It tends to promote favorable consideration of regressive and potentially inflationary types of revenue measures in a desperate drive to achieve a balanced budget for its own sake. Thirdly, it is evident that the distribution of the under-estimate of income and income tax liability is not divided equally among income groups but rather falls with the heaviest hand on the wage-salary earner whose income is subject to withholding. In this fashion the intended effects of a progressive income tax rate structure are in fact largely nullified.

Actual income tax collections through December are shown below. In terms of budget targets only 32 per cent of the total has been collected. However, collections from the withholding tax, predominantly on wages and salaries, stand at 79 per cent, or above the rate required to achieve budget targets. Collections from agriculture and business proprietors subject to declaration of income and self-assessment of tax liabilities are only 13 per cent. Owing to provisions of the tax law farmers are subject to special provisions permitting later filing of returns and payment of taxes so that the bulk of payments from agricultural proprietors is expected after 31 January. Although rental income of landlords is a small part of the national total, nevertheless the under-estimate of this type of income by the Finance Ministry and the slow progress of actual collection of tax liabilities is even more flagrant than for other income groups.

Income Tax Collections to Date
Compared with Total Liabilities
Estimated by Finance Ministry
(In billions of yen)

Type of income share	Income tax liability for Fiscal 1947-48	Actual collections through December	Deficit remaining to be collected	Actual collections as % of total liability for the year
All income shares	68.5	21.6	46.9	32
Wages & salaries	18.4	14.5	3.9	79
Proprietors' income	48.9	6.3	42.6	13
Dividends & interest	.9	.8	.1	89
Rent	.3	1/	.26	15

1/ 44 million yen.

It is not possible to make firm estimates of the average number of taxpayers of each type for the year as a whole; nevertheless, the rough estimates which are available make it clear that the average wage and salary earner, subject to withholding, has in fact paid a considerable larger absolute amount of income tax thus far this year than has the average taxpayer in the self-assessment group. Thus the overall regressiveness of even the income tax structure as it has so far operated is clearly apparent.

Prospects for fulfillment of budget estimates for income tax by the end of the fiscal year are not bright. Even allowing for the rise in late payments following the 31 January final declarations of income, and allowing for collections in April and May properly to be carried back against fiscal 1947 liabilities, it is probable that a large deficit on income tax will remain. Nevertheless, the current tax collection drive of the government, spurred by Eighth Army surveillance in the field, should do much to improve the situation.

Many factors have been suggested to explain the disappointing performance of tax collections and in particular personal tax laws and its radical departure from previous Japanese practice in the matter of declaration of income and self-assessment of tax liability. It takes time for the taxpaying public to become familiar with its obligations and with new methods of procedure. The level of taxpaying morality in Japan has never been high. Concealment of income, particularly the large amounts of black-market profits, and willful evasion of tax payment by self-assessment groups have been important. A third factor has been the lack of adequate numbers of properly trained and experienced tax collecting officials. Fourthly, these officials have in fact carried on a campaign against alleged inequities and defects of the income tax law and have even urged the public through posters, mass meetings, etc., not to comply with the law or pay their taxes. The tax officials have complained of their lack of power to enforce the law properly and have also maintained that their remuneration is completely out of line with the importance of their public responsibilities. Further, some business concerns, though withholding taxes from employees, are not remitting the tax money to the tax offices, and are using the funds for financing current operations.

On balance it is clear that the productivity of the Japanese tax system is far less than is necessary to balance the budget and is completely out of line with the actual income situation and the capacity of the economy to pay taxes. Furthermore the tax program called for in the budgets is clearly regressive in character. This is even more the case with actual tax collections to date, analyzed above. Realization of this fact, quite apart from problems of equity or justice, has undoubtedly been a factor in wage demands of trade unions and thus a further element in the inflationary situation in the last few months.

Changes in Japanese Income Tax Laws in 1947

Major changes and improvements in Japanese tax structure and tax laws were made during this fiscal year. The chief change was in the personal income tax. In March 1947 a new law was made effective. It called for a more complete system of tax-withholding at source for wages and salaries and for dividends and interest. Most important, however, was the introduction of a self-assessment system whereby recipients of other types of income were obligated to estimate their prospective income for the year, assess

their tax liabilities, and pay quarterly installments thereon, subject to a final settlement based on actual income earned as of 31 January. It is this system which has broken down so badly in this first year of operation, either because of its unfamiliarity to taxpayers, or to its lack of strong enforcement and penalty provisions.

In December 1947, a major alteration in the law was adopted. It made numerous changes in exemptions and credits and tax rates, in large part designed to lighten the burden on wage-earners. It also provided for a system of severe fines and penalties for evasion of taxes, late payment, etc. It may be hoped that with this and possibly later desirable revisions of the law, and with stronger enforcement and tax collection measures, the receipts from income tax, especially from the self-assessment groups, will show marked improvement in fiscal 1948-49.

Government Finance, Public Debt, and Increase in Note Issue

Because of a continuing cash operating deficit in Japanese Government finances over the year 1947 there has been a steady and generally rapid increase both in total national debt outstanding and in Bank of Japan note issue. The increase in the former from 1 January to 31 December 1947 amounted to 117 billion yen; while the note issue increased by 125 billion yen and currently totals between 210 and 220 billion yen. There is of course a general close relationship though not necessarily a direct correspondence between these two magnitudes. The similar trend in 1947 is one symptom of the fact that the government was unable to borrow from the public at large, absorbing private savings and thus "sterilizing" some of the excess purchasing power. Instead it was forced to borrow chiefly from the Bank of Japan and moderately from the commercial banking system, particularly in the last quarter of the year. This involved directly an increase in the note issue and thus a heavy inflation of the money supply. However, it would be naive to lay prime stress on note issue as a cause of inflation in general, or on "control" of note issue as a stabilization measure. In fact such monetary phenomena are basically merely symptoms and effects of the more basic malajustments in the economy, involving serious shortages of supplies of all kinds, maldistribution of existing supplies and of purchasing power, and the ineffectiveness of the budgetary and fiscal system discussed above.

Change in Note Issue and Selected Bank of Japan Assets
(In billions of yen)

Period	Liabilities		Assets		
	Note Issue	Total loans and investments	Nat'l govt. securities & advances	RFB securities	Loans
Total Mar. 31 - Dec. 31, 1946	+ 70.1	+62.9	+41.2	0	+21.8
Total Jan. 1 - Dec. 31, 1947	+125.7	+128.1	+103.9	+32.3	—18.1
Total Mar. 31, 1946- Jan. 10, 1948	+188.5	+196.5	+159.1	+34.0	+ 3.4

From the table some notion can be obtained of the major direct components of the increase in the note issue represented essentially by changes in the assets of the Bank of Japan. It is evident that during 1947 the increased holdings of national government securities plus advances to the government account for approximately 80 per cent of the total increased note issue. The other part is represented by an increase in the holdings of the Reconstruction Finance Bank in part offset by a decrease in other loans.

Increase in RFB securities which are guaranteed by the national government, actually reflect a more or less corresponding amount of loans made by the RFB to private industries. Thus in fact an active private business demand for credit is also a contributory factor to recent increases in the note issue although on a far smaller scale than the deficit operations of the government budget.

During 1948 it will be important to obtain better data on the private demand for investment and working capital and the pattern to date of actual lending by financial institutions to private industry. This will facilitate more effective measures relating to the volume and distribution of credit to business and thus contribute to the objective of maximizing production of essential commodities and minimizing inflationary pressures.

REPORT ON THE INDUSTRIAL DISARMAMENT OF JAPAN

submitted to

THE SECRETARIES OF STATE, WAR & NAVY

by

THE NATIONAL ENGINEERS COMMITTEE

of

ENGINEERS JOINT COUNCIL

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in Japan. Freedom from fear of rearmament will be attained only so long as such a police force remains in authority.

For the guidance and direction of the policing forces, there should be established a group of technological specialists who will keep informed as to Japanese industrial and research activities.

Respectfully submitted,

THE NATIONAL ENGINEERS COMMITTEE

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CORRECTION

THIS DOCUMENT

HAS BEEN REPHOTOGRAPHED

TO ASSURE LEGIBILITY

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COAL PRODUCTION, JAPAN, AND AVAILABLE

APPENDIX IV

decade, the soundest policy would appear to be for Japan to return to the situation prevailing before 1931. Then its coal consumption was in balance with production, with only such minor inter-country coal movements as local needs for differing grades of coal and relative transportation costs make economic.

T. E I

COAL IN JAPAN
(Metric Tons)

Source: Foreign Minerals Survey, U. S. Bureau of Mines, October 1945, Table 56

Year	Production	Production, lignite	Imports*	Exports	Bunkers	Apparent Consumption
1925	(1) 31,459,415	(2) 169,426	(3) 1,768,435	(3) 2,716,071	(4) 2,418,795	28,262,410
1926	(1) 31,426,549	(2) 161,134	(3) 2,044,827	(3) 2,611,039	(4) 2,777,472	28,243,999
1927	(1) 33,530,607	(2) 178,613	(3) 2,703,258	(3) 2,190,837	(4) 2,529,778	31,691,863
1928	(1) 33,860,181	(1) 147,750	(3) 2,778,725	(3) 2,184,839	(4) 2,462,736	32,139,061
1929	(1) 34,257,817	(1) 139,031	(3) 3,254,644	(3) 2,043,584	(5) 2,497,000	33,110,908
1930	(1) 31,376,213	(1) 128,624	(3) 2,692,817	(3) 2,130,825	(4) 2,282,893	29,783,936
1931	(1) 27,987,271	(1) 117,741	(6) 2,692,679	(3) 1,540,061	(4) 1,902,470	27,355,160
1932	(1) 28,053,375	(1) 108,532	(6) 2,716,127	(6) 1,387,895	(6) 1,777,320	27,712,819
1933	(1) 32,523,746	(1) 115,788	(6) 3,495,926	(6) 1,560,181	(6) 2,018,607	32,556,672
1934	(1) 35,924,989	(1) 124,786	(6) 4,060,650	(6) 1,087,209	(6) 2,091,461	36,931,755
1935	(1) 37,762,491	(1) 108,526	(6) 4,048,780	(6) 1,018,819	(6) 2,414,742	38,486,236
1936	(1) 41,802,711	(1) 109,494	(6) 4,200,708	(6) 1,112,135	(7) 2,294,000	42,706,778
1937	(8) 45,258,000	(9) 110,000	(6) 4,426,386	(6) 1,027,608	(9) 2,000,000	46,766,778
1938	(10) 44,600,000	(9) 110,000	(6) 3,741,636	(6) 758,462	(9) 1,500,000	46,193,174
1939	(9) 45,000,000	(9) 110,000	(11) 3,809,893	(11) 679,737	(9) 1,500,000	46,740,156
1940	(9) 46,750,000	(9) 115,000	(9) 4,600,000	(9) 500,000	(9) 1,250,000	49,715,000
1941	(9) 48,500,000	(9) 120,000	(9) 9,000,000	(9) 300,000	(9) 1,000,000	56,320,000
1942	(9) 50,250,000	(9) 125,000	(9) 12,800,000	(9) 300,000	(9) 500,000	62,375,000
1943	(12) 52,000,000	(9) 125,000	(12) 16,600,000	(12) 300,000	-	68,425,000
1944	(12) 54,000,000	(9) 125,000	(12) 14,000,000	-	-	68,125,000

* Official Japanese figures which do not include imports from Formosa, Korea and Karafuto.

(1) Questionnaire, Mining Bureau, Tokyo.
(2) Proceedings of the Fifth Pacific Science Congress, Canada, 1933, Vol. 2, Page 1495.
(3) International Trade Unit, Bureau of Foreign and Domestic Commerce, Department of Commerce.
(4) Imperial Institute, Mineral Industry, Summary.
(5) Jahresbericht des Reichs Kohlenverbandes fur das Geschaftsjahr, 1933-36, Page 128.
(6) Annual Return of the Foreign Trade of Japan.
(7) Reichskohlenrat, 1938, Page 146.
(8) Oriental Economist, 1940.
(9) Estimated.
(10) Roush, Mineral Industry.
(11) Japan Advertiser, quoted by Foreign Economic Administration Document 428244.
(12) Estimated by Foreign Economic Administration, E.P. 60.1

TABLE II

CRUDE-OIL REFINERIES IN THE JAPANESE EMPIRE (1) (2)
(Capacity in Barrels of 42 Gallons)

Company	Location	Crude Capacity bbls. per year
Japanese Navy	Yokkaichi, Miye	6,600,000
Mitsubishi Oil Co.	Kawasaki, Kanagawa	3,465,000
Ogura Oil Co.	Yokohama, Kanagawa	3,300,000
Japanese Navy	Tokuyama, Yamaguchi	3,300,000
Nippon Oil Co.	Kudamatsu, Yamaguchi	2,500,000
" " "	Tsurumi, Kanagawa	2,000,000
" " "	Amagasaki, Hyogo	1,650,000
Toa Oil Co.	Shimizu, Shizuoka	1,600,000
Nippon Oil Co.	Akita, Akita	1,320,000
Hayama Sekiyu Co.	Kawasaki, Kanagawa	1,320,000
Nippon Oil Co.	Kashiwazaki, Niigata	1,320,000
Ogura Oil Co.	Tokyo, Tokyo	1,155,000
Nippon Oil Co.	Niigata, Niigata	1,000,000
Maruzen Oil Co.	Shimotsu	1,000,000
Toa Oil Co.	Wakayama, Wakayama	1,000,000
Unknown (possibly Toa Oil Co.)	Mitaki, Yokkaichi	1,000,000
Niitsu Sekiyu Co. (Marushin)	Niitzu	825,000
Aikoku Oil Co.	Kawasaki, Kanagawa	660,000
Nihon Sekiyu Co.	Tokuyama, Yamaguchi	400,000
Maruzen Sekiyu Co.	Osaka, Osaka	330,000
Toyo Sekiyu Co.	Osaka, Osaka	230,000
Toho Sekiyu Co.	Yokohama, Kanagawa	165,000
Asahi Sekiyu Co.	Hikoshima	165,000
" " "	Tokyo, Tokyo	165,000
Nihon Kogyo Co. (Hayama Oil Co.)	Funakawa, Akita	165,000
Nippon Oil Co.	Karugawa, Hokkaido	132,000
Edogawa Oil Co.	Tokyo, Tokyo	85,000
Hayama Oil Co.	Niigata, Niigata	66,000
Niitsu Sekiyu Co.	Hirasawa, Akita	66,000
Toyo Shoku Co.	Yokohama, Kanagawa	66,000
Maruzen Sikiyu Co.	Niigata, Niigata	40,000
Asahi Sekiyu Co.	Akita, Akita	17,000
47 West coast refineries	Akita and Niigata	532,000
Not known		2,036,000
	Total Japan	39,675,000
Chosen Sekiyu Co.	Genzan, South Kankyo, Korea	1,650,000
Manshu Sekiyu Co.	Dairen, Kwantung	1,650,000
Nippon Oil Co.	Byoritsu, Byoritsu, Formosa	82,500
	Total Japanese Empire	43,057,500

(1) U. S. Bureau of Mines Table based largely on U. S. Naval Intelligence Report of January 1942, Foreign Economic Administration Document 408414 and information given by the Enemy Section of the Foreign Economic Administration.

(2) Basis of calculation of capacity is 330 days a year or 90 percent efficiency.

TABLE III

PRODUCTION OF SYNTHETIC OIL, SHALE OIL, CASINGHEAD GASOLINE, AND COKE-OVEN AND GAS-INDUSTRY PRODUCTS IN THE JAPANESE EMPIRE (1)

Year	Synthetic Oil	Shale Oil	Casinghead gasoline	Coke-oven and gas industry	Totals
1929			20,000		20,000
1930		336,000	62,716		398,716
1931		427,000	116,408		543,408
1932		497,000	85,596		582,596
1933		609,000	91,370		700,370
1934		406,000	101,388		507,388
1935		840,000	160,887		1,000,887
1936		861,000	239,309		1,100,309
1937	215,000	1,015,000	257,959		1,487,959
1938	323,000	1,015,000	279,915		1,617,915
1939	782,000	1,015,000	289,544		2,086,544
1940	1,020,000	1,015,000	300,000	1,380,000	3,715,000
1941	1,060,000	1,015,000	300,000	1,670,000	4,045,000
1942	1,732,000	1,211,000	320,000	1,960,000	5,223,000
1943	2,550,000	2,009,000	190,000	1,788,000	6,537,000
1944	3,140,000	2,807,000	190,000	1,430,000	7,567,000
1945	4,170,000	3,605,000	190,000	911,000	8,876,000

(1) U. S. Bureau of Mines table made from study of the Foreign Economic Administration reports E.O.C. 65, E.O.C. 66B and other studies made by the Enemy Section of Foreign Economic Administration.

APPENDIX V

REPORT OF POWER TASK COMMITTEE---JAPAN

References:

(a) Offices of Strategic Services, Research and Analysis No. 1000, Vol. I

(b) Excerpts from Pauley Report

(c) Supreme Command for the Allied Powers (SCAP) Summation Non-Military Activities in Japan and Korea---January, 1946

(d) Fullerton Notes

A review of the references indicates that:

1. Japan's electric power capacity and generation is ample and its equipment-production facilities adequate.

2. Capacity and generation are primarily hydro.

3. There are about ten basic supply and distribution grids, poorly interconnected and varying between 50 and 60 cycles.

4. Thermal capacity and production is best developed in heavy-industry areas.

5. The statistical data, while apparently obtained from the same sources, is reported for different periods and on different bases. While not directly comparable they provide a general relative idea of the conditions.

The object of eliminating Japan's war potential, while leaving them a reasonable subsistence level, may be accomplished, in part,

by a limitation of power capacity and generation to that of their "firm" or regular hydrocapacity.

Reference (a) indicates that Japan's power developed in three general phases:

I. Until the late 1920's hydroplants were constructed and rated on a "jingo" or "regular" rating of minimum stream flow on all but the 10 dryest days of the year. This rating produced "firm" power almost all the year.

II. From the late 1920's through the late 1930's secondary stream flow was developed and hydroplants installed with a "commonly used rating" based on capacity with minimum stream flow on the 183 wettest days of the year. This is the basis of capacity reported in all references.

III. In the late 1930's the development of thermal plants was expanded from hydrostandby to base load for their rapid war preparations.

The large steam plants, which would be more adaptable for reparations than hydroplants, appear to be so called "private" plants of the heavy industries or government-owned plants with these industries as their principal consumers.

Reference (b) gives data on generation for the year 1930, which indicates the slight dependence of public-utility plants at this period on thermal power. These data are copied below:

Power Generation 1930 (Plants over 500 Kw)--Pauley Report

	Hydro Kwhr	Thermal Kwhr	Total Kwhr
Public Plants	12,524,990,000	1,508,700,000	14,033,690,000
Private Plants	906,300,000	833,200,000	1,739,500,000
Total	13,431,290,000	2,341,900,000	15,743,190,000
Est. Gov't steel plants (Yawata)		300,000,000	300,000,000
		2,641,900,000	16,043,190,000

Note: Government railway plants not included.

Reference (a) gives the following data on average hours of operation of steam and hydroplants at full capacity for the period 1934--1938.

Island	Hydro	Public Thermal	Private Thermal
Hokkaido	6491	1547	Not available
Honshu	5391	2241	"
Shikoku	4822	1578	"
Kyushu	5844	4695	"
Average Japan	5483	2504	2819

Reference (b) also gives the following data as of November, 1945 on the number and capacity of completed hydro- and thermal plants, by capacity.

	Under 5000 Kw		5000 - 50000 Kw		50000 & Up Kw		Total Kw	
Hydro	No.	Capacity	No.	Capacity	No.	Capacity	No.	Capacity
Public*	1,157	1,166,109	264	3,636,955	17	1,118,400	1438	5,921,464
Private	56	61,134	13	175,450	-		69	236,634
	1,213	1,227,298	277	3,812,405	17	1,118,400	1507	6,158,098
Steam								
Public*	60	41,677	37	641,100	20	2,220,500	117	2,903,277
Private	100	229,990	64	748,000	1	68,000	165	1,045,990
	160	271,667	101	1,389,100	21	2,288,500	282	3,949,267
Totals	1,373	1,498,961	378	5,211,505	38	3,406,900	1789	10,107,365

*Includes government and private railway company plants.

Reference (a) estimates 1944 capacity as follows:

Island	Hydro	Thermal	Total
Hokkaido	251,000	235,000	486,000
Honshu	5,219,000	3,486,000	8,704,000
Shikoku	142,000	181,000	324,000
Kyushu	640,000	1,251,000	1,892,000
	6,252,000	5,153,000	11,406,000

Reference (c) indicates that Japan's use of power for war industries started about 1931 and that there is a surplus of hydropower in most areas. Chart No. 20 shows about 16 million kwhr generated

in 1930--1931, (exclusive of the Nippon Steel Mills) which checks roughly with the 1930 figures in the table from reference (b). Assuming an average 5400-hour hydroyear, this production could be obtained with about 3,000,000-kw capacity or half the reported "commonly used" hydrocapacity now installed.

Theoretically the "firm" hydropower should be available 8500 hours a year which would require only 1,900,000 kw. No data are given for the hydroplants on this "jingo" or "firm" basis.

Because the generation and distribution systems in Japan are cut up into about ten grids of different frequencies, the total power could not now be distributed to the permitted consumers on a nation-wide basis. However, it might be accomplished on an area basis since each grid appears to be self-contained and industries are quite localized.

The attached tabulation of data from reference (a) is a breakdown of power consumption by industries and grids, which illustrates this point. The consumption data are for 1937. Details are given for metal, mining, chemical and ceramic industries. Totals are given for other industries. Reference (c), Chart 20, shows 1937 total consumption about twice 1930--1931. Where data for 1930 were given for similar conditions in reference (b) these data have been tabulated for comparison and underscored.

The only data for capacities, by grids, were given in reference (a) for 1941. These have been tabulated to provide an idea of the distribution of generating facilities. The totals do not check

with later data, possibly because plants under construction, but not completed, have been included and steam plants may have been destroyed by bombing later in the war; also 1000 kw is the smallest size included.

Other pertinent information obtained from reference (a) and possible disposal of the plants are given below for each grid.

HONSHU

The Northeast Honshu (Tohoku) grid operated on 60 cycles until 1942 but extensive rewiring of generators through 1944 has made 50-cycle predominant. It is interconnected with the Tokyo grid through the Inawashiro Substation. "Substantial" blocks of power may be transferred. The grid was well integrated by the Tohoku Electric Power Development Co. starting in 1938. The area is predominantly hydro. Only 13 of the 127 known generating stations are over 10,000-kw capacity.

The large power consumers are chemicals, chiefly calcium products, and mining of metal and petroleum.

Removal of all thermal plants and reduction of hydro to firm capacity is feasible since 1937 generation is only about three thousand times the hydrocapacity.

The North Central Honshu (Tokyo) grid operates primarily on 50 cycles and is the most completely integrated in Japan. It is interconnected with the Tohoku grid on the north and, by double-frequency stations, can draw power from the border of the South Central grid.

The area is predominantly hydro, even for stand-by, and contains the largest hydrostations in Japan. 80% of the power comes from about 200 small hydrostations. There were about 19 steam plants in the Tokyo and Kawasaki-Yokahoma area which were used largely for regulation and peak loads.

The chemical industry, including explosives and electrolytic hydrogen, is by far the largest consumer. Transportation and residential services were next largest with steel fabrication, textiles, paper products, ceramics, and metal mining following.

Removal of all thermal plants is feasible. Reduction of hydro- to firm capacity appears practical from the capacity-generation ratio.

The South Central Honshu (Osaka-Nagoya) grid operates primarily on 60 cycles with double-cycle plants which can be tied in to the Tokyo grid. The capacity is balanced between hydro and thermal. Until recent years 230 hydroplants carried base load throughout the year. The integration is good.

Hydroplants and older small steam plants are well distributed. The principal thermal generation was concentrated in larger plants around Osaka and adjacent cities of Amagasaki and Kobe. About four large steam plants were located at Nagoya.

The textile industry is a major consumer with chemicals (about 1/3 rayon) a close second. Residential and transportation loads are next largest along with steel products. Paper products and ceramics are followed by machinery, transportation equipment, and food products.

Duplication of facilities would permit elimination of the thermal plants. Reduction of hydro- to firm capacity should be considered with reduction of heavy-industry load.

The Southwest Honshu (Chugoku) grid operates primarily on 60 cycles, is predominantly thermal and is more highly concentrated than most of Japan. Most of the thermal plants are privately owned serving the chemical, textile and cement industries, which are the largest consumers.

Rayon was the largest chemical user with about the same consumption as in South Central Honshu.

Since the area is reported only fairly well integrated and reserves are low, selective removal of the steam plants would be required unless the manufacturing plants of which they are a part are also removed for reparations.

There is a 30,000-kw undersea interconnection between Southwest Honshu and the Northern area of Kyushu.

HOKKAIDO

The West Hokkaido grid operates on 60 cycles and appears relatively unimportant industrially. It contains two steam plants near the city of Hakodate; one of 4000-kw capacity and the other, a factory plant, 5500-kw. No separate data are given on the consumption of power or the integration of steam and hydroplants. The three hydroplants are rated at 2,000, 2,000 and 1840 kw. Their output could be the limitation for the area.

The Central and East Hokkaido grid operates primarily on 50 cycles and is balanced between hydro- and thermal capacity. There are few interconnections. Three thermal plants (one of 74,500-kw capacity and two of 50,000-kw each) and one 51,000-kw hydroplant supply about 50% of the power. The large thermal plants serve the Yubari coal fields. One 25,000-kw thermal plant serves a paper mill and another of 21,500-kw capacity serves Nippon Steel Co. This covers the largest industrial loads.

High-voltage transmission lines connect the Yubari coal field thermal stations with two cities. A separate line connects the large hydroplant with another city. More data would be required for an intelligent recommendation. If interconnection of the lines is practical and a better integration with the smaller hydro- and steam plants possible, the industrial load of the area could conceivably be carried by the hydrostations. If coal is to be mined extensively for export, reduction to firm hydrocapacity might not be practical.

SHIKOKU

This island is reported to be the least developed electrically. The grid operates on 60 cycles. Capacity appears balanced between hydro and thermal. Thermal stations are concentrated in the cities of Kochi, Tokushima, Takamatsu, and near Niihama. Transmission lines are reported to connect these cities with the hydrostations.

Chemicals (principally rayon, chlorine and fertilizers), nonferrous mining, and metal-working constitute the important loads. These are small compared with the other areas but are apparently met

by use of thermal as well as hydrostations. Of the 17 reported steam stations seven are over 10,000 kw, one of these is 60,000 kw and the other 40,000 kw. These seven stations total 171,000 of the 189,000 thermal kilowatts reported for the region.

Removal of the thermal stations and reduction of hydro to firm capacity is indicated. Some of the industrial plants might be removed also since there appears to be a large difference between 1930 and 1937 consumption.

KYUSHU

The Yawata-Tobata-Kokura grid operates on 50 cycles and is entirely thermal. It is interconnected with the Southwest Honshu grid by a 30,000-kw line, a 10,000-kw line to East Kyushu and one to the West Kyushu grid. No breakdown of figures is given for this area although there are some partial estimates, or notations that they are omitted. The plants serve Japan's principal steel company, the Synthetic Chemical Industries, Asahi Glass, Asano Cement Co., Mitsui Mining Co. (the Chikugo coal fields) and Japanese ordnance plants. It is apparently the industrial heart of Japan's war production.

The grid is reported to be well interconnected. The steam plants range in size from 7,000 to 136,600 kw.

Removal of these plants is recommended.

The East Kyushu grid operates on 50 cycles, is well integrated and predominantly hydro. It has partial interconnection with the West Kyushu grid through double-frequency plants. The few steam plants serve the chemical industry. Production in this area is reported to be adjusted to seasonal variations in power generation.

Removal of the steam plants is feasible. Reduction to firm hydropower should be seriously considered.

The West Kyushu grid operates on 60 cycles and is well integrated. Hydroplants carry the base load and the thermal stations supply dry-season deficiencies. There is a high degree of duplication of facilities and a concentration of thermal stations near Omuta. There is no breakdown of industry consumption for this grid, which includes Nagisaki.

Removal of the remaining steam plants is feasible. Reduction to firm hydro is indicated by the large general increase in 1937 loads over those for 1930 for this island.

DATA FROM FULLERTON NOTES

Data obtained by Lt.-Col. E. A. Fullerton in Japan were examined in Washington at the Office of Chief of Engineers; they are in sufficient detail so that, given time, summaries could be prepared if almost any form desired. The data are reported to be more accurate in many respects than other reports.

Some of the data which might be of immediate use to the Committee were copied and summary tabulations are attached. The data on Generating Capacity by Frequency in December, 1945, and the data on Maximum and Firm Hydrocapacity, at about the same period, check closely. There is a reasonable check between this capacity data and that shown by the tabulation of capacity increase since 1936. However, these total capacity figures are about one million

kilowatts lower than those given in the Pauley report and 2-1/2 million lower than those estimated by the OSS report. The major discrepancy is in thermal capacity.

The Fullerton notes indicate the thermal plants are in poor condition as a result of bombings and lack of maintenance. This checks the OSS report. The distribution systems also are in need of repair. Fullerton estimates that in December, 1945, 40% of the available capacity was utilized and that 65% could be when world markets are restored. Considerable repair and reconstruction would be required to bring a large portion of the balance up to rated capacity.

The table of hydrogenerating capacity taken from folder #35 indicates firm capacity about 45% of maximum capacity. This checks the relation indicated by the typical daily generation charts in SCAP report for February.

GRID CAPACITIES, 1941
(From OSS--R&A 1000, Vol. I)

	HONSHU					HOKK	
	N.E. (Tohoku)	N.Cent. (Tokyo)	S.Cent. (Osaka) (Nagoyu)	S.W. (Chugoko)	Total	West	East Cent
Hydro 10^3 Kw	373	2,255	2,125	187	4,940	6	2
Steam "	126	2,630	2,171	493	3,420	9	25
Total - (1941)	499	4,885	4,296	680	8,360	15	4
No. Hydroplants		200(?)	230(?)	45		3	
No. Steam Plants		19(?)	70(?)	28		2	
Total	127		300+	74		5	
Cycles	50	50	60	60		60	5

Consumption 10^6 Kwhr 1937 (From OSS--R&A 1000, Volume I)

Iron and Steel						
Mills & Blast Furn.	-	364	500	1	865)	
Castings	3	32	43	-	78)	
Other	4	115	123	8	252)	
Total	7	511	668	9	1,195)	
					)-	357
Nonferrous*					)	
Aluminum	-	154	112		266)	
Copper	13	57	30	14	114)	
Zinc	20	75	-	-	95)	
Total	33	177	99	14	276)	
Mining						
Coal	-	61	-	60	121	
Metal	82	102	9	31	224	
Petroleum	34	-	-	-	34	
Minerals	3	1	1	3	8	
Total	119	164	10	94	387	319
Chemicals						
Rayon Prod.	2	158	543	452	1,155	
Dyes & Intermed.	-	16	71	11	98	
Calcium Cyanamide	233	568	111	-	912	
H_2 for Ammonia	22	200	130	-	352	
Chlorine	15	121	145	33	314	
Calcium Carbide	224	555	281	-	1,060	
Fertil. & Ind. Chem.	14	64	59	22	159	
Other & Explosives	5	107	79	8	199	
Total	515	1,789	1,419	526	4,249	1,485

	HOKKAIDO			SHIKOKU	KYUSHU					
o) Total	West	East & Central	Total		Yobata-Kokura	West	East	Total	Total 19	1930 Totals
4,940	6	218	224	147	0	135	303	438	5,760	6,158
3,420	9	256	265	189	512	507	39	1,058	4,931	3,949
8,360	15	474	489	336	512	642	342	1,496	10,691	10,107
	3	36	39	31						
	2	11	13	17						
	5	47	52	48	—	—	—	—	—	—
	60	50		60	50	60	50			

865)			23)	-)			860)	1,748)		
78)			2)	-)			10)	90)		
252)			7)	1)			22)	282)		
1,195)			32)	1)			892)	2,120)		
)-	357		)-	12	)-	4	)-	70	)-	444
)			)		)		)		)	
266)			-)	28)			-)	293)		
114)			-)	29)			42)	185)		
95)			-)	46)			-)	141)		
276)			-)	103)			42)	620)		
121			330	-			810	1,261		
224			-	97			126	447		
34			1	-			-	35		
8			-	2			-	10		
387	319		331	110	99	42	936	474	1,753	946
1,155			-	52			122		1,370	
98			-	-			31		129	
912			-	-			231		1,143	
352			-	-			209		561	
314			-	41			64		419	
1,060			-	-			402		1,462	
159			2	17			41		219	
199			5	1			29		234	
4,249	1,485		7	105	152	4	1,129	740	5,537	2,335

GRID	HONSHU					HOKK	
	N.E. (Tohoku)	N.Cent. (Tokyo)	S.Cent. (Osaka) (Nagoyu)	S.W. (Chugoko)	Total	West	East Cent
Consumption 10^6 Kwhr 1937 (Cont'd)							
Ceramics							
Glass & Glassware	-	40	70	-	110		
Cement	37	191	222	92	542		
Other	2	11	68	11	92		
Total	39	242	360	103	744		253
Other Consumers							
Elec. Machinery	-	177	99	-	276		
Other Machinery	3	187	169	9	368		
Autos	-	20	8	1	29		
Trans. Equip.	1	69	158	35	263		
*Transportation	7	795	578	26	1,406		
Rubber Prod.	1	42	56	5	104		
Lumber	14	29	64	9	116		
Textiles	29	344	1,834	196	2,403		878
Foods	27	129	143	33	332		
Paper	5	329	312	62	708		
Printing	1	22	16	1	40		
Elec. Pwr. & Gas	23	166	313	52	554		
Residential	81	732	687	118	1,618		
Miscellaneous	1	28	50	7	86		
	193	3,069	4,487	554	8,303		
Total Regionally	906	6,061	7,086	1,300	15,353		
Other Uses*							
Net Available	1,027	7,638	9,429	1,588	19,682		
Line Losses	174	1,306	1,454	229	3,163		
Generated	1,201	8,944	10,883	1,817	22,845		

* Other uses include: Miscellaneous nonferrous metals - 304; street and highway lighting - 110 -- Total 5,005

Note: Underscored figures are 1930 consumption on an ass... figure in the adjacent column. (Figures from ...

Appendix V
Report of Power Task Committee--Japan

		HOKKAIDO			SHIKOKU		KYUSHU						
Total		West	East & Central	Total			Yobata-Kokura	West	East	Total		Total 19	1930 Totals
110				1	-					33		144	
542				37	24					210		813	
92				-	3					14		109	
744	253			38	16	27	10			257	135	1,066	416
276				-	-					16		292	
368				4	4					15		391	
29				-	-					1		30	
263				3	1					30		297	
1,406				15	11					68		* 1,500	
104				5	1					21		131	
116				19	6					11		152	
2,403	878			6	2	175	46			68	39	2,652	965
332				10	13					65		420	
708				246	6					116		1,076	
40				1	1					4		46	
554				24	18					133		729	
1,618				56	53					173		1,900	
86				1	1					8		96	
8,303				390	290					729		9,712	
15,353				798	672					3,985		20,808	12,264
												5,005	
19,682				837	690					4,604		25,813	
3,163				138	109					650		4,060	
22,845				975	799					5,254		29,873	15,778

*nonferrous metals - 304; government arsenals and shops; factories - 4,551;
110 -- Total 5,005

consumption on an assumed comparable basis. They compare to the
column. (Figures from Pauley Report.)

TABLE II

CALCIUM CYANAMID PLANTS OF JAPAN

Prefecture or Province	Subprefecture or District	City, Town or Village	Address	Company	Annual Capacity (M.T. Nitrogen)
HONSHU (HONDO)					
Iwate-ken	Hienuki-gun	Hanamaki-machi		Tohoku Shinko Kagaku K.K. (North-eastern Development Chemical Co., Ltd.)	1,800
Niigata-ken	Higashikanbara-gun	Ryokanose-muri	Mukaikanose	Showa Denko K.K. (Showa Electrical Industry Co. Ltd.)	25,200
" "	Nakakubiki-gun	Obuke-mura	Nishifuku-shima	Shinetsu Kagaku Kogyo K.K. (Shinetsu Chemical Industry Co. Ltd.)	10,500
" "	Nishibubiki-gun	Aomi (Omi)-machi	Aomi, 2209	Denki Kagaku Kogyo K.K. (Electro-chemical Industry Co. Ltd.)	22,000
Toyama-ken	Shimoniikawa-gun	Michijita-mura	Motoshin, 751	Nippon Ka-baido Kobyo K.K. (Japan Carbide Industry Co. Ltd.)	3,800
" "	Nakaniikawa-gun	Namerikawa-machi	Azuma-cho, 266	Chuetsu Denki Kogyo K.K. (Chuetsu Electrical Industry Co. Ltd.)	1,500
" "	Imizu-gun	Fushiki-machi	Kushioka, 61	Hokkai Denka Kogyo K.K. (Northern Sea Electrochemical Industry Co.Ltd.)	1,900
Fukui-ken	Nanjo-gun	Takefu-machi	Kitagomura, 36	Daido Kagaku Kogyo K.K. (Daido Chemical Industry Co. Ltd.)	4,200
Gifu-ken		Ogaki-shi	Kitakiriishi-machi, 167	Ibikawa Denki Kogyo K.K. (Ibikawa Electrical Industry Co. Ltd.)	1,500
KYUSHU					
Fukuoka-ken		Omuta-shi	Shinkai-cho, 1	Denki Kagaku Kogyo K.K.	18,500
				TOTAL	90,900

A P P E N D I X IV

Japan's Coal Production and Resources

In the accompanying chart which shows Japan's coal production and "Coal available to Japan", the lower line shows coal production in Japan since 1924. Until 1931, production was about equal to consumption (less bunker coal), since exports were usually approximately equal to imports. But beginning in 1931, imports began to exceed exports (see Table I) and after 1941 greatly exceeded them, amounting in 1943 and 1944 to half the domestic production in 1925-1933. Even these figures are somewhat misleading, since the Japanese did not record coal brought into the main islands from Formosa, Korea, and Karafuto as imports. Actual imports in 1940, for example, were about double those shown; the figures for 1943-4, however, are approximately correct.

The upper line in the chart adds the combined coal production in Formosa, Karafuto, and Korea prior to 1931, and the production in Manchuria after that time. It must be recognized, however, that this additional productive capacity was only theoretically "available" to Japan, since the Japanese proceeded to develop coal-consuming industries in the territories over which they acquired political control, and also sold the coal produced in the Far Eastern market. Thus, in 1925, more than two-thirds of the coal produced in Formosa was exported, but only one-fifth of it went to Japan. By 1942, consumption in Formosa had so increased that exports (including bunker coal) were only one-quarter of the production. As nearly as can be determined from the figures available, Formosa has never contributed as much as half a million metric tons yearly to the home islands coal supply, and its return to Chinese sovereignty will not materially change the coal situation in Japan.

TABLE II

CALCIUM CYANAMID PLANTS OF JAPAN

Prefecture or Province	Subprefecture or District	City, Town or Village	Address	Company	Annual Capacity (M.T. Nitrogen)
HONSHU (HONDO)					
Iwate-ken	Hienuki-gun	Hanamaki-machi		Tohoku Shinko Kagaku K.K. (North-eastern Development Chemical Co., Ltd.)	1,800
Niigata-ken	Higashikanbara-gun	Ryokanose-muri	Mukaikanose	Showa Denko K.K. (Showa Electrical Industry Co. Ltd.)	25,200
" "	Nakakubiki-gun	Obuke-mura	Nishifuku-shima	Shinetsu Kagaku Kogyo K.K. (Shinetsu Chemical Industry Co. Ltd.)	10,500
" "	Nishibubiki-gun	Aomi (Omi)-machi	Aomi, 2209	Denki Kagaku Kogyo K.K. (Electro-chemical Industry Co. Ltd.)	22,000
Toyama-ken	Shimoniikawa-gun	Michijita-mura	Motoshin, 751	Nippon Ka-baido Kobyo K.K. (Japan Carbide Industry Co. Ltd.)	3,800
" "	Nakaniikawa-gun	Namerikawa-machi	Azuma-cho, 266	Chuetsu Denki Kogyo K.K. (Chuetsu Electrical Industry Co. Ltd.)	1,500
" "	Imizu-gun	Fushiki-machi	Kushioka, 61	Hokkai Denka Kogyo K.K. (Northern Sea Electrochemical Industry Co.Ltd.)	1,900
Fukui-ken	Nanjo-gun	Takefu-machi	Kitagomura, 36	Daido Kagaku Kogyo K.K. (Daido Chemical Industry Co. Ltd.)	4,200
Gifu-ken		Ogaki-shi	Kitakiriishi-machi, 167	Ibikawa Denki Kogyo K.K. (Ibikawa Electrical Industry Co. Ltd.)	1,500
KYUSHU					
Fukuoka-ken		Omuta-shi	Shinkai-cho, 1	Denki Kagaku Kogyo K.K.	18,500
				TOTAL	90,900

Karafuto

Coal production in Karafuto developed so slowly that even by 1930 it was only 655,326 metric tons when it first equalled domestic consumption, which up to that time had been met partly by imports. But thereafter exports increased rapidly and went wholly to Japan, which in 1943 received 4½ million tons out of a total of 7½ million tons produced in Karafuto. What market can be found for this present excess production capacity, is not now evident, nor is it known that production there has been wholly on a commercial operating basis, since its rapid increase was clearly for strategic purposes. If this excess capacity is retained after Karafuto is returned to Russian sovereignty, it will compete in Far Eastern markets with Chinese and Korean coal.

Korea

According to the best figures available, imports of coal into Korea approximately equalled production there until 1931, but thereafter production increased from 1,100,000 metric tons in 1932 to an estimated 9,000,000 tons in 1944. Because of the development of enterprise in Korea by the Japanese, apparent coal consumption in Korea was always larger than production until 1942. Even in 1944, production exceeded consumption by only 3 percent. The return of Korea to Korean control should, therefore, have no appreciable effect on the coal situation in Japan, assuming that the enterprises there which have been the principal consumers of coal are maintained.

Manchuria

The Japanese took over Manchuria in 1931, but their influence there had been steadily increasing since 1904, and the increase in coal

production, especially at Fushun, was a joint Chinese-Japanese enterprise. By 1925, production exceeded 7 million tons yearly, with exports of 3 1/3 million tons that year. Exports remained at about that level until 1937, with production increasing until it reached 14½ million tons in 1937. However, coal consumption in Manchuria, due to the strategic development of Japanese industry there, increased faster than production, and exports since 1937 have been only 1¼ million tons yearly. Imports in 1941 were a million tons, increasing to 2½ million tons in 1944. Thus Manchuria has had no exportable surplus of coal since 1937. Coking coal has been imported (presumably from Kailan) and steam coal exported. Previous to 1939, exported Manchurian coal went to Japan. After that year, coal imports into Japan from China (chiefly Kailan), which had averaged less than a half-million tons yearly in 1925-1935, increased to 2½ million in 1939, and reached 8 million tons in 1943 (U. S. Bureau of Mines - "Foreign Minerals Survey", October, 1945, table 57), and imports from Manchuria declined to less than half of what they had been previously.

If the Chinese are able to maintain coal consumption in Manchuria after they regain political control of that region, there will be no necessity for their exporting coal to Japan.

It thus appears that Karafuto alone among the various areas over which Japan acquired political and commercial control during the Twentieth Century was able to contribute any considerable fraction of its coal output to the supply of Japan. After 1941 Karafuto was sending over half its output to Japan. An exportable surplus of 3½ to 4½ million tons is not large enough to have great weight in the Far Eastern coal market, and the production cost of this coal is not known. Considering the uncertainties as to the accuracy of the data on coal movements in the past

APPENDIX I-A

ENGINEERS JOINT COUNCIL - 1945-1946

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W. N. Carey,	Secretary

American Institute of Mining and Metallurgical Engineers

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American Society of Mechanical Engineers

D. Robert Yarnall,	President
A. D. Bailey,	Past-President (1946)
Robert M. Gates,	Past-President (1945)
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American Institute of Electrical Engineers

Wm. E. Wickenden,	President
Charles A. Powel,	Past-President (1946)
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H. H. Henline,	Secretary

American Institute of Chemical Engineers

James G. Vail,	President
L. W. Bass,	Past-President (1946)
George G. Brown,	Past-President (1945)
S. L. Tyler,	Secretary

EXECUTIVE COMMITTEE

Malcolm Pirnie, Chairman
Harvey S. Mudd
Robert M. Gates
Charles A. Powel
L. W. Bass

APPENDIX I-B

THE NATIONAL ENGINEERS COMMITTEE

Administrative Committee

H. Foster Bain
Charles W. E. Clarke
Sidney D. Kirkpatrick
Harry S. Rogers
R. E. Zimmerman
Carlton S. Proctor, Chairman

Control Committee

Sidney D. Kirkpatrick
Harry S. Rogers
Carlton S. Proctor, Chairman

TASK COMMITTEES

Committee on Metals

I. W. Wilson
Zay Jeffries
Milton Male
R. E. Zimmerman, Chairman

Committee on Mineral Resources

T. T. Read
W. B. Heroy
A. C. Fieldner
James Rabbit
H. Foster Bain, Chairman

Committee on Chemical Industry

C. O. Brown
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J. H. Critchett
H. R. Lee
Sidney D. Kirkpatrick, Chairman

Committee on Power

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Charles W. E. Clarke, Chairman

APPENDIX II

JAPAN'S MINERAL AND METAL INDUSTRIES

IRON AND STEEL

Basic and most important to modern industry in Japan are the minerals used in making iron and steel. They derive an especial importance in the present circumstances from the fact that iron and steel are the basis of the heavy industry and this in turn is at the heart of armament. If the war potential of the country is to be destroyed, it is clear that annual production must be cut back to approximately what it was before the Japanese began to divert steel into armament, i.e., approximately 2,300,000 metric tons of ingots per year. Fortunately, control of gross production is readily obtainable since Japan must import iron ore to sustain such a permitted output. Further, safeguards may be erected in the way of control of manufacture, size of units and quality of product.

In the recommended 1,600,000 metric tons of finished steel per year, only 20,000 tons have been assigned for purposes of shipbuilding. That figure does not contemplate the use of steel for the main structures of ships, but relates rather to propulsion machinery and appurtenances of wooden vessels. During the course of the next five years, the maintenance of a balanced economy may indicate the advisability of assigning additional tonnages of steel to shipbuilding, but it is recommended that such cases be handled separately and on their merits.

No attempt has been made to recommend the number of tons of each class of finished steel products to be made from the 2,300,000 metric tons of ingots. The only stipulation is that none of the steel should be used for other than peacetime purposes. Let the Japanese steel industry, under supervision, apportion year by year the percentage of steel

to be devoted to each category of product, on the basis of apparent requirements.

In one particular, the matter is pertinent here as it relates to the import of ferro-alloy minerals necessary to make the so-called special steels. The growth in output of these steels has been rapid as Japanese manufacturers have learned to appreciate quality and in the later years of the war it rose to unexpected heights. The total demand for Japan, Korea and Manchuria grew from 342,705 metric tons in 1937 to 1,357,040 metric tons in 1942, after which no reliable estimates are available. To make these steels, nickel, chromium, tungsten, molybdenum, silicon manganese and vanadium are all required. While most of the alloy steels were used during the war in making armament, they are also essential to peacetime industries, especially if consumer goods are to be manufactured for domestic use and export. It is in such lines as machinery, machine tools, instruments and light manufactures that alloy steels are most needed. Take as one example the coal industry, which clearly must be maintained, and in which alloy steels find multitudinous uses in mine water pumps that must be corrosion-resistant, in crushers, mills and pulverizers that require abrasion and impact resistance, and in mine cars and transportation equipment where stretch, impact and wear resistance are essential. Similar studies of other essential peacetime industries have been made and are equally persuasive of the importance of alloy steel in a normal economy.

All recommendations should be considered subject to adjustment and modification in line with broad economic and political considerations as the latter become crystallized and operative. For example, there has not been any provision for the export of steel products from Japan to

nearby foreign markets. It is a corollary that production in those markets, formerly dependent upon Japan, will have to be fostered and developed in order that their needs may be supplied. If the time-lag promises to be substantial and world demand indicates that shortages will otherwise be prolonged, some provision for the export of steel products from Japan may be indicated as desirable, at least temporarily. Moreover, the economies of neighboring nations which have been dependent upon Japanese markets may be seriously upset if those markets are closed arbitrarily. There may be an overall advantage, for instance, in allowing Manchurian pig iron to constitute a part of the total supply available to Japanese steel industry.

Open Hearth Plants and Capacities

(Data from Pauley Report)

Plant	Location	No. of Furnaces Acid	No. of Furnaces Basic	Size of Furnace (M.T.)	Annual Capacity in M.T. 1944	Annual Capacity in M.T. End of War
HOKKAIDO						
Nippon Seitetsu,	Wanishi		4	150	500,000	300,000
Nippon Seiko	Muorran		2	10)		
			2	25)		
			1	30)		
			1	50)	500,000	500,000
		1		25)		
		7		50)		
Total - Hokkaido					1,000,000	800,000
HONSHU						
Nippon Seitetsu,	Kamaishi		2	30)		
			3	50)		
			1	60)	587,000	287,000
			4	100)		
Nippon Seitetsu,	Fuji		4	15	64,000	64,000

APPENDIX II (Cont'd)

Plant	Location	No. of Furnaces Acid	No. of Furnaces Basic	Size of Furnace (M.T.)	Annual Capacity in M.T. 1944	Annual Capacity in M.T. End of War
HONSHU (Cont'd.)						
Nippon Kokan,	Kawasaki		8	30)	610,000	200,000
			4	50)		
			5	20)		
Nippon Soda,	Oshima		2	15)		
			1	25)		
			1	35)	37,000	37,000
Daido Seiko,	Osaka		2	50)	80,000	80,000
Kotobuki Jukogyo,	Kyoto	-	-	-	30,000	30,000
Yamato Seiko,	?		1	30)		
			1	40)		
			2	50)	167,000	60,000
		1		30)		
Nakayama Seiko,	Osaka		2	40)		
			1	50)	229,000	229,000
			2	70)		
Amagasaki Seitetsu,	Amagasaki		4	30)		
			2	40)	382,000	382,000
			1	50)		
Azuma Seiko,	Azuma		2	25)		
			2	40)	122,000	122,000
			1	50)		
Toyodo Seiko,-	Kariya-Chita	-	-	-	15,000	15,000
Osaka Seiko	Nishijima		2	35)		
			2	45)	135,000	135,000
Nippon Seitetsu,	Hirohata		6	150	600,000	600,000
Nippon Kokan,	Tsurumi		4	50)		
			3	60)	380,000	380,000
Toho Seiko,	Miya		2	30	40,000	40,000
Mitsubishi Seiko,	Tokyo		1	15)		
		2		10)	41,000	41,000
		1		15)		

APPENDIX II (Cont'd.)

Plant	Location	No. of Furnaces Acid	No. of Furnaces Basic	Size of Furnace (M.T.)	Annual Capacity in M.T. 1944	Annual Capacity in M.T. End of War
HONSHU (Cont'd.)						
Kawasaki Jyoko,	Kobe		1	10)		
			1	25)	526,000	526,000
			9	35)		
			1	70)		
Sumitomo Kingoko,	Osaka		1	30)		
		3		40)	128,000	128,000
Sumitomo Kingoko,	Amagasaki		3	40	180,000	135,000
Sumitomo Kingoko,	Wakayama		2	70)		
			1	100)	220,000	128,000
		2		70)		
Kobe Seikosho,	Kobe		1	30)		
			1	20)		
			1	25)	434,000	213,000
			6	50)		
		2		50)		
Toto Seiko	Osaka		2	50	30,000	30,000
Naigi Seiko,	?		1	30	22,500	22,500
Tokyo Seitetsu,	Tokyo		1	25)		
			1	30)	40,800	40,800
Tokyshi Taura,	Tokyo		2	50	90,000	90,000
Nichia Seiko,	?		3	35	144,000	144,000
Others					905,000	845,700
	Total - Honshu				6,240,000	5,000,000
KYUSHU						
Nippon Seitetsu,	Yawata		1	15)		
			9	?)		
			3	50)		
			22	60)		
			4	100)	2,492,000	2,343,000
			2	200)		
		1		15)		
		1		25)		
Asano Jukogyo,	Kokura		2	40)	161,000	161,000
			3	50)		

APPENDIX 11 (Cont'd.)

Plant	Location	No. of Furnaces Acid	No. of Furnaces Basic	Size of Furnace (M.T.)	Annual Capacity in M.T. 1944	Annual Capacity in M.T. End of War
KYUSHU (Cont'd.)						
Mitsubishi Seiko,	Nagasaki	-	-	-	20,000	0
Total - Kyushu					2,673,000	2,504,000
GRAND TOTALS					9,913,000	8,304,000

Electric Furnace Capacity

Data from Pauley Report, and from SCAP report "Materials Essential for Making War" dated December 14, 1945.

Location	Annual Capacity, Metric Tons 1944	End of War
Hokkaido	39,000	39,000
Honshu	2,933,000	2,613,000
Kyushu	336,000	340,000
Total	3,308,000	2,892,000

There are 762 Heroult electric furnaces, ranging from 1/2 ton to 20 ton capacity, whose total charging capacity is 3,330 tons.

There are also 119 high frequency induction furnaces, ranging from 1/10 ton to 5 ton capacity, whose total charging capacity is 95 tons.

Bessemer Steel Plant

There is only one Bessemer plant in Japan, that of Nippon Kokan, at Kawasaki, Honshu. It has an annual capacity of 500,000 metric tons.

APPENDIX II (Cont'd.)

Blast Furnaces

No. of Furnaces	Daily Capacity Metric Tons
1	40
1	70
1	200
2	225
4	300
9	350
4	400
3	500
4	600
5	700
4	1,000
38	18,110

Total Annual Capacity as rated (1944) - 6,554,000 metric tons.
Total Annual Capacity at end of war - 5,613,000 metric tons.

Apparent Consumption of Steel Products

(1,000 Metric Tons)

(A)[1] ROLLED PRODUCTS 1926-1930 Average .

Rails	Shapes	Bars	Sheets and Tin Plate	Plates	Wire	Pipe & Tube	Others	Total
210	229	484	91	282	76	53	114	1,539

(B)[2] ROLLED PRODUCTS, INCLUDING CASTINGS AND FORGINGS

Year	Rolled Steel	Castings, Forgings, Etc.	Total
1926	1,069	76	1,145
1927	1,157	79	1,236
1928	1,613	99	1,712
1929	2,236	109	2,345
1930	1,613	86	1,699
Average	1,538	89	1,627

(C)[2] STEEL PRODUCTS

Year	Total
1925	1,500
1926	2,100
1927	2,100
1928	2,300
1929	2,600
1930	2,100
1931	1,800
1936	3,750
1937	5,100
1942	4,700

Sources: 1. November 1945 Report, Industry Division, ESS.

2. SCAP Report, February 1946, - Calculated apparent consumption by adding imports to production and subtracting exports.

COPPER

Next to steel, copper was one of the most critical metals in the Japanese minerals economy. The Japanese developed a complete technology for mining and smelting copper long before the restoration, but soon after introduced foreign practice in metallurgical operations and before World War I, built up a substantial self-contained copper industry. In the years between the two World Wars, imports were small, except in 1926 to 1928 when they averaged 12,500 tons.

Consumption stood at about 70,000 tons from the middle 20's to 1933 when it began to increase rapidly for use in the armament program. By 1937 the total consumption of copper had risen to 150,000 tons, and it kept at approximately that figure until the increasing difficulties in shipping incident to the war cut down imports.

Of the domestic production, approximately 60,000 tons were from ores mined in Japan proper. The remainder was from ores mined in Formosa, Korea and elsewhere. These were supplemented by imports of blister copper largely from the United States. In the 30's, Japan built

up a considerable smelting industry based on imported ores and prior to the outbreak of the war with China was also building up an export business in manufactured copper and brass goods, expecially wire and sheet.

While Japanese mines have been seriously depleted, their industry is so organized that they can treat with profit very low-grade copper ores. A pyrite concentrate containing 2 percent of copper will be so handled as to recover copper, iron and sulphur, as well as any accessory metal such as gold, silver or nickel. Japanese tariffs also were so arranged as to give imports of ores an advantage over metal imports. The Japanese copper industry demands consideration both from the standpoint of its war potential and the desirability of encouraging transfer into the manufacture of finished consumer goods.

According to the best available estimates, the annual consumption of copper in Japan at the beginning of the war amounted to, roughly, 150,000 tons divided as follows: Ammunition, 75,000 net tons; power and communication industry, 30,000 net tons ; marine uses, 15,000 net tons; air and land transportation, 15,000 net tons ; other industries, 15,000 net tons.

These figures are believed to be substantially correct and on the basis of them and the noted production from domestic ores there should be enough local copper to supply all non-military demands. In time, the mine supply will decrease and exports of copper and brass goods will similarly decrease. Imports can be stopped without serious damage to peacetime industry, and such action is recommended because of the close relation of copper to ammunition and other war potentials.

Japanese Copper Industry

Japan Proper

(All Units in Metric Tons)

Reparations Report

Mine Production (copper content of concentrates) 1940-1944 Avg.=63,245

Mine Production plus Imports - 1940-1944 Avg. = 109,235

Copper Consumption 1930-1935 Avg. = 73,360

FEA Report

	1943
Mine Production (Recoverable Copper)	79,500
Maximum Mine Capacity	91,000
Smelter Production	114,000
Smelter Capacity	140,700
Refinery Production	122,000
Refinery Capacity	133,500

Pauley Report

Home Consumption 1931-2 = 51,000; 1933-4 = 91,000; 1935-6 = 130,000

Electrolytic Copper Production 1943 = 123,721; 1944 = 99,196

1943 War Time Requirements - Estimated 150,000

Apparent Consumption 1935-1939 Avg. 143,025
1940-1944 Avg. 141,885

Mine Production (contained ore) 1940-1944 Avg. = 77,377

Refinery Production 1935-1939 Avg. = 63,516
1940-1944 Avg. = 104,181

Imports - Refined Copper 1935-1939 Avg. = 77,649
1940-1944 Avg. = 39,705

Refinery Capacity 1945 = 147,000

OES Report - February 7, 1944 - Figures from Nippon Kogyo Kaishi

Average Consumption , 1925-1929 incl. = 75,295

LEAD AND ZINC

Those metals have never been produced in large quantities in Japan, and up to the development of modern flotation methods a considerable portion of the local consumption was satisfied by imports of metal. For the period of World War I, a limited number of ancient mines were modernized and the mixed sulphide ores came to have value. In 1931, local smelter production of zinc from domestic and imported ores was 215,407 tons, in addition to which almost as much metal was imported. In 1940, the last year for which complete figures are available, the smelting production is estimated to have been 55,000 tons, and metal imports, 33,000 tons. Exports are not recorded, but in the prewar years zinc was going out of the country in the form of brass and galvanized sheets. A stock of metal was meanwhile built up in the country for war purposes.

Lead has been smelted from earliest times and the process is simple. Production amounted to 4,070 tons in 1931, with imports of 53,889 tons, and exports of only 497 tons. In 1940, the corresponding figures were 15,000 tons, 101,428 tons and 1,294 tons. Consumption rose from 57,600 tons in 1931 to an estimated hundred thousand tons in 1939, after which consumption declined through the accumulated stocks and amounted to 85,000 tons when the war commenced in China. Imports of lead from Korea, Manchuria and Hongkong about equalled local production in recent years. Imports from Korea, Manchuria and Indo-China about balanced local production of zinc.

It is doubtful if either lead or zinc needs to be imported to provide for the legitimate peacetime uses of Japan, but local mining and treatment are of importance since to a considerable degree production of copper, gold, silver and in small degree other metals is dependent upon

lead and zinc smelting. If exports of finished goods, such as plumbing, grow naturally, as they may well do, imports may again be needed.

Japanese Lead Industry

Japan Proper

(All units in Metric Tons)

FEA Report

1943	Lead Mine Production (Recoverable Lead)	13,000
	Maximum Mine Capacity (Recoverable Lead)	13,750
	Refined Lead Production	18,000
	Lead Smelting & Refining Capacity	24,500

Pauley Report

Apparent Lead Consumption

1935-1939 Avg. = 92,339 1940-1944 Avg. = 63,396

Lead Mine Production, 1940-1944 = 17,296

Lead Smelter Production, 1940-1944 = 17,425

Lead Smelter Capacity, 1944 = 37,380

Lead Refinery Production, 1935-1939 Avg. = 12,945
1940-1944 Avg. = 27,601

Lead Refinery Capacity, 1944 = 53,800

Imports of Metallic Lead - 1935-1939 Avg. = 81,284
1940-1944 Avg. = 35,422

Japanese Zinc Industry

Japan Proper

(All units in Metric Tons)

FEA Report

1943	Zinc Mine Production (Recoverable Zinc)	28,000
	Maximum Mine Capacity (Recoverable Zinc)	30,000
	Refined Zinc Production (Total)	39,000
	High Grade Zinc - 26,000	
	Low Grade Zinc - 13,000	
	Zinc Refining & Smelting Capacity (Total)	82,300
	High Grade Zinc - 49,000	
	Low Grade Zinc - 33,300	

Pauley Report

Zinc Mine Production (Japan Proper) (Zinc Content) = 1940-1944 Avg. = 70,200

	Zinc Refinery Production	Metallic Zinc Imports
1935-1939	Avg. = 44,484	39,623
1940-1944	Avg. = 59,393	7,463

1945 Refinery Capacity = 178,600

Apparent Consumption of Zinc in Japan Proper

1935-1939 = 84,106
1939-1944 = 68,357

TIN

Tin deposits are found at various points in Japan, especially on the Island of Kyushu, where tin mining is an ancient industry in the south. In 1909 the Mitsubishi Companies found tin in the Aktenobe Mine on Honshu, and in later years they and others developed other deposits on both islands. None of the deposits are large, and in 1931 Japanese production was 1,015 tons, with imports of 3,257 tons. In 1940 the corresponding figures were 1,620 and 9,840 tons. All this was consumed at home, save for minor amounts exported as tinfoil, and in various manufactures.

Japanese Tin Industry

Japan Proper

(All units in Metric Tons)

FEA Report

Tin (Recoverable Tin)	1943 = 2,000
Smelter Capacity	1943 = 5,000

Pauley Report

Apparent Tin Consumption

1935 - 1939 Avg. = 7,639 1940-1944 = 9,410

Pauley Report (Cont'd.)

Tin Mine Production (Tin Content)		Tin Content Ore Imports
1941 -	0	1,564
1942 -	1,924	1,315
1943 -	1,125	680
1944 -	380	0

	Tin Smelter Production	Tin Refining Production
1935-1939 Avg.	0	1,677
1940-1944 Avg.	2,413	1,943

Imports of Metallic Tin

1935-1939 Avg. =	5,982
1940-1-3-4 Avg.=	9,320

NICKEL

Approximately 50 percent of the 800-odd tons of nickel imported into Japan in 1930 was consumed by Government arsenals and shipyards. With the rationalization of industries following 1931, and again after the outbreak of war in China in 1937, there was a phenomenal increase in the consumption of nickel until 1941 when it reached about 8,730 tons. Not all of this was in war uses, for the Japanese engineers and industrialists developed a wide diversity of applications for nickel alloy steels, nickel-plating, and nickel alloys for peacetime industries.

Japan is almost entirely dependent on imports for its supply of nickel, since there are no deposits of significance, and the by-product obtained in the form of sulphate from copper refineries amounts to but a few tons a year. Up to 1936 imports were of metal; after that, ores were imported from New Caledonia and Dutch East Indies. The supply and its sources through recent years are summarized in the following table, which data must be read in consideration of the fact that published figures in Japanese Customs imports of any kind do not include materials

purchased abroad for the Imperial Government. There was, for example, a considerable tonnage of nickel bought for use in coinage and not reflected in the import statistics. It was later melted down and used to make alloys for armament.

DATA BEARING ON CONSUMPTION OF NICKEL
(In Metric Tons)

Year	Production Ni Content	Imports of Ore Ni Content	Refinery Production	Imports Metal	Total
1931	None?		0	812	812
1932	"		0	1,844	1,844
1933	"		0	3,258	3,258
1934	"		0	2,639	2,639
1935	"		0	3,924	3,924
1936	"	292	0	2,460	2,460
1937	"	704	0	6,511	6,511
1938	"	2,529	33	8,171	8,204
1939	"	No Data	143	12,208	12,951
1940	"	"	617	2,786	3,403
1941	"	"	1,823	1,240	3,063
1942	21	5,250*	1,392	0?	1,592
1943	42	No Data	1,748	0?	1,748
1944	48	"	634	0?	634

SOURCES: Japanese Mining Bureau - Production, Imports of Metal
U. S. Bureau of Mines - Imports of Ore.

* From Celebes and Burma. Estimate of Foreign Economic Administration, E. F. 60.1

It will be necessary for Japan to continue to import either nickel, metal or ores, or both. It would seem reasonable to impose no obstacles to either, but to permit the free play of competition to determine the results.

This will afford the most ready field for application of the principle of a peacetime economy, based on importation of a minimum of raw materials and applying to them the available energy from hydro power, and the available labor, skill and managerial ability.

In reorienting the industry of Japan toward peace instead of war, certain principles should be kept in mind. In view of the fact that

Japan will need to import food, there should be no unnecessary importation of other raw materials. In other words, where there is possibility of manufacturing on the basis of domestic raw materials, that is to be preferred. Also, it is preferable that Japan import raw materials rather than finished or semi-finished goods, so that, to the maximum, the power, fuel, labor, skill and management of the country be used in the production of finished goods for domestic consumption or export. Finally, restrictions should be applied on import of raw materials necessary to heavy industries rather than to the manufacture of consumer goods, if the object of effecting the disarmament of Japanese industry necessary to prevent war is to be met.

MANGANESE

The most necessary of the minerals in the ferro-alloy group is manganese, although its use in alloys is minor. It is employed mainly as a scavenger in making steel, and for this purpose it is essential to use 12 to 14 pounds in the making of each ton of steel. Most of this is carried off in the slag, but the importance of the small amount which remains in the steel has come to a new appreciation. Manganese also has important applications as a non-metallic in chemical industries. While there are numerous deposits in Japan, they are small and the domestic supply is wholly inadequate. Ore has long been imported from other East Asiatic countries, particularly India, Malaya and the Phillipines. In the prewar years, 1931 to 1941, inclusive, domestic production increased from 12,849 metric tons to 92,000 tons, while the import rose from 40,316 to approximately 175,000 tons. Exports are not significant. Ferro-manganese production is reported to have grown from 34,710 tons in 1935 to 68,553 in 1941. With the steel industry cut back to one-third of the

maximum wartime output, it is doubtful that Japan can be self-sustaining in manganese ores for any long period, although it could for a few years. If it be found desirable, an interdiction on manganese imports for a limited term of years may be exercised.

CHROMITE

The Japanese are better supplied with this mineral than with manganese ores. In 1931 domestic production was 9,675 metric tons, with no recorded imports. In 1941 the production had grown to 50,212 tons, with 7,500 tons of imports. Thereafter, imports apparently increased rapidly and large tonnages of high-grade ore were looted from the Philippines. Chromium has many essential uses in the arts and industries and has been rapidly rising in importance, particularly following development of chromium plating and the manufacture of so-called stainless steels, which by reason of their great strength and stiffness are competing strongly with the light metals in many fields. No great damage would result to the country by forbidding imports of chromite ore for a limited term of years, although it is not important as a war potential material.

TUNGSTEN

This is another of the metals important in making alloy steels, particularly those used for cutting tools. The amount needed is not large and to a considerable extent molybdenum can be substituted for it. Domestic production of tungsten ores in Japan is unimportant, and the steel makers have depended largely on ores from Korea with imports from China, Burma and other East Asian sources easily available. Japanese production of tungstic oxide, 55 percent concentrate in 1931, is given as 52 tons, and in 1941 as 957 tons. In the same years, Korea produced

16 and an estimated 2,600 tons, respectively. The Korean concentrates are calculated at 60 percent WO_3. Wartime production seems to have been heavily subsidized, but ordinary output may be sufficient to meet domestic needs of the reorganized steel industry, although this is by no means certain and small imports in reasonable quantity might be safely permitted.

MOLYBDENUM

Molybdenum has been produced in Japan, but almost entirely from imported ores, especially from Korea. The amounts involved are not large, and there is no present knowledge which warrants belief that Japan could supply itself in the future. Recognition of the value of molybdenum in alloy steels has been greatly enhanced by wartime experiences, especially in the United States.

Minor ferro-alloy minerals -- vanadium, cobalt and others -- have been used in Japan, as elsewhere, but the tonnages and values involved are not important.

While the ferro-alloy minerals are essential to the continuance of industry in Japan, all the more so if steel consumption is to be channelled into the manufacture of consumer goods, the actual tonnages involved are not large and any necessary control of their movement should be easily effected. Electric furnaces of one type or another, themselves large consumers of special steels, have been largely used in the reduction of these ores and the production of the ferro-alloys, so that a system of licenses would control the largest part of the production. However, blast furnaces may also be used so that such control would not be complete and a better means would be by licensing imports. The

simplest way to make this effective would be by control of the customs in some such manner as the Chinese Maritime Customs were long managed under British supervision. As previously suggested, however, it is doubtful whether any, and at most more than a temporary, control is desirable in the field of ferro-alloys or the ores from which they are made.

ANTIMONY

Smelting of antimony ores has been carried on in Japan for nearly three-quarters of a century, although it has been based mainly on the importation of ores because deposits in Japan are few, small and lean. The ore used came largely from China, the world's chief producer, but after the war with China began, Indo-China became an important source of supply. The whole production was small, from 2,500 to 3,500 tons per year, and can hardly have done more than meet domestic demands. Neither Korea nor Manchuria has been a producer of importance. Certain antimony compounds and alloys are used in modern industry and will continue to be needed in Japan.

MINOR METALS

Arsenic, bismuth and a few other metals, or their compounds, are regularly recovered as by-products from copper, gold, silver and lead smelting. Arsenic is used for making insecticides, and both it and bismuth have pharmaceutical uses. About half the arsenic produced has been exported. Future production will depend on the activity in non-ferrous smelting, and no good purpose would seem to be served by restricting it.

Mercury is produced in small quantities in Japan, but imports have been the main source of supply. The consumption rose rapidly in the year of war preparation. Any restriction found necessary can be accomplished.

by control of imports. Neither Korea, Formosa nor Manchuria is an important producer, although a small amount of mercury comes from the first named country.

PRECIOUS METALS

The Japanese Empire was an important producer of gold and silver, although slightly less than half the output came from mines in Japan itself. Formose yielded a minor amount and Korea slightly more than half. The larger part of both the gold and the silver was obtained as a by-product of non-ferrous smelting, the copper or lead in the ore being used as a collector in the furnace work in the usual manner. Independent production of neither gold nor silver was important, although there is a limited amount of placer mining. In Manchuria placer mining is more important than lode mining. The figures for gold production through the prewar years are given below in Kilograms as reported by the Bureau of Foreign Exchange of the Japanese Ministry of Finance:

Year	Japan	Korea	Formosa	Total
1931	12,275	9,031	553	21,860
1932	12,497	9,700	817	23,014
1933	13,728	11,508	652	25,888
1934	15,146	12,427	1,002	28,577
1935	18,324	14,710	1,157	34,189
1936	22,234	17,489	1,294	41,018
1937	23,010	22,948	1,306	47,164
1938	24,067	27,737	1,688	53,493
1939	25,926	29,192	1,265	56,384
1940	25,583	25,288	803	51,675
1941	25,328	25,584	897	51,810

In order to bring about the increase in production shown above, it was necessary for the Imperial Government to pass on to the miners the world increase in the price of gold brought about by the action of the United States Government; which Japan did reluctantly and only after considerable delay. In Korea the new price was not paid until after the

Oriental Consolidated, the last of the foreign-owned gold mines, was brought under Japanese ownership. Then a marked increase in production occurred at once. The increase in price was followed by heavy subsidies which were maintained until the war cut off Japan's market for gold. Thereafter the gold mines were stripped of supplies, equipment and manpower to favor copper, coal and iron mining, which was held to be more essential. The same policy was followed in the occupied countries. In postwar years it would seem that without artificial stimulus, Japan should be able to supply 15,000 to perhaps 20,000 kilograms of gold worth at the present American price between $170,000,000 and $225,000,000.

The silver production came mainly from the same sources as did the gold, that is, from the ores mined and smelted mainly for their content of non-ferrous metals. The outputs for the years 1931 to 1941, inclusive, are tabulated below, again in kilograms. The rise in output was due to war stimulus of copper and less production rather than to any special influence operating on silver alone.

Year	Kilograms
1931	167,583
1932	163,625
1933	185,610
1934	217,254
1935	256,007
1936	303,653
1937	314,391
1938	408,145
1939	436,148
1940	358,410
1941	360,298

The figures for the separate production of Korea and Formosa are not available, but presumably those quoted above include all the silver from ores treated by Japanese smelters both in Japan proper and at Chinnampo in Korea.

Platinum and its associated metals are obtained only to a very small amount as by-products from placer operations or from smelting. Japan is almost entirely dependent on imports, and there seems to be no possibility of its becoming self-sufficient.

INDUSTRIAL MINERALS

Japan is fairly well supplied with those minerals which, while they do not ordinarily yield metals to be used as such, do afford the basic raw materials for many industries. Of the three great wheel horses of chemical industry, Japan has abundant supplies of limestone and sulphur, although it is far from self-supporting in the case of salt. Sulphur is present in surplus quantities and is exported, as is also limestone as a constituent of cement. Phosphate-bearing limestone is deficient and must be imported. Clays, concrete materials and building stones are adequate but production of many of the non-metallic minerals is on a small scale.

Sulphur and Pyrite

The sulphur used to make sulphuric acid and for other industrial purposes is partly mined as sulphur, partly as pyrite, and also is obtained in considerable portion from smelter fume. Part of the material shipped and sold commercially as pyrite is really low-grade sulphur rock mixed only in part with real pyrite. The sulphur sold abroad is refined brimstone. Sulphur deposits which are mined in Japan are only in minor part solfataric. The big mines are on deposits of sedimentary rock, largely tuff thoroughly impregnated with sulphur from volcanoes which were active nearby when the sediments were being laid down. The deposits are mined underground on a room and pillar system and the coarse crushed rock, when

roughly sorted, is retorted in closed cast iron kettles, the sulphur being run out into molds. A part only of the fine and low-grade rock finds its way to the acid plant where it is roasted and treated as pyrite.

Sulphur production as such climbed rapidly from about 60,000 tons in 1931 to 200,000 tons in the war years. The largest part of this came from two mines in southern Hokkaido, and one in northern Honshu. Up to 1941, sulphur was regularly exported in amounts from 25,000 to 75,000 tons. At the same time pyrites were being imported for making acid, despite a local production of roughly a million tons per year. Of this, substantially half came from the Yonahara Mine of the Fujita interests. Smelter fume from copper, lead and zinc smelting was an important source of sulphur for acid-making, and the industrial organization was such that ores very low in copper or lead content were useful. Japan furnished a market for pyrite and for very low-grade copper sulphide concentrates.

In the case of ores of too low content of copper, gold or silver to warrant treatment by regular smelting, they were roasted as ordinary pyrite, leached if they contained any copper, and the residue of iron, in the form of "bluebilly" sold to the blast furnaces for making pig iron. In recent years zinc sulphide ores have made an increasing contribution to the supply of sulphur for making acid.

With the limitation and control of production of sulphuric acid, no further restrictions need be applied to the production, import or export of any of these materials. Ordinary commercial demand can easily be met by domestic production.

Salt

No salt mines have been developed in Japan and climatic conditions

do not favor any large solar salt industry. Domestic production has been about 600,000 tons per year, fairly consistently maintained for two decades or more. Meantime consumption has increased from about 1,000,000 tons in 1930 to nearly 3,000,000 at the beginning of war. This gap was filled by imports which came in minor degree from Formosa, Korea and Manchuria, and in major degree from China, but which also came as far as from the Red Sea countries and East Africa.

Control of salt supply is one of the most effective devices that can be used when it can be applied, as the Japanese did in conquering the hill tribes in Formosa. However, since salt is the basis for the soda ash and caustic soda industries, that are required for soap, rayon and textiles, there would seem to be no valid reason for shutting off the supply to these peacetime chemical industries.

Phosphate Rock

The supreme importance to the Japanese of an adequate supply of fertilizer is self-evident. Among the materials for making artificial fertilizers, phosphate rock for the manufacture of super-phosphate is most important. And since Japan has adequate supplies of sulphuric acid available from domestic materials, it would not be economical to import finished super-phosphate, assuming that it were available.

In Japan proper there is substantially no phosphate rock, but in prewar years domestic production based on imports from mandated and other islands in the Empire rose from 87,420 tons in 1930 to 375,285 tons in 1935. In addition, there was imported from other sources 632,690 and 814,782 tons in the two corresponding years. To operate the super-phosphate plants of Japan at prewar capacity will require about 800,000 tons

of rock per year, and there can be but little question of the need of at least as much as before the war if the increased population of Japan is to be fed from its restricted area. It would seem wise so far as possible to allow the source of supply to be determined by ordinary economic and commercial considerations. Both Korea and China, the near-by sources, will doubtless come quickly to need at home all the rock either can supply. That from the Pacific Islands, mandated and other-wise, will be subjected to increasing demand, and access to these sup-plies is a proper subject for consideration in connection with peace-treaty discussions of their future supervision.

Egyptian and North African phosphate rock is available only in East Asia as an incident in balancing freight and of shiploading in connection with general trade. The same may be said as regards rock from Florida, of which a tonnage of some 250,000 tons per year had been going to Japan prior to the war. Here the movement has been favored by the higher grade of the rock available for export and the natural combination of cotton and rock to make up outgoing cargo balancing silk and light manufactures coming from Japan.

MINOR MINERALS

Mica, asbestos, graphite, quartz crystal, fluorspar and other vari-ous minerals of industrial value are found in both Japan and Korea and are worked in a small way. Neither country affords a supply of any of these which is important in international trade. Production of all of these minerals depends largely on the poverty of the country as much or more than on the abundance of the deposits. It is the availability of cheap but skilled hand labor which makes it possible to mine, dress and

grade them, and the industries serve a useful purpose since they are in general supplementary to others of greater importance or size. It would not seem to be either necessary or desirable to place any handicap in the way of the future growth of any of these industries.

It is desirable to permit and encourage the Japanese to go as far as they can, in the manufacture of clay goods of all classes from fire-brick to china and art pottery. The necessary materials are present, sufficient fuel is available, as is the skill and temperament of the workers. Here is an excellent field for Japanese industry in working up into finished goods raw materials of which only very small amounts need to be imported and which are readily salable in world markets to establish foreign exchange.

TABLE I

WORLD NITROGEN PRODUCTIVE CAPACITY (1)

These data are estimates for 1944 and were obtained from the U. S. Tariff Commission, U. S. Department of Agriculture, and authoritative confidential industrial sources.

(Thousands of short tons of nitrogen)

COUNTRY	TOTAL ANNUAL CAPACITY (2)	
Australia	7	
Belgium	220	
Canada	270	
Chile	350	
China	15	
Czechoslovakia	50	
France	350	
Germany	1,500	
Great Britain	400	(3)
Holland	165	
Hungary	20	
Italy	250	
Japan, including Korea and Manchuria	380	
Norway	120	
Poland	140	
Rumania	10	
Russia	220	
South Africa	9	
Spain	10	
Sweden	30	
Switzerland	13	
United States	1,225	
Yugoslavia	35	
Miscellaneous	20	
Total	5,809	(4)
Less: Total Capacity of Germany & Japan	1,880	
United Nations Capacity	3,929	
Plus: Estimated Permitted German Postwar Capacity	275	
World Total Postwar Capacity	4,204	
World Consumption in 1938 for Agriculture and Industry	3,158	(5)
World Excess Postwar Capacity	1,046	

(See Next Page for Footnotes.)

TABLE I

WORLD NITROGEN PRODUCTIVE CAPACITY (1)

Footnotes

(1) Assuming no war demolition.

(2) Total capacity includes synthetic, cyanamid, by-product and Chilean nitrate.

(3) This estimate subject to variation -- may be 100 low.

(4) This total capacity is a minimum which might be moderately increased, provided minor bottle-necks presumably existing at many plants are eliminated, but such moderate possible World increase above this figure would require all plants to be operated for maximum capacity at the same time.

(5) Includes some German war preparation.

The average annual consumption for agriculture and industry, for the years 1924 to 1929, was 1,610,000 short tons of Nitrogen; 1930-1934, 1,930,000 tons; 1935-1938, 2,780,000.

For the purposes of this study, total productive capacity is taken conservatively low. After eliminating productive capacity for Germany and Japan, and using for the peak year of 1938 total world consumption, there still exists an excess capacity of over 1,000,000 short tons of Nitrogen per year.

APPENDIX III-A
NITROGEN

TABLE II

WORLD NITROGEN STATISTICS

CAPACITY

(Thousands of short tons of nitrogen)

YEAR	BY-PROD.	SYN.	CYAN.	TOTAL
1924	410	560	250	1,220
1925	420	700	280	1,400
1926	435	815	315	1,565
1927	470	1,017	330	1,817
1928	510	1,312	335	2,157
1929	545	1,733	390	2,668
1930	572	2,210	465	3,247
1931	590	2,628	510	3,728
1932	600	2,943	520	4,063
1933	610	3,110	520	4,240
1934 (1)	624	3,231	539	4,392
1935				
1936				
1937		4,138		
1938 (2)				
1939				
1940				
1941				
1942 (3)				

(1) Data for 1924-1934 were obtained from the U.S. Tariff Commission Report #114, page 62.
(2) Data for 1935-1938 were obtained from the Annual Report of the British Sulfate of Ammonia Federation for 1937-38.
(3) Data for 1938-1942 were obtained from confidential sources.

These figures are approximations because of conversion from fertilizer years to calendar years; conversion of metric tons to short tons; and rounding off for expression as thousands of tons.

TABLE II (Cont'd.)

WORLD NITROGEN STATISTICS

PRODUCTION

(Thousands of short tons of nitrogen)

YEAR	BY-PROD.	SYN.	CYAN.	TOTAL EXCL. CHILE	CHILEAN	TOTAL INCL. CHILE
1924	352	355	120	828	412	1,240
1925	369	432	146	947	433	1,380
1926	398	552	182	1,131	346	1,478
1927	440	703	208	1,351	277	1,628
1928	467	945	215	1,626	543	2,169
1929	497	1,102	251	1,849	555	2,404
1930	477	1,019	256	1,751	420	2,171
1931	397	991	185	1,573	193	1,766
1932	346	1,149	167	1,662	120	1,782
1933	357	1,264	199	1,820	75	1,895
1934 (1)	397	1,348	235	1,979	145	2,124
1935	390	1,690 (4)		2,080	197	2,277
1936	404	2,020 (4)		2,024	211	2,635
1937	465	2,290 (4)		2,755	227	2,982
1938 (2)	530	2,386 (4)		2,950	246	3,196
1939	529	2,700 (4)			249	
1940					317	
1941					255	
1942 (3)					241	

(1) Data for 1924-1934 were obtained from the U.S. Tariff Commission Report #114, page 62.
(2) Data for 1935-1938 were obtained from the Annual Report of the British Sulfate of Ammonia Federation for 1937-38.
(3) Data for 1938-1942 were obtained from confidential sources.
(4) Includes cyanamid.

These figures are approximations because of conversion from fertilizer years to calendar years; conversion of metric tons to short tons; and rounding off for expression as thousands of tons.

TABLE II (Cont'd.)

WORLD NITROGEN STATISTICS

CONSUMPTION

(Thousands of short tons of nitrogen)

YEAR	AGRICULTURE	INDUSTRY	TOTAL	AVERAGE BY PERIODS
1924	1,075	140	1,215)	
1925	1,175	149	1,325)	
1926	1,269	179	1,444)	1,910
1927	1,457	197	1,655)	
1928	1,721	211	1,933)	
1929	1,880	220	2,100)	
1930	1,775	190	1,965(	
1931	1,575	170	1,745(	
1932	1,650	165	1,815(	1,938
1933	1,790	205	1,995(	
1934 (1)	1,970	200	2,170(	
1935	2,150	330	2,480)	
1936	2,460	380	2,840)	2,890
1937	2,685	395	3,080)	
1938(2)	2,740	418	3,158)	
1939				
1940				
1941				
1942 (3)				

(1) Data for 1924-1934 were obtained from the U.S. Tariff Commission Report #114, page 62.
(2) Data for 1935-1938 were obtained from the Annual Report of the British Sulfate of Ammonia Federation for 1937-38.
(3) Data for 1938-1942 were obtained from confidential sources.

These figures are approximations because of conversion from fertilizor years to calendar years; conversion of metric tons to short tons; and rounding off for expression as thousands of tons.

TABLE III

AVERAGE ANNUAL IMPORTS, EXPORTS, PRODUCTION AND CONSUMPTION of CHEMICAL FERTILIZERS IN JAPAN

(In 1,000 Metric Tons)

Name of Commodity	Imports	Exports	Production	Consumption
Sulphate of Ammonia	265	102	449	612
Calcium Cyanamid	2	14	210	198
Nitrate of Soda	28	1	0	27
Superphosphate	0	114	1,073	960
Synthetic Phosphates	9	0	171	180
Phosphate Rock	705	0	0	705
Sulphate of Potash	47	2.2	0.13	44.9
Muriate of Potash	27.1	0.4	0.21	37
Other Potash Fertilizers	no record			
Soya Cake	936	0.3	248	940
Fish Cake & Fish Meal	113	29	239	198

TABLE III-A

AVERAGE ANNUAL PRODUCTION and ESTIMATED ANNUAL NEEDS for FERTILIZER MATERIALS, 1940-1945

(In 1,000 Metric Tons)

Fertilizer	Average Annual Production 1940-1945	Estimated Annual Needs
Sulphate of Ammonia	946	800
Calcium Cyanamid	177	200
Nitrate of Soda	0	30
Superphosphate	792	900
Synthetic Phosphates	164	175
Phosphorite	1.7	700
Sulphate of Potash	0	45
Muriate of Potash	0	40
Other Potash Fertilizer	18.7	20
Soya Bean & Oil Cake	199	600
Fish Cake and Fish Meal	94	200

TABLE IV

SYNTHETIC AMMONIA PLANTS OF JAPAN

Prefecture or Province	Subprefecture or District	City, Town or Village	Address	Company	Annual Capacity (M.T. Nitrogen)
HOKKAIDO					
Hokkaido	Sorachi-gun	Sunagawa-machi		Toyo Koatsu Kogyo (Oriental High Pressure Industry Co. Ltd.)	51,500
HONSHU					
Aomori-ken		Hachinohe-shi	Konakano-machi, Okinono	Nitto Kagaku Kogyo K.K. (Nitto Chemical Industry Co. Ltd.)	6,200
Akita-ken		Akita-shi	Ibarajima	Asahi Kagaku Kogyo K.K. (Morning (Rising) Sun Chemical Industry Co. Ltd.)	10,300
Niigata-ken	Nakakanbara-gun	Ishiyama-mura	Enoki	Niigata Ryusan K.K. (Niigata Sulfuric Acid Co. Ltd.)	5,200
" "	Nakakubiki-gun	Nakago-mura	Fujisawa	Nippon Soda K.K. (Japan Soda Co.Ltd.)	1,500
Fukushima-ken	Iwaki-gun	Onahama-machi	Takayama, 34	Nippon Suiso Kogyo K.K. (Japan Hydrogen Industry Co. Ltd.)	20,600
Toyama-ken	Nei-gun	Hayahoshi-mura	Sasakura, 885	Nissan Kagaku Kogyo K.K. (Nissan Chemical Industry Co. Ltd.)	33,500
Kanagawa-ken		Kawasaki-shi	Ogi-machi, 28	Showa Denko, K.K.	69,000
" "		Yokohama-shi	Tsurumi-ku, Daikoku-cho, 35	Dai Nippon Tokkyo Hiryo K.K. (Great Japan Patent Fertilizer Co.Ltd.)	10,300
Aichi-ken		Nagoya-shi	Minato-ku, Showa-cho, 8-chome, 4	Yahagi Suiryoku K.K. (Yahagi Waterpower Co. Ltd.)	22,700
				Sub-Total Forward	230,800

TABLE IV (Cont'd.)

SYNTHETIC AMMONIA PLANTS OF JAPAN

Prefecture or Province	Subprefecture or District	City, Town or Village	Address	Company	Annual Capacity (M.T. Nitrogen)
				Brought Forward	230,800
HONSHU (Cont'd.)					
Hyōgo-ken	Kako-gun	Befu-machi		Taki Seihisho (Taki Fertilizer Works)	10,300
Yamaguchi-ken		Shimonoseki-shi	Hikoshima, Miyamae	Toyo Koatsu Kogyo K.K.	2,300
" "		Ube-shi		Ube Chisso Kogyo K.K.	49,400
KYUSHU					
Fukuoka-ken		Yawata-shi	Kurosaki	Nippon Kasei Kogyo K.K. (Japan Synthetic Industry Co.Ltd.)	17,000
" "		Omuta-shi	Sanko-cho, 8	Toyo Koatsu Kogyo K.K.	59,000
Miyazaki-ken		Nobeoka-shi	Tsunedomikita, 4319	Asahi Benberugu Kenshi K.K. (Rising Sun Bemberg Silk Yarn Co.Ltd.)	12,000
Kumamoto-ken	Ashikita-gun	Minamata-machi	Hama, Mategata	Nippon Chisso Hiryo K.K. (Japan (Nitrogenous Fertilizer Co. Ltd.)	16,500
SHIKOKU					
Ehime-ken		Niihama-shi	Otsu, 31	Sumitomo Kagaku Kogyo K.K. (Sumitomo Chemical Industry Co.Ltd.)	54,300
				TOTAL	451,600

APPENDIX III-A
NITROGEN

APPENDIX III-B
SULPHURIC ACID

TABLE I

PRODUCTION OF DIFFERENT CONCENTRATIONS OF SULPHURIC ACID IN JAPAN, 1929-38
(Metric Tons)

Year	Fuming	65° Be. and over	60° Be. and over	Chamber	Total	Total Calculated on 50° Be. Basis
1929	22,208	258,538	19,376	845,883	1,146,003	1,295,183
1930	7,197	134,343	38,470	795,743	975,753	1,057,318
1931	5,125	99,596	58,247	887,625	1,050,593	1,118,323
1932	5,621	102,667	52,503	1,172,311	334,102	1,402,974
1933	8,984	180,829	21,464	1,402,861	1,614,138	1,715,880
1934	12,175	220,628	16,211	1,496,619	1,745,633	1,868,128
1935	50,359	305,241	23,326	1,627,013	2,005,939	2,199,919
1936	176,677	363,634	19,408	1,877,773	2,437,492	2,746,831
1937	190,455	575,816	130,014	2,305,150	3,201,435	3,653,701
1938	195,710	627,033	135,762	1,796,806	2,755,311	3,238,203

Sources: Kojo Tokei Hyo 1937: 1938
Nippon Soda Kogyo Shi, December 1938
Nippon Kokusei Zukai, 1941

TABLE II

ESTIMATES OF SULPHURIC ACID CONSUMPTION IN JAPAN, 1929-38
(Metric Tons of 50° Be. Acid)

Year	Consumption: For Ammonium Sulphate	For Superphosphate	For Rayon and Staple Fiber	Other Uses (1)
1929	281,000	485,000	30,000	493,000 (2)
1930	347,000	431,000	41,000	233,000 (2)
1931	443,000	435,000	51,000	186,000
1932	495,000	496,000	76,000	349,000
1933	542,000	586,000	103,000	459,000
1934	637,000	543,000	171,000	502,000
1935	724,000	657,000	262,000	546,000
1936	1,051,000	707,000	350,000	641,000
1937	1,108,000	784,000	555,000	1,180,000
1938	1,324,000	629,000	638,000	621,000

(1) Includes any shipments to Formosa, Karafuto and the mandated Islands, but not exports to Korea and foreign countries, including Manchuria and Kwantung Leased Territory.

(2) Not corrected for change in stocks, unknown.

TABLE I

APPARENT DISTRIBUTION OF CONSUMPTION OF CALCIUM CARBIDE
IN JAPAN 1929-1938
(Metric Tons)

Year	Production	Imports	Exports	Stocks	Consumption for Calc.Cyan	Acet.Acid	Fuel Acetylene
1929	216,169	010	8,537	-	168,428	2,832	* 36,382
1930	299,744	012	9,932	19,519	241,643	4,440	* 43,741
1931	203,742	-	10,696	22,059	155,234	5,562	29,710
1932	279,892	-	13,794	15,400	225,575	6,947	40,235
1933	276,986	-	16,237	3,759	221,945	9,727	40,718
1934	304,174	-	19,506	25,005	202,496	12,391	48,335
1935	388,911	-	23,029	49,678	253,244	15,652	72,313
1936	423,652	-	25,911	44,952	281,064	19,227	102,176
1937	443,161	-	20,574	52,829	303,386	26,632	84,692
1938	417,082	5,137	17,930	31,321	281,968	28,536	115,293
Averages, 1929-1934:							
Arithmetic			13,117			6,993	39,887
Rounded and used			13,000			7,000	40,000

* Uncorrected for Stocks

Materials and Electric Engrgy to Produce Yearly 360,000 metric tons of calcium carbide and therefrom 360,000 metric tons of calcium cyanamid and 60,000 metric tons of packed carbide.

Calcium Carbide, 360,000 M.T.		Yearly Materials,M.T.	Yearly Energy KwY
Limestone		667,000 MT	
Bituminous Coke		209,000 MT	
Bituminous Coal: Burning Limestone	103,000 MT		
Drying Coke	4,000 MT		
		107,000 MT	
Carbon Electrodes		9,000 MT	
Electric Energy			156,000 KwY
Calcium Cyanamid, 380,000 M.T.			
Nitrogen Content, 80,000 M.T.			
Gaseous nitrogen, separated from liquid air	107,000 MT		
Electric Energy: Separating Nitrogen	3,000 KwY		
Nitrifying Carbide	1,000 KwY		4,000 KwY
Packing Calcium Carbide for Sale			
Sheet Steel for Drums	4,000 MT		
Calcium Carbide and Calcium Cyanamid, Total Energy Yearly			160,000 KwY

REPORT ON THE INDUSTRIAL DISARMAMENT OF JAPAN

Submitted to

THE SECRETARIES OF STATE, WAR & NAVY

by

THE NATIONAL ENGINEERS COMMITTEE

The National Engineers Committee was appointed by Engineers Joint Council on February 12, 1945, to carry out the studies requested by the then Secretary of State, Edward R. Stettinius, Jr., in his "memorandum of request" attached to his letter to Engineers Joint Council of December 28, 1944. That letter requested the preparation of "studies and proposals bearing upon the industrial disarmament of aggressor states."

The National Engineers Committee's report on Industrial Disarmament of Germany was submitted to the Secretaries of State, War and Navy, through Engineers Joint Council, on September 24, 1945.

Engineers Joint Council, of which Mr. Alex D. Bailey is Chairman, includes the President, Junior past President and Secretary of : American Society of Civil Engineers, American Institute of Mining & Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, and American Institute of Chemical Engineers. Mr. Malcolm Pirnie is Chairman and Mr. Robert M. Gates , Vice-Chairman of the Executive Committee.

Under date of November 8, 1945, Assistant Secretary of State, W. L. Clayton wrote to Engineers Joint Council expressing the State Department's appreciation for the report on Germany and requesting "an examination of the question of industrial disarmanent of Japan", as a result of which the National Engineers Committee was reconstituted for that purpose.

To fulfill the assigned objectives, it has been accepted by this Committee as its function, to recommend measures for the control of the industrial level of Japan, such that her war potential and the threat

to future world peace and security by another Japanese aggression, will be as largely as possible eliminated. To this end it has been considered necessary to identify the critical war potential elements of Japanese industry to be eliminated or controlled, so as to permit the non-war potential section of Japanese industry to function safely on a free enterprise basis.

This report has been prepared to meet the above stated objectives and the National Engineers Committee submits it, encouraged by the fact that the recommendations of its report on Germany were substantially all included in the directive of the Allied Control Council of March 29, 1946, for the limitation and control of German industry.

FUNDAMENTAL CONSIDERATIONS FOR INDUSTRIAL DISARMAMENT

The purpose of this report is to prescribe a plan for the control of the Japanese nation which will eliminate its threat or challenge to world peace for generations to come. In the formulation of any such plan, positive and continuing military and industrial disarmament must be the ultimate goal but ruthless and indiscriminate destruction of all industry and of a sustaining national economy will defeat the re-establishment of peace and the eventual admission of Japan into the councils of peaceful nations. The plan proposed must be firm but also just in the eye of the liberty loving people of the world. The complete elimination of Japanese industry, leaving the nation to eke out a living on agriculture and fishing, if possible, would create social chaos and suffering of such magnitude that enforcement would be impossible, and world opinion would repudiate the action.

The seizure, destruction or elimination of all arms, ammunitions, implements of war and combat vessels, and of facilities for their production, was directed immediately upon the occupation of Japan and was executed with order and dispatch. The surveys and studies to assemble the data necessary for an orderly control of civilian economy were begun immediately and the Committee has had the benefit of the data thus accumulated. The work of the Committee began, therefore, with a study to develop a plan which would limit the industrial economy of Japan, secure industrial disarmament, and control the war potentials until long after the occupation by the army has terminated.

The fundamental factors which have been considered are the psychology of the Japanese people, the extent and limitation of the natural resources particularly significant for war, the control of industrial facilities for processing and manufacture, the effect of controls upon national economy and standards of living, and the will of the controlling nations to perpetuate their supervision.

Japanese Psychology Must Be Adjusted

The Japanese attack upon Pearl Harbor and the war of conquest in the Pacific was the fruition not only of years of industrial preparation, but generations of psychological and religious indoctrination and perversion. It would be folly to assume that the aggressive, brutal instincts cultivated for years have been completely purged by conquest and by the judgments of the courts of justice. This perversion and fanaticism must be corrected by means other than industrial disarmament, but the plans for disarmament must be so firm and enduring as to check effectively any resurgence of militarism and of ambition for conquest.

Any plan which is to be effective must be simple and direct in operation, not unbearably oppressive to the common people, and not repugnant to fair minded and liberty loving people of the world.

A Peaceful Economy in the Western Pacific Must Be Developed

For generations Japan has planned to make the whole of Asia tributary to her economy and a means of support to her military aspirations and dominance. The economic dependence of Asia upon Japan is, therefore, much greater than that of Central Europe upon Germany. In the pursuit of these ambitions, Japan has succeeded in suppressing the industrial strength of her neighbors as she has built up her own. The destruction of her aggressive power and the control of her potentials for future war will be insufficient, therefore, without the simultaneous development of industry, agriculture and trade in and among the neighbors of the Japanese Islands.

The question of setting and enforcing regulations pertaining to Japan proper, which will harmonize with policies adopted toward countries liberated from Japanese domination, should receive careful consideration. With respect to both export and import, the economies of various nations or districts have been inter-related, and each new situation will present problems involving market outlets, employment, means of obtaining necessary supplies, and preservation of invested capital in countries outside of Japan. If Japanese markets are wholly and prematurely closed before others are developed, violence may be done to the industrial economies of nations formerly dependent upon such outlets. On the other hand, during the period of readjustment and world-shortages in certain items, and until domestic industries are developed, it may be found advantageous to have Japan supply at least a part of the requirements of

populations in nearby sections of the world. These considerations will affect final decisions relating to the production of commodities and capital goods in Japan and will have a bearing upon the allowable extent of imports.

The end results, however, should contemplate a balanced economy for Japan, devoid of the threat of war, and an expanding economy for her neighbors in the Western Pacific.

Policies and Procedures for Control Must Be Simple

If the controls imposed over the industry of a conquered nation are to be successful, they must be few in number, direct in application, and require a minimum of policing. Policies and procedures endorsed by the government of a victorious nation in the immediate aftermath of the horrors of war become soft and relaxing with waning memory. The re-alignments of power policies, the commercial pressures for the development of trade, the sentimental expressions of humanitarians, all tend to weaken and relax the limitations and controls for the suppression of national expansion and conquest.

The controls herein recommended have been applied, therefore, to the primary war materials and resources so as to be limited in number and direct in application. They will require a minimum of policing, which may be expected to remain long after large scale military occupation has been discontinued.

Primary Materials and Operations Should Be Controlled

In the long list of components of modern war, there are certain primary materials that have such particular properties and are required in such quantities, that war without them would be impossible. Without steel

and steel alloys there would be no great fleets of ships and tanks and trucks, nor great assemblies of armament. Without aluminum there would be no great fleet of fighter, bombing and torpedo planes. Without fuels and lubricants, modern air, land and sea power would be immobilized. Without explosives to be conveyed to the targets, the instruments of war would be useless as weapons of destruction. These primary considerations immediately suggest the basic plan for the destruction of war potential.

When a nation is engaged in building a navy, or an air force, or equipping an army, hundreds of materials may become critical items. A shortage of tungsten or molybdenum, or some plasticizer for synthetic rubber may represent a bottleneck in needed production. Controls may become necessary over the entire economy. When, on the other hand, it is desired to perpetuate the disarmament of a nation, this can be accomplished with the control of a few primary materials and operations.

Specific Controls for Industrial War Potential

All industrial processes, regardless of whether they are operating for peaceful or aggressive purposes, are based upon three essential factors without any one of which, production would be impossible, to wit: raw materials, processing equipment and energy. The recommendations for the control of Japan's industrial war potential are, therefore, based on these essential factors as they appear in the following industries:

I. Mineral and metal industries

II. Heavy chemical industries

III. Fuel industry

IV. Electrical power industry

and they are supplemented by certain general recommendations regarding:

V. Construction industry

VI. Scientific research

VII Nuclear energy

In certain particulars where imports must be permitted for the establishment of a balanced domestic economy they may be effectively supplemented by a system of import licenses.

MINERAL AND METAL INDUSTRIES

Japan is not well supplied quantitatively with ores and minerals, although small amounts of many of them are known to be present and most of them have been mined, usually on a limited scale. The local supplies were supplemented by mining in the conquered and later in the occupied countries, but in the main the metallurgical industries of Japan have been built up on the basis of imported raw materials which have been processed to finished products by use of steam or hydroelectric power, plus labor and skill. For a number of years, the main increase in value due to manufacture has gone into war or preparation for war, and there has been relatively little export of minerals or metals. An outflow of machinery and machine tools had begun, and in the exports of the country was a small but increasing stream of mineral products. The most abundant material and the one most largely produced, is coal. It also made the largest contribution to the export of mineral products. The coal trade was fairly well balanced, imports and exports being about equal before 1931. In general, Japan sent out steam coal, of which it has an abundance, and brought in coking coal of which its supply is limited. It would be possible for the Japanese to support a sufficient coke-making industry,

using local coal only, for a considerable term of years, but a wiser policy was adopted, that of importing rich coking coal from North China and Manchuria to mix with its own lower grade coking coal, and shipping out an equivalent amount of high grade steam coal. Of iron ore, Japan had an estimated reserve of only 80,000,000 tons, and its steel industry was built up largely on imports of ore, pig, and scrap. In the later years of the war when shipping difficulties became severe, Japan dipped heavily into its home ore reserve. More than two-thirds of the recent production of steel in Japan was for war purposes.

IRON AND STEEL

Based upon a study of average requirements for the 1926-1930 period, and with adjustments for current conditions, the apparent need for steel in Japan is set forth, by consuming industries, in the following tabulation:

	Industry	Metric Tons
1.	Construction	350,000
2.	Automotive	50,000
3.	Rail Transportation	210,000
4.	Containers,- cans, barrels, drums	180,000
5.	Shipbuilding, secondary uses	20,000
6.	Mining, Quarrying and Lumbering	40,000
7.	Machinery, Industrial Equipment, Tools, Agricultural and Electric Equipment, Applicances and Utensils	350,000
8.	Aircraft, Ordnance, Export	none
9.	Miscellaneous, not classified above	120,000
10.	Allowance for rapid increase in population due in part to repatriation	280,000
	Total	1,600,000

The foregoing figures are in reasonable harmony with a reported average peacetime consumption, for the 1926-1930 period, of 1,539,000 metric tons of rolled steel products, or a total of 1,627,000 metric

tons including steel castings, forgings, and others. During the 1930's and beyond, the extraordinary expansion of the Japanese steel industry to a potential productive capacity of approximately 9,000,000 metric tons of finished products, equivalent to 13,000,000 tons of ingots, reflects clearly the development of a facility for war purposes.

Therefore, it is recommended that:

1. To eliminate the war potential of this most basic of Japan's heavy industries and to provide for the justifiable needs of a peacetime economy, there be permitted an annual production of 1,600,000 metric tons of finished rolled steel products, equivalent to 2,300,000 metric tons of ingots. The installed steel-making capacity necessary to support such production is approximately 2,500,000 metric tons. By far the largest part of this should be concentrated in three or four of the most efficient open hearth plants, operating in close proximity to blast furnaces and rolling mills.

2. To support the recommended steel making operations, there be permitted the annual production of 1,500,000 metric tons of blast furnace iron, or approximately 65% of the ingot tonnage. In addition, there should be permitted a production of 500,000 metric tons of foundry iron per year by the blast furnaces, for castings. If in practice it be found that the supply of steel scrap is more than sufficient to support the production of 2,300,000 metric tons of ingots, the permissive amount of blast furnace iron may be decreased accordingly.

3. As a part of the total 2,300,000 metric tons of ingots, there be permitted the annual production of 230,000 metric tons of electric furnace steel ingots. This means an installed capacity of approximately 250,000 metric tons. There existed in Japan at the time of surrender about 3,000,000 tons of such capacity; all but 250,000 tons of this capacity should be removed or destroyed.

4. As to the importation of scrap for steel-making purposes, permission should be held in abeyance until the situation is more clearly defined and the needs of the industry can be better determined on the basis of practice. An ample domestic supply may now be available for the recommended rate of production, and it may persist for some years if effectively gathered and handled. It is thought that the islands may "originate"

sufficient steel scrap annually to support the making of 2,300,000 metric tons of ingots, or if not, that something of the order of magnitude of 400,000 tons of scrap per year might be accorded consideration, when and as the need is demonstrated.

5. With respect to the principal ferroalloys and alloying metals required for the production of different varieties of steel, optional procedures be permissive. The choice is between importing these products as used by the steel industry, or importing wholly or in part the necessary raw materials and converting them to metallics in Japan. The recommended allowable production of 2,300,000 metric tons of steel ingots per year will require approximately 21,000 tons of 75% ferromanganese, and the equivalent of 6,200 tons of 50% ferrosilicon. For the production of alloy steels, an estimated 3,000 - 3,600 metric tons of contained chromium may be required, and about 1,000 - 1,500 metric tons of nickel. A few hundred tons each of molybdonum, vanadium, and tungsten are indicated.

6. On account of normally varying requirements for different kinds of finished steel products from time to time, the permissive sum total of mill capacities for converting ingots to finished products should be substantially in excess of the steel-making capacity.

7. The importation of raw materials, primarily iron ore and coking coal, should be regulated to provide such amounts as may be required to make up any deficiency in domestic production of such raw materials, but with due regard to both the rate of depletion of Japanese mines and the need of neighboring states for markets for their ores.

8. Exports of steel products to markets formerly dependent on Japanese supply, should be permitted only to the extent that economies of such countries will not be seriously disrupted.

ALUMINUM

While the available data as to the Japanese aluminum industry are relatively meager and in many instances somewhat conflicting, the basic facts are clear. Aluminum production within the Japanese Empire did not commence in any appreciable quantity until the year 1935. The best

available rounded figures for Japanese production are as follows:

YEAR	POUNDS
1935	7,000,000
1936	13,000,000
1937	32,000,000
1938	49,000,000
1939	65,000,000
1940	90,000,000
1941	158,000,000
1942	228,000,000
1943	312,000,000
1944	243,000,000

Until cut off by the war, Japan imported considerable quantities of aluminum ingot, but very little aluminum in fabricated or semi-fabricated form. Japan exported practically no aluminum either in ingot or in further fabricated forms. The production figures as given above clearly indicate the part aluminum played in building up the Japanese war machine and the need for a strict control of the post-war Japanese aluminum industry in order to eliminate this war potentiality.

Except for the availability within the former Japanese Empire of a considerable amount of hydro-electric power, the basic economics of aluminum production in the Japanese Empire are substantially the same as is the case with Germany. The home islands of Japan contain no bauxite or other aluminous ores susceptible to economic utilization for the production of aluminum. The early Japanese aluminum production was based on alumina obtained from Korean alunite and Manchurian bauxitic shales. The utilization of those materials and the subsequent smelting of aluminum was heavily subsidized by the Imperial Government. The more recent production was undoubtedly primarily based upon high grade bauxite, obtained from the Dutch East Indies and the Malayan Archipelago.

Insufficient information is available to estimate accurately the amount of aluminum needed by post-war Japan for its peacetime requirements, but it can be approximated at between 10,000,000 and 15,000,000 pounds per year. The amount of employment involved in the production of this quantity of aluminum would be negligible in its effect upon Japanese economy as the total employment would be only about 250 or 300.

In view of the fact that there would be no economic gain and probably actually an economic loss in permitting Japan to produce her small post-war requirements for aluminum, and that there are positive war potential dangers and hazards in allowing Japan any aluminum production, it is recommended that similar prohibitions, limitations and controls be put into effect for Japan as were recommended by the National Engineers Committee and are now in effect in the case of Germany. It is believed that, subject to control, Japan may safely be allowed to import such aluminum as may be needed for civilian products, provided the fabricating facilities are limited in size and capacity to those needed for such civilian products.

Therefore, it is recommended that:

1. All alumina producing plants and all aluminum smelting plants within the borders of post-war Japan be eliminated by either demolition or removal.

2. Importation of bauxite or any aluminous ores be prohibited, except for a limited amount to be used as such for other than smelting of aluminum, as provided for hereinafter. (Recommendation 7).

3. The control of the aluminum industry may be regulated through the allocation of electrical energy and regulations developed to cover its distribution. Should any aluminum smelting be permitted, this would become an important control; with the elimination of all aluminum smelting, this would have direct controlling application to the fabrication of aluminum.

4. The fabrication of aluminum in post-war Japan be restricted to light industry such as the manufacture of civilian consumer goods. The control in this case may be exercised by the limitation as to the size and type and quantity of manufacturing equipment permitted and the control on the importation of aluminum (Recommendation 5).

5. A quota for the quantity of aluminum and aluminum scrap to be imported by Japan be determined by competent authorities. This quota should be flexible and subject to periodic review and adjustment. For the nearby term, a figure of approximately 4,000 metric tons is recommended.

6. All aluminum in any form including scrap now on hand in Japan, be seized and distributed in accordance with the foregoing.

7. The quantity of alumina used as such and aluminum compounds normally used in peacetime in such industries as the ceramic, manufacturing and chemical industries be determined by competent authorities and a quota based thereon, and that such items be admitted only up to this quota. The total amount of aluminum contained in such alumina and aluminum compounds is small and without smelting facilities could not be converted into metallic aluminum.

MAGNESIUM

From the limited data available it is evident that the Japanese magnesium industry is quite similar to and has paralleled the Japanese aluminum industry. The best available rounded figures for Japanese production are as follows:

Year	Pounds
1935	700,000
1936	1,500,000
1937	2,000,000
1938	2,800,000
1939	4,300,000
1940	6,800,000
1941	5,900,000
1942	6,200,000
1943	9,100,000
1944	10,600,000

Due to the fact that magnesia and consequently magnesium chloride and magnesium are economically produced not only from magnesite and dolomite but also by the extraction of magnesia from sea water, there is no limitation from an economic point of view upon the raw materials for magnesium production which are now available to Japan. To this extent her magnesium situation differs from her aluminum situation. However, in other respects, the two situations are practically identical and it is equally obvious that the Japanese magnesium production was developed only in connection with her war machine. This industry should also be strictly controlled in order to eliminate its war potentiality, as a basic alloy in aircraft production and as an incendiary munition.

It is doubtful whether as much as 1,000,000 pounds of magnesium per year would be needed by post-war Japan for peacetime requirements. The production of any such quantity as this would have a negligible effect upon the Japanese economy. Therefore, it is recommended that similar prohibitions, limitations and controls in regard to the Japanese magnesium industry be put into effect as have been recommended for the Japanese aluminum industry, i.e. that:

1. All Japanese magnesium production facilities be eliminated by demolition or removal.

2. Essential peacetime needs for magnesium chemicals be supplied from domestic raw materials, but electric power requirements so controlled as to prevent metal production.

Essential magnesium chemicals for medicinal and industrial uses can be manufactured from domestic raw materials subject to direct control of electric power requirements to prevent any metal production therefrom.

COPPER

The peacetime requirements for copper in Japan are estimated at approximately 70,000 metric tons per annum. Figures taken from various reports indicate a rate of consumption increasing from 69,000 tons in 1930 to an average of more than 150,000 tons in the later war years. For the immediate future, a permissive annual available supply of 70,000 metric tons per year should meet requirements for peacetime economy.

Data on the consumption of copper in Japan are confusing. For example, in the Pauley Report, the figure for 1931 is given as 51,000 metric tons. In the Journal of the Mining Institute of Japan, Vol. 53, June 1937, page 59 the consumption for 1931 is reported as 70,421 tons. According to the latter authority, in only one year of the decade following 1919 has the consumption of copper been substantially less than 70,000 metric tons.

Exports of copper from Japan, varying from less than a hundred to several thousands of tons are reported in addition to the home consumption.

Domestic mine production, as presently developed, is represented as capable of furnishing between 70,000 and 80,000 metric tons of contained copper. Smelting and refining capacities are considerably in excess of those figures. Therefore, it is recommended that:

> Copper smelting and refining capacities in excess of 85,000 metric tons, be eliminated to provide for a peacetime allowance of 70,000 metric tons per year.

LEAD

In the data available, figures for strictly peacetime consumption of lead in Japan are not given. For the ten year period, 1935-1944, the average annual figure, approximately 78,000 metric tons, is undoubtedly

far above normal requirements. The indicated lead content of the maximum domestic ore production is around 17,000 metric tons, with smelting and refining capacity considerably in excess of that figure. It is recommended that:

1. Facilities with a capacity of approximately 20,000 tons be retained for producing 17,000 tons of lead from domestic ores, or any necessary part thereof.

2. Permission to import additional quantities of metallic lead be based upon demonstrated needs as they develop in connection with the production of products for civilian use.

ZINC

Present refinery capacity of 178,600 metric tons should be reduced to about 40,000 tons, which would then be in approximate balance with mine production of 30,000 tons as reported for the year 1943. Apparent consumption of zinc during the ten year period 1935-1944 shows an average of 76,000 tons. Until the need for importation of ore or metallic zinc can be demonstrated, any necessary quantities of the metal, up to 30,000 tons per year, should come from local production.

TIN

Primary smelting capacity for tin ore should be eliminated, and only a small amount of refinery capacity, (of the order of 750 tons) should be permitted for production of secondary metal from tin dross. Imports of metallic tin should be restricted to the minimum level required by tin plate and other peacetime industrial uses. Depending upon the rate of operations of the various consuming industries, an appropriate figure probably will fall within the range of 2,000 to 3,500 metric tons of tin per year.

MACHINE TOOLS

According to the best available inventory there are 77,939 machine tools in operative condition in the arsenals of Japan. In the aircraft industry it is estimated that there are approximately 400,000. Tools in the so-called civilian industries number about 619,000, bringing the total to something more than 1,000,000. With the elimination of war activities, including the production of aircraft, it is apparent that a substantial reduction in the number of tools is both feasible and advisable.

The present potential capacity for the production of machine tools is placed at 20,000 to 25,000 units per year. Twenty companies, of which five predominate, have most of the producing capacity. Prior to the war, numerous machine tools were imported to serve as models and patterns, and the Japanese industry is reported to have been reasonably successful in duplicating them.

It is recommended that the machine tools installed in the arsenals and aircraft plants be eliminated, along with those in industrial establishments which have functioned mainly in support of the war potential of Japan. The estimate for such reduction may be around 50%. As to the machine tool industry, a production of 20,000 - 25,000 units per year probably will not exceed the annual replacement requirements when peacetime industry is well under way, and such replacements should be permitted.

HEAVY CHEMICAL INDUSTRY

Japan, liko her axis partners, built much of her war program around

her heavy chemical industries. In the three years from 1934 to 1937 chemical output was increased by more than 50 percent in annual value -- from 851 million yen ($ 238,800,000) to 1,424,594,000 yen ($ 400,000,000). Much of this and subsequent expansion during the war was in the nitrogen, sulphuric acid and calcium carbide industries, which contributed directly to war production and which, therefore, must be considered as key commodities in any program of industrial disarmament.

Japan's chemical industry is based largely on available raw materials -- coal (non-coking), sulphur and pyrite, chrome, limestone and magnesite (from Manchuria). It lacked and must therefore import salt, phosphate rock, potash, petroleum and rubber. A fairly abundant supply of hydro-electric power and ready access to mineral resources of Japanese dominated areas of China and Manchuria helped to make up these deficiencies.

FIXED NITROGEN

Nitrogen is of most vital importance to the Japanese economy both in peace and in war. Ability to meet the food requirements of her large population depends primarily upon chemical fertilizers, particularly nitrogen. At the same time, nitrogen is the basic element of all military explosives -- with the exception of the atomic bomb. Because of this two-fold dependence, the Japanese built a large synthetic ammonia industry that had an estimated capacity in 1944 in excess of 450,000 metric tons of nitrogen, exceeded only by Germany and the United States. In addition, Japan had ten calcium cyanamid plants with a total annual nitrogen fixation capacity of 90,000 metric tons. By-product ammonia from coke-oven and other gas plants added about 20,000 tons making a total nitrogen output of at least 560,000 metric tons.

From a viewpoint of immediate war potential, the synthetic ammonia plants offer the greater threat to peace. Their production can most readily be oxidized to produce nitric acid for explosives. Therefore, these facilities must be destroyed or drastically reduced to the minimum needed for food production. Calcium cyanamid is consumed almost entirely for agricultural purposes, however, and since these plants cannot be readily diverted to war production, they should be operated to the fullest possible extent in order to make up for other deficiencies in fertilizer production. By-product nitrogen is related directly to coking operations and its output will be reduced in proportion to the curtailment of the Japanese iron and steel industry.

With the foregoing objectives in view, namely, eliminating war potential without unduly crippling the output of fertilizers needed for essential food production, it is recommended that:

1. The synthetic nitrogen production of post-war Japan be limited to 180,000 metric tons of nitrogen per year of which 90,000 tons shall be produced as calcium cyanamid and the remainder supplied by synthetic ammonia plants, preferably those using hydro-electric power for the production of the necessary hydrogen.

2. All production capacity for nitrogen fixation as synthetic ammonia in excess of 90,000 metric tons be eliminated by destruction or removal. Related equipment suitable for hydrogenation of coal, oils or other organic materials for the production of alcohols, synthetic fuels, etc. should likewise be eliminated.

3. Japanese citizens and nationals, corporations or the Japanese government or any agents thereof, be prevented from obtaining complete or partial control of any financial interest in any nitrogen fixation plant in any other countries.

4. Synthetic ammonia and related high-pressure plants all require heavy steel and alloy forgings as essential parts of their equipment. The same steel mills that produce these heavy forgings and castings produce

armament, heavy artillery pieces, gun carriages, etc. If the iron and steel industry were prevented from the use of such facilities, it would be difficult or impossible to rebuild the synthetic ammonia, alcohol and fuel plants.

The foregoing recommendations are made in the firm knowledge and belief that the existence of synthetic nitrogen facilities in excess of the minimum required for food production will greatly increase the cost and difficulty of policing post-war Japan, and will constitute a definite war potential.

SULPHURIC ACID

Limitation of direct war potential in sulphuric acid manufacture in Japan is not in itself a difficult undertaking. It can best be accomplished by intelligent integration of sulphuric acid manufacture with the capacity of essential consuming industries, particularly fertilizers, rayon and synthetic fibers, petroleum refining and certain metallurgical uses. Speed is essential in the carrying out of the first part of this integration if widespread starvation, through shortages of fertilizers, is to be avoided in Japan.

Exclusive of military installations, Japan in 1938 had a capacity to produce, in its contact process sulphuric acid plants, approximately 3,500 metric tons per day of 100 percent acid. In addition to this homeland capacity, there were production facilities of perhaps 300 to 500 tons in Korea, Manchuria and North China. Some additional capacity was undoubtedly built after 1938, but is not believed to be important. The number and type of contact plants owned and operated by the Army and Navy at their various arsenals was a carefully guarded military secret before the war, but again the indications are that their combined capacity was not great and that the plants were of semi-obsolete type.

Except for these military installations which were believed to use refined native sulphur as raw material, all plants operate on gases from pyrite, zinc blende or copper roasters, or by the use of crude sulphur containing 50 percent or more of inert material. There are ample supplies of these raw materials for sulphuric acid manufacture.

Prior to 1933 only a relatively few Japanese acid plants had equipment for the production of 20 percent oleum (104.5% H_2SO_4) and at that time there were no installations for the production of 40 percent oleum (109.0% H_2SO_4). The output of fuming sulphuric acid increased from 8,984 metric tons in 1933 to 12,175 in 1934, to 50,359 in 1935, to 176,677 in 1936 and to 195,710 in 1938. Two-thirds of this came from the large plant on Kyushu of Toyo Koatsu Kogyo K.K. Generally speaking, oleum is required for the efficient production of explosives and for the manufacture of organic chemicals of a type which can form the nucleus of a chemical industry with real war potential. Were it possible to eliminate all oleum production and confine the sulphuric acid industry to ordinary concentrations, the control problem would be greatly simplified. If later it is found that certain medicinals or other essential chemicals require small amounts of oleum in their manufacture, its manufacture may be permitted under license and strict control. Oleum cannot be imported satisfactorily.

Sulphuric acid in sufficient quantity to produce Japan's requirements of superphosphate and ammonium sulphate for fertilizers, for the manufacture of rayon and synthetic fiber, for petroleum refining, for the pickling of iron and steel, in electric storage batteries, in electrolytic refining of copper and zinc, and in the manufacture of chemicals for peacetime use -- will require careful integration based

on figures that are not yet available in sufficient detail. Prior to the war about 60 percent of the sulphuric acid produced in Japan was required to manufacture ammonium sulphate and superphosphate. Since the output of neither of these essential fertilizers will likely be curtailed, it is estimated that at least 2 million tons of 50-deg. acid will be required for these vital uses. Other uses will require about 750,000 tons so that a maximum output of about 2,750,000 tons from a total plant capacity of 3,000,000 tons of 50-deg. acid (1,865,000 tons of 100 percent acid) should be adequate. It is therefore, recommended that:

1. The Japanese capacity for the production of sulphuric acid in excess of 3,000,000 tons per year of 50-deg. acid should be eliminated, first at all military arsenals and explosives plants, and second, at those poorly located to serve peacetime industries.

2. The manufacture of the permitted quantity of acid be by the contact rather than by the older chamber process for the following reasons:

   (a) Contact acid produces a better grade of ammonium sulphate.

   (b) Chamber operation requires the consumption of a certain amount of ammonia which will be needed for the fertilizer program.

   (c) Contact plants, if damaged, can be put back into operation without the extensive use of sheet lead or skilled lead burners required for chamber process plants.

3. Production of oleum and fuming sulphuric acid should be eliminated as a war hazard, or if found essential for certain restricted uses, its manufacture should be licensed, but all existing capacity should be dismantled or destroyed.

4. Since sufficient raw materials are readily available within Japan proper in the form of pyrite, crude sulphur, zinc blende, sulphide copper ores, etc., it will not be necessary to control the production of these materials insofar as they are used in sulphuric acid manufacture.

CALCIUM CARBIDE

Calcium Carbide is of vital importance to the national economy of Japan. Its largest single use is in the form of the derivative, calcium cyananid, required for nitrogen fertilizers to increase the supply of home-grown foods. Next in importance are the uses of carbide for lighting homes, mines, and fisheries, to generate acetylene for the welding and cutting of iron and steel and the handicraft industries that fabricate all metal articles. Finally, and of growing importance in Japan as in Germany, is the use of acetylene for the manufacture of acetic acid for the food and chemical industries and for the production of other organic chemicals.

Calcium carbide is a large consumer of electric power. The allotment of 360,000 metric tons of carbide yearly, proposed later herein, would require — including energy to convert 300,000 metric tons of cyananid — 160,000 kwy, the sale of which at $0.003 per kwh would yield $4,200,000 annually to the Japanese power industry.

Within the ten-year period 1929-1938, the year 1937 marks the highest outputs of carbide and cyananid and in that year 381,000 metric tons of cyananid were produced, requiring 301,000 metric tons of carbide. On the basis of 21 percent of nitrogen contained, the 380,000 metric tons of cyananid would yield 80,000 of nitrogen. The capacity of the Japanese cyananid industry is 90,000 metric tons of fixed nitrogen from which a production of 80,000 tons would logically be expected. This is approximately the amount of nitrogen from cyananid recommended for fixed nitrogen.

For the six-year period of 1929-1934, we find the following yearly averages for other calcium carbide uses:

For fuel acetylene	40,000 metric tons yearly
For exportation	13,000 metric tons yearly
For acetic acid and Chemicals	7,000 metric tons yearly

These amounts, with the 300,000 metric tons assigned to the manufacture of calcium cyanamid are proposed as rational allotments for the postwar years and they are so named in the table that next follows. For comparison, the corresponding tonnages reported as consumed in 1937 are also entered:

Japanese Peacetime Requirements of Calcium Carbide in Metric Tons

Uses of Calcium Carbide	Consumptions Recorded, 1937	Proposed Postwar Allotment
Calcium cyanamid for fertilizer nitrogen	303,400	300,000 M.T.
Acetylene for welding, cutting and lighting	84,700	40,000 " "
Acetylene for acetic acid and other chemicals	26,600	7,000 " "
Exportation	20,600	13,000 " "
Total	435,300	360,000 M.T.

Therefore, the following measures and methods of control are recommended:

1. That the Japanese calcium carbide industry be limited to an aggregate capacity to produce yearly 360,000 metric tons from supplies of electric power from time to time available, and in each year to produce no more than that amount.

2. That the Japanese calcium cyanamid industry be permitted an aggregate capacity to produce yearly 80,000 metric tons of contained nitrogen in form thereof, and in each year to produce up to that amount of contained nitrogen from permitted capacity of 90,000 metric tons.

3. That a calcium carbide-calcium cyanamid control commission be established and authorized from time to time to inspect all plants in Japan wherein calcium carbide, calcium cyanamid or both may hereafter be made, to control the operation of such plants to the extent necessary to limit their outputs of calcium

carbide and cyanamid to the yearly aggregate amounts provided for above and, by license, to control the manufacture, distribution, sale,. exportation and importation of such outputs.

FUEL INDUSTRY

The fuel industry is of importance in the military potential of Japan as a source of mechanical energy. One of the most striking characteristics of modern warfare is the amazing increase in the amount of energy employed in proportion to military manpower. Much of modern warfare depends, in combat, on petroleum rather than on coal, but coal is the principal source of energy in the production of the materials employed, both the equipment and the explosives, which are used either as propellants or as detonants.

COAL

Japan is adequately, though not abundantly, supplied with coal. Its total coal reserves were estimated at 8 billion tons in 1913 and re-estimated at 16 billion in 1932. It is mostly bituminous coal of Miocene Tertiary Age, though much smaller amounts of both anthracite and lignite are available and currently being produced. A fair proportion of the coal is of coking quality. About one-half of the reserves (and 1/4 of 1935 production) are in the island of Hokkaido, with Kyushu as the next most important in reserves. Honshu, the largest of the islands of Japan, has a coal field in Hitachi and Awaki prefectures, but the quality is inferior and the quantity uncertain.

In the decade 1912-1921 the coal production in Japan proper increased from about 20 to 30 million tons. But a most significant feature in the total increase of coal resources was the extension of Japanese political

control over coal-producing areas outside its islands. Beginning with Formosa, acquired from China in 1895, and followed by Karafuto (the southern half of Sakalien) in 1905, Korea, annexed by Japan in 1910, and Manchuria, over-run in 1931 and set up as a puppet state, the coal available to Japan was greatly increased.

The basic question, however, is whether the coal-producing capacity left in Japan will be adequate to meet the needs of the post-war economy. Apparently it will, but the answer to the question cannot be certainly deduced from the production capacity data. The post-war coal needs will be determined by the volume and activity permitted to the industries which are the principal consumers of coal, and by the railway traffic and shipping resulting from such activities. Similarly, the needs for coking coal will be fixed by the volume of metallurgical activity permitted, and the requirements for bunker coal by the shipping activity allowed.

If, when these quantities are determined, there remains surplus capacity to produce coal for export, the question will arise as to the advisability of removing the surplus production equipment and delivering it to China as a part of reparations, or to retain such surplus equipment to support the export of coal.

Whatever course is followed, measures should be instituted to ensure that Japanese coal is not dumped into Chinese and other markets as a means of increasing trade balances at a loss. Current estimates suggest that recent Japanese output has been supported by subsidies up to 40% of the cost of production. China will need all the export markets for coal available as a help to trade balances in its post-war recovery and development. The Japanese coal industry should not be allowed to interfere with this. Because different industries need different grades of coal

there always will be exchange among the various producing and consuming areas of the Far East, but this should be confined to a normal economic pattern; just what this pattern will be can be determined only by experience and detailed studies made on the ground.

It is, therefore, recommended that:

> The coal industry of Japan be placed under a control system which will provide for domestic heating and the needs of the metallurgical, manufacturing and transportation industries of a peacetime economy and for the prescribed level of exchange of exports and imports.

PETROLEUM

In modern warfare, as in peacetime industry, petroleum and its products are among the most essential of materials. Without an internal supply, no nation can keep on fighting after its stored supply is exhausted, unless it can so protect its lanes of transport as to continue to draw upon the resources of some other neutral, friendly or occupied country better favored by nature. The petroleum fields in Japan are very limited and despite painstaking and informed effort, have never been made to yield more than about 10 percent of the normal demand of the country. For the remaining supply for peacetime industry, and for virtually all its strategic supply, the nation must depend upon imports.

The storage capacity in Japan in pre-Pearl Harbor days was, roundly, 55,000,000 barrels, of which 20,000,000 may be classified as dominantly commercial and 35,000,000 essentially strategic. The latter was partly above and partly below ground and, being at or near the navy bases, presumably will be destroyed as the latter are wiped out. The commercial storage was somewhat in excess of the normal needs of the country since a few years ago the government forced the petroleum companies to put in storage and carry a six months' stock.