PROVISIONAL INTELLIGENCE REPORT

THE FIXED NITROGEN INDUSTRY IN THE SOUTH EUROPEAN SATELLITES

CIA/RR PR-95
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THE FIXED NITROGEN INDUSTRY IN THE SOUTH EUROPEAN SATELLITES

CIA/RR PR-95

(ORR Project 22.158)

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CONTENTS

~~S-E-C-R-E-T~~

Appendixes

Tables

Charts

CIA/RR PR-95
(ORR Project 22.158)

S-E-C-R-E-T

THE FIXED NITROGEN INDUSTRY
IN THE SOUTH EUROPEAN SATELLITES*

Summary

The basic product of the fixed nitrogen industry in the South European Satellites** is ammonia. All the commercially useful forms of fixed nitrogen produced in these countries are derived from naturally occurring or synthetic ammonia. The principal product derived from ammonia is nitric acid, which is perhaps the most important military chemical and an indispensable industrial chemical. As a military chemical, it is essential to the manufacture of all propellants and nonatomic high explosives. The use of nitric acid as a fuel oxidizer in rocket-propelled guided missiles has not yet become significant in the South European Satellites. As an industrial chemical, nitric acid is used principally for the manufacture of nitrogenous fertilizers such as ammonium nitrate and sodium nitrate and for industrial explosives and organic dyestuffs.

The only process employed at the 6 fixed nitrogen plants in the South European Satellites is the Haber-Bosch ammonia synthesis process, and the only process used for the manufacture of nitric acid is the ammonia oxidation process. The actual technology varies somewhat between that used in the first Hungarian plant, which was US-engineered, and that used in the first Bulgarian plant, which was designed by the USSR.

The total estimated production of ammonia in the South European Satellites during 1954 is about 55,000 metric tons.*** This output was equivalent to about 8 percent of the estimated ammonia production of the USSR for 1954 of 700,000 tons. Of this total, 54,250 tons are to be produced synthetically at the 6 fixed nitrogen plants existing within the area and 845 tons as byproduct ammonia from the Rumanian coking plant at Recita and the new Rumanian byproduct coking plant

* The estimates and conclusions contained in this report represent the best judgment of the responsible analyst as of 1 October 1954.
** Albania, Bulgaria, Hungary, and Rumania.
*** Throughout this report, tonnages are given in metric tons.

S-E-C-R-E-T

at Hunedoara. By 1956, total ammonia production in the South European Satellites is expected to reach about 110,000 tons, of which 105,550 tons will be from synthetic ammonia plants. Before World War II, only 1 large plant existed in Hungary, 2 small plants were operative in Rumania, and none in Albania or Bulgaria. By the end of 1956, 3 large additional synthetic ammonia plants will have become operative in the South European Satellites.

Bulgaria has 1 fixed nitrogen plant, a part of the Stalin Chemical Combine at Dimitrovgrad. Estimated production of synthetic ammonia in 1954 is 23,800 tons. By 1956 the expanded capacity should allow a production of 35,100 tons per year. The 1954 production of synthetic ammonia is 3.4 percent of the estimated 1954 production of the USSR. The capacity of the industry is more than adequate to meet indigenous requirements for fixed nitrogen in the manufacture of explosives. The industry is also capable of making an appreciable contribution to agricultural productivity, but the current pattern of allocation does not favor agriculture.

At the present time, Hungary has 1 operative fixed nitrogen plant at Petfurdo. Estimated production of synthetic ammonia in 1954 is 19,500 tons. By 1957 the second fixed nitrogen plant, at Kazincbarcika, should raise national production to almost 75,000 tons of synthetic ammonia per year. In 1954, Hungary's production of synthetic ammonia was equal to only 2.8 percent of the estimated 1954 production of the USSR.

Hungary's production of ammonia is largely channeled into production of explosives, and the balance of the nitric acid and ammonium nitrate produced from ammonia may reach agriculture in the form of "Petiso"* fertilizer. Until the Kazincbarcika enterprise becomes operative, the domestic industry seems incapable of aiding agriculture to any effective degree after the priority demands of the explosives producers are met.

Rumania has 2 prewar fixed nitrogen plants fully operative and 1 postwar plant partially operative. Estimated production of synthetic ammonia in Rumania in 1954 is 10,950 tons, equal to about

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* A physical mixture of ammonium nitrate and pulverized calcium carbonate also known as kalkammonium nitrate or nitro chalk.

1.6 percent of the estimated 1954 production of the USSR. Estimated production of about 12,000 tons of concentrated nitric acid in 1954 is largely the production of the new plant at Ucea-de-Sus. This plant will boost concentrated nitric acid production to 23,500 tons in 1956, compared with a prewar peak of 5,900 tons in 1939. Production has been heretofore inadequate to meet more than the requirements of the established explosives plants, and only incidental amounts of domestic production have been devoted to agriculture.

Completion of the Ucea enterprise should give Rumania nitrogen production far in excess of the requirements of existing explosives factories. This surplus may be allocated to agriculture and miscellaneous users, or Rumania may follow the lead of Bulgaria and utilize surplus production as an export commodity.

In the South European Satellites, there is no stockpiling; consumption generally equals domestic production. If a surplus of ammonia and nitric acid were produced, stockpiling in those forms would require prohibitive numbers of special pressure vessels for the gaseous ammonia and of stainless steel or aluminum tankage for the corrosive nitric acid. Thus it is believed that any stockpiling is in the form of finished products — filled munitions, high explosives, and nitrogenous compounds such as ammonium nitrate, sodium nitrate, and urea.

Imports of nitrogenous compounds for use as agricultural fertilizers have supplemented domestic production. Imports of synthetic ammonia or nitric acid are infrequent and small. A trend which may develop, already demonstrated in Bulgaria, is the seeking of export markets for nitrogenous compounds not allocated to domestic consumers. Exchange credits may have priority over domestic needs for fertilizers, which are apparently not as critical as the need for foreign exchange.

Because of insufficient information, the requirements for synthetic ammonia in the South European Satellites in 1954 must be estimated largely on the basis of estimated production. Consumption in 1954 is estimated by broad category of use: 25,470 tons, or 47 percent of the total, for the manufacture of nitrogenous fertilizers; 28,640 tons, or 52.8 percent, for the manufacture of military and industrial explosives; and 140 tons, or 0.2 percent, for miscellaneous other uses such as refrigerants, dyestuffs, and plastics.

The primary input requirements for the manufacture of the estimated 54,250 tons of synthetic ammonia produced in the South European Satellites are estimated at from 39.1 million to 43.4 million cubic meters of nitrogen, 108.5 million to 130 million cubic meters of hydrogen, 7.32 to 8.14 tons of iron catalyst, and 82 million to 92.6 million kilowatt-hours of electrical energy.

The fixed nitrogen industry in the South European Satellites is practically self-sufficient in vital raw materials and apparently is not vulnerable to economic warfare. A clear weakness, however, is the enforced reliance upon external suppliers for the catalysts required in ammonia synthesis and in the subsequent oxidation of ammonia to nitric acid. These external suppliers are presumably other Soviet Bloc countries. The platinum catalyst vital to ammonia oxidation is supplied principally by the USSR.

Current information indicates that the satisfaction of explosives requirements by the fixed nitrogen industry is being emphasized at the expense of nonmilitary users. For example, in addition to supplying its own explosive factories, Hungary has been reported as supplying substantial tonnages of its explosives output to Communist China.

Because all fixed nitrogen plants are dependent upon electrical energy and pure synthesis gas to synthesize ammonia, the industry is potentially vulnerable to destruction of power plants or synthesis gas purification installations.

The fixed nitrogen industry is potentially a good indicator of military intentions to the extent that it indicates the importance of industrial production to meet military needs relative to the importance of the needs of an economy oriented toward peace. Cessation of exports of nitrogenous products and the curtailment of supplies of nitrate fertilizers to agriculture would indicate a diversion of fixed nitrogen production to uses other than those prevailing in peacetime economy.

Greatly increased production of military high explosives would be preceded by increased production of concentrated nitric acid and a concomitant reduction in the output of sodium nitrate, urea, and possibly ammonium nitrate. In addition, substantially all of the ammonium nitrate that was produced following the reallocation of nitric acid output would be diverted from agriculture to the explosives industry. These shifts in the allocation of fixed nitrogen production would precede full-scale military operations of the conventional type.

Because the existing plants in the South European Satellites are primarily attuned to meet the requirements of the explosives industry, such a realignment of consumption patterns to support mobilization for war would be more difficult to detect than in the fixed nitrogen industries of the USSR or Czechoslovakia, which devote the largest part of their available fixed nitrogen supplies to agriculture. Nevertheless, current indications are that the industry is not presently mobilized to support preparations for war.

I. History and Organization.

A. General.

Following World War I, most of the world's nations initiated programs for the construction of fixed nitrogen plants. All of these plants employed one of several commercially adaptable modifications of the original Haber-Bosch process. Among the South European Satellites, only Hungary and Rumania had erected plants making use of this process before World War II, and there have been major expansions in both of these countries in the postwar years.

In the postwar period, Bulgaria constructed its first and only fixed nitrogen plant -- largely with Soviet technology and equipment. Albania has no domestic facilities for nitrogen fixation, and there are no indications of any plans to erect such facilities.

B. Bulgaria.

Before 1952, Bulgaria lacked any domestic fixed nitrogen industry. The Stalin Chemical Combine at Dimitrovgrad is the sole major chemical combine in the country as well as the only nitrogen products plant. There are no specific indications of which government organ administers the plant at Dimitrovgrad. There have been references to a "Chemical Industry Branch of the Ministry of Heavy Industry," 1/* and it is probable that the Dimitrovgrad plant is controlled by this administrative division of the Ministry of Heavy Industry. As the number of chemical plants in Bulgaria is small, it is unlikely that there are any intermediate administrative organs between the Chemical Industry Branch and the plant management.

C. Hungary.

In 1930 the Hungarian government authorized the construction of Hungary's first Haber-Bosch nitrogen fixing plant at Petfurdo. The plant became operative in 1932 and was expanded during the succeeding years, reaching its greatest capacity in the early 1940's. Aerial bombardment in 1944 crippled the plant so effectively that domestic output of nitrogen products was shut off. Restoration of the facilities at Petfurdo, almost to prewar capacity, was probably completed by the end of 1948.

A second, and considerably larger, nitrogen fixing plant is under construction as part of the chemical combine at Kazincbarcika in Borsod County. These two plants currently constitute the fixed nitrogen industry of Hungary.

The organization of the nationalized industry since World War II apparently went through several stages of development before the emergence of the current organization. It is believed that the fixed nitrogen plants fall within the jurisdiction of 1 of 5 Industrial Centers under a Chemical Directorate which is within the Ministry of Heavy Industry. 2/ There was partial confirmation of this relationship as of September 1953. 3/

It is apparent that the general supervision of the fixed nitrogen industry originates high in the government, as is characteristic in the Communist form of government. This general policy would certainly apply to the fixed nitrogen industry, which produces the materials that form the bulk of agricultural fertilizer and high explosives.

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* Footnote references in arabic numerals are to sources listed in Appendix E.

As an indication of the current priority given to the industry, 25X1C [redacted] the general cutbacks in equipping heavy industry do not apply to the Kazincbarcika fixed nitrogen plant and that construction is proceeding according to plan. 4/

D. Rumania.

Before World War II the two existing fixed nitrogen plants in Rumania were privately owned enterprises. In the postwar period the nationalization of private enterprises probably included the fixed nitrogen plants.

In November of 1949 a Ministry of Metallurgical and Chemical Industries was created. An organization called the Industrial Directorate for Chemicals was also established as a subordinate to this Ministry, and this Directorate would logically control the fixed nitrogen plants. 5/

25X1C [redacted] organizational change occurred late in 1951 or in 1952. At this time, separate Ministries were created (the Ministry of the Chemical Industry and the Ministry of the Metallurgical Industry) from their single predecessor. 6/ This change 25X1C [redacted] and an elaboration upon this latest setup indicates the establishment of four Production Directorates under a Deputy Minister. One of these Directorates is the General Directorate of Inorganic Chemistry. It is probable that this administrative organization is in immediate control of the fixed nitrogen plants in Rumania. 7/

25X1C [redacted] that the Chemical Ministry cooperates with the Ministry of the Armed Forces in the production of strategic war materials. The first postwar fixed nitrogen plant nearing completion at Ucea-de-Sus is a development of this policy.

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II. Supplies.

A. Production.

1. Synthetic Ammonia.*

a. Bulgaria.

Before World War II, synthetic ammonia was not produced domestically in Bulgaria. The erection of the Stalin Chemical Combine at Dimitrovgrad gave the country its first fixed nitrogen plant. The plant was formally opened at the end of 1951, and steady production of ammonia was attained early in 1952. 9/ Production of ammonia during the first calendar year of operation is estimated at 18,700 tons. The
25X1C capacity [redacted] undergoing a 50-percent expansion in 1953. 10/ Allowance for this increase would indicate an estimated output of over 35,000 tons annually by 1956 — assuming that the additional capacity was utilized.

Estimated production of synthetic ammonia in Bulgaria, 1951-56, is shown in Table 1.

Table 1

Estimated Production of Synthetic Ammonia in Bulgaria a/
1951-56

Metric Tons

Year	Production: Synthetic Ammonia	Production: Nitrogen Content	Probable Range of Production (Synthetic Ammonia)
1951	Negligible		
1952	18,700	15,400	17,500 to 21,000
1953	23,800	19,600	21,000 to 24,000
1954	23,800	19,600	23,000 to 24,000
1955	27,600	22,700	24,000 to 30,000
1956	35,100	28,900	34,000 to 35,500

a. For the methodology used in developing this table, see Appendix C.

* For a graphical representation of the processes and techniques employed in fixed nitrogen plants, see Figure 1, following p. 18.

b. Hungary.

Before World War II the production of synthetic ammonia in Hungary was limited to the Nitrogen Works at Petfurdo. The plant suffered crippling damage during World War II but was substantially restored by the end of the Three Year Plan (1947-49). By 1952 it was further expanded to increase production of synthetic ammonia to an estimated 19,500 tons. 11/

The first postwar synthetic ammonia plant is under construction in Borsod County. Initial production is expected to start in the latter part of 1955, and the probable output for that year is about 10,000 tons of synthetic ammonia. By 1957, capacity production of 55,000 tons of synthetic ammonia should be realized.

When both plants are operating at near estimated capacity, domestic ammonia production will be about 75,000 tons annually. Estimated production of synthetic ammonia in Hungary, 1954-57, is shown in Table 2.

Table 2

Estimated Production of Synthetic Ammonia in Hungary by Plant a/
1954-57

Metric Tons

Plant	1954	1955	1956	1957
Peti (Petfurdo)	19,500	19,500	19,500	19,500
Sajomenti (Kazincbarcika)	None	10,000	40,000	55,000

a. For the methodology used in developing this table, see Appendix C.

c. Rumania.

Before World War II, small installations for the production of synthetic ammonia were located at Tarnaveni and Fagaras. As late as 1949, production at both plants was only about half their designed capacity because of inadequate raw material supplies and the inferior quality of the catalyst in use. 12/

The new fixed nitrogen plant under construction at Ucea-de-Sus, designed and begun by Nazi Germany during World War II, is still awaiting vital equipment which is being fabricated in the other Satellites without the benefit of the original plans drawn up by what are now West German chemical concerns. 13/ In view of the already huge investments in the plant and the pressing need for nitrogen products, substantial production was expected by 1953. The equipment for ammonia synthesis is believed to be already installed and operative. It is estimated that production will approach designed capacity of 7,000 tons in 1954.

Thus domestic ammonia capacity will be almost tripled (from 4,200 tons to 11,200 tons) between World War II and the end of 1954. Production of synthetic ammonia will be multiplied five times (from 2,100 tons to 10,950 tons) between the postwar low in 1949 and estimated output for 1954.

The ammonia produced at Tarnaveni is converted to aqua ammonia (18 to 25 percent water solution), and output may exceed 11,000 tons of aqua ammonia if the plant is operating near capacity. 14/ Estimated production of synthetic ammonia in Rumania, for selected years, 1949-56, is shown in Table 3.

Table 3

Estimated Production of Synthetic Ammonia in Rumania by Plant a/
Selected Years, 1949-56

Metric Tons

Plant	1949	1953	1954	1956
Combinatul (Tarnaveni)	700	1,350	1,350	1,350
Combine No. 1 (Fagaras)	1,400	2,700	2,700	2,700
Sovromchim (Ucea-de-Sus)	None	6,500	6,900	6,900

a. For the methodology used in developing this table, see Appendix C.

2. Nitric Acid.

a. Bulgaria.

Nitric acid is produced at Dimitrovgrad at the normal strength of approximately 48 percent pure acid — or, possibly, 60 to 65 percent pure acid strength if the absorption of the oxidized ammonia occurs in a pressurized system. Whichever strength results from the process, all the synthetic ammonia converted to dilute nitric acid is believed to be utilized in fertilizer production.

Estimated production of nitric acid in Bulgaria, 1951-56, is shown in Table 4.

Table 4

Estimated Production of Nitric Acid in Bulgaria a/
1951-56

Metric Tons

Year	Production	Probable Range of Production
1951	Negligible	0 to 100
1952	62,000	59,000 to 65,000
1953	75,900	72,000 to 78,000
1954	100,000	95,000 to 110,000
1955	112,000	110,000 to 120,000
1956	146,000	135,000 to 150,000

a. Production figures are on the basis of 48 percent nitric acid, which is the probable concentration produced at the one plant.

b. Hungary.

Before World War II, only the Petfurdo installation is known to have had the equipment for the production of concentrated nitric acid (96 to 99 percent pure acid). War damage to the plant was overcome to the extent of restoring nitric acid capacity to

12,000 tons annually by 1950. Additional expansions of the restored facilities will bring the capacity at this site up to 18,000 tons by 1955.

The new plant under construction at Kazincbarcika will have about twice the highest capacity of Petfurdo, and a production rate of close to 36,000 tons annually should be reached by 1957 at Kazincbarcika alone.

Estimated production of nitric acid in Hungary by plant for selected years, 1950-56, is shown in Table 5.

Table 5

Estimated Production of Nitric Acid in Hungary by Plant a/
Selected Years, 1950-56

Metric Tons

Plant	1950	1952	1954	1955	1956
Peti (Petfurdo)	12,000	12,000	16,000	17,500	17,500
Sajomenti (Kazincbarcika)	None	None	None	Negligible	15,000

a. Production figures are on the basis of 100 percent acid. For the methodology used in developing this table, see Appendix C.

c. Rumania.

Before World War II the installation at Fagaras was the only producer of concentrated nitric acid in Rumania. During the war the initial capacity was increased by more than 50 percent. In 1949, only 25 percent of the capacity was producing (at the rate of about 2,300 tons a year). Near-capacity production of 9,000 tons should be reached in 1956.

The second and newest installation, at Ucea-de-Sus, is expected to begin production of nitric acid during 1954. Production should approach capacity in 1955.

Estimated production of nitric acid in Rumania, by plant for selected years, 1949-56, is shown in Table 6.

Table 6

Estimated Production of Nitric Acid in Rumania by Plant a/
Selected Years, 1949-56

Metric Tons

Plant	1949	1952	1954	1955	1956
Combine No. 1 (Fagaras)	2,300	4,600	6,900	9,000	9,000
Sovromchim (Ucea-de-Sus)	None	None	5,000	14,500	14,500

a. Production figures are on the basis of 100 percent acid. For the methodology used in developing this table, see Appendix C.

3. Nitrogenous Fertilizers.

a. General Status.

Several types of nitrogenous fertilizers are produced in the South European Satellites. Before 1954, almost all nitrogenous fertilizers were produced from synthetic ammonia, and little was produced from the ammonia naturally occurring in the byproduct gases of coking plants.

b. Nitrogenous Fertilizers from Synthetic Ammonia.

Among these nitrogenous fertilizers produced from synthetic ammonia are the various artificial fertilizers which require synthetic ammonia as a starting material or of which ammonia is a major component. In the former class are sodium nitrate and urea, and in the latter class are ammonium sulfate, ammonium nitrate, and "Petiso."*

* A physical mixture of ammonium nitrate and calcium carbonate, also known as kalkammonium nitrate or nitro chalk.

The nitrogen content of the major nitrogenous fertilizers produced in the South European Satellites is shown in Table 7.

Table 7

Nitrogen Content of the Major Nitrogenous Fertilizers Produced in the South European Satellites

Fertilizer	Nitrogen Content (Percent)
Ammonium Nitrate	34 to 34.5 (Bulgaria)
Sodium Nitrate	16.1 (Bulgaria)
Petiso	17.0 (Hungary)
Aqua Ammonia	19.4 (Rumania)
Ammonium Sulfate	21.0 (Standard)
Urea	46.3 (Bulgaria)

c. Ammonium Sulfate from Coking Byproduct Gas.

Natural ammonia is a component of the byproduct gas produced in the coking of bituminous coal. The ammonia is recovered from the gas by absorption with sulphuric acid. By 1954 the metallurgical combine at Sztalinvaros is expected to have the facilities for producing this fertilizer but apparently will not begin production before 1955. It will be the first plant with such an operation in Hungary. Estimated production of byproduct ammonium sulfate in Hungary, 1954-57, is shown in Table 8.*

* Table 8 follows on p. 15.

Table 8

Estimated Production of Byproduct Ammonium Sulfate in Hungary 15/
1954-57

Metric Tons

Year	Production	Probable Range of Production
1954	None	
1955	6,800	5,500 to 7,500
1956	8,500	8,200 to 8,900
1957	8,900	8,500 to 9,000

Until 1953, byproduct ammonium sulfate was produced in Rumania only at the Recita bituminous coal coking plant. Beginning in 1953, the new coking plant at Hunedoara was to have become operative. With both of these plants producing at near capacity, the production of byproduct ammonium sulfate may rise to 7,550 tons in 1956. Estimated production of byproduct ammonium sulfate in Rumania, for selected years, 1949-56, is shown in Table 9.

Table 9

Estimated Production of Byproduct Ammonium Sulfate in Rumania 16/
Selected Years, 1949-56

Metric Tons

Year	Production	Probable Range of Production
1949	750	500 to 750
1952	1,040	900 to 1,050
1954	3,100	2,800 to 3,200
1955	5,050	4,700 to 5,100
1956	7,550	7,400 to 7,800

A summary of estimated production of all forms of fixed nitrogen in the South European Satellites, for selected years, 1949-56, is given in Table 10.*

B. Inventories and Stockpiles.

1. Working Inventories.

No information is available to indicate what constitutes a working inventory in the South European Satellites. An analysis of the known circumstances of the industry leads to the conclusion that significant synthetic ammonia inventories are impractical at the present time in these countries.

Reasonably, a working inventory may be defined for the purposes of this report as a production surplus which would be capable of supplying regular consumers in the event of a cessation of production for an appreciable period. Because consumption has heretofore exceeded production, working inventories are more likely still a goal of the industry rather than an accomplishment. It is improbable that production will ever exceed demand by any appreciable degree, because the storage of anhydrous ammonia will present a major obstacle to large-scale inventories in this form.

Generally, the same storage and container problems govern the maintenance of working inventories of nitric acid as govern those of synthetic ammonia. When working inventories in a basic fixed nitrogen product become feasible, the acid form is the more convenient one for storage and future use and presents fewer limitations than does the anhydrous ammonia form of fixed nitrogen. Furthermore, treatment by nitric acid is the customary method by which most nitrate fertilizers and all conventional (nonatomic) explosives involving nitration are synthesized.

Application of Western analogy to inventory practices in the South European Satellites would be misleading because of the differences in the degree of economic development. Consequently, in the absence of express information on the prevailing practices of the chemical industries of the South European Satellites, useful estimates of working inventories cannot be made.

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* Table 10 follows on p. 17.

Table 10

Summary of Estimated Production of All Forms
of Fixed Nitrogen in the South European Satellites a/
Selected Years, 1949-56

Metric Tons

Year	Synthetic Ammonia	Nitric Acid b/	Ammonium Nitrate	Sodium Nitrate	Urea	Byproduct Ammonium Sulfate c/	Petiso	Aqua Ammonia
1949	13,100	28,250	19,000	0	0	750	67,000	5,760
1952	43,200	61,800	39,500	16,000	4,000	1,040	28,000	10,800
1953	53,850	79,270	63,500	25,500	6,500	1,650	48,000	11,120
1954	54,250	113,820	83,000	28,000	7,000	3,100	70,000	11,120
1955	68,050	132,850	88,300	32,000	8,000	11,850	90,000	11,120
1956	105,550	164,250	95,800	38,000	9,500	16,050	145,000	11,120

a. Production figures are a summation of the tables of production estimates for individual countries given in Appendix A.
b. The estimates for nitric acid represent the equivalence in terms of 100 percent pure acid for all nitric acid strengths and nitrate compounds produced.
c. This is the only nitrogenous compound listed here which is not produced from synthetic ammonia.

2. Stockpiling.

There is no information available on the stockpiling of fixed nitrogen products within the South European Satellites, and it is probable that no considerable stockpiles exist. The stockpiling of large quantities of ammonia and nitric acid would require prohibitive numbers of special pressure vessels and noncorrosive containers. It is likely, therefore, that synthetic ammonia and nitric acid are converted to the form of fertilizers, finished explosives, and small quantities of commercially useful nitrogenous compounds and stockpiled in these forms.

25X1C [redacted] the use of ammonium nitrate and concentrated nitric acid in explosives production. Storage of intermediary forms of explosives, such as nitroglycerine and trinitrotoluene (TNT), requires delicate handling. [redacted] 25X1C indicate the existence and activity of various munitions plants — in Hungary particularly. It is in the form of finished munitions that fixed nitrogen output which has been used in explosives is most likely stockpiled. The size of these reserves cannot be estimated with any validity, for the amounts of explosives used for military training and support of warring Satellites is highly speculative.

The demand for nitrogenous fertilizers in the South European Satellites is much greater than the supply, and stockpiles are probably limited to the normal accumulation of regular production which is held in storage until the start of the fertilizing season.

C. Trade.

1. Synthetic Ammonia.

Trade in synthetic ammonia is of no great significance in the South European Satellites. There is limited trade, however, in certain nitrogenous compounds and in small lots of special chemicals derived from nitric acid. Because the Satellites do not officially report trade in absolute figures concerning individual chemicals, estimates must be made primarily on the basis of official trade statistics of countries dealing with members of the Soviet Bloc.

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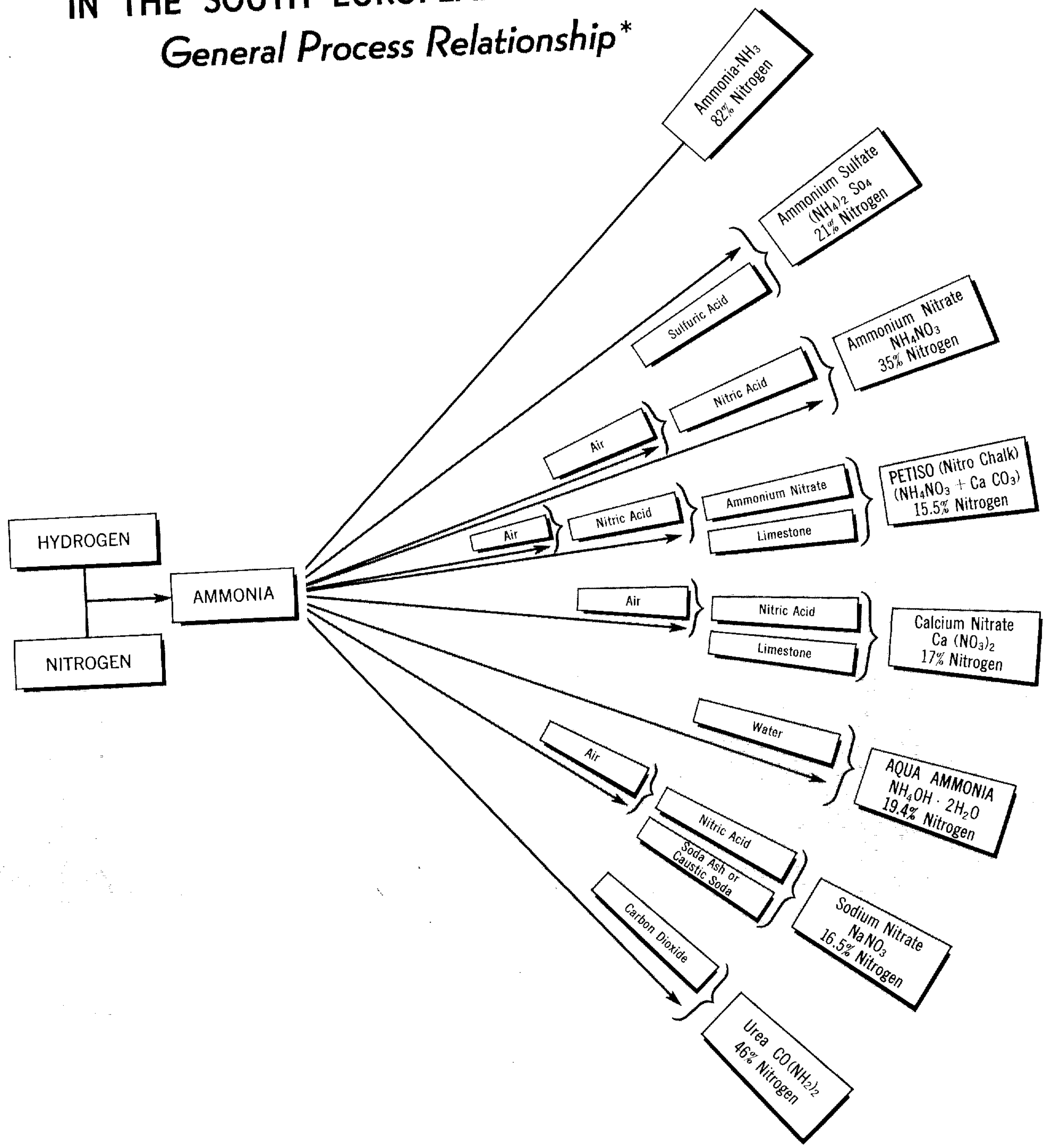
Figure 1

FIXED NITROGEN INDUSTRY
IN THE SOUTH EUROPEAN SATELLITES
*General Process Relationship**



**Formulae and percentages are on a theoretical basis.*

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2. Nitric Acid.

During recent years, only small and infrequent lots of nitric acid have been shipped to the South European Satellites. The one exception is an officially reported export from Italy to Rumania of 313 tons of nitric acid during the first half of 1953. 17/ There are no known exports of nitric acid out of the Soviet Bloc. Information is so fragmentary that a tabulation of reported shipments in recent years would be of no value.

3. Nitrogenous Fertilizers.

Considerable quantities of nitrogenous fertilizers have been imported by Hungary and Rumania. It is anticipated, however, that imports by Hungary and Rumania will decrease appreciably as Hungary completes the Kazincbarcika combine and Rumania finishes the Ucea-de-Sus installation.

Estimated imports of nitrogenous fertilizers into the South European Satellites, 1949-54, are given in Table 11.

Table 11

Estimated Imports of Nitrogenous Fertilizers into the South European Satellites 1949-54

Metric Tons

Year	Albania	Bulgaria	Hungary	Rumania
1949	Negligible	200	500	4,500
1950	500	500	1,000	4,500
1951	1,000	500	2,000	5,000
1952	1,200	1,000	2,200	6,000
1953	1,300	500	2,000	6,000
1954	1,500	500	2,000	7,500

With the advent into production of Dimitrovgrad, in 1952, Bulgaria became an exporter of nitrogenous fertilizers. Reported exports of nitrogenous compounds by Bulgaria to non-Bloc countries, 1951-54, are shown in Table 12.

Table 12

Reported Exports of Nitrogenous Compounds by Bulgaria to Non-Bloc Countries, 1951-54

Metric Tons

Importer	1951	1952	1953	1954
Egypt (Sodium Nitrate)	0	4,000 18/	3,000 19/	3,500
England (Urea)	0	0	0	500 20/

Reported exports of nitrogenous fertilizers by Hungary to non-Bloc countries, 1951-52, are shown in Table 13.

Table 13

Reported Exports of Nitrogenous Compounds by Hungary to Non-Bloc Countries, 1951-52

Metric Tons

Importer	1951	1952
Egypt (Ammonium Nitrate)		2,000 21/
Switzerland (Ammonium Sulfate)	300 22/	10 23/
Switzerland (Sodium Nitrate)		20 24/

Exports of nitrogenous fertilizers are likely to be maintained and possibly expanded as new fixed nitrogen plants are constructed. One of these is the Dimitrovgrad plant, which is exporting a significant part of its production of nitrogenous compounds.

25X1C [redacted] that Hungary exported to China, among other commodities, 2,300 tons of liquid high explosives. 25/
25X1C [redacted] as yet unconfirmed, but in view of the apparent consumption patterns for nitric acid in Hungary, it is probably accurate.

Generally, there have been infrequent exports of nitrogenous fertilizers. Spot shipments seem to have been made on an individual contract basis, as a marketable surplus became available within these countries. On the other hand, demands for other products may have necessitated the bartering of these fertilizers to secure exchange credits, even though domestic needs for the commodities bartered could not be filled. Long-term prospects indicate that as domestic capacity expands there will be a steady decrease in the importation of nitrogenous fertilizers from outside the Soviet Bloc.

It is expected that there will be increasing exports to the Free World to obtain exchange credits for importation of commodities which are required by the South European Satellites, and for which they are incapable of satisfying their requirements from domestic sources.

D. Availability.

Because there is no known current trade in synthetic ammonia, as such, in the South European Satellites, and because there is believed to be no stockpiling, availability is considered to be equivalent to the national production of synthetic ammonia.

Imports of nitric acid are believed to be sporadic and incidental. Stockpiling of nitric acid is unlikely, and therefore availability is essentially equivalent of production.

The estimated availability of nitrogenous fertilizers in the South European Satellites, 1954, is shown in Table 14.*

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* Table 14 follows on p. 22.

Table 14

Estimated Availability of Nitrogenous Fertilizers in the South European Satellites, 1954 a/

Metric Tons

Country	Production	Imports	Exports	Net Trade	Availability
Albania	0	1,500	0	+ 1,500 b/	1,500
Bulgaria	9,380	500	3,880	- 3,380 c/	6,000
Hungary	12,500	2,000	3,000	- 1,000 c/	11,500
Rumania	1,200	6,000	0	+ 6,000 b/	7,200

a. Figures refer to total nitrogen content only.
b. Plus (+) indicates net imports.
c. Minus (-) indicates net exports.

Table 14 presents an estimate of the availability of nitrogenous fertilizers for the current year only. Because historical data are scant, the projection of this table back through the years has been purposely avoided.

In the future, production of nitrogenous fertilizers will become more and more the measure of availability, but domestic consumption probably will fall short of available supplies as long as these countries must barter some of their domestic production for commodities produced outside the Soviet Bloc.

III. Consumption.

A. Synthetic Ammonia.

In the South European Satellites synthetic ammonia is largely consumed by conversion to nitric acid. The nitric acid may be used directly to produce nitrate salts, or the acid may be first concentrated and consumed in the manufacture of a variety of compounds, principally high explosives.

Most of the ammonia not converted to nitric acid will go into the production of synthetic urea or ammonium nitrate, which has a dual use as fertilizer and as a major component of high explosives. The balance of the unconverted ammonia will be used as a refrigerant, either as liquefied ammonia or as aqua ammonia (approximately a 25 percent water solution of ammonia).

The differences in end uses of ammonia among the South European Satellites cannot be determined. A single consumption pattern has been devised, therefore, to show the use pattern for synthetic ammonia. Three broad consumption groups have been resorted to in this estimate. The estimated consumption of synthetic ammonia in the South European Satellites, 1954, is shown in Table 15.

Table 15

Estimated Consumption of Synthetic Ammonia in the South European Satellites a/ 1954

Use	Consumption (Metric Tons)	Percent of Total
Nitrogenous Fertilizers	25,470	47.0
Explosives (Industrial and Military) b/	28,640	52.8
Other	140	0.2

a. For the methodology used in developing this table, see Appendix C.
b. This requirement includes ammonia consumed in the production of the nitric acid.

B. Nitric Acid.

Available information does not provide a detailed nitric acid consumption pattern for the South European Satellites. Nitric acid, as produced from the oxidation of ammonia, is a water solution of pure acid ranging from 48 to 65 percent. This weak acid may be used directly to produce fertilizers such as ammonium and sodium nitrates.

If the acid is concentrated, its principal use is in the manufacture of conventional high explosives. Relatively small amounts go into special chemicals such as dyestuffs and solvents.

Broad use categories were employed to indicate the consumption pattern for nitric acid. The available information does not show the distinctions between the allocation of the nitric acid in each of the South European Satellites. A single consumption pattern, therefore, has been constructed. The estimated consumption of nitric acid in the South European Satellites, 1954, is shown in Table 16.

Table 16

Estimated Consumption of Nitric Acid in the South European Satellites a/ 1954

Use	Consumption (Metric Tons)	Percent of Total
Nitrogenous Fertilizers	39,000	34.2
Explosives (Industrial and Military) b/	74,520	65.4
Miscellaneous Chemicals	500	0.4

a. For the methodology used in developing this table, see Appendix C.
b. Consumption figures are on the basis of all nitric acid being converted to 100 percent acid.

C. Ammonium Nitrate.

Although ammonium nitrate is widely used as an agricultural fertilizer throughout the world, it can be readily converted to the production of explosives. It is probable that in the South European Satellites the military use predominates, despite public claims that plants known to produce ammonium nitrate are geared to meet domestic requirements for nitrogenous fertilizers.

There is no precise information on the distribution of ammonium nitrate output between agricultural and explosive uses, but estimates based on individual plant studies show that as much as three-fifths of this product may be directed to explosives manufacture. Full mobilization for war probably would require that practically all ammonium nitrate be allocated to the munitions-filling plants.

D. All Forms of Fixed Nitrogen.

Consumption estimates for synthetic ammonia and nitric acid in the South European Satellites cover all the significant uses for nitrogenous compounds. All nitrogen fixation in these countries is done by the ammonia synthesis process. The generalized consumption pattern for synthetically fixed nitrogen is shown in Table 15.*

The general use pattern for the three principal nitrogenous compounds -- ammonia, nitric acid, and ammonium nitrate -- is shown graphically in Figure 2.**

IV. Input Requirements.

A. Synthetic Ammonia.

Power requirements for the production of synthetic ammonia vary greatly with the process used to produce the synthesis gas (mixture of hydrogen and nitrogen). Of a total production of 54,250 tons of synthetic ammonia predicted for 1954 in the South European Satellites, it is estimated that 80 percent, 43,300 tons, will be produced using hydrogen generated in the well-established water-gas reaction; about 17.7 percent, 9,600 tons, will be produced using hydrogen freed in the decomposition of natural gas (only in Rumania); and the remaining 2.3 percent, 1,350 tons, will be produced from the electrolytic decomposition of salt solutions.

The electrical energy required to produce 1 ton of synthetic ammonia, using hydrogen from one of the aforementioned sources, is as follows 26/:

* P. 23, above.
** Following p. 26.

	Kilowatt-Hours
Natural Gas Hydrogen	1,000
Water-Gas Hydrogen	1,380
Electrolytic Hydrogen	13,300

The raw material requirements (excepting energy requirements) for the production of 1 ton of synthetic ammonia are substantially the same in all the modifications of the Haber-Bosch process used in the South European Satellites. The following requirements are based on the experience of one US producer:

Nitrogen (Cubic Meters)	720 to 800
Hydrogen (Cubic Meters)	2,000 to 2,400
Iron Catalyst (Grams)	135 to 150
Water (Cubic Meters)	100 to 400
Steam (Process) (Metric Tons)	1 to 2

The quantitative input requirements for the manufacture of 54,250 tons of synthetic ammonia can be calculated from these coefficients. The input requirements for the manufacture of synthetic ammonia in the South European Satellites, 1954, are shown in Table 17.

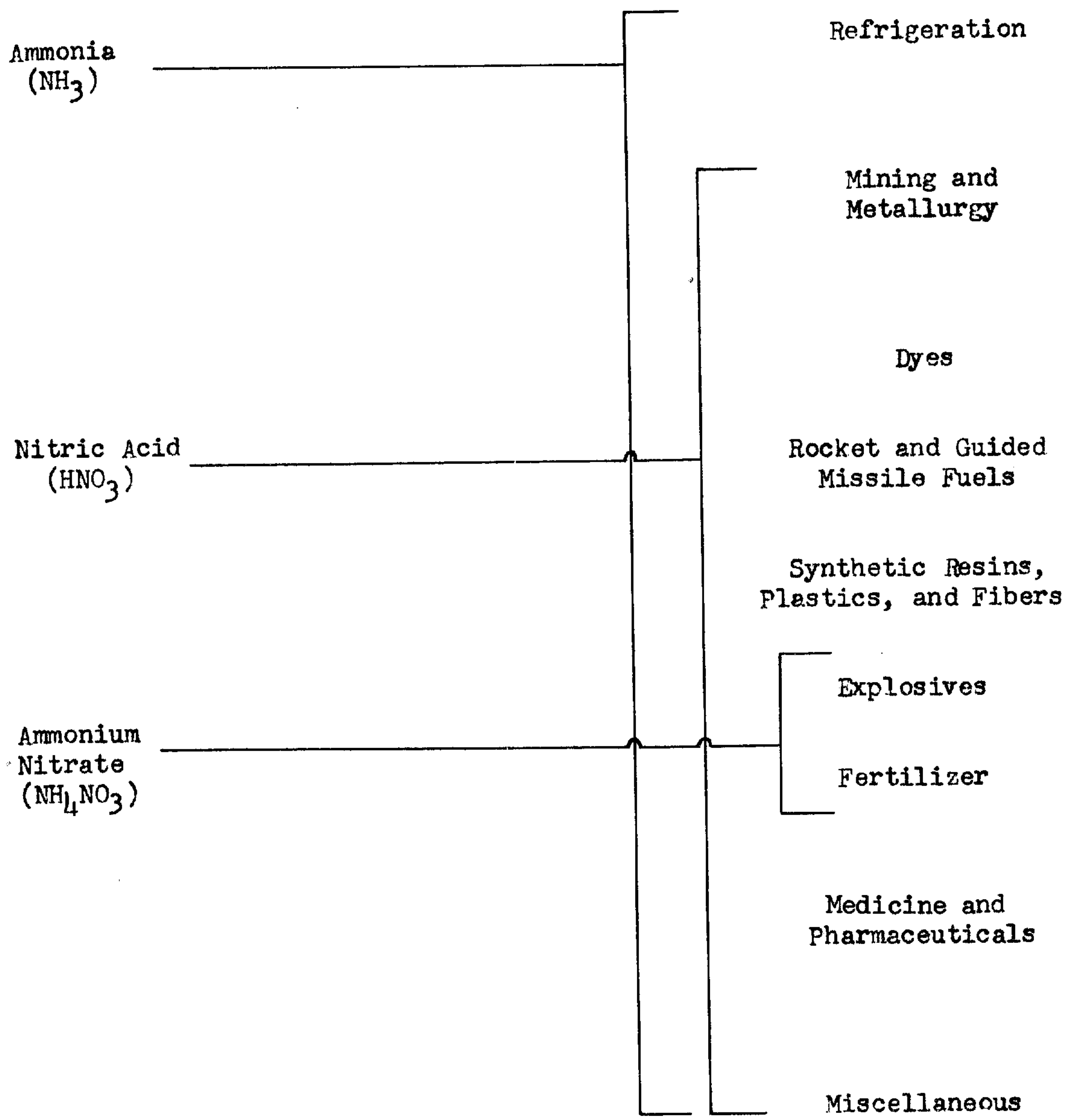
Table 17

Input Requirements for the Manufacture of Synthetic Ammonia in the South European Satellites 1954

Input	Unit	Requirements
Nitrogen	Million Cubic Meters	39.1 to 43.4
Hydrogen	Million Cubic Meters	108.5 to 130.0
Iron Catalyst	Metric Tons	7.32 to 8.14
Water	Million Cubic Meters	5.42 to 21.7
Steam (Process)	Metric Tons	54,250 to 108,500
Electrical Energy	Million Kilowatt-Hours	82 to 92.6

Figure 2

General Use Pattern for the Three Principal
Nitrogenous Compounds
in the South European Satellites



B. Nitric Acid.

Raw materials and power requirements for the production of nitric acid from synthetic ammonia are practically identical from one installation to another. Differences in input requirements are determined by the design and conversion efficiency of the process equipment at a particular installation. In view of the steadily increasing influence of Soviet technology on the South European Satellites, the raw material requirements established for the manufacture of nitric acid in the USSR will be used as a basis for determining the requirements in these countries. 27/

The average consumption coefficients for the manufacture of 1 ton of nitric acid are as follows:

Synthetic Ammonia (Kilograms)	290	to 300
Platinum Catalyst (Grams)	0.10	to 0.13
Water (for cooling) (Cubic Meters)	80	to 145
Steam (Kilograms)	145	to 360
Electrical Energy (Kilowatt-Hours)	210	to 300

These raw material consumption coefficients have been used in computing the raw material requirements for the manufacture of an estimated 113,820 tons of nitric acid (100 percent equivalent of all acid produced) in the South European Satellites during 1954. Input requirements for the manufacture of nitric acid in the South European Satellites, 1954, are shown in Table 18.

Table 18

Input Requirements for the Manufacture of Nitric Acid in the South European Satellites
1954

Input	Unit	Requirements
Synthetic Ammonia	Metric Tons	33,000 to 34,100
Platinum Catalyst	Kilograms	11.38 to 14.8
Water (for cooling)	Million Cubic Meters	9.1 to 16.50
Steam	Metric Tons	16,500 to 40,900
Electrical Energy	Million Kilowatt-Hours	23.9 to 34.0

C. Ammonium Nitrate.

The input requirements for the manufacture of ammonium nitrate are important because it is the largest tonnage final product and the only one of the fertilizers which has immediate military potential. The average consumption coefficients for the production of 1 ton of ammonium nitrate are as follows 28/:

Synthetic Ammonia (Kilograms)	217 to 220
Nitric Acid (100 percent strength) (Kilograms)	805 to 816
Steam (Kilograms)	400 to 1,000
Water (Cubic Meters)	20 to 40
Electrical Energy (Kilowatt-Hours)	15 to 30

The total quantitative input requirements for the production of 83,000 tons of ammonium nitrate can be calculated from these coefficients. Input requirements for the manufacture of ammonium nitrate in the South European Satellites, 1954, are shown in Table 19.

Table 19

Input Requirements for the Manufacture of Ammonium Nitrate in the South European Satellites 1954

Input	Unit	Requirements
Synthetic Ammonia	Metric Tons	18,000 to 18,350
Nitric Acid (100 percent pure)	Metric Tons	66,900 to 67,800
Steam	Metric Tons	33,200 to 83,000
Water	Thousand Cubic Meters	1,660 to 3,320
Electrical Energy	Thousand Kilowatt-Hours	1,245 to 2,900

V. Capabilities, Vulnerabilities, and Intentions.

A. Capabilities.

1. General.

The fixed nitrogen industries of the South European Satellites have made great strides toward meeting the needs of their explosives industries and allowing an appreciable surplus for export or for agriculture. The total estimated production of ammonia in the South European Satellites during 1954 will be 55,250 tons. Of this total, 54,250 tons are to be synthetically produced at the 6 fixed nitrogen plants existing within the area, and 845 tons are to be produced from byproduct ammonia from coking operations at Recita in Rumania and at Sztalinvaros in Hungary.

The nitrogen content of this ammonia is available on a priority basis to an established and still growing explosives industry. Other chemical producers have strategic uses for chemical nitrogen, but such industries and agriculture have only a secondary priority on domestic nitrogen output.

The production of synthetic ammonia will undergo a substantial increase between 1954 and 1956. In fact, it is estimated that it will increase from 54,250 tons in 1954 to 105,550 tons in 1956. The synthetic ammonia available during 1954 could provide more concentrated nitric acid for strategic uses than was available from domestic output during World War II. The ammonium nitrate produced from dilute nitric acid can be allocated to the explosives industry or to agriculture, as desired. It is estimated that as much as three-fifths of the ammonium nitrate production in 1954 will go to the explosives industry.

By the end of 1956, considerable additional capacity should be available to supply agriculture with significant amounts of nitrogenous fertilizers.

2. Bulgaria.

The capabilities of Bulgaria in the production of fixed nitrogen are based on the operations of its single plant at Dimitrovgrad. Only since 1952 has the country been capable of domestic production. It is estimated that during 1954 Bulgaria produced 23,800 tons of synthetic ammonia, a little more than 3.4 percent of the estimated production of the USSR. 29/ A 50-percent expansion in production is expected to be made at Dimitrovgrad by 1956.

Even in its first year of operation, this plant was more than capable of supplying domestic consumers of nitric acid and ammonium nitrate for explosives manufacture. The current capacity is also capable of making a substantial contribution to domestic agriculture if the production is used in the form of nitrogenous fertilizers.

3. Hungary.

The capabilities of Hungary in the production of fixed nitrogen are important to several strategic consumers in maintaining their independence of foreign suppliers for essential starting materials. It is estimated, nevertheless, that Hungary produced only 19,500 tons of synthetic ammonia in 1954, about 2.8 percent of the estimated 1954 production of the USSR.

Postwar expansions in nitric acid production capacity at the sole prewar fixed nitrogen plant -- the Nitrogen Works at Petfurdo -- should have made the country capable of supplying the requirements of Hungarian explosives plants. After the demands by the explosives industry for nitric acid are met, the balance of the nitric acid can be used to produce ammonium nitrate, which may be allocated to further explosives production or may be diverted to use as an agricultural fertilizer. When the second plant, at Kazincbarcika, becomes fully operative, the country should have nitric acid production far in excess of the needs of its own explosives industry. The country seems presently incapable, however, of supplying the needs of agriculture as well as the priority demands of the explosives industry.

4. Rumania.

The capabilities of Rumania in the production of fixed nitrogen seem inadequate to meet the comparatively modest requirements for nitrogenous products. It is estimated that during 1954, Rumania will produce 10,950 tons of synthetic ammonia, a little over 1.5 percent of the estimated 1954 production of the USSR.

The production of the two prewar plants is evidently directed toward meeting the requirements of the major explosives manufacturing plant within the country. Only token amounts of domestic production are believed to have reached agriculture, even in the postwar period.

Completion of the new fixed nitrogen plant at Ucea-de-Sus should make the country fully capable of supplying its own requirements for ammonia in explosives production. The industry will have the capacity to benefit agricultural production if all fixed nitrogen production is not devoted to explosives production or to export.

B. Vulnerabilities.

1. Bulgaria.

The fixed nitrogen industry of Bulgaria is self-sufficient in raw materials and is apparently invulnerable to economic warfare. Bulgaria, however, is undoubtedly reliant upon external sources for the catalysts required in the ammonia synthesis process and the subsequent ammonia oxidation process which yields nitric acid. Full use of domestic capacity will be governed by the ability to import sufficient quantities of these catalysts.

Steady, near-capacity production depends upon the upkeep of the process equipment which was originally supplied by the USSR. Bulgaria has had little or no experience in the fabrication of the specialized equipment needed for replacements or for expansion of established facilities. Thus, the country is dependent upon external sources for the maintenance and replacement of process equipment. It is consequently vulnerable to economic warfare in the form of embargoes on process equipment.

Destruction of selected processing units would halt domestic production of fixed nitrogen for an extended period and would limit the supplies of fixed nitrogen to explosives manufacturers.

2. Hungary.

The fixed nitrogen industry of Hungary, heretofore confined to a single plant, has been self-sufficient in raw materials and is plainly invulnerable to economic warfare. If the new plant at Kazincbarcika masters the problem of a dependable hydrogen supply from indigenous brown coal resources, the industry will continue to be independent.

The enforced dependence of the country upon its own machine building industry, which is apparently having difficulty in fabricating the special equipment for the process, may prevent the efficient operation of this plant without outside assistance.

Adequate synthetic ammonia supplies are essential to the production of nitric acid and ammonium nitrate. The ammonia producing units are, in turn, subject to vagaries in the supply of synthesis gas and electrical energy which are typical of Hungary. Both of these input items are produced within or near the individual plant, and curtailment of the supply of either would affect plant output directly.

3. Rumania.

The fixed nitrogen industry of Rumania is practically self-sufficient in raw materials and is almost invulnerable to economic warfare. Insufficient and inferior catalysts used in the processes kept the two established fixed nitrogen plants operating far below the capacity of the equipment as late as 1949. This critical need for imported catalysts may exist at the present time.

Completion of the newest plant, at Ucea-de-Sus, has been hampered since World War II by the inability of the Rumanians to replace many missing pieces of equipment, and various other Soviet Bloc countries have been assigned the task of fabricating the missing facilities. One source claims that the plant may never become fully operative unless the original plans drawn up by what are now West German chemical concerns become accessible.

The concentration of the industry in three plants presents a definite potential vulnerability. In the event of a prolonged stoppage of ammonia supplies, the explosives plants would be forced to supply themselves from stockpiles to maintain operations, and stockpiles of synthetic ammonia and nitric acid are considered most unlikely.

C. Intentions.

1. Bulgaria.

Since 1952, Bulgaria has found markets outside the Soviet Bloc for some of its sodium nitrate and synthetic urea production, thus securing exchange credits. Presumably, ammonium nitrate output is being directed towards intra-Bloc consumption as an explosives constituent.

The fixed nitrogen industry is potentially a good indicator of Bulgarian intentions to the extent that relative priorities for military and domestic use are significant. Preparatory to engaging in large-scale military operations, domestic fixed nitrogen capacity would be diverted from agriculture and the export market to the explosives industry to a far greater extent than at present. Thus, a marked decrease in exports, coupled with a curtailment of nitrogenous fertilizers to agriculture, may well indicate the diversion of synthetic ammonia production almost exclusively to military consumers.

2. Hungary.

Preparation for large-scale military operations by Hungary would be preceded, probably, by the reallocation of ammonium nitrate from production of Petiso to production of explosives. This was demonstrated by the drop in Petiso output at Petfurdo during a period coincident with the Korean War. In addition, nitric acid supplies to industries other than explosives manufacturing would be drastically curtailed. Therefore, sizable increases in the production of military explosives would be made at the expense of nitrogenous fertilizer output and can be expected to occur prior to military operations in excess of normal training requirements.

3. Rumania.

Available information indicates that in Rumania fixed nitrogen is now largely allocated to production of explosives. Therefore, no discernible shift from agricultural uses to military requirements can be expected.

Conversely, a shift from production of explosives to production of nitrogenous fertilizer would indicate an increasing emphasis on agricultural production. The function of the new plant at Ucea will indicate which type of consumer is to predominate in Rumania.

APPENDIX A

ESTIMATED PRODUCTION OF FIXED NITROGEN IN THE SOUTH EUROPEAN SATELLITES*

Tables 20, 21, and 22 which follow show estimated production of all forms of fixed nitrogen in Bulgaria, Hungary, and Rumania, respectively, for selected years.

Table 20

Estimated Production of All Forms of Fixed Nitrogen in Bulgaria a/
1952-56

Metric Tons

Year	Synthetic Ammonia	Nitric Acid (48 Percent) b/	Ammonium Nitrate	Sodium Nitrate	Urea
1952	18,700	62,000	20,000	16,000	4,000
1953	23,800	75,900	33,000	25,500	6,500
1954	23,800	100,000	35,000	28,000	7,000
1955	27,600	112,000	40,000	32,000	8,000
1956	35,100	146,200	47,500	38,000	9,500

a. All production in Bulgaria is attributed to the Stalin Chemical Combine at Dimitrovgrad.
b. Tonnage estimate is in terms of the actual strength of nitric acid produced.

* For the source of these national estimates, see Appendix B.

Table 21

Estimated Production of All Forms of Fixed Nitrogen in Hungary a/
Selected Years, 1947-56

Metric Tons

Year	Synthetic Ammonia	Nitric Acid (100 Percent)	Ammonium Nitrate	Petiso b/	Ammonium Sulfate
1947	2,500	3,600	4,000	12,000	0
1949	11,000	11,000	19,000	67,000	0
1950	12,000	11,200	19,300	70,000	0
1951	14,500	11,500	19,500	45,000	0
1952	19,500	12,000	19,500	28,000	0
1953	19,500	12,000	28,000	48,000	0
1954	19,500	16,000	41,500	70,000	0
1955 c/	29,500	17,500	41,500	90,000	6,800
1956	59,500	32,500	41,500	145,000	8,500

a. Figures refer to actual tonnage output of the indicated products and are a summation of plant production estimates.
b. A physical mixture of ammonium nitrate and pulverized calcium carbonate.
c. The first year of estimated production at the Kazincbarcika site.

Table 22

Estimated Production of All Forms
of Fixed Nitrogen in Rumania a/
Selected Years, 1938-56

Metric Tons

Year	Synthetic Ammonia	Aqua Ammonia b/	Nitric Acid (100 Percent)	Ammonium Nitrate	Ammonium Sulfate
1938	2,700	0	5,500	0	0
1939	3,800	8,280	5,900	0	0
1949	2,100	5,760	2,300	0	750
1952	4,000	10,800	4,600	0	1,040
1953	10,550	11,120	6,900	2,500	1,650
1954	10,950	11,120	11,900	6,500	3,100
1955	10,950	11,120	23,500	6,800	5,050
1956	10,950	11,120	23,500	6,800	7,550

a. Figures refer to actual tonnage output of the indicated products and are a summation of plant production estimates.
b. Solution of ammonia in water of approximately 25 percent ammonia content.

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APPENDIX B

FIXED NITROGEN PLANTS IN THE SOUTH EUROPEAN SATELLITES

1. Stalin Plant.

   a. Full Name. Kimicheski Kombinat "Stalin." 30/ (Stalin Chemical Combine)

   b. Location. Dimitrovgrad (formerly Rakovski), Bulgaria.

   c. Coordinates. 42°03' N - 25°37' E.

   d. Estimated Annual Capacity (Metric Tons).

Synthetic Ammonia		Nitric Acid (48 Percent)	
1951	0	1951	0
1952	24,000	1952	75,000
1953	24,000	1953	100,000
1954	24,000	1954	100,000
1955	35,500	1955	150,000 31/
1956	35,500	1956	150,000

Nitrogen Fertilizers	
1952	40,000
1953	70,000
1954	70,000 32/
1955	105,000 33/

   e. Estimated Annual Production (Metric Tons).

Synthetic Ammonia		Nitric Acid (48 Percent)	
1951	0	1951	0
1952	18,700 (17,500 to 21,000)	1952	62,000 (59,000 to 65,000)
1953	23,800 (21,000 to 24,000)	1953	75,900 (72,000 to 78,000)
1954	23,800 (23,000 to 24,000)	1954	100,000 (95,000 to 110,000)
1955	27,600 (24,000 to 30,000)	1955	112,000 (110,000 to 120,000)
1956	35,100 (34,000 to 35,500)	1956	146,000 (135,000 to 150,000)

Nitrogen Fertilizers		
1951	0	
1952	40,000	(38,000 to 43,000) 34/
1953	65,000	(64,500 to 70,000)
1954	70,000	(69,000 to 70,500)
1955	80,000	(78,000 to 82,000)
1956	95,000	(94,000 to 105,000)

f. Process.

The ammonia is synthesized by some undetermined variation of the Haber-Bosch process. The necessary nitrogen is supplied by the conventional methods of air liquefaction and subsequent recovery of pure nitrogen by distillation. 35/ The necessary hydrogen is probably supplied by gasification of the low-grade coal in the surrounding Maritsa Basin. [redacted] the iron oxide 25X1C catalyst required in the converter was initially imported from East Germany. 36/

Available photographs indicate that standard processes are used in the oxidation of the ammonia produced in the converter and in the subsequent production of nitric acid and urea. Seven furnaces for the oxidation of ammonia are known to be available at the plant. 37/ In the absence of specific information, it is assumed that dilute nitric acid is produced in the conventional manner. The solid finished products are transported on a conveyor belt for packing and distribution. 38/ The packing is in the form of 50-kilogram asphalted paper sacks. 39/

The quantitative allocation of synthetic ammonia output to the production of ammonium nitrate, sodium nitrate, and urea has been estimated, as original plans on this phase are several years old. 40/

Synthetic urea is produced from part of the synthetic ammonia output. It is believed that the newer and more direct process of combining excess ammonia and carbon dioxide under high pressure is employed to produce urea.

Percentages, by weight, of the total fertilizer capacity were used for each product as follows: ammonium nitrate, 50 percent; sodium nitrate, 40 percent; and synthetic urea, 10 percent.

g. Comments.

Operation of the plant is thought to have begun in late 1951 and operation at initial capacity to have been attained by early 1952. 41/ A 50-percent expansion of the original capacity has been 25X1C [redacted] 42/ [redacted] which also states 25X1C that some nitric acid production will go into explosives manufacture. 43/ This would require concentrated nitric acid, which was probably not in production in the first years of operation. Since the required sulfuric acid is available at the combine, the concentration of nitric acid is quite possible if fabrication of the equipment can be performed.

Although the plant has been long heralded as the first artificial fertilizer plant for the benefit of Bulgarian agriculture, the indications are that domestic needs are given secondary consideration. With a part of the production, Bulgaria is repaying the USSR for the equipment and technical guidance received in the construction of the plant. 44/ An appreciable share of the remainder of fertilizer production is offered for sale to Soviet Bloc and non-Bloc countries -- most likely in barter to secure needed materials not available within Bulgaria. 45/

Despite public claims to the contrary, it is probable that little of the fertilizer production of the plant is reaching Bulgarian agriculture. If a nitric acid concentrator becomes part of the plant's facilities, even more of the synthetic ammonia output will be channelled into explosives production, which is the principal use for concentrated nitric acid in the South European Satellites.

2. Pet Plant.

a. Full Name. Peti Nitrogen Muvek.
(Peti Nitrogen Works)

b. Location. Petfurdo, Hungary.

c. Coordinates. 47°10' N - 18°08' E.

d. Estimated Annual Capacity (Metric Tons).

Synthetic Ammonia

1938	6,500	46/
1940	14,500	47/
1947	3,000	48/
1949	12,000	49/
1951	20,000	50/
1954	20,000	51/
1955	20,000	
1956	20,000	

Nitric Acid (100 percent)

1940	18,000	52/
1947	4,000	53/
1949	12,000	54/
1951	12,000	
1953	12,000	
1954	18,000	55/
1955	18,000	
1956	18,000	

Ammonium Nitrate

1940	10,000	56/
1948	21,000	
1953	42,000	57/
1954	42,000	

Calcium Nitrate

1940	17,500	58/

Petiso (Nitro Chalk)

1940	37,000	
1948	51,800	59/
1949	73,000	60/
1954	73,000	

e. Estimated Annual Production (Metric Tons).

Synthetic Ammonia

1949	11,000	(10,000 to 11,500)
1950	12,000	(11,500 to 12,000)
1951	14,500	(13,500 to 16,000)
1952	19,500	(18,500 to 20,000)
1954	19,500	(18,500 to 20,000)
1956	19,500	(18,500 to 20,000)

Nitric Acid (100 Percent)

1949	11,000	(9,500 to 11,500)
1950	12,000	(11,500 to 12,000)
1954	16,000	(14,500 to 18,000)
1955	17,500	(15,000 to 18,000)
1956	17,500	(17,000 to 18,000)

Ammonium Nitrate

1948	18,000	(15,000 to 18,000)
1953	28,000	61/
1954	41,500	(40,000 to 42,000)
1956	41,500	(40,000 to 42,000)

Petiso (Nitro Chalk)

1948	48,660	62/
1949	67,000	63/
1952	28,000	64/
1953	48,000	65/
1954	70,000	(65,000 to 73,000)
1956	70,000	(65,000 to 73,000)

f. Process.

The ammonia is synthesized by the Nitrogen Engineering Corporation's (N.E.C.) modification of the Haber-Bosch process, which operates at 300 atmospheres of pressure and 500 degrees Centigrade. 66/ The required hydrogen is supplied by the carbonization of previously dehydrated Varpalota lignite. 67/ The required nitrogen is supplied by Linde air liquefaction machines of 2,000 cubic meters per hour nitrogen capacity. 68/ A photograph taken in 1935 indicates that there are at least 4 compressors available for high-pressure synthesis. 69/

The ammonia is oxidized to nitric oxides and is subsequently absorbed in water to form weak nitric acid by use of an old-type Pauling unit. Concentration of the nitric acid to 98 percent strength is performed in a modern Bamag plant. 70/ The reported construction of 6 additional absorption towers during 1951 and 1952 indicates a major expansion of the nitric acid capacity of the plant. 71/ The extent of this expansion is reported to raise concentrated nitric acid capacity up to 18,000 tons annually by the end of the current Five Year Plan (1954). 72/ Limestone (calcium carbonate) is supplied from the Bakony Mountains. 73/ A considerable portion of the nitric acid is mixed with ammonia to form dissolved ammonium nitrate, which is subsequently crystallized to give a solid form for use in explosives or in fertilizer. 74/ There occurs a physical mixing of ammonium nitrate with pulverized limestone to give a mixture which is marketed under the trade name of Petiso. 75/ This fertilizer is packed in 50-kilogram paper bags for shipping. 76/ The practice of mixing limestone in the fertilizer is intended to aid in the correction of the acid soils of Hungary. 77/

g. Comments.

This plant was established by the Hungarian government in 1930. 78/ Production began in 1932, with an initial ammonia capacity of 24 to 25 tons per day. 79/ Capacity subsequently expanded to 45 tons per day by 1944, when severe bombing made operation impossible. 80/ The plant was reconstructed by the end of 1948 to the extent of having ammonia capacity restored to 12,000 tons annually. 81/ During 1951, 6 towers for acid absorption and concentration were under construction and were to be completed by early 1952. The indispensable acid-proof bricks for these towers were being furnished by the dismantling of the saltpeter plant in

Monsonmagyarovar, which was connected with the Hunting Cartridge Factory located there. The new towers were reported to be precise models of the 3 existing ones, and this is the basis for the estimate of expansion of nitric acid capacity. 82/

[redacted] 25X1C during 1951 emphasis was on the production of ammonium nitrate for ammunition. 83/ [redacted] that in late 1952 the bulk 25X1C of ammonium nitrate was going into explosives manufacture and not into Petiso fertilizer. 84/ Some eight carloads of ammonium nitrate are 25X1C [redacted] as being directed daily to the explosives works at Fuzfo and Peremarton. 85/ The distribution of explosives produced at Petfurdo has been reported as 43 percent to the USSR, 20 percent for export, and the balance for consumption in Hungary. 86/

The apparent shift in allocation of ammonium nitrate from production of fertilizer to production of explosives coincident with the period of the Korean War suggests the possibility that Hungary may have furnished military support for that operation.

One recent public announcement speaks of the expansion of the Pet Plant. 87/ The latest word was a radio announcement of the building of a new artificial fertilizer factory at Petfurdo beginning in June of 1954. It is to be completed in 1955. 88/ The credibility of this announcement is questionable in view of the large construction known to be under way at Kazincbarcika. Until information as to the magnitude of this purported expansion is received, no estimate of additional fertilizer output beyond the established 1949 capacity will be made for this plant.

3. Borsod Chemical Combine.

a. Full Name. Sajomenti Vegyimuvek. 89/
(Sajo Valley Chemical Works)

b. Location. Kazincbarcika, Hungary.

c. Coordinates. 48°15' N - 20°38' E.

d. Estimated Annual Capacity (Metric Tons).

Synthetic Ammonia		Nitric Acid (100 Percent)		Petiso Fertilizer	
1954	0 90/	1954	0	1954	0
1955	36,000 91/	1955	12,000	1955	100,000
1956	50,000	1956	36,000 93/	1956	160,000 94/
1957	60,000 92/	1957	36,000	1957	160,000

e. Estimated Annual Production (Metric Tons).

Synthetic Ammonia		Nitric Acid (100 Percent)	
1954	0	1954	0
1955	10,000 (8,000 to 15,000)	1955	Negligible
1956	40,000 (36,000 to 44,000)	1956	15,000 (12,000 to 20,000)
1957	55,000 (50,000 to 56,000)	1957	34,500 (32,000 to 36,000)

Petiso (Nitro Chalk)		
1954	0	
1955	20,000	(15,000 to 25,000)
1956	75,000	(65,000 to 125,000)
1957	120,000	(100,000 to 135,000)
1958	155,000	(145,000 to 160,000)

f. Process.

The ammonia is synthesized by some modification of the Haber-Bosch process. Because it has been indicated that this plant is essentially a duplicate of the Peti Nitrogen Works, the process may be the N.E.C. system used at Pet. 95/ Partial confirmation of this supposition is provided by a public announcement to the effect that the compressor to be used has an operating pressure of 350 atmospheres, which is closer to the N.E.C. process than to any other known modification of the Haber-Bosch process. 96/

The necessary hydrogen is to be supplied by a coking plant which is to be built and is to rely on the surrounding brown coal deposits. 97/ Nitrogen will presumably be supplied by air liquefaction and subsequent distillation. "Compressors for the fertilizer plant are the largest ever built in Hungary and are being manufactured by the Mavag organization," according to public announcements. 98/ Thus, the Mavag organization may well be building, in addition to the synthesis gas compressor, the liquefaction machines for producing nitrogen.

g. Comments.

This combine is part of the large chemical combine under construction in Borsod County along the Sajo River north of the industrial center of Miskolc. Periodic Hungarian press releases indicate a planned capacity of twice that of Pet and indicate that eventually the production of Petiso at this plant will bring national production to more than 3 times the 1954 level. 99/ [redacted] 25X1C support the press reports of the probable production of this plant. 100/ The press omits any reference to a plan to produce the concentrated nitric acid required for the nitration of raw materials for explosives. 101/

A Swiss firm fabricated a Bizaai continuous nitration plant, designed for nitrating glycerine, which was believed on order for the Hungarians. 102/ This unit, if it is like the one constructed for the DuPont Company, has a rated capacity of 11,000 tons of nitroglycerine annually, which would require at least 9,150 tons of concentrated nitric acid annually for this operation alone.

[redacted] that the Sajobabony plant 25X1C of the Borsod Combine is generally believed to be modeled after the well-known munitions plant at Balatonfuzfo (Fuzfogyartelep, 47°04' N - 18°01' E). 103/

It is evident that the new operations at Kazincbarcika will make an appreciable contribution to the explosives capacity. In fact, it has a planned capacity for concentrated nitric acid greater than that existing in the country up to the time of its creation. 104/

[redacted] the general cutback in 25X1C equipping heavy industry in Hungary, in line with the "new course" policy, does not apply to the Borsod County chemical works (Sajomenti) and that the construction and equipping of the chemical combine is proceeding according to plan. 105/

4. Nitrammonia Plant.

a. Full Name. Chemical Combine No. 1. 106/

b. Location. Fagaras (4 km south of and west of road to Iliena), Rumania.

c. Coordinates. 45°49' N - 24°59' E.

d. Estimated Annual Capacity (Metric Tons)

Synthetic Ammonia		Nitric Acid (100 Percent)	
1938	2,800 107/	1938	5,950 108/
1949	2,800	1943	9,300 109/
1954	2,800	1949	9,300
1956	2,800	1954	9,300

e. Estimated Annual Production (Metric Tons).

Synthetic Ammonia		Nitric Acid (100 Percent)	
1949	1,400 (1,250 to 1,450) 110/	1949	2,300 (1,850 to 2,400) 111/
1952	2,700 (2,500 to 2,800)	1952	4,600 (4,500 to 4,800)
1954	2,700 (2,500 to 2,800)	1954	6,900 (6,500 to 7,000)
1956	2,700 (2,500 to 2,800)	1956	9,000 (8,900 to 9,300)

f. Process.

Some undetermined modification, possibly the Fauser system, of the Haber-Bosch process is employed in ammonia synthesis. Methane gas undergoes thermal decomposition to yield carbon black and the essential hydrogen. 112/ The methane gas is normally passed through a sulfur-eliminating apparatus, but in July of 1949, the installation worked without this purifier. 113/ The necessary nitrogen is supplied by air liquefaction and subsequent separation from an unknown type of liquefaction machine. 114/

Two compressors are available for conversion of the synthesis gas to liquefied ammonia. Ammonia is next oxidized in furnaces using platinum meshes. The installation has 4, and possibly 5, furnaces, but in 1949 only 1 of these furnaces was used because of the lack of platinum meshes. 115/

There is a Bamag installation used for concentration of the nitric acid produced in the absorbers. The output has been referred to as "Hoko," which indicates acid concentrating based upon the German pre-World War II procedures. 116/

g. Comments.

The plant at Fagaras was constructed in the late 1930's with capital supplied mostly by the First Rumanian Explosives Corporation of Bucharest. 117/ The plant was established to manufacture the basic materials for the explosives industry. 118/ It was originally called the "Nitrammonia Corporation" and was located adjacent to its main consumer, the plant of the First Rumanian Explosives Corporation. 119/ The erection of this plant was clearly aimed at minimizing the importation of raw materials for explosives.

Since the outbreak of the Korean War, wartime production was reported to have been resumed. 120/ [redacted] 25X1C expansion in plant facilities, beginning in 1949 and continuing through 1952. 121/ It appears that the expansion is designed to increase the extraction of nitrates; [redacted] seeing 25X1C plans for the repair and expansion of the absorption purification and evaporation buildings in the Brasov office of the responsible Ministry. 122/

25X1C [redacted] the production of ammonia and explosives up until September 1953. Hearsay information, [redacted] 25X1C 25X1C [redacted], indicates that the combine was one of the most important in Rumania in the production of strategic chemical products. 123/ This claim is given considerable credit, for this plant will continue to be the major producer of fixed nitrogen products until the new plant at Ucea-de-Sus becomes operative. No expansion of ammonia capacity beyond 2,800 tons, which is maximum capacity, is known to have been reached at Fagaras.

5. Nitrogeni Factory.

a. Full Name. Combinatul Chimico-Metalurgic Tarnaveni. 124/ (Tarnaveni Chemical-Metallurgical Combine)

b. Location. Tarnaveni (formerly Dico San Martin), Rumania.

c. Coordinates. 46°20' N - 24°16' E.

d. Estimated Annual Capacity (Metric Tons).

Nitrogen Gas		Synthetic Ammonia		Calcium Cyanamide	
1939	4,000	1939	1,200 127/	1939	7,400 129/
1949	4,000 125/	1949	1,400 128/	1949	0 130/
1952	4,000 126/	1953	1,400		
1954	4,000	1954	1,400		

e. Estimated Annual Production (Metric Tons).

Synthetic Ammonia		Aqua Ammonia (25 percent Ammonium Hydroxide)	
1949	700 (650 to 750) 131/	1949	5,760 (5,350 to 6,180)
1953	1,350 (1,200 to 1,400)	1953	11,120 (9,950 to 11,600)
1954	1,350 (1,200 to 1,400)	1954	11,120 (9,950 to 11,600)
1956	1,350 (1,200 to 1,400)	1956	11,120 (9,950 to 11,600)

f. Process.

The Fauser process, a modification of the Haber-Bosch process, is employed here. 132/ Before World War II the hydrogen was supplied exclusively by special electrolytic cells. 133/ Since World War II, a natural gas plant has supplied the hydrogen (produced by thermal decomposition of methane gas) necessary for ammonia synthesis. 134/ The nitrogen is supplied through air liquefaction and subsequent reduction. 135/ This equipment originally supplied nitrogen gas to the cyanamide plant as well as to the ammonia plant.

There are no known facilities for the oxidation of ammonia to produce nitric acid. The ammonia is further processed by absorption in water to form a 25-percent solution which is transported in 60-liter bottles and railroad tank cars. 136/ This is a most convenient way of transporting the ammonia for which there is no high-pressure equipment for the transportation of liquefied anhydrous ammonia.

Before World War II, calcium cyanamide was manufactured from calcium carbide, using the Polzenius-Krauss process. 137/ The installations for this process, however, were removed shortly before World War II. 138/

An undetermined fraction of the aqua ammonia production goes into the production of high-grade ammonium sulfate. It appears that the plant is equipped with steam-jacketed kettles and additional equipment to crystalize out of solution the ammonium sulfate. Ammonium carbonate is also reported to be in production. 139/

g. Comments.

The report of ammonia going into the production of ammonium sulfate is possibly true. Only technical-grade ammonium sulfate is produced in this manner; fertilizer-grade ammonium sulfate is usually made from the ammonia in coke-oven (byproduct) gas. If production of technical-grade ammonium sulfate is a fact, it is most likely very limited, because the need for ammonia in other forms is most pressing.

In 1949 the US Department of Commerce refused an export license for catalyst material required by the ammonia plant at Tarnaveni. 140/ This indicates the inability of the Rumanians to supply the plant with the essential catalyst and supports a report stating that in 1949 production was half of designed capacity because of the use of inferior catalysts. 141/

It is assumed that the Rumanians have since mastered this situation and that the plant is now operating at near capacity. This assumption seems warranted in view of the priority which such a project would have and also in the light of the fact that the largest ammonia synthesis plant in the country, at Ucea-de-Sus, will have, when it is completed, similar but more extensive requirements for the same type of catalyst.

The aqua ammonia produced at Tarnaveni was shipped to the Fagaras plant, at least until 1949. 142/ It is obviously used in the production of nitrogenous compounds such as fertilizers or explosives constituents. Some ammonia liquor (aqua ammonia) is probably supplied to the Solvay process plants and to refrigeration plants. 143/

No expansion of ammonia capacity beyond the last reported figure of 1,400 tons annually is anticipated. The installation should operate indefinitely, for it was reported to be in excellent condition and stocked with sufficient replacement parts. 144/ It is most unlikely that any further processing of the ammonia will be done here, because the larger installations at Fagaras -- and eventually at Ucea -- can economically handle any production of the Tarnaveni plant beyond the amount which it supplies directly to final consumers.

6. Sovromchim Factory.

a. Full Name. Uzinele Sovromchim Ucea. 145/

b. Location. Ucea-de-Sus, Rumania (4 km south of town in a forest).

c. Coordinates. 45°41' N - 24°53' E.

d. Estimated Annual Capacity (Metric Tons).

Synthetic Ammonia

1951	0
1952	7,000 146/
1954	7,000
1956	7,000

Nitric Acid (100 Percent) 147/

1953	0
1954	14,900
1956	14,900

Ammonium Nitrate 148/

1951	0
1952	7,000
1954	7,000
1956	7,000

e. Estimated Annual Production (Metric Tons).

Synthetic Ammonia

1952	0	
1953	6,500	(6,300 to 6,800)
1954	6,900	(6,800 to 7,000)
1956	6,900	(6,800 to 7,000)

Nitric Acid (100 Percent)

1953	0	
1954	5,000	(4,000 to 7,500)
1955	14,500	(14,000 to 14,900)
1956	14,500	(14,000 to 14,900)

Ammonium Nitrate

1952	0	
1953	2,500	(2,300 to 3,000)
1954	6,500	(6,300 to 7,000)
1955	6,800	(6,700 to 7,000)
1956	6,800	(6,700 to 7,000)

f. Process.

An undetermined modification of the Haber-Bosch process is employed at this plant. The necessary hydrogen is produced in a methane (natural) gas processing plant. 149/ Because German firms, such as Linde, were among the original contractors for the fabrication of the plant's equipment, the essential nitrogen is presumably produced by the conventional air liquefaction and subsequent fractionation. 150/ The nitrogen capacity was to be 60 metric tons a day. 151/ The major part of the ammonia synthesized (estimated at about 80 percent) is further processed to produce nitric acid. The remainder of the ammonia produced is reacted with part of the nitric acid to yield ammonia nitrate.

Equipment for concentration of the nitric acid was on order in East Germany and was due for delivery in mid-1952. 152/ Approximately 75 percent of the weak nitric acid is expected to be concentrated, and the remainder will be consumed in the production of ammonium nitrate.

Thus, a large part of the concentrated nitric acid is to be used for producing nitrocellulose. [redacted] of 25X1C artillery powder, as well as ammonium nitrate and nitrocellulose, suggest that the ammonium nitrate and nitrocellulose are consumed in the production of military explosives. 153/ There are no indications that any of the synthetic ammonia produced here will reach agriculture in the form of nitrogenous fertilizers.

g. Comments.

Nazi Germany planned the construction of this factory in the late 1930's, but the collapse of Germany occurred before most of the machinery contracted for had been supplied. 154/ After World War II the USSR initiated the creation of a joint Soviet-Rumanian company called "Sovromchim" to complete and operate the plant at Ucea. 155/ As late as October 1953, East German technicians were reported as assisting in the completion of the project. 156/ The 25X1C [redacted] the use of East German technical personnel under the auspices of a Rumanian-East German "Gerochim," created in 1952 on the initiative of Sovromchim. 157/ [redacted] 25X1C that the East Germans failed to supply the missing equipment because of other commitments and that the burden was than shifted to Czechoslovakia. [redacted] 25X1C complication, it is probable that production of concentrated nitric acid and military explosives will not begin in this plant before late 1954.

Before World War II a gunpowder (probably smokeless) factory with a capacity of 7,000 tons a year was a part of this plant. 158/ A 1949 report indicates that 2 gunpowder factories with a combined capacity of 7,000 tons are planned. 159/ It is speculated that the nitrocellulose produced elsewhere in the combine will go into single-base gunpowders in the one plant and into double-base gunpowders (additional constituent of nitroglycerine required) in the other plant.

After the requirements for concentrated nitric acid in the nitrocellulose plant are satisfied, the remainder is likely to be used in nitrating such raw materials as toluene and glycerine to produce trinitrotoluene (TNT) and nitroglycerine, respectively. The nitroglycerine will be specifically required if double-base powders are produced here.

When this plant becomes fully operative, it should be more than capable of freeing Rumania from the need to import explosive constituents, and it should have considerable capacity for the production of nitrogenous fertilizer.

APPENDIX C

METHODOLOGY

1. Production.

a. Synthetic Ammonia, Tables 1 and 3.

There is available some reliable information on individual plant statistics for synthetic ammonia plants which existed before World War II. Some estimates of changes at prewar plants and of the nature of postwar plants are based on public announcements, but most are based on defector reports and other intelligence sources.

National production estimates are a summation of the estimated production for individual plants. For details on specific plants, see Appendix B. For many plants the broad range of estimated production results from the many factors which have remained conjectural and were of necessity estimated with allowance for reasonable errors.

b. Nitric Acid, Tables 4 and 6.

All national production estimates are a summary of individual plant estimates. Plant estimates are based on the estimated availability of synthetic ammonia, specific plant information concerning equipment and production of nitric acid, and -- to a lesser extent -- the requirements for nitric acid as calculated from production estimates of products requiring nitric acid in their manufacture. For specific plant information, see Appendix B.

c. Nitrogenous Fertilizers, Tables 7 and 9.

All national production estimates are a compilation of individual plant estimates. Plant estimates are based on reports of production of specific fertilizers and on allocation of the synthetic ammonia and nitric acid produced at these plants.

Byproduct ammonium sulfate estimates were made by the application of standard conversion factors to bituminous coke production at byproduct coking plants. For the source of these factors and their exact manner of application, see The Coal Chemical Industry in the South European Satellites, CIA/RR PR 85, November 1954. S, US OFFICIALS ONLY.

d. Imports, Tables 11 and 13.

Estimated imports are based almost entirely upon fragmentary information about the amounts of natural nitrogenous compounds that the South European Satellites have been able to secure, because information as to the exact size of imports such as Chile saltpeter is not reported.

e. Availability, Table 14.

Because stockpiling is believed to be only negligible and on a seasonal basis in the case of fertilizers, availability is defined here as production plus imports minus exports. Estimates having been previously made for these three components of availability, the summation of these three items is shown in Table 14.

f. Consumption Patterns, Tables 15 and 16.

These estimates of consumption patterns are based entirely upon individual plant consumption patterns within each country. Various reports on the distribution of plant production of synthetic ammonia and nitric acid and knowledge of specific products produced within the industry have been combined to construct a use pattern for a particular plant. These figures are, in turn, compiled to give national consumption patterns.

APPENDIX D

GAPS IN INTELLIGENCE

1. Bulgaria.

a. Production.

Several important details about the plant at Dimitrovgrad have been unreported from any source. It would be helpful to know the rated synthetic ammonia capacity of the plant. In addition, the current distribution of synthetic ammonia production between the three principal nitrogenous products would be of great value in determining shifts in allocation for the purpose of preparing and supporting a large-scale military operation. Finally, the nature of the reported expansion over the initial capacity is a serious gap. Specifically, it would be valuable to know whether the expansion is in synthetic ammonia capacity or in the addition of nitric acid facilities.

b. Requirements.

Information is needed concerning Bulgarian domestic requirements for nitric acid for the manufacture of explosives, especially postwar expansions of established plants and new facilities designed for munitions production.

c. Consumption.

Details are lacking concerning the distribution of fixed nitrogen production among domestic, Soviet Bloc, and Free World consumers. This information is of importance in determining the function of this industry in Bulgaria.

2. Hungary.

a. Production.

The prewar processes and production capacity at Petfurdo are well established. Information is desired concerning the precise nature and extent of the expansions which have occurred at this plant since 1950 in order to indicate more clearly the postwar function of this plant.

Information, other than public announcements, on the new combine at Kazincbarcika is very sparse. Data on production capacity, products, and prospective consumers of this plant's production are all desired. These details are important for determining the purpose of economic expansion in this field.

b. Consumption.

Information is needed indicating the allocation of fixed nitrogen production between explosives production and such primarily nonmilitary outlets as agriculture, dyestuffs, and plastics. In addition, the distribution of fixed nitrogen production among domestic, Soviet Bloc, and Free World consumers is desired.

3. Rumania.

a. Production.

The capacity of the two prewar plants in Rumania is well established. Postwar expansions of an indeterminate nature have been reported at the Fagaras plant. Details on this purported expansion would be most helpful. The original plans for the construction of the fixed nitrogen plant at Ucea-de-Sus are known in general form. Information on changes in the original plans since the collapse of Nazi Germany could be high value, as the plant is thought to be designed primarily for the benefit of the Rumanian military establishment. In addition, the time at which various parts of the combine became operative is highly uncertain, and therefore clarification is desired in order to establish more definitely when this largest plant begins to contribute to domestic output.

b. Consumption.

Postwar information on the consumers of the production of the Tarnaveni plant would be of interest. The supposition that it supplies the explosives plant at Fagaras lacks confirmation. Verification of reported ammonium sulfate production is desired, and the extent of this production would be of interest in constructing a more precise consumption pattern for the output of this plant.

Information on the prospective consumers for the production of the Ucea plant would be of great interest. Such details would help to establish the actual functions of the new fixed nitrogen facilities within the country.

APPENDIX E

SOURCES AND EVALUATION OF SOURCES

1. Evaluation of Sources.

a. Bulgaria.

Because a fixed nitrogen industry was nonexistent in Bulgaria before World War II, there was no prewar information available that was applicable to the industry under study here. In the postwar period, no single source has afforded any comprehensive picture of this industry.

25X1A [redacted] have all been utilized to varying degrees in the compilation of the picture of the Bulgarian fixed nitrogen industry. Several press claims have supplemented this information to an appreciable degree. But none of these categories alone could have supplied a meaningful summary of this industry. Details on the industry have been supplied to a larger extent by statements and pictures in the Soviet press than by first-hand observers. Bulgaria has been unique among the South European Satellites in the supply of pictorial information it has made available.

b. Hungary.

Information of the prewar status of the Hungarian fixed nitrogen industry has been quite comprehensive, as it was supplied
25X1A [redacted] with the industry and have since left the country. [redacted] which 25X1A
gave a comprehensive and detailed run-down on the Petfurdo plant through 1945.

Of the postwar intelligence reports, [redacted] 25X1A
have cast light on recent developments which, [redacted] 25X1C
25X1C [redacted], give a broad view of developments within the industry. By far the most valuable reports in the postwar period have been those
25X1C emanating [redacted] Their principal value stems from the interpretation of press articles by a legation employee with considerable familiarity with Hungarian industry.

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c. Rumania.

The pre-World War II status of the fixed nitrogen industry in Rumania has been determined from translations by FDD and by the Army of official German documents and German technical publications. Postwar developments have been partially reported by [redacted] 25X1A document concerning the status of the two prewar plants. [redacted] 25X1A

25X1A [redacted] have supplemented this first report to give a fair picture of the current status of the fixed nitrogen industry. Information from all sources is scanty and general as regards the only postwar fixed nitrogen plant under construction.

2. Sources.

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

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

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

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

25X1A 1. [redacted]

STATSPEC [redacted]

25X1A

Next 7 Page(s) In Document Exempt

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