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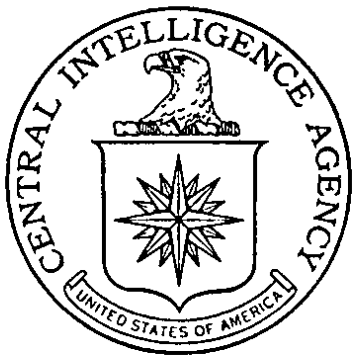
No 77

ECONOMIC INTELLIGENCE REPORT

ESTIMATED CONSUMPTION OF COPPER FOR TELECOMMUNICATIONS PURPOSES IN THE SINO-SOVIET BLOC IN 1956



CIA/RR 100
3 September 1957

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S-E-C-R-E-T

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(ORR Project 46.1722)

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FOREWORD

This report gives an estimate of the amount of copper* used by the Sino-Soviet Bloc for providing telecommunications facilities in 1956. An apportionment of the facilities (between military and non-military) for which copper usage is given in this report cannot be made.

For two reasons, no consideration is given in this report to the use of aluminum as a substitute for copper for telecommunications wireline purposes. First, there is no evidence that aluminum is being or is to be used for telecommunications wirelines in the Sino-Soviet Bloc. Second, US industry does not use aluminum for this purpose, because it has higher resistance than copper and because aluminum joints have not stood up well in practice. This is not to say, however, that in an emergency in which copper was scarce aluminum or some other metal would not be used.

Reusable copper wire recovered from the process of rebuilding, rerouting, or renewing communications lines of one kind or another has not been considered in this report.

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Some facilities not included in the tabulations and for which data cannot be reasonably estimated follow:

1. Exclusive facilities of the military and those of other functional users such as railroads, shipping, and aviation.

* The grade of copper referred to in this report is that generally used around the world for electric communications: electrolytic copper with a purity of 99.9 percent or better.

2. Mobile telecommunications facilities.

3. Amplifier, repeater, and loading coil facilities.

4. Nonconventional "communications" facilities such as radar and navigation aids.

5. Conductors and transformers used for bringing electric power into telecommunications facilities.

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ESTIMATED CONSUMPTION OF COPPER FOR TELECOMMUNICATIONS PURPOSES IN THE SINO-SOVIET BLOC IN 1956*

Summary and Conclusions

The estimated consumption of copper for telecommunications purposes in the Sino-Soviet Bloc** in 1956 was more than 88,000*** metric tons.**** The USSR consumed almost 47,000 tons, Communist China almost 17,000 tons, and the European Satellites almost 26,000 tons. A summary of the estimated consumption of copper for telecommunications purposes in the Sino-Soviet Bloc in 1956 is shown in Table 1./

Telecommunications facilities and services in the Sino-Soviet Bloc requiring copper appear highly inadequate to serve the needs of the vast areas of the Bloc under either emergency or wartime conditions. The inadequacy in the European portion of the Bloc is, however, less severe than elsewhere. Present demands of the military services for more and better rapid electric communications facilities and services are extensive. It is estimated that the inadequacies of telecommunications facilities in the Sino-Soviet Bloc are so great that, at current rates of expansion and improvement, it will take until 1965 to develop a modern, automatic system. Should the Bloc elect to introduce a modern, automatic system by 1960 to meet emergency or wartime conditions, the annual use of copper for telecommunications purposes would be several times greater than the 88,000 tons estimated for 1956.

The Soviet Sixth Five Year Plan (1956-60) is far more comprehensive and ambitious than previous Plans and appears to point toward overcoming numerous telecommunications vulnerabilities involving increasing uses of copper. The telecommunications base in Communist China appears inadequate in terms of geographic coverage and capacity of system. Present plans emphasize the construction of underground cable and the extension of telephone wirelines to all hsiens (counties). As the

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* The estimates and conclusions contained in this report represent the best judgment of ORR as of 1 July 1957.

** In this report, the area referred to as the Sino-Soviet Bloc comprises Albania, Bulgaria, Communist China, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and the USSR.

*** This total has been derived from unrounded data and is not the sum of the rounded components stated here.

**** Tonnages are given in metric tons throughout this report.

/ Table 1 follows on p. 2.

Table 1

Estimated Consumption of Copper for Telecommunications Purposes in the Sino-Soviet Bloc a/
1956

Metric Tons

Consumption Items	USSR	Communist China	European Satellites	Total
Wire-diffusion facilities	2,000	380	350	2,800
Radiobroadcast facilities	2,300	26	420	2,800
Television facilities	3,300	N.A.	220	3,500
Microwave transmitter-receiver station facilities	27	9	2	38
Cable and wireline facilities	39,000	17,000	25,000	80,000
Total	47,000	17,000	26,000	88,000

a. For detailed computations, see Tables 2, 4, and 5 (pp. 5, 13, and 20, respectively, below). All data in this report are rounded to two significant figures. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.

base expands and fast and dependable servies are provided, greater quantities of copper will be required annually. Telecommunications facilities in the European Satellites are believed to be adequate to meet minimal present needs of their respective economies.

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1. Introduction.

Telecommunications networks of the USSR 1/* and Communist China consist chiefly of open wire and some relatively short cable lines.

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Open wire and cable, aerial and underground, are used in the European Satellites. Carrier equipment on many Sino-Soviet Bloc routes permits simultaneous operation of as many as 24 telephone channels. Wireline systems in the Bloc are supplemented by a few short microwave radio relay routes and, in the USSR and Communist China, by extensive networks of high-frequency, long-range radio communications stations. 2/ These networks appear to be highly inadequate to serve the vast areas of these countries for control; command; and operational, logistical, and administrative needs under emergency or wartime conditions. Adequate expansion of them would require large quantities of copper.

The military services at present pose most exacting requirements for rapid communications facilities, in terms of instantaneous readiness to serve, absolute reliability, adequate number of channels, adequate capacity for carrying traffic, and security. 3/ It is almost certain that, at least in large portions of the Sino-Soviet Bloc, existing telecommunications facilities and services have not yet met these requirements.

To introduce a modern automatic telecommunications system, one capable of handling the daily increasing traffic load in the Sino-Soviet Bloc, is a large task. The task is aggravated by the vastness of the areas, the inadequacies of rapid telecommunications facilities, and the shortage of technical personnel. The USSR may develop such an automatic system for the Moscow area as early as 1965, 4/ but the provision of such a system for the remaining parts of the Bloc may require many more years. Should the Bloc decide to develop a crash program for the provision of an automatic telecommunications system to meet emergency or wartime conditions, the annual rate of copper usage would be several times greater than that estimated for 1956.

The estimated consumption of copper for telecommunications purposes in the Sino-Soviet Bloc in 1956 was about 88,000 tons. The following sections of the report give the breakdown of this figure by area and by end use.*

2. USSR.

The estimated consumption of copper for telecommunications purposes in the USSR in 1956 was about 47,000 tons. The Sixth Five

* Detailed methodology for the computation of wirelines is to be found in Appendix A, Methodology.

Year Plan, which supports the estimated consumption of copper for 1956, is far more comprehensive and ambitious than previous Plans and appears to point toward overcoming numerous telecommunications vulnerabilities involving increasing uses of copper. Should the USSR succeed, in addition, in purchasing high-capacity,* dependable, and secure telecommunications equipment and facilities outside the Sino-Soviet Bloc, the reduction of existing telecommunications vulnerabilities will be substantially accelerated.

The estimated consumption of copper for telecommunications purposes in the USSR in 1956, by end use, is shown in Table 2.**

The Soviet Sixth Five Year Plan provides for an estimated capital investment of 8 billion rubles in telecommunications plant and equipment for its basic civil system.*** 5/ This Plan, far more comprehensive and ambitious than previous Plans, seems to indicate a realization on the part of the USSR of the inadequacies of its present telecommunications resources. Some of the announced major goals are as follows:

a. To establish a network of potentially high-capacity trunkline telecommunications routes by installing at least 10,000 kilometers (km) 6,200 miles) of microwave radio relay lines and by laying twice as much underground high-capacity interurban trunkline (including coaxial) cable as was laid during the Fifth Five Year Plan (1951-55). The Sixth Five Year Plan figure for interurban trunkline cable is estimated to be 19,000 km (11,800 miles).**** 6/

* High capacity denotes telecommunications cable or radio relay systems having a capacity of from several hundred to as high as 3,600 telephone circuits. Telephone circuit capacity denotes the number of telephone conversations which can be carried simultaneously between two points. Up to 20 two-way telegraph circuits can be derived from 1 telephone circuit. For the transmission of television programs of acceptable picture quality, capacity equivalent to 450 telephone channels is required. The same radio relay or coaxial cable facilities which transmit television programs can be diverted to, time-shared with, or shared by telegraph, telephone, and facsimile services, depending upon the total capacity of a specific link.

** Table 2 follows on p. 5.

*** Subject to sharing or commandeering by military and other government users.

**** Some of this mileage may cover a project which is reported to be under way to bury two multiconductor cables from Moscow to Vladivostok. The Moscow-Novosibirsk portion is reported to become operational in 1957. (Text continues on p. 8.)

Table 2

Estimated Consumption of Copper for Telecommunications Purposes in the USSR a/
1956

Metric Tons

Consumption	Amount
Wire-diffusion centers	95 b/
Wire-diffusion outside cable and wire for loudspeakers	1,900 c/
Wire-diffusion loudspeakers	45 d/
Radiobroadcast transmitter stations	3 e/
Radiobroadcast receivers	2,300 f/
Television transmitter stations	4 g/
Television receivers	3,300 h/
Microwave transmitter-receiver stations	27 i/
Coaxial cable	800 j/
Trunkline cable	5,700 k/
Trunkline cable bypassing cities	8,800 l/
Wirelines	23,000 m/
Total	47,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. The Sixth Five Year Plan (1956-60) calls for the addition of 30,000 wire-diffusion centers. 7/ It is estimated that 6,000 centers were installed in 1956 and that each used 35 pounds (lbs) of copper. 8/
c. The Sixth Five Year Plan calls for the addition of 16 million loudspeakers. 9/ It is estimated that 3.2 million loudspeakers were installed during 1956. Based on the average usage in a number of installations, 10/ 2 No. 22 A.W.G. (American Wire Gauge) wires, each 100 meters (m) long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker.
d. It is estimated that each of the 3.2 million loudspeakers installed in 1956 contained one-half ounce of copper. 11/
e. A minimum of 63 FM (frequency modulation), VHF (very high frequency) radiobroadcasting stations was planned for operation by the end of 1960. 12/ It is estimated that 12 stations were installed in 1956 and that each used 500 lbs of copper. 13/

Table 2

Estimated Consumption of Copper for Telecommunications Purposes
in the USSR
1956
(Continued)

f. The Sixth Five Year Plan calls for an increase of 25 million radio-broadcast receivers. 14/ It is estimated that 5 million receivers were installed in 1956 and that each contained 1 lb of copper. 15/

g. It is estimated that 9 television stations were installed in 1956 and that each used 1,000 lbs of copper. 16/

h. The Sixth Five Year Plan increases the number of television receivers 7.2 million. 17/ It is estimated that 1.44 million television receivers were installed in 1956 and that each contained 5 lbs of copper. 18/

i. At least 10,000 kilometers (km) of microwave radio relay lines are to be installed under the Sixth Five Year Plan. 19/ It is estimated that 40 microwave stations were installed in 1956 and that each utilized 2 regular transmitter and receiver sets and 1 emergency set. It is estimated that each set used 500 lbs of copper. 20/

j. The Sixth Five Year Plan approximately doubled the length of coaxial cable routes. 21/ The Leningrad-Moscow and Moscow-Khar'kov routes measure approximately 1,350 km (840 miles). It is estimated that 540 km (336 miles) of coaxial cable were installed in 1956; that the cable consisted of 6 coaxial tubes, 3 pairs of No. 19 A.W.G. and 4 pairs of No. 22 A.W.G. wire for control circuits, and 21 quads of No. 19 A.W.G. wire for voice frequency circuits; and that it averaged 1 lb of copper per foot.

k. During 1956, 3,800 km of interurban trunkline cable were to be installed in the USSR. One cable, estimated to be 540 km long, was to be coaxial cable. 22/ It is estimated that the remaining 3,260 km of interurban trunkline cable were installed in 1956 and that the cable contained one 150-pair, No. 19 A.W.G. copper cable, with each conductor weighing 12.8 lbs per kilometer.

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The emphasis being given the subject, both in the Bloc and in the US, however, appears to justify its consideration in this report. There follows

Table 2

Estimated Consumption of Copper for Telecommunications Purposes
in the USSR
1956
(Continued)

a computed estimate of the possible consumption of copper for this purpose, based upon US analogy.

There are approximately 100 cities in the USSR with a population of 130,000 or more. 24/ It is reasonable to assume that at least 20 percent of these cities, including the 16 republic capitals and several of the larger cities in the USSR, were bypassed in 1956. [redacted] a method of bypassing Kiev and Moscow, using several cities within a radius of 25 to 50 km (16 to 31 miles). 25/ Assuming a radius of 25 miles and the use of 150-pair, No. 19 A.W.G. cable (3.9 lbs per 1,000 conductor feet), a total of 8,800 tons of copper would be required. 50X1

m. To determine the quantity of copper used in the USSR for telephone and telegraph wireline purposes in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 5, p. 20 , below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 100,000 subscribers added in 1956 (see Table 5, Column A) amounted to 300 tons of copper.

It is assumed that the 141,000 km of urban telephone wire added in 1956 (see Table 5, Column D) was No. 22 A.W.G. wire weighing 2.89 kilograms (kg) per kilometer. This amounted to approximately 400 tons of copper.

It is assumed that 50 percent of the 264,000 km of interurban and international telephone and telegraph wire added in 1956 (see Table 5, Columns C and E) was 4-millimeter (mm) solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight), weighing 50.6 kg per kilometer. This amounted to approximately 22,000 tons of copper. The estimated total amount of copper used in 1956 for wirelines in the USSR was 23,000 tons.

b. To increase the capacity and speed of telegraph service four times through automation and mechanization of operations.

c. To extend phototelegraphic (facsimile) service five times.

d. To increase the aggregate length of interurban telephone channels almost 2.5 times compared with 1955. The aggregate length of such channels connecting Moscow with the Far East and Eastern Siberia is to be increased more than 7 times, with Western Siberia and the Urals 5 times, and with the Central Asian republics* 3 times.

The successful completion of the Plan will not only benefit the civil system but will materially increase telecommunications support for military and other purposes. Telecommunications resources of the Sino-Soviet Bloc not normally used by military identities are subject to military or other high-priority use, and, because of basic inadequacies of these resources at present, such use would undoubtedly take place in a major emergency or war effort.

The USSR-France trade agreement 26/ now in negotiation includes an attempt to purchase from France sufficient microwave equipment and facilities to install 1,300 km of radio relay line. These facilities purportedly will be used for relaying television programs. Although the professed usage may be true, these facilities with the necessary terminal equipment could handle simultaneously hundreds (possibly as many as 3,600) of telephone conversations and other telecommunications services, including telegraph and facsimile. Possible motives of the USSR in attempting to obtain this very high-capacity equipment are as follows:

a. Recognition of the inadequacy of the equipment still being produced and put into service. A decision may have been reached, possibly resulting from recent disturbances in the European Satellites, that the currently planned expansions of the Soviet telecommunications system could not support an expanded, accelerated economy for a modern, widescale military action.

* For the purposes of this report, the term Central Asian republics denotes the Kazakh, Kirgiz, Tadzhik, Turkmen, and Uzbek SSR's.

b. An effort to catch up with Western technological progress, both in research and development and in manufacture of equipment for major trunklines, and at the same time to divert its own production of equipment of more limited capacity to secondary or feeder lines which must exist to originate the traffic flowing through the trunkline system.

c. A prototype system to be automatically supplied if the negotiation should succeed. In addition to saving manpower and time in research and development, the time-span for acquiring installation, operation, and maintenance know-how could be significantly shortened.*

3. Communist China.

The estimated consumption of copper for telecommunications purposes in Communist China in 1956 was about 17,000 tons. The telecommunications base in China appears inadequate in terms of geographic coverage and system capacity. Present plans emphasize the construction of underground cable and the extension of telephone wirelines to all hsiens (approximately 2,000). As the base expands and fast and dependable services are provided, greater quantities of copper will be required annually. A breakdown of the estimated consumption of copper for telecommunications purposes in Communist China in 1956, by end use, is shown in Table 3.**

The telecommunications plans and accomplishments of Communist China for 1956 are vague. The First Five Year Plan (1953-57) for telecommunications was reported nearly fulfilled in 1956, 1 year ahead of schedule. The need for expansion and improvement of telecommunications in the Sino-Soviet Bloc is greatest in China, where the facilities are not only overloaded and obsolete but the inadequacies of the base are great in terms of geographic area and capacity of system. Efforts are being made to overcome these conditions and inadequacies. Emphasis is being placed on the construction of underground cable, and microwave radio relay facilities are under development for major long-distance trunklines. The installation of automatic and semiautomatic telegraph and telephone switching equipment in communications centers is proceeding. Finally, telephone wirelines are being extended to all hsiens.

---

* [redacted] the USSR was negotiating with Hungary in late 1956 for the procurement of 6 billion rubles worth of microwave equipment over a 6-year period. 27/ 50X1

** Table 3 follows on p. 10.

Table 3

Estimated Consumption of Copper for Telecommunications Purposes in Communist China a/
1956

Metric Tons

Consumption Items	Amount
Wire-diffusion centers	14 b/
Wire-diffusion outside cable and wire for loudspeakers	360 c/
Wire-diffusion loudspeakers	9 d/
Radiobroadcast transmitter stations	3 e/
Radiobroadcast receivers	23 f/
Television transmitter stations	N.A.
Television receivers	N.A.
Microwave transmitter-receiver stations	9 g/
Coaxial cable	N.A.
Trunkline cable	N.A.
Trunkline underground cable bypassing cities	2,900 h/
Wirelines	14,000 i/
Total	17,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. It is estimated that 900 wire-diffusion centers were installed in 1956 28/ and that each used 35 lbs of copper. 29/
c. It is estimated that 625,000 wire-diffusion loudspeakers were installed in 1956. 30/ Based on Soviet analogy (see Table 2, footnote c, p. 4, above), 2 No. 22 A.W.G. (American Wire Gauge) wires, each 100 meters long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker.
d. It is estimated that each of the 625,000 wire-diffusion loudspeakers installed in 1956 contained one-half ounce of copper. 31/
e. It is estimated that 12 radiobroadcast transmitter stations were installed during 1956 32/ and that each used 500 lbs of copper. 33/
f. It is estimated that 50,000 radiobroadcast receivers were installed in 1956 34/ and that each contained 1 lb of copper. 35/
g. [redacted] the use of microwave radio relay facilities in China, but specific locations of stations are unknown. China

50X1

Table 3

Estimated Consumption of Copper for Telecommunications Purposes
in Communist China
1956
(Continued)

contracted with East Germany for the delivery of 40 VHF microwave radio relay stations in 1956 and was currently negotiating for another type of communications network equipment. 36/ It is estimated that 40 radio relay stations were installed in 1956 and that each used 500 lbs of copper. 37/

h. The Chinese appear to be giving consideration to the defense of their communications system, as are the other Sino-Soviet Bloc countries. 38/ If in 1956, 10 cities were bypassed, assuming a radius of 25 miles and the use of 100-pair, No. 19 A.W.G. cable (3.9 lbs per 1,000 conductor feet), a total of 2,900 tons of copper would be required.

i. China plans to install 700,000 pole-kilometers (430,000 miles) of telephone lines during 1956-57 in the hsiens. The quota for 1957 was stated to be 40 percent above that for 1956. 39/ It is estimated that 292,000 km (181,000 miles) of 4-mm copperclad wire were installed in 1956 and that the copper in the wire weighed 109 lbs per kilometer.

4. European Satellites.

The estimated consumption of copper for telecommunications purposes in the European Satellites in 1956 was 26,000 tons. Telecommunications facilities of the Satellites are believed to be adequate to meet minimal present needs of their respective economies. A breakdown of the estimated consumption of copper for telecommunications purposes in the European Satellites in 1956, by country and by end use, is shown in Table 4.*

* Table 4 follows on p. 13.

Plans of the European Satellites, although not specific, call for the improvement and modernization of telecommunications facilities. The capacity of long-distance trunklines is to be increased in Hungary, Poland, and Rumania by the use of microwave radio relay facilities and in Czechoslovakia by the use of coaxial cable facilities. With the exception of Albania, all of the Satellites are expected to have television service by 1960.

Table 4

Estimated Consumption of Copper for Telecommunications Purposes in the European Satellites a/
1956

Consumption Items	Pounds							Total (Metric Tons)
	Albania	Bulgaria	Czechoslovakia	East Germany	Hungary	Poland	Rumania	
Wire-diffusion centers	420 b/	9,400 c/	N.A.	N.A.	18,000 d/	110,000 e/	3,500 f/	64
Wire-diffusion outside cable and wire for loudspeakers	1,300 g/	95,000 h/	38,000 i/	N.A.	12,000 j/	310,000 k/	150,000 l/	270
Wire-diffusion loudspeakers	31 m/	2,300 n/	940 o/	N.A.	280 p/	7,500 q/	3,800 r/	7
Radiobroadcast transmitter stations	500 s/	N.A.	N.A.	N.A.	500 t/	500 u/	N.A.	1
Radiobroadcast receivers	1,000 v/	20,000 w/	100,000 x/	280,000 y/	190,000 z/	250,000 aa/	90,000 bb/	420
Television transmitting stations	N.A.	1,000 cc/	2,000 dd/	2,000 ee/	1,000 ff/	2,000 gg/	1,000 hh/	4
Television receivers	N.A.	1,500 ii/	190,000 jj/	280,000 kk/	3,000 ll/	15,000 mm/	500 nn/	220
Microwave transmitter-receiver stations	N.A. oo/	N.A. oo/	N.A. oo/	N.A. oo/	N.A. oo/	3,500 pp/	N.A. oo/	2
Coaxial cable	N.A.	N.A.	N.A. qq/	N.A. qq/	N.A.	N.A.	N.A.	N.A.
Trunkline cable rr/	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Trunkline underground cable bypassing cities	970,000 ss/	970,000 tt/	1,900,000 uu/	2,900,000 vv/	1,900,000 ww/	6,800,000 xx/	2,900,000 yy/	8,400
Wirelines	68,000 zz/	5,900,000 aaa/	13,000,000 bbb/	6,100,000 ccc/	7,800,000 ddd/	2,700,000 eee/	2,100,000 fff/	17,000
Total	1,000,000	7,000,000	15,000,000	9,600,000	9,900,000	10,000,000	5,200,000	26,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. Radiofication of 12 villages in Albania was reported in 1956. It is estimated that each wire-diffusion center in these villages used 35 lbs of copper. 40/
c. It is estimated that 270 wire-diffusion centers were installed in Bulgaria in 1956 and that each used 35 lbs of copper. 41/
d. It is estimated that 500 wire-diffusion centers were installed in Hungary in 1956 and that each used 35 lbs of copper. 42/
e. It is estimated that 3,160 wire-diffusion centers were installed in Poland in 1956 and that each used 35 lbs of copper. 43/
f. It is estimated that a minimum of 100 wire-diffusion centers was installed in Rumania in 1956. This estimate was derived by using the reported number of centers in operation and number of subscribers in 1955 and the estimated number of loudspeakers added in 1956 (see footnote l). It is estimated that each center used 35 lbs of copper. 44/
g. It is estimated that the increase of 1,000 loudspeakers in 1955 was repeated in 1956. Based on Soviet analogy (see Table 2, footnote c, p. 5, above), 2 No. 22 A.W.G. (American Wire Gauge) wires, each 100 meters long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker. 45/

Table 4

Estimated Consumption of Copper for Telecommunications Purposes
in the European Satellites
1956
(Continued)

h. It is estimated that 74,000 loudspeakers were installed in Bulgaria in 1956. Based on Soviet analogy (see Table 2, footnote c), 2 No. 22 A.W.G. wires, each 100 meters long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker. 46/
i. It is estimated that 30,000 wire-diffusion loudspeakers were installed in Czechoslovakia in 1956. Based on Soviet analogy (see Table 2, footnote c), 2 No. 22 A.W.G. wires, each 100 meters long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker. 47/
j. It is estimated that the increase of 9,000 loudspeakers in Hungary in 1955 was repeated in 1956. Based on Soviet analogy (see Table 2, footnote c), 2 No. 22 A.W.G. wires, each 100 meters long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker. 48/
k. It is estimated that 240,000 wire-diffusion loudspeakers were installed in Poland in 1956. This is 20 percent of the planned increase for 1956-60. Based on Soviet analogy (see Table 2, footnote c), 2 No. 22 A.W.G. wires, each 100 meters long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker. 49/
l. It is estimated that 120,000 wire-diffusion loudspeakers were installed in Rumania in 1956. This estimate was extrapolated from the estimated number of loudspeakers in use in mid-1954 and 1955. Based on Soviet analogy (see Table 2, footnote c), 2 No. 22 A.W.G. wires, each 100 meters long and each containing 6.39 lbs of copper per kilometer of wire, were used per loudspeaker. 50/
m. It is estimated that each of the 1,000 loudspeakers installed in Albania in 1956 contained one-half ounce of copper. 51/
n. It is estimated that each of the 74,000 loudspeakers installed in Bulgaria in 1956 contained one-half ounce of copper. 52/
o. It is estimated that each of the 30,000 loudspeakers installed in Czechoslovakia in 1956 contained one-half ounce of copper. 53/
p. It is estimated that each of the 9,000 loudspeakers installed in Hungary in 1956 contained one-half ounce of copper. 54/
q. It is estimated that each of the 240,000 loudspeakers installed in Poland in 1956 contained one-half ounce of copper. 55/
r. It is estimated that each of the 120,000 loudspeakers installed in Rumania in 1956 contained one-half ounce of copper. 56/
s. It is estimated that 1 radiobroadcast transmitter station was installed in Albania in 1956 and that it used 500 lbs of copper. 57/
t. It is estimated that 1 radiobroadcast transmitter station was installed in Hungary in 1956 and that it used 500 lbs of copper. 58/
u. It is estimated that 1 radiobroadcast transmitter station was installed in Poland in 1956 and that it used 500 lbs of copper. 59/
v. It is estimated that 1,000 radiobroadcast receivers were installed in Albania in 1956 and that each contained 1 lb of copper. 60/
w. It is estimated that 20,000 radiobroadcast receivers were installed in Bulgaria in 1956 and that each contained 1 lb of copper. 61/
x. It is estimated that 100,000 radiobroadcast receivers were installed in Czechoslovakia in 1956 and that each contained 1 lb of copper. 62/
y. The estimated average annual increment of radiobroadcast receivers in East Germany for 1951-55 was 280,000. It is estimated that this annual increment did not change in 1956 and that each receiver contained 1 lb of copper. 63/
z. The Hungarian Second Five Year Plan (1956-60) calls for an average annual production of more than 400,000 radiobroadcast receivers. The number of radio subscribers increased 66,000 during the first quarter of 1956. It is estimated that 190,000 radiobroadcast receivers were added in Hungary in 1956 and that each contained 1 lb of copper. 64/
aa. The estimated increase of 246,000 radiobroadcast receivers in Poland in 1956 was extrapolated, using the growth rates for 1953-54 and 1955. It is estimated that each receiver contained 1 lb of copper. 65/
bb. The estimated increase of 90,000 radiobroadcast receivers in Rumania in 1956 was extrapolated from the estimated number of receivers in use in mid-1954 and 1955. It is estimated that each of these receivers contained 1 lb of copper. 66/
cc. It is estimated that 1 television transmitting station was installed in Bulgaria in 1956 and that it used 1,000 lbs of copper. 67/
dd. It is estimated that 2 television transmitting stations were installed in Czechoslovakia in 1956 and that each used 1,000 lbs of copper. 68/
ee. It is estimated that 2 television transmitting stations were installed in East Germany in 1956 and that each used 1,000 lbs of copper. 69/

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ff. It is estimated that 1 television transmitting station was installed in Hungary in 1956 and that it used 1,000 lbs of copper. 70/
gg. It is estimated that 2 television transmitting stations were installed in Poland in 1956 and that each used 1,000 lbs of copper. 71/
hh. It is estimated that 1 television transmitting station was installed in Rumania in 1956 and that it used 1,000 lbs of copper. 72/
ii. It is estimated that 300 television receivers were installed in Bulgaria in 1956 and that each contained 5 lbs of copper. 73/
jj. It is estimated that 38,300 television receivers were installed in Czechoslovakia in 1956 and that each contained 5 lbs of copper. 74/
kk. It is estimated that 55,000 television receivers were installed in East Germany in 1956 and that each contained 5 lbs of copper. 75/
ll. It is estimated that 600 television receivers were installed in Hungary in 1956 and that each contained 5 lbs of copper. 76/
mm. It is estimated that 3,000 television receivers were installed in Poland in 1956 and that each contained 5 lbs of copper. 77/
nn. It is estimated that 100 television receivers were installed in Rumania in 1956 and that each contained 5 lbs of copper. 78/
oo. Although [redacted] the use of microwave radio relay facilities in the Satellites, evidences of the installation of such facilities in 1956 were found only in Poland. 50X1
pp. It is estimated that the microwave radio relay link installed in Poland in 1956 between Warsaw and Lodz consisted of 2 terminal stations and at least 1 relay station and required a total of 7 transmitter-receiver units, with each unit using 500 lbs of copper. 79/
qq. Although [redacted] the use of coaxial cable facilities in Czechoslovakia and East Germany, there were no indications of such cable installations in any of the Satellites during 1956. 50X1
rr. The Satellite countries in their Five Year Plans [redacted] refer only in general terms to trunkline cable expansions and to the increases in telephone subscriber facilities to be made to meet the inadequacies in telephone and telegraph services. Specific increases of such facilities were not given for 1956. The estimated use of copper for these items is included under wirelines. 50X1
ss. The six principal cities in Albania range in population from 15,000 to 80,000. 80/ Based on Soviet analogy (see Table 2, footnote 1, p. 5, above), it is assumed that telecommunications underground trunklines were constructed to bypass at least 1 of these cities in 1956, using a radius of 25 miles and 100-pair, No. 19 A.W.G. cable weighing 3.9 lbs per 1,000 conductor feet. 81/
tt. Five of the principal cities of Bulgaria have a population of 50,000 or more. 82/ Based on Soviet analogy (see Table 2, footnote 1), it is assumed that telecommunications underground trunklines were constructed to bypass at least 1 of these cities in 1956, using a radius of 25 miles and 150-pair, No. 19 A.W.G. cable weighing 3.9 lbs per 1,000 conductor feet. 83/
uu. [redacted] in 1952, bypass long-distance telecommunications lines were being constructed around towns which might be target areas. 84/ Ten of the principal cities of Czechoslovakia have a population of 50,000 or more. 85/ It is assumed that telecommunications underground trunk lines were constructed to bypass at least 2 of these cities in 1956, using a radius of 25 miles and 150-pair, No. 19 A.W.G. copper cable weighing 3.9 lbs per 1,000 conductor feet. 50X1
vv. It is planned that in East Germany telecommunications cables will be routed around, rather than through, cities in the future. The "ring around Berlin" includes underground telecommunications cable routes around the city. Telecommunications centers built underground away from cities are becoming increasingly important. 86/ Seventeen of the principal cities in East Germany have 50,000 or more population. 87/ It is assumed that telecommunications underground trunklines were constructed to bypass at least 3 of these cities in 1956, using a radius of 25 miles and 150-pair, No. 19 A.W.G. copper cable weighing 3.9 lbs per 1,000 conductor feet.
ww. In connection with civil defense in Hungary, plans were drafted for the reconstruction of piping systems in every city. Piping or conduits of the radial type were to be converted to circular or belt networks. Reserve cables were to be laid and connected to two separate sources of electricity. An underground telecommunications center away from Budapest was being built. 88/ Eight of the principal cities in Hungary have 50,000 or more population. 89/ Based on Soviet analogy (see Table 2, footnote 1), it is assumed that telecommunications underground trunklines were constructed to bypass at least 2 of these cities in 1956,

Table 4

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using a radius of 25 miles and 150-pair, No. 19 A.W.G. cable weighing 3.9 lbs per 1,000 conductor feet.

xx. There are indications in Poland that strategic road construction is to bypass major settlements, with the result that telegraph lines must be relocated. 90/ Thirty-seven of the principal cities in Poland have 50,000 or more population. 91/ Based on Soviet analogy (see Table 2, footnote 1), it is assumed that telecommunications underground trunklines were constructed to bypass at least 7 of these cities in 1956, using a radius of 25 miles and 150-pair, No. 19 A.W.G. cable weighing 3.9 lbs per 1,000 conductor feet. 92/

yy. Sixteen of the principal cities of Rumania have 50,000 or more population. 93/ Based on Soviet analogy (see Table 2, footnote 1), it is assumed that telecommunications underground trunklines were constructed to bypass at least 3 of these cities in 1956, using a radius of 25 miles and 150-pair, No. 19 A.W.G. copper cable weighing 3.9 lbs per 1,000 conductor feet. 94/

zz. To determine the quantity of copper used in Albania for telephone and telegraph wirelines in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 6, p. 21, below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 300 subscribers added in 1956 (see Table 6, Column A) amounted to 2,000 lbs, or 0.88 ton, of copper.

It is assumed that the 300 km of urban telephone wire added in 1956 (see Table 6, Column B) were No. 22 A.W.G. wire weighing 2.89 kg per kilometer. This amounted to approximately 0.87 ton, or 1,900 lbs, of copper.

It is assumed that 50 percent of the 350 km of interurban and international telephone and telegraph wire added in 1956 (see Table 6, Column C) was 4-mm solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight) weighing 50.6 kg per kilometer. This amounted to approximately 29 tons, or 64,000 lbs, of copper. The estimated total amount of copper used in 1956 for wirelines in Albania was 68,000 lbs, or 31 tons.

aaa. To determine the quantity of copper used in Bulgaria for telephone and telegraph wirelines in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 7, p. 22, below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 9,000 subscribers added in 1956 (see Table 7, Column A) amounted to 58,500 lbs, or 26.5 tons, of copper.

It is assumed that the 18,000 km of urban telephone wire added in 1956 (see Table 7, Column E) were No. 22 A.W.G. wire weighing 2.89 kg per kilometer. This amounted to approximately 52 tons, or 114,000 lbs, of copper.

It is assumed that 50 percent of the 31,000 km of interurban and international telephone and telegraph wire added in 1956 (see Table 7, Column G) was 4-mm solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight) weighing 50.6 kg per kilometer. This amounts to approximately 2,600 tons, or 5.7 million lbs, of copper. The estimated total amount of copper used in 1956 for wirelines in Bulgaria was 5.9 million lbs, or 2,700 tons.

bbb. To determine the quantity of copper used in Czechoslovakia for telephone and telegraph wireline purposes in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 8, p. 23, below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 55,000 subscribers added in 1956 (see Table 8, Column A) amounted to 357,000 lbs, or 162 tons, of copper.

It is assumed that the 125,000 km of urban telephone wire added in 1956 (see Table 8, Column E) were No. 22 A.W.G. wire weighing 2.89 kg per kilometer. This amounted to approximately 362 tons, or 797,000 pounds, of copper.

Table 4

Estimated Consumption of Copper for Telecommunications Purposes
in the European Satellites
1956
(Continued)

It is assumed that 50 percent of the 66,000 km of interurban and international telephone and telegraph wire added in 1956 (see Table 8, Column G) was 4-mm solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight) weighing 50.6 kg per kilometer. This amounted to approximately 5,500 tons, or 12.2 million lbs, of copper. The estimated total amount of copper used in 1956 for wirelines in Czechoslovakia was 13 million lbs, or 6,000 tons.

ccc. To determine the quantity of copper used in East Germany for telephone and telegraph wireline purposes in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 9, p. 24, below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 24,000 subscribers added in 1956 (see Table 9, Column A) amounted to 156,000 lbs, or 70.7 tons, of copper.

It is assumed that the 107,000 km of urban telephone wire added in 1956 (see Table 9, Column B) were No. 22 A.W.G. wire weighing 2.89 kg per kilometer. This amounted to approximately 309 tons, or 681,000 lbs, of copper.

It is assumed that 50 percent of the 29,000 km of interurban and international telephone and telegraph wire added in 1956 (see Table 9, Column C) was 4-mm solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight) weighing 50.6 kg per kilometer. This amounted to approximately 2,400 tons, or 5,290,000 lbs, of copper. The estimated total amount of copper used in 1956 for wirelines in East Germany was 6,130,000 lbs, or 2,780 tons.

ddd. To determine the quantity of copper used in Hungary for telephone and telegraph wireline purposes in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 10, p. 25, below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 15,000 subscribers added in 1956 (see Table 10, Column A) amounted to 98,000 lbs, or 44 tons, of copper.

It is assumed that the 67,000 km of urban telephone wire added in 1956 (see Table 10, Column D) were No. 22 A.W.G. wire weighing 2.89 kg per kilometer. This amounted to approximately 194 tons, or 430,000 lbs, of copper.

It is assumed that 50 percent of the 40,000 km of interurban and international telephone and telegraph wire added in 1956 (see Table 10, Column F) was 4-mm solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight) weighing 50.6 kg per kilometer. This amounted to approximately 3,300 tons, or 7.3 million lbs, of copper. The estimated total amount of copper used in 1956 for wirelines in Hungary was 7.8 million lbs, or 3,500 tons.

eee. To determine the quantity of copper used in Poland for telephone and telegraph wireline purposes in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 11, p. 26, below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 31,000 subscribers added in 1956 (see Table 11, Column A) amounted to 202,000 lbs, or 91 tons, of copper.

It is assumed that the 162,000 km of urban telephone wire added in 1956 (see Table 11, Column B) were No. 22 A.W.G. wire weighing 2.89 kg per kilometer. This amounted to approximately 468 tons, or 1.03 million lbs, of copper.

It is assumed that the 100,000 km of wire in cables for regional and long-distance purposes installed in 1956 (see Table 11, Column C) were No. 19 A.W.G wire weighing 5.8 kg per kilometer. This amounted to approximately 580 tons, or 1.28 million lbs.

It is assumed that 50 percent of the 974 km of interurban and international telephone and telegraph wire added in 1956 (see Table 11, Column D) was 4-mm solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight) weighing 50.6 kg per kilometer. This amounted

Table 4

Estimated Consumption of Copper for Telecommunications Purposes
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(Continued)

to approximately 80 tons, or 178,000 lbs, of copper. The estimated total amount of copper used in 1956 for wirelines in Poland was 2.7 million lbs, or 1,200 tons.

fff. To determine the quantity of copper used in Rumania for telephone and telegraph wirelines in 1956, it is necessary to determine the annual growth of telephone subscribers, the growth in kilometers of urban telephone wire, and the growth in kilometers of interurban and international telephone and telegraph wire for 1956 (see Appendix A, Table 12, p. 27, below).

Based on the experience of a US electronics company in 1952, an average of 6.5 lbs of copper was used per subscriber line on inside wiring and equipment in telephone exchanges. This applied to the 2,000 subscribers added in 1956 (see Table 12, Column A) amounted to 13,000 lbs, or 5.9 tons, of copper.

It is assumed that the 5,000 km of urban telephone wire added in 1956 (see Table 12, Column D) were No. 22 A.W.G. wire weighing 2.89 kg per kilometer. This amounted to approximately 14 tons, or 32,000 lbs, of copper.

It is assumed that 50 percent of the 11,000 km of interurban and international telephone and telegraph wire added in 1956 (see Table 12, Column F) was 4-mm solid copper wire weighing 115 kg per kilometer and 50 percent was copperclad wire (44 percent copper by weight) weighing 50.6 kg per kilometer. This amounted to approximately 910 tons, or 2 million lbs, of copper. The estimated total amount of copper used in 1956 for wirelines in Rumania was 2.1 million lbs, or 930 tons.

APPENDIX A

METHODOLOGY

The following tables give the methodology used in determining the estimated growth in telephone subscribers and in kilometers of wire added for urban telephone service and interurban and international telephone and telegraph service in the USSR and the European Satellites in 1956.

Table 5

Estimated Telephone Subscribers and Kilometers of Telephone and Telegraph Wire in the USSR a/
1950-56

Thousand Units

	(A)	(B)	(C)	(D)	(E)	(F)
	Telephone			Wire (Kilometers)		
				Telephone b/		
Year	Subscribers c/	Wire b/ d/ (Kilometers)	Telegraph d/	Urban	Interurban and International	Total Telephone and Telegraph d/
1950	1,400	2,300 e/	1,000 e/	2,000 f/	310 f/	3,300 g/
1951	1,500	2,500	1,200 h/	2,200 h/	380 h/	3,700
1952	1,600	2,700	1,400 h/	2,300 h/	440 h/	4,100
1953	1,700	2,900	1,600 h/	2,400 h/	500 h/	4,500
1954	1,800	3,100	1,800 h/	2,600 h/	570 h/	5,000
1955	1,900	3,300	2,000 h/	2,700 h/	630 h/	5,400
1956	2,000 i/	3,500	2,200 i/	2,900 i/	690 i/	5,800

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. The sum of the urban telephone wire and interurban and international telephone wire, Columns D and E, equals the telephone wire, Column B.
c. 95/
d. The sum of the telegraph and telephone wire, Columns C and B, equals the telephone and telegraph wire, Column F.
e. Based on data for 1922-27, 96/ an average ratio of total telephone wire (69.8 percent) to total telegraph wire (30.2 percent) was used.
f. Based on data for 1922-27, 97/ an average ratio of urban telephone wire (86.5 percent) to interurban and international telephone wire (13.5 percent) was used.
g. This figure was derived from the following data: (1) there were 3.0 million km (1.86 million miles) of telephone and telegraph wire in the USSR in 1939; (2) the Germans destroyed 1.2 million km (744,000 miles) 98/ of wire during World War II; (d) during 1943-45, 700,000 km were replaced or added; (4) during 1946-50, 780,000 km (7,800 km, 50-pair cable) of wire and 50,000 km of nonferrous wire were installed. 99/
h. The Fifth Five Year Plan more than doubles the length of interurban and international telephone and telegraph wire in 1950 and increases the urban telephone exchange lines 30 to 35 percent. 100/
i. The annual growth in telephone subscribers and expansion of telegraph wire, urban wire, and interurban and international wire for 1951-55 was assumed to continue for 1956.

Table 6

Estimated Annual Increase in Telephone Subscribers and in Kilometers of Telephone and Telegraph Wire in Albania
1954-56

	(A)	(B)	(C)
		Wire (Kilometers)	
Year	Telephone Subscribers	Urban Telephone a/	Telephone and Telegraph Interurban and International
1954	300 b/	300	350 c/
1955	300 d/	300	350 c/
1956	300 d/	300	350 e/

a. Based on a ratio of 1 km of wire per telephone subscriber for 1928-29. 101/ This ratio was applied to the annual increase in subscribers shown in Column A.
b. 102/
c. The Five Year Plan (1951-55) called for the construction of 1,200 km of telephone and telegraph line. 103/ It is assumed that 240 km of this line were added each year of the Plan. The calculation is based on a ratio of 1.45 km of wire per kilometer of line for 1921-31 104/ and increased the 240 km of line to 350 km of wire.
d. Extrapolated, based on the annual growth for 1953-54 of 300 subscribers.
e. Extrapolated, based on the calculated average annual growth rate of wire for 1951-55.

Table 7

Estimated Telephone Subscribers and Kilometers of Telephone and Telegraph Wire in Bulgaria a/
1949-56

	(A)	(B)	(C)	(D)	(E)	(F)	(G)
					Wire (Kilometers)		
	Telephone		Telegraph		Telephone b/		
Year	Subscribers	Wire b/ (Kilometers)	Offices c/	Wire d/ (Kilometers)	Urban	Interurban and International	Telephone and Telegraph Interurban and International e/
1949	68,000 f/	344,000	1,314	50,000	136,000	208,000	258,000
1950	76,000 g/	385,000	1,401	53,000	152,000	233,000	286,000
1951	85,000 g/	430,000	1,488	57,000	169,000	261,000	318,000
1952	94,000 f/	476,000	1,575	60,000	188,000	288,000	348,000
1953	102,000 h/	516,000	1,662	63,000	203,000	313,000	376,000
1954	112,000 h/	567,000	1,749	67,000	223,000	344,000	411,000
1955	120,000 h/	607,000	1,836	70,000	239,000	368,000	438,000
1956	129,000 h/	653,000	1,923	73,000	257,000	396,000	469,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. Based on a ratio of 5.06 km of wire per telephone subscriber for 1921-41 105/ -- 39.4 percent was for urban use and 60.6 percent for interurban and international use. These percentages were applied to Column B. The sum of Columns E and F equals Column B.
c. Extrapolated, using the average annual growth of 87 telegraph offices for 1945-47. 106/
d. Based on a ratio of 38.1 km of wire per telegraph office for 1921-31. 107/
e. The sum of Columns D and F equals Column G.
f. 108/
g. Interpolated, using the average growth for 1949-52.
h. Extrapolated on the basis of the 1949-52 average annual rate of growth.

Table 8

Estimated Telephone Subscribers and Kilometers of Telephone and Telegraph Wire in Czechoslovakia a/
1948-56

	(A)	(B)	(C)	(D)	(E)	(F)	(G)
	Telephone		Telegraph		Wire (Kilometers)		
					Telephone b/		Telephone and Telegraph
Year	Subscribers	Wire b/ (Kilometers)	Offices c/	Wire d/ (Kilometers)	Urban	Interurban and International	Interurban and International e/
1948	384,000 f/	1,320,000	5,808	147,000	870,000	450,000	597,000
1949	418,000 g/	1,440,000	5,895	150,000	950,000	490,000	640,000
1950	452,000 g/	1,560,000	5,982	152,000	1,030,000	530,000	682,000
1951	486,000 g/	1,680,000	6,069	154,000	1,110,000	570,000	724,000
1952	520,000 g/	1,790,000	6,156	156,000	1,180,000	610,000	766,000
1953	554,000 h/	1,910,000	6,243	158,000	1,260,000	650,000	808,000
1954	607,000 i/	2,090,000	6,330	161,000	1,380,000	710,000	871,000
1955	662,000 f/	2,280,000	6,417	163,000	1,500,000	780,000	940,000
1956	717,000 j/	2,470,000	6,504	165,000	1,630,000	840,000	1,006,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. Based on a ratio of 3.45 km of wire per telephone subscriber for 1921-29 109/ -- 66 percent was for urban use and 34 percent for interurban and international use. These percentages were applied to Column B. The sum of Columns E and F equals Column B.
c. Based on a ratio of 25.4 km of wire per telegraph office for 1921-29 and 1932-37. 110/
d. Extrapolated, using the average annual growth of 87 telegraph offices for 1921-46. 111/
e. The sum of Columns D and F equals Column G.
f. 112/
g. Interpolated, using the average annual growth for 1948-53.
h. 113/
i. 114/
j. Assumed to be the same annual growth as in 1955.

Table 9

Estimated Telephone Subscribers and Kilometers of Telephone and Telegraph Wire in East Germany a/
1950-56

	(A)	(B)	(C)	(D)
		Wire (Kilometers) b/		
Year	Telephone Subscribers	Urban Telephone	Telephone and Telegraph Interurban and International	Total Telephone and Telegraph
1950	360,000 c/	1,611,000	428,000	2,040,000
1951	394,000 d/	1,763,000	469,000	2,230,000
1952	429,000 d/	1,920,000	510,000	2,430,000
1953	464,000 e/	2,076,000	552,000	2,630,000
1954	473,000 d/	2,116,000	563,000	2,680,000
1955	482,000 f/	2,157,000	573,000	2,730,000
1956	506,000 f/	2,264,000	602,000	2,870,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. Based on a ratio of 5.66 km of urban, interurban, and international telephone and telegraph wire per telephone subscriber for 1921-29 115/ -- 79 percent of the total telephone and telegraph wirelines were for urban use and 21 percent for interurban and international telephone and telegraph use. These percentages are applied to Column D. The sum of Columns B and C equals Column D.
c. 116/
d. Interpolated.
e. 117/
f. 118/

Table 10

Estimated Telephone Subscribers and Kilometers of Telephone and Telegraph Wire in Hungary a/
1954-56

	(A)	(B)	(C)	(D)	(E)	(F)
	Telephone			Wire (Kilometers)		
				Telephone b/		Telephone and Telegraph
Year	Subscribers	Wire b/ (Kilometers)	Telegraph c/	Urban	Interurban and International	Interurban and International d/
1954	217,000 e/	1,330,000	263,000	984,000	346,000	609,000
1955	230,000 f/	1,410,000	279,000	1,043,000	367,000	646,000
1956	245,000 g/	1,500,000	296,000	1,110,000	390,000	686,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. Based on a ratio of 6.13 km of wire per telephone subscriber for 1922-29 119/ -- 74 percent of the telephone wire was for urban use and 26 percent for interurban and international use. These percentages were applied to Column B. The sum of Columns D and E equals Column B.
c. Based on a ratio of telegraph wire to interurban and international telephone wire for 1921-29. 120/ This ratio of about 75 percent was applied to Column E.
d. The sum of Columns E and C equals Column F.
e. Calculations based on a figure of 143,000 subscribers in 1937 121/ and the increase in number of telephone lines of 151.6 percent in 1954 above the level of 1937. 122/
f. 123/
g. 124/

Table 11

Estimated Increase in Telephone Subscribers and in Kilometers of Telephone and Telegraph Wire in Poland a/
1956

(A)	(B)	(C)	(D)
		Wire (Kilometers) b/	
		Telephone and Telegraph Interurban and International	
Year	Subscribers	Telephone Urban	Cable	Wire
1956	31,000 c/	162,000 d/	100,000 e/	974 f/

a. Above the level of the previous year.
b. 125/
c. 126/
d. The Five Year Plan (1956-60) calls for the construction of 404,100 km of paired wire for urban networks. It is assumed that 162,000 km were installed in 1956.
e. The Five Year Plan calls for the construction of 5,004 km of cable for regional and long-distance purposes. It is reasonable to assume that at least 50-pair cable was used and that 100,000 km were installed in 1956.
f. The Five Year Plan calls for the construction of 4,870 km of copper wire. It is assumed that 974 km were installed in 1956.

Table 12

Estimated Telephone Subscribers and Kilometers of Telephone and Telegraph Wire in Rumania a/
1951-56

	(A)	(B)	(C)	(D)	(E)	(F)
	Telephone			Wire (Kilometers)		
				Telephone b/		Telephone and Telegraph
Year	Subscribers	Wire b/ (Kilometers)	Telegraph c/	Urban	Interurban and International	Interurban and International d/
1951	137,000 e/	803,000	255,000	342,000	460,000	715,000
1952	140,000 e/	820,000	261,000	350,000	471,000	732,000
1953	141,000 e/	826,000	263,000	352,000	474,000	737,000
1954	145,000 e/	849,000	270,000	362,000	487,000	757,000
1955	148,000 f/	867,000	277,000	370,000	497,000	773,000
1956	150,000 f/	879,000	281,000	375,000	504,000	784,000

a. The computations represented in this table have been made on the basis of unrounded data, and the rounded totals here shown will not always agree with the sum of the rounded components.
b. Based on a ratio of 5.86 km of wire per telephone subscriber for 1921-29 127/ -- about 43 percent of the telephone wire was for urban use and about 57 percent for interurban and international use. These percentages were applied to Column B. The sum of Columns D and E equals Column B.
c. Based on a ratio of telegraph wire to urban telephone wire for 1921-25. 128/ This ratio of 3 km of telegraph wire to 4 km of urban telephone wire was applied to Column D.
d. The sum of Columns C and E equals Column F.
e. 129/
f. Extrapolated, using the average annual growth for 1951-54.

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