CONFIDENTIAL

DEPARTMENT OF STATE

Office of Research and Intelligence

No. 3300

THE JAPANESE IRON AND STEEL INDUSTRY: A STUDY OF THE MAGNITUDE OF THE DISARMAMENT PROBLEM

Description

A preliminary analysis of the present capacity of the iron and steel industry in Japan as compared with peacetime capacity, and a discussion of the problems of excess capacity in the light of future steel requirements.

Washington, D. C.

May 20, 1946

Copy No. 46

CONFIDENTIAL

TABLE OF CONTENTS

LIST OF TABLES

PREFACE

The purpose of this study is to ascertain the present status of the iron and steel industry in Japan and to determine how much of it is needed for a peaceful economy in that country.

The amount considered to be needed will differ according to the interpretation of the "normal" peacetime level, however. To reduce the Japanese steel industry to a 'normal' level may mean either to leave the amount of plant and equipment necessary to meet civilian requirements during the years of preparation for war and of war itself, or to reduce the industry to the level it had reached before the Japanese Government decided on a planned and intensified expansion of the iron and steel industry to serve its then conceived military aims. The latter method implies a revision to the level of no later than 1936, because it was in 1936 that the Japanese made the iron and steel industry a central part of their war economy. In 1937 the Iron and Steel Industry Control Law was promulgated. This law, in contrast to earlier iron and steel legislation such as the Iron Manufacturing Fostering Law of 1917 and the pertinent parts of the Important Industries Law of 1931, initiated a policy of strict control and direction of iron and steel output which led through various phases to the establishment in 1940 of the Iron and Steel Control Association.

Japan's iron and steel mills were damaged relatively little by the war and their failure to produce according to plan was due primarily to the difficulties posed by transportation and raw material problems. Actual disarmament, therefore, may take place in the following three ways:

1) Through dismantling of plants.
2) Through restriction of the supply of raw materials by strict import controls.
3) Through the two aforementioned methods simultaneously applied to the same or to different segments of the industry.

This study does not offer a detailed statement of the meaning of the various disarmament levels to Japanese consumers nor does it examine the reconstruction problems of recovery from war shortages and disrepair. The discussion of the probability of iron and steel exports and of the payment problems connected with imports for the Japanese iron and steel industry is left for future studies.

The basic statistical sources used in this study are the Seitetsugyo Sanko Shiryo (Reference Data on the Iron Manufacturing Industry, published by the Bureau of Mines of the Japanese Ministry of Commerce and Industry in 1937), and data collected by the Pauley Reparations Mission and the US Strategic Bombing Survey.

Reference is also made to the following reports dealing with the topic of this study:

Department of State, Office of Financial and Development Policy: Heavy Industry in Japan, August 27, 1945, provisional draft.

Foreign Economic Administration, Enemy Branch: An Estimate of Steel Consumption in Non-Military Needs in Post-Surrender Japan, July 6, 1945.

Far Eastern Commission, Committee No. 1, Reparations, Interim Reparations Removal Program for Japan. No. C1-001, 30 March, 1946

Aide-Memoire, submitted by the British Embassy in Washington, D.C. to the Far Eastern Commission, FEC 058, May 10, 1946.

SUMMARY

The Japanese iron and steel industry was built up with the help and protection of the Japanese Government, which through successive laws promulgated between 1917 and 1945 exercised increasing control over the industry.

At the end of World War II, Japan proper had sufficient capacity to produce an estimated 5.6 million metric tons of pig iron, 11.7 million tons of steel ingots, and 9.8 million tons of finished steel. These amounts, by comparison with earlier figures, indicate a reduction of capacity through war damage of about 15 percent for pig iron, 18 percent for steel ingot, and 12 percent for finished steel production. All war damage in the steel industry is, however, easily repairable.

Japan was never able to produce iron and steel at full capacity; on the contrary, actual production at all times lagged considerably behind capacity. This situation resulted mainly from a shortage of supply of the necessary raw materials and was aggravated during the war years by a partial breakdown of the transport system, caused by the destruction of the ferry system between Hokkaido and northern Honshu and by the bombardment of ships carrying raw materials for the industry on the Inland Sea and outer sea-lanes.

In spite of increased production of indigenous ores, Japan always imported iron ore from Korea, the Philippines, Malaya, and Manchuria. The low quality of her domestic ores makes continued imports necessary. A similar situation obtains with respect to coke. The metallurgical coal of Hokkaido and northern Kyushu is suitable for coking, but only when used in a mixture of 30 percent of imported and 70 percent of

domestic coal; only in the emergency of the war did the Hokkaido industry rely entirely on indigenous coal.

The supply situation in manganese and chromium is slightly better, although some imports will probably be necessary. Imports of tungsten, nickel, tin, and molybdenum will also continue to be necessary; cobalt and vanadium may be available in sufficient quantities for the most important requirements. Limestone is abundant in Japan proper.

Various agencies have made estimates of the amount of iron and steel necessary annually for a peacetime Japanese economy, excluding iron and steel consumption of the Army, Navy, and Air Forces and of industries serving them. The Office of Financial and Development Policy of the Department of State arrived at a future consumption figure of 2.25 million tons of finished steel, while the Division of Japanese and Korean Economic Affairs of the Office of Economic Security Policy of the Department of State estimated in an interim plan future requirements of finished steel at around 2.96 million tons and in a later long range plan at around 2.4 million tons. The British Government set the future civilian consumption of ingot steel[1/] at 3.5 million tons, while the Enemy Branch of the Foreign Economic Administration estimated that the postwar requirements of finished steel will be around 1.3 million tons. In a reconsidered estimate based on the experience of three periods--1926-1930, 1931-1936, and 1937-1944--the present study submits a future possible consumption of no more than 2.7 million tons of finished steel, 3.4 million tons of ingot steel, 1.5 million tons of pig iron and 1.9 million tons of scrap. About 4.2 million tons of coal, including 2.5 million tons of coking coal, are also needed.

1/ The British paper refers only to ingot steel. Varying with the amount of loss in conversion, it is estimated that 3.5 million tons of ingot steel will provide about 2.5 to 2.8 million tons of finished steel annually.

If Japan is permitted to produce these requirements, it will have to secure substantial amounts of the auxiliary materials from abroad, but will need only 27.6 percent of the finished steel capacity which existed at the end of the war, 29 percent of the then existing ingot capacity, and probably only 26.8 percent of the pig iron facilities; the remaining capacity constitutes excess.

Several considerations will influence the disposition of such excess capacity. If geographical location near an important raw material becomes decisive, the plants in the coal regions of northern Kyushu and Hokkaido, the capacities of which are nearly sufficient to meet Japan's future requirements, may be preserved. Different decisions will be made if proximity to the consumer or transport conditions alone are controlling. Again, the relative technical advantages or disadvantages of open hearth or electric furnaces may suggest changes in the proportion between them. Labor supply has proved to be no insurmountable difficulty numerically, but the availability of skilled workers has constituted a lasting problem for the Japanese industry. Finally, the solution of the Zaibatsu problem will enter into the decision on the possible survival of a plant. It seems, however, that the Zaibatsu problem, on account of its magnitude, calls for a solution independent from the question of elimination of excess capacity of plants, perhaps along the lines suggested by the American Mission on Japanese Combines, which recommends total elimination of all Zaibatsu power and monopolistic organization of any kind in Japan.

THE JAPANESE IRON AND STEEL INDUSTRY: A STUDY OF THE MAGNITUDE OF THE DISARMAMENT PROBLEM

I. PRESENT CAPACITY OF THE IRON AND STEEL INDUSTRY

A. Capacity by Type of Steel

At the end of the war, Japan had sufficient iron and steel capacity[1] to produce an estimated 5.6 million metric tons of pig iron, 11.7 million tons of steel ingots, and 9.8 million tons of finished steel. In the last year of the war, as shown in Table I, as a result of war damage, the Japanese iron and steel industry suffered a reduction of about 15 percent in pig iron capacity, 18 percent in steel ingot capacity, and 12 percent in finished steel capacity.[2]

Table 1. IRON AND STEEL CAPACITY, JAPAN PROPER, 1944 AND 1945
(in 1,000 metric tons)

	1944	End of War
Pig iron	6,600	5,600
Steel ingots	13,700[a]	11,700[a]
Finished steel	11,100	9,800
Rolled steel	8,600	7,700
Other steel[b]	2,500	2,100
Coke[c]	17	13

a. Includes Bessemer steel.

b. Includes forgings, castings, and special steel products.

c. Coal through-put daily.

Source: Data submitted to the Pauley Reparations Mission(hereafter cited as Reparations Mission) and the US Strategic Bombing Survey, Basic Materials Section (hereafter cited as USSBS).

1/ Throughout this report, "capacity" means maximum effective capacity.
2/ "Finished steel" as used in this paper includes rolled steel, castings, forgings, and special steel.

B. Extent of War Damage

As shown in Table 2, the major concentration of Japan's iron and steel industry is at the huge, integrated works of Nippon Seitetsu KK at Yawata in northern Kyushu. The Yawata works at the end of the war had 37 percent of Japan's steel rolling capacity. The plant suffered only slight damage during the war. Its pig iron capacity, which in 1944 was 2,190,000 metric tons, decreased in the last months of the war to 2,100,000 tons; its steel ingot capacity was reduced by 185,000 tons during 1944 and the first eight months of 1945. Although the Yawata works is the largest iron and steel plant in Japan, the island of Honshu had 70 percent of Japan's steel ingot capacity at the end of the war. On Honshu, the largest concentration of steel capacity was in Tokyo, followed by Kobe, Kawasaki, Osaka, and Hirohata.

Hokkaido ranked third in iron and steel capacity at the end of the war. Shikoku, the fourth of the main islands of Japan, has no known iron or steel manufacturing plants.

It is apparent that the war has crippled the facilities of Japan's iron and steel industry to only a moderate degree; however, relatively heavy damage was registered in the following plants:

1) The Nippon Seitetsu plant at Kamaishi, where, between the end of 1944 and the time of the surrender, the capacity of the open hearth works was reduced by 52 percent, the capacity of the pig iron works by 61 percent, and that of the rolling mills by 64 percent.

2) The Nippon Kokan works in Kawasaki, where capacity decreased, during the same period, by 38 percent in the pig iron works, by 67 percent in the open hearth mills, and by 17 percent in the rolling mills.

3) The steel mills of Nippon Seiko KK at Muroran, Hokkaido, which lost about 40 percent of their capacity in this period.

4) The open hearth installations of the Sumitomo Kinzoku Kogyo works at Wakayama, which lost 42 percent of their capacity in the last eight months of the war

5) The integrated works of Nakayama Seikosho KK at Osaka and of Amagasaki Seitetsu KK at Amagasaki, which were shut down in 1944. Both plants had suffered damage by bombing and spillage.

The ingot steel mills and the rolling mills of Nippon Seitetsu KK at Osaka were moved to Korea.1/

C. Repairability of War Damage

These figures indicate considerable damage in some of the iron and steel plants, but it is stated by at least one source that all damage could be repaired within six months or, at the latest, a year.2/

Table 2.. CAPACITY OF IRON AND STEEL INDUSTRY AT THE END OF THE WAR BY AREA, JAPAN PROPER[a]
(in thousand metric tons)

Area	Pig Iron	Steel Ingots[b]	Rolled Steel[c]	Coke[d]
Hokkaido	1,137	839	180	1.7
Wanishi	1,137	300	180	1.7
Muroran	-	512	-	-
Others	-	27	-	-
Honshu	2,121	8,113	5,666	3.8
Tokyo	-	1,236	108	-
Kobe	-	865	787	-
Kawasaki	576	848	940	-
Osaka	365	601	280	-
Hiroshata	700	600	450	2.5
Amagasaki	128	550	384	-
Yokohama	71	380	516	-
Kamaishi	235	287	380	0.4
Wakayama	-	144	-	-
Nishijima	-	141	-	-
Ayuma	-	122	-	-
Kyoto	30	90	-	-
Fuji	-	64	-	-
Oshima	-	45	-	-
Kawaguchi	16	-	-	-
Others	-	2,140	1,821	0.9
Kyushu	2,355	2,744	2,721	7.4
Yawata	2,100	2,507	2,373	7.4
Kokura	255	161	217	-
Others	-	76	131	-
Total Japan Proper	5,613[e]	11,696	8,567	12.9

a. Based on data submitted to Reparations Mission
b. Includes Bessemer steel
c. For 1944. Does not include forgings, castings, and so-called special steel products
d. Coal through-put daily, based on data submitted to Reparations Mission.
e. To this total may be added 285,000 metric tons of sponge iron and 30,000 metric tons of charcoal pig iron; all capacities as of the end of the war.

1/ Reparation Mission and USSBS
2/ USSBS

D. Theoretical Capacity vs. Production

Within a short time, then, Japan could restore its wartime iron and steel capacity, if it were left free to do so. This, however, does not mean that it would actually be able to produce at full capacity. Even in peak years full capacity was never reached. In 1939, pig iron production was 3,179,000 tons while capacity was about 5,767,000 tons; steel ingot production amounted to 6,694,000 tons, while approximate capacity was 10,721,000 tons; and rolled steel production reached 5,548,000 tons, while capacity was near 8,513,000 tons.1/ Even during the war years, production at capacity was never fully attained. Available figures on Japan's wartime capacity and production of steel ingots show that from April 1941 to March 1945 an average of only 57 percent of the available steel capacity was utilized. In the twelve months from April 1944 to March 1945, only 43 percent of the steel capacity was used.

The gap between actual output and capacity during the war years was not due to a crippling of plants. The major cause for the failure to utilize full capacity seems to have been the shortage of supply of the necessary raw materials for the iron and steel industry, which at all times made production at full capacity impossible. Secondly, the gap between capacity and production is explained by the partial breakdown of the transport system, caused by the destruction of the ferry system between Hokkaido and northern Honshu, with immediate consequences for the steel industry in that area, and by the bombing of the ships carrying the raw materials for the industry on the Inland Sea and outer sealanes.

E. Raw Materials for Iron and Steel

An analysis of iron and steel capacity has to take account of Japan's raw material position. A review of the supply of the basic materials

1/ USSBS

necessary for iron and steel production reveals the stringent position in which the Japanese iron and steel industry is placed.

1. Iron Ore. Domestic production of iron ore was never sufficient to meet the demands of Japanese iron and steel production. In the years between 1930 and 1936, Japan proper produced an average of 367,000 tons of iron ore annually and had to import a yearly average of 2,479,000 tons of ore. Although Japan was able, especially during the war years, to increase its domestic ore production to almost double the 1936 amount of 621,000 tons of ore, it still had to import in the years from 1939 to 1944 an average of 3,936,000 tons of ore. Japan's dependence on imported ores was due not only to a shortage in quantity of ores, but also to the low qualities of the indigenous minerals. Imports came mainly from China, Korea, the Philippines, Malaya, and Manchuria. Japan will undoubtedly continue to rely on imports of ores. Attempts to improve the iron ore situation by using the domestic iron sands have, at least during the war years, not led to any great successes. Twenty companies tried to utilize these sands; six reported small progress, which was, however, not of any commercial significance.[1]

2. Coke. A similar situation prevails with regard to another basic material, coke. Most of Japan's bituminous coal is of low grade and not suitable for coke. Only some of the coal in Northern Kyushu and in Hokkaido is satisfactory for coking. But even these better grades were usually used only in mixtures of at least 30 percent North China Coal and 70 percent domestic coal. Only in the emergency of the last war years did the Nippon Seitetsu plant at Wanishi rely entirely on Hokkaido Coal.[2] Imports of better grades of coal will, therefore, still be necessary.

1/ FEA, Long-Range Control of Japanese Rearmament, August 9, 1945. It is especially the presence of titanium which makes the Japanese iron sands unsuited for iron production.

2/ USSBS, Interrogation No. 504, Fujiwara Ginjiro.

3. Manganese and Chromium. Japan is in a better supply position in regard to manganese and chromium. The Japanese have recently been able to develop their manganese ore production considerably. Ore production increased steadily from 43,535 metric tons in 1933 to 130,000 tons in 1939 and 400,679 in 1944. However, imports were relatively high, too, at least until 1940. Japan imported 117,120 tons of manganese ore in 1933, 223,061 tons in 1939, and 125,000 tons in 1940. Imports decreased from 80,000 tons in 1941 to 20,000 tons in 1943; this decrease, however, may have been due to a shortage of transportation facilities or to supply out of stockpiles rather than to increased national production.1/

Similarly, there was an upward trend in domestic production of chromium ores. Production amounted to 19,997 tons in 1933, 44,638 tons in 1939, 53,550 tons in 1940, and 81,481 tons in 1944. During the same period imports dropped from 58,464 tons in 1940 to 33,000 tons in 1943 and 20,000 tons in 1944.2/

Imports of manganese and chromium ores will still be necessary in the future especially since the domestic mines may be exhausted soon. The limited substitutability of manganese and chromium for each other in the steel manufacturing process, however, lessens the seriousness of a shortage limited to one of these minerals.

4. Tungsten. Domestic production of tungsten ore in Japan was at all times lower than imports. Production until 1938 was under 100 tons per year, while imports averaged around 800 tons annually. Between 1940 and 1944 average yearly production of tungsten ore amounted to 818 tons,

---

1/ Japanese Report to Reparations Mission on Manganese Ores.
2/ Japanese Ministry of Commerce and Industry, Exports and Imports of Japan Proper, 1940 and 1941. According to the Pauley Reparations Mission Report, however, imports rose; Pauley gives the 1941 import figure as 37,000 tons, and the 1943 import figure as 50,000 tons. (Reparations Mission on chromium ore production.)

while annual imports averaged around 2,862 tons. Imports may, therefore, still be necessary in the future.

5. Nickel, Tin, and Graphite. Japan proper produces only very small amounts of nickel and tin; most of Japan's requirements for these metals have to be met by imports. Moreover, all of Japan's tin deposits are of low grade. Japan's graphite deposits are equally poor. Crystalline graphite of crucible grade, important in steel manufacturing, has been imported largely from Ceylon and Madagascar.1/

6. Molybdenum. Molybdenum ore production in Japan proper is not sufficient to meet domestic needs; it has been and must continue to be supplemented by imports. Highest imports were in 1939 and 1940, when 4,246 tons and 5,078 tons respectively were imported; however, some of this molybdenum may have been stockpiled. Imports dropped to 275 tons in 1941 and rose to 900 tons in 1944. Domestic production rose only in the last three years of the war to the not very significant output of 82 tons in 1942, 176 tons in 1943, and 398 tons in 1944. Moreover, these totals apparently include low-quality grades to which the Japanese industry resorted when imports and stockpiles became deficient.

7. Cobalt. The relatively small amounts of cobalt consumed in Japan were provided by imports and small-scale domestic production. It is believed that domestic mines could probably meet the most important requirements if necessary.2/

8. Vanadium. No data on the vanadium supply in Japan are available as yet, but it is believed that there is no deficiency of vanadium.

1/ REF-XL5416, October 1944.
2/ Ibid.

Requirements and production are only a few hundreds tons a year.

9. Limestone. Limestone is the principal material used as a flux. There has never been a shortage in the supply of this material in Japan.

10. Summary of Supply Position. From the foregoing it is evident that Japan has to rely on imports of practically all raw materials needed in the manufacture of iron and steel. Substitution by intensified domestic production is not possible. The volume of imports of raw materials permitted to Japan will therefore by itself go far to determine the degree of utilization of Japan's iron and steel industry.

II. ESTIMATES OF PEACETIME IRON AND STEEL REQUIREMENTS

In order to establish the amount of iron and steel necessary for a peaceful Japanese economy in the light of past Japanese experience, reference may be made either to iron and steel consumption before the China Incident, i.e., the years up to 1937, or to civilian consumption during the militant phase after 1937. In either case total requirements are reduced by the elimination of iron and steel consumption by the Army, Navy, and Air Forces, as well as by industries serving them. On the other hand, the growth of population in Japan proper since these years must be taken into account.

A. Estimate of the Office of Financial and Development Policy of the Department of State[1/]

This study gives consideration to consumption before actual war preparations began and takes 1936 as the representative year for Japanese iron and steel consumption in peacetime. On the basis of an analysis of Japan's national income, it is estimated that 40 percent of

---

1/ Department of State, Office of Financial and Development Policy, Heavy Industry in Japan, 27 August 1945 (Provisional draft)

the heavy industrial production in that year was used for military purposes. The paper recommends, therefore, the general limitation of heavy industry to about 60 percent of 1936 levels in order to give Japan enough heavy industry to support the civilian economy and to allow a reasonable rate of growth. Applying this three-fifths formula to finished steel, of which Japan consumed an estimated 3.8 million metric tons in 1936, postwar finished steel requirements would be estimated at about 2.25 million metric tons annually. It may be questioned, however, whether the year 1936 is in fact representative for peacetime steel consumption. During this year expansion of the iron and steel industry for war purposes was already apparent and, even apart from war preparations, 1936 was a year of unusually great activity in all fields of industry.

B. Two Estimates of the Division of Japanese and Korean Economic Affairs of the Office of Economic Security Policy, Department of State

1. Interim Plan. The Division has suggested as an interim plan that Japan be allowed to retain sufficient steel ingot capacity to produce 3.7 million metric tons, which is the peacetime ingot requirement indicated by the study. This estimate is based on the average annual consumption of 4.4 million tons of ingot steel during the five-year period from 1932 to 1936. If it may be assumed that 25 percent of this output was used for military purposes, the average annual civilian consumption, at a time when Japan's population was about 68,000,000 was 3.3 million tons. If this consumption figure is adjusted to the present population of 75,000,000 people, 3.7 million tons of ingot steel seem to be required. On the basis of the ratio between finished steel and ingot steel prevalent at the chosen period, this estimate would allow for 2.96 million tons of finished steel.

2. Long-Range Plan.- In a more recent statement outlining the reduction of the Japanese industrial war potential, the Division proposes that "peaceful needs should be defined substantially as the standard of living prevailing in Japan during the years 1930-1934 (i.e., average Japanese per capita consumption during those years)". In those years, average consumption[1] amounted to 2.2 million tons of finished steel. Corrected for growth in population, this means a present peaceful need of 2.4 million tons of finished steel. The figure is, however, only an approximation. If, for instance, the suggested limitation of future shipbuilding[2] is accepted, average steel consumption for shipbuilding will be 54,000 tons lower than in the period of 1930-1934, when it amounted to a yearly average of 198,000 tons. On the other hand, the estimate does not take into consideration future exports which still may be needed to pay for imports. From 1930 to 1934, Japan exported an average of 353,000 tons of finished steel annually, mainly to her colonies.[3] For the future, exports must be expected to be much less, say about 80,000 to 100,000 tons of finished steel, as they will serve only to facilitate imports needed to maintain the 1930-1934 standard of living. The estimate will also be somewhat modified by the fact that some of the steel used in 1930-1934 was used for military purposes which are no longer permissible. This amount must be deducted from the estimate; however, this reduction will probably be more than offset by the increased requirements of steel for construction and repair necessary to establish 1930-1934 standards.

1/ ORI Report No. 2815, The Place of Foreign Trade in the Japanese Economy, Vol. II, January 1946, p. 43. Consumption includes the steel consumption of (a) Machinery and iron-working industries, (b) construction, (c) railroads, (d) shipbuilding, (e) "other uses", as in mining, petroleum, gas and water supply, and in sundry unspecified applications.

2/ See II, D, footnote 1 on p. 13.

3/ ORI Report No. 2815, p. 40.

It seems, therefore, justified to say that the long-range plan of the Division envisages future requirements of no less than 2.4 million tons of finished steel annually, which in turn calls for 3 million tons of steel ingots if the 1930-34 conversion rate between ingot and finished steel again obtains.

C. Estimate of the British Government

An Aide-Memoire submitted by the British Embassy to the Far Eastern Commission proposes that Japan's civilian consumption of steel be set at 3.5 million tons of ingot steel per year,[1] which would allow for the production of about 2.5 to 2.8 million tons of finished steel, depending on the conversion rate between ingot and finished steel.

D. Estimate of the Foreign Economic Administration

The Foreign Economic Administration (FEA) tried to arrive at a reasonable peacetime consumption figure by studying "the general magnitude of demand in the years 1917-1925," using different base years for various steel consumers. It arrived at an estimate of 1,327,000 metric tons of finished steel for possible postwar requirements.[2] Table 3 itemizes these requirements by consumer.

Table 3. FEA ESTIMATE OF JAPAN'S POSTWAR REQUIREMENTS OF FINISHED STEEL

Railways	278,000 metric tons
Shipbuilding	64,000 " "
Engineering and construction	400,000 " "
Machinery and iron industry	300,000 " "
Mining	30,000 " "
Petroleum, gas, water works	30,000 " "
Other	225,000 " "
Total	1,327,000 metric tons

1/ Aide-Memoire, transmitted by the British Embassy in Washington, D. C. to the Far Eastern Commission, FEC 058, May 10, 1946. The basis for the estimate was not made available

2/ Foreign Economic Administration, Enemy Branch, An Estimate of Steel Consumption in Non-Military Needs in Post-Surrender Japan, July 6, 1945

The FEA estimates appear to be too low for several reasons. The study apparently used consumption figures of rolled steel only, leaving out the other kinds of finished steel, such as forgings, castings, and special products. Another weakness results from the use of incomplete statistics in the study. It is based on the 1937 Seitatsugyo Sahko Shiryo, which is defective, probably because of incomplete reporting by consumers. Beyond these general criticisms, additional arguments must be raised against the individual estimates of the FEA paper. With the exception of the railroads every item should be revised upward. The railway estimate of FEA projects a future consumption of 278,000 tons of steel yearly. Yet the steel consumption of Japan's railroads has tended to decrease since 1925. Although the railroads consumed an annual average of 292,000 tons of steel between 1926 and 1930 and an average 238,000 tons between 1931 and 1935, their requirements diminished to 224,000 tons yearly between 1937 and 1941, and fell still further during the war years in spite of the fact that the Japanese population increased by 16 million people between 1926 and 1944. It is possible that increased amounts of finished steel will again be required to repair war damage and make greater improvements in operating equipment. However, accurate data concerning such requirements are not available. Simply on the basis of the average annual per capita consumption of 0.272 tons of steel between 1937-1944; adjusted for the present Japanese population of 75,000,000 people; Japanese railroads may be expected to require 204,000 tons of steel annually rather than 278,000 tons as the FEA report suggested.

On the other hand, the figure of 64,000 tons for steel requirements for commercial shipping is too low. If the suggestions with respect to

merchant shipping in Japan now before the Far Eastern Commission are accepted, Japan's commercial shipping would require annually about 144,000 tons of steel.1/

FEA's estimate of essential steel consumption after the war in engineering and construction is patterned after the annual average consumption of steel in this sector of the Japanese economy during the years 1926-1930 rather than 1931-1935, on the explicit assumption that in the latter years steel was already used by these industries for "war preparation demands." Future requirements are set at 400,000 tons of steel annually. This figure does not allow for the growth of population; the necessary adjustment would bring it up to 542,000 tons. It must also be pointed out that the increase in steel consumption from 1931 to 1935 can be attributed only to small extent to war preparations. It rather is mainly explained by the growth of population, by the increased use of steel in construction generally, and by intensified industrialization, such as the development of the rayon industry and the development of machinery industries. The average steel consumption of those years seems therefore a more appropriate indicator than the earlier period chosen by FEA, especially when the present additional needs due to war damage are considered. Average annual steel consumption in the years between 1931 and 1935 was 696,000 tons of steel; if this figure were corrected according to the increase in population, postwar requirements would be placed at 780,000 tons of steel rather than FEA's 400,000 tons.

1/ A plan is now being discussed to permit Japan to construct new ships up to an annual aggregate tonnage of 80,000 gross tons and to retain enough facilities to keep a fleet of 3,000,000 gross tons. The average life span of a ship is presumed to be 20 years, and a fleet of 3,000,000 gross tons is believed necessary to keep commercial shipping alive. New ships will be of no larger size than 5,000 gross tons and will serve the inter-island and Asiatic trade. (See Far Eastern Commission, Committee No.1, Reparations, Interim Reparations Removal Program for Japan No. C1-001, March 30, 1946.) Conversion of Volume of shipping in gross tons to weight is made according to the formula FEA suggests: for new ships it is gross tons times .545 plus 10 percent. For upkeep of the existing fleet it is (gross tons times .545 plus 10 percent) times 3 percent. (See FEA loc.cit. pp 7/8)

The same argument applies to the FEA estimate on future steel needs in machinery and iron works. But even if it is accepted that 1926-1930 offers a better pattern than 1931-1935, on the assumption that Japan will be less industrialized than in the latter period, correction should be made for growth in population. The estimate would then appear to be 456,000 tons of steel rather than 371,000 tons.

The choice of 1926-1930 as the base period is more fortunate in the case of future steel consumption in petroleum, gas, and waterworks. The higher consumption of steel in this sector of the economy after 1930 was due to the increased oil storage during those years, which will probably not be permitted in the future. Owing to the availability of cheap electricity, gas works are not as important as waterworks, which will undoubtedly be the most important consumer of the three. Considering the increase in population since the late twenties, future needs in this field may be estimated at 43,000 tons per annum.

For steel consumption in the field of mining, FEA again prefers the pattern of the years 1926-1930, claiming that the thirties were already years of war preparation. Yet the period of 1930-1935 can hardly be so classified. The intensified mining activity during those years, with the consequent greater consumption of steel, may continue to be necessary for civilian purposes, considering that Japan will need the scarce minerals her soil offers now even more than before, since imports will be more difficult. The period from 1930 to 1935 seems, therefore, to be a better base period than the twenties. The average yearly steel consumption in the early thirties was 69,000 tons of steel; this amount, with correction for growth of population, would suggest an estimate of 83,000 tons for future annual steel requirements in mining.

Similarly, it may be doubted whether 1926-1930 is really a better base period for an estimate of future steel requirements for such miscellaneous items as nails, bolts, screws, etc. But even if this base period is accepted, the increase in population should be considered and the estimate for future steel needs should be revised upward to 300,000 tons yearly.

If the revisions suggested were actually made, then the estimated total of Japan's future civilian steel consumption, following the FEA categories, would amount to no less than 2,000,000 metric tons of steel annually.

E. Reconsidered Estimate

Tables 4 and 5 give the total consumption of finished steel during three different groups of years, each representative for a definite economic phase of the Japanese steel industry. The period from 1926 to 1930 immediately preceding the passing of the Important Industries Law of 1931 was one in which heavy industry was just beginning to be developed consciously; 1931-1936 was a period of increased industrial expansion which served primarily peaceful aims; and 1937-1945 was a period of industrial activity devoted to war. Table 6, derived from Table 5, presents the statistics on Japan's civilian consumption of steel after 1937. The average annual consumption for each group of years may be taken as a basis for estimates of Japan's requirements for finished steel in a peaceful economy. In order to allow for the changes in population over the years, per capita consumption of steel for each period has been computed and multiplied by the present population figure of 75,000,000.

Since the three periods represent different phases of Japan's industrial development, these estimates are indexes of steel requirements for three different degrees of industrialization in Japan. The average

civilian consumption of the last period may serve as an example of what the Japanese themselves considered enough steel for civilian purposes in an era dedicated to war.

On the basis of the average finished steel consumption of the first period, corrected for changes in population, Japan's finished steel requirements amount to 2.6 million tons; on the basis of the data of the second period, requirements amount to 2.9 million tons. It should, however, be noted that these figures are slightly too high because these consumption averages contain small but increasing amounts used for military purposes not to be allowed in the future. On the basis of the statistics on civilian consumption for the third period, corrected for the change of population, Japan's requirements would amount to no more than 2.7 million tons of finished steel.1/

1/ Table 7 shows consumption of finished steel in 1934 by consumer groups; Table 8 shows finished steel consumption by civilian consumers in 1938; and Table 9 shows finished steel consumption by military consumers in 1938. Although the classification of some categories in Table 7 and Tables 8 and 9 is different, direct comparison for merchant shipbuilding is possible. In 1934 shipbuilding required 330,000 tons of steel. It can be assumed that the required material was mainly used for merchant ships, since the "scrap and build" program for commercial shipping was actively carried out in that period. Steel consumption for merchant shipbuilding in 1938 (i.e., 327,000 tons) is only somewhat less than in 1934 and can still be presumed to serve largely civilian purposes, especially since the Navy's requirements for the same year were listed separately as 575,000 tons of steel (see Table 9). There is no doubt that with the outbreak of World War II Japanese merchant shipping, like all the other services, contributed heavily to the Japanese war effort; but in view of the fact that Japan, has to replace and to repair her lost and damaged merchant ships and in view of the importance of commercial shipping for Japan's peacetime economy, steel for merchant shipbuilding has been treated as a civilian requirement in this study and is included in the above estimates of Japan's future steel requirements. This procedure seems justified also in light of the fact that steel requirements for merchant shipbuilding were generally of the same magnitude during the periods of 1931-1936 and 1937-1944, with the exception of the last war years, when the increased steel requirements for merchant shipbuilding must be attributed to military purposes alone. It should be noted, however, that at present recommendations have been made to the Far Eastern Commission to limit Japanese merchant shipping to a volume which would probably require no more than 144,000 tons of steel annually. (See Section II, D.)

If we allow for a downward revision of the second estimate of requirements for the reasons given above, the estimates based on the last two periods approach each other, and 2.7 million tons may be taken as a sound estimate for Japan's civilian requirements for finished steel. Japan's steel capacity may be limited accordingly, unless a somewhat higher degree of deindustrialization is wanted and the first estimate, with a downward revision for military consumption, is accepted.

Table 4. AVAILABILITY AND CONSUMPTION OF FINISHED STEEL IN JAPAN PROPER, 1926-1936
(In 1,000 metric tons)

Year	Net Supply of Finished Steel[1]	Total Disappearance[2]	Rolled Steel[3]	Forgings[4]	Castings[4]	Special Steel[4]
1926	2,061	2,049	1,937	24	42	10
1927	2,074	2,058	1,979	25	43	11
1928	2,363	2,350	2,250	32	48	19
1929	2,628	2,620	2,512	38	49	21
1930	2,124	2,135	2,048	27	39	21
Average 1926-30	2,250	2,242	2,153	29	44	16
1931	1,725	1,707	1,643	17	31	16
1932	2,048	2,052	1,946	32	43	31
1933	2,767	2,848	2,664	64	63	57
1934	3,155	3,162	2,946	71	80	65
1935	3,522	3,504	3,252	72	100	80
Average 1931-35	2,643	2,654	2,490	51	63	49
1936	3,996	n.a.	n.a.	n.a.	n.a.	n.a.

n.a. = not available

1/ Production plus imports less exports

2/ Where total consumption exceeds net available supply, consumption seems to have drawn on existing stockpiles

3/ Includes military consumption and imported steel

4/ These are estimated on the basis of 100 percent consumption of the net available supply of forgings, castings, and special steel products as indicated in reports by the Japanese.

Source: Seitetsugyo Sanko Shiryo, 1937, pp. 5 and 122; Japanese data submitted to Reparations Mission.

Table 5. JAPAN PROPER: TOTAL CONSUMPTION OF FINISHED STEEL IN THE FISCAL YEARS 1937-1945 1/

(In 1,000 metric tons)

Year	Total	Rolled	Forgings	Castings	Special Steel
1937	6,159	5,856	97	155	51
1938	5,073	4,554	133	237	149
1939	5,729	5,099	156	275	199
1940	5,099	4,307	175	209	408
1941	5,454	4,527	185	248	494
1942	4,881	3,806	218	252	605
1943	5,554	4,289	206	315	744
1944	4,761	3,107	179	317	1,158
Average 1937-44	5,338	4,443	168	251	476
First quarter of fiscal year 1945	730	469	25	49	187

Source: USSBS

1/ Fiscal year = April 1-March 31 (e.g. 1937 = April 1, 1937 to March 31, 1938)

Table 6. JAPAN PROPER: CIVILIAN CONSUMPTION OF ALL FINISHED STEEL IN THE FISCAL YEARS 1937-1945 1/

(In 1,000 metric tons)

Year	Total	Rolled	Cast	Forged	Special
1937	4,242	4,070	95	41	36
1938	2,933	2,684	152	54	43
1939	3,254	2,982	166	58	48
1940	2,660	2,399	160	60	41
1941	2,412	2,170	134	58	50
1942	2,233	1,971	136	60	66
1943	2,432	2,092	154	74	112
1944	2,081	1,777	150	55	99
Average 1937-44	2,780	2,618	143	58	62
1st quarter 1945	334	278	23	8	25

1/ Includes railroads, merchant shipbuilding, industrial facilities, public works, machinery and machine tools, manufactured goods, miscellaneous. It is assumed that some consumption for war purposes is included in these figures. Railways, shipbuilding and many other industries were working for war purposes and civilian consumption simultaneously, and no detailed breakdown between materials allocated for any one of these uses seems feasible.

Source: USSBS.

Table 7. JAPAN PROPER: CONSUMPTION OF FINISHED STEEL IN 1934

(In 1,000 metric tons)

Machinery and iron-working industries	1,003
Construction	792
Railroads	319
Shipbuilding	330
Other uses	604
Total[1/]	3,048

Source: ORI No. 2815, The Place of Foreign Trade in the Japanese Economy, January 1946, Vol. II, p. 43.

Table 8. JAPAN PROPER: CIVILIAN CONSUMPTION OF FINISHED STEEL IN 1938

(In 1,000 metric tons)

Railroads	173
Merchant shipbuilding	327
Industrial facilities	868
Machinery and tools	615
Manufactured goods	640
Miscellaneous	310
Total	2,933

Source: USSBS

Table 9. JAPAN PROPER: MILITARY CONSUMPTION OF FINISHED STEEL IN 1938

(In 1,000 metric tons)

Army	489
Navy	575
Air Forces	264
Total	1,328

Source: USSBS

1/ This total is somewhat below the 1934 total consumption figure given in Table 4 because of incomplete reporting of consumption of imported steel.

III. FUTURE PROBLEMS OF THE JAPANESE IRON AND STEEL INDUSTRY

A. Future Requirements of Iron, Steel, and Auxiliary Materials

If it should be decided that Japan's future civilian requirements are not higher than 2.7 million tons of finished steel Japan's needs for ingot steel would be equivalent to 3.4 million tons of ingot if the ratio between finished and ingot steel is assumed to be the same as that which prevailed in the years 1930-1933, i.e., 80:100.1/

On the basis of this amount of ingot steel, Japan would need about 1.5 million tons of pig iron and about 1.9 million tons of scrap for ingot production. It is difficult to establish the exact proportion between pig and scrap. The Japanese have tried since 1936 to increase the use of pig iron, but actually the average ratio of pig to scrap in the years from 1936 to 1943 was 45:55. Specifically, however, a higher proportion of pig than 45 was used in open hearth furnaces, just as the proportion of scrap was much higher than 55 in electric furnaces. The necessity to economize foreign exchange for imports might force the Japanese to use mostly pig iron, the production of which can be increased by the importation of iron ore. Imports of iron ores are considerably cheaper than imports of the equivalent in pig iron or scrap iron.

The prospective output of 2.7 million tons of finished steel and of 3.4 million tons of ingot steel corresponds to the steel production

1/ It should be noted that this ratio prevailed at a time when Japan produced mainly common steel and imported special steels. From 1940 on, when imports of finer steels became a problem, Japan started to diversify her own steel production and to manufacture more alloy steel. The loss in trimmings and waste became higher, and the ratio between finished and ingot steel declined toward a relationship of 75:100, which corresponds more nearly to the American pattern. This decline in proportion became still more marked toward the end of the war because not all of the steel reported as ingot proved suitable for alloy steel.

level of the early thirties, especially that of 1933. At that time the iron and steel industry consumed about 4,000,000 tons of coal.[1] The average ratio between ingot steel production and total coal consumption of the Japanese iron and steel industry was about 82: 100 in the period between 1930 and 1934, but decreased considerably in later years. If the ratio of 1930-1934 is accepted as an indicator for the future, the iron and steel industry in Japan may be expected to consume about 4.1 million tons of coal at the new level of steel production.

The production of 1.5 million tons of pig iron calls for 1.5 million tons of metallurgical coke, for which, in turn, 2.5 million tons of coking coal are needed.[2]

The war years have demonstrated, that Japan's iron and steel industry can in an emergency rely to some extent on the domestic coal deposits of Hokkaido and Kyushu and forego the imports of better grade coal from abroad. However, some imports will undoubtedly be necessary.

The charge of iron ore needed for the production of 1.5 million tons of pig iron would amount to 2.27 million tons if the average ratio of 66: 100 between "pig iron produced and ore consumed," which existed between 1930 and 1934, should continue to obtain. This ratio will decrease to the extent that Japan has to use domestic ores, which have an average iron content of 55 percent. It must be borne in mind, however, that Japan

1/ General Headquarters, Supreme Commander for the Allied Powers, National Resources Section Report #21: The Coal Industry of Japan in Recent Years, February 1946, p. 12.

2/ It is assumed that for 1 ton of pig iron about 1 ton of metallurgical coke is needed and that 1 ton of metallurgical coke requires 1.67 tons of coking coal.

cannot produce all its ore domestically; perhaps a maximum of only one million tons of useful indigenous ore can be produced annually in the future.1/

As far as fluxes are concerned, it may be assumed on the basis of the experience of the American steel industry, that no more than 812,000 tons of limestone, 13,600 tons of fluorspar, and 13,600 tons of dolomite will be needed.2/

Although the percentage of chromium in steel varies widely with the type of steel manufactured, it is assumed that on an over-all basis the amount of chrome ore required for steel production is 0.5 per cent of the total weight of ingots. Production of 3.4 million tons of ingot steel, as envisaged here, would require a supply of 17,000 tons of chrome ores.

Similarly, the assumption is that the amount of manganese in all forms required for steel production is 0.7 per cent of the weight of ingots produced, which means in the present case a possible demand of 23,800 tons.

The requirements for molybdenum, vanadium, tungsten, and nickel will vary according to the type of steel manufactured, but they will not be higher than 510 tons of molybdenum, 112 tons of vanadium, 289 tons of

1/ Domestic production of 2 million tons of iron ore has been assumed as possible according to statistics of iron ore output in Japan during the war as quoted by the Industrial Division, Economic and Scientific Section, SCAP, 18 January 1946, in a Summary of Information Presented to the Far Eastern Commission, p. 11. According to the statistics, the Japanese reached a domestic iron ore production of 2 million tons in 1942 and an even 2,5 million tons in 1943. But this was very low-grade ore and used only under war pressure.

2/ The formulas state that 0.36 tons of limestone are necessary for each ton of pig iron and .084 tons of limestone for each ton of open hearth steel. This actually makes the requirements for limestone in the manufacture of steel somewhat smaller than 625,000 tons for the future Japanese steel production, since not all the steel will be open hearth steel, but some will be made in electric furnaces. Of dolomite and fluorspar,.004 tons of each material are needed per ton of steel.

tungsten, and 3,400 tons of nickel, provided that the production of steel ingot is limited to 3.4 million tons.1/

The domestic supply of chromium and manganese may have to be supplemented by imports, since the intensified production of the war years cannot last with the exhaustion of the mines in sight. The supply of all the other ferro-alloys, with the possible exception of vanadium, is not enough to meet requirements; imports of all of these materials will therefore continue to be necessary.

Table 10 summarizes Japan's possible future annual requirements of pig iron, scrap, and steel and auxiliary materials for the production of iron and steel on a yearly maximum basis; it is based on the assumption that 2.7 million tons of finished steel and 3.4 million tons of ingot steel are approved as the future annual steel requirements.

1/ The amount of molybdenum going into steel manufacture is .015 percent of the weight of the steel ingots; the amount of vanadium is .003 percent of the total weight of ingots produced; the amount of tungsten .0085 percent of the total weight of steel ingots; and the amount of nickel about 0.1 percent of the total weight of ingots. All the cited formulas, including those for chrome ores and manganese, are taken from FEA's preliminary draft of a Civil Affairs Guide, The Administration of the Japanese Iron and Steel Industry, May 1945, pp. 10 ff.

Table 10. JAPAN'S POSSIBLE FUTURE REQUIREMENTS OF IRON, SCRAP, AND STEEL AND AUXILIARY MATERIALS FOR THE PRODUCTION OF 2.7 MILLION TONS OF FINISHED STEEL ON A YEARLY MAXIMUM BASIS

(In metric tons)

Ingot Steel	3,400,000
Pig Iron	1,500,000
Scrap	1,900,000
Coal	4,100,000[a]
Iron ore	2,270,000
Limestone	812,600
Dolomite	13,600
Fluorspar	13,600
Chrome ores	17,000
Manganese (all forms)	23,800
Molybdenum	510
Vanadium	102
Tungsten	289
Nickel	3,400

a) Including 2,500,000 tons of coking coal to produce 1.5 million tons of metallurgical coke.

It should be noted that some of the materials mentioned in Table 10 are interchangeable to a certain degree (for instance, chromium and manganese or tungsten and molybdenum) and that others are not absolutely mandatory for the steel process, as for example dolomite or fluorspar. The types of steel which Japan is permitted to produce will determine the actual amounts of the alloying materials required.

If Japan's future steel requirements are fixed at a different level from 2.7 million tons of finished steel, requirements for iron and steel materials would also differ. Yet, in any case, in the light of the estimates discussed earlier in this paper, it seems likely that the future needs for steel will be considered to lie within the limits of 2.2 million and 3.0 million tons of finished steel. Table 11 (see p27) summarizes the material requirements for the production of iron and steel at alternative levels between 2.2 million and 3 million tons of finished steel.

It is evident that the chief problem for Japan is, as mentioned before (see Section I, E), whether Japan will be able to secure these raw materials in the necessary quantities. At all suggested levels, it will be necessary for Japan to import considerable quantities of raw materials. The influx of foreign raw materials, however, will be largely a matter of Allied import control. 1/

1/ An analysis of future import requirements in the iron and steel industry will be presented in ORI Report No. 2815: The Place of Foreign Trade in the Japanese Economy, Vol. I, now in preparation

TABLE II. JAPAN's POSSIBLE FUTURE REQUIREMENTS OF PIG IRON, SCRAP, INGOT STEEL, AND AUXILIARY MATERIALS AT ALTERNATIVE LEVELS OF FINISHED STEEL 1/
ON A YEARLY MAXIMUM BASIS (in metric tons)

	Level of 2,200,000	Level of 2,300,000	Level of 2,400,000	Level of 2,500,000	Level of 2,600,000	Level of 2,700,000	Level of 2,800,000	Level of 2,900,000	Level of 3,000,000
Ingot steel	2,750,000	2,880,000	3,000,000	3,120,000	3,250,000	3,400,000	3,500,000	3,600,000	3,750,000
Pig iron	1,200,000	1,300,000	1,350,000	1,400,000	1,500,000	1,500,000	1,600,000	1,600,000	1,700,000
Scrap	1,500,000	1,600,000	1,650,000	1,700,000	1,800,000	1,900,000	1,900,000	2,000,000	2,000,000
Coal 2/	3,200,000	3,500,000	3,700,000	3,800,000	3,900,000	4,100,000	4,300,000	4,400,000	4,500,000
Including coking coal	2,000,000	2,200,000	2,250,000	2,300,000	2,500,000	2,500,000	2,600,000	2,600,000	2,800,000
Iron Ore	1,800,000	1,960,000	2,000,000	2,100,000	2,270,000	2,270,000	2,400,000	2,400,000	2,570,000
Limestone	648,000	700,000	744,000	752,000	796,000	812,000	846,000	864,000	908,000
Dolomite	10,800	11,600	12,000	12,400	12,800	13,600	14,000	14,400	14,800
Fluorspar	10,800	11,600	12,000	12,400	12,800	13,600	14,000	14,400	14,800
Chrome Ores	13,500	14,000	15,000	15,500	16,500	17,000	17,500	18,000	19,000
Manganese (all forms)	18,900	20,300	21,000	21,700	23,100	23,800	24,500	25,200	26,600
Molybdenum	405	435	450	465	495	510	525	540	570
Vanadium	81	87	90	93	99	102	105	108	114
Tungsten	230	247	255	264	281	289	296	306	323
Nickel	2,750	2,880	3,000	3,120	3,200	3,400	3,500	3,600	3,750

1/ Based on the conversion rates and formulas used in Table 10.

2/ The amount of metallurgical coke needed is equal to the amount of pig iron produced.

B. Excess Iron and Steel Plant Capacity

Although the shortage of raw materials will act as a brake on Japan's steel output, the question of the future disposition of Japan's iron and steel plant capacity still remains. Should Japan be permitted to keep enough facilities to produce all her future civilian requirements of iron and steel or not, it seems plausible that these requirements set the maximum permissible capacity, unless Japan is to be required to produce beyond this limit for reparations or exports. With the estimated civilian requirements of 2.7 million tons of finished steel as a hypothetical maximum, the future needs call for only 27, 6 percent of the finished steel capacity as it existed at the end of the war, for 29 percent of the then existing ingot capacity, and probably for only 26.8 percent of the pig iron facilities. In other words, milling facilities for 7.1 million tons of finished steel, ingot facilities for 8.3 million tons of ingot, and iron capacity for 4.1 million tons of pig iron are now in excess of civilian requirements.

C. Geographical Location as a Consideration for the Preservation of Plants

Another point at issue is whether, in connection with the dismantling of plants, a selection according to geographical location should be made. Geographical location of those plants which Japan will be allowed to retain will play a part in determining the economics of production and distribution. In general, the geographical factors to be considered are location with respect to raw materials and proximity to the market for finished steel. The following paragraphs summarize the more important locational factors in Japan.

From the point of view of raw materials, only two areas are of importance: Hokkaido and northern Kyushu, where the indigenous coal deposits may prove to be sufficient to meet all the needs for coking

coal of the steel industry of the former territory and a substantial part of the requirements of the industry of the latter. As a matter of fact, the iron and steel plants situated in Hokkaido and northern Kyushu could meet Japan's future requirements for iron and steel if operated at or near full capacity. Iron and steel capacity as it existed at the end of the war in these areas would be more than enough for future pig iron needs, enough for ingot requirements, and almost sufficient for the future needs of finished steel. (See Table 12.)

12. CAPACITY OF IRON AND STEEL WORKS IN HOKKAIDO AND NORTHERN KYUSHU AT THE END OF THE WAR 1/

(in 1000 metric tons)

Product	Plant	Location	Capacity	Total Japanese Requirements
Pig iron	Nippon Seitetsu	Kyushu, Yawata	2,100	
		Hokkaido, Wanishi	1,100	
	Asano Jukogyo	Kyushu, Kokura	200	
			3,400	1,500
Ingot steel	Nippon Seitetsu	Kyushu, Yawata	2,507	
		Hokkaido, Wanishi	300	
	Nippon Seiko	Hokkaido, Muroran	512	
	Asano Jukogyo	Kyushu, Kokura	161	
			3,480	3,400
Finished steel	Nippon Seitetsu	Kyushu, Yawata	2,243	
	Asano Jukogyo	Kyushu, Kokura	217	
			2,450	2,700

1) Future requirements are here assumed to call for 2.7 million tons of finished steel.

Source: Reparations Mission

These areas, however, lack most of the other necessary raw materials. The local iron ores which the Hokkaido industry used intensively during the last war years are of too poor a quality to allow for large-scale production of steel. Proximity to these coal deposits, although an advantage, may not be considered important enough to become a criterion for sparing or dismantling plants, inasmuch as all the other raw materials necessary in the steel manufacturing process have to be imported into these areas. It is perhaps more important that steel plants be located near good ports in order to receive raw materials and ship the finished product to the often distant consumer by sea; this method of transportation is preferable, even where railroad service is available, on account of lower freight costs. It may be noted that from this point of view the plants in northern Kyushu and in Hokkaido offer an additional advantage--shared, however, by other plants elsewhere. From the point of view of location close to the consumer, the plants near the industrial centers of Kobe, Osaka, Nagoya, and Tokyo have the advantage.

D. Open Hearth vs. Electric Furnaces

The question of whether, on the ingot level, open hearth furnaces should be preferred to electric furnaces is difficult to answer. The cheap supply of electric power made the use of electric furnaces relatively more frequent in Japan than in the United States. Electric furnaces in Japan produce not only special steels, as is mainly the case in the American industry, but also common steel. During the war years they faced a serious difficulty only in the shortage of material for electrodes, which had to be imported. Since electric furnaces can be charged with 100 percent scrap, their continued existence or prevalence will have a determining influence on the ratio of pig to scrap in Japan's future iron and steel industry.

E. Labor Problems

The Japanese iron and steel industry seems always, even during the war years, to have been able to muster growing numbers of workers. Reports from four plants of Nippon Seitetsu KK, for instance, show a steady rise in the average number of persons at work during the period from 1934 to 1943, as Table 13 demonstrates.

Table 13. AVERAGE NUMBER OF PERSONS AT WORK IN FOUR PLANTS OF THE NIPPON SEITETSU KK DURING 1934, 1940, and 1943

	1934	1940	1943
Yawata Works	37,729	51,992	52,084
Wanishi Works	1,427	6,728	10,566
Kamaishi Works	4,263	7,948	9,406
Hirohata Works	-	4,679	9,083

Source: USSBS

Yet, although the number of workers needed did not present an insurmountable difficulty to the iron and steel industry, the scarcity of skilled workers became an increasingly serious problem, especially during the war years. When manpower was drafted for military service, the iron and steel industry could recruit officially mobilized workers, farm hands, students, women, teen-age laborers, Koreans, girl volunteers, and general volunteers. But it was difficult to train them. As the scope of the draft was extended, this substitute group grew proportionately. The resultant further decline in technical skill developed into a serious problem which the Japanese iron and steel industry was not able to solve. 1/

It is difficult to appraise now how much change and dislocation the dismantling of steel plants will cause in the labor market. However, it is almost certain that the substitute workers called in during the

1/ USSBS, based on data from Nippon Seitetsu KK

war will be dismissed first. There is also a chance that the available skilled workers will be concentrated in the surviving plants and thus help to relieve the problem of scarcity of skill. Unemployment resulting from the elimination of plants may, therefore, be expected to be greatest among the group of unskilled and semi-skilled workers. The magnitude of such prospective unemployment, however, cannot yet be ascertained because of a lack of sufficient data.

F. The Zaibatsu Problem as a Consideration in Dismantling Plants

It has been proposed that the destruction of Zaibatsu power be a primary consideration in determining which plants are to be dismantled. This plan would offer difficulties in the iron and steel industry, however, which was almost completely dominated by the Zaibatsu.[1/]

The Zaibatsu problem, therefore, may call for a solution independent from the question of the elimination of plants.

The American Mission on Japanese Combines, headed by Corwin D. Edwards, suggests the total elimination of the Zaibatsu and all members of their families and clans from the enterprises once controlled by them. The mission also recommends the breaking up of all monopolies and monopolistic combinations in the sense of the anti-trust laws, as well as the splitting up of big corporations, the divestiture of forced mergers, and the reinstatement of small businessmen forced out of their property by the Zaibatsu. Elimination of bank

---

1/ The Nippon Seitetsu concern alone, in whose control the Japanese Government, Mitsui and Mitsubishi shared, represented by the end of the war 75 percent of Japan's blast furnace capacity, 29 percent of its open hearth capacity, and 36 percent of its rolling capacity.

control of big business, of interlocking directorates, and of government holdings are also recommended.1/ The mission's report allows for exceptions only when special circumstances or emergencies call for them and on condition that the Supreme Commander for the Allied Powers approves. Provisions are also made for the preservation of technological units.2/

1/ Summary of Recommendations, excerpt from Report of Mission on Japanese Combines, March 14, 1946.
2/ Ibid.