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Department of State Burea of Intelligence and Research, Intelligence Information Brief No. 236, 'Yugoslavia Nuclear Reactor Goes into Operation'

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Summary:

This report gives an overview of Yugoslavia’s nuclear program and its tight links with both East and West in terms of financial aid and training programs

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BUREAU OF INTELLIGENCE AND RESEARCH

YUGOSLAVIA NUCLEAR REACTOR GOES INTO OPERATION

Yugoslavia's nuclear program passed an important milestone the end of 1959 with the coming into operation of a 6.5-10MW nuclear research reactor. On December 28 Tito, Vice Presidents Kardelj and Rankovic, and delegations from the USSR and the International Atomic Energy Agency took part in elaborate ceremonies marking its completion. The Yugoslavs did the construction work and installation, but the blueprints, "hardware," heavy water, and nuclear fuel were bought from the USSR. While Western countries supplied only subsidiary equipment for the new reactor, they have played a large role in helping Yugoslavia develop its nuclear program. The Yugoslavs have devoted a large amount of money and energy to this program and have made impressive progress. Their goals lie mainly in the economic medical, and research fields, but the prestige factor has undoubtedly intensified their drive.

* * *

Characteristics of New Reactor

The newly commissioned reactor is located at the "Boris Kidric Institute of Nuclear Research" at Vinca, about 10 miles from Belgrade and within sight of the Danube. When in full operation it will have a normal capacity of 6.5 megawatts (MW) and 10 MW under forced power. The reactor is of the "tank" type, using 2 percent enriched uranium as fuel and heavy water as a moderator-coolant. Danube water is also used for certain cooling operations. The critical mass of the reactor is 285

kilograms of nuclear fuel, with 340 kilograms needed for full operation.[1]

The reactor cost between $13 - $15 million, of which Soviet equipment and fuel were valued at $1,500,000. It will be used in training Yugoslavia's nuclear scientists and technicians and will produce isotopes for use in industry, agriculture, medicine, and various fields of research.

USSR's Role

Yugoslavia's negotiations with the United States on the construction of a US nuclear reactor in Yugoslavia were unsuccessful, mainly because the Yugoslavs refused to agree to the "safeguarding" conditions, including inspection, that were required by the US, and the US's willingness to supply nuclear fuel only on a loan basis.

The USSR's first proposal to help Yugoslavia build a nuclear reactor was put forth during the Khrushchev-Bulganin visit to Belgrade in mid-1955. With Khrushchev's strenuous effort at rapprochement with Belgrade as background, Yugoslav-Soviet agreements were signed in late 1955 and the first half of 1956 on scientific and technical cooperation in the nuclear field and on the type of reactor the USSR would supply.

Reportedly, hard bargaining went into the negotiations over price. The Yugoslavs made clear that while they wanted the Soviet reactor, they wanted it without strings and at world-market prices. To them the purchase was strictly a business transaction. The USSR finally agreed to supply the reactor and fuel for $1,500,000 with payment in trade. The terms of trade, the period of payment, and the interest rate, if any, are not known.

Since construction of the reactor began in late 1956, the number of Soviet technicians and engineers at Vinca has varied from 5 to 20. Also, several Yugoslav scientists have been trained in the USSR in reactor operation, maintenance of controls, care of pumps, etc.

There were a number of reports in early 1958 that deliveries of Soviet equipment and uranium were running considerably behind schedule,

1. Details on the reactor were obtained from published Yugoslav material and statements by Western scientists who have visited Vinca over the last two years. Comment on other parts of the Yugoslav nuclear program came from qualified observers, whose statements were supported by one or more independent sources.

with Yugoslav officials privately contending that the delay resulted from the deterioration in Yugoslav-Soviet relations during that period. There was no sign, however, that the USSR ever tried to stop shipments altogether.

The delay in Soviet shipments was one of the principal reasons why the 6.5-10 MW reactor was put into operation in late 1959 instead of in late 1957 or early 1958 as originally scheduled.

Another main cause of delay was the accident in October 1958 involving Vinca's zero-power exponential pile. This Yugoslav-built pile, put into operation in May 1958, went out of control and inflicted severe radiation burns on six attending technicians. All six were flown to Paris, where one died. While the zero-power pile is separated from the large reactor, the Yugoslavs arranged to use the same heavy water in both units (to save money), and the accident necessitated a thorough study to see if the water had been contaminated. Moreover, the Yugoslavs, shocked and embarrassed by the accident, refurbished and strengthened safety precautions in all their nuclear installations and generally reviewed their methods before moving ahead with the completion of their big reactor.

Western Assistance

While Western countries (including the US) had little to do with the 6.5-10 MW reactor, they have played an important role in Yugoslavia's nuclear-energy program. Yugoslav scientists and engineers have studied at Oak Ridge and the Argonne National Laboratories in the US, as well as at various US universities. Others have studied at Harwell in the UK, and in various French, German, Scandinavian, and Belgian institutes.

Along with several types of isotopes, Western countries have supplied Yugoslavia with a large betatron, accelerators, and numerous other pieces of equipment necessary for advanced nuclear research.

In early 1959 Yugoslav officials told an American businessman from a firm selling equipment for nuclear installations that they wanted to buy additional nuclear reactors for training purposes, and indicated that Yugoslavia would be willing to sign a bilateral agreement with the US for such reactors if the required inspections were made by the International Atomic Energy Agency and not by the US Atomic Energy Commission.

Yugoslavia's Nuclear Program and Goals

For a small and still underdeveloped country, Yugoslavia has spent a large amount of money and energy on its nuclear program. Reportedly, $20 - $25 million had gone into the program by the end of 1959. The

country's three research institutes (Vinca, "Rudjer Boskovic" in Zagreb, and "Josef Stefan" in Ljubljana) are well supplied with equipment built in Yugoslavia or purchased abroad, mainly in the West. They have a highly developed training program for nuclear scientists and technicians at home and in the West. They have prospected for (and have found) domestic sources of uranium-producing ore.

Yugoslavia's immediate goals are in research, training, and the production of isotopes. Its long-range goals (tentatively set down in a 10-15 year plan) include such grandiose projects as nuclear-powered merchant ships and power plants. The Yugoslavs say that their reserves of lignite will run out in about 30 years, and at that time their hydro-electric resources will have reached optimum use. They plan to have their first experimental nuclear power plant in operation in the early 1970's. They admit, however, that the production of nuclear-powered ships is beyond their reach for the foreseeable future.

Along with these economic goals the Yugoslavs have prestige reasons for pushing ahead with their nuclear program. For one thing they are "keeping up with the Eastern European Joneses." While their 6.5-10MW reactor came into operation after those in several Eastern European countries and Communist China, they claim that theirs is bigger and better. The Yugoslav reactor is in fact bigger than those now in operation in Eastern Europe, and about the same as the one in Communist China.

More important to Yugoslavia's leaders is the prestige effect on underdeveloped and uncommitted countries of having a well-developed nuclear program. They have steadily increased their efforts to play a leading part in the nonbloc world, and with the production of isotopes at Yugoslavia's new reactor they will be able to show their advanced position by giving nuclear assistance to the underdeveloped countries of Africa and Asia. Further, the Yugoslavs have used their position in the International Atomic Energy Agency to carry forward their self-appointed role of spokesmen for the underdeveloped world. Pointing to their own acceptance of "stringless" nuclear assistance from West and East as an example, the Yugoslavs have argued on every possible occasion that the Agency's main function is to promote this type of assistance to underdeveloped countries.

State -- RD, Wash., D.C.