

The Cessation of Production of Weapons-Grade Plutonium in Russia

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As a result of nuclear arms reductions, 10 of the 13 Russian plutonium-production reactors have been shut down, and Russian President Yeltsin has pledged that the three remaining reactors will be shut down by the year 2000. However, the closure of these reactors will not be a simple matter. The three production reactors have been operating since the mid-1960s as dual-purpose reactors producing plutonium for weapons as well as heat and electricity for local residents.

The Krasnoyarsk-26 reactor is the sole supplier of heat to the 70,000 residents of Krasnoyarsk, and the Tomsk reactors supply about 30 percent of the heat used in Tomsk. The two Tomsk reactors supply 650 gigacalories per hour, and there are no potential replacement energy sources at present. The reactors are graphite-moderated, channel-type, pressurized-water-cooled reactors. Each has 2,800 aluminum-alloy cooling channels and uses aluminum-clad, natural-uranium slug fuel. Although the reactors are now operating principally to supply heat to their respective cities (Tomsk and Krasnoyarsk) they continue to operate on a weapons-grade-plutonium-production cycle, each discharging 1,200 metric tons of spent fuel annually. Fuel is discharged with a typical burn-up of 650 to 800 megawatt-days per metric ton. Discharged fuel is stored in pools for up to many months before reprocessing. (Corrosion of the aluminum cladding prevents longer-term storage.) Hence these three reactors also produce roughly 1.5 metric tons of weapons-grade plutonium each year.

In December 1993, representatives of the Russian government (led by Victor Chernomyrdin) and of the U.S. government (led by Al Gore) met in Moscow to discuss issues of mutual interest. At this meeting, the parties agreed to conduct "a study on replacing plutonium-production reactors with alternate

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energy sources to provide electricity and heat in a clean and safe manner.” In a follow-up agreement in March 1994 the U.S. pledged to help Russia obtain financing to replace the Tomsk and Krasnoyarsk reactors and aid in the construction of the new plants. In addition, the U.S. offered to set up energy conservation programs in the two cities. In June 1994, the parties made a commitment to shut down the reactors by the year 2000 and to stop the use of freshly produced plutonium for military purposes. Several replacement power sources are currently being considered for Tomsk:

- ◆ construction of one 500-MW_e nuclear heat-supply unit, (=3D 500 MW_e),
- ◆ construction of four 100-MW_e gas-fired power plants, (=3D 400 MW_e),
- ◆ construction of two 200-MW_e coal-fired power units, (=3D 400 MW_e),
- ◆ conversion of the dual-purpose production reactors.

Last year, the Tomsk city council approved construction of a nuclear-power heat-supply station to replace the two production reactors at Tomsk-7. The strongest argument for this option was that it would preserve the jobs of people currently working in the reactors. But there is little funding available, and, in the absence of Western financial support, this option has a minimal chance for realization.

The gas-fired power plant option would use gas turbines converted from jet engines developed for military aircraft. However, Russia has not yet produced any gas turbines for stationary power. Additionally, it would be necessary to build a natural gas pipeline to Tomsk. Thus, it appears now that this option is not being seriously considered.

Initially, the coal option was rejected by Tomsk’s local authorities due to the absence of a transportation infrastructure to deliver coal to the area. The pollution problems associated with a coal-fired plant were an additional reason for this decision. But the option is not completely dead.

Early on, the Krasnoyarsk-26 city administration thought the coal option was best. Construction of a coal-fired plant south of the city began over 10 years ago, but its construction has been suspended. As in Tomsk, there is little funding available, and without Western financial support the coal option is unlikely to be pursued, at least in the short term.

Finally, after the Gore-Chernomyrdin meeting in June 1994 Russia announced that it was considering construction of a high-temperature gas-cooled reactor at Krasnoyarsk-26. Because no information was released, it is difficult to estimate the prospect of this option now.

Given all these difficulties, some Russian experts believe that conversion

of the existing reactors is the best alternative. Close collaboration between Russian and U.S. experts is needed to resolve the complex technical and financial issues involved with such conversion. This is the subject of the following article.