

Greening of European Electricity Industry

The challenge of policy integration across cognitive
and administrative specialisation

Mari Hegg Gundersen, Anne Louise Koefoed
and Atle Midttun

Research Report 5/2004

BI Norwegian School of Management
Department of Innovation and Economic Organisation
Centre for Energy and Environment

Mari Hegg Gundersen, Anne Louise Koefoed and Atle Midttun:
*Greening of European Electricity Industry: the challenge of policy integration across
cognitive and administrative specialisation*

© Mari Hegg Gundersen, Anne Louise Koefoed and Atle Midttun
2004

Further reproduction prohibited without permission

Research Report 5/2004
ISSN: 0803-2610

BI Norwegian School of Management
P.O.B. 580
N-1302 Sandvika
Phone: +47 67 55 70 00

Printing: Nordberg Hurtigtrykk

The report may be ordered from:

Norli
Phone: 67 55 74 51
Fax: 67 55 74 50
Mail: bi.sandvika@norli.no

Abstract

Focusing on greening of electricity industry (GEI), this report¹ explores the positions and outlook of various units within the EU system with mandates in the greening of electricity industry process. The study takes a knowledge-based perspective on administrative decision-making, where administrative units are seen as carriers of cognitive models and as specialized competency networks.

Embedded in the EU's administrative management of GEI, the study finds positions that can be referred to as four underlying conceptual models:

1) The market efficiency model, which is typically found in units handling internal market policy, competition policy and de-regulation policy of the EU. The core focus of this model is on efficient allocation of economic resources between alternative deployments in an economy where both economic resources and technologies are given and scarce.

2) The innovation/exploration model, which relates to the innovation policy dimension of GEI. Environmental reorientation of the energy system is here seen as a question not only of efficiency, but also of technological change. The core focus of this model is new industrial development and growth as a function of innovation.

3) The eco-efficiency model, which relates specifically to the environmental policy dimension of GEI. The greening challenge is here transformed into economic incentives. The core focus of this model is on internalisation of costs of environmental damage and negative external effects into the business model and into the regulatory market design.

4) As a major input factor in the economy GEI also raises important industrial policy concerns. The core focus of the industrial policy model is on building up and maintaining industrial capabilities within the territorial domain in focus, in this case the EU.

The final part of the report develops an outlook on future European GEI policy, drawing on each of the perspectives and relating the policy alternatives also to the interests of the European Parliament and member countries. It is argued that the market efficiency model, with its eco-efficiency extension, is hard to defend politically when seen from the perspective of the EU Parliament or when related to the distributive interests of member countries.

¹ This is the second report that comes out of the project named "The Energy- related Environmental Policy Game" financed by Norwegian Research Council, Industry and Energy and the Norwegian Energy Association (EBL), project no. 146690/210. We are grateful for the contributors' support of the project.

In comparison, the innovation/exploration approach has many strong sides as far as EU policy-making is concerned. With a niche market strategy, and/or project based financing, the innovation perspective creates the possibility for partnerships rather than confrontation with existing member state and industrial interests. The flexible tools in the innovation approach also allow for tradeoffs between different fractions in Parliamentary decision-making. A disputed weakness of the innovation model, if applied as a dominant strategy for greening of electricity, however, is its debateable efficiency and high costs.

The outlook on greening of electricity industry coming out of the industrial policy model is ambiguous in so far as this model can be applied at different levels - from the individual nation state to the EU level. With a dominant focus on low input energy prices as part of a European industrial competitiveness strategy, this model has a credibility problem as far as GEI is concerned.

While in a static perspective the policy outlooks derived from the different cognitive frameworks may conflict, a dynamic perspective could show them to be more complementary.

As a final point, the report notes that irrespective of the production side solution to GEI in Europe, European energy policy is conspicuously under-developed when it comes to initiatives to reduce energy consumption.

Keywords: EU energy policy, greening of electricity, renewable energy sources, innovation, policy models

Content

Abstract	3
Introduction	7
The Challenge of Functional Specialisation	9
The Challenge of Functional Specialisation	9
The market/efficiency model	9
The innovation / exploration model	10
The eco-efficiency model	11
The industrial policy model	12
Approaches to and Perspectives on Greening of Electricity Industry in the European Commission	13
Directorate-General for Energy and Transport (DG TREN)	15
Conventional Energy Directorate (C):	15
Electricity and Gas unit	15
New Energies and Demand Management Directorate (D)	17
New and Renewable Energy Sources Unit	17
DG Research	19
The Energy Programme	19
DG Environment	21
Climate Change Unit	21
DG Competition	23
Horizontal State Aid Unit	24
DG Enterprise	25
Unit E1; “Environmental Aspects of Enterprise Policy”	26

Outlook on Greening of Electricity Industry in the EU	28
Outlook derived from the market efficiency model	29
Outlook derived from the innovation model	31
Outlook derived from the industrial policy model	33
A dynamic perspective on GEI	34
References	38

Introduction

Over the last decade, the European Union has intensified its focus on greening of electricity industry (GEI), which in this report more specifically refers to policies promoting new and renewable energy sources in the stationary energy system. The main Community policy framework and legislation in this area, and most relevant to the electricity industry, are²:

- 1997 – White Paper. Energy for the future: Renewable sources of energy
- 2000 – Green Paper: Towards a European strategy for the security of energy supply
- 2001 – Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market
- 2003 – Directive restructuring the community framework for the taxation of energy products and electricity
- 2003 – Directive on Emissions Trading
- 2003 - New Electricity Deregulation Directive

Given its massive contribution to EU's total CO₂, NOX and SO₂ emissions, the greening of electricity industry plays a central role in achieving EU's environmental policy targets. However, environmental concerns and specialised environmental policy objectives, in a well-established industrial sector like energy, confront a number of other important policy concerns. EU's energy policy, for instance, also has to achieve other community targets such as security of supply, efficiency and competitiveness, as well as market integration³ across member state borders. Furthermore, these overarching community objectives are 'translated' into multiple policy initiatives (e.g. environmental policy, competition policy, industrial policy and deregulation policy) each with its own policy agenda and cognitive outlook.

Environmental policy initiatives in the energy sector therefore entail a great challenge of coordination across competing interests and policy concerns, often anchored in separate administrative units with their own knowledge bases and cognitive outlooks. Focusing on greening of electricity industry (GEI), this report explores the positions and outlook of various units within the EU system with mandates that affect this policy field.

² See http://europa.eu.int/comm/energy/res/index_en.htm . Additional legislative pieces in the area of renewable energy promotion are: 2002 – Directive on the energy performance in buildings, and 2003 – Directive on the promotion of the use of biofuels or other renewable fuels for transport.

³ See DG Environment , and http://europa.eu.int/comm/energy/electricity/index_en.htm , and http://europa.eu.int/comm/energy/res/index_en.htm

Empirically, the report builds on a combination of written documentation and interviews⁴ with the units within the European Commission that have been involved in decision-making processes related to GEI. This includes the DG Transport and Energy (DG TREN) represented by the unit for electricity and gas and the unit for new and renewable energy sources; DG Research represented via its Energy Programme, DG Enterprise, represented by its environment unit; DG Environment, represented by its unit for climate change; and DG Competition, represented by its horizontal state aid unit. These units are included because they play major roles in the launch and promotion of initiatives that seek to 'green' the electricity industry.

Our restriction to deal only with the Commission, and not the other policy-making institutions, the Council and the Parliament is given by our focus on the EU administration and in part because of resource limitations. Supplementary analysis of Parliamentary decision-making is, however, given in the concluding discussion⁵.

⁴ We would like to thank the following persons for letting us interview them in Brussels:

Mr Karl Kellner, head of unit, New and Renewable Energy sources, DG TREN

Mr Matti Supponen, electricity and gas unit, DG TREN

Mr Domenico Rossetti di Valdabero, Energy Programme, DG Research

Mr Jean Louis Colson, Head of unit, Horizontal State-Aid, DG Competition

Mr Stefano Vergote, Climate change unit, DG Environment

And Mrs Anne Sole-Mena, Environment unit, DG Enterprise.

⁵ We would like to thank Claude Turmes from the Committee on Industry, External trade, Research and Energy and Christina Malmros and Hannes Kugi from the Committee on Environment, Public health and Consumer policy for useful information about decision-making in the Parliament. We will also thank the Environmental Advisor Trygve Hallingstad, from the Norwegian EU delegation for his willingness to meet with us and discuss these issues.

The Challenge of Functional Specialisation

Our analysis of the policy context for greening of electricity industry in the EU is informed by a knowledge based perspective on administrative decision-making. In this perspective specialised administrative units are seen as entities that tend to maintain or reproduce their knowledge base by developing specialised competency networks, typically also involving specialised academic and industry partners in a knowledge infrastructure (Etzkowitz & Leydesdorff, 2000). Cognitive specialisation involves functional specialisation within public administration, but at the same time also institutional openness for each functional unit to integrate its own knowledge network into complementary external knowledge domains.

An extensive literature has described how specialised administrative units together with their industrial and societal “clienteles” create segmented policy communities (Olsen 1978, Jordan 1981, Cawson 1985, Schmitter 1986, Midttun 1988). To the extent that these networks succeed in consistently integrating their knowledge base they may take on a paradigmatic character, implying in Kuhn’s (1996) terms conceptual world-views that consist of theories and trusted methods that analytically define the field. Within these paradigms, functional specialists may try to extend their scope by refining theories, explaining puzzling data, and establishing more precise measures of standards and phenomena, but the paradigm may also limit learning and integrated thinking beyond its outlook. Knowledge specialisation therefore, may tend to segment functional perspectives and make it difficult to integrate them into broader knowledge systems to address broader policy issues.

In the context of greening of electricity industry, at least four fairly distinct functional knowledge domains stand out as salient: the market efficiency domain, the eco-efficiency domain, the innovation/exploration domain and the industrial policy domain. In the following they are presented in a stylised form.

The market/efficiency model

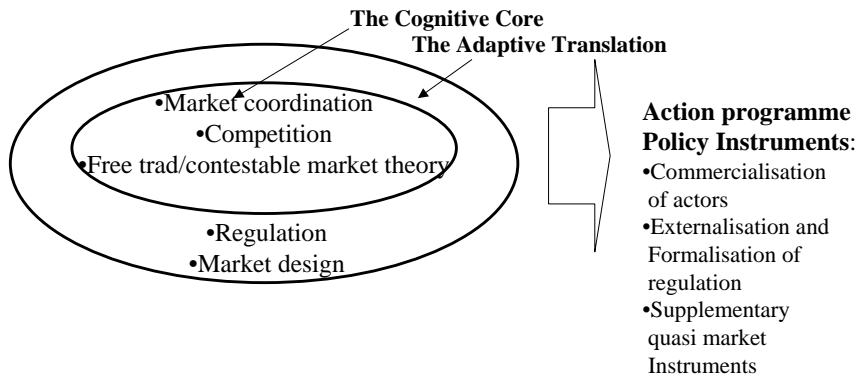
The market efficiency model is typically found in arenas handling internal market policy, competition policy and de-regulation policy of the EU.

The core focus of this model is on efficient allocation of economic resources between alternative deployments in an economy where both economic resources and technologies are given and scarce (figure 1). 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 2001). 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 model 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 1. The Market Efficiency Model⁶



The innovation / exploration model

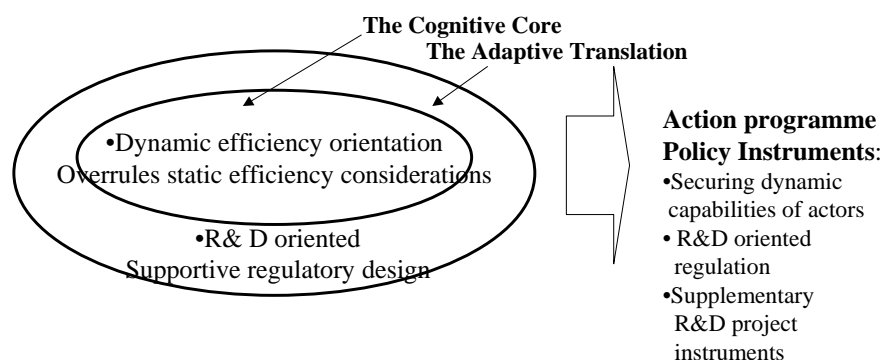
The innovation/exploration model relates to the innovation policy dimension of GEI. Environmental reorientation of the energy system is here seen as a question not only of efficiency but also of technological change. The core focus of this model is on development and growth as a function of innovation. 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 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 model are support of research and development combined with facilitation of industrial learning environments that support innovation and technological learning. The aim is

⁶ Following Lakatos (1978) we distinguish between the cognitive core and the adaptive translation of the core into "realistic" propositions and/or normative policies

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.

Figure 2. The innovation/exploration model



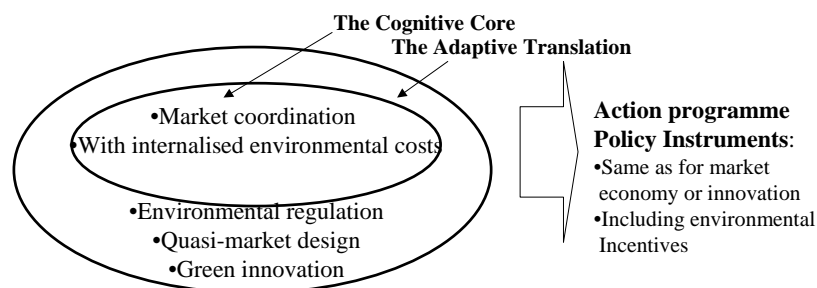
The eco-efficiency model

The eco-efficiency model relates specifically to the environmental policy dimension of GEI. The greening challenge is here transformed into economic incentives.

The core focus of this model (figure 3) is on internalisation of the costs of environmental damage and negative external effects into the business model and into the regulatory market design. Depending on policy orientation this model may be compatible with either of the two models mentioned above.

Interpreted within the efficiency/ exploitation oriented paradigm, the focus of eco-efficiency is on how economic incentives can restructure the market, either through taxation or quasi-market designs so as to introduce a trade-off for the firms between net private benefits and marginal environmental costs (Turner & Pearce 1990). Further, from an organisational point of view, the eco-efficiency model raises a focus on pollution control, environmental management and product stewardship in the firm in response to the economic incentives built into the market context.

Figure 3 The Eco-Efficiency Model

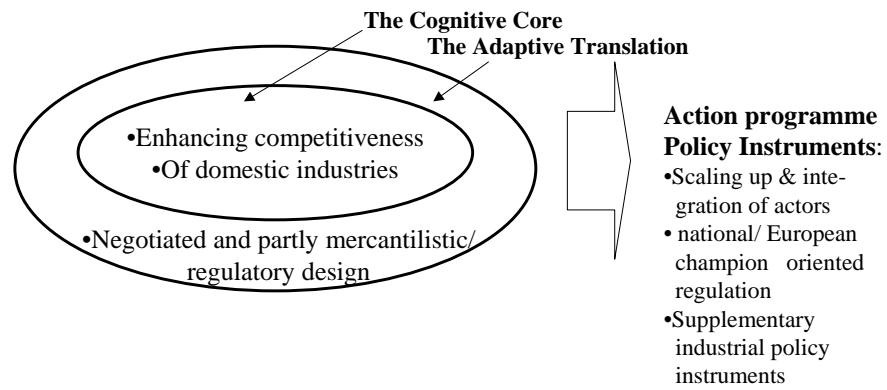


The industrial policy model

As a major input factor in the economy, GEI also raises important industrial policy concerns. The core focus of the industrial policy model is on building up and maintaining industrial capabilities within the territorial domain in focus, in this case the EU. Industrial competition on a global scale is therefore partly defined in mercantilist terms as a race between national/regional champions, whether at the firm or industrial sector level. The role of public policy is to provide the partnership and nurturing context for the national champion.

While the pure market efficiency model is neutral to national championship, the industrial policy model is likely to favour the use of market / efficiency pressures only as long as strategic domestic industry prospers. The industrial policy model may also be linked to the innovation / exploration model, but only to the extent that it stimulates technological development favourable to national / regional industrial development (figure 4).

Figure 4. The industrial policy model



Approaches to and Perspectives on Greening of Electricity Industry in the European Commission

As described in the introduction, legislation and promotion of renewable energy sources (RES) and greening of electricity industry (GEI) have an interface with several policy arenas in the EU. The sectoral specialist on energy, the Directorate for energy and transport, DG TREN is obviously central to this issue. Other directorates with strong interests in this area are DG Environment, DG Research, DG Competition and DG Enterprise. All DGs contain multiple subdivisions with different work functions, core interests and objectives. Hence one may conceive of divergent views on policy interests, priorities and e.g. legislative instruments at the Commission level among the various Directorates but also within a single Directorate.

The promotion of renewable energy sources is an issue that relates to several units but for different reasons. In DG TREN, GEI is a main priority in directorate D (New Energies and Energy Demand); however it is also a concern for the units under its directorate C (Conventional Energies) but for different reasons and with different concerns attached. It is of concern for Directorate D because renewable energy sources, clean energy supply, and clean technology development is in fact their main preoccupation and point of interest; and for Directorate C because renewable energy sources, their integration and increased market share potentially creates obstacles and challenges to what is its main preoccupation, namely internal market functioning and competition.

DG Research works closely with the renewable unit of DG TREN, its focus is on meeting the targets in the RES directive but also defining the future path for new technologies that will produce the electricity in the next 20 to 50 years. Other DG's with great interests in RES legislation and promotion are DG Competition and DG Enterprise. They both share the concern of Directorate C in DG TREN when it comes to the internal market functioning. However, the State Aid unit in DG Competition has very clear guidelines when it comes to promotion of RES due to the acknowledgement that support is needed in order to increase the share of electricity production from RES.

DG Environment has yet another approach to the GEI process. It is focused on how energy issues are related to the climate change issue and on how to integrate specific environmental objectives into EU's energy policy. More specifically, the objectives are to reduce the environmental impact of energy production and use, promote energy saving and energy efficiency and increase the share of el production from RES. (EEA 2002)
In the following, we shall examine the directorates' outlooks and approaches to GEI more closely.

Directorate-General for Energy and Transport (DG TREN)

The main orientation of this DG can be found in its *mission statement*: “The Directorate-General for Energy and Transport is responsible for developing and implementing European policies in the energy and transport field. Its mission is to ensure that energy and transport policies are designed for the benefit of all sectors of the society, businesses, cities, rural areas and above all of citizens”⁷.

This DG has many directorates, we chose to interview the two units, which are most directly connected to our main topic, namely greening of electricity industry.

Conventional Energy Directorate (C):

A main focus of the Conventional Energy Directorate has been to establish common rules for the internal market of electricity. A directive to this effect was adopted 19 December 1996 and was to be implemented in the member States by February 1999. This directive abolished exclusive rights, it required unbundling of network activities from generation and supply activities and its fundamental objectives were transparency and non-discrimination. After the adoption of this directive, the role of the Commission, and in particular this unit has been to monitor closely the market and to identify obstacles and shortcomings.

The evolution of the market, choices made by Member States in their implementation and obstacles underlined in the benchmarking reports, produced by the Commission, have justified amendments to the directive, agreed upon in June 2003 and is now referred to as the new electricity directive⁸. It will open the electricity market for all non-household customers by July 2004, and for all customers by July 2007. The amended directive reinforces public service obligations (PSO), which now also includes energy efficiency and climate issues and sets up mandatory electricity labelling for fuel mix and for some emission and waste data⁹.

Electricity and Gas unit¹⁰

Within the Electricity and Gas Unit within DG TREN, there is a concern that the greening of electricity could be a potential distortion to the electricity market, and in some cases, it is already seen as a distortion. This concern, is

⁷http://europa.eu.int/comm/dgs/energy_transport/home/mission/index_en.htm

⁸ Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003.

⁹ http://europa.eu.int/comm/energy/electricity/index_en.htm

¹⁰ Main source: Interview with Matti Supponen

first of all, based on the lack of harmonisation of support schemes for renewable energy in the member states. “The court decision on the German feed-in scheme opened so many possibilities to promote green electricity that, at the moment, there is hardly any harmonisation in the way green electricity is supported” (Supponen). Secondly, the concern in the unit is that the ambitious political goal of increasing the consumption of electricity from renewable energy sources from a 15 to 22,1% share in 2010 will dramatically influence the rest of the market.

The main focus in this unit is on the electricity market side; there is therefore a strong preference for market based support schemes when it comes to promotion of electricity from renewable energy sources. This view is very much in line with the market / efficiency model discussed in previously, where the core focus is on efficient allocation of resources.

Among the new elements in the amended electricity directive, is the labelling of electricity, disclosure and public service obligations (PSO). PSOs cause concern in the Electricity and Gas Unit as they are very broadly defined and now also includes energy efficiency and climate issues. PSO is a very open concept, which in the area of electricity allows the member states to support a wide range of initiatives e.g. from subsidising electricity to poor consumers to supporting investments in renewable energy installations. The unit is concerned with the potential market distorting effect of these practices.

Discussing the emissions trading directive¹¹ with representatives from this unit, it is revealed that this initiative also is seen to have a potential market distorting effect, depending on the allocation of free emissions within each country. For companies it is crucial whether they are located in a country with ambitious targets or not. There might be large differences in emission allocations in neighbouring countries, which will give some companies lower obligations than other.

The unit here clearly demonstrates its anchoring in the market-efficiency perspective although it recognises that social and environmental issues are high on the political agenda and need to be taken into consideration.

¹¹ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003.

New Energies and Demand Management Directorate (D)

Within the New Energies and Demand Management Directorate within DG TREN, the development of renewable energy, particularly energy from wind, water, solar power and biomass, is seen to be the central aim of the European Commission's energy policy. There are several reasons for this. First of all because GEI/RES plays an important role in reducing CO₂ emissions, secondly, because increasing the share of RES in the energy balance enhances sustainability and third because it helps improve the security of supply within the Community.

New and Renewable Energy Sources Unit¹²

Within the subunits most directly responsible for GEI, the New and Renewable Energy Sources Unit, attention is on meeting the requirements in the RES-directive, which states that the share of renewable electricity is to increase from 15% (2003) to 22,1% by 2010. Of the presently 15% el from RES, most of this is large hydro, and with little options for further hydropower development, the additional 7% is to come from other renewable energy sources and translates into about 250 TWh.

There is a clear understanding in the Commission that there is a need for support to renewable energy sources, since they are not expected to be economically competitive with conventional energy sources for some years. RES support is seen as unproblematic in this unit – the justification for this is rooted in the lack of internalisation of external costs of electricity production from fossil fuels and the fact that coal and nuclear industry is still subsidised.

Focusing on the RES directive also involves a follow up on the reporting from the member states and to evaluate the different support instruments in the member states by 2005 with a focus on effectiveness in terms of costs and impact and effect in terms of increase in capacities.

The emphasis in the New and Renewable Energy Sources Unit is on increasing capacity so as to reach a certain critical mass where RES industry becomes interesting for investors, industries, and also from an industrial policy perspective. There is also an emphasis on technology development: "...we are on the research and demonstration activities, to reduce the costs of RES technologies, we want to take demonstrated technologies as quickly as possible to the market" (Kellner).

The view of the representatives from this unit is that formal policy agreements, such as the RES directive are 'skeletons and structures' that

¹² Main source: Interview with Karl Kellner and Hans Jacob Mydske.

establish commitments and directions from the member states. However, structures more crucial to implementation and realisation of policy agreements and targets are "the programmes and projects" handled and financed by this unit jointly with DG Research.

Research programmes are seen as the most direct EU instrument, since other support schemes are in the hands of Member States. Intelligent Energy Europe (EIE) is an example of a project that aims at introducing new technologies. It has a budget of 200 million Euros for a 4-year period (2003-2006) and is handled by DG TREN. The focus of the project is security of supply¹³, reduction of CO₂ emissions in order to meet Kyoto obligations, reduction in energy demand and the increase of supply from renewable energy. This program has four parts, which again have different focus. One part is the SAVE programme, which focus on improvement of energy efficiency and rational use of energy, in particular in the building and industry sectors, The second programme is Altener, with focus on promotion of new and renewable energy sources for centralised and decentralised production of electricity and heat and their integration into the local environment and the energy systems. STEER, the third part, supports initiatives related to all energy aspects of transport and the promotion of renewable fuels (biofuels) and energy efficiency in transport. COOPENER, the last programme, is intended to support initiatives related to the promotion of renewable energy sources and energy efficiency in the developing countries, in particular in Africa, Asia, Latin America and the Pacific.

One purpose of research programmes, in the energy field, is to assist Member States in implementing RES legislation. It is also emphasised that programmes build knowledge bases, they act as a link to the market, bring out best practices, and provide input to policy processes and other policy units. The programmes are seen as tools to speed up the process of implementing new technologies. The importance of avoiding a replica of the Internal El market Directive's pace (1990 – 2007) is pointed out.

The conflict between the energy market and support to renewable energy sources, which was of central concern to the Electricity and Gas Unit, was not a primary focus of the New and Renewable Energy Source Unit of DG TREN. The representatives do not see any incompatibility if all proposals are in accordance with EU rules i.e. following State Aid Guidelines, further, the unit represents a pluralistic view on policy tools and policy implementation. When it comes to climate initiatives, these are not seen as a "cure all" strategy and the Unit sees it as important to realise RES

¹³ A marked feature of energy supply in Europe is the degree of external dependence (50% now, projected 70% in 2030).

potentials in different applications and different sectors with different means (RES in transport, RES el, RES heat).

A milestone for this unit was the reporting on the RES directive in October 2003. In this reporting, the member states were to give more details on how targets are to be achieved. Reported information from Member states, as well as annual reporting in the EIE programme serves as input to the Commission to assess the success of support schemes and technologies. It serves as an information base for the proposal to be developed by the Commission since the RES directive states that, the Commission is to come up with a proposal for a harmonisation of support schemes by 2005 “if required”. The directive is very clear in this respect, and the formulation “if required” is essential here.

With the focus on development of new technologies and introduction of these to the market, the thinking in this unit comes close to the innovation/exploration model. The otherwise static resource allocation perspective, on which economic cooperation in EU is based, is strongly supplemented by a focus on technological innovation in this unit of DG TREN.

DG Research

The main orientation of this directorate can be found in its Strategic goal: “Developing sustainable energy systems and services for Europe is the strategic goal of EU energy research. In addition, the aim is to contribute to a more sustainable development worldwide. This strategy will lead to an increased security and diversity of energy supply, and will provide Europe with; high-quality, low-cost energy services, improved industrial competitiveness, reduced environmental impact, and a better quality of life for all Europeans”¹⁴

The Energy Programme¹⁵

Within DG Research, the most GEI relevant initiative would be the energy programme. According to representatives from this DG, the Energy Programme has a strong focus on the RES directive with its ambitious goal of increasing the share of consumed electricity from renewable energy sources from 15 to 22% and on the development of new and emerging energy technologies (hydrogen, fuel cells, CO₂ capture).

The main instrument used by DG Research to reach its goals is the 6th EU Framework Program (2002-2006) for research and technological

¹⁴ http://europa.eu.int/comm/research/energy/gp/gp_pol_en.html

¹⁵ Main source: interview with Domenico Rossetti di Valdabero

development (RTD), which has a budget of approximately €17.5 billion. Much of this is divided up between seven thematic priority areas. Energy research is part of the thematic area called “Sustainable Development, Global Change and Ecosystems”. Priorities for non-nuclear energy research under FP6 include: Security of energy supply, increased use of renewable energy and enhanced competitiveness of European industry.¹⁶ There are several differences between the 6th program and the 5th, particularly the stop in support to fossil fuel research is worth mentioning.

The conversation with the representative from DG Research pointed out that the DG’s main focus is:

1) **To support technological development.** The main topics are: Clean energy, in particular renewable energy sources and their integration in the energy system, including storage, distribution and use; energy savings and energy efficiency, including those to be achieved through the use of renewable raw materials; alternative motor fuels; fuel cells, including their applications; new technologies for energy carriers/transport and storage, in particular hydrogen; new and advanced concepts in renewable energy technologies; capture and sequestration of CO₂, associated with cleaner fossil fuel plants.

2) **To support EU policies** with *scientific* based data. To illustrate the relevance, he mentioned that the research initiated from this DG has contributed to the calculation factor for external costs from electricity production (5 eurocent)¹⁷, which now is included in the Community guidelines on State aid for environmental protection. The research from this DG has also developed the tool (the so-called “SAFIRE” model) able to calculate indicative targets for renewable which will be used in the “green electricity” directive¹⁸.

It was pointed out that the value of scientific support is significant when making policy decisions. The 5 eurocents mentioned in the Community guidelines on state aid for environmental protection represent about the double of the electricity price. This figure comes from a scientific consensus among European researcher in the field of quantification of external costs. This scientific basis was useful for policy justification. It was also pointed out to us that DG research is a major contributor to the promotion of renewable energy sources. When looking at the policy support

¹⁶ http://europa.eu.int/comm/research/energy/gp/gp_pol_iss_en.html#3

¹⁷ “Extern E” study, it was the external cost of energy 10 volumes its one of the biggest research activities or economist activities in the energy field” (Rosetti)

¹⁸ TERES study from 1995 and the Saphire model from 1990 was used.

options to promote RES in el production there are: traditional policy and measures, such as taxes, standards and labelling to mention the most important. However, the least controversial and most accepted option by industry and by the public is the research and development. R&D as a tool to promote renewable energy also have high political acceptance. The research projects have a long-term focus and are very important for new and immature technologies. As seen by the representative of the Energy Programme, it is not an alternative to other instruments but a very important supplement.

DG Environment

The main orientation of this DG can be found in its *mission statement*: “-To maintain and improve the quality of life through a high level of protection of our natural resources, effective risk assessment and management and the timely implementation of Community legislation.

-To foster resource-efficiency in production, consumption and waste-disposal measures.

-To integrate environmental concerns into other EU policy areas.

-To promote growth in the EU that takes account of the economic, social and environmental needs both of our citizens and of future generations.

-To address the global challenges facing us notably combating climate change and the international conservation of biodiversity.

-To ensure that all policies and measures in the above areas are based on a multi-sectoral approach, involve all stakeholders in the process and are communicated in an effective way.”¹⁹

Climate Change Unit²⁰

Within DG Environment, the unit that most directly affects the energy sector is the Climate Change Unit. The focus in this unit is on how energy issues relate to the climate change issue. They follow the development of energy policy issues and initiatives, and try to integrate the awareness of climate change as much as possible into those policies. There is a confidence in the fact that energy policy will be mainly climate change driven.

An issue that is getting more attention is the fact that different policies like the RES directive and the Emission Trading (ET) directive have emerged more or less independently. They are both needed as of today, but if the ET framework change substantially in the future, in terms of stricter

¹⁹ DG Environment Information Brochure

²⁰ Main Source: Stefano Vergote

targets, then the promotion of renewable energy sources might need to be readdressed.

When it comes to support schemes this unit points to the fact that the feed-in tariffs have been rather successful on the delivery of capacity installation. However this DG would very much like to see a system with trade in green certificates that works. “We think that certification schemes, in particular when they are made at the European level, would fit much better with the liberalization of the electricity market” (Vergote). They are planning a study next year to look at liberalization and green certificates and how this fits with emissions trade.

DG Environment also emphasizes security of supply as an objective with the same importance as curbing climate change. They would like to see policies developed in a way that could meet both objectives at the same time.

So far the Parliament has been a main driver of environmental policies, but the new composition of the Parliament after including the next 10 countries will most likely have a different focus, since development of industries are important to the new member states. The EU as an environmental front-runner may therefore change.

In the mission statement it is written that DG Environment is in favour of environmental policy and wants to promote more stringent environmental policy. DG Environment uses economic analysis and cost benefit analysis as a method to get through with their policies. As opposed to DG TREN, which can introduce policies and argue that it is necessary for security of supply, DG environment always have to prove that their policies are cost effective and that the value in terms of environmental benefits are higher than the costs or disadvantages for the affected sector or industry.

The Climate Change unit it is also strongly market based. “In this unit and in the air quality unit, economic thinking is really at the heart of the things that are being planned, and the emissions trading is in the heart of that. The economic instrument is really how we wanted it to happen” (Vergote).

For the moment DG Environment is working on an action programme together with DG Research on environmental technology. The communication on this plan will come before the end of this year. It is about how certain barriers for environmental technologies can be removed.

Based on this interview we found a very strong market orientation in the DG’s environmental policy thinking. The eco-efficiency model is clearly the model that comes closest to the Climate Change Unit’s policy orientation.

DG Competition

The main orientation of this DG can be found in the following *mission statement*: “The mission of the Competition Directorate General is to enforce the competition rules of the Community Treaties in order to ensure that competition in the EU market is not distorted, thereby contributing to the welfare of consumers and the competitiveness of the European economy”.²¹

DG Competition’s main areas of activity are: Anti-trust, Merger Control, Liberalisation and State Intervention and State Aid. It also deals with the international dimension of competition policy, as partner of the industrially developed countries or as a counsellor to countries with transforming economies.

Of critical importance to GEI is the question of state aid, since the failure to internalise environmental externalities through polluter pay taxation implies that GEI largely must come via support mechanisms

In principle, DG Competition has a critical view of state aid: a distortion of competition, as can be seen in the following quote: “by giving certain firms or products favoured treatment to the detriment of other firms or products, state aid seriously disrupts normal competitive forces. Neither the beneficiaries of state aid nor their competitors prosper in the long term. Very often, all public subsidies achieve is to delay inevitable restructuring operations without helping the recipient actually to return to competitiveness. Unsubsidised firms who must compete with those receiving public support may ultimately run into difficulties, causing loss of competitiveness and endangering the jobs of their employees. Ultimately, then, the entire market will suffer from state aid, and the general competitiveness of the European economy is imperilled.

The EC Treaty prohibits state aid that distorts competition in the Common Market. The EC Treaty, however, allows exceptions to the ban on state aid where the proposed aid schemes may have a beneficial impact in overall Union terms. Article 87 of the EC Treaty defines the form of aid, which is accepted. Only a supranational and independent authority can take the decision as to whether or not aid granted by Member States is compatible with the Common Market. The Commission's role is to monitor proposed and existing state aid measures by Member States to ensure that they are compatible with EU state aid legislation, and that it not distorts intra-community competition.

The Commission has adopted a number of “guidelines” or “frameworks” to clarify its State aid policy in a number of areas. Where protection of the environment is the area, which relates to energy issues. The concept of environmental protection is defined in the guidelines as: “any action designed to remedy or prevent damage to our physical surroundings

²¹ <http://europa.eu.int/comm/dgs/competition/mission/>

or natural resources, or to encourage the efficient use of these resources.” Aid granted in conformity with all the conditions set out in these regulations is automatically considered compatible with the common market.”²²

Horizontal State Aid Unit²³

Within DG Competition the unit most directly linked to GEI issues is the Horizontal State Aid Unit. In the outlook of this unit, state-aid is seen as a trade off between competition policy on the one hand and other policies of public interests, like environmental policies, on the other hand. The EU Treaty is based on free market economy principles, which means that by definition state-aid is something negative, however the treaty recognizes that state-aid can be necessary in order to pursue objectives of public interests. It therefore allows the Commission to evaluate the trade-off between the negative impact of distortions in the market and the possible beneficial impact for the society. It is emphasised that the economic balance when doing the trade-off must be made in a EU context.

In order to do this economic balance, the Commission publishes guidelines²⁴ to clarify its State-aid policy in the different categories. These guidelines are binding to the Commission and they are drafted in close cooperation with DG Environment, and by consultation from DG TREN.

The new guidelines from 2001 include detailed provisions related to green electricity. According to our talks with the representative of the unit, the new guidelines “show first of all a certain tendency by member states to grant more state-aid in the field of greening of electricity than before. It also shows the goodwill of the Commission to accept these aids in these fields”. Another change with the new guidelines is that the Commission considers that there is no incentive for state-aid if a company is obliged by law to do certain investment.

To be considered as state-aid under the Treaty four cumulative criteria have to be met: The company receiving the support must get an advantage, the measure must be selective, it must be founded by the state resources/budget, and finally it must affect trade between member states.

In our talk with the representative of the unit, the Preussen Electra case, which had recently been resolved by the European court, was mentioned. It was not defined as state-aid, because there were no transfers of

²² http://europa.eu.int/comm/competition/citizen/citizen_stateaid_en.html

²³ Main source: Jean Louis Colson, Head of unit

²⁴ Official Journal, 3rd of February 2001, these guidelines superseded the old guidelines from 1994.

http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/c_037/c_03720010203en00030015.pdf

state resources. However, one could argue that it conflicts with the free movement of goods principle. But this was also rejected in the same court ruling because the liberalization of the el market in the union was not complete, so in a way there was not yet a complete free movement of goods. Another reason given by the court was that even if free movement of goods is a basic principle of community law, this principle could be mitigated by another very important principle, which is environmental protection. The timing of the German case was crucial, because in a fully liberalized market the free movement of goods principle is such a high principle that it cannot be mitigated by environmental protection.

When it comes to the discussion of cross-border trade in renewable electricity it is not possible to design a national system that limit by law the imports of green electricity from another member state. But to design a national aid scheme, which favours green electricity produced within your member state, is not against the treaty.

In terms of basic cognitive perspectives outlined in the previous section, this DG conforms to the market and efficiency model. It is controlling the deregulation of the electricity market in order to make sure that the market is functioning. The horizontal state aid unit must, however, accept the European Court's willingness to prioritise environmental concerns and also innovation and technology development. In this respect this unit comes closer to the eco-efficiency and innovation oriented model.

DG Enterprise

The main orientation of this DG can be found in its *mission statement*: “DG Enterprise is responsible for measures to enhance the competitiveness of European enterprises. Our role is to help create an environment in which firms can thrive, for example by helping facilitate access to markets and promoting entrepreneurship and innovation. We advocate an industry-wide policy that secures overall favourable framework conditions, while taking greater account of the specific needs of industrial sectors. We believe that with the support of an appropriate policy mix, the competitive development of our enterprises is vital to sustainable growth in Europe, and also provides the resources to meet rising social and environmental demands.”²⁵

The Enterprise DG contributes to the Lisbon objective of transforming the EU into “the most competitive and dynamic knowledge-based economy in the world, capable of sustainable growth with more and better jobs and greater social cohesion by 2010”.

²⁵ http://europa.eu.int/comm/dgs/enterprise/work_programme_en.htm

Unit E1; “Environmental Aspects of Enterprise Policy”²⁶

Of most direct relevance to our GEI perspective is the DG’s Unit E1, Environmental Aspects of Enterprise Policy. The objective is to promote sustainable production and eco-efficiency as a driver of industrial competitiveness. Actions in this area will contribute to achieving the legislative programme of the Commission for environmental policies while ensuring the right balance between competitiveness and environmental objectives and integrating sustainable development and enterprise policy, thus preparing the basis for an EU sustainable production policy²⁷.

As pointed out by the Unit’s representative, the Sustainable Development strategy in the European union has three pillars: The economic, the social and the environmental pillar. DG Enterprise’s accent is on the economic pillar and in ensuring that the three pillars are in balance. The representative of the Environment Unit pointed out that a competitive European industry is a necessity to acquire the resources necessary to achieve the goals of environmental protection and social cohesion. She pointed out that the unit is a so-called *mirror unit* that is looking particularly at the Commission’s environmental proposals coming from other DGs to check if they are in harmony with enterprise policy, cost-effective and based on impact assessments. She also pointed out this unit of DG Enterprise rarely legislates on environmental issues. Instead it contributes to proposals from DG Environment of DG Transport and Energy in these fields. The industries, which this unit clearly focuses on, are the manufacturing industries and the competitiveness of these industries as a whole. There is therefore a concern with the energy issues from the large consumers perspectives. The DG follows the development in the energy field, in order to see how the prices evolve and how this is going to have an effect on the competitiveness of the European industries.

Another focus of the environmental unit in DG Enterprise is to encourage companies to produce as cleanly as possible. Another important task is checking the balance of relevant Commission proposals, to see that they attain the maximum environmental benefit at the least cost for industry. Manufacturing industries are subject to a number of pieces of environmental legislation, and the environmental unit of DG Enterprise works to ensure coherence and avoid unnecessary accumulations of legislation, that are confusing and difficult for companies to manage.

The competition focus also comes through as DG Enterprise favours market-based instruments and voluntary approaches. According to the Unit’s

²⁶ Main source: Anna Solé-Mena

²⁷ The Enterprise DG Management Plan 2003;
http://europa.eu.int/comm/dgs/enterprise/pdf/amp_2003.pdf

representative, there is a strong belief in the market, and this DG is positive to the liberalisation of the market, which is believed to generally tend towards a reduction in energy prices.

Against this background, DG Enterprise comes close to the industrial policy model, although also with a market efficiency orientation e.g. in the preference for different types of policy instruments. The Lisbon objective of transforming the EU into “the most competitive and dynamic knowledge-based economy in the world” also has an innovation orientation, however the focus on new technology, new firm and new industrial development is not very strongly articulated in the environment unit.

Outlook on Greening of Electricity Industry in the EU

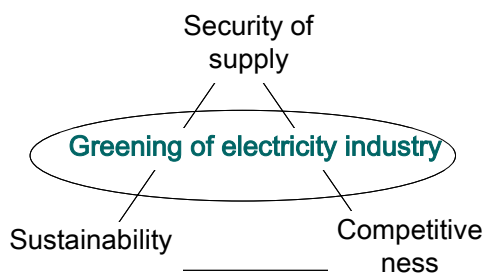
Our exploration of cognitive models and policy tools for greening of electricity industry in the European Commission is only one piece of the larger European GEI puzzle. The other parts of this puzzle, obviously involves aligning national perspectives and interests in the Council of Ministers and the interests and perspectives of the European Parliament in the European GEI strategy.

Our concluding discussion of the future greening of European electricity therefore draws on perspectives and models from the relevant EU DGs and their sub-units, but also relate them to the wider context of member state interests and positions taken by the European Parliament.

As already discussed in the introduction, greening of electricity industry does not only involve multiple stakeholders, but also multiple thematic foci. Renewable energy is but one of several Community objectives which have an effect on the operation of the electricity sector. Besides the sustainability objective, which is obviously a core element, the EU has simultaneously flagged competitiveness and security of supply as major energy policy objectives (figure 5). Reflecting the various elements of the broad agenda, multiple policy initiatives have been taken including:

- renewable sources of energy;
- strategies for the security of energy supply
- taxation of energy products and electricity
- emissions trading
- initiatives for electricity deregulation

Figure 5. Greening of Electricity Industry in the European Policy Context



A critical question, however, is if any of the cognitive outlooks and the associated policy tools explored in the previous section, carry the promise of delivering on all these objectives and in such a mix as to satisfy the European Parliament? Furthermore, do the outlooks and associated policy tools, when applied in real life, produce acceptable distribution of gains and losses across member countries to carry in the Council of Ministers?

The following sections derive policy implications out of the preceding perspectives and models and their articulation within the EU Commission, and discusses their robustness against the interests of the Parliament and the Member States. The discussion is stylised and presents the positions and their implications in a fairly rudimentary form.

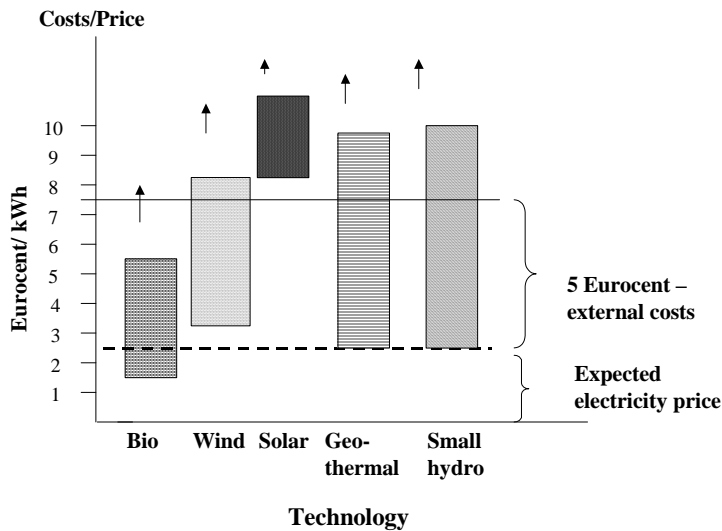
Outlook derived from the market efficiency model

The outlook on greening of electricity industry coming out of the market efficiency model clearly prioritises general competitiveness among the three EU policy goals (figure 5 above). Articulated primarily within the Electricity and Gas Unit, in DG TREN and the Horizontal State Aid Unit in DG Competition, general deregulation of energy becomes the framework also for greening policy, with priority given to market-compatible policy instruments. Aligning the market efficiency model with its green correlate, the eco-efficiency model, the preferred greening strategies involves internalising environmental externalities into the energy prices at least cost and with choice of the most competitive technology. This approach is clearly very much in line also with basic thinking in DG Environment, the Climate Change Unit as illustrated in the following quote:

“In this unit and in the air quality unit, economic thinking is really at the heart of the things that are being planned, and the emissions trading is in the heart of that. The economic instrument is really how we wanted it to happen”.

With any realistic estimate of externalities (5 Eurocents argued by DG Research), this approach could create a strong incentive for investment in non-polluting renewable energy sources and the next generation energy technologies (figure 6). Renewable technologies such as small hydro, wind and biomass would become profitable, assuming fair competition between green suppliers across Europe and full third party access in the European grid.

Figure 6. Energy technologies with and without externality costs²⁸



²⁸Sources: IEA <http://library.iea.org/dbtw-wpd/textbase/npsum/RenewPowerSUM.pdf>
Exchange rates: 1 Euro = 8,5 NOK, 1 USD = 7 NOK,
Expected electricity price NOK 0,22 (NVE 2002)

It may be recalled that the Electricity and Gas Unit in DG TREN expressed a strong preference for market based support schemes when it comes to the promotion of electricity from renewable energy sources. All allowance for national variation was frowned upon, including concern with the allowance for national allocation of free emissions within each country under the emissions trading scheme.

However, the market efficiency model, with its eco-efficiency extension, is hard to defend politically when seen from the perspective of the EU Parliament or when related to the distributive interests of member countries. The failure to materialise greening of energy industry through the CO₂ tax in the 1990s is a case in point.

Our interview with the representative in Parliament, Claude Turmes of the Energy Committee and chairman of its work on the directive on renewable energy sources, indicated that he remained highly sceptical of the electricity market's ability to remain competitive. The strong concentration tendencies, as a result of mergers and acquisitions organised by the mega-players like EON, EdF, RWE and Vattenfall worried him. Secondly he expressed scepticism against the strong technological standardisation that a pan-European market approach would imply.

Parliament, therefore, seems much more intent on supporting multiple technologies in the renewable energy field, and member states seem reluctant to accept competitive exposure of their preferred green technologies. The standard market efficiency approach of the Conventional Energy Directorate, the electricity and gas Unit, and the DG Competition is therefore hardly viable as a greening strategy, given the interests of the European Parliament and the Member States.

Outlook derived from the innovation model

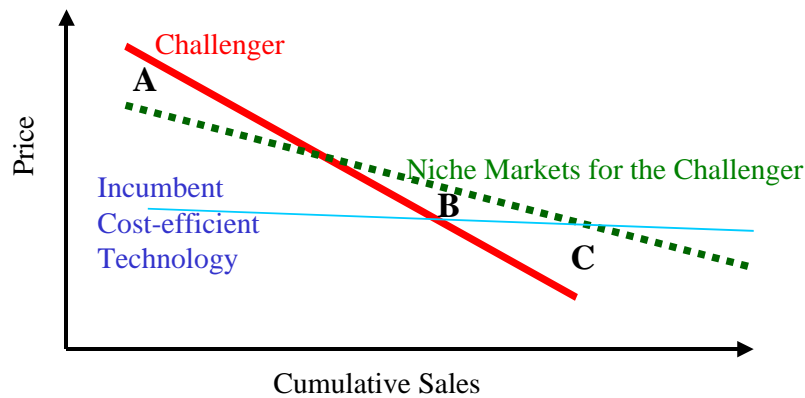
The outlook on greening of electricity industry coming out of the innovation model clearly prioritises technology development as a major greening strategy. Articulated primarily within DG research and DG TREN, the New and Renewable Energy Sources unit GEI is embedded in an innovation and technology development perspective. This perspective has less focus on present cost and more focus on future potentials.

The innovation approach is typically concerned with finding appropriate contexts for stimulation of the development of individual technological solutions. Thus staging niche markets where the challenger-technology can be partially and temporarily protected from direct competitive exposure is a favoured approach. Only when initial learning costs have been carried can the challenging technology gradually be market exposed (figure 7). The new technology (here denoted as challengers) must be given a certain up front stimulus A, but may soon be accommodated in a

niche market, which is willing to pay for the specific qualities provided (stapled line) until it becomes competitive against standard technologies.

The innovation approach here clearly provides a different policy outlook from the standard market efficiency model, which is focused on standardised competitive exposure across technological divides.

Figure 7. Learning Curves in Electricity Industry (IEA 2003)



Implicitly and explicitly the niche market thinking underlies much of DG Research and DG TREN's approach to the promotion of new renewable energy sources approach. This comes clearly across in the New and Renewable Environmental Sources Unit's emphasis on increasing capacity so as to reach a certain critical mass where RES industry becomes interesting for investors, industries, and also from an industrial policy perspective:

“...we are on the research and demonstration activities, to reduce the costs of RES technologies, we want to take demonstrated technologies as quickly as possible to the market”.

As pointed out in the previous description, DG Research also has a strong focus on innovation and technological development, however, with a longer-term perspective than the colleagues in DG TREN can allow. There seemed to be optimism about introduction of new technologies, and there is a strong belief in both units in R & D as an effective tool when it comes to delivering technical change and changes in energy supply systems.

The innovation approach has many strong sides as far as EU policy-making is concerned. The interventions from DG TREN, New and Renewable Resources Unit and DG Research have a promising interface

with national policy systems. With the niche market strategy and / or project based financing, the innovation perspective creates possibilities for partnerships rather than confrontation with member states and industrial interests. The flexible tools in the innovation approach also allow flexible tradeoffs in Parliamentary decision-making. Our interview with Mr Turmes, from the Energy Committee in the European Parliament, clearly indicated a preference for the flexible differentiation, which lies in the innovation approach. This outlook, for instance, led him to critically question the idea of a tradable certificate system, because it would lead to a too one-dimensional technology support. Compared to traditional policy measures such as taxes, standards and labelling, the research and development tool promoting renewable energy seems to be more politically acceptable.

The weakness of the innovation model, if applied as a dominant strategy for greening of electricity, may be its debateable efficiency and high cost. However, as already pointed out in the previous discussion of learning curves, the project based financing of renewable energy projects is significant to innovation processes and is intended to trigger development towards dominant and viable technological designs (Utterback & Abernathy (1975), and to trigger cost reduction and standardisation. Hence the phase of support is seen as a transient stage on the way towards mature technologies capable of reaching scale and scope advantages.

Outlook derived from the industrial policy model

The outlook on greening of electricity industry coming out of the industrial policy model is ambiguous in so far as this model can be applied at different levels, from the individual nation state to the EU level. The formulation, as voiced by the DG enterprise, focuses predominantly on the competitiveness of established industrial consumers in the EU area. The mandate to “enhance the competitiveness of European enterprises” sets an agenda of least cost supply of energy, which is primarily seen as an input factor in the economy.

Although the focus of the Environment unit in DG Enterprise is to encourage companies to produce as cleanly as possible, this is balanced against another important task of checking the balance of all the Commission proposals to see that they give the maximum environmental benefit but at the least cost to industry. The manufacturing industries are subject to a great many pieces of environmental legislation, and the environmental unit of DG Enterprise works to avoid unnecessary overlaps in legislation that are confusing and difficult for companies to manage. This aligns DG enterprise with the market efficiency model, but in opposition to its eco-efficiency correlate.

DG Enterprise therefore favours market-based instruments and voluntary approaches. According to the Unit’s representative, there is a

strong belief in the market, and this DG is positive to the liberalisation of the market, which is believed to reduce the energy prices for the industry.

With a dominant focus on low input energy prices as part of a European industrial competitiveness strategy, this model has a credibility gap as far as GEI is concerned. Firstly, as clearly expressed by DG Enterprises Environment Unit, it clearly opposes the extensive taxation deemed necessary under the market based eco-efficiency model to compensate for the negative externalities. The very low environmental tax that was recently accepted is hardly enough to contribute substantively; whereas, the emissions trading scheme that will start in the EU in 2005 may give a significant push to cleaner energies. Hence, it seems that the industrial policy model assumes that the society as a whole should carry the cost of greening and GEI oriented innovation (as contrasted with an implementation of the polluter pay principle).

While an industrial policy mode applied at the EU level may gather extensive political support, member states may clearly have domestic industrial policy agendas that contradict it e.g. the interests of the new renewable energy-industrial groups (wind- CHP and bio fuel industries). The industrial policy model, therefore, carries considerable ambiguity depending on the level of anchoring (EU or nation state) and the focus (energy consuming industry or energy producing industry).

For the moment DG Enterprise dominantly defines GEI in terms of least cost strategies seen from industrial consumers point of view. However, a European industrial policy in this field could also potentially take an energy producer point of departure. Many member states have implicitly taken this position and also reached interesting results; Danish Wind industry, with a large share of the global wind power market being a case in point. If considering new industry, the industrial policy position could come closer to the innovation policy position.

A dynamic perspective on GEI

The policy outlooks derived from the different cognitive frameworks, represented by various administrative units in the EU, may conflict when only considering them within a static perspective. However, a dynamic perspective could show them to be more complementary. Of particular interest is the interplay between political decision-making and industrial transformation.

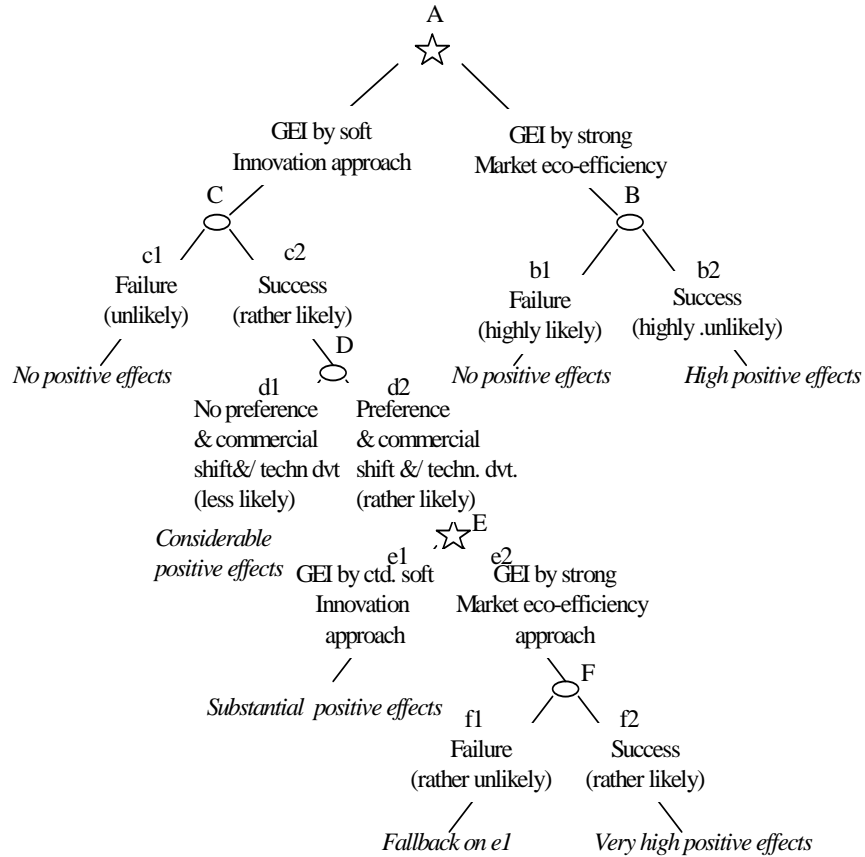
Experiences from the dynamic process initiated by "soft" negotiated de-regulation of European electricity industry has shown that the interplay between initial negotiated agreements and subsequent market dynamics has taken the reform far beyond the negotiated requirements. When companies

saw their interests served by taking fully part in the new competitive economy, they took the reform further by themselves, and thereby pushed others. In this way the reform was pushed far beyond the relatively narrow limits set by the initial political accord.

Although RES industry does not enjoy a similar market position as the large conventional players in the electricity market there may be parallels to the deregulation experience. In the case of greening of electricity industry, one could imagine that soft negotiated projects and innovation-based initiatives could lead to more dynamic market processes as established actors discover strategic advantage of joining in.

More systematically this line of reasoning can be schematically presented in a game tree, where the implications of regulatory choices and their consequences are displayed in a sequential order (Midttun & Koefoed 2001) (figure 8). The game tree has two kinds of nodes: nodes where choices are being made (represented by stars) and nodes where “nature” chooses her moves, conceived as industrial reactions to regulatory choices, designated by circles in the figure.

Figure 8. A dynamic model of GEI



Assuming that a strong pan-European implementation of the market efficiency model to GEI is highly improbable in the short run, insistence on such a policy approach is likely to lead to failure (b1) for reasons discussed before. This means that we are likely to forsake the high positive effects that such a strategy might have if successful (b2). The choice of the project and innovation oriented approach might be more likely to succeed (c2), but would in turn yield less, but yet considerable positive effects in terms of GEI (d1). However, in the next round, the soft innovation and project-based oriented approach may trigger technological development (dvt.) and / or

commercial shifts, and strengthen the positive GEI outcome, but also thereby create a new basis for the next round of regulation. Primary commercial concerns of energy industry may change accordingly, as greening implies economic gains and pays off as a commercial strategy. At this point (E), initiatives based on stronger elements of the market efficiency model has a far larger chance of being implemented (f2), as industrial interests might have taken the GEI strategy on board already, or may be compelled by the market forces to adjust their policies. Furthermore leading firms that have already introduced and integrated "green" technologies may welcome strong market competition to allow them scope for commercial operation. It is therefore possible that we might end up with a stronger market based and more efficient strategy (f2) but only via the initial soft innovation path (C-D-E-F)

Given the unacceptable risk posed by the nuclear option²⁹, and the common recognition that major steps must be taken towards environmental sustainability, it can be argued that the innovation path is strongly needed to bring forward a new generation of energy technologies. Yet it is equally clear that successful transformation on a larger scale will need these technologies to be streamlined by a powerful business model through application of cost-efficiency from the competitive market model if the costs shall not be too high to bear. The European Commission's preference for pan European market solutions (Majone 1990) makes for an administrative pull in this direction also when it comes to GEI.

Irrespective of the production side solution to GEI in Europe, European energy policy is conspicuously under-developed when it comes to energy consumption. As pointed out both by the representatives of DG research and of the Energy Committee in the European Parliament, the demand side of energy is less developed in EU policy. While many believe that a major contribution to "greening" may come from flexible decentralisation of technologies and a major emphasis on energy utilisation, there is no real EU agenda in this area.

When EU ultimately shapes up its GEI policy it should therefore mobilise efforts more strongly in this direction. After all, "negawatts" may ultimately be cheaper than megawatts, although perhaps less easily displayed politically.

²⁹ By international convention, nuclear industry does not have to take responsibility for accidents through private risk insurance. Having to internalise a commercially based risk premium would probably put the nuclear option out of business.

References

Andersen & Eliassen (eds) (2001): *Making policy in Europe*, Sage Publications, London.

Cawsson, A (ed) (1985): *Organised Interests and the State: Studies in meso-corporatism*, Sage Publications. London.

Commission Staff Working Paper (2002): *Security of supply - The current situation at European Union level*, November 14, and Final report Communication from the Commission to the Council and the European Parliament, *Final report on the Green Paper "Towards a European strategy for the security of energy supply"* available at: http://europa.eu.int/comm/energy_transport/en/lpi_lv_en1.html

DG Environment Information Brochure

Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003. Concerning common rules for the internal market in electricity and repealing Directive 96/92/EC

Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003. Establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC

Edquist, Charles (2001): "Innovation Policy - A Systemic Approach", in D. Archibugi and B-Å. Lundvall (eds.) *The Globalizing Learning Economy*, Oxford: Oxford University Press, 2001

Etzkowitz, H. & Leydesdorff, L. (2000): "The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry government relations". *Research Policy*, Vol. 29, 2000

European Environmental Agency (2002): "Energy and environment in the European Union", Environmental issues report No. 31, Copenhagen

Foray, D. (1997): "Generation and distribution of technological knowledge: Incentives, norms and institutions". In Edquist, C. (ed): *Systems of innovation - Technologies, institutions and organizations*, London: Pinter

International Energy Agency (2003), *Creating markets for energy technologies*, IEA/OECD.

- Jordan, A. G. (1981): "Iron Triangles, Wolly Corporatism and Elastic Nets: Images of the Policy Process", *IIUG Discussion Papers*.
Wissenschaftszentrum, Berlin.
- Kuhn, Thomas S. (1996): *The structure of scientific revolutions*, Chicago University of Chicago Press.
- Lakatos, Imre (1978): *The Methodology of Scientific Research Programmes-philosophical papers*, Cambridge University Press, Cambridge.
- Lundvall, Bengt-Åke (2002): *Innovation Growth and Social Cohesion*, Elgar.
- Majone, G. (1990): *Deregulation or re-regulation?: regulatory reform in Europe and the United States*, London : Pinter.
- March, James G. (1991): "Exploration and Exploitation in Organizational Learning", *Organizational Science*, vol. 2, no.1.
- Midttun, Atle (1988): "The Negotiated Political Economy of a Heavy Industrial Sector: The Norwegian Hydropower Complex in the 1970's and 1980's", *Scandinavian Political Studies*, vol. 11, no. 2.
- Midttun, Atle and Koefoed, Anne Louise (2001): "The Effectiveness and Negotiability of Environmental Regulation", *International Journal of Regulation and Governance*.
- Norges Vassdrags- og Energidirektorat (2002): "Kostnader ved produksjon av kraft og varme 2002".
- Official Journal, 3rd of February 2001, State Aid Guidelines superseded the old guidelines from 1994.
- Olsen, J. P (1978): "Folkestyre, byråkrati og korporativisme", *Politisk organisering*. Universitetsforlaget. Olsen (red).
- Samuelson Paul A. and William D. Nordhaus (2001): *Macroeconomics*, Boston, Mass. McGraw-Hill/Irwin.
- Schmitter, P.C. (1981): "Interest Mediation and Regime Governability in Contemporary Western Europe and North America", in Berger, S (red): *Organising interests in Western Europe*.

Turner, R. Kerry & Pearce, David (1990): *Economics of natural Resources and the Environment*, The Johns Hopkins University Press.

Utterback, J.M and Abernathy, W.J. (1975): “A Dynamic Model of Process and Product Innovation”, *The International Journal & Management Science*, Vol. 3, No 6.

Web pages

http://europa.eu.int/comm/dgs/energy_transport/home/mission/index_en.htm

http://europa.eu.int/comm/energy/electricity/index_en.htm

http://europa.eu.int/comm/energy/res/index_en.htm

http://europa.eu.int/comm/research/energy/gp/gp_pol_en.html

http://europa.eu.int/comm/research/energy/gp/gp_pol_iss_en.html#3

http://europa.eu.int/comm/energy/intelligent/doc/presskit_en.pdf

<http://europa.eu.int/comm/dgs/competition/mission/>

http://europa.eu.int/comm/competition/citizen/citizen_stateaid_en.html

http://europa.eu.int/comm/dgs/enterprise/work_programme_en.htm

http://europa.eu.int/comm/dgs/enterprise/pdf/amp_2003.pdf

<http://library.iea.org/dbtw-wpd/textbase/npsum/RenewPowerSUM.pdf>