leads to dissociate the political transaction and the transactions on RES-E electricity. The peculiarities of the asset specificity to these transactions, the uncertainties and the externalities treatment leads to identify three objectives for choosing between the three concurrent governance structures: the securization of the investments, the incentives to the economic efficiency, and the possibility of mutualization of the supplementary balancing costs with the weakly programming production.

The features of the three concurrent structures of hybrid governance – feed-in tariffs , bidding system and system of exchangeable quotas - between which the public authority can choose are determined mainly by the content of the regulatory contract between the public authority and the mandated purchasers. But the system of the quotas presents a strong originality because the bilateral dependence between producers-investors and mandated purchasers is managed autonomously by the two parties which choose themselves between market, contracts or vertical integration, whereas in the two other devices the contractual arrangement is completely organized by the regulatory contract which offered powerful guarantees. In the quotas system the bilateral dependence requires the recourse to the vertical integration or to the vertical quasi-integration; the use of the certificates markets must be mainly a means of adjustment to respect the quota, what is not considered as such by the Public Economics literature on the quotas system.

The comparison of the advantages and the shortcomings of the three structures according to three criteria - the transactional efficiency, the control of the collective costs and rents, and the innovation and industrial policy – show that, according to a given hierarchy of criteria, one structure of governance is in better adequacy to it than the two other ones.

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