

## EDITOR'S PAGE

### THE EU ENERGY AND CLIMATE POLICY IMPACTS THE FUTURE ENERGY MIX IN ESTONIA

The electricity production in Estonia is based on the domestic fossil fuel – oil shale. The present structure of electricity production in Estonia has stayed unchanged during almost 50 years, and over 90% of electricity is produced in the world largest oil shale power plants. In spite of many negative aspects of the oil shale power industry, which include the energy efficiency and considerable environmental problems, optimal electricity prices, sustainable economic development and security of energy supply or independence from the import have been provided for the Estonian economy and population for a long time. The last indicator places Estonia



to the fourth position in the European Union. Only Denmark, Poland and Czech Republic are in a better position than us. However, under the present conditions of electricity production along with providing the security of energy supply, the environmental problems, market situation and energy policy must also be taken into consideration. In 2004 Estonia joined the European Union and with the Treaty of Accession the deadlines and terms for bringing the Estonian oil shale power industry into line with the EU legal acts and environmental targets were fixed. The main obligations for Estonia entail the following: the share of renewable electricity in the total energy demand must reach at least 5.1% to 2010, electricity market has to be opened by 100% to 2013, and oil shale power industry must be brought into line with the EU environmental requirements by 2016. The most demanding commitment is to satisfy the requirement of bringing the emissions from oil shale boilers into line with the terms and conditions established for large combustion plants in the European Union (Directive 2001/80/EEC) according to which the amount of sulphur and nitrogen compounds in the emissions must remain below 200 mg/Nm<sup>3</sup> and concentration of fly ash in the emissions must not exceed 30 mg/Nm<sup>3</sup>. Today only two energy units with the total capacity of 430 MW that were refurbished in 2004 with the introduction of fluidized bed technology comply with these requirements. In addition, the environmental requirements valid in Estonia must be satisfied according to which the annual emission amounts of sulphur dioxide must not exceed 25000 tons after 2012. Presently the amounts of SO<sub>2</sub> emissions from

the Estonian oil shale power plants are more than 2.5 times higher. In the near future the CO<sub>2</sub> emissions from oil shale combustion which show high amounts, but still conform the EU Emissions Trading rules will create problems, too. By the year 2008 the oil shale power plants had sufficient quota at their disposal, but since 2009 an additional CO<sub>2</sub> quota has to be purchased. The oil shale-based electricity production would become economically even more questionable after the new EU Energy & Climate Package being approved by the European Council in Brussels on December 11-12, 2008. With the Energy & Climate Package, the European Union will set a target to cut the greenhouse gas emissions by 20% by the year 2020 compared to 1990 and by 30% if other big industrial countries follow this initiative also. The share of renewable fuels in the energy consumption will be increased to 20% and that of bio fuels to 10%. The amendments in the Greenhouse Gas Emission Trading Directive have the strongest influence on the Estonian electricity production. According to this directive the system of permitted emission trading will be changed and national distribution plans replaced by the auctions or allocation of free emission allowances based on the common rules for the whole European Union. In the emission allocation schemes the main trading procedure will be organising the auctions that will certainly increase the price of tradable emission quota significantly. In the sector of electricity production from where the major share of greenhouse gas (GHG) emissions are thrown into the atmosphere, a new emission trading system is planned to be introduced in 2013. It will definitely be the most difficult for the new member states where the electricity production is largely based on fossil fuels. One of these countries is also Estonia. Considering the possible risks for the security of energy supply in these countries, a compromise was reached in the European Council which allows, in certain conditions, allocating some limited emission quotas free of charge to the energy enterprises by the year 2020 after the new trading scheme has been introduced. It is definitely not sufficient for preserving the competitiveness of oil shale energy industry, since the analyses show that the price of tradable CO<sub>2</sub> quota in the free market may rise to 50 €/ton in the future. In addition to the strict targets of the EU energy and climate policy, we have also to consider the influence of certain factors from our close vicinity. After closing the Ignalina Nuclear Power plant at the end of 2009, the deficiency of electrical capacity will threaten the Baltic region when the electricity market will be opened in 2013, and with the construction of Estlink-2 it may happen even earlier. Then Estonia will dive into the harsh market competition with the Nordic countries, and outside the European emission trading system the electricity from Russia is a significant factor. Along with opening the electricity market the current regulated electricity prices will disappear. When taking into account all these circumstances, Estonia has to change the structure of electricity production already in the near future. These changes have been fixed in the new Development Plan for the Electricity Sector 2018 which was approved by the government order No. 74

of February 26, 2009. Figure 1 shows one of the most probable electricity production scenarios in Estonia up to 2020 and after 2025. We can see that the main goal is essential reduction of oil shale power industry, significant expansion of the use of renewable energy and introduction of nuclear power.

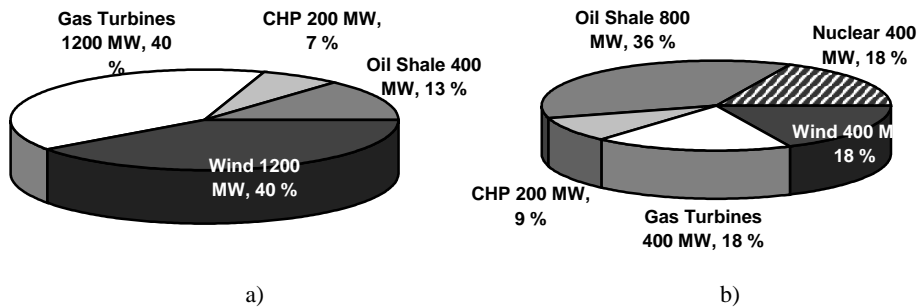


Fig. 1. Possible scenarios for the future electricity production in Estonia: a) up to 2020; b) after 2025.

When comparing the set targets with the present structure of electricity production in Estonia, where over 90% of electricity is produced in oil shale power plants, the changes will be quite significant.

Although the government has made a principal decision about the future use of nuclear power, as a matter of fact, a nuclear power plant cannot be launched earlier than 2025. Therefore the reduction of emission load from the electricity production must begin from the wider implementation of renewable. In the conditions prevailing in Estonia the most attractive renewable energy resource is the wind energy. The resource of possible unused

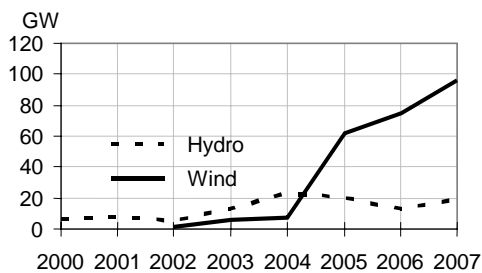


Fig. 2. Production of electricity from hydro and wind resources in Estonia.

hydropower makes about 30 MW and its implementation will not solve the problems of electricity production. At the same time the length of Estonian coastline with islands makes in total 3800 km, and there are sufficient possible sites for building wind farms both on the coast and offshore. Figure 2 shows the rapid development in this field in Estonia after 2002.

Before the implementation of nuclear power very rapid growth in the use of wind power can be expected, and by 2020 the total capacity of wind farms in Estonia may reach 500 MW that makes the control for load curves in the electrical system much more complicated. In addition to the electrical capacity randomly generated by wind generators, the increasing share of

CHP plants in the electricity production must also be considered. When in the former electricity production structure the main attention and studies were focused on improving the efficiency of oil shale combustion plants and reduction of environmental impact, the introduction of new energy mix requires a new approach and profound studies on providing the reliability and controllability of the power system under the conditions of cooperation between large oil shale power plants and wind farms. Since there are no large hydropower plants in Estonia, organisation of such a cooperation in order to provide high reliability of the power system and energy quality in conformity with the requirements is an extremely complicated task.

This special issue of *Oil Shale* that has been mainly prepared by the researches of the Tallinn University of Technology and Kaunas University of Technology is dedicated to the analyses and studies of these problems. I hope that many readers of *Oil Shale* journal will find a lot of useful information for the future performance of the power system under the conditions of cooperation between large oil shale power plants and wind farms.

*Ülo RUDI*  
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The papers published in this issue have been discussed and approved by Editorial Board and presented for publication as the special issue of the journal. The papers have been prereviewed.

Prof. H. Tammoja, Director of the Department of Electrical Power Engineering of Tallinn University of Technology is the guest editor of this special issue.