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Soviet Ferrous Metallurgy Since 1940
By Edward Ames

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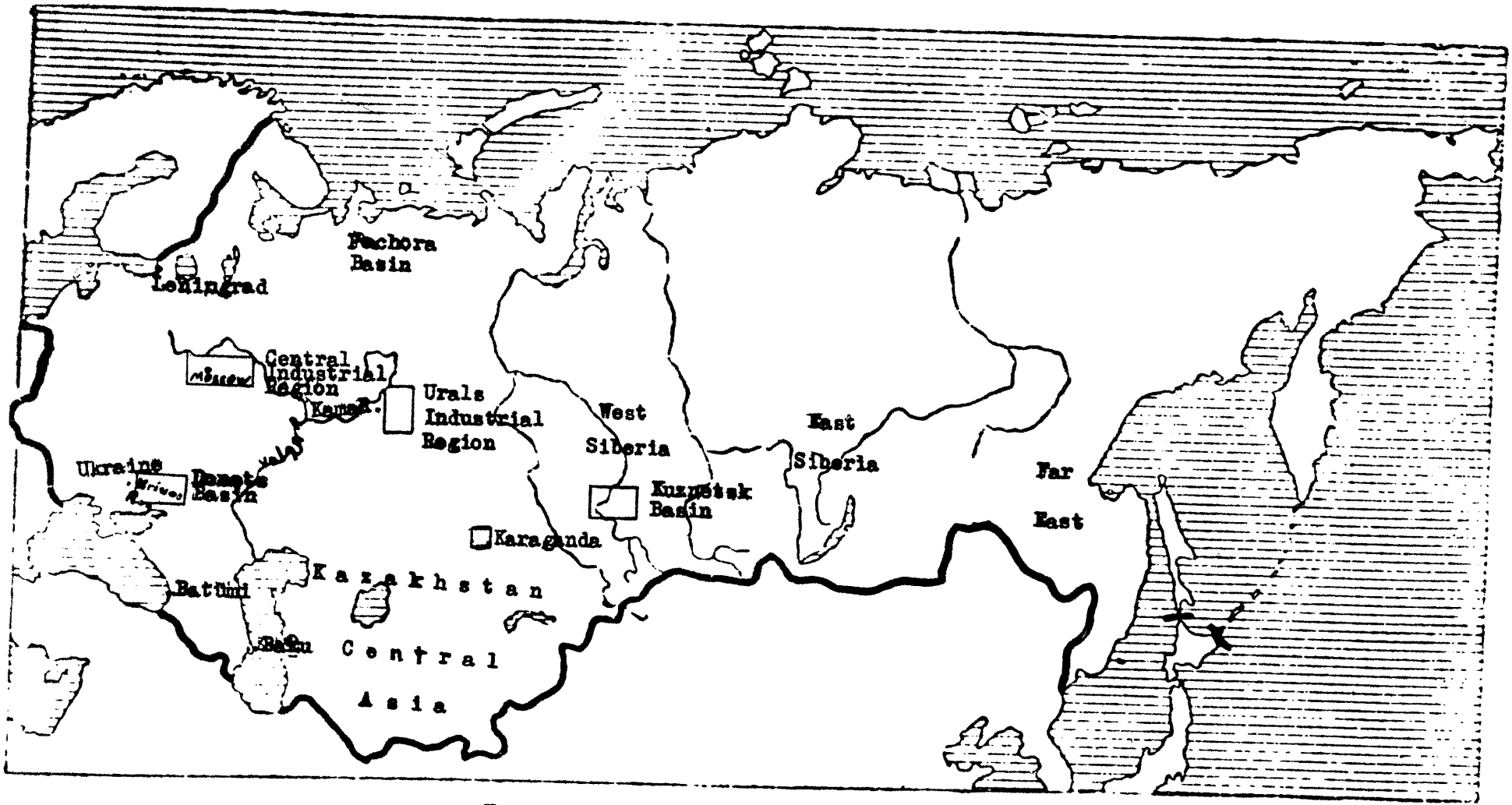

Economic Regions of the U.S.S.R. (postwar frontiers)

August 14, 1951

SOVIET FERROUS METALLURGY SINCE 1940

Edward Ames 1/

Since the industrial and military potential of a country is to a considerable extent dependent on its steel production, a study of the Soviet ferrous metallurgical industry is of considerable importance in an evaluation of present Soviet strength. It is an industry on which information is, by Soviet standards, comparatively plentiful, and it is therefore possible to derive relatively satisfactory statistical information. This paper will be concerned with the course of production since 1940, the course of capital expansion since 1940, and the prospects for further development of the industry.

Ferrous metals production since 1940

Output of ferrous metals is largely concentrated in the plants of the Ministry of Ferrous Metallurgy, but there is also a certain amount of steel and rolled metal produced in the larger machinery plants, which mainly utilize scrap originating in their own basic production processes. It is necessary, therefore, to distinguish statistically between data relating to the Ministry and data relating to the entire industry. In Table 1 data are presented comparing 1940 output with output planned for 1950 under the Postwar Five-Year Plan (1946-1950) as well as with actual output attained in 1950. It appears from this table that although steel and rolled metal production were 1.9 and 3 million tons above plan in 1950, pig iron production as a whole (though not that of the Ministry of Ferrous Metallurgy) was slightly below planned levels. 2/

1/ I am indebted to Professor M. Gardner Clark of the School of Industrial and Labor Relations of Cornell University for assistance on a number of points in this analysis. The conclusions, however, are my own.

2/ For 1940 "hard figures", giving tonnages produced, are available. Relatively good data are available for 1945 and for 1950, relating output in those years to 1940, either for the country as a whole or for particular regions. For other years, estimates must be made on the basis of reported year-to-year percentage changes. Such estimates differ according to whether they are based upon 1945 and "work forward", or upon 1950 and "work backward", since the reported percentage increases are apparently rounded. In this paper, the procedure has been to start with 1950 and "work backward", since the available data for 1945 seem to contain some ambiguity, as a result, again, of rounding operations. If this method be legitimate, the figures for later years are more reliable than those for the middle years of the decade.

Table 1

Soviet Ferrous Metals Output, 1940 and 1950

(In millions of metric tons)

	1940	1950	
	Results	Plan	Results
Pig iron, total	14.9	19.5	19.3
Ministry of Ferrous Metallurgy	14.5	19.1	19.2
Other agencies	.5	.4	.1
Steel, total	18.3	25.4	27.3
Ministry of Ferrous Metallurgy	14.7	20.4	22.6
Other agencies	3.6	5.0	4.7
Rolled metal, total	13.1	17.8	20.8
Ministry of Ferrous Metallurgy	11.1	15.6	17.2
Other agencies	2.0	1.2	3.6

Source: For Ministry of Ferrous metals, statements by Tevosyan, Minister of Ferrous Metallurgy, at the 1946 Supreme Soviet (Zasedaniya Verkhovnogo Soveta, Pervaya Sessiya, 12-19 marta 1946, pp. 142 ff) and in Trud, January 6, 1951. For total USSR - report in Pravda, April 17, 1951 for the increase over 1940; for the 1940 figure, Pavlov, M. A., Metallurgiya Chuguna, Moscow 1948.

Using the 1950 figures and applying to them the reported year-to-year percentage increases in output, it is possible to obtain continuous output series for pig iron, steel and rolled metal over the period 1943-1950, and also pig iron output for 1942 (see Table 2). These data are of interest in indicating the extent Soviet industry was affected by the German occupation of Ukrainian and other areas where metallurgical plants were located, as well as the extent to which recovery has taken place.

Table 2 *

Soviet Ferrous Metals Output, 1940-1950

(In millions of metric tons and in percent of previous year)

	Pig iron		Steel		Rolled metal	
	Percent of previous year	Tonnage	Percent of previous year	Tonnage	Percent of previous	Tonnage
1940		14.9 a)		18.3 a)		13.1 a)
1941	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1942	n.a.	4.9	n.a.	n.a.	n.a.	n.a.
1943	117 e)	5.7	n.a.	8.6	n.a.	6.8
1944	131 d)	7.4	129 d)	10.6	128 d)	7.3
1945	121 c)	8.9	115.6 c)	12.3	118 c)	8.5
1946	112 b)	11.3	109 b)	13.4	113 b)	9.6
1947	114 b)	12.7	109 b)	14.6	115 b)	11.0
1948	122 b)	15.2	128 b)	18.7	128 b)	14.1
1949	119 b)	16.5	125 b)	23.2	127 b)	17.9
1950	117 b)	19.3 a)	117 b)	27.3 a)	116 b)	20.8 a)

n.a. Not available

* This table is computed by working backward from 1950 figures, using year-to-year percentage increases, which are obviously rounded. The margin of error is thus greatest for the early years. As a check turn to Table 3 giving eastern output, which equalled total output in 1943. The error resulting from this backwards computation is .1 million tons for pig iron, .4 million tons for steel, 1.2 million tons for rolled metal. In this table, the 1943 figures are taken as equal to "East" in Table 3, and the others are obtained by working backwards from 1950. The effect of this procedure would seem to be an underestimate of output for the years 1944 on, with a decreasing margin of error for the later years.

a) See Table 1.
b) Kuzminov, Voprosy Ekonomiki, No. 6, 1950, p. 30
c) Pravda, February 17, 1946
d) Planovoe Khozyaistvo No. 1, 1945
e) Voznesenski, Voennaya Ekonomika SSSR v Period Otechestvennoi Voiny, Moscow, 1948, p. 142.

A somewhat more detailed analysis of the output data is given in Table 3, which is based in part upon a regional breakdown of pig iron and steel output in 1940, given as an appendix to this report. 1/ The German occupation affected the so-called Southern and South-Eastern regions as well as part of the Central Region. The Southern region consists largely of the Ukraine, together with adjacent areas in Russia proper (R.S.F.S.R.). This was the principal single producing area before the war and utilized the Krivoi Rog and Kerch iron ore deposits. The Southeast region includes the steel plants in the Stalingrad and Lipetsk areas, the Center steel plants in the Moscow and Leningrad areas, plus pig iron capacity in the Tula area. Owing to the distribution of plant capacity, the German invasion led to the loss of all the pig iron capacity of the South, Southeast and for a very short period, of the Center, but apparently not the steel capacity of the Center. At the same time, a large part of the movable steel equipment in the Center (particularly the Moscow and Leningrad plants) was evacuated to the Urals at the end of 1941. In 1942 and 1943, therefore, output of the Center was negligible, but for varying reasons: pig iron output was low because of damage to the plants near Tula, and steel output very small because of the evacuation of equipment and personnel. In 1944, however, output began to increase in these areas as well as in the South, where rehabilitation work began almost as soon as the areas had been recaptured from the Germans.

In the non-devastated sections, the so-called "East" is the area in which the bulk of war-time increases in production took place. In 1940, this output was largely in the Urals but additional capacity was located in a large plant in West Siberia (the Kuznetsk metallurgical combine in Stalinsk), a steel plant in Komsomolsk (on the Amur River in the Far East), and very small steel-marking capacity in several East Siberian towns. During the war, pig iron output declined somewhat in the Kuznetsk plant, presumably because of transportation shortages which forced the plant to use local ores and thus presented technological problems, and because of a coke shortage. On the other hand, steel output was increased 2/ when two small steel plants began operations, one in Uzbekistan and one in Kazakhstan. The bulk of wartime increases in output, however, occurred in the Urals.

Since the end of the war, the bulk of the increases in production have occurred in the devastated areas as might have been expected. In 1950, pig iron output in the devastated areas and in the East was 8.2, and 2.2 million tons greater, respectively, than in 1945. In the case of steel eastern output was 3.5 million tons and South and Center output 4.1 million tons greater in 1948 than in 1945.

1/ Rolled metal data are less satisfactory than for others, and it has not yet proved possible to compile a table for rolled metal to compare with those for pig iron and steel.

2/ In 1945, steel output was 40 percent greater than in 1940 (Pravda May 11, 1951, and Kuzminov, Voprosy Ekonomiki 6, 1951). Tonnage data have not been computed.

Table 3

Soviet Pig Iron and Steel Output, 1940-1950 - By Regions

(In millions of metric tons)

	Pig iron					Steel		
			East					
	Total a)	Devastated areas b)	Total c)	Kuznetsk d) plant	Urals a)	Total a)	South and Center b)	East
1940	14.9	10.6	4.3	1.5	2.8	18.3	11.9	6.3
1941								
1942	4.9	-	4.9					
1943	5.7	-	5.7			8.6	-	8,6
1944	7.4	1.1	6.3			10.6	1.6	9.0
1945	8.9	2.1	6.8	1.3	5.5	12.3	2.5	9.8
1946	11.3	4.4	6.9			13.4	3.4	10.0
1947	12.7	5.7	7.0	1.5	5.5	14.6	4.0	10.6
1948	15.2	7.2	8.0	1.6	6.4	18.7	6.6	12.1
1949	16.5					23.2		
1950	19.3	10.3	9.0	1.8	7.2	27.3		

a) See Table 2.

b) As indicated by asterisked footnote in Table 2, this estimate probably underestimates total output beginning in 1944 but to a decreasing extent. In terms of the methods used in preparing this table, the error is concentrated in the data for the devastated areas; actually output in 1944 in these areas was probably higher and hence recovery rates slower after 1944 than is indicated in this table.

c) Eastern output, in percent of 1940, was given for 1943 in Voznesenski, op. cit. p. 80, for 1944 in Izvestiya, April 1, 1945, for 1945 in Pravda, May 15, 1950, for 1947 in Trud, August 30, 1948.

d) Urals and Siberian output for 1945, 1946 and 1950 are based on Pravda, May 11, 1951, and Kuzminov, Voprosy Ekonomiki No. 6, 1951; for 1947 and 1948 on Trud, December 31, 1948 and Pravda, March 5,. 1949.

It was shown in Table 1 that although steel and rolled metal output in 1950 were considerably above plan, pig iron output was slightly below plan. There are two possible explanations for this situation. In the first place there is some direct evidence that the Soviet Union is importing pig iron for finishing from the satellites, and in the second place scrap availability has made possible the increase in productivity. Normally, the Soviet Union uses relatively little scrap in steel manufacture. The reason would seem to be that since industrialization is a fairly recent development in the Soviet Union there is no large pool of metal goods in existence from which scrap may regularly be drawn as has been the case in older industrialized countries. For example, the relative size of the railroad system is such that steel rail is not forthcoming in nearly as great amounts for scrap purposes as in the United States or West European countries. In addition, the inventory of automobiles is much smaller and obsolescence proceeds much further prior to scrapping than in the United States. Before the war, Soviet steel production was not much greater than pig iron production and during several years in the mid-1930's it was actually less. It is, therefore, of interest to examine the ratio of steel production to pig iron production over the past decade, as shown in Table 4. 1/

Table 4

Soviet Steel Output as a Percentage of Pig Iron Output

1940-1950

Year	Ratio		Year	Ratio
1940	1.22		1946	1.19
1941	n.a.		1947	1.14
1942	n.a.		1948	1.23
1943	1.51		1949	1.41
1944	1.43	Plan	1950	1.30
1945	1.38	Actual	1950	1.41

It is not surprising that this ratio should have increased during the war, when large quantities of scrap from the battlefields and devastated areas was becoming available. What is more surprising is that the ratio should have dropped beginning in 1945, and that, having dropped until 1947, it should then have begun to rise again.

1/ These figures differ from actual ratios used in the open-hearth furnaces because a part of Soviet pig iron is used for purposes other than steel-making (e.g. castings, ferro-alloys, etc.), imports of pig iron are available, and some pig iron is used in Bessemer and Thomas convertors (5.9% of the total).

This circumstance suggests that considerable imports of pig iron from the satellites became available, or that a "secondary scrapping period" took place in the devastated areas. If the latter interpretation be correct, then many enterprises (and especially railroads) in these areas resumed operations immediately after the war using damaged equipment and received replacements only beginning in 1948, at which time the damaged equipment was scrapped. It is not now possible to give any quantitative evaluation of the relative importance of these factors. In terms of short-run output prospects, however, it would appear likely that scrap is not now forthcoming in the same volume as in the past. In the Soviet Union, the trade unions are stressing scrap collections as a major activity and in the satellite countries scrap collections are receiving much more publicity than in the recent past. These circumstances suggest a scrap shortage which may, for the immediate future, retard the increase in steel output.

Capital construction since 1940

Capital construction over the past decade has gone through several stages. First, at the outbreak of the war, capital construction was drastically reduced. 1/ Second, when it became clear that the Germans would occupy the southern industrial area, it was decided to evacuate as much equipment as possible and to set it up in the East, chiefly in the Urals. In addition, a certain amount of net new construction was undertaken. 2/ This construction was, in general, limited to projects which had either been begun before the war or which had been planned as part of the Third Five-Year Plan. An indication of the volume of capital construction in ferrous metallurgy is given in Table 5, which estimates Soviet output of metallurgical equipment.

Output of metallurgical equipment stopped completely for a time in late 1941, partly because one of the largest plants (in Novokramatorsk in the Ukraine) was evacuated in face of the German advance, and partly because the other (the Urals Machinery Plant (Ukalmashzavod) in Sverdlovsk) was converted to tank production but production was resumed in 1942. Obviously most increases in ferrous metallurgical output in the East in 1942 and 1943 came about through the use of evacuated equipment rather than the use of newly manufactured equipment. By 1944, output of metallurgical equipment was above the prewar level. The series in Table 5 is oncomplete because of uncertainty as to what actually happened in the industry in 1947. The 1947 plan called for a 66 percent increase in output and during the first three quarters, output was 21, 61 and 6 percent respectively, greater than during the corresponding quarters of 1946. It may be that there was a delay in completing new plant capacity or that such capacity as was actually completed was used for other purposes (defense, equipment for the atomic energy program, etc.).

1/ Voznesenski, op. cit., pp. 33 ff.
2/ Klimenko, KI, Uralski Promyshlenny Raion, Moscow 1945, pp. 26, 29.

Table 5

Soviet Production of Metallurgical Equipment, 1940-1950

	In metric tons	In percent of 1940	In percent of previous year
1940	28,000 a)	100	
1941			
1942	3,500	13	227 b)
1943	8,000	28	400 c)
1944	30,000 c)	107 c)	
1945	(32,000)d)	114 d)	
1946	(44,000)d)	157 d)	140 e)
1947	48,700	174	d)
1948	94,500	338	194 e)
1949	120,000	429	127 e)
1950 Plan	102,900 a)	370	
1950 Actual	134,400	480 f)	112 e)

a) Notkin, A.I., Ocherki Teorii Sotsialisticheskogo Vosproizvodstva, Moscow, 1948, p. 282.

b) Voznesenski, op. cit., p. 142. Strictly speaking, refers to blast furnace equipment only and the tonnage data are illustrative only.

c) In nine months of 1944, output was three times as great as in all of 1943, and for the year as a whole it was above prewar. The figures given are illustrative only. Gatovski, Ekonomicheskaya pobeda sovetskogo Soyuza, Moscow, 1946, p. 10211.

d) The 1947 plan called for a 66 percent increase over 1946. It was not completed and no reports seem to have been published concerning realized increases. The figures given here are illustrative. It is quite possible that output in 1947 was less than in 1946 as a result of conversion of plant to other purposes (defense, atomic energy program, etc.).

e) Kuzminov, Voprosy Ekonomiki No. 6, 1951.

f) Pravda, April 17, 1951.

The extent of rehabilitation of capacity and net capital construction over the past decade may be estimated on the basis of the following reasoning. The output of blast and open hearth furnaces depends upon two factors: the number of days they are in operation per year, and the output per furnace per day. The former factor is almost a constant in Soviet practice. The latter is measured by two coefficients: one measuring the number of cubic meters of blast furnace volume required to produce one ton of pig iron per day, and the other the number of tons

of steel produced per square meter of open hearth furnace floor space per day. The smaller the blast furnace index or the larger the open hearth furnace index, the more intensively is the equipment in question used. In 1949, the index of blast furnace utilization was 18 percent better than in 1940, and that of open hearth furnace utilization was 24 percent better than in 1940. 1/ Disregarding changes in the number of idle days of furnaces, Soviet metallurgical capacity in 1940 and 1949 and gross capital construction in 1941-1949 have been calculated in Table 6 below.

Table 6

Soviet Metallurgical Capacity, 1940 and 1949, and Gross Capital Construction 1941-1949

(In millions of metric tons)

	Pig iron	Steel
Actual 1949 output	16.5	23.2
Output of 1949 plant at 1940 efficiency a)	14.0	18.7
Minus wartime output increases in East	2.5	3.5
Minus prewar output in East	4.3	6.3
1949 capacity of plants in South, Southeast and Center, at 1940 efficiency	7.2	8.9
Actual 1940 output of these plants	10.6	11.9
Minimum capacity not yet rehabilitated, 1949 at 1940 rates of efficiency,		
in tonnage	3.4	3.0
in percent of prewar capacity	32.	25.
Gross capital construction 1941-1949, in tonnage capacity of plant, at 1940 efficiency		
Wartime Eastern Corporation	2.5	3.5
Rehabilitation, 1943-1949	7.2	8.9
of which, in 1943-1944 b)	2.3	2.8
and in 1945-1949	4.8	6.1
Total	9.7	12.4

a) Taking into account the changes in efficiency in blast and open hearth furnace utilization given in source cited in footnote 1.

b) Planovoe Khozyaistvo, No. 5, 1948, pp. 36-7.

1/ Zasedaniya Verkhovnogo Soveta SSSR, 12-19 Yuniya 1950 g., p. 72. By the end of 1950 the improvement was 25 and 33 percent, respectively. (Pravda, April 17, 1951)

If this reasoning be admissible, only 70 percent of the prewar blast furnace capacity and 75 percent of the prewar open hearth furnace capacity of the devastated areas had been put back into operation in 1949. These figures are maximum estimates since they are based upon the assumption that there has been no completion of new capacity in the East since 1945.

Assuming that there was no increase in the efficiency of utilization of plant from 1949 to 1950, corresponding estimates for 1950 may be made. In 1950, pig iron output was 30 percent greater than in 1949 and steel output 28 percent greater. 1/ If efficiency remained constant, such increases would indicate 88 percent restoration of blast furnace, and 96 percent restoration of open hearth furnace capacity 2/, a total of 9.2 million tons of pig iron and 11.3 million tons of steel capacity. 3/

The foregoing computations have been based upon the assumption that there has been no net addition to ferrous metallurgical capacity in the East. The Five-Year Plan spoke of new plants to be built in the Leningrad area, near Orsk in the southern Urals, in the Caucasus, near Kursk, and expansion of steel capacity in the Uzbek and Kazakh plants. No reports seem to have been published concerning most of these plants since about 1948, although the report by the Central Statistical Administration on the results of the Five-Year Plan published April 17, 1951, state that production of ferrous metals "has been organized"--whatever that may mean--in the Caucasus. It is, therefore, not clear whether construction has continued at all since about 1948, or on what scale. Moreover, there have been no reports of completions of blast furnaces or open hearth furnaces in the Urals or Siberia. Since the Soviet press ordinarily reports such completions, and since there have been a few reports of progress in the construction of the Caucasian plants, it is not unreasonable to suppose that there have been no actual completions especially in view of the analysis just completed concerning rehabilitation.

1/ Pravda, February 1 and 3, 1951.

2/ Bolshevik, No. 21, 1946 indicates that the postwar Five-Year plan was intended to complete the rehabilitation of 10 million tons of pig iron and 9.8 million tons of steel capacity. It is clear that these figures must represent cumulative rehabilitation rather than rehabilitation for the period 1946-1950, since according to Table 6 the Soviets would otherwise have planned to rehabilitate more capacity than existed in the first place.

3/ Since the figures for 1950 are more tentative than those for 1949, no effort has been made to include them in Table 6.

Thus an analysis of the course of capital construction and rehabilitation in Soviet ferrous metallurgy leads to the following conclusions:

(1) Increases in output from 1940 to 1950 are the result of two factors:

(a) An increase in the efficiency of utilization of equipment
(b) Wartime capital construction in the East

(2) Although the Ukraine, and perhaps the devastated areas as a whole, produced more in 1950 than in 1940 1/, the increase was achieved through better utilization of equipment rather than raising the amount of equipment above prewar levels. It is probable that rehabilitation is only just now being completed.

(3) Although output in the East has increased since 1946, such increases are explainable in terms of better utilization of equipment rather than by increases in plant capacity.

Prospects for further development of the industry

In his much quoted speech of February 1946, Stalin stated that "at the end of three or four five year plans", the Soviet Union was to achieve an output of 50 million tons of pig iron and 60 million tons of steel. The figures he used are those he had earlier used in his report to the XVIII Congress of the Communist Party in 1939, and were designed to give the Soviet Union the same per capita consumption of these products as the United States had in 1929. As part of their original objective, of "overtaking and surpassing the leading capitalist countries", they have lost a part of their significance, particularly in view of expanded Soviet population and of a much increased United States output. They are, however, the only indication now available as to Soviet long-run objectives. It is reasonable to ask whether they are attainable.

In the period from 1943 to 1950, Soviet pig iron output increased from 5.7 to 19.3 million tons and steel output from 8.3 to 27.3 million tons, representing an average annual increase of 1.9 and 2.4 million tons, respectively. A part of this increase did not represent net new construction, since a part of the facilities were only in a partly destroyed condition. On the other hand, the ability of the metallurgical equipment industry to supply a construction program has steadily grown. Assuming that the increase in production can continue on its present course with no acceleration, output of pig iron by 1965, would equal 47 million tons and output of steel 63 million tons. In order then for the Soviet Union to reach Stalin's targets by 1946, it would seem that it need only maintain its present rate of annual increases.

1/ Trud, February 25, 1951.

A statement of this kind is in no way a prediction, and to project a seven-year series for an additional fifteen years will cause the statistican's blood to run cold in his veins. There is no convincing analysis which indicates in any other sense that the program can be realized. At the present time, there have been complaints in the Soviet press about perennial shortages of adequate coking coal, about difficulties in the use of many of the ores which would have to be used in the realization of the program, about problems in the long-hauls of ores and coking coal which must even now be undertaken. The achievement of a program such as this implies that resources will be available to the ferrous metallurgical industry both for output and for expansion. It is not clear that this will be the case. During the period preceding the last war, Soviet investment in ferrous metallurgy declined in terms of current rubles beginning in 1936, and some authorities hold that if the current rubles are deflated by a cost index the decline set in much earlier. In a period of war threat, Soviet investment moved away from basic industry to fabricating industry (i.e. defense equipment). In the event of continued international tension, the same may occur and indeed may have already occurred. In any case, the calculation just made serves to place in somewhat better focus the effort which must be made to achieve Stalin's long-run objective.

Appendix

There are presented below two tables giving Soviet pig iron and steel output, respectively, in 1940, by regions. The main reason for presenting them is that they may be of use to students in the field and represent a compilation of isolated and miscellaneous sources, which may not otherwise be readily available.

Soviet Pig Iron Output by Regions, 1940

(In millions of metric tons)

Total	14.9
Ukraine	9.2 a)
RSFSR	5.7 b)
Total Occupied Areas	10.625 c)
South and Southeast	10.133 d)
Ukraine	9.183 a)
RSFSR	.950 e)
Central Occupied RSFSR	.492 f)
East	4.276 g)
West Siberia	1.500 h)
Urals	2.776

a) Bolshaya Sovetskaya Entsikopediya, Vol. 15 p. 803.

b) Kamenitser, S. E., and Urinson, M.S., Rossiiskaya Federatsiya v Novoi Pyatiletke, Moscow, 1947, p. 29.

c) Planovoe Khozyaistvo No. 5, 1947 p. 38; Stal No. 3, 1947, p. 195 gives this output as 71 percent of total. It is given here as 71.3 (see footnote g).

d) Pravda, December 31, 1948, gives this output as 68 percent of total.

e) By subtraction. Includes Taganrog, Kerch and presumably the Lipetsk plants, which under 1940 regional classification becomes "Southeast" rather than "Center" as previously.

f) By subtraction. Includes Tula plants.

g) Belyunov, C.A., ed., Planirovanie na zheleznodorozhnom transporte, Moscow, 1948, Part I, p. 66, gives this output as 28.7 percent of total.

h) Clark, M. G., Some Economic Problems of the Soviet Iron and Steel Industry, Harvard PhD thesis, unpub., p. 239, indicates Siberian output of 1,490,000 tons in 1939. This figure is taken as an approximation of 1940 output.

Soviet Steel Output by Regions in 1940
(In millions of metric tons)

	Total	Output which during the war was in Occupied Territory	Output which during the war was in Unoccupied Territory
Total	18.3 a)	10.6	7.6
RSFSR	9.6 b)	2.0	7.6
Ukraine	8.6 c)	8.6	-
South and Center	11.9 d)	10.6	1.3
South	10.6 e)	10.6	-
Ukraine	8.6 c)	8.6	-
RSFSR	2.0	2.0	-
Center	1.3 f)	-	1.3 f)
East	6.3	-	6.3

a) See Table 1. The sub-classifications add up only to 18.2 presumably because of "rounding operations" made by the Soviet writers from whom the data are taken.
b) Kamenitser, S. E., and Urinson, M. S., Rossiiskaya Federatsiya v novoi pyatiletke, Moscow, 1947, p. 29.
c) Bolshaya Sovetskaya Entsiklopediya, Vol. 15 p. 803.
d) 65 percent of total. Stal No. 3, 1947.
e) 58 percent of total, Pravda, Dec. 31, 1948.
f) The plants in the Center which were actually captured by the Germans (Tula and Kosaya Gora) are believed to produce only pig iron. The Lipetsk plant, beginning in 1940, was apparently classified as "South" rather than "Center" in Soviet statistics.