ELECTRICITY:

Energy-independent but dirty, Estonia makes 'big shift' to renewables

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LONDON -- For nearly a century, Estonia has been scraping greasy rocks from the earth to light its homes and power its industries. This tiny country on the Baltic Sea has learned to exploit one of the planet's most abundant yet least used fossil fuels to become one of the only energy-independent countries in Europe.

But oil shale is a dirty business. Piles of residue ash rising 600 feet high near the Russian border have been dubbed the Estonian Alps. The waste can be so hazardous that mounds have been known to spontaneously combust. The country ranks alongside India and just behind Russia and China as among the most energy-intensive economies in the world.

Now Estonia's industry is engaged in a historic transition. It is shifting from producing electricity, which increasingly will come from renewables, to refining oil shale into profitable diesel and jet fuel.

New technologies will soon replace methodologies used since extraction began in the closing days of World War I. If successful, experts say, the innovations could lead to mining huge deposits now lying fallow around the world.

Estonia's evolution is symbolized by its accession this spring to the International Energy Agency as the club's 29th member and the first to join since Poland in 2008. Although membership will have little practical effect, Economic Affairs Minister Juhan Parts said it would achieve an ambition "to take an active role in the designing of global energy policy."

Oil shale is sometimes called the rock that burns. It contains solid bituminous material called kerogen, which releases liquid oil when heated. It is not the same as shale oil, the liquid found in shale deposits. Adding to the semantic confusion, oil shale, when refined into liquid fuel, is referred to as shale oil.

Oil shale is found in many parts of the world, but the largest deposits are in the Green River Formation in Utah, Wyoming and Colorado. The U.S. Geological Survey says the area contains more than 4 trillion barrels of oil, though only a fraction may be recoverable, and at great expense. Last September, Royal Dutch Shell PLC became the latest oil major to call off its efforts to tap into U.S. oil shale, although smaller companies are still active (*EnergyWire*, Sept. 25, 2013).

Nowhere, however, is oil shale of a higher quality than in Estonia. It contains twice as much organic matter -- the stuff that burns -- as in the United States.

Estonia gets 70 percent of its primary energy supply from the substance. But it also accounts for 80 percent of its greenhouse gas emissions, the IEA says.

"Everybody understood, the government as well, that we have to change the oil shale industry, and this process is going on at the moment. But it takes time," said Einari Kisel, a senior fellow of the World Energy Council and a former deputy secretary general for energy in the Estonian government.

"We are going through a big shift in the whole system. Today there is around 2,000 megawatts of electrical capacity based on oil shale installed in Estonia. The outlook is that there will remain only about 700 after 10 years," Kisel said from Tallinn, the capital.

Slashing emissions through technology

The shortfall in electrical output will be made up from biomass, from wind farms -- with new turbines mounted on those towering piles of oil shale refuse -- and from connections with the Baltic and Nordic energy pools, such as hydropower from Norway, Kisel told *EnergyWire*.

The drivers behind the transformation are the need to slash carbon emissions and to meet the European Union's energy and environment directives, said Kristine Berzina, an analyst for the Washington-based German Marshall Fund in Brussels.

"You are seeing a progressive increase in renewable energy technology in Estonia. They exceeded their 2020 requirements for renewables in 2011, and they are still growing," she said.

New technology is at the center of Estonia's development plans. About 80 percent of oil shale is processed as it has been since the beginning, and 20 percent in upgraded plants developed in the 1980s and '90s. Now the national oil shale company, Eesti Energia, is ready to launch a third-generation technology, called Enefit280.

Enefit280 plants are designed for maximum efficiency, generating electricity from excess heat and gas. An IEA study released last month said the system is water-free and ready for carbon capture technology.

"Estonia's technological breakthrough could catalyze a new approach to exploring the vast global reserves of this fossil fuel frequently perceived as a significant pollutant," the report said.

Kisel was more cautious. He said Enefit280 runs well in the pilot phase but needs to be scaled up. "It's not operational yet. It's too early to say if it's a breakthrough."

It also requires testing on other grades of oil shale, including the leases in Utah acquired by Enefit American Oil, a subsidiary of Eesti Energia.

"The project is on hold until the new technology is introduced properly in Estonia," Kisel said. Enefit leases 30,000 acres of state, federal and private land that is believed to hold the equivalent of 2.6 billion recoverable barrels of oil (*EnergyWire*, Aug. 6, 2013).

Kisel said commercial production in Utah was expected around 2018. Eesti Energia also has operations in Jordan.

Kicking the habit

Besides the difference in the quality of shale oil, the U.S. project faces the additional hurdle of opposition by local communities and environmentalists, which exists on a far lower scale at home.

"You don't see much opposition because it's such a job creator," said Berzina of the German Marshall Fund.

The Narva district of eastern Estonia is sparsely populated. Its people are mostly Russian speakers who need the anchor of the industry and would otherwise have difficulty integrating with the rest of Estonia's 1.3 million people, she said.

The devastation of 96 years of digging open-pit mines also is being repaired through reclamation and afforestation projects that gained impetus after Estonia became free of the Soviet Union in 1992.

Without the burden of importing its energy needs, Estonia has been one of the fastest-growing economies in the developed world in the last decade. At the same time, it is unique in the dominance of a single energy source, a dependency it is now seeking to end.

"They have this technology and this wealth in place. It makes sense to use it smartly, and I think that's what they are trying to do," Berzina said. "They are investing heavily in research and development. They want to be able to do this responsibly, but how do you achieve that is another question."