

Overview on combustion and retorting of Estonian oil shale, environmental concerns and solutions

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World reserves of oil shale are huge and strategically significant. However, the use of them for combustion and retorting poses environmental challenges. Energy generation in Estonia uses pulverized firing (PF) and fluidized bed combustion (FBC) systems - technology whose environmental impacts have not been evaluated. According to the content of hazardous trace compounds quantified in ash fractions of each boiler unit, the FBC technology is suggested to be more environmentally friendly compared to the PF process. The actual discharge of pollutants to the environment was evaluated. Airborne particulate emissions were studied on site and their fate was evaluated in smog chamber experiments. Gaseous and particulate discharges from power plants and retorting and the volatilization of phenols from spent shale disposal and leachate lagoons have an impact on atmospheric quality. The leaching behavior of ash fractions and spent shale in laboratory as well as in field conditions was studied. Leachate from spent shale wastes contains toxic metals, phenols and carcinogenic polycyclic aromatic hydrocarbons. The disposed mounds of spent shale wastes generated in retorting are sources of secondary pollution to soil and surface water due to leaching of toxic mineral and organic compounds. Lessons learned with Estonian commercial oil shale power plants and retorting facilities producing oil, clearly demonstrated the prospect of processing this kind of fossil fuel. The reuses of solid wastes as byproducts could give benefit to the production and significantly decrease the environmental hazard of oil shale industry.