JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
MINISTRY OF INDUSTRY
THE REPUBLIC OF BULGARIA

THE STUDY
ON
THE RATIONAL USE OF ENERGY
IN
THE REPUBLIC OF BULGARIA

(SUMMARY)

MARCH 1994

THE ENERGY CONSERVATION CENTER, JAPAN

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Contents

1. Overview of the Study

1. OVERVIEW OF THE STUDY

1.1 Background of the Study

(1) East European countries, placed under socialist rule as a result of Soviet influence after World War II, have been rapidly moving toward democracy and a market economy since the disappearance of the Berlin Wall at the end of 1989.

In the Republic of Bulgaria, the movement toward democracy was initiated by a political power shift in October 1989, and the first non-communist cabinet was formed in November 1991 through two free elections.

Economic reforms were started in February 1991. The first step of such economic reforms is the liberalization of financing, foreign exchange and commodity prices, as well as economic stabilization by a renovation of land ownership, retrenchment in finance and a high bank-rate policy. It has been completed successfully. Now, the economic reform is in the second step toward the privatization of national enterprise. For this policy, the "Law of Privatization of National Enterprise" was adopted in April 1992 and the Agency of Privatization was set up in August 1992 for positive privatization. Although many of the medium- and small-sized companies have been in the process of privatization, however, most of the national large-sized companies have not been privatized substantially, for the shares of many large-sized stock companies are owned by the state.

Like other East European countries, the Republic of Bulgaria is burdened with a huge foreign debt (13 billion U.S. dollars as of the end of 1992). The dissolution of the COMECON system, which had undertaken about 80 percent of the foreign trade, and the impact of the Yugoslav conflict damaged industrial production, with the unemployment rate hitting about 13 percent at the end of 1992. The GDP in 1992 declined 20 percent over the previous year level. The country is now facing a business recession in the process of shifting toward market economy.

Under such circumstances, the country signed an association agreement with EC in February 1993 and made a convention with EFTA (European Free Trade Association) come into force in July 1993 to expand trade with the west market.

(2) In the Republic of Bulgaria, as in other East European countries, the businesses were run by the government when the country was under the socialist rule. Energy prices were set at lower values by the national policy, and there was no incentive for energy conservation. The unit energy consumption rate was reportedly 30 percent poorer than that in the west European countries.

The Republic of Bulgaria imports two thirds of primary energy. The shift from barter transactions under the COMECON system to market transaction based on hard currency will cause the country to encounter higher energy price comming near to international market price, and increased expenditure of foreign currencies.

The domestic energy supply of the country involves such problems as safety of old nuclear power plants, deterioration of thermal power plants, and limitation to the supply sources of natural gas and imported electric power. It is said that there is no supply shortage for the time being because of the reduced demand due to industrial stagnancy. In long view, however, the supply system of the country is very vulnerable.

For these reasons, a rational use of energy is a major concern of the Republic of Bulgaria.

(3) Against this background, the Japan International Cooperation Agency (JICA) dispatched Project Finding Team to Bulgaria, as a part of the Japanese effort to aid East European countries, and exchanged views on the feasibility of implementation of the Project. The Government of Bulgaria requested JICA in July 1991 to conduct a study of this matter.

In response to this request, JICA dispatched a preliminary study team and a preparatory study team to make the required survey and discussion. Following this survey, an agreement on the Scope of Work was concluded between JICA and the Ministry of Industry and Trade, a counterpart agency of this study in February 1992.

JICA assigned the Energy Conservation Center, Japan to conduct the study.

In May 1992, the Ministry of Industry and Trade was reorganized and separated into the Ministry of Industry and the Ministry of Trade. The responsibility as the counterpart for this study will be succeeded to by the Ministry of Industry.

1.2 Purpose of the Study

The purpose of the present study is to make contribution to the promotion of energy conservation in the manufacturing industries in Bulgaria through studies given in the following (a) to (e):

(a) Proposal on energy conservation measures on the national level for the manufacturing industry
(b) Proposal on the organization for the promotion of energy conservation and its activities
(c) Study of the feasibility of energy conservation by technical and administrative improvements in the model factory
(d) Preparing the reference data for promotion of energy conservation in manufacturing sectors
(e) Transfer such techniques as method of study to the counterpart

1.3 Scope of the Study

1.3.1 Study on the energy situation in the Republic of Bulgaria

(1) Energy policy of the Government

(2) Current energy situation in Bulgaria

(3) Situation of energy use

1.3.2 Study on the promotion of rational use of energy in the industry

(1) Related laws and regulations

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(3) Situation and evaluation of energy conservation promotion activities in related organizations

a) Current energy conservation promotion activities
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c) Future program for energy conservation promotion

1.3.3 Use of energy in five factories in five industrial sectors

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d) Situation of major energy consuming equipment
e) Problems in each factory and countermeasures without changing the current process
f) Evaluating effects of the countermeasures
g) Preparing the reference of the technical guideline for energy conservation promotion in industries

1.3.4 Recommendation for energy conservation promotion in Bulgaria

a) New organization for energy conservation promotion
b) Activities of the organization
c) Measures for energy conservation in the manufacturing industry

1.4 Counterpart Governmental Organization and Study Object

1.4.1 Counterpart governmental organization: The Ministry of Industry

The Ministry of Industry controls the production plants except for the construction material production plant and the supply of petroleum and natural gas.

1.4.2 Factories surveyed

(1) Factories

Table 1.1 shows the names of the factories to be surveyed.

Table 1.1 Name of Surveyed Factories

Type of industry	Factory name	Location
Synthetic detergent factory	Verila	Sofia
Vegetable oil factory	Prima-M	Polski Trambesh
Pulp and paper factory	Celhart	Stamboliiski
Textile factory	Nitex-50	Sofia
Glass factory	Stind	Sofia

(2) Energy related organizations

(a) Governmental organizations in Bulgaria

Ministry of Industry
Committee of Energy
Ministry of Finance
Ministry of Environment
Ministry of Regional Development, Housing and Building
National Statistical Institute
Standardization and Metrology Committee

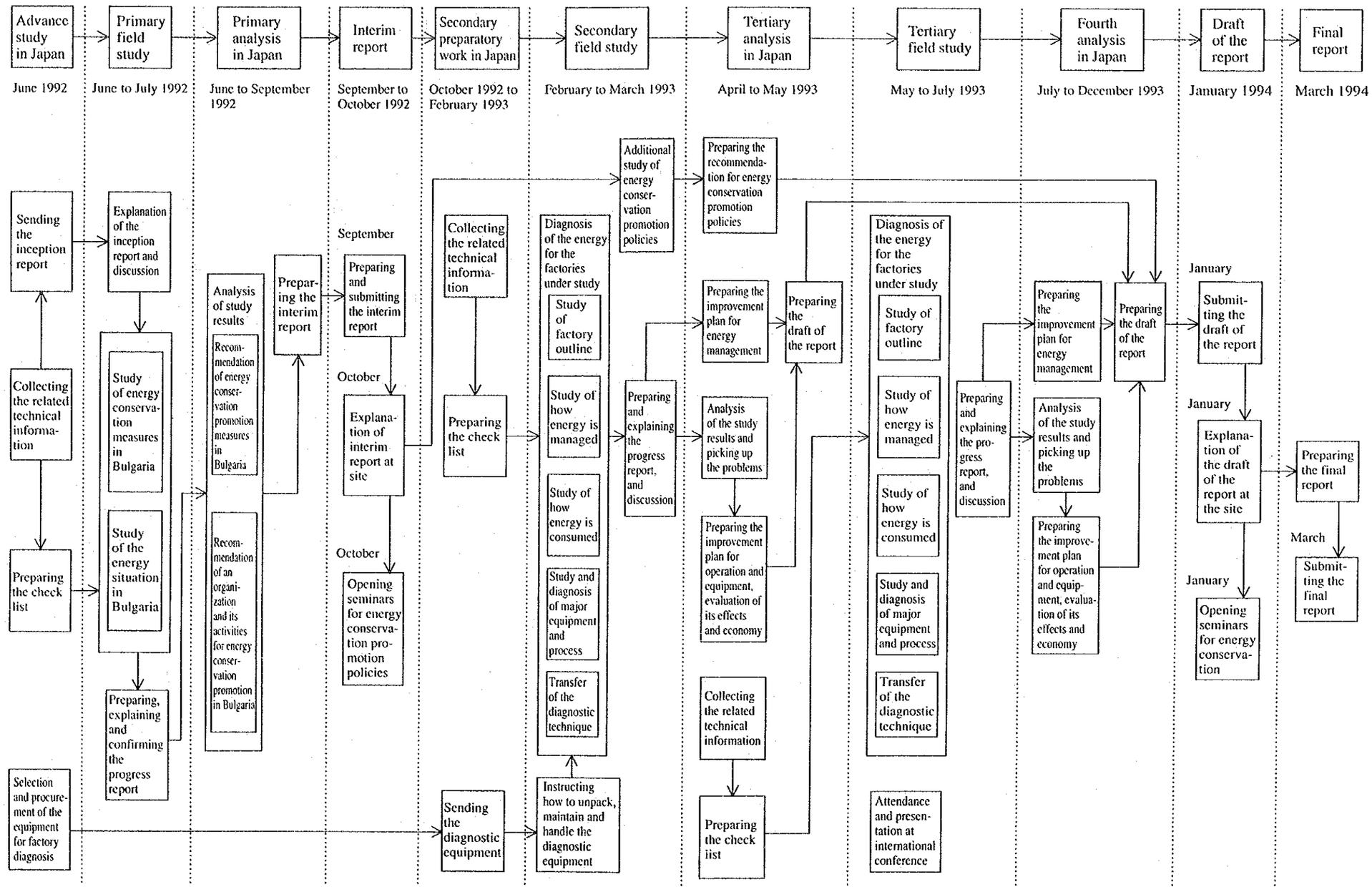
(b) Related organizations for energy conservation measures in manufacturing sectors

Industrial Energetics
Scientific and Technical Unions in Bulgaria
National Electric Company
Bulgargas
Petrol
Electro Impex
Bulgarian Chamber of Commerce and Industries
Ecotech Products

1.5 Method of the Study

The overview of the study is graphically shown in Figure 1.1.

Figure 1.1 Overview of the Study on the Rational Use of Energy in the Republic of Bulgaria



1.6 Progress of Field Study

1.6.1 Study of energy situation and energy conservation measures

The study on the energy situation of the Republic of Bulgaria, the energy measures of the Government, and current situation on the implementation of energy conservation promotion measures in manufacturing sectors is executed based on the data collected in the study program, as well as the interview with the Ministry of Industry, energy related organizations and related plants.

Before starting the study, the details of the study were explained to the counterpart, using the inception report. Thanks to the proper arrangement of the counterpart, the study was carried out smoothly, and the original target could be achieved.

Based on the results of the field study and making reference to the examples of energy policies adopted in Japan and other countries, we have worked out the proposals on measures suited to the actual situation in the Republic of Bulgaria.

Based on these proposals, we discussed with the counterpart and Bulgarian personnel related to policies and measures to have correct understanding of the views of the Bulgarian side, in order to incorporate such information into the final report.

1.6.2 Factory study

a) Since the date of arrival of the measuring equipment for field study changed from January 1993 to mid-February and the study group was to go back to Japan in March, the original program of surveying five plants from the early February to March was changed to the schedule of studying the two factories (synthetic detergent factory and vegetable oil factory) in March and the remaining three factories from June to July.

b) For the glass and pulp/paper factories out of the five, the factories to be studied was changed from the originally planned for the following reasons:

Type of industry	Name of scheduled factories	Name of new factories	Reasons for change
Glass	Interior	Stind	Operation suspended due to sales slowdown
Pulp and paper	Rulon Iskar	Celhart	Heat source was not supplied scheduled inspection by heat suppliers

Since both plants were very cooperative with the study, the survey was conducted as scheduled without any problem, despite sudden change.

c) Prior to plant study, we explained to the counterpart the method of handling the diagnostic equipment and instruments, and provided training in handling them.
We also explained the study method to the counterpart and personnel of the factories according to the check list prepared in advance. We also requested them to prepare the required data and to work the positions to install measuring instruments.

d) For general survey of the plants and energy management conditions, we obtained required information on the current situation and problems as well as future programs, by interview according to the check list, data collection, book reviewing and visual inspection.

Regarding the study of the energy consuming equipment and problems in energy use, we tried to have correct understanding on actual situations and problems of the operation methods and equipment performances, through the measurement by diagnostic equipment and measuring instruments brought from Japan, study of the drawings and diagrams, inspection of the past data and observation of the actual work.

During the survey, efforts were also made to transfer technologies on diagnostic procedures and analysis procedures to the counterpart.

e) At the termination of the study in each plant, we reported the results of the measurement and comments on observation to the management, and exchanged views with them.

Furthermore, after the field survey was over, the study results were confirmed with the Bulgarian side; then we prepared the progress report to be submitted to the Ministry of Industry.

f) Regarding energy management problems and improvement measures, study will be made on the overall energy conservation promotion system, including energy management organization, target setting, record and use of energy consumption data, and the employees' education, making reference to the management techniques successfully adopted in the Japanese factories as well as the particular local circumstances. Then improvement measures applicable to the plants will be submitted.

As for the problems involved in energy use and their countermeasures, minor modification of the equipment without changing the current process or improvement measures by additional installation of the equipment will be studied. After economic evaluation, improvement measures fitted to the plants will be submitted.

1.6.3 Counterpart

Having a high technological level, the counterpart has quickly learnt how to operate the diagnostic equipment and instrument, so that the counterpart alone could conduct necessary measurements in the latter part of the projected survey. The members had a very high morale and was very cooperative with the work.

1.6.4 Diagnostic equipment and instruments

Some of the diagnostic equipment and instruments were faulty in operation, but after having been repaired, all of them performed normal operations without giving any trouble to the study.

1.6.5 Preparing the data for the technical guideline

Based on the results of studying the plants, we picked up major points involved in energy management and energy use for each type of industry, and showed the main energy conservation techniques and their examples; then we worked out the reference data based on which the counterpart would prepare their own technical guideline for energy conservation.

1.6.6 Participation in energy forum

We took part in the Energy Forum sponsored by Scientific and Technical Unions in Bulgaria, and made a presentation on Japanese energy conservation measures and activities in the industrial field.

1.6.7 Holding seminars

We are scheduled to hold seminars to promote energy conservation activities reflecting the results of the study.

1.7 Composition of Study Group and Counterpart, and Field Study Schedule

See Appendices (1) to (3).

2. Energy Situation in Bulgaria

2. ENERGY SITUATION IN BULGARIA

(1) Supply of Primary energy

The Republic of Bulgaria is poor in natural resources, producing a very small amount of coal and natural gas. Relatively much coal is produced in this country, but is mostly low-quality brown coal (including lignite). Among the east European countries, Bulgaria is particularly poor in energy supply.

In the supply of the primary energy, the rate of the domestic energy is not more than 34 percent in 1990, and the country depends on imports for about 66 percent of the energy. Furthermore, the country depends heavily on the former Soviet Union for the supply. Table 2.1 shows the transition of primary energy supply.

Table 2.1 Transition of Primary Energy Supply

Year		1989		1990		1991	
		TJ	%	TJ	%	TJ	%
Domestic	Solid fuel	254,661	17.7	229,832	18.9	209,601	24.6
	Liquid fuel	2,989	0.2	2,544	0.2	2,378	0.3
	Others (Note)	193,526	13.5	185,680	15.3	174,779	20.5
	Total	451,176	31.4	418,056	34.4	386,758	45.4
Imported	Liquid fuel	591,430	41.2	421,967	34.7	192,336	22.6
	Gas	232,424	16.2	227,353	18.7	173,666	20.4
	Others	159,831	11.2	148,613	12.2	99,049	11.6
	Total	983,685	68.6	797,933	65.6	465,052	54.6
	Grand total	1,434,861	100.0	1,215,989	100.0	851,810	100.0

(Source: National Statistical Institute)

Note: The primary energy produced in hydroelectric power plants and nuclear power plants is included.

(2) Electric power

The current power generating capacity is 10,000 MW, of which 8,500 MW belongs to the National Electric Company. The power supply comprises 38.2 % nuclear power, 34.7 % thermal power by lignite, 18.3 % thermal power by imported coal, 4.0 % thermal power by petroleum and gas, and 4.8 % hydroelectric power. There is no pumped storage hydroelectric plant in this country. Adjustment between demand and supply depends on hydroelectric power generation and imports of the electric power from the former Soviet Union.

Table 2.2 illustrates the transition of the power supply.

The demand for electric power particularly in the industrial sections has fallen since 1991 due to the poor economic performance in Bulgaria. Even though the country faces deterioration of facilities and safety problems, lack of supply will not occur for the time being.

Table 2.2 Transition of Electric Power Supply (unit: 1000 Mwh)

Year	1985	1986	1987	1988	1989	1990	1991
Domestic	41,632	41,820	43,470	45,039	44,331	42,144	38,917
Imported	5,959	4,571	4,672	4,450	4,937	5,487	3,716
Total	47,591	46,391	48,142	49,489	49,268	47,631	42,633

(Source: National Statistical Institute)

(3) Energy consumption by industrial sectors

In substance Bulgaria was an agricultural country favored with fertile land and warm climate. However, in the early period of socialistic planned economy, major emphasis was placed on promotion of heavy industries. In the period from 1950s to 1960s, the country achieved a two-digit percentage of the industrial growth. As a result, the ratio of manufacturing production in the composition of GDP by industries reached 69 percent in 1988, whereas the agricultural production was reduced to 11 percent.

The energy consumption in the industrial sectors in Bulgaria occupies about 60 percent of the total consumption in the country, including that in transportation and consumer sectors, as illustrated in Table 2.3. At present, the economic activities are sluggish, so energy consumption in the industrial sectors is reduced, and that for the entire country is also reduced.

Many people consider that ten years will be required to recover the level of energy consumption of 1980s.

Table 2.3 Trend of Energy Consumption by Sector

Year	Industry PJ	Agriculture PJ	Household PJ	Total PJ	Industry %
1980	701.6	45.5	145.2	1,160.2	60.4
1985	795.5	47.9	182.8	1,311.0	60.6
1986	801.5	47.9	175.4	1,308.0	61.2
1987	799.9	49.7	187.6	1,331.1	60.0
1988	822.4	50.7	193.0	1,353.8	60.7
1989	781.2	55.0	199.9	1,330.5	58.7
1990	722.7	49.2	195.8	1,192.9	60.5
1991	467.1	34.4	174.3	850.5	54.9

3. Study on the Promotion of Rational Use of Energy in the Industry

3. STUDY ON THE PROMOTION OF RATIONAL USE OF ENERGY IN THE INDUSTRY

3.1 Energy Conservation Policy under Old Political System

(1) Energy price

In the trade between Bulgaria and the former Soviet Union under the COMECON system, the energy price was maintained far below the international standard in favor of the Soviet Union.

Furthermore, as part of the social policy, the Government provided the subsidies to the energy suppliers so that the price of electric power, coal and heat were maintained below the production cost.

So energy saving incentive did not work effectively and no voluntary effort was made to improve efficiency in energy use.

(2) Legal control

a) Energy conservation measure by a mere administrative measure

Energy conservation under the old political system was promoted by the administrative measure, without any law or regulation for an effective use of energy.

However, the Electric Power Act was available for the supply and operation of electric power. In accordance with the Act, the Energy Management Section (Inspection Bureau) of the Committee of Energy checked if a factory met the requirements of energy unit consumption rate determined by the Government and gave an advice if they did not meet the requirements. Factories were legally required to conform to the improvement program. If they failed to conform, penalties were imposed on them.

From 1976 to 1986, the energy conservation program was implemented. In 1978 and 1984, factory diagnosis campaign was conducted to solve the problems of power supply involved in deterioration of power plants and shortage of fuels.

However, the required amount of energy was supplied on a stable basis to the factories by the Government at a cheap cost under the planned economy, so each factory did not recognize the need of promoting energy conservation so much, and the diagnosis could not obtain the expected result.

Innovation of the political system in 1991 was accompanied by organizational reshuffle, and this inspection system was abolished.

b) Sections and personnel in charge of energy in factories

Factories were legally required to assign personnel in charge of energy in the part of 1960s. Their major role was to maintain the electric power equipment in the factory according to the Electric Power Act, and their status within the company was not very high.

When the energy conservation program was implemented in 1976, energy sections were established in large factories and energy other than electric power was also controlled. In some large factories, these energy sections still remain today.

(3) Holding of seminars

Symposium and seminars have been frequently held on the theme of energy facilities and energy conservation by the Energy Scientist Union established 20 years ago. Since it is not a Governmental organization, it does not receive any Government subsidy, it is supported by the membership fee and participation fees for the symposium or seminars.

It opens 50 courses of seminars every year, and the experts in charge of energy in universities, research institutes and factories serve as lecturers for these seminars. It also issues publications whenever required.

(4) Technological development and factory guidance

Industrial Energetics belongs to the Committee of Energy. It was established in 1970s by the Ministry of Electric Power. At the time of establishment, it had institutes and eleven branches in addition to the headquarters, staffed with a maximum of 200 engineers.
Its activities covered the development and commercialization of the equipment and machinery using energy (burners, boilers, traps and measuring instruments), evaluation of the energy efficiency for the equipment and machinery, analysis of energy consumed by factories, improvement proposal, setting up of energy consumption standards for typical processes, etc.

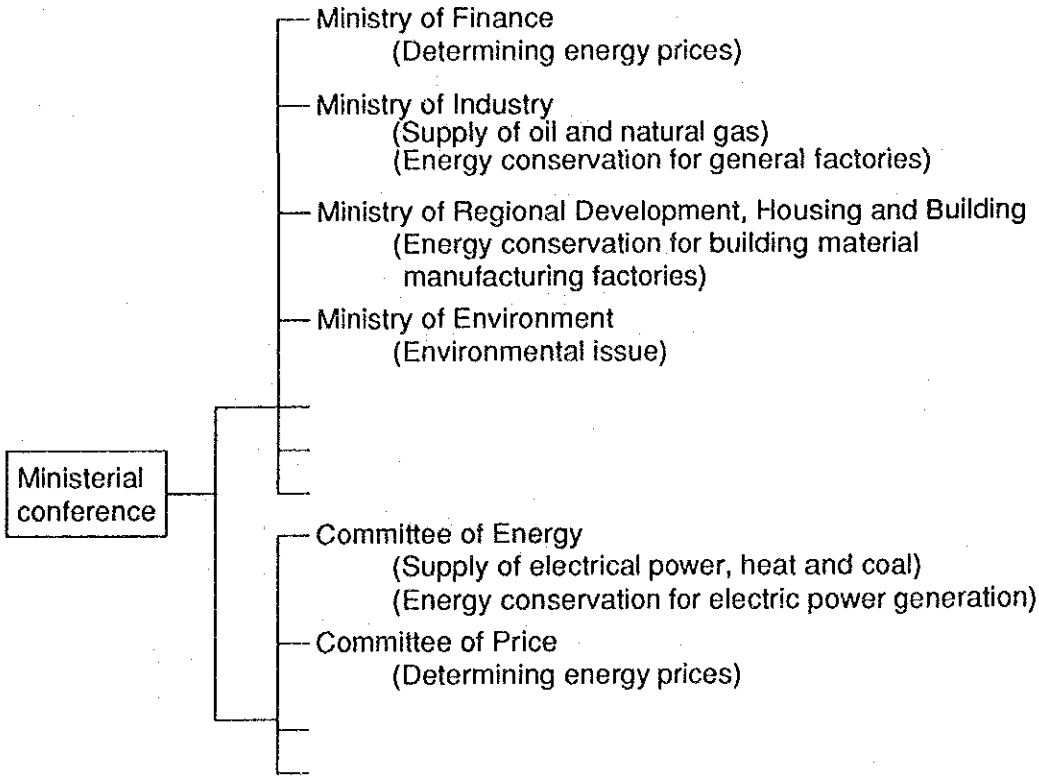
3.2 Current Situation of Energy Conservation Policy

(1) Governmental organizations

The Government organizations change with every administration. There is no Governmental organization which determines the comprehensive energy policy and provides an integrated administration of the demand and supply of energy.

Figure 3.1 shows the organization for energy conservation promotion of the Government of Bulgaria:

Figure 3.1 Governmental Organization Chart



Regarding the energy supply, the Committee of Energy takes charge of supply of electrical power, heat and coal, while the Ministry of Industry takes charge of supply of petroleum and natural gas.

With respect to energy demand, the Ministry of Regional Development, Housing and Building controls the building materials including cement, whereas the Ministry of Industry controls the others, also serving the function of promoting energy conservationin in the respective industries. The Committee of Energy manages the supply of electrical power, heat and coal, and serves the function of supervising the National Electric Company, heat supply companies and coal mine companies; it also promotes the electric power conservation.

National Agency for Energy Efficiency was founded in October 1992 as an organ to work out and implement the nationwide program for rationalization of energy use in linkage with Ministries. Since then, the necessary budgetary measures were not taken and the Agency was abolished in June 1993 before starting substantial activities.

There is no private organization for integrated promotion of energy conservation on the national level.

(2) Energy price

The basis of interdependent energy supply between Bulgaria and the former Soviet Union was lost by the disintegration of the COMECON system and the former Soviet Union, and energy came to be handled at the price close to the international market price.

As part of the effort for economic reform, the Government liberalized the energy price in June 1991. At present, all petroleum products are imported, and are traded at the free market price conforming to the international price. The natural gas price is determined in conformity to the petroleum price.

However, the prices of electric power, heat and coal is determined by the Government every three months with consideration given to the economic burden to the consumers. These prices are set below the production cost and subsidies are provided to compensate for the cost differences. However, these prices are gradually increased.

There is no demand charge system for electric power or heat; only the meter charge system is used.

(3) Energy conservation policy

At present, Bulgaria has no long-term energy policy. Since there is no energy conservation policy, no energy conservation activity is done by the Government. Only studies are made under the project through cooperation by foreign countries.

The Committee of Energy and Ministry of Regional Development, Housing and Building are interested in energy conservation promotion activities, and each of them is studying and planning energy conservation measures regarding electric power. The contents are still fluid. Both organizations are in charge of only part of energy problems. To promote overall energy conservation, measures taken by these two organizations are not sufficient.

The Ministry of Industry is current being reorganized, but the Ministry of Industry is required to take the lead in promoting nationwide energy conservation activities.

(4) Energy conservation project by foreign countries

A macroscopic study has been conducted by the World Bank on energy in general, and the draft report including the analysis of the energy industry and the proposals on policy and measures was submitted to the Ministry of the Ministry of Industry and Trade.

Regarding energy conservation diagnosis for factories, the U.S.A. consultants conducted energy conservation diagnosis on eight factories of the industrial fields using simple measuring instruments with the USAIDS budget amounting to 47,000 dollars (US dollars), and the interim report is already submitted.

According to EC Thermi-Program, a center was set up in Bulgaria to demonstrate the highly efficient equipment of the West. This activity is concerned with study of the energy consumption in the food manufacturing plants, holding of seminars and demonstration of the equipment.

3.3 Problems of Energy Demand and Supply, and Energy Conservation Policy

The policy of the Bulgaria with regard to energy demand and supply, and energy conservation is considered to face the following problems:

(1) Problems of energy demand and supply

a) Excessive dependency (67 %) on imports for energy

b) Most of the energy is imported from one country, the former Soviet Union.

c) The lignite, the major domestic energy resource, is of low calorie, and requires desulfurization and denitrification in use.

d) The nuclear power plants were made by the former Soviet Union, and face the safety problems.

e) Some of the thermal power plants are deteriorated and require thorough improvement.

f) The energy consumption efficiency for the industrial sector is poor.

g) Electric power is used for room heating in general households.

(2) Problems of energy conservation policy

a) All the past policies have been abolished in the process of political reform, and there is no concrete policy.

b) There is no Governmental organization to take charge of integrated administration of energy problems; the functions are currently decentralized and dispersed. Therefore, the policies are studied separately by various sections.

c) A long-term economic program is not yet worked out.

d) The energy price is liberalized to a considerable extent, but the Government subsidies are granted for energy for household use, and the price is kept low as a policy.

The electric power and steam for industrial use are based on the meter charge system alone. The effective system is not yet adopted to ensure a stable balance between the revenue and expenditure on the part of the supplier, or to ensure promotion of energy conservation on the part of the users.

e) The shares of the factories are owned by the Government; the factories are not yet privatized in real terms.

f) Both the Government and enterprises are financially pressed, and have no fund for taking measures or making the required investment.

3.4 Proposal on Energy Conservation Promotion in Bulgaria

Based on the results of studying the energy supply and demand and implementation of energy conservation measures, we would like to propose policies and measures which are considered to be effective in promoting energy conservation on the national level. Table 3.1 shows the overview.

Table 3.1 Summary of Proposed Policies

	Item	Current problems	Priority items for implementation	Short-term items for implementation	Mid-term items for implementation
1	Energy policy administrative organizations	The relevant authorities are different according to the type of energy.	The agency in charge of the comprehensive energy policy should be set up within the Ministry of Industries. An inter-ministerial liaison conference should be organized.		
2	Energy policies	The basic energy policy is not yet worked out.	The mid- and long-term demand and supply prospect should be prepared. The basics for energy policies should be determined and publicized. Energy conservation policies should be determined.		Laws and regulations should be set up.
3	Energy prices	Energy prices are partly kept to low values for political reasons. Promotion of energy conservation is adversely affected by some charge system.	 The charge system should be modified so as to be oriented for energy conservation.	Energy prices should be raised to the international price levels or to a level reflecting the cost.	
4	Promotion measures of energy conservation for factories	All energy conservation promotion packages are left abolished owing to difficulties in national finance and poor factory funds.	Information on the situation of energy consumption in major factories must be collected.	Energy intensive factories should be designated. Energy manager should be assigned.	Technical criteria for energy conservation should be established.
			Motivation must be given.	The factories in designated factories and individuals posting remarkable achievements should be commended.	Incentives should be introduced (tax reduction).
		There is no systematic supply of information.	Information supply promotion should be budgeted. A seminar for training should be held. (Entrustment) A guide and diagnosis should be provided. (Entrustment)	Training courses should be held. (on commissioning basis) Diagnosis and guidance should be implemented. (on commissioning basis)	Periodicals should be published.
		The factory is hindered from investment by such economic reasons as poor funds.	Budget for investment promotion should be designed and budgeted. (Tax deduction and financing in low interest)	A system for financing at low interest should be set up.	A tax incentive system in favor of investment for energy conservation should be set up.
5	Organization to implement energy conservation promotion measures	There is no public organization to implement the concrete measures to promote energy conservation.	A policy implementation administrative section should be established within the Ministry of Industries.	An "Energy conservation center" should be set up.	
6	Technological development	No efforts have been made at the public level to develop energy conservation technologies.		A budget for technological development must be appropriated.	Technological development must be implemented at the public level.

4. Study of Energy Consumption in Model Plants

4. STUDY OF ENERGY CONSUMPTION IN MODEL PLANTS

4.1 Overview of Factories to be Studied

Five factories have been studied, and Table 4.1 illustrates their overview:

Table 4.1 Overview of Factories to be Studied

Factory name	Verila	Prima-M	Celhart	Nitex-50	Stind
Industry type	Chemical	Foodstuff	Pulp and paper	Textile	Glass
Product	Synthetic detergent	Vegetable oil	Paper and bags	Wool textiles	Glass bottles
Number of employees	750	227	1,760	520	750
Production	Detergent 17.5 kt	11.3 kt	35.6 kt	Textiles 525 km	38.2 kt
1989 as base year	36 %	73 %	58 %	22 %	37 %
Energy consumption					
Natural gas	6.4 Mm^3				22.6 Mm^3
Heavy oil	0.5 kt	2.5 kt	44.9 kt		
Steam				28.0 Tcal	5.4 Gcal
Purchased electric power	6.4 GWh	3.3 MWh	49.8 GWh	3.2 GWh	16.7 GWh
Size level	Maximum	Higher level	Maximum	Intermediate level	Intermediate level

Note: Production and energy consumption represent values for 1992.

All of these plants are incorporated, but all shares are still owned by the nation. Management people are all dispatched from the Government; these companies are state-run in the true sense.

Due to the sluggish market conditions, the production is dropped to a half or one third that during the peak period, except for the vegetable oil. This is one of the reasons for poor energy unit consumption.

4.2 Current Situation of Energy Management

In all the factories, energy conservation targets are not yet set up, so systematic energy conservation campaign by participation of all employees is not yet initiated. Any particular measures have not yet been taken except that steam strap was updated to achieve the substantial reduction in steam consumption in one of the factories.

The energy price has been intentionally set low, and their interest in the cost has not been sufficient because of the state-run company structure, so interest in energy conservation efforts has not been very strong.

The biggest problem in launching the energy conservation campaign is shortage of the energy measuring instruments. In one of the plants, the steam and electric power measuring instruments are installed for each process, and measurements are recorded every day; both the journal and monthly report are kept. In other four plants, however, no action has been taken to get correct information on and to provide effective management of the thermal energy consumption for each process. In some factories, even the flow meter for receiving natural gas were not provided.

In some of the plants equipped with boilers, feed water flow meters are not provided, so there is no way of knowing about the volume of steam generation.

If the energy consumption is not correctly grasped for each process, the evaluation of the consumption level and detection of abnormalities cannot be made, and effects of the measures cannot be evaluated. Thus, energy conservation target cannot be set up and improvement activities cannot be launched.

Secondly, poor equipment maintenance was observed in many occasions. Some of the equipment are old and outdated, and new equipment are also installed. Highly efficient equipment were observed not to exhibit their original performance due to poor maintenance. According to the factory people, operational funds are insufficient due to the poor management performance, and no budget can be assigned to equipment maintenance, even though they are well aware of the necessity of equipment maintenance.

Although different factories with these factories are included, we asked five factories in the preliminary study concerning problems of energy conservation promotion. Table 4.3 illustrates their replies:

Table 4.2 Problems of Energy Conservation Promotion

Item	Number
Uncertainty of energy price prospect	3
Little possibility of energy shortage	1
Little room for promoting further improvement	1
Shortage of engineers	1
Difficulty in obtaining good equipment	5
Insufficient system of research and development	1
Shortage of fund for facility improvement	3
Superannuated facility improvement	3
Shortage of measuring equipment	5

4.3 Problems in Energy Use

(1) Chemical factory

The chemical factory, which manufactures many kinds of products including synthetic detergent and resins, has suspended the operation of many of the facilities.

a) Synthetic detergent dryer

This is an Italian-made equipment installed in 1974. This type is generally used for this application, and there is no problem.

The following describes the operational problems:

① Fluctuation of hot air temperature due to improper setting of the automatic controller of the natural gas combustion equipment
② Insufficient control of water content in materials
③ Lack of efficient operation due to high pressure slurry pump controller failure
④ Insufficient maintenance of paste pump
⑤ Falling off of heat insulations of the dryer tower

b) Boiler and steam piping

The boiler studied has been maintained immediately before the study, and its efficiency was as good as 89 %.

The following describes the operational problems:

① Air ratio slightly excessive
② Shortage of feed water and fuel flow meter
③ Insufficient heat insulation of steam collector piping and valves
④ Rearrangement of steam piping
⑤ Steam leaking from pipes and falling off of heat insulators
⑥ Shortage of steam strap

c) Electric equipment

① Integration of the transformers in the substation No.5

d) Effects of improvement

Improvement of above points will save about 12% of the fuel, with the required cost being recovered within one year.

(2) Vegetable oil factory

a) Oil production process

Since imbalance of capacity is observed for each process, idle equipment can be used to improve the yield.

The following describes the problems and improvement points:

① Direct steam blowing into the cooker
② Use of DT exhaust gas heat
③ Benzine heater can be eliminated.
④ Great benzine loss
⑤ Steam leakage due to improper valve position
⑥ Use of steam condensate heat
⑦ Preheating in degumming process can be eliminated

b) Boiler and steam piping

① Insufficient blowing of boiler water
② Shortage of feed water and fuel flow meter
③ Excessive air ratio due to excessive air blower
④ Insufficient heat insulation of steam collector piping and valves
⑤ Partial failure of steam trap operation

c) Effect of improvements

Improvement of above points will save about 40% of the fuel, with the required cost being recovered within two years.

(3) Paper and pulp factory

This is a large integrated plant ranging from lumber treatment to paper bag making, and is designed in an energy conservation process so that chemicals waste liquid for the pulp production is used for boiler fuel.

The following describes the problems and improvement points:

a) Paper production process

① Improvement of availability factor of highly efficient equipment and long-term continuous operation
② Return to indirect cooking by maintenance of cooking process heater
③ Use of neutral sulfite pulp waste liquor as fuel
④ Increase of the mixing ratio of the raw material with used paper
⑤ Early maintenance of the vacuum evaporator to prevent the number of effect from being reduced
⑥ Increase of black liquor concentration
⑦ Cleaning the combustion air inlet of the recovery boiler
⑧ Rise of white liquor temperature by reducing make-up water
⑨ Reduction in the number of paper machine cylinders and improvement of heat pattern
⑩ Control of hood exhaust of paper machines
⑪ Maintenance of paper machine drainage system and adoption of blow-through system

b) Steam piping

① Insufficient heat insulation of steam collector piping and valves

c) Electric equipment

① Integration of transformers
② Reduction of compressor air pressure

d) Effects of improvement

Improvement of above points will save about 11% of the fuel and 2% of electric power, with the required cost being recovered in a short time.

(4) Textile factory

Steam is successfully saved by updating the steam strap, but much steam is still consumed for room heating.

The following describes the problems and improvement points:

a) Finishing drier

① Normalization of the air supply and exhaust by exhaust fan maintenance
② Decrease of steam pressure
③ Reduction of drying load
④ Change of cooling air source
⑤ Prevention of work interruption

b) Finishing process

① Installation of measuring instruments for management
② Heat insulation of the equipment and liquid surface cover
③ Prevention of steam leakage
④ Recovery of hot waste water heat

c) Spinning and weaving processes

① Effective temperature and humidity control
② Maintenance of air conditioning equipment damper and spray nozzle
③ Change of duct blowout direction
④ Integration of air conditioners
⑤ Improvement of setting of pneumafil nozzle and pressure control

d) Steam piping

① Insufficient heat insulation of steam collector piping and valves

e) Room heating

① Reduction of the ventilation load by closing the clearances
② Reduction of steam pressure
③ Room heating temperature control
④ Introduction of exhaust gas of the fine spinning machine

f) Water

① Control of water level in water storage tank and air conditioner

g) Electric equipment

① Integration of transformers
② Water pump speed control
③ Turning off the unnecessary lamps

h) Effects of improvement

Improvement of above points will save about 23% of the steam and 6% of electric power, with the required cost being recovered within one year.

(5) Glass factory

The factory is divided into two parts; factories No.1 and No.2 having the same processes, of which we studied only the factory No.2. The forming capacity is inferior that of the glass melting tank furnace, so the unit consumption can be improved by replacing the forming machine.

The following describes the problems and improvement points:

a) Glass melting tank furnace

① Improvement of heat insulation
② Reduction of air ratio by automatic furnace pressure control, closing the aperture and replacement of the burner
③ Reduction of exhaust gas loss by replacement of the checker brick
④ Improvement of glass liquid level control
⑤ Increased use of cullet

b) Annealing Lehr

① Improvement of bottle loading method

c) Chemical glass composition

① Improvement of meltability by changing the batch composition

d) Economizer

① Use of idling equipment

e) Electric equipment

① Control of the number of transformers
② Selective operation of highly efficient compressor
③ Reduction of compressed air pressure

f) Effects of improvement

Improvement of above points in factory No.2 alone will save about 9% of the fuel and 2% of electric power in the entire factory, with the required cost being recovered within one year.

5. Reference Data to Work Out Technical Guideline for Energy Conservation Promotion

5. REFERENCE DATA TO WORK OUT TECHNICAL GUIDELINE FOR ENERGY CONSERVATION PROMOTION

The Ministry of Industry or the Energy Conservation Center planned to be founded is expected to take a lead in implementing the factory diagnosis and education of the plant engineer required to promote the energy conservation. To push forward these activities, it is essential to work out the guideline on which the personnel in charge will depend.

The data included in the present report describes technical matters which will be helpful in working out the guideline, based on the following principles:

(1) The data should be available to the engineers of the Ministry of Industry or the Energy Conservation Center ① as a diagnosis instruction manual, ② as a textbook for seminar or ③ as data to determine the progress of rationalization of the factory.

(2) The level of the description should be easily understood by the engineers for four to five years after graduating from universities or colleges who have not been working in this field.

(3) To meet the current situations of the industries in the Republic of Bulgaria, the range of the description should be limited to the matters related to the processes in the plants of our study, and the data shall include the basic items, referential numerical values and the description of the energy conservation techniques and examples.

The following items should be included in the description:

1. Characteristics of the data
2. Diagnostic procedures
3. Energy management
4. Chemical products
5. Vegetable oils
6. Pulp and paper
7. Textile
8. Glass
9. Boiler
10. Use of steam
11. Electrical equipment
12. Calculation of heat insulation by computers

It is expected that the guideline will be prepared by the Ministry of Industry or the Energy Conservation Center with the aid of this Report, and will be further improved provided with additional information collected through its own factory diagnosis.

6. Appended Data
(Members, Counterpart, Timetable, S/W and Measuring Instruments)

Appended Data 1

Members of the Study Group

No	Name	Duty	Description of responsibilities
1	Mitsuo Iguchi	Leader, General management	General management, energy management and energy conservation policies
2	Teruo Nakagawa	Deputy leader	Heat management technology and measurement technology, and liaison negotiation
3	Masashi Miyake	Process control	Study of detergent production process and heat management technology
4	Masashi Endo	Process control	Study of vegetable oil production process and heat management technology
5	Akira Koizumi	Process control	Study of paper & pulp production process and heat management technology
6	Shoji Nakai	Process control	Study of glass production process and heat management technology
7	Takashige Taniguchi	Process control	Study of textile production process and heat management technology
8	Yukio Nozaki	Energy management technology	Study of heat management technology
9	Tetsuo Ohshima	Energy management technology	Study of heat management technology
10	Yorihiko Tanaka	Electricity management technology	Study of electric power receiving and distribution and electric facilities at detergent and vegetable oil factories
11	Kazuo Usui	Electricity management technology	Study of electric power receiving and distribution and electric facilities at paper & pulp, glass and textile factories
12	Hironobu Tsukimoto	Energy policy	Study of energy situation and policy
13	Takao Shiomi	Energy management technology	Overall heat management technology (domestic jobs)
14	Masayoshi Morita	Energy management technology	Overall heat management technology (domestic jobs)
15	Jiro Konishi	Energy management technology	Overall heat management technology (domestic jobs)
16	Ayako Sato	Energy management technology	Overall heat management technology (domestic jobs)
17	Motoo Hori	Energy policy and energy conservation popularization	Energy policy, energy conservation popularization (domestic jobs)
18	Yukie Kawaguchi	Energy policy and energy conservation popularization	Energy policy and energy conservation popularization (domestic jobs)

Appended Data 2

List of Counterparts

Members of the Ministry of Industry

No	Name	Assignment
1	Mr. Dobrin Oreshkov	Team Leader and Electric Expert
2	Mr. Valentin Stankov	Heat Expert
3	Mr. Mitko Dimitov	Heat Expert
4	Mr. Nestor Nestorov	Heat Expert

Appended Data 3

Timetable of the Field Study

1) Primary field study

Members
① Mitsuo Iguchi (Leader)
② Teruo Nakagawa (Deputy leader)
③ Hironobu Tsukimoto (Energy policy)

No	Date	Day of the week	Itinerary
1	June 15, 1992	Monday	Departure from Tokyo
2	June 16	Tuesday	Arrival at Sofia and visit to the Japanese Embassy
3	June 17	Wednesday	Courtesy visit to Ministry of Industry and reporting to the Japanese Embassy
4	June 18	Thursday	Explanation of the inception report
5	June 19	Friday	Explanation of the study method
6	June 20	Saturday	Study (Ecotech Product)
7	June 21	Sunday	Preparation for the study
8	June 22	Monday	Study (Ministry of Industry and the Committee of Energy)
9	June 23	Tuesday	Study (Ministry of Finance, Ministry of Environment and National Statistical Institute)
10	June 24	Wednesday	Study (chemical factory and paper & pulp factory)
11	June 25	Thursday	Study (Textile factory) Movement from Sofia to Veliko Tarnovo
12	June 26	Friday	Study (glass factory and vegetable oil factory) Movement from Polski Trambesh to Sofia
13	June 27	Saturday	Preparation for the study
14	June 28	Sunday	Preparation for the study
15	June 29	Monday	Study (Standardization and Metrology Committee and Bulgarian Chamber of Commerce and Industry)
16	June 30	Tuesday	Study (Scientific and Technical Unions in Bulgaria and Industrial Energetics)
17	July 1	Wednesday	Study (National Electric Company, Electrimpex and Bulgargas)
18	July 2	Thursday	Study (Committee of Energy, Ministry of Industry and Ministry of Construction)
19	July 3	Friday	Study (Ministry of Industry, Petrol and National Statistical Institute)
20	July 4	Saturday	Preparation for the study
21	July 5	Sunday	Preparation for the study
22	July 6	Monday	Study (Ministry of Industry) and preparation of a progress report
23	July 7	Tuesday	Signing of the progress report and reporting to the Japanese Embassy
24	July 8	Wednesday	Courtesy visit to Ministry of Industry and the Japanese Embassy, and departure from Sofia
25	July 9	Thursday	En route home
26	June 10	Friday	Arrival at Tokyo

2) Explanation of interim report in Bulgaria

Members
① Mitsuo Iguchi (Leader)
② Teruo Nakagawa (Deputy leader)
③ Hironobu Tsukimoto (Energy policy)

No	Date	Day of the week	Itinerary
1	October 20, 1992	Tuesday	Departure from Tokyo
2	October 21	Wednesday	Arrival at Sofia
3	October 22	Thursday	Courtesy visit to the Japanese Embassy, reporting to Ministry of Industry, and meeting
4	October 23	Friday	Opening of seminar
5	October 24	Saturday	Data arrangement
6	October 25	Sunday	Data arrangement
7	October 26	Monday	Explanation of the interim report
8	October 27	Tuesday	Meeting with Ministry of Industry, and preparation and signing of minutes
9	October 28	Wednesday	Reporting to Ministry of Industry and the Japanese Embassy. Movement from Sofia to Vienna
10	October 29	Thursday	Reporting to JICA Austria Office, and departure from Vienna
11	October 30	Friday	Arrival at Tokyo

3) Secondary field study

A. First team

Members
① Mitsuo Iguchi (Leader)
② Teruo Nakagawa (Deputy leader)
③ Yukio Nozaki (Heat management technology)

No	Date	Day of the week	Itinerary
1	February 15, 1993	Monday	Departure from Tokyo
2	February 16	Tuesday	Arrival at Sofia and visit to the Japanese Embassy
3	February 17	Wednesday	Explanation to Ministry of Industry
4	February 18	Thursday	Study (Efficient Energy Agency) and Unpacking of received study equipment
5	February 19	Friday	Study (National Statistical Institute) and unpacking of received study equipment
6	February 20	Saturday	Preparation for the study
7	February 21	Sunday	Preparation for the study
8	February 22	Monday	Study (EC Energy Center), and inspection and calibration of study equipment
9	February 23	Tuesday	Study (Committee of Energy), and inspection and calibration of study equipment
10	February 24	Wednesday	Study (Ministry of Construction), and inspection and calibration of study equipment
11	February 25	Thursday	Study (Ministry of Industry), and inspection and calibration of study equipment
12	February 26	Friday	Study (Scientific and Technical Unions in Bulgaria), and inspection and calibration of study equipment
13	February 27	Saturday	Preparation for the study, and joining with the second team

B. Second team

Members	①	Mitsuo Iguchi	Leader (Joining from the first team)
	②	Teruo Nakagawa	Deputy leader (Joining from the first team)
	③	Masashi Miyake	Detergent production process
	④	Masashi Endoh	Vegetable oil production process
	⑤	Yukio Nozaki	Heat management technology (Joining from the first team)
	⑥	Yorihiko Tanaka	Electricity management technology

No	Date	Day of the week	Itinerary
1	February 26, 1993	Friday	Departure from Tokyo
2	February 27	Saturday	Arrival at Sofia and joining with the first team
3	February 28	Sunday	Preparation for the study
4	March 1	Monday	Meeting with the detergent factory
5	March 2	Tuesday	Meeting with the vegetable oil production factory and departure of member Tanaka from Tokyo
6	March 3	Wednesday	Meeting with Ministry of Industry and arrival of member Tanaka at Sofia
7	March 4	Thursday	Meeting with Ministry of Industry
8	March 5	Friday	Meeting with Ministry of Industry
9	March 6	Saturday	Preparation for the study
10	March 7	Sunday	Preparation for the study
11	March 8	Monday	Study of the detergent factory
12	March 9	Tuesday	Study of the detergent factory
13	March 10	Wednesday	Study of the detergent factory
14	March 11	Thursday	Study of the detergent factory
15	March 12	Friday	Study of the detergent factory
16	March 13	Saturday	Preparation for the study
17	March 14	Sunday	Preparation for the study. Movement from Sofia to Veliko Tarnovo
18	March 15	Monday	Study of the vegetable oil factory
19	March 16	Tuesday	Study of the vegetable oil factory
20	March 17	Wednesday	Study of the vegetable oil factory
21	March 18	Thursday	Study of the vegetable oil factory
22	March 19	Friday	Study of the vegetable oil factory. Movement from Veliko Tarnovo to Sofia
23	March 20	Saturday	Departure from Sofia of members Miyake, Endo, Nozaki and Tanaka
24	March 21	Sunday	Data arrangement
25	March 22	Monday	Meeting with Ministry of Industry. Arrival at Tokyo of members Miyake, Endo, Nozaki and Tanaka

No	Date	Day of the week	Itinerary
26	March 23	Tuesday	Preparation of a progress report
27	March 24	Wednesday	Preparation and signing of the progress report
28	March 25	Thursday	Reporting to the Japanese Embassy. Movement from Sofia to Vienna
29	March 26	Friday	Reporting to JICA Austria Office
30	March 27	Saturday	Departure from Vienna
31	March 28	Sunday	Arrival at Tokyo

4) Tertiary field study

Members	①	Mitsuo Iguchi	Leader
	②	Teruo Nakagawa	Deputy leader
	③	Akira Koizumi	Paper & pulp production process
	④	Takashige Taniguchi	Textile production process
	⑤	Shoji Nakai	Glass production process
	⑥	Tetsuo Ohshima	Heat management technology
	⑦	Kazuo Usui	Electricity management technology

No	Date	Day of the week	Itinerary
1	May 29, 1993	Saturday	Departure from Tokyo
2	May 30	Sunday	Arrival at Sofia
3	May 31	Monday	Preparation for the study
4	June 1	Tuesday	Meeting with the paper & pulp factory and arrangement for the presentation at the International Conference
5	June 2	Wednesday	Meeting with the glass factory
6	June 3	Thursday	Meeting with the textile factory
7	June 4	Friday	Adjustment of the study equipment
8	June 5	Saturday	Preparation for the study
9	June 6	Sunday	Preparation for the study
10	June 7	Monday	Study of the glass factory
11	June 8	Tuesday	Study of the glass factory
12	June 9	Wednesday	Study of the glass factory
13	June 10	Thursday	Study of the glass factory
14	June 11	Friday	Study of the glass factory
15	June 12	Saturday	Preparation for the study
16	June 13	Sunday	Movement from Sofia to Plovdiv
17	June 14	Monday	Study of the paper & pulp factory
18	June 15	Tuesday	Study of the paper & pulp factory
19	June 16	Wednesday	Study of the paper & pulp factory
20	June 17	Thursday	Study of the paper & pulp factory
21	June 18	Friday	Study of the paper & pulp factory. Movement from Plovdiv to Sofia

No	Date	Day of the week	Itinerary
22	June 19	Saturday	Preparation for the study
23	June 20	Sunday	Preparation for the study
24	June 21	Monday	Movement from Sofia to Varna
25	June 22	Tuesday	Participation in and presentation at the international conference
26	June 23	Wednesday	Participation in and presentation at the international conference
27	June 24	Thursday	Participation in and presentation at the international conference
28	June 25	Friday	Movement from Varna to Sofia
29	June 26	Saturday	Preparation for the study
30	June 27	Sunday	Preparation for the study
31	June 28	Monday	Study of the textile factory
32	June 29	Tuesday	Study of the textile factory
33	June 30	Wednesday	Study of the textile factory
34	July 1	Thursday	Study of the textile factory
35	July 2	Friday	Study of the textile factory
36	July 3	Saturday	Departure from Sofia of members Koizumi, Taniguchi, Nakai, Oshima and Usui
37	July4	Sunday	Arrangement of data materials
38	July 5	Monday	Preparation of a progress report. Arrival at Tokyo of members Koizumi, Taniguchi, Nakai, Oshima and Usui
39	July 6	Tuesday	Preparation of a progress report and adjustment of equipment
40	July 7	Wednesday	Signing of the progress report
41	July 8	Thursday	Reporting to the Japanese Embassy. Movement from Sofia to Vienna
42	July 9	Friday	Reporting to the JICA Austria Office and departure from Vienna
43	July 10	Saturday	Arrival at Tokyo

Appended Data 4

SCOPE OF WORK
FOR
THE STUDY ON THE RATIONAL USE OF ENERGY
IN
THE REPUBLIC OF BULGARIA

AGREED UPON BETWEEN
MINISTRY OF INDUSTRY AND TRADE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Sofia, February 28th, 1992

MR,SPAS SPASSOV
DEPUTY MINISTER
MINISTRY OF INDUSTRY
AND TRADE

MR.YUKIO OTSU
LEADER OF THE PREPARATORY
STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Government of the Republic of Bulgaria (hereinafter referred to as "the Government of Bulgaria"), the Government of Japan decided to conduct a study on the rational use of energy in industry in the Republic of Bulgaria (hereinafter referred to as " the Study")in accordance with the relevant laws and regulations in force in Japan.

Accordingly, Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Bulgaria.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The objective of the Study is to contribute to the promotion and strengthening of rational use of energy in the field of industries in the Republic of Bulgaria(hereinafter referred to as "Bulgaria") by studying the technical and managemental applicability of rational use of energy and formulating the report for the promotion of rational use of energy in the representative industries stated below:

1. Chemical Industry
2. Paper and Pulp Industry
3. Textile Industry
4. Glass Industry
5. Food Industry

III. SCOPE OF THE STUDY

In order to achieve the above objective, the Study shall cover the following items.

1. Study on the energy situation in Bulgaria
   - 1.1 Government policy of the energy
   - 1.2 Present energy situation in Bulgaria
   - 1.3 Situation of energy use in the field of whole industries in Bulgaria

2.Study on the promotion of rational use of energy in the industry

2.1 Related laws and regulations

2.2 Current program for rational use of energy

2.3 To study and evaluate the activities of the authorities concerned

(1)Current activities for promotion of rational use of energy

(2)Achievements of past activities

(3)Future plan/program for promotion of rational use of energy

3.Study on the situation of energy use in the factory of each industry

3.1 Situation of energy use in each factory

(1)Outline of the factory

(2)Situation of energy management

(3)Energy flow chart

(4)Situation of major energy consuming equipment

(5)Problems in each factory and countermeasures without changing the existing production process

(6)Estimated effects of the countermeasures

4.Recommendation for the promotion of the rational use of energy in Bulgaria

4.1 New organization to promote rational use of energy

4.2 Activities of the above organization

4.3 Measures to promote rational use of energy in the field of industries

4.4 Countermeasures without changing the existing production process and to estimate their effects

5.Preparation for the reference of the technical guideline for the promodtion of rational use of energy in industries

IV. SCHEDULE OF THE STUDY

The Study shall be carried out in accordance with the tentative schedule of the Study as shown in the Appendix.

V. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Bulgaria in particular stages of the Study as shown in the Appendix .

Twenty (20)copies of the Inception Report
Twenty (20)copies of the Progress Report
Twenty (20)copies of the Interim Report
Thirty (30)copies of the Draft Final Report and its summary
Thirty (30)copies of the Final Report and its summary

VI.UNDERTAKINGS OF THE GOVERNMENT OF BULGARIA

1.To facilitate smooth conduct of the Study, the Government of Bulgaria shall take the necessary measures:

1.1 To secure the safety of the Japanese Study Team (hereinafter referred to as "the Team")

1.2 To permit the members of the Team to enter, leave and stay in Bulgaria for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees

1.3 To exempt the members of the Team from taxes, duties and other charges on equipment, machinery and other materials brought into, and out of, Bulgaria for the conduct of the Study

1.4 To exempt the members of the Team from income tax and charges of any kind imposed on, or in connection with, any emoluments or allowances paid to them for their services in connection with the implementation of the Study

1.5 To provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into Bulgaria from Japan in connection with the implementation of the Study

1.6 To secure permission for entry into private properties or restricted areas for the conduct of the Study

1.7 To secure permission for the Team to take all data and documents (including photographs) related to the Study out of Bulgaria to Japan

1.8 To provide medical service as needed. Its expenses will be

chargeable to the members of the Team.

2.The Government of Bulgaria shall bear claims, if any arises against the members of the Team resulting from, occuring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or wilful misconduct on the part of the members of the Team.

3.Ministry of Industry and Trade (hereinafter referred to as "MIT")shall act as the counterpart agency to the Team and also the co-ordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4.MIT shall provide the Team with the following, at their own expense, in cooperation with other organizations concerned:

4.1 Available data and information related to the Study
4.2 Counterpart personnel
4.3 Suitable office space with necessary equipment in Sofia
4.4 Credentials or identification cards
4.5 Driver of Vehicle(mini-bus)

VII.UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:

1.To dispatch, at its own expense, study team to the Republic of Bulgaria

2.To pursue technology transfer to the Bulgarian counterpart personnel in the course of the Study

VIII.OTHERS

JICA and, MIT shall consult with each other in respect of any matter that may arise from, or in connnection with, the Study.

TENTATIVE SCHEDULE OF THE STUDY

Year	1992								1993											
Month	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
JICA Study team Work in Japan																				
JICA Study team Work in Bulgaria																				
JICA Study team Report Output		IC/R	P/R			IT/R						P/R					DF/R			F/R

PROCUREMENT OF EQUIPMENT

Abreviations: IC/R: Inception Report
P/R: Progress Report
IT/R: Interim Report
DF/R: Draft Final Report
F/R: Final Report

MINUTES OF MEETING
ON
THE STUDY ON THE RATIONAL USE OF ENERGY
IN
THE REPUBLIC OF BULGARIA
AGREED UPON BETWEEN
MINISTRY OF INDUSTRY AND TRADE
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. The Preparatory Study Team organized by the Japan International Cooperation Agency visited the Republic of Bulgaria from February 25 to February 29, 1992 for the purpose of discussing the Scope of Work regarding the Study on The Rational Use of Energy in the Republic of Bulgaria with the Ministry of Industry and Trade of the Government of the Republic of Bulgaria.

2. In connection with the above, a series of meetings were held between the Bulgarian side represented by Mr. Bojidar Fotev, General Director, Ministry of Industry and Trade and the Japanese side headed by Mr. Yukio Otsu, Leader of the JICA Preparatory Study Team. (The attendance list is found in the Appendix)

3. These records should be read in conjunction with the "Scope of Work" agreed upon between the Ministry of Industry and Trade and JICA dated Feb. 28, 1992.

4. SPECIAL ISSUES HIGHLIGHTED

4.1 Regarding Item 3 of Article III.SCOPE OF THE STUDY, selected five(5) factories shall be as follows:
(1)VERILA Ltd. - Sofia (Chemical Industry)
(2)RULON ISKAR Ltd. - Sofia (Paper & Pulp Industry)
(3)NITEX-50 Ltd. - Sofia (Textile Industry)
(4)INTERIOR Ltd. - Elena (Glass Industry)
(5)PRIMA M Ltd. - Polski Trambesh (Food Industry)

M. O

B.F.

4.2 The Bulgarian side requested the Japanese side to provide the equipment, measuring equipment and equipment carrying vehicle, upon the completion of the said study, and the Japanese side agreed to it.

4.3 The consignee of the above equipment shall be as follows:
Mr.Dobrin Oreshkov
Expert,
Ministry of Industry and Trade
8, Slavyanska Str.
Sofia 1046
BULGARIA

4.4 Both sides agreed on that Bulgarian side assigns counterpart engineers for the Japanese study team while their field survey in Bulgaria for technology transfer, and numbers of Bulgarian counterparts shall be as follows:

(1) 4(four)engineers; 3(three) heat engineers and 1(one) electric engineer, from Ministry of Industry and Trade, who shall be assigned for the the whole field survey at the factories.

(2) 4(four)engineers; 3(three) heat engineers and 1(one) electric engineer, from each factory, who shall be assigned for nearly one week only when the Japanese study team makes field survey at the factory.

Done in Sofia
February 28, 1992

MR.BOJIDAR FOTEV
GENERAL DIRECTOR,
INDUSTRIAL SCIENCE AND
INFORMATICS DEPT.,
MINISTRY OF INDUSTRY AND TRADE

MR. YUKIO OTSU
LEADER,
PREPARATORY STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

LIST OF ATTENDANCES

Bulgarian Side

Ministry of Industry and Trade

Mr. Bojidar Fotev	General Director, Industrial Science and Informatics Dept.
Ms. Margarita Kambosseva	Senior expert, Industrial Science and Informatics Dept.
Mr. Dobrin Oreshkov	Senior expert, Energy strategy
Mr. Tzveti Lazarov	Expert, Internationl economic relationship

Japanese Side

JICA Preparatory Study Team

Mr. Yukio Otsu	Leader
Mr. Takao Kaibara	Member
Mr. Akio Kimura	do.
Mr. Teruo Nakagawa	do.
Mr. Toshinori Isogai	do.

Embassy of Japan

Mr. Kazumasa Sibuta	Attache

Appended Data 5

Equipment List

No	Name	Set (s)
1.	Equipment carrying vehicle with antishock rack and lifter	1
2.	Ultrasonic flowmeter for fuel oil or water	2
3.	High temperature anemometer for gas	6
4.	Steam condensate flow meter	1
5.	Pitot type flow meter	1
6.	Differential pressure transmitter for orifice	1
7.	Oxygen meter for exhaust gas	2
8.	Carbon dioxide and monoxide meter for exhaust gas	1
9.	Pretreatment unit for sampling exhaust gas	1
10.	Sampling tube for exhaust gas	10
11.	Thermometer for surface	2
12.	Thermocouple with compensate cable for gas	40
13.	Suction pyrometer	1
14.	Infrared radiation thermometer (low range)	1
15.	Infrared radiation thermometer (high range)	1
16.	Glass thermometer	5
17.	Hygrometer	10
18.	Infrared thermal video system	1
19.	20 channel recorder with data memory and reader	3
20.	Personal computer (desk top type) for analysis	1
21.	Personal computer (book type) for field work	2
22.	Water conductivity meter	1
23.	Water pH meter	1
24.	Water hardness meter	1
25.	Pressure gauge with transmitter for furnace gas	1
26.	Pressure transmitter for steam	1
27.	Steam trap checker	1
28.	Watt-power factor meter	5
29.	Power meter	1
30.	Tachometer	1
31.	Lux meter	1
32.	Circuit tester	1
33.	Voltage detector	5
34.	Heat resisting gloves	5
35.	Cobalt glass for eye protect	5

No	Name	Set (s)
36.	Camera	1
37.	Power insulation gloves	5
38.	Extension power cord with tools	3
39.	Stop watch	2
40.	Wagon desk for field work	4
41.	Training unit for measurement of temperature and power	1
42.	Training unit for measurement of water flow and power	1
43.	Training unit for measurement of gas pressure and power	1
44.	Transducer (for power)	6
45.	Transducer (for current)	2
46.	Transducer (for voltage)	2

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