Uranium: Backbone of Nuclear Industry

By its very nature, uranium is an extremely energy-efficient element. One kilogram of enriched uranium fuel can be obtained from about 2.5 tons of relatively poor ore with uranium content of 0.2%. But if we know that one kilogram of low-enriched uranium is equivalent to 100 tons of coal in terms of energy it contains, then we’ll see that the amount of uranium ore will be 40 times less than the amount of coal needed to produce the same energy.

Another positive thing is that coal has to be delivered to the power plant ‘as is’ while uranium ore does not need to be transported far away from the mining site. The uranium extracted from it and uranium fuel takes up even less space compared to coal, which leads to a drastic reduction in transport costs.

Nuclear fuel contains uranium-235. This isotope accounts for as little as 0.7% of natural uranium. For this reason, uranium is first enriched, pressed and sintered into pellets. The uranium dioxide pellets containing up to 5% of uranium-235 are placed inside hollow zirconium rods and sealed with plugs.

Several hundreds of fuel rods, in turn, are grouped into fuel assemblies. A fuel assembly is a complex structure, but essentially it is a bundle of fuel rods. During the reactor refueling operation, fuel assemblies are those individual modules that are loaded into or unloaded from the reactor core.

Special containers, or casks, are used to transport fuel assemblies from the manufacturing site to the nuclear power plant.

Fresh nuclear fuel itself is not dangerous in terms of radiation risks because its radioactivity is very low.

Nevertheless, there are special procedures in place at nuclear power plants to ensure safe handling and storage of nuclear fuel. All handling operations take place in a special enclosure. To deliver the fuel into the reactor compartment, it is placed inside transport casks and placed on dedicated platforms.

One full fuel load of a VVER-1200 reactor comprises 163 fuel assemblies. They remain in the reactor core for about 4.5 years in total until the next full reload.

A large power reactor needs only a few tens of tons of low-enriched uranium to operate for a year. In comparison, a coal-fired power plant generating an equivalent amount of electricity would consume five trainloads of coal per day, not year.

Rosatom offers the full range of nuclear energy solutions, from engineering and construction services, nuclear fuel supplies and staff training to operation and maintenance of nuclear reactors and decommissioning of nuclear facilities.

Rosatom’s TVEL Fuel Company is a global leader in the production and supply of nuclear fuel.

Every year, around 400 billion kilowatt-hours of clean, low-carbon electricity is generated with TVEL-made fuel.

Dozens of nuclear reactors worldwide use nuclear fuel from Russia. In some European countries, mostly in Central Europe, those nuclear reactors are a backbone of the national energy system, generating half or more of electric power there. Power prices in those countries are the lowest in the European Union.

Russian nuclear fuel for VVER reactors is the most efficient in the market. It is affordable and ensures cost-efficient operation at enhanced power and in extended fuel cycles.

The new fuel for VVER-1200 reactors has an increased uranium density, enabling them to operate in a flexible, variable-duration fuel cycle and load-following mode and improving the reactor economy.

TVEL Fuel Company holds:

Top 1 position in terms of uranium conversion and enrichment capacity

A third of the global uranium enrichment market

17% of the global market for NPP fuel

10+ destination countries for the supply of research reactor fuel and components