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SHORT COMMUNICATIONS

FUTURE OUTLOOK OF THE ESTONIAN OIL SHALE AND POWER INDUSTRY*

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Academician ILMAR ÖPIK presents an extremely interesting and enlightening article on "Future Outlook of the Estonian Oil Shale and Power Industry" where he sums up **the results of the work in the Estonian mining industry** in 1997. Six mines and three open casts mined in total 22 Mtons of oil shale with the energy content of 43 TWh. After partial enrichment 14.4 Mtons of oil shale was sold with the average price of 98 EEK/t with the total energy content of 36 TWh and the energy price of 0.04 EEK/kWh. From this amount in total a little less than 8 TWh of electricity was generated in two power plants while the yield of shale oil and gas was 5 TWh produced in three shale oil processing plants and the production of heat made 2 TWh. Thus the **efficiency of the oil shale energy conversion** against the mined oil shale can be taken about 37 %. According to the development plan, the share of oil shale in the Estonian national primary energy balance must be reduced from the present 62 % to 52-54 % to the year 2005 and to 47-50 % to the year 2010.

Prof. Öpik considers it obvious that the more economical natural gas and peat based **CHP** which are to be built in Estonia will **compensate the difference between the winter and summer loads** (5 and 3 TWh), both in the oil shale based Narva condensation power plants and in oil shale production. The US *NRG Energy* business plan from June 1997 suggested a reasonable privatisation schedule for the renovation of the Estonian power plants: in 8-10 years 500 MUSD will be invested for the rehabilitation of 1 GW of production capacity, including replacement of the obsolete pulverised combustion boilers with new fluidized bed boilers with their efficiency increased from 29 % to 34-36 %. The obtained renovated capacity of 1 GW would allow the annual production of 6 TWh with the invariable load. The improved efficiency would reduce the demand of oil shale for 17-24 % and for the annual production of 6 TWh only 16-18 TWh of oil shale energy will be required.

Prof. Öpik analyses also **the mining conditions for oil shale**. The main deposits of oil shale are located deeper than 30 m and thus surface mining is not economical. At the same time, the production cost of one ton of oil shale

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from open casts makes 63-70 % from the similar indices of the biggest mine in Estonia - the *Estonia* mine. The difference in the production cost of underground mines and open casts can be decreased with the overall reduction of the oil shale price. Presently in five mines out of six and in one open cast out of three oil shale is enriched. The oil shale class below 25 mm is not enriched and thus about 20 % of the mined energy content is lost as waste from enrichment having no energetic value. If to enrich the class over 100 mm only, the energy loss will decrease to 5-6 %. At the same time, the construction of a 14 km long oil shale transporting railway section Ahtme-Sirgala should be completed, which would reduce the oil shale haulage for 30 km and the high tariffed (20,6 EEK /t) main railway line would not be required for the oil shale transport any more.

Thus the designed capacity of only one mine - the *Estonia* mine (9 Mt of non-enriched mined product or 17 TWh a year) would be sufficient for the reconstructed generation capacity of 1 GW if the mine operates at the same load during all the seasons. For the oil shale energy price of 8.6 EEK /GJ, the share of the fuel in it along with the reorganisation of oil shale haulage would drop from the present 0.2 EEK/kWh to 0.088 EEK /kWh. As a result, in 1 GW PP the **production cost of the electricity generation of 6 TWh/year would decrease about 650 MEEK.**

Prof. Öpik recommends also solutions for the period when the fluidized bed boilers are being installed and the pulverized combustion boilers are still in operation. He does not see any possibility for the production of **shale oil** with the less oil shale cost than 600 EEK per a ton of crude shale oil. It means that shale oil as a strategic product must be subsidised and this can be done at the cost of the 90 day fuel oil security reserve. Since each ton of shale oil can replace a ton of imported fuel oil and the storage of the 90 day security reserve with the capital cost makes 200-250 EEK per a ton of imported fuel, this cost can serve a basis for calculating the necessary state level compensation to shale oil producers.

The oil shale industry has no development plan in regard of the changes in the market and the problem concerning the body responsible for the direct and indirect cost of closing mines/open pits in the future. The author considers several options for the supply of inexpensive oil shale to oil industry where the retorts UTT that can refine non-enriched oil shale have the most promising perspective. The production capacity of 2 retorts in the Eesti PP is higher than the present oil production of 65-70 ths. t/a.

Prof. Öpik concludes, summing up the future perspectives, that to 2010 the expected share of oil shale compared to that in the Estonian primary energy balance will decrease from 36 TWh/a to 27 TWh/a. This would give the increase of the efficiency of energy conversion in the mined product from 37 % to about 45 %.