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NON-FERROUS METALS - POLICY AND PRODUCTION

In 1956 and 1957, the USSR surprised the West by exporting appreciably more than 10% (59.9 and 85.4 thousand tons) of its domestic aluminium production.¹ In 1958, the Kremlin earned considerable unpopularity in the tin-producing countries (Malaya, Indonesia, Bolivia) by selling tin in large enough quantities to bring about a serious reduction in the world market price.² However, during 1959 the Soviet Union conducted its non-ferrous metals trade in such an orthodox and well-behaved manner as to evoke not even the mildest protest from producers in the free world.

An explanation for this apparent paradox is provided in the appendix below by Colonel Jan. Kowalewski who argues, with a wealth of supporting evidence, that although the USSR has been self-sufficient in all the main non-ferrous metals since approximately 1956 (see table, p. 9), a continuing problem is caused by the fact that the communist bloc as a whole is far from attaining equilibrium in the supply and demand of non-ferrous metals.

Throughout 1959, Soviet planners have been making strenuous efforts to save copper and lead by persuading industry to replace these metals with aluminium. The following quotation from Planned Economy (No. 1, 1959) is a typical example:

"The rapid tempo of the development of the aluminium industry will permit the introduction of aluminium as a manufacturing material on a larger scale, providing immense savings. For example, in the electrical industry a ton of aluminium replaces two tons of copper, and in the cable-making industry it replaces three tons of lead. At the same time the production of aluminium requires smaller capital investments and is cheaper to exploit than the production of copper and lead. Raw material resources for the production of aluminium are more wide-spread, more accessible and in practise do not restrict the development of the aluminium industry. The use of aluminium and plastics in the cable industry will save the state during the seven year plan up to 10 milliard rubles and will provide savings of more than 400,000 tons of lead and more than 400,000 tons of copper."

At the end of last year, the Central Committee, CPSU, published a letter (December 16th, 1959) urging the less wasteful use of the non-ferrous metals as a whole, and commending the Orenburg Sovnarkhoz, in particular, for planning to use aluminium as a

¹New York Times, 9 February 1958.

²New York Times, 3 October 1958.

substitute for copper in the windings of electric motors. This letter also points to the increasing use of aluminium for structural purposes (in the building industry). While new outlets for aluminium such as these are being developed, the Soviet press is simultaneously lamenting the slowness with which some plants for the production of metal are being built. For example Trud (July 15th, 1959) observed that the Irkutsk factory, which at present is scheduled to take 12 years (1953-65) to complete, may not in fact be finished until 1969, if progress continues at the present snail's pace. "The only thing that is growing quickly", Trud said, "are the losses, which this year have reached almost 2,000,000 rubles."

A totalitarian state such as the USSR, it might be thought, could arrange the completion of this factory in half the time if aluminium were seriously in short supply. Moreover Trud's criticism seemed to be aimed not so much at emphasizing the need for more aluminium as at stressing the wastefulness of tying down capital and resources for too long a period on one project. The context was the profitability of capital, rather than a bottleneck in metal supplies. Moreover the table given by Colonel Kowalewski (on p. 7 below) demonstrates that during the last two years for which figures are available (1957 and 1958) the USSR imported no aluminium at all.

As regards copper, the figures suggest that the USSR began to achieve self-sufficiency during the 5th five-year plan (1951-1955). But China began to be a major importer as soon as the strategic embargo was relaxed sufficiently to permit it, and a recent report in Die Welt (October 15th, 1959) shows that China is still buying more than 2,000 tons of copper wire a month from Western Germany.³ For this metal the table on p. 7 shows that there have been no imports into the USSR since 1954. Consequently the exhortations in the Central Committee's letter to find substitutes for copper are more likely to be motivated by the high cost of the metal and the need to export it to other bloc countries rather than by a physical shortage of it.

The cost factor also underlies another general conclusion reached by Colonel Kowalewski, who argues that it will restrain the Kremlin from embarking on any major programme of dumping non-ferrous metals overseas. As has been shown above, it is not so prohibitive as to prevent the USSR from undercutting free world producers for limited periods in specific metals. But the speed with which the Soviet foreign trade experts agreed to limit their aluminium exports to Britain after the Board of Trade had forwarded a Canadian protest,⁴ and then meekly cut back Soviet sales of tin when Malaya, Indonesia and Bolivia complained⁵ suggests that they are perhaps even more sensitive to the political balance sheet than to the need to amass foreign currency.

r.r.g.

³In 1959, China imported copper in various forms worth more than £14.5 million from W. Germany and Great Britain. (Financial Times, 8 January 1960.)

⁴Daily Telegraph, Oct. 3, 1958.

⁵Reuter, UN Bureau, November 26, 1958.

THE SOVIET UNION'S STRUGGLE FOR SELF-SUFFICIENCY IN METALS

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by Jan Kowalewski

When, in 1928 the planners of the Union of Soviet Socialist Republics set out to achieve full economic and strategic self-sufficiency in non-ferrous metals, they were faced with a difficult task. The Soviet Union was endowed with enormous natural resources in ores, but the non-ferrous metals industry was limited in scope and the number of qualified engineers and technical experts was totally inadequate. They have finally achieved their goal, however, for the Soviet Union is now one of the leading world producers of non-ferrous metals, second only to the United States of America in copper production, second only to Canada in nickel and approaching the position of the biggest world producer of aluminium.

In achieving their present position, the Russians made liberal use of the advancement in Western science and technical knowledge. The foreign "capitalist" interests that acquired concessions in Russia before the revolution introduced not only the necessary investment capital but also scientific and technical methods previously unknown to Russia. British, German, French and Belgian enterprises, incorporating the latest technical advances, were established. Two outstanding examples were a copper electrolytic refinery at Kyshtym and a copper production plant at Karsakpay, working the poor porphyry copper ores of Dzhezhazgan. The giant Soviet plant built many years later at Balkhash was an exact copy of the Karsakpay plant.

The revolution and the civil war severely depleted the ranks of men skilled in mining and metallurgy. The plans for the development of non-ferrous mining and metallurgy called for 11,000 engineers and technicians by 1933 - the end of the first five-year plan - to man the new mines, ore processing plants and smelters. Yet by 1930, when the reconstruction of the non-ferrous metallurgical industry began, there were only 346 engineers (compared with a target at that stage, of 1,000) and 458 technicians (against a need for 1,800). Furthermore, 75 per cent of these men had less than a year's factory experience, and only 7 per cent had more than three year's experience.

In an attempt to meet this drastic shortage, the Soviet authorities sought technical aid from the United States of America in the early stages of their development plans. In 1928 the head of the All-Union Non-Ferrous Metals and Gold Trust, Mr. Serebrovskiy, visited the United States and Canada and made contracts with an engineering consulting firm in New York for about 175 American engineers to serve as consultants for the Soviet non-ferrous mining and metallurgical industries. These engineers remained in the Soviet Union until 1937, during which time basic reconstruction and development were being carried out under the first and second five-year plans.

Thanks to their co-operation, there were considerable improvements in the existing plants, and production was increased by the introduction of up-to-date methods, such as the electrolytic process in place of the distillation process in zinc production. Technical aid was extended to all metals except tin. Soviet commentators have long described Western metallurgists as "secretive"

in their development of nickel and tin technology.

Soviet metallurgists made extensive use of the written works of American, German, French and other metallurgists and scientists. As a result of the last war, the Soviet Union profited from the knowledge of the Germans and Japanese. For instance, the entire zinc plant at Magdeburg was transferred to Altay, in the Soviet Union, and the Russians applied the technical methods used in the North Korean magnesium plant built by Japan with American technical help before the war.

Current developments in the Western countries are studied very thoroughly, and all articles appearing in the Western press on mining and metallurgy are translated and published in Soviet "information journals."

A determined effort is being made to augment the number of scientists, engineers and technical mining experts. Under the auspices of the All-Union Science Research Institute for Non-Ferrous Metals, separate scientific research institutes have been established for various groups of metals, including aluminium and magnesium, copper, nickel and cobalt, tin and the rare metals. Several specialized departments and laboratories have been opened by the Soviet Science Academy and by most Soviet universities and other technical institutions. Laboratories associated with production plants also make a material contribution to this research.

As a result of this effort, the number of trained people is now adequate for all Soviet needs, and non-ferrous mining and metallurgy have not only reached the theoretical level of Western techniques but are benefiting from the fruits of Soviet research.

In practical applications, however, the Soviet non-ferrous metals industry still lags behind Western standards. In particular disadvantages include high cost of production, low productivity and an excessive loss of metals during the whole recovery process from the treatment of ore to the production of refined metal. During the present seven-year plan (1959-1965), a great effort is being made to eliminate these defects, and of the planned increase in production during this period about half is expected to come from an improvement in the productivity of labor and in technological processes. The remainder will depend upon new investment.

Now that the capacity of the metallurgical plants has been increased so substantially, there is an urgent need for bigger supplies of ore to keep the plants working to capacity.

Domestic consumption of non-ferrous metals is expected to rise considerably during the seven-year plan (1959-1965), and it is estimated that in 1965 Soviet industry will need nearly twice as much copper and copper-zinc alloys as it used in 1958. This means, of course, that in seven years, twice as much ore must be mined.

The latest complete figures show that in 1957 the total volume of non-ferrous metal ores mined in the Soviet Union amounted to 19.5 million cubic metres, of which 92.5 million cubic meters

were mined by open-cast methods and the remaining 100 million cubic meters of ore are to be mined by open-cast methods and only 140 million cubic meters by underground operations.

It is proposed to meet the demand for increased output in two ways. Several new mines are to be opened, equipped for large-scale production, amounting to 12-16 million cubic meters a year from each underground mine; and it is hoped that the introduction of technical improvements will increase the productivity of labor to one-and-a-half times or even double the previous level and, at the same time, reduce production costs by at least 20 percent.

It was necessary to increase the capacity of the mines and the ore processing plants more rapidly than that of the smelters, because, in general, the richest ores have been exhausted. Now that poorer ores (with a lower metal content) must be mined, the quantity of ore must be increased in order to maintain the output of metal. For example, during the period 1950-1955, the output of copper ore was increased 1.8 times, but copper production rose only 1.5 times. During the same period, the output of nickel ore was raised 1.6 times, but production of nickel increased only 1.37 times.

To make good the shortage of ore from domestic sources, the Soviet Union imports large quantities of non-ferrous metal ores and concentrates from abroad; slag heaps are reworked; and non-ferrous metal scrap is intensively collected and processed.

Imports of ores and concentrates have increased sharply in recent years, the total value having risen from 1,000.5 million rubles (about £88 million sterling) in 1955 to 1,815 million rubles (£159 million) in 1957. In the latter year the main suppliers were Czechoslovakia, 427 million rubles (£37 million), China, 359.7 million rubles (£32 million); Poland, 143 million rubles (£13 million); and Bulgaria, 107 million rubles (£9 million). In 1958 the total value was 1,614 million rubles (£142 million); Czechoslovakia still leading with 523 million rubles (£46 million).

Old slag dumps have proved to be a rich source of metals. A recent inspection in Altay alone showed that there were some 10 million tons of slags, containing 200,000 tons of lead and 650,000 tons of zinc. As a content of one per cent lead is considered to be payable, these slags are as profitable a source as the "rich" ores normally mined. Already the Ust Kamenogorsk Combine in the Altay and the electro-zinc plant in Ordzhonikidze are working slags. In several lead-zinc plants special slag sections are to be built, and three large installations are being provided at copper plants to treat slag dumps.

The planned annual production of metals from slag dumps is 10,000 tons of lead, 90,000 to 95,000 tons of zinc, 1,000 tons of tin and a considerable amount of copper and rare metals. This output can be achieved at moderate capital cost, and the cost of production is very small, amounting to no more than 100 rubles (£8 15s.) a ton.

In the Soviet Union - and, in fact, in all countries of the Soviet economic bloc - much importance is attached to the collection of non-ferrous metals scrap for the recovery of secondary metals. The Council of Economic Mutual Assistance (Comecon) has a special department dealing with the problems of using scrap metals. At the first meeting of the council in December, 1958, delegates said that the recovery of secondary metals was playing an increasing part in the production of non-ferrous metals. For instance, about 30 per cent of the total annual production of copper in the Soviet Union is from scrap, and important quantities of lead and zinc are similarly recovered.

In pursuing self-sufficiency in non-ferrous metals in the Soviet Union it was believed that the enormous ore reserves, revealed by earlier energetic prospecting, brought that objective within reach. But, mainly because the rapid industrialization of the country greatly increased the consumption of non-ferrous metals, and because, with the exhaustion of the richer ores, the great programme of expansion in production had to be satisfied by mining lower-grade ores lying at deeper levels and hauling ores over long distances to keep production plants working at full capacity, the production of metals did not begin to catch up with domestic consumption until just before the last war.

By 1938, however, self-sufficiency had been attained in zinc, and a few years later, the country became self-sufficient also in aluminium, magnesium and nickel. The war interrupted this progress, however, and although the output of aluminium, magnesium, nickel and tin continued to increase, there was an appreciable drop in the production of copper, lead and zinc, and it was necessary to rely partly upon imports to cover requirements. But the balance was restored during the post-war reconstruction period (1946-1950) and official statistics of Soviet foreign trade for 1955, 1956 and 1957 show that the Soviet Union was exporting large quantities of copper, zinc, lead, tin, aluminium and other metals. Some of these exports were, however, offset by imports of certain non-ferrous metals, as shown on a subsequent page.

The present seven-year plan does not envisage the general export of non-ferrous metals, for, as domestic consumption is expected to rise considerably, production will be planned to meet these growing demands, with due allowance for the obligations undertaken by the Soviet Union in respect of its partners in the Soviet economic bloc - the East European satellites, China and other Asiatic republics.

The importance of Soviet supplies of metals to the countries of the Soviet economic bloc was noted at the second session of the Council of Economic Mutual Aid, held in May, 1959. At that meeting it was stated that, although the European countries represented on the council had increased their production of non-ferrous metals, deliveries of metals from the Soviet Union to those countries would be "considerably increased."

In other words, although the Soviet Union is reaching self-sufficiency in non-ferrous metal production, the Soviet economic bloc, as a whole, is far from being self-sufficient. The best proof of that point was the fact that, when the embargo on copper exports to China was lifted, China began to buy large quantities of copper wire on the London market, even though the Soviet Union was exporting copper and copper wire at the same time.

So much importance is attached by the Soviet Union to the cause of becoming self-sufficient in non-ferrous metal production that development of mining and metallurgy has been conducted regardless of cost. As a result, several enterprises were established under such unfavorable conditions that they would be considered uneconomic by Western standards.

Moreover, the economic standards of Soviet mining and metallurgy are still poor, because the productivity of labor is still low and technology is, in practice, not yet equal to Western standards. Thus, there is a considerable loss of metals that could be recovered by more efficient methods.

But, for the time being, these economic considerations have been of secondary importance in the Soviet Union, and the development of the non-ferrous industries has not been hampered by high costs of production. The Soviet Government, in setting the planned targets, insisted on only a gradual lowering of costs of production and improvement in the productivity of labor.

In the present seven-year plan, however, this problem has been given special emphasis and a big reduction in production costs is expected during that period.

The exclusive nature of the Soviet non-ferrous metals industry has produced a set of domestic prices for ores, concentrates and metals quite different from those ruling in the Western countries. Using statistics for 1955-58 recently issued by the Soviet Union, it is possible to compare these price levels. For easy comparison, the prices are shown in the table on the next page as indices based on the price of copper, which is taken as 1.

It will be seen from the table that, although zinc and lead cost about one-third of the price of copper in the West, zinc costs three-quarters as much as copper in the Soviet Union, and lead is one-and-a-quarter times as expensive as copper. Nickel, which, in the West, costs only 2.5 times as much per ton as copper, costs 4.4 times as much in the Soviet Union. Tin (3.3 times the price of copper in the West) is 18 times more expensive than copper. The costs of production of cadmium in Russia are seven times those in the West, and production costs of cobalt are eight times the Western costs.

These price levels refer to final products - that is, industrial metals. But to allow the costs of mining and recovering metals to be evaluated at various stages, special price lists are maintained for metals in ores, in concentrates and as final metal products.

SOVIET AND WESTERN NON-FERROUS METAL PRICES INDEX

Copper = 1

	Soviet Union	Western Countries
Zinc.....	0.75	0.32
Aluminium.....	0.9	0.76
Copper.....	1.0	1.0
Lead.....	1.25	0.28
Nickel.....	4.4	2.4
Tin.....	18.0	3.15
Selenium.....	21.0	22.5
Tellurium.....	21.0	6.3
Cadmium.....	34.0	4.25
Cobalt.....	38.0	6.3
Lithium.....	90.0	
Zirconium.....	230.0	
Niobium.....	286.0	
Tallium.....	714.0	24.0
Germanium.....	2,860.0	533.0
Indium.....	7,140.0	65.0-80.0

The Soviet price of copper is taken as 4,900 rubles (about £430 sterling)

For instance, a ton of copper in its final metallic form is valued at 4,900 rubles (About £430 sterling); a ton of copper contained in a concentrate of more than 25 per cent copper content is valued at 4,260 rubles (about £374); a ton of metal in a concentrate containing between 9 and 25 per cent of copper is worth 3,700 rubles (about £325); and a ton of copper contained in ore is valued at 1,950 rubles (about £171).

For zinc, a ton of metal is valued at 3,329 rubles (£292); in concentrates at from 1,000 to 1,500 rubles (£88 to £132); and in ore, 250 rubles (about £22).

The domestic price of aluminium, in final form is 4,400 rubles (£386); lead costs 6,125 rubles (£537); nickel, 21,560 rubles (£1,891); and tin, 88,200 rubles (£7,737).

The price lists showing the value of metals in their various stages of production form a basis for transactions between the mines and their suppliers and buyers. But Soviet commentators point out that the price lists are, at present, very unjust, as they give a distinct advantage to the metallurgical plants, and are most disadvantageous for the mines and the ore processing plants. For instance, at the present scale of prices, the lead and zinc plants are showing large profits, but the units forming the whole under-structure of their production - namely, the ore processing plants and mines - are working at a heavy loss, because of the discrepancy in the prices. The discrepancy, therefore, tends to discourage those engaged in mining and processing ore. A general revision of these prices levels is expected.

The peculiarities of the Soviet economic system, with its high costs of production, make it very unlikely that the Soviet Union would attempt to dump non-ferrous metals on the Western

market. Even allowing for large exchange premiums on the conversion of rubles into pounds sterling or dollars, the big difference in the patterns of Western and Soviet prices of these metals would, at any rate, make it a highly uneconomic venture.

It was mentioned earlier in this article that, during 1955, 1956 and 1957, the Soviet Union exported increasing quantities of non ferrous metals, and offset some of the exports by imports. This apparently paradoxical picture makes sense if the figures for those years are studied a little more closely. They are set out in the accompanying table.

SOVIET FOREIGN TRADE IN NON-FERROUS METALS

(In metric tons)

		1955	1956	1957	1958
Copper	exports	36,700	52,400	60,600	43,000
	imports	none	none	none	none
Zinc	exports	35,500	50,900	72,200	66,400
	imports ¹	47,300	48,100	32,500	31,400
Lead	exports	26,200	40,500	54,900	62,200
	imports ²	17,600	26,700	27,700	30,200
Tin	exports	2,100	3,300	18,300	22,300
	imports ³	16,900	15,700	22,000	19,400
Aluminium	exports	41,000	59,900	85,000	114,900
	imports	7,000	9,700	none	none

¹All from Poland

²Mainly from North Korea, Yugoslavia, Iran, etc.

³All from China.

The table shows that, when the Soviet Union was exporting copper and aluminium without any imports of those metals, it was covering a large part of its exports of zinc and lead (about half of its exports in 1957 and 1958) by imports from other countries in the Soviet economic bloc. With tin, however, the picture was altogether different, the quantities of tin exported having been regularly smaller than imports of tin from China. This position will probably be maintained, since the agreement limiting Soviet exports of tin to the West sets a maximum of 13,500 tons in 1959.

The valuation of these exports and imports, made in rubles at the official rate (11.4 rubles to one pound sterling, or four rubles to one American dollar), shows that the prices are calculated at levels below the domestic prices for industrial metals quoted earlier in this article but still considerably above the market prices in the West. They do, however, roughly follow the pattern and proportions of Western prices for non-ferrous metals, as shown below.

SOVIET PRICES FOR EXTERNAL TRADE

	Rubles per metric ton	Sterling equivalent (average)	Western market prices ⁺
Zinc.....	1,113 to 1,180	£100 11s.	£97 0s.
Lead.....	1,400 to 1,460	£125 9s.	£71 15s..
Aluminium.....	1,822 to 2,117	£172 15s.	£180 0s.
Copper.....	4,000 to 4,140	£375 0s.	£250 0s.
Tin.....	8,350 to 12,000	£892 11s.	£794 10s.

⁺Aluminium price as quoted by Metal Bulletin, Oct. 16, 1959.
Other prices, London Metal Exchange, Oct. 22, 1959.

The increasing scale of Soviet exports of metals appears, at first sight, to be an important pointer to future trends of international trade in non-ferrous metals: as shown by the table of imports and exports in the period 1955 to 1957, Soviet exports of copper, lead, zinc and aluminium were more than doubled; and those of tin jumped suddenly in 1957 by 15,000 tons, indicating a marked development of the domestic tin industry, since imports of tin from China increased by only 6,300 tons.

A large part of these exports, however, went to the countries of the Soviet economic bloc, and it can be expected that the Soviet Union will, to an increasing extent, be their main supplier of non-ferrous metals in the future. Exports of non-ferrous metals from the Soviet Union to the West are, therefore, likely to remain limited in quantity and irregular.

PROGRESS TOWARDS SELF SUFFICIENCY
in the production of
estimated non-ferrous metals production
(metric tons)

	Copper	Zinc	Lead	Nickel	Tin	Aluminium	Magnesium
1940 Best pre-war production	146,000	85,000	80,000	15,000	3,000	?	1,000
1945 Post-war production	120,000	52,000	40,000	17,000	4,500	85,000	2,170
1950 End of fourth five year plan	218,000	130,000	90,000	38,800	12,000	155,000	3,000
1955 End of fifth five year plan	348,000	250,000	210,000	49,000	21,600	450,000	8,100
1958 Present Day production	435,000	350,000	260,000	58,000	28,800	600,000	10,500
1960 Planned for end of sixth five year plan	556,000	450,000	320,000	80,000	35,000	900,000	16,900
1965 Planned for end of the seven year plan	800,000	550,000	390,000	-	-	1,800,000	-

Production of refined copper amounted to: 1958, 405,000 tons; 1960 (planned), 520,000 tons; and 1965 (planned), 750,000 tons.

The horizontal lines between figures mark approximately the beginning of self-sufficiency in each metal.

From 1940 onwards the figures are estimates with possible errors of plus or minus 10 to 15 percent.