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SOVIET IMPORTS OF POLYCRYSTALLINE GERMANIUM

CENTRAL INTELLIGENCE AGENCY

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Large imports of germanium by the USSR in recent months probably indicate an inability of domestic sources to supply adequate amounts of this rare elementary metal to meet increases in production of electronic semiconductor devices (transistors, signal diodes, and power rectifiers). The current imports portend a substantial increase in Soviet production of semiconductors in 1962 in comparison with that in 1961. Soviet production of germanium semiconductor devices for all of 1962 could increase by one-half and total production of semiconductors by one-fourth from this source alone.

From December 1961 to August 1962, the USSR imported 9,150 kilograms (kg) of polycrystalline germanium from the Société Générale de Minerais of Belgium. 1/ Shipments occurred in December 1961 and in May, June, and August 1962. Converted into its primary end product, these several thousand kg of germanium will yield many millions of transistors, signal diodes, and power rectifiers. Other uses of germanium are negligible by comparison.

Some measure of the possible impact of these germanium imports on the Soviet electronics industry can be realized by comparing the yields of finished devices obtained in both the US and the USSR per kilogram of polycrystalline germanium. In 1960 the US electronics industry extracted an average of 8,700 usable units from a kilogram of germanium. This figure cannot be applied directly to Soviet industry, because of different levels of production technology and a different product mix, but a rough figure of 3,800 units per kilogram has been derived as a minimum Soviet yield, using analogies from US industry weighted by Soviet yield factors and product mix. 2/ Thus 9,150 kg of polycrystalline germanium probably represents at least 35 million semiconductor devices. Even this conservative estimate is about 54 percent of the estimated Soviet production of germanium semiconductor devices in 1961 and about 22 percent of the estimated total Soviet output of all semiconductors in 1961. Estimated Soviet production of semiconductors of

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all types was 160 million units in 1961, and, of this total, 65 million units were manufactured from germanium. Although semiconductors also are made of silicon, selenium, copper oxide, and magnesium copper sulfide, in the USSR, more semiconductors are made of germanium than any other single element. Silicon semiconductors will become increasingly important in the future because of their ability to operate at higher temperatures, but at present production is limited by the more exacting refining and manufacturing processes involved in rendering silicon usable for the electronics industry.

Polycrystalline germanium was an embargoed item in East-West trade by virtue of COCOM agreements before 1959, but currently this metal is merely on the Watch List. COCOM members, who include all major non-Communist exporters of germanium, are required to report all shipments of Watch List items, but no restrictions are levied on the amount or direction of trade. Significant exports of germanium to the Sino-Soviet Bloc had not been reported before December 1961. Less than 2,000 kg of this metal had been sold to the various East European Satellites and the USSR from January 1959 through November 1961 (see the table).

Although the Société Générale de Minerais apparently plans on a long-term market in the USSR for their germanium, this expectation may not be realistic. 3/ Soviet practices relative to strategic commodities such as germanium indicate that imports probably will be terminated as soon as domestic production can meet requirements. Moreover, there appears to be no lack of potential sources of germanium within the USSR, although these sources may be costly to exploit. Current surveys of Soviet production technology for semiconductors indicate some difficulties, especially in the refining of germanium from a crude form to the highly pure state needed by the electronics industry. Present Soviet imports, however, are believed to reflect an imbalance that probably will be alleviated in the near future. Significant imports of germanium by the USSR should dwindle after 1965, the end of the Seven Year Plan (1959-65), unless more effort is exerted to use semiconductors in the industrial and consumer sectors of the Soviet economy.

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Table

Sino-Soviet Bloc Imports a/ of Polycrystalline Germanium from Reporting COCOM Member Countries b/
1959 - Third Quarter of 1962

Kilograms

Year	USSR	Poland	Hungary	Czechoslovakia	East Germany	Communist China
1959	0	1	0	0	95	64
1960	0	52	15	200	0	234
1961	4,420 c/	586.6	39.8	314	203.3	11
1962 (Three Quarters)	5,000	759.2	185.1	174	0	0

a. Imports by Poland were chiefly in the form of germanium dioxide, which converts to polycrystalline germanium with a 35-percent loss of original weight. In addition, a small part of Poland's imports (69 kg) were in a monocrystalline state that has been converted from polycrystalline germanium with a 10-percent loss in original weight. Communist China also has imported some monocrystalline germanium (41 kg), as have Czechoslovakia, East Germany, and Hungary, the latter three in negligible amounts.
b. There are believed to have been several unreported sales of germanium to the Bloc by Western countries and some intra-Bloc sales, but these total no more than a few hundred kg.
c. The major portion of this amount -- 4,150 kg -- was imported in December and probably will be used for production in 1962.

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Analyst: [redacted]

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Coord:

Sources:

1. Belgian Monthly COCOM Statistical Reports: S. 1463, Dec 61; S. 1532, May 62; S. 1533, Jun 62; S. 1543, Aug 62. C.
2. Data on the methodology used to compute the product mix are available in the files of this Office.
3. [redacted]

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