EnPAcc Environmental Protection in the Electricity Sector of the Accession Counties

Energy Policy Support for Environmental Protection in the Electricity Sector of Accession Countries (EnPAcc)

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Glossary

CO_2	Carbon dioxide
CCGT	Combined Cycle Gas Turbine
CDM	Clean Development Mechanism
CEEC	Central and Eastern European Countries
CFCs	Chloroflurocarbons, which are GHGs
CH_4	Methane
CHP	Combined Heat and Power
DG	Distributed generation
EBRD	European Bank of Reconstruction and Development
EC	European Commission
ET	Emissions Trading
FGD	Flue Gas Desulphurisation
GHG	Greenhouse gas. The six GHGs covered by the Kyoto Protocol are CO2, CH4, N2O, CFCs, HFCs PFCs and SF6
HFCs	Hydroflurocarbons, which are GHGs.
IET	International Emissions Trading
IPP	Independent Power Producers
IT	Information technology
JI	Joint Implementation
NO_X	Oxides of Nitrogen, a pollutant created by the combustion fuels, which causes acidification of the environment. N20 is a GHG.
Particulates	Very small particles created by the combustion of fuels, which leads to local air pollution.
PCFs	Perfluorocarbons, which are GHGs.
R&D	Research and Development
RECS	The Renewable Energy Certificate System, an independent European industry platform seeking to define a protocol for international trading in renewable energy certificates
SF_6	Sulphur hexafluoride, a GHG.
SO_X	Oxides of sulphur, a pollutant created from the combustion of fuels (especially from low grade coal and oil), which causes acidification of the environment.
TGC	Tradable Green Certificate, which are issued to accredited generators for the measured delivery of a predetermined quantity of renewable energy.
TWh	Tera Watt hour (1 million Mega Watt hours)
VOC	Volatile organic compounds.

Executive Summary

Energy Policy Support for Environmental Protection in the Electricity Sector of Accession Countries ('EnPAcc') was a project supported by the European Commission SYNERGY programme, supporting energy policy development in accession countries.

The project ran for sixteen months, between November 1999 and March 2001. The team comprised eight partners from three countries currently negotiating to join the EU (Estonia, Poland and Slovenia) and three EU countries (UK, Finland and Austria). The team was drawn from the electricity industry and consulting companies.

The objective of the project was to explore the conflicts and complementarity between electricity sector liberalisation and environmental protection, and propose ways to enhance environmental protection. Examples have been collected of both adverse and beneficial impacts of liberalisation, drawing on EU experience to date. The project also explored some of the wider structural and commercial implications of liberalisation that were important to the accession country partners.

At the core of the work programme were three workshops, held in each of the partner EU candidate countries. Each workshop attracted 30-40 participants, drawn mostly from the electricity sector of the host country. Participation in workshops, and the discussions therein, were a key part of the value of the EnPAcc project, both in terms of project dissemination and refining the written outputs of the project.

This report is a compressed summary of the considerable volume of work undertaken by the project team. It is based on the working documents, which were prepared as a basis for each of the aforementioned workshops, but also on the discussions and feedback obtained at the workshops. The intention has been to produce a report of use to both policy makers and industrial strategists. An effort has also been made to include general experiences of liberalisation from those countries that have already gone through the process, as requested by accession country project stakeholders.

To make effective use of project resources, the team focused on two main technical areas to develop practical recommendations. Firstly, distributed generation (DG), or the use of smaller-scale, environmentally-friendly electricity generation; and secondly, tradeable market instruments, or a variety of permits, certificates and other commodities that are created and consumed in response to market drivers, to achieve environmental protection objectives.

The report concludes that many actions can be taken by both government and industry that will be consistent with the demands and future reality of a liberalised electricity sector, and that will contribute to an enhanced environmental performance from the sector.

However, whilst there are many exciting opportunities for electricity sector companies to take independent actions, success in these initiatives demands firm intervention from government. A key requirement is the creation of an operational legislative and policy framework that provides clear rules and market signals. It is fundamental that such a framework be consistent with the new realities of an increasingly European-wide, single, liberalised energy market.

A clear case of complementarity between liberalisation and environmental protection, is removing the many existing barriers to distributed generation. This can have the effect of both improving the market prospects for environmentally clean generation technologies and enhancing competition in generation. Recommended actions include: establishing fair and consistent rules for grid access, establishing transparent and consistent arrangements for the

provision of information by district network operators to DG developers and users, and streamlining planning and permitting procedures for DG facilities.

The team found that the situation as regards tradable economic instruments is different in each of the study countries. However, the key point is that, given the right market mechanism, environmentally beneficial power projects can have an additional source of revenue, which is entirely consistent with liberalised electricity markets.

1 Introduction

There is a common challenge facing policy makers across Europe, both in existing EU countries and those countries that aim to accede to the EU (the candidate states). The challenge is to liberalise the energy sector in line with EU Directives on Electricity and Gas, whilst at the same time achieving environmental performance objectives.

Many commentators have observed that these objectives are apparently contradictory. The purpose of the 'EnPAcc' project was to bring together a group of companies and organisations from EU and accession candidate countries to share experience and to explore the options to reconcile these liberalisation and environmental objectives.

1.1 Project team and funding

The project ran for sixteen months from November 1999 to March 2001. The project team comprised industrial partners from three accession countries (Estonia, Poland and Slovenia) and industrial and consultant partners from three EU countries (Austria, Finland and the UK).

Table 1.1: The EnPAcc Project team

Country	**Company**	**Comment**
Accession countries		
Estonia	Eesti Energia	State-owned electricity monopoly
Poland	Polskie Sieci Elektroenergetyczne SA (PSE)	Polish Power Grid Company (state owned)
Slovenia	Elektrogospodarstvo Slovenije (EGS)	Slovenian electricity utility (state owned).
EU countries		
Austria	Verband der Elektrizitätsunternehmen Österreichs (VEÖ)	Austrian Association of Electricity Companies
Austria	Verbundplan GmbH	Consultancy arm of the Austrian utility Verbund
Finland	Fortum Power and Heat Oy (formally Imatran Voima Oy (IVO)	Major Finish energy company with interests in a number of accession countries
UK	Energy for Sustainable Development (ESD) Ltd	Sustainable energy consultancy, responsible for EnPAcc project management.
UK	TXU Europe Power Ltd (Formally Eastern Generation)	Major UK-based European power generation company

The project was funded by the European Commission under the SYNERGY program and contributions from the participating companies.

1.2 Scope of the project

To make effective use of project resources, at the start of the project the team agreed to focus on power sector issues associated with improving the airborne emissions, in particular SOx, NOx, particulates and CO_2. In the latter stages of the project, the team concentrated on just two areas – distributed (embedded) generation and tradable economic instruments – both of which are areas of great potential and rapid development.

At the core of the work programme were three workshops, held in each of the partner accession countries. Each workshop attracted 30-40 participants, drawn mostly from the electricity sector of the host country.

The structure of the project involved the joint preparation of a series of working documents (not reproduced here), all of which were contributed to by all team members, which fed-into the discussions held at the three country workshops.

The focus of the working papers remained firmly on advancing environmental protection in the electricity sectors of accession candidate countries, but evolved in response to the most pressing information needs of the accession country partners. A guiding principle for the choice of topics was to maximise value to these companies, and to the attendees at the three country workshops.

1.3 Structure of this report

This report is a summary of the important findings and conclusions of the EnPAcc project. It's contents is drawn from both the working documents prepared in advance of the workshops and, more significantly, the discussions and feedback obtained at the workshops and project team meetings. The intended audience is policy makers and electricity sector strategists in accession countries, although the report is likely to be interest to a wide range of electricity sector stakeholders.

The structure of the report is as follows: following on from the introduction in section 1. section 2 describes the drivers, status and effects of electricity liberalisation in general terms i.e. without looking closely at the environmental implications. The inclusion of this section reflects a strong message that came out the workshops – that the accession country partners wish to know more about the general experiences of liberalisation from those countries that have already gone through the process.

Building on the two previous sections, section 3 aims to identify the impacts of liberalisation that either contribute to or undermine environmental protection in the electricity sector. It goes on to consider corporate attitudes and responses to environmental issues.

Sections 4 and 5 summarise the project team's findings and views on the two detailed area of investigation – distributed generation and tradable economic instruments. Each section contains policy and industrial strategy recommendations on these topics. Section 6 summarises the conclusions and recommendations of the project as whole.

Finally, the annexes in section 7 contains supporting factual information regarding each of the study accession countries, and a summary of the international and European policy context for environmental protection in the electricity sector.

1.4 The accession process

At the European Council meeting in Helsinki in December 1999, it was decided that the EU should be in a position to begin negotiations for EU membership with Czech Republic, Estonia, Hungary, Poland, Slovenia and Cyprus. Subsequently it was decided to open negotiations with Bulgaria, Latvia, Lithuania, Malta, Slovakia, Romania. Moreover, Turkey has been given the status of a candidate county.

The conditions of accession are set out the *acquis communautaire.* The acquis contain both energy and environmental rules, including to the requirement to harmonise national energy and environmental legislation with EU standards.

Regarding recent progress to accession, the EU summit in Nice in December 2000 made advanced the process of internal reform required for the EU to expand from 15 to nearly 30 Member States. For example, notional voting totals were set for candidate countries. Nonetheless, it now seems that the original timetable of is unlikely to be met. Expectations are that a completion of accession in the period between 2003 and 2005 is more likely.

1.5 Environmental protection in accession countries

During the Communist era, environmental protection in the electricity sector of accession countries was based on central planning and ‘command and control’ type policies. Environmental legislation was often “all pain and no gain” i.e. environmental protection simply added to the costs of electricity generation and supply. The uninterrupted supply of cheap electricity, essential to economic and industrial development, took a natural precedence over environmental protection. Environmental standards were low and compliance poor, as there was no clear motivation or reward for utilities for achieving or over-achieving on environmental performance. Furthermore, there was no net financial incentive for state enforcement agencies to impose environmental standards on state-owned electricity companies.

Nevertheless, there were positive aspects. Central control facilitated the development of infrastructure that can deliver efficient energy services, such as district heating networks. Policy makers had the power to take decisions without fear of contravening free market principles. And in theory, by virtue of their monopoly position and their close ties to the state, electricity utilities were able to access cheap capital and/or pass on the cost of environmental protection to the consumers. In practice, politically determined electricity tariffs, limited public funds and organisational inefficiencies meant that utilities were unable to pay for environmental protection.

This picture changed dramatically during the 1990s. Utilities and governments, with international aid (e.g. from the EBRD), made strong efforts to reduce emissions of SOx and particulates. Following the requirements of the Second Sulphur Protocol of the Geneva Convention (see previous section), the emissions of these pollutants were reduced substantially. However, the investment required also led to long-term financial liabilities, which will have to be resolved prior to a full liberalisation of the CEE electricity markets. For example, in Poland the investments for FGD and electrostatic precipitators were secured primarily by long term power purchase agreements between the power plants and the transmission system operator on fixed power prices and quantities. Such agreements are not seen as being sustainable in a liberalised market. The most challenging air emission problem is now the same as existing EU countries - how to reduce GHG emissions. The reliance on coal and outdated infrastructure compounds the problems.

2 Energy market liberalisation – drivers, status, effects and trends

The liberalisation of European electricity markets is part of a World-wide trend to reduce the direct role of government in the energy sector. The principal reasoning for this trend is to increase economic efficiency and enhance competitiveness. In the European Union, there is the additional reason of furthering the integration of the Member States.

2.1 Policy Drivers for liberalisation

The most important legislation driving the liberalisation of the European electricity markets is the *Electricity Market Directive*, which aims to establish common rules for the production, transmission an distribution of electricity among the 15 Member States. The deadline for transposing the Directive into National Legislation was 19Th February 1999. The Directive requires EU member states:

- to allow open access to unrestricted electricity supply for 30% of electricity supply by 2000 and 33% by 2001.
- to 'unbundle' generation, transmission and distribution; and,
- to allow non-discriminatory access to the grid for the eligible consumers.

Although only indirectly relevant to the electricity market, the *Gas Market Directive,* is also important since it aims to allow eligible customers to choose their gas supplier and have access to gas networks in the EU. The deadline for the Directive to be transposed into national legislation was 10th August 2000. The Directive allows some leeway in transposition and is not as prescriptive as the Electricity Markets Directive. For example, it requires that only a third of gas consumers be able to choose their supplier by 2008.

Naturally, the Directives are not in force in accession countries at present. However, all accession countries have started the process of restructuring their power sectors in order to be compliant to Directives upon joining the EU – as required in the *acquis communautaire*.

The third important policy driver, especially in economies in transition, is the Energy Charter process[1] which was initiated by the European Commission in 1991 as an aid to the economic recovery of eastern Europe. In particular, the Energy Charter Treaty of 1995, aims to promote east-west industrial co-operation by providing legal safe guards in areas such as investment, transit and trade[1]. The Energy Charter process also constitutes an 'evolutionary process' for countries in transition towards a market based economic system. It has been signed by almost all European countries, but it is not yet ratified.

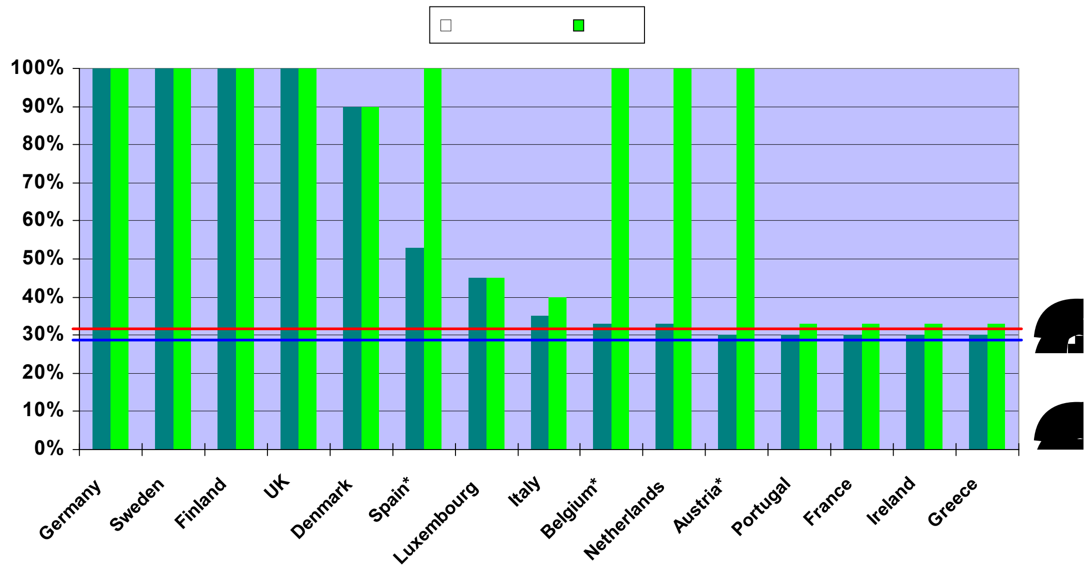
2.2 The EU perspective

2.2.1 Status of liberalisation in the EU

At present about 65% of EU electricity consumers can choose their supplier, significantly more than that required by the existing EU legislation (one-third of consumers by 2003). However, liberalisation has progressed unevenly across the EU so far. Some countries were fully liberalised well before the liberalisation Directives (e.g. Sweden, Finland and UK), whilst others have lagged behind the minimum requirements (e.g. France).

[1] *the 1991 European Energy Charter; the 1994 Energy Charter Treaty (as amended by the 1998 Trade Amendment); and the 1994 Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects*

Figure 2.1: The degree of electricity sector market opening in the EU



* Austria 100% from October 2001, Spain 100% from 2004, Belgium: 100% from 2010

Source: Verband der Elektrizitätsunternehmen Österreichs, the Austrian Association of Electricity Companies, 2000.

The degree of market opening alone is not a sufficient indicator of actual market conditions in European countries. Despite being 100% open in a legal sense, there are many other factors that stifle true competition. For example, there are four forms competition models for grid access in European power sectors – regulated access, negotiated access, the competitive pool model and the single buyer model[2]. Each form has implications on the ease of grid access and competition. Some countries lack a specific energy regulator (Germany and Luxembourg).

The result is a wide range in the degree of competition in the different member states. Furthermore parts of the electricity sector receive special treatment from governments for historic, political and social reasons. For example, in Germany, the coal sector still receiving large government subsidies. In France many of the costs of nuclear generation have been absorbed by the state, producing effectively subsidised electricity. Such market distortions are at odds with establishing true and fair competitive energy markets. Overall, there is still a long way to go before a single market for electricity is achieved. An additional problem has been the disparity between market opening in the electricity sector and the gas sector.

At the time of writing, the European Commission has stated it's intention to speed up the liberalisation process, with the aim of achieving 100% opening of Member State electricity and gas markets by 2005. The EC is also expected to require that transmission network operators be fully independent from generation and sales, that EU states have an independent energy regulator and clearer cross-border trade rules[3].

2.2.2 The impact of liberalisation in the EU

The European electricity sector is currently experiencing a period of rapid transformation. However, liberalisation is not the only driver and there are other important factors as well, namely globalisation, the influence of capital markets and new technologies, the explosive growth of the internet ("e-commerce"), the convergence of gas and electricity markets and the growing influence of environmental concerns. It is the combination of these different factors which is causing the rapid transformation we are now witnessing.

The major impacts of the liberalisation process in the EU so far have been[4]:

- *A significant fall in electricity prices, due to price competition in generation and supply.* The fall in electricity prices has been of the order of 10-20% in fully liberalised markets. Industrial tariffs tend to decline more than domestic tariffs, reflecting the keener competition for industrial customers, and the small profit margins on domestic tariffs.

- *Investments in the electricity industry are much more risky.* Investments made by state-owned monopoly utilities were low risk, as the public ownership and control removed virtually all market risk. If an investment under performed, the subsequent costs could be passed on to the customers or written off by the government. Market risk is a key competence for operating in competitive power markets.

- *Pressure to increase the return on capital employed.* This follows directly from the previous point. Investors and lenders demand higher rates of return to reflect the greater risk of companies operating in liberalised markets. As a result, whereas investment in the electricity industry was previously viewed almost in the same category as government bonds, i.e. "safe but dull", now, electricity sector stocks are much more volatile, driven largely by merger and acquisition activity.

- *A fundamental change in the relationship between customers and electricity suppliers[5].* Electricity companies have changed from companies with a focus on social responsibility, to business-orientated companies. While public service obligations remain a part of supply licences, competition means that supply companies' main attention is on customer satisfaction, principally through low prices. Electricity companies have to be inventive in providing additional services that win new customers and retaining exiting ones. Empowered by choice, a type of electricity consumer has developed, who demands specific electricity services and who will look at several suppliers to get the best deal.

2.2.3 Corporate responses to liberalisation in the EU

Actors in the electricity market have responded in a number of ways to the new conditions. As noted, one of the major impacts of liberalisation has been a fall in electricity prices as companies compete on cost. This has had two main knock-on effects:

- *Cost cutting*. For example, reducing the workforce, avoiding new investment, cutting back on R&D spending and outsourcing services.
- *Mergers and acquisitions.*

The reasoning for cost cutting is obvious, but why mergers and acquisitions? Firstly, mergers and acquisitions allow companies to become more competitive through realising economies of scale. For example, separate customer billing systems in two companies may be replaced by one centralised system. The IT revolution presents many new opportunities for rationalisation in this way.
There are broader advantages to greater size too, such as a spreading of risk, access to cheaper capital and greater resistance to take-over by competitors. Mergers and acquisitions can also offer companies a fast track to growth. With the prospects of

expansion limited by stagnant electricity markets in their domestic market, mergers and acquisitions (often overseas) are the only way for companies to achieve growth and profit objectives and satisfy their shareholders.

The change in the relationship between customers and suppliers is driving companies to fight over smaller and smaller consumers, right down to the domestic ‘mass-market’ level. For this market, the creation of an identifiable brand is very important, although electricity suppliers often have difficulty achieving this. It will take a long time for electricity to rid itself of it’s public service image, and is not regarded as 'value-added' consumer product.

A common approach to reach the mass market is thus to sell electricity alongside other products and services under one common brand. Examples include branding with banking, supermarket chains, insurance and house moving services as well as the more obvious utility services, telecomms, water and gas.

Competition in the mass market (or “domestic” market) is being further accelerated by the development of 'e-commerce'. The internet provides electricity consumers with a convenient means to compare different offerings from many different suppliers. Equally, electricity companies can offer low prices through reducing administration costs and co-selling with other services, such as gas supply. For both parties the effort of ‘switching’ to a new electricity supplier is greatly reduced. Furthermore, the geographic location of the supplier is of little importance.

2.2.4 Future EU Trends

From this complex picture of new technologies, new markets and commercial forces, it is possible to envisage future trends for the European electricity market. Opinions diverge, but many experts expect that: regarding power generation:

- The operating life of existing large-scale coal and nuclear generating capacity will be extended through refurbishment, but few new large-scale plant will be built Europe.

- There will be increasing use of natural gas and distributed generation. The share of renewable energy and cogeneration will increase, as a result of EU and Member State legislation and stimulation measures.

- There may be international or national policy restricting, or putting a cost on, the emission of GHG gas emissions. For example, a wider application of carbon taxes, voluntary agreements to reduce emissions or emission trading schemes that place a cap on GHG emissions.

While on the demand (consumer) side:

- An increasing number of electricity consumers will require high quality power supplies to run computer systems.

- Retail will become a separate business in it own right. The retail market will segment with a major distinction between industrial and mass markets. The mass market will be dominated by multi-product retailers, who increasingly use the internet to interact with customers.

- There will be more services ‘beyond the meter’ especially for industrial consumers. Companies are likely to start offering more energy services, such as heating and light, rather than pure energy supply (i.e. become ESCOs – Energy Service Companies). This provides a market opportunity for energy efficiency and distributed generation.

And finally regarding the company operations:

- The electricity market will segregate into an oligopoly of large multinational energy companies, for whom electricity is only one of their business interests, and smaller niche players who are able to exploit market opportunities more effectively than larger companies.

- Financial risk management tools will become increasing important for managing business risk. Energy industry financial services and products will become more sophisticated e.g. the emergence of weather derivatives for hedging climatic risk.

- There will be more cross-border trade, although physical trade may be limited by the capacity of the network.

- Transmission and distribution businesses will become part of a wider ‘network’ business, where companies have interests in other energy carriers and telecommunications (a good example is the UK National Grid Company which has interests all over the world in both electricity and telecoms[6])

2.3 Accession country perspective

2.3.1 The Status of liberalisation in accession countries

Accession countries entered the 1990s with fully centrally planned electricity sectors. The power companies were monopolistic, vertically-integrated and state-owned. The first step of transition to market economics in the power sector has been the disaggregation (“unbundling”) of the utilities into generation, transmission and distribution companies and to convert them to stock companies. The second step - the current phase of liberalising the electricity market – has been privatisation, mostly starting with the privatisation of power plants. This privatisation has a number of motives:

- Preparation for market opening and competition as required by EU regulations.

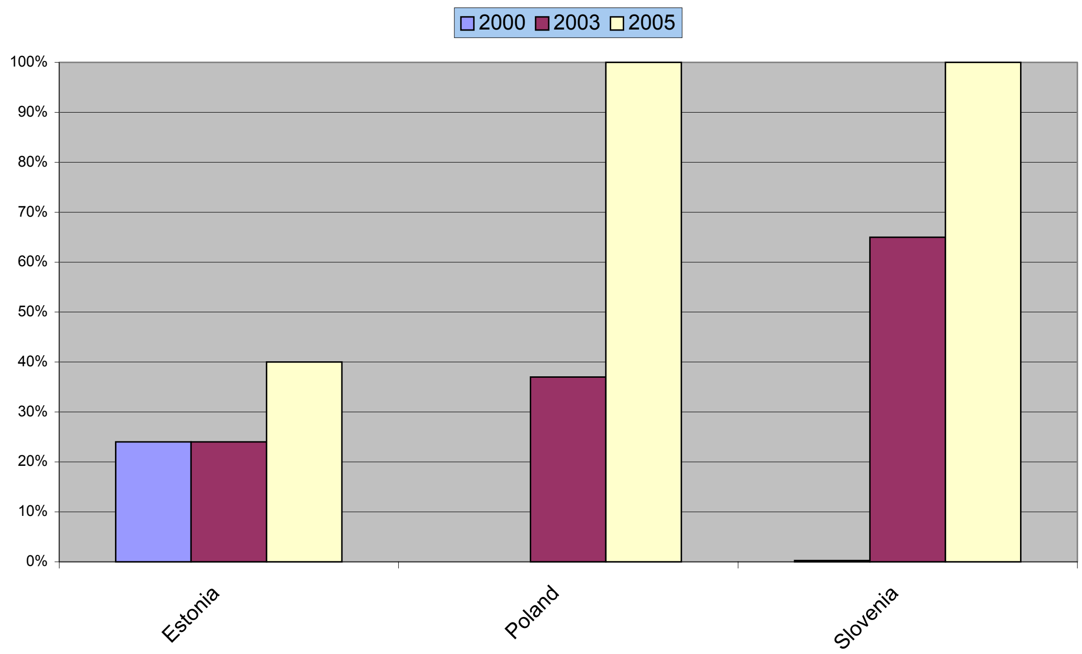
- Many power plants need capital intensive rehabilitation, life-time extension and environmental upgrading. These need to be financed by private investors.

- Privatisations provide welcome revenues for the state.

The accession states have all made major changes in their energy and electricity policies and laws over the past decade. In all three countries, electricity sector policies should be in line with all European Commission Directives by the time of accession. Of the three study countries, Poland has gone the furthest towards market liberalisation. In 2000 43% of the electricity market was open to competition, putting Poland ahead of Italy, Portugal, France and Ireland and beyond that required of the EU Electricity Directive (30% by 2000). Full market opening in Poland should occur in 2005, and in 2005 and 2007 for Slovenia and Estonia respectively (see figure 2.2 below). However, access to the grid in Estonia and Slovenia remains considerably restricted to independent power producers (IPPs).

Privatisation and local government ownership the most notable changes in the heating sector over the past several years. There has also been considerable private, primarily foreign, investment in both the electricity and heating sectors in all three countries. Joint ventures have been made or are underway with the major electricity companies in all three.

Figure 2.2: The status and prospects of electricity market opening in the EnPAcc accession partners countries.



Country	2000	2002	2003	Full opening
Estonia	24%	24%	40%	100% by 1st Jan 2007 (estimation only[2])
Poland	43%	51%	/	100% by 5th Dec 2005
Slovenia	0%	/	65%	Expected by 2005, but no date set.

2.3.2 Future trends in accession countries

Section (2.2.4) considered the experience of electricity liberalisation in the EU and the associated trends. As liberalisation is occurring in the CEEC later than in many EU countries, it is reasonable to expect that many of these experiences and trends will eventually apply to accession countries. However, there are fundamental differences in the circumstances of the countries, which will influence the outcome of the liberalisation process.

Firstly, liberalisation in the accession countries is accompanied by transformation of the whole economic system, from central planning to market-orientated economies. Secondly gross national product of accession countries is significantly lower than the EU average.

Thirdly, the physical energy systems of accession countries are different from those in EU countries[7]. Coal (and in the case of Estonia, oil shale) plays a much more dominant role in both the primary energy balance, the electricity sector and the national economies of the CEECs. Generating capacity is often over-sized or ill suited to the present day electricity demand, being optimised for the energy-intensive economies and power systems of the previous era. Furthermore, power systems are typically in need of refurbishment.

[2] There is no official decision yet concerning market opening in Estonia, a Working Group of the Ministry of Economy is still working.

On the positive side, CEECs generally have a high proportion of district heating, often combined with cogeneration plant (combined heat and power - CHP). However, as with the electricity sector, district heating systems are often in need of refurbishment.

These factors must be taken into account when extrapolating EU power sector trends and environmental practices to the accession countries.

3 The impact of liberalisation on environmental protection

A key question for the EnPAcc project has been: *what aspects of electricity market liberalisation support environmental protection and what aspects undermine it?* This section attempts to identify impacts of liberalisation that have a strong influence on the environmental performance.

3.1 Impacts that support environmental protection

Liberalisation should allow greater market share of environmentally clean power generation sources, through elimination of market barriers posed by a monopolistic electricity industry. Consumers have the freedom to choose who supplies their electricity and how, allowing them to choose environmentally advantageous options such as electricity from renewables (e.g. through 'green tariffs') and cogeneration.

In theory, a fully liberalised energy market will not favour one industry or technology over another. All subsidies are removed and there is a 'level playing field' for competing energy technologies, so allowing clean power options to gain market share. Indeed, provided that environmental costs are included in the price of electricity, non-polluting and efficient technologies should be at a natural advantage because of low environmental and fuel costs.

In practice many market distortions persist that protect the position of established players and inhibits the growth of clean power. Furthermore the short-term response of the industry to liberalisation commonly undermines the position of cleaner generation.

3.2 Impacts that undermine environmental protection

Lower electricity prices encourage consumers to use more energy, not less, since the economic value of energy efficiency and conservation actions is reduced. This results in higher emissions and greater primary energy use.

Intense price competition forces the use of the cheapest generation sources. In many case this is coal and nuclear capacity where investment costs are largely written off and where environmental / decommissioning costs are not fully included in the prices. Competition has even resulted in market prices lower than operating costs as utilities battle for market share. Only large, cash-rich utilities can pursue this economically unsustainable strategy. The net effect can be very damaging for environmentally friendly generation. The expansion of (non-large hydro) renewable energy in Europe depends almost exclusively on government support schemes.

Cogeneration has further suffered from the differing rates of market opening of gas and electricity markets. Since liberalisation cogeneration markets have stagnated. In some countries, such as Germany, a significant proportion of cogeneration plants have shut down or have become unprofitable[8].

Competition in the electricity sector is leading to lower R&D in the electricity industry. Most governments, under acute financial pressure, are also reducing their support for energy R&D[9]. There is thus a danger that technological development of electricity industry will be hindered.

3.3 Is liberalisation good or bad for environmental protection?

So far there does not appear to be a strong link between the current liberalisation process and environmental protection[10,11]. In some countries, such as the UK, environmental performance has clearly improved mostly due to the ‘dash for gas’ and increased productivity of nuclear generation, although this might have happened without market liberalisation. In contrast, as noted in the previous section, liberalisation in Germany, at least in the short-term, is undermining the market for environmentally friendly generation and increasing the use of generation more polluting generation assets.

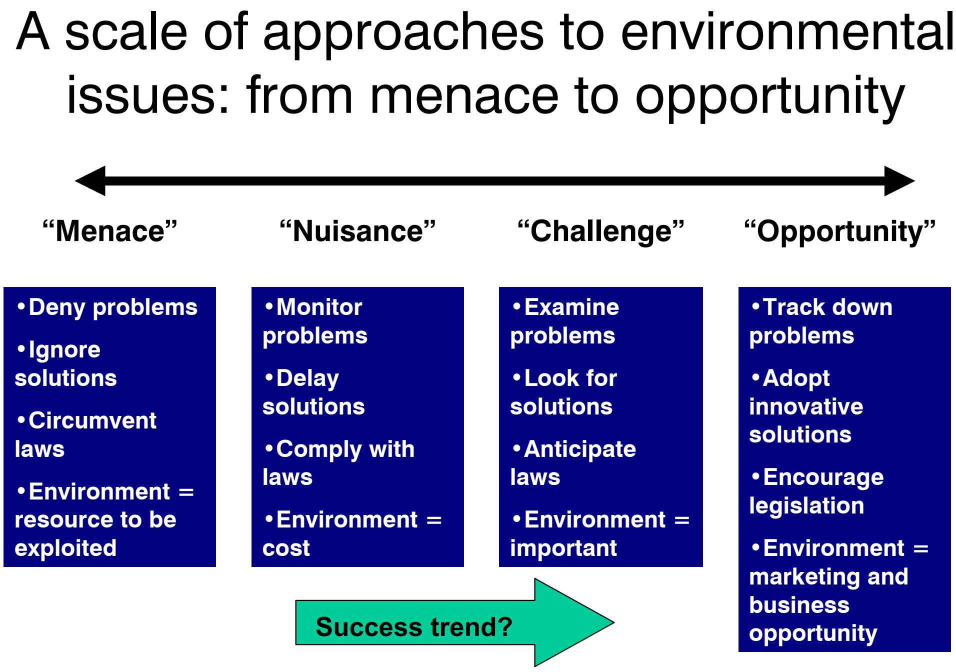
As discussed section 2.3 Europe is still far from creating a single market for electricity free from serious market distortions. Even in liberalised electricity markets, the business cycle of the electricity industry is so long (life-time of investments, project development time…etc) that it will take several years or even decades for the longer-term effects to become clear.

Furthermore, there are many the methods and mechanisms for environmental protection in liberalised markets that have yet to be properly applied, such as the tradable economic instruments outlined in section 5. Environmental externalities of production are still commonly excluded from energy prices, so the environment is undervalued in the market place.

3.4 Corporate responses to environmental drivers

Companies operate in a complex business environment influenced by regulatory, political, financial and commercial factors. It is not possible to be prescriptive about what options will succeed in maximising environmental protection in liberalised energy markets. Nonetheless, some commentators have made observations about the differing approach of electricity companies around the world to environmental problems. Figure 4.1 illustrates the diversity of reactions that may be seen in the electricity sector, in the form of a 'scale' of responses from regarding the environment as a ‘menace’ to business operations through to it being an ‘opportunity’.

Figure 5.1: Possible corporate reactions to the imperative of environmental protection.



Adapted from a presentation: by Paul Bulteel, Secretary General of UNIPEDE/EURELECTRIC, Nov. 1999[12]

The position of most companies on this 'scale' is largely a result of the policy and business environment that the company works in. However, it should be noted that innovative, far-thinking companies operating in a liberalised energy sector are more willing to adopt the 'opportunity' attitude shown above.

It would be easy to suggest that all companies should strive towards an 'enlightened' view of the environment as an opportunity. However there are some very obvious dangers of being too progressive, for example having clean but expensive power that no customer can afford. However there are dangers in taking the other extreme view, of environment as menace, for example being unable to respond quickly when consumers become more educated about environmental impacts, or when stricter legislation is introduced.

These observations are fairly obvious, but as accession country power sectors begin to operate in liberalised markets, additional factors are likely to come into play:

- Poor environmental performance is a risk to a company's reputation and can damage its brand. Company brands are a crucial asset for marketing in competitive markets. A brand has a market value in its own right and they take many years to develop. Environmental interest groups are very quick to exploit environmental damage by well-known companies and the value of brands can be destroyed very quickly. For example, Shell has spent the best part of a decade repairing its image after the Brent Spar incident and the exposure of its alleged activities in Nigeria.

- Policies for stimulating greater environmental protection in the electricity sector are creating new market opportunities. For example, most German and Austrian utilities market their electricity as being produced in an environmentally sound way. A very small number of electricity consumers are willing to pay a premium for power from renewable sources.

Box 1: Green tariff experience from Finland

The development of the voluntary green market in Finland was actually driven by the consumers themselves. A group of environmentally conscious customers emerged and made their wish known to purchase green electricity. This induced the electricity companies to diversify their production, and offer electricity tariffs based on biomass, wind and hydro power. The NGO The Society for Nature Protection Finland then offered to certify green tariffs (at a price) and so give consumer confidence in the green products on offer. It is to be noted that the certification process had no official character, everything was on a voluntary basis.

Most of the utilities quickly created their own green tariffs. They offered a range of green tariffs declaring "contents" of the electricity in terms of the proportions of wind electricity, bio-electricity, etc to respond to different markets, at a premium price of about 20% higher than normal retail tariffs.

The success of this was good in the beginning, but soon these markets appear to have saturated quickly, and today the growth in this sector is modest. Not all green tariff customers are domestic customers, some commercial customers buy green electricity for their marketing and advertising.

4 The Role of Distributed Generation (DG)

This section describes the role of distributed generation, one of the two environmental protection options that the EnPAcc project has focused on, that may be adopted by the electricity sector in candidate accession countries as a contribution to minimising the environmental impact of the sector.

Distributed generation (DG) - also referred to as 'decentralised', 'embedded' or 'dispersed' generation - refers to power generation by small units (usually rated at less than 30 MW_{el}) connected directly to the distribution network.

A range of generation technologies are candidates for distributed generation. They can be separated into those based on fossil fuels and those based on renewable energy. Important fossil fuel technologies are efficient reciprocating engines (e.g. gas engines), mini- and micro-turbines and fuel cells. Most renewable energy technologies are suitable for distributed generation applications. These include: wind power plants, biomass and biogas CHP plants, small-hydro plants, solar thermal and photovoltaic power plants.

Distributed generation could have enormous implications for the future operation of distribution networks. With domestic and micro generators able to satisfy typical off-peak domestic demand, local networks could reach a point where there was no net flow of electricity over certain portions of the day. At such times the primary role of the network would be to provide balance and stability, rather than electricity[13].

4.1 Why DG is growing in interest

Distributed generation is not a new concept. It has been a feature of the electricity industry since it began more than a century ago. However, after a period of centralisation of electricity systems following the Second World War, DG is becoming more popular again, mainly due to technological improvement, cost reductions relative to competing energy sources, lower investment risk (see section 2.3.1) and environmental performance.

Technology advance of renewable DG applications is being stimulated by government support schemes for renewable energy for renewable energies. Meanwhile 'micro-power' technologies (especially fuels cells and micro-turbines) are attracting increasing interest and investment from private companies, in anticipation of their enormous market potential in both stationary and transport applications. These developments are helping to reduce the cost of DG and make them more competitive.

Another driver for DG is that DG can sometimes respond to customer needs better than electricity from the grid. Certain consumers are increasingly demanding *very high quality power supplies* to run critical IT systems. Interruptions to IT power supplies can have serious economic repercussions. 'New economy' companies, fearful of their financial exposure to shortfalls in power performance, are demanding at least 99.9999% reliability – equivalent to 30 seconds of annual outage – a level of performance that power suppliers can find it hard to guarantee. Dedicated energy sources may be the only way for companies to ensure this level of reliability. The recent power shortages in California are a stark reminder that even the power systems in the most advanced economies can fail.

On-site generation (especially cogeneration, where a there is sufficient heat load) can also mean cheaper energy supply for customers than energy supply from a utility. On-site power production has always been used in industry, but with the advent of smaller, cleaner generation units, such benefits are available to smaller and smaller consumers. The economics of distributed generation can be further enhanced by the avoidance of any environment taxes that are collected along with the electricity supply.

Finally, in a broader context, DG can contribute to *regional development* by bringing both power and economic activity to rural areas. This is an important consideration in CEE countries and European countries alike, but perhaps especially in CEE countries. Since the fall of communism and the closure of many state enterprises, unemployment in rural areas of CEE countries has risen and there has been significant urban migration. Furthermore, the proportion of people currently engaged in agriculture in accession is much greater than in EU countries. For example, whereas the EU-15 the farm sector employs 5% of the population, in Poland the proportion is over 20%14. Upon integration with Europe, this proportion is likely to fall as accession country farmers compete and loose against the industrialised farmers of the EU. This rural development will be an crucial topic for accession country development as a whole, and DG can have a positive effect.

4.2 The disadvantages of DG

There are a number of disadvantages of increasing the extent of DG in electricity power systems. First of all there are *technical implications for the network*. Capital expenditure will be required to integrate more DG into existing networks.

There are also *legal and commercial implication for the network.* The balance of supply and demand in modern power systems in not only a result of technical sophistication, but also a huge amount of network regulations and codes. These legal and commercial arrangements will need to be reviewed to allow greater use of DG.

By nature of their dispersed nature, DG also means that the environmental impact is spread over a greater area, so impacting on more people. DG projects are this subject to many regulatory barriers, which can be severely restrict the potential applications of DG despite the technical and economic potential for their application.

Financing DG can be a significant barrier. Traditional financiers of energy projects tend to prefer projects over a certain size (typically $30million), to justify the effort required in terms of risk assessment, due diligence...etc. This makes it hard for small projects to obtain financing.

Finally, there is the issue of *technological risk.* Many DG technologies are in need of technological development and there is lack operational experience.

4.3 Possible policies and measures to support DG

4.3.1 Assessing the potential

The first step for policy makers should be to *assess the potential for the different DG technologies in the country* in both technical and market terms. The assessment should determine country-specific costs of different DG technologies, the macro economic costs and benefits and the environmental impact of the different options. The cost benefit analysis should include all social-economic and environmental effects. As explained in the previous section, DG can has a positive effect on local economies and this factor should be taken into account when forming policy, for example it may be appropriate to integrate DG into regional development plans.

4.3.2 Regulatory issues

The most important barriers to DG are not technical, they are regulatory[15]. Firstly grid connection issues are at present one of the most common market barriers to DG. Therefore policy makers should *establish a network charging regime for DG that facilitates fair competition in generation*. There are a large number of individual issues to be addressed, but the necessary changes will probably necessitate a review of design and operational codes for network access, followed by guidance to distribution network operators. Within this context *the contribution of distributed generation to network performance should be recognised.*

Furthermore, given that many DG projects are small-scale potentially developed by small companies with limited resources, the sheer complexity of grid access can be a significant barrier to DG. Policy makers should therefore *facilitate the involvement of distributed generation as much as possible*. This will generally entail establishing more transparent and consistent arrangements for the provision of information by district network operators to developers and users of DG.

Secondly, as mentioned elsewhere planning and permitting procedures for DG can be significant barrier too, at least by increasing project lead times and at worse prohibiting almost any kind of energy development. Furthermore project development costs do not fall proportionally with project size, discriminating against smaller developments. To encourage DG, policy makers should consider *streamlined planning and permitting procedures for projects* conforming to a certain criteria (e.g. under a certain size, within a certain geographic area or of a certain type). Streamlining of planning procedures is one of the requirements of the proposed Renewable Directive, so accession countries have to make a move in this direction in any case.

In view of the fact that DG is commonly done at the local level, policy makers should consider devolving power for planning consent to local authorities and municipalities as much as possible.

4.3.3 Market issues

Certification of environmentally advantageous DG energy is an important step in the development of DG. There are many possible advantages for certifying energy from clean power sources. Certification is a form of quality assurance for power, so incentivising generators to meet minimum standards of technical and environmental performance. Furthermore it provides an automatic inventory of clean power generation of a country or region, improving the quality of information available to the market place and policy-makers.

Perhaps most importantly of all, certification can help to enable an efficient market for clean power. Certificate systems can facilitate the voluntary market, as consumers can be sure of purchasing a energy ‘product’ with certain environmental characteristics. Government can stimulate such markets by *public procurement,* for example by installing cogeneration in public buildings or purchasing electricity through ‘green electricity’ tariffs. Such actions have a double benefit – stimulation of the market by creating demand and making a statement.

By awarding certificates for quantities of energy, certification can form the basis of a market-based mechanisms for supporting DG technologies. Such systems are preparation in many countries, aimed principally at the stimulation of a competitive market for renewable energy, but with some attention also being paid to cogeneration. CEE countries should be reviewing the performance of these mechanisms and considering their application (see section 6).

4.3.4 Technical issues

As R&D spending in energy technologies has fallen dramatically since liberalisation, and at the same time many DG technologies are held back by technical immaturity, it may be appropriate for government to fund the R&D programs into promising technologies. It is important to be aware of other international programmes and develop international collaborative programmes where appropriate. There is also scope for leveraging greater results for the same money by supporting private research programmes.

4.3.5 Direct stimulation measures

Policy makers can also take more direct steps to promote DG. At present we can observe a variety of support schemes adopted with varying success in the EU, for example

- Guaranteed power purchase (feed in tariffs)
- Tax exemptions (for example exemption from an ‘eco-tax’ placed on the generation or consumption of energy in order to ‘internalise’ environmental externalities of production)
- Capital grants to reduce the capital cost of DG developments. Renewable energy investments are commonly characterised by high initial costs, and low operating costs. Therefore capital grants can be an effective way to stimulate the market.
- ‘Obligations’ or ‘quotas’ requiring the production or consumption of a certain quantity of DG energy. This approach can be combined with tradable economic instruments to act directly on the pollutant

Not all such economic stimuli are aimed exclusively at DG technologies, as many of these will apply equally to renewable or other generation connected at a transmission voltage.

A full discussion of this topic is beyond the scope of this project, but policy makers should be aware that, whilst sometimes being effective at promoting DG[3], *direct subsidies are basically inconsistent with free market principles as they are a form of market distortion which does not promote competition, so are economically inefficient*. Market-based mechanisms are a better fit for liberalised electricity markets.

4.4 Strategic options for industry

For the reasons stated in sections 2.2 and 4.1 we are likely to see an increasing amount of distributed generation in the power sectors of the next few decades. In this transitional period we may see different business and regulatory approaches to DG. The extremes of these categories could be characterised by two scenarios:

- Defence scenario. Generators continue to invest in large centralised thermal power stations. Market regulations disadvantages DG by following the centralised power system view and imposing unfavourable conditions for grid connection. The transmission and distribution companies support this position. Embedded benefits are not recognised or rewarded. Electricity suppliers do not move into energy services. Equipment manufacturers continue to research, develop and sell only large-scale power technologies.

- Innovation scenario. Generators divest in large centralised capacity and seek to develop DG projects. New entrants into the generation market bring with them new technologies and ways of doing business. Distribution companies adopt pricing structures that reward embedded benefits and work with DG developers to provide network solutions. Mini-grids become more common, facilitating the greater penetration of DG. The gas transmission network partially replaces the electricity transmission network for

[3] Renewable energy and cogeneration has flourished in Germany, Spain and Denmark due to feed-in tariffs.

transporting large quantities of energy. Supply business seek to find local solutions to energy provision, become energy service companies and develop DG as part of their services.

Today's liberalised power sectors are somewhere between these two extremes and share elements of both the 'defence' and the 'innovation' view. The likelihood is, however, that even in the short term some companies will take an innovative approach to electricity, and will use it to win market share from the traditional electricity supply industry. Overall environmental performance of the sector should be improved through this route.

It is helpful to examine potential routes that could be taken by different sectors of the electricity industry in moving from a strategic position that militates against DG (i.e., 'defence') to one that promotes it (i.e., 'innovation'). For this purpose it is useful to view possible industry actions against two variables – time scale (short-term versus long-term), and strategic response ('defence' versus 'innovation).

These scenarios are presented in figures 4.2 and 4.3 below, which offer possible strategic responses by generation companies and by distribution companies, who are the market actors who have the strongest influence of DG developments.

Figure 4.2 Possible strategic responses to DG by generators, short term and long term.

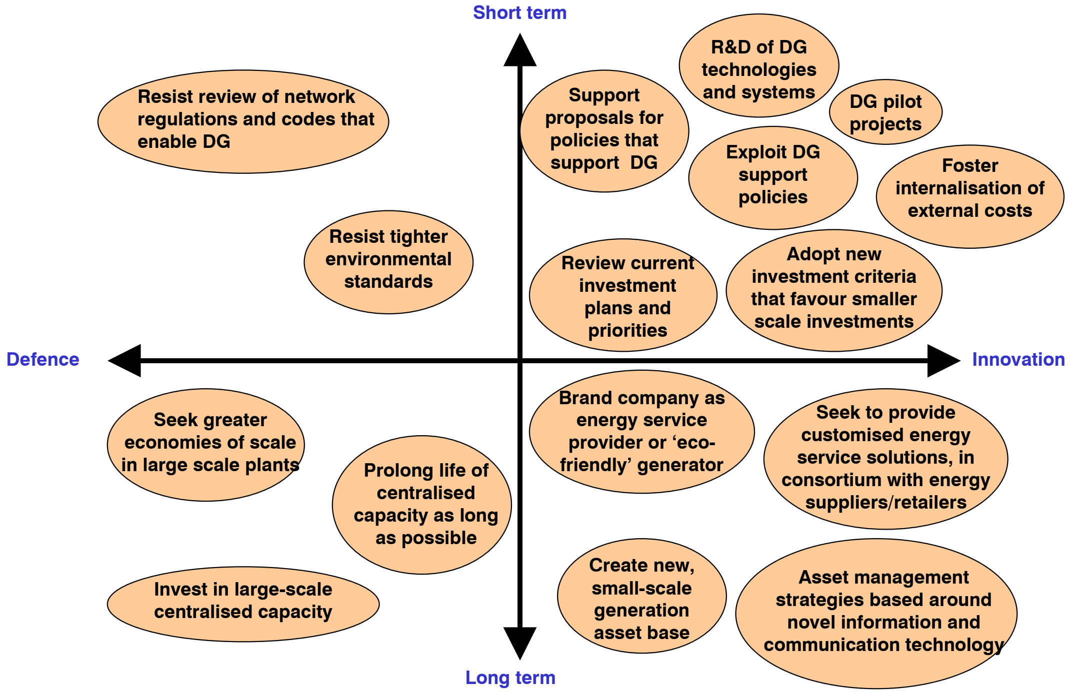
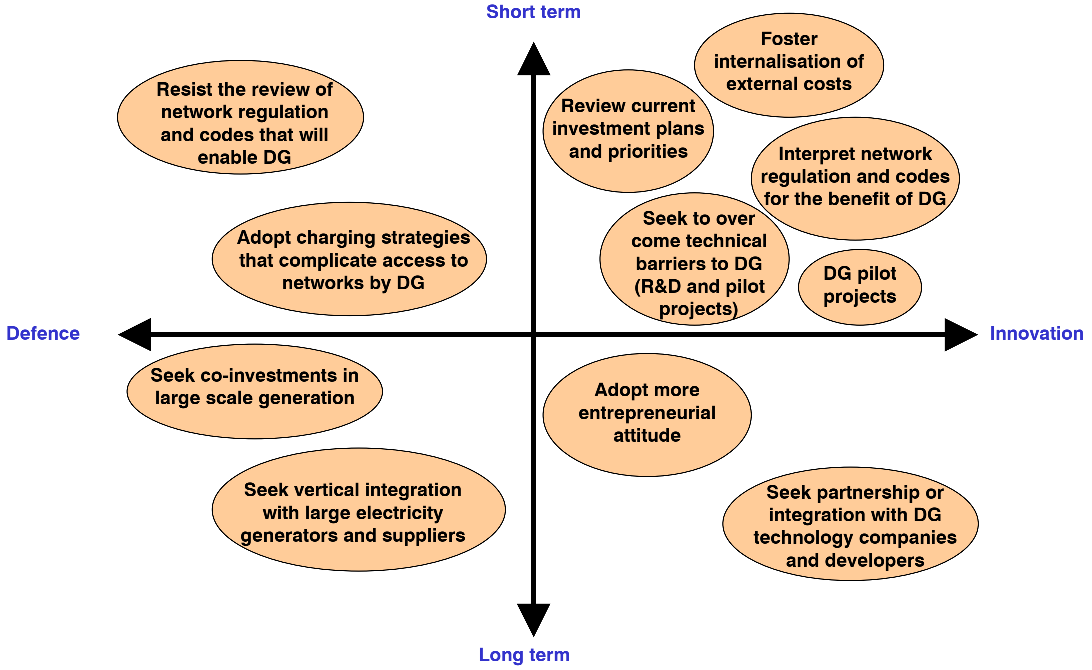


Figure 4.3: Possible strategic responses to DG by distribution companies, short term and long term.



5 The role of tradeable economic instruments

This section describes the status and potential role of tradeable economic instruments in accession countries. This is the second of the two environmental protection options that the EnPAcc project has focused on that may be adopted by the electricity sector in candidate accession countries as a contribution to minimising the environmental impact of the sector. The scope of the discussion is limited to consideration of the Kyoto flexible mechanisms and tradable green certificates.

5.1 Tradeable economic instruments fundamentals

A fundamental reason for liberalisation of electricity markets is to improve the economic efficiency of the industry, i.e. to lower the price of electricity by introducing more competition into electricity generation, distribution and supply. Policy makers are now looking to market forces to reduce the cost of achieving environmental goals.

One method of doing this is to translate the environment into the language of the market through the use of tradable economic instruments. In practical terms this means that the environmental benefits and dis-benefits (also referred to as environmental 'externalities') which policy makers try to control are accounted for through tradable commodities. With the commodity defined, government can then put in place the necessary demand drivers and use market forces to deliver environmental protection. This can lead to significantly lower costs for meeting policy objectives.

It is important to recognise that market mechanisms built around tradable economic instruments are merely a *mechanism* for achieving environmental policy goals. Such mechanisms have little relevance unless government takes responsibility for implementing policies that create a demand for the economic instruments. It is the creation of this demand, through targets, tax exemptions, quotas or caps on emissions, or targets for uptake of renewables, which is central to the system design if specific environmental objectives are to be achieved.

Liberalised electricity markets give greater scope for the applications of these instruments, because many market actors are already doing business in a competitive market. Also, policy makers can have difficulty finding ‘command and control’ type policies, such as subsidies and trade restrictions, that do not impinge on competition law, state-aid rules, consumer protection and all the other regulations associated with the European markets.

5.2 The Kyoto flexible mechanisms

The best known tradable economic instruments currently under development are the three Kyoto flexible mechanisms, proposed as means to lower the cost of compliance to the Kyoto Protocol on GHG emissions[16]. They are: International Emissions Trading (IET), Joint Implementation (JI) and the Clean Development Mechanism (CDM).

Put simply, the mechanisms grant economic entities (companies) in an Annex I country[4] the ability to make emission reduction investments in another country, and take an agreed portion of the emission reduction credit to meet emission targets or obligations in their own country.

[4] Estonia, Poland and Slovenia are all Annex 1 countries who have signed the Kyoto Protocol under the United Nations Convention on Climate Change - UNFCCC.

In this way the investing entity meets its emission reductions at lower cost than by taking domestic action, and the host country obtains power sector investment. The benefits of the project, in the widest sense (i.e. developmental, financial, emission reduction...etc) would normally be shared between the project partners as appropriate.

IET and JI are of most relevance to accession countries, since CDM is for projects based in developing (i.e. non-Annex I) countries that have not agreed to emissions reductions under the Kyoto Protocol, and hence do not have treaty obligations under Kyoto to reduce their emissions. Estonia and Slovenia have agreed to reduce their GHG emissions to 8% below overall GHG levels in 1989 and 1987 respectively, while Poland has agreed to reduce GHG emissions 6% below 1990 levels under the Kyoto Protocol. JI projects and IET are viewed by all three governments as means to achieve these targets. If the mechanisms are put in place, then IET and JI *could* bring significant investment into accession countries, as there are generally more low-cost emission reduction opportunities in accession countries than other Annex I countries.

As with the EU 15 Member States, none of the CEECs have ratified the Kyoto Protocol. Each of the three came to the Conference of Parties (COP) 6 negotiations in The Hague in November prepared to complete the Protocol, with the stated objective of ratifying the Protocol before 2002. This is still the stated objective of each of the three governments. The three are working with the other CEE accession states to co-ordinate their negotiating position with that of the EU. Each has stated that, upon ratification of Kyoto, they will permit JI and IET to be used to meet Kyoto targets.

5.3 Emissions trading in accession countries

Domestic emissions trading (ET) schemes are emerging in some countries (e.g. Canada, Denmark and the UK) as a means to meet national emission reductions targets. *These schemes may or may not interface eventually with international trading*, as envisaged under Kyoto.

An accession country may wish to establish a national emissions trading scheme for the following reasons:

- Reducing the national cost of Kyoto compliance.
- Preparing for inclusion into the EU Community system upon accession. Being part of the wider European market should lower Kyoto compliance costs and provide a mechanism for inward investment. To obtain maximum benefit from these opportunities, Accession countries should develop internationally compatible trading schemes in parallel with, and coordinated with the leading EU countries.
- Preparation for international emissions trading under Kyoto from 2008, to obtain the same benefits as for joining the EU community system, but on an even larger scale.

Reasons for delaying developing a national system are:

- Waiting for national circumstances to be more appropriate for establishing emissions trading. Many countries need to progress restructuring of the economy and concentrate on capacity building of the institutions responsible for environmental protection before attempting to implement a complex emissions trading scheme.
- Waiting for greater certainty about the Kyoto protocol and international climate policy in general.
- Waiting for possible EU guidelines on national emissions system design and the learning from the experience of other countries.

The decision to implement a national emissions trading system in an Accession country will depend on many factors. However an important issue is an anticipation of the marginal cost of abatement within the national scheme relative to the anticipated marginal cost of abatement within the EU Community scheme or wider international trading. Many believe that abatement costs should be lower, hence Accession countries should target for inward investment under emissions trading and joint implementation. Joint implementation will happen whether the Accession country has a national trading scheme or not, however to benefit from inward investment under emission trading a national scheme must be established first.

5.4 Joint Implementation in Accession countries

Provided that the marginal costs of abatement in Accession countries are lower than other Annex I countries, then Joint Implementation could be an important mechanism for bringing inward investment into Accession countries.

Some commentators seem to support the idea that JI can easily be replaced with International Emissions Trading[17]. Why bother with setting up JI projects with the Annex I area when emission credits can be traded more easily, conveniently and cheaply through International Emission Trading?

There are several justifications for JI. Firstly, JI can be a vehicle for technology transfer and capacity building. IET trading just allows host countries to sell spare emissions credits that they manage to achieve either through the good fortune of having 'hot air' or through emissions abatements that they manage to achieve with domestic resources. With strong economic growth predicted in some Accession countries, some countries will not have any such emissions credits to sell. In many economies in transition there may be good opportunities for emissions reductions, but the host lacks the technology or the capital to realise those projects. JI enables such projects to take place. So in effect, JI enables host countries to achieve additional emissions reductions, through the use of modern technologies and the support of foreign investors, that would otherwise be impossible. Sharing the ERUs and other project revenues between host and investor allows both parties to the benefit.

Secondly, JI allows the private sector to take the initiative. Relying on just International Emissions Trading requires governments to decide where to put the heaviest reduction burden amongst the different sectors of the economy. This is unlikely to lead to least cost abatement solutions. JI allows private entities to pursue abatement projects in any Annex I country.

Thirdly, the mechanism of JI is further advanced than International Emissions Trading. There are still key aspects of IET requiring further *political* debate. The remaining issues for JI tend to be *operational*, with many of the political problems already adequately treated.

There are other justifications for JI, but arguably most important reason is that the main task of the UNFCCC is to commit Parties to the Protocol and build financial and technological bridges between North and South, East and West. Without these bridges climate policy is likely to fail. JI (and CDM) are in that spirit of 'bridge building', IET is not.

5.5 The status of ET and JI in the study countries

5.5.1 Estonia

Estonia has already far exceeded its target for 2010 (8% reduction). The country could thus in theory be a net exporter on emissions credits and could obtain revenue from credit sales. Another approach might be for the Government to 'bank' it's spare Assigned Amount[5] for future commitment periods.

[5] 'Assigned Amounts' is the official term in the Kyoto Protocol defining the total allowed emissions for a Party over the commitment period 2008-2012.

The electricity sector is responsible for nearly half of the annual CO_2 emissions. Furthermore most of the current power generation and transmission technologies are outdated and rather inefficient, and domestic fossil fuel (oil-shale) has a high CO_2 emission rate due to its high mineral carbon content. Hence the potential for CO_2 savings is high and investments are thus are expected to be highly effective. Nonetheless, the absolute size of savings is relatively small, as a result of Estonia being a relatively small country.

To date there has been more development work on JI than ET in Estonia. Eesti Energia AS participates actively in two working groups BALTREL (Regional Association of Power Companies) and the Finnish company FORTUM, which are dealing with JI.

Estonia hosts some Activities Implemented Jointly (AIJ) pilot projects. There are 19 projects in Estonia both implemented and ongoing. They mainly consist of district heating efficiency improvement and biomass boiler conversions in smaller towns in various parts of Estonia financed by bilateral donor countries Sweden (NUTEK/SIDA) and Denmark (DANCEE).

JI will be an important mechanism for bringing new investment into the Estonian power sector, and most of the CO_2 credits shall be transferred through JI. However it is not yet clear whether *JI will achieve its full potential in terms of technology transfer and capacity building.* Results from NUTEK-s Small Boilers Conversation Projects have had good results, information has been well disseminated and delivered to the various beneficiaries: energy utilities, municipalities and NGO-s.

The principal barrier to the faster development of JI in Estonia is the absence of national or international, regulations.

As regards ET in Estonia, no emission trading deals have been made to date, since no rules regulations for ET have yet been established by the relevant authorities (principally the Ministry of Environment and Ministry of Economy). Eesti Energia AS, is currently actively seeking possibilities for ET projects, in order to gain additional resources for investments in energy efficiency, technology improvement and switching to less polluting fuels.

There is strong interest from Eesti Energia to create the ET framework either bilaterally or in cooperation with BALTREL and other EU countries. The EU Commission proposal is regarded as a positive input to the relevant authorities to continue the collaboration on international ET schemes. The most likely outcome is that authorities will just wait until international rules are established and then adopt these for application nationally.

Since Estonia currently has no difficulties with meeting the Kyoto target, it is unlikely that any national emissions trading systems will be established. Nonetheless, it should be noted that electricity exports are an important balance of trade item for Estonia, and these may be increased in the future (notably to Russia). Critics of the JI mechanism argue that if Estonia promotes JI projects and thereby 'exports' some of those credits to other Annex 1 countries, it may find itself with insufficient credits to meet its domestic targets.

5.5.2 Poland

Poland is the third largest emitter of CO_2 amongst the economies in transition countries, after Russia and the Ukraine. At the national level, Poland can stay below the Kyoto target of 6% below the emission from the 1988 base year, without special investments and could provide CO2 saving potential at moderate costs. The only sector that is likely to experience significant growth in emissions up to the first commitment period is the transport sector.

In common with Estonia, JI is a much more attractive proposition in Poland than emissions trading at this time. As noted Poland is likely to meet its Kyoto targets with ease.

Furthermore there are plenty of cheap abatement options. Restructuring is likely to lead to further abatement project opportunities. Emissions from the electricity sector are expected to grow again after 2000 due to increased electricity demand and increased utilisation of coal plant. Thus only an intensive program of investment could stabilize CO2 emissions at the presently relatively low level.

The Polish Government accepts all the flexible mechanisms proposed under the Kyoto Protocol, including JI. The main issues in Poland on JI and EIT concern how to structure and regulate JI investment and emissions trading. The Secretariat for JI has been established as a division of the Polish UNFCC Executive Bureau in the National Fund for Environmental Protection and Water Management, and general guidelines and criteria for AIJ/JI projects have been set up.

In July 2000 the Polish Government signed the first memorandum of understanding for two JI projects with the Dutch Government. JI has the potential to be an important mechanism for bringing new investment into the Polish power sector, as long as certain conditions are fulfilled, namely:

- there must be clear and transparent rules, principles and guidelines for JI established by the COP
- there must be active governmental policy on JI mainly by host countries
- there must be cost-efficient and effective registration, certification and crediting procedure for JI projects, and
- efficient negotiations are needed between governments of donor and host countries.

To summarise the principal barriers for JI in Poland, they are:

- international uncertainty and a lack of agreement on principles, rules, guidelines and modalities for the flexible mechanisms;
- the lack of active government policy on JI
- complicated procedures for the preparation and acceptance for JI projects
- the lack of effective operational rules, and
- unclear benefits for investors.

The concept of emissions trading has been widely discussed in Poland, especially with respect to SO_2. After several years of consideration and development a SOx trading scheme, limited to the electricity (and possibly CHP) sector, is expected to go “live” in late 2002, early-2003. There is strong interest on the part of the Polish Government to use this to gauge the opportunities for broader emissions trading in GHGs within the Kyoto flexible mechanism framework.

Furthermore, the SOx scheme should influence the form of the long-awaited new Environment Law. So far the the main barrier to emissions trading has been the lack of any legal base for implementing emissions trading in Poland, itself caused by the low priority of the issue compared with more pressing policy changes in combination with marked controversies regarding this topic.

The historic lack of support for emissions trading within the EU has also been important, although this situation has been modified by the publication of the EU Green Paper, which Polish authorities are very familiar with. In the end, the development of a national ET system will depend on political decisions on an international and national level.

Emissions trading could potentially help to reduce the costs of fulfilling GHG emission reduction requirements, and could create better circumstances for investments in the power sector on one condition, that the sector must have a medium to long-term emissions reduction obligation giving planning certainty over a fairly long time horizon.

So it seems that Poland is in a 'wait and see' situation as regards emissions trading. Domestically restructuring needs to proceed further before entertaining the idea emissions trading. On the international scale, it remains to be seen to what extent emissions trading becomes a part of the European energy market, although the green paper and the prospect of Kyoto trading in 2008 make it seem likely that it is going to be.

5.5.3 Slovenia

Slovenia will have a difficult time meeting its Kyoto GHG reduction targets and number of investments will have to be made domestically to reduce emissions. Therefore, its government is reluctant to 'sell' any of its 'credits' through JI or EIT for fear that by doing so, it might not be able to use those to meet its obligations under Kyoto.

The National Programme of greenhouse gases (GHG) emissions reduction is currently in preparation and the implementation of this Programme will ensure basic conditions for emissions trading. Nevertheless trading is expected to happen only after 2008.

The National Programme of GHG emissions reduction covers all of Slovenia, without separate treatment of individual sectors. Therefore it will be necessary to make an agreement between sectors about free and additionally needed quantities. It is anticipated that emission reductions from the electricity sector will come mostly from the reduction of generation from coal. In general, the marginal cost of abatement in Slovenia is higher than other accession countries, partially because the carbon intensity of electricity production is relatively low (mostly due to the contribution of nuclear and hydro generation).

The European Commission green paper provides further impetus for emission trading in Slovenia, however, it is unlikely to accelerate the establishment of emissions trading Slovenia before Kyoto trading in 2008. Emissions trading will certainly offer opportunities for investments in the Slovenian power system.

Table 5.1: Summary of situation regarding Emissions Trading (ET) and Joint Implementation (JI) in the three study accession countries

Key: + Positive point; - Negative point; ● Conclusion

	Estonia	Poland	Slovenia
Factors that make ET and JI an unattractive option	+ Will more than meet Kyoto targets* + Many cheap abatement options. + Well advanced market regulation	+ Should meet Kyoto targets easily*. + Large market. + Plenty of attractive abatement options. + Likely to be one of the most important JI markets. + Could lead to a significant influx of investment. + Practical experience with SOx trading. + Emission trading already subject to much discussion	+ Difficulty in meeting Kyoto targets – a national ET scheme could reduce cost of meeting Kyoto targets + ET already subject to much discussion.
Factors that make ET and JI an unattractive option	- Small market. - Still monopoly structure. - Generation over capacity.	- Complicated situation as regards environmental law - On-going restructuring of energy sector and economy in general	- Unlikely to have 'spare' credits. - Relatively high cost abatement options (low carbon intensity of electricity production)
Other comments	• The principal barrier is the absence of national or international, regulations. • Increased electricity exports to Russia could increase domestic emissions, reducing scope for selling PPAs.	• A policy of 'wait and see'	• Unlikely to be a net exporter or credits as difficulty in meeting Kyoto targets. • Domestic ET system by 2008 likely

* This significance of being able to meet the Kyoto targets easily is that country is likely to have 'spare' credits to sell abroad, thus allowing the Kyoto flexible mechanisms to encourage foreign investment and technology transfer in carbon abatement projects.

5.5.4 Government policy options for JI and IET

The role of government must be to provide clarity and certainty to the economic actors who will actually undertake actions and deliver the GHG emissions reductions. Even when debating an overall policy, Governments can still take actions, as Poland has done, that will accelerate understanding of the mechanisms and put national economic entities in a stronger position to participate in international trade in the future. Such actions need not compromise future policy conclusions, and are consistent with all three countries' intentions eventually to ratify the Kyoto protocol and permit the JI and IET mechanisms.

5.5.5 The electricity sector's strategic options for JI and ET

The development of ET or JI is ultimately out of the control of individual companies. At present the mechanisms are not sufficiently developed to warrant detailed short-term corporate planning or strategy. Rather, it is appropriate stay informed on the issues until the direction of future policy becomes clearer. Nevertheless it is still important for companies to familiarise themselves with these emerging markets, so that they can plan to take full advantage of new opportunities and manage the associated risks. A more pro-active input can be made by companies by lobbying for the adoption of these instruments, and in such a way that the electricity sector interests will be served.

One pro-active action that industry groupings may consider, either on a domestic or regional basis, is the creation of a trading simulation, either with government support or independently, such as those already run in the EU and on a domestic scale. Well-designed and run simulations can provide economic entities with an intense learning environment and familiarisation with the trading principles. Simulations of this sort can be a very effective way of raising industry and public awareness of the key issues of ET/JI, and furthermore this can be achieved at relatively low cost and very little risk to participants. Such simulations also enable policy makers to learn about likely industry responses and economic outcomes.

Finally it should also be observed that the investor community are likely to perceive a higher long-term value of a power sector company if that company adopts a strategy to develop and exploit new opportunities in international emissions trading and related markets.

5.6 Tradeable Green Certificates (TGCs)

The concept of TGCs is somewhat different from the Kyoto Mechanisms. The core principle is that renewable electricity has two distinct components of its overall value. First is the actual energy, which can command a price depending on the open electricity market. Second is the fact that the energy derives from a renewable resource, in other words the 'greenness' or 'environmental benefit' of that generation. This has a completely separate market value. To trade the environmental benefit of renewable generation we split the environmental benefit from the energy, and create a market mechanism that treats them as separate products.

Government can then stimulate the growth of renewables generation by setting a purchase obligation on electricity companies, or stimulating consumption of renewables benefits through (e.g.) fiscal means, creating a demand for TGCs that is higher than the current renewable electricity production. High certificate prices, caused by limited supply, should draw new generation into the market.

Table 6.1: Generic advantages and disadvantage of TGC systems

Advantages	Disadvantages
• When combined with a renewables obligation, TGCs provide a mechanism for the development of national renewable energy capacity on a least-cost basis, with minimal distortion of the electricity market and minimal conflicts with the liberalisation process. • Good compatibility with liberalised electricity markets • Facilitation of the voluntary market for renewables, with or without an obligation. • Accurate monitoring of renewable electricity production. • The prospect of interfacing domestic TGC systems (i.e. creating international trade) so reducing the cost of meeting the combined renewable generation targets, and creating export markets for competitive generators.	• The current lack of practical experience with TGC system design and operation. • The unknown but potentially high cost and complexity of system implementation, especially for small markets where there are too few actors to get the benefits of competition.

What are the possible advantages and disadvantages of seeking to implement a TGC system in an accession country? The main advantages include:

- Preparation for the proposed *Renewables Directive* (see Annex 7.3.2). If accepted in its present form, the Directive will require countries to set a target for renewables growth and guarantee the origin renewable electricity. TGC systems should be the cheapest way of achieving such obligations.

- Preparation for possible international trading of TGCs. International trade brings greater economic efficiency to the TGC system as a whole (greater liquidity, competition…etc) but has ambiguous effects for individual countries. For example, if a country has the potential for internationally competitive renewable generation, international trade will open up export markets for the domestic industry, although the compliance cost to any obligation may *increase*, as domestic TGC prices are leveled with the higher international prices. On the other hand, if a country has limited potential for renewable generation, compliance costs can be reduced, as cheaper TGCs can be sourced abroad.

Nevertheless, to take full advantage of the possibilities of international trade, early implementation of a national system is desirable. International trade implies a certain degree of harmonisation of TGC systems, it is best if the TGC system is designed to be compatible for international trade from the start[6].

- Increased economic integration. This is an important point for the European Union.

In contrast, TGC systems may not be suitable for accession countries at the present time because:

- There are already policies for supporting or stimulating renewable energy, which would not fit with a TGC system.
- The cost and complexity of system implementation.
- The current lack of practical experience with TGC system design and operation.
- In some cases the degree of market liberalisation may be so low, that the arguments for TGCs based on their compatibility with competitive electricity markets do not carry much weight.
- The level of voluntary demand for renewable electricity is so low that there is effectively no voluntary renewables market to facilitate with TGCs

5.6.1 Policy options for TGCs

Possible policy options to promote TGCs could include:

- Undertake a review of all European and international experience with TGC systems, and perform a detailed analysis of advantages and disadvantages of applying such a system to the country in question. Such a review should address the creation of demand drivers through government intervention, the design of a TGC market mechanism, and restrictions and conditions on international trading.
- Successful implementation of TGC systems requires the commitment of government and industry. Government could invite industry opinion on TGC systems, either through a small working group or else through a public consultation exercise, as a first step in increasing industry understanding of the idea, and getting public support for it.
- To learn about progress elsewhere, government departments could actively engage in international (EU-wide) developments in TGC markets, on a government-to-government level. This could entail bilateral contact with EU MS or other Accession candidate government departments, to discuss cooperation in the joint development of TGC systems. Alternatively it could involve attendance at established international forums such as the RECS group meetings (http://www.recs.org).
- Having established industry acceptance, and having agreed the advantages and principles of a TGC system from a policy perspective, the next step is system design. There is much to be learned from the efforts of EU Member States and other countries. The main requirement in system design is to define the basic institutional infrastructure necessary to implement a TGC system - this includes the responsibilities for generator accreditation, certificate issuing and verification, the management of a central registry to enable tracking and auditing of certificates, the provision of a marketplace to permit

[6] For information regarding the industry led RECS Group, which is at the forefront of the effort to harmonize Europe's TGC systems visit www.recs.org.

simple, low-risk trade in TGCs, and finally the mechanism for 'redemption' or 'retirement' of TGCs. In addition, governments would need to pay close attention to the treatment of carbon (i.e. GHG emissions) benefits within TGCs. This is currently an area of great concern within the international TGC community, and deciding whether TGCs are inclusive or exclusive of other GHG benefits is essential to create a widely tradeable commodity.

5.6.2 Strategic options for industry

TGC developments are not restricted to government-driven initiatives. There are now two good examples of TGC systems which are being championed by industry rather than policy makers, in Europe. The first is the Dutch Green label system established in 1998 following the acceptance of voluntary quotas on green power by distribution companies, which was the first TGC system in Europe. The second is the RECS Group (see above, and working group three report), which is of direct relevance to accession countries, as it aims to set up the protocols for international trade of TGCs.

These examples show that it is possible for electricity sector companies in accession candidate countries to create a voluntary market for green certificates, perhaps in response to pressure by government. Provided that such a system is designed incorporating agreed rules for international trade, the market may be international. Such a system could be implemented in a relatively short period of time.

More immediately, there are distinct commercial opportunities for renewable generation companies in the accession countries. As TGC systems develop elsewhere in Europe, a market is being created for TGCs, wherever they originate from. Where there are particularly good renewable energy resources, that may be developed at least cost, it may well be possible to create a new business by creating and exporting TGCs into the EU market. Before following this opportunity, a detailed analysis would be needed to characterise the risks and benefits of selling into a European market.

A specific recommendation is for potential TGC producers in the accession candidate countries to join the RECS group (details above) to learn rapidly about the dynamics of the TGC market, and begin the process of price discovery, to feed into a provisional risk / benefit analysis.

6 Conclusions and recommendations

The EnPAcc project has brought together a group of electricity sector companies and consultants with shared concerns and complementary knowledge and experience. It has been successful in exploring the issues and concerns of most importance to the accession candidate country partners. Foremost among these concerns has been the likely impact of energy sector liberalisation on environmental protection, and more widely on the electricity sector as a whole. One of the most valuable aspects of the project for the participants has been the process of discussion and sharing of experience and opinion, which has led to a better understanding of the options for environmental protection in a liberalised electricity market.

It is clear that liberalisation carries potential threats to environmental protection. As the EU electricity sector liberalisation progresses we have witnessed fierce price competition between companies, sometimes resulting in artificially low retail prices for power. There are notable casualties of this price war, not least cogeneration (CHP) in some countries, where investment decisions have been suspended and plant has even been switched-off since it cannot compete with power prices from bulk suppliers, and renewable energy investments that are harder to make against a background of very low retail electricity prices. These are clear examples of liberalisation adversely affecting environmental performance.

However it is also clear that liberalisation gives the electricity sector greater freedom to respond to demands expressed by customers and other influencers in the market. This primacy of customer demand means that many EU electricity companies are increasingly using their environmental performance as a marketing tool, seeking to build brand identity and brand loyalty in order to capture and keep customers. The value of environmental performance in branding must not be under-estimated, and many leading EU electricity companies have this as a strong plank of their overall corporate identity. We should expect to see the same forces at work in the accession candidate countries as liberalisation progresses, and as consumers adapt to greater choice in the market. This development has the potential to make a significant positive contribution to environmental protection in the medium term.

Market-driven responses by a liberalised electricity sector are one thing. But such actions will not deliver the radical change in environmental impacts that are required to counter the growing threat of global warming. Government must continue to bear responsibility for 'setting the rules of the game', and providing the legislative and policy framework within which market actors operate.

The EnPAcc project team have focused on two technical areas that can improve environmental performance in the electricity sector, and which will require government intervention to maximise their impact; these are distributed generation (DG) and tradeable market instruments. DG involves the use of smaller-scale, relatively low environmental-impact electricity generation, connected at a low voltage level within distribution networks or even at the scale of individual houses and buildings. Tradeable market instruments encompasses a variety of permits, certificates and other commodities that are created and consumed in response to market drivers, and to achieve environmental protection objectives.

6.1 Distributed generation (DG)

We conclude that in all three accession partner countries market liberalisation can offer great potential for the wider application of DG, by allowing consumer choice in the supply of energy and allowing third party access to the power grid. Liberalisation has progressed rapidly in accession countries over the last few years, principally in response the requirements of accession. We are thus entering an era were many exciting possibilities for the application of DG in accession can come to fruition - if the right frameworks are put in place.

We recommend that accession country governments:

- Assess the potential for different DG technologies, in technical and market terms, and determine the country-specific costs and benefits of the DG options paying due regard to the socio-economic and environmental aspects. This information is vital for assessing the potential for DG to contribute to national policy goals.

In addition, to encourage DG in a way that is consistent with liberalised electricity markets we recommend that governments:

- Establish a network charging regime for DG that facilitates competition in generation, recognising the contribution of distributed generation to network performance.
- Facilitate the involvement of DG by establishing transparent and consistent arrangements for the provision of information by district network operators for the developers and users of DG.
- Streamline planning and permitting procedures as much as possible.

6.2 Tradable Economic Instruments

The project focused on two of the three Kyoto flexible mechanisms (Emissions Trading and Joint Implementation) and tradable green certificates (TGCs). We conclude that each of the accession partner countries is in a different position regarding the development and potential for these instruments.

Poland, by far the largest of the three study countries (with a population about 20 times greater than Estonia or Slovenia), is set to be one of the most important markets for Joint Implementation projects. The country already has experience with SOx trading, which could facilitate the establishment of carbon emissions trading in future. Estonia is set to meet its Kyoto targets with ease, and has many cheap carbon abatement options. Slovenia will have difficulty in meeting its Kyoto targets, so is focusing on domestic action. Tradable green certificates may be of interest to accession countries, but there do not appear to be any concrete action to develop TGCs trading systems at present.

The role of government in this area is critical and is to provide certainty and clarity to the market actors who will actually use the tradable economic instruments. An objective should be to keep transaction costs to a minimum to avoid economic inefficiency. This will require government to consult energy sector stakeholders to find the most robust and efficient market mechanisms.

6.3 General recommendations

For both focus areas, the challenge for government is to understand how to create a legislative and policy framework for the electricity sector that is consistent with the development of liberalised markets. Choosing a legislative approach that restricts or distorts trading and competition will result in inefficient and ineffective liberalisation, and will put the needs of trading companies in conflict with government. Conversely, the approaches suggested in the EnPAcc project are designed to work in harmony with a liberalised energy sector, and promote the evolution of a single, harmonised European energy market.

The challenge for individual electricity sector companies in the accession candidate countries is to respond to the demands and threats of liberalisation, while at the same time taking a pro-active approach to environmental protection. We conclude that taking such an approach is likely to deliver long-term benefit to companies, by making them better able to appeal to and retain customers, and by maximising their perceived market value. Being pro-active and taking an early position as leaders in environmental protection will undoubtedly give such companies a clear marketing advantage in the longer term.

The approaches suggested in the EnPAcc project are intended to be examples of high-profile, relatively low-risk actions that will help companies position themselves as innovative, responsible, and environmentally-friendly. The numerous individual corporate reactions to DG are summarised in section 4.4.

The development of the Kyoto flexible mechanisms is ultimately out of the control of individual companies, although companies can contribute to the process of development through working groups and international cooperation. In contrast the development of green certificate trading has been more strongly influenced by corporate action. Interested companies are encouraged to observe or join the Renewable Energy Certificate Trading (RECS) Group – an industry-led platform dedicated to establishing the protocol for international trade of green certificates (for more info visit www.recs.org). Promoting the generation and trade of green certificates between EU and Accession candidate countries is an exciting prospect, and a leading example in promoting the operation of a single European market for energy. Furthermore, it would allow investment in renewable energy in accession countries, and contribute to least-cost environmental protection for the enlarged European Union.

7 Annexes

7.1 Per capita GDP and electricity consumption in six CEE accession countries

Figure 7.1: Per capita GDP in Central and Eastern European Countries (1998)

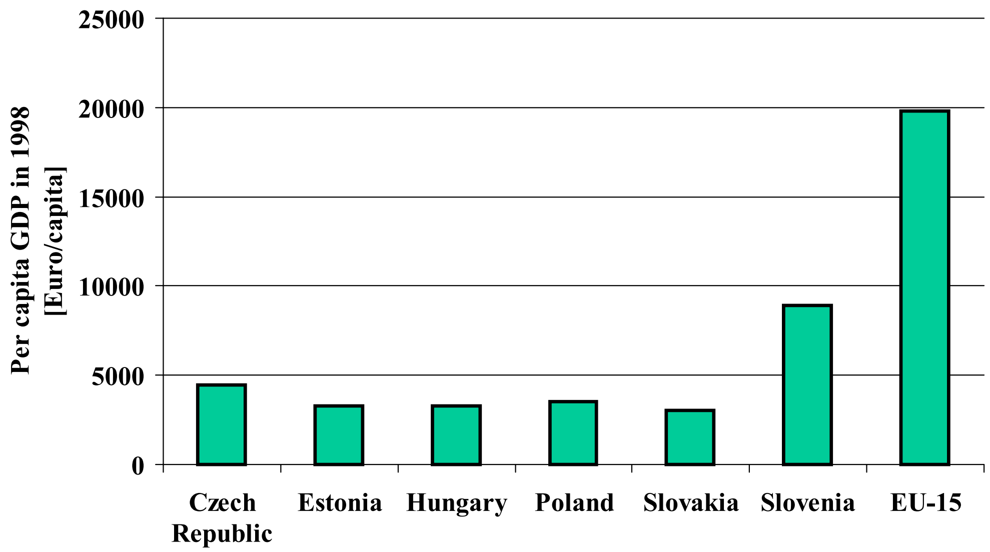


Figure 7.2: Per capita electricity consumption in Central and Eastern European Countries (1997)

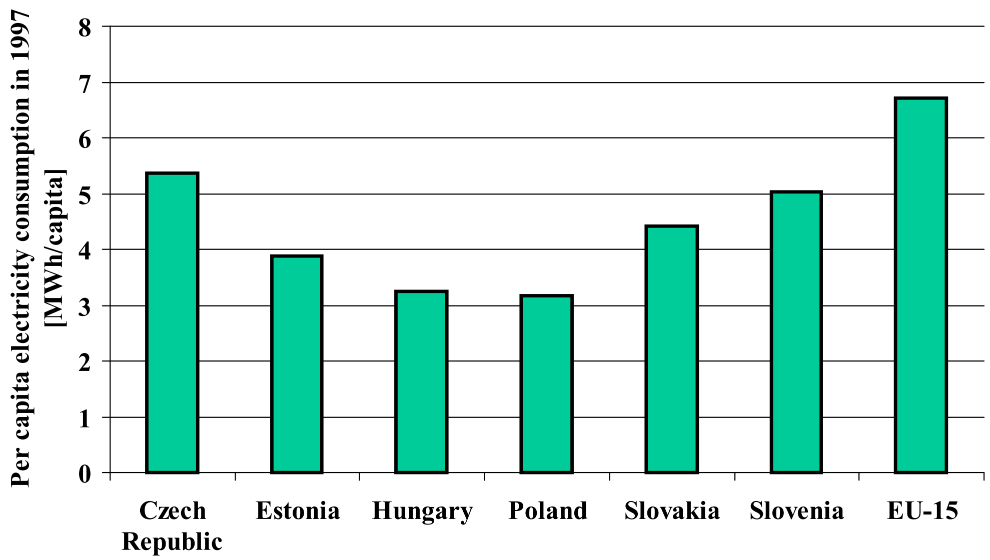
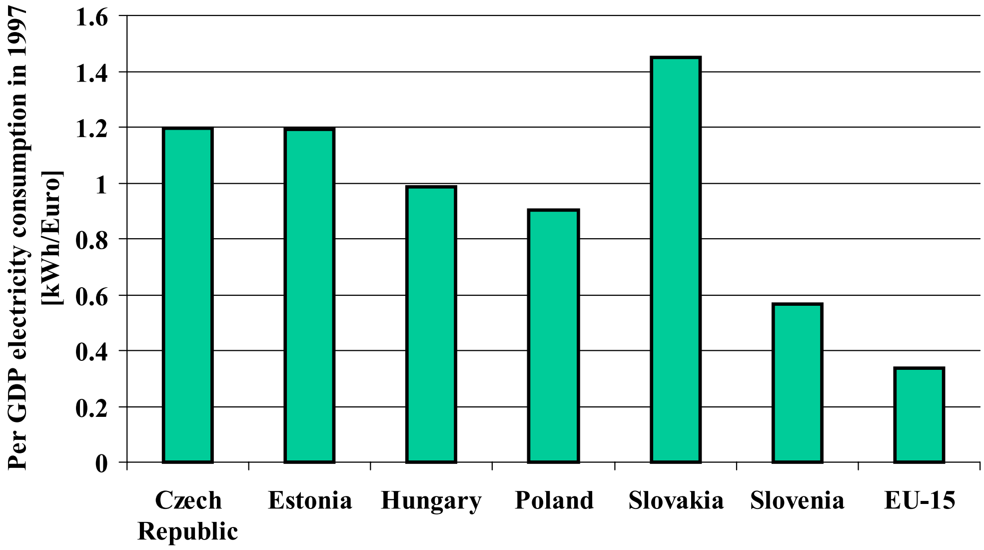


Figure 7.3: Per GDP electricity consumption in Central and Eastern European Countries



7.2 Summary of EnPAcc study countries: Estonia, Poland, Slovenia

7.2.1 Estonia

Estonia has a land area of 45,227 square kilometres. The population is approximately 1.45 million, of which about half live in urban areas. Access to energy is mostly through gas/electricity networks and district heating. Primary energy consumption declined following independence from the Former Soviet Union (FSU) in 1991, and has now stabilised at about 62.5 TWh per annum (44.64 kWh per capita). Figure 1 represents the current energy supply situation. GDP at purchasing parity was 8.94 Billion Euros (1999 estimate) and GDP per capita at 6,125 Euro.

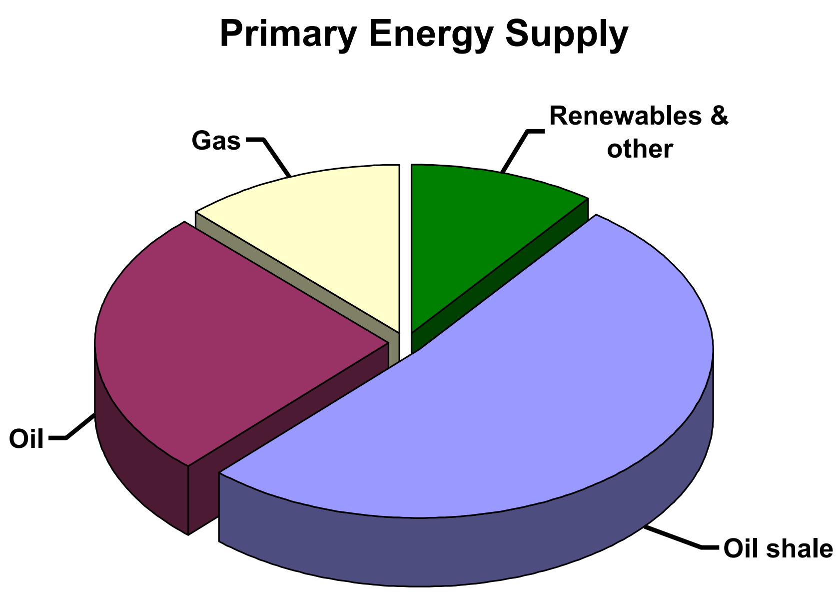


Figure 1 *- Share of Primary Energy Supply in Estonia (1998)*
Source: IEA

Estonia is the only country in the world where oil shale is the primary source of energy. Oil shale accounts for 52% of primary energy production and is used for 93% of Estonia's electricity production and 21% of its heat. Although Estonia has no other hydrocarbon resources, the country is positioning itself as a major transit centre for oil exports from Russia and the newly independent states to Europe. At Independence, Estonia exported two thirds of its electricity to other parts of the Former Soviet Union. However, electricity exports now only account for about 15% of annual production.

Since independence, Estonia has moved rapidly towards integration with the European Union. It is among the "fast track" candidate countries for accession to the European Union. Estonia hopes to achieve full EU membership by January 2003. Estonia's economy has grown steadily since 1994, spurred by economic liberalisation and privatisation. Relations with Russia -- the major power in the region -- remain of great importance. In addition, Russia is a major trading partner, and Estonia depends upon Russia for its oil and gas supplies.

The prices of fuels and energy have increased since Estonia's return to independence. Prices of liquid fuels, natural gas and coal are now comparable with European free market prices. Most fuel prices are deregulated, with the exception of oil shale and some natural gas, for which the Ministry of Economic Affairs must approve prices. Natural gas prices for large consumers are deregulated.

Electricity prices to consumers are also determined by the Ministry of Economic Affairs. The average price of wholesale electricity from oil shale is significantly below average European prices. It is roughly on a par with inexpensive Scandinavian hydro power at about 2 euro cents per kWh.

Estonia built up a large stock of district heating during the Soviet era. Currently some 70% of all residential dwellings are connected to district heating, and maintaining that share remains an important part of Estonia's overall social and environmental policy.

7.2.2 Poland

Poland has a land area of 312683 square kilometres. The population is 38.6 million, of which approximately 61% live in towns or cities. The GDP is Euro 147 billion (2000), with per capita GDP at Euro 3807/unit population. Poland has well-developed electricity and gas networks that allowing it to export electricity as well as substantial penetration of district heating, with a share of over 52%.

Figure 1 represents the current energy supply situation. Poland's energy sector is been dominated by coal and lignite owing to it's natural reserves and the coal industry has historically had a strong influence over domestic policy. However there is set to be significant penetration of gas into the market as a result of both liberalisation and growing environmental awareness. The share of coal in the electricity sector is extremely high at approximately 97 % (1998)

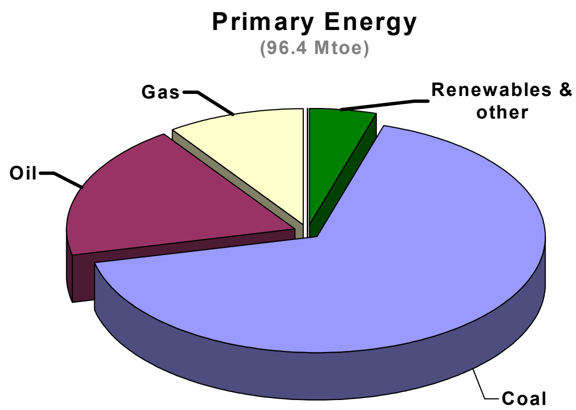


Figure 1 *- 1998 primary energy fuelling in Poland (Mtoe)*
Source: IEA

Poland's energy sector is the largest in Central and Eastern Europe, in 1997 total electricity production totalled142, 769 GWh (installed capacity 33, 717 MW), of which the capacity of professional CHP plants represents 4800MW and industrial plants represents 3000 MW. There is substantial (over 30%) overcapacity within the sector and in addition it is estimated that about two-thirds of the total installed capacity requires modernising.

The Polish energy sector has undergone significant changes over the past decade with significant progress being made towards liberalisation, investor stakes have been sold in a number of power plants, heating plants and a distributor, the continuation of this programme has been clearly set out. The legal framework for liberalisation was created in 1997, however the market is yet to be fully liberalised and as such Poland is unable to trade power with neighbouring Germany.

There has been significant investment in the Polish energy sector from companies such as Electricité de France, Enron, AES, International Power and Powergen.

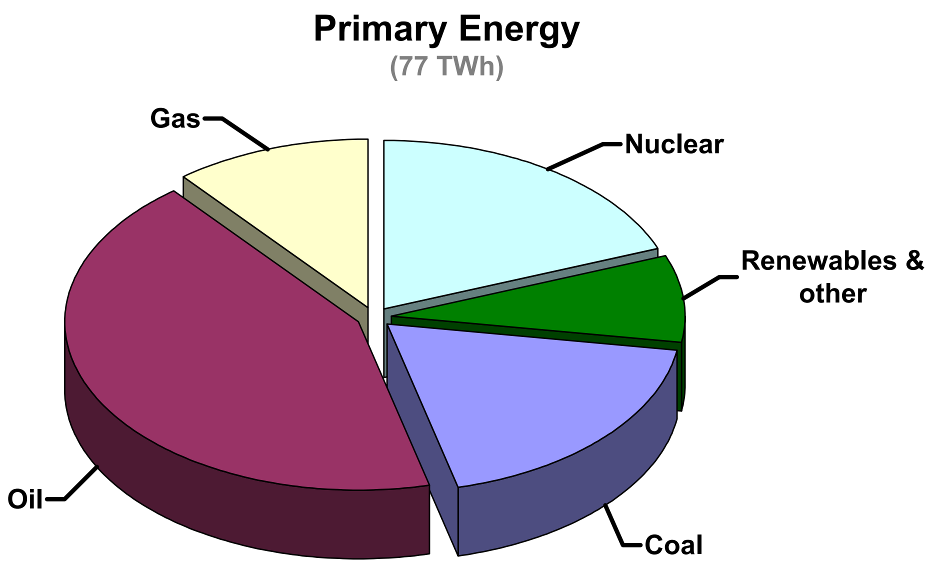
The market in Poland now sets electricity prices, however heat is still regulated and therefore CHP is currently finding itself stuck between two different systems of regulation. The growth in electricity demand is set to grow substantially over the coming years and it is anticipated that by 2020 there will be over 50% growth.

Poland is dominated by heavy industry, where there is an extremely high demand for process steam. District heating provides approximately half of the residential heating needs in Poland (75% in urban areas) and has been substantially upgraded over the past decade, through international investment, including the world bank, the efficiencies of the district heating plants are now comparable to those in Western Europe, however they remain to be fuelled predominantly by hard coal and lignite.

With such a heavy reliance on coal, fuel diversification is the natural step in the Polish energy market, gas will play an important role in the future and the supplies are expected to come from Russia.

7.2.3 Slovenia

With an area of 20,256 $km^{2.}$ and a population of 1.98million, Slovenia is one for the smaller Central and Eastern European countries. Access to energy (excluding transport) is mainly through gas, electricity and district heat networks. Wood is an important heating fuel in rural areas. Primary energy consumption declined briefly following the Yugoslavia in 1991 and has now stabilised at about 77TWh/a. GDP in 1998 was 20.4 billion Euro, with a growth rate of 3.6%/a. GDP per capita has been increasing steady from 6,366 Euro/a in 1993 to 10,300



Euro/a in 1998.

Figure 1 *- 1998 primary energy consumption in Slovenia*
Source: IEA

Slovenia has reserves of poor quality coal, but no oil and gas. Coal continues to be of importance to Slovenia both heating and for electricity generation, but the share of solid fuel is declining. The share natural gas is increasing rapidly. Despite the lack of domestic gas reserves, one of the privileges of Slovenia's geographic position is that it's gas supply network is connected to pipelines supply continental Europe with gas from Algeria and Russia.

Historically the industrial sector has been the major energy consumer in Slovenia, reaching 56% of final energy consumption in 1984. The share has now fallen to 37%, with transport accounting for 25% and other consumers 38%. The per capita energy consumption is relatively high, due to a high share of energy intensive industry such as steel and aluminium production, as well as paper processing. A structural change towards a more service-orientated industry will take time. The decline of the coal sector, due to both economic and environmental reasons, as already caused political and social difficulties.

The current electricity generation mix comprises about 26% Hydro, 37% conventional thermal (mostly domestic coal and lignite) and 37% nuclear power. The nuclear power originates from just one power station, Krško (632 MWe), which is jointly owned by Slovenia and neighbouring Croatia. Slovenia consumes half of its output. The plant is over-sized for the rest of the power system, meaning that Slovenia suffers over capacity in base load generation, while peaking capacity is lacking. Slovenia's gross electricity consumption is about 10TWh. Natural gas is used to produce less than 3% of electricity, but this share is expected to increase.

Electricity prices are regulated and are well within the EU range. Gas prices are slightly higher than in most EU countries.

Since independence, Slovenia has moved rapidly towards integration with the EU. Full membership of the EU is planned for January 1st 2003, although it might be as late as 2005.

7.3 Summary of international and European legislation

The environmental impacts of the electricity industry are controlled by legislation at all levels from international to local. This section outlines the most important international and European laws and policy initiative affecting air emissions from the power sector of EU and accession countries at the time of writing.

7.3.1 International policy context

- *The United Nations Framework Convention on Climate Change and the Kyoto Protocol.* The UN Framework Convention on Climate Change (UNFCCC) was adopted at the Rio Earth Summit in 1992, with the ultimate objective of stabilising greenhouse gases (GHGs) in the atmosphere. The six GHGs covered by the Protocol are CO2, CH4, N2O, CFCs, HFCs PFCs and SF6 – see glossary for full names.

  The 1997 Kyoto Protocol called for all Annex I countries (developed countries) to reduce emissions of six greenhouse gases by 5.2% relative to 1990 levels, during the commitment period of 2008-2012. All EU accession countries are included in Annex I and so far all have signed the Kyoto Protocol but none have ratified[18].

  The Kyoto Protocol also defines individual "quantified emission limitations" for countries. The CEEC targets were fixed following the Kyoto conference which assigned an 8% collective reduction as for the EU. The targets are shown in table 1 below.

Table 1: Emission limits according to the Kyoto Agreement				
Anthropogenic emissions of carbon dioxide in Mt/a of CO2				
	Emission levels in base year	base year	Emission ceilings for 2008-2012	Percentage emission reduction for 2008-2012
Accession countries				
Czech Republic	165	1990	152	-8%
Estonia	38	1990	34.8	-8%
Hungary	87	average 1985-87	82	-6%
Poland	477	1988	449	-6%
Slovenia	15.6	1986	14.4	-8%
EU				
Austria	62	1990	54	-13%
Finland	59	1990	59	0%
United Kingdom	615	1990	538	-12.5%
EU-15	3351	1990	3083	-8%

To assist Parties in lowering the cost of compliance with their Kyoto targets, the Kyoto Protocol provides for the use of three market-based flexible mechanisms:

- International Emissions Trading
- Joint Implementation
- Clean Development Mechanism

Following the lack of progress at the 6th Conference of the Parties (COP) in the Hague in November 2000, the next step will be a follow-up meeting scheduled for July of 2001.

The Kyoto Protocol is the most important - and controversial - international environmental agreement to date. If ratified it will alter the development pattern and energy systems of all countries. Even if not ratified, the political will to combat climate change will continue to have a strong influence on policy at a European and a Member State level.

- *The 1979 Geneva Convention on Long-range Transboundary Air Pollution,* issued by the United Nations Economic Commission for Europe, sets the framework for agreements on pollutant air emissions reduction in Europe. Target pollutants are Sulphur, Nitrogen Oxides, Volatile Organic Compounds (VOCs), heavy metals persistent organic pollutants, ozone and ammonia. Since its entry into force the Convention has been amended by seven protocols. The latest, the Gothenburg Protocol of 1999 sets the country emission targets for sulphur, nitrogen oxides, VOCs and ammonia for the year 2010 and is thus the major international agreement aside of the Kyoto Protocol to define the environmental policy of European countries.

Table 2 shows the proposed/agreed limits for sulphur and nitrogen oxide emissions in selected EU and Accession countries.

Table 2: Emission limits according to the Gothenburg Protocol[19]				
Anthropogenic emission limits of sulphur in kt/a of SO2				
	Emission levels		Emission ceilings	Percentage emission reductions for 2010
Accession countries	1980	1990	for 2010	(base year 1990)
Czech Republic	2257	1876	283	-85%
Estonia				
Hungary	1633	1010	550	-46%
Poland	4100	3210	1397	-56%
Slovenia	235	194	27	-86%
EU				
Austria	400	91	39	-57%
Finland	584	260	116	-55%
UK	4862	3731	625	-83%
EU 15l	26456	16436	4059	-75%
Anthropogenic emissions of nitrogen oxides in kt/a of NO2				
		Emission levels	Emission ceilings	Percentage emission reductions for 2010
Accession countries		1990	for 2010	(base year 1990)
Czech Republic		742	286	-61%
Estonia		No	data	Available
Hungary		238	198	-17%
Poland		1280	879	-31%
Slovenia		62	45	-27%
EU				
Austria		194	107	-45%
Finland		300	170	-43%
UK		2686	1181	-56%
EU-15		13161	6671	-49%

7.3.2 Summary of EU policy

Listed below are the most important EU Policies and Laws for environmental protection in the electricity sector.

- *The Large combustion plant Directive (*EU directive 88/609 EEC, 94/66 EC) limits emissions from large combustion plants (LCP), sets emission limits for new power plants and for whole countries on SO_2, NO_x and dust. A strengthening of this Directive with respect to lower emission concentrations and introduction of emission limits for existing plants is being discussed. The amendment will tighten emission limit values for SO2 and particulates from new plants and lay down strict NOx limits for gas turbines. This Directive should provide an important boost for cogeneration[20].

- *The Integrated Pollution Prevention and Control (IPPC) Directive* (96/61 EC) on integrated pollution prevention and control (IPPC), which combines all EU regulations on environmental impact reduction and requires industries to apply the best available technologies.

- *The National Ceilings for acidifiers and ozone precursors (proposal for a Directive)* proposes national ceilings for each Member State, to be achieved by 2010, using 1990 levels as a base. These national ceilings would aim to ensure EU-wide emissions reductions of 78% for SO2, 55% for NOx, 21% for ammonia and 60% for VOCs by 2010.

- *State Aid Guidelines.* On December 21st 2000, the European Commission adopted a new set of guidelines for state aids granted for the purposes of environmental protection. The document was valid from 1 January 2000 and sets out rules that EU member states must follow to have the payments authorised by the Commission. The effect of the guidelines will be to allow the continuation of a broad array of renewable energy and cogeneration support schemes.

- *The Action plan on Energy Efficiency* addresses energy efficiency equipment standards and calls for negotiated agreements in the main industries, including the electricity supply industry. It is essentially a guide to policy making, rather than a proscriptive piece of legislation.

- *The 1997 White Paper on Renewable Energy* reviews the potential for renewable energy in the EU and proposes a doubling of the share of renewable energy in the EU's gross primary energy consumption from the present 6%, to 12% by 2010[21]. A *Renewables Directive* is expected in late 2001, which will set targets for renewable electricity production in each member state and require certification of renewable electricity, amongst other measures to stimulate renewable energy growth up to the 12% target.

- *The Emissions Trading Green paper,* published in Spring 2000, was intended to launch a discussion on greenhouse gas emissions trading within the European Union, and on the relationship between emissions trading and other policies and measures to address climate change. The Green paper proposes a limited CO_2 emissions trading scheme by 2005 within the Community to enable "learning-by-doing" prior to the Kyoto Protocol's emissions trading, which could happen as early as 2008.

- *Support for a CHP.* The most important document for CHP is the 1997 'Communication on the promotion of CHP' which suggests the target of doubling CHP penetration from 9 to 18% by 2010. However, it has no legal basis and is only a guide to policy making. The April 2000 'Action Plan to Improve Energy Efficiency in the European Community' Seeks to coordinate other policy measures that impact CHP and simply re-states the 18% target. Cogeneration proponents are now calling for a Directive to promote cogeneration, perhaps in a similar fashion to the proposed renewables Directive.

- *Green Paper: Towards a European strategy for the security of energy supply (2000).* A discussion paper stimulated by the fact that Europe is becoming increasingly dependant on energy imports. It is likely to lead to specific policies on European security of supply in the future.

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16 There are many easily available sources that describe the basic principles of the Kyoto flexible mechanisms, so it is not worth repeating them here. The web is the best source of information as the subject is so fast moving. A simple and concise summary can be found at http://www.environment.detr.gov.uk/climateoffice/03.htm. A more comprehensive website can be found at http://www.unfccc.de/

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