Environmental Activities

Oil shale industry has been developed in Estonia for almost a century. The experience with handling oil shale industry related environmental impacts has improved significantly since then. The technological progress has enabled us to reduce environmental impacts without decreasing the production volumes but rather even increasing the volumes.

In 2013, one of the key priorities of Eesti Energia was to reduce environmental impacts and increase production efficiency simultaneously. Simply put, our activities on reducing environmental impacts can be split to preventive and restoring. The preventive actions are primarily related to environmental investments.

We continued with planting forest on former territories of oil shale industry and gave a totally new beginning to former Aidu quarry.

Eesti Energia follows all environmental requirements by European Union. In our daily work we are guided by the following principles of environmental protection:

- We use environmental management systems that conform to the international standards ISO 14001 and EMAS to manage environmental impacts.
- We are lowering the CO_2-intensity of the energy delivered to customers.
- We analyse the environmental impact of any new project before starting it and apply the best available technology (BAT) to reach our targets.
- We use our resources carefully and conservatively, we are increasing our reuse and recycling of waste and we are reducing our environmental emissions.
- We work closely with scientific research institutions and consultation firms and we are always looking for new solutions.
- Under equal conditions in procurement tenders, we prefer suppliers with a certified environmental management system.

Preventive Investments in Environment Protection

We continued to keep the SOx emission levels as low as possible also in 2013. We were able to reduce the emissions remarkably by installing deSOx desulphurisation equipment on four generating units in Narva Power Plants and adding crushed stone and mine waste to other energy units as supplementary source of calcium. This allowed us to meet the strict SOx restrictions and produce at the same time 10.56 TWh of electricity and 1.24 TWh of heat.

DeNOx equipment was installed on one energy generating unit already fitted with deSOx equipment in order to reduce nitrogen oxide emissions. The installed equipment allowed us to reduce NOx emissions almost twice.

We increased efficiency through improved usage of resources. We continued with maximizing the usage of oil shale ash. To increase the efficiency of oil shale resource we started using mine waste, formerly considered as a waste or by-product, and low caloric oil shale in generation process. Diversification of energy generation portfolio has significantly reduced environmental impacts.

With the construction of new Auvere energy unit we invested in a new and cleaner, more efficient and low-emission production capacity. Besides reducing emission allowances the circulating fluidized bed technology allows higher flexibility in fuel usage, such as a combination of oil shale and biomass or other fuels.

In terms of renewable energy we prioritised wind energy but also waste-to-energy generation, a totally new method in Estonia. The new wind parks in Paldiski and Narva were opened in 2013. Narva wind park was built on the former ash field of Balti power plant. The new waste-to-energy unit of Iru power plant is using mixed waste to generate electricity and heat. The new fuel increased the plant's electricity and heat production and therefore also its competitiveness. Iru plant used more than 180,000 tonnes of waste for energy generation in 2013.

Construction of Paide Co-Generation Plant in Final Stage

Increased capacity of decentralised electricity and heat co-generation supports maximum and environmentally sustainable fuel usage.

In 2013 Paide CHP plant reached its final construction stage marking the key event in Eesti Energia's co-generation field. We started the cold commissioning at the end of the year and first heat was produced for Paide in the beginning of year. The electricity capacity of biomass based co-generation plant is 2 MW and heat capacity is 8 MW. Considering the local heat consumption co-generation plant of such capacity is an optimum and best solution. After commissioning the existing boiler plants in Paide will be held in reserve to cover peak demand.

Restoration of Mining Areas

Before returning former open pit mine areas to natural and living environments the areas are restored through forestation, turning into arable land or creating a new purpose for the area. Afforestation is the most common method of cultivating the open cast mines. As a result of mine recultivation forest of up to 50 years of age is growing in open cast mines. In 2013, 251 ha of forest were planted on former mining areas. Since the 1960s we have planted forest on some 13,000 hectares during the recultivation process. In 2013, after the closure of Aidu quarry we had a great opportunity to add new value to the local community in the process of restoration of the area. In 2020 we expect to open in this unique area an international water sports centre together with local municipality. In 2013 the construction of first phase, a 2.3 km long, 162 m wide and 3.5 meter deep rowing channel, was completed. The former open cast mine has 30 kilometres of oblong reservoirs, which are split by 4 million trees planted over 40 years. As many other recultivated open cast mine areas Aidu is becoming more popular for fishing and hunting among locals.

Investigating and Assessing Environmental Impacts

In 2013 we focused on improving the assessment of environmental impacts. So far we had only studied specific emissions from a single source of pollution and their local impact on surrounding environment. In 2013 together with other oil shale companies we started mapping and assessing the impact of oil shale industry on environment. As a first step we ordered a survey to identify the environmental impacts of new technologies used in oil shale mining today. Since last century the oil shale industry has gone through a giant leap towards more efficient and environmentally friendly production. Therefore we need also recent studies. We can say that due to the hard work and extensive investments the oil shale industry of Eesti Energia is cleaner than ever.

Major Environment Projects in 2013

65,000 Salmons at Their New Home

For the tenth year Eesti Energia released 5,000 two-year old salmons into Jägala River, next to Linnamäe hydroelectric power station. Over ten year 65,000 young salmons have found a new home in Linnamäe waters. The spawning conditions in Jägala River are limited due to Linnamäe dam and hydroelectric power station. Therefore, Eesti Energia is compensating the natural process by releasing juvenile fish downstream of dam.

Mixed Waste, a New Resource Introduced by Eesti Energia in Local Energy Landscape

Eesti Energia opened electricity and heat co-generation plant in Iru, first in Estonia to operate on mixed waste. The waste-to-energy unit is not competing with household waste sorting and collection by type but is rather an alternative to landfilling. In Estonia, approximately 300,000 tonnes of mixed waste remains unsorted each year. Of this the waste-to-energy unit is able to recycle about 220,000 tonnes. Approximately 85% of energy in the waste is converted into electricity and heat in Iru.

Oil Shale Ash in Road Construction

We used project OSAMAT to analyse the most efficient way of turning oil shale ash, by-product of oil shale industry, to a valuable road construction material. The parties of the project, partially financed by European Union LIFE+ program, include Eesti Energia, Estonian Road Administration, construction company Nordecon and consulting company Ramboll. Oil shale ash was tested as a stabilising layer under asphalt on Simuna-Vaiatu road.

New Wind Park on Pakri Peninsula

Eesti Energia and Nelja Energia opened jointly a new wind park on the northern end of Pakri peninsula. The wind park is comprised of 18 new 2.5 MW energy generators equally distributed between Eesti Energia and Nelja Energia. The new and existing energy generators on Parki peninsula cover the average electricity consumption of some 50,000 Estonian families.

Forest Taking Over the Territory of Viru Mine

Viru mine was closed on 1 June after 48 years of operations and mining of 80.5 million tonnes of commercial oil shale. The office building, fuel enrichment plant and other buildings will be demolished and the former mining area will be taken over by forest. Estonia mine will continue mining the oil shale in former Viru mining area.

Wind Park on Ash Field

Eesti Energia opened a unique wind park next to Narva on a former ash field of oil shale power plant. The wind park consists of 17 energy generators of 2.3 MW and total capacity of 39.1 MW. Approximately 30,000 Estonian families are supplied with this environmentally friendly wind power.

Oil Industry Strengthen Its Odour Monitoring

Eesti Energia Oil Industry introduced the substance reduction plan to complement the existing monitoring measures. As Virumaa region is densely populated with industrial establishments it has greater potential for unpleasant odour. If all regional entities would strengthen their odour monitoring the problem could be jointly solved.

Eesti Energia Balti Power Plant Testing Low Calorific Oil Shale

Oil shale that has so far been considered unusable for electricity generation is mixed with coal, which has 10–30% higher calorific value, in order to get a fuel suitable for burning. For years 8.4 MJ/kg was considered as the best calorific value of oil shale. This, however, means that a significant portion of low calorific value oil shale remains unused. Such oil shale has been considered as mine waste and unsuitable for electricity and heat production. In the course of testing, low calorific value oil shale is mixed with high calorific value coal that should generate fuel mix suitable for burning. As a result we increase the efficiency of mined oil shale and create less mine waste. It also allows channelling more of high calorific value oil shale to higher value adding shale oil industry.

Environmental Impact and Ratios

Eesti Energia increased the production of heat and electricity significantly in 2013 compared to a year before. The production of liquid fuels and accompanying producer gas remained at the same level as a year before. It is worth mentioning that while the electricity generation increased the environmental emissions increased less indicating a drop in specific emissions year-on-year. This is best described by lower sulphur dioxide or SO_2 special emissions that continue to decline also after a significant drop in 2012.

While higher production increased the utilisation of oil shale the mixed waste was used for the first time as a source of fuel in electricity generation in 2013. The amount of pumped mining water has dropped significantly due to termination of excavation operations in Aidu quarry and Viru mine.

Air emissions have decreased compared to previous years while the production volumes have increased. Lower SO_2 and NO_x emissions indicate that the related investments have been well targeted and efficient. While the production volumes have remained at the same level or even grown we have clearly managed sticking to an annual SO_2 emissions limit, which is 25,000 tonnes a year since 2012.

Higher fly ash quantities are partially related to the introduction of low calorific value oil shale as the mineral substance of fuel used has increased. Therefore, we consider it especially crucial to find more alternatives for using ash. Lower usage of biomass in electricity generation and indirect impact of alternative SO_2 reduction methods are behind higher CO_2 emissions. We stopped the large-scale usage of biomass in Balti power plant in the second half of 2012 due to changes in legislative environment.

Both, the introduction of low calorific value oil shale and alternative SO_2 reduction measures have increased the volume of oil shale ash. In order to increase the recycling rate of oil shale ash, which currently has remained almost on the same level, we have prepared several development projects. The volume of mine waste has decreased since the introduction of low calorific value oil shale. A moto mountain established close to Estonia mine is a perfect example of potential usage of mine waste. The construction requires up to 12 million tonnes of mine waste of which 1.5 million tonnes were used in 2013. Until new projects are launched the depositing of material is temporarily increasing. The level of suspended matter and sulphates that reached environment with pumped mining water is directly related to the volume of dewatering. The latter is mostly impacted by the rainfall.

PRODUCTION	UNIT	2011	2012	2013
Electricity	GWh	10,428	9,378	10,560
Heat	GWh	1,263	1,137	1,242
Liquid fuels	th tonnes	184.5	209.5	213.7
Producer gas	million m³	58.1	65.2	62.1

RESOURCES USED	UNIT	2011	2012	2013
Commercial oil shale	million tonnes	15.8	14.8	17.2
Natural gas	million m³	98.2	59.4	47.3
Biofuels	million tonnes	0.4	0.5	0.1
Mixed waste	th tonnes	-	-	184.2
Cooling water	million m³	1,522.9	1,307.2	1,487.6
Pumped mining water	million m³	224.8	203.0	138.1
incl. water from quarries	million m³	131.8	112.2	61.6
incl. water from underground mines	million m³	93.0	90.8	76.5

EMISSIONS	UNIT	2011	2012	2013
SO_2	th tonnes	56.8	23.2	21.2
incl. Narva Power Plants	th tonnes	56.6	23.1	21.1
NO_X	th tonnes	12.8	9.9	8.8
Fly ash	th tonnes	28.3	6.5	9.1
CO_2	million tonnes	12.3	11.0	13.4

SOLID WASTE	UNIT	2011	2012	2013
Oil shale ash	million tonnes	7.1	6.9	8.1
incl. recycled	million tonnes	0.1	0.1	0.1
Mine waste	million tonnes	9.0	8.1	5.6
incl. recycled	million tonnes	8.1	7.6	3.7

WATER POLLUTANTS	UNIT	2011	2012	2013
Suspended matter	th tonnes	1.7	1.1	0.8
Sulphates	th tonnes	131.5	76.0	64.8

ENVIRONMENTAL FEES PAID	UNIT	2011	2012	2013
Resource fees	million euros	28.7	30.4	28.3
Pollution fees	million euros	19.8	17.8	24.5

Environmental Fees

Environmental fees are split between pollution fees and fee for the right to use the resource or resource fee. Eesti Energia pays resource fees for the state owned resources such as oil shale and water. The state collects a fee for the environment pollution in order to compensate for the damages caused by pollution.

As stated by law part of the environment fees is paid to the local municipality the pollution impacts. Large portion of environment fees is invested to different environmental projects through Environmental Investment Centre (SA KIK) all across Estonia. SA KIK finances environment projects in the fields of water, waste, wildlife, energy and environment awareness. The 53 million euros paid by Eesti Energia oil industry in Ida-Virumaa region as environmental fees is therefore used to improve the environment throughout Estonia. Of this amount 13% goes directly to the budget of Ida-Virumaa municipality that can be used for developing the local area.

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Environmental Research and Environmental Protection Action Plan

One of the priorities of Eesti Energia is to co-operate with local and international universities, research institutions, consulting companies and technology development firms within its development activities. Eesti Energia is directly involved in environmental protection research and development of different technologies, which becomes especially important in cases when there are no standard solutions on using oil shale. We established a joint entity Enefit Outotec Technology with internationally well-known technology company Outotec to test oil shale of various origins and adjust technological solutions in the lab and pilot plant in Frankfurt, Germany.

Major environmental research and action plans in 2013

- We continued with OSAMAT project, partially financed through EU Life+ program, to test large-scale usage of oil shale ash in road construction. We tested oil shale in mass-stabilisation of peat embankment together with Estonian Road Administration, construction company Nordecon and consulting company Ramboll.
- Eesti Energia, Kunda Nordic Tsement and Tallinn University of Technology jointly study the potential usage of ashes emerging due to changes in fuel characteristics and implementation of new exhaust cleaning equipment in production of different cement composites.
- In co-operation with Tallinn University of Technology we study the efficient usage of oil shale ash in neutralising acid soil.
- We studied with Geological Survey of Estonia the environmental safety of Narva Power Plants ash fields and their potential impact on environment in order to ensure the safety and environmental friendliness of oil shale ash depositing technology.
- Together with Tallinn University of Technology we started with fundamental research on burning oil shale in oxygen in order to prepare for potential CO_2 catching and depositing projects.
- Together with Tallinn University of Technology and the ecology lab of Eesti Energia we continued with industrial testing of co-generation of low calorific value oil shale, coal and other fuels in the circulating fluidized bed boilers of Narva Power Plants. We analysed the results to find an optimum mix of oil shale and coal or other fuels.
- Together with Oil Shale Competence Centre, Tartu University, Tallinn University of Technology and other oil shale processing companies we initiated the compilation of a program researching environmental impacts of oil shale mining and processing. The aim of research is to assess objectively the environmental damages of oil shale industry and to compare revenue from oil shale with expenses arising from environmental impacts.
- During the preparation of Uus-Kiviõli mine for mining operations we ordered several environmental assessments from experts including the impact of mining on soil and groundwater.
- Together with Tartu University we studied the impact of underground mining on wetlands.
- Together with Environmental Board, Environmental Inspectorate and Estonian Environmental Research Centre we prepared action plan for reducing nuisance from odours for Eesti Energia Oil Industry.