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EDITOR'S PAGE

IS ESTONIAN OIL SHALE BENEFICIAL IN THE FUTURE?

Estonian oil shale industry is a child of wars and crises. In the beginning, during World War I, Estonian oil shale was used in Petrograd as a surrogate of coal. A potent method for shale oil processing was developed in the 1930's, during The First Estonian Republic. Thanks to oil shale, Estonia became independent of foreign fuel and power. Up to World War II, Estonian oil shale mining growth matched the development of shale oil processing. The cement industry started using oil shale to improve the quality and economy of production. Oil shale processing products became some of Estonia's essential export items. The oil shale products and shale oil accounted for 8 per cent of Estonian exports (Fig. 1).

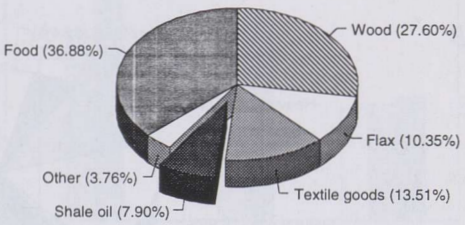
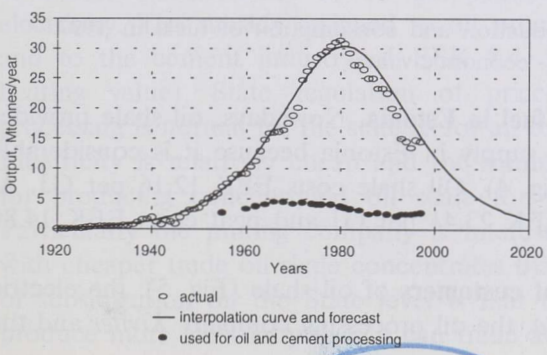


Fig. 1. Estonian export in 1939 (9 months)

After the World War II, the soviet authorities immediately started to develop shale oil processing, mostly for the Baltic Sea Navy and gas generation for the city of Leningrad. The central-station electric power industry started in Estonia in the 1950's. Oil shale mining production reached its **maximum level of $31.35 \cdot 10^6$ tonnes** per year in 1980 (Fig. 2).



After the 80's there was a steady decline in mining. The first scientific prognoses of the

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Fig. 2. Estonian oil shale mining production in 1920-2020: *1* - actual; *2* - interpolation curve and forecast; *3* - used for oil and cement processing

inescapable decrease in oil shale mining were published in 1988. According to this, the Estonian oil shale industry would vanish in the third decade of the next century.

From the beginning of the 1990's, the consumption and export of electricity have dropped in Estonia, as has been the case in all East European countries. The **minimum level of oil shale mining was $13.5 \cdot 10^6$ tonnes** per year. This occurred in 1994/1995. Some increase in consumption of electric power and oil shale began at the end of 1995. Oil shale processing began to increase gradually in 1993.

Oil shale is the most important fuel in Estonia today. In 1997, oil shale provided 76 per cent of Estonia's primary energy supply and accounted for 57 per cent of its economic value (Fig. 3).

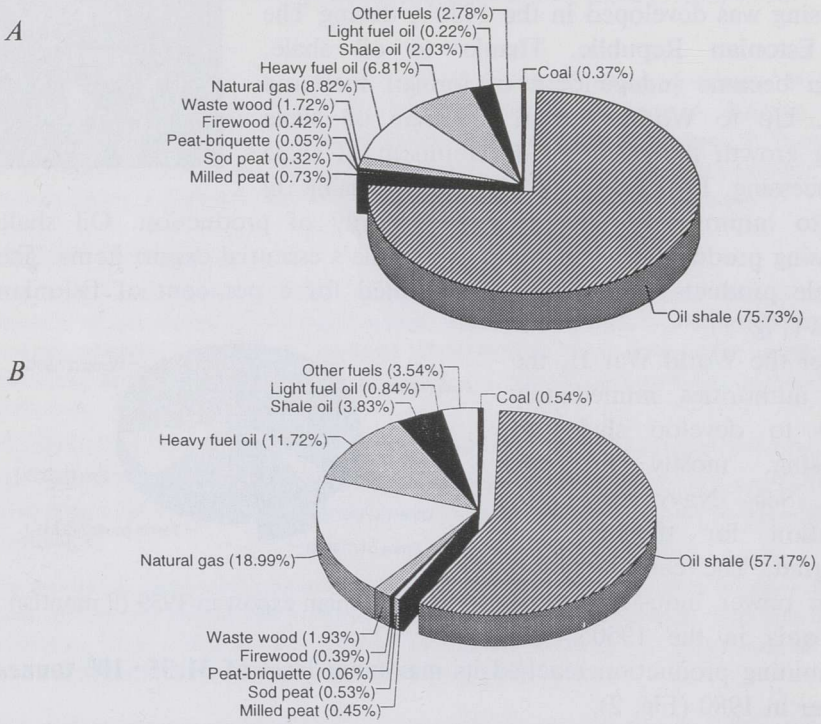


Fig. 3. Estonian production and consumption of fuels in 1997: *A* - heating value; *B* - economic value

Oil shale is the cheapest fuel in Estonia. Nowadays, oil shale provides an essential part of the fuel supply in Estonia because it is considerably cheaper than other fuels (Fig. 4). Oil shale costs EEK 12.16 per GJ. At the same time, coal costs EEK 23.41 per GJ and peat costs EEK 14.80 per GJ (year 1997).

There are three important customers of oil shale (Fig. 5): the electric power company *Eesti Energia*, the oil processing company *Kiviter* and the

factory *Kunda Nordic Cement.* In 1995, the power company utilised 81 per cent of the oil shale mass and 77 per cent of its heating value. The balance was utilised mainly by the processing company (16 per cent of the mass and 21 per cent of the heating value). The cement factory and others had a small part of the oil shale market, approximately 2.3 per cent of the mass and heating value.

The state energy policy inhibits increases in the oil shale price even though the mining infrastructure is decaying. Government price policies subside oil shale processing.

The energy of oil shale for oil processing is 1.9 times cheaper than the heating value of raw oil shale for power stations (Fig. 6).

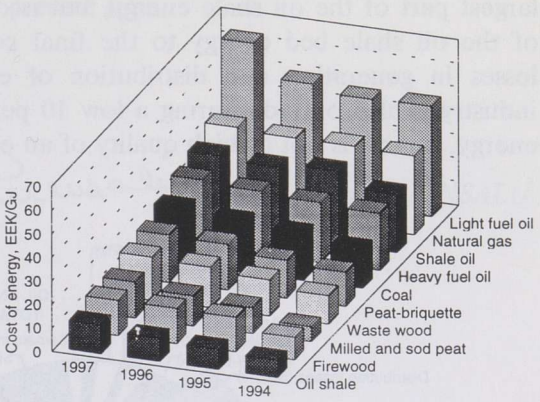


Fig. 4. Cost of fuels energy

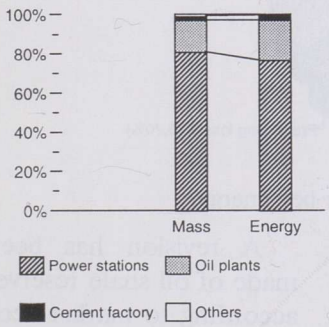


Fig. 5. Oil shale consumption, mass versus energy

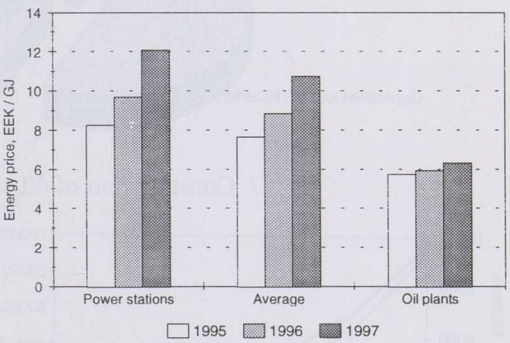


Fig. 6. Energy price of oil shale

It could be considered as a **state subsidisation** of oil and cement export at the expense of electricity. The subsidy assigned to oil processing was of EEK $124 \cdot 10^6$ and to the cement industry of EEK $8.4 \cdot 10^6$ in year 1997 (based on heating value). State regulation of prices and subsidization of oil processing is normal for the state as for an owner of all oil shale industry. Electricity is relatively cheap and the mining company has a possibility for producing concentrated oil shale for processing as a by-product. Particularly the mining company is interested in cash flow and agrees with cheaper trade oil shale concentrates than cost price. The motivation of subsidization on the State level is that the power company can not produce more electricity than it can trade at present, but the oil plant is

able to trade all produced shale oil, including export. It is obvious that in the case of privatisation, the subsidisation of oil processing will cease.

Power or oil industry, that's the question (Fig. 7). This question may be set up in this way: which option is more beneficial for the Estonian Republic at the present time and which option will best carry our natural resources to the final consumer? The power industry is utilising the largest part of the oil shale energy, but is delivering only 11-12 per cent of the oil shale bed energy to the final consumer. The reason is great losses in generation and distribution of electricity. The oil processing industry is also only delivering a low 10 per cent of the oil shale deposit energy, but oil is not as high quality of an energy form as electricity.

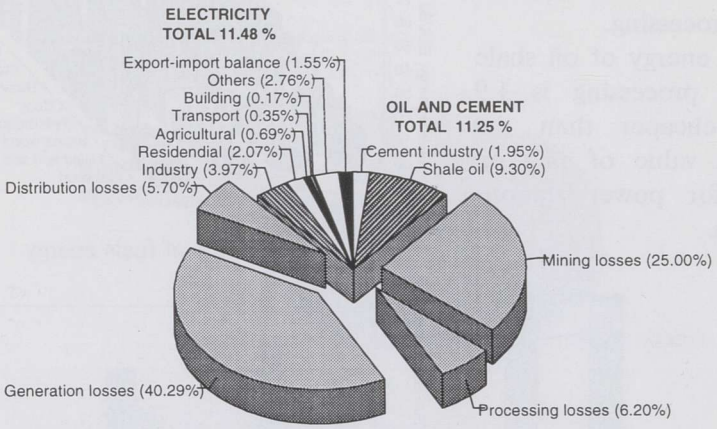


Fig. 7. Consumption of oil shale bed energy

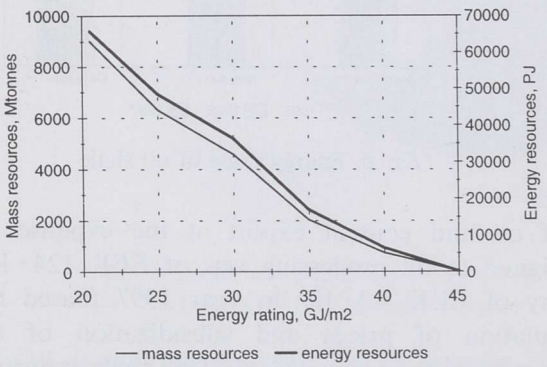
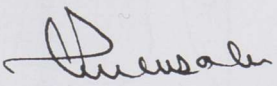


Fig. 8. Distribution of Estonian oil shale resources

A revision has been made of oil shale reserves according to market economy conditions (Fig. 8). The bases for the prognosis is the electricity demand projection and the presumption that energy utilisation per gross domestic product must decrease significantly. One takes the energy rating of 35 GJ per m^2 (about 10 MWh per m^2) as a critical value for a mineable bed. Mining fields have the energy rating from 36.5 to 46.3 GJ per m^2, with an average of 42.2 GJ per m^2. Consequently about 20 per cent higher than minimum limit is allowed for oil shale resources. Russian oil shale

resources that occurred beyond the Narva River have an energy rating below 35 GJ per m^2 and, according to market economy criteria, would not have mineable reserves. Based on this new point of view, Estonian oil shale mine fields have approximately 10^9 tonnes of mineable reserves and exploration fields have double these reserves.

The Estonian oil shale resources are twice as large as the oil shale that has been mined up to the present time.



Enno REINSALU