

Developing Green Markets

Design Challenges and Pioneering Experience in three
European Settings – The Netherlands, the United Kingdom
and Sweden

Atle Midttun, Arne Jakobsen, Nikolaus Kramer, Karen Lagendijk,
Monique Voogt

Project Report from “the Energy-related Environmental Policy Game
in Europe”

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Preface

This report sums up research done under the project “The Energy-related Environmental Policy Game in Europe: Development and Strategic Challenges to Norwegian Energy Industry” financed by the Norwegian Research Council, the Norwegian Electricity Industry Association (EBL), the Norwegian Water Resources and Energy Directorate (NVE) and a group of Norwegian energy companies including Agder Energi, Bergenshalvøens Kommunale Kraftselskap, Dalane Energi, E-co Energi, Nord Trøndelag Energi, Statkraft, and Statnett. We are grateful for the support and also wish to thank the members of the steering committee, Erlend Broli, Trond Arnljot Jensen, Nils Arne Nes, Simona Petroncini, Ada Solberg, Øyvind Stakkeland, Reinert Vassbo, Lars Vormedal Hans Magne Ådland and particularly its coordinator Kjell Olav Kristiansen for insightful comments to earlier presentations of this report. We are also grateful for valuable comments from researchers, Berit Tennbakk, Lasse Torgersen and Orvika Rosnes at ECON who participated in the research team.

June 2005

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Introduction

Following deregulation of the principal energy markets, and EU failure to impose harmonised taxation on polluting emissions, some European countries have moved towards market based greening of energy supply by facilitating various forms of green certificate trade.

The motivation behind this development is complex and includes:

- expectations of higher cost efficiency under market based than plan based greening;
- expectations of innovation and development of new technologies and business models under protected learning in the new green certificate arenas;
- expectations of predominantly national and local industrial returns from the technology development outlined above;
- expectations that the green markets will efficiently enhance a sustainable development of the energy system.

The recursion to market based greening is demanding, however, as political authorities thereby engage extensively not only in market regulation, but also in market construction, even to the extent of taking responsibility for creating demand and balancing it with sufficient supply. Because of the design challenge and the goal complexity, green electricity market development therefore appears to involve considerable policy learning. The regulation and market construction itself, thus, contains strong elements of innovation. In this way policy innovation comes to interplay with the technological and commercial innovation of market actors that it is supposed to bring about.

Interplay between policy and commercial/technological innovation is not without complication, however, and raises several challenges. To shed light on the challenges of electricity market greening by market design, the paper explores some of the European variants through an analysis of the Dutch green certificate-, the UK renewable obligation- and the Swedish el-certificate model. It presents brief descriptions of the three green electricity trade systems including such features as stages of development, market organisation, actors, contracts and market function.

On the basis of these descriptions, the report discusses challenges and success factors in green market design.

Summary

This report explores some of the drivers behind this development and describes and analyses experiences in the Dutch, UK and Swedish green electricity markets.

The report points out that the recursion to market based greening is demanding, as political authorities thereby engage extensively not only in market regulation, but also in market construction, even to the extent of taking responsibility for creating demand and balancing it with sufficient supply. Because of the design challenge and the goal complexity, green electricity market development therefore appears to involve considerable policy learning and regulation and market construction itself, thus, contains strong elements of innovation. The report, therefore, shows how policy innovation comes to interplay with the technological and commercial innovation of market actors, that it is supposed to bring about.

The Rise and Fall of the Dutch Green Power Market

The Dutch support system for green power has attracted much interest, both because of its new and challenging choice of support schemes as well as for its continuous changes in the regulatory design.

The Netherlands saw the emergence of the first green power certificate market in Europe as well as the first green market to open up to imported certificates and therewith to pay a premium to green power generated outside national borders. Renewable electricity was stimulated by a combination of consumption incentive (ecotax exemption) and production incentive (production subsidy). Electricity suppliers collected the ecotax (REB) from conventional electricity customers. Green electricity customers paid a premium for the green electricity but were exempted from the ecotax (REB), which offset the green premium

However, as the report points out, the Dutch green electricity market also illustrates the challenges of a pioneering and unilateral strategy that ultimately had to be abandoned. A major problem with the Dutch regulatory system for renewable electricity was that it was continuously changing. These changes not only concerned the design of support schemes, but also the market actors and/or policy makers involved as well.

Because of the overwhelming availability of hydropower in “reciprocal countries” and its eligibility, not only for the ecotax exemption but also for the generation subsidy, the Netherlands experienced a huge inflow of green certificates from already existing hydropower plants. This led to a political reaction.

The change from a regime based on fiscal incentives to a regime based on generator subsidy also implied that the bulk of the payment was directly given to the producer, thus skipping the energy supplier out of the loop. This has resulted in much confusion since it required renegotiations of all existing contracts that had been established during the old subsidy regime or its predecessor.

The Renewable Obligation Order in the UK

The Renewables Obligation Order (RO) in the UK has also been one of the few operative market based certificate schemes in Europe. The RO imposes the obligation on licensed suppliers to either source a certain and growing percentage of their electricity from renewables or to pay a certain amount into the so called buyout fund. The buyout fund is then redistributed to the suppliers who have met their obligations by redeeming ROCS.

The report describes the basic functions of the RO scheme and describes its major challenges including such issues as: competition issues, credit risk and regulatory risk:

As far as competition is concerned, the paper points out that a few large incumbents dominate the UK retail market for electricity and that the same players also dominate the demand for ROCS.

As far as credit risk is concerned, the biggest setback for the RO came from the credit problem within the buyout pool which was only recognised after two major company failures. The paper shows how proposals were tabled to mutualise at least a part of this risk across all suppliers.

In addition to the commercial risk from shortfall in the buyout fund and possible liquidity and structural problems in the RECS market. The paper also discusses the problem of regulatory risk including concern about uncertainty of future quota levels, concerns about overriding drivers behind government policy and concerns about overriding intervention by EU policies.

The paper also discusses the challenges of conflicting industrial interests. It is shown how renewable generators, such as the Renewable Power Association and the Wind Energy Association, are, for instance, pushing for ambitious policies and restrictions. Traditional energy-industrial actors on the other hand more inclined to support moderation and softer approaches, such as extensive co-firing where bio fuels are mixed with traditional fuels in modified conventional burners.

The Swedish Elcert Model

The Swedish elcert model has also attracted international interest. It was introduced to stimulate generation of electricity from renewable energy sources.

The introduction of electricity certificates implied a regime shift in Swedish support policy for renewables, away from fixed subsidies towards market based support. The Swedish certificate model is based on an obligation for electricity users, with some exceptions, to buy a certain number of certificates, depending on their total consumption, their so-called quota obligation. For ordinary households the electricity retailer, in most cases, handles the obligation. In 2003, the quota obligation was set at 7,4% of electricity consumption. This quota obligation will successively be increased, up to 2010 to 16,9% on a yearly basis. If the quota obligation is not met, the quota-responsible must pay a levy to the state.

In spite of reasonable technical performance, the report shows how a number of concerns have been raised about the Swedish elcert market. A major concern has been with the ability of the market to drive investments in new technology.

Concerns have also been raised about market transparency and strategic behaviour. The report also points out that there have been several discussions about windfall profits for paper and pulp industry where energy generation served as part of waste management and self-supply of electricity. Nevertheless, the report points out, the new certificate market has provided a new focus on energy generation as an attractive business area.

Challenges and Opportunities

The report identifies several challenges and opportunities:

In all three cases, practice from competition authorities so far has been to go soft on green markets, as they are in an initial build-up-phase. Nevertheless, there is probably a limit to how long such de-facto amnesty from competition law could last without giving rise to serious questioning. Like for the underlying electricity markets, internationalisation might be necessary to cope with the structural challenge.

Furthermore, the report discusses how the challenge of dynamic learning and quickly changing framework conditions was a particular challenge in the Dutch case: Startled by the rapid developments of the market, the report points out that policy makers decided at a too early stage to evaluate and revise the market system. The market and its players did not have sufficient time to properly respond to the new market conditions.

The report points out that the English and the Swedish green electricity markets have not seen comparable dramatic shifts in regulatory design. Nevertheless, the report documents that in both cases, there have

been industrial concerns with open-ended policy positions and lack of long-term government commitment.

The report also shows how green certificates through quotas may have effects on the traditional electricity markets that are not trivial to overview. The el-certificate system can be said to have a price-limiting effect on the basic power market, if the renewable electricity displaces expensive marginal electricity generation. However, this effect has to be balanced off against the increased costs of higher green el quotas, which at a certain point will outweigh the price fall in the regular electricity market

The report shows that another major challenge with market-based instruments is that they trigger strategic industrial adaptation. On the one hand such triggering carries large dynamic potential for mobilisation of resources to reach environmental policy goals. On the other hand they also imply a risk of unforeseen side effects

In the comparative analysis, the report also points out the paradoxical European diversity in market design. While the non-compliance fine in the UK market sets an upper limit to price formation, the Swedish elcert system, is much more vulnerable to imbalances in the supply and demand. Since the price ceiling is set at 150% of the average market price over the year, gross imbalances could have dramatic effects. Swedish policy-makers are therefore under strong pressure to set the certificate demand at a realistic level. The UK and Sweden have also pursued widely different policies on inter-period trading.

Finally, the report also discusses lessons to be learnt from the three market experiences. This includes an argument for transparency, simplicity and recursion to known model that we argue, may help provide the necessary assurance. The report also argues for well-conceptualised symmetry conditions between integrated market systems as another necessary precondition for a well functioning European market.

Chapter I

Analytical Reflections on Design Challenges

Constructing green markets involves internalisation of environmental damage or negative external effects into the business model and into the regulatory market design. The focus is on how economic incentives can be built into the market, so as to introduce a trade-off for the firms between net private benefits and marginal environmental costs (Turner & Pearce 1990).

Building pollution controls, environmental management and product stewardship into the organisational design of the firm thus becomes the responsibility of the firm in response to market incentives and regulatory pressure that provides privileged resource allocation to ecologically oriented niche markets

However, such market construction involves a number of design challenges. Firstly, the degree to which viable markets may be rationally designed is debated and rational design models are actively challenged by learning models. Secondly, the goal and design criteria are also debated, notably how to balance static and dynamic efficiency concerns. Thirdly, distributive issues across national boundaries - usually denoted “industrial policy” and between domestic interests raises complex stakeholder concerns. Finally, the degree of policy intervention in itself poses a challenge, as deep and comprehensive regulatory engagement raises an extended coordination challenge.

This chapter explores each of these issues in some further detail

Rationalism versus Learning

Constructing green markets involves a fundamental policy design challenge, as it entails setting of framework conditions for dynamic commercial development, yet at the same time involves policy learning and experimentation which potentially changes the same framework conditions over time.

The classical mode of regulation is for the policy-maker to take a *strong rationalist position*, characterised by a dominant belief in deductive theoretical analysis. Based on strong a priori optimization logic and simplistic behavioural models within a well-defined functional scheme, this analysis, in many cases allows clear prediction of outcomes and clear deduction of optimal policies and strategies.

While practice according to this regulatory ideal type may occur in some cases of simple market adjustment, it is unlikely for more complex market intervention, not so speak of complete market redesign. This is recognised even within the circle of game theoretical market-designers that therefore find it necessary to subscribe to a *medium or weak deductive-rationalist position* (Roth 1999, Milgrom 2000). The reasons given for the retreat to a weaker rationalist position is that practical design carries with it a responsibility for detail that confounds the simple models and deductive analytical methods that characterise most game-theoretic analysis in the economic literature. As argued by Roth (1999), complexity of the strategic environment itself, as well as complexity of participants' behaviour carries with it variety that transcends even very sophisticated regulation theory. One set of approaches to complexity and limited information, within the rationalist tradition, has been to develop regulatory strategies that elicit knowledge about actors' strategies and then feed this into revision of the regulatory model. This mode of dynamic regulation has often been termed the "menu of contract" approach, since eliciting of strategic information takes place through the commercial actors' choices among a set of regulatory contracts. Since the contracts allow the actors to make different profit under different efficiency performance, their choice of contracts implicitly reveals their efficiency potential. This information is then used to redesign the regulatory contracts for the next period and so on. Through successive regulatory games, the regulator, in this way, seeks to elicit the innovation potential from the market actors and then revise his position.

Departing more radically from the rationalist position, a learning school of regulation argues that dynamic complexity entails a more fundamental learning approach from the regulator.

One of the most radical formulations of the learning approach to regulation is the so-called transition management approach, spear-headed by the Dutch government in practice and developed analytically by Dutch scholars (Kemp et al 2001, 2003; Rotmans et al 2000, 2001). Transition management breaks with the planning and implementation model and policies aimed at achieving particular outcomes. It is based on a different, more process-oriented philosophy, whereby deliberate attempts are made to bring about structural change in a stepwise manner. Transition management is a form of process management against a set of goals set by society whose problem solving capabilities are mobilized and translated into a transition programme, which is legitimized through the political process.

A transition management approach to regulation consists of a set of connected changes in technology, the economy, institutions, behaviour, culture, ecology and belief systems that reinforce each other. Within a transition there is multiple causality and co-evolution of independent

developments (Rotmans et al. 2000 and 2001). By engaging in “context control” transition management orients market dynamics towards societal goals.

Transition management is best viewed as a form of soft planning or indicative planning, where regulation/ policy interventions are evaluated against two types of criteria: 1) the immediate contribution to policy goals; and 2) the contribution of the policies to the overall transition process.

Regulatory Design under Static versus Dynamic Efficiency

The difference between rationalist versus the learning approach to regulation partly hinges upon differences in a static efficiency versus a dynamic efficiency point of departure. The rationalist perspective typically takes a static efficiency point of departure. Although dynamic efficiency considerations are increasingly included in rationalist regulation, this is done as a secondary supplementary element to the traditional static efficiency point of departure. The learning perspective on the other hand starts the other way round with a strong anchoring in the Austrian tradition in economics and in innovation theory (Vaughn 2001), which features much weaker rationality assumptions.

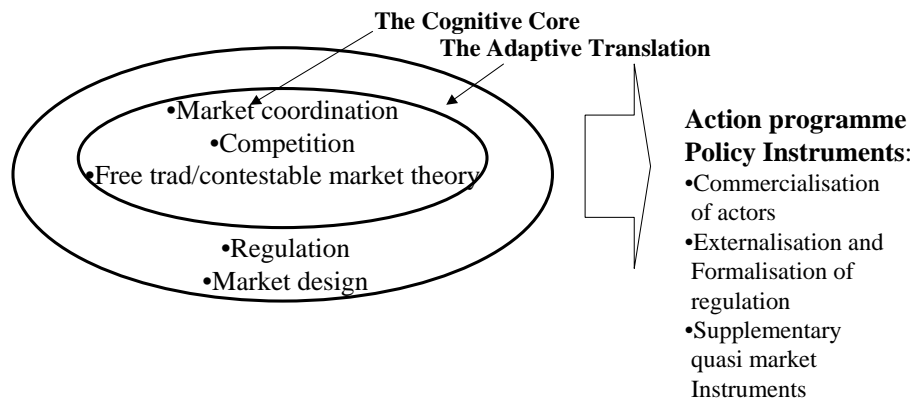
The Market-efficiency Perspective

The core focus of the market efficiency perspective is on efficient allocation of economic resources between alternative deployments in an economy where both economic resources and technologies are given and scarce. The typical method employed is optimisation, and the fundament of an extensive theoretical framework is the welfare theorem postulating that a competitive market based on the free trade solution is Pareto-optimal (Samuelson and Nordhaus 2005).

In organisation theory March’s (1991) concept of exploitation covers a similar cognitive orientation, characterised by a focus on refinement, choice, efficiency, selection, implementation and execution.

The action programme or core policy instruments in this perspective are market exposure, competition policy and regulatory design that foster competitive pressure and cost efficiency. Within organisations this approach fosters combinations of internal competitive incentives and tight programming of efficient routines with a cost minimisation focus (figure I.1).

Figure I.1: The Market Efficiency Perspective⁶



The innovation/exploration perspective

The innovation/exploration perspective sees environmental reorientation of the energy system as a question not only of efficiency, but also of technological change.

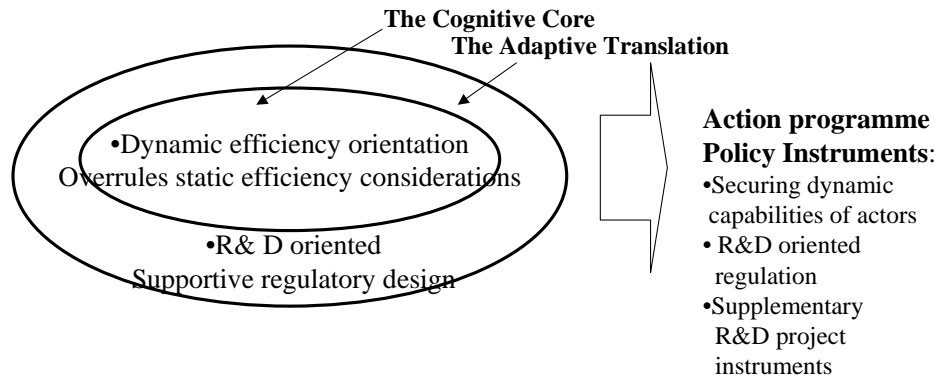
The core focus of this model is on development and growth as a function of innovation. Competitive pressure is also here of central importance, but then as a force to stimulate creativity and not cost minimization (Edquist 2001; Lundvall 2002) (figure I.2).

In organisation theory March's (1991) concept of exploration covers the orientation characterised by a focus on variation, risk taking, experimentation, flexibility, discovery and innovation.

Core policy instruments within this perspective are support of research and development combined with facilitation of industrial learning environments that support innovation and technological learning. The aim is to elicit new technical solutions and to stimulate promising already operative technologies to cut costs and increase performance through protected niche markets and the associated learning curves (OECD 2003).

⁶ Following Lakatos we distinguish between the cognitive core and the adaptive translation of the core into "realistic" propositions and/or normative policies

Figure I. 2 The innovation/exploration perspective



Like for individual firms, the regulatory regime has to strike careful balances between static and dynamic efficiency concerns. Continuing the firm analogy, the striking of this balance implies taking complementary policy instruments into use, just as the firm often handles the dual task by developing specialized organizational tools.

Regulatory Design and the Distributive Dimension

In addition to the static-versus dynamic challenge, distributive issues also feature prominently in regulatory design. Again, with analogy to business strategy, we may speak of a stakeholder or a conflict of interest dimension. In the case of regulation, this is perhaps most prominently displayed in international distributive concerns, reflected in industrial policy, but also in distributive concerns between various intra-national stakeholders

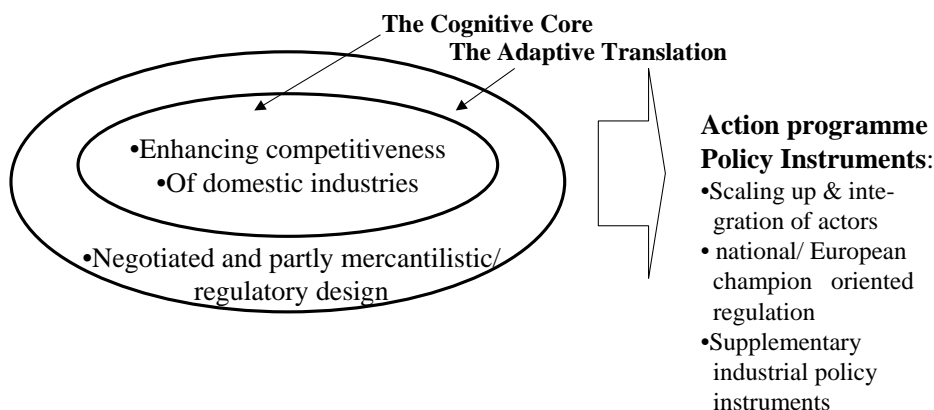
Industrial Policy

The core focus of the industrial policy perspective is on building up and maintaining industrial capabilities within the territorial domain in focus. Industrial competition on a global scale is therefore partly defined in mercantilist terms as a race between national/regional champions (whether at a firm or industrial sector level). The role of public policy is to provide the partnership and nurturing context for the national champion and/or to build

or support strong industrial clusters within promising sectors with national location.

While the pure market efficiency perspective is neutral to national championship, the industrial policy model is likely to favour the use of market/efficiency pressures as long as strategic domestic industry prospers. The industrial policy perspective may also be linked to the innovation/exploration perspective, but only to the extent that it stimulates technological development favourable to national/regional industrial development (figure I.3).

Figure I.3: The industrial policy perspective

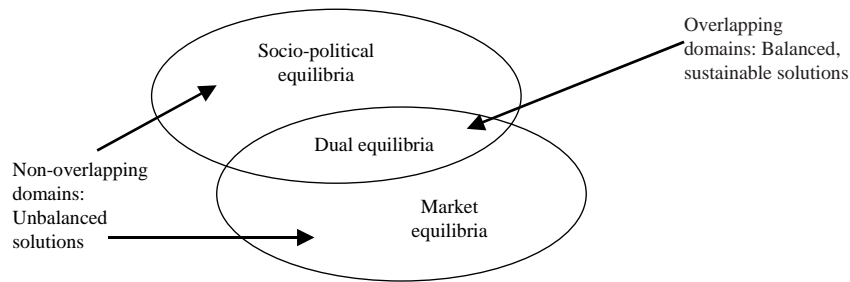


Social Acceptability

In the intra-national context, the pressure of democratic legitimacy dictates that social acceptability be a major design criterium for policy solution. From this point of view, the concept of social equilibrium is introduced as an additional criterion to the neoclassical concept of economic equilibrium. Successful policies emerge only in those situations where both criteria overlap (figure I.4)

Some pure economic market solutions with a high degree of economic efficiency may imply socially unacceptable distributive effects and not qualify on the social criteria. On the other hand, solutions where the economic realities are neglected would be examples of unilateral socio-political equilibria where economic efficiency conditions are not met.

Figure I.4: Social and economic equilibria⁷



To the extent that regulatory design must accommodate international and intra-national distribution, a stakeholder dimension sets boundaries and premises for both static efficiency and dynamic efficiency concerns.

The Challenge of Deep Regulatory Intervention

Green electricity markets and similar quasi-market constructions represent some of the most ambitious engagements as they include *both design of the basic trading mechanisms, as well as the constitution of demand and/or supply preferences*. This model of market-intervention thereby includes the fundamental motivation for exchange as an object for strategic public policy design.

In the opposite end of the policy spectrum, *market adjustment* constitutes perhaps the least radical form of public intervention. Through government intervention already existing markets are adjusted to function better and/or include new concerns. This adds an administrative restriction to the general exchange regime, but basically leaves the regime intact within this restriction. An example would be environmental taxes to introduce externality costs.

A step further in policy complexity, but still short of the full market construction is *de-regulation* or opening up planned economy/regulated monopoly to competitive market exposure. This represents a more complex form of public intervention than market adjustment. The assumptions are, however, that there is an underlying interest from both buyers and sellers to trade. The role of government thus is to facilitate organisation of the sector

⁷ From Finon, Johnsen & Midttun (2004)

under general market law, but not to involve in the actual creation of demand, such as in the green electricity market. An example would be the opening up for competitive energy markets.

Competitive market organisation may necessitate more specific government engagement also in *market design for specialised transactions*. Public authorities may then add on to the general exchange regime, a specialised exchange regime, often to supply specialised supplementary facilitation of the primary exchange. Examples would be specialised functions in electricity trade, such as balancing power; grid access etc. where highly specific rules and market mechanisms are applied to vital supplementary market functions.

The four regulatory approaches are briefly summarised in table I.1. The challenge of balancing policy learning and innovation processes probably increases with the deepening of the regulatory intervention in the market system and the degree of technological innovation that takes place in the market arena. The establishment of green electricity markets, apparently scores high along both dimensions as it represents an ambitious extension of the regulatory agenda and a heavy burden of design and control, at the same time as the regulated market is supposedly a dynamic one in terms of expected technological and commercial innovation.

Table I.1: Typical uses of market mechanisms in current regulatory practice

Regulatory Approach	Main focus	Characteristics	Example
I Market adjustment	Existing markets are adjusted to function better/ include new concerns	Administrative restriction added to the general exchange regime. The restriction is set outside of the market system	Environmental taxes
II De-regulation	Opening up for competitive market exposure	New sectors opened up to general market rules	Opening up for competitive energy markets
III Market design for specialised transactions	Institutionalisation of specific elements beyond the standard market rule model	Adds specialised exchange regime,	Specialised functions in electricity trade: balancing power; grid access etc.
IV Market design with constitution of preferences	Institutionalisation of specific elements beyond the standard market rule model Actors and preferences are explicitly constituted by design	Transfers the design element to the fundamental motivation for exchange	Green certificates markets Climate/ emissions markets

Concluding Remarks and Introduction to the Empirical Case Studies

The regulatory design challenges presented above are each highly demanding, but even more so when they play together. There are some fairly obvious links between the debate over theoretical perspectives and the debate over the relevant mix of deductive and empirical experimental

analysis. When strong rationality is evoked in market design, it is usually done with explicit or implicit reference to the market-efficiency perspective and vice versa, the learning perspective is typically introduced with reference to technological development and dynamic efficiency. Similarly, the deepening of regulatory engagement is also likely to make policy-makers more directly responsible for distributive outcomes. The complexity of the issues involved in regulatory design of green electricity markets is a good argument for pragmatic empirical exploration.

The following sections explore the challenges of green certificate market design in the pioneering Dutch green certificate market, the UK renewable obligation system and the Swedish elcert market. Each case provides a brief introduction on the basic regulatory design and the history of the market evolution. A presentation is then given of the basic market construction and the major actors and their interests. Based on preliminary observations and evaluations, the case descriptions also highlight important market outcomes and events.

A final section brings out the major challenges and dilemmas to green market construction, including such issues as: efficiency and market competition; static and dynamic efficiency and learning curves; industrial policy issues and distribution between national interest; multi-market complexity; design variations in common green certificate markets.

Chapter II

The Rise and Fall of the Dutch Green Power Market⁸

The Dutch support system for green power has attracted much interest, both because of its new and challenging choice of support schemes as well as for its continuous changes in the regulatory design.

The Netherlands saw the emergence of the first green power certificate market in Europe as well as the first green market to open up to imported certificates and therewith to pay a premium to green power generated outside national borders.

However, the Dutch green electricity market also illustrates the challenges of a pioneering and unilateral strategy that ultimately had to be abandoned.

From a regional based production subsidy to a ‘national trading scheme for green energy’: the Green labels initiative

Before the start of the liberalisation of the electricity market, renewable energy support came from a mix of instruments ranging from feed-in tariffs based on avoided cost, direct subsidies, fiscal investment incentives and a system benefits charge.

As a consequence of greening of the tax system in the mid-nineties, the ecotax or regulatory energy tax (REB) on final energy consumption was introduced in 1996. Renewable electricity consumption was exempt from the ecotax. Moreover, producers of renewable electricity received a production incentive from the ecotax funds collected from non-renewable electricity consumers.

In 1997, Dutch energy suppliers concluded a voluntary agreement with the Dutch government to aim at 1700 GWh renewable electricity production by 2000, representing 3.2% of total Dutch electricity supplies. The target was proportionally split among the energy suppliers according to their share in distribution.

An electronic green label system was introduced early 1998 to register green electricity generation and consumption on a national level. The green label system worked in three stages: new labels were issued, trading in green labels were registered, and finally redeemed as

⁸ By Karen Lagendijk and Monique Voogt

documentation of green electricity supply. Local energy suppliers carried out the green label administration and reported all data to the Central Registration Authority.

The feed-in tariffs for electricity were gradually phased out as the electricity market is opened to competition in July 2001 and the market relied solely on tax incentives and certificates to support further greening of electricity.

Principles of the system

Under the EU renewable electricity Directive the Netherlands was allocated an indicative target of 9% of total electricity consumption in 2010. The Dutch government realised the limitations inherent in its geographical location when it came to the development of large-scale green projects. It therefore designed a scheme to encourage the consumption of green energy by Dutch customers, which also allowed import.

The incentives lay in an ecotax on the consumption of electricity, with an exemption for the consumers of green electricity with a reference to the polluter pays principle. By stimulating the demand for green electricity, Dutch government expected green generation capacity in the Netherlands to rise, but also to be supplemented by additional imports.

The market for renewable electricity was opened to all customers in 2001. A new tradable green certificate system was set up for the verification and tracking of renewable electricity and to facilitate the trade and retail supply of renewable electricity.

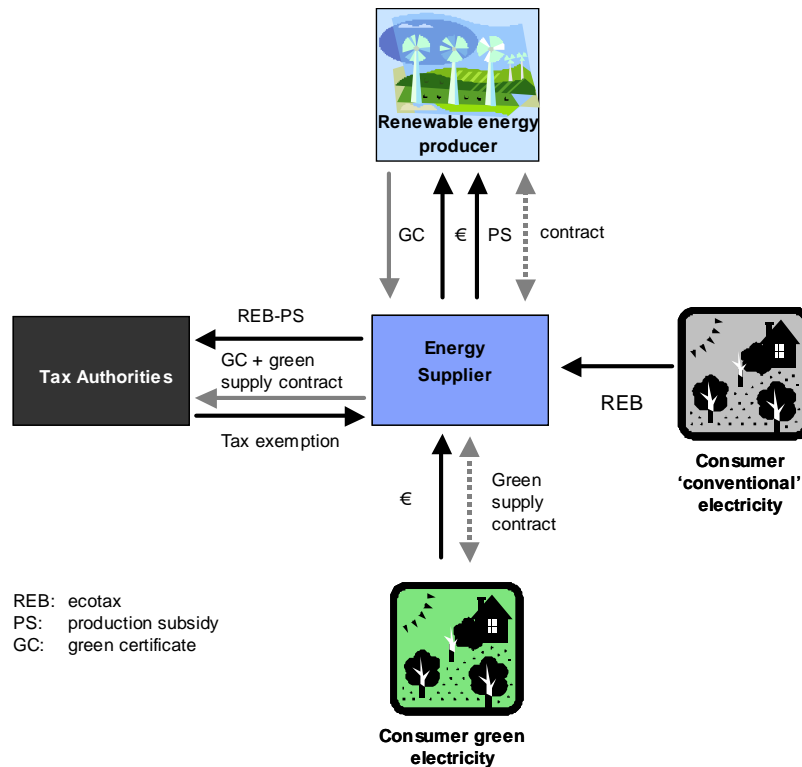
One of the factors behind the great success was also that the green market provided an opportunity for energy suppliers to attract new customers beyond their former geographically oriented monopoly as well as new market players the opportunity to enter the Dutch power market. Where customer switching was otherwise limited by local restrictions

Since the openings of the Dutch retail market for renewable electricity the number of renewable electricity customers increased from about 250,000 to approximately 1.3 million in January 2003. This surge in demand was mainly due to the above mentioned ecotax exemption and production incentive. Encouraged by the success of the renewable electricity market, the Dutch government decided that it would seek to achieve its renewable electricity target on the basis of a voluntary market for renewable electricity.

Instruments in the system: a dual incentive

Renewable electricity was stimulated by a combination of consumption incentive (ecotax exemption) and production incentive (production subsidy), illustrated in Figure II.1

Figure II.1: Schematic overview of Dutch renewable electricity incentive scheme as of July 2001.



Electricity suppliers collected the ecotax (REB) from conventional electricity customers. Green electricity customers paid a premium (€) for the green electricity but were exempted from the ecotax (REB), which offset the green premium. The supplier bought enough green certificates (GC) from renewable producers to match their supply of renewable electricity to green customers. Furthermore, based on the purchase contract for the physical power between the supplier and the renewable producer, the supplier could grant a production subsidy (PS) to the renewable producer from the ecotax revenues. The remaining ecotax revenues were transferred to the tax authorities, along with a matching supply of green certificates. The development of the support levels is provided in Table II.1

Table II.1

Table 1. Regulatory energy tax, exemption for green consumers, production subsidy (€/kWh)

	1996-97	1998	1999	2000	2001	2002 ¹⁾	2003 ²⁾	2004 ^{3),4)}	2005 ⁵⁾
Ecotax (REB) 0-10.000 kWh	1,34	1,34	2,25	3,72	5,83	6,01	6,39	6,54	7,19
Ecotax exemption (36i Wbm)	1,34	1,34	2,25	3,72	5,83	6,01	2,90	1,50	0
Production subsidy (36o Wbm)	1,34	1,34	1,47	1,61	1,94	2,00	2,07	0	0

¹⁾ Hydropower excluded from ecotax exemption since January 2002

²⁾ January 2003: 46,3 €/t, July 2003: 29,0 €/t²

³⁾ January 2004: 29,0 €/t, July 2004: 15,0 €/t

⁴⁾ 36o Wbm abolished as per July 2003

⁵⁾ 36i Wbm abolished as per January 2005

The ecotax proved to be an effective means for stimulating demand for renewable electricity. In particular from the moment when foreign green certificates could be imported to the Dutch scheme and a large flow of cheaper green certificates became available from so-called reciprocal countries (Austria, the Nordic countries, etc.).

Limiting and Dismantling the Green Certificate Regime

Because of the overwhelming availability of hydropower in “reciprocal countries” and its eligibility, not only for the ecotax exemption but also for the generation subsidy, the Netherlands experienced a huge inflow of green certificates from already existing hydropower plants. This led to a political reaction and in January 2002 hydropower was no longer eligible for energy tax exemptions, putting an end to investments in new Dutch small-scale hydropower⁹ but still providing some profitable opportunities for imported small-scale hydropower.

Turning away from a consumption-based model, conserving a green market

The large amounts of imported green power led to a large discussion on the success of the green certificate system. Critics specifically focused on the high loss of tax revenues leaking abroad and the fact that the existing promotion scheme did not result in much new renewable production capacity. Another problem associated with the Dutch reliance on renewable electricity imports was that supply would be uncertain in the longer run, if these electricity flows are needed by the exporting countries themselves to fulfil their own national renewable energy targets. There were increasing doubts that imported green certificates could be counted towards the Dutch

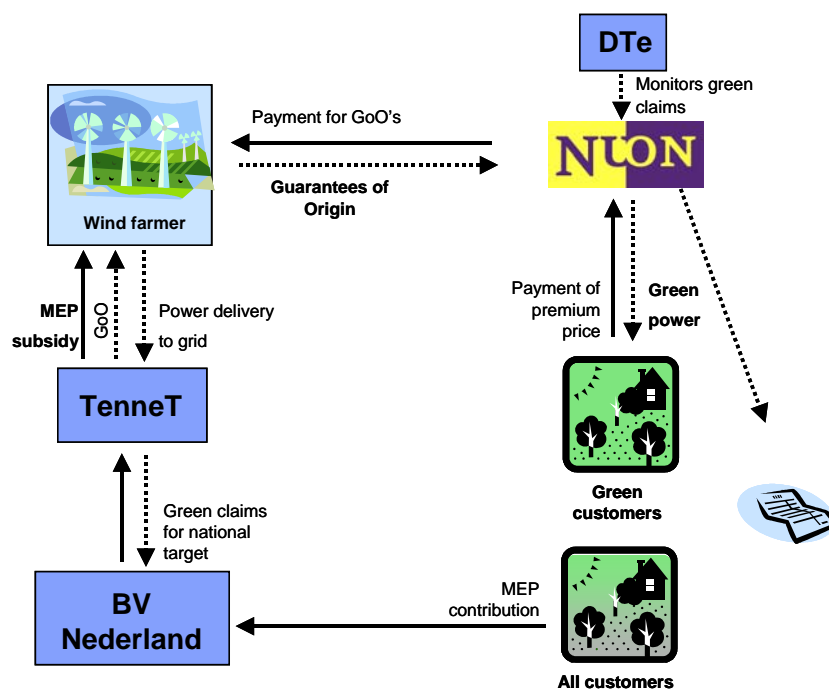
⁹ Large-scale hydropower has not been supported by the green certificate system from the start of the system.

target, which would imply that subsidizing imports was useless. The Dutch government's expectation that other EU countries would opt for the same subsidy scheme seemed unrealistic.

Considering the critics and uncertainties, investors in the Netherlands started to anticipate changes in the support framework. The ecotax-based support framework could not provide the long-term revenue security needed for investments in new projects. In addition, domestic producers had to compete against lower cost imports.

In November 2002, a proposal was made for an amendment to the Electricity Law of 1998 called 'environmental quality of power production' (Milieukwaliteit Elektriciteitsproductie, MEP) in conjunction with a lowering of the ecotax exemption and the abolishment of the production subsidy (360 Wbm). This proposal represented a shift in emphasis from demand stimulation through the ecotax exemption to a more production-oriented scheme with technology-based feed-in tariffs in the MEP. The MEP passed through Parliament in December 2002 and was implemented in July 2003. MEP is for national production only with a production start cut off date of 1 January 1996. At the same date, ecotax exemption was halved, aiming at a reduction of imports. In order to regain investment stability the level of the MEP feed-in tariff is fixed at the level of the tariff in the first year that the MEP was requested for duration of 10 years following the start of operation of an installation. The tariffs were differentiated according to the renewable energy technologies and sources. Figure II.2 provides a schematic overview of the MEP.

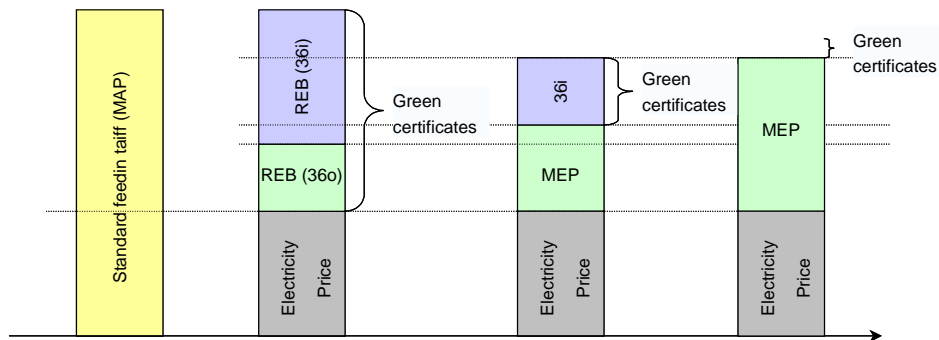
Figure II.2:
Schematic overview of the MEP; the Dutch renewable electricity incentive scheme as of July 2003



The change from a regime based on fiscal incentives to a regime based on generator subsidy also implied that the bulk of the payment was directly given to the producer, thus skipping the energy supplier out of the loop. This has resulted in much confusion since it required renegotiations of all existing contracts that had been established during the old subsidy regime or its predecessor. The government denied the market a transitional regime or guidelines to deal with those issues.

Figure II.3 illustrates the sources of revenues for a renewable electricity producer under the different schemes.

Figure II.3: Sources of revenue under different renewable electricity support schemes.



Main market players

The Dutch green certificate scheme has involved a number of actors, including various government ministries and agencies in design and control functions. It has activated a broad spectrum of players, ranging from established energy companies to independent power generators, traders and final consumers that had to actively opt for the scheme.

Government involvement

The Ministry of Economic Affairs was the initiator of the green certificate scheme and has stayed in the lead for green power and its support ever since. It has however delegated most of the operational and implementation activities to the appointed Issuing Body, the Groencertificatenbeheer (GCB), later to change to CertiQ (both daughter organisations of the transmission system operator Tennet).

Inherent in its task as Issuing Body, GCB was responsible for the infrastructure of the green certificates system, the control of renewable plants asking to participate in the scheme of green certificates, the issue of those certificates, their transfer from accounts to other accounts in the Netherlands or abroad and the final redemption of the same certificates, serving in turn for proof of green delivery to end-consumers. Its involvement within the RECS (Renewable Energy Certificate System) has also put the GCB at the forefront of developments in terms of international trade of green certificates. This involvement along with the RECS test phase has allowed for a wide array of countries for traders to choose from when sourcing green certificates for the Dutch market (France, Norway, Sweden, Finland, Germany, Austria and Denmark).

As the instrument for stimulating the consumption of green energy was tax-exemptions, the tax authorities clearly involved. The tax authorities were responsible for checking the adequacy of the transactions performed under the scheme with the rules and regulations in place then. Now that the tax exemption system has been stopped the tax authorities are no longer involved and the regulator DTe has taken up their monitoring role.

Since the dismantling of the certificate system, the green market is now functioning without financial supports of any sort. Consumption of green energy on a voluntary basis, though most suppliers have held their price promises keeping green at the price of grey electricity. Since green energy is now being offered as a 'special product' within the marketing mix of energy suppliers, the regulator DTe is now charged with the supervision of the 'green claims' of those suppliers. This entails a control on the amounts of green electricity claimed to be delivered to end-consumers and the reconciliation with the amounts suppliers actually have sourced. How this control will take place is not clear yet as the DTe still has to publish guidelines as to green energy supply.

Generation companies

In parallel with the development of the green market, the energy market in the Netherlands entered in 1996 a strong wave of concentration, leading to three major energy utilities being created: Nuon, Essent and Eneco. Nuon and Essent, based on the inherited regional position, have been very active in developing their renewables generation portfolio, each with its specialty in terms of technology-choice. Essent profiled itself as a biomass producer, this mainly because of the co-firing possibilities that its existing production assets were offering. Nuon endorsed the image of a wind promoter, with an average build-rate of 100MW per year over the period 1999-2003.

Next to the 'historical operators', a foreign entrant E.On, with the acquisition of production assets in the Netherlands, also played a significant role in the production of biomass. Along with Essent and other parties, E.On was signatory to the Coal Covenant, voluntary commitment from coal producers to insert a percentage of biomass in their power plants (or alternatively to reduce the same amount of CO₂ via other measures).

While all independent renewables power producers are contractually linked to one of the large suppliers, given the risks inherent to the programme responsibility, they represent a lion's share of the Dutch renewables installed capacity. They have had much weight in policy-making via their effective and organised lobby.

Traders

Next to the obvious involvement of large suppliers of green energy (Nuon, Eneco and Essent) and of the main producers, foreign traders have also had a significant involvement in the trading/sourcing of green certificates. We think here of Statkraft, Electrabel and Vattenfall, leading, in some cases even to establishment of new business in the Netherlands. While liquidity has severely dried with the abolishment of the fiscal incentives, those traders are still active in sourcing guarantees of origin for remaining green customers.

Final consumers

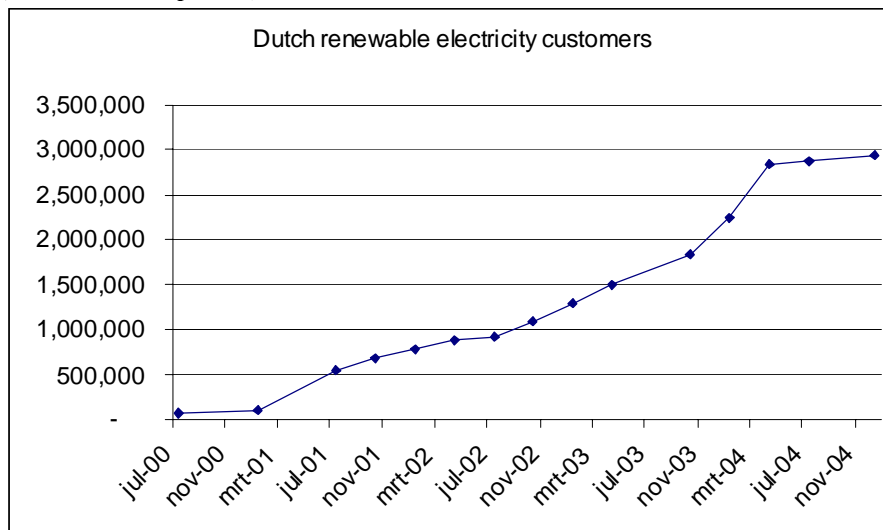
The Dutch market for energy consists for households of 7 million customers, of which 2.8 million customers have switched to green over the whole period. This number has not been showing signs of decreasing, with most suppliers setting forth their green-for-the-price-of-grey promise.

Nuon made the first steps of green marketing with its 'niche' product *Natuurstroom*, launched in 1996, and offering its captive customers with an alternative to conventional power in the form of a CO₂-free product (on the basis of wind, solar and hydro) against a small price premium.

With the tax exemption scheme further democratising green products, the interest from customers swiftly increased together with the number of suppliers offering a green product. From 'green energy in your mother tongue' (targeted at minorities) to Shell entering the green market and marketing from its filling stations, the offer of green product was as diverse as it was short-lived. Most of those suppliers have now left the market or interrupted their marketing activities, as the margins slimmed. To date, only Essent and Nuon are actively pursuing shares of the green market.

The system did bring about some very positive effects. Driven by the high levels of support for renewable electricity supplies and the fact that only the market for green electricity consumers was opened, the period July 2001-July 2004 has been a very important period in the history of Dutch electricity demand. The utilities seized the opportunity to attract new customers in a market that until then had been fully regionally oriented and had not experienced any competition. Strong marketing campaigns were set up to develop a brand name and several new companies were erected to take a share in this new market. Green electricity became a new and well-known product in the Dutch market. The number of green power consumers increased enormously, peaking to approximately 40 per cent of household consumers purchasing green power (see Figure II.4).

Figure II.4: Number of green electricity consumers in the Netherlands (source: Greenprices)



Conclusions and future development

Future regulatory regime

The Dutch government has made a commitment to renewable electricity investors that once they qualify for the MEP they are guaranteed a 10-year support from production start at the tariff fixed in the first year of receiving MEP for this installation. Thus, following the start of installation of a renewable power production plant and following qualification for the MEP, investment support is guaranteed for this plant. However, the tariff itself is not fixed, but yearly set for a maximum of two years ahead. Thus, new investments still face an uncertainty on the exact level of support as well as the continuation of the MEP scheme. These developments have created large uncertainties with respect to the actual realisation of the targeted 9% renewable electricity in the year 2010. It is interesting to note that when designing the MEP the Dutch government was careful to give sufficient room for existing capacity to be kept financially profitable to operate since this capacity is to contribute towards the Dutch target as well. This goes in line with the thinking behind the European renewable electricity Directive though many countries today seem to overlook the role of existing production in reaching the European targets.

Interestingly, Dutch members of Parliament reintroduced an article in the 1998 Electricity Law opening up the opportunity for the Minister to revert to a mandatory share of renewables in supplier's fuel mix (similar to

the UK and Swedish systems) in the case the supply would fail to catch up with the demand for green power. Expectations are that a new turn could take place in 2005/2006.

A strong increase of renewable electricity demand

Stimulation of the demand for renewable electricity has led to a large increase in the number of renewable electricity consumers in the Netherlands. Whereas prior to the implementation of the consumption-based scheme just 500,000 renewable electricity consumers existed, numbers rapidly increased to 1.3 million in January 2003 and nearly 3 million in December 2004 (out of 7 million households). However, with the tax exemption fully abolished and the opening-up of the grey power market for competition, the growing interest in green power is jeopardised. Already in the second half of 2004 the growth in renewable electricity consumers has flattened. The number of renewable electricity customers switching back to grey power is still limited as most electricity suppliers have engaged in longer-term contracts with their domestic customers and have made a promise to these customers that prices would not be increased during this contract term. At the end of this contract term it is not known how suppliers will decide to deal with their green electricity offerings.

Continuous changes in support schemes

The Dutch regulatory system for renewable electricity in the last years clearly can be characterised as continuously changing. These changes not only concern the design of support schemes, but also the market actors and/or policy makers involved as well as their exact role on the system (see Figure II. 5). The continuous uncertainty whether existing support schemes and tariffs would be continued and under what conditions have resulted in a strong reluctance on investments and stronger requirements from banks. After a considerable increase in green power production capacity in the period 1999-2002, production growth has shown signs of decreasing and this despite the intentions of the MEP subsidy.

Figure II. 5: Evolution of renewable electricity support in the Netherlands

Before 1999 Production scheme	<ul style="list-style-type: none"> Regional support schemes with fixed feed-in tariff per MWh wind energy supplies. Green label scheme started in 1998
1999-2002 Stimulating demand for green energy	<ul style="list-style-type: none"> Encouraging the demand for green energy Introduction of the Ecotax, with exemption for green electricity consumption Opening-up of the renewable electricity market in July 2001 Green labels => green certificates October 2001: ratification of the renewable electricity Directive Strong increase green electricity customers: from 500,000 in July '01 to 1.3 million in Jan. '03 Imports took off; doubts on added value of some imports (aging installations- possible double subsidy?) Considerable increase in renewable production capacity: from 2,500 GWh in 1999 till 3,500 GWh in 2002
2003 – 2004 Halt to green imports and moving to a production-based scheme	<ul style="list-style-type: none"> Isolated position in Europe wrt import of certificates; uncertainty whether imports may count to target Putting an halt to green imports: from 2002 hydro power no longer eligible for production support; full abolishment production support in July 2003 Gradually phasing out of ecotax exemption, ending on December 31 2004 Shift to focus on green power produced in the Netherlands; introduction MEP in July 2003. July 2004: opening-up grey power consumption market Certificates => Guarantees of Origin
Future	<ul style="list-style-type: none"> High commitments on green power supplies while availability is limited Uncertainty on meeting the targeted 9% in 2010

Future of the green market: production and supply

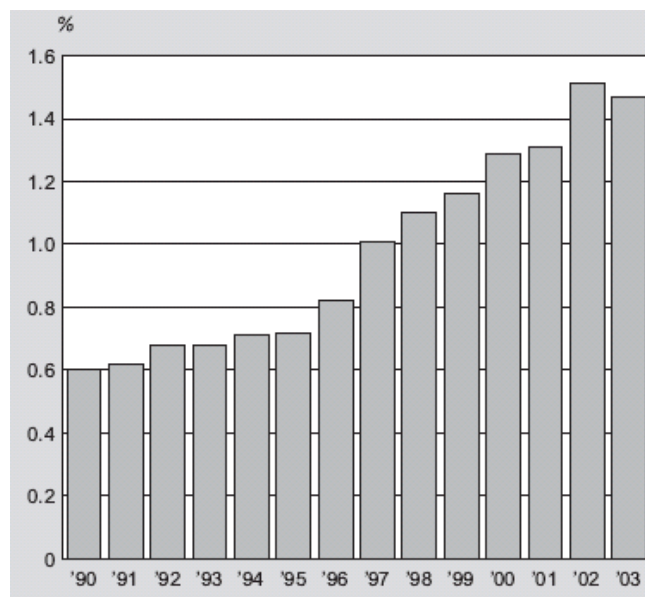
The Dutch market for renewable energy is still a relatively small market that primarily needs a stable investment climate and a solid long-term market perspective before it will really take off. The continuous regulatory changes have done large damage in terms of bringing about new investments as well as new market players willing to invest. For the first time since the early nineties the share of domestic renewable energy supplies in total Dutch energy consumption slightly decreased

Figure II.6 illustrates that the share of domestic renewable energy supplies in total energy consumption in the Netherlands reached nearly 1.5% in 2003.

The share of domestic renewable electricity supplies in total electricity consumption remained stable at a share of 3.3. %. The import of renewable electricity decreased from 9.7% in 2002 to 8.7% of domestic electricity

consumption. Clearly the targeted share of 5% renewable energy¹⁰ and 9% renewable electricity by 2010 are not within reach.

Figure II. 6: Share of Dutch renewable energy supply in total supply (source CBS 2004)



Overall and in designing its future regime for promoting renewable energy, the Netherlands will need to take into account its domestic potential for self sufficiency and put it in the context of what is achievable for the rest of Europe.

The Dutch market being too small to reach the targets Europe has set for it and a harmonised European scheme in which the Netherlands can source from any other Member State its own renewable requirements not in foreseeable sight, the Dutch government should grab the few and far in between opportunities of signing bilateral agreements with countries presenting a potential surplus that can be exported to the Netherlands.

¹⁰ Officially the targeted share for renewable energy in the Netherlands is specified as 10% in the year 2020. The share of 5% renewable energy in the year 2010 is used as an unofficial intermediate target.

Chapter III¹¹

The Renewable Obligation Order in the UK

The Renewables Obligation Order (RO) is the central part of the UK strategy for stimulating the growth of renewable energy production in a market-based manner. As such, the RO is one of the few operative market based certificate schemes in Europe, with active plans for expansion both in time and volume.

For the UK, the RO is part of a broader climate change and renewables policy, where it interplays with other policy instruments. We have therefore chosen to give a brief overview of this policy context up front.

Climate Change Policy and Renewables in the UK

Under the Kyoto Protocol the UK has to reduce its Emissions by 12% in the first Kyoto Period 2008-2012 compared to the base year 1990. Apart from Kyoto, the UK has set itself a more ambitious domestic target of a 20% reduction by 2010. So far, progress has been good, mainly due to a shift in power generation from coal to gas. However, with the continuing depletion of gas reserves in the north seas, the UK is about to become a net importer of gas. A potential rise in gas prices would make a further shift from coal to gas increasingly difficult. Apart from the abovementioned emission reduction target, the UK aims to source 10% of its power demand by 2010 from renewable sources.

The strategy to reach this target is based on four market-based instruments:

The UK emissions trading scheme was launched as the worlds first cross-sectoral GHG emissions trading scheme in April 2002. Direct participants took on voluntary absolute targets to be achieved on an incremental basis from 2002 to 2006. These targets were, against a 1998-2000 baseline, determined by a ‘descending clock’ auction held by the UK government. An incentive fund of £215,000,000 was made available. The incentive payment is paid annually to companies once they have demonstrated compliance by holding allowances equivalent to or greater than the level of verified emissions. The direct participants include mainly

¹¹ By Nikolaus Kramer

companies from the oil and gas, chemicals, air travel, retail and mining sectors¹².

In addition, the UK also implements the EU emissions trading scheme. Furthermore, the UK also features the Climate Change Levy, which is a tax on the energy use of non-domestic customers. For electricity, this tax currently amounts to 4.3 GBP / MWh. If a supplier can show that electricity provided to non-domestic customers has been produced with renewable energy sources, he is exempted from the CCL. A part of this tax exemption is usually passed back to the generator. The CCL therefore leads to indirect subsidies for renewable generation.

The Renewables Obligation Order came into place in 2002 and will be expanded on below.

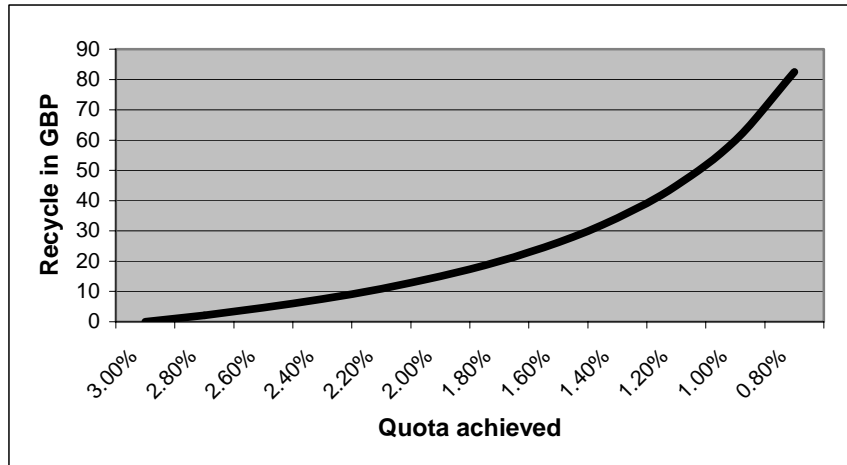
The Renewable Obligations Order, an Overview

The Renewables Obligation Order (RO) is the central part of the UK strategy for stimulating the growth of renewable energy production in a market-based and thus cost effective manner. The RO separates the underlying physical power and the green value by issuing Renewable Obligation Certificates (ROCS), which are held in a central database as a proof of renewable production. The RO came into place in 2002 and was amended in 2004; the responsible authorities are currently carrying out a review with possible changes taking effect from 01/04/2005.

The RO imposes the obligation on licensed suppliers to either source a certain and growing percentage of their electricity from renewables or to pay a certain amount into the so called buyout fund. The buyout fund is then redistributed to the suppliers who have met their obligations by redeeming ROCS. Monies raised from companies not complying is thus redistributed to companies that have met their Obligation, in proportion to the number of ROCs they presented in that year. This will act as a further market stimulation. Figure III.1 shows the relationship between the fulfilment of the quota obligation and the recycle value per ROC:

¹² For more information and analysis of the auction, see the DEFRA report at <http://www.defra.gov.uk/environment/climatechange/trading/pdf/trading-progress.pdf>

Figure III. 1: Recycle per ROC¹³



The objective of this redistribution is to create a direct link between the balance of demand and supply and the value of ROCS in a transparent and mechanical way as well as to put a protective cap on the costs consumers have to face for supporting renewables. In 2003/2004 for example, the total RO across Great Britain was 13,627,412 MWh, multiplying this by the buy-out payment of 30.51 GBP gives a total cost to consumers of 415,772,340 GBP. The timeframe of the system is currently until 2026/2027, with quota levels rising from 3% in 2002/2003 to 10.4% in 2010/2011, and the government has proposed a further annual increase in quota levels by 1% until 2015/2016. This increase will come into force from the 01/04/2005 if Parliament approves it. Table III.1 shows the respective obligation on suppliers:

Table III.1: Quota Obligation¹⁴

Year	Obligation	Year	Obligation
2002/2003	3.0%	2009/2010	9.7%
2003/2004	4.3%	2010/2011	10.4%
2004/2005	4.9%	2011/2012	11.4%
2005/2006	5.5%	2012/2013	12.4%
2006/2007	6.7%	2013/2014	13.4%
2007/2008	7.9%	2014/2015	14.4%
2008/2009	9.1%	2015/2016	15.4%

¹³ Own calculation

¹⁴ The Renewables Obligation Order 2005 Statutory Consultation (<http://www.dti.gov.uk/energy/renewables/policy/roo2005.shtml>)

The quotas are set quite high and the whole market is designed to be short at least over the first years. This is to ensure that fees have to be paid into the buyout-fund and thus the value of the recycle payment does not go to zero. It is therefore crucial to understand that payment into the buyout fund is not seen as a penalty, which has to be avoided, but as a legitimate alternative to redeeming ROCS. Without suppliers missing the quota the value of the buyout fund would be zero, thus devaluing the ROCS considerably.

Further characteristics of the RO

At a more detailed level, the RO features specific characteristics with respect to: banking, co-firing, buyout payment, relations to the Scottish market, eligible technologies and treatment of existing installations:

Banking of ROCS is restricted, ROCS produced in the last obligation period can be used for up to 25% of individual quotas. This is meant to smoothen the effect of weather etc on individual years while preventing the build-up of large stocks of ROCS, which in turn could lead to extremely volatile prices.

The use of ROCS obtained by cofiring biomass and fossil fuels is restricted. While cofiring is recognized as a form of renewable energy production, special rules and quotas on cofiring are designed to prevent the market being flooded by cofired ROCS which would then render ROCS from other technologies uncompetitive.

The buyout payment has been set at 30 £ for the 2002/2003 obligation period and is increased each year with the Retail Price Index to protect investors from inflation.

The equivalent for the RO (England & Wales) is the Renewable Obligation (Scotland) Order for Scotland. ROCS issued in Scotland are defined as Scottish Renewable Obligation Certificates (SROCS). The Office of Gas and Electricity Markets (OFGEM) administer both.

There exist separate quota obligations and buy-out funds for Scotland and England & Wales, however ROCS and SROCS can be used against both obligations. This leads to a situation where the value of the same instrument (ROCS, SROCS) might differ depending on whether it is used against an obligation in England & Wales or Scotland. In the 1st compliance period this led to the extreme situation where the same recycle value for the same instrument was 15.94 GBP in England & Wales and 23.55 GBP in Scotland respectively.

The RO features a clear delineation of eligible technologies, including: Co-firing biomass with fossil fuels, landfill gas, biomass, sewage gas, on-shore wind, offshore wind and small hydro¹⁵.

Before the RO come into place, the government supported renewable energy under the Non-Fossil Fuel Obligations (NFFOs)¹⁶ requiring electricity companies to ensure that a certain amount of electricity generating capacity from non-fossil fuel generating stations was available to them in specified periods. Electricity companies in turn set up the Non-Fossil Fuel Purchasing Agency (NFPA) as a vehicle to enter collectively into non-fossil contracts to discharge their obligations. The Fossil Fuel Levy collected from licensed suppliers recovers the additional costs. With the coming in place of the New Electricity Trading Arrangements (NETA) in 2001 the NFPA role changed. The NFPA is still buying output from existing NFFO obligations under long term contracts, now auctioning the power and the green value in the form of ROCS into the market, eligible to receive a potential shortfall via the Fossil Fuel Levy. The auctioning of ROCS via transparent online auctions with published prices undoubtedly has some merits for the market.

To be eligible, the electricity must be physically supplied to customers in Great Britain. ROCs issued in respect of electricity supplied to customers in Great Britain, whether in Scotland or in England and Wales, will be eligible for the Obligation in England and Wales.

Prices

The following table shows the average prices achieved for ROCS in NFPA auctions, the average price for ROCS in the NFPA auctions has fluctuated around £ 50 during its history from late 2002.

¹⁵ The Renewables Obligations refers to the following technologies DTI/ Johannesburg Renewable Energy Coalition (2005): C:\Documents and Settings\fgl86008\My Documents\johannesburg renewables policy.htm:
Landfill gas, Sewage gas, Energy from waste, where only non-fossil derived energy is eligible. Energy from incinerating mixed waste is not eligible. Energy from the non-fossil derived element of mixed waste using advanced technologies is eligible. Hydro <20MW, Onshore wind, Offshore wind, Biomass, Geothermal power, Wave and tidal power, Solar photovoltaics, Energy crops, Co-firing of biomass with fossil fuels (revised proposals as detailed in The Renewables Obligation Amendment Order 2003)| Any biomass can be co-fired until 31 March 2009 with no minimum percentage of energy crops.| 25% of co-fired biomass must be energy crops from 1 April 2009 until 31 March 2010.| 50% of co-fired biomass must be energy crops from 1 April 2010 until 31 March 2011.| 75% of co-fired biomass must be energy crops from 1 April 2011 until 31 March 2016. Co-firing ceases to be eligible for ROCs after this date

¹⁶ Non-Fossil Fuel Obligation
(http://www.dti.gov.uk/energy/renewables/policy/nffo_obligation.shtml)

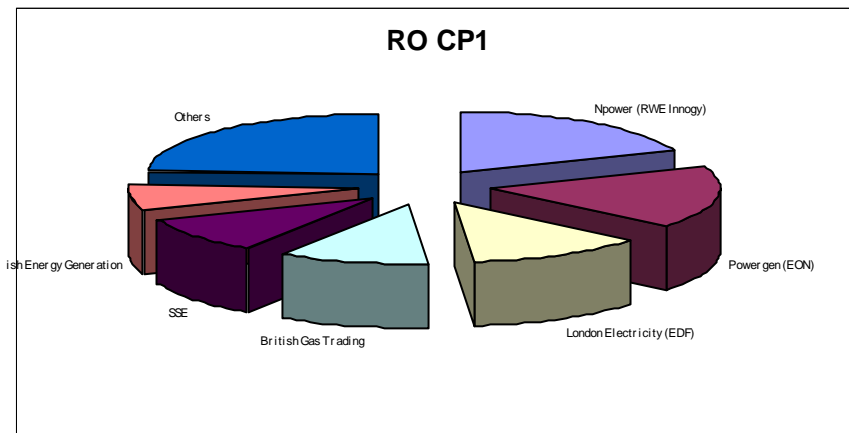
Table III. 2: Average ROCS prices in NFPA auctions¹⁷

17 October 2002	£ 47.13 MWh	20 January 2004	£ 47.46 MWh
16 January 2003	£ 47.46 MWh	20 April 2004	£ 49.11 MWh
15 April 2003	£ 46.76 MWh	21 July 2004	£ 52.07 MWh
16 July 2003	£ 48.21 MWh	10 November 2004	£ 48.50 MWh
21 October 2003	£ 45.93 MWh		

Actors and Market Structure

A few large incumbents dominate the UK retail market for electricity; the same players therefore dominate the demand for ROCS. Figure III.2 shows the RO for the largest players during the first compliance period:

Figure III. 2: Shares of suppliers in the total Renewable Obligation in the 1st compliance period¹⁸



6 large players who account for more than 75% of the RO dominate the market. This market structure has implications for the liquidity of the market leading to the following characteristics:

¹⁷ Non-Fossil Purchasing Agency (<http://www.nfpa.co.uk/>)

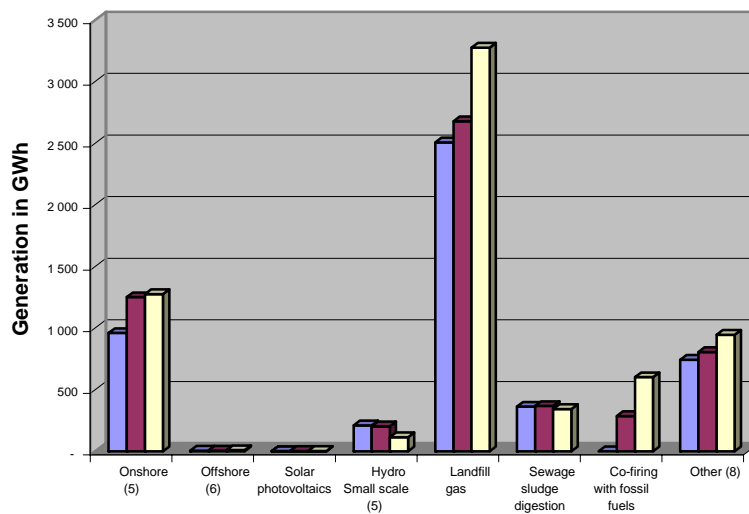
¹⁸ The Renewables Obligation – Ofgem’s first annual report (http://www.ofgem.gov.uk/temp/ofgem/cache/cmsattach/6125_renewables_obligation.pdf)

- The majority of trades are done on a bilateral basis for compliance basis and pure trading for speculative purposes is very thin.
- Many generators are not prepared to take volume risks and therefore prefer off take agreements (possibly including LECS and electricity as well) to outright trades with a fixed volume.
- There are a number of contractual structures being used to pass the risk inherent in the buyout mechanism back to the generator.

New Capacity

The process of planning, permitting, investment decision and finally building and connecting to the grid of new renewable capacity (especially in offshore wind) can take a few years, it is therefore difficult to say in which stages various proposed projects currently are. Since the RO started in 2002 it is difficult to assess how successful it has been so far in encouraging new investment. It is certain that the RO has encouraged a growth in co fired biomass generation as can be seen in the following graph:

Figure III.3: Types of renewable generation in the UK¹⁹



Co-firing of biomass fuel in fossil fuel power stations is not a new idea. Technically it has been proven in power stations worldwide, although, until recently, it was not practised in the UK. The biomass fuel is usually fed by means of the existing stoking mechanism as a partial substitute for the fossil

¹⁹ Energy Statistics: Renewables
http://www.dti.gov.uk/energy/inform/energy_stats/renewables/index.shtml

fuel. The combustion system may cope with up to a 25 per cent substitution without any major changes to the boiler design and airflows, but fuel preparation and transport systems may be the limiting feature at percentages much lower than this.

Renewable sources are also used to generate heat. The three sources of heat production in the United Kingdom are: the direct combustion of bio fuels (97 per cent of the total), active solar heating, and geothermal aquifers. Together they produced energy equivalent to 662 thousand tonnes of oil equivalent, slightly above the figure for 2002. When this figure is combined with the use of renewable sources for electricity generation, renewable sources accounted for 1.4 per cent of the United Kingdom's total primary energy requirements in 2003, up from 1.3 per cent in 2002 and 1.1 per cent in 2001.

Experiences with the RO

Shortfall in the buyout fund

The biggest setback for the RO came from a quite unexpected side and was a problem nobody had really taken into account when the system started – the credit risk within the buyout fund. The supplier TXU was obliged to pay around 23 Mio £ into the buyout fund, but went bankrupt towards the end of the first obligation period which created a shortfall of 23 Mio in the buyout fund reducing the recycle payment for redeemed ROCS from an anticipated 20.52 £ to 15.94 £. Thus the default of a single supplier reduced the value of ROCS by 20% and seriously undermined investors' confidence in the mechanics of the RO. Two other suppliers have been unable to fulfil their financial obligations to the buyout fund since, showing that bankruptcy of suppliers is a very real possibility. The credit problem within the buyout pool has been recognised and there are proposals on the table to mutualise at least a part of this risk across all suppliers.

Proposed changes to the buyout mechanism in case of a default

To mitigate the impact of any further shortfalls in the buy-out funds, the following mechanism is being proposed: If there is a shortfall of 10% or more in the total buyout fund, a mutualisation process is triggered. If the shortfall is between 10% and 50% of the total value of the buyout fund, the whole shortfall will be mutualised, which means that every supplier has to pay in the recovery fund according to his share of the RO. This recovery mechanism is capped at 50% shortfall.

No speculative trading

Trading in the ROCS market is mainly being done for compliance purposes. Nevertheless, the lack of speculative trading may be a sign of weak market credibility and trading restrictions. ROCS cannot, for instance, be cashed in without having a quota obligation. Thus it is always necessary for the trader to go through a supplier with end consumers.

The credit risk in the buyout fund is also damaging to independent trade. Many argue that there is a lack of transparency in the market as information is in the hands of a few incumbents. One can also hear the argument that prices don't show enough volatility to attract traders.

Regulatory Risk

In addition to the commercial risk from shortfall in the buyout fund and possible liquidity and structural problems in the RECS market, there is also the problem of regulatory risk. This includes concern about uncertainty of future quota levels, concerns about overriding drivers behind government policy and concerns about overriding intervention by EU policies.

No certainty on quota levels after 2010/2011

Although the government has proposed to increase quota levels until 2015/2016 this might not be enough to give investors and the financial community enough confidence on future revenues from long-term investments in renewable energy projects. As soon as there are enough ROCS produced to fulfil the quota on suppliers there is the danger of ROCS values decreasing dramatically as a) there will be no buyout fund to recycle once the quota is fulfilled and b) surplus ROCS can not be cashed in and expire completely worthless.

Conflicting Industrial Interests

In addition to national government and EU interests, UK Renewables Obligation policy is also exposed to considerable diversity in industrial interests. Renewable generators, such as the Renewable Power Association and the Wind Energy Association, are, for instance, pushing for ambitious policies and restrictions. Traditional energy-industrial actors on the other hand more inclined to support moderation and softer approaches, such as extensive co-firing where bio fuels are mixed with traditional fuels in modified conventional burners. Extensive co-firing allowances will increase compliance and lower refunding and thereby limit investments in new renewable technologies. Farming interests behind bio-crops may also support co-firing. Friends of the Earth therefore point to the effect of co-firing reducing ROC prices and thereby switching revenue away from other renewable technologies, especially wind. The potential volume of co-firing

ROCs and the ease of switching between coal and co-firing will have a negative affect on renewable investor confidence.

The problem seems to be that the Obligation mechanism may only deliver a limited share of the target, and that extensive co-firing will be needed to help out.

Policy Drivers

Government is engaged in a careful balancing act where it, on the one hand has made strong international commitments to renewables targets. On the other hand it is faced with the challenge of maintaining credible stability ion the market framework. If the rule changes are perceived as being made simply to enable the Government to meet its 10% target there will be no confidence that further rule changes won't be introduced, which fundamentally alter the dynamics of the market if Government targets are not met.

This means that investors will need to make both commercial and political bets and thus adds complexity to commercial decisions, which may increase the hesitance of market actors to invest.

Policy Influence from the EU level

Regulatory risk is also enhanced as the EU commission shapes its renewable energy policy in parallel to national authorities. UK government is therefore restricted and influenced by another decision-making level, which adds yet another source of complexity to commercial actors.

Chapter IV

The Swedish Elcert Model²⁰

The electricity certificate system was introduced in Sweden in May 2003, to stimulate generation of electricity from renewable energy sources. The goal was to increase the share of new renewable electricity with 10 TWh before 2010, based on the 2002 level. Electricity generation from wind, solar energy, peat (qualified from April 2004) and certain bio-fuels, old small-scale hydro, and any new hydropower projects, may under this scheme attain energy certificates.

The introduction of electricity certificates implied a regime shift in Swedish support policy for renewables, away from fixed subsidies towards market based support.

The Swedish el-certificate model

The Swedish certificate model is based on an obligation for electricity users, with some exceptions, to buy a certain number of certificates, depending on their total consumption, their so-called quota obligation. For ordinary households the electricity retailer, in most cases, handles the obligation. In 2003, the quota obligation was set at 7,4% of electricity consumption. This quota obligation will successively be increased, up to 2010 to 16,9% on a yearly basis.

If the quota obligation is not met, the quota-responsible must pay a levy to the state. The levy is set to 150% of the volume weighted average electricity certificate price under the given certificate period (1. April previous year to the 31. March the year after). For 2004 and 2005, the levy was however fixed at 175 SEK and 240 SEK respectively. The electricity consumption is declared to the energy authorities March 1st every year. On April 1st, el-certificates corresponding to the quota obligation must be placed on the quota-responsible's certificate account.

Preliminary statistic overviews show that about 7 million elcertificates have been issued under the period May 2003 until March 2004. These certificates came from around 1700 plants. The largest share of certificates came from bio fuel electricity production (74%). Hydropower stood for 18% and wind for 8%.

²⁰ By Arne Jakobsen and Atle Midttun

The quota obligation for 2003 amounted to 4.4 million el-certificates. Only 3.5 million certificates were redeemed, which gave a quota fulfilment of about 79%. The average price of certificates in the first period was 216 SEK.

Energimyndigheten (Swedish Energy Agency), registers eligible production devices and oversees quota compliance. When a facility is accepted, certificates are issued monthly, based on the electricity generated in the facility.

Svenska Kraftnät, the TSO/national grid company, registers fulfilled contracts including number of certificates and price. Its main task as far as the certificates are concerned, is to develop and run a register of certificates and their owners, to issue certificates, based on the measurement of electricity generation that qualifies for certificates.

At the present, the Swedish electricity certificate system only includes generation in Sweden. The Swedish government has, however, expressed an intention to allow international trade in certificates in the future²¹. Norway is presently planning to introduce a similar certificate system, which is planned to be integrated with the Swedish in 2007.

Estimated green power potential

The government's estimate at the beginning of the elcert system was that the existing annual generation potential entitled to certificates was around 6.5 TWh. The future potential for electricity generation qualifying for el-certificates is estimated by Swedish authorities as given in table IV.1

Table IV.1: Potentials for domestic green el generation (TWh)

	2010	2012	2015
Wind Power	4.2	9	10
Chp	4.5	5	6
Hydropower	2.25	2.3	2.5
Industrial processes	6	6.4	7
Sun, waves, geothermic	0	0	0
Sum "reasonable" potential	16.95	22.7	25.5

Source: STEM (2004)

Wind potential

The so-called natural potential for onshore wind is by the Swedish government estimated to be between 35 and 70 TWh. The potential for offshore wind is estimated to be 100 TWh, limited only by the sea depth.

²¹ prop 2002/2003: 40

According to the Swedish energy authorities, the technical limitations to wind power are probably determined by how the electricity system may be balanced in a cost-efficient manner. The energy authorities estimate that the limitation may be around 10-30% wind power share of the total system²². The economic potential corresponds to the technical at prices around 45 to 65 øre/kWh.

The largest practical limitation on wind power, they argue, is probably the licensing procedures, and the resource demand they put on licensing authorities.

Bio-fuelled CHP potential

The natural electricity potential for bio-fuelled CHP in 2010 is estimated by the energy authorities at 60 TWh. The span of CHP generation cost is large: between 46 – 61 øre/kWh. These potentials are based on the market managing to establish 20 boilers with an average capacity of 20 MW with a utilization of 4500 hours annually.

A central condition for introducing a new boiler is most likely the need for additional heat locally as it is not probable that well functioning burners will be removed.

However, the certificate system encourages fuel conversion and changed operation routines, that may provide added renewable energy input from existing burners. Much of this potential has, however already been activated.

Hydropower potential

The natural potential is estimated on the basis of Sweden's topography and hydrology. The technical potential has been set to 130 TWh. The technical potential for increasing generation in existing large scale hydropower facilities, in a recent Government review, has been estimated to 3.1 TWh and the economically viable potential is estimated at 1-2 TWh.

Given the time-consuming and expensive licensing procedures, and the large opposition against increased exploitation of rivers, there has been little interest in exploiting this potential. The estimated 430 GWh additional hydropower until 2020 and the further 220 GWh beyond that is expected to come from increased efficiency in large-scale hydropower within the scope of traditional maintenance programmes.

The same review has estimated the economic potential for further large-scale hydropower development to 5 TWh. The potential for small-scale hydro, which is covered by the certificate, is 1 TWh.

²² Given the integrated character of the Nordic power market, such limitations should be set for the Nordic system as a whole. Given a total energy consumption of around 400TWh, the Nordic market could carry a total of 80 TWh wind power (20%).

Industrial boilers

The Energy authorities have estimated that the renewable generation within industrial boilers can be increased to 7 TWh until 2015. Generation the first 12 months of the certificate system was 4.5 TWh renewable electricity. Based on existing plans, the Energy authorities expect generation in year 2010 to be around 6 TWh.

Solar and wave potential

Solar and wave based electricity generation are less mature techniques and are likely to find a place within the certificate system only after 2020. However, the potential for solar and wave energy is extensive.

The cost for electricity generated by solar cells is today estimated by the energy authorities between 3-5 kr per kWh and even if this cost is assumed to come down to 2 kr /kWh year 2012 and 1 kr by 2020, the electricity certificate instrument cannot be used to support this development.

There is an estimated potential for commercially exploitable wave energy of 12 TWh in Sweden. At the present, prototypes are being tested, and the Energy authorities expect considerable wave energy to come on stream after 2020.

Potential for bio fuel

The increased generation in industrial boilers and in CHP that have been commented on earlier will demand large quantities of bio fuel. The potential for additional ecological, technical and economic exploitation of bio fuel, is, estimated to 78 TWh, by the Energy authorities compared to the existing exploitation of 125 TWh/year. It is seen as realistic to increase bio-based power generation by 3 TWh until 2010.

Actors and interests

The Swedish Elcert scheme has involved a number of actors both including paper and pulp industry, regional heating, traditional generators as well as new wind generators, energy suppliers and industrial and a few domestic end users

Paper and pulp industry

Swedish paper and pulp industry have traditionally generated electricity from waste products from the paper and pulp production. Particularly chemical processing with black liquor as a waste product has been used for energy generation, while also utilising the heat for industrial processes. Mechanical processes have to a lesser extent resulted in energy generation.

While energy generation from paper and pulp industry has served as part of waste management and self-supply of electricity, the new certificate market has provided a new focus on energy generation as an attractive business area. Paper and pulp industry is therefore gearing up electricity production and is building up further capacity.

Energy intensive industry has a “zero” obligation initially, and with extensive gains from their supply side involvement for a number of these actors, they have thus seen major windfall profits. As an increasing number of other countries introduce similar certificate schemes (Norway being one of the first candidates) the industrial policy motivation reasoning behind the temporary quota exemption gradually disappears and hence one may expect a real quota obligation to be introduced sooner or later.

The annual consumption of electricity for this segment is close to 40 TWh, and exposing this industry segment to the quota obligation will have major implications on the supply/demand balance in the market for certificates

Regional heating

Swedish regional heating industry has also been one of the contributors to the elcert supply. The certificate adds on to the electricity price and makes bio fuel an interesting alternative to coal for this industry. We have therefore seen extensive fuel switching to profit from the new certificate market.

Like for the paper and pulp industry, the certificate market may stimulate refocusing and motivate this industry to develop electricity generation as a business area. Some companies may be motivated to install electricity generation capacity in the existing heating system, and it could also motivate these companies to uphold production for electricity only in periods where heating is not required. For this purpose, they may develop cooling capacity to match the electricity generation instead.

Wind-power generators

Some wind generators may so far have had advantage from the Elcert market through transition regimes. The support given to this segment under the previous regime included 9 øre/kwh + environmental bonus of 18 øre + additional investment support. With the introduction of the elcert system the environmental bonus was gradually removed. The 9 øre/kwh already previously removed.

With the elcert model, this generation segment was introduced to a new support scheme more or less at the level of the old one. However the lack of a long-term certainty of the market for certificates has resulted in a more or less full stop of new investments decisions for wind power. However, the volume of new wind power developments that passed the

investment decision in Sweden was not very impressive, even before the elcertificate scheme was introduced.

Hydropower generators

Existing (by May 2003) small hydro-, as well as all new hydro production is also covered by the Elcert support regime. These generators received less support under the old regime (only 9 øre/kwh) and may be more easily accommodated under the Elcert regime. The owners of these generation facilities are typically the large el-companies, and to some extent the medium-sized regional electricity generators.

Potentials for new, added capacity within the segment is limited; the main reason being strong opposition within Sweden to license further hydropower generation.

Electricity suppliers

As default demanders, electricity suppliers have not experienced a strong competitive challenge in attracting customers. The traditionally low customer focus on electricity supply has spilled over to the certificate market and allowed a comfortable profit level for this new market segment. In practice these actors have been able to pass on the certificate-cost to the consumers.

Industrial actors that have opted for direct demand responsibility

As a consequence of the sizeable transaction costs charged by the electricity suppliers, a number of industrial actors have opted for direct demand responsibility and are managing their obligations themselves. However during the first quota year, only a total of 64 consumers (industry and households) opted for and registered as voluntary quota-obligatory. Most of these consumers were supposedly industrial actors.

Households that have opted for direct demand responsibility

Very few households have opted for direct demand responsibility. Given the marginal importance in the personal economy, this has been a field for green enthusiasts. The energy authorities have estimated that a minimum of 25 000 kwh of annual consumption is required for a household/consumer to profit from registering as a voluntary quota obligatory. However, this implies that the subject consumer is willing to “free of charge” spend necessary time to follow the market and contract certificates.

Markets/ Contracting and arenas

During the late planning phase of the Swedish certificate market a number of established energy suppliers with access to and understanding of the coming regulations and market fundamentals acquired certificates for a price around 100 SEK/MWh. The sellers were typically owners of smaller generation units (wind or hydro) that would lose the old 9 øre/kwh support and hence were willing to sell off at this price level.

Trade was typically bilateral, between large producers and distributors, often within the same integrated company. However, OTC, or broker-mediated trade also dominated this trade.

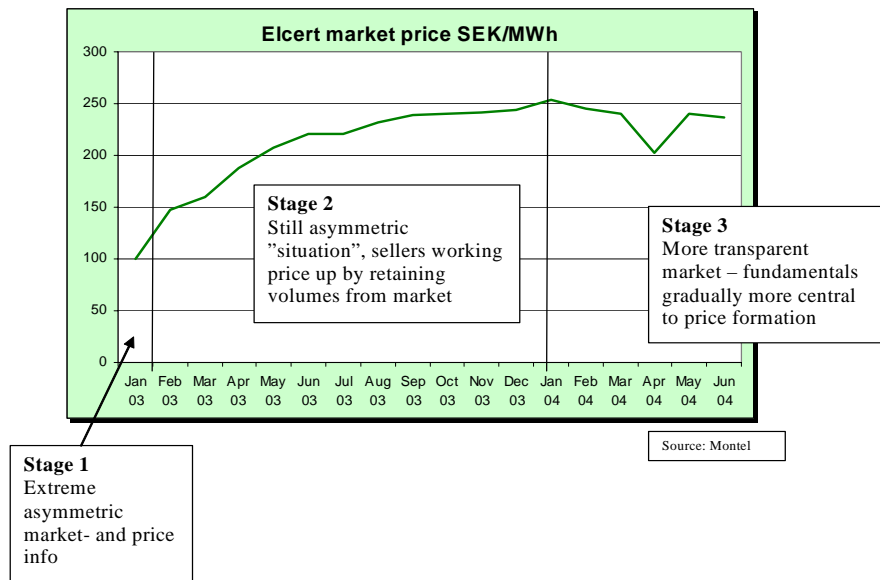
Specialised brokers such as Greenstream Network and Natsource were initially major intermediaries in this trade, along side specialisation within the large Swedish utilities such as Vattenfall, Sydkraft and Fortum.

The typical contract was a forward contract, based on meeting the annual quota obligation. Typically this would entail the producer providing steady generation for a period of ½ to 1 year on a fixed price basis. There are a few long contracts spanning several years.

The generators effectively managed to “work” the market price up from a level of 120 SEK to approximately SEK 240-250 SEK/MWh (figure IV.1). This was done by partly “window shopping” through which sellers provided constantly higher prices on the sell side of the spread, and then often disappeared before closing deals, but also through active trading. The price level of 240-250 SEK/MWh corresponds well to the tax adjusted sanction fee of 175 SEK/MWh, and hence represented a price-cap for this period.

More recently brokering has been taken over by large general power brokers like Montel, ICAP and SKM. The market price has remained at a level of 230-240 SEK/MWh, with the exception of an intermediate dip down to approximately 200 SEK/MWh. As we passed the deadline for reporting- and settlement of the quota year 2003 in end March 2004, there were expectations within the market for a price increase towards the level of the 2004 sanction fee adjusted for tax (approximately 330 SEK/MWh). However this development did not materialise. In the spring of 2004, Nord Pool introduced a spot-product with a related financial settlement, but this has hardly been traded. The spot orientation replicates the regular power market, and did not meet the forward needs of the elcert market, given by the regulatory design. With an underlying liquid spot-market missing, long-term financial derivatives to provide an alternative to “physical” forward contracting were absent as well.

Figure IV.1: Price development and stages²³.



The environmental effects

For existing wind power, the electricity certificates do not trigger any major increase in generation. The marginal generation costs are lower than the existing price in the regular electricity market, and hence electricity generation from these facilities, therefore, already makes sense. However incentives for optimisation of operations are increased as a result of the increased revenues from existing production capacity.

For small-scale hydropower, the certificates represent extra profitability for, in most cases, already profitable generation. However, the certificates provide incentives to undertake maintenance and upgrading leading to increased generation.

Also for bio-based CHP, the certificates have provided extra income for already profitable investments, but have not led to any extensive increase in electricity generation capacity. Some 1 to 3 TWh additional renewable electricity generation has though been introduced from generators that have switched to bio fuels from fossil fuels. High electricity- and certificate prices have made CHP generation profitable even in periods with low demand for heat. It is, however, by the end of 2004 estimated that the bulk of this potential for added renewable electricity generation has been exhausted.

²³ STEM 2004, with adjustments.

Having stated this, it should also be noted that by the end of 2003 only 50 % of the capacity installed within the CHP segment is fuelled by bio. This means another 3 TWh of fossil fuelled CHP still in theory could be replaced by bio fuel. However this capacity cannot be completely fuelled by bio for different reasons.

Concerns

In spite of reasonable technical performance, a number of concerns have been raised about the Swedish elcert market. A major concern has been with the ability of the market to drive investments in new technology. In their second market evaluation, the Energy authorities remark that the el-cert system has not yet led to large new investments in renewable el. While they do not doubt the capacity of the market to drive investments, the time frame needs to be prolonged. The five years perspective originally introduced is obviously too short.

However, the el-certificates provide sufficient support for minor investments, including activities that dominantly imply supplementary investments to further e.g. change in fuelling of already existing plants.

Concerns have also been raised about market transparency and strategic behaviour. A number of actors have complained that the non-compliance fee has functioned as a price target. Furthermore that the unlimited banking availability has given the producers large market power, and that the non-compliance fee should not go to the state but to the renewable energy producers. Small actors have complained about the costs and complexity of trading and would like Nord Pool to take a more leading role as far as certificate trade is concerned.

Furthermore, the Swedish authorities have been criticized for underestimating production year 2002. A quicker and larger conversion took place than what the certificate inquiry expected, with a surplus of certificates on the market.

Further discussion of challenges and dilemmas of the Swedish certificate market is given together with the two other markets in the following concluding chapter on challenges and opportunities.

Chapter V

Challenges and Opportunities

In the introductory chapter, we have pointed out that, as a policy tool green markets involve a number of design challenges including:

- Static efficiency considerations such as the need to convincingly display transparency, liquidity and competition.
- Rationality considerations, such as how far such quasi-markets can be designed on a rational basis, as against learning by doing, where market construction becomes more of a learning process²⁴.
- Innovation considerations, such as how efficient promotion of mature environmental technologies may be combined with the need to promote less mature technologies that may need differentiated niche markets to develop their “learning curves”.
- Distributive concerns, such as how one may avoid “unfair” distribution between nations and windfall profits to special domestic interests.

Having explored the development of three green markets in Europe, we shall - in this chapter - briefly sum up some of the most important challenges, opportunities and learning points under each of the major design challenges listed above. By way of conclusion, we shall subsequently outline some of the specific opportunities and challenges in designing green electricity markets on a European scale.

Transparency, Liquidity and Competition

When we consider the green electricity markets from a static efficiency point of view, competition, liquidity and transparency issues are particularly challenging, given the small scale and national character of most certificate markets. As shown in the preceding sections, concerns about competition have been raised in all three cases.

In the Swedish el-certificate case, there have been complaints of limited transparency and strategic behaviour. Large parts of the trade are handled bilaterally, or through OTC brokerage, and hardly any volume is traded over the more transparent Nordic power exchange, due, in part to

²⁴ This applies particularly to the complex multi-market effects arising from the impacts of the green markets on the underlying regular electricity markets.

deficient market design. Nord Pool's certificate market has therefore, thus far, not had sufficient volume to become a central reference point for transparent trade.

As previously pointed out, the price in the Swedish certificate market rapidly rose to the level of the non-compliance fine, in spite of over-supply of certificates. The latest review by the energy authorities noted that there were concerns about possible strategic behaviour from the paper and pulp industry to keep up the certificate prices in a situation with a sizeable over supply of certificates. These concerns are raised even though the fairly broadly dispersed biomass generation has served to enhance competition in the Swedish elcert market, compared to other certificate markets (Bye et al 2002).

Final judgment of motivations behind market strategic behaviour is difficult to pass, however, as banking option allows accumulation of certificates for use under future scarcity and many thus motivate current under-supply of certificates. One could argue that the flexibility inherent in the banking option should not carry all the blame for deficiencies in the Swedish market development. It has been claimed that rather the sanction price mechanism is more to blame. Starting with a fixed and thereafter increasing price, and finally taking away the sanction mechanism all together, has motivated saving of certificates in order to cash in under future scarcity, that everybody expects, because there are few actors that dare to invest under a regime that only lasts until 2010.

During the first year, with certificate prices at the sanction price level, the increasing sanction price may have led some actors to expect further price increases, and therefore to save certificates in spite of the problematic negative signals from a fundamental surplus of certificates in the market. This strategy has indirectly been supported by the Energy Authority (STEM) that has continuously argued that the fixed sanction fees have a price-indicating function.

Serious questions have also been raised about the competitiveness of the UK ROCS market and it has been argued that competition suffers under the lack of speculative trading, leaving trading in the ROCS market mainly for compliance purposes. The lack of speculative trading is due to several factors, including the fact that

- ROCS cannot be cashed in without having a quota obligation. Thus it is always necessary to go through a supplier with end consumers.
- Prices don't show enough volatility to attract traders.
- Lack of transparency in the market with information being in the hands of a few incumbents.

In the Dutch green certificate market, liquidity was more than sufficient in the early years due to extensive international trade. Allowing imports into

the scheme has definitively helped this liquidity beyond hopes. However, as the tax incentive decreased and were abolished, liquidity severely dried up.

In all three cases, practice from competition authorities so far has been to go soft on green markets, as they are in an initial build-up-phase. Nevertheless, there is probably a limit to how long such de-facto amnesty from competition law could last without giving rise to serious questioning. Like for the underlying electricity markets, internationalisation might be necessary to cope with the structural challenge. As green certificates may in principle be traded without any attachment to physical power flows, and internationalisation in this case would, therefore, not be limited by the physical system.

Learning Versus Stability

A major challenge in developing green certificate systems has been to balance stability and learning in regulatory design. We have previously pointed out that: On the one hand the depth and complexity of regulatory engagement in construction of the green market dictates extensive regulatory learning. On the other hand, short sightedness and frequent shifts in regulatory framework may also have a negative effect on industrial innovation, as it might undermine confidence in future framework conditions as a basis for technological investment decisions.

The challenge of dynamic learning and quickly changing framework conditions were particularly clear in the Dutch case: Startled by the rapid developments of the market, policy makers decided at a too early stage to evaluate and revise the market system. The market and its players did not have sufficient time to properly respond to the new market conditions. Consequently, conclusions were drawn based on incorrect market assessments. The continuous policy changes and even the threat of further changes led to an unstable investment climate. Combined with the lack of a clear long-term perspective of the Dutch government on the priorities and choice in the renewable electricity market this resulted in reluctance to undertake new investments.

More specifically, investments were impeded because investors in green energy experienced: 1) lack of commitment and short-sighted reviews of the scheme leading to the conclusion that it was ineffective in developing new capacity; 2) lack of transition periods; 3) that banks and other financial actors distrusted the promised subsidies because of floating regulatory environment, leading to no-one getting financing without a power purchasing agreement being closed with an energy supplier before development (risk transfer to energy suppliers and traders); 4) that change in regulatory route at the whim of the government had left many stranded with their investments, like for example Nuon in Norway; 5) lack of a long-term

view on what the government really wants with prices being anyone's guess. The effects of these dramatic changes in framework conditions is clearly illustrated by the significant reduction in the number of planned new investments on the Dutch market in the last few years

The English and the Swedish green electricity markets have not seen comparable dramatic shifts in regulatory design. Nevertheless, in both cases, there have been industrial concerns with open-ended policy positions and lack of long-term government commitment.

In the UK case, although the government proposed to increase quota levels until 2015/2016, this might not be enough to give investors and the financial community enough confidence on future revenues from long-term investments in renewable energy projects. As soon as there are enough ROCS produced to fulfil the quota there is the danger of ROCS values decreasing dramatically because there will be no buyout fund to recycle once the quota is fulfilled and surplus ROCS can not be cashed in and expire completely worthless.

Similarly, concern has been raised by Swedish wind generators that the time-horizon for the certificate period was too short and that uncertainty of regulatory change was too large to motivate substantive capital investment. The main volume of certificates has come from already existing bio-fuel plants that have undertaken marginal investments in fuel conversion. For bio-based CHP, the certificates have provided extra income for already profitable investments, and have therefore not led to any extensive increase in generation. About 1 TWh extra electricity generation has, according to Kåberger (2004), come from generators that have shifted to bio fuels from earlier fuel mixes with fossil components. High el- and certificate prices has made Chp generation profitable even in periods with low demand for heat. It is estimated that this should have led to some 0.5TWh extra electricity generation. For wind-power, however, the elcert model has implied a lowering of support for new capacity and a stronger risk exposure.

Yet the complexity of designing markets with responsibility for also balancing supply and demand may necessitate considerable learning and adjustment. The government estimate at the beginning of the Swedish elcert-market was that the existing generation capacity entitled to certificates was around 6.5 TWh. After the first year of the certificate system, the total production was 10 TWh. It is therefore also understandable that government needs adjustment opportunities and therefore refrains from strong long-term commitments.

Should the quota obligation increase beyond resources available at reasonable costs, one could risk dramatic price increases, given that the absolute non-compliance fine in the Swedish elcert-arrangement is taken away and substituted by a fine derived from the market price. The Swedish

government has therefore, as previously presented, taken great care to explore the resource potential for eligible certified generation and the potential for licensing them. All the same, such estimates are ridden with uncertainty, and illustrate the challenging task of taking explicit responsibility for defining market preferences. The fixed price ceiling in the first period proved to be an important balancing factor, yet rather paradoxically, given the large supply surplus.

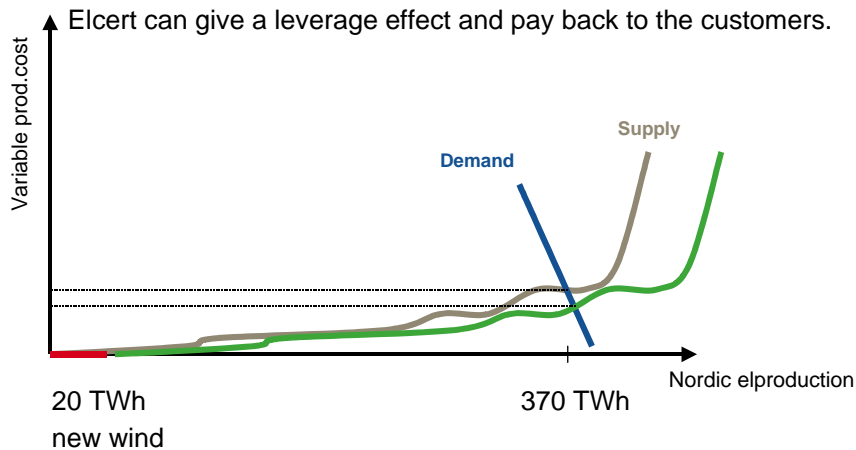
These examples illustrate that the challenge of regulatory learning is indeed a difficult one. Paradoxically, dynamic learning at the policy level may undermine innovative investment and learning at the industry level. Trading off policy learning and flexibility against stability is, therefore, a careful balancing act.

Multi-Market Complexity

The perhaps greatest challenge to a rationalist market design is to overview the interaction between the new certificate markets and the underlying electricity markets. Several analyses point out that introduction of green certificates through quotas may have effects on the traditional electricity markets that are not trivial to overview (ECON 2004; Bye et al, 2001).

In order for the goals for electricity from renewable sources to be met by 2010, the electricity certificates must trigger considerable investments in new capacity. Such investments increase the total generation, which leads to a lower electricity price. A lower electricity price stimulates the demand, which again leads to increased demand for certificates, to a higher certificate price, increased profitability for renewable generation, investments in new generation capacity, and hence lower prices in the regular power market etc. The el-certificate system can be said to have a price-limiting effect on the basic power market, if the renewable electricity displaces expensive marginal electricity generation (figure V.1). However, this will have to be balanced off against the increased costs of higher green el quotas, which at a certain point will outweigh the price fall in the regular electricity market

Figure V.1:



From a security of supply point of view, the increased generation from the green electricity market might have positive effects, although some of the new renewable portfolio might have rather fluctuating input. However, the resulting price fall could also limit investment in traditional technologies, such as gas fuelled CHP, that might otherwise have been built.

Recently, focus has also been on the unintended effects of Dutch certificate trade on the electricity flow between Scandinavia and continental Europe. While Scandinavia was experiencing power shortage and price peaks during winter 2002 and 2003. Dutch demands for green electricity imports to actually flow across Scandinavian and North European borders implied that cable capacity was reserved for electricity flows against market needs. While the electricity market dictated south-north flows, the certificate trade dictated flows the other way (Jess Olsen 2005).

It appears that the complex interaction effects can only partially be anticipated by deductive analysis. Extensive experimental learning is therefore likely to be necessary, indicating that development of new quasi-markets may possibly be just as adequately described as innovation and experimentation as by rational design.

Green markets and innovation

From an innovation policy point of view, the innovation challenge is that a certificate system with competitive price formation will, at the most, only stimulate the development of the most mature technologies such as bio-fuel and wind and may not further development of immature renewable energy technologies. Different green technologies are at different stages of

development. If the certificate market in line with static efficiency considerations only supports the most efficient green technologies, in the most efficient locations, this may create a lock-in from an innovation policy point of view. Immature technologies will thereby not be adequately financed and promising new technologies with a steep learning curve may never be developed.

If, as indicated in numerous studies, including the IEA's study on energy system transformation (OECD 2003) there is a need not only for research and development, but also for actual market application to develop operative technology, then also immature technologies need niche markets to be taken further. New renewables such as wave power or solar cells would need additional support beyond the certificate price generated in a competitive market for mature green technologies over a considerable period to develop their potential.

Given the low risk/ low cost strategy of fuel conversion, compared to the higher risk strategy of wind power investment, one could argue that the market actors have responded soundly from a static efficiency point of view, and that exploitation of the wind power should under any circumstance only have come after saturating the fuel shift potential. Nevertheless, from a dynamic efficiency perspective, there is concern that a more long-term stable framework needs to be put in place for the more long term "next generation" investments to take place.

Neither the Dutch, UK nor Swedish green electricity markets have successfully developed differentiated niche markets for immature green technologies. Having problems with liquidity and transparency already, further differentiation of small markets to drive innovation, would be highly problematic.

Green Markets, Industrial Policy and National Positioning

Green markets are part of industrial policy and national positioning on the EU and international climate policy arena. As such there is implicit and or explicit expectation of national industrial and/or compliance return.

From an industrial policy point of view, the Dutch green electricity market had many flaws: The main mistake in the design of the system was that the one-sided market opening for imports left the Netherlands in an isolated position. Without any requirements for reciprocity foreign renewable electricity producers could enter the Dutch market while Dutch producers had no possibilities for export.

A second key mistake was to rely too strongly on the interpretation of target setting in the Directive, without solid verification of this interpretation with the Commission. The Dutch government had interpreted the target setting in the renewable electricity directive correctly as

consumption targets. When carefully reading the text²⁵, the Dutch interpretation in itself would seem correct, but it was in practice not shared by other EU member states²⁶. Thus, while the Netherlands relied upon being able to account the imported certificates to their national target, the exporting countries regarded these certificates as representing part of their national production to be included in the counts to meet their target. Only in 2004 did the Commission clarify that imported certificates could contribute to consumption targets, but then only if the exporting country had agreed. Such agreement was not explicitly negotiated with the exporting countries at the time.

A third design failure was that insufficient restrictions were set on the inflow of imported certificates. Consequently, large import flows were achieved but severe doubts were raised about the quality of these imports. Electricity could be exported to the Netherlands from aging installations and other installations that had already received national support in their own market. In that way some renewable electricity generation was paid for twice. In spite of the fact that the support scheme was intended to bring new generation capacity on stream, irrespective of its location in Europe, it brought about much less new capacity than was paid for.

In the UK case, the more symmetric organisation of the English and Welsh and the Scottish market raised less industrial policy concerns. As already mentioned, however, there exist separate quota obligations and buy-out funds for Scotland and England & Wales, where ROCS and SROCS can be used against both obligations. This led to a situation where the value of the same instrument (ROCS, SROCS) might differ, depending on whether it was used against an obligation in England & Wales or Scotland. In the first compliance period this led to the extreme situation where the same recycle value for the same instrument was 15.94 GBP in England & Wales and 23.55 GBP in Scotland respectively.

The Swedish elcert market remains restricted to one country. However, negotiations over expansion into a common certificate market with Norway are raising some industrial policy concerns. The calibration of the green electricity requirement over time is one such issue. Obviously, some symmetry must be established between the two countries on critical dimensions, in order to establish reasonable burden sharing. Industrial policy concerns have also been raised over unequal treatment of industrial groups. Paper and pulp industry is, for example much more favourably treated in the Swedish than in the proposed Norwegian regulatory design.

²⁵ This interpretation is literal and intentional re the directive text – reading the footnote of the annex “carefully” could justify the misinterpretation that it is not a consumption goal or rather a production target

²⁶ The directive leaves it to member states to implement the intended consumption target, in effect, as a production target and thereby deselecting the option of internal trade.

Internationalisation potentially implies efficiency gains, as it allows exploitation of comparative advantages. However, this may in turn, create distributive problems, since the allocation of potentially competitive green el generation may not be evenly distributed across the participating countries. As national authorities impose the levy as an extra cost, there may be reactions if the industrial returns multiply in one country and are absent in another.

Domestic distributive issues

In addition to the international distribution of costs and benefits, the distribution of gains and losses, between domestic actors, has also been a major concern.

In the Netherlands, creating a new product (i.e. green certificates) next to the physical energy has raised the issue of ownership. Regional utilities with long-term 'feed in tariffs' agreement with small producers have found themselves having to deal with these producers claiming ownership of the green certificate. This problem, although often raised by the sector, occurred once more during the introduction of the MEP, which re-split the subsidy into green certificates on the one hand and a 'feed-in tariff' on the second hand.

In Sweden, the debate over the elcert model focused on the fact that the transition to electricity certificates has had relative different effects for different generation technologies. The certificate price of over 200 SEK/MWh has implied more than a doubling of the compensation to bio-fuel and small-scale hydropower (Sandberg 2004). Actors with bio-fuel and hydropower facilities, such as the paper and pulp industry, have therefore been seen to harvest large windfall profits. Furthermore, critique has been voiced over the fact that the same paper and pulp industry is itself exempted from quota obligations. For wind-power, however, the elcert model has implied a lowering of support for investments in new capacity and a stronger risk exposure over time, while existing capacity has stood to prosper under generous transition rules.

In the UK, one of the major debates on distribution of gains and losses has been the credit risk from the buyout fund. The supplier TXU was obliged to pay around 23 Mio £ into the buyout fund but went bankrupt towards the end of the first obligation period which created a shortfall of 23 Mio in the buyout fund, reducing the recycle payment for redeemed ROCS from an anticipated 20.52 £ to 15.94 £. Thus the default of a single supplier reduced the value of ROCS by 20% and seriously undermined investor's confidence in the mechanics of the RO. Two other suppliers have been unable to fulfil their financial obligations to the buyout fund since, showing that bankruptcy of suppliers is a very real possibility. The credit problem

within the buyout pool has been recognised and there are proposals on the table to mutualise at least a part of this risk across all suppliers.

To mitigate the impact of any further shortfalls in the buy-out funds the following mechanism is being proposed: If there is a shortfall of 10% or more in the total buyout fund, a mutualisation process is triggered. If the shortfall is between 10% and 50% of the total value of the buyout fund, the whole shortfall will be mutualised, which means that every supplier has to pay in the recovery fund according to his share of the RO. This recovery mechanism is capped at 50% shortfall.

Whether we are facing questions of green certificate ownership, windfall profits or shortfalls in buyout funds, distributive issues are likely to be particularly important, given the artificial character of the certificate market as a “political construction” The question of legitimacy both of procedures and outcomes is therefore critical.

Opportunities and Challenges in Designing Green Markets on a European Scale

Having recently initiated CO₂ emission trading, one may ask why the EU should embark on supplementary trade in green electricity. The extensive EU ambitions in bringing about green transformation of the energy system, however, call for strong instruments and efficient resource utilisation both in the short and long run and there are good reasons to expect stronger effects from green electricity markets than climate policy instruments. Climate instruments have to be negotiated to meet complex multi-sectoral considerations, where least common denominator usually becomes the acceptable target among the sectors. Green electricity markets, on the other hand, can be calibrated to a higher performance standard, irrespective of other sectors.

Besides the efficiency gains from competitive exposure in national markets, the major efficiency effect of certificate markets will be added only with international standardisation and market integration.

Large European volumes also unleash learning effects on a large scale over large series and may therefore enhance innovation. Furthermore, a larger integrated European market for green electricity would allow more extensive market differentiation than closed national markets and therefore facilitate niche markets for immature green technologies, alongside the general green el markets. More fragmented national technology applications may not achieve the same learning improvement.

However, large variation in green market design as well as more fundamental disagreement over policy tools makes the development of a European certificate market difficult to achieve.

Many challenges faced in our three national cases will also face the EU green certificate market. A major challenge with market-based instruments is that they trigger strategic industrial adaptation. On the one hand such triggering carries large dynamic potential for mobilisation of resources to reach environmental policy goals. On the other hand they also imply a risk of unforeseen side effects - if companies develop market-strategies out of line with public policy expectations. Some of the strategies from large hydropower producers to acquire windfall profits in the Dutch green electricity market are cases in point.

As pointed out in the previous analysis, unleashing of market-based investment strategies demand policy-stability and long-term commitment. The constant change in the Dutch policy framework and the relative short-term orientation of the Swedish and UK schemes, have not yet unleashed large scale investment in build-up of new green electricity capacities. This has created a fundamental mismatch between the risk-positions of potential investors, and the long-term environmental policy goals. With the limited assurance of long-term policy commitment, the retailers are not able to provide the long-term contracts that are needed as long-term hedges for investors.

Presumably integrating agreement under EU regulation may be more stable, as the multinational character creates a lock in to established solutions. On the other hand, such agreements may be much more difficult to arrive at. The complexity of existing green electricity market designs are a strong indication of the wide spectrum of policy positions, even within market-oriented nations, and represent a basic challenge to market-integration. On the one hand, the Dutch market has featured extensive international openness and has been consumer and demand side driven through the tax exemption and partly generation support. On the other hand, the UK market has featured politically induced obligation targets and a non-compliance fine, which has driven the market.

The Dutch market was, in its initial stage of international openness faced with supply abundance from extensive renewable supplies in neighbouring countries. The UK market, on the other hand was under-supplied, in comparison to the obligation targets. This was done quite deliberately in order to have substantive fine payments go into the buyout fund, thereby providing incentives for development of further renewables supply. As the fine set an effective ceiling there was no danger of wild price developments.

While the non-compliance fine in the UK market sets an upper limit to price formation, the Swedish elcert system, is much more vulnerable to imbalances in the supply and demand. Since the price ceiling is set at 150% of the average market price over the year, gross imbalances could have

dramatic effects. Swedish policy-makers are therefore under strong pressure to set the certificate demand at a realistic level.

The UK and Sweden have also pursued widely different policies on inter-period trading. While the UK allows only limited “banking” - 25% from one year to the immediate next in order to minimize the possibility of strategic behaviour; Sweden allows unlimited banking for the whole certificate period, and argues that this increases market efficiency.

Nevertheless, the likelihood of achieving international standardisation through market-based means is probably greater through market development than through political coordination of planned economies. As argued by Midttun & Koefoed (2001), the sequential alignment of regulatory market opening and internationally oriented industrial strategies may constitute a self-reinforcing mechanism for market internationalisation.

At the end of the day, such alignment should focus on simplicity and recursion to well established market models. As politically constructed markets, green electricity must, more than traditional commodity markets, stand the legitimacy test. Transparency, simplicity and recursion to known model may help provide the necessary assurance.

Well conceptualised symmetry conditions between integrated market systems is, as already mentioned, another necessary pre-condition for a well functioning European market. Without well developed symmetry in essential parameters, the Dutch case indicates how business strategies may undermine the trading system.

Given the loose federal character of the European Union, and the prevalence of strong planned economy tools in several member countries, development of green electricity markets will probably in its initial phases have to come about through bilateral agreement rather than by strong EU policy dictate. Only with successful demonstration of viability of international green electricity markets, will the EU be able to move on towards a common European market based platform.

With a few successful national regimes backed up by international industrial strategies there might be a possibility for a broader European market to take form. Many countries are going to feel a strong need for efficient greening and international trade when the deadline for fulfilment of their green electricity targets moves closer.

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