No 76

PROVISIONAL INTELLIGENCE REPORT

THE ELECTRIC WIRE AND CABLE INDUSTRY OF THE SINO-SOVIET BLOC

CIA/RR PR-154
28 February 1957

CENTRAL INTELLIGENCE AGENCY

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Approved For Release 1999/09/26 : CIA-RDP79-01093A001200030007-6

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Supplementary Source References for
CIA/RR PR-154

Classification SECRET

28 Feb 57

Number of copies

	Recipient	Date	Returned
1	AD/RR	19 Mar 57	12 apr 57
2, 3	St/C file copies	21 Mar 57	
17, 25-27	Extras filed in St/C	22 Mar 57	
1, 3, 17, 24-27	Records Center	19 July 58	

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PROVISIONAL INTELLIGENCE REPORT

THE ELECTRIC WIRE AND CABLE INDUSTRY OF THE SINO-SOVIET BLOC

CIA/RR PR-154

(ORR Project 36.903)

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FOREWORD

This report summarizes and brings up to date the available intelligence on the electric wire and cable industry of the Sino-Soviet Bloc. The major products of this industry are power cable and communications cable.

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(ORR Project 36.903)

THE ELECTRIC WIRE AND CABLE INDUSTRY OF THE SINO-SOVIET BLOC*

Summary

The annual value of production of electric wire and cable** in the Sino-Soviet Bloc*** regained the prewar level by 1948, tripled between 1946 and 1951, and doubled between 1951 and 1956. The estimated value of production in 1955 was US $1.2 billion.**** Of this total, power cable accounted for 62 percent and communications cable, for 38 percent. In 1955, wire and cable represented about 20 percent of the total value of production of all electrotechnical products by the Bloc. The annual value of production of wire and cable by the Bloc is expected to increase to more than US $1.3 billion in 1956 and to almost US $2.2 billion in 1961, an increase of more than 83 percent above the value of production in 1955.

From 1946 through 1955 the USSR has consistently provided about two-thirds of the total value of production of wire and cable by the Sino-Soviet Bloc. In 1955, East Germany and Czechoslovakia were the second and third most important producers, accounting for 9 and 7 percent, respectively.

Although the members of the Sino-Soviet Bloc generally are able to meet their requirements for wire and cable, specific temporary limitations on production do result from faulty planning or from shortages of raw materials, particularly copper. Because of continuing expansion of the wire and cable industry of the Bloc, neither the substitution of aluminum for copper nor the expansion of production of copper by the Bloc is likely to offset the increasing demand for copper by the wire and cable industry. In 1955 the consumption

* The estimates and conclusions contained in this report represent the best judgment of ORR as of 15 December 1956.

** In this report the term wire and cable refers to electric wire and cable unless otherwise specified.

*** As used in this report, the term Sino-Soviet Bloc includes the USSR, Bulgaria, Czechoslovakia, Communist China, East Germany, Hungary, Poland, and Rumania. Albania is not included, because electric wire and cable are not produced there.

**** Values are given in 1955 US dollars throughout this report.

of copper by this industry amounted to an estimated 325,000 metric tons.* Of this total, domestic production is estimated to have contributed 251,000 tons, 43 percent of the total production of copper by the Bloc; and imports, 74,000 tons. About 40 percent of these imports were supplied by the UK, and West Germany and Japan each supplied about 19 percent.

Although inferior to that of the US, the technology of much of the wire and cable industry of the Sino-Soviet Bloc is nearly on a par with that of the countries of Western Europe, and the capability for research and development is equal to that of these countries. In some areas of development, such as the substitution of plentiful for scarce materials, the Bloc has worked more intensively than the Free World and may have made greater progress. Although the average manufacturing facility of the Bloc is inferior to that of the US, some individual plants in the Bloc are probably as modern as any in the world. As a result, the industry in the Bloc has the equipment, personnel, and technology to produce any type of wire and cable required in the foreseeable future.

I. Introduction.

A. Definition of the Industry.

The electric wire and cable industry is defined as comprising those manufacturing facilities which draw, fabricate, and insulate metal into wire and cable end products designed to conduct electric current. Electric wire and cable may be either bare or insulated, differentiated from other cable products solely by its use as an electrical conductor and not necessarily by the type of metal used. Metals of high conductivity, such as copper and aluminum, are essential to the production of most wire and cable. Steel and combinations of steel and copper or aluminum also are used, however, to carry electric current when strength or economy are important considerations.

* Tonnages throughout this report are given in metric tons.

Production of wire and cable ranges from the processing of wire bars, ingots, and pigs* of metal of electrical quality to the final bare or insulated wire and cable end product. In this report, only facilities producing wire and cable end products are included in the industry. Thus, if a wire and cable plant receives copper rods** from a separate rolling mill, the facilities of the rolling mill are not included in the wire and cable industry. If the rods are produced at the plant producing the end product,*** however, the rod-making facilities are included.

The bare steel wire which is produced by ferrous metal rolling and drawing facilities and which is used as a conductor is not included in the estimates of production of wire and cable, but the bare steel wire which is produced or processed in electric cable plants is included.

The wire and cable industry in most countries consists of a few large plants which produce most of the products. Combined with these large plants are a few small facilities, which may be (1) part of a larger facility producing related items of which wire and cable are components; (2) part of a larger facility which produces an input to wire and cable, such as a ferrous or nonferrous rolling mill; or (3) an independent facility which specializes in production of only a few products, usually bare wire and magnet wire. The tendency in the Sino-Soviet Bloc is to concentrate production in fewer and larger plants than does the Free World. There is also a tendency, particularly in the European Satellites, to combine production of wire and cable with production of such unrelated items as refrigerators, vacuum cleaners, and other consumer goods.

B. Importance of the Industry.

The importance of the wire and cable industry to the Sino-Soviet Bloc was emphasized by Malenkov in his speech of 19 February 1956 to the delegates of the 20th Congress of the Communist Party of the Soviet Union (CPSU). 1/**** The solution of the main economic task of increasing industrial production, he said, depends primarily

* In bulk form, copper is in wire bars, aluminum in ingots, and lead in pigs.

** Wire bars rolled into thick wire, from 1/4 inch to 7/8 inch in diameter.

*** Such a plant would be the integrated type of plant which produces most of the wire and cable in most countries.

**** For serially numbered source references, see Appendix F.

upon sharply raising the productivity of labor by increasing the power of the machinery available to each worker. To increase the power of machinery, he added, electric power, generating facilities, and means of utilizing electric power must be increased. Such expansion is dependent upon an adequate supply of electrical conductors -- that is, wire and cable.

Wire and cable are equally valuable for other purposes. Military electronic equipment for early warning systems, communications nets, and all varieties of modern weapons, including guided missiles, depend on the reliability of the wire and cable used in their construction. Motor vehicles and aircraft require complicated electrical systems. In particular, the growing economies of the Sino-Soviet Bloc require a major expansion of telecommunications, which are primarily dependent upon wire and cable products.

In 1955, wire and cable represented an estimated 20 percent by value of the total production (in 1955 US prices) of electrotechnical products in the Sino-Soviet Bloc.* Because wire and cable represent large investments of money and of strategic materials in power and communications systems, the location of power plants, the choice between hydrogenerating and steam generating systems, and the choice between microwave or coaxial-trunk-lines communications systems may be determined largely on the basis of the relative economic cost of wire and cable.

C. Scope of This Report.

The emphasis of this report is focused on estimates of the total value and the composition of production of wire and cable in the Sino-Soviet Bloc and on estimates of trade, use patterns, and inputs. Production of each country was estimated independently, the sum of these estimates equaling the total for the Bloc.

Estimates of the value of production are given for 1938 and for the years 1946-55. Administrative organization, trade, use patterns, and inputs are given for 1955 only. Data on technology are intended primarily to indicate the state of technology as of 1955.

* The current estimate for output of electrotechnical products in the Sino-Soviet Bloc in 1955 is US $5.6 billion. 2/ (See Table 2, p. 17, below, for estimates of production of wire and cable in the Sino-Soviet Bloc.)

No attempt is made to treat exhaustively the patterns of input and consumption in specific detail. The inputs given are estimated physical quantities of the most essential materials and labor, and the use pattern is determined for broad consuming sectors.

D. Nature and Uses of the Product.

The metal used to carry the current in wire and cable is called the conductor. This conductor may be bare metal, insulated only by air, or it may be covered with special insulating material. Conductors are typically in the form of one strand or a few strands combined in a small diameter called a wire or of many strands twisted together in a large diameter called a cable. The term cable usually refers to large conductors or combinations of conductors inside a common cover.

The effectiveness of the cable depends directly upon both the electrical and mechanical characteristics of the materials used in construction. The design of the cable and the quality of manufacture are equally important. In general the cable must be made of pure conductor metal, usually copper or aluminum, and of materials with good insulating qualities. The cable must be designed and manufactured for the electrical load and for the mechanical stress required of it. Poor workmanship can nullify the asset of good materials and vice versa.

Electric current is carried in a cable either to deliver power or to carry signals of some type. Power cable can be divided roughly into three general categories: (1) cable to transmit power from the generating facility to the substation, (2) cable to transmit power from the substation to the individual consumer, and (3) cable to transmit power from the power net to consumption applications. Communications cable is roughly divided into cable which carries voice signals and cable which carries other signals, such as television or control signals.

E. Historical Development of the Industry.

1. USSR.

Production of wire and cable was begun in 1878 with the establishment of the Northern Cable Plant (Sevkabel') in Leningrad. The industry remained largely dependent upon Germany for machinery and technology until after World War II. Since the war the USSR has rapidly trained its own specialists and has become at least equal to East Germany in technological progress. Although some cable-making

equipment was lost in the war, much was evacuated to the east. After the war, with the help of machinery taken from the European Satellites, particularly East Germany, the industry in the USSR was able to produce more in 1946 than it did before the war. The industry has expanded rapidly since the war to become pre-eminent among the countries of the Sino-Soviet Bloc.

2. Bulgaria.

Production of wire and cable in Bulgaria was negligible until 1948. Since then the increase in production has been very rapid, although in 1955 Bulgaria provided only 0.5 percent of the total production of wire and cable in the Sino-Soviet Bloc.

3. China.

The wire and cable industry of China was established in the 1930's by the Japanese in Manchuria and by the Europeans in Shanghai. Before World War II the industry was fairly large, being comparable to that of prewar Hungary in the value of total production, although inferior technologically. Although most of the largest Chinese plant was removed to the USSR in 1945, production revived rapidly, even during the civil war. Since the assumption of control by the Communists, large increases have been planned for the industry, starting in 1953. It is estimated that by 1955 the wire and cable industry of Communist China produced more than that of Poland and ranked after that of Czechoslovakia in the value of production within the Sino-Soviet Bloc.

4. Czechoslovakia.

The wire and cable industry of Czechoslovakia dates from about 1894. Its technology has been essentially German, although some equipment is produced domestically. The prewar level of production was regained soon after World War II, and the industry now ranks next to that of East Germany within the Sino-Soviet Bloc. Much of the product is exported to the USSR.

5. East Germany.

The wire and cable industry of East Germany was established in the last quarter of the 19th century. Before World War II, German firms dominated the European industry, establishing plants in almost

every country in Eastern Europe. As a consequence of World War II the industry in East Germany was destroyed, both by war damage and by Soviet expropriation of equipment. Nevertheless, East Germany is the second largest producer of wire and cable in the Sino-Soviet Bloc. Although deprived of many scientists and technicians by the USSR, East Germany continues to lead all other countries of the Bloc except the USSR in technology. The industry has not been used to full capacity since about 1953, because of a lack of orders and shortages of raw materials. Since World War II, most of the production has gone to the USSR.

6. Hungary.

The wire and cable industry of Hungary was established between 1900 and 1920, largely by German firms, and was concentrated in Budapest. The industry was small but well developed technologically before World War II. The war resulted in extensive damage to one large plant, and the USSR removed some equipment, but the industry has expanded very rapidly since the war. Hungary is noted for its production and exports of cable-making machinery.

7. Poland.

Most of the wire and cable industry of Poland was established between 1920 and 1935, much of it by German firms. Poland was hard hit by World War II and by the removal of equipment to the USSR. Since the war the industry has suffered severe shortages of materials and equipment. The USSR has supplied raw material in exchange for finished products.

8. Rumania.

Before World War II the wire and cable industry of Rumania was very small, but since the war the many small plants of the industry have been amalgamated into larger, modern units of production, and the industry has expanded rapidly. Except for its largest facility, the industry is distributed among plants producing ferrous metal products and other electrotechnical products.

II. Administrative Organization.

In those countries of the Sino-Soviet Bloc which have large electrotechnical industries, cable plants are subordinated to an administrative agency concerned exclusively with wire and cable. Those

countries with smaller electrotechnical industries subordinate their cable plants directly to the ministerial administrative apparatus, sometimes including in a single ministry all electrotechnical activity and the administration of facilities for generating electric power.

In general, the administrative organs are responsible for the supply of inputs, for production, and for distribution of all wire and cable products. In some countries, distribution is handled by a separate organization. Some facilities for producing wire and cable are formally subordinated to ministries other than the electrotechnical because the main production of the plant in which these facilities are located is not devoted to wire and cable.* At the same time, however, these facilities may be subordinated to the organization handling wire and cable for the coordination of production and for technical support.

The administrative organizations responsible for wire and cable in the individual countries of the Sino-Soviet Bloc are shown in Table 1.**

III. Technology.***

A. USSR. 3/

1. Equipment.

The USSR has large quantities of wire and cable machinery which was manufactured in Germany before World War II. This machinery is slow compared with modern US designs. Many new machines of domestic manufacture have been installed since 1950, however, and the industry is continuing to replace old machinery with new. Continuous vulcanizing equipment has been installed at several plants, and there are plans for installing additional units. Old braiding machines and enameling machines have been reconditioned in several plants, resulting in claimed increases in production up to 40 percent. The USSR is producing new rewinding machines for light hookup wire. It is claimed that these machines will increase production an additional 30 percent. Thus the USSR is rapidly modernizing its wire and cable plants, although most of its equipment probably was obtained before World War II.

* See Appendix A.
** Table 1 follows on p. 9.
*** For research facilities, see Appendix A.

Table 1

Administrative Organizations Responsible for Electric Wire and Cable in the Sino-Soviet Bloc
1955

Country	Ministry	Minister	Subministerial Organization	Director	Comments on Suborganization
USSR a/	Ministry of the Electrotechnical Industry	Skidanenko, Ivan Timofeyevich	Main Administration of the Cable Industry (Glavkabel')	Yeremenko	Responsible for production of electric wire and cable.
			Main Administration of the Sale of Electrical Output (Glavelektrosbyt)	N.A.	Responsible for the distribution of all electrotechnical products, including wire and cable.
Bulgaria b/	Ministry of Electrification	Georgiyev, Kimen	State Enterprise for Electrical Equipment Production (Elprom)	Stanev, D.	Responsible for production of all electrical equipment.
Communist China c/	First Ministry of Machine Building	Huang Ching	Electrical Equipment Industry Control Bureau	N.A.	Responsible for production and sales of all electrical equipment.
			Northeast Electrical Manufacturing Industry Control Bureau	N.A.	The Mukden Electric Wire Plant is Plant No. 7 of this Bureau; the Mukden plant is the only cable plant not in the main Control Bureau.
Czechoslovakia d/	Ministry of Engineering	Polacek, Karel	Main Administration of Electrical Engineering	N.A.	Responsible for production and sales of all electrical equipment.
East Germany e/	Ministry for Heavy Machine Construction	Apel, Erich	Main Administration of Cable (Main Administration No. 7 under Production Area II)	Holland	Responsible solely for electric wire and cable.
Hungary f/	Ministry of Metallurgy and the Machine Industry	Csergo, Janos	Administration of the Heavy Electrical Engineering Industry	N.A.	Responsible for all heavy electrical equipment.
Poland g/	Ministry of Machine Construction	Tokarski, Julian	Central Administration of the Electrotechnical Industry	N.A.	Responsible for all electrotechnical products
			Union of the Cable and Wire Industry	N.A.	Subordinate to the Central Administration and responsible solely for electric wire and cable.
Rumania h/	Ministry of Electric Energy and the Electrotechnical Industry	Cioara, Gheorghe	General Administration of Electrical Equipment	Chief of Plans Service: Ioan Chief of Production Service: Ozeranschi, Dumitru	Responsible for all electrotechnical products.

a. 4/ b. 5/ c. 6/ d. 7/ e. 8/ f. 9/ g. 10/ h. 11/

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2. Materials and Products.*

The wire and cable industry of the USSR produced 19 gauges of wire in 1951. At that time the director of one leading plant urged that the industry increase the number of standard gauges to between 33 and 35** because much wire was being wasted. When a consumer required a size between two of the manufactured sizes, he had to use the larger size. Probably considerable wire still is wasted in this manner, because there is no indication that the number of gauge sizes has been increased.

The main effort of the Soviet industry is directed toward substituting plentiful for scarce materials. The press constantly gives detailed accounts of material savings through substitution. The following substitutions have been noted:

(a) To some extent, aluminum for copper as a conductor in practically all types of power cable, but especially in overhead transmission cable, bus bars, and magnet wire;

(b) Aluminum for lead as cable sheathing;

(c) Polyvinyl chloride for lead as cable sheathing, particularly for telephone cables;

(d) Glass and plastics for cotton;

(e) Plastics for rubber.

Aluminum has long been used in the USSR to replace copper; as long ago as 1930, bare overhead conductors were made of aluminum in Moscow. Although considerably cheaper per pound than copper, aluminum has many drawbacks. Because aluminum cables must be much larger than copper cables of equivalent capacity, aluminum cables tend to be more cumbersome, and their use raises the cost of insulation and sheathing. The excessive volume of aluminum wire also makes it difficult

* Communist China, Czechoslovakia, East Germany, Hungary, Poland, and probably Bulgaria and Rumania have adopted Soviet industrial standards (strengths, sizes, test methods, lengths, and the like) in their wire and cable industries.

** US industry produces about 44 standard gauges of bare copper wire.

to use in rotor and stator windings (magnet wire) where space must be held to a minimum. In this field, new designs and new thinner insulating compounds are being developed to increase the practicability of using aluminum. In bare overhead lines where the insulation problem does not exist, aluminum is very effective, especially because an aluminum conductor weighs half as much as an equivalent copper conductor.

Other drawbacks of aluminum as a conductor include the difficulty of welding aluminum and of connecting aluminum to terminals of machines, instruments, and fixtures. These problems are being solved gradually, and it seems certain that aluminum will be used increasingly as an electrical conductor.

Among the new insulation materials being developed and soon to be put into mass production are epoxy-resins, organo-silicone rubbers and varnish resins, synthetic resins, and aluminum oxide. It has been found that the organo-silicone varnish, combined with fiberglass in insulating motor windings, results in fewer breakdowns of motors caused by overheating. The Soviet goal is to develop a synthetic insulation which will withstand temperatures up to 180 to 200 degrees centigrade, or even higher.

One outstanding development appears to be oil-filled cable which can withstand 220,000 volts in continued operation. This type of cable is probably in only limited or experimental production. Soviet technicians also plan to develop a 420,000-volt, oil-insulated cable by the end of 1957. All the oil-filled cables rely for insulation on oil forced into the cable casing under pressure up to 10 atmospheres. The design and production of these cables would show a high degree of technical competence in the Soviet wire and cable industry.

Another cable of recent development in the USSR is the 400,000-volt, aluminum-conductor, steel-reinforced (ACSR) cable to be used in the Kuybyshev-Moscow transmission line. Nine lines of 900 kilometers each must be manufactured for the project. Each line is 30.2 millimeters (mm) in diameter and weighs 1.8 tons per kilometer. This huge cable is difficult to manufacture. That the USSR could set up manufacturing facilities at several plants to make this cable demonstrates considerable technical competence in the design of machinery and of products as well as in production.

The testing of a sample of Soviet coaxial cable, however, indicated that the polyethylene dielectric (a nonconducting material) was of poor quality (perhaps reworked, that is, used a second time) and that the Soviet extrusion technique used to apply the dielectric was poor. The center conductor had dielectric voids (bare spots), and the dielectric itself showed excessive shrinkage during aging. The cable was operative, however, although less efficient than its US counterpart.

B. Communist China. 12/

1. Equipment.

Until the expansion of the Mukden Electric Wire Plant (1953-56) (see Appendix A), most equipment was of Japanese origin and was designed to make the simpler types of wire and cable, not large, complicated cables. The rate of production of the Japanese equipment is slow compared with modern US or Soviet designs.

The Soviet and East German equipment going into the Mukden plant will raise the quality of Chinese Communist wire and cable machinery at least to the level of that of East Germany. The consequence of this modernization of the Chinese wire and cable industry is that the Chinese Communists will be able to produce a more varied, complicated product in greater quantity than before. In addition, their mode of production will closely follow that of the USSR, facilitating interchanges of technology and personnel.

2. Materials and Products.

The Chinese Communist industry has been handicapped consistently by the poor quality of its electrolytic copper. Improper refining produces copper with impaired conductivity and mechanical properties. Fine wire, for instance, cannot be drawn of impure copper; it will break at the points of concentration of impurities. This problem is aggravated by the lack of good diamond dies for the drawing of fine wire. The low conductivity (high resistance) of Chinese copper results in the overheating of cables. Larger sizes of cable have to be used for a given load than would normally be used.

The Chinese Communists have succeeded in manufacturing 10,000-volt, insulated power cable in the Shanghai Electric Wire Plant. The Mukden plant can produce ACSR cable of up to 61 wires which can be used for 154,000-volt lines and higher. Research on underground cables is being carried on at the Mukden plant also.

Because many Soviet standards for wire and cable are already being followed, it is probable that the Chinese Communists will leave most of the work of research and development to the USSR. For the present the Chinese are doing little original work in developing new materials or products.

C. Czechoslovakia. 13/

1. Equipment.

Czechoslovak equipment is approximately the same in age and type as that of East Germany. Although Czechoslovakia does produce some cable-making equipment, probably most of the existing facilities are of German origin, with a smaller proportion being of Hungarian origin.

2. Materials and Products.

Czechoslovakia is following the universal trend in shifting from copper to aluminum conductors and from lead to aluminum sheathing. Some new insulating materials such as "silon," a synthetic fiber similar to nylon; "noval," a plastic; another plastic insulation made from corn-silk; and new glass fiber and varnish insulations were introduced in 1956. Many of the new materials and products are based on Soviet standards, although, considering the facilities available, it is probable that extensive research is being carried out domestically.

D. East Germany. 14/

1. Equipment.

Historically, Germany has been the leader in designing and producing cable-making machinery and now has excellent facilities for such production. Paradoxically, the East German wire and cable industry is poorly equipped compared with that of the USSR or the US. Most of its equipment was manufactured before World War II, and much of it dates back to 1910-30. In consequence, production from these machines is much less than production in the USSR. This situation prevails because the USSR removed much of the best equipment after World War II and took much of the new equipment produced by East Germany since World War II as reparations.

The old German equipment still turns out a product of good quality, although not in great quantity. Even the Soviet inspectors could find no fault with the wire and cable exported to them as reparations. Moreover, despite the shortage of modern equipment in their domestic industry, the East Germans have gone ahead in designing and producing new aluminum-sheathing machines, continuous vulcanizing equipment, and special machines for the manufacture of coaxial cable.

Once the East Germans direct their production of equipment to their own industry, it is certain the industry could soon increase in efficiency and in capacity if required. In view of the magnitude of the Soviet plan to modernize and expand the wire and cable industry in the USSR, however, East Germany will probably not receive the benefits of its production for 2 or 3 Five Year Plans to come.

2. Materials and Products.

East Germany has been developing its technology for new products and materials on a broad front. With excellent personnel, adequate facilities, and much support (and prodding) from the USSR, the East Germans have been capable of research and development in the most varied and difficult fields. A sampling of the research program in East Germany serves to illustrate its scope: (a) to develop maximum frequency cables,* (b) to eliminate lead sheathing by the substitution of aluminum and plastic, (c) to develop and improve all types of insulating plastics,** (d) to adapt domestic cellulose for production of insulating paper, (e) to improve further the continuous vulcanizing process, and (f) to develop the drawing of fine aluminum wires for use in measuring instruments.

Because all results are undoubtedly available to the USSR and to the Soviet Satellites as well, the research and development

* A new coaxial cable was recently designed that carries 1,920 simultaneous conversations and requires only one-tenth of the copper and lead used in manufacturing a similar cable of older design.

** In particular, the East Germans have developed a magnet wire enamel called "isoperlon" from the plastic "perlon," a compound of polyamide and resins. Because "isoperlon" has exceptional insulating qualities, it can be applied in very thin layers on aluminum magnet wire. This characteristic reduces the aggregate volume of the wire and allows aluminum windings to be used in motors and generators without unduly enlarging the volume for a given power rating.

program of East Germany may be considered indicative of the future standard of technology in the Sino-Soviet Bloc. The speed with which new technology is assimilated by the various countries of the Bloc will depend on the investment in the industry and on the availability of raw materials.

E. Other Countries. 15/

1. Equipment.

Most of the equipment for production of wire and cable machinery in Bulgaria, Poland, Hungary, and Rumania is 20 to 30 years old. Except in Hungary, which produces considerable cable-making equipment, most of the equipment in the European Satellites was supplied by Germany. Damage during World War II, age, and obsolete designs combine to keep the average piece of equipment at about the productive level of that in East Germany. Some individual plants, such as the Electrocablul Electric Equipment Plant in Rumania, however, are relatively modern, having been re-equipped after World War II by new East German, Hungarian, and Soviet machinery.

Some progress has been made in designing machines for aluminum sheathing, and the continuous process type of equipment is being installed on a very limited scale. The larger producers in the Sino-Soviet Bloc have consistently allocated the continuous process type of equipment to themselves, leaving little modern equipment for the smaller producers.

2. Materials and Products.

A major concern of Bulgaria, Hungary, Poland, and Rumania is to develop substitute materials for scarce imported materials. These countries are particularly anxious to substitute aluminum for copper as a conductor and aluminum for lead as sheathing. New products have to be designed to use the new materials efficiently. Other substitutions being implemented are plastic for rubber and for weather-proof and magnet wire insulations.

All four countries have adopted some Soviet cable standards and will probably continue to do so. The USSR also provides most of the new technological processes in products and materials, although the domestic research efforts within these four countries contribute in adapting products to local needs and in integrating new products into the programs for production.

IV. Production.*

A. Sino-Soviet Bloc.

The estimated value of production of wire and cable in the Sino-Soviet Bloc is shown in Table 2.** The level of production prevailing before World War II was regained by 1948. The annual value of production tripled between 1946 and 1951, doubled between 1951 and 1956, and is expected to increase approximately 65 percent between 1956 and 1961 to an annual value more than 83 percent above that of 1955. Before World War II the USSR accounted for about one-third of the total value of production of wire and cable in the areas now included in the Bloc. Since the war the USSR has consistently contributed about two-thirds of the total value of production by the Bloc. Indexes of the estimated value of production by the Bloc are shown in Table 3.***

Estimated production of wire and cable in the Sino-Soviet Bloc in 1955, by type of product, is shown in Table 4.**** Of the value of production of wire and cable by the Bloc, power cable accounted for 62 percent and communications cable for 38 percent. The major categories, insulated power cable and telephone and telegraph cable, accounted for 50 percent of the value of production.

Wire and cable which are known to use aluminum conductors are estimated to have accounted for 8 percent of the value of production in 1955. Some types of cable traditionally using copper conductors, such as insulated power cable, were treated as having copper conductors, although it is known that some aluminum conductors are used in these types.

B. Individual Countries.

1. USSR./

The two largest wire and cable plants in the USSR, the Moscow Cable Plant (Moskabel') and the Northern Cable Plant (Sevkabel'), produced 38 percent of total Soviet production of wire and cable in//

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* For detailed methodology, see Appendix D.
** Table 2 follows on p. 17.
*** Table 3 follows on p. 18.
**** Table 4 follows on p. 19.
/ For figures on production in the USSR, see Tables 11 and 12, Appendix B, pp. 47 and 48, respectively, below.
// Continued on p. 20.

Table 2

Estimated Value of Production of Electric Wire and Cable in the Sino-Soviet Bloc a/
1938 and 1946-61

Million 1955 US $

Country	1938	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	Percent of Production in 1955
USSR	109.3	130.9	177.8	239.0	310.9	363.1	442.8	540.2	655.4	712.9	783.8	862.2	948.4	1,043.2	1,147.5	1,262.3	1,388.5	66
Bulgaria	Negligible	Negligible	Negligible	0.4	0.8	1.0	1.7	2.2	5.1	5.6	6.1	6.8	7.4	8.2	9.0	9.9	10.9	Negligible
China b/	11.6	4.9	7.2	12.8	13.9	16.7	19.5	22.9	25.4	30.7	64.1	90.4	117.2	131.3	147.0	164.7	184.5	5
Czechoslovakia	29.3	13.2	18.1	23.6	29.3	37.2	45.3	54.4	65.3	75.3	86.6	97.0	108.8	122.4	136.9	153.3	171.9	7
East Germany	153.8 c/	43.5	44.0	52.6	57.9	71.6	79.2	92.3	101.5	92.3	101.5	110.6	120.8	132.0	144.1	157.3	166.5	9
Hungary	7.3	3.6	5.2	6.1	8.2	11.3	15.1	20.3	27.1	33.9	40.6	46.8	53.8	59.2	65.1	68.3	71.7	3
Poland	20.3	8.8	17.6	30.8	34.4	40.5	44.0	47.6	52.0	57.3	63.0	69.3	76.2	83.8	92.2	101.4	111.6	5
Rumania	2.8	1.8	3.2	5.8	9.2	14.7	16.9	23.6	26.2	29.0	32.4	36.0	40.0	44.3	49.2	54.6	60.6	3
Total	334.3	206.7	273.2	371.1	464.7	556.1	664.6	803.6	957.8	1,036.9	1,178.1	1,319.1	1,472.6	1,624.4	1,791.2	1,971.9	2,166.2	100
Percentage produced by the USSR	33	63	65	64	67	65	67	67	68	69	66	65	64	64	64	64	64	

a. Because of rounding, figures may not add to the totals shown.
b. Figures for pre-Communist China (1938-48) are for approximately the same area as are those for Communist China (1949-61).
c. The figure for estimated production in East Germany in 1938 is for the same area as are the figures for postwar East Germany.

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Table 3

Indexes of the Estimated Value of Production of Electric Wire and Cable in the Sino-Soviet Bloc
1938 and 1946-61

1951 = 100

Country	1938	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
USSR	25	30	40	54	70	82	100	122	148	161	177	195	215	237	261	287	316
Bulgaria				26	48	59	100	133	303	332	365	402	442	486	534	588	647
China a/	63	26	37	68	74	89	100	121	132	163	337	474	616	689	774	868	968
Czechoslovakia	68	29	40	52	68	82	100	120	144	166	191	214	240	270	302	338	379
East Germany	194 b/	55	56	66	73	90	100	117	130	117	130	142	155	169	184	201	213
Hungary	48	24	34	40	54	75	100	134	179	224	269	310	355	391	430	451	474
Poland	46	20	40	70	78	92	100	108	118	130	143	157	173	190	209	230	253
Rumania	16	11	19	34	55	87	100	140	155	172	192	213	237	263	291	324	359
Total	50	31	41	54 56	70	84	100	121	144	156	177	198	222	244	270	297	326

a. Figures for pre-Communist China (1938-48) are for approximately the same area as are those for Communist China (1949-61).

b. The figure for estimated production in East Germany in 1938 is for the same area as are the figures for postwar East Germany.

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Table 4

Estimated Production of Electric Wire and Cable in the Sino-Soviet Bloc, by Type a/
1955

Type of Wire and Cable	Value (Million 1955 US $)									Percentage Produced by the USSR	Volume b/		
	USSR	Bulgaria	Communist China	Czechoslovakia	East Germany	Hungary	Poland	Rumania	Total		Unit	Quantity	Product Mix
Power wire and cable													
Bare power cable													
Aluminum-conductor, steel-reinforced	57.1		3.4	5.5	2.7	3.1	7.0	3.6	82.4	69	mt c/	135,700	7
Copper	19.1		16.4	1.0		0.5			37.0	52	mt	30.700	3
Aluminum	1.1			2.0			0.4		3.5	32	mt	4,000	Negligible
Total	77.4		19.8	8.4	2.7	3.5	7.4	3.6	122.8	63			11
Insulated power cable	236.5	1.0	7.0	20.6	29.8	6.6	14.0	5.7	321.2	74	km d/	263,300	27
Weatherproof wire	31.5	0.3	3.7	2.1	5.1		2.6	1.3	46.6	68	km	249,100	4
Magnet wire	41.2	2.3	3.7	8.7	7.6	10.2	7.3	2.5	83.5	49	mt	52,400	7
Building and appliance wire	62.5	0.3	5.7	3.1	12.7	4.7	6.1	1.8	97.0	64	km	646,700	8
Automobile, aircraft, and tractor wire	44.1			1.3	1.6	0.5	4.2	3.6	55.3	80	km	502,700	5
Total	493.2	3.9	39.9	44.3	59.6	25.4	41.5	18.5	726.4	68			62
Communications wire and cable													
Control cable	26.0	0.3	4.0		6.1	0.9			37.3		km	8,300	3
Telephone and telegraph cable	172.4	1.0	7.0	29.7	22.8	11.2	20.0	6.7	270.8		km	87,700	23
Coaxial cable	19.3			6.3	10.6				36.2		km	142,900	3
Bare communications wire													
Ferrous								0.1	0.1		mt	400	Negligible
Nonferrous	11.0		10.2				1.0	1.8	24.1		mt	16,000	2
Total	11.0		10.2				1.0	1.9	24.2				2
Field wire	33.1		3.0	4.0	1.3	0.5		2.6	44.4		km	905,300	4
Hookup wire	28.5	0.9		2.4	1.3	1.0	0.4	2.6	37.0		km	352,700	3
Field cable, aluminum	0.3					1.6			1.9		km	3,700	Negligible
Total	290.6	2.2	24.2	42.4	41.9	15.1	21.4	13.9	451.7	64			38
Grand total	783.8	6.1	64.1	86.6	101.5	40.6	63.0	32.4	1,178.1	66			100

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Appendix D, Table 27, p. 68, below.
c. Metric tons.
d. Kilometers.

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1955. Other plants produced from less than 1 percent to 8 percent of the total. Except for the concentration in the two largest plants, production of wire and cable is widely dispersed in the USSR.

The pattern of Soviet production in 1955 was similar to that of the entire Sino-Soviet Bloc -- 63 percent in power cable and 37 percent in communications cable. About 52 percent of total production was represented by the two largest categories, insulated power cable and telephone and telegraph cable. About 8 percent was represented by wire and cable utilizing aluminum conductors. Only 3 percent of production was allocated to coaxial cable, more than one-half of which was produced at Moskabel'.

In 1955 the USSR accounted for about three-fourths of total production by the Sino-Soviet Bloc of automobile, aircraft, and tractor wire; field wire; insulated power cable; and control cable. The USSR also supplied more than one-half of the coaxial cable produced in the Bloc. Soviet production accounted for less than one-half of Bloc production in only two categories -- bare communications wire (45 percent) and aluminum field cable (17 percent).

2. European Satellites and Communist China.*

Communist China accounted for about 5 percent of the total value of production of wire and cable by the Sino-Soviet Bloc in 1955. Almost one-half of the Chinese Communist production was devoted to bare power cable and bare communications wire, and approximately one-fifth of total production was represented by insulated power cable and insulated telephone and telegraph cable. China produced no coaxial cable; hookup wire; aluminum field cable; or automobile, aircraft, and tractor wire.

The European Satellites accounted for the following proportions of the total value of production of wire and cable by the Sino-Soviet Bloc in 1955: Bulgaria, less than 1 percent; Czechoslovakia, 7 percent; East Germany, 9 percent; Hungary, 3 percent; Poland, 5 percent; and Rumania, 3 percent. No Satellite produces every category of wire and cable,** although only Bulgaria produces fewer than 9 of the 13 categories. All the Satellites produce the important categories, insulated power cable and insulated telephone

* For figures on production in the European Satellites and in Communist China, see Tables 13 through 26, Appendix B, pp. 49-62, below.
** Categories of wire and cable are defined in Appendix C.

and telegraph cable. Among the Satellites, only Czechoslovakia and East Germany produce coaxial cable, and East Germany and Hungary produce the most complete line of wire and cable products.

The leading non-Soviet producer in the Sino-Soviet Bloc of each category of wire and cable is as follows: bare power cable, ACSR -- Poland; bare power cable, copper -- Communist China; bare power cable, aluminum -- Czechoslovakia; insulated power cable -- East Germany; weatherproof wire -- East Germany; magnet wire -- Hungary; building and appliance wire -- East Germany; automobile, aircraft, and tractor wire -- Poland; control cable -- East Germany; telephone and telegraph cable -- Czechoslovakia; coaxial cable -- East Germany; bare communications wire -- China; field wire -- Czechoslovakia; hook-up wire -- Rumania; field cable, aluminum -- Hungary.

The category of wire and cable produced in greatest volume by each non-Soviet member of the Sino-Soviet Bloc is as follows: Bulgaria, insulated power cable and insulated telephone and telegraph cable (produced in equal volume); Communist China, bare power cable; Czechoslovakia, insulated telephone and telegraph cable; East Germany, insulated power cable; Hungary, insulated telephone and telegraph cable; Poland, insulated telephone and telegraph cable; Rumania, insulated telephone and telegraph cable.

V. Trade.

A. East-West Trade.

1. Imports from Non-Bloc Countries.

a. Bare Copper Wire. 16/

Imports of bare copper wire by the Sino-Soviet Bloc amounted to 74,000 tons in 1955. This quantity is 2.7 times the amount imported in 1953 and about 13 percent of the estimated total supply of copper in the Bloc in 1955. Nearly 60 percent of the amount imported in 1955 went to the USSR. Poland and Czechoslovakia each received about 12 percent of the total, with Hungary, East Germany, and Rumania following in that order.

About 40 percent of the bare copper wire imported by the Sino-Soviet Bloc in 1955 was supplied by the UK, while West Germany and Japan each supplied about 19 percent. Other significant exporters were Finland, Belgium, the Netherlands, and Sweden.

The sharp increase of imports in 1955 compared with 1954 reflects the trend beginning on 16 August 1954, when COCOM (Coordinating Committee for Export Controls) lifted its embargo on shipments of bare copper wire 6 mm and under in diameter to the Soviet Bloc but not on shipments to Communist China. Shipments of such wire to the Soviet Bloc jumped from a monthly average of about 1,350 tons before 16 August 1954 to about 5,100 tons per month in late 1954. 17/ The monthly average in 1955 was about 6,000 tons. The sharp rise in shipments to the Soviet Bloc in 1955 was led by the UK with a sevenfold increase over 1954. 18/ As long as bare copper wire remains the only form of copper unembargoed, it is expected that the Soviet Bloc will continue to import such wire at approximately the rate which prevailed in 1955.

b. Covered Wire and Cable.*

The Sino-Soviet Bloc imported nearly 10,000 tons of covered wire and cable in 1955. Of this total the USSR imported about 75 percent, the remainder going primarily to Communist China and Rumania. Other countries of the Bloc imported very little covered wire and cable. 19/ Imports were received primarily from the UK and France and, to a far lesser extent, from Belgium and Italy.

In 1955, imports of covered wire and cable by the Sino-Soviet Bloc declined about 40 percent as compared with 1954; imports declined from most countries except the UK. 20/ The downward trend in imports of covered wire and cable by the Bloc is expected to continue, but at a decreasing rate, as long as bare copper wire is not embargoed.

Multipair cable, submarine cable, and the coaxial type of communications cable were placed under embargo by COCOM as of 22 June 1955. 21/ Because no exports to the Sino-Soviet Bloc of these types of cable have been discovered, these types are not included.

2. Exports to Non-Bloc Countries.

a. Wire and Cable.

Exports of wire and cable from the Sino-Soviet Bloc to non-Bloc countries have been slight. The only export of a specified quantity noted in 1955 was a shipment of aluminum cable, probably ACSR,

* This category includes all nonbare wire and cable regardless of the conductor metal.

from Hungary to Argentina. The shipment amounted to about 1,880 tons and was valued at $1,140,672. 22/

b. Cable Manufacturing Equipment and Technical Assistance. 23/

The only known export by the Sino-Soviet Bloc of facilities for manufacturing electric cable is from Hungary to India. The Hungarians began construction of a plant at Patiala in northern India in January 1955. This plant is to produce 85,000 pounds of hard-drawn copper wire annually and an equal amount of enameled magnet wire. The hard-drawn wire is to be used on the Bhakra-Nangal hydroelectric project. 24/ Although extremely small, the plant is of great value to India and probably represents a cost to Hungary of only about $25,000. Unspecified amounts are also believed to have been exported to Egypt, Syria, and Turkey by Bulgaria; to Turkey by East Germany; to Brazil by Hungary; and to Afghanistan and Burma by the USSR.

Czechoslovakia may have entered the field of foreign aid in 1956 with installations for manufacturing electric cable. The probable targets for such aid would have been Egypt, India, Indochina, Burma, and the Arab countries. 25/

B. Intra-Bloc Trade. 26/

Intra-Bloc trade in wire and cable in 1955 probably accounted for about 5 to 10 percent of total production by the Sino-Soviet Bloc. The estimated pattern of such trade is shown in Table 5.* Poland is the largest exporter to other countries of the Bloc, followed by East Germany and Hungary. The USSR exports very little wire and cable to other countries of the Bloc; Rumania exports none.

The USSR took the largest share of intra-Bloc imports in 1955, probably about 75 percent, despite its relatively large domestic production. Bulgaria was the second largest importer, followed by Communist China and Rumania. Czechoslovakia, East Germany, and Hungary import no wire and cable; Albania and Poland import very little.

Practically all of the imports of wire and cable by Communist China are bare copper wire and rods. Most of the imports by the USSR, on the other hand, are insulated wire and cable. Bulgaria and Rumania also import mostly insulated wire and cable.

* Table 5 follows on p. 24.

Table 5

Estimated Pattern of Intra-Bloc Trade in Electric Wire and Cable
1955

Exporter	Importer										
	USSR	Albania	Bulgaria	Communist China	Czechoslovakia	East Germany	Hungary	Poland	North Korea	Rumania	Vietnam
USSR		X	X	X					X		
Bulgaria								X		X	X
Communist China									X		
Czechoslovakia			X							X	
East Germany	X								X	X	
Hungary	X	X								X	
Poland	X			X							
Rumania											

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VI. Use Pattern and Requirements.

A. Use Pattern.

Most of the products of the wire and cable industry are designed for specific uses. Accordingly, the use pattern of the industry has been determined from the known applications of the various categories of products and, where a category has more than one use, from an estimated priority allocation between end uses.

The principal uses of wire and cable are in (1) industry, including the manufacture of products and the supplying of electric current for internal uses; (2) power networks, including the distribution of electric current to consumers; (3) communications networks, including both land lines and wireless transmission; and (4) certain direct military end items.

The estimated allocation of various wire and cable products in the Sino-Soviet Bloc for the principal purposes listed above is shown in Table 6.*

Table 7** shows the estimated use pattern of wire and cable in the Sino-Soviet Bloc in 1955.

B. Requirements.

The requirements*** of the Sino-Soviet Bloc for wire and cable are filled in the course of any one year, although temporary shortages of wire and cable exist from time to time. Such temporary shortages result not from inadequate capacity but from shortages of materials or faulty planning. No major delays in power or communications projects have been attributed to shortages of wire and cable.

VII. Inputs.

A. Labor.

Employment has been estimated for all wire and cable plants in the Sino-Soviet Bloc for at least 1 year. Table 8**** shows the/

* Table 6 follows on p. 26.
** Table 7 follows on p. 27.
*** Requirements are defined as actual orders for wire and cable.
**** Table 8 follows on p. 27.
/ Continued on p. 28.

Table 6

Estimated Allocation of Electric Wire and Cable Products in the Sino-Soviet Bloc by Principal Uses
1955

Percent

Product	Industry	Power Networks	Communications Networks	Direct Military End Items
Bare power cable		100		
Insulated power cable	50	50		
Weatherproof wire		100		
Magnet wire	100			
Building and appliance wire	100			
Automobile, aircraft, and tractor wire	100			
Control cable	50	30	20	
Telephone and telegraph cable			100	
Coaxial cable	40		60	
Bare communications wire			100	
Field wire				100
Hookup wire	100			
Field cable				100

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Table 7

Estimated Use Pattern of Electric Wire and Cable in the Sino-Soviet Bloc
1955

Percent

Country	Industry	Power Networks	Communications Networks	Direct Military End Items	Total
USSR	41	30	25	4	100
Bulgaria	68	15	17	0	100
Communist China	23	44	28	5	100
Czechoslovakia	33	24	38	5	100
East Germany	44	25	30	1	100
Hungary	49	18	28	5	100
Poland	39	27	34	0	100
Rumania	41	24	27	8	100
Sino-Soviet Bloc	39	29	27	5	100

Table 8

Estimated Labor Force of the Electric Wire and Cable Industry
in the Sino-Soviet Bloc
1955

Country	Number
USSR	46,500
Bulgaria	940
Communist China	13,700
Czechoslovakia	11,800
East Germany	13,700
Hungary	6,100
Poland	11,400
Rumania	4,900
Total	109,000

estimated labor force of the wire and cable industry of the Sino-Soviet Bloc in 1955.*

B. Materials.

Table 9** shows the estimated inputs of certain selected materials for the wire and cable industry of the Sino-Soviet Bloc in 1955. These inputs were computed by applying the input coefficients for representative products of the US wire and cable industry*** to estimated production by the Sino-Soviet Bloc.****

The most important input required by the wire and cable industry in the Sino-Soviet Bloc in 1955 was copper. Estimated consumption of more than 325,000 tons represented about 56 percent of production of copper by the Bloc, which is estimated at 579,000 tons. 27/ Because the industry received imports of 74,000 tons of bare copper wire, it consumed only about 251,000 tons of domestically produced copper, or 43 percent of Bloc production, in 1955.

VIII. Capabilities, Vulnerabilities, and Intentions.

A. Capabilities.

The wire and cable industry of the Sino-Soviet Bloc is capable of producing a full line of products. The USSR, for instance, produced the largest ACSR cable in the world for the Kuybyshev-Moscow transmission line. The technology of the Bloc, however, is inferior to that of the US, and its equipment is generally less modern and less efficient than US equipment. Moreover, the countries of Western Europe are probably superior technologically to all the countries of the Bloc except the USSR.

In research and development the leading countries of the Sino-Soviet Bloc, the USSR and East Germany, are approximately at the same level as the countries of Western Europe. The wire and cable industries of the USSR and East Germany are working on the same problems and apparently have been as successful in solving them as the US wire

* These estimates were extended to 1955 by the methods indicated in Table 10, Appendix A, p. 37, below.
** Table 9 follows on p. 29.
*** See Table 27, Appendix D, p. 68, below.
**** See Tables 11 through 26, Appendix B, pp. 47-62, below.

Table 9

Estimated Inputs of Selected Materials for the Electric Wire and Cable Industry in the Sino-Soviet Bloc
1955

Metric Tons

Country	Metals					Materials for Insulation				
	Copper	Aluminum	Lead	Steel	Tin	Enamel	Paper	Rubber	Plastic	Other a/
USSR	204,000	66,300	58,700	61,300	104.0	280	8,730	44,040	11,430	18,700
Bulgaria	2,340	0	290	150	0.5	16	50	110	60	190
Communist China	30,910	3,820	2,170	3,070	5.0	26	360	2,930	0	2,210
Czechoslovakia	21,890	8,540	6,820	6,570	9.3	60	1,500	3,180	2,080	1,220
East Germany	28,880	3,100	7,670	5,320	18.4	53	1,150	6,680	3,280	3,030
Hungary	12,340	3,580	3,890	2,820	3.8	70	690	2,010	100	0
Poland	16,870	1,250	4,610	2,650	6.2	50	1,010	2,870	411	1,520
Rumania	7,820	4,090	1,700	3,360	2.2	17	340	1,370	490	780
Total	325,050	90,680	85,850	85,240	149.4	572	13,830	63,190	17,851	27,650

a. Textile braid, asphalt, pitch, and mica form the bulk of this category.

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and cable industry. The Bloc is probably ahead in the development and use of substitute materials, such as aluminum for copper or lead and plastic for rubber or lead, because of the effort devoted to reduce imports by using domestic supplies.

There is no doubt that the Sino-Soviet Bloc has the equipment, the personnel, and the technology to produce any type of wire and cable it requires in the foreseeable future. In addition, the increasing industrial integration of the Bloc will result in a significant reduction in the cost of production because of specialization, standardization, and the increased productivity of labor.

At present the wire and cable industry of the Sino-Soviet Bloc has the capacity to process more materials than are available.

B. Vulnerabilities.

The scarcity of some vital materials such as copper and lead is indicated by the great effort being made to create acceptable substitutes. The effort to utilize more plentiful materials has been and will continue to be expensive in terms of skilled manpower and intricate research equipment. Moreover, additional expense will be incurred when new machinery, such as that for aluminum sheathing, has to be installed on a large scale. Added to these expenses will be the cost of learning to use the new types of wire and cable with entirely different characteristics. In some instances the substitute materials are inferior to the original materials, and the cost of poorer performance may approach or overbalance the initial savings in cheaper materials.

The wire and cable industry of the Sino-Soviet Bloc is vulnerable to economic warfare. Because the Bloc imports a significant portion of its supply of copper, the cessation of such imports would temporarily interrupt the production of wire and cable. The same situation exists with regard to rubber.

Another important vulnerability is the necessity of having a continuous supply of diamond and hard alloy steel dies. These dies are usually produced centrally for a great many wire and cable plants, although the plants usually have facilities for reboring old dies. Because the centralized facility for making dies is vulnerable, the wire and cable industry could be brought to a halt fairly easily and rapidly through the destruction of this facility.

C. Intentions.

A major aim of the Sino-Soviet Bloc in the wire and cable industry, as in most industries, is to be independent of Free World sources of supply of end products and raw materials. In terms of the capacity to produce end products, the Bloc has largely achieved this aim. At present the Bloc is seeking to reduce its dependence upon the Free World for imports of raw materials through technological advances.

Another intention of the Sino-Soviet Bloc, which has been partially accomplished, is the standardization of cable materials and end products. Many Soviet standards have been adopted already by the European Satellites and Communist China Further plans toward this end are being made and carried out.

It is probable that some specialization by plants will take place, particularly where they are concentrated, as in Hungary and East Germany. Under the system of regional supply prevalent in the USSR and Communist China, plants are diversified to supply a wide variety of wire and cable products. With the dispersion of plants, specialization will succeed only where the product is highly complex, requiring an expensive facility for production that would be economical only when there was production in great volume.

The Sino-Soviet Bloc intends to modernize its wire and cable industry as rapidly as possible. The new automatic and continuous processes developed recently are being adopted rapidly. Apparently the industry will be expanded primarily by increasing productivity rather than by building new or larger plants. Evidently the chief reason for this decision is that the quality of products as well as the volume of production rises with the installation of new equipment. The policy appears to be to replace old capital equipment with new equipment instead of merely adding the new.

APPENDIX A

MANUFACTURING AND RESEARCH FACILITIES

I. Manufacturing Facilities.

Table 10* gives basic information on each of the major wire and cable plants in the Sino-Soviet Bloc. The basic information includes the name of the plant, its location, the name of its director, the date of its founding, the estimated labor force in 1955, and comments pertaining to its history and technology. Plants are listed according to country, in alphabetical order by city.

II. Research Facilities.

A. USSR. 28/

The Scientific Research Institute of the Cable Industry** directs and controls the research and development program of the wire and cable industry in the USSR. Most of the actual work is done in the laboratories of the leading cable plants.*** The NIIKP oversees developmental work in the various plant laboratories, actively helps the plants to initiate production of new types of wire and cable, and cooperates with machine-building plants, such as the Vulkan Plant at Leningrad, in developing improved designs of cable-making machinery and equipment.

Three other organizations which are concerned with cable research and development are as follows: (1) Cable Section, Scientific and Technical Council, Ministry of the Electrical Industry of the USSR, which formulates policy concerning the direction which the NIIKP will follow in cable research and development; (2) the All-Union Bureau of Electrical Insulation of the All-Union Scientific and Technical Society of Power Engineers,**** which is an honorary group of distinguished technical people who present technical papers and are

* Table 10 follows on p. 37.

** Nauchno-Issledovatel'skiy Institut Kabel'noy Promyshlennosti (NIIKP); K.Y. Sergevchuk, Director.

*** See Table 10, p. 37, below.

**** Vsesoyuznoye Nauchnoye Inzhenerno-Tekhnicheskoye Obshchestvo Energetikov (VNITOE).

usually active educationally as well as professionally; and (3) the All-Union Electrotechnical Institute imeni V.I. Lenin, Order of Lenin,* under the Ministry of the Electrotechnical Industry. The VEI concentrates on basic research in the fields of insulation and design.

The best engineering school in the USSR for wire and cable engineering is the Moscow Power Engineering Institute.

B. Bulgaria. 29/

It is possible that the Vasil Kolarov Plant, which is new and equipped by the USSR, may have some laboratory facilities. Apparently Bulgaria depends almost entirely on the USSR and on the other European Satellites for its technological development.

C. Communist China. 30/

Both the Shanghai Electric Wire Plant and the Mukden Electric Wire Plant have small laboratories. Information on the organization for research on cable, if one exists, is not available. The First Ministry of Machine Building probably has a section concerned with all technological developments in the electrical industry as a whole.

Although Communist China has engineering schools which probably teach wire and cable engineering, many Chinese Communist students go to the USSR. For example, a group of workers and engineers from the Mukden plant are attending or have attended technical schools in Leningrad. The Sevkabel' plant and the NIIKP have excellent facilities for training the Chinese.

D. Czechoslovakia. 31/

Two plants, one in Bratislava and the other in Prague, are known to have laboratories. In addition, the Research Institute for Cables and Insulators** was formed in 1951 to direct research and also

* Vsesoyuznyy Elektrotekhnicheskiy Ordena Lenina Institut imeni V.I. Lenin, abbreviated VEI. This Institute is located at Krasnokazarmennaya Ulitsa 12, Moscow.

** The Institute, which is located on Tovarenska Ulice in Bratislava, 1-1/2 blocks from the cable plant in that city, employed about 112 people in 1951. The known accomplishments of the Institute are limited to new insulating materials. The Director of the Institute is Ferdinand Keviczky.

to provide additional facilities. The Institute is supported by the cable plants, each contributing 4 percent of their gross income.

E. East Germany. 32/

All research in East Germany is done in the laboratories of four plants. The value of this work in East German marks (Deutsche Mark East -- DME), which indicates the relative importance of each plant in the research program in 1954 is as follows:

Plant	East German Marks
Kabelwerk Koepenick (KWK)	200,000
Kabelwerk Oberspree (KWO)	500,000
Kabelwerk Meissen (KWM)	100,000
Zentrales Entwicklungsbuero (ZEB*) of Kabelwerk Vacha (KWV)	400,000

The ZEB of KWV, which is under the direction of Diplom-Physiker Kramer, has been concerned primarily with the development of high-frequency cable and apparatus. A new system of institutes was initiated in 1953 to do strictly basic research, whereas the plants listed above carry on applied research. These institutes are called Zentralinstitute (Central Institutes). One, which is located in Berlin, is known as the Kunststoffinstitut (Plastics Institute). The basic research now performed by the plants will be carried out by the Central Institutes when they are in full operation.

The research staffs at the plants listed above cooperate on specified projects with other plants, as follows: (1) KWO and KWV with Sachsenwerk Radeberg in the 7-centimeter wavelength region and with Funkwerk Koepenick in the 3-centimeter wavelength region on wave guide development; (2) KWO with the Metal Works in Schoeneweide on steel-copper wire development; (3) ZEB of KWV with the Buna Plant in Schkopau and the Electrochemical Combine in Bitterfeld on new plastics; (4) KWO with the paper factory in Wolfswinkel on new insulating papers.

The Arbeitskreis Isolierwerkstoffe (Work Circle for Insulation Materials), under the direction of Dr. Guenther Panning, was set up in May 1955 to coordinate the program to improve the quality of insulation materials.

* Central Development Bureau.

Another agency, the Arbeitskreis Werkstoffe der Elektrotechnik (Work Circle for Electrotechnical Material), under Dr. Hahn, performs a similar function for a much wider range of materials.

F. Hungary. 33/

Research is accomplished in the laboratories of the large plants in Budapest, notably the Cable and Wire Plant. Considerable work is being done on the development of aluminum sheathing by Professor Laszlo Verebely at the Budapest Technical University. Apparently the results of research up to the middle of 1954 were not satisfactory, because information indicates that a great deal of work remains to be done. Professor Verebely also is interested in new applications of aluminum conductors, although the aluminum sheathing project has priority.

G. Poland. 34/

The Krakow Electric Equipment Works has an excellently equipped laboratory which is probably the main facility for the applied research and developmental work in Poland. For more basic research, a group of professors of the Warsaw Technical Academy organized the Institute of Electrometry and High Tensions (Instytut Miernictwa Elektrycznego) in 1952. A testing section and an ultra-high-tension laboratory were organized at Warsaw Polytechnic.

Polish engineers, presumably from Polish cable plants have visited East German cable plants on several occasions. The Poles seemed especially interested in the machines used rather than in the development of products or materials.

Poland, like the other European Satellites in varying degrees, depends upon the USSR and East Germany for much of its technological support.

H. Rumania. 35/

The laboratory at the Electrocablul Electric Equipment Plant appears to be the most prominent facility for applied research in the cable industry of Rumania. The Rumanian agencies which plan and carry out research on wire and cable all have the broader responsibility of research in the whole electrotechnical field. These agencies are the Electrotechnical Research Institute in Bucharest, the Institute of Electrical Machinery and Equipment in Craiova, the Institute of Power Studies and Plans in Bucharest, and the Institute for Research and Planning of Electrical Equipment in Bucharest.

Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
1. USSR					
Khabarovsk	Amur Cable Plant 36/ Russian name: Amurskiy Kabel'nyy Zavod, or Amurkabel'	1956	N.A.	N.A.	This plant, which may have been designed by Kabelwerk Meissen, is known to have been under construction in 1954 and to have begun production in the middle of 1956. No estimate of production was attempted.
Khar'kov	Cable Plant Northeast 37/	Before World War II	N.A.	5,800 a/*	This plant supplies mines in the Donets Basin.
Kiev	Ukrainian Cable Plant 38/ Russian name: Ukrainskiy Kabel'nyy Zavod, or Ukrkabel' Address: Red October St.	Before 1918	Grabin, Lev Borisovich	2,500 b/	This plant, which was evacuated to Sverdlovsk during World War II, was completely re-equipped after the war, although much of the machinery was of prewar design and manufacture. The plant concentrates on production of power cable and is alleged to have extremely low costs. The productivity of labor, however, is estimated to be lower than that of the Northern Cable Plant (Sevkabel') and of the Moscow Cable Plant (Moskabel') because of the lack of equipment for handling materials.
Kirs	Kirs Cable Plant, Plant No. 269 40/ Russian name: Kirsinskiy Kabel'nyy Zavod	1950	N.A.	350 a/	This plant supplies ACSR (aluminum conductor, steel-reinforced) cable for the Moscow-Kuybyshev transmission line.
Kol'chugino	Kol'chugino Cable Plant, Plant No. 681 41/ Russian name: Kol'chuginskiy Kabel'nyy Zavod	Before World War II	N.A.	2,300 a/	None.
Kuybyshev	Kuybyshev Cable Plant, Plant No. 693 42/	1944	Kutsevol	1,700 a/	The original equipment for this plant came from the Sevkabel' plant, which was partially evacuated to Kuybyshev in 1944.
Leningrad	Northern Cable Plant 43/ Russian name: Sevkabel' Address: Kozhevennaya Liniya 40, Vasiliyevskiy Ostrov	1878	Bykov, D.	5,000 c/	The oldest cable plant in the USSR, this plant suffered severe damage in World War II, and was almost completely rebuilt. It is the most technologically advanced plant in the USSR and the second largest producer of wire and cable. The plant produces a complete line of cable products and is noted for production of coaxial cable. The best facilities for cable research in the USSR probably are located at this plant.

* Footnotes for Table 10 follow on p. 46.

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
1. USSR (Continued)					
Moscow	Moscow Cable Plant, Plant No. 330 44/ Russian name: Moskovskiy Kabel'nyy Zavod, or Moskabel' Address: 2-ya Kabel'naya 2, Entusiastev Chaussee	1917	Kutsovol, M.S.	6,600 d/	This plant is the largest wire and cable producing facility in the USSR. Plant facilities were partially evacuated to Tomsk in 1941; no war damage was sustained. The plant produces a complete line of wire and cable products and is technologically above average for the USSR, being noted particularly for developing and putting into production new types of insulation.
Moscow (Khotkovo)	Electric Cable Plant, Plant No. 198 45/ Russian name: Elektroprovodniy Zavod	Before World War II	Ukhorskiy, A.T.	1,400 a/	This plant supplies the Kuybyshev hydroelectric power station.
Odessa	Odessa Cable Plant 46/ Russian name: Odesskiy Kabel'nyy Zavod Address: Vodaprovodniy St.	1948	Komlev	1,000 a/	This plant, which has German, US, and UK equipment, was originally combined with a steel wire plant. Production of wire and cable was placed in a separate shop in 1950.
Podol'sk	Podol'sk Cable Plant, Plant No. 683 47/ Russian name: Podol'skiy Kabel'nyy Zavod	1942	Farber, Julius	1,100 a/	This plant, which has German, US, and UK equipment, sustained no damage in World War II. The plant may receive bare copper wire from Odessa.
Shcherbakov	Shcherbakov Cable Plant 48/ Russian name: Shcherbakovskiy Kabel'nyy Zavod	1941	Finkel'shteyn	1,300 a/	This plant, which was enlarged and modernized in 1954, specializes in automobile wire.
Sverdlovsk	Ural Cable Plant, Plant No. 694 49/ Russian name: Ural'skiy Kabel'nyy Zavod	1942	Kuranov, I.V.	4,200 a/	The original equipment for this plant came from the Sevkabel' plant, which was partially evacuated to Sverdlovsk in World War II.
Tallinn	Tallinn Cable Plant 50/ Russian name: Eesti Kabel'nyy Zavod	1950	Keskyul'	800 a/	This plant has a rod mill and supplies power stations.

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
1. USSR (Continued)					
Tashkent	Salar Electric Cable Plant, Plant No. 682 51/ Russian name: Tashkentskiy Elektrokabel'nyy Zavod	During World War II	Safonov, K.F.	5,000 a/	The original equipment for this plant came from the cable plants at Khar'kov or Kol'chugino, or both, when they were evacuated in World War II.
Tomsk	Tomsk Cable Plant, Plant No. 631 52/ Russian name: Tomskiy Kabel'nyy Zavod	1942	Korolev, P.G.	4,600 a/	The original equipment for this plant came from the Sevkabel' plant, which was partially evacuated to Tomsk in World War II. The plant also received equipment from the Siemens and Halske Cable Plant in Berlin after the war.
Ufa	Ufa Cable Plant, Plant No. 680 53/ Russian name: Kabel'nyy Zavod Address: Between Frunze and Pushkin Streets	1948	Tuigunov	2,200 a/	None.
Yerevan	Yerevan Cable Plant 54/ Russian name: Yerevanskiy Kabel'nyy Zavod, or Yerevankabel' Address: 10 Stalin St.	1945	Dikranyan, Mgrdich	1,000 e/	The original equipment for this plant was taken from the Kabelwerk Oberspree plant in East Germany. During 1950-55, however, considerable new automatic machinery was installed, including a rod mill. The plant is possibly the best equipped cable plant in the USSR, although in 1955 it was producing bare communications wire, which is simply made, as its chief product. The plant has had difficulties in manufacturing more complicated products, particularly in utilizing its new machinery to full capacity. Deficiencies in management appear to be hampering production. The plant is potentially the most efficient in the USSR, and it will probably expand production greatly in the next few years.

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
2. Bulgaria					
Burgas	Vasil Kolarov Cable Plant 56/	1951	Chanev, Viko	460 f/	This plant was under construction for 2 years, being completed in 1952. The plant was equipped with Soviet machines.
Sevliyevo	Elprom Cable Plant, or the Nenko Iliyev Electric Cable Plant 57/	Probably before World War II	N.A.	480 f/	This plant has East German and Hungarian equipment.
3. Communist China					
Hsiang-t'an	Hsiang-t'an Electric Wire Plant 58/	September 1953	N.A.	300 g/	This is a new, modern plant.
K'un-ming	K'un-ming Electric Wire Plant 59/ 194 Cheng-i Road	1930	Wang, Weitsai	1,000 g/	This plant has its own rolling mill. The old equipment is of German and UK make. Some equipment was removed to Shanghai and Hsiang-t'an in 1946.
Mukden	Mukden Electric Wire Plant (No. 7 Plant of the Northeast Electrical Manufacturing Industry Control Bureau) 60/ No. 8, Section 3, Chuankung St., Tiehsi Quarter	1938	N.A.	7,500 g/	At the end of World War II, this plant was the largest in Communist China, but 96 percent of its equipment was removed to the USSR in 1945. The plant was re-equipped by the Chinese Communists and resumed production in 1950. Huge investment by the Chinese, starting in 1954, is converting the plant to modern technical standards, utilizing equipment and technical assistance from the USSR and East Germany. By 1957 the plant is expected to produce two-thirds of the wire and cable made in China. A branch plant at Harbin was established during the Korean War from facilities of the Mukden plant but is believed to have been moved to Mukden.
Shanghai	Shanghai Electric Wire Plant 61/ 410 Ning-Wu Road 519 Li-yang Lu	Before World War II	N.A.	2,500 g/	This plant, which uses Soviet standards, is probably the oldest wire and cable plant in China. The plant was expanded and modernized in 1951-53 and has a copper-smelting operation.

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
3. Communist China (Continued)					
Tientsin	Cheng-hua Plant 62/	August 1952 (Facilities existed before World War II)	N.A.	1,800 g/	Four plants -- the private Cheng-hua Electric Wire Plant and the Chiu-ta, Hsing-ya, and Tung-hua Rubber Products Plants -- were amalgamated to form this enterprise, which is operated jointly by the state and its owners.
4. Czechoslovakia					
Bratislava	Electric Cable Plant 63/ Address: Triangular area bordered by Tovarenska Ulice, Minske Nivy Ulice, and Cesta Vukakaradzica Ulice	1894	Markovic, Ludevit	3,800 a/	This plant -- which suffered no damage in World War II -- was enlarged in 1942-44 and nationalized in 1945. The plant has suffered from a shortage of nonferrous metals, especially copper, and in 1953 production actually stopped for 2 weeks. The plant has a research institute.
Brno	Electric Cable Plant 64/	N.A. Probably since World War II	N.A.	300 a/	None.
Decin	Electric Cable Plant 65/ Address: Ustecka Ulice 33, Podmokly Section	Before World War II	N.A.	1,500 a/	This plant was formerly part of AEG (Allgemeine Elektrizitaets Gesellschaft), Berlin.
Kladno	Electric Cable Plant 66/	1905	N.A.	2,200 a/	This plant is noted for good workmanship and high-quality materials.
Prague	Electric Cable Plant 67/ Address: near Kabelovny 278, Hostivar suburb	Before World War II	Hrdlicka, Jan	1,500 a/	This plant, which has a laboratory, was nationalized in 1945. Shortages of diamonds, copper, and rubber were noted in 1952. Rejects amounted to about 15 percent of production in 1952.
Topol'cany	Electric Cable Plant 68/ Address: Tovarenska 12	1938	N.A.	500 a/	This plant, which formerly belonged to Aktiengesellschaft (AG) in Bratislava, was enlarged in 1948-49.

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
4. Czechoslovakia (Continued)					
Velke Mezirici	Electric Cable Plant 69/	Before World War II	Svihalek	1,300 a/	This plant was nationalized in 1949.
Vrchlabi	Electric Cable Plant 70/	Before World War II	N.A.	400 a/	Modern machinery from East Germany was installed at this plant in 1946. A shortage of raw materials existed in 1950.
Vsetin	Electric Cable Plant 71/ Address: Honetova Ulice	N.A.	Koppa	300 a/	None.
Zavadka nad Hronom	Electric Cable Plant 72/	1951	N.A.	200 a/	This plant started full production in 1951.
5. East Germany 73/					
Berlin	VEB Kabelwerk Koepenick (KWK) 74/ Address: Friedrichshagener Strasse	Before World War II	Forstmeyer	2,500 b/	KWK, formerly the Vogel Wire and Cable Plant was 80 percent dismantled by the USSR. The plant was rebuilt and operating at 90 percent of capacity by 1953. The plant processes and distributes industrial diamonds.
Berlin 25X1B	VEB Kabelwerk Oberspree (KWO) 75/ Address: Wilhelminenhofstrasse 76-77 Telephone: 630010 and 630646 [redacted]	1890	Pohler, Georg,	3,700 b/	KWO was formerly one of the oldest plants in the AEG (Allgemeine Elektrizitaets Gesellschaft) in Berlin. Through damage in World War II and dismantling by the USSR, this plant lost about 60 percent of its facilities. The plant was reconstructed gradually but was still only one-half its prewar size in 1953.
Berlin	VEB Kabelwerk Adlershof (KWA) (Branch of KWK)	Before World War II	Berenson	400 b/	KWA, formerly the Adriadne Corporation, produces nonelectrical nickel wire for weaving fine mesh.
Meissen	VEB Kabelwerk Meissen (KWM) 76/ Address: Werk I: Niederauer Strasse 42 Werk II: Fischergasse 14-16	Before World War II	Braever, Rudolf	900 b/	Werk I, formerly Vereinigte Zuender und Kabelwerk Meissen A.G., was destroyed in World War II and was rebuilt about 1949-50. Werk II, formerly Mesco Metallwaren Fabrik, Helm & Co. was dismantled by the USSR in 1945, rebuilt in 1951, and started production in 1952. The USSR returned KWM to East Germany in April 1952. KWM has a large laboratory.

Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
5. East Germany (Continued)					
Niederoderwitz	VEB Lausitzer Kabelwerk (LKW)	Before World War II	Kleemann	300 b/	LKW was operating at 70 percent of capacity in 1953.
Plauen	VEB Leitungswerk Plauen (LWP) 77/	About 1920	Stephan, Hans	500 b/	LWP, formerly the Siemens-Schuchert Cable Plant, was completely modernized in 1938. The slight damage which was suffered in World War II was repaired in 1945. The USSR returned LWP to East Germany in 1951.
Schoenow	VEB Kabelwerk Schoenow (KWS) 78/ Address: Heinrich Heine Strasse	1926	Seng, Emil	400 b/	KWS, formerly the Schulze, Schneider, and Dort Cable Plant, was 70 percent destroyed in World War II and reconstructed in 1948-52. The USSR returned the plant to East Germany in 1952.
Vacha	VEB Kabelwerk Vacha (KWV) 79/	About 1928	Spaeth, Max	400 b/	KWV, formerly a subsidiary of AEG (Allgemeine Elektrizitaets Gesellschaft) in Berlin, suffered no damage in World War II but was about 30 percent dismantled by the USSR in 1946. The USSR returned KWV to East Germany about 1948-49, and the plant regained its prewar size by 1951. KWV produces the best coaxial cable in East Germany; the coaxial cable is developed in a fine laboratory for high-frequency research, which had been constructed in 1938. KWV was operating at 30 percent of capacity in 1953.

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
6. Hungary					
Budapest	Cable and Wire-Rope Plant 80/ Hungarian name: Kabel es Sodronykotelgyar Address: Budafoki Ut 60, Budapest XI	About 1920	Chatel, Otto	2,500 1/	The machinery of this plant, formerly Felton and Guilleaume, was built by Siemens and Schuchert before World War II. The plant, which was taken over by the Germans in 1944 and by the USSR after the war, suffered slight damage in World War II. The USSR which had removed some equipment in 1945-46, owned 50 percent of the plant in 1948 and resold its share to Hungary in 1953. The plant is considered efficient.
Budapest	Cable and Synthetic Materials Plant 81/ Hungarian name: Kabel es Muanyaggyar Address: Fehervari Ut 120, Budapest XI	1900	Farkas	1,600 1/	This plant, formerly Felton and Guilleaume, was nationalized in 1947. The plant was partially destroyed by fire in 1948 and was still being reconstructed in 1951. The USSR owned 70 percent of the plant in 1950 and resold its share in 1953.
Budapest	Electrical Machinery and Cable Plant 82/ Hungarian name: Villamosgep es Kabelgyar Address: Gyomroi Ut 128, Budapest X	Before World War II	Farkas, Mihaly	1,200 1/	This plant, formerly Siemens-Halske A.G. of Berlin, suffered 75 percent damage during World War II. The plant was taken over by the USSR as former German property and reconstructed in 1946-51. The USSR resold the plant to Hungary in 1953.
Budapest	Permel Enamel Wire Plant 83/ Address: Szarpary Ut 39, Budapest X	Probably 1946	N.A.	800 1/	Two new buildings were completed in 1950.
7. Poland					
Bedzin	Cable and Wire Plant 84/ Address: Sielecka Ulica 3 Telephone: 711-62	1927	N.A.	900 1/	Worn out by war production but undamaged, this plant was the first to start production after World War II. The plant has a rod mill. There is no room to expand.
Bedzin	Proton Enameled Wire Plant 85/ Address: Kosciuszka Ulica 56 Telephone: 310-24	1934	N.A.	N.A.	None

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
7. Poland (Continued)					
Bydgoszcz	Polish Cable Plant 86/ Address: Fordonska Ulica 112 Telephone: 11-37	1920	N.A.	2,400 i/	This plant, formerly Siemens AEG of Berlin, was a modern and technically advanced plant before World War II. The plant was damaged during the war.
Dziedzice	State Cable Plant 87/ Address: Pierwszego Maja Ulica 59 Telephone: 1	1928	N.A.	150 i/	None.
Krakow	Krakow Electric Equipment Works 88/ Address: Prokocimska Ulica 75 Telephone: 546-98	1927	N.A.	2,700 i/	This plant has some machinery from the destroyed Skoda Cable Plant in Warsaw; the Germans installed it during World War II. The plant was not damaged during the war and has been expanded. The plant has an excellent laboratory and the most modern rod mill in Poland.
Lodz	Cable Band and Electric Wire Plant 89/ Address: Wolczanska Ulica 168 Telephone: 146-70	1935	N.A.	N.A.	None.
Ozarow	Ozarow Cable Works 90/ Address: Poznanska Ulica 15 Telephone: 12	1929	N.A.	2,700 i/	This plant, formerly Felton and Guilleaume, was badly damaged in World War II. The plant is well equipped and has a rod mill.
Poznan	Electric Cable Plant 91/	N.A.	N.A.	1,900 i/	None.
8. Rumania					
Bucharest	Boleslaw Bierut Works 92/ Address: Boulevard Bucuresti, Novi 164	N.A.	N.A.	350 f/	This plant is primarily a ferrous and nonferrous metal rolling mill and supplies the Dinamo Plant in Bucharest with magnet wire.

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Table 10

Electric Wire and Cable Plants in the Sino-Soviet Bloc
(Continued)

City	Plant	Date of Founding	Director	Labor Force in 1955 (Number)	Comment
8. Rumania (Continued)					
Bucharest	Electrocablul Electric Equipment Plant 93/ Address: Soseaua Garei Catelu, No. 4	1948	Parcioaga, Virgil	2,500 f/	This plant was formed in 1948 through the centralization of the facilities of the following plants: (1) Fabrica Electrocablul, Bucharest; (2) Fabrica Elnor, Bucharest; (3) Electrotuburi, Bucharest; (4) a factory in Cluj; (5) two factories in Stalin-Brasov; and (6) a factory whose location is unknown. The plant, which was enlarged in 1951, uses many Soviet techniques and standards.
Campia-Turzii	Sarmei Industria Wire Plant j/ 94/	Probably prewar	Stanatzev, I.	850 f/	This plant is a producer of ferrous metal products. Production of wire and cable is secondary.
Timisoara	Electro Banat Plant 95/ Address: 14 Boulevard of the Republic	N.A.	Nagy	1,200 f/	This plant may also produce electric meters, batteries, and some special-purpose lamps.

a. The estimate was computed by increasing the estimated labor force in a base year for the plant by one-half the increase in the value of production at the plant from the base year through 1955; that is, the productivity of labor was estimated to have increased one-half as rapidly as production.
b. The estimate was extrapolated by assuming that the labor force increased 15 percent between 1954 39/ and 1955.
c. The estimate assumes the maximum labor force allowed by the plant area.
d. The estimate was extrapolated from 1953 on the basis of the value series for Moskabel', assuming an annual increase of 5 percent in the productivity of labor.
e. 55/
f. The estimate was computed by increasing the estimated labor force in a base year for the plant by three-quarters the increase in the value of production at the plant from the base year through 1955; that is, the productivity of labor was estimated to have increased one-fourth as rapidly as production.
g. The estimate was computed by increasing the estimated labor force in a base year for the plant by four-fifths the increase in the value of production at the plant from the base year through 1955; that is, the productivity of labor was estimated to have increased one-fifth as rapidly as production.
h. The labor force in 1955 is estimated to have equaled the estimated labor force in the base year.
i. The estimate was computed by increasing the estimated labor force in a base year for the plant by two-thirds the increase in the value of production at the plant from the base year through 1955; that is, the productivity of labor was estimated to have increased one-third as rapidly as production.
j. This plant is subordinate to the Ministry of the Metallurgical and Chemical Industry.

APPENDIX B

STATISTICAL DATA ON PRODUCTION

Table 11

Estimated Value of Production of Electric Wire and Cable in the USSR a/
1938 and 1946-55

Plant	Million 1955 US $											Percent of Production in 1955
	1938	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	
Cable, Northeast (Khar'kov)	8.1	7.2	9.7	13.0	16.3	17.2	24.2	32.6	43.2	46.7	51.3	7
Ukrainian Cable (Ukrkabel', Kiev)	25.0	10.1	14.9	19.9	26.6	33.2	38.3	43.9	49.9	56.6	62.2	8
Kirs Cable						1.5	1.5	2.0	2.5	2.9	3.2	Negligible
Kol'chugino Cable	6.8	6.0	8.2	10.9	13.6	14.4	18.9	25.4	33.8	36.4	40.0	5
Kuybyshev Cable		1.4	1.9	2.5	3.1	3.3	9.9	13.4	17.8	19.3	21.2	3
Northern Cable (Sevkabel', Leningrad)	35.6	24.9	35.6	53.3	67.3	80.0	93.7	106.9	118.6	128.1	138.3	18
Moscow Cable (Moskabel')	30.4	43.5	56.6	67.8	80.0	92.1	104.3	116.5	130.4	143.4	157.8	20
Moscow Electric Cable (Khotkovo)	3.3	2.9	4.0	5.3	6.6	7.8	10.4	13.4	17.2	18.4	20.2	3
Odessa Cable				1.8	2.3	2.7	4.6	5.9	7.6	8.2	9.0	1
Podol'sk Cable		2.4	3.3	4.4	5.4	6.4	9.5	12.2	15.6	16.8	18.5	2
Shcherbakov Cable		4.1	5.5	7.4	9.2	10.8	12.2	15.8	20.2	21.2	23.4	3
Ural Cable (Sverdlovsk)		8.8	11.9	15.8	19.8	21.0	27.4	36.9	49.0	52.8	58.0	7
Tallinn Cable						5.5	6.1	7.9	10.1	10.8	11.9	2
Salar Electric Cable (Tashkent)		7.5	10.2	13.6	17.0	19.9	25.4	32.8	41.9	45.4	50.0	6
Tomsk Cable		11.1	15.1	20.1	25.2	26.7	29.0	39.2	52.0	56.0	62.0	8
Ufa Cable					14.6	15.5	20.3	27.4	36.4	39.3	43.2	5
Yerevan Cable (Yerevankabel')		1.0	2.0	3.1	4.0	5.1	7.1	8.1	9.0	10.6	14.0	2
Total	109.3	130.9	177.8	239.0	310.9	363.1	442.8	540.2	655.4	712.9	783.8	100

a. Because of rounding, figures may not add to the totals shown.

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Table 12

Estimated Production of Electric Wire and Cable in the USSR, by Type a/
1955

Type of Wire and Cable	Value (Million 1955 US $)																		Volume b/	
	Cable Plant Northeast	Ukr-kabel'	Kirs Plant	Kol'chugino Plant	Kuybyshev Plant	Sev-kabel'	Mos-kabel'	Khotkovo Plant	Odessa Plant	Podol'sk Plant	Shcherbakov Plant	Ural Plant	Tallinn Plant	Salar Plant	Tomsk Plant	Ufa Plant	Yerevan-kabel'	Total	Percent of Total Value	Unit	Quantity
Power wire and cable																					
Bare power cable																					
Aluminum-conductor, steel-reinforced	10.3	3.0	1.9	6	4.2	2.1	0.8	4	0.9	0.9	1.2	5.8	2.4	7.5	6.2			57.1	7	mt c/	94,150
Copper		3.7				9.7								5.0			0.8	19.1	2	mt	15,900
Aluminum							1.1											1.1	Negligible	mt	1,300
Total	10.3	6.7	1.9	6	4.2	11.8	1.9	4	0.9	0.9	1.2	5.8	2.4	12.5	6.2		0.8	77.4	10		
Insulated power cable	20.5	37.6	1.0	10	6.4	41.9	30.3	10	3.6	1.9	4.7	17.4	2.4	15.0	18.5	13.0	2.5	236.5	30	km d/	193,900
Weatherproof wire	5.1	1.2		2		1.1	8.8		0.9			2.9	1.2	2.5	3.1	2.2	0.5	31.5	4	km	168,500
Magnet wire	5.1	0.7			2.1	6.4	4.6				7.0	2.9	1.8	2.5	3.1	4.3	0.6	41.2	5	mt	25,800
Building and appliance wire	5.1	0.3		4		12.5	10.7	2	3.6			5.8	1.2	2.5	6.2	6.5	2.1	62.5	8	km	416,600
Automobile, aircraft, and tractor wire		1.6					19.7			6.5	10.5	5.8						44.1	6	km	401,200
Total	46.2	48.2	2.9	22	12.7	73.6	76.0	16	9.0	9.3	23.4	40.6	8.9	35.0	36.9	25.9	6.5	493.2	63		
Communications wire and cable																					
Control cable	5.1	0.1	0.3	2		1.1	3.5	4					1.2	2.5	6.2			26.0	3	km	5,800
Telephone and telegraph cable		11.6		16	8.5	38.0	36.0			9.3		11.6		10.0	18.5	13.0		172.4	22	km	55,800
Coaxial cable						2.6	10.9					5.8						19.3	3	km	76,400
Bare communications wire e/							5.0										6.0	11.0	1	mt	7,300
Field wire		2.4				22.3	8.4											33.1	4	km	674,700
Hookup wire						0.7	18.0						1.8	2.5		4.3	1.2	28.5	4	km	271,300
Field cable, aluminum																	0.3	0.3	Negligible	km	640
Total	5.1	14.0	0.3	18	8.5	64.7	81.7	4		9.3		17.4	3.0	15.0	24.6	17.3	7.5	290.6	37		
Grand total	51.3	62.2	3.2	40	21.2	138.3	157.8	20	9.0	18.5	23.4	58.0	11.9	50.0	61.6	43.2	14.0	783.8	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Table 27, Appendix D, p. 68, below.
c. Metric tons.
d. Kilometers.
e. Nonferrous.

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Table 13

Estimated Value of Production of Electric Wire and Cable in Bulgaria a/
1948-55

Plant	Million 1955 US $								Percent of Production in 1955
	1948	1949	1950	1951	1952	1953	1954	1955	
Vasil Kolarov Cable				0.7	0.9	2.7	3.0	3.3	53
Elprom Cable	0.4	0.8	1.0	1.0	1.3	2.4	2.6	2.9	47
Total	0.4	0.8	1.0	1.7	2.2	5.1	5.6	6.1	100

a. Because of rounding, figures may not add to the totals shown.

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Table 14

Estimated Production of Electric Wire and Cable in Bulgaria, by Type a/
1955

Type of Wire and Cable	Value (Million 1955 US $)			Percent of Total Value	Volume b/	
	Vasil Kolarov Cable Plant	Elprom Cable Plant	Total		Unit	Quantity
Power wire and cable						
Insulated power cable	1.0		1.0	16	km c/	800
Weatherproof cable	0.3		0.3	5	km	1,700
Magnet wire		2.3	2.3	38	mt d/	1,500
Building and appliance wire	0.3		0.3	5	km	2,200
Total	1.6	2.3	3.9	64		
Communications wire and cable						
Control cable	0.3		0.3	5	km	70
Telephone and telegraph cable	1.0		1.0	16	km	320
Hookup wire	0.3	0.6	0.9	15	km	8,600
Total	1.6	0.6	2.2	36		
Grand total	3.3	2.9	6.1	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Table 27, Appendix D, p. 68, below.
c. Kilometers.
d. Metric tons.

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Table 15

Estimated Value of Production of Electric Wire and Cable in China a/
1938 and 1945-61

Plant	Million 1955 US $																		Percent of Production in 1955
	1938	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	
Hsiang-tan Electric Wire										0.3	0.9	1.3	1.6	1.9	2.1	2.4	2.6	3.0	2
K'un-ming Electric Wire	N.A.	0.5	0.9	1.3	2.2	2.5	2.7	3.0	3.2	3.5	3.7	4.3	4.8	5.4	6.0	6.8	7.6	8.5	7
Mukden Electric Wire	11.6	16.3					1.6	3.3	4.9	5.1	7.2	35.5	56.8	78.1	87.5	98.0	109.8	123.0	55
Shanghai Electric Wire	N.A.	1.3	2.2	3.2	5.8	6.1	6.5	6.8	7.8	9.0	10.3	11.7	13.4	15.3	17.2	19.3	21.6	24.1	18
Cheng-hua	N.A.	0.9	1.6	2.3	4.2	4.6	5.0	5.4	5.8	6.2	7.1	8.1	9.3	10.6	11.9	13.3	14.9	16.7	13
Other b/	N.A.	1.0	0.2	0.4	0.6	0.7	0.8	1.0	1.1	1.3	1.5	3.2	4.5	5.9	6.6	7.4	8.2	9.2	5
Total	11.6	20.0	4.9	7.2	12.8	13.9	16.7	19.5	22.9	25.4	30.7	64.1	90.4	117.2	131.3	147.0	164.7	184.5	100

a. Because of rounding, figures may not add to the totals shown. Figures for pre-Communist China (1938-48) are for approximately the same area as are those for Communist China (1949-61).
b. Estimated at 5 percent of the total.

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Table 16

Estimated Production of Electric Wire and Cable in Communist China, by Type [a]
1955

Type of Wire and Cable	Value (Million 1955 US $)							Percent of Total Value	Volume [b]	
	Hsiang-tan Plant	K'un-ming Plant	Mukden Plant	Shanghai Plant	Cheng-hua Plant	Other [c]	Total		Unit	Quantity
Power wire and cable										
Bare power cable										
Aluminum-conductor, steel-reinforced			3.2			0.2	3.4		mt [d]	5,500
Copper			7.1	1.2	7.3	0.8	16.4		mt	13,600
Total			10.3	1.2	7.3	1.0	19.8	31		
Insulated power cable	0.3	1.4	2.5	2.3		0.3	7.0	11	km [e]	5,700
Weatherproof cable	0.1		1.4	1.2	0.8	0.2	3.7	6	km	19,900
Magnet wire	0.4	0.2	1.8	1.2		0.2	3.7	6	mt	2,350
Building and appliance wire		0.9	3.9	0.6		0.3	5.7	9	km	38,100
Total	0.9	2.6	19.9	6.5	8.1	2.0	39.9	62		
Communications wire and cable										
Control cable			1.4	2.3		0.2	4.0	6	km	900
Telephone and telegraph cable	0.3	0.5	3.5	2.3		0.4	7.0	11	km	2,300
Bare communications wire [f]	0.1	1.2	7.8	0.6		0.5	10.2	16	mt	6,800
Field wire			2.8			0.1	3.0	5	km	60,900
Total	0.5	1.7	15.6	5.3		1.2	24.2	38		
Grand total	1.3	4.3	35.5	11.7	8.1	3.2	64.1	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Table 27, Appendix D, p. 68, below.
c. Other plants are assumed to have the same product mix as the five main plants.
d. Metric tons.
e. Kilometers.
f. Nonferrous.

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Table 17

Estimated Value of Production of Electric Wire and Cable in Czechoslovakia a/
1951-55

Plant	Value (Million 1955 US $)					Percent of Production in 1955
	1951	1952	1953	1954	1955	
Bratislava Electric Cable	13.1	15.9	19.1	22.1	25.4	29.3
Brno Electric Cable	1.3	1.6	2.0	2.3	2.6	3.0
Decin Electric Cable	5.1	6.1	7.4	8.5	9.8	11.0
Kladno Electric Cable	10.1	12.3	14.8	17.0	19.6	22.6
Prague Electric Cable	5.1	6.1	7.4	8.5	9.8	11.0
Topol'cany Electric Cable	2.0	2.5	2.9	3.4	3.9	5.0
Velke Mezirici Electric Cable	4.6	5.5	6.6	7.6	8.7	10.0
Vrchlabi Electric Cable	1.7	2.1	2.5	2.9	3.3	4.0
Vsetin Electric Cable	1.3	1.6	2.0	2.3	2.6	3.0
Zavadka nad Hronom Electric Cable	0.5	0.6	0.7	0.8	1.0	1.0
Total	45.3	54.4	65.3	75.3	86.6	100.0

a. Because of rounding, figures may not add to the totals shown.

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Table 18

Estimated Production of Electric Wire and Cable in Czechoslovakia, by Type a/
1955

Type of Wire and Cable	Value (Million 1955 US $)											Volume b/	
	Bratislava Plant	Brno Plant	Decin Plant	Kladno Plant	Prague Plant	Topol'cany Plant	Velke Mezirici Plant	Vrchlabi Plant	Vsetin Plant	Zavadka nad Hronom	Total	Percent of Total Value	Unit	Quantity
Power wire and cable														
Bare power cable														
Aluminum-conductor, steel-reinforced	1.3	1.3		2.9							5.5	7	mt c/	9,100
Copper				1.0							1.0	1	mt	810
Aluminum			1.0		1.0						2.0	2	mt	2,300
Total	1.3	1.3	1.0	3.9	1.0						8.4	10		
Insulated power cable	6.3	1.3	2.9	3.9	1.5		3.5	0.7	0.5		20.6	24	km d/	16,900
Weatherproof cable	1.3				0.5			0.2	0.1		2.1	2	km	11,000
Magnet wire	2.5			3.9	1.0			0.3		1	8.7	10	mt	5,500
Building and appliance wire	1.3						1.8		0.1		3.1	4	km	21,000
Automobile, aircraft, and tractor wire	1.3										1.3	1	km	11,500
													k	
Total	14.0	2.6	3.9	11.7	3.9		5.2	1.2	0.8	1	44.3	51		
Communications wire and cable														
Telephone and telegraph cable	7.6		4.9	7.8	2.0	0.8	3.5	1.3	1.8		29.7	34	km	9,600
Coaxial cable	2.5				2.9	0.8					6.3	7	km	24,700
Field wire					1.0	2.3		0.7			4.0	5	km	81,100
Hookup wire	1.3		1.0					0.2			2.4	3	km	23,000
Total	11.4		5.9	7.8	5.9	3.9	3.5	2.1	1.8		42.4	49		
Grand total	25.4	2.6	9.8	19.6	9.8	3.9	8.7	3.3	2.6	1	86.6	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Table 27, Appendix D, p. 68, below.
c. Metric tons.
d. Kilometers.

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Table 19

Estimated Value of Production of Electric Wire and Cable in East Germany a/
1938 and 1946-55

Plant	Million 1955 US $											Percent of Production in 1955
	1938	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	
VEB Kabelwerk Koepenick (KWK)	16.8	3.4	3.4	5 1	7.6	10.1	12.6	15.2	16.8	15.2	16.8	17
VEB Kabelwerk Oberspree (KWO)	50.2	20.1	20.1	22.6	22.6	25.1	25.1	27.6	30.1	27.1	30.1	30
VEB Kabelwerk Adlershof (KWA)	1.7	0.3	0.3	0.5	0.8	1.0	1.3	1.6	1.7	1.6	1.7	2
VEB Kabelwerk Meissen (KWM)	15.2					3.0	4.6	7.6	9.1	8.2	9.1	9
VEB Lausitzer Kabelwerk (LKW)	2.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	Negligible
VEB Leitungswerk Plauen (LWP)	3.4	1.7	2.0	2.4	2.7	3.0	3.4	3.5	3.7	3.3	3.7	4
VEB Kabelwerk Schoenow (KWS)	2.2	0.6	0.6	0.6	1.1	1.5	1.9	2.2	2.3	2.0	2.3	2
VEB Kabelwerk Vacha (KWV)	10.4	2.1	2.1	3.1	3.1	3.1	3.1	3.1	3.1	2.8	3.1	3
Other	51.3	14.5	14.6	17.5	19.3	23.9	26.4	30.8	33.8	30.5	33.8	33
Total	153.8	43.5	44.0	52.6	57.9	71.6	79.2	92.3	101.5	91.4	101.5	100

a. Because of rounding, figures may not add to the totals shown.

Table 20

Estimated Production of Electric Wire and Cable in East Germany, by Type a/
1955

Type of Wire and Cable	Value (Million 1955 US $) KWK Plant	KWO Plant	KWA Plant	KWM Plant	LKW Plant	LWP Plant	KWS Plant	KWV Plant	Other c/	Total	Percent of Total Value	Volume b/ Unit	Quantity
Power wire and cable													
Bare power cable d/	0.3		0.6	0.8			0.1		0.9	2.7	3	mt e/	4,500
Insulated power cable	5.8	12.1		1.6				0.3	9.9	29.8	30	km f/	24,500
Weatherproof cable	1.6	0.6				0.6	0.5	0.1	1.7	5.1	5	km	27,300
Magnet wire	2.0	2.2	0.5	0.1		0.2	0.2		2.5	7.6	7	mt	4,800
Building and appliance wire	1.1	1.6	0.4	1.7	0.5	2.0	0.6	0.5	4.2	12.7	12	km	84,500
Automobile, aircraft, and tractor wire					0.3		0.8		0.5	1.6	2	km	14,500
Total	10.8	16.6	1.4	4.2	0.8	2.8	2.3	0.9	19.9	59.6	59		
Communications wire and cable													
Control cable	0.1	2.8	0.3			0.9			2.0	6.1	6	km	1,400
Telephone and telegraph cable	5.0	5.9		4.3					7.6	22.8	22	km	7,400
Coaxial cable		4.8						2.2	3.5	10.6	11	km	41,800
Field wire	0.5			0.4					0.4	1.3	1	km	25,700
Hookup wire	0.5			0.4					0.4	1.3	1	km	12,000
Total	6.0	13.5	0.3	5.0		0.9		2.2	14.0	41.9	41		
Grand total	16.8	30.1	1.7	9.1	0.8	3.7	2.3	3.1	33.8	101.5	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using prices in Table 27, Appendix D, p. 68, below.
c. Other plants are assumed to have the same product mix as the eight main plants.
d. Aluminum-conductor, steel-reinforced.
e. Metric tons.
f. Kilometers.

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Table 21

Estimated Value of Production of Electric Wire and Cable in Hungary a/
1938 and 1946-55

Plant	Million 1955 US $											Percent of Production in 1955
	1938	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	
Cable and Wire-Rope	2.5	1.5	2.0	2.8	3.8	5.1	6.9	9.5	12.8	16.0	19.2	47
Cable and Synthetic Materials	1.6	1.3	1.9	1.3	1.6	2.4	3.2	4.4	6.1	7.6	9.1	22
Electrical Machinery and Cable	3.1	0.6	0.9	1.3	1.7	2.4	3.0	3.7	4.6	5.7	6.8	17
Permel Enamel Wire		0.2	0.4	0.8	1.1	1.5	2.0	2.7	3.6	4.6	5.5	14
Total	7.3	3.6	5.2	6.1	8.2	11.3	15.1	20.3	27.1	33.9	40.6	100

a. Because of rounding, figures may not add to the totals shown.

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Table 22

Estimated Production of Electric Wire and Cable in Hungary, by Type a/
1955

Type of Wire and Cable	Value (Million 1955 US $)						Volume b/	
	Cable and Wire-Rope Plant	Cable and Synthetic Materials Plant	Electrical Machinery and Cable Plant	Permel Enamel Wire Plant	Total	Percent of Total Value	Unit	Quantity
Power wire and cable								
Bare power cable								
Aluminum-conductor, steel-reinforced	1.9	0.5	0.7		3.1	8	mt c/	5,000
Copper		0.5			0.5	1	mt	400
Total	1.9	0.9	0.7		3.5	9		
Insulated power cable	3.8	1.4	1.4		6.6	16	km d/	5,400
Magnet wire	2.9	0.5	1.4	5.5	10.2	25	mt	6,400
Building and appliance wire	3.8	1.9			4.7	12	km	31,600
Automobile, aircraft, and tractor wire		0.5			0.5	1	km	4,100
Total	12.5	4.1	3.4	5.5	25.4	63		
Communications wire and cable								
Control cable		0.9			0.9	2	km	200
Telephone and telegraph cable	5.8	2.7	2.7		11.2	28	km	3,600
Field wire		0.5			0.5	1	km	9,300
Hookup wire	1.0				1.0	2	km	9,100
Field cable, aluminum		0.9	0.7		1.6	4	km	3,000
Total	6.7	5.0	3.4		15.1	37		
Grand total	19.2	9.1	6.8	5.5	40.6	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Table 27, Appendix D, p. 68, below.
c. Metric tons.
d. Kilometers.

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Table 23

Estimated Value of Production of Electric Wire and Cable in Poland
1946-55

Plant	Million 1955 US $										Percent of Production in 1955
	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	
Bedzin Cable and Wire	2.0	2.1	2.2	2.3	2.5	2.6	2.8	3.0	3.4	3.7	6
Polish Cable						9.4	10.1	11.0	12.2	13.4	21
State Cable	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	1
Krakow Electric Equipment Works					10.1	11.0	11.9	13.0	14.3	15.7	25
Ozarow Cable Works					10.1	11.0	11.9	13.0	14.3	15.7	25
Poznan Electric Cable						7.6	8.2	9.0	9.9	10.9	17
Other						2.1	2.3	2.5	2.7	3.0	5
Total	8.8	17.6	30.8	34.4	40.5	44.0	47.6	52.0	57.3	63.0	100

a. Figures are shown for production of individual plants in 1946-50 where such estimates are possible. Because of rounding, figures for 1951-55 may not add to the totals shown.

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Table 24

Estimated Production of Electric Wire and Cable in Poland, by Type [a]
1955

Type of Wire and Cable	Value (Million 1955 US $)									Volume [b]	
	Bedzin Plant	Polish Cable Plant	State Cable Plant	Krakow Plant	Ozarow Plant	Poznan Plant	Other [c]	Total	Percent of Total Value	Unit	Quantity
Power wire and cable											
Bare power cable											
Aluminum-conductor, steel-reinforced	0.4			3.1	3.1		0.3	7.0	11	mt [d]	1,200
Aluminum	0.4						Negligible	0.4	1	mt	450
Total	0.7			3.1	3.1		0.4	7.4	12		
Insulated power cable	0.4	4.0	0.2	2.4	3.1	3.3	0.7	14.0	22	km [e]	11,500
Weatherproof cable	0.7		0.1	1.6			0.1	2.6	4	km	13,700
Magnet wire	0.7	1.3	0.1	3.1	1.6		0.3	7.3	11	mt	4,600
Building and appliance wire		2.7		1.6	1.6		0.3	6.1	10	km	40,800
Automobile, aircraft, and tractor wire				0.8		3.3	0.2	4.2	7	km	38,600
Total	2.6	8.0	0.4	12.6	9.4	6.5	2.0	41.5	66		
Communications wire and cable											
Telephone and telegraph cable	0.6	5.4	0.2	2.4	6.3	4.3	1.0	20.0	32	km	6,500
Bare communications wire [f]	0.2			0.8			Negligible	1.0	2	mt	680
Hookup wire	0.4						Negligible	0.4	Negligible	km	3,700
Total	1.1	5.4	0.2	3.1	6.3	4.3	1.0	21.4	34		
Grand total	3.7	13.4	0.6	15.7	15.7	10.8	3.0	63.0	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Table 27, Appendix D, p. 68, below.
c. Other plants are assumed to have the same product mix as the six main plants.
d. Metric tons.
e. Kilometers.
f. Nonferrous.

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Table 25

Estimated Value of Production of Electric Wire and Cable in Rumania a/
1951-55

Plant	Million 1955 US $					Percent of Production in 1955
	1951	1952	1953	1954	1955	
Boleslaw Bierut Works	0.7	0.9	1.0	1.2	1.3	4
Electrocablul Electric Equipment	10.1	14.2	15.7	17.4	19.5	60
Sarmei Industria Wire	2.5	3.5	3.9	4.4	4.9	15
Electro Banat	3.5	5.0	5.5	6.1	6.8	21
Total	16.9	23.6	26.2	29.0	32.4	100

a. Because of rounding, figures may not add to the totals shown.

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Table 26

Estimated Production of Electric Wire and Cable in Rumania, by Type a/
1955

Type of Wire and Cable	Value (Million 1955 US $)					Percent of Total Value	Volume b/	
	Boleslaw Bierut Works	Electrocablul Electric Equipment Plant	Sarmei Industria Wire Plant	Electro Banat Plant	Total		Unit	Quantity
Power wire and cable								
Bare power cable c/		1.9	1.0	0.7	3.4	11	mt d/	5,900
Insulated power cable		3.9	0.5	1.4	5.7	18	km e/	4,700
Weatherproof cable		1.0		0.3	1.3	4	km	7,000
Magnet wire		1.0		0.3	2.5	8	mt	1,600
Building and appliance wire	1.2	1.0	0.5	0.3	1.8	5	km	12,000
Automobile, aircraft, and tractor wire		1.9	1.0	0.7	3.6	11	km	32,700
Total	1.2	10.7	2.9	3.7	18.5	57		
Communications wire and cable								
Telephone and telegraph cable		3.9	1.5	1.4	6.7	21	km	2,200
Bare communications wire								
Ferrous	0.1				0.1	Negligible	mt	430
Nonferrous		1.0	0.5	0.3	1.8	6	mt	1,200
Total	0.1	1.0	0.5	0.3	1.9	6		
Field wire		1.9		0.7	2.6	8	km	53,600
Hookup wire		1.9		0.7	2.6	8	km	24,000
Total	0.1	8.8	1.9	3.1	13.9	43		
Grand total	1.3	19.5	4.9	6.8	32.4	100		

a. Because of rounding, figures may not add to the totals shown.
b. Value was converted to volume by using the prices shown in Table 27, Appendix D, p. 68, below.
c. Aluminum-conductor, steel-reinforced.
d. Metric tons.
e. Kilometers.

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APPENDIX C

PRODUCT CLASSIFICATION

The breakdown of wire and cable into categories which cover the whole range of cable products but which are still manageable involves loss of precision.* The following categories are considered to be a workable compromise.**

I. Power Cable.

A. Bare Power Cable.

1. Bare power cable includes the following categories: ACSR cable is composed of one or several steel strands twisted together with many aluminum strands. This cable is cheap and strong compared with copper cable, although inferior as a conductor, and is used almost exclusively for the transmission of heavy or high voltage current in certain categories of power cable. In the US, however, this cable is beginning to find use as lead-in wire from the power net to the individual consumer.

2. Copper cable has approximately the same uses as ACSR, but it has been almost completely replaced by ACSR. Copper cable is composed entirely of copper strands twisted to any desired size. Steel-copper or "copperweld," which is a copper-coated steel wire, is included in this category. Also included are copper busbars (bars of copper with a large cross section for carrying heavy currents short distances) and trolley wire.

3. Aluminum cable includes all bare aluminum wire other than ACSR, including aluminum bus bars.

B. Insulated Power Cable.

Insulated power cable includes all portable and stationary (buried or overhead) cable used to carry heavy currents and high

* The categories are formed on the basis of use except for coaxial cable, which has many uses but has a distinctive construction.
** All conductors are copper unless otherwise indicated.

voltages. This cable is insulated with paper, rubber, and varnished cambric (a linen fabric impregnated with varnish). Insulated cable is used where bare cable is not practicable,* as in the powering of portable machines or in the transmission of current underground. This cable is often sheathed with lead or aluminum to make it moisture-proof and armored with steel wire or tape to resist mechanical damage.

C. Weatherproof Wire.

Weatherproof wire is covered with asphalt-impregnated cotton braid or, lately, with plastic to protect it from corrosion by the elements. The covering does not insulate the conductor electrically. Such wire is used to carry power into houses and factories from the power net and for low voltage overhead lines.

D. Magnet Wire.

Rotor and stator windings of electric motors and generators use magnet wire. The wire is made in sizes ranging from small cross-section, single-strand wire to large cross-section strips (rectangular or square) and is insulated with enamel, glass fiber, cotton, asbestos, silk, paper, and other materials, many of which are new synthetic fibers or plastics.

E. Building and Appliance Wire.

Building and appliance wire is used inside buildings for low-voltage circuits such as lighting. This wire is flexible (composed of several strands), is insulated with rubber or plastic, and is often used in conduits. Appliance wire is a flexible cord which is insulated with rubber, usually covered with a cotton braid, and used on low-voltage electric appliances.

F. Automobile, Aircraft, and Tractor Wire.

Automobile, aircraft, and tractor wire is made both for the high-tension engine leads and for the general electrical circuits of aircraft and vehicles other than control cable. The wire is insulated and sometimes armored.

* That is, the bare conductor must be insulated to avoid grounding the current during transmission to the desired outlet.

II. Communications Cable.

A. Control Cable.

Control cable is a multiconductor, the individual conductors of which are insulated with rubber. This cable is used to operate control devices such as those on automatic machinery. Aircraft, guided missiles, and ships use much of this cable to control various electrical devices.

B. Telephone and Telegraph Cable.

Telephone and telegraph cable is a multiconductor cable which usually contains individual twisted pairs for simultaneous conversations. Each conductor is individually insulated with paper. This cable is generally used for large interurban communications networks.

C. Coaxial Cable.

In its simplest form, coaxial cable has a stranded central conductor covered with a polyethylene or similar dielectric over which is braided a copper mesh to form the outside conductor. The outside conductor is insulated, usually with polyvinyl chloride (PVC), and is sometimes jacketed with another PVC layer or is lead sheathed. Coaxial cable can also be air spaced; that is, air replaces the polyethylene dielectric. The inner and outer conductors then are spaced with a helically wrapped insulation or spacers at intervals. Some coaxial cable is semirigid or rigid, with a copper tube forming the outside conductor. Large-capacity cables are constructed by combining several (usually 5 or 6) coaxial tubes in a common covering. Coaxial cable is used for high-frequency current. Television signal transmission, multichannel telephone communications, and radar signal transmission are foremost among the most important uses of such cable. Thus coaxial cable has uses which cut across categories. Because its construction is unique and its uses are so important, however, coaxial cable was considered worthy of separate consideration in this report. No coaxial cable has been knowingly included in other categories.

D. Bare Telephone and Telegraph Wire.

Bare telephone and telegraph wire includes the following categories:

1. Steel wire is a single-strand conductor used for rural telephone or telegraph lines. The wire has poor conductivity and is therefore precluded from long-distance use, but because it is cheap and strong, it is ideal for rural lines with wide-spaced supporting poles.

2. Copper wire which is solid and hard drawn has the same uses as steel wire. Copper is a better conductor than steel, but the comparatively high cost of copper often precludes its use.

E. Field Wire.

Field wire is composed of several strands of copper and steel, usually with the steel strands outnumbering the copper 4 to 3, 5 to 2, or 6 to 1. The steel wire is included for strength. Field wire is insulated with rubber, is covered with a textile braid, and is used either as a single conductor with ground return or, more frequently, in twisted pairs. Field wire is used exclusively by the military for frontline communications.

F. Hookup Wire.

Hookup wire is a plastic-insulated, stranded conductor of small size which is used to connect components in electronic equipment such as radio, television, and radar sets.

G. Aluminum Field Cable.

Aluminum field cable is used by the military behind the frontline operations for the heavier communications load required by supporting operations. The cable is similar to a multipair telephone cable with only a few pairs, usually 4 to 6. The conductors are aluminum. This category was set up to handle such cable separately from field wire because the field cable has aluminum conductors and because its purpose is different.

APPENDIX D

METHODOLOGY

I. Production.

A. Outline of Procedure.

Because of the extreme heterogeneity of wire and cable products, value is the most feasible measure of production. To arrive at the value of production, all wire and cable products first had to be divided into categories which were as homogeneous as possible without being cumbersome in number. A typical size and type of product then was assigned to represent each category. All estimates of production were made in terms of typical products and were valued by the prices of typical products prevailing in the US in 1955.

The estimates of production rest basically on the study of 4 Soviet cable plants and 8 East German cable plants for which considerable data are available. The average productivity of labor in the four Soviet plants was used as a standard by which the output of other plants, both in the USSR and in the European Satellites, was estimated. Estimates were checked by reference to the East German plants and by analogy with US production. It was possible to estimate the production of the Chinese Communist plants without reference to the Soviet or the East German standards for productivity of labor except as a check on the reasonableness of the estimates for Communist China.

B. Inputs.

Table 27* shows the material inputs of representative products of the wire and cable industry in the US and the prices of the final products in 1955.

The representative products were based on typical US requirements for the manufacture of cable. Although a precise representation is difficult to obtain with so few products, it is believed that the estimates of value suffer little error compared with the errors inherent in the sources used as basic data.**

* Table 27 follows on p. 68.
** Continued on p. 71.

Table 27

Inputs of Materials for Representative Products of Electric Wire and Cable with Prices of Final Products in the US
1955

Types and Sizes	Weight (Kilograms) Copper	Aluminum	Steel	Lead	Tin	Insulation	Total	Price (F.O.B., US $)
Power wire and cable								
Bare power cable								
Aluminum-conductor, steel-reinforced		690	310				1,000 a/*	607 a/
Copper (including bus bars) trolley wire, round, AWG b/ 3/0	1,000						1,000 a/	1,205 a/
Aluminum (including bus bars)		1,000					1,000 a/	857 a/
Insulated power cable								
Single-conductor, rubber-insulated, lead-sheathed, AWG 2, 600 volts	306		356	719	0.35	101	1,482 c/	1,220 c/ d/
Weatherproof wire, triple braid, AWG 6	121					111	232 c/	187 c/
Magnet wire, standard enamel, round, AWG 23	989					11	1,000 a/	1,594 a/
Building and appliance wire, rubber-insulated, covered with braid, stranded conductor, AWG 10	48				0.054	42	90 c/	150 c/
Automobile, aircraft, and tractor engine wire, PVC-insulated, e/ stranded conductor, AWG 14	19					10	29 c/	110 c/

* Footnotes for Table 27 follow on p. 70.

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Table 27

Inputs of Materials for Representative Products of Electric Wire and Cable with Prices of Final Products in the US
1955
(Continued)

Types and Sizes	Weight (Kilograms) Copper	Aluminum	Steel	Lead	Tin	Insulation	Total	Price (F.O.B., US $)
Communications wire and cable								
Control cable, rubber-insulated, lead-sheathed, AWG 10, 19 conductors, 600 volts	890		565	1,130	1.01	350	2,936 c/	4,478 c/ d/
Telephone and telegraph cable, paper-insulated, dry core, lead-sheathed, AWG 22, single paper, 0.09 mc, f/ 101 pairs	584		785	1,570		156	3,095 c/	3,088 c/ d/
Coaxial cable (any use) JAN RG-8/U, stabilized polyethylene dielectric, vinyl protective covering, 7 strands of AWG 21, characteristic impedance 52 ohms, approximate loss at 20 mc 0.8 decibels per 100 feet	80				0.09	73	153 c/	253 c/
Bare communications wire								
Steel, solid, AWG 10			1,000				1,000 a/	300 a/
Copper, hard-drawn, round, solid, AWG 10	1,000						1,000 a/	1,500 a/
Field wire WD-1/TT, insulated with latex rubber, textile covering, twisted pair; each conductor has 1 copper and 6 steel wires, copper wire 0.01 inch in diameter and steel wire 0.0095 inch in diameter	0.9		4.54			7.3	12.74 c/	49 c/

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Table 27

Inputs of Materials for Representative Products of Electric Wire and Cable with Prices of Final Products in the US
1955
(Continued)

Types and Sizes	Weight (Kilograms)							Price (F.O.B., US $)
	Copper	Aluminum	Steel	Lead	Tin	Insulation	Total	
Hookup wire, PVC-insulated, AWG 16	11.6					6.8	18.4 c/	105 c/
Field cable, aluminum-conductor, paper-insulated, dry core, lead-sheathed, AWG 22, single paper, 0.09 mc, 6 pair		34		477		40	551 c/	525 c/

a. Inputs in kilograms and price in US $ per metric ton.
b. American wire gauge.
c. Inputs in kilograms and price in US $ per kilometer.
d. Excludes steel armor.
e. Polyvinyl-chloride.
f. Megacycles.

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Inputs of materials vary with the product selected as representative in any category. The error which may be introduced by the selection of a particular product is also believed to be minor in comparison with the errors inherent in the basic data. All inputs of materials could not be included, because of the vast variety of materials used in the industry. Only the most critical and indicative inputs have been included.

The value of production by each country of each category of product was estimated for 1955. The values were divided by the price of the typical product in the US and thus were converted to physical quantities. The quantities so estimated were then converted to quantities of major inputs by the factors shown in Table 27.* Because the product mix is assumed to be the same throughout the years estimated, the physical inputs vary directly with value and may be computed for any year by the use of a ratio of the value in that year to the value in 1955.

Estimates of the labor force were not computed by analogy to production in the US but are merely the totals of estimates for individual plants.

C. Plant Studies.

The Soviet plants Moskabel', Sevkabel', Ukrkabel', and Yerevankabel' were examined exhaustively. It was possible to arrive at estimates of production and of the labor force independently for these plants. These figures on productivity of labor could be used, therefore, as a standard for other plants in the USSR and in the Sino-Soviet Bloc. Information is also available for the eight principal East German plants,** which provided independent estimates. Because the German plants are neither modern nor working near full capacity, these plants could not be used as a standard.

Reports concerning both inputs and production of the four Soviet plants were used. The data on production were converted to physical quantities of the typical products. This conversion was easy when the data on production specified size and either weight or length. When size was not given, size was estimated by noting the use the cable was to serve, any terminology indicative of type and use, or the consumers of the cable.

* P. 68, above.
** See Table 10, p. 37, above.

In effect, two estimates were made, one of inputs, primarily copper and aluminum, and one of production of final products. These estimates were reconciled by using the product mix indicated in the estimates of production and the total volume of production indicated in the estimates of inputs. Total production was converted to value by using the prices of typical products; and the productivity of labor was computed by dividing the value of production in a given year by the labor force, independently estimated, for that year. Figures on the productivity of labor at cable plants in the US were used to check the reasonableness of the estimate. Press reports were the primary source for estimating the changes in the value of production and in the size of the labor force of the plants from year to year.

A procedure similar to that used for the four major Soviet plants was used for the Mukden and K'un-ming Plants in Communist China. The value of production by other Chinese Communist plants in a given year was estimated by analogy to the K'un-ming Plant. The time series was estimated on the basis of the potential for growth of individual plants and the overriding fact that the Mukden Plant will be predominant by 1957 by virtue of a huge program of expansion.

All other plants in the Sino-Soviet Bloc were examined (1) to estimate the labor force for at least 1 year; (2) to estimate the product mix; (3) to ascertain the subordination, location, director, and history; (4) to evaluate the productive capacity of all Soviet plants in relation to the standard of the 4 Soviet plants; and (5) to evaluate the productive capacity of the European Satellite plants in relation to the average standard of all Soviet plants.

Sources who were actually at the plants were used in estimating the labor force whenever possible. Both the labor force and the product mix were checked and, in some cases, were estimated primarily from descriptions of facilities for production, although this type of information is the least reliable. Production was also checked as much as possible by descriptions of facilities for production.

The product mix was estimated on the basis of data on facilities for production, on consumers, on inputs, and on products. The last factor mentioned is the most reliable and productive source of information both for the choice of types of wire and cable and for the weight to be assigned each type of wire and cable. No analogy to the product mix in the US was made in estimating the product mix of the Sino-Soviet Bloc.

The factors considered in estimating the productivity of individual plants in comparison with the Soviet standard were (1) the age and the make of the equipment; (2) the product mix; (3) the state of technology in general, including the training of labor; (4) the evidence of equipment for handling materials; and (5) the year for which the estimate was made. The estimate of productivity was checked whenever possible by information concerning the input of materials and production of final products.

D. Estimates for Individual Countries.

1. USSR.

Soviet production* of wire and cable and the labor force** of the four major plants -- Moskabel', Sevkabel', Ukrkabel', and Yerevankabel' -- which accounted for 48 percent of total Soviet production in 1955 were estimated for 1938 and 1946-55. On the basis of these estimates, an average figure for the productivity of labor at the four plants was computed for the years mentioned above. An index of value of the combined production of the four plants was also calculated for the same years.

Production by each of the other Soviet plants was estimated for a base year*** on the basis of the size of the labor force and the productivity of labor relative to the average productivity estimated for the four major plants. By the use of an index of value of production by the four major plants, estimates of production by the other plants in the base year were extended over the years these plants were in production for 1938 and 1946-50.

Total production of the USSR in 1950 could then be computed by adding production by all plants. The estimate of total production in 1950 was extended over the period 1950-55 on the basis of the index of the value of production.****

This index was derived from (a) a Soviet press release stating that the index of the total value of wire and cable produced in the USSR rose from 100 in 1950 to 180 in 1953 96/; and (b) the

* See Table 11, p. 47, above.
** See Table 10, p. 37, above.
*** A different year for each plant.
**** See Table 3, p. 18, above.

increases in the index of the value of production estimated for the four major plants for 1954 compared with 1953 and for 1955 compared with 1954.

The average output per employee-year in the Soviet wire and cable industry in 1955 was $16,860. This average was used as a standard for measuring the productivity of other cable plants in the Sino-Soviet Bloc except in East Germany and in Communist China.

2. Bulgaria.

The estimate of total production of wire and cable in Bulgaria was derived for the year 1951 by adding the estimated production of the Elprom Cable Plant in that year and one-quarter of the estimated production of the Vasil Kolarov Cable Plant in 1953.* It was assumed that the latter plant did not go into full production until 1953. The distribution of production between the two plants in 1951 was maintained in 1952.

Production in the years 1948-54 was derived from production in 1951 by using the index 97/ shown in Table 3.** The percentage distribution between the two plants in 1953-61 was obtained by deducting the known production of the Vasil Kolarov Cable Plant in 1953 (the base year for that plant) and allocating the residual production to the Elprom Cable Plant. The series for 1954-61*** was based on the percentage increase in 1954 above the level of 1953 -- that is, 10 percent per year.

3. China.

The series for production of wire and cable in China was based on the absolute value of production of individual plants for various years.**** The production of each plant was expanded over the years 1945-61 by using 1957 as a base year. In that year the Mukden Plant is scheduled to produce two-thirds of all production of wire and cable in Communist China./ Because total production could be estimated for 1948 and allocated to (a) Shanghai and (b) the rest of China (excluding Manchuria), 98/ 1948 afforded a second base year.

* See Table 13, p. 49, above.
** P. 18, above.
*** See Table 2, p. 17, above.
**** See Table 15, p. 51, above.
/ The following discussion does not pertain to the Mukden Plant except for the years 1957-61.

The series was extended from 1948 back to 1945 on the basis of an index of the value of production* which was developed from data of the Chinese National Resources Commission (NRC). 99/ The series was completed by assuming a rate of growth in production of 12 percent from 1957 through 1961 and by interpolating between 1948 and the base year for each plant.

4. Czechoslovakia.

The index of the value of production of wire and cable in Czechoslovakia* was based primarily on the years 1949 and 1951. Total production in 1951** was obtained by adding production by all plants in the base year, estimated as if that year were 1951 for each plant. Inasmuch as the years actually estimated covered the small range of years between 1949 and 1953, this procedure does not involve great error, especially because the choice of 1951 -- the middle year -- involves compensating errors.

Total production in 1949 was obtained from the Plan figure of 1,467 million crowns. 100/ Crowns were converted to US dollars on the basis of 50 crowns to $1, the official rate of exchange. 101/ The result appears reasonable when checked by the number of employees in the industry in 1949. 102/

The average annual rate of increase in 1949-51 was about 21 percent. The index was extrapolated backward on the assumption that the earlier annual rates of increase had been larger than that of 1949-51; the annual rate of increase was set at 30 percent for the years 1947-49 and at 40 percent for 1946-47. Production in 1949 was assumed to have returned to the prewar level because of the new plants which started production in 1946-47 and because of the rapid revival of production in the old plants which were damaged only slightly in World War II. The index was extrapolated forward on the assumption that the rate of increase would gradually decline from the rate of 1949-51 because of the diminishing increase in the productivity of labor. The index declines also because there is no indication that the plants are planning major expansion or modernization. The annual rate of increase was set at 20 percent for the years 1951-53 and at 15 percent for 1953-55.

* See Table 3, p. 18, above.
** See Table 17, p. 53, above.

Estimates of production were extrapolated from 1955 through 1961* by assuming that the average annual rate of increase will be 12 percent.

5. East Germany.

Total production of wire and cable in East Germany in 1953** was calculated by adding the estimated production of the 8 major wire and cable plants and production of all other plants, which was estimated at one-half of production of the 8 major plants. 103/

Production in 1938 and from 1946 to 1953 was derived from the series of annual totals of production by individual plants. The series for production by plants was estimated from information on the percentage of the facilities of various plants which survived World War II and on the percentage of capacity utilized in 1953.

The series on production in the years 1953-55 was based on information indicating a planned decrease in production in 1954. 104/ This series was extrapolated from 1955 through 1961* on the assumption of an average annual increase of 9 percent.

6. Hungary.

The index of the value of production of wire and cable in Hungary*** was based primarily on 2 years, 1950 and 1953. Production by each plant was estimated for 1950 and production of the three largest plants was also estimated for 1953.**** From these years the index was extrapolated forward with decreasing annual rates of increase: 25 percent for 1953-54 and 20 percent for 1954-55. For the years before 1950 the index was obtained by adding estimates of production by the individual plants; production by plant was estimated from information on damage during World War II and from other historical data.†

Figures for the years 1955-61* were extrapolated on the basis of the following annual rates of increase: 15 percent for 1955-57, 10 percent for 1957-59, and 5 percent for 1959-61.

* See Table 2, p. 17, above.
** See Table 19, p. 55, above.
*** See Table 3, p. 18, above.
**** See Table 21, p. 57, above.
† See Table 10, p. 37, above.

7. Poland. 105/

Total production of wire and cable in Poland was estimated for 1951* by applying the index of the value of production** to the estimated production of the individual plants in their base years, except in the case of the 3 plants for which no estimates could be made and the 2 plants for which estimates were made for 1946. The 3 plants for which no estimates could be made were combined in the "other plants" category shown in Table 23 and estimated to account for 5 percent of production in 1951. The production of the 2 plants for which estimates were made for 1946 is believed to have increased 5 percent annually during 1946-51. In this manner the total production for 1951 was established. This total was extended to the years 1938 and 1946-55 by means of the index of the value of production. Production during 1956-61*** was extrapolated on the basis of an increase of 10 percent per year, the annual rate of increase during 1953-55.

Estimates of production by individual plants were extended from 1951 through 1955 by using the index of the value of production in order to calculate the labor force in 1955 and the contribution of individual plants to total production in 1955.

8. Rumania.

Total production of wire and cable in Rumania in 1951**** was obtained by adding the estimated production of all wire and cable plants. The total for 1951 was extended to cover the years 1938 and 1946-55 by the use of the index of the value of production shown in Table 3.†

The Rumanian press published the index of actual production for the years 1949-52 and gave a Plan figure for 1955 in terms of a percentage increase over 1950. 106/ From this information the index for 1949-55 was computed. Because production was assumed to have risen rapidly during 1946-49, an annual increase of 80 percent was used for 1946-47 and 1947-48 and 60 percent, for 1948-49. Production in 1938

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* See Table 23, p. 59, above.
** See Table 3, p. 18, above.
*** See Table 2, p. 17, above.
**** See Table 25, p. 61, above.
† P. 18, above.

was estimated at about 1.5 times production in 1946. The series for estimated production shown in Table 25* utilizes this index of the value of production.

Production in the years 1956-61** was estimated by assuming an annual increase of 11 percent, the average increase for the years 1952-55.

E. Cross-Check on Estimates of Soviet Production by Comparison with the US.

As cross-checks on the estimates of production,*** two comparisons of US and Soviet production of wire and cable with that of related products were made to determine whether or not the estimates of Soviet production of wire and cable are of the correct order of magnitude. The two comparisons are of the ratios resulting in each country from (1) the annual value of production of insulated wire and cable, expressed as a percentage of the annual value of production of selected electrotechnical products**** in selected years, and (2) the change in the annual value of production of insulated wire and cable from one year to another, expressed as a percentage of the change in the annual physical production of electric energy in the same years.

These comparisons are meaningful because two economies with comparable production of electrotechnical products in terms of types of products and of total value may be assumed to have similar ratios of the types described above. Comparability was increased by using earlier years for the US than for the USSR. The years selected for the US were, for the first comparison, 1935, 1937, 1947, 1950, and 1951; for the second comparison, the changes between the following

* P. 61, above.

** See Table 2, p. 17, above.

*** Because it is estimated that the USSR contributes two-thirds of the wire and cable produced by the Bloc, a check on the USSR serves also as a check on the Bloc.

**** The electrotechnical items were selected for their technological association with wire and cable. "Technological association" means that in terms of demand the products are complementary to wire and cable; that is, wire and cable is used in some fairly stable ratio to the selected products. The selected products are electric motors, electric generators, power and distribution transformers, electrical integrating instruments, electrical testing equipment, other electrical measuring instruments, commercial radio communications equipment, electronic-type components, radio receiving and transmitting tubes, and telephone and telegraph equipment.

years: 1935 and 1937, 1937 and 1947, and 1950 and 1951. The years selected for the USSR were, for the first comparison, 1947, 1950, 1951, and 1955; for the second comparison, 1947 and 1950, 1950 and 1951, and 1951 and 1955.

In the first comparison the average ratio of the USSR exceeded that of the US in the years selected by 3.5 percent. In the second comparison the average ratio of the USSR was 18.6 percent below that of the US. The second ratio is believed to be less reliable because production of insulated wire and cable in the US actually declined between 1947 and 1950, whereas the annual production of electric energy increased. For this reason the changes in US production between 1947 and 1950 were not used in the second comparison. If the changes in US production between 1947 and 1950 had been included in the second comparison, the average ratio of the USSR would have exceeded that of the US by 10.1 percent.

Although there is no known criterion for evaluating the ratios objectively, it is believed that the disparity between the US and Soviet ratios is small enough in both comparisons to indicate that the estimates of production of wire and cable are of the correct order of magnitude.

II. Trade.

A. East-West.

1. Imports of the Sino-Soviet Bloc from the Free World were based entirely on officially reported exports of the Free World. These reports were checked with CIA reports, which failed to reveal any additional unreported exports. Because wire and cable products are not embargoed, it would appear that the incentive to conceal exports to the Bloc is not strong. Some countries or individual exporters may feel that it is wise not to show a large volume of trade with the Bloc, however, for domestic political reasons and for the sake of good relations with the US, which does not export wire and cable to the Bloc. In addition, countries not belonging to COCOM and therefore not required to report, may have failed to report some exports. For these reasons, even though the supporting evidence is slight, the estimate of imports of wire and cable by the Bloc from the Free World is considered minimal.

2. The pattern of exports by the Sino-Soviet Bloc to underdeveloped countries was estimated largely from press statements and State Department dispatches, together with some information from CIA reports.

B. Intra-Bloc.

The pattern of trade in wire and cable within the Sino-Soviet Bloc was estimated from CIA reports which varied from spot shipments to statistics on trade for entire months or quarters of a year, as in the case of East Germany. Quantitative estimates were not attempted on the basis of such meager information.

APPENDIX E

GAPS IN INTELLIGENCE

1. General.

The major gaps in intelligence concerning the wire and cable industry of the Sino-Soviet Bloc are (a) the lack of actual information on inputs for many wire and cable plants, (b) the lack of information on requirements for wire and cable, and (c) the lack of information on production of cable-making equipment.

2. Inputs.

Although acceptable estimates of the product mix of plants can be made from press releases or other reports of production and sales, the absolute level of production is difficult to estimate accurately without a knowledge of the inputs of materials. Inputs of copper and aluminum are particularly useful because the estimate of total production in terms of value can be accurately checked by knowledge of the conductor metal available.

Reliable information on inputs is available for only a few plants, and this information is 3 or more years old. Recent, precise information on inputs of materials is lacking. The desired information should describe the material accurately as to form, chemical content (as electrolytic versus blister copper or buna versus natural rubber), the end use, and the quantity consumed in a given period of time.

3. Requirements.

It is difficult to evaluate the adequacy of the industry without knowing more exactly requirements of the Sino-Soviet Bloc for wire and cable. The information now available consists primarily of piecemeal statements of requirements for specific projects, frequently couched in a general, qualitative form. Information on broad requirements in quantitative form, either in value or in physical terms, is needed. Requirements of industrial segments of the economy such as the electrotechnical industry or the mining or metallurgical industries would be useful. Requirements of individual countries for specific types of wire or cable regardless of the consumers would be even more useful.

In lieu of such desirable information, statements by persons concerned with the wire and cable industry of the Sino-Soviet Bloc on the demand for products of this industry are useful. Any information concerning consideration of the supply of wire and cable in planning or implementing new projects, particularly military projects, would indicate the degree of success in filling requirements.

4. Production of Equipment.

Although the countries which produce cable-making equipment and, in some cases, the producing plants are known generally, information is lacking on the number of machines of specific types which are produced. Information of this type would aid in estimates of future expansion, of changes in product mix, and of the state of technology. Information on cable-making equipment should include an exact description of the equipment, the quantity being produced, and the final destination of the equipment as well as the location and designation of the manufacturer.

APPENDIX F

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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