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NSC BRIEFING

24 JANUARY 1956

## WORLD COPPER AND USSR

- I. Copper shares with gold and silver the distinction of being one of the metals longest known to man. In today's industrial economy, its ductility makes it useful--as a pure metal or an alloy--in such applications as pots and pans, tubing and the rotation bands on artillery shells, while its excellent conductivity makes copper absolutely essential in the electrical, electronic and communications industries.
- A. The mounting demand for copper in the modern world is shown by the rise in world production from a level of some 1 million tons a year, before World War I, to double that by 1929, and over 3 million tons a year today.
- B. As an example of copper's uses, the following percentage breakdown of US consumption in a typical year (1950) shows:
- Electrical manufacturing: 30%
  - Automobiles (NOT including electric components): 14%
  - Building trades: 13%
  - Light and power lines: 10%
  - Telephone and telegraph: 9%
  - Ammunition (civilian): 7%
  - Radio and television: 5%
  - Other: 12%
- II. Discussion of world copper production figures is complicated by the fact that the metal is virtually indestructible--so that in any year the overall copper supply includes not only new

DOCUMENT NO. 28  
NO CHANGE IN CLASS. II  
DECLASSIFIED  
CLASS. CHANGED TO: TS S C  
NEXT REVIEW DATE:  
AUTH: HR 70-2  
DATE 1-14-80 REVIEWER:

25X1

copper mined but also old copper reclaimed. The figures we present here, however, are for the output of electrolytic copper from "primary" refiners--that is to say, largely new copper from mines, plus a smaller amount of re-processed scrap copper (but NOT including the great bulk of reclaimed copper alloys which are processed every year by "secondary" users. On this basis, world copper producers rank as follows (see chart):

- A. US--40%, or 1.2 million tons in '54 (750,000 tons mined).  
USSR--13%, or 400,000 tons in '54 (354,000 tons mined).  
Chile--8%, or 240,000 tons in '54 (364,000 tons mined).  
W. Germany--8%, or 235,000 tons in '54 (only 2,000 tons mined).  
Canada--7%, or 226,000 tons in '54 (275,000 tons mined).  
Rhodesia--6%, or 175,000 tons in '54 (398,000 tons mined).  
Other Free World--16%, or 492,000 tons in '54 (458,000 tons mined).  
Other Bloc--2%, or 83,000 tons in '54 (54,000 tons mined).
- B. Thus, the Sino-Soviet Bloc, as a whole, produces almost 16% of the world's output of refined copper, while two regions in the USSR presently account for the lion's share of this: Kazakhstan, with about 60% of Soviet production, and the Southern Urals, with about 30%.

III. With its present overriding emphasis on industrial expansion, the Bloc finds itself perennially deficient in copper. In the Fifth "5-Year Plan", just concluded, the USSR had hoped to increase its copper production by 90% but actually achieved only a 50% increase. During their next "5-Year Plan," the

- A. We do not expect the Soviets to achieve this expansion easily. Since 1939, no new large reserves have been discovered in the USSR, and smaller finds have just about equalled the amounts mined. Thus, Soviet copper reserves today stand at about 20 million tons (compared with US reserves of 25 million).
- B. Further limiting factors on Soviet production are the relative poorness of reserve ores and the technical barriers to economical production of copper from such ores.
1. Ore in Kazakhstan, which represents over 50% of Soviet reserves, averages only about 1% copper (a little above the US average).
  2. Efficient extraction from such low-grade ores requires plenty of water, but Kazakhstan is particularly poor in water-resources.
- IV. Under these circumstances, three other courses are open to the Bloc in order to solve its chronic copper deficiency: development of new production (possibly in China, where important discoveries have been claimed in both the Southwest and Northwest); imports from the Free World (which totalled some 100,000 tons in '55 and had been as high as 130,000 tons the previous year); and, finally, substitution of other metals--aluminum in particular--for copper.

- A. The first of these courses--new production--offers no immediate prospect for bettering the Bloc's copper deficit. Even if the new Chinese reserves are proved, years of development and substantial capital investment will necessarily precede the actual availability of Chinese copper in significant quantities.
- B. Imports from the Free World probably offer the easiest means for closing the Bloc gap, so long as the world price is not exorbitant. Actually, since COCOM embargo on exports of copper wire to the Bloc was lifted (Aug '54), purchases of Free World copper by the Bloc have gone down and Bloc attempts at clandestine procurement of other still-embargoed forms of copper on the world market have declined by 90%.
- V. However, in the interest of long-range Bloc self-sufficiency, it is the third possible course-- substitution - which may now be taking a major place in Bloc thinking.
  - A. There are strong economic arguments for substitution. The world over, copper ore is not only limited in quantity but is becoming less and less satisfactory in quality as the better deposits are worked-out. Any expansion in copper output, therefore, is not only difficult but becomes progressively more costly.
    - 1. By contrast, bauxite of good quality is abundant and widely distributed. Increases in the output of aluminum, therefore, are made both easily and without any significant increase in costs.

3. This combination of ready availability and stable price has already made aluminum an economically attractive substitute for copper.
- B. In the US, we have already substituted aluminum for copper in nearly all long-range electric transmission lines. Similar substitutions, in significant percentages, have been made in the US automobile industry, in refrigeration and the construction field.
  1. 100% substitution would also be possible, at no loss in efficiency, in electric bus-bars, conduit, many types of wire and cable, tubing, screens, fasteners of all descriptions, cartridge clips, cases and boxes, and any number of utensils. The overall saving in copper under such a substitution program could be as great as 20%.
  2. Aluminum could additionally be substituted for copper, probably without any important loss of efficiency, in such applications as valves and fittings, radiators, shell-casings, miscellaneous hardware and appliance items, and some alloys, for a further possible copper saving of another 20%.
- C. Under these circumstances, it is significant to note that the Soviet Sixth "5-Year Plan" calls for an expansion of aluminum production by over 100%--from the '55 level of 545,000 tons to a goal of over a million tons by '60.

D. It is impossible to say with any certainty that the USSR and its Bloc associates are now about to launch a major program of substitution. However, there is no question but that the expansion of Soviet aluminum production will not only increase the USSR's potential in the aircraft and missile fields, but will also permit a significant substitution of aluminum for copper, should Soviet planners so desire.