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*A comparison of the "political price-/amount market" model with the "political quota-/certificate price market" system.*

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# Renewable Energy Governance Systems

***A comparison of the "political price-/amount market" model with the "political quota-/certificate price market" system (The German and Danish cases)***

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# *Preface*

This book is one of three books from the research project, *"Internationalisation of the Energy Markets, and its Influence Upon the Danish Energy Policy-with Special Focus Upon the Danish-German connection".*

The project was financed by the Ministry of Environment and Energy within the program for *Energy and Society, and Aalborg University.* In this book, *"Renewable Energy Governance Systems",* the new German renewable energy law is compared with the Danish renewable energy legislation from 1999.

In another book *"Electricity Reforms, Innovative Democracy and Technological Change",* I analyse the dynamics of the Danish energy system and its public regulation processes, with special focus on the electricity sector.

A third book "Current corporate strategies of the German Electricity Supply Industry" written by Lutz Mez and Annette Piening, Freie Universität, Berlin, deals with the development within the German energy sectors, focussing on public regulation processes, and the electricity sector.

Without intending to escape a personal responsibility for the written English, I want to thank both Gwen Bingle and Juliana Felkner for their competent and patient work with correcting and improving my English.
Finally I would like to thank Annelle Riberholt for doing the layout work on the book.

Frede Hvelplund
June 2001

# *1. Introduction: Public regulation and renewable energy (RE )- political prices or political quotas ?*

Renewable energy, and especially wind power, plays an increasing, and in some cases, substantial role in energy systems. From being regarded as a playing field on the fringe of the energy scene, wind power infrastructure is now entering the electricity scene as an important electricity supplier with, in 2001 for instance, around 15% of the total electricity consumption in Denmark. In parallel, the EU's target is to increase the proportion of RE (excluding large hydropower) in electricity supply from the present 4% to 12.5% around 2010 (Directive 2000/EC).

This junction means that public regulation strategies and the political design of an RE path have secured a growing interest from the large actors on the energy scene. It has thus become increasingly important for fossil fuel companies to assume the control of and/or to take over the development of RE. Simultaneously, grassroots groups and producers in that field having gained more strength and self-confidence, they believe that it is necessary to keep an organisational momentum linked to groups and organisations that are locally rooted and independent from the large fossil fuel companies.

Against this backdrop of increased organisational competition, tougher rivalry can be witnessed on the discourse-, as well as the legislative- and implementation levels. The manifestation thereof is the present struggle between two main types of public regulation.
The two main models are:

(a) The "Political price-/amount market[1]" model, which has politically set prices for RE electricity, and where the produced quantity of RE electricity is determined on the market; and
(b) The "Political quota-/certificate price market[2]" model, where the RE electricity quantity is politically fixed as a quota, and the RE electricity prices determined on a market.

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[1] The price is politically determined, and the RE-electricity amount is determined on a market.
[2] The amount (quota) is politically set, and the price is partly determined on the market, 'partly' only, because the price in the new Danish "Political quota-/certificate price market" system can only oscillate between a politically defined minimum and maximum.

The “Political price-/amount market” model has been successful in Spain, Denmark and Germany, countries that boasted around 80% of the European wind power production in 2000. In 1999, a law, introducing a "Political quota-/certificate price market" model for RE, was approved for implementation around 2003 by the Danish Parliament. In 2000 a new advanced "Political price-/amount market" model was approved by the German Parliament, and in 2001, a "Political price-/amount market" model was accepted by the French Parliament. In parallel, the EU commission, especially the commission for competition, was working towards the introduction of a sort of “Tradable Green Certificates” system(EC DG17, 1999).

But recently, in the latest Directive proposal[3], which has been accepted by the Council of Ministers, the Commission has accepted the use of the "Political price-/amount market" model, and keeps the question of the future regulation framework open. The “Political quota-/certificate price market" model then no longer is ‘THE future regulation model’. This development has lately been supported by a European Court adjudication, which says, that the German "Political price-/amount market" model is not to be regarded as illegal state aid, and is therefore acceptable as a way of regulating RE development (Case C-379/98).

***Premise 1. The arena is open.***
*Due to its continuation in Germany, Spain, and its introduction in France, as well as the new EU Directive and the EU Court Decision of March 13th, the "Political price-/amount market" model has become a realistic candidate as a model for the future EU RE regulation framework. This conclusion is reinforced by the heavy implementation difficulties encountered by the Danish "Political quota-/certificate price market" model.*
*The "Political quota-/certificate price market" model no longer is ‘the future EU regulation framework’. Other possibilities must be examined.*

The "Political quota-/certificate price market" model is mostly supported by the electricity utilities[4], whereas the "Political price-/amount market" model

[3] See Note 1.
[4] The association of Danish Electricity Utilities, DEF, strongly supports the model, whereas the association of European Utilities, Eurelectric, expresses official support. (See Mr Pierre Inge, in “The market imperative - Eurelectric´s view of the need for Tradable Green Certificates, the “First International Workshop” on Green certificate trading in Europe - A new currency for renewable energy?”, Oct. 12th 2000, Radisson Hotel, Brussels.) This conference was attended by 180 participants and was sponsored by the EU Commission and some Utilities.

is generally advocated by both RE producers and grassroots groups[5]. The Green/EFA Group in the European Parliament has been persistently struggling to keep the "Political price-/amount market" type of regulation as a legal option for EU countries.

The main arguments for introducing a "Political quota-/certificate price market" system have been linked to the belief that a system with quota regulation and a price regulated on the market would, due to increased competition between suppliers of RE, result in getting more ‘value for the money’ of RE. Upon examining the various arguments and the dynamics of the debate, it is striking that there does not seem to be any thorough discussion of consequences ensuing for public regulation. Namely, compared to fossil fuel technologies, RE technologies are characterised by:

a. *Having different natural resource bases from location to location, a factor which makes it necessary to establish a governance system, which furthers an EU-wide "site efficiency"* [6] *generating process. The certificate price market system operates with a "mono-price"*[7] *system, which takes into account the regional differences in natural resource base (Chapters 3 and 4).*
b. *Having a cost structure with a very high percentage of investment-/fixed costs and very low running costs, which implies high investor risks on the market, difficulties in establishing a free market as well as the increasing importance of keeping the competition on the equipment market alive (Chapter 5).*
c. *Being dispersed around the country, and often in residential areas, which makes it particularly crucial to involve neighbours and people from the region in the design, development and ownership of RE projects (Chapter 5).*
d. *Being newcomer technologies, thus having minor market shares and meeting resistance strategies from established technologies (Chapter 5).*

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[5] In Denmark, the Organisation for Renewable Energy (OVE) is opposed to the 1999 “Green Certificate” law, and, in a press release from May 20th 2001, recommended that the Danish Government change the RE-regulation back to a "Political price-/amount market" system. The Association of Danish Wind Turbine Owners and Wind Turbine Producers are also very critical of the "Green Certificate law”.

[6] "Site efficiency" refers to efficiency linked to the utilisation of a natural resource in a given location/site.

[7] A "mono-price" system is defined as a system with a single certificate market price for a country, a group of countries and/or the EU as a whole.

***Premise 2. The specific demands of an RE regulation framework have not yet been sufficiently examined.***
*There are specific characteristics linked to the development and implementation of RE technologies (see a, b, c and d, above), which have not yet been included in the discussion of a regulation framework. When negotiating this future regulation framework at the level of the EU, but also within each EU country, it is a must to analyse what demands these characteristics will impose upon the framework.*

Taking the above two premises into consideration, namely, that the "arena is open", and that " the specific demands of an RE regulation framework have not yet been sufficiently examined", it is the aim of this publication to improve the analytical basis for the following important decisions:

1. On a global basis, when dealing with the question of an RE regulation framework, should one advocate politically regulated amounts (quotas), combined with prices being decided on a market (the "Political quota-/certificate price market" model)? Or is it better to determine prices politically and let the quantity produced be regulated on the market (the "Political price-/amount market model)?
2. Should Danish politicians change the legislation from a system with a "Political quota-/certificate price market" to a sort of "advanced[8] "Political price-/amount market" model such as the German (2000) type?[9]
3. Should the EU consider the "Political price-/amount market" model as a relevant model for a future EU regulation framework?
4. How should the political system be designed in order to be able to handle 'radical technological changes'[10]?

Consequently, we are not only debating which of the above two regulation frameworks to use, but also how to improve the democratic decision processes behind these types of discussion.

[8] The 'advanced' designation refers to the characteristic of the new German "Political price-/amount market" model, whereby price differentiation is a function of varying RE capacities in different locations.

[9] There is still time enough for this transition, since the Danish "Political quota-/certificate price market" system is to be implemented in 2003.

[10] By 'radical technological changes' is meant mean such changes as do not only require technical alternatives, but also entail new institutional and organisational solutions, which might go, and often do go, against the economic and organisational /business cultural interests of existing companies within the field in question.

# 2. Methodological and theoretical approach

The methodological approach is shown in Figure 1 and discussed in Section 2.1.

The "Political price-/amount market" systems and the "Political quota-/certificate price market" systems should be regarded as part of a broader regulation context. The understanding of a relevant context for our present discussion is described in Figure 2, Section 2.2.

## 2.1. The main methodological structure

The main structure in the present analysis is shown in Figure 1 below.

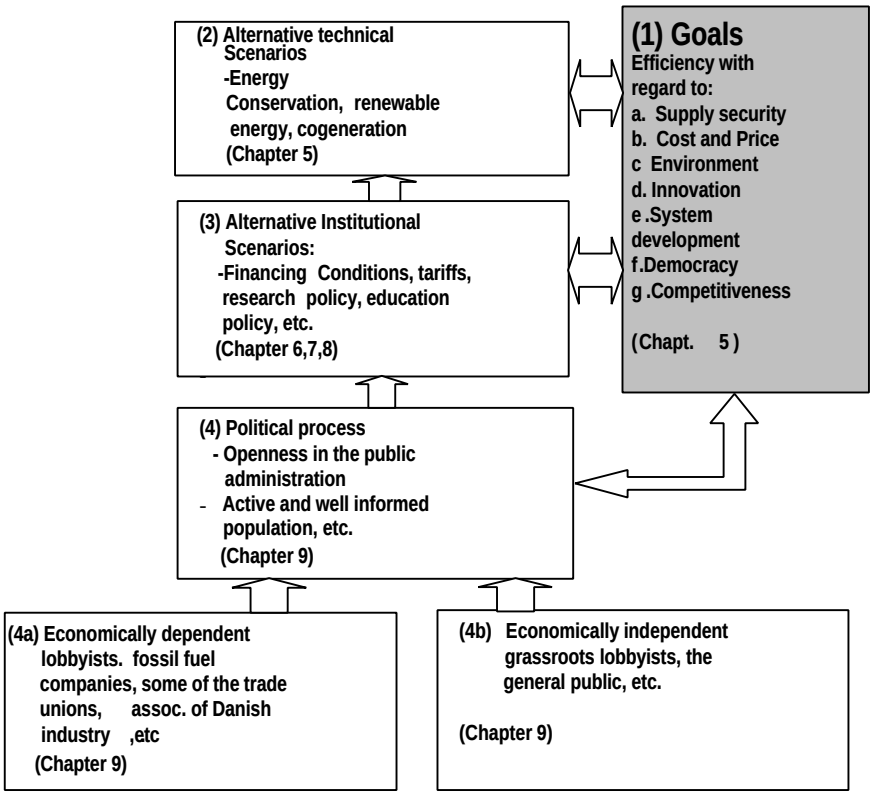


**Figure 1. The *"three level analysis"* approach**

**Figure explanation**: *The figure shows the goals against which the solutions should be measured (Box 1), the character of alternative technical scenarios (Box 2), the necessary institutional reforms in order to implement a given scenario (Box 3), and the political process behind the design and implementation of institutional reforms (Boxes 4, 4a and 4b).*

It is considered a necessity here to establish a methodology that makes it possible to see the links between *political goals, technical scenarios, institutional reforms and the political processes* because:

- **The goals** should be described, in order to support the prioritisation process between various solutions. As can be seen from Box 1, both cost *and* price efficiency are mentioned, as producing RE-electricity cheaply is not sufficient, if market power enables the producer to make high/excess profits. Innovation efficiency is also included, since the development and introduction of new energy technologies may further a process of inventiveness in a region, an aspect that should be included in the cost benefit analysis supporting the political decision processes.
- **Democratic efficiency**[11] is especially important in relation to the general introduction of RE-technologies, as it represents the basic condition for the development of a culture/organisation of innovation and inventiveness in a given region.
- **Alternative technical scenarios** should be described, as it is impossible to establish an open democratic debate without having studied the full spectrum of technical possibilities/alternatives. Furthermore, it is neither possible nor meaningful to discuss genuine institutional reforms, without being aware of the link between concrete technical scenarios and the specific institutional reforms required for the implementation of these scenarios.
- **Alternative institutional scenarios** should be outlined in order to promote a concrete discussion of the financial-, educational-, political- (research policy), administrative-, etc. reforms needed to secure the development and implementation of a specific spectrum of technical scenarios.
- **The political process** behind the development of goals, technical scenarios and institutional reform alternatives should also be described. The discussion of concrete political reforms that can support the ability of the

[11] In a nutshell, we define it as both *access to information* and *access to resources* at an early stage of the technological development process. This usually means that the State, in addition to a policy of openness before decisions are taken, should allocate financial resources to grassroots groups that have displayed persistently innovative efforts within a certain technological field.

political system to further the necessary ‘radical technological changes’ should also definitely be on the agenda. It should be emphasised here, that this discussion is of special interest in periods when it is necessary to develop and implement new technologies, which are an ‘innovation risk’ for established companies within the field in question. This currently is the case in the ‘turning point’ situation on the energy scene. It is now an explicit Parliamentary goal to decrease the market share of relatively powerful (both politically and economically) companies that are closely linked to fossil fuel extraction and consumption.

It is also important to be aware that the ‘three level’ analytical model includes a division of the democratic discourse between ‘economically dependent’ (Box 4a) and ‘economically independent’[12] lobbyists (Box 4b). This analytical distinction is crucial at a point characterised by a need for ‘radical technological changes’. It is foreseeable that this conjuncture will entail a number of win/loose situations, where the currently powerful fossil fuel and uranium based companies are expected to lose market shares, and where new technologies such as RE and conservation technologies are bound to gain market shares. Moreover, there is much evidence from experience over the last twenty years in Denmark that the fossil fuel based companies are faced with huge economic and organisational setbacks, when it comes to the development and implementation of the new energy conservation- and RE technologies.

The main analysis in this publication is structured along the ‘three level analysis’ discussed above, with a discussion of the goals and technical scenarios in Chapter 5, the institutional scenarios in Chapters 6, 7, and 8 and the political process in Chapter 9. This analysis is performed within an analytical macrostructure, which is described in the following section.

[12] "Economically dependent" lobbyists are those who have either personal and/or business interests in given solutions. These usually are the organisations linked to the established energy companies. "Economically independent" lobbyists do not get direct personal or organisational economic benefits from one or the other solution. This would typically be the case of ‘grassroots’ organisations linked to the energy scene.

## *2.2. The analytical macro-structure: Important areas and mechanisms of governance*

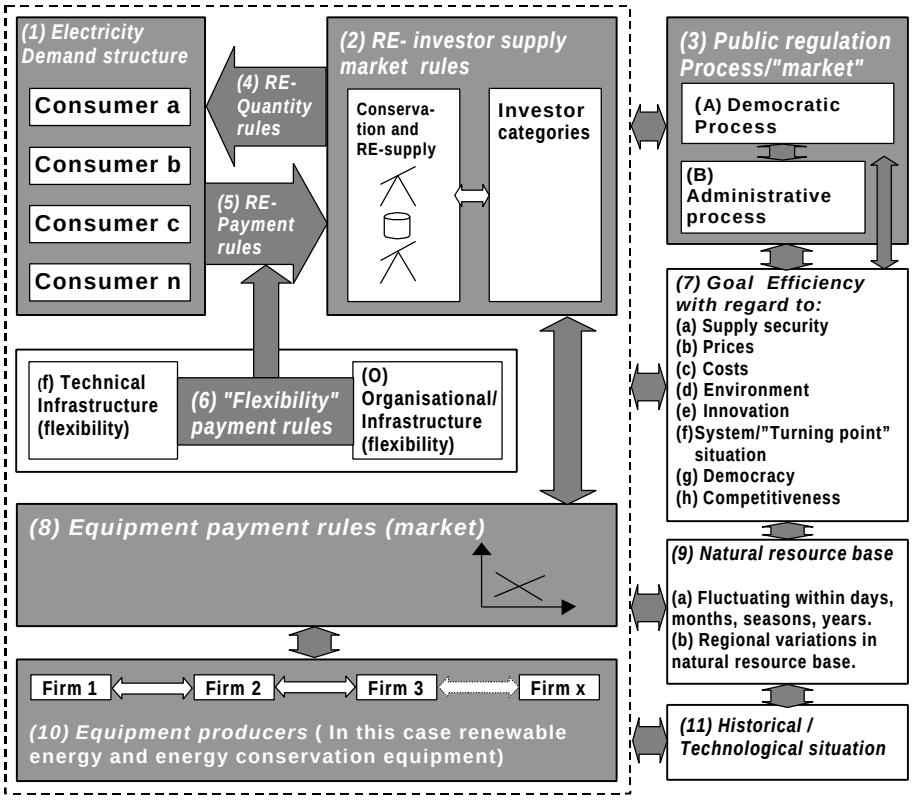


**Figure 2. The analytical macrostructure linked to important areas of governance**

**Figure explanation***: Boxes 1-6, 8 and 10 represent important areas of public and market regulation. Boxes 7, 9 and 11 represent regulation "preconditions" in the model here. We are naturally well aware that these "conditions" are also changeable and dynamic.*

The characteristics of this macrostructure are that:

a. the equipment market (Box 8) as well as the electricity market (Arrows 4 and 5) are included. This is especially due to the fact that some important RE technologies, such as wind power and photovoltaics can be regarded as energy "automatons", which_means that around 80% of the

value-added that is built into the ‘ab’ plant electricity price can be attributed to the investment in the RE-plant. The market for equipment is therefore especially important.

b. the natural resource base (Box 9) is important, as we are dealing with technologies that are dependent upon a specific natural resource base in a specific region. This is, to a large extent, a condition which differs from the basic situation of fossil fuel and uranium technologies, which depend on a world market price for fossil fuel and uranium, the price of this resource base being thus almost the same from location to location.
c. The historical/technological situation (Box 11) is especially important, as we are dealing with a historical situation characterised by fundamental change, where technologies based upon fossil fuels and uranium are to be replaced by energy conservation- and RE technologies. This entails new and relatively specific political and technological problems of change, which have to be dealt with in the analysis.
d. The “flexibility” payment rules (Box 6) are crucial in a situation of technological change, where there are daily, weekly, monthly and seasonal fluctuations in the output of new RE technologies. A technical as well as an organisational system has to be established, so that this feature of the new technologies can be taken into account.
e. The public regulation process (Box 3) should also be dealt with, as the new energy conservation and RE technologies require public regulation processes that take into consideration the specific "political characteristics"[13] of these technologies. As far as wind power is concerned, especially, it is necessary to take into consideration that people living close to wind turbines should have the right to own these turbines as a compensation for the potential noise and visual pollution.

The above analytical macrostructure basically differs from the macrostructure that can be disclosed, when analysing the reasoning and discourse within and around the Ministry of Energy and Environment regarding the introduction and implementation of a "Political quota-/certificate price market" model in Denmark.

[13] A specific "political characteristic" of wind power is that turbines have to be placed in windy areas, where, consequently, they are visible for the people living in the neighbourhood. The Danish experience shows that when local inhabitants and neighbours are the owners of these turbines, the degree of local political support for wind turbines is high. Thus, the Danish policy furthering local corporative ownership of wind turbines has so far been one of the "secrets" behind the successful Danish wind power development.

One way of describing the main difference between the present approach as illustrated in Figure 2 and the approach of the Ministry is that the Ministry does not seem to take into account the equipment market (Box 8), the specific characteristics of the natural resource base (Box 9), the specific historical/technological situation (Box 11), the "flexibility" payment rules (Box 6) and the specific conditions related to the political process (Box 3). Fundamentally, the logic in the Ministerial discourse was, and still seems to be limited to a discussion of the price aspect of the electricity market (Arrow 5) combined with some arguments regarding competition and cost efficiency at the goal efficiency level (Box 7).

Another way of describing the difference between the approach in Figure 2 and the discourse of the Ministry is that the Ministry inherently assumes that a "Political quota-/certificate price market" model and a "Political price-/amount market" model have the same impacts upon- and are influenced in the same way by the historical/technical situation, the natural resource base, the political situation, the equipment market and the "flexibility" payment rules (Boxes 11, 9, 3, 8 and 6). The Ministry thus basically holds a "ceteris paribus" assumption regarding the impacts upon- and influences of the institutional context on the RE-payment rules in Arrow 5.

# 3. The two models

In the following, we will take our examples from the concrete "Political quota-/certificate price market" model, which was approved by the Danish Parliament in 1999, and the "Political price-/amount market" model, which was approved by the German Parliament in 2000. We will describe the two models in the box (1, 2, 4 and 5) section of the Figure 2 analytical macro-structure. This means we will be describing the two models in a manner rather similar to that which has been prevailing in the debate led by the Ministry of Environment and Energy. We thus exclude any detailed discussion of the surrounding institutional context.

The ***Danish "Political quota-/certificate price market"*** model was approved by the Danish Parliament on May 28th 1999, and is supposed to be launched beginning of 2003. One of its crucial features is that politicians will have to decide upon a quota of RE that should be produced during each of the coming years. The number of years has not yet been decided upon, although the administration in the Ministry of Energy and Environment believes that it is necessary to fix a yearly quota for a minimum period of 6-8 years (Ministry of Environment and Energy, 1999).[14] Because of this quota, consumers are obliged to buy a specific share of their electricity consumption from RE sources. Thus, on the basis of their expected production, RE suppliers can sell certificates on the market, where consumers, usually through their electricity distribution company, will purchase enough certificates to fulfil their buying obligation. In parallel, the market is responsible for the establishment of a price for the certificates, which, according to the law, should not be lower than 1.32 EUR/C/kWh or higher than 3.57 EUR/C/kWh.

[14] It should be emphasised that the above publication does not discuss how one possibly can establish political quotas for a minimum period of 6-8 years.

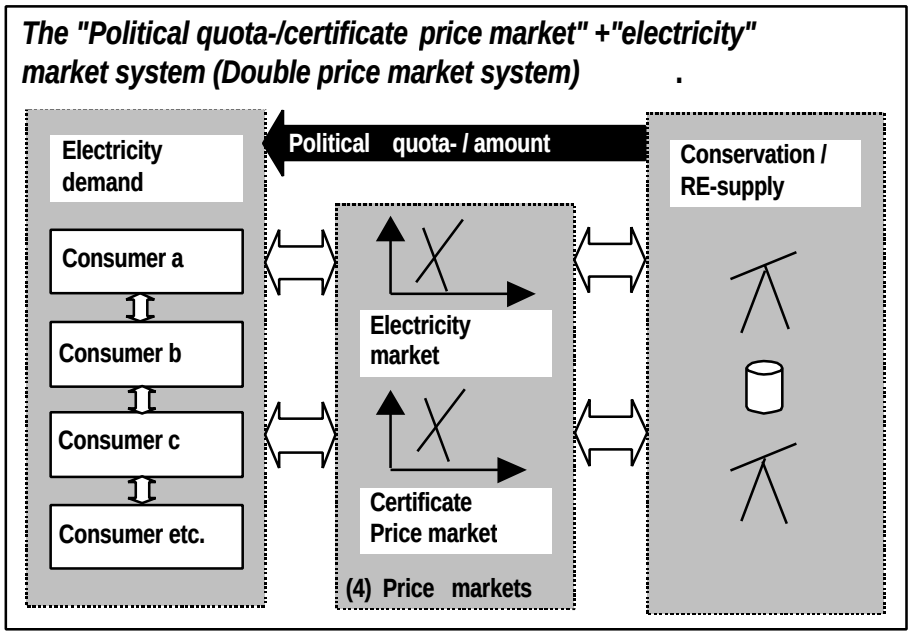


**Figure 3. The Danish "Political quota-/price market" model after 2003**

Figure 3 illustrates the system, with a politically set quota, and the combination of a certificate market and a price market for electricity *as it is planned to function after 2003.*

For wind turbines contracted in 2000, 2001 and 2002, a payment of 4.36 EUR/C/kWh will be the basic electricity price for a period of 10 years[15], as soon as the European Commission approves the Danish system. Interviews[16] with the Association of Wind Turbine Manufacturers and "Jydsk Vindkraft A/S", a company selling wind power projects, have basically revealed that no contracts have been undersigned under these new rules. In March 2000, 36 MW wind power was installed, whereas the capacity installed in March 2001 was only 2 MW! The 600 MW of wind power built in 2000 were based on contracts from before December 31st 1999, when the rules were those of a "political price-/market amount" model, rules that were much more favourable then than after this date. Wind turbine projects contracted before December 31st 1999 are paid 5,7 EUR/C/kWh for a period of 10 years plus

[15] It has not been decided yet whether these 10 years are 10 years of full load production on a reference site or just 10 calendar years. So the rules for investors in new wind turbines are still unclear in the new Danish legislation.
[16] Conducted on May 21st 2001.

2.24 EUR/C/kWh for the first 12,000 full load hours. Thus, in 2000, the Danish wind power boom was due to a system with politically set prices for wind turbines contracted before the end of 1999 and to the very uncertain and less favourable rules for contracts undersigned after this date.

For the 1999-2003 period, Denmark has a "transitory" regulation framework based upon a "Political price-/amount market" system, which resembles the new German "Political price-/amount market system. This transitory model is interesting, as it combines the Nordpool, the Scandinavian electricity market, with a "Political price-/amount market" model, thus obliging the Danish customers to buy a specific quota of their electricity consumption from green technologies, such as cogeneration- and RE plants. The "price market" element is therefore limited to the share of consumption that is not supplied by the new green technologies. These are consequently subordinated to an "amount market" system, which is comparatively, as will be confirmed in Section 7.3.1, the most efficient market type when dealing with RE technologies where the main cost share is at the equipment production level.

**The German advanced "Political price-/amount market"** model, approved by the German "Bundestag" in February 2000, is characterised by a politically set price for RE based electricity. For wind power, the price is 9.54 EUR/C/kWh for production from a wind turbine on a reference site[17] during 10.4 years, and thereafter 6.48 EUR/C/kWh (Erneuerbare-Energien-Gesetz-EEG, 2000). If a wind turbine produces more than the reference wind turbine, it will get the higher price during fewer years. On a very good site, the wind turbine will only get the higher price for five years. Nevertheless, the economic advantage derived from placing a wind turbine on a good site is still clearly greater than placing it in a less windy inland location. On an inland site, a wind turbine might get the high price for 20 years. The above prices will prevail during a 20-year period for wind turbines erected in 2001.

It should be mentioned here that, unlike the "Political quota-/certificate price market" system, the "Political price-/amount market" system can rely on political prices allocated to a group of wind turbines build in a specific year (year group of wind turbines), and does not necessarily have to agree upon any specific price for a coming year group of wind turbines. As mentioned

[17] "The reference site shall be a site determined by means of a Rayleigh distribution with a mean annual wind speed of 5.5 meters per second at a height of 30 meters. Source: Annex to the "Gesetz für Vorrang Erneuerbarer Energien“ (Erneuerbare-Energien-Gesetz-EEG). Approved by the German Bundestag on February 25th 2000.

above, the "Political quota-/certificate price market" system requires a political quota decision for a period of minimum 6-8 years in order to establish the necessary investment security.

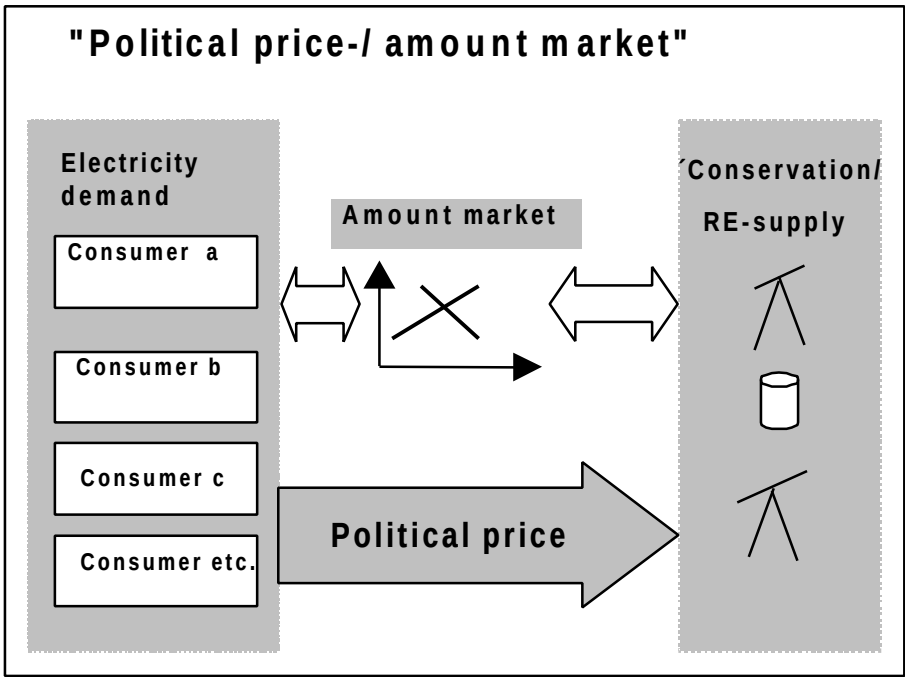


**Figure 4. The German advanced "Political price-/amount market" system**

Wind turbines built in 2002 will get a price that is 1.5% lower during a 20-year period; wind turbines erected in 2003 will get a price that is 1.5% lower than the 2002 price, etc. Thereby a rationalisation pressure is built into the German legislation.

**The reform was implemented in 2001** and has already proved a success, since there has been a boom in the building of wind turbines, as well as photovoltaics systems and biogas plants (Köbke, 2001).

# *4. Illusions in the "Political price-/amount market" versus the "Political quota-/certificate price market" model discourse*

As the discourse is loaded with economic interests, superficial market ideology and evasive strategies seem to be replacing the thorough analysis of market power processes.

Therefore, before entering a more detailed analysis, it is worthwhile to evaluate three important assertions that have dominated the debate so far: namely, that: (a) the "Political quota-/certificate price market" system is more market-oriented, (b) it will develop on a free market, and (c) it will provide more value for money than a "Political price-/amount market" system. These statements are delusions that we shall deconstruct in the following.

The *first delusion* is that a "Political quota-/certificate price market" system, with its politically set quantities (quotas) and market prices,[18] is ***more market-oriented*** than a "Political price-/amount market" system with politically fixed prices and amounts produced determined on a market. This delusion has been very successful indeed, as it now is an almost undisputed 'fact' that the so-called "Green Certificate" trading on the basis of a market plus quota regulation is 'THE genuine market' system. The success of this discourse is both impressive and ironic, since such a model, with quota regulation plus some price regulation, is very close to the type of regulation which was abolished in Eastern Europe after the fall of the communist regimes, some years ago.

[18] The prices in this system are also politically controlled, as they cannot be higher than 3,6 EUR/C or lower than 1,34 EUR/C.

Table 1 illustrates why this is a delusion.

| | "**Political quota /certificate price market" model**. (Danish model from 2003) | "**Political price /amount market" model**. (Present German, Spanish and French model) |
|---|---|---|
| **Price determination** | ***Market and Political*** *(political minimum/ maximum price)* | ***Political*** |
| **Amount determination** | ***Political*** | ***Market*** |

*Table 1. Political-, and market determination of price and quantity in two regulation models*

**Comment**: *The price in the Danish "Political quota-/certificate price market" model is partly politically defined, since the law determines that the price should not be below 1,32 EUR/C/kWh or above 3,57 EUR/C/kWh.*

As illustrated in the Table, the "Political quota-/certificate price market" model shows the political interference on the market at both the quantity *and* the price levels in the Danish case. The only political intervention in the "Political price-/amount market" model is at the price level.

The "Political quota-/certificate price market" model is not more liberal or market-oriented than the advanced "Political price-/amount market" model. On the contrary, the Danish "Political quota-/certificate price market" model, due to its 100% State-defined amounts, and partly State-defined prices, is closely related to the governance frameworks of former East-European planned economies until around 1990.

The *second delusion* is the underlying assumption that a "Political quota-/certificate price market" model will be a free market with competition between many suppliers meeting many mutually independent buyers. Nobody knows whether this will really be the case, as nobody seems to have analysed this question.

After having examined the discourse under this angle, it is therefore striking that so many researchers, administrators and utility representatives solely deal with the bureaucratic and bookkeeping technicalities linked to the introduction of a "Political quota-/certificate price market" system. The questions examined seem to mainly revolve around: “How can we keep track of the certificates, so that cheating becomes difficult? How should we concretely organise the market with regard to the establishment of a market place?” etc. The analysis of ‘market technicalities’, though undoubtedly important, completely overshadows any analysis of the *power dynamics within such a market*. “How many suppliers and how many buyers will there be on the market?[19] Will there be any ownership links between sellers and buyers?[20] Will the market really function like a free market with free competition between the sellers and between the buyers?” These rather essential questions seem to have totally disappeared from the discourse.

At present, the EU co-funded “RECert-sim” simulation model is being tested in 16 different locations all over Europe. The first test took place in Denmark, on March 20th, 2001. Some of my written questions[21] to the organiser[22] were*: ”Is it allowed to establish strategic alliances between RE generator groups? How would this function in the simulation model?”* and *“Is it allowed to make large consumer purchase associations? What impact does the establishment of such “consumer cartels” have on the model?*
His answer to all of these questions was: *“I think we would dissuade this, as it distorts the market”*.

Upon examining the report of the “RECS”, collaboration between a group of European electricity utilities, it also appears that their work is limited to a discussion of the technicalities linked to the establishment of a Certificate Trading system (Christoffersen, 1999). There is neither a discussion of the potential development and use of market power on the market, nor any debate regarding the appropriate market size and number of actors on the market.

After the 1999 electricity law which focused, among many other laws, on the introduction of a “Green Certificate“ system in Denmark, analyses were

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[19] In Denmark, there will probably be 2-3 sellers and a similar number of buyers.
[20] In Denmark, a couple of very large “buyer associations”, agglomerates of distribution companies, own the power companies that will be largest suppliers of Green Certificates on the market.
[21] Mail sent to Tim Crozier-Cole on March 7th 2001.
[22] Tim Crozier-Cole (E-mail: Tim@esd.co.uk).

made in order to establish a process of implementation. In 1999, a well known consultant firm, PriceWaterhouseCoopers, analysed a number of questions for the Ministry of Energy and ended up with an array of recommendations in their report entitled “Organising a renewable energy market and trade with green certificates” (PriceWaterhouseCoopers, 1999). Here again, this report only deals with the bookkeeping aspects of certificates and the technical organisation of the trade, but contains no discussion about the potential misuse of market power or whether there will be enough actors on the market to ensure an efficient free market process.

Altogether then, the illusion of a well functioning Green Certificate market is kept alive by an almost ‘logorheic’ discussion of market technicalities. Thus any evaluation of *‘the market’* and its dynamics is completely circumvented in the current analysis and public discussions.

The Danish "Political quota-/certificate price market" will not be a free market with many independent suppliers meeting many independent buyers. In reality, the number of buyers may very well be limited to 3-5 large buyer associations meeting 2-3 large RE suppliers. In practice, this might result in negotiated prices, prices that do not at all reflect the dynamics of a free market.

The *third delusion* is that a "Political quota-/certificate price market" model would result in a situation with ‘better value for money’ than a "Political price-/amount market" model. The European Commission supports this viewpoint[i] by comparing the price development of RE in the UK “Tender” system with the German and Danish "Political price-/amount market" system (European Commission, DG17, 1.

First of all, can one conclude that the UK “Tender” system is more price-efficient than the "Political price-/amount market" system? From the observation of price development, one can see that UK prices decreased from 0,068 to 0,049 EUR/C/kWh during the 1990-1997 period, whereas German and Danish prices did not decrease during the same period. But in the UK, only around 120 MW wind power infrastructure was built in 1996 and 1997, whereas 506 MW was built in Denmark and 829 MW in Germany. During the same period, German development was characterised by an increase in the proportion of installed inland wind energy capacity, from 13,7% in 1993 to 48% in 1997(Schwenk and Rehfelt, 1999). The seemingly obvious conclusion to be drawn from these figures is that, if within a country that boasts many good coastal sites, as in the UK example, one only selects a small fraction of the best of these, one will get very low wind power kWh prices.

Moreover, if in a country that has many inland sites, such as Germany, one uses an increasing proportion of these relatively modest wind sites, then wind power kWh prices will not decrease. Therefore, one cannot conclude from the figures first quoted that the UK “Tender” system is more efficient than a "Political price-/amount market" system.

Secondly, the UK “Tender” system does not bear any resemblance to a "Political quota-/certificate price market" trading system. The UK “Tender” system results in the winners of the tender getting a fixed price per kWh for the whole length of the contract period. So, in that sense, the UK “Tender” system is more closely related to a version of guaranteed price systems, which also include the "Political price-/amount market" system.
Thirdly, there is competition in the "Political price-/amount market" system, in the sense that buyers of wind turbines, independently of their guaranteed prices, try to buy wind turbines from the best and cheapest supplier, where they get the ‘best value for their money’. This competition has resulted in an 80% decrease in wind power prices from 1980 to 2000.

There is no documentation, whether in the background analyses- or in the discussions leading up to the approval of the 1999 Danish legislation, regarding potential new dimensions of competition, which should provide ‘more value for the money’ in a "Political quota-/certificate price market" system.

The conclusion regarding this *third delusion* is that there is no available analysis or reasoning that could support the hypothesis of getting ‘better value for money’ in a "Political quota-/certificate price market" system than in a "Political price-/amount market" system.

On the contrary, as it will be argued in the following, it is probable that the "Political quota-/certificate price market" system will result in less competition and more expensive RE based electricity than in a "Political price-/amount market" system.

# 5 The EU state of affairs

## 5.1 2000-2001 changes furthering an open-ended discussion of the future RE regulation framework

*The renewable energy directive.* At a meeting of the Council of Ministers on December 5th 2000, a new RE directive was agreed upon. The directive is now being processed for the second time in the European Parliament. The European Parliament now wants binding RE targets for each member country, instead of consultative ones, as stated in the current text. Furthermore, the Parliament demands a minimum transition period of 10 years instead of the seven years suggested in the directive proposal.

It is, therefore, not certain that the directive will be accepted by the Parliament.
The contents of this directive can be summarised as follows:

*1.* The Commission refrains from introducing a community wide "Green Certificate" trading system and accepts the continued use and implementation of "Feed in" fixed price regulatory systems.
As stated in the EU draft directive explanatory memorandum, *"the Commission has concluded that insufficient evidence exists to provide, at this stage, a harmonised Community-wide support scheme setting the price for RES-E (electricity from RE) through Community-wide competition between RES-E generators, in particular with regard to direct price support being the most important form of support in practice"(Directive/2000/EP&EC).*

2. The Commission still believes in the advantages of introducing a Union wide RES-E competition strategy. In the same source as above, one reads: *"Nevertheless, the Commission believes that this should remain the objective since its achievement is likely, in the medium-term, to reduce prices of RES-E and increase the penetration of RES-E in the internal market."* The Commission will, no later than 5 years after the enforcement of the Directive, present a report on experience gained with the application of various national support schemes in Member States. A future Union wide framework for RES-E competition should be designed on the basis of the following principles quoted from the draft directive:
*"-Compatibility with the principles of the internal electricity market;*
*-Consideration of the characteristics of the different technologies;*
*-Efficiency and simplicity;*

*-Inclusion of sufficient transitional regimes to maintain investors' confidence and avoid stranded costs. (Directive/2000/EP&EC)"*

*3.* The type of RES-E union wide competition system could either be a "Feed in" fixed price type or a "Green certificate" type, as stated in the same source: *"In fact, on the basis of the existing evidence, it is not appropriate, at present, to conclude that either of the existing models should form the exclusive basis of an internal market for RES-E."*

*4.* The indicative objective for the whole Community of a 12,5% share of electricity consumption from RE sources (excluding large hydro) by 2010 should be pursued. The share in 1997 was 3,2%.

*5.* It is recommended that a process of RES-E certification be established, in order to prepare a Union-wide trade framework.

According to *the "Community guidelines on State aid for environmental protection", the guidelines* allows for a subsidy of up to 40% for energy savings, combined heat and power, and RE, in some cases 50%, when the investment serves a whole local community, such as on an island for instance (European Commission, Directorate General, 2000). Furthermore, still quoting from the above source: *"The Commission considers that, where it can be shown necessary, Member States will be able to grant investment aid to support renewable energy, up to 100% of eligible costs. The installations concerned will not be entitled to receive any further support"*.

*The EU Court decision of March 13th 2000, regarding the German "Political price-/amount market" law(Judgement of the Court/Case C-379/98, 2001)* . PreussenElectra and its subsidiary, Schleswag AG, had sued the German Government for enforcing a "Political price-/amount market" legislation obliging Schleswag to buy electricity from RE sources, especially wind power, at a specified guaranteed price. They asserted that the law was illegal state aid and went against EU competition rules.

The Court's judgement was:

(a) that the legislation is not illegal state aid and

*(b)* that, *"In the current state of Community law concerning the electricity market, such provisions are not incompatible with Article 30 of the EC Treaty (now, after amendment, Article 28EC)" (Judgement of the Court, 2001).* This means that the "Political price-/amount market" legislation is not in the 'current state of Community law' against the EU, as far as competition on the internal market is concerned.

*Conclusion* regarding the EU state of affairs:
The “Green Certificate” trading system has lost momentum since 1998 because of:

- The introduction of a new German Renewable Energy law, based upon the "Political price-/amount market" model.
- The introduction of a new French regulatory framework also based upon the "Political price-/amount market" model.
- The postponement of the Danish “Green Certification” implementation,
- An RES-E Directive that accepts the continuation of the "Political price-/amount market" model, as it is implemented in Germany and Spain, and as it is currently practised during the Danish transitional period. The EU Commission still believes in the establishment of a framework for the general competition between RES-E producers, but explicitly says, **that this framework does not have to be a “Green Certificate” trading system.**
- The EU Court’s decisions of March 13th allowing for the continuation of the German "Political price-/amount market" legislation.

***Altogether, this means that the certificate model has a much weaker position politically on the EU scene in 2001 than it had in 1998-1999, when the Danish certificate reform was approved by the Parliament. At that time, a "Political quota-/certificate price market" system was considered the up-and-coming European Governance framework for RES-E. Now in 2001, the situation is much more open, which makes it worthwhile discussing future governance framework(s) without a predetermined development path.***

## *5.2 The EU goals with regard to RE based electricity production*

In the EU renewable energy draft directive, it is stated in Article 3 that*: “Member States shall adopt and publish a report setting national targets for future consumption of electricity from renewable energy sources. Such targets shall identify the national objectives for future levels of consumption of electricity from renewable energy sources, in terms of kWh consumed or as a percentage of electricity consumption, on a year-by-year basis for the next 10 years. They shall be compatible with the objective of 12% of the gross domestic energy consumption by 2010 set in the White Paper on Renewable Energy Sources and in particular with the 22.1% share of electricity from renewable energy sources in the total EU electricity consumption by 2010 as referred to in Annex 1 to this Directive”(RE Draft Directive/EP&EC/2000).*

According to Annex 1 of the draft directive, this means that RE production (including large hydro) must increase from 13.9% in 1997 to 22.1% in 2010 of the total EU electricity consumption. During the same period, RE (excluding large hydro) based electricity production is supposed to increase from 3.2% to 12.5% of EU electricity consumption. The EU policy therefore is to further what is called "new renewable energy technologies"[23] such as wind power, biomass, photovoltaics, wave energy, etc. Figure 5 shows the increase in annual RE-based electricity production (excluding large hydro), an increase that can be calculated from Annex 1 in the Directive.

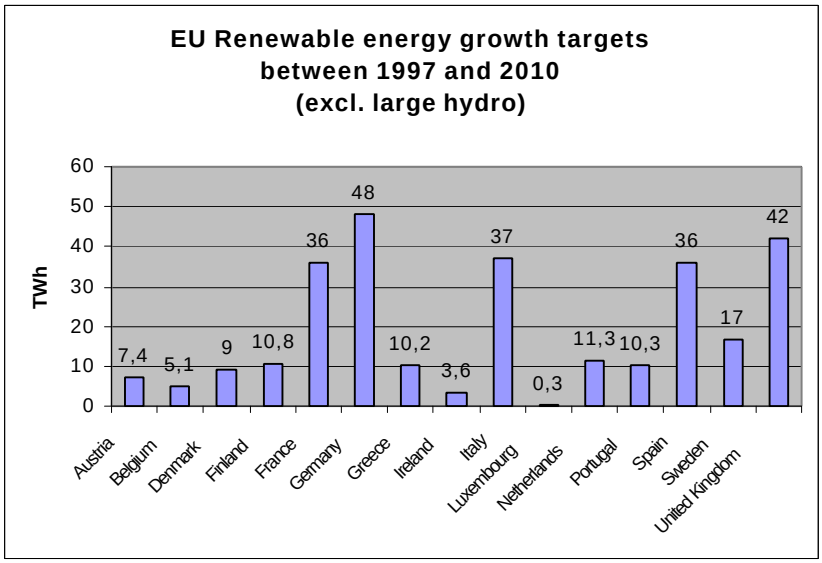


**Figure 5. Increase in annual RE based electricity production 1997-2010 (excluding large hydro) as expected in Annex 1 of the EU renewable energy draft directive.**

For the EU as a whole, the goal of the directive is that RE-based electricity production in 2010 be 284 TWh higher than it was in 1997.

As we can see from the above distribution between EU countries, the EU takes the development of RE sources all over Europe for granted. Germany, for instance, is supposed to increase its RE-based electricity production by

[23] By "new renewable energy" technologies, the EU generally means "new" in relation to RE technologies that are already extensively used nowadays, such as mainly "large hydro" power plants.

48 TWh within that period. This goal is very realistic, if inland wind power sites are included in the plan. *Furthermore, it is obvious from Figure 5 that RE growth is not supposed to only occur in countries with access to good coastal wind sites, such as for instance, Denmark, Ireland and the United Kingdom.*

On the basis of the above-mentioned EU annex to the renewable energy draft directive, it is justified to assume that EU policy does count on inland wind sites in Europe in order to achieve the goals set in the directive.

As mentioned initially, RE technologies are characterised by having different natural resource capacities from location to location. A wind turbine on an inland site in Germany only produces around 50% of the quantity produced on a very good coastal site in Ireland or Scotland. When dealing with nuclear-, natural gas- or coal-fired power plants, variations from location to location will mainly depend upon differences in cooling facilities, with a coastal site being slightly cheaper than an inland site that requires cooling towers.

Regarding wind power, this difference is illustrated in Figure 6 below.

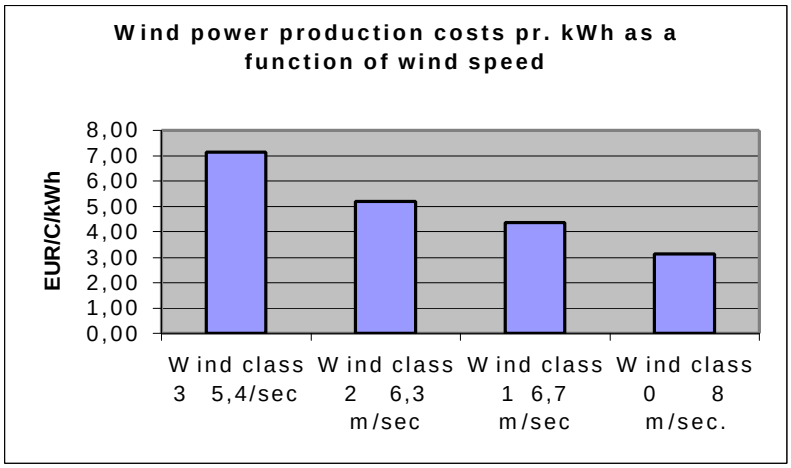


**Figure 6. Wind power production costs as a function of the wind site.**

**Figure comments**: *1 MW Micon wind turbine with a 60 meters rotor diameter and a 50 meters hub height. Annual production per 1 MW installed capacity on wind class 3, 2, 1 and 0 sites is assumed to be respectively 1719MWh; 2358MWh; 2810MWh; and 3934 MWh; investment cost:*

*1011655 EUR, maintenance costs/ year: 26796 EUR, interest rate: 7% and economic life: 20 years. (Source: a combination of data from "Energy and Environment Data", Denmark and DWI 1999.)*

Wind class 3 represents a typical central European (German) inland site, wind class 2 a typical Danish inland site and wind class 1 a good site close to the Danish West coast. Wind class 0 could stand for a very good coastal site in, for instance, Scotland or Ireland.

It is already worth emphasising that if wind power production on inland sites is required, and there is only one marketplace and one price for "Green Certificates" in Europe, the price level needed in order to produce wind power in Central Europe will be at around 9 EUR/kWh, as some profit is necessary to stimulate investment. This price would result in very high profits on the good wind sites, with between 90-160% profits on the good (classes 0 and 1) sites. Hence the problem of establishing a mono-price market for RE in the EU. This argument is valid because it is, as discussed above a necessity to use inland wind sites in Central Europe[24]. If it were sufficient, in order to reach the EU energy goal, to only use the good coastal sites in, for instance, Denmark, Ireland, Scotland, the French West coast, etc., a mono-price market might function, as differences between the various resource capacities used would be relatively small.

When combining the information from Figures 5 and 6, we can conclude the following:

1. Due to the declared EU goal of increasing the percentage of RE based electricity production (excluding large hydro) from 3.2% to 12.5% during the 1997-2010 period, it is necessary to not only exploit the best coastal sites for wind power. It is also necessary to use good inland wind sites all over Europe. This is also due to the fact that the production price difference between good coastal sites and inland sites is smaller than indicated here, because inland locations are usually closer to consumers, and therefore require less investments in transmission networks. This factor is not included in Figure 5.
2. Due to the specific characteristic of RE sources, i.e. that the resource base varies from region to region, *the efficiency of an RE technology should be measured against its 'exploitation efficiency' of the natural resource base in a given location.* It consequently is imperative that the public regulation framework, which is to be established Union-wide, be

[24] Further development of inland wind power technology is naturally also very important for Russia, Ukraine, China, etc.

flexible enough to allow for competition in the efficient use of a given natural resource in a specific region.

In the following chapter we will discuss how the latter could be done, by comparing different public regulation frameworks.

# 6. Renewable energy: the case of public regulation in a situation with differences in the natural resource base

In our model union, we have three countries: Country 1, Country 2, and Country 3. They have decided to form a union, and to co-ordinate their efforts with regard to energy- and greenhouse gas policy.

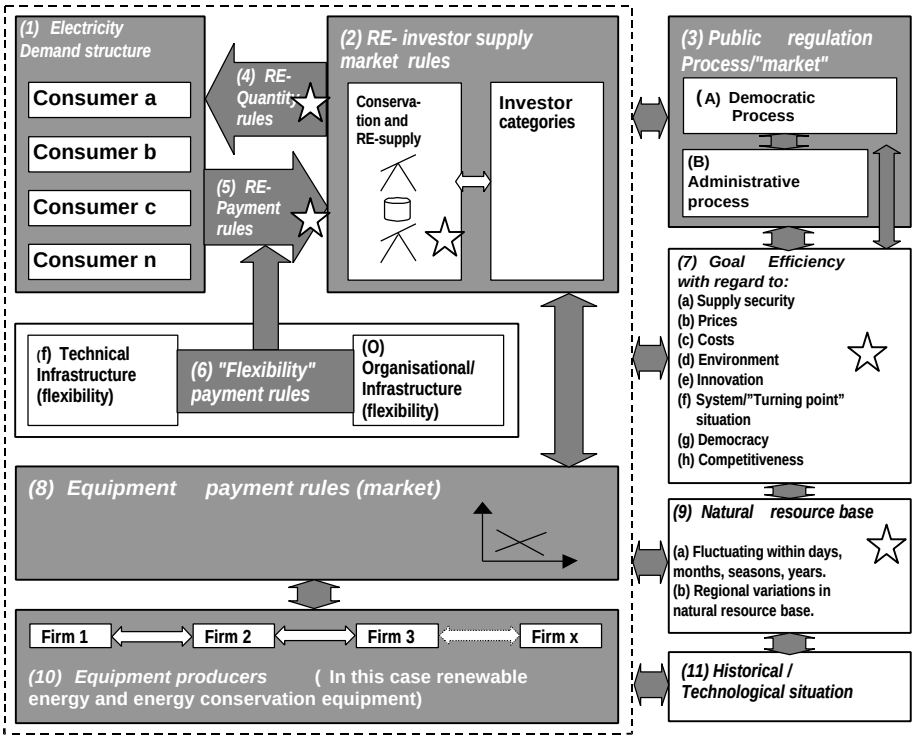


**Figure 7. The areas discussed in this chapter**
*Source*: Figure 2.

The analytical macrostructure guiding this chapter are pointed out by means of the stars, indicating that, in this chapter, we mainly deal with the electricity market (Arrows 4 and 5), the conservation and RE supply (Box 2), goal efficiency (Box 7), and the natural resource base (Box 9). A case-study example provides the framework for our discussion.

## *6.1 The wind resource situation (a case example)*

Three countries have examined their resource situation. With regard to wind power resources, they have drawn up the cost- and resource curves shown in Figure 8, using the data from Figure 6.

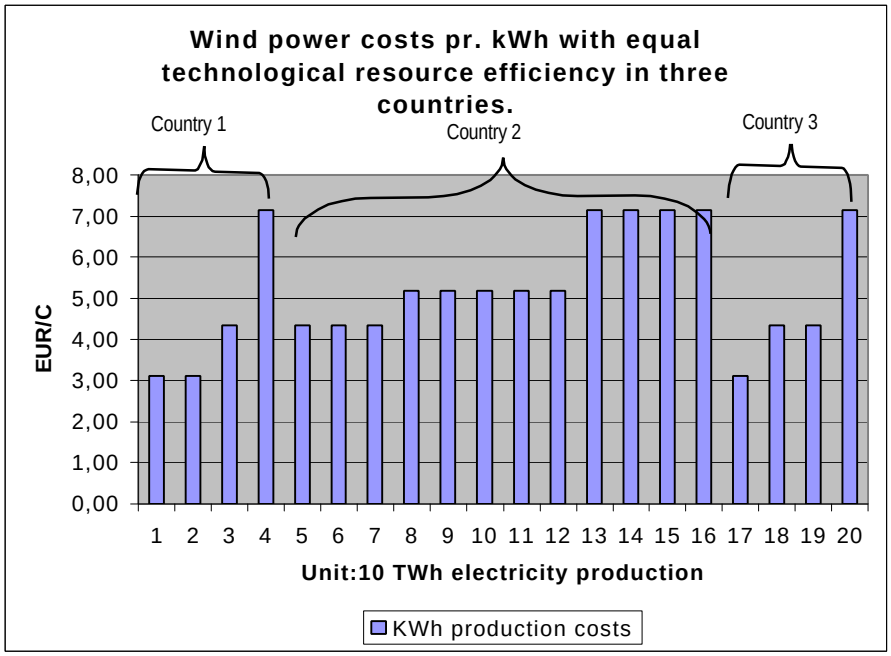


**Figure 8. Wind power production costs in the three countries**
**Comments***: The wind sites belong to the four categories described in Figure 6.*

The characteristics of these resource curves are:

The countries have found the energy problems linked to pollution from the use of uranium- and fossil fuel based electricity production so serious, that the entire 200 TWh yearly wind power production should be used. They therefore have decided to establish a common regulation framework in order to ensure a dynamic, socio-economically efficient and innovative development of these resources.

In the process of trying to define this common regulation framework, the two following governance models will be examined:

1. The "Political quota-/certificate price market" model, where the amount of RE is decided upon by politicians and the price is determined on the market. This model is currently being introduced in Denmark.

2. The "Political price-/amount market" model, where politicians determine the price of RE and the quantity of RE is determined on the market. This was the former Danish model, and is the present Spanish, German and French model.

Here, in Chapter 6, we will discuss these two governance systems, using the above case study combined with a “neo-classical” cost and price analysis.

Our main analytical focus will be on which models result in the highest social cost linked to the implementation of a given RE amount. Linked to this, it should be emphasised, that the introduction of the “Political quota-/certificate price market" model is often motivated by arguments stating the need for competition and cost reduction linked to RE implementation. In the current debate, power companies, especially, claim that the politically "Political price-/amount market" model does not maintain cost reduction pressure upon the owners of wind turbines and wind sites.[25]

## *6.2 The "Political quota-/certificate price market" model*

In the "Political quota-/certificate price market" model, the amount of RE-electricity is politically regulated by a quota, and the price is determined on a market for electricity. A similar system was approved by the Danish Parliament in 1999, and its implementation is planned around 2003.

This system should be seen in relation to the "Political price-/amount market", where the price is regulated politically, and the quantity regulated on market. This system is sometimes also called the “fixed price system”, and is the system which is used in, for instance, Germany, Spain and France, and which will be used in Denmark until around 2003.

In Figure 9, the three countries have introduced a common "Political quota-/certificate price market" system. Linked to their different wind resources, this governance system entails the following wind power cost functions and profits for wind site- and wind turbine owners:

[25] See, for instance, page 2 in “Stromthemen”, nr. 4, April 2000. (Publisher: Informationszentrale der Elektrisitätswirtschaft e.V. Postfach 700561, 60555 Frankfurt am Main.)

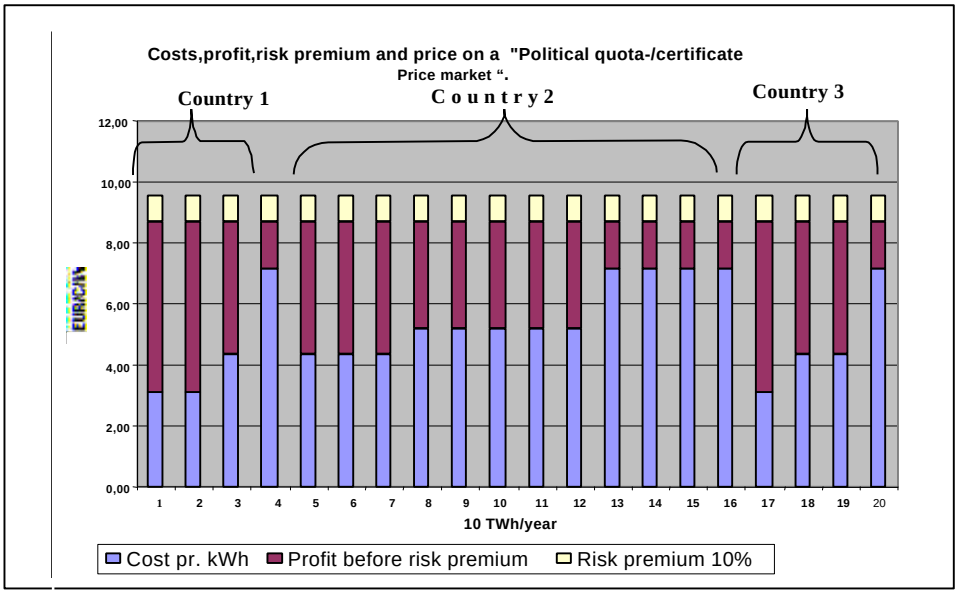


**Figure 9. Costs, profits and prices in a union wide "Green Certificate" market (case example)**
*Source*: Figure 6 data regarding production costs.

Further assumptions: 10% risk premium due to fluctuating prices. 20% profit demand on a wind class 3 site.

The Figure shows that, on this market, there is a single price for wind power all over the Union, namely the one settled on a case Union (European) certificate market[26]. Politicians have established a quota system, which ensures that an annual production of 200 TWh RE-electricity is secured. In order to reach this TWh goal, it is necessary that the kWh price on the market is at least high enough for it to be profitable to use wind class 3 sites, which concretely translates into a price slightly above 8 EUR/C/kWh. Additionally, the fluctuating prices on the certificate market imply that the investors demand a 10% risk premium, increasing the price to 9,8 EUR/C/kWh.

It is theoretically possible to establish a process of implementation, where the best coastal sites, wind class 0 and 1, are used in the first phase, wind class 2 in the next phase and in the final phase, wind class 3. According to this model then, Germany should not make its inland sites operational until the good coastal sites in Denmark, Ireland, Scotland, etc., have been fully exploited. This theoretical possibility would imply lower certificate prices in the first phase, which would then increase in the second phase, ending up at the Figure 5 level during the last phase. There are good arguments against this type of strategy. The technical argument is that "inland" wind power technology is, in a broad sense, very different from coastal wind power technology. Inland wind turbines are designed differently from coastal site wind

[26] In order not to complicate the argument, we assume, that the basic price for electricity, underlying the 'Certificate price', is the same in all three countries.

turbines; the infrastructure around the wind turbines is not the same, etc. Therefore, it is necessary to begin the technological development process of inland wind technology and its infrastructure concurrently with the development of coastal wind technology.

The important message here, though, is that, independently of whether wind power development is extensively pursued with the simultaneous implementation of inland and coastal wind turbines, or in phases linked to wind site capacities, as described above, the final situation will be the one illustrated in Figure 9.

The conclusions regarding this "Political quota-/ Certificate price market" system are the following:

a. The model is characterised by introducing competition between power producers union-wide. If we were dealing with fossil fuel technologies, where power plants function on the same resource base from country to country, it might prove a good model[27]. But it certainly is not compatible with RE resources, which vary from location to location. In the RE case, competition should further the most efficient use of a given natural resource in a given location.
b. The “Political quota-/certificate price market" system offers no possibility of price differentiation between very good and relatively poor, but politically necessary wind sites[28]. Consequently, the margin of profit indicated in Figure 5 is unnecessarily high, because *all* three countries get the necessary price to stimulate the investments needed on the poorest sites. Thus the wind site-/wind turbine owners in coastal zones will particularly benefit from this system.
c. The model does not afford the possibility of having higher payment pr. kWh in the first, for instance, 10 years of production, and lower payment pr. kWh, when the debt has been paid back, for a given RE plant. This means that old, out of debt wind turbines get the same payment pr. kWh as new indebted wind turbines.
d. The model does not allow for the possibility of giving a higher payment pr. kWh for RE-plants built in 2001 than for RE plants build in 2002, 2003, etc. It is not suitable for a process of adapting prices in accordance

[27] Even in this case, the deregulation of power companies often degenerates into the establishment of power production oligopolies, and poorly functioning markets. The experience from California and the UK emphasises this problem.

[28] Wind sites, which are needed in order to fulfil both the politically defined CO2 reduction goals and the goals with regard to establishing supply security.

with RE productivity- and cost reduction development aim[29]. The "Political quota-/certificate price market" model has to announce production quotas 6-8 years in advance, in order to establish a minimum of market stability. These annual quotas will result in a price, which has to be the same, independently of RE plant year group.

e. Linked to the above problem, it will become almost impossible to launch new technologies with initially very high costs in a "Political quota-/certificate price market" system. A high quota, established in order to obtain the necessary high prices, would have to remain even after a period with costs and price reductions. This is especially problematic in the initial stages of the given RE technology's entrance in the market.

f. Due to the very high profits made by owners in coastal zones in general, the cost pressure upon firms producing wind turbines will be relatively low. This lack of cost pressure is reinforced by the quota system, where the wind turbine industry generally has no motivation to lower its costs, as the quantity of wind power capacity sold is decided upon politically and not determined on the market. For the wind turbine industry as a whole, the only way to increase its profits will be to lower production costs *and to increase prices***.** We are naturally aware that, as long as wind turbine manufactures do not collaborate on the market, some form of price competition will remain between them. But the motivation to establish “strategic collaboration” between wind turbine manufacturers will be much higher in a “Political price-/amount market" system than in a "Political price-/amount market" system, where “turnover” can be increased by lowering prices and production costs.

e. Due to the large consumer paid profits made by owners of old wind turbines and owners of wind turbines on good coastal sites, a political resistance against wind power will develop.

In Figure 9, 200 TWh of wind power are produced per year. Table 2, below, shows the accumulated payments, profit, average kWh price and profit rate in the Figure 9 situation.

[29] The new German "Political price-/amount market" model includes a 1.5% (pr. year group of RE plants) reduction in payment pr. kWh, from 2001 to 2002 and from 2002 to 2003, etc. Productivity gains are thus furthered and anticipated in this model.

| | |
|---|---|
| a. Production costs | 10428 mil. EUR |
| b. Profit due to “mono-price” regulation framework | 6972 mil. EUR. |
| c. Risk premium caused by fluctuating prices | 1740 mil. EUR |
| d. Total payment for 200 TWh | 19140 mil. EUR. |
| e. Average price pr. kWh | 9,57 EUR/C |
| f. Profit as a % of production costs | 83% |

*Table 2. Annual economic consequences of the "Political quota-/certificate price market" (mono-price model) for a production of 200 TWh (case example)*
*Source*: Figure 9 data, among other aspects, the distribution according to wind site; with wind class 0: 15%; wind class 1: 30%; wind class 2: 25% and wind class 3: 30%. The costs are drawn from the figures behind Figure 3.

N.B.: 200 TWh/ year is close to the EU directive goal of 284 TWh by the year 2010. Thus the figures in this case study could represent a yearly production around 2007 in the ‘EU scenario’.

## *6.3 The advanced "Political price-/amount market" model: politically set prices and market determined RE amounts.*

### *6.3.1 The characteristics of the advanced "Political price-/amount market" model*

"Political price-/amount market" models, until 1999, were characterised by basically *one politically guaranteed price per kWh,* and a market determining the quantity of RE-based electricity. This system was competitive in the sense that any buyer of a wind turbine would buy the “best value for money” wind turbine. As there were no politically set quotas, wind turbine producers could, as a group, sell more, if they were able lower their wind turbine prices. This system resulted in a decrease of Danish wind power costs per kWh of around 75% from 1981 to 1997. The advantage of the system was *price security and competition*, but its disadvantage was a single price, independent of the wind site. The above ‘first generation’ "Political price-/amount market" system was a ‘mono-price’ system like the “Political quota-/certificate price market" system. The main differences between these two systems is that, due to guaranteed prices, the "Political price-/amount market" system circumvents the need to pay a risk premium to investors and that the absence of a politically set quota promotes competition between wind

turbine suppliers. But, basically, the first generation "Political price-/amount market" system did not secure the main aim of establishing a competition process, which generates *"site efficiency"*. By *"site efficiency"* we mean efficiency with regard to exploiting a given natural resource in a given location.

As a part of the present reforms on the energy scene, a "Political price-/amount market" system has been developed in Germany. It is still a system with politically designed prices, and a market determined quantity, but it introduces price differentiation between sites with different resource bases. In this respect then, it is a further development from the first generation 'mono-price' "Political price-/amount market" systems, which were in use in, for instance, Denmark and Germany until 1999.

We call the model "advanced" because of its ability to foster a competition process, which increases "site efficiency" in a non-bureaucratic way[30]. This model is currently being introduced with the new German RE law, where RE will get a higher payment for a 10.6 year period of production on a reference wind site, i.e. for wind turbines erected in 2001: 17.8 Pf/kWh (9,54 EUR/C). During the rest of the wind turbine lifetime, the payment will be 33% lower, e.g. for wind turbines built in 2001: 12.1 Pf/kWh (6,48 EUR/C)(EEG, 2000). Furthermore, the kWh payment is lowered by 1.5% pr. year, so that a wind turbine built in 2002 will get 17.8 Pf/kWh minus 1.5%, that is 17.5 Pf/kWh annually.

Thus, according to the new rules, a wind turbine built in 2011 will get 17.8 Pf/kWh divided by $(1 + 0.015)^{10}$ = 15.34 Pf/kWh during the high price period, and 10.43 Pf/kWh during the low price period. Prices will thereby put pressure on wind turbine producers to make them introduce innovations and lower their production cost. In Figure 10, the effects of this type of regulation are illustrated.

[30] It is worthwhile mentioning, that the UK tendering system could in theory be called an ideal system, in the sense that it potentially fosters the pursuit of site efficiency in a detailed way, as the auction is linked to a specific wind site. Meanwhile, unfortunately, the UK system seems too bureaucratic and unable to ensure sufficient wind power capacity. The advanced "Feed in" system might secure site efficiency without the bureaucratic disadvantages of the UK system.

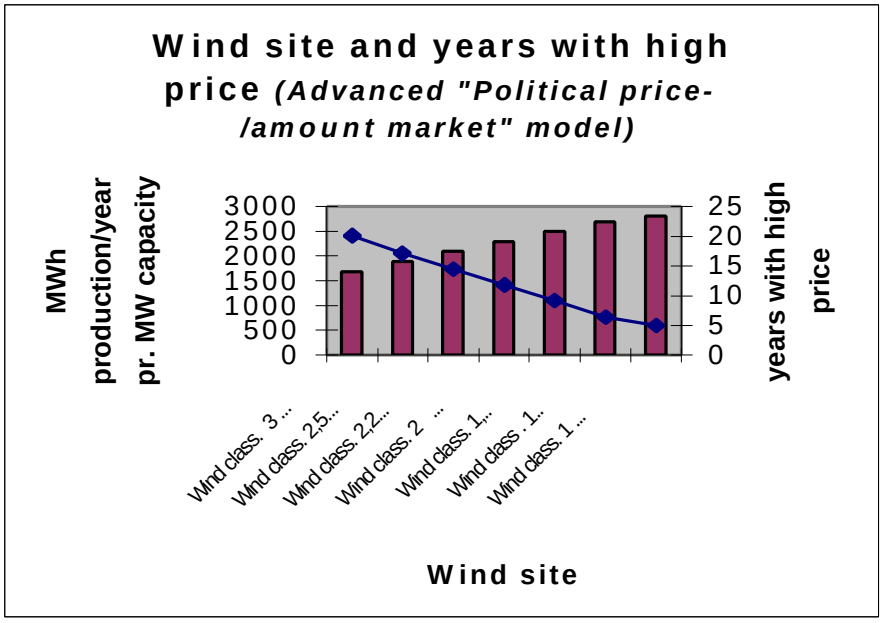


**Figure 10. The advanced "Political price-/amount market" model and its wind site dependent price framework.**

**Comment**s: *The columns, elaborated on the basis of figures drawn from Figure 6, show the annual wind site production pr. MW of wind turbine capacity. The down-sloping curve shows the number of years during which the wind turbine owners are paid the high price. In Germany, the high price will, as mentioned above, be 9,54 EUR/C/kWh and the low price 6,48 EUR/C/kWh for wind turbines erected in 2001. A wind turbine on a good coastal site will only get the high payment for 5 years (the low price thereafter), whereas a wind turbine on an inland site will get the high payment for 20 years.*

### *6.3.2 The cost and price efficiency of the advanced "Political price-/amount market" model*

The price performance of the advanced "Political price-/amount market" model is shown in Figure 11 for the three countries.

The Figure displays exactly the same cost structure as in Figure 9. The only difference is that the advanced "Political price-/amount market" model has a politically defined, site dependent price framework, which makes it possible

to decrease the profit on good wind sites without destroying the economy of inland wind sites.

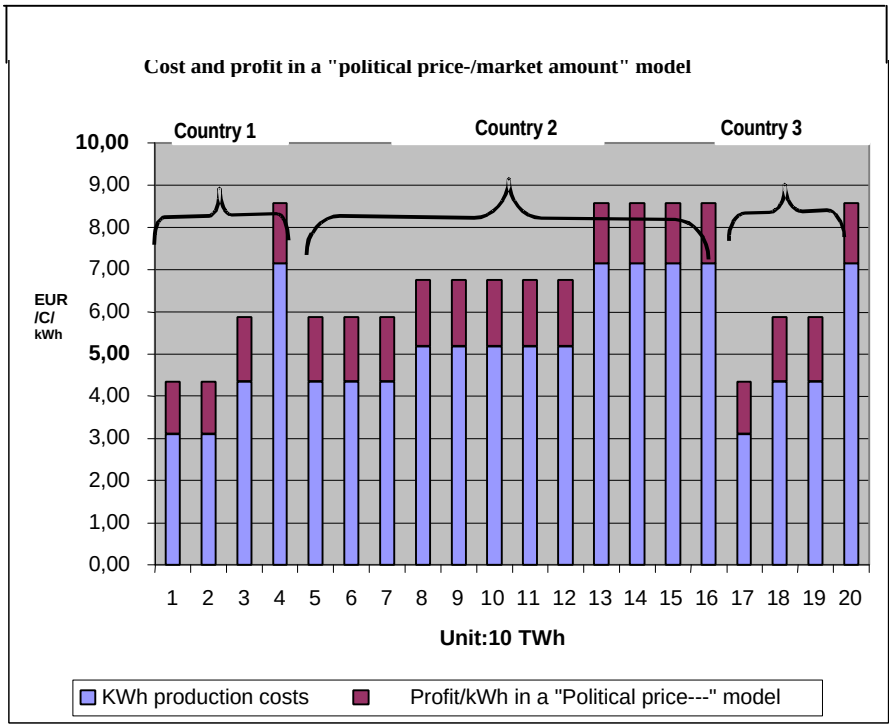


**Figure 11: Price, profit and costs in the "Political price-/amount market" model. (case example)**

(Politically fixed, site dependent price linked to the performance of a reference wind turbine: the German model)
**Assumptions***: The same costs/kWh as in Figures 6 and 10. Profits are a percentage of costs: 40% on wind site 0, 35% on wind site 1, 30% on wind site 2 and 20% on wind site 3. These profit percentages are approximations of the profits that we have calculated on the basis of the new German prices. Since prices are politically guaranteed, there is no need for any risk premium.*

As illustrated in Figure 11, this advanced fixed price model makes it possible to lower the profit margin on good wind sites, without destroying the economy of poorer wind sites, a requirement that has been politically defined as indispensable to achieve energy policy goals.

In this case 200 TWh are produced pr. year. Table 3 below shows the total payment, the total profit, the average kWh price and the profit rate for one year.

| | |
|---|---|
| a. Production costs 200 TWh RE-based electricity production. | 10428 mil. EUR |
| b. Profit | 2923 mil. EUR |
| c. Total payment for 200 TWh. | 13351 mil. EUR |
| d. Average price pr. kWh | 6,68 EUR. |
| e. Profit as a percentage of production costs | 28% |

*Table 3. Economic consequences of the advanced "Political price-/amount market" model. (Case example)*

**Assumptions**: *Figures drawn from Fig. 11*

As can be observed, this model, with politically set, site dependent prices, results in a “multi-price” system, thus avoiding excess profit on good wind sites.

To conclude, we can say that:

a. This model is, to a much greater extent than the "Political quota-/certificate price market" model, a market model, as there is no politically set quota. Therefore, there still is a motivation for wind turbine producers to increase market volume by lowering production costs.
b. The advanced "Political price-/amount market" model makes it possible to lower the profit for wind site- and wind turbine owners in favourable locations, without destroying the wind turbine economy of poorer sites, which it is a political goal to exploit.
c. The advanced "Political price-/amount market" model allows for a lower payment to older, out of debt wind turbines without eroding the economy of new wind turbines.
d. The model can, as it is done in the German model, be used in a process of gradually reducing the kWh payment from RE year group to year group, and in that way motivate and anticipate RE productivity gains.
e. The model puts a higher cost pressure on wind turbine producers selling wind turbines to good wind sites, than the "Political quota-/certificate price market" model. This is because the model is close to a wind site dependent price, instead of the general price of the "Political quota-/certificate price market" model, which is determined by the poorest wind site on the market within the established quota.

f. Due to the lower payment for RE in this model, and the absence of excess profits for wind site- and wind turbine owners, the political acceptance of wind power will be easier to achieve.
g. It is worthwhile mentioning that our simulations of the German “advanced Feed in-amount market” model show that the profits from wind turbines on coastal wind sites are still far higher than on inland wind sites. This model therefore still fosters a relatively strong motivation to seek the best wind sites for wind turbines.
h. Due to the flexibility of the system, the price relationships can be constructed so that it is possible to create a common price formula for the EU, if it is politically desired.

### *6.3.3 Comparison of the advanced "Political price-/amount market" model with the "Political quota-/certificate price market" model*

In Figure 12, the price and cost structures of the advanced "Political price-/amount market" model and the "Political quota-/certificate price market" model are compared.

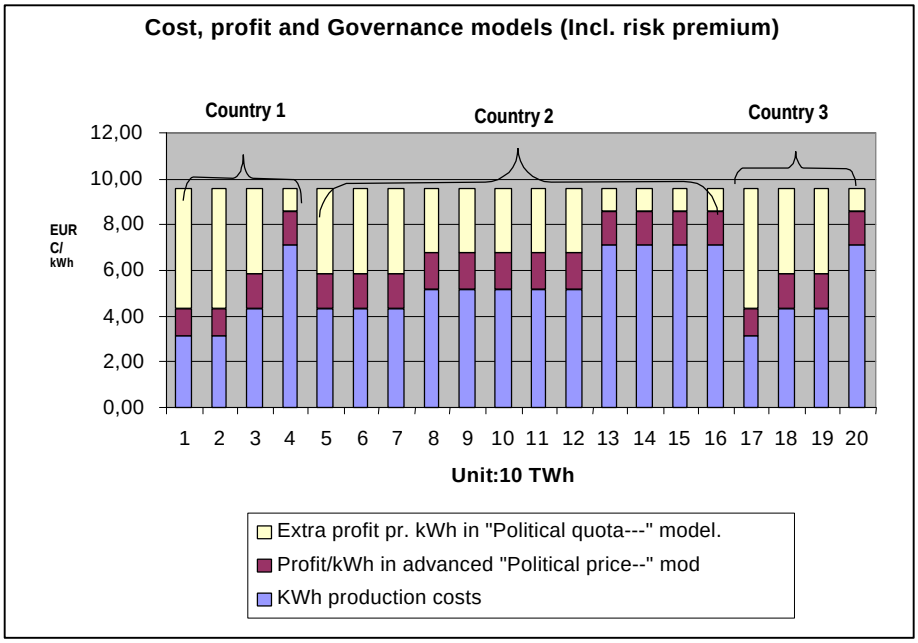


**Figure 12. Price and cost structures of the advanced "Political price-/amount market" model and the "Political quota-/certificate price market" model. (Case example)**

*Source*: Figures 9 and 11. The Figure illustrates the costs linked to the ‘mono-price’ structure of the "Political quota-/certificate price market" model, where it is inevitable that the market pays the same price for RE on a good wind site as for wind power produced on an inland site.

Table 4 summarises the economic differences between the two regulation frameworks:

| | The *"Political quota-/certificate price market"* model | The *advanced "Political price-/amount market"* model. |
|---|---|---|
| a. Production costs 200 TWh RE based electricity. | 10428 mil. EUR | 10428 mil. EUR. |
| b. Profit | 8712 mil. EUR | 2923 mil. EUR |
| c. Total consumer payment for 200 TWh. | 19140 mil. EUR | 13351 mil. EUR |
| d. Average price pr. kWh | 9,6 EUR/C/kWh | 6,7 EUR/C/kWh |
| f. Profit as a % of production costs | 83% | 28% |

*Table 4. Comparison of the economic consequences of the “Political quota-/certificate price market model” versus the advanced "Political price-/amount market" model. (Case example)*

**Comments**: *The difference is mainly due to the fact that the "Political quota-/certificate price market" model” is a ‘mono-price’ model with potentially heavily fluctuating prices, whereas the advanced "Political price-/amount market" model is characterised by predictable prices and the adaptation of prices to local natural resources.*

When examining the above analysis and conclusions, it is worthwhile emphasising that we are dealing with a static methodology, which does not include an analysis of the dynamics on the market, and the interplay between market, innovation, local acceptance of wind turbines and the political process. An analysis including the institutional context shown in Figure 2 is needed for such analysis by listing the actors on the market scene, and establishing theories regarding the interrelationship between these actors. This type of analysis will then come into play with the price developments described above. One could for instance imagine that the high profits linked to

good wind sites in the "Political quota-/certificate price market" model could result in local political resistance against wind projects and/ or that politicians would abstain from increasing the quota, if prices on the market rose too much. These types of questions will be dealt with in the following chapter, by means of the Danish example.

# *7. An institutional analysis of RE governance models.*

This publication began with an emphasis on four main problems, which should be taken into consideration when establishing a RE institutional framework. In the above analysis, we have dealt with the important characteristics linked to RE, namely the various natural resource backgrounds in different regions.

The other three main features of RE technologies are:

*a.* *The cost structure problem*

The cost structure is characterised by about 85-90% investment costs, and only 10-15% running costs. Thus, once a wind turbine has been built, one is dealing with a technology with a "stranded cost" percentage that is far higher than in a fossil fuel power plant. This results in very high investor risks on the market. What effects then will this cost aspect have on the development of competition on the market?

*b.* *The problem of decentralised inconveniences linked to RE*

RE, and especially wind power, is characterised by being difficult to conceal, and often has to be distributed in a given area within the vicinity of a number of communities. This means that a lot of people will feel the visual and, in some cases also, noise inconveniences linked to, for instance, having a biomass- or wind power plant in their neighbourhood, whereas the direct[31] pollution effects linked to nuclear-/ fossil fuel technologies are much more centralised and concentrated upon a few sites like Gorleben, The Hague, various coal and uranium mines, etc. One can naturally install offshore wind power systems away from residential areas, but their total output would not be sufficient to supply whole continents with electricity and energy. Furthermore, such concentrated production of wind power would make it necessary to build huge high-tension power lines.

*c.* *The 'newcomer' technology problem*

This problem is especially linked to the lack of know-how as well as cultural and economic motivation with regard to the implementation of RE-technologies among the established nuclear and fossil fuel based

[31] By 'direct pollution effects' we mean the environmental drawbacks linked to having a power plant, a high-tension transmission line, a nuclear waste deposit in one's close neighbourhood.

techno-organisations[32]. So politically as well as institutionally, RE technologies face organisational resistance from strong and well-established actors on the energy scene. This ‘factor’ should be seriously taken into consideration when defining the selection criteria presiding over the choice of an appropriate RE institutional framework.

These types of questions, among others, will be discussed using the Danish case.

The reasons for changing the Danish system from a "Political price-/amount market" system with political price regulation to a system with political quota regulation are to be found in the following quotation, drawn from Annex 14, Ministry of Environment and Energy, Dec. 8th, 1998:

“*The quota market will replace the present system of fixed prices for payment of RE current as well as the subsidy for electricity production, which has lead to new wind turbines being economically overcompensated. In their evaluation report of March 1998, the Council for Energy and Environment recommended that this inexpedient application of subsidiary funds be changed”(Ministry of Environment and Energy, 1998, p.44).*

The hope was to thereby establish a sort of competition on the RE market, fostering a situation where “more value for money” would be obtained. Nevertheless, the Ministry of Energy does not provide any descriptions of mechanisms that could promote this cost reducing process.

Thus the argument in the above quotation is weak, since the problem of ”overcompensation” is not at all solved by a shift to a "Political quota-/certificate price market" system. As we have shown in the preceding chapters, it is quite the opposite.

[32] By using the concept of ‘techno-organisation’, we are emphasising the fact that organisations are closely linked, economically as well as culturally, to the character of the technique they promote. Organisations are therefore purpose-designed and built around their technique and are often unable and/or lack the motivation to implement other techniques.

## *7.1 The Danish "Political quota-/certificate price market": a double price market system combined with a politically fixed quota*

The components of the double price market are:

***Component 1**: A "Political quota-/certificate price market" system* is established, where consumers are obliged to buy a certain quantity of RE. A market for "Green certificates" is introduced, where a producer of RE gets a green certificate, which can then be sold to the consumers, so that they can fulfil their quota obligation. The "Green Certificate" quotas for a given number of years are fixed by the Danish Parliament. The law has established price limits, so that the certificates cannot be cheaper than 10 øre/kWh (1,34 EUR/C) or exceed 27 øre/kWh (3,6 EUR/C). The "Green Certificate" price will therefore oscillate between 10 and 27 øre/kWh.

***Component 2**: A spot market for electricity*, where RE based electricity is sold. With reference to average 1999 prices (10 øre/kWh (1,34 EUR/C), this would mean prices oscillating between 18 øre/kWh (2,34 EUR/C) and 37 øre/kWh (4,96 EUR/C), depending on the certificate price. (In practice, the oscillations would have been greater, since, in 1999, the Nordpool price was fluctuating around the average, 10 øre/kWh). This is around 50% of the price paid today, and below the level where it can be expected that new windmills will be built. No new contracts have been signed under these new terms in 2001.

The Nordpool spot market price is an enemy of any innovation, since it mirrors the short-term marginal costs of fossil fuel technologies on a market with periods with a massive excess of large hydro and fossil fuel capacity. At present, the spot market price is close to the short run marginal cost linked to coal-fired plants, which is around 10 øre/kWh (1,34 EUR/C).
In the following, we will discuss a series of problematic spheres, which should be included in the regulation discussion of RE in one or the other market versions.

## *7.2. The institutional analysis*

(The institutional context in which the RE-governance system is embedded)

This analysis is called an institutional analysis because it emphasises the institutions in which the market is embedded. If one considers Figure 13 below, it is noticeable that it is linked to former analyses in Figures 9, 10 and 11, in the sense that it enumerates a number of institutions, within which the cost and price formation processes described in these Figures take place.

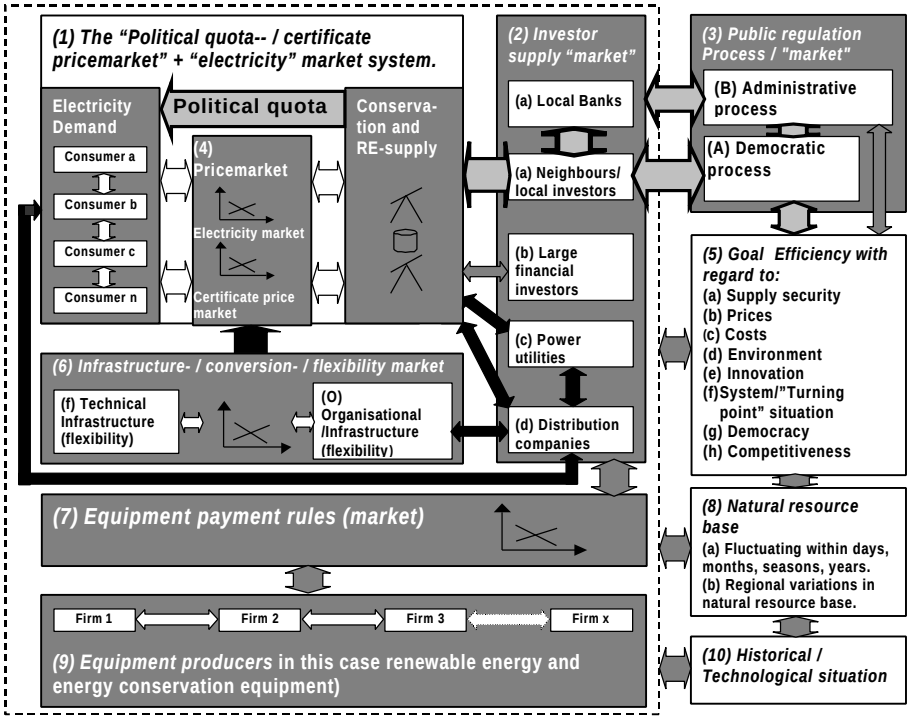


**Figure 13. A relevant[33] institutional context around RE governance systems.**

**Figure explanation**: *The Figure is a version of the overview Figure of Chapter 2, which especially focuses upon the interrelations between the public regulation process (Box 3), the investor supply market (Box 2), the equipment market (Box 7) and the conversion and flexibility market (Box 6). The specific interest of this chapter thus resides in an analysis of the links*

[33] In relation to energy policy goals, and the four RE characteristics described in Chapter 1.

*between the above areas, and the "Political quota-/certificate price market" governance system.*

*As mentioned in chapter 2, the approach used by the Ministry of Environment and Energy has been to avoid analysing these links.*

*The most important messages in the Figure are the following:*

***(a) It is necessary to examine both the market for electricity and its "Green Certificates" (Box 4), and the market for energy equipment (Box 6).***

In the background analysis for the reform, only the less important of these two markets, the market for electricity, was discussed.

Furthermore, it should be underlined that within the market for electricity, as it is illustrated in Box 4, the new Danish regulation represents a **"Double price market"** with both an electricity- and a "Green certificate" market.

***(b) "RE-investor supply" and its composition do matter (Box 3)***.

(Boxes 3A and 2a are connected to each other by the dotted arrows that display the importance of the links).

The areas thus linked provide a description that makes it possible to discuss a series of interrelated questions such as:

-the importance of discussing the connections between the people who reap the economic benefits from investing in RE (e.g. wind power), and the people who carry the potential burdens linked to noise and visual inconveniences. One way of "solving" this problem is to fuse these two groups by supporting a policy centred on neighbour- and local ownership. Furthermore, this discussion is linked to the political process in Box 3A, indicating that people's political acceptance of RE plants will depend on the extent to which *some of the economic benefits are given to the people who carry the burden.*

-the importance of discussing the *need for "price stability*", when wanting to secure the financing of RE plants by means of the services of local banks. Securing this financing possibility is essential, when wanting to keep neighbour and local investors sufficiently strong to survive competition on the investor market.

-the importance of recognising that neighbour and local investors, due to their economic and cultural independence of fossil fuel companies, among other factors, have been the innovators and initiators[34] of invest-

[34] On Feb. 1st 1999 in Copenhagen, S. Auken, the minister of Energy, said at a

ment in Danish RE during these past 25 years. There is thus also a link back to the descriptions of both the character of political processes furthering the innovation potential within this field, and the policy influence on the composition of the ”investor supply”.

**(c) The study of market power does matter**.

When analysing the effects of changes in public regulation, it is crucial to be able to take a closer look at the concrete characteristics of development on the market, especially with regard to monopolistic and/or oligopolistic tendencies. Figure 13 illustrates, by means of the black arrows between the demand and supply sides that, at present, the demand side (distribution companies) is the owner of the supply side, i.e. the power utilities and distribution companies, which can also build RE plants. This is the case in the present Danish system, but there are similar ownership links in all the Northern European electricity service supply systems.

The above ownership links naturally cause huge problems with the establishment of market control by large fossil fuel based actors, making it possible for these to squeeze out investors[35] who do not have a strong capital background and ownership connections to the demand side.

**(d) The infrastructure for electricity conversion and production flexibility should be analysed, as it is essential for the economy of RE technologies**

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meeting with Tage Dræby, Hans Bjerregård, Frede Hvelplund, and the chief of his department, Leo Bjørnskov, as well as others from the department, that we had now reached a level where development could no longer be “driven by 12 idealistic schoolteachers”. With this colourful metaphor, he hinted that it was now time for big capital and large companies especially, to invest in “offshore wind power” development. The assumption behind this statement, whereby technological development is now out of the reach of local people and their creativity, does not seem to be well grounded, especially when one considers the big problems linked to the present utility driven (ELTRA and ELKRAFT) model of exporting surplus wind power to neighbouring countries. The technological alternative to this export model is to integrate the fluctuating RE sources locally. This strategy might well prove much more efficient than the utility driven export model, and the creativity and support of the “twelve schoolteachers” is certainly required to develop and implement this local integration.

[35] Due to the cost structure of RE production (e.g. wind power), characterised by both high capital costs (85-90% of costs) and low running costs (10%), low price periods will drive investors with a weak capital background to bankruptcy. This state of affairs may then potentially result in small investors being bought up by big investors with a strong capital background, such as the large utilities.

The economy of RE sources and especially wind power is a function of the technical infrastructure in which the particular RE is embedded. Wind power-, photovoltaic- and wave energy production varies according to the amount of wind-, sun- and wave energy. When the RE proportion of total electricity production is lower than around 5-10%, these variations will be absorbed by the electricity system. When the proportion of RE rises above this percentage, and there is, as in the Danish energy system, a very high proportion of cogeneration, there is, and will continue to be a tendency toward surplus energy production, due to wind- and heat bound electricity production. The excess production periods will typically be cold windy winter weekends, during which the wind- and heat bound electricity production is high and the electricity consumption low.

With almost 50% of the heat consumption based upon cogeneration of heat and electricity and 15% of total electricity production from wind power, the Danish electricity system has reached a boundary with several periods of "excess" wind- and heat bound electricity production. This "problem" will increase in parallel with reaching the official Danish goal of producing at least 50% of electricity by means of wind turbines around 2030.

The present official strategy to solve this "problem", i.e. huge electricity exports during windy periods, entails the risk of very low sales prices for wind power. A scenario built on an increasing proportion of forced export at low prices will probably result political resistance against wind power and make a CO2 reduction policy increasingly difficult to champion. The present successful expansion of wind power capacity in Northern Germany, producing electricity during the same periods as Denmark, reinforces this "problem".

Another strategy is to use wind power in regional systems, consisting in heat pumps linked to cogeneration, flexible regulation of cogeneration units and the establishment of cogeneration- and wind turbine systems, which, on their own, can already stabilise the grid. This strategy will make it possible for Danish system operators to decide when to import and when to export electricity. At present, this type of system is being discussed in Denmark and seems to be much more promising economically than the current official export strategy (Lund, 2001).

Linked to the above discussion, it is important to analyse to what extent a well functioning competition exists between various technical solutions. This is crucial with regard to the establishment of a flexible infrastructure, which results in a politically acceptable economy for RE technologies in general and for wind power in particular. The "Infrastructure, conversion and flexi-

bility market" should therefore imperatively be included in the analysis (Box 6 in Figure 13.)

## *7.3 Comparison of the "Political price-/amount market" with the "Political quota-/certificate market"model*

### *7.3.1 "Liberalizing" a dwindling market and "bureaucratising" a growing market*

In a "Political price-/amount market" system" there is a politically set price, and a quantity of available RE decided on the market. Consequently, wind turbine manufacturers can increase the amount of wind turbines sold by decreasing their sales prices.

In a "Political quota-/certificate price market" system, with politically fixed quotas and prices determined on the market, there might be some short-term price competition on the market between existing suppliers of, for instance, wind power. Meanwhile, the quantity of politically determined wind power may have been settled for the following 6-8 years (Ministry for Environment and Energy, 1999), which entails that wind turbine producers cannot influence the turnover by lowering prices. In fact, the only strategy enabling wind turbine producers to increase their turnover in a "Political quota-/certificate price market" system is to increase prices, since the quantity to be sold year after year is the consequence of a political decision[36].

*The structure in Figure 13 then illustrates that a certain degree of 'market liberalization' is established on the electricity "double market", (Box 4). In parallel, the existing market regulation system for energy equipment (Box 6) is replaced by a bureaucratically regulated quota system, which removes the competitive motivation of equipment producers (e.g. wind turbine producers) to lower their sales prices. So what happens, seen within the structure in Figure 13, is that some 'market liberalization' is achieved on the electricity "price market", (Box 4). In parallel, the existing market regulation system for energy equipment (Box 7) is replaced by a bureaucratically regulated quota system, which removes competition between equipment producers' (e.g. wind turbine producers), a competition necessary to lower sales prices.*

[36] Nevertheless, there is a certain political motivation to lower prices, since too high prices might encourage popular support to other solutions.

Whether this is an important problem or not depends upon actual developments on the market. One of the general market structural changes is the *probable decrease of value added on the market for electricity and the likely increase of value added on the market for energy equipment*, seen as a proportion of the sales price at the consumer level. Concretely, the change to some types of RE systems, such as, for instance, wind power, *represents an automation of electricity production*, with 85-90 % as investment costs and the rest as maintenance costs. Once the wind turbine is built, nobody works on it. It just produces electricity for 20-30 years, and is usually maintained by service units linked to wind turbine factories. This entails that the wind turbine will not work more efficiently because of competition with other wind turbines on the electricity market.

In a traditional electricity service supply system, the situation is totally different. At least in theory, one might expect that market competition on the electricity market might put pressure upon the power utilities, which will then dismiss some of the people employed at the power plant. A wind turbine can dismiss no one, once it is built. Any potential personnel compression can then only happen at the level of the wind turbine factory, because a wind turbine is in principle an energy automaton.

At present, fossil fuel back-up systems are still being used, but in the future, a system with different types of storage techniques, such as for instance hydrogen storage, might be developed. These systems also appear to be "automatic storage systems", which hardly require any maintenance performed by employees in an energy organisation.

***Thus the market for electricity is declining in importance, whereas the market for energy equipment is becoming increasingly crucial.***

The existence of a market for equipment and a market for electricity, as discussed above, is therefore especially significant during the ongoing technological change, when the value-added chain changes and when fossil fuel systems are replaced by RE- and energy conservation systems. This change in value added is illustrated in the discussion below, and in Figure 14:

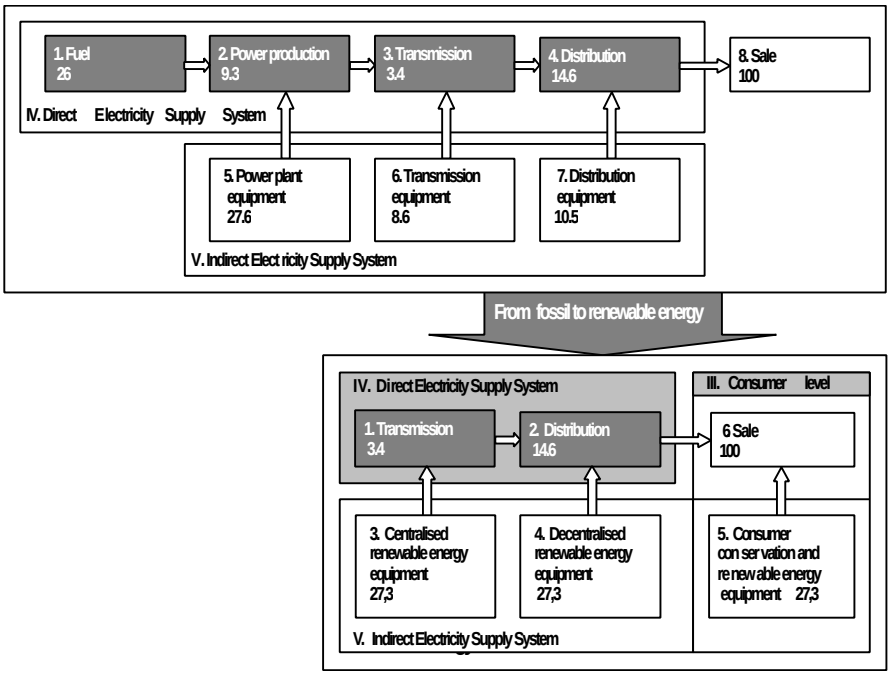



**Figure 14. Change in value added profile, in the transition from a fossil fuel based system to a system based on RE- and electricity conservation**
*Source*: Hvelplund, 2001.

**Figure explanation***: The "Indirect electricity system", as represented by the upper and lower V boxes, constitutes the energy equipment needed for a certain sales volume at consumer level. The "Direct electricity supply system", as portrayed by the upper and lower IV Boxes, constitutes the system usually conceived of as the electricity system.*

*In the upper IV and V Boxes,* ***the coal-based fossil fuel system****, the indirect electricity system, sub-boxes 5, 6 and 7, has only 46.7% of the_value-added/sale in box 8 (Hvelplund, 2001). The "Direct Electricity supply system", box IV, has 53,3% of the total value-added in this coal-based system.*

*In the lower box IV and V,* ***the renewable energy system****, the indirect electricity system, boxes 3, 4 and5, has a value added of 82% of the turnover/sale in box 6 (consumer payment). The "Direct Electricity supply system", box IV, here has an accumulated turnover amounting to 18% of the turnover at the consumer level.*

In Table 5, the relative importance of the market for equipment is compared within a fossil fuel system and RE-/electricity conservation system.

| | ***Equipment market*** | ***Electricity Market*** |
|---|---|---|
| Fossil fuel systems | 47% | 53% |
| RE- and electricity conservation systems | 81% | *19%* |

*Table 5: Moving from fossil fuel to RE means a change in value added from the electricity market to the equipment market.*

**Conclusion**: In the above discussion, and as shown in Table 5, we have been documenting the argument whereby the present technological change of direction from fossil fuel based systems entails a development that shifts the value added away from *the electricity market*, (Box 4 in Fig. 13). Interestingly enough, it is also this diminishing market that is sought after and liberalized by means of the present "double market" reform.

In parallel with this, the value-added percentage is increasing on the *market for energy equipment.*

*It is therefore no less significant, that the 1999 electricity law that regulates this expanding market, abolishes the existing "market forces" and replaces them with a "quota" based bureaucratic regulation model.*

But why is the latter important, when seen in relation to energy policy goal performance? At the beginning of Section 4.1, it was argued that the "Political price-/amount market" system did not entail less "market competition" than a "Political quota-/certificate price market" system with politically fixed amounts (quotas) and a price fixed on the market. Meanwhile, the arguments above indicate that the conversion to the "Political quota-/certificate price market" system represents in fact a decrease in "market competition", since the new system introduces market forces on an market arena that is losing importance, and abolishes market forces on the other promising arena. Seen in relation to policy goals, the purpose of introducing markets is mainly to cut down on costs.

***But the new system introduces a market at the electricity market level, where there are almost no costs to cut, and abolishes a market at the equipment market level, where the largest part of the costs are clearly determined,*** when dealing with electricity production from RE automatons. Therefore, it is reasonable to deduce from the above arguments and analysis

that the new Danish “double market” system does imply a goal performance reduction with regard to increasing competition and cost efficiency.

Finally, the present technological changes away from fossil fuel based systems should foster a development that shifts the value added away from *the electricity market* (Box 4 in Figure 13), to the equipment market (Box 7 in Figure 13). This concretely spells a change from a fossil fuel power plant system, where the number of employees at the power plant can be reduced due to increased competition, to a system consisting of energy automatons, hardly requiring maintenance once the wind turbine is erected. The “Political quota-/certificate price market" model represents an increased price competition between energy robots that will not allow for cost reduction, as no employees can be fired. At the same time, the quota system linked to this model severely weakens competition between the producers of these energy automatons.

*In the present situation of technological change, the "Political quota-/certificate price market" system ends up introducing price competition on a dwindling market and abolishing market competition on an expanding market.*
*The "Political price-/amount market" is increasing market competition on the growing market for equipment, and is therefore especially well suited to the present period of technological change.*

### 7.3.2 The "Political quota-/certificate price market" system and the socio-economic costs of renewable energy

Our comparison with the advanced "Political price-/amount market" model, in Section 6.3.3, indicates that this model has far lower public service costs linked to introducing RE than the “Political quota-/certificate price market" model. The main question then is, to what extent a regulation framework has the ability to secure that a public service payment is minimised, seen in relation to the energy policy goal to be achieved. The conclusion is:

*The disadvantage encapsulated in models like the "Political quota-/certificate price market" model, which hand over price control to the market, is that it becomes almost impossible to establish a time- and natural resource dependent price (public service payment).*
*In this model, consumers pay a considerable amount of "wasted" public service payment to, for instance, windmill owners, who would have erected the windmill even if they had only got the high public service payment during the period when they were paying their loans back. In a "Political quota-/certificate price market" model, it might be necessary to pay the wind turbine owners 27 øre/kWh in public service payment throughout the whole lifetime of a windmill, whereas in a system with politically fixed prices, the payment could already be lowered after, for instance, 7 years on good wind sites.*

*The advantage of the advanced "Political price-/amount market" model is that, by placing political regulation at the level of prices and letting the market regulate the amount, the public service payment can be regulated over time and taking into account differences in the natural resource base.*

*Politicians can thus regulate the amount by lowering or increasing the prices.*

### *7.3.3 Abolishing price stability and the decreased local and neighbour participation*

*(The effects of price fluctuations and market dominance on the double electricity market)*

*The advanced "Political price-/amount market" model with politically set prices, and the amount fixed on the market generates competition on the equipment market.*

Although the price is almost guaranteed for a 10-15 years period at least, the investor will want to buy the wind turbine at the lowest possible price***. Consequently, as there is competition on the equipment market, a system with fixed prices is basically cost sensitive.*** Therefore, despite the fact that in such a system, the price of wind turbine electricity is to a large extent politically defined, once it has been determined, the market functions, ***and creates competition on the equipment market***. In that sense, one could categorise it as a rather non-bureaucratic version of the UK tender system. It is thus not

incidental that wind power cost pr. kWh has been reduced by more than 75% since 1981.

*A. The "Political quota-/certificate price market" double market system results in heavily oscillating prices and a loss of energy policy goal performance.*
*The electricity market*: As mentioned above, the electricity price on the Scandinavian Nordpool market, fluctuates between 1 and 4 EUR/C/kWh, depending on the amount of rain, which then determines the amount of available hydropower. Furthermore, depending on the degree of investment in surplus capacity, prices fluctuate between the long-term and short-term marginal costs plus profit. The years around 2000 are characterised by excess capital. This then results in electricity prices on the Nordpool market that, on average, are far below the long term marginal costs of electricity production.

Furthermore, as we shall see below, the electricity market is not a free market, *and the largest actors on the energy scene can quite easily manipulate prices.*

*B. Fluctuations in wind resources*: Due to wind resources varying from one year to the next, wind power will fluctuate within a margin of 30%. The Danish year 2000 wind power capacity of 2500 MW, would for instance under 1994 wind conditions, produce 1500 GWh more in one year, than under 1996 wind conditions.

If the goal of 50% wind power electricity is to be reached around 2025-2030, the annual increase in wind power capacity will have to be between 200 and 250 MW, which, around 2005, will be only 7-8% of the installed wind power capacity. In 2015 the annual increase in wind power capacity will only be around 5% of the total wind power capacity. This means that the normal annual fluctuations in wind velocity will clearly exceed the annual wind power quota.

The price of certificates will therefore be a function of wind speed and not of political decisions with regard to the amount of wind power that should be installed. Consequently, the price of Green Certificates will oscillate between 10 to 27 øre/kWh (1,32 and 3,57 EUR/C/kWh) depending on the actual wind energy resource of the year in question.

*C. Cost structure of wind power*: Considering total costs, wind turbines are characterised by having high construction costs and low running costs. The

long run marginal cost (LRMC) is 4-6 EUR/C/kWh, whereas the short run marginal cost (SRMC) is below 0.5 EUR/C/kWh

*D. Development of market control and price manipulation.*
In Denmark and in most other countries where there are ownership relations between power producers and distribution companies, one cannot describe the market as free. In Figure 28, this link is illustrated by the black arrows inside and under Box 6, between the "demand units", which are simultaneously the electricity distribution companies and the present owners of the power companies. In Jutland-Funen, these distribution companies are already closely collaborating in the ELFOR[37], and are at present undergoing comprehensive fusion processes.

When a market consists of a supply, which, due to weather conditions, heavily fluctuates, combined with a supply cost structure as described above, prices will continuously be very sensitive and vary between the short-run marginal costs and the long-run marginal costs. Wind turbines, for instance, will continue to produce, even when the kWh sale price sinks to 0.5 US/C/kWh. But in this case, there will be insufficient resources for long-term maintenance and amortisation of the loans, and windmill owners with a weak capital background will face bankruptcy.

In such a system with heavily fluctuating prices, which are very sensitive to minor changes in supply and demand, the prices of Green Certificates can be manipulated by minor changes in the supply of- and demand for RE. When this is combined with a market, where the demand organisations own the power plants, which are large suppliers of RE based electricity, there is a combination of economic motivation, technical possibility and sufficiently asymmetric power on the market to allow strong actors to exert price manipulation. As the proverb goes, "Opportunity makes the thief". From a social sciences point of view then, if no price manipulation occurred under such conditions, it would provide a really interesting organisational 'exception'.

We therefore come to the conclusion that the market will not become a free market with many suppliers and many buyers. Consequently, the political discussion can no longer be concealed behind the utopia of a future "free market". It is a necessity, for practical as well as scientific reasons, to discuss questions such as: which types of associations will be formed and who will the dominant actors be? Who has the best strategic position on this type of

[37] An association of power distribution companies in Denmark.

"Political quota-/certificate price market" system, and how will the most powerful actors manipulate prices and long- term technological development?

As may be deduced from the discussion above, even a small amount of surplus capacity may lead to a big drop in prices. Large mergers of buyers may have an interest in such price drops, as long as they own only a small part of the wind turbines currently on the market. In fact, the utilities only own 20% of the wind power capacity today, which means that they have to buy 80% from external producers. By just creating a minor excess of wind turbine capacity compared to the green quota, a steep drop in the wind power price could be induced; from around the level of the long run marginal costs (LRMC) to the level of the short run marginal costs (SRMC). Consequently, a number of privately and co-operatively owned wind turbines would go bankrupt, and the utilities or other strong agents on the market might be able to buy them at low prices. Because the green quota is known, it will not be difficult to define the extra capacity that would need to be established. The Competition Council could, in theory, keep this potential for manipulation at bay through bureaucratic control, with a demand for account separation between distribution and production activities.

In practice, however, it is very difficult to control whether there is a real separation of costs, if the technicians and the engineers of a distribution company-owned wind turbine factory and the distribution company itself are employed by the same management and work in the same buildings.

*It should be mentioned, that hitherto in the "Political price-/amount market" model, the Parliament has kept the price for non polluting electricity stable, and it therefore could not be easily manipulated by the strongest actors on the market.*

We have thus analysed a system in which:

- the price base, i.e. the Scandinavian Nordpool prices, fluctuates greatly, due to the variation in rainfalls influencing hydropower, in combination with a cost structure with large differences between short-term marginal costs and long term marginal costs in the basic capacity of coal-, nuclear- and hydropower. The wind power supply fluctuates within a 30% margin, due to wind resources changing from year to year.
- the cost structure of e.g. wind power is characterised by around 4-6 EUR/C/kWh in long run marginal costs and 0.5 EUR/C/kWh in short-run marginal costs, combined with assets, the lifetime of which is 20 to 30 years.

- large actors, especially the old fossil fuel organisations, are, due to ownership relations, in a position where they can manipulate the prices of RE.

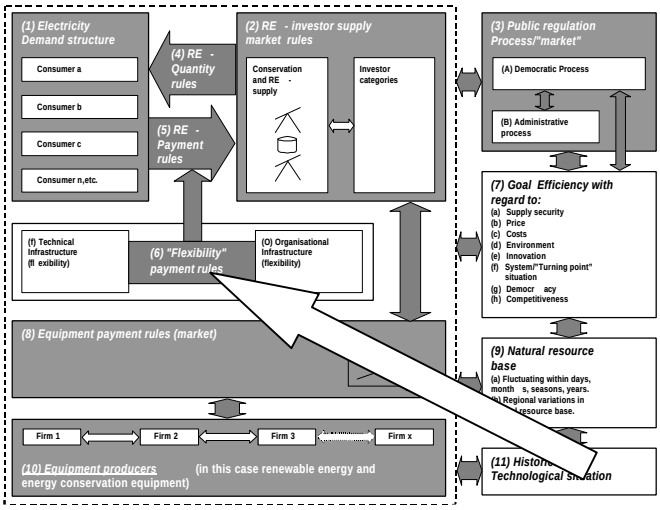
The "double market system" will be characterised by heavily oscillating and manipulated prices.

***The worst consequence related to oscillating and manipulated prices is that the traditionally small and innovative investors, neighbour and local investors,*** will leave the investor market for three reasons:
-*Firstly,* they will find it difficult to get loans from the local banks, since they can only show very fluctuating and insecure price/income prognoses.
-*Secondly,* they might not dare to invest, as, generally, they do not have the capital base making it possible for them to survive several years with excess capacity and short-term marginal pricing on the electricity markets.
-*Finally,* they might not want or dare to enter a market, where it is rather obvious, that large actors are in a position to manipulate prices.

***The consequences of loosing neighbour and local investors from the "investor supply group" are:***
***- Fewer investors and decreased investor competition resulting in more expensive RE.***
***- Declining technological innovation, as an economically independent and innovative investor group has left the RE scene.***
***- As the only investor group that supplies a form of compensation to the ones who carry the burden leaves the market, the local political resistance against RE will increase.***

A main problem linked to the loss of independent investors is that the remaining investors have no economic or organisational motivation to invest in RE plants, as these have to compete with the short-term marginal costs of fossil fuel plants in the present excess capacity situation. Thus there is ***no serious investment incitement amongst the remaining investors.***
***Therefore, without neighbour- and local investors, the public service payment for RE will increase. The political resistance will also increase, and both the support from local people and their innovative commitment will be lost.***

# 8 Renewable energy and system integration




When discussing how different regulation mechanisms work in relation to specific goals, it is not sufficient to only be aware of the general characteristics of the organisations that should be regulated. It is also necessary, as indicated in the Figure above, to circumscribe the specific *technical* historical configuration, within which the change is taking place. There is no doubt that a need has arisen to change the regulation within the electricity supply system in such a way that it can absorb the fluctuating RE sources in order to avoid having to sell wind power at extremely low prices on the market (in the Danish case the Nordpool market).

The technical regulation possibilities are mainly outside the scope of wind turbines, which have to operate when there is wind energy. Consequently, it seems logical to continue giving wind power producers a fixed price pr. kWh of wind power produced.

Some technical regulation possibilities are described as a combination of decentralised cogeneration units, heat storage systems, heat pumps, hydrogen systems, cogeneration and wind generators, which are able to stabilise the grid (Lund, 2001). Henrik Lund has, in Energidebat 2001, compared a system infrastructure characterised by a combination of investment in high tension grid capacity and RE- electricity export, with a system infrastructure comprising heat pumps, flexible cogeneration units, grid stabilising RE-

plants and cogeneration units, etc. The result of this comparison is that the latter system, where the amount of forced RE electricity export is close to zero and where RE-electricity, to a very large extent, is regionally absorbed in Denmark, has a distinctly better economy than a system characterised by heavy investments in high tension lines combined with forced export, during periods with a more significant production of wind- and heat bound electricity.

In his scenarios for 2015, 25%[38], that is around 9 TWh, of the entire Danish electricity production, is provided by wind energy. In an infrastructure able to absorb the wind- and heat bound electricity, the annual gain, seen in relation to the "forced export" strategy, will be around 1.2 EUR/C/kWh wind power produced.

The technical infrastructure in which RE-technologies are embedded is therefore fundamentally meaningful for the economy of RE systems. The significance of this infrastructure increases in parallel with wind power gradually reaching a relatively high proportion of the total electricity consumption. In Denmark, wind power represents 15% of total electricity consumption in 2001, combined with a cogeneration production amounting to 50% of heat consumption. Denmark has therefore reached a level where a modernisation of the energy infrastructure has to be developed and implemented.

From a governance point of view, *the current strategy* is to regulate both by the building of more high-tension transmission lines and by letting the large coal-fired power plants be the regulating units. At present, the 1999 Electricity Law endows the companies responsible for system regulation with a regulation monopoly. This means that regulation capacity is bought from large coal-fired power plants, which are very slow when it comes to technical regulation, whereas the speedier regulation process that could come from decentralised cogeneration units is not currently exploited.

In this context, it is not surprising, that ELTRA, which is responsible for system regulation in Jutland-Funen, is currently buying regulation power from large power plants, because these are owned by the very distribution companies that own ELTRA. Additionally, it should be emphasised that this company, responsible for system regulation, is a non-profit monopoly, which

[38] In 2000, wind power represents 15% of the total electricity consumption. So it can be expected that 25% will be reached before 2010, if a reasonable governance system is introduced.

get all its costs covered by consumers. This means that it does not have any economic incitement to find regulation solutions that are cheaper than the *"large coal fired power plant plus high tension lines"* solution.

It is crucial then that the 1999 Danish electricity law be changed according to the following main guidelines. It should secure that the companies responsible for the system, such as ELTRA in Jutland-Funen and ELKRAFT in Zealand, become both economically motivated and obliged by law to actively work toward the establishment of a regulation system that does not force the owners of RE plants to export during periods with very low prices. The present technological monopoly, linked to the "forced export" regulation model combined with the compulsory consumer payment toward the expansion of high tension lines and regulation by means of the large coal fired power plants, should be replaced by a competitive system.

E. Münster describes an interesting proposal for a type of competitive system. He suggests that the company responsible for the system elaborate prognoses for purchase and sales prices for the coming five days as well as prognoses for the next 12 hours. By means of an electronic information network, the "market" will then react towards the prognoses, and the latter will be relatively rapidly improved upon, thanks to a learning process both at the level of decentralised producers and consumers and at the level of the prognoses maker, i.e. the company responsible for the system (Münster, 2001). Thus, all these scattered units will be "free" to react upon the information concerning central regulation and production needs, since it will be accumulated at a centralised level.

*The conclusion is that the innovative organisations, which might establish new and cheaper regulation strategies, do not have the legislative right or the economic motivation to establish these new regulation strategies.*

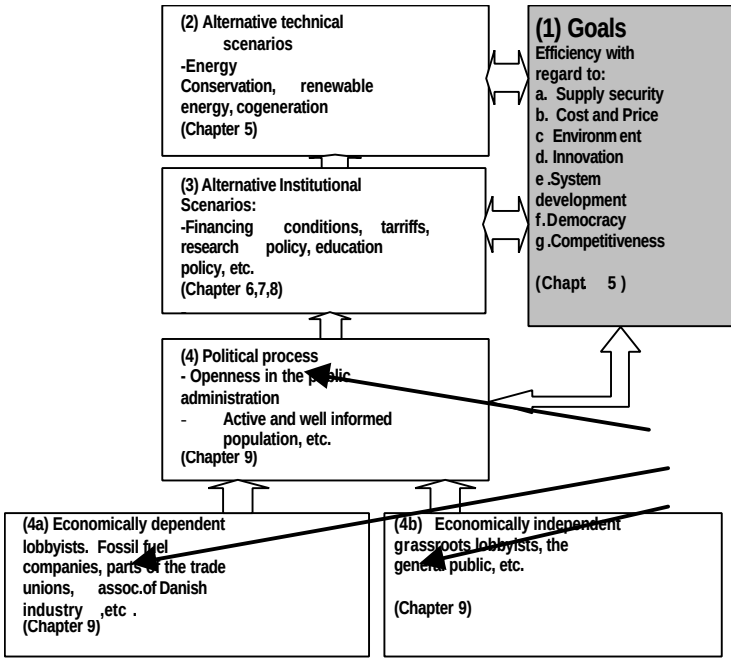
*Economic incitement is lacking since any electricity consumer pays the same price for regulation services and high-tension lines, independently of how extensively or not these services are used. Thus, if a group of consumers were able to decrease their use of high-tension lines by means of local regulation activities, they would have to pay double price, namely both for the regulation service provided by the company responsible for the system and for their local regulation investments. When this situation is combined with these companies' lack of economic motivation and cultural willingness to utilise the regulation potential of decentralised cogeneration plants, the development of new regulation possibilities is curbed.*

*Therefore, there is now a need for changes in the electricity law, making it economically possible to engage in local and regional regulation investments, thereby avoiding the expensive current regulation linked to increased high tension line capacity combined with large coal-fired power plants.*

*A system of regulation, where the need for regulation accumulated at a centralised level is diffused down to decentralised producers and consumers, should be elaborated in order to establish a competition enabling the utilisation of regulation facilities at a decentralised level.*

# 9. The Danish discussion and decision process behind the introduction of a "Political quota-/certificate price market" system

In this chapter we are dealing with the political process behind the development of a new institutional renewable energy governance framework in Denmark (Figure 1, boxes 4, 4a and 4b, as shown below).




## 9.1 Purpose and theoretical approach

The main question in this chapter is: *How should the political system be designed in order to be able to handle a situation with extensive "radical technological changes" within the energy area?*

In order to construct some answers to this question, we will analyse the Danish decision-making process behind the May 1999 approval of an Electricity law encompassing the introduction of a "political price-/amount market" system in Denmark.

The background that frames the question is the comparison made in the preceding chapters of two different institutional frameworks designed to further RE-electricity development and implementation. We call this institutional level the "first order"[39] level. Here we will examine the political process, which designs these institutional frameworks. We call this political level the "second order"[40] level. As already mentioned in Chapter 2, we are dealing with a paradigmatic technological change away from fossil fuel and uranium technologies to energy conservation- and RE technologies. This change is a "radical" technological change, as it is characterised not only by requiring technical changes, but also organisational changes. The last twenty years of "energy evolution" history in Denmark have shown that new actors and new organisations are needed as innovators, since they are free from economic as well as organisational binding to the fossil fuel and uranium technologies (Hvelplund, et al, 1995).

Generally speaking, in this situation of change, fossil fuel- and uranium-based actors do not have any comparative advantages. Due to their stranded costs both with regard to hardware- and software investments as well as their organisational culture, they are faced with a number of comparative disadvantages. Consequently, they are generally in a win/lose situation, where they are losing market shares, turnover, profits and jobs, in order to be successful with RE technological development. This state of affairs usually makes them resist systemic changes away from fossil fuel and uranium technologies. The common attitude is, "We are against change now, since we have excess capacity, but if politicians, nevertheless, require it, we will be the ones making it happen".

Concurrently, with their resistance to this "innovation risk", these companies are in a very strong political and financial position, which makes them able to heavily influence the political process (Hvelplund and Lund, 1994). In this situation of change, it is interesting to see to what extent the "second order" institutional framework, i.e. the central administration, the Parliament and surrounding democratic institutions, has the ability to support an innovative development furthering new green technologies and their organisational connections. Or is the situation such that the central administration and the

[39] By "first order" institutional framework we mean the institutions that are in direct contact with the implementation actors, such as the RE-electricity buyers, sellers, equipment producers, etc. The preceding analysis dealt with this "first order" institutional regulation system.

[40] By "second order" or "meta" institutional framework we mean the framework that designs the "first order" framework. This is usually the central administration, the Parliament, the institutions participating in the democratic process.

Parliament are subordinated to the fossil fuel and uranium technocratic structure and are designing policies that mainly support the organisations within this structure?

Methodologically, the present analysis will mainly rely upon written material from the Ministry and concrete reactions to suggestions emanating from various interest groups. The analysis is closely linked to the process behind the Parliamentarian approval of a change in the Danish RE-governance framework from a "Political price-/amount market" to a "Political quota-/certificate price market" system and structured in relatively close accordance with the methodology elaborated in Janis's "Groupthink". The approach is shown in Figure 15. [41]

[41] Based on a figure in Janis, Irving L., "Groupthink", Boston: Houghton Mifflin Company, 1982, p. 244.

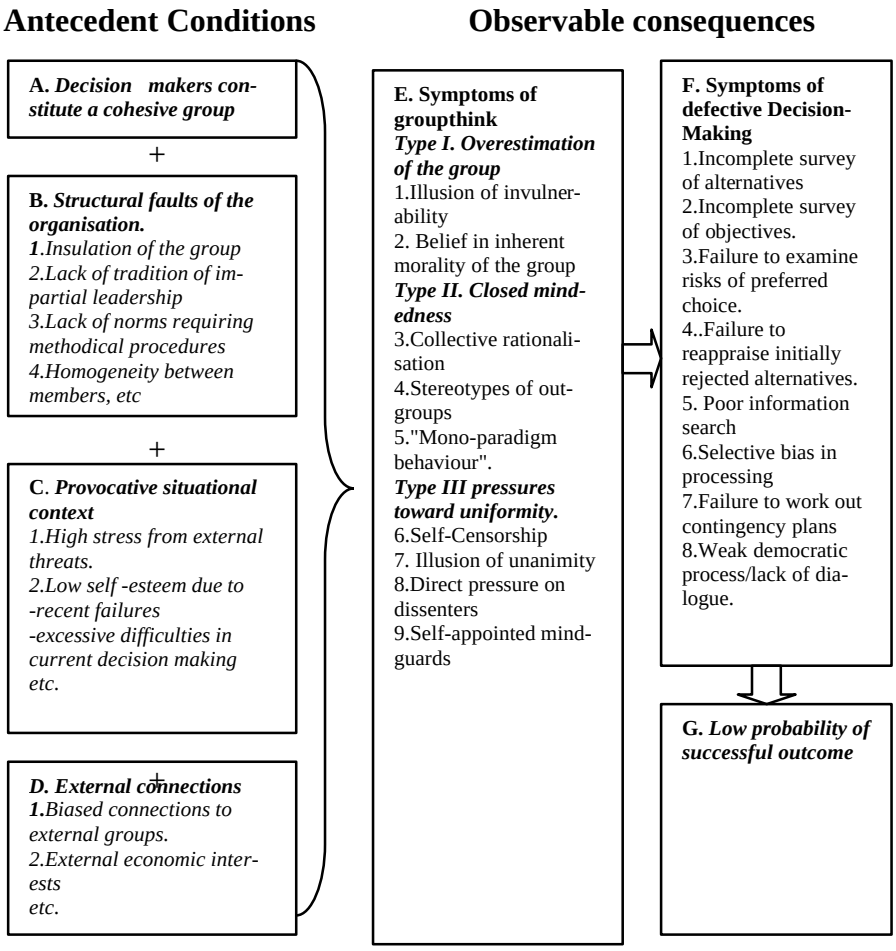



**Figure 15. Theoretical analysis of groupthink**
*Source*: Partially based on information from "Groupthink" (Janis, 1982).

**Comment**: *The structure of the approach is to look at both the symptoms of defective decision-making (Box F), and some potential causes in Boxes A-E.*

The main differences between the above Figure, and Janis's figure, are the following:

- We believe that it is necessary to *focus upon the links between the Ministry and various external lobby groups*. In relation to this, it is considered of particular importance to keep track of the connections between the Ministry and respectively, the lobbyist groups with or without economic dependency as far as the questions discussed are concerned. Con-

sequently, we have added Box *D, External connections*, to Janis's original figure, focusing on (1) potentially biased connections to external groups and (2) external economic interests. This addition is in keeping with our assumption about the paradigmatic technological change we have described above.

- Furthermore, in the same spirit, we have found it useful to examine the *Ministerial ability to avoid a "mono-paradigm" behaviour*, by which we mean the behaviour characterised by a single way of looking at the problem area. Therefore, under Box E, we have added Point 5, "Mono-paradigm behaviour". This point is important due to our understanding of the situation of change as a paradigmatic change, requiring technical as well as organisational changes on both the "first order" and "second order" institutional levels.
- Finally, we consider the *inclusion of "the public" necessary* in order to further any "radical technological change". "The public" does not have particular economic interests linked to any specific technology, and therefore can be regarded as economically independent. Consequently, "the public", by means of its "organisation", the Parliament, is the potential carrier of innovations. Hence, we have added Point 8 in "Weak democratic process/lack of dialogue", Box F, to Janis's original figure.

## *9.2. Symptom analysis with regard to the decision process*

The decision process can be divided into two phases, namely:

I. the discussion before the Parliamentary agreement regarding a new electricity law, on March 3rd, 1999 and
II. the implementation analysis and discussions from August 1999 to December 1999.

The two phases outlined above already point towards one of the basic flaws in the decision, which was that the main analysis came after the decision was made instead of before, and that this analysis was consequently limited to a discussion regarding how the law should be implemented and did not include a debate on whether the governance construction was feasible.

### *9.2.1. The discussion before the parliamentary agreement on March 3rd, 1999*

*A. The viewpoints and analysis of the Ministry of Energy and Environment.*

The "reform group" within the Ministry of Energy and Environment listed some central elements of a future electricity reform in a February 9th, 1998 paper entitled "Discussion Draft for an Energy Reform". In this paper, a number of problems linked to the Danish "Political price-/amount market"

model are described in a rather unspecified way. The "Political price-/amount market" system is described as:

- "old-fashioned and working against environmental as well as economic-efficiency goals, and
- inefficient because of differences in RE-electricity prices paid by various distribution companies, resulting in a process where wind turbines are not built on the best sites"(Energistyrelsens reformgruppe, 1998).

The recommendations in the above paper are rather unclear, although the system with RE-quotas and RE-Certificates is mentioned. Furthermore, it is recommended that the consumers pay for the RE public service payment directly, via the electricity price. This move is recommended in order to remove RE payment from public finances.

The first relatively clear proposal regarding the future electricity reform was published in August 1998 as a paper emanating from the same reform group. This paper contains a section called "The establishment of a *green quota market"*, where the proposed "Political quota-/certificate price market" system is briefly outlined, with the following characteristics:

- Consumers will be obliged to buy a certain RE quota,
- RE producers will get "Green Certificates", and
- a market for these "Green Certificates" will be established.

It is worthwhile to note a specific formulation in this working paper, namely: *"As the decentralised development with biomass and inland based wind turbines will typically be implemented by many, smaller agents, it will be appropriate to organise a market for green electricity"*(Energistyrelsens reformgruppe, 1998). This statement is telling since it exposes the assumption of a market with many suppliers. This 1998 “wishful-thinking” belief in a well-functioning market survived until the parliamentary decision of March 1999.

A few months after this decision, this trust in a well functioning market had disappeared from the "Report on the Danish green certificate market": *"The Danish Wind Turbine Owners Co-operative, a limited liability co-operative, and the power companies can be expected to significantly dominate the market during the first years. As electricity consumers are simultaneously obliged to purchase green certificates, it is possible for the dominant suppliers to take advantage of their market position to achieve monopoly profits"(Ministry of Energy, 1999).*

The discussion on the electricity reform intensified during the Autumn of 1998, when fragments of the arguments behind the reform came to public

knowledge. During a conference in September 1998[42], the Minister of Energy, Svend Auken, underlined that the "Green market" should ensure that "we reach our RE goals in an efficient way", and that a "Certificate market [should] provide better opportunities to sell the Danish RE-electricity on the international market". Another paper from the Ministry of Energy mentions, "*that in order to ensure a cost efficient RE-development, a market for green electricity"* should be established. In the same paper, the Ministry of Energy writes: *"A well-functioning green market implies many actors and market transparency"(Energystyrelsen, 2/12/1998).*

During December 1998 and January 1999, there was a rather active debate going on between some Parliamentarians, grassroots organisations and scientists, urging the Ministry of Environment and Energy to answer a number of questions. In an important two and a half pages note, a month before the parliamentary decision, the Energy Administration compares the "Political quota-/certificate price market" model with the "Political price-/amount market" model. The main drift of this note is a glorification of the "Political quota-/certificate price market" model with arguments such the following:

(a) "Both RE electricity producers and buyers can take advantage of the flexibility on a future market for electricity. Both producers and buyers of RE-electricity get incitements to pursue cost efficiency and to mutually adjust production and consumption".
(b) In a "Political quota-/certificate price market" model all the actors on the market are incited to strive for cost efficiency. Efficiency incentives are created in all the segments linked to the market for RE- electricity".
(c) If, in a "Political price-/amount market" model a price should be paid, which would secure a certain quantity of RE electricity, this price should be changed until it had the right level. Consequently, there would be insecurity regarding the price. In this model, the price insecurity is to a higher degree political than in the "Political quota-/certificate price market" model (Ministry of Energy and Environment, 29/1/1999). (The arguments are here directly translated, but perhaps unclear. Author's note.)
(d) "A "Political quota-/certificate price market" model only makes sense, if the price is not set centrally, but is determined on a market, between supply and demand."

It is very difficult to discuss the argument in this paper, as there is no background analysis indicating the assumptions behind its short statements. As

[42] Speech given at the IDA conference regarding the electricity reform, Sept. 7th, 1998.

far as (a) is concerned, it is very strenuous to decipher what is meant by the argument. What is, for instance, meant by ‘asking owners of a wind turbine to adapt its production to the consumption level’? A wind turbine produces, when there is wind, which entails that, technically, the adaptation has to be performed within the systems in which the wind turbines are embedded. What is meant by (b) then, when the "Political quota-/certificate price market" system, by means of the quota, weakens incitements on the crucial market for equipment? Concerning (c), it is difficult to understand why the insecurity regarding price in the "Feed in--" system is a problem, since it is possible, as it is currently done in the "Advanced feed in--" system in Germany, to secure a specific price for electricity from wind turbines built in 2001, and a new 1.5% lower kWh price for electricity from wind turbines built in 2002, etc. This provides price security for the investment linked to a given wind turbine. The argument linked to (d) is interesting, as the electricity law does state a centrally fixed minimum as well as a maximum price. Furthermore, the law allows for governmental interference on the market by means of a governmental purchase of certificates. Consequently, the author of the above note, so firmly arguing for the "Green Certificate--" model, should find the present law "meaningless".

The Ministry further discusses the problem of market power in a one-page note dated January 6th 1999[43]. In this note, there is no serious debate about the problem, but rather a discussion of how small RE producers’ entering the market could be secured. This is rather irrelevant, as small RE producers are already part of "The Danish Wind Turbine Owners’ Energy Co-operative”, the producers association, and will certainly continue to seek membership in the future. The power companies are other significant producers and are owned by 2-5 very large associations of buyers. But these problems are not at all discussed in the above note. Neither were they discussed anywhere else before the parliamentary decision was taken.

Before the Parliamentary decision of March 3rd 1999, the Ministry of Energy and Environment’s main avowed reasons for introducing the "Political quota-/certificate price market" system were:

a. to establish competition between RE producers
b. to participate in the establishment of a European market for Green energy.

This was combined with a series of arguments stating that the existing "Political price-/amount market" system had the following problems :

c. it gave excess subsidy to/profits for some wind turbine owners

[43] J.nr.6409-110, Miljø- og Energiministeriet. 67.. januar 1999

d. the tax funded RE price subsidy was increasing too heavily, due to the expansion of RE capacity. Therefore, there was a need to remove the public service payment to RE from the public finance account.

Arguments c. and d. were indeed relevant, and indicated a need to change the regulation framework. But they did not display a causation link to the introduction of a "Political quota-/certificate price market" regulation framework. These arguments could also have been used as the basis for the introduction of an advanced "Political price-/amount market" system.

*B. Viewpoints from other discussion participants before the Parliamentary decision in March 1999.*

Although a usually "green/red" party, the Danish Socialist People's Party, finally supported the "Political quota-/certificate price market" model, it is worth underlining that all the green energy organisations were opposed to the new model, and lobbied actively against it. Until the Parliamentary agreement of March 3rd that we described above, there was, although the time for democratic debate was rather limited, a widespread and articulate opposition.

The organisation for renewable energy (OVE) was very sceptical about the "Political quota-./certificate price market" model already back in the Autumn of 1998, when they decided to suggest the securing a minimum price, which would make it possible for small investors to invest in RE technologies in the future (OVE/SEK, undated). So OVE was open for a certificate system, but wanted price security for investors. Preben Maegård, the head of the "Peoples Centre for Renewable Energy", wrote a letter in January 1999 to the chairman of the energy committee in the Danish Parliament, where he argued against the "Political quota-/certificate price market" system and advocated a "Political price-/amount market" system (Nordvestjysk Folkecenter for Vedvarende Energi, 1999). I had already written an article in October 1998 pointing out that the certificate market would not function, and that it would remove the small innovative investors from the investor group (Hvelplund, 10/1998). In an article in "Ingeniøren", Niels I. Meyer, Professor at the Danish Technical University (DTU), also warned against the negative impacts of a "Political quota-/certificate price market" upon the small innovative investors (Meyer, 1998). On September 4th 1998, Ulrich Jochimsen and Jann Sørensen from the "Energy and Environment office" in Flensborg, the border region, wrote an article against the "Political quota-/certificate price market" system, pointing out that this system was only sup-

ported by the large utilities, such as PreussenElectra[44], and that this system would damage Danish RE development (Jochimsen and Sørensen, 1998). The German Chairman of EUROSOLAR, Herman Scheer, a member of the German Bundestag and the SPD´s[45] environment and energy spokesman, sent a letter to Svend Auken, the Danish Minister of Environment and Energy, where he argued against the introduction of a "Political quota-/certificate price market" system, and urged Auken to reconsider plans and to ensure that the "Political price-/amount market" model would remain an option at the EU level[46]. In a Conference in Copenhagen, organised by 11 European green organisations[47] on October 12th 1998, Herman Scheer argued for the continuation of a European "Political price-/amount market" governance model. He said, *"Even if Gerhard Schröder is a friend of PreussenElectra, he cannot do it. There are many of us who will not accept it [a change away from the "Feed in—" regulation], and his small majority will disappear"*[48]. As the new 2000 German RE law demonstrated, he was right.

On January 15th 1999, the Danish Association of Wind Turbine Manufacturers also warned against the introduction of a "Political quota-/certificate price market" system, arguing that the market would be too small to function successfully (Dagbladet Aktuelt, 15/1,1999).

A persistent supporter of the reform was, and still is, the Danish Association of Electricity companies, DEF, which, from mid-1998, already supported a "Green Certificate--" reform. See, for instance, (Christoffersen, 1998), using the Netherlands[49] "Green Certificate System-" as an example.

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[44] After fusion with VIAG, the name is E.O.N.

[45] The German Social Democratic Party.

[46] Letter dated from December 2nd 1998 from Hermann Scheer to Svend Auken. (In German and also translated into Danish).

[47] BundesverbandWindEnergie e.V., (BWE), Germany, EUROSOLAR, FördergesellschaftWindenergie, (FGW), Germany, Bundesverband Erneuerbare Energie e.V., (BEE), Bonn, EUROSUN-Intergroup for members of the European Parliament, The Association of Wind Turbine Owners, (PAWEX), The Netherlands, The Organisation for Renewable Energy in Denmark, (OVE), The Danish association of wind turbine owners, The Danish Ecological Council, and the Society for Green Technology, (IDA).

[48] "SPD afviser grønt elmarked" Information d. 13 October 1998.

[49] This example does not have much to do with the Danish reform, as the Netherlands' "Green Certificate system" has a politically set base RE-electricity price of around 5,5 EUR/C/kWh, plus a certificate payment amounting to about 2 EUR/C/kWh.

*Conclusion regarding the debate before the Parliamentary decision on March 3rd 1999.*

On the 3rd of March 1999, the Government and a vast majority in the Parliament agreed upon the new electricity reform[50]. This agreement contained a section on the establishment of a "Political quota-/certificate price market" governance system for RE. It was a part of the arrangement that, before the end of 1999, it should be decided how the trade should be organised and how price fluctuations could be avoided on the marketplace. Furthermore, it was *"assumed"* that, in 2003, well functioning market frames would be established.

The new electricity law was approved by the Parliament on May 28th 1999.
From all the notes from the Ministry of Environment and Energy, it obviously transpires that the administration had decided to support the "Political quota-/certificate pricemarket" model, and that they had had no intention of comparing this model with any alternative governance framework(s). All the notes represent "sales" arguments for the "Political quota-/certificate pricemarket" model, and there are no arguments to be found which might back other models.

Furthermore, there was no dialogue in the sense that it was - and still is not possible to get hold of any consistently worded case for the introduction of the "Political quota-/certificate price market" model. There was no background report from the Ministry of Environment and Energy analysing a "Political quota-/certificate price market" model in a coherent way. There were just notes on one, two, or maybe three pages with short "five line type" arguments supporting the "Political quota-/certificate price market" model without any serious and extensive comparison between alternatives.

So referring to our initial questions, we can conclude that, before approval in the Danish Parliament, there was no earnest discussion with regard to alternatives, there was no debate about the risks linked to the introduction of a "Political quota-/certificate price market" model, there was no far-reaching and coherent communication, and there was no systematic description of the theoretical considerations supporting the future reform.

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[50] Elreformen. Miljø- og energiministeriet 3. marts. 1999. Aftale mellem regeringen,Venstre, Det Konservative Folkeparti, Socialistisk Folkeparti og Kristeligt Folkeparti.

Thus the decision process displayed all the "symptoms" characteristic of "defective decision making", as they are described in "Groupthink"(Janis, 1982), the book we mentioned earlier on.

### *9.2.2 The implementation analysis and discussions from August 1999 to December 1999*

As mentioned above, the Parliament also requested further investigations before the final implementation of the law. Thus these analyses regarding (a) the technical organisation of a "Political quota-/green certificate price market" system, and (b) the establishment of a stable and well-functioning market were initiated. A consultancy firm, PriceWaterhouseCoopers (PWC) analysed mainly the organisation of the market, part (a), and the Ministry of Energy analysed part (b).

An advisory group of 28 members, representing the administration, energy companies and a number of social sciences practitioners[51] was established. This group held a series of meetings in September and October 1999.

The meetings were challenging because the administration took it for granted that the "Political quota-/certificate price market" system should be implemented following a parliamentary decision. I did maintain, as did other members of the group, that it was also the objective of the group to voice its opinion about the function of the market, and that, if we found challenging problems in the "Political quota-/certificate price market" model indicating that alternative governance models might be more suitable, we should report this to the public and to the Ministry. Naturally, the Parliament would then be able to change its decision, if the administration and the advisory group suggested new investigations of potential alternatives to be performed.

The advisory group thus submitted a number of comments along with the PWC September draft report. For instance, Jørn Mikkelsen from ELTRA, the company responsible for the transmission system in Jutland-Funen, wrote, "*We agree, that the transmission of certificates between countries is indispensable, if a "Political quota/certificate price market" model is to be considered meaningful on a longer term base- and therefore meaningful at all"(Mikkelsen, 1999).* This comment from an ELTRA representative is interesting, especially since Germany and France have introduced a sequel of the "Political price-/amount market" model, and since the European court has deemed the German "Political price-" model acceptable.

[51] A group that I was a member of.

DEF, The Danish association of Energy Companies (mainly electricity companies) found the draft report satisfactory, and emphasised the fact that the advisory group should not discuss the pros and cons of the "Political quota-/certificate price market" model, as this model had been "approved by the Parliament". The question then revolved around the implementation of the new law, and not around whether it should actually be carried through.

Søren Krohn, from the Danish association of wind turbine producers, was very critical towards the conclusions of the above-mentioned draft report, and underlined, that a "Political quota-/certificate price market" model could not work on an isolated Danish market. Moreover, he pointed out that the recommendations in the report, section 9.5.4., mainly supported the interests of the DEF. PWC, for instance, suggested that the wind turbines owned by power companies, and already paid up by electricity consumers, should also obtain "Green certificates" for their production. Furthermore, he expressed difficulties in understanding how a system, where a few electricity distribution companies bought Green certificates from their own two power companies, could be a sound basis for a well-functioning market (Krohn, 1999).

Confronted with this type of critique at a meeting with the advisory committee, PWC stated that the conclusion, on page 93 in the draft report, was copied word for word from a DEF paper[52], and was sent for comments, without any references, to the members of the advisory group. Additionally, it was made clear, that in the background research, PWC had mainly interviewed DEF members. This naturally resulted in a very tough discussion during the following meeting of the advisory group. On page 62 of the above draft report, PWC also declared that the risk of market dominance by the buyers-/distribution companies would probably be lower than the risk from the producer side. I countered this statement by mentioning that the buyers/distribution companies owned the largest RE electricity supplier, i.e. the power companies, and that they consequently were in an extremely good position as far as market power was concerned.

Marianne Bender, the chairperson of OVE, the Danish association for renewable energy, underlined in her critique (Annex 3 October meeting of the advisory group)[53], as others also did it, that it would be essential to replace

[52] The paper is published in (DEF Oct. 1999) J. nr. 413-02-01."Prisdannelsen på VE-bevismarkedet."

[53] Annex 3. Skriftlige kommentarer til PriceWaterhouseCoopers rapportudkast om VE-marked. Distributed at the meeting with the advisory group on September 21st 1998.

PWC with a impartial consultancy firm, without client interests[54]. In the same Annex, Flemming Tranæs, from the association of Danish Wind Turbine Owners, was very critical of the report, and found it unacceptable that the power companies should obtain certificates, as this would represent a double subsidy for these companies. Furthermore, he pointed out that it was not satisfactory that PWC had only interviewed members of DEF and the central administration. He mentioned that it looked as if DEF had written the report. Later, as mentioned above, it was admitted that DEF had written the final conclusion and recommendations on page 93 in the draft report.

The final PWC report was submitted in October 1998 and, amongst others, raised the following comments;
Søren Krohn from the association of wind turbine producers concluded that neither PWC nor the Energy administration were even close to having sufficiently analysed a future market for RE certificates. He also concluded that during the work in the advisory committee and upon examining PWC´s work, it had become increasingly doubtful whether the implementation of a RE-certificate market was a good idea at all. He regarded the "Political quota-/certificate price market" model as being the most complicated and inefficient, when comparing it with either a "Political price-/amount market" model or an auction type model like the one contemporarily practised in the U.K. He also found it unacceptable that power companies would be getting certificates for wind turbines that consumers had already paid via the electricity price. A main statement in his critique is to be found on page 14: *"The notorious waste caused by the fact, that the contemplated RE-certificate system in general has not at all been analysed from a societal point of view in order to find the cheapest way of implementing renewable energy, probably is quite considerable"(Krohn, 1999).*

Hans- Erik Kristoffersen from DEF[55] found the PWC report satisfactory, and furthermore commented on a short paper from the Energy administration, "Price formation on a RE certificate market". He did not believe that the problem with market power discussed in that paper would be serious: *"It does not seem plausible, that a single company could achieve so much market power, that the strategic game shown in the paper could be realised. On a long-term basis, new actors will enter the market. The establishment of a larger European market for certificates will also reduce the possibility of exploiting a potentially dominant position. Furthermore, competition*

[54] PWC does consultancy jobs for members of the DEF.
[55] Kommentarer til PWC rapport og Energistyrelsens udkast til notat om prisdannelsen på VE-bevismarkedet.

*authorities will keep an eye upon the development on the market" (Kristoffersen, 1999).*

DEF, which is the central organisation for the Danish Power and Electricity Distribution Companies, consequently did not believe in the problematic nature of the following dimension, i.e. the fact that large buyers' associations formed by the distribution companies would own the largest suppliers of certificates on the market, the two large power plant companies. It is worth remarking though, that DEF found the establishment of a European Certificate market essential for the well functioning of the internal market, a precondition that, with the present development in Germany, France and the European Union, does not seem to be under way.

Marianne Bender from the Danish Association for Renewable Energy (OVE) pointed out[56] that the coming "Political quota-/certificate price market" model was tailored for large RE suppliers, such as the current power companies, and the large buyers associations amongst the distribution companies. She also underlined that, with heavily fluctuating prices, small investors would not be able to survive periods of low prices, whereas large investors would have the capital background and/or governmental financial support enabling them to survive these periods. Thus, the system would imply concentration on the investor side. She, furthermore, mentioned that it had so far not been illustrated how a "Political quota-/certificate price market" system would entail increased competition, when compared with a "Political price-/amount market" system. She concluded by " *warning against the establishment of a "Green Certificate--" market, without it being sufficiently analysed and without having examined its consequences thoroughly".*

### *9.2.3 Conclusion regarding the symptoms of the discourse and decision process*

*A campaign without dialogue*

In the phase from mid 1998 to March 1999, when the decision was taken in Parliament to approve a new electricity law containing the implementation of a "Political quota-/certificate price market" system, the debate showed the following characteristics:

- There was no systematic analysis behind the introduction of a "Political quota-/certificate price market" system. The administration submitted several one to three-page papers, where the advantages of a "Political quota-/certificate price market" system were described. These notes dis-

[56] Kommentarer vedr.notat(udkast):"Prisdannelse på et marked for VE-beviser", 16 November 1999.

played no depth whatsoever in their analysis/description, and it still impossible to find any paper from the administration which explains in what way a "Political quota-/certificate price market" system could provide more competition and "value for the money", than a "Political price-/amount market" system.

- The administration's strategy was one of extensively *stolid and insensitive openness.* "Notes" and small papers were publicly accessible on the Internet. Furthermore, there were hearings, and people from the administration participated in several seminars up until the March decision. Meanwhile, the main problem was that obviously, the Ministry was entering the discussion with a "closed mind". In its notes regarding the future RE governance system, it just advocated the "Green Certificate--" model, not at all discussing whether it was/is a valid model or not. Obviously, there is no problem with "advocating" something if there is a consistent, systematic and open analysis behind the argument. In that case, it is possible to analyse the assumptions and enter a well-founded discussion. But when there are only "sales arguments" and no systematic analysis of what lies behind these arguments, fruitful dialogue becomes very difficult.

  The administration perhaps heard but certainly did not listen. Campaigning had replaced fruitful dialogue.

In the implementation phase after the March 1999 decision, the policy of openness continued, and a very broad advisory group representing many different interests and viewpoints worked during the Autumn of 1999. This period could be characterised by the following:

- The agenda was limited, as it was not accepted to discuss the basic decision underlying the introduction of a "Political quota-/certificate price market" system. The Parliament had decided in the new law that such a system should be introduced and the question then, was how to implement this system. The situation in the advisory group was very awkward, as the discussion often ended up with basic arguments against the introduction of this system. But these arguments were necessarily outside the agenda.
- Several basic arguments against the "Political quota-/cerficate price market" system were put forward by different groups and individuals, but there was no Ministerial reaction towards these arguments.
- PriceWaterhouseCoopers, the consultant firm, mainly interviewed members of a single interest group, namely the association of power producers and power distributors, DEF, which was very much in favour of the "Green Certificate--" system. This interest group also bought consul-

tancy services from PWC, so PWC was not an economically neutral and independent investigator.

*The general situation, then, was such that, before the parliamentary decision in March, no systematic analyses were performed. After the decision was made by the Parliament, it was no longer on the agenda to question it, as it had already been finalised.*

*Inability to reappraise initially rejected alternatives*
The analysis after the parliamentary approval in March 1999 was not able to include this reappraisal, despite suggestions from various members of the advisory group. One of the advisors, J. Birk Mortensen, a member of the Danish Economical Council, was very sceptical regarding the functioning of the certificate price market and suggested a system with a fixed certificate price, in order to avoid the monopoly problems inherent to the Certificate market (Mortensen, 1999).

It was clear from the discussion before the decision, that the main arguments for the introduction of a "Political quota-/certificate price market" system was:

- *To establish competition between RE producers*.
  This was emphasised at a seminar on September 7, 1998 by Svend Auken, the Minister of Energy, with statements such as: *"A well-functioning green market implies many actors and market transparency"*[57].
- *To participate in an open European RE-electricity market.*
  During the same seminar, the Minister of Energy stated: *"The Certificate market provides better opportunities to sell Danish RE-electricity on the international market"*. This was underpinned by arguments from the administration, painting a picture of development in Europe, where the EU commission and most other countries would also introduce a "Green Certificate--" system.

As Annex 2 (in Report on "Political quota-/cerficate price market") illustrates, it no longer is the assumption of the Ministry that the market will consist of many small RE-suppliers (Energistyrelsen, 1999). Furthermore, international development in 2000 and 2001 has shown, as described in Chapter 5, that the situation did not evolve, as it was assumed it would in the premises behind the Parliamentary decision of March 1999.

[57] Speech given by the Minister of Energy, Svend Auken, at an IDA conference regarding the electricity reform, Sept. 7th, 1998.

***It is worthwhile to emphasise that the above-mentioned two main assumptions behind the March 1999 decision have changed fundamentally since that decision***. So far, there have been no signs heralding a change of decision in accordance with the changed assumptions. The goal remains to implement the "Political quota-/certificate price market" system from around 2003.

The symptoms with regard to the decision making process are summarised in Table 5.

| | |
|---|---|
| *a. Discussion of alternatives* | *The administration never seemed to want to pursue a serious discussion of alternatives.* |
| *b. Survey of objectives/ goals* | *The original goal was to reach 20% RE-based electricity in 2000, but there were no objectives with regard to the organisational method of achieving this goal.* |
| *c. Analysis of risks* | *There was no analysis of the obvious risks linked to changing governance systems.* |
| *d. Ability to reappraise initially rejected alternatives.* | *Hardly any ability or willingness to change courses: neither as a response to changed premises, nor as a reaction to arguments emanating from individuals and groups sceptical about the "Political quota-/certificate price market" model.* |
| *e. Quality of information research* | *There was no systematic analysis of whether there would be many actors on the future market and whether it would be well functioning.* |
| *f. Bias in processing the information at hand* | *From mid 1998, there was a clear bias in favour of the "Political quota-/certificate price market" model.* |
| *g. Consciousness regarding paradigm* | *There has not been any systematic discussion concerning the theoretical paradigm behind the "Political quota-/certificate price market" model.* |
| *h. Contingency plans* | *No plans established, which means that the changed premises from 2000 and 2001 basically do not influence the reform.* |
| *h. Democratic process and quality of dialogue.* | *There was an exceptional openness and apparent willingness to enter into a "dialogue" with the public. In practice however, there was generally no reaction to opposing viewpoints raised by green organisations or individuals. Neither was there any systematic and documented rejection of the arguments. Thus, there was a state of willingness to hear and argue, but not to listen in an open-ended dialogue.* |

*Table 5. Symptoms of defective decision-making.*

That there was something the matter with the discourse is clear, with symptoms of disease at almost all levels. At the same time, a legitimate self-

defence argument from the viewpoint of the administration would be to emphasise that there was open access to information, with ministerial notes and answers to questions from Parliamentarians posted on the Internet, there was a number of publicly available consultancy reports, that Ministry employees participated in several seminars and conferences up to the final decision, etc. A vast majority in Parliament then agreed to approve the new electricity law, including the establishment of a "Political quota-/certificate price market" system. Furthermore, after the decision was taken, in the Autumn of 1999, a very broad advisory group was set up, representing power companies, the wind power industry, various energy companies, industry in general, grass-roots organisations, universities, etc. The administration could almost claim that it was a textbook example in administrative openness and democracy ending up with a massive approval in Parliament.

Despite time constraints and the use of economically dependent consultancy firms, the decision process certainly was open and democratic from late August 1998 and onwards. It is understandable why some would describe the process as close to the best praxis. That is one of the causes making it especially interesting to try to understand why the decision process, nevertheless, showed almost every sign of defective decision-making.

## *9.3 Symptoms of groupthink*

We have no evidence of- nor belief in the fact that the administration of the Ministry might have had any "illusion of invulnerability" or a "belief in the inherent morality of the group". Therefore, "overestimation of the group" probably was not a dominant characteristic of the group dealing with these questions in the Ministry[61].

Regarding "Closed-mindedness", type II in the groupthink symptoms, it seems clear that from August 1998, when the first proposal concerning a "Political quota-/certificate price market" system was published, ***there was no serious willingness in the Ministry of Energy and Environment to discuss alternatives to this model.*** This "Political quota-/certificate price market" model was considered necessary because of EU requirements,. It was also considered liberalistic and "modern" and the up and coming way of organising the RE-electricity governance framework not just in Denmark, but in all of Europe.

[61] Figure 11, type I "Groupthink symptom".

A classical symptom of groupthink is a "stereotyping of out-groups", which probably did develop within the Ministry. On several occasions it was rather obvious that people arguing against the "Political quota-/certificate price market" system and for the "Political price-/amount market" model were considered to be out of real contact with the market realities of today's world. This "Political price-/amount market" model was an outdated "non-alternative", which was promoted by groups that had not noticed the new developments in history, groups whose economic interest resided in a continuation of "too favourable" prices for RE-electricity. These groups, furthermore, had not yet noticed that the times when development could be driven by "twelve idealistic schoolteachers[58]" were gone, and that it was time for "market" and "big capital".

As far as "mono-paradigm" behaviour is concerned, the Ministry did not construct any fundamental analysis aimed at circumscribing their general paradigmatic stand. There was no systematic discussion of the premises behind the advocating of a "Political quota-/certificate price market" system. There never seemed to be any space for the little boy in "The Emperor's new clothes" to say that there was at best no more "liberalisation" or "free market" in the "Political quota-/certificate price market" model than in the "Political price-/amount market" model. In the publications from the Ministry, there is no analysis of the specific character of the technological change in question. Neither is there any comparative discussion of the various political effects entailed by the two governance frameworks. In general, there just seems to be a relatively "vague" model representation behind the decision, namely a sort of neo-classical understanding of economy. But even this understanding is never precisely described.

Regarding "in group" pressures towards uniformity, the question has not been analysed in any depth here. Outwardly, the Ministry always showed unanimity, which naturally does not prove that this perceived unanimity always existed. Maybe the relatively closed Ministerial "Electricity reform Group", which functioned from 1996 to 1998, had comprehensive discussions, including disagreements.

But we do know that, if this was the case, these discussions were never reflected in the public arena or amongst the Parliamentarians making the final decision in March 1999. The public and the Parliamentarians were faced with a non-choice, namely one institutional solution: the "Political quota-/certificate price market" model.

[58] See footnote 41.

## *9.4 Antecedent conditions influencing the decision making process*

We have not examined whether the "decision-maker" group in the Ministry constitutes a cohesive group with negative[59] "groupthink" tendencies. By means of reading the documents from the Ministry, some "structural faults" in the way the Ministry is working can be localised.

- No alternatives were systematically listed, and neither was pro ET contra systematically discussed. There is no background material from the Ministry with this type of systematic analysis. If this is the traditional way of analysing this type of important questions, it can be described as a "structural fault" within the Ministry.

- One cannot maintain that the Ministry insulated itself after the first ministerial paper describing the "Political quota-/certificate price market" model was "published" in August/September 1999. From this point of time, the Ministry displayed extensive openness of information, and participated in conferences and seminars dealing with the subject. But the Ministry was very closed before that time, and had established a rather insulated group, "the electricity reform group", which held meetings for invited experts and interest groups, but had no systematic public discussion of different RE-electricity governance models.

This would indicate, that the reference group communicating with the Ministry in this phase mainly belonged to the external group "economically dependent" lobbyists, mainly people from the established electricity sector.

-Regarding communication with external groups, the employment of the consultancy firm, PriceWaterhouseCoopers (PWC), as investigator of important questions regarding the implementation phase, can be regarded as a structural mistake[60], as PWC was not economically independent[61] of one important interest group participating in the discussion, namely the electricity companies. PWC collected information almost exclusively from electricity

[59] By this is meant tendencies, which further the mentioned sympthoms of defective decision making in Figure 11.
[60] We call it a "structural mistake", as it is linked to a part of the normal behaviour in the Ministry to employ consultancy firms without seriously analysing their degree of economic independence. I mentioned the problem on several occasions in the "advisory group" without any reaction from the Ministry of energy employees.
[61] These companies are on different occasions PWC customers.

sector actors[62]. In the Autumn of 1998 they had 24 meetings with electricity sector people, and one meeting with a representative for the wind turbine industry and one meeting with a representative for the association of Danish wind turbine owners. PWC had no meetings with the Danish Association for Renewable Energy, OVE. Regarding used literature, PWC mentions eight papers from the Danish electricity companies, one critical paper from the association of Danish wind turbine producers, and no further critical papers or articles, although several existed at that time. Due to its performance in practice with a very biased information collection process, the use of PWC proved to be very problematic. This was foreseeable, as PWC has their cultural and economical relationship to the electricity sector, which on different occasions, are PWC customers. The ones not listened to, for example, the organisation for renewable energy (OVE) have no intentions of -nor money to use PWC as consultant. In general, it is a structural fault to use a consultant who can be accused of not being economically independent with regard to the questions examined, and the actors interested in the outcome of the examination.

-It should here be underlined, that when Janis, in "Groupthink", talks about insulation of the decision group, he talks about a physical group linked to a specific organisation. In this case it would be the decision-makers in the Ministry of Environment and Energy. Here we talk about an insulation process with regard to an analytical paradigm, economical interests and viewpoints. The latter type of insulation process was very present in the period before mid 1998, where the decision in reality was taken. In this period there were close links to the viewpoints of the economically dependent, and weak connections with the economically independent lobbyists.

The discussion in Autumn 1998 and the Spring 1999 were to be considered as pseudo-democratic discussions, where the Ministry defended and advocated the model which they had decided upon before the democratic discussion started in the Autumn 1998, and where the Danish Association of Electricity companies, DEF, supported the Ministry all the way through this discussion.

***Regarding "lack of norms requiring methodological procedures", which secures that alternatives are systematically evaluated, it is evident that the performance of the Ministry, in this case, reveals a clear lack of such procedures.***

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[62] See annex 8 page 77 and annex 9 page 79 in ,"Organisering af VE-marked og handel med VE-beviser", PWC October 1999.

## *9.5 What made the decision process defective?*

As summarised in Table 5, the decision process after mid 1998 had almost all the symptoms of a defective decision process. This included no serious discussion of alternatives, no risk analysis nor contingency plans, poor and biased information research, weak ability in reappraising the decision, no open ended discussion with opponents and no ability nor willingness to discuss the theoretical paradigm behind the "Political quota-/certificate price market" model. But how could a decision process end up with so many symptoms of defectiveness?

One level of explanation could be that an almost final decision seems to have been made before mid 1998, when the public was shown the concrete plans for the establishment of a "Political quota-/certificate price market" model. So the period after mid 1998 was not the real decision process, but a process of selling a decision, which in reality was made before mid 1998.

This explanation makes sense, when trying to explain why the administration was very insensitive to arguments opposing the "Political quota-/certificate price market" model from the very beginning of the public debate in the Autumn of 1998.

So the decision process might be described as having three phases:

a. The real decision[63], before the public debate started in Autumn 1998, mainly made within the Ministry within the "Electricity reform group" in collaboration with representatives from the electricity sector.
b. A pseudo-decision process from Autumn 1998 to March 1999, when a majority in the Parliament agreed upon the "Political quota-/certificate price market" model.
c. An "implementation preparation" process, where a wide number of people from different organisations and with different interest were participating in discussions which were not supposed to deal with the question "whether to implement"-, but only the question "how to implement" a "Green Certificate-/quota market system.

In this case, the openness in phase (b) and (c) could be regarded as just a part of a legitimisation process designed to confirm the initial decision in phase (a). This type of conclusion also explains why the administration did not at

[63] It is somehow difficult to catch what a decision in fact is. Most likely, there has just developed a common understanding of the problem in the "Electricity reform group" representing a "de facto" decision

all react to the very extensive critique which was put forward, also during the Autumn 1999 implementation preparation phase. It is difficult to find any other explanation for this willingness to hear, but not to listen and react, nor enter any deep dialogue with the opponents.

It should be underlined that the Ministry was very efficient in the sense that it had the ability to sell the idea of the "Political quota-/certificate price market" model to the Parliamentarians. The only remaining "problem" seen from the viewpoint of the Ministry is that an unexpected reality has "come to town" destroying the premises of the original decision:

- The Ministry did not realise that the European development did not develop, as assumed in the premises behind the decision. Neither the EU Commission, the EU Court, Germany nor France behaved as expected in the premises, and the "Political quota-/certificate price market" model has not become the "one and only" RE-electricity governance model for Europe.
- The "Political price-/amount market" model has survived in Europe for at least 5-10 years, and might probably become an important inspiration for a coming European RE-electricity governance framework.
- This means that for at least five years from now on, and probably more years to come, there will be no common market for RE-electricity in EU. Consequently, the Danish model will be limited to Denmark and maybe the rest of Scandinavia. But Scandinavia is not really interesting for Denmark, as the quantity of new renewable energy sources is very limited, and competition with Scandinavian hydro power is impossible for the Danish wind turbines and biomass plants.
- The Ministry premise of many suppliers of RE-electricity does not seem to be realised, and a coming Certificate market will not have sufficient suppliers and buyers. Consequently it cannot be well functioning, as assumed before the decision in 1999.

Now there is a need for changing the original decision, but has the Ministry the ability to change this decision? In order to analyse this, it is worthwhile to shortly summarise the groupthink symptoms and antecedent conditions that might have caused the defective decision making discussed here. Table 6 summarises the main problems in the Ministry leading to the above symptoms of a defective decision making process.

| | |
|---|---|
| "Closed-mindedness" | **Yes.**<br>-No opposing viewpoints were included after the start of the public debate in August 1998.<br>- No discussion regarding the general paradigm linked to the introduction of a "Green Certificate-/quota market system".<br>- No systematic listing of the premise behind the introduction of a "Green Certificate--" model. |
| "Stereotyping out-groups" | **Probably yes**. It was a clear impression in an array of seminars and conferences that the opponents of this new "Certificate---" model were "out of date" promoting a "Feed in model", which could not be realised in EU-Europe. |
| "Mono-paradigm" behaviour. | **Yes**<br>-No ability to look thoroughly into their own premises, nor trying to include sociological and political viewpoints on the RE-electricity development process. |
| "Insulated decision group" | **Yes.** Until mid 1998, the electricity reform group held meetings and discussions outside the public sphere, though in relatively close contact with representatives for the well-established electricity sector. |
| External connections<br>1. Biased connections to external groups.<br>2. Lack of consciousness regarding economic interests of external groups. | **Yes**<br>- Biased connections in the phase before mid 1998.<br>- Biased connections via the use of PriceWaterhouseCoopers.<br>- No serious communication with opponents to the "Green Certificate--" model. |
| "Lack of norms requiring methodological procedures". | **Yes.** No paper from the Ministry showed a systematic comparison of alternative RE-electricity governance frameworks. |

*Table 6. Summary regarding Symptoms of Groupthink and antecedent conditions.*

It is naturally worthwhile to pose the question: Why did the Ministry act in the above way. Was it because of bad organisation, or was it a sort of

"structural manipulation". Was it a way of taking the "risk out of democracy"[64]? The Ministry was very successful regarding selling "their own" governance framework to the Parliament. This was done by the "Ministerial system", which, on purpose or not in tune with reality, took the risk out of a democracy which indeed was risky, due to the extensive openness of information and willingness to engage in public discussions. The Ministry itself had created a considerable "democratic risk" by supporting openness and some participation. In reality, it also dismantled this risk by acting as follows:

Firstly the decision probably was, in one way or another, made within the Ministry before the public debate started in August 1998.

Secondly this debate was not supplied with any systematic material making it possible to discuss alternative governance systems. So there was only one institutional solution to choose from.

Thirdly, without any developed alternatives, the decision period from September 1998 until around February 1999 was much too short, when dealing with such complicated questions.

A bit harshly, one could say, the Ministry was extremely efficient in making a bad decision, and doing it against the opposition of all the green groups, the wind turbine industry, and the association of Wind Turbine owners in an environment with a high level of openness and public participation. Furthermore, the taken decision favoured the traditional electricity sector, which got exactly the governance model they wanted.

## *9.6 Conclusion*

The initial question in this chapter was: "How should the political system be designed in order to be able to handle "radical technological changes". The described decision process has some good elements linked to a high level of willingness and tradition for openness of information and public participation in seminars, conferences, etc. The paradox, though, is that despite this high level of "democracy" the economically independent lobbyists were totally outdone in this "first half" of a not yet ended battle regarding the Danish and EU governance framework for RE-electricity. This "first half" of defeat for the economically independent lobbyists (energy grassroots groups)

[64] See "Taking the risk out of democracy" Alex Carey 1995. Illini Books edition, 1997.

represents almost a tradition, and has occurred on several occasions in the last 25 years of Danish energy history. This tradition of losing the "first half" probably is caused by a longer distance from the administration to these groups, than from the administration to the economically dependent lobbyists, the electricity companies, which often enter the decision process at an early stage. The "second half" will probably be performed in the next couple of years until around 2004, where the "Green Certificate -/quota market" model will move from ideology to reality. In this period, it is very valuable that the Ministry has a tradition for openness of information.

Nevertheless, it is a rather costly experience to start up with a non-functioning model, and it is worthwhile to try to learn from the experiences within this decision process.

How should the decision process have been designed?
We cannot give an exhaustive answer here, but only convey some suggestions, based upon the (some would say naive[65]) assumption, that the Ministry wants an improved and more democratic decision process.

1. The decision should never be made in closed Ministerial "inside groups" communicating mainly with the electricity companies.
2. A procedure should be established where alternatives are put forward and pro ET contra thoroughly discussed.

This discussion should be open and encompass viewpoints from a broad spectrum of interest groups. The Ministry should allocate funds to grassroots groups in order to enable them to buy independent consultancy assistance. This should be in order to solve the big problem that the electricity organisation has full time people employed on the subject, paid by the electricity consumers, whereas the grassroots groups often have limited time and financial capacity.

3. Consultancy firms employed by the Ministry should always be economically independent of the large actors within the energy scene. If this is

[65] It naturally might be a Ministerial tactic to act as in this case, in order to get the decision passed in the Parliament without problems from the green organisations. The only problem is that reality "comes to town" and, in this case, with a totally different appearance than the premises behind the decision. The administration then sees huge problems linked to the difference between reality and the governance framework being implemented.

not possible, it should be secured that "counter expertise" is employed in order to supply "second opinions".

4. In general, answers from the Ministry on questions from, for instance, members of the Parliament, should have a much higher quality than in this case. Sufficient resources and a system to secure specific quality demands that ministerial answers have to be developed. This is probably a resource question. If it is a resource question, it should be kept in mind that this type of decisions could have economic consequences amounting to billions of ECU[66].

[66] In the year 2000, the export of Danish wind-turbines amounted to more than 1 billion ECU, and the production to the home market constituted more than 0.5 Billion ECU. So gambling with this industry might show up to be a very costly business.

# *10. Conclusion/executive summary*

This publication includes, as described in Chapter 1, Figure 1, an analysis regarding which RE-electricity governance framework should be chosen on a global basis, both in Europe and in Denmark, and how the political system should be designed in order to handle technological change that encounters strong resistance from established energy companies on the market.

We thus analyse both the RE-electricity institutional framework ("first order" institutional framework), and the political system that designs and governs this framework ("second order" institutional framework). This 'double purpose' is motivated by the current situation of change, which is characterised by a crucial shift away from techno-organisational structures linked to fossil fuels and uranium, to new and relatively weak (politically and financially speaking) techno-organisations linked to energy conservation and the use of RE resources. This change often implies a decrease in the market share of financially and politically well established fossil fuel based companies. A fact that often results in a win/lose situation (seen from the viewpoint of these companies) is that, compared to the previous situation, they mostly do not possess any competitive comparative advantages when it comes to the development and implementation of the new green energy technologies. In many cases, in fact, they are even disadvantaged, due to their stranded hardware and software costs. Therefore, developing and implementing new technologies within such companies mostly has to compete with the short-term marginal costs of fossil fuel techniques.

This condition has been enforced, especially since these companies have, in recent years, and especially in Europe, consistently shown excess capacity. In the current situation, the Parliament has an important role to play, as the institution supporting the innovation and implementation of the new green technologies that are considered 'innovation risks' by fossil fuel and uranium based companies. The Parliament is therefore tested in the sense that it will be revealed whether the Government is able to act independently of large and influential economic-, political- and ideological pressure groups, which are often represented by the large fossil fuel and uranium based companies.[67] Is the Government, in this current situation of change, sufficiently independent from vested interests to be able to support the innovation, de-

[67] The new American Bush Government is an example of a government that does not have the economical independence needed to further a technological innovation process on the energy scene.

velopment and implementation of the new energy conservation and RE technologies? This undoubtedly is one of the most important contemporary questions. Recent developments under the new American Presidency have very clearly shown that this type of independence does not presently exist in the USA._Obviously, neither the EU nor Denmark can boast a clear-cut independent situation, but at least the balance of power in the EU and Denmark, between economically dependent and independent lobbyists, does not seem to systematically favour only the vested interests of fossil fuel and uranium consortiums.

## *10.1 Comparison of two RE-electricity governance frameworks ("first order" institutions)*

Two main public regulation frameworks for RE were examined:

***- The "Political price-/amount market"*** model, with politically decided prices on RE electricity, and with the produced quantity of RE determined by the market: This model has been used with great success in Denmark, Germany and Spain, where around 80% of the EU wind power has been implemented so far. Since the 1999 Danish electricity law, Denmark has left this model, but in 2001 the French Parliament decided to introduce a "Political price-/amount market" model for France. There are a number of different "Political price-/amount market" model versions, but *the one analysed in detail here is the new German, advanced "Political price-/amount market" model*, with a price differentiation for RE electricity according to the local RE resource base.

***- The "Political quota-/certificate price market"*** model**,** with politically decided quantities of RE (quotas) and prices of certificates are defined on a certificate market. A version of this model has so far been used in the Netherlands for a couple of years. There are also various certificate model versions. *The one we have extensively analysed here was approved by the Danish Parliament in the spring of 1999, and will probably be implemented around 2003.*

***So the basic comparison in this publication is between the new German advanced "Political price-/amount market" model, and the new Danish "Political quota-/certificate price market" model.***

***The basic aim*** of this comparison has been to find out which model yields the best goal performance with regard to RE price and costs, technological innovation, and democracy.
The analytical approach in this publication is motivated by an understanding of the problems related to RE implementation, an understanding which emphasises that there are *four special characteristics* which should be taken into consideration when establishing a framework for the implementation of RE technologies.

*Firstly,* it is important to be aware that RE technologies differ from fossil fuel technologies with regard to their resource base. Fossil fuel technologies such as coal-fired power plants can basically buy coal at the same world market price in all of Europe. The economy of coal-fired power plants is, therefore, mainly dependent upon the management efficiency of these plants. RE technologies such as wind-, biomass -, wave- and solar energy have a resource base that varies from place to place. Production using these technologies is thus dependent upon both management efficiency and the local resource base. There is no world market where one can buy wind energy and then "burn it" where one wants to. This contrast between fossil fuel- and RE technologies makes a great difference in the demands one should place upon the public regulation frameworks.

*Secondly,* RE technologies such as wind turbines, photovoltaics, and wave power systems are, due to the avoidance of commercial fuels, characterised by around 80% of their total life-time costs built into the initial investment costs. They can be considered as a sort of energy automaton. This feature should be seen in relation to fossil fuel power plants, which usually have only around 40- 50% of costs linked to the initial investment, the rest of the costs being labour and fuel costs. This characteristic of RE technologies results in a specific market behaviour, as almost all costs, once the initial investment has been made, can be regarded as "stranded costs". Investing in RE technologies, therefore, is an even more risky activity than investing in fossil fuel technologies. This has many implications for market development, especially with regard to the development of market power institutions, such as mergers and strategic alliances between power producers as well as power distributors, which infiltrate (capture) public regulation authorities and politicians by heavy lobbying activities and 'buy' public opinion by means of propaganda in the media, and by sponsoring research projects.

*Thirdly,* RE technologies are characterised by being linked to the sites where the RE source is located. In the case of wind energy, the need to use inland sites implies that wind turbines often have to be built in populated areas.

This factor often stimulates local resistance, due to visual and noise inconvenience from the wind turbines. One of the best ways to counteract this effect is to provide compensation to wind turbine neighbours by making it a legal obligation that they should have the right to a certain amount of shares in the wind turbine.

*Fourthly,* RE-technologies are newcomers having minor market shares, and meeting resistance strategies from established fossil fuel and uranium techno/organisations.

As a consequence of the above perspective on the problem, our investigation *began with* a short description of the general methodology and theoretical framework (Chapter 1 and 2). Then the two RE governance models were described in combination with an illumination of some ideological delusions in the discourse (Chapter 3 and 4). In Chapter 5 we analysed the EU state of affairs with regard to RE regulation. Then we went on to investigating the *adaptability of the two models* to various RE resource bases (Chapters 6 and 7). In Chapter 8 we discussed the need for a new renewable energy regulation infrastructure. Finally we analysed the decision process behind the introduction of a Danish "Political quota-/certificate price market" regulation system (Chapter 9).

**Which type of model introduces the best type of competition?**
First of all, it is important to point out that we cannot back the assertion of advocates of the “Political quota-/certificate price market" models, who often claim that the latter are more “free market” than the "Political price-/amount market" models. In the "Political quota-/certificate price market" model, politicians determine the RE quantity (quota), and the price is (partly)[68] defined on the market. In the "Political price-/amount market" model, politicians determine the price, and the quantity is fixed on a market. Which model is ‘most market oriented’ is thus impossible to derive from abstract discussions.

After taking a closer look at market reality with the analysis in Chapter 7, it was concluded that:

- the “Political quota-/certificate price market" model ends up introducing price competition (between energy automatons) on a dwindling market, and abolishing market competition on an expanding market for energy equip-

[68] In Denmark the politicians define a minimum and a maximum price for RE certificates.

ment. This is due to the fact that RE technologies are often energy automatons, with around 80% of total costs built into the initial investment. Once windmills have been erected on their final site, it is impossible to cut down on their costs. The only stage during which the costs of wind turbines can be compressed is in the factories where the energy automatons are produced. But in the "Political quota-/certificate price market" model this market for equipment is weakened because the politically determined quotas make it impossible for the wind turbine branch to increase sales by lowering wind turbine production prices.

- the “advanced “Political price-/amount market” model would increase competition on the expanding market for equipment, and is, therefore, especially well suited to a period of transition to RE technologies, which can be considered as energy automatons.

**Conclusion 1.** The "Political price-/amount market" model (2000 German type) represents more market competition than the "Political quota-/certificate price market" model (1999 Danish type) since it establishes increased competition on the market for equipment, in this case *“energy automatons”*.

The "Political quota-/certificate price market" model ends up introducing a rather pointless price competition between *energy automatons.* It is rather pointless because a competitive system, which, in theory, can decrease costs in fossil fuel based systems by firing people in rationalisation processes, is introduced between automatons that cannot be rationalised, since there is virtually no one to fire once the automatons have been installed on the production site.

Thus, with the design of this "Political quota-/certificate price market" price competition system, the regulators are in fact fighting yesterday’s war.

**Which type of competition will develop on a "Political quota-/certificate price market"?**

It is interesting to observe that, so far, there has been no analysis of this question in the Danish decision process leading up to the approval of the new Danish electricity law in 1999. Instead of analysing potential market outcomes, given the specific nature of this market, the main analytical efforts have been concentrated on the analysis of a number of bureaucratic technicalities linked to the “advent” of a market for Green Certificates. Questions have included: how can we keep track of the certificates? For how long

should the buyer be able to store a certificate?, etc. These *are* important questions once it has been decided to implement a ”Political quota-/certificate price market" system. But before this decision is taken, it is crucial to analyse potential developments on this type of market. This was done neither *before* the decision of proposing a “Political quota-/certificate price market" system was taken, nor *after*.

The analysis in this publication leads to the following conclusion regarding potential developments on a "Political quota-/certificate price market".

Prices on the future Danish “double market”, consisting of a fluctuating “Green certificate-/ Quota market” combined with a fluctuating electricity market, at present, the Nordpool market, will oscillate between 2 to 10 EUR/C/kWh. This makes it very difficult for small independent co-operative investors to take part in the game, as they cannot borrow money for the initial wind turbine investment when income prospects are so insecure. Larger institutional investors and power companies on the other hand would have the possibility to continue investing due to their much stronger capital base.

Furthermore. the number of actors on the market will be limited to a few (2-5) large groups of buyers, mainly associations of electricity distribution companies. The access to the supply side will be limited to the large power companies, along with an association of wind turbine owners and perhaps a couple of newcomers (which will be very small seen in relation to the two aforementioned). Thus, in reality, the market will consist of 2-5 buyers and 2-3 sellers.

Additionally, the 2-5 buyers (the distribution companies) own the power utilities. What is thus obtained is a “market” with an oligopolistic structure on both the sellers’ and the buyers’ sides, moreover with close ownership links between one big producer, the power companies, and the buyer oligopolies.

The technological structure, with 80% of the costs as sunk-/stranded costs and short-term marginal costs that are close to zero, leads to a market that can be manipulated rather easily. Wind turbine owners display an almost vertical supply curve, meaning that they will continue selling electricity even at a very low market price. So if the oligopolistic buyers group agrees to buy less during a certain period, the prices of certificates will sink to the bottom level of 1,34 EUR/C/kWh. And if the owners of independent/co-operative wind turbines cannot survive this low price for a while, they will have to sell their turbines at an absurdly low price. The same buyers group could also

agree to build excess wind turbine capacity for a period of time with the help of their power plants, a move that could also drag the “Certificate” price down to ground level.

**Conclusion 2. Type of competition on a Danish "Political quota-/certificate price market"**

a. Due to the cost structure of RE technologies, with more than 80% of total costs as initial costs, the RE electricity supply curve is almost vertical on a short-term basis. With a quota politically set at between 5-10% of the installed wind power capacity, the potential 20-30% yearly fluctuation of annual wind resources will often completely annul the effects of the politically set quota. Consequently, the Certificate price might oscillate between 1.34 EUR/C/kWh and 3,6 EUR/C/kWh, simply as a function of yearly fluctuating wind resources.

b. Moreover this Certificate price oscillation is superimposed on a heavily fluctuating ”base electricity price” on the Nordpool- and Leipzig spot markets for electricity. It is thus very likely that the conjunction of these variations will affect the prices of RE-electricity, which might then range between an average price of.2,6 EUR/C/kWh one year and an average price of just above 6 EUR/C/kWh the next.

c. The combination of an almost vertical RE supply curve, a market with very few suppliers, and ownership relations between large buyers and large power company RE suppliers makes the market price very sensitive to manipulation by the largest market agents.

d. Due to heavily fluctuating prices and the constant danger of price manipulation, small, innovative and independent (from fossil fuel technologies) investors will no longer invest in wind turbines.

e. Due to fewer investors, competition between investors will decrease, and the investor profit increase, with higher RE prices as the result.

f. Due to the pullout of small innovative investors, the local and regional innovative process linked to RE will suffer.

g. Due to lack of economical and organisational incitements amongst the remaining investors dominated by organisations linked to fossil fuel based power systems, these investors will demand a relatively high investor profit, when investing in RE technologies.

h. As a result of a-h, the political goodwill linked to wind turbines might decrease, and politically determined quotas might become very small. Consequently, it will be increasingly difficult to reach the CO2 goals.

**How do the regulation models cope with natural resources varying from location to location?**

The costs of producing wind power vary from around 3 EUR/C/kWh on a very good coastal site, in Ireland, for instance, to around 7 EUR/C/kWh on an inland site in central Europe.

The EU policy regarding RE displays a consciousness of the necessity to not only use very good coastal sites, but also good inland sites in Central Europe.

The regulation situation consequently differs from the situation with fossil fuel technologies, where the resource base, such as coal, oil or gas, has a world market price, and can be bought everywhere in Europe at the same price plus transportation costs.

So changing from fossil fuel technologies to RE technologies also spells a shift from a situation with a uniform resource base to a situation with resources varying from location to location. This change has important implications for the design of a feasible public regulation framework.

The main implication is that once resources of *differing quality have to be used*, it is necessary to establish a public regulation system, which promotes the efficient use of a resource in a given location. The regulation should encourage what we define here as “site efficiency”, by which we mean the cost efficient use of a given site. At the same time, the regulation system should foster a motivation to seek the best sites within the areas that, according to political demands, should also be used for wind power production.

The comparison between the German, advanced "Political price-/amount market" model and the Danish “Political quota-/certificate price market" model leads our analysis to the following conclusions.

The main problem of *the Danish "Political quota-/certificate price market" system* is that it is a “mono-price” model. We thereby mean that there will be only one certificate price on the market for all wind turbines. Thus, a wind turbine on a very good coastal site will get the same payment as a wind turbine on an inland site. And if politicians find it necessary to not only exploit the good coastal sites, they will have to guarantee a “Green Certificate” payment, which provides a sufficient investment incitement for inland wind turbine investors. The coastal wind turbine owners will benefit from this system, and obtain very high profits per kWh. The painful consequences of this type of “mono-price” system might be acceptable in a small country like Denmark, with many coastal sites and relatively few inland sites. But it would prove very expensive, if extended to the whole EU, where the very good coastal sites of Ireland would get the same payment per kWh as the not as good inland sites of central Europe.

In our ‘calculation case-study’, we have a model Union with the following distribution of wind sites: 15% in wind class 0, 30% in wind class 1, 25% in wind class 2 and 30% in wind class 3. In a model Union with this type of wind resource distribution, the additional profit (on top of production costs) needed to impel investments will be 80%, which is simply due to the fact that one has to pay inland prices for coastal sites.

The German, advanced "Political price-/amount market" model is characterised by its supporting a process of generating “site efficiency”, with a price formula securing price differentiation between wind sites. A wind turbine on a very good wind site will get 9.54 EUR/C/kWh during the first five years and only 6,48 EUR/C/kWh for the rest of its production lifetime. A wind turbine on an inland site will get the high price for a period of 20 years. Using this methodology of price differentiation, it becomes possible to avoid paying the “inland price” for wind turbines placed on coastal sites. Thus, in the above model Union, this public regulation strategy only requires a **28%** profit on top of production costs to stimulate investments.

**Conclusion 3. Ability to deal with a varying natural resource base**
The Danish "Political quota-/certificate price market" model is a “mono-price” model, which guarantees the same price for both certificates from very good coastal sites and less favourable inland sites.

The German, advanced "Political price-/amount market" system is a “multi-price” model, which allows for price differentiation between very good coastal sites, good coastal sites and inland wind sites with less wind resources. The consequences of this difference are that:

a. The advanced "Political price-/amount market" system can support a much cheaper given wind power development than the "Political quota-/certificate price market" system can.
b. The cost pressure on equipment producers will be higher in the advanced "Political price-/amount market" system than in the "Political quota-/certificate price market" system. This is because it prevents excess profits for wind turbines on coastal sites, profits that would make the producers less cost sensitive. This characteristic is further enhanced by the fact that there is no quota regulation in the “advanced feed in” system, which means that producers can sell more if they are able to produce more cheaply in this system.
c. As the advanced "Political price-/amount market" system (2000 German model) produces cheaper RE electricity than the "Political quota-/certificate price market" system (1999 Danish model), the political goodwill towards RE will be easier to sustain when using the advanced "Political price-/amount market" regulation framework.

***How do the two models deal with RE technological development and cost reductions?***

The "political quota-/certificate price market" model has to state RE quotas several years ahead. In the Danish case, the Ministry of Environment and Energy has mentioned 6-8 years as a necessary period in order to establish sufficient investor security. So the quota today should be able to secure investments with today's RE productivity, which also means, that the price 6-8 years from now should be high enough to secure a pay back of the investment costs linked to today's RE productivity level. But within 6-8 years the cost pr kWh of a given new RE technology can decrease considerably. In the last 6-8 years the cost of wind power per kWh has decreased by at least 25%. A governance "Political quota-/certificate price market" system is not able to lower the price paid due to RE productivity improvements, as this would destroy the economy of the firstcomer technology version.

As a consequence of the above arguments it also is very difficult in this governance system to establish quotas resulting in very high prices for the first year groups of a given RE technologies. If this is done, the society also will have to pay this very high introduction price for the ensuing year groups, even when they have much lower production costs.

Conclusion 4.
The "Political quota-/certificate price market" system is not able to lower the price in parallel with cost reductions of RE year groups. This results in a too high payment for RE electricity resulting in political resistance against this technology.

Furthermore, it hampers the possibility of establishing a market situation with very high prices at the initial stages of the RE technology introduction at a market. This impedes the introduction of new RE technologies.

Finally it should be emphasised that when combining Conclusion 3 with Conclusion 2, where it is stated that small independent investors tend to withdraw from the market in the "Political quota-/certificate price market" model case, all the points in Conclusion 3 are then even more strongly buttressed.

Figure 16 illustrates the problems linked to the "Political quota-/certificate price market" model.

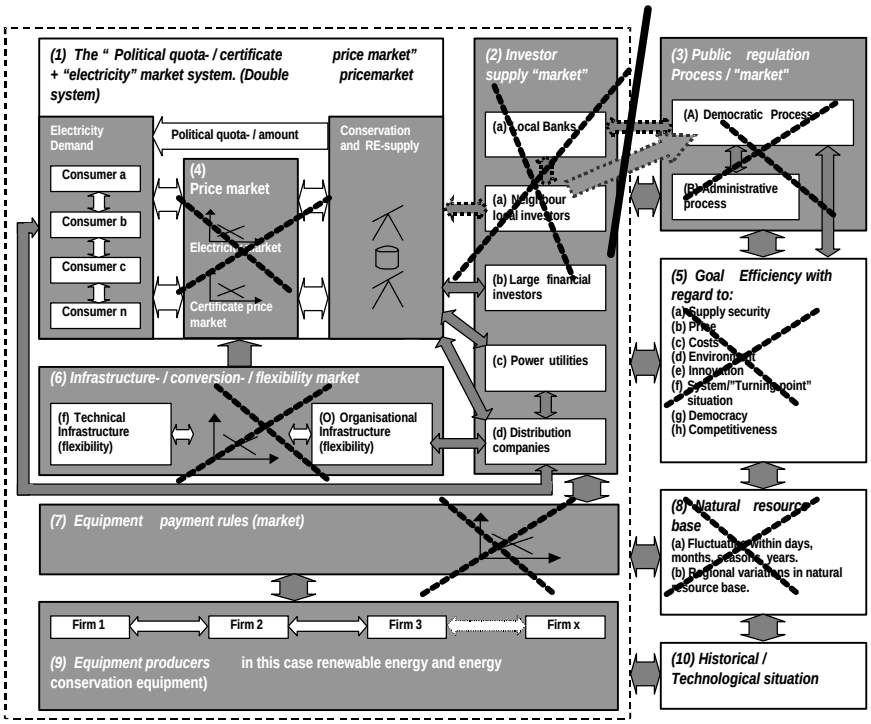


**Figure 16. The decomposition of competition in the "political quota-/certificate price market" model.**

**Comments**:
The investor market (box 2) is weakened due to the decrease in independent investors.
The price market (box 4) is weakened due to an insufficient number of actors and due to lack of independence between agents at the market.
The equipment market is weakened due to the quota system making it un-economical to lower product prices for the producers as a group.
The regulation and flexibility market does not function, due to the present monopoly situation.
The political acceptance of RE (box 3) is weakened due to decrease in the number of neighbour and local investors.
Table 7 concentrates the above conclusion in a comparison of the two governance models.

| | "Political price-amount market " model | "Political quota-/certificate price market" model |
|---|---|---|
| (a) Is it a market model? | ***The price is political and the amount is decided upon a market*** | ***The amount is political and the price is partly decided upon a market, partly political set.*** |
| (b) Is it furthering competition between equipment producers? | ***Yes. The equipment producers can expand sales and profit by lowering production costs*** | ***No. The equipment producers are facing quota. They can mainly expand profit by increasing sales prices.*** |
| (c) Can it price differentiate between good and bad wind sites? | ***Yes, as it is done in the German model.*** | ***No. In this "mono price" model, the same price is paid independently of site resource base*** |
| (d) Can it price differentiate price in time for a given RE plant. | ***Yes, as it is done in the German model.*** | ***No. The same price has to be paid during the whole lifetime of a RE plant.*** |
| (e) Can it lower the price in parallel with RE productivity improvements? | ***Yes, as it is done in the German model.*** | ***No. The quota has to be set for a 6-8 years period, and latecomer plants are paid the same as firstcomer plants.*** |
| (f) Does it support neighbour and local investors? | ***Yes. The foreseeable prices make it possible to get loans from the local banks.*** | ***No. The fluctuating and manipulated prices make it too difficult to get loans from the local banks.*** |
| (g) Does it put a cost pressure upon equipment producers? | ***Yes. Almost the same cost pressure is on investors at good wind sites, as investors at inland wind sites.*** | ***In general, no. The mono price system gives high profits to owners of good coastal sites. This weakens the cost pressure upon plant producers.*** |
| (h) Does it support independent investor groups? | ***Due to the above (f), yes.*** | ***Due to the above (f), no.*** |

*Table 7. A comparison of the "political price-/amount market" model with the "political quota-/certificate price market" model.*

## *10.2 The discourse behind the design of the Danish RE-electricity reform. ("second order institutions")*

RE technologies are still "newcomer" technologies entering a hostile environment/market, where the established fossil fuel and uranium techno-organisations will lose market shares if the RE technologies are successful. When designing the governance framework, it is important to bear this development condition in mind and ensure that organisations independent from the fossil fuel- and uranium technologies be given an important role to play in the RE development and implementation process.

The controversy over the introduction of a "Political quota-/certificate price market" system in Denmark was characterised by the following:

a. The decision process *was defective* as there was no serious analysis of alternatives, no risk analysis or contingency plans, a poor and biased information research, a weak reappraisal of the decision, no open-ended debates with opponents, no thorough discussion of the theoretical paradigm behind the "Political quota-/certificate price market" model.

b. This defective decision process probably *evolved during three phases:*
*Phase 1,* during which the decision was apparently taken in a Ministerial group called "the electricity reform group" before mid 1998 and away from any open public debate.

*Phase 2,* from September 1998 to March 1999. A 'public' debate was then going on, but the Ministry of Environment and Energy only argued for a "Political quota-/certificate price market" model without showing any alternative possibilities. The Ministry did not seriously analyse and/or publicly and systematically rejected the many objections raised against the model, especially by Danish and German green organisations, and by Herman Sheer, the German SPD spokesman for Energy questions.

During this period, the Ministry thus 'heard but did not listen' and just continued to sell its "Political quota-/certificate price market" model to the public and the Parliamentarians. This strategy proved successful, and a solid parliamentary majority backed the proposal in a March 1999 agreement. The new electricity law including the "Political quota-/certificate price market" model was approved by the Parliament in May 1999.

In *Phase 3,* during the Autumn of 1999, the implementation of the "Political quota-/certificate price market" model was analysed and discussed. A con-

sultancy firm, Price Waterhouse Coopers (PWC) made a report for the Ministry without seriously dealing with the problems linked to the general model and the implementation process. These problems had been raised both orally and on paper by several members of a broad Ministerial "advisory group", which had been set up to follow and comment upon this work. During this process, PWC collected information almost solely from the electricity companies, generally ignoring the objections and problems put forward by the association of wind turbine manufacturers, the association of wind turbine owners, the Organisation for Renewable Energy (OVE) and the economists, amongst others, from the Danish Economic Council.

The problem linked to the decision process can therefore be summarised by emphasising that the Ministry acted ‘narrow-mindedly’, without being able- or willing to establish an open decision process, where the pros and the cons regarding the introduction of a "Political quota-/certificate price market" were listed and evaluated in relation to alternative possibilities. The result of this process was that the institutional framework decided upon was designed in accordance with the demands and requirements of the fossil fuel based part of the electricity sector. The suggestions and demands of the green organisations were generally ignored during this "first half" of negotiations. This state of affairs will most certainly be challenged in the coming period, when the theoretical reform meets the reality of a very limited Danish market with only 2-3 sellers and 3-5 large buyers, thus creating almost ideal conditions for a dysfunctional market.

**What then could/should be done to avoid this type of flawed decision?**

1. It is important to avoid decisions being taken in closed "insider circles", as such groups will often be heavily influenced by the strongest actors on the market, in this particular case the electricity companies.
2. A procedure should be established in the Ministry, whereby alternatives are systematically described and the pros and cons analysed according to an institutionalised methodological framework.
3. Consultancy firms employed by the Ministry should be economically independent from the large established energy companies. If that is not possible, grassroots organisations should be allocated resources for a counter expertise, which can thus supply a well-documented second opinion.
4. Generally speaking, answers from the Ministry to questions from the public and Parliamentarians should display much more intellectual thoroughness than they did in this particular case. This could be secured (amongst others) by allocating sufficient resources to the employees who have to formulate the answers. Additionally, a procedure should be es-

tablished, whereby Parliamentarians who are not satisfied with a Ministerial answer can obtain resources towards the elaboration of a "second opinion". This might prove rather time- and resource consuming, but probably less so than the administrative resources wasted on the making of defective decisions that have to continually be changed and improved ad hoc.

# *11. A coming innovative and democratic "Political price-/amount market" system.*

This system is illustrated in figure is illustrated in Figure 17 and can in brief be described as follows.

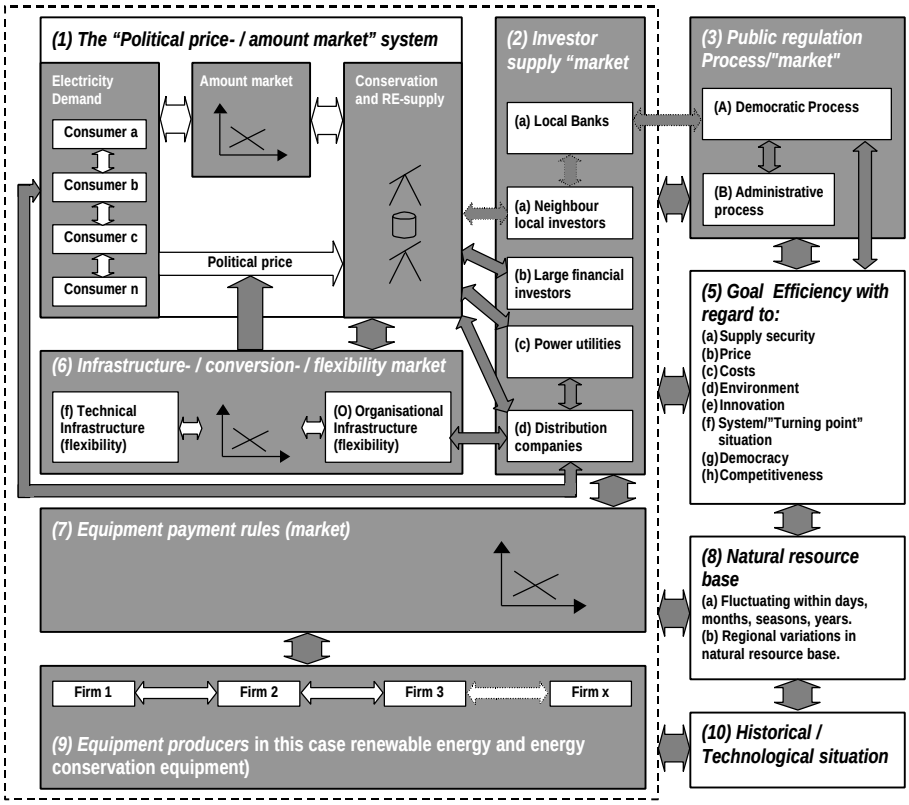


**Fig 17. The proposed "Political price-/amount market" system.**

The here proposed RE reforms has the following main components; the introduction of:

A "political price-/amount market" system of a similar design as the new German system.

A governance system giving investment priority to neighbour-/local investors securing, that these groups always have the right to achieve ownership shares.
A flexibility and conversion market, ensuring that local and regional technologies are included in the infrastructural regulation tasks.
A system of openness at early phases of the public regulation decision process.

The result of including these components might probably be, as analysed in this publication, that the many "different markets" will be vitalised:
The amount market because of a mechanism of produced amounts decided by a market.
The equipment market while turnover can be increased by lowering prices.
The investor market because of the continuance and strengthening of local and neighbour investor groups at the market.
The political market because of a system of openness, which makes it possible for many people to participate in the democratic process.

As a result of this vitalisation of the economical- as well as the "political market" the RE innovation process will probably accelerate, and the achievement of an array of energy policy goals will be within reach.

# *12. Postscript in view of a European market for RE*

The EU Commission now seems much less intent on a "Political quota-/certificate price market" model than they were a couple of years ago. In parallel the EU court decision, mentioned in Section 2.2, recognises that "Political price-/amount market" models are not to be considered an illegal State aid/public regulation mechanism. These developments, together with the fact that the French Parliament has just approved a "Political price-/amount market" model, not to mention the German legislation (2000) concerning the advanced "Political price-/amount market" model, mean that the situation seems much in 1999, when the Danish Parliament approved a legislation introducing a "Political quota-/certificate price market" regulation framework.

Thus, the arena is still open for discussions about the nature of a European regulation framework. As emphasised in this publication, it is important to establish a type of regulation which promotes natural resource “site efficiency”, when dealing with the development of RE sources, where resource intensity varies from location to location. It is also important to establish a model, which furthers local participation in the development of RE sources.

The "Political quota-/certificate price market" model is a “price market” model, with the market determining the prices, whereas the advanced "Political price-/amount market" model is an “equipment market” model, where the market settles the produced quantity. As the equipment market is *the* important market to be considered when dealing with technologies which can be regarded as energy *automatons*, ***an EU market for RE should particularly ensure that the equipment market functions.***

The above arguments then support the advanced "Political price-/amount market" model as a model for Europe. It is especially significant that this model is particularly well suited to a large area with very different natural resources, as it promotes the generation of “site efficiency”. When considering the present national "Political price-/amount market" models, it is important to bear in mind that they do not just represent temporary "Political price-/amount market" regulation, until it becomes technically possible to establish a "Political quota-/certificate price market" model. Rather, they are crucial stages on the way to an operationally common European regulation

framework, based upon the principles in the advanced "Political price-/amount market" model.

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