Energy planning in Poland and Estonia against the background of their energy efficiency policies

Katrin Blechschmidt
Energiestiftung Schleswig-Holstein
Daenische Strasse 3-9
D-24103 Kiel
Germany
k.blechschmidt@essh.de

Keywords

Poland, Estonia, energy planning, energy policy, energy efficiency, renewable energies

Abstract

Poland and Estonia belong to the Central and Eastern European countries that will first join the European Union within the next years. One of their tasks within the accession process is the improvement of energy efficiency and the stronger utilisation of renewable energy sources. Naturally, a lot of legal and financial efforts have to be undertaken to reach this goal. However, also the instrument of energy planning is of very great importance since it can help to develop the energy sector in a more sustainable way.

A research study was undertaken concentrating on the role of energy planning within the Polish and Estonian energy policy. It shows the main emphasises of energy policy in both countries and the instruments predominantly used for the promotion of energy efficiency and renewable energy sources. By the examination of several energy planning projects, their developments processes, achievements and problems, an analysis of the instrument of energy planning has been done focusing on its effects for improving energy efficiency and renewables. In addition, energy planning activities of other countries, e.g. Denmark and Germany, have been looked at for decisive factors that made them successful. It has been examined if and how these factors could be transferred to the energy planning systems in Poland and Estonia while paying special regard to the specific requirements of their energy economy and energy policy.

Introduction

As an inheritance from the former centrally regulated economy without prices reflecting the market situation, energy efficiency and the utilisation of renewable energies have been nearly non-existent in the Central and East European countries (CEEC) until the 1990s. Already in the beginning of the accession process the European Commission came to the conclusion that there are still a lot of work and investments necessary to improve energy efficiency and to reduce environmental damages caused by energy production and utilisation in the CEEC. Although the European Commission declared that both Poland and Estonia will be able to adjust their energy policy to that of the EU in the short term, i. e. to prepare a legal basis for the energy sector according to the regulations made by the EU, the Commission still points at problems regarding energy efficiency and energy-related environmental problems in those countries. For example, the Estonian energy sector is two to four times less efficient than the average of all EU member states, and the Polish energy sector is two to three times less efficient. Together with the utilisation of oil shale in Estonia and coal and oil in Poland this leads to massive environmental problems.[1]

Taking this estimation as a basis, I started a study to examine how energy efficiency (together with the use of re-

1. Europäische Kommission (European Commission, ed.), 1997.

newable energy sources) can be improved in Poland and Estonia. I selected Poland and Estonia, because at the beginning of this research about three years ago, they have been the only Central and East European countries of the Baltic Sea Region being in the first round of countries in the negotiation process with the European Union. By now, this circle of countries has been widened, but I wanted to stick to Poland and Estonia, and an expansion of the study by some more countries did not seem feasible.

The aim of the study was to examine if there are any energy planning processes going on in both countries and if they are suitable to improve the efficiency of the energy sector and the utilisation of renewable energy sources. Therefore it was necessary to get an impression of the situation of the energy sector and the energy policy in the beginning, then moving further to the subject of energy planning. This was important because energy planning activities – even if they only take place at local level – are not detached from the political environment at national level.

To get the necessary information for the study, a lot of material (legislation, political programmes, other studies etc.) has been analysed. But this, of course, is not quite sufficient to get a proper impression of what is going on in a foreign country. Therefore, many interviews have been necessary with political and economical stakeholders to get the newest information and to get a little bit deeper insight into the current political and economical developments.

Poland

ENERGY ECONOMY STRUCTURE AND ENERGY RESOURCES

From the beginning of the 1990ies, with the transformation from central to market economy the Polish energy economy and energy policy have been undergone extensive changes. The transformation process started with the foundation of the State Hard Coal Agency in 1990 and the closure of several inefficient hard coal mines. A programme for the reconstructing and modernisation of the energy sector was set up containing the following components: (i) price adjustments (phasing out budget subsidies and reaching economically justified market prices), (ii) commercialisation (as first step to the privatisation of the energy generation, distribution and transmission sectors), (iii) establishment of a new legal and regulatory framework to introduce competitive and regulated energy markets.[2] Since this time the privatisation process of the Polish energy economy is still going on and is part of the accession process for the European Union membership.

The Polish **power sector** is the largest in Central and Eastern Europe, with 33 000 MW installed capacity and a production of 138 TWh in 1998, out of which power plants and cogeneration plants fired by hard coal produced about 60% of the power consumed. Plants burning lignite produced about 38% and hydroelectric plants about 2% of the power consumption. There are about 4 800 MW installed capacity in large CHP plants and 3 000 MW installed capacity in cogeneration industrial plants. The share of electricity produced in cogeneration amounted to 15.4% of the total power production. The huge share of coal in the overall power volume (98%) is rather unique in Europe and has the advantage of having no capacity constraints for the Polish power system. However, it causes a lot of socio-economic and environmental disadvantages.[3]

Currently, in Poland there are 17 big power plants in operation and more than 170 smaller industrial power plants. The 17 big plants as well as the 33 energy utilities (their task is the energy distribution and transmission) are already privatised. Owner of the Polish power grid is the still state-owned joint stock company *Polskie Sieci Elektroenergetyczne S.A.* (Polish Power Grid Company, PSE S.A.).[4]

Poland is a country with a large central **district heating** system. More than 50% of the households are supplied with central heating from the municipal DH system, in urban areas even more. About half of this heat is produced in CHP plants. There are 20 big district heating plants, which are already partly privatised, and lots of small municipal DH plants. These plants and the DH grid are mainly owned by the municipalities, but some of them, however, already started to sell them to investors. Considering the poor shape of the Polish district heating sector, the modernisation and development process will take quite long and will be expensive.[5] Additionally to the DH system, there are about 17 million small heating boilers in individual houses or apartments, most of them burning coal with low efficiency.[6]

The Polish **gas market** is monopolistically organised. The only enterprise in this sector is the *Polskie Gornictwo Naftowe i Gasiwnictwo S.A.* (Polish Oil and Gas Company, PGNiG S.A.) which is state-owned but shall be reconstructed. The **oil market** is in Poland of minor importance since the own oil production is rather insignificant. The biggest oil producers are PGNiG S.A. and Petrobaltic.[7]

Because of a very huge production of coal, both lignite and hard coal, Poland is rather independent from energy imports, at least compared to other European countries. The indigenous energy resources satisfied 91.5% of Poland's energy demands in 1998. These included hard coal (55.2%), lignite (13.1%), wood, waste and other renewables (3.9%) and hydropower (0.4%). Petroleum products and natural gas were mainly imported (95.9% and 66.8% of the domestic consumption respectively).[8] Poland has no nuclear energy.

However, since 1990 the structure of exploration and use of primary energy was undergoing gradual changes. Although coal is still the dominant source for primary energy and Poland was the seventh coal producer in the world (1998), its share dropped significantly from 62.3% in 1990 to 50.6% in 1998, and a further decline is being expected. Meanwhile, the exploration and use of brown coal as well as

2. Energy Charter Secretariat (Ed.), 2000, p. 6 ff.
3. Energy Charter Secretariat (Ed.), 2000, p. 40; International Energy Agency (Ed.), p. 1.
4. Kaminski, 2002, p. 2.
5. Energy Charter Secretariat (Ed.), 2000, p. 40; International Energy Agency (Ed.), 2001, p. 1; Kaminski, 2002, p. 3.
6. Salay, 1999, p. 24.
7. Öko-Institut et al (Ed.), 2000, p. 32 f.
8. Energy Charter Secretariat (Ed.), 2000, p. 40..

natural gas remained stable, and the share of self-produced oil even reached more than the double amount than in 1990, due to the discovery of oilfields in the Baltic Sea. But this output satisfies only 2% of the annual domestic consumption, and the existing oilfields will presumably be emptied in 2035.[9]

The total final energy consumption remained nearly stable throughout the time and was 63.5 Mtoe in 1998, of which 36% was consumed by the industrial sector, 31% by the residential sector, 15% by the transport sector and 7% by the services sector. [10]

The energy intensity in Poland is still much higher than the EU average, although it decreased considerably since 1990. Reasons are the very poor heat insulation of buildings, the low efficiency of heat sources, the big losses in the transformation and distribution of energy and the very often missing regulatory technologies and individual heat meters.[11] Nevertheless, the primary energy consumption per capita in the 1990ies was about 25% lower than the EU average.[12]

The evaluation of the **renewable energy** utilisation in Poland is very difficult because there is no really exact data existing. The data vary significantly depending on the study taken as a basis. In the *Development Strategy of the Renewable Energy Sector*, which was adopted by the Polish Government in September 2000 (more information see below), it is assumed that the current share of renewables in the consumption of primary energy is about 2.5% with the total primary energy consumption being around 4 000 PJ.[13]

Currently, the basic sources of renewable energy in Poland are biomass and hydropower. Geothermal energy, wind energy and solar energy are of lower significance. In the 1990ies, the share of renewable energy sources was gradually increasing. The main contributing factors were:

- a considerable increase in the utilisation of wood and waste wood mainly in rural areas and the commissioning of local district heating plants using straw and waste wood,
- the implementation of new geothermal heating plants,
- the commissioning of several wind power plants and numerous small hydropower stations,
- the implementation of heat and power plants utilising biogas from municipal landfills and waste water treatment plants.[14]

ENERGY POLICY

The Polish energy policy is very much oriented on the accession process to the European Union and the requirements connected with this process. This mainly includes the opening of the Polish energy market and the introduction of competitive energy prises as well as the security of the energy supply. Thus, the **Energy Law** from December 1997 as the most important document of the Polish energy policy is very much focused on these objectives. Nevertheless, in Art. 1 also the "efficient and rational use of fuels and energy" is laid down as a purpose of the law.[15] However, in practice the energy policy does not very much reflect this objective.

Another relevant document are the **Guidelines for the Energy Policy of Poland until 2020** (approved by the Council of Ministers in February 2000). They comprise the main objectives of the Polish energy policy, draw up long-term forecasts for the development of the energy sector within three scenarios, and lay down an action programme. According to these Guidelines the key elements of the Polish energy policy are – in parallel to the objectives of the Energy Law – energy security, improvement of competitiveness and protection of the natural environment. To reach these goals, several strategies for state activities are defined. One of them is the "Energy efficiency improvement strategy". Its main element is the promotion of modern technology with high efficiency. Also, the utilisation of renewable energy sources plays a role in this document – even though a minor one. There are no quantitative goals set up in the Guidelines but the importance of both aspects has been made obvious in a more general way, also as a contribution to solve the problems of energy security and ecological security.[16]

The third important document of the Polish energy policy is the **Development Strategy of the Renewable Energy Sector**, adopted by the Council of Ministers in September 2000. Besides the examination of the current situation of renewable energies and a forecast until 2010 and 2020, the Strategy comprises the state objectives for the further development of renewables and an action plan to reach these goals. In this document the strategic objective for the development of renewable energies is defined: the share of renewables in Poland's primary energy balance shall increase to 7.5% in 2010 and to 14% in 2020. Thus Poland does not intend to reach the goal of the European Commission which is a share of 12% renewables by 2010. According to the Strategy, this target is "not feasibly achievable in Poland", mainly because supporting mechanisms for the development of renewables are not yet sufficiently existing and operating in Poland as they are already in the EU for a much longer period.[17] Although there was a lot of criticism concerning the Strategy and it took quite long to get it approved, it is still a huge step forward into the right direction, and Poland is the only one of the Central and East European countries setting up such a document. As a result of the Strategy, a Strategy for the Development of Wind Energy Utilisation is going to be elaborated by the Ministry of Environment which will

9. Guidelines for the Energy Policy of Poland until 2020, 2000. The exact data regarding the share of single primary energy sources varies depending on the study taken as basis. For example, the PEEREA Review amounts the share of lignite coal in 1998 to 55.2 % whereas the Guidelines amounts it to 50.6 %.
10. Energy Charter Secretariat (Ed.), 2000, p. 41.
11. Energy Charter Secretariat (Ed.), 2000, p. 15.
12. Öko-Institut et al (Ed.), 2000, p. 27.
13. Development Strategy of the Renewable Energy Sector, 2000.
14. Development Strategy for the Renewable Energy Sector, 2000; Guidelines for the Energy Policy of Poland until 2020, 2000, p. 12.
15. Energy Law (Poland), 1997, Art 1 (2).
16. Guidelines for the Energy Policy of Poland until 2020, 2000, p. 4, 8, 50.
17. Development Strategy for the Renewable Energy Sector, 2000.

rather be an action plan (a draft strategy is already existing). One after another, such an action plan shall be worked out for the other renewable energy sources, too.

Despite these objectives and strategies, the every-day energy policy in Poland does not very much concentrate on aspects of energy efficiency and renewable energies. There are very little instruments to promote them, and the instruments existing are rather weak. The only state instrument to promote renewables is the **Ordinance of the Minister of Economy** of 14 December 2000 concerning an obligation to purchase electric energy from unconventional and renewable sources and co-generated with heat and an obligation to purchase heat from unconventional and renewable sources[18]. According to the Energy Law, the Ministry of Economy as responsible institution for the energy policy was obliged to work out this obligation. It determines that energy utilities involved in trading electricity are obliged to purchase electricity produced from renewables up to a certain amount of their annual sales. This amount was 2.4% in 2001 and goes up to 7.5% in 2010 and subsequent years (according to the goal set up in the Development Strategy of the Renewable Energy Sector). For the purchase of heat no limit is defined.[19] However, so far there are no positive results concerning the development of renewables connected with this obligation. This is due to various problems: First of all, there are no sufficient control mechanisms existing. In principle, the Energy Regulatory Authority (ERA) is responsible to check if the energy utilities have purchased electricity from renewables in the defined amount. But there seems to be no defined procedure how the control should work and what sanctions will be imposed. Theoretically, it would be possible to give a penalty to those who did not purchase enough renewable electricity, but the amount of such penalties is not fixed in the obligation or elsewhere. Thus the penalty is a matter of negotiations with the utilities dependent on their economical situation, and can therefore be different for each utility. Because of this procedure, a lot of utilities did not purchase the defined amount of renewable electricity, hoping that the penalty will be lower than the energy charge. Despite the still unsettled question who is responsible and has to pay for the connection of renewable energy production plants (e. g. wind turbines) to the energy grid, this rather insufficient obligation is one reason for the poor development of renewable energies in Poland, because it is not possible for renewable energy producers to forecast their operating costs and revenues, so investments are very difficult to plan.

The most significant instrument to promote energy efficiency and energy savings in Poland is the **Thermomodernisation Programme and Fund**. The programme came into force in 1999 and provides technical and financial support for energetic improvement in the residential sector (e. g. heat insulation), the reduction of energy losses in the district heating network and the transformation from conventional to renewable energy sources. The programme is carried out by the *Polish National Energy Conservation Agency (KAPE)*. The characteristic of the programme is that it provides a special motivation premium for investors who completed the project in time and paid back 75% of the loan – the rest (25%) will be paid from the fund sources.[20] In July 2001 some modifications of the programme and fund have been introduced, because the original one has not been widely used, probably due to a lack of publicity, the difficult procedures for obtaining financial support and problems related to decision making in housing co-operations and municipalities.[21] In addition to this fund, there are also some other sources of financial support for energy efficiency projects. These are, however, funds of non-governmental institutions like *Ekofundusz (EcoFund)* or of municipalities and voivodships; from the side of the state the Thermomodernisation Fund is the only direct financial support.

There are several reasons for the rather weak energy efficiency policy of the Polish government. One of them has to be seen in the very strong position of coal as indigenous energy source in the energy balance. Therefore Poland is relatively independent from energy imports and has rather overcapacities than the need to save energy. Thus there is no direct pressure for the government to promote energy efficiency projects and especially renewable energies. Additionally, the production of energy from renewables is much more expensive than the use of conventional energy sources, and to keep the energy prices as low as possible is, because of the economical situation, currently more relevant to the daily policy than environmental aspects. Also, to a big amount the municipalities are responsible for the energy production, especially heat production. They have even less money and are forced to use the little that they have to solve the biggest problems, which are the modernisation of their antiquated energy supply system (heating plants, DH grid etc.) and partly the renovation of public and residential buildings including heat insulation.

Another explanation is that important actors of the energy policy are not very sensitive to matters of energy efficiency and renewables. This mainly concerns the Ministry of Economy and the Energy Regulatory Authority. The Ministry of Economy, which is responsible for the energy policy, mainly focuses on economical aspects of the energy market and is less interested in energy efficiency and renewables and therefore does not develop sufficient policies or instruments to promote them. Rather, the Ministry of Environment (without any responsibility in the energy sector) is more active and for example pushed the elaboration of the Development Strategy of the Renewable Energy Sector. But there is no consistent energy efficiency policy existing within the Polish government. Also, the Energy Regulatory Authority does not have the promotion of energy efficiency and renewables on its agenda. It rather follows the interests of the energy utilities.[22]

18. Ordinance of the Minister of Economy, 2000.
19. Ordinance of the Ministry of Economy, 2000, § 1.1, § 2.
20. International Energy Agency (Ed.), 2001, p. 3.
21. Energy Charter Secretariat, 2000, p. 34.
22. For example, ERA supports or at least does not hinder the very wind-energy-hostile policy of the Polish Power Grid Company (PSE). PSE set up a regulation saying that energy producers have to inform them about the forecast of their energy production for the next 48 hours. This of couse is not possible for wind energy producers. Also, PSE tries to denigrate wind energy in the public opinion. But the ERA does not see itself responsible for these problems and therefore does not intervene.

ENERGY PLANNING

Something general

In Poland the instrument of energy planning was introduced with the Energy Law of 1997. But already before, energy planning activities took place in Poland. For example, in 1995 seven local district heating plans have been elaborated within a start-up project together with Danish institutions. Independent from this project, also other DH plans have been worked out in several municipalities.

The Energy Law defines in Art. 16 ff and Art. 19 ff that energy utilities as well as local municipalities have to set up energy plans. Municipalities (Polish: *gmina*) have to work out so called "guidelines" that serve as a basis for the energy plans of the utilities. According to the law the guidelines shall determine:

- an assessment of the present situation and forecasted changes in the demand of heat, electricity and gaseous fuels
- measurements for the rationalisation of the energy use
- possibilities for using existing energy surpluses, local and renewable energy sources and CHP
- the scope of co-operation with other municipalities.[23]

Currently, however, only about 10% of the Polish municipalities have yet worked out energy planning guidelines, due to several problems. First of all, the Energy Law does not set any deadline for finishing the energy planning processes and does not include any control mechanisms. Therefore, from the legal point of view there is no need to hurry, and the gminas take there time. The only pragmatic reason for them to work out the guidelines is to get funds from the government for investments in the energy sector – here the guidelines are the preposition to get the money. Additionally, in most municipalities there is a lack of personal and especially financial resources for the energy planning process itself and for the implementation of the results afterwards. The Polish government does not provide any funds for energy planning processes, so the communes are mostly dependent on the aid of foreign consultants (a lot of whom are involved in energy planning projects in Poland) and support programmes of other European governments or the European Union (e. g. PHARE). Another problem is that the Energy Law provides only rather general statements regarding the contents of the guidelines and the process for their development. And since there is nearly no experience in the municipalities about how to work out such plans (since the Polish municipalities had no self-government and correspondingly no planning rights before the 1990ies), the gminas are hardly able to handle the challenge.[24] Another result of this situation is that the concrete design of the guidelines is very much dependent on the emphasis of the municipalities or the consultants, respectively. Therefore, each of the guidelines looks a bit different, and they are not easily comparable with each other.

The guidelines have mainly the character of investment plans for the gminas to solve the most urgent problems of the local energy sector (e. g. modernisation of district heating plants and the district heating network). Aspects of energy efficiency and renewable energies have nearly no relevance within the plans, in most of the guidelines they are not integrated in any way. And the Energy Law is too general in this respect and does not provide valuable clues.

Examples of energy planning projects

Danish-Polish Project "Energy Planning in Poland on the Municipal Level"

The most relevant energy planning project in Poland has probably been the Danish-Polish project "Energy planning in Poland on the municipal level – support to decision makers" that has been carried through by the Danish consultant COWI and Polish National Energy Conservation Agency KAPE. The project was financed by the Danish Ministry of Environment and Energy and the Danish Energy Agency. The aim of the project was to promote the idea of energy planning in Poland and to set up exemplary energy plans in several municipalities.

Altogether about 400 gminas with 10 000 to 70 000 inhabitants participated in the project. Out of this pool seven cities have been selected to support them in their energy planning processes. Then again, there was a selection, and the three gminas Bytów, Legionowo and Myszków (that represent different municipal structures) have been chosen to set up exemplary energy plans. According to the energy planning guidelines set up in the project, the energy plans should contain the following aspects:

- an evaluation of the current and future demand for electricity, heat and gas in the municipality,
- an evaluation of options to meet this demand,
- an analysis of different development scenarios for the electricity, heat and gas supply system.

Orienting at these guidelines, the three municipalities worked out their energy plans with the objectives of a secure and stable energy supply and low energy prices. According to this, the energy plans are first of all a basis for planning and investment activities of the local energy utilities. The energy plans are oriented at the currently most urgent necessities of the Polish energy system: the modernisation of the old worn-out power plants, boiler houses and energy grids, and the reduction of energy prices for the consumers. Aspects of energy efficiency and the use of renewables are of rather minor importance and hardly turned up in the energy plans at all. There have been made proposals for the renovation of buildings while using the Thermomodernisation Fund, but the investments shall be financed exclusively by the building owners. The calculated payback period of about 10 to 40 years, however, does not make the implementation of such proposals very likely.

23. Energy Law (Poland), 1997, Art. 19 (3).
24. Therefore an Energy Planning Secretariat was created within the Polish National Energy Conservation Agency (KAPE) that aims to promote the idea of energy planning and to provide necessary know-how in co-operation with the Danish Energy Agency.

Although the energy plans of this project are not very sufficient concerning matters of energy efficiency and renewables, the project was certainly very important for the capacity building in the local authorities and served the objective of building an operative energy supply system. The project was finished in September 2001, and follow-up projects have been started in Legionowo and Myszków with the aim to support the energy utilities by the implementation of their energy supply plans and to work out feasibility studies for this implementation.

Estonia

ENERGY ECONOMY STRUCTURE AND ENERGY RESOURCES

The characteristic of the Estonian energy sector is the top position of oil shale in the energy exploitation and utilisation. Estonia accounts for about 70% of the world's oil shale production. Already prior World War II, the use of oil shale allowed the country to become independent of foreign fuel and power supplies. After the war, the oil shale production was extended to provide liquid fuel and gas made from oil shale as well as electricity for the Leningrad region in the USSR. After regaining independence in 1991, Estonia still remained exporter of oil shale based electricity to Russia, even though the export decreased considerably.[25]

Oil shale very much dominates the Estonian **power sector,** with a share of 98% on the electricity production. The biggest amount of electric energy is produced by *Eesti Energia AS*, a state-owned electricity company. The main production unit of Eesti Energia are the *Narva Power Plants*, consisting of the *Eesti Power Plant* (1 610 MW) and the *Balti Power Plant* (1 390 MW) which account for about 95% of the Estonian electricity production. In June 2000, 49% of Narva Power Plants have been sold to *NRG Energy Inc.*, a subsidiary of the American company Northern States Power. The plants are located around Narva in the Northeast of Estonia near the oil shale mines. The installed capacity is bigger than the own Estonian electricity demand because the plants have been build to produce electric energy also for the Soviet Union. Meanwhile, the plants are in a very bad condition. Their modernisation and efficiency improvement is part of the deal with NRG. Additionally to oil shale, natural gas is used for electricity production (e.g. in the Iru power plant near Tallinn), also fuel oil to an even lesser extend.[26]

The Estonian **heat production** is based on different primary energy fuels, with liquid fuels (heavy oil, shale oil) having the biggest share, followed by natural gas and solid fuels (oil shale, peat, biomass). Within the last years, however, the shares of oil shale and fuel oil as energy sources with high CO_2 emissions decreased while the shares of natural gas, peat and biomass has risen. In Estonia, heat is mainly produced in boiler houses (65%) but also in CHP (35%). The heat supply is based mainly on district heating (DH). In the beginning of the 1990ies, about 80% of the heat consumers were connected to the DH grid. In recent years, however, the heat demand dropped while the priced increased, and as a result a lot of the DH consumers disconnected from the grid. As a tendency, smaller independent and more efficient gas and wood fired boilers have been installed instead in the buildings. Such small boilers give better opportunities to regulate the heat consumption, hence to reduce the costs of heating. Heat production facilities are already mainly owned by the municipalities. The biggest heat producer in Estonia is *AS Tallinna Soojus* holding five big boiler houses directly in Tallinn and 45 smaller boiler houses in the municipality of Tallinn.[27]

Estonia has developed a **natural gas** network linking the largest towns and industrial centres and covering about 70% of the Estonian population. Natural gas is imported (from Russia), distributed and sold by *AS Eesti Gaas*, that also owns more than 90% of the country's natural gas network. The company was already privatised, and the share capital is divided between the German *Ruhrgas* (32.4%), the Russian *OAO Gazprom* (30.6%), the Finish *Fortum OY* (10.1%) and smaller stakeholders (27.3%).[28] Just like in Poland, the **oil market** in Estonia is of little significance since there is no oil production.

Because of the huge share of oil shale on the primary energy production, Estonia can cover most of its primary energy demand by indigenous energy sources (about 70% in 1996). Oil shale accounted for 62% of the primary energy supply in 1997, followed by peat and wood (13%). The growing share of the latter contributes to the independence from energy imports, even though Estonia is not as independent as Poland. The other primary energy sources like motor fuels (12%), natural gas (11%), fuel oils (3%) and coal (1%) have to be imported.[29] However, the big share of oil shale, having a rather low efficiency of only about 0.27 to 0.3, causes a lot of environmental damages during the mining (consumption of land) and burning process (climate gas emissions). Estonia does not use nuclear energy.

Especially in the beginning of the 1990ies the energy sector in Estonia has undergone considerable changes. Both the primary energy supply and the final energy consumption decreased almost twice. From 1993 the level of energy production and consumption has gradually stabilised. The drop in the energy production was mainly caused by drastically diminished electricity exports to Russia and Latvia which decreased by about 90 % from 1980 to 1995. This resulted in an undercapacity of mines and open pits and an increase of the fixed costs. Because of this development, two oil shale mines have been closed in 1999 and 2000.[30] The declining demand for primary energy, however, was also caused by a more effective performance of the energy sector, first of all the decrease of losses due to energy saving measures.[31]

25. U.S. Department of Energy (Ed.), 2003.
26. U.S. Depertment of Energy (Ed.), 2003; Kallaste et al (Ed.), 1999. p. 26 f.
27. Kallaste et al (Ed.), 1999, p. 29; Long-term Development Plan for the Estonian Fuel and Energy Sector, 1998, p. 5; Ministry of Economic Affairs (Ed.), 2000, p. 20 f.
28. Ministry of Economic Affairs (Ed.), 2000, p. 31.
29. Kallaste et al (Ed.), 1999, p. 23 ff.
30. Kallaste et al (Ed.), 1999, p. 23 ff; Ministry of Economic Affairs (Ed.), 2000, p. 42.
31. Ministry of Economic Affairs (Ed.), 2000, p. 16.

Despite energy efficiency improvements in recent years, the energy intensity is still much higher than in the European Union. Reasons for this situation are the low technical standards and the low efficiency of energy facilities compared to other industrial countries.[32]

On the other hand, Estonia has a comparably big share of **renewable energy sources** on the primary energy supply. Wood is the dominating fuel among the renewables, followed by peat – at least if peat is counted as a renewable energy source. Together they accounted for about 13% of the primary energy supply in 1996, and their share is expected to increase even more within the next years. The other renewable energies are of much lower significance. Despite of certain progress that was achieved in implementing hydropower and wind energy, those represent only 0.1% of the primary energy supply.[33] There are, however, high potentials for using wind energy, especially at the coastline of Estonia, that are currently developed, mainly with the help of foreign investors. Until recently, there was only one wind mill at the isle of Hiiumaa with a capacity of 150 kW. Within the last months, some more small wind mills have been erected, but old Danish ones because these have been economically more feasible than the new big ones. So far, no single new wind mill has been installed in Estonia.[34]

ENERGY POLICY

The Estonian energy policy is very liberal and market oriented, governmental control and interference in the energy sector are minimised. This kind of liberalism also concerns aspects of energy efficiency and renewable energy sources – no concrete and binding targets are set, and they are only of minor importance to the every-day energy policy.

The legal basis of the Estonian energy sector is the **Energy Act** that passed the parliament in June 1997. It regulates the fuel and energy market and the state supervision and adopts basic rules of the EU Directive concerning the liberalisation of the electricity and gas market. As an instrument for the promotion of renewable energy sources § 28.1 of the law obliges energy traders to **purchase electricity produced from renewable energy sources** (hydropower, wind energy, solar energy, biomass, waste gas or waste material) at a price that constitutes 90% of the basic rate for residential consumers – at least as long as the purchased volume of renewable electricity does not exceed 2% of the total utilised electricity in Estonia.[35] This regulation, however, hides some disadvantages: Due to the rather low energy prices, the feed-in tariffs for renewables are also very low (currently about 6.1 Euro-cent/kWh for wind energy), in fact too low to make the production of electricity from renewables economical feasible. Additionally, the energy traders can collect fees from the electricity producers for using the energy grid. The amount of fees is not regulated anywhere and is totally up to the energy traders. Thus, the feed-in tariffs are reduced once more, and the utilisation of renewables is even less profitable.

Within the next time the Energy Act is going to be substituted by three other laws: the Energy Market Law, the Liquid Fuels Law, and the Natural Gas and District Heating Law. This substitution became necessary because the old law that covered all sectors of the energy supply was not detailed enough for EU requirements in the accession process. While the Energy Market Law already passed the Cabinet, the development of both the other laws takes a bit longer.

The Energy Act does not provide any objectives for the development of the energy sector. This is done in the **Long-term Development Plan for the Estonian Fuel and Energy Sector.** It sets the principle target to provide a stable and high quality energy supply at optimum (means minimum) prices. Also, the application of free market conditions and the fulfilment of the EU accession requirements are aimed at, resulting in the need of a more efficient fuel and energy supply.[36] The Development Plan outlines the main development trends of the energy sector until 2005 and partly until 2018, formulates strategies concerning the future development of the fuel and energy mix and the necessary policies and instruments to reach the goals (this part, however, is rather weak). For example, the share of renewable energy sources (including peat) is planned to increase up to 13% of the primary energy demand. This share, however, is nearly already reached (about 12.6%), but not due to special promotion of renewables but rather due to more exact calculation methods, especially regarding the utilisation of wood.[37] With regard to energy efficiency, no absolute reduction in the energy demand is planned. Rather, the intention is to increase the GDP two times faster than the energy demand, so a drop in energy consumption relative to the Estonian GDP can be reached. Nevertheless, also the modernisation of the energy facilities, especially the oil shale based power plants, the wider use of cogeneration and energy saving measures in the heating sector are seen as important contributions to an efficient energy production.[38] According to the requirements of the Energy Act, the Development Plan is going to be revised quite soon.

The Estonian government produced one document dealing specifically with questions of energy efficiency: the **National Programme on Energy Saving**, approved by the government in January 2000, and its **Implementation Plan**, approved in March 2001. The programme, however, is rather weak and provides mainly background information on the different energy production and consumption sectors. Only the Implementation Plan contains some more concrete measurement proposals such as preparing energy development plans in counties and municipalities and developing methods for the energy certification of buildings. It even goes that far as to say who should be responsible and how much money would be required for each of the measures. However, the Implementation Plan is equipped

32. Netherlands Energy Research Foundation ECN (Ed.), 1999, p. 21.
33. Ministry of Economic Affairs (Ed.), 2000, p. 47.
34. Information from Kull (2002).
35. Energy Act (Estonia), 1997, § 28.1 (1), (2).
36. Long-term Development Plan for the Estonian Fuel and Energy Sector, 1998, p. 3.
37. Vares (unpublished paper); also information from Vares (2001).
38. Long-term Development Plan for the Estonian Fuel and Energy Sector, 1998, p. 3 ff.

with very little financial resources and therefore has to be seen more as a political document than as a real action plan. The budget is 1 Estonian Crone (EEK) per capita, that means only about 1.5 million EEK (100 000 Euro).[39] Even in the relatively cheap Central and East European countries this is too little for significant investments, so the plan won't have any big effect on the Estonian energy efficiency situation.

At least, meantime Estonia can take part in the **SAVE Programme** of the European Union that was set up to promote energy efficiency projects. The participation in the ALTENER programme for promoting renewable energy sources, however, was not possible because the fee that would have to be paid by the Estonian government was too high.[40]

The rather low importance of matters of energy efficiency and renewables in the national energy policy also becomes obvious by having a look at the money that the government provides for those policy fields. It constantly decreased from the middle of the 1990ies.[41] Since there are nearly no financial means at the national level for supporting energy efficiency projects and renewable energy sources (most of the financial resources are used for the modernisation of the oil shale sector) Estonia relies very much on international cooperation, especially with Denmark.

There are different reasons for this lack of political interest in the promotion of energy efficiency and renewable energy sources. One has to be seen in the still insufficient liberalisation of the Estonian energy market and the strong position and influence of the monopolistic energy utilities. Also, the production from energy, mainly electricity, from oil shale is very cheap (because external costs are not included in the energy price), so that – like in Poland – there is no pressure to look for other possibilities to satisfy the energy demand, even if it is growing. The additional utilisation of renewable energy sources would only result in overcapacities in the oil shale sector. The practice of pushing the oil shale production has also political reasons because this sector is connected with a lot of jobs, that already had to be reduced when two mining grounds have been closed some years ago. And of course, according to the government there is a lack of financial resources in the state budget for energy efficiency and renewable energy projects or support programmes since most of the money goes in the modernisation of the oil shale power plants to meet the requirements of the EU (emission reduction).[42]

The situation at local level is a little bit different. Since the responsibility for the heat supply was transferred to the municipalities, they are now rather enthusiastically trying to substitute the old heating boilers with new efficient ones and to modernise the district heating grid – at least as long as they have some money available or can organise some from foreign sources. This approach is also politically and socially important for the local authorities since due to the rising energy prices a lot of people are not longer able to finance their heat demand. Thus the municipalities are forced to limit the prices by using less primary energy sources in efficient heating facilities and reducing the heat losses. In their activities the local authorities have been widely supported by three **Regional Energy Centres**, located in Rakvere, Viljandi and Võru. They have been founded in 1996 in the frame of an EU PHARE project and have been financed by PHARE for three years. They supported local authorities and small local energy utilities in their activities in energy planning, implementation of energy efficiency measures and preparation of projects. Meanwhile, the Centres are no longer an official institution but part of the personnel is still working as a group of independent experts.[43]

ENERGY PLANNING

Something general

Opposite to the situation in Poland, there has no general energy planning system been introduced in Estonia. There is no kind of energy planning legislation within the Energy Act or in any other law. Thus the local authorities are in no way obliged to work out energy plans. Nevertheless, a lot of municipalities have developed energy plans voluntarily, mainly within the EU PHARE project "Investment Preparation Facility, Regional Development and Energy Planning" (for more information see the examples below). Within this project, more than 40 energy plans have been elaborated. One of the project aims was to give several consultants the possibility for capacity building in the sector of energy planning. Therefore the energy plans have been worked out by many different consultants from all over the country. Based on this project, the Danish-Estonian pilot project "From energy plan to implementation" was carried out with the objective to exemplary implement a selection of measurements that have been proposed in the energy plans in four municipalities. The investments are mainly done on the supply side such as the establishment of an automatically working heat boiler using wood. Within the energy plans, matters of energy efficiency and renewable energies played only a minor role and have only been taken into account as long as they have been economically feasible. The plans – as a reflection of the project title – have rather been an investment preparation for the modernisation of the local energy production and distribution facilities to guarantee a secure energy supply for the municipalities. Thus the plans served as a basis for local decision makers.

In Estonia there is no specific legislation for the utilisation of wind energy. The installation of wind mills is only restricted by the building law and the coast protection law. Currently there are a lot of planning activities for wind energy utilisation. Some of them, however, did not work out as well as expected. For example, at the peninsula of Sõrve there have been plans to erect six wind mills, but the environmental impact assessment (EIA), which is obligatory for such plans, came out with the result that there can only

39. Information from Vares / Rudi (2002).
40. Information from Vares (2002).
41. Information from Rudi (2001).
42. Information from Madis Laaniste (2002).
43. Information from Hüüs / Rudi (2001, 2002).

three wind mills be installed at the most. Now, the project has been frozen. In another case there was no sufficient electricity grid, so the wind energy producer had to build one first. It is expected that most of the wind energy projects currently being at the planning or EIA stadium are going to be stopped because there are too many uncertainties.[44]

Normally, for the planning of wind energy projects several steps are necessary. These are:[45]

1. zonation of possible wind energy production areas,
2. measuring wind speed and calculation of the expected amount of produced wind energy,
3. getting the planning permission from the local authorities,
4. setting up (or revising) the detailed physical plan by the investor, environmental impact assessment,
5. approvement of the detailed physical plan by the municipality,
6. getting the building permission,
7. getting the permission from *Eesti Energia* to use the electricity grid (very often an improvement or upgrade of the grid and the substations are necessary and have to be paid by the investor),
8. erection of the wind mill and technical check-up.

Within the last time, a wind energy zonation was made for the area of the whole Estonian coastline, financed by the United Nations Development Programme. Usually, the municipalities don't make such a zonation by themselves, only some of them did because of a big interest of investors. For example, for the island of Saaremaa a zonation has been set up as a thematic regional spatial plan (see next chapter for further information). Also for the county of Pärnumaa there are some considerations to make it likewise, but so far there are only some rather general ideas.

Examples of energy planning projects

PHARE project "Investment Preparation Facility, Regional Development and Energy Planning": Energy plan of the municipality of Saverna

The energy plan of Saverna is first of all an investment plan with the aim to solve the most urgent problems of the town's energy supply system. The plan only concentrates on the heat supply system, the electricity supply as well as the consumer sector are totally left out. The speciality of Saverna is a big share of wood used for heat supply, only one of four boiler houses is using fuel oil. However, the efficiency of the wood boilers is only about 45-50%, because they have originally been designed for burning coal. Now they are not big enough for firewood logs, thus parts of the wood can't be burned which leads to the rather low efficiency. The biggest problem of the heat supply system of Saverna are the huge heat losses of up to 62%, because the district heating network is widely overdimensioned. Accordingly, the measurement proposals of the energy plan mainly concern the modernisation of the old DH network and the substitution of the big pipelines by new smaller ones. Also, the renovation of the boiler houses and the installation of new decentral boiler houses have been considered. The energy plan of Saverna only examined the central heat supply system of the local energy supplier that is 100% owned by the municipality. Thus the energy plan is exclusively an investment plan for the utility and does not contain any action plan for the local authority of how to develop the energy supply in the municipality in the next future.

Saverna is one of the four cities that are taking part in the Danish-Estonian follow-up project "From energy plan to implementation". Thus the municipality will get some funding for the implementation of its energy plan and investments in the energy sector. However, whether the energy plan will get fully implemented is not yet guaranteed and has to be seen within the next time.[46]

Wind energy planning at the island of Saaremaa[47]

Saaremaa is the only one of the 15 Estonian counties that already worked out a wind energy zonation for the whole area. The zonation was developed by taking specific spatial criteria (such as nature protection areas, building areas, infrastructure etc.) and the wind speed data into account. Based on this different zones have been defined regarding their suitability for being used for wind energy production:

1. exclusion zones (not suitable at all),
2. restriction zones,
3. reservation zones,
4. naturally unsuitable zones,
5. not restricted zones (very suitable).

Not restricted zones count for only 15.5% of the whole county area. Although the island of Saaremaa belongs to the areas with the most potential for wind energy production, however, the actual area being available is rather limited.

The wind energy plan was developed in co-operation with the island's Biosphere Reservation Centre and the University of Tartu. The municipalities of the county have not been involved in the planning process but have been very open-minded against the zonation. Until now, the plan is not legally binding. But this shall be changed during the next two years by integrating it into the County Plan. This plan is legally binding and is the basis for the development of the municipalities.

44. Information from Kull (2002).
45. Information from Kull (2002).
46. Information from Vares / Rudi (2002).
47. Information from Jõearu (2002).

Energy planning in other European countries

HEAT PLANNING IN DENMARK

Comparing European countries, Denmark seems to be the one with the best or the most detailed organised energy planning system. It was developed after the oil crises of the 1970s to reduce Denmark's dependence on energy imports and includes the local as well as the regional planning level. As an important part of the energy policy after the oil crises the Heat Supply Act was adopted in 1979 regulating the development of strategies for the establishment and alteration of collective energy supply systems and for the use of indigenous energy sources. On this basis heat supply plans were worked out at local level and summarised at regional level to regional heat supply plans. Those included evaluations of and guidelines for:

- the establishment of collective supply systems across the municipal boundaries, e. g. the supply of natural gas, surplus heat, waste incineration and geothermal energy;
- regional allocation of straw or straw surplus and surplus wood;
- the long-term utilisation of biomass, wind and solar energy.

The first part of the heat planning process in Denmark was finished in 1989, and a new Heat Supply Act came into force in 1990. It gives all responsibility to municipalities which shall estimate heat planning projects and decide upon their implementation.[48]

There have been several factors why the heat planning process in Denmark was that successful:

- The planning authorities have been provided with working instructions developed by the national energy authority and some regions. The instructions contained all necessary information about the planning objects and about the single steps of the planning process.
- Another important assisting document was the so called supply catalogue. It included necessary organisational advice as well as technical and economical declarations of heating plants. Additionally, there have been organised courses about how to use the catalogue.
- The Ministry of Energy was obliged to co-operate with energy suppliers. This lead to the establishment of different working groups at national, regional and local level which concentrated on co-ordination as well information distribution.
- The heat planning process has been supported by the existence of extensive data material, i. e. of building registers and resident registers.
- Additional instruments such as energy taxes and the co-operation with utilities promoted the implementation of the heat planning results to a big extent.
- There has been a legislative foundation and obligation for the development of heat plans, and the plans themselves have had a binding character for local and regional authorities.[49]

After the last elections in Denmark and the changes in the government, efforts of pushing an innovative energy efficiency policy have been reduced.

ENERGY CONCEPTS IN GERMANY

In Germany there is no legislation for separate, legally binding energy planning including comprehensive targets and strategies for the further development of energy production and consumption. Nevertheless, some local and regional authorities have elaborated energy concepts for their planning area (sometimes only for a part on a municipality) on a voluntary basis.

Energy concepts in Germany (mainly West Germany) have been established mainly in the 1980s and 1990s. They concentrated on the extension of district heating, on energy saving in local buildings and on the utilisation of CHP. The development of energy concepts has been supported by financing programmes of the Federal Government and of several Federal State Governments. The problem with these programmes was that only the development of energy concepts has been supported, but not its implementation into praxis. Thus there are a lot of deficits in this field that are cumulated by the fact that energy concepts are not legally binding. As reasons for the insufficient implementation the following aspects can be counted[50]:

- The measures proposed in the concepts have not been economical, due to low energy prices and missing financing programmes.
- There has not been enough money at the local authorities for investments.
- There was a lack of free working capacities (in many cases jobs were only created for the phase of the concept development, and after this phase there was nobody available and responsible for the concept implementation).
- Necessary organisational and technical know-how was missing.

Since the implementation of energy concepts has been rather insufficient, the results have been quite modest, too: in nearly no municipality that worked out an energy concept a reduction of the absolute energy consumption could be reached, nor was this expected in the near future.[51] Another study even came to the conclusion that energy concepts hardly contributed to the development of CHP projects and to a wider use of renewable energy sources. Projects have been set up independently from energy concepts, respectively municipalities without such a concept established energy efficiency projects, too.[52]

48. INTERREG IIC project Baltic CHAIN (unpublished).
49. Krawinkel, 1991, p. 85 ff.
50. Damm, 1996, p. 197 f.
51. Damm, 1996, p. 197 f.
52. Schlusche, 1991, p. 151 ff.

But these results do not mean that energy concepts are not a suitable instrument for promoting energy efficiency and utilisation of renewable energy sources at all. Rather better preconditions must be provided, or energy concepts should be seen more as a database for information about the situation of energy production and consumption, local energy sources and possible strategies for a more environmentally friendly energy supply to be integrated into every-day regional or municipal planning processes.

PRECONDITIONS FOR EFFECTIVE ENERGY PLANNING ACTIVITIES

Taking the examples of energy planning in Denmark and Germany as a basis (even if the plans have partly different contents than the Polish and Estonian energy ones), it can be recognised that several preconditions must be fulfilled to ensure a successful development and also implementation of energy plans:

- Basic knowledge must be provided for local and regional authorities and planners regarding organisational and technical requirements (working instructions, guidelines, training programmes). Additionally, new working capacities should be created within the planning authorities with responsibility for energy planning. To make use of external knowledge via consultants as it is done in Poland and Estonia might be a first step in this direction. But still it is important to make some capacity building in the public authorities, too.
- During the planning process the co-operation with relevant actors (energy suppliers, architects, also inhabitants) is of great importance for information dissemination and the practical implementation of the planning subjects later on.
- Relevant data material must be made available, such as information about local energy sources, the age of buildings and scenarios about the future population development. This might be a problem in the Central and East European countries where there is still a lack of a suitable data basis.
- The implementation of set up strategies for energy efficiency and use of renewable energies must be ensured. This includes a kind of implementation control, but also economical preconditions for investments in the energy efficiency and renewables sector. This could be done by additional instruments like financing programmes and/or energy taxes.

Especially this last point might be a big challenge for Poland and Estonia and is so far one of the most important obstacles for a sufficient implementation of the already set up energy plans.

Conclusions

The Polish and Estonian energy stakeholders are quite aware of the importance of energy efficiency measures and the use of renewable energy sources. Partly, this is even stated in the according legislation. But in the every-day energy policy those aspects play only a very minor role. Although in both countries there is an obligation for the energy utilities to purchase renewable energy, this instrument does not sufficiently work for different reasons. Thus the use of renewable energy sources is not economical feasible, and their share at the primary energy sources is growing only rather slowly (but at least it is growing). Since the emphasis of the energy policy and financial resources are channelled into activities of privatisation, establishment of an energy market and modernisation of old emission-intensive energy plants as required by the EU for the negotiation process, there is not much room and money left for energy efficiency activities. Other problems like the security of the energy supply are more urgent and require direct solutions and money. At least some specific standards for limiting the energy demand of new buildings are existing, so that energy efficiency at the consumer side can be improved within the near future.

Nevertheless, there are some stakeholders pushing energy efficiency activities and providing the necessary financial resources, especially with the help of other countries like Denmark. Those stakeholders also help to build a sufficiently working instrument of energy planning. This kind of foreign help is very important because the authorities involved in energy planning in Poland and Estonia do not yet have sufficient experience in such planning activities and are dependent on external support (both for financing and capacity building). Although in Estonia energy planning has not been made obligatory by legislation (as it has been done in Poland), there are also a lot of such activities going on. The energy plans worked out in Poland and Estonia are not quite comparable with those set up for example in Denmark or in Germany. They don't put an emphasis on aspects of energy saving or expanded use of renewables. They are rather investment plans to solve the most urgent problems of the local energy supply, such as the modernisation of the district heating network and the boiler houses. But in the end, these activities will also contribute to an improvement of energy efficiency. However, mostly the necessary money is missing to implement the energy plans into practice, because in both countries there are no special state funds for setting up and implementing the energy plans. But at least energy plans are required by the government to get any support for whatsoever in the energy supply sector.

Energy planning can for sure contribute to the improvement of the energy efficiency standard and the use of renewable energy sources in Poland and Estonia. The mere existence and use of this instrument (being obliged or not) in both countries can be seen as a basis carrying some potential for its extension. But energy plans can only be sufficient (especially in their implementation) in combination with other instruments such as investment funds, energy taxes or efficiently working purchase obligations (for renewables or CHP), because as long as energy consumption is as cheap as it is currently (because of the neglect of external costs) investments in the energy efficiency and renewables sector is very often not economically feasible. Additionally, the integration of energy planning aspects into local and regional spatial planning and vice versa is relevant to ensure an overall sustainable development.

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Acknowledgements

A lot of statements in this paper I was only able to make thanks to personal information from several experts (in order of visits):

For the Polish case study

Tomasz Parteka, Feliks Pankau (President's Office of the Pomeranian Region, Gdansk); Elzbieta Wróblewska (Ministry of Economic Affairs, Warsaw); Aneta Ciszewska, Ryszard Wnuk (Polish National Energy Conservation Agency KAPE, Warsaw); Dirk Jesaitis (Planning Office Jesaitis, Eckernförde); Stefan Schwind (KESCO Energy GmbH, Berlin/Krakow); Ulla Vestergaard Rasmussen, Ture Hammar (Danish Energy Agency, Copenhagen); Jan Andersen (Roskilde University, Roskilde); Else Bernsen, Kurt Madsen, Henrik K. Petersen (COWI Consulting Engineers and Planners AS, Lyngby); Kirstine H. Lorenzen (Energicenter Danmark); Piotr Korcelli (Polish Academy of Sciences, Warsaw); Katarzyna Michalowska-Knap, Anna Oniszk-Poplawska (EC BREC, Warsaw); Marek Potrykowski (Ministry of Economic Affairs, Warsaw); Marie Szwalko (Ministry of Infrastructure, Warsaw); Marek Krawczynski (Energy Regulatory Authority, Warsaw).

For the Estonian case study

Villu Vares, Ülo Rudi (Estonian Energy Research Institute, Tallinn); Priit Enok (ÅF-Esteam, Tallinn); Meeli Hüüs (Lääne-Virumaa Energy Centre, Rakvere); Jüri Lass (Ministry of Environment, Tallinn); Heikki Kulbas (Ministry of Economic Affairs, Tallinn); Rolf Bungart (OSTWIND Verwaltungsgesellschaft mbH, Regensburg); Ulla Vestergaard Rasmussen, Ture Hammar (Danish Energy Agency, Copenhagen); Jan Andersen (Roskilde University, Roskilde); Else Bernsen, Kurt Madsen, Henrik K. Petersen (COWI Consulting Engineers and Planners AS, Lyngby); Kirstine H. Lorenzen (Energicenter Danmark); Susev Soosar (EnPro Engineers Bureau Ltd., Tallinn); Madis Laaniste (Ministry of Economic Affairs, Tallinn); Ain Kull (University of Tartu, Tartu), Raimo Razumov (Pärnu County Government, Pärnu); Marek Raud, Raimond Jõearu (Saaremaa County Government, Kuressaare); Jaan Tepp (Estonian Wind Power Association EWPA, Tallinn).