WORLD ENERGY DATA SYSTEM

MASTER

WENDS

VOLUME II
COUNTRY DATA
CZ—KS

OFFICE OF PROGRAM MANAGEMENT SUPPORT

ARGONNE NATIONAL LABORATORY

ARGONNE, ILLINOIS 60439

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Vol. II of XI

WORLD ENERGY DATA SYSTEM (WENDS)

VOLUME II

COUNTRY DATA

(CZ—KS)

June 1979

OFFICE OF PROGRAM MANAGEMENT SUPPORT
Argonne National Laboratory
Argonne, Illinois 60439

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THE WORLD ENERGY DATA SYSTEM

The World Energy Data System (WENDS) is a managerial level information bank containing organized data on those countries and international organizations that may have critical impact on the world energy scene. The system was developed by the Office of Program Management Support at Argonne National Laboratory for the Office of International Affairs of the Department of Energy (DOE). The Office of International Affairs also provided funds for the collection of the following information:

- Country data which provides general background information on the economy, government, and energy orientation.
- Similar compilations of information concerning energy-related international organizations.
- Summaries of energy-related international agreements.

Nuclear fission information was collected for the Plans and Analysis Division, Office of Nuclear Energy Programs, DOE. It includes the following:

- Nuclear facility profiles which provide resumes of facts concerning specific installations.
- Nuclear program summaries,that is, overviews of the fission R&D programs in selected countries.

All the WENDS data contains references to enable verification and expansion of the information. Since all data sources are non-classified, complete information is not always available. The Office of Program Management Support at Argonne welcomes any information that will complete these synopses in future publications. Please address comments to:

WENDS
Office of Program Management Support
Building 362
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This compendium of international energy-related information was compiled from a computerized database and is now available in a series of volumes. The total set of information is as follows:

Volume	Title	Contents
I	COUNTRY DATA Afghanistan, Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Bolivia, Brazil, Burma, Canada, China, Colombia	Review of background information for each country listed.
II	COUNTRY DATA Czechoslovakia, Denmark, Egypt, Finland, France, Germany (East), Germany (West), Greece, Guinea, India, Indonesia, Iran, Italy, Japan, Korea (South)	
III	COUNTRY DATA Libya, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Niger, Nigeria, Norway, Pakistan, Peru, Philippines, Poland, Portugal	
IV	COUNTRY DATA Senegal, South Africa, Soviet Union, Spain, Sweden, Switzerland, Taiwan, Tanzania, Thailand, Turkey, United Kingdom, United States, Upper Volta, Venezuela, Yugoslavia	
V	INTERNATIONAL ORGANIZATION DATA Asian Development Bank, European Economic Community, Inter-American Development Bank, International Atomic Energy Agency, International Energy Agency, Nuclear Energy Agency, United Nations, World Bank	Review of backgound information for each international organization listed.

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INTRODUCTION TO

COUNTRY DATA

ORIENTATION

WENDS includes four volumes of energy-related information concerning 57 countries.

ORGANIZATION

The information for each country is grouped together and numbered as a unit, with each page number preceded by the State Department tags code. The countries themselves are in alphabetical order by country name. The table of contents indicates the countries and corresponding tags codes contained in this volume. Within each country grouping most of the following topics are addressed:

- Country Background
  - Economic Profile
  - Demographic Profile
  - Professional Labor Force Participation Profile
  - Educational Resources
- Government Background
  - Energy Policy: Basic Legislation
  - Governmental Structure for Energy Policy and R&D
  - Organization for Implementation of Energy Policy and R&D
- Energy Background
  - Energy Policy and Objectives
  - Desired Degree of Energy Self-Sufficiency
  - Indigenous Energy Resources
  - Patterns of Energy Sources and Uses
  - Projections of Demand
  - Projections of Energy Supply, Imports, and Exports
  - Environmental Considerations
  - Commercial Applications
  - Power Production Facilities
  - Energy Industries
- Energy R&D Activities
  - Energy R&D: Status and Outlook
  - Energy R&D: Budget
  - Energy R&D: Priorities
  - Energy R&D: Impact
  - Government Supported Energy R&D in Industry, Universities and National Laboratories
  - Energy R&D Role of Private Industry
- International Activities
  - Involvement in International Energy R&D Organizations
  - Assessment of International Activities
- Key References
- Notes and Evaluations

CONTENTS

Each page of discussion contains the country name, the topic title, the initials of the researcher, and the date on which the page was prepared. The treatment of a particular discussion topic is similar for each country in order to facilitate comparative analysis.

In the table of contents each topic title is identified by a topic code. On the notes and evaluation page this code provides a short-hand method of determining which specific documents were used to prepare that page of information.

WENDS COUNTRY DATA

CZ: CZECHOSLOVAKIA

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COUNTRY DATA--CZECHOSLOVAKIA
ECONOMIC DATA PROFILE

SMH 15 MAR 78

GNP (Current million $)-56,600
PER CAPITA INCOME ($)-3,821
EXPORTS (million $)-9,395
MONETARY UNIT-Koruna (Crowns)
TOTAL ENERGY R&D BUDGET (million $)--

INFLATION RATE--
DISPOSABLE INCOME ($)--
IMPORTS (million $)-9,705
EXCHANGE RATE (1US$=)-See Note
5.77 commercial,
9.27 noncommercial

TRANSPORTATION SYSTEM DESCRIPTION

Total railway length of 13,241 km (2,803 electrified); carries 48% of freight traffic. Rail links from north to south excellent; links from east to west good. Roads and highways total 73,538 km (56,581 km hard surfaced); carry 80% of passenger transport. Navigable rivers total 480 km. East German, Polish, and Black Sea ports used for overseas trade. Some 60 regular internal air services; main airports at Prague, Brno, Bratislava, Olomouc, and Kosice (Prague and Bratislava are international).

NOTE: Foreign trade with West in hard currencies.

--not available

COUNTRY DATA--CZECHOSLOVAKIA
DEMOGRAPHIC DATA PROFILE

SMH 15 MAR 78

LAND (million sq km)-.128
POPULATION (millions)-15.1
LITERACY %-nearly 100
LIVE BIRTHS/THOUSAND-19.5
MEDIAN AGE/MALES-28
AVERAGE FAMILY SIZE-3.3
PRIMARY SCHOOL GRADS-1,881,414(b)
INDUSTRIAL WORKERS-2,980,716
AGRICULTURAL WORKERS-837,479
POPULATION GROWTH %-.8

ARABLE LAND (million sq km)-.054
POPULATION DENSITY (/sq km)-116
% RURAL POPULATION-33.3
DEATHS/THOUSAND-11.5
MEDIAN AGE/FEMALES-31
NET MIGRATION(millions/yr)-.005(a)
SECONDARY SCHOOL GRADS-422,263(b)
PROFESSIONAL WORKERS-1,356,120
COLLEGE GRADS-154,645(b)
UNEMPLOYED--

(a) Figure for 1967. No data since then, but migration per year is negligible.
(b) Reflects number of students in attendance. Secondary school category includes high school, evening and correspondence school for adults, part-time school for workers, and technical/vocational and teacher-training schools.

--not available

COUNTRY DATA--CZECHOSLOVAKIA
KEY TECHNICAL EDUCATIONAL RESOURCES

SMH 15 MAR 78

	LOCATION
Charles University	Prague
Comenius University	Bratislava
Palacky University	Olomouc
Purkyne University	Brno
Safarik University	Kosice
Czech Technical University	Prague
Slovak Technical College	Bratislava
Technical College in Kosice	Kosice
Technical University of Brno	Brno
College of Mining	Ostrava
College of Chemical Technology	Pardubice
College of Chemical Technology	Prague
College of Transport Engineering	Ziline
College of Forestry and Wood Technology	Zvolen
College of Mechanical and Electrical Engineering	Pilsen
College of Mechanical and Textile Engineering	Liberec

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY POLICY: BASIC LEGISLATION SMH 15 MAR 78

AREAS OF BASIC LEGISLATION AFFECTING ENERGY POLICY

No information is available on energy or resource-specific legislation.

1-The State economic plans, prepared by State Planning Commission in consultation with relevant ministries and agencies, provide general guidelines for energy policies and priorities. These fall into three categories:

a-long-term plans which cover 15 to 20 years;
b-five-year plans (most recent is the Sixth Five-Year Plan, 1976-80): plans for fundamental research and R&D; guidelines on number of workers required and volume of resources necessary for implementation of programs; training plans for better qualified R&D personnel;
c-annual plans: annual targets in five-year framework; scheduling of specific tasks and projects; requirements in industry; plans on required number of workers, financing and budget requirements.

2-There has been evidence of an increasing concern in energy conservation during the 1970's. Regulations are in effect for savings in consumption of electricity in agriculture, industry and commercial sectors. There is a ban on use of electric appliances in agriculture during peak hours. The Government has exhibited a reluctance to regulate public consumption, but was recently forced to encourage savings in the domestic sector as well. Electricity for heating is forbidden if other means are available; reduction of street lighting except in the center of the city and at important crossings is enforced; and lighting of historic monuments, etc., is banned.

COUNTRY DATA--CZECHOSLOVAKIA
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D SMH 15 MAR 78

THE FEDERAL GOVERNMENT

Czechoslovakia (Czechoslovak Socialist Republic-CSSR) is a federal state comprising two republics (Czech and Slovak) with equal rights and separate governments. The Federal government handles foreign relations, defense, foreign trade, transport and communication. In theory, the two Republics are responsible for all other matters. In reality, power is centralized at the federal level. The Communist Party, in turn, controls most activities of government.

EXECUTIVE BRANCH (FEDERAL)

President--Chief of State (Gustav Husak); elected by Federal Assembly. Husak simultaneously holds the position of First Secretary of the Czechoslovak Communist Party.

Premier (Lubomir Strougal), as head of government, is charged with planning and execution of energy policy in conjunction with his Cabinet; appointed by the President (as is the entire Cabinet) and responsible to the Federal Assembly.

Minister of Fuel and Power (Vlastimil Ehrenberger). Advises and oversees the planning and execution of energy policy; R&D program development and implementation in context of five-year plans, oversees specific fuel and power trusts, enterprises, and institutes; and is ultimately responsible for nuclear power station construction.

LEGISLATIVE BRANCH (FEDERAL)

Federal Assembly (Parliament)--five-year term; consists of two chambers of equal stature.
1-House of the People (200 members--138 Czechs and 62 Slovaks, in proportion to population)
2-House of Nations (150 members--75 Czechs and 75 Slovaks)

OTHER PARTS OF ENERGY STRUCTURE (FEDERAL)

1-State Planning Commission (Chairman and Deputy Minister, Dr. Vaclav Hula). Responsible for long- and short- (five-year-plans) term economic planning, including energy plans and priorities.
2-Ministry of Technology and Investment Development (Ladislav Supka). Coordinates R&D in general (together with the respective Ministries for Construction and Technology in the Czech guidelines for implementation; basic and applied research planning under directives of State Economic Plan; directs and coordinates inter-branch programs and projects financed by the State; facilitates information sharing in R&D network; some financing and management of R&D projects; coordination with other federal bodies of international cooperation. Minister appointed by the President; ultimately responsible for Atomic Energy Commission.

COUNTRY DATA--CZECHOSLOVAKIA
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D (CONT) SMH 15 MAR 78

3-Atomic Energy Commission-CSKAE (Chairman, Jan Neumann). Responsible for peaceful use of atomic energy and coordination of atomic energy program.

4-"R&D Network" is the total of R&D related centers and institutes throughout the country. There are five major classifications: Czechoslovak Academy of Sciences and Slovak Academy of Sciences and numerous centers attached to them; universities and institutes of higher learning; R&D centers, information services and testing centers under supervision of ministries and state administrative bodies; legally/economically independent R&D institutes and organizations; and industry R&D centers (labs, workshops, development/design/technological units). Network centers are involved in: basic and applied R&D; information and consultation services; training of experts; problem solving; participation in development.

THE REPUBLICS (CZECH AND SLOVAK)
In theory, the Republics are responsible for domestic (national) related matters--especially planning, administration, and implementation of economic programs. In reality, they follow the lead of the Federal government.

EXECUTIVE (REPUBLICS)
Prime Minister (Czech)--Josef Korcak
Prime Minister (Slovak)--Peter Colotha
Their Respective Cabinets include Ministries of Construction and Technology (Czech-Karel Lobl; Slovak-Vaclav Vacok) which work with the Federal Ministry of Technology and Investment Development on general R&D programs: formulation of policies and distribution of funds; participation in State programs and direction of regional ones; financing of projects; coordination of R&D network including new organizations.

LEGISLATIVE (REPUBLICS)
National Councils (Parliaments)

OTHER PARTS OF ENERGY STRUCTURE (REPUBLICS)
Planning Commissions(Czech-Stanislave Razl; Slovak-Karol Martinka). Economic planning, target setting, implementation.

COUNTRY DATA--CZECHOSLOVAKIA
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/SMH 15 MAR 78

MINISTRY OF FUEL AND POWER

Oversees energy-related enterprises, trusts ("a trust denotes a group of factories or producing entities which are legally independent and work together on a cooperative basis, subject to overall management by the trust general directorate"--U.S. Commerce Dept, OBR, October 1977), and sectoral managements ("not trusts but groupings of operational units without legal independence"--ibid).

1-Ostrava-Karvina Mines Turst (Ostrava)
2-Coal Mines Trust (Kladno)
3-Northern Czech Brown Coal Mines Trust (Most)
4-Brown Coal Mines and Briquette Trust (Sokolov)
5-Coal and Lignite Mines Trust (Prievidza)
6-Slovak Gas Works Trust (Bratislava)
7-Czechoslovak Gas Enterprises Trust (Prague)
8-Slovak Power Enterprises Trust (Bratislava)
9-Czech Power Works Trust (Prague)
  a-Organization for the Rationalization of Electrical Energy Works--ORGREZ (Brno)
10-Czechoslovak Uranium Industry Sectoral Management (Pribram)
11-Institute for the Research and Development of Fuels (Bechovice)
12-Scientific Research Institute for Coal (Ostrava-Radvanice)
13-Research Insitute for the Mining Sector at Prague (Prague)
14-Power Research Institute (Prague)

ENERGY RELATED ENTERPRISES, TRUSTS, GROUPS, INSTITUTES ATTACHED TO OTHER FEDERAL MINISTRIES

1-Ministry of General Engineering (Pavil Bahyl); many trusts related to all kinds of engineering questions, including:
  a-Czechoslovak Automotive Works Trust (Prague)
    1)-Motor Vehicles Research Institute (Prague)
  b-Tesla Enterprises for Electronics and Low/Voltage Technology Trust (Prague)
    1)-Tesla Research Institute for Nuclear Technology and Instrumentation (near Prague)
2-Ministry of Metallurgy and Heavy Engineering (Zdenek Pucke); groups related to metals and industrial equipment/machinery, including:
  a-High-Voltage Electrical Engineering Works (Prague)
    1)-Research Institute for High-Voltage Electrical Engineering (Prague)
    2)-Research and Development Institute for Electric Motors (Brno)
    3)-Research Institute for Cables and Insulators (Bratislava)
    4)-Research and Development Institute for Electrical Instruments and Controls (Brno-Horni Herspice)
  b-Czechoslovak Street-Car/Train-Wagon Works Trust (Prague)
    1)-Research Institute for Rail Vehicles (Prague)
  c-Power Engineering Works Trust (Brno)
3-Ministry of Technology and Investment Development (Ladislav Supka); introduction and development of new technologies, including:

COUNTRY DATA--CZECHOSLOVAKIA
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/SMH 15 MAR 78
(CONT)
- a-Center for Scientific, Technical and Economic Information (Prague)
- b-Institute for the Economics and Management of Scientific/ Technical Development (Prague)
- c-Institute for the Development of Fuel and Energy Resources (Prague)
- d-Czechoslovak Center for the Study and Development of Measures to Protect the Environment Against Pollution (Bratislava)

ENERGY-RELATED ENTERPRISES, TRUSTS, INSTITUTES ATTACHED TO MINISTRIES OF THE CZECH AND SLOVAK REPUBLICS

- 1-Czech Republic
  - a-Czech Ministry of Construction and Technology (Karel Lobl)
    - 1)-State Institute for Regional Planning (Prague)
  - b-Czech Ministry of Forestry and Water Conservation (Ladislav Hruzik)
    - 1)-Research Institute for the Forest and Game Economy (Zbraslav nad Vltavou)
    - 2)-Research Institute for the Water Economy (Prague)
- 2-Slovak Republic
  - a-Slovak Ministry of Construction and Technology (Vaclav Vacok)
    - 1)-Institute for Regional Planning (Bratislava)
  - b-Slovak Ministry of Forestry and Water Conservation (Frantisek Hagara)
    - 1)-Water Economy Costructions (Bratislava)
    - 2)-Research Institute for the Forest Economy (Bratislava)
  - c-Slovak Ministry of Industry
    - 1)-Slovchemia Trust of Chemical Production Firms (Bratislava)
      - a)-Research Institute for Crude Oil and Coal Gas (Bratislava)
      - b)-Research Institute for Petrochemicals (Novaky)
  - d-Slovak Ministry of (Domestic) Trade
    - 1)-West Slovak Coal Reserves Sectoral Management (Bratislava)

NUCLEAR ENERGY R&D
- 1-Czechoslovak Atomic Energy Commission--CSKAE (Chairman, Jan Neumann). Responsible to Federal Ministry of Technology and Investment Development.
- 2-Tesla Researh Institute for Nuclear Technology and Instrumentation. Attached to Federal Ministry of General Engineering.
- 3-Institute of Nuclear Research (Director, Stanislav Havel)--established 1952; under auspices of Czechoslovak Academy of Sciences. Basic research using experimental reactor with 2,000KW output. Equipment provided by USSR.

COUNTRY DATA-CZECHOSLOVAKIA
ENERGY POLICY OBJECTIVES SMH 15 MAR 78

Five-year plans outline basic energy policy. The Sixth Five Year Plan (1976-80) set the following objectives:

1-Development of nuclear technology in the long term as a basic alternative to fossil fuels. Use of nuclear energy for electricity and heating, ultimately to account for over 50% of installed power production capacity by year 2000. The development of nuclear power base is encouraged because of: cost (cheaper than conventional sources), environmental concerns, and the existence of generous deposits of natural uranium. Priorities include: production of nuclear power equipment; acquisition of new technology to meet nuclear program (trade with West may prove important); major restructuring of industry to cope with nuclear needs.
2-Short-term emphasis on coal technology. Mining and strip mining of brown coal to be particularly important while shift to nuclear power is in its elementary stages. Priorities include: stepped-up production of equipment for mining, stripping and transport of brown coal; acceleration of exploration programs; expanding output at existing fields and increasing capacity of coal-based power stations.
3-Conservation and rationalization of energy. Planned savings of 2-2.5% in 1976-80 period. Prioties include: reduce energy and raw material consumption; prevent waste through more efficient use of fuels; develop energy saving techniques; use substitutes for raw materials with a high energy consumption requirement.
4-Protection and development of the environment. Priorities include: control of air pollution.

Problems in achieving objectives:

1-Reorientation and retooling of industry to nuclear power production is proceeding slowly. Nuclear program quite ambitious based on past experience.
2-Manpower shortage and lack of technically trained personnel.
3-Inefficient use of equipment; expensive breakdowns; poor maintenance.
4-Inefficient use of manpower and poor organizational methods.
5-Power station construction consistently behind schedule; delays in equipment production.
6-Availability of hard currencies for trade with West poses problem.
7-Inadequate financing; wasteful investments--failure to concentrate funds and effort where needed (past philosoply based on "little bit for everyone.")

COUNTRY DATA--CZECHOSLOVAKIA
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY SMH 15 MAR 78

Czechoslovakia is resource poor in deposits of oil and natural gas. Country has relied on Soviet supplies of crude in particular (USSR meets well over 90% of country's oil needs). In late 1960s/early 1970s, USSR began encouraging its East European comrades to diversify their supplier sources, for Soviet production was beginning to lag behind increasing demand. As a result, Czechoslovakia decided to increase oil imports from the Middle East. Price hikes in early to mid 1970s affected these plans, and the country has continued to rely on oil from the USSR. (Soviet prices were at first stable but later began to increase also; Soviet prices based on sliding five-year averages of world oil prices.) The oil situation has deeply affected the tenor of energy policies in the near future. It has concentrated on developing a domestic power base (coal in the short term; nuclear power in the long term) but a growth in fuel and energy imports is anticipated. During the 1976-80 period about 50% of the planned increase in output will be met by domestic primary sources of energy.

Plans and problems with regard to energy self-sufficiency:

1-COAL--Although coal (especially brown coal) is posed as a short-term answer to energy needs, the exploitation process is likely to require new techniques; coal is becoming less accessible and more costly to extract. Quality of coal is also declining (high ash and sulfur content), and it is expected that domestic sources will be exhausted in 50 to 60 years.

2-OIL--Decrease in use of oil for power production. After 1980 crude oil to be used only in petrochemical industry and in transportation. The country has meager domestic resources and new discoveries are unlikely. As a result, they are likely to invest in USSR energy and fuel-related projects in exchange for crude oil supply (and natural gas).

3-HYDROELECTRIC--Energy problems of the 1970s have led to re-examination of hydro potential not seriously considered previously, but the cost is high.

4-NUCLEAR--Nuclear energy expected to account for following percentages of total electric power generated:

1975- 1%
1985- 15.7%
2000- 47.2%

Expected growth in nuclear capacity is optimistic given delays in construction and equipment production.

Czechoslovakia's planned industrial growth in 1976-80 is at its lowest in a long time; the need to decrease energy consumption is one of the main reasons for slowing planned growth.

COUNTRY DATA--CZECHOSLOVAKIA
INDIGENOUS ENERGY RESOURCES

DLR 05 APR 78

NONREWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
COAL (million tonnes)	11,573	2,493	Most, Klado, Ostrava
BROWN COAL/LIGNITE (million tonnes)	9,857	3,870	Sokolov, Chomutov, Teplice
TOTAL COAL (million tonnes)	21,430	6,363	
CRUDE OIL (million tonnes)	--	7	Smilov, Mikova, Olka, Gbely, Hodinin, Stefanov
SHALE OIL	--	--	
NATURAL GAS (billion cubic meters)	--	14-19	Strahava, Pribor, Zukow, Vacenovice, Lanzhat, Vyska (Ostrau), Vyska-Zwerndorf
URANIUM	--	--	Jachymov, Karlovy-Vary, Marianske-Lazne, Pribram-Dobris, Usti
RENEWABLE			
HYDROELECTRIC (TWh/yr)	10	--	
GEOTHERMAL	--	--	West Carpathians (particularly near Austrian border)

--not available

COUNTRY DATA--CZECHOSLOVAKIA
PATTERNS OF ENERGY SOURCES AND USES

SMH 15 MAR 78

CONSUMPTION BY SECTOR

	TWh	MTCE	%share
INDUSTRY	42.7	71.1	67.2
AGRICULTURE	2.7	4.5	4.2
TRANSPORT	3.7	6.1	5.8
HOUSEHOLD AND SERVICES	15.2	25.4	23.9

In 1975 electric energy production was 59.3 TWh/yr while consumption was 63.5 TWh/yr (imports 5.4; exports 1.2).

In million tonnes coal equivalent, total energy production for 1975 was 91.9 while consumption was 105.9.

It is estimated that consumption of electricity will reach 83.5 TWh/yr by 1980 (7 TWh/yr below Czechoslovak target plans) while production will reach 77 to 79 TWh/yr.

The relative share of domestic consumption of electricity is increasing.

COUNTRY DATA--CZECHOSLOVAKIA
PROJECTIONS OF DEMAND

SMH 15 MAR 78

	STANDARD PHYSICAL UNITS			TRILLION BTU		
RESOURCE	1975	1985	2000	1975	1985	2000
COAL (million tonnes)	77.22	87.3	--	3064.8	3465.8	--
OIL (million tonnes)	17.8	24.0	--	706.7	952.8	--
SHALE OIL	--	--	--	--	--	--
NATURAL GAS (billion cu m)	4.2	(a) 9.4 (b) 14	--	--	(a) 332.2 (b) 494.7	--
NUCLEAR (billion kwh)	.5	--	--	1.7	--	--
HYDROELECTRIC (billion kwh)	4.0	--	--	13.6	--	--
GEOTHERMAL	--	--	--	--	--	--
SOLAR	--	--	--	--	--	--
URANIUM	--	--	--	--	--	--

(a) low case and (b) high case range

--not available

COUNTRY DATA--CZECHOSLOVAKIA
PROJECTIONS OF ENERGY SUPPLY, IMPORTS, AND EXPORTS SMH 15 MAR 78

RESOURCE	1975	1985	2000
COAL (See Note) (million tonnes)			
INDIGENOUS SUPPLY	79.4	87.33	--
IMPORTS	5.6	--	--
EXPORTS	6.8	--	--
CRUDE OIL (See Note) (million tonnes)			
INDIGENOUS SUPPLY	.2-.3	--	--
IMPORTS	14.7-17.5	19.6+	--
EXPORTS	0	--	--
SHALE OIL	--	--	--
NATURAL GAS (billion cubic meters)			
INDIGENOUS SUPPLY	.8-1.2	1.0-1.7	--
IMPORTS	3.2	8.1	--
EXPORTS	.002	--	--
URANIUM	--	--	--
HYDRO/GEOTHERMAL	--	--	--
OTHER (FUEL WOOD)-(million cubic meters)			
INDIGENOUS SUPPLY	1.3	--	--
IMPORTS	--	--	--
EXPORTS	.003	--	--

COAL NOTE: Includes coal, brown coal and lignite. Brown coal and lignite production figures have been converted to coal equivalent. Coal comprises 28.0 of total; brown coal and lignite 51.4 (or 85.6 in original tonnage). By 1980 coal production is expected to stay the same while brown coal/ lignite production will increase to 59.4 (or over 97.0 in original tonnage). Coal, brown coal, and lignite comprised 65.8% of primary energy sources in 1975.

CRUDE OIL NOTE: Over 90% of crude oil imports (will) originate from USSR.

--not available

COUNTRY DATA--CZECHOSLOVAKIA
ENVIRONMENTAL CONSIDERATIONS SMH 15 MAR 78

Protection of the environment figures prominently in the Sixth Five-Year Plan (1976-80) and is one of the main rationalizations for pursuing nuclear energy policy in the long term.

Environmental R&D priorities include:
1-Technical means to protect atmosphere, water, and soil against pollution;
2-Improved techniques for in-plant environment protection;
3-Air pollution control devices, especially for control of industrial smoke.

Concern expressed over environmental effects of coal and strip mining and use of low-grade coal (with a high ash and sulfur content).

The Plan for 1976-80 calls for a total of 2.9 billion Koruna in investments in air and water pollution control devices in the chemical industry.

An environmental protection program is under way in Slovakia to reduce the level of industrial fumes in Jelsava, Bratislava, Krompachy, and Istelne.

Among the organizations, agencies and institutes concerned with environmental questions are:
1-Czechoslovak Center for the Study and Development of Measures to Protect the Environment Against Pollution (Bratislava)--under purview of Ministry of Technology and Investment Development;
2-Environment Council (Prague);
3-Czech Technical Environment Control (Prague);
4-Hydrometeorological Institute (Prague)--air and water pollution;
5-Institute of Environmental Ecology, Czech Academy of Sciences (Pruhonice);
6-Institute of Human Environment, Technical University of Prague--sponsors postgraduate programs in environmental conservation. International Union for Conservation of Nature and Natural Resources (IUCN) holds special sessions at the Institute on the environment and engineering.

COUNTRY DATA--CZECHOSLOVAKIA
COMMERCIAL APPLICATIONS SMH 15 MAR 78

The government follows the progress of the R&D network (see section 2C). Recently R&D centers and staffs have been the object of sharp criticism from government quarters. Lack of application of R&D is one important criticism.

Czechoslovakia is slowly expanding cooperation with the West in order to facilitate commercial applications of energy R&D. A decree issued in January 1976 permits foreign firms to open offices in Czechoslovakia for the first time since 1948 (permits valid for one year and renewable). Government has been encouraging cooperation deals between Czechoslovak and Western firms (see section 4F) including:

1-Tax incentives (discounts to 30%) and bonuses for Czechoslovak producers who form cooperation agreements with foreign producers; also preferential prices and import subsidies (to 50%).

2-Law (1977): allocation of hard-currency to export enterprises for non-planned purchases. Normally Czechoslovak firms require barter (counter-purchase) commitments from Western firms in order to generate hard currencies for nonplanned imports (purchases not included in annual budget). Law should result in decrease of demands for counterpurchase or deferred payment.

3-Some moves to simplify procedures: small deals do not require Ministry of Foreign Trade approval.

A major difficulty exists in balancing a desire for centralization and tight control against a desire to facilitate cooperation arrangements. The Government still appears to prefer purchasing licenses from Western firms as the more politically safe and acceptable course of action.

COUNTRY DATA--CZECHOSLOVAKIA
POWER PRODUCTION AND ENERGY CAPABILITY

SMH 15 MAR 78

POWER PRODUCTION

TYPE PLANT	TOTAL GW	0-499	500-800	800+ MW	
COAL	(See NOTE)	--	--	--	--
GAS	--	--	--	--	--
OIL	--	--	--	--	--
GEOTHERMAL	--	--	--	--	--
HYDROELECTRIC	1.69	--	--	--	EXISTING
	2.77	--	--	1	PLANNED
NUCLEAR	.15	1	--	--	EXISTING
	1.8	1	--	2	PLANNED (1980)
	7.80	2	4	4	PLANNED (1990)
	22-35	--	--	--	PLANNED (2000)
SOLAR	--	--	--	--	--

Total existing installed capacity is 13.63GW; 17.3-21.2 is planned for 1980; 32.4-35.5GW is planned for 1990; 50-63.4GW is planned for 2000. However, nuclear power plant construction is already behind schedule. It was expected that nuclear power would account for 50% of installed capacity by 2000; hydroelectric for 13%, thermal for 36%, and imports of electricity for 1%.

ENERGY PRODUCTION

SOURCE	#	OUTPUT LAST YR	RESERVES	TOTAL OUTPUT TO DATE
COAL MINES (including strip)	--	113.6 MILLION TONNES	19-21.4 BILLION TONNES	--
OIL WELLS	--	2,600 BBL/DAY	19 MILLION BBLS	--
NATURAL GAS	--	92.2 MILLION CU/FT DAY	15-19 BILLION CU METERS	--
U MINES	--	--	--	--
HYDRO	--	--	10 TWH/YR	--

REFINING CAPACITY: In 1976-77 refining capacity was about 16 million tons/yr; eight refineries (about 80% rate of utilization)--Zaluzi, Kralupy, Kolin, Pardubice, Zvolen, Strazske. Largest refinery is Slovnaft complex with a capacity of 170,000 bbls/day.

NOTE: Combined capacity of thermals plants is 11.79 GW. Expected capacity by 1980 is 15.5 GW, including conventional and hydro power.

--not available

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY INDUSTRIES SMH 15 MAR 78

No accurate or comprehensive count of vendors in the area of energy technology exists.

A number of Czechoslovak industries have purchased licenses or entered into cooperative agreements with foreign-based (Western) firms for the supply of energy-related equipment or technology. (See section 4F)

Most foreign firms work through the Foreign Trade Organizations (FTOs) In Czechoslovakia there are over 80 FTOs; each handles a particular good, service, or product line. According to U.S. Commerce Dept. (OBR, October 1977); "The State FTOs are set up either as corporations or as joint-stock companies, both of which have their own capital resources. The corporations are legally independent entities which cannot assume state liabilities and for whose own liabilities the State is not responsible. Joint-stock companies are owned by groups of manufacturing enterprises in the same field of industry and are also limited in the extent of their financial liability. The joint-stock form of organization enables the manufacturing enterprises to participate directly in management and to obtain dividends from company profits."

FTOs handling energy-related equipment/products include:

1-Chemapol (Director General, Zdenek Mojzisek)--crude oil, basic chemical products and raw materials, fuels;
2-Keramental--ores, metals;
3-Ligna--timber;
4-Metalimex--coal, lignite, coke, non-ferrous metals, ores, abrasives;
5-Pragoinvest--diesel engines, equipment for mining and electrical engineering industries;
6-Simex--equipment and services for Prague subway, transit gas pipeline projects;
7-Skoda Plzen--power plants and equipment, equipment for mining and electrical engineering industries;
8-Skoda export--complete plants and machinery for the power, metallurgical, and engineering industries;
9-Strojexport--all types machinery, equipment, fittings, complete plants;
10-Vitkovice-Zelezarny a Strojirny Klementa Gottwalda--coal mining equipment, nuclear power station equipment;
11-Zavody Silnoproude Elektrotechniky--heavy electrical equipment;

Engineering enterprises most involved in expanding nuclear program include: Skoda, CKD, Vitkovice, Sigma, Chomutov Valcovny Trub, and ZES. In all, some eight industrial associations and 37 producing enterprises and research institutes are to produce and develop nuclear engineering equipment. Plans require restructuring of many enterprises in order to emphasize nuclear technology and equipment.

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY R&D: STATUS AND OUTLOOK SMH 15 MAR 78

NUCLEAR

Nuclear R&D becoming well established. Czechoslovakia, with the aid and backing of USSR is expected to be a leader in production of nuclear equipment and power stations for COMECON countries. Emphasis on nuclear technology is likely to necessitate some imports of Western technology (either through cooperative agreements or purchase of licenses).

COAL

Increasing emphasis on coal R&D. Particular attention is being given to new mining techniques and exploitation of low-grade brown coal.

OIL & GAS

Petroleum and natural gas R&D proceeding as well as might be expected given country's lack of these resources.

ALTERNATIVE TECHNOLOGIES

R&D in alternative energy technologies (solar, geothermal, wind, etc.) is virtually non-existent. Geothermal research is in its infancy--planning, exploration, etc--and is unlikely to play an important role in country's energy program.

OBSERVATION

Energy conservation R&D established recently but lacks focus of concentrated efforts. Cut-backs in supply of Soviet crude and rise in oil prices have made energy saving R&D necessary. Progress in environment R&D.

R&D has been the subject of criticism by governmental spokesmen, including Premier Strougal. The major problems appear to be:

1-inefficiency of research and inefficient use of funds;
2-lack of creativity;
3-failure to apply R&D; need for more communication and involvement between producing enterprises and R&D centers and institutes;
4-inefficient use of industrial research personnel;
5-outdated equipment;
6-need to concentrate on traditionally strong areas and import technology in others (often less expensive to purchase licenses from foreign companies).

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY R&D: BUDGET SMH 15 MAR 78

No energy R&D budget figures are available. However, expenditures for total R&D programs is estimated at K14.5 billion/yearly (about US $2.6 billion/yearly) for the 1976-80 period--3.9% of the national income. This is an 8.5% increase over R&D expenditures for the period 1971-75. The Slovak Republic will increase its share in total R&D.

Planned investments under the Sixth Five-Year Plan (1976-80) highlight a serious concern for the energy and fuel sector. Total planned investments (which include R&D) will reach some K80 billion. Major projects will include the petrochemical and oil refining industry, coal mining (open caste mining), nuclear power stations, construction and expansion of gas lines, power equipment production--primarily nuclear. (In 1974 alone K80 million was invested in preparatory work on a V-2 nuclear power station.)

1-K2.9 billion will go toward air and pollution control measures in the petrochemical industry.
2-Investments will emphasize expanding and modernizing production of primary energy resources.
3-Government will invest K2.9 billion over a nine year period for a joint Czechoslovak-Hungarian hydro power project.
4-Power station construction will comprise almost one-third of all capital investments (k39.5 billion or $7 billion).
5-A sizeable amount will be spend on ore and mineral exploration.

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY R&D: PRIORITIES SMH 15 MAR 78

NUCLEAR

Czechoslovakia is using light water reactors in the short term, which permits rapid shift to nuclear power base; heavy water reactors are still in the experimental stage (require high capital investment). Particular priorities include:

1-equipment: steel pipes, welding materials, semiconductors for power transmission, pumps, electrical and electronic equipment, automatic controls;
2-research emphasis on nuclear energetics and wider use of radio-isotopes;
3-planning/preparatory work for V-2 power stations--light water;
4-long term (post 1985): components for fast breeder reactors, helium cooling loops, generators;
5-use of nuclear reactors in centralized heating, gradual dual nuclear capacity--electricity and heating;
6-more extensive studies on: safety and health protection; reliability of plant and components; fuel problems in production of nuclear energy (including use of natural uranium and disposal of radioactive waste); potential for heating/electricity of large cities, etc.

COAL/BROWN COAL

1-equipment: mining cables; overlayer stripping equipment; belt transformers for opencast mines;
2-more efficient use of coal, new methods in exploitation and exploration;
3-coal gasification: experimental pilot plant; experimental combustion chamber to test quitability of types of burners; underground gasification of low quality lignite.

OIL AND GAS

1-enlarge storage capacity; underground storage of gas;
2-modernization of distribution system; enlarge pipeline capacity;
3-distillation and primary processing equipment;
4-efficiency in use of liquid fuels and gas;
5-new technology for deep drilling under complex conditions; increase automation of extraction and processing.

CONSERVATION

1-new energy saving equipment to reduce industrial consumption of power and raw materials;
2-other energy-saving equipment: better insulation; thermostatic controls; new appliances; purchase of technology for the efficient use of energy. (According to one report: "Two-thirds of country's municipal heating operates without thermostats, and measurement and control of heat and lighting are minimal.")

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY R&D: PRIORITIES (CONT)

SMH 15 MAR 78

GEOTHERMAL

Low priority, but R&D efforts include:

1-Planning, mapping/exploration.

2-R&D to year 2000: spatial distribution and measurement of terrestrial heat; experimental drill holes; data gathering on perspective sites--geological, tectonical, geophysical, etc. information; cost-effectiveness studies; experimental use in greenhouses; development of legal measures to protect sites. Problems with encrustation and liquidation of waters.

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY R&D: IMPACT

SMH 15 MAR 78

Czechoslovakia expects that installed capacity of nuclear power plants will be as follows:

1980--installed capacity of 1.8GW
1990--installed capacity 7.8 to 10GW
2000--installed capacity of 22 to 35GW

COUNTRY DATA--CZECHOSLOVAKIA
GOVERNMT. SUPPORTED ENERGY R&D IN IND., UNI. & NAT. LABS/SMH 15 MAR 78

INDUSTRY

State owned. Most R&D in industry is planned and supported by the government.

1-Skoda Works (Plzen) particularly active in evolving nuclear R&D program. Building large-scale workshop; production of nuclear equipment/reactors.

2-Skoda is cooperating with Kurchatov Institute (USSR) on a project for dual purpose (electricity/heat) nuclear power plant.

3-See page 25 for details on Czechoslovak cooperation with Western firms.

UNIVERSITIES

Most universities receive state support. University R&D is an important part of the state R&D network (see pp. 3, 5, 6).

1-Charles University (Prague)--important nuclear program--Faculty of Technical and Nuclear Physics.

2-Czech Technical University (Prague)--oldest and largest; cooperates on many government projects. Faculty of Nuclear Science and Physical Engineering (includes Nuclear Reactors Department). The University also features a Faculty of Electrical Engineering (including an Electric Power Generation and Distribution Department). Number of specialized institutes attached to the university.

Other universities and colleges offer specialized training and research for specific industries such as the College of Minint at Ostrava, etc.

LABORATORIES

Many laboratories and institutes come under purview of Ministry of Fuel and Power, Ministry of General Engineering, Ministry of Metallurgy and Heavy Engineering, and Ministry of Technology and Investment Development (see pages 7, 8).

1-Under auspices of Federal Ministry of Fuel and Power is the Permanent Working Group for Fuel and Energy Supplies (Deputy Minist and Chairman, Joseph Farka).

2-The Power Institute (Prague) offers specialized training to power industry workers.

3-Programs sponsored by Ministry of General Engineering include development of new energy saving appliances such as fully transistorized TV set.

4-Tesla National Enterprise (Holesovice) is working on more efficient sources of lighting (sodium high-pressure discharge tubes), automatic light switches, illuminating additives for roadways.

5-Geothermal R&D is carried out at:

a-Dionyz Stur Institute of Geology-GUDS (Bratislava)

b-Central Geological Institute-UUG (Prague)

COUNTRY DATA--CZECHOSLOVAKIA
ENERGY R&D: ROLE OF PRIVATE INDUSTRY SMH 15 MAR 78

Industry is state-owned. A number of large Czechoslovak enterprises have been slowly increasing contact with Western firms (through co-operation deals or purchase of licenses). Licenses are not treated as a substitute for Czechoslovak R&D programs but rather as an integral part of them. Recently concluded agreements include:

1-Schiff & Stern GmbH (Austria)--cooperation deal with Drukov (FTO Stroj-export on heating equipment;
2-Beijer Trading AB (Sweden) and Interdonau Olymp (Austria)--co-operation deal with Technosport CSTV (FTO Strojexport) on water heating equipment;
3-Siemens (West Germany)--license to ISGR (Bratislava) for purification plant; water treatment station;
5-Joy (France)--license to Banske Stavby (Prievidza) for mine loaders;
6-OMV (Austria)--license to Nafta Gbely Moravske Naftove Doly-Hodonin for drilling equipment and technical assistance (petroleum and gas);
7-Luwa AG (Switzerland)--license to Polytechna for absorption process to purify gases and liquids.

Other foreign firms that have supplied energy-related equipment and advice:

1-Vereinigte Edelstahlwerke (Austria) has supplied mobile drilling units for deep well drilling;
2-Elin-Union AG (Austria)--order from Technoexport (Bratislava) for flare gas recycling plant (Slovnaft refinery);
3-Krupp Industrie und Stahlbau (West Germany)--machinery for producing cables for coal mining industry;
4-Krupp Industrie und Stahlbau (West Germany)--construction of effluent treatment plant for refinery complex;
5-Eisenwerk Weserhutte (West Germany)--leader of international consortium to supply lignite opencast mine equipment (for Maxim Gorky mine at Most).

COUNTRY DATA--CZECHOSLOVAKIA
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS SMH 15 MAR 78

ORGANIZATION	INVOLVEMENT
International Atomic Energy Agency (IAEA)	--
COMECON (Council for Mutual Economic Assistance-CMEA) There has been increasing economic cooperation on energy related projects in Eastern Europe	Very Active
International Union for Conservation of Nature and Natural Resources (IUCN) Various environmental groups within Czechoslovakia participate	--
International Council of Scientific Unions	--
United Nations (UN) Czechoslovakia cooperates in various energy-related activities; involved with UN geothermal energy programs since 1975.	--

--not available

COUNTRY DATA--CZECHOSLOVAKIA
ASSESSMENT OF INTERNATIONAL ACTIVITIES SMH 15 MAR 78

For Czechoslovakia, the current, most important area of bilateral and multilateral cooperation is in the area of nuclear power station equipment production and construction. At this point, most efforts are in cooperation with the USSR. However, major difficulties exist with the Czechoslovak inability to meet production schedules with minimum delays and quality equipment. The USSR is, however, able to exert pressure through its supply of crude oil to Czechoslovakia. (Soviets have also used their oil supply monopoly to "encourage" East European participation in Soviet oil and raw material development projects.)

Electricity import agreements are likely to be negotiated among the East European countries in order to meet the planned industrial growth for 1976-80.

It is also quite likely that there will be an increase in trade agreements with the U.S.--particularly technology and know-how. This will, however, require hard currency. The first Euroloan ($60 million) was made in 1975. Czechoslovakia will probably borrow more, but it will be done cautiously.

Agreements with Middle East oil-producing countries are not as extensive as expected. The rise of oil prices in 1973-74 affected planned imports of crude.

COUNTRY DATA--CZECHOSLOVAKIA
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WENDS COUNTRY DATA

DA: DENMARK

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COUNTRY DATA--DENMARK
ECONOMIC DATA PROFILE

DLR 14 FEB 78

GNP (1976, billion $)-37.8
PER CAPITA INCOME ($)-7448
EXPORTS (1976, billion $)-8.8
MONETARY UNIT-krone
INFLATION RATE-9%
DISPOSABLE INCOME ($)--
IMPORTS (1976, billion $)-12.0
EXCHANGE RATE (1 US$=)-6 kroner
TOTAL ENERGY R&D BUDGET (1977, million $)-17.0

TRANSPORTATION SYSTEM DESCRIPTION

Copenhagen's bus, suburban train and taxi service is good, and rates are reasonable. Rail and air services connect all major European centers. Direct air flights are available between Copenhagen and major U.S. cities, and many international carriers serve Copenhagen's Kastrup International Airport, providing worldwide connections.

--not available

COUNTRY DATA--DENMARK
DEMOGRAPHIC DATA PROFILE

DLR 23 FEB 78

LAND (million sq km)-.05
POPULATION (millions)-5.08
LITERACY (%)-99
LIVE BIRTHS/THOUSAND-14.2
MEDIAN AGE/MALES--
AVERAGE FAMILY SIZE--
PRIMARY SCHOOL GRADS--
INDUSTRIAL WORKERS--
AGRICULTURAL WORKERS--
POPULATION GROWTH (%)-0.5

ARABLE LAND (million sq km)-.03
POPULATION DENSITY (/sq km)-114
% RURAL POPULATION--
DEATHS/THOUSAND-10.2
MEDIAN AGE/FEMALES--
NET MIGRATION (millions/yr)--
SECONDARY SCHOOL GRADS--
PROFESSIONAL WORKERS--
COLLEGE GRADS--
UNEMPLOYED-190,000

--not available

COUNTRY DATA--DENMARK
KEY TECHNICAL EDUCATIONAL RESOURCES

DLR 23 FEB 78

	LOCATION
University of Aalborg	Aalborg
University of Aarhus	Aarhus
University of Copenhagen	Copenhagen
University of Odense	Odense
University of Roskilde	Roskilde
Engineering Academy of Denmark	Lyngby
Technical University of Demark	Lyngby

COUNTRY DATA--DENMARK
ENERGY POLICY: BASIC LEGISLATION DLR 14 FEB 78

1-Act on Mineral Resources in Greenland 1965 provides that all of Greenland's resources are the property of the state and that revenues accruing from any mineral production must be paid to the Danish Exchequer.
2-Act on the Fund for the Promotion of Technical and Industrial Development 1970 established the Development Fund to promote and disseminate R&D results in Danish industry.
3-Act on Research Councils and the Planning Council for Research 1972 set up the structure for administering government support of R&D projects through Research Councils in a variety of areas and established the Planning Council for Research.
4-Act on Technological Service 1973 established the Technology Council to advise on measures to promote technological development and to coordinate and promote public support of technological services.
5-Act on Electricity Supply 1976 empowers the Minister of Commerce to decide the type and extent to which different forms of energy should be used in power plants and to decide measures with regard to combined production of electricity and heat.
6-Act on Energy Policy Measures 1976 gives the Minister of Commerce responsibility for all energy matters except those pertaining to Greenland, set up an energy administration to aid him and abolished the Atomic Energy Commission.
7-Act on the Safety and Environmental Conditions Applicable to Nuclear Installations 1976 established standards for atomic plants.
8-Act on Public Grants for Energy Saving Measures Related to Industrial Processes 1977.

COUNTRY DATA--DENMARK
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DLR 16 FEB 78

LEGISLATIVE

A unicameral parliament called the Folketing is composed of not more than 179 members. The Folketing plays a significant role in energy policy formation. Committee on Energy Policy has been set up to review and discuss any proposed energy legislation.

EXECUTIVE

The Monarch (Queen Margrethe II) has largely ceremonial functions; probably her most significant independent power lies in her right to appoint the Prime Minister (Anker Joergensen) and Cabinet Ministers, who are responsible for administration of the government.

Since 1976, the Ministry for Commerce (Ivar Norgaard, Minister) has been responsible for all energy matters with the exception of energy questions pertaining to Greenland. Within the Ministry, the Energy Department is responsible for energy policy and planning and the Danish Energy Agency for policy implementation.

OTHER PARTS OF THE ENERGY STRUCTURE

1-Energy Council--advisory body for policy review and planning which is attached to the Ministry for Commerce.
2-Riso National Laboratory--research establishment responsible for nuclear R&D and consultation to the Ministry for Commerce. The Laboratory can also execute such activities in other energy fields.
3-Ministry for Greenland (Joergen Hansen, Minister)--responsible for all energy matters in Greenland.
4-Inspectorate of Nuclear Installations of the Agency of Environmental Protection--reports to the Ministry of the Environment concerning all nuclear power safety matters.

COUNTRY DATA--DENMARK
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 17 FEB 78

Primary responsibility for implementing the energy policy rests with the Ministry for Commerce (Ivar Norgaard, Minister). Key administrative units within the Ministry are:

1-Energy Department--energy policy and planning
2-Danish Energy Agency--policy implementation
3-Energy Council--advises on planning and research
4-Riso National Laboratory--nuclear energy consultation

The total number of institutes and laboratories responsible for implementing the energy R&D program is at present about 30, and they can be roughly grouped in six categories as follows:

1-Riso National Laboratory (under Ministry for Commerce)
2-Geological Survey of Greenland (GGU, under Ministry for Greenland)
3-National Building Research Institute (SBI, under Ministry for Housing)
4-Some of the institutes under the Academy for the Technical Sciences
5-A number of laboratories and institutes in universities, and technical high schools, in particular the Technical University of Denmark
6-Private institutes and laboratories in industry

COUNTRY DATA--DENMARK
ENERGY POLICY AND OBJECTIVES

DLR 17 FEB 78

Denmark has been developing a comprehensive national energy policy since 1975. In May 1976 the Danish Government put forward an energy plan covering the period until 1995. The main objectives of the energy plan are:

1-To reduce vulnerability with regard to the supply of energy, especially Danish dependence on petroleum supplies, as rapidly as is compatible with the aims of economic and social development and the quality requirements for the environment.

Denmark will pursue this objective in two ways:

Firstly, within the framework of EEC and IEA cooperation Denmark will contribute to the building-up of stock-piles and the preparation of other crisis measures, so that it will be possible to mitigate and delay the effects of any new interruptions in petroleum supplies or other sudden changes.

Secondly, Denmark will work towards the creation of a versatile energy supply system, under which Denmark will attempt to exploit domestic energy-producing raw materials in order to reduce dependence on imported oil.

2-To curb the growth of energy consumption, laying particular emphasis on measures that will take effect relatively quickly.

3-To coordinate and intensify R&D in the energy sector in support of efforts to ensure greater security of supply, curb the growth of consumption and, in the longer term, offer a variety of choices in the energy sector.

The most important aspects of the long-term objectives are:

1-To bring about a reduction in the speed at which non-renewable energy-producing raw materials are exhausted by more efficient use of energy and care in identifying trends in consumption which involve particular pressure on energy supplies.

2-To cooperate in the establishment of long-term methods of resolving the energy problem, e.g. by using continuous energy sources.

The energy plan has been considered by Parliament but the implementing measure relating to nuclear power has been postponed due to opposition within Parliament and a sharp increase in public opinion against nuclear energy. The Minister for Commerce declared that the government would not be in a position to propose that Parliament make a decision until additional information and assessments on the entire issue of nuclear energy (in particular the waste problem) are available.

The energy plan puts forth the most comprehensive and intensive conservation program in the IEA.

COUNTRY DATA--DENMARK
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY DLR 15 FEB 78

A goal of the Danish Energy Policy is to reduce dependence on oil from the current 89% (98% of which is imported) to 61% in 1985 and 48% in 1995 through lower energy consumption, by strong conservation measures and through diversification of energy sources and intensive exploitation of indigenous energy resources. Projections of overall energy self-sufficiency are as follows:

	PERCENT
1976	1.7
1980	16.4
1985	31.1
1990	36.7

COUNTRY DATA--DENMARK
INDIGENOUS ENERGY RESOURCES

DLR 23 FEB 78

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
COAL (million tonnes)	0.02	0.02	Central Jutland
CRUDE OIL (million tonnes)	--	41	Danish North Sea
NATURAL GAS (billion cu ft)	--	700	Danish North Sea
URANIUM	294.8	6.4	Southwestern Greenland

--not available

COUNTRY DATA--DENMARK
PATTERNS OF ENERGY SOURCES AND USES

DLR 14 FEB 78

CONSUMING SECTOR-1975

	INDUSTRY	TRANSPORT	OTHERS	TOTAL
COAL (million tonnes)	0.35	--	0.21	0.56
OIL (million tonnes)	2.2	3.3	7.5	13.0
NATURAL GAS (billion cu ft)	0	--	3.88	3.88
UTILITY ELECTRICITY DISTRIBUTED (billion kWh)	4.68	0	11.72	16.40

--not available

COUNTRY DATA--DENMARK
PROJECTIONS OF DEMAND

DLR 14 FEB 78

	STANDARD PHYSICAL UNITS			MTOE		
	1975	1985	2000	1975	1985	2000
COAL (million tonnes)	1.6	3.4	a) 3.5 b) 4.2	2.3	4.8	a) 5.0 b) 6.0
OIL (million tonnes)	16.1	13.1	a) 20.2 b) 30.4	16.1	13.1	a) 20.2 b) 30.4
NATURAL GAS (billion cubic feet)	--	97.1	a) 178.6 b) --	--	2.5	a) 4.6 b) --

Figures for the year 2000 are (a) low case and (b) high case estimates calculated from the National Data Appendix for the Final Report on Phase I, IEA Systems Analysis Studies.

--not available

COUNTRY DATA--DENMARK
PROJECTIONS OF ENERGY SUPPLY, IMPORTS AND EXPORTS DLR 14 FEB 78

RESOURCE	1975	1985	2000(a)	2000(b)
COAL (million tonnes)				
INDIGENOUS SUPPLY	--	--	--	--
NET IMPORTS	1.9	3.4	3.5	4.2
OIL (million tonnes)				
INDIGENOUS SUPPLY	0.1	2.0	0.1	0.1
NET IMPORTS	16.6	11.3	19.2	35.3
NATURAL GAS (billion cu ft)				
INDIGENOUS SUPPLY	--	97.1	178.6	--
NET IMPORTS	--	--	--	--

Figures for the year 2000 are (a) low case and (b) high case estimates calculated from the National Data Appendix for the Final Report on Phase I, IEA Systems Analysis Studies.

--not available

COUNTRY DATA--DENMARK
COMMERCIAL APPLICATIONS DLR 17 FEB 78

A number of measures have been taken by the Danish Government with the aim of enhancing energy R&D in the private sector and the commercial application of R&D results in the country.

1-Since 1976, grants have been given to district heating supply enterprises (mostly municipally owned or controlled) to connect existing heating districts, using present-day technology.
2-A Development Fund has been established to promote R&D activities in industry through economic support, development contracts and investments in Danish companies, and to disseminate R&D results to industry and trades. Expansion of the Fund in favor of energy projects has been proposed.
3-Act on Public Grants for Energy Saving Measures Related to Industrial Processes 1977 has authorized grants for firms producing and supplying materials used in conservation projects and for business projects intended to use the results of development projects of those firms.

A major impediment to commercial application seems to be the generally tight economic situation which influences the willingness to spend resources on the development of capital intensive new lines of operation.

Denmark has plans to develop nuclear generating capacity. However, public opinion has swung sharply against nuclear energy. As a result, Parliament has postponed implementation of nuclear development until the areas of contention can be resolved.

Greenland is known as an area with oil and gas, uranium, hydropower and coal possibilities. However, exploration efforts are limited by climatic, logistical and environmental concerns. Furthermore, as long as issues regarding the future relationship between Denmark and Greenland (i.e. the ownership of mineral resources in Greenland and the authority to make decisions in this field) are not solved, development activities will be impeded. Greenland is negotiating the terms of home rule with the Danish Government.

COUNTRY DATA--DENMARK
ENERGY R&D: STATUS AND OUTLOOK DLR 21 FEB 78

The Program of Energy Research and Development provides the framework for energy development in Denmark. The first phase of the program was approved by Parliament in December 1976. The second phase is now being detailed pursuant to a parliamentary agreement and the assumption that the universities, research councils and national laboratories will continue to fund energy R&D at the 1975 level in real terms.

NUCLEAR
According to the Government's energy plan announced in 1976, Denmark was to have five nuclear plants by 1995, accounting for 20% of its electricity supply. However, implementation has been repeatedly postponed due to pressure from the public and from within Parliament. It is now unlikely that there will be any nuclear capacity before 1990. Nonetheless, exploratory drilling for uranium in Greenland is proceeding. R&D projects include design, construction and operation of a semi-commercial scale uranium extraction plant; treatment and storage of low activity waste; development, fabrication and examination of fuel elements; reactor technology; computer applications; radioecology and dosimetry.

COAL
To compensate for the postponement of nuclear energy, a considerable increase of coal use by power stations is scheduled. At present, coal share in electricity fuel use exceeds 50%. R&D projects include laboratory experiments with fluidized bed combustion, establishment of a coal catalog and coal use in small heating stations.

OIL AND GAS
Hydrocarbon potential is expected both onshore and offshore in Greenland. Government officials estimate that oil production from the Danish Sector of the North Sea could be 2 million tonnes by 1985, decreasing to 0.1 million tonnes in 2000. These figures cannot be considered firm until the fields are declared commercial, which is expected to take place in 1978. In 1976 and 1977 the GOD intensified their feasibility studies to provide a basis for a Parliamentary decision by the end of 1978 or beginning of 1979 on the introduction of natural gas. The energy plan foresees the completion of a distribution network in 1981. Meanwhile, a Danish oil industry study suggested the plan's forecast to be unrealistic.

NEW ENERGY SOURCES
Establishment of a state-owned energy development company for use of geothermal energy and possibly solar energy is under consideration. R&D projects include development of 3 full scale district heating geothermal heating plants, low temperature heat production from solar energy, flat plate solar collectors, 2 wind energy conversion systems of at least 600 kW each, assessment of wind resources and biogas systems for farm application.

COUNTRY DATA--DENMARK
ENERGY R&D: STATUS AND OUTLOOK (CONT) DLR 21 FEB 78

CONSERVATION

The energy plan envisages the most comprehensive and intensive conservation program in the IEA. The most ambitious target is that established for the residential/commercial sector which exhibits negative growth for the period 1976-1985. The goal for overall growth of energy consumption is 1.2% over the same time period.

COUNTRY DATA--DENMARK
ENERGY R&D: BUDGET

DLR 14 FEB 78

	$US MILLIONS FY 1977
CONSERVATION	
Industry	0.2
Residential and Commercial	1.3
Transportation	0.3
Others	0.2
COAL COMBUSTION	0.2
NUCLEAR FISSION	
LWR	4.9
Fuel cycle	3.5
SOLAR HEATING AND COOLING	0.8
WIND	1.2
BIOMASS	0.07
GEOTHERMAL	0.4
NUCLEAR FUSION	0.8
OTHER SOURCES	0.1
SUPPORTING TECHNOLOGIES	
Electric power conversion	0.07
Transmission and distribution	0.1
Energy storage	0.8
Energy systems analysis	1.3
Others	0.7
TOTAL GOVERNMENT ENERGY R&D BUDGET	17.0

Fiscal year: 01 APR-31 MAR
Exchange rate used: 1 US$ = 5.88 kroner

While the Danish energy R&D budget is relatively small, it has been expanding rapidly. The growth of the budget from 1976 to 1977 (63%) and from 1977 to 1978 (41%) is remarkable. However, in 1980, the budget is expected to be about 23% less than in 1979.

COUNTRY DATA--DENMARK
ENERGY R&D: PRIORITIES

DLR 21 FEB 78

Development of Danish energy R&D policy and objectives is still at an early stage and will likely be further defined during subsequent stages. Presently, the criteria for establishing priorities are the potential impact in the short term, the presence of Danish expertise in the area concerned, the financial resources required and how the project will fit into international R&D programs. In accordance with these principles, it appears that first priority is given to the following:

1-Conservation
2-Hydrocarbon exploration and exploitation in Denmark and Greenland
3-International cooperation

COUNTRY DATA--DENMARK
ENERGY R&D: IMPACT

DLR 28 FEB 78

NON-RENEWABLE PRIMARY ENERGY SAVINGS FROM NEW TECHNOLOGIES

	TRILLION BTU	
	1985	2000
SOLAR HEATING	6.64	25.26
INSULATION	62.62	90.13
WASTE HEAT (Coupled Production)	17.08	39.85
WIND CONVERSION	2.85	24.67
HEAT PUMPS	3.79	10.44

COUNTRY DATA--DENMARK
GOV'T SUPPORTED ENERGY R&D IN IND, UNIV & NAT'L LABS DLR 12 OCT 77

UNIVERSITIES	PROGRAM AREA	KEY INDIVIDUALS
University of Copenhagen Bohr Institute	Nuclear	
University of Aarhus Institute of Physics	Nuclear	
Technical University	Solar	
LABORATORIES		
Riso National Laboratory	Nuclear	Dr.Allen Mackintosh, Director

COUNTRY DATA--DENMARK
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 21 FEB 78

The Government stated that the private sector is to a high degree directly involved in the government R&D programs either as main or sub-contractors. Furthermore, the review of ongoing governmental programs takes place in Steering Groups with representatives from industries as appropriate.

A survey made in 1975 indicated that about 60 firms were sponsoring energy R&D activities. In all, some 130 projects were reported of which 91 were in the field of conservation (mostly industry and residential/commercial), 6 on enhanced oil production, 6 on solar heating, 3 on wind power, 2 on LWR, 1 on ocean power and 20 on supporting technologies. In addition to these activities a number of smaller firms or groups of people are working independently on development or demonstration projects particularly in the area of renewable forms of energy.

A.P. Moller serves as the sole concessionaire for all Danish on- and offshore hydrocarbon exploration and production. This work has been carried out by the Danish Undergrounds Consortium (DUC) which is composed of A.P. Moller (Danish), Royal Dutch/Shell, Texaco and Chevron.

COUNTRY DATA--DENMARK
INVOLVEMENT IN ENERGY R&D ORGANIZATIONS

DLR 22 FEB 78

ORGANIZATION	DEGREE OF INVOLVEMENT
NEA	Active
IAEA	Active
IEA	See below
CCMS	Active
EEC	Active
Nordic Council	Active

DETAIL OF IEA PARTICIPATION

The following IEA Implementing Agreements have been signed by Denmark:

TECHNOLOGY AREAS	CONTRIBUTIONS (Estimates in 1000 US $)
NUCLEAR POWER	
Exchange of Technical Information on Nuclear Reactor Safety	Information exchange
SOLAR HEATING AND COOLING	
Performance of Systems	125
R&D Coordination on Components	75
Testing Collectors	262
Use of Meteorological Information	75
WIND	
Cooperation in Large Scale Wind Energy Conversion Systems	4000
Environmental and Meteorological Aspects of Wind Energy Conversion Systems	12
Investigation of Rotor Stressing and Smoothness of Operation of Large Scale Wind Energy Conversion Systems	27
TOTAL	4576

Denmark is participating in the following IEA Working Parties:

1-Conservation
2-Nuclear Safety
3-Radioactive Waste
4-Solar Heating and Cooling
5-Ocean Energy Systems
6-Wind Power
7-Fusion Power
8-Hydrogen
9-Waste Heat Utilization

COUNTRY DATA--DENMARK
KEY REFERENCES

DLR 24 FEB 78

	LOCATION
1-Danish Energy Policy 1976, Government of Denmark, Ministry of Commerce, May 1976.	IA
2-Base Document: Denmark, National Energy R and D Program Reviews, International Energy Agency, Paris, 10 Nov 77.	IA
3-Base Document on Denmark, Standing Group on Long Term Co-operation, International Energy Agency, Paris, 07 Dec. 77.	IA

COUNTRY DATA--DENMARK
NOTES AND EVALUATION

DLR 28 FEB 78

	LOCATION
1-Denmark Atomic Energy Program Summary, SEP 75 (3C, 4E 5B)	IA
2-State Dept Telegram 00089 from AMEMBASSY COPENHAGEN 09 JAN 76 Unclassified (4C, 4E, 5A)	IA
3-"Denmark", The Stateman's Year-Book 1976-1977, St. Martin's Press, New York, 1976 (1D, p.873)	--
4-Danish Energy Policy 1976, Ministry of Commerce, Denmark, MAY 76 (3A, p.24-25)	IA
5-"Denmark", National Basic Intelligence Factbook, CIA, JUL 76 (1B)	IA
6-Review of Denmark, Standing Group on Long-Term Co-operation, International Energy Agency, Paris, 07 MAR 77 (4A, p.2-3)	IA
7-State Dept Background Notes on Denmark, MAR 77 (1A, 1B, 2B)	--
8-"Denmark", The Europa Yearbook 1977, Vol I, Europa Publications Limited, London, 1977 (1D)	--
9-Survey of Energy Resources 1976, World Energy Conference, London,1977 (3C)	--
10-International Petroleum Encyclopedia, Petroleum Publishing Company, Tulsa, Oklahoma, 1977 (3C, p.280)	--
11-Treaties in Force: A List of Treaties and Other International Agreements of the U.S. in Force on January 1, 1977, Treaty Affairs Staff, Office of the Legal Advisor, Dept of State, 1977 (5B)	IA
12-An Initial Multi-National Study of Future Energy Systems and Impacts of Some Evolving Technologies, Jointly prepared by Brookhaven National Laboratory and Kernforschungsanlage Juelich, MAR 77 (4D, p.48-49)	IA
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14-The Role of Foreign Governments in the Energy Industries, Office of International Affairs, Dept of Energy, OCT 77 (2A, 3A, 3B, 3H, 4A, 4F)	IA
15-Base Document: Denmark, National Energy R and D Program Reviews, International Energy Agency, Paris, 19 NOV 77 (2A, p.3-4, 7-8, 15-16; 2B, p.3-4, 14; 2C, p.3-4, 13; 3A, p.2-3, 5; 3D-3F, p.19; 3H, p.1-2, 8, 15-16; 4A, p.9-12; 4B, p.20; 4C, p.6-7; 4F, p.12-15; 5A, p.17)	IA
16-Licensing and Supervision of Nuclear Installations in Denmark, Riso National Laboratory, Denmark, 23 NOV 77 (2A, 2B)	IA
17-Base Document on Denmark, Standing Group on Long-Term Co-operation, International Energy Agency, Paris 07 DEC 77 (2B, p.1; 2C, p.1; 3A, p.2; 3B, p.26, 30; 3H, p.2, 4, 20; 4A, p.1-4, 29)	IA

--References thus marked are available at public libraries

WENDS COUNTRY DATA

EG: EGYPT

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COUNTRY DATA--EGYPT
ECONOMIC DATA PROFILE

DLR 03 APR 78

GNP (1976, Million $)--13,200
PER CAPITA INCOME (1975, $)--310
EXPORTS (1976, Million $)--1,790
MONETARY UNIT--Gold Egyptian Pound (LE)
TOTAL ENERGY R&D BUDGET--

INFLATION RATE (%)--
DISPOSABLE INCOME ($)--
IMPORTS (1976, Million $)--4,400
EXCHANGE RATE (1 US $=)--LE 0.39

TRANSPORTATION SYSTEM DESCRIPTION

Both regional and worldwide airlines serve Cairo's International Airport. Internal air service is available from Cairo to Luxor and Aswan. Rail service is available south to Aswan and north to Alexandria from Cairo. The capitol has an abundance of taxis.

--not available

COUNTRY DATA--EGYPT
DEMOGRAPHIC DATA PROFILE

DLR 03 APR 78

LAND (million sq km)--1.002	ARABLE LAND (million sq km)--.032
POPULATION (millions)--40	POPULATION DENSITY (/sq km)--36.3
LITERACY (%)--40	% RURAL POPULATION--55.7
LIVE BIRTHS/THOUSAND--35.1	DEATHS/THOUSAND--13.2
MEDIAN AGE/MALES--	MEDIAN AGE/FEMALES--
AVERAGE FAMILY SIZE--	NET MIGRATION (millions/year)--088
PRIMARY SCHOOL GRADS--	SECONDARY SCHOOL GRADS--
INDUSTRIAL WORKERS--1,220,000	PROFESSIONAL WORKERS--
AGRICULTURAL WORKERS--4,200,000	COLLEGE GRADS--
POPULATION GROWTH (%)--2.2	UNEMPLOYED--145,000

--not available

COUNTRY DATA--EGYPT
PROFESSIONAL LABOR FORCE PARTICIPATION PROFILE

CWC 25 OCT 77

EMPLOYMENT (1974- thousand workers)

1. Agriculture	4,212
2. Industry	1,150
3. Construction	315
4. Transport, Communication and Storage	405
5. Trade and Finance	883
6. Housing	139
7. Utilities	43
8. Social Development Services	1,853
9. Electricity	38
Total	9,038

COUNTRY DATA--EGYPT
KEY TECHNICAL EDUCATIONAL RESOURCES

CWC 25 OCT 77

UNIVERSITY	YEAR FOUNDED	NUMBER OF STUDENTS
1. Cairo Univ.	1908	50,320
2. Alexandria Univ.	1942	41,777
3. Ein Shams Univ.	1950	46,636
4. Asyut Univ.	1957	14,149
5. Al-Azhar Univ.		31,867
6. American Univ. in Cairo		1,500
7. Mansoura Univ.		26,000
8. Tanta Univ.		26,833

There are 61 Teachers Colleges and 71 High Institutes.

COUNTRY DATA--EGYPT
ENERGY POLICY: BASIC LEGISLATION DLR 03 APR 78

CHRONOLOGY OF BASIC LEGISLATION AFFECTING ENERGY SECTOR

1-Permanent Council of National Production established 1952.
2-Egyptian Atomic Energy Establishment (AEE) established 1957.
3-Law 59 of 1960 regulates use of and protection against ionizing radiation. AEE supervises this law.
4-Electricity supply industry placed under unified national control by the formation of the Ministry of Electric Power 1964.
5-Law 47 of 1965 authorizes joint ventures for petroleum exploration, exploitation and development.
6-Law 43 of 1974 greatly modified restrictive tax, labor and currency laws in favor of foreign enterprises. It also gives protection against nationalization, confiscation and sequestration.
7-Desequestration Law of July 1974, returned to former owners agricultural land, lots and buildings, provided they had not undergone property transfers or architectural alterations; did not apply to foreigners who had been compensated, nor ex-nationals nor expatriates who had not returned to Egypt by the end of 1974.
8-Presidential Decree 1167 of July 1975, abolished public institutions which served to coordinate and control sectors via national plans and established Higher Councils for each economic sector (including one for petroleum and one for electricity). Councils have no voice in planning and no budgetary power.
9-Established Higher Council for International Economic Cooperation and the Organization for Arab and International Economic Cooperation 1975.
10-Ministry of Electric Power restructured in 1976 and renamed Ministry of Electricity and Energy.
11-Law 43 amended to extend tax holiday beyond 5 years, to exempt wages of foreign investors and to employ the same exchange rate for expatriating funds as for their entrance, 1976.
12-Law 12 of 1976 established the Egyptian Electric Power Authority.
13-Law 196 of 1977 established the Nuclear Materials Authority.
14-Law 9 of 1977 amended the petroleum exploration and production agreement between the Egyptian Petroleum Authority and Mobil Oil.
15-Decree of 23 March 78 established an interministerial Supreme Committee to guide Egyptian participation in the Egypt--U.S. Cooperative Energy Options Assessment.

COUNTRY DATA--EGYPT
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DLR 04 APR 78

LEGISLATIVE

Under the constitution, the unicameral People's Assembly (360 members) has sole authority to enact legislation while it is in session.

EXECUTIVE

Egypt has a strong presidential-type government. President (Anwar Sadat) is popularly elected to a 6-year term. President appoints the Vice-President (Hosni Mobarek), Prime Minister (Mamdouh Salem) and Council of Ministers. When the People's Assembly is not in session he rules by decree, but legislation so promulgated must be submitted to the assembly for approval when it reconvenes.

There are three ministries at the Cabinet level which are primarily concerned with energy policy and R&D:

1-Ministry of Petroleum, directed by Ahmad Hilal, which is responsible for the petroleum sector and administration of the Petroleum Research Institute and the Geological Survey and Mining Authority.
2-Ministry of Atomic Energy and Scientific Research, headed by Mohamed Abdel Maaboud El-Guebeily, which is responsible for:
a-overall research priorities and planning
b-nuclear research and research facilities
c-(with Ministry of Electricity and others) for nuclear power generation and directly related facilities.
3-Ministry of Electricity and Energy, headed by Ahmad Sultan (also Deputy Premier for Production and Egypt's top energy official), responsible for all uses of electric power and power generation including nuclear power generation (with Ministry of Atomic Energy and Scientific Research). It includes the Egyptian Electricity Authority (EEA), Rural Electrification Authority (REA), Qattara Depression Authority and Nuclear Power Plants Authority (NPPA).

OTHER PARTS OF THE ENERGY STRUCTURE

1-Atomic Energy Establishment, directed by Dr. Kamal Effat, is responsible for nuclear R&D.
2-Three Higher Councils have been created to handle policy matters for energy related sectors:
a-Higher Council for Petroleum
b-Higher Council for Electricity
c-Higher Council for Utilization of Nuclear Energy (chaired by President Sadat)
3-National Planning Institute, headed by Dr. El-Walid El-Shafie, provides input for national development projects.
4-Supreme Committee is an interministerial body which has recently been established to guide Egyptian participation in the Egypt-U.S. Cooperative Energy Options Assessment.

COUNTRY DATA--EGYPT
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 04 APR 78

NUCLEAR

MINISTRY OF ATOMIC ENERGY AND SCIENTIFIC RESEARCH

Minister Mohamed Abdel Maaboud El-Guebeily is responsible for overall scientific research priorities and planning. In the nuclear field, the Ministry is responsible for all nuclear research and research facilities. With respect to nuclear power generation and directly related facilities, responsibility is shared with the Ministry of Electricity and Energy and other ministries. The policy management of nuclear power facilities will eventually be handled by an independent board or agency which will include the Ministers of Atomic Energy and Scientific Research and Electric Power and Energy.

EGYPTIAN ATOMIC ENERGY ESTABLISHMENT (AEE)

The AEE reports to the Ministry of Atomic Energy and Scientific Research. Director of the agency is Dr. Kamal Effat. The AEE is responsible for:

1-training nuclear specialists
2-research in atomic energy
3-institutions for nuclear training and research
4-nuclear materials (exploration, extraction, trade and use)
5-production of nuclear materials and equipment
6-security and safeguards
7-proposal of atomic energy legislation and projects
8-international cooperation
9-regulation and licensing of nuclear plants

The AEE collaborates with all ministries and government organizations concerned with nuclear matters and national planning as well as with scientific research centers and universities.

NUCLEAR POWER PLANTS AUTHORITY (NPPA)

NPPA was created in 1976 within the Ministry of Electricity and Energy for the purpose of implementing plans for establishing nuclear powered electricity generating plants. This authority is responsible for the development and operation of Egypt's first planned nuclear power plant of 600 MW, which is planned for completion in 1981. Director of the NPPA is Dr. Kamal Effat.

NON-NUCLEAR

EGYPTIAN GENERAL PETROLEUM AUTHORITY (EGPA)

Subordinate to the Ministry of Petroleum, the EGPA was created in 1976 to replace the Egyptian General Petroleum Corporation. EGPA is responsible for negotiating production sharing exploration contracts with foreign companies, monitoring company exploration and development activities, and providing labor and logistics assistance to the companies to facilitate a rapid expansion of crude oil production. EGPA oversees the following companies:

1-General Petroleum Company (GPC)
2-Misr Oil Company
3-Petroleum Cooperative Society Company

COUNTRY DATA--EGYPT
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 04 APR 78

4-Alexandria Process Petroleum Company
5-El-Nasr Process Petroleum Company
6-Suez Process Petroleum Company
7-Petroleum Pipelines Company

The following agencies are under the jurisdiction of the Ministry of Electricity and Energy:

1-EGYPTIAN ELECTRICITY AUTHORITY (EEA)
Responsible for generation, transmission and distribution of electrical energy. Chairman is Mohamed Kamel Hamed.

2-RURAL ELECTRIFICATION AUTHORITY (REA)
Responsible for promotion and development of sub-transmission and distribution systems in rural areas and villages. Operation of those systems remains the responsibility of EEA. REA Chairman is Dr. Fouad Jaher.

3-QATTARA DEPRESSION AUTHORITY
Created in 1976 to manage the Qattara Depression Project. A twelve member steering committee is comprised of an equal number of members from FRG and Egypt. The Board of Advisors is comprised of members from FRG, France, Egypt and the U.S. Executive Chairman is Adly Kamel Yakan.

NATIONAL RESEARCH CENTER
Responsible for solar and wind R&D. Director is Dr. Mohamed Ali Kamel.

SOLAR ENERGY COMMISSION
Government organization which promotes and sponsors solar R&D. Dr. Mahmoud El-Koshairy is President of the commission.

ACADEMY OF SCIENTIFIC RESEARCH AND TECHNOLOGY
Nominally under the jurisdiction of the Ministry of Atomic Energy and Scientific Research, the academy recommends future research. President is Dr. Abdel Moneim Aboul Azm.

COUNTRY DATA--EGYPT
ENERGY POLICY AND OBJECTIVES DLR 05 APR 78

Egypt's two major steps toward solving her economic problems are the efforts to widen the Suez Canal and expand its operations and to increase oil production. In addition, a great deal of attention is being given to the industrial export sector. In order to carry out industrial expansion, according to Egypt's top energy official Ahmad Sultan (Minister of Electricity and Energy), the government is anxious to supply adequate supplies of inexpensive power. There are two energy resources of potentially great benefit to Egypt's economy: 1) the associated natural gas being flared in the Gulf of Suez area; and 2) the still under-utilized hydroelectric potential of the Nile. If these two sources are developed to meet the bulk of Egypt's domestic energy needs, the export of excess petroleum products could ease the balance of payments deficit.

By the year 2000, an additional 14,000 MW of installed electric capacity is planned. This additional capacity will be produced by a small hydro plant on the Nile (1,500 MW), the Qattara Depression Project (10,000 MW) and nuclear or other (2,500 MW). If the Qattara Project fails, 2,500 to 12,500 is expected to be made up by nuclear power production. The share of total power production made up by hydroelectricity is expected to drop from 64% (1975) to 38% by 1985. The government hopes to reach a production level of 1 million barrels of oil per day by 1980. Recently, estimates have been scaled down to 700,000 barrels per day (31.7 million tonnes per annum). During the period of the current Five-Year Plan (1976-80), Egypt intends to intensify oil production in existing fields and carry out extensive exploration and development of new deposits.

COUNTRY DATA--EGYPT
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY DLR 05 APR 78

Egypt has an abundance of domestic energy resources. Currently, hydroelectric power is providing the bulk of domestic energy needs. Substantial quantities of oil products are imported in spite of the increasing production of petroleum in the country. Refinery capacity is still limited.

Government policy aims at total self-sufficiency in the petroleum sector by the 1980's and aims at generating an increasing exportable surplus. Domestic consumption is about 7 million tons per annum, and output in 1976 reached 18.4 million tons. Total output of crude oil was 50% higher than the previous year (due in part to the recovery of the Sinai fields) and is expected to increase further.

COUNTRY DATA--EGYPT
INDIGENOUS ENERGY RESOURCES

DLR 05 APR 78

NONRENEWABLE	RESOURCES	RESERVES	LOCATION IDENTIFIED RESERVES
COAL (million tonnes)	25	13	Suez
CRUDE OIL (million tonnes)	1,499	455.8	Eastern and Western Desert,
NATURAL GAS (trillion cu. ft.)	5	3	Nile Delta, Western Desert, Gulf of Suez, offshore east of Alexandria
RENEWABLE			
HYDROELECTRIC (billion kwh/yr)	23	7	Nile River

COUNTRY DATA--EGYPT
PATTERNS OF ENERGY SOURCES AND USES CWC 20 OCT 77

SOURCES

In 1975, 9.7 billion kwh of electricity were generated: 6.7 billion kwh (69%) from hydro units and 3 billion kwh (31%) from thermal units.

USES

No information

COUNTRY DATA--EGYPT
PROJECTIONS OF DEMAND

DLR 05 APR 78

RESOURCE	STANDARD PHYSICAL UNITS 1975	1985	2000	TRILLION BTU 1975	1985	2000
COAL (million tonnes)	1.54	1.6	1.6	42.7	45	43
CRUDE OIL (million tonnes)	8.25	12.3	12.7	351.2	523	542
NATURAL GAS (cubic km)	0.06	0.1	0.1	2.05	2	2
HYDRO POWER (billion kWh/yr)	6.80	8.3	9.8	77.3	94	112
NUCLEAR POWER (billion kWh/yr)	--	4.1	36.9	--	47	420

--not available

COUNTRY DATA--EGYPT
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS AND EXPORTS DLR 05 APR 78

RESOURCE	1975	%US	1985	%US
COAL (million tonnes)				
INDIGENOUS SUPPLY	0		--	
IMPORTS	1.54	13	--	--
EXPORTS	0	0	--	--
CRUDE OIL (million tonnes)				
INDIGENOUS SUPPLY	8.42		35	
IMPORTS	2.08	0	--	--
EXPORTS	0.92	0	15	--
NATURAL GAS (cubic km)				
INDIGENOUS SUPPLY	0.06		--	
IMPORTS	0	0	--	--
EXPORTS	0	0	--	--

--not available

COUNTRY DATA--EGYPT
ENVIRONMENTAL CONSIDERATIONS DLR 06 APR 78

In Egypt, as in most underdeveloped countries, environmental protection has been considered a luxury that could not be given attention until the economic development process was well underway. However, in recent years, there has been a growing concern for and attention to environmental considerations. Egypt's awareness was raised rather painfully with the many environmental problems that have arisen from the construction and operation of the Aswan High Dam. The Dam has produced only half the expected electric power and expanded irrigation to only a fraction of the new lands supposed to have been brought under cultivation. The major problems, however, have been such environmental side effects as collecting deposits of silt and water hyacinth which are beginning to clog canals and irrigation channels, destruction of the sardine fishing industry, erosion, soil infertility and water pollution. Also, because of the resulting increase in humidity, many of Egypt's ancient monuments are being destroyed. The Environmental Protection Agency, aided by the Ford Foundation, is funding a $1 million, three-year study of the problem from Aswan to the Delta. The study will be carried out by scientists from the University of Michigan jointly with the Egyptian Academy of Scientific Research and Technology. It will involve monitoring stations between Aswan and Alexandria to observe the chemical, biological and geological properties of the Nile water and access the nature of its movement. This information will contribute to a more complex study of the effects of the dam and possible solutions to problems.

The Study Group on Building Materials and Technology of the US-Egypt Joint Commission has proposed a project that will create an environmental laboratory to be included in the construction of a new Department of Architecture at Cairo University. Coordinators of the Study Group are James Haecher (US) and Dr. Ahmed El-Erian (Egypt) Principal Investigators of the project are Mr. Joseph Shapeh, Head of the Department of Architecture, Cairo University, and Professor Lester Fadec, Department of Architecture, University of Michigan. Estimated cost of the project is $12,000.

COUNTRY DATA--EGYPT
COMMERCIAL APPLICATIONS DLR 06 APR 78

Law 43 of 1974 was introducted to encourage foreign private investment in a broad range of Egyptian economic activities, particularly in oil production and other export-oriented projects. Import substitution investments are also accepted provided they benefit the domestic economy and help to relieve the balance of payments deficit. Although this made a number of changes in investment and repatriation of profits laws, there are several shortcomings that require correction before it becomes fully effective in attracting substantial foreign investment. Since the law's promulgation, the government has introduced a number of amendments reducing these problems, such as granting longer corporate tax holidays, simplyfying application procedures and bureaucratic structures impeding investment implementation, and rationalizing the exchange rate procedures for entrance and expatriation of finance capital and profits.

During the past decade, there has been rapid deterioration in Egypt's infrastructure. Transportation, communications and other facets of the infrastructure are inadequate for smooth investment implementation. A considerable amount of international foreign aid and Egyptian funds are currently being applied to the restoration and expansion of Egypt's infrastructural facilities.

Nevertheless, Egypt offers a number of attractions to foreign capital: A reasonably diversified and sophisticated industrial sector, abundant labor, a potentially large domestic market and an excellent geographical location. The OPEC countries have established investment offices in Cairo and made funds available for joint ventures with Western companies. Recently, several foreign banking concerns have established operations in Cairo to facilitate foreign investment and currency transactions.

In Egypt, the advent of economical and practical solar technology is hoped to contribute to raising the standard of living among the extremely poor rural villagers. However, several problems exist which may impede commercial application:

1-The limited resources available to the government are already strained, so implementation of rural energy projects is often dependent on financing from development agencies.
2-Solar and wind technologies must be adapted to fit the conditions of the specific areas. The acceptance and effective use of new sources of energy by villagers is dependent on an interactive educational and guidance process.
3-The governments of aid-giving countries are often reluctant to provide funding for projects that do not encourage the export of their own manufactured goods.

COUNTRY DATA--EGYPT
POWER PRODUCTION FACILITIES

CWC 26 OCT 77

The National Power System (NPS) of Egypt interconnects all the main hydro and thermal generating stations in Egypt and supplies electric power to all the cities, villages and industrial and agricultural centers all over the country.

The standardized voltages of the NPS are: 500 KV and 220 KV for bulk transmission and interconnection; 132KV, 66 KV and 33 KV for subtransmission and 11 KV and 380/220 V for medium and low voltage distribution systems, respectively.

The total installed (name plate) capacity of NPS is about 4000 MW. Hydroelectric power accounts for 2445 MW, oil fired plants for about 1420 MW, and gas turbine plants for 137 MW.

Major system generating facilities consist of the Aswan Hydro-power cascade (2445MW) in upper Egypt; and groups of oil fired plants located around Cairo, Alexandria, and in the Nile Delta (these stations constitute what is known as the Northern Egypt Power System).

The Aswan hydro block is connected to the Northern Egypt system through two, 500 KV, single circuit transmission lines which run for 788 KM with 2 intermediate substations, from Aswan to the Cairo 500 KV substations where auto-transformers provide the interconnection to Northern Egypt 220 KV system.

COUNTRY DATA--EGYPT
ENERGY R&D: STATUS AND OUTLOOK CWC 21 OCT 77

NUCLEAR

Inchass Research Center (AEE site NE of Cairo) has a Soviet-supplied 2 MW research reactor (critical 1961). Principal activities to date have been conducted there. A 600 MW reactor (Westinghouse) is planned for completion in 1981 pending completion of U.S. - Egypt Agreement for Cooperation in Peaceful Uses of Atomic Energy. Planned site is Sidi Kreir (35 kms east of Alexandria). Egypt plans construction of an additional U.S. - supplied 1000 MW reactor by 1983. Long-range plans call for construction of 10 nuclear power stations over next 20 yrs, with reactors purchased from Western Europe as well as the USA. Egypt thought to be interested in cooperative agreement with Canada on heavy water production (Egypt produces some heavy water as a by-product of a fertilizer plant at Aswan).

DESALINATION

Conceptual design for 5 million gallon per day plant prepared for DOE by Burns and ROE submitted to Egypt in April 1975. It is thought that the plant, which would supply water for experimental farm to be located near Borg El-Arab, W. of Alexandria on Med. Sea coast, would be fossil fired, and later coupled with a nuclear plant.

HYDROELECTRICITY

Mile Barrages Development- The government plans electrification of 3 existing barrages and construction of another 7 between Aswan and the Delta barrage. Four of new barrages under study by Ministries of Electricity and Irrigation. Total potential capacity estimated at 630 MW, yielding 4.7 billion kwh per annum. Available irrigation requirements.

Qattara Depression Project- Plan to dig canal (or twin underground tunnels) 75 km long between Qattara Depression (W. desert 200km west of Alexandria) and Med. Sea. Evaporation from surface of level of water at 50 meters below sea level. Flow of water through hydro-electric plants would be used to generate 10,000 MW, according to government estimate. International group of consultants named Joint Venture Qattara (mostly FRG firms) is working on: land mine removal, surveying, hydro-geological study, power market survey, oceanographic study, ecology studies and regional planning. Feasibility study on use of peaceful nuclear explosives to dig canal is to be completed in 1978.

FOSSIL

PETROLEUM- Policy in the petroleum sector aims at self-sufficiency and the generation of an increasing exportable surplus. Despite the loss of the Sinai oil fields in 1967, total Egyptian petroleum production has indeed been substantially higher than local consumption, except 1972-74, when production problems reduced total output and the corresponding Egyptian share of oil produced in collaboration with foreign oil companies. These production problems have since been remedied. Recent petroleum price increases have spurred exploration efforts (particularly by the major Western oil companies) and all indicators point toward substantial increases in output and exports. In addition, the Sinai oil fields which have a production capacity of about 3 million tons per annum, have now been recovered.

TERTIARY OIL RECOVERY

USDOE's Bartlesville Energy Research Center conducted preliminary evaluation and concluded miscellar/polymer flood technique can be applied to the Ras Charib Oil field.

SUMED PIPELINE

Scheduled to begin operational tests in Dec., 1976. Initial capacity is 72.15 million tonnes of crude oil per year, to be raised to 109 million tonnes per year. Plans call for construction of a refinery (22.7 million tonnes capacity) at the Med. Sea terminal.

DISCUSSIONS WITH USDOE

Plans are being discussed for DOE-Egyptian cooperation in waste lubricating oil research, evaluation of crude oil, oil-spill research and coal utilization and conversion.

SOLAR

Talks are under way between USDOE and Egypt on possible cooperation on: Solar irrigation pump, solar thermal power plant, solar photovoltaic cells for power and water heating. Federal Republic of Germany and France are funding solar research and the National Science Foundation (USA) is sponsoring study, with participation of New Mexico State University on the design of solar boiler performance.

COUNTRY DATA--EGYPT
ENERGY R&D: BUDGET

DLR 06 APR 78

ACTIVITY	US $ MILLION (FY 1976)	
Petroleum Research and Production	28.9	
Sumed Pipeline expenditures (additional World Bank funds)	(80.0)	
Academy for Scientific Research and Technology	3.5	
National Research Center	1.5	
Research Programs		(.179)
Atomic Energy Programs		(.248)
Qattara Depression Project	2.5	
FRG Funding for Qattara	(4.2)	
College of Petroleum and Minerals	52.5	

PUBLIC SECTOR INVESTMENT PROGRAM UNDER THE 1977 PLAN

	US $ MILLION	% SHARE
Agriculture	309	9.4
Transport and Communications	1064	32.3
Industry and Mining	784	23.8
Petroleum	246	7.4
Electricity	231	7.0
Other	664	20.1
Total	3298	100.0

The Egyptian government's budget is aggregated to the point that identification of line item expenditures is virtually impossible. The only funds clearly related to energy R&D are those above.

COUNTRY DATA--EGYPT
ENERGY R&D: PRIORITIES DLR 07 APR 78

According to an official of the Ministry of Atomic Energy and Scientific Research, Egypt's R&D interests are centered on:

a-Atomic development and application
b-Petroleum exploration and development
c-Solar and wind power development

Little research is underway in hydroelectric power and none at all on geothermal sources. Petroleum R&D is the most important in terms of political realities, but in the context of planned research, atomic energy takes precedence.

The Minister of Electricity and Energy, however, indicated that since development of atomic energy sources is so far advanced, reactors are commercially available and Egypt is faced simply with choosing a technology for project implementation, rather than nuclear R&D. He considers the number one priority to be the Qattara Depression hydro-scheme, with secondary emphasis on solar and wind studies.

Research in the above areas is being conducted largely by non-Egyptian experts. The only current in-house R&D project of significance in the Ministry of Electricity and Energy is on network load distribution.

COUNTRY DATA--EGYPT
ENERGY R&D IMPACT

CWC 25 OCT 77

PROPOSED GENERATING INSTALLATIONS (EGYPTIAN ELECTRICITY AUTHORITY)

Plant Location and Type	No. of Unit & MW Ratings	Year	Total MW
1. Helwan (GT)	6x20	1977	120
2. Kafr El Dawar (T)	2x110	1977	220
3. Talkha (GT)	9x20	1978	180
4. Cairo West, Unit 4 (T)	1x87	1979	87
5. Abu kir (T)	4x150	1980	600
6. Ismailta (T)	2x150	1981	300
7. Suez I (T)	2x150	1981	300
8. Suez II (T)			

COUNTRY DATA--EGYPT
GOV'T SUPPORTED ENERGY R&D IN IND, UNIV AND NAT'L LABS DLR 07 APR 78

INDUSTRY	PROGRAM AREAS	KEY INDIVIDUALS
Lahmeyer (FRG)	Qattara Depression Project	
Salzgitter (FRG)	Qattara Depression Project	
Deutsche Project Union (FRG)	Qattara Depression Project	
Bundesanstalt fur Wissenschaften und Rohstoffe (FRG)	Qattara Depression Project	
Harzie Engineering	Qattara Depression Project	
CER Nuclear (US)	Qattara Depression Project	
Westinghouse (US)	Sidi Kreir	
Betchel (US)	Sumed Pipeline	
UNIVERSITIES		
Ein Shams University	Solar	
Middle East Research Center	Water resources, petroleum	
Cairo University	Solar	
LABORATORIES		
Inchass Research Center	Isotopes production, uranium contaminants, ultra pure metals	
Solar Energy Lab National Research Center	Solar power stations, wind R&D, bioconversion	Dr. Ibrahim Sakr, Director of the Laboratory
Petroleum Research Center	Petroleum R&D	
Desert Institute	Solar R&D	
Solar Energy Commission	Solar R&D	Dr. Mahmoud El-Koshairy, Pres.
Academy of Scientific Research and Technology	Solar R&D	Dr. Abdel Moneim Aboul Azm, Pres.
Middle Eastern Regional Radioisotope Center for Arab Countries	Development and application of radioisotopes	Dr. Ismail Bassioni Hazzaa, Director

COUNTRY DATA--EGYPT
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 07 APR 78

The role of private industry in Egypt's R&D is only significant in the petroleum sector at this time. Other sectors are dominated by public owned and operated bodies. Minister of Petroleum Hilal stated in January 1977 that Egypt had signed 30 oil exploration agreements with 29 international firms. The 1977 exploration and development expenditures were estimated at $422.4 million, plus an additional $245.3 million allocated by the Egyptian government. By late 1977, the number of agreements had increased to 35 covering nearly 200,000 square miles on and offshore.

COUNTRY DATA--EGYPT
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS DLR 07 APR 78

ORGANIZATION	DEGREE OF INVOLVEMENT 1976
IEA	$ 50,349

Other organizations to which Egypt belongs which are not strictly R&D organizations include:

Arab League
Organization of African Unity (OAU)
General Agreement on Tariffs and Trade (GATT)
United Nations
OPEC
OAPEC

SUMMARY OF IAEA ASSISTANCE TO EGYPT PLANNED FOR 1978

	EXPERTS			
PROJECTS	DURATION OF ASSIGNMENT (months)	ESTIMATED COST ($US)	ESTIMATED COST OF EQUIPMENT AND SERVICES ($US)	ESTIMATE COST ($US)
Waste management	--	--	30 000	30 000
Raw materials prospection	--	--	18 000	18 000
Radiopharma-ceuticals	3	10 500	45 000	55 500
Nuclear regulations	3	10 500	--	10 500
Radiation damage studies	6	21 000(a)	18 000(a)	39 000
Use of radioisotopes in agriculture	6	21 000(a)	18 000(a)	39 000
Total	18	63 000	129 000	192 000

(a) Assistance will only be provided for this project in substitution for the other assistance covered by this table or if additional contributions from Member States of funds or services become available.

COUNTRY DATA--EGYPT
KEY REFERENCES

DLR 10 APR 78

REFERENCE	LOCATION
1-Info Memo from Bill Carter (DOE/I) to George Cozzolino on Energy Information for Wends, Oct 77.	IA
2-Atomic Energy Program Summary for Egypt, Oct 76.	IA
3-Egypt's Need for Its First Nuclear Power Plant, by Egyptian Ministry of Electricity and Energy, Nov. 76.	IA
4-Egypt, Book I, Country Background Information, LDC Energy Program, compiled by Argonne National Laboratory, 20 FEB 78.	IA

COUNTRY DATA--EGYPT
NOTES AND EVALUATIONS

DLR 10 APR 78

	LOCATION
1-State Dept Telegram 7819 from AmEmbassy Cairo 08 Jan 75 Unclassified (2A, 3H)	IA
2-State Dept Background Notes on Egypt, Sept 75 (2A, 2B, 5A, 5B)	--
3-Letter to John Ball (BERC) from Nelson Sievering (1A), 19 Dec 75 (4A)	IA
4-State Dept Telegram 488 from AmEmbassy Cairo 14 Jan 76 Unclassified (2C, 4B, 4C)	IA
5-Nuclear Engineering International, Feb 76 (4A)	--
6-State Dept Telegram 1479 from AmEmbassy Cairo 04 Jan 76 Unclassified (4A, 4E)	IA
7-State Dept Airgram A-18 from AmEmbassy Cairo 20 Feb 76 Unclassified (4A, p.5)	IA
8-State Dept Telegram 5755 from AmEmbassy Cairo 28 Apr 76 Unclassified (5B)	IA
9-Atomic Energy Program Summary for Egypt, ERDA/BMA, Oct 76 (2A, 2B, 2C, 3C, 4E, 5A, 5B)	IA
10-Memo from Helfrich to Sievering on Congressional Request for Information, 04 Oct 76 (4A, p.13)	IA
11-IAEA General Conference Paper GC (xx) INF/165/Add.1, 07 Oct 76 (2C, p.2; 4C, p.5; 4E, p.4; 5A, p.5)	IA
12-Egypt's Need for Its First Nuclear Power Plant, by Egyptian Ministry of Electricity and Energy, Nov 76 (2A, p.1; 2C, p.1; 3C, p.2-5; 3D, p.2; 3I, p.5; 4A, p.3, 12; 4D, p.21, table 2)	IA
13-State Dept Telegram 295365 from Sec. of State to AmEmbassy Cairo 03 Dec 76 Unclassified (4A, 5B)	IA
14-State Dept Telegram 17079 from AmEmbassy Cairo 10 Dec 76 Unclassified (4A)	IA
15-THE EUROPA YEARBOOK 1977, vol. 2, Europa Publications Ltd. (1C, 1D, 2A, p.510-530)	--
16-THE STATESMAN'S YEARBOOK 1976-1977, St. Martin's Press, New York, (1D, 2A, p.892-901)	--
17-Feasibility Study for Enchanced Oil Recovery from the Ras Gharib Oil Field (summary) 06 Jan 77 (4A)	IA
18-State Dept Telegram 624 from AmEmbassy Cairo 12 Jan 77 Unclassified (2C, 4A)	IA
19-Trip Report by Dr. Mostafa Talaat, Univ. of Md., on NSF sponsored trip to Cairo, 21 Jan 77 (2B, p.2; 4E, p.2)	IA
20-State Dept Airgram A-13 from AmEmbassy Jidda 21 Jan 77 Unclassified (2B, 2C)	IA
21-State Dept Airgram A-24 from AmEmbassy Cairo 14 Feb 77 Unclassified (5B, p.5)	IA
22-"Egypt: Change Comes to a Changeless Land", NATIONAL GEOGRAPHIC, Mar 77 (1B, p.316)	--
23-World Bank Report #1624EGT entitled Egypt Economic Report, 22 Mar 77 (2B, p.i, 3A, p.25, 3F, p.25, table 8; 4A, p.25; 4B, p.1; 4E, p.25)	IA
24-Foreign Economic Trends and Their Implications for the U.S., Egypt, Dept of Commerce, Jun 77 (1A)	IA
25-Information Memo from Bill Carter (DOE/I) to George Cozzolino on Egypt Energy Information for WENDS, 27 Oct 77 (2B, 4A, 5B)	IA

COUNTRY DATA--EGYPT
NOTES AND EVALUATIONS (CONT) DLR 10 APR 78

	LOCATION
26-Technical Assistance, Experts and Equipment to Be Provided in 1978 From the Agency's Own Resources, IAEA Board of Governors, 31 Oct 77 (5B, p. B.16 3)	IA
27-International Data Collection and Analysis (Draft), prepared by Nuclear Assurance Corp. for DOE, Dec 77 (3C, 3E, 3F)	IA
28-Preliminary Report on the Energy Resources of Egypt, report reparerd for DOE by U.S. Geological Survey, U.S. Bureau of Mines, U.S. Bureau of Reclamation and Argonne National Laboratory, 1978 (3C, p.4)	IA
29-Egypt, Book I, International Energy Development Program, compiled by Argonne National Laboratory, 20 Feb 78 (1A, section G; 1B, section G; 2A-2C, section A; 3A-3B, section A; 3G, section C; 3H, section B; 4B, section D; 4E, sections D, 5; 4F, section D; 5A, section E)	IA
30-Palmedo, Philip, Report of Foreign Travel, 31 Mar 78 (2A, 2B)	IA

--References thus indicated are available at public libraries

WENDS COUNTRY DATA

FI: FINLAND

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COUNTRY DATA--FINLAND
ECONOMIC DATA PROFILE

DLR 20 DEC 77

GNP (1975, million $)-26000

INFLATION RATE-18%

PER CAPITA INCOME ($)-3750

DISPOSABLE INCOME--

EXPORTS (1975, million $)-5500

IMPORTS (1975, million $)-7600

MONITARY UNIT-Finnmark

EXCHANGE RATE (1976, 1US$=)-3.85 Finnmarks

TOTAL: EMERGY R&D BUDGET--

TRANPORTATION SYSTEM DESCRIPTION

Finland's domestic air network is one of the best in Europe. In addition, Helsinki is served by daily flights to many international airports. The country also has efficient rail and long distance bus services. The road network is well-maintained. Nearly all major highways and most important secondary roads are paved.

--not available.

COUNTRY DATA--FINLAND
DEMOGRAPHIC DATA PROFILE

DLR 20 DEC 77

LAND (thousand sq. km.)-337	ARABLE LAND (thousand sq. km.)-26.9
POPULATION (millions)-4.7	POPULATION DENSITY (/sq. km.)-11
LITERACY (%)-100%	% RURAL POPULATION--
LIVE BIRTHS/THOUSAND-66.7	DEATHS/THOUSAND-44.4
MEDIAN AGE/MALES--	MEDIAN AGE/FEMALES--
AVERAGE FAMILY SIZE--	NET MIGRATION (millions/yr)--
PRIMARY SCHOOL GRADS--	SECONDARY SCHOOL GRADS--
INDUSTRIAL WORKERS-580,800	PROFESSIONAL WORKERS--
AGRICULTURAL WORKERS-352,000	COLLEGE GRADS--
POPULATION GROWTH (%)-0.4	UNEMPLOYED-74,800

--not available

COUNTRY DATA--FINLAND
KEY TECHNICAL EDUCATION RESOURCES

DLR 23 DEC 77

Helsinki University
Oulu University
Technical University of Helsinki
Turku University

COUNTRY DATA--FINLAND
ENERGY POLICY: BASIC LEGISLATION DLR 22 DEC 77

There is no basic legislation relating to Finnish energy policy or R&D programs.

COUNTRY DATA--FINLAND
GOVERNMENT STRUCTURE FOR ENERGY POLICY R&D DLR 22 DEC 77

Under the Finnish Constitution, political power is divided between the Parliament and the President of thee Republic, with substantial powers reserved to the President.

LEGISLATIVE-a unicameral Parliament consisting of 200 members is the supreme authority in Finland. Legislation may be initiated by any member of Parliament as well as the President or the Council of State.

EXECUTIVE-power is vested in the President (Urho K. Kekkonen) who handles foreign policy, except for certain international agreements and decisions of war or peace that must be submitted to Parliament; is Commander in Chief of the armed forces and has wide decree and appointive powers. Executive power is exercised by the Council of State (Cabinet) which is made up of the Prime Minister (Martti Miettunen) and Ministers for the various departments of the central government.

Main responsibility for the Finnish energy program lies with the Ministry of Trade and Industry (Arne Berner, Minister). Within the Ministry, the Energy Department (Erkki Vaara, Director) is responsible for the development of energy policy and energy R&D.

OTHER PARTS OF THE ENERGY STRUCTURE

1-Ministry for Foreign Affairs, Political Division (Jussi Makinen, Head of Dept.) is charged with nuclear affairs
2-Atomic Energy Commission(Erkki Laurila, Chairman) acts as an advisory body to the Ministry of Trade and Industry in matters relating to the atomic energy program and nuclear safety.
3-Energy Policy Advisory Comittee, which is chaired by the Minister of Trade and Industry, reports to the Council of State.

COUNTRY DATA--FINLAND
ENERGY POLICY AND OBJECTIVES DLR 20 DEC 77

A comprehensive energy program was prepared during 1976 by the Energy Department of the Ministry of Trade and Industry. In preparation for approval of the program a report on Finland's energy situation is expected to be submitted to Parliament in the fall of 1977.

The aim of Finnish energy policy is to curb the rate of increase of energy imports. Efforts to attain this goal focus on energy conservation and the introduction of nuclear power. Other elements in the energy program include:

1-requirement for all new power plants to be constructed so that they could employ at least two alternative fuels;
2-planning flexibility in determining how much electricity will be produced from nuclear plants, from oil, from coal, from peat and by hydropower;
3-a proposal to develop "energy forests" to produce fuel.

COUNTRY DATA--FINLAND
INDIGENOUS ENERGY RESOURCES

DLR 19 DEC 77

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
URANIUM (thousand tonnes U3O8)	--	1.9	Joensuu and Paltamo (east), Kolari (north)
PEAT (million tonnes)	--	2430	Southern Finland
RENEWABLE			
HYDROELECTRIC (billion kWh/year)	19	10.5	Kemo and Vironski rivers, Oulu Dam

Finland has no known deposits of coal, oil or natural gas and it is not likely that significant sources of these fuels will be discovered.

--not available

COUNTRY DATA--FINLAND
PATTERNS OF ENERGY SOURCES AND USES

DLR 19 DEC 77

	CONSUMING SECTOR-1975			
	RESIDENTIAL & AGRICULTURAL	INDUS-TRIAL	TRANSPOR-TATION	TOTAL
COAL (million tonnes)	1.1	1.6	0	2.7
PETROLEUM (million tonnes)	4.0	3.0	2.6	9.6
NATURAL GAS (billion cu. ft.)	0	23.3	0	23.3
HYDROPOWER (billion kWh)	--	--	--	35.1

--not available

COUNTRY DATA--FINLAND
PROJECTIONS OF DEMAND

DLR 19 DEC 77

	STANDARD PHYSICAL UNITS		MTOE	
	1974	1985	1974	1985
HYDROPOWER (billion kWh)	36.3	35.1	3.1	3.0
FIREWOOD, WOOD WASTE (MTOE)	4.1	3.7	4.1	3.7
COAL (million tonnes)	1.4	2.7	2.0	3.8
PEAT (MTEC)	0.5	1.2	0.1	1.7
FUEL OIL (MWh)	52.0	66.7	4.6	5.9
OTHER OILS (MTOE)	6.8	10.2	6.8	10.2
NATURAL GAS (billion cu. ft.)	15.5	46.6	0.4	1.2
NUCLEAR POWER (billion kWh)	0	57.4	0	4.9

COUNTRY DATA--FINLAND
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS AND EXPORTS DLR 20 DEC 77

RESOURCE	1975	1985	2000
COAL (million tonnes)			
INDIGENOUS SUPPLY	0	0	0
IMPORTS	3.8	--	--
EXPORTS	0	--	--
CRUDE OIL (million tonnes)			
INDIGENOUS SUPPLY	0	0	0
IMPORTS	9.6	--	--
EXPORTS	0	--	--
NATURAL GAS (billion cu. ft.)			
INDIGENOUS SUPPLY	0	0	0
IMPORTS	24.4	--	--
EXPORTS	0	--	--
HYDRO AND GEOTHERMAL (billion kWh)			
INDIGENOUS SUPPLY	35.1	--	--

--not available

COUNTRY DATA--FINLAND
ENERGY R&D: STATUS AND OUTLOOK DLR 22 DEC 77

NON-NUCLEAR

Forests cover about 70% of Finland's land area. Over 500,000 hectares which are not needed for other agricultural purposes are judged to be suitable for raising quick-growing trees. A study conducted by Swedish investigators indicated that the one-half million hectares developed as "energy forests" could produce fuel equivalent to 2-3 and one-half million tons of oil. To that end, Finland is conducting research on a 30 hectare experimental plot to determine the extent of fuel supply that could be obtained from short cycle forestry. There is also 750,000 hectares of neglected deciduous forests from which 7-8 million cubic meters of wood could be cut annually for use as fuel.

Research on solar cell development is conducted on a small scale. Preliminary studies on solar batteries have been initiated. The contribution of solar energy toward meeting Finland's energy demand has not yet been determined.

Finland's hydro power resources have been almost fully utilized and its share of energy production will thus decrease in the future. The possibilities of solving energy problems by using oil, gas, coal or peat-fired thermal power stations are limited due to resource availability, economic and environmental reasons. According to official reports, Finnish conditions justify that the major part of the country's growing electric consumption be based on nuclear power.

NUCLEAR

Loviisa I, a Soviet engineered atomic power plant of 420 MW capacity began operation in 1977. The twin plant Loviisa II, also Soviet engineered, is under construction and is expected to be completed in 1978. Also under construction is a 660 MW plant being built with help from Sweden. Discussions concerning the next atomic power plant to be built indicate that it will have a design capacity of 1000 MW and be built with Soviet assistance. Finland is designing and constructing an emergency cooling system for a plant the Soviet Union is building for Libya.

COUNTRY DATA--FINLAND
ENERGY R&D: BUDGET

DLR 20 DEC 77

	THOUSANDS OF $US
MINISTRY OF TRADE AND INDUSTRY	1976
NUCLEAR	
Basic Research	473
Safety	853
Location of Power sites	1132
Sources of Domestic Fuel	105
Industrial Research and Planning	784
PEAT-Basic Research	157
OTHER ENERGY PROGRAMS	
Long-Term Planning	158
Energy Conservation	131
Administrative Expenses	433
TOTAL	4226

The fiscal year is the same as the calendar year.

Exchange rate used: 3.80 Finnmarks equals US$1.

COUNTRY DATA--FINLAND
ENERGY R&D: PRIORITIES

DLR 20 DEC 77

Finnish energy R&D priorities are largely focused on nuclear energy. More than three-fourths of the 1976 Government funds for energy R&D activities are associated with the peaceful use of nuclear energy. Additionally, the Government encourages the production of peat as fuel for power stations in order to decrease Finland's dependency on energy imports. In addition to funds for basic research, the Government allocated $US 23 million for the State Fuel Center (VAPO) which uses peat as its main source of energy.

COUNTRY DATA--FINLAND
GOV'T SUPPORTED ENERGY R&D IN IND, UNIV AND NAT'L LABS DLR 23 DEC 77

INSTITUTES	PROGRAM AREAS	KEY INDIVIDUALS
Technical Research Center	Solar cell development, solar batteries	Prof. Tor Stubb
Biochemical Research Institute	Use of isotopes in the elucidation of metabolic reactions, radiation studies	Prof. Artturi Virtanen, Dir.
Insitute of Radiation Physics	Environmental radioactivity, radiation protection	K. Salimati, Director
Institute of Marine Research	Study of radionuclides in Baltic Sea Water	F. Korelaff, Head of Dept.
State Institute for Technical Research	Design of special instruments based on physical, including nuclear phenomena	E. Laurila, Director
Peat and Oil Research Laboratory	Peat: drying, briquetting, carbonization, gasification, extraction and compression; oil: synthetic oils	
UNIVERSITIES		
Helsinki University Dept of Physics	Experimental nuclear physics, expecially nuclear spectroscopy	P.E. Tahvonen, Director
Accelerator Lab	Nuclear spectroscopy, theoretical work on nuclear structure	L. Simons, Director
Dept of Nuclear Physics	Nuclear models, elementary particles	K. Laurikainen, Director
Research Institute for Theoretical Physics	Nuclear structure, nuclear matter, elementary particles, many body problems	V. Ambegaokar, Director
Oulu University Biochemistry Dept.	Radioactivity, autoradiography	Sakari Piha, Chairman
Technical University of Helsinki Dept. of Technical Physics	Neutron diffraction, reactor kinetics, isotopes, spectroscopy	Prof. O. Lokki, Head of Dept.
Turku University Wihuri Physical Lab	Nuclear magnetic resonance at low temperatures, elementary particles	Prof. V. Hovi, Head

COUNTRY DATA--FINLAND
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 23 DEC 77

The following companies/organizations are involved with energy:

1-Confederation of Finnish Industry--central organization which deals with energy R&D problems within industry.
2-Atomic Energy Limited--a corporation formed for the use of atomic energy in industry.
3-Finnish Industrial Power Company--electrical supply R&D, including nuclear.
4-Finish Nuclear Society--initiates and maintains cooperation in the field of nuclear research and technology. The Society represents universities and research establishments as well as Finland's main metal, electrical, and process industries interested in nuclear applications.
5-FINNATOM--secures bids for and manufactures reactor components. Member firms include:

A. Ahlstrom Osakeyhtio
Oy Nokia Ab
Rauma-Repola Oy
W. Rosenlew an Co., OY
OY Stromberg AB
OY Tampella AB
Valmet OY
OY Wartsila AB

COUNTRY DATA--FINLAND
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS DLR 23 DEC 77

ORGANIZATION

NEA
IAEA
Nordic Contact Organization for Atomic Energy
Nordic Coordination Committee for Nuclear Energy
NORDITA (Nordic Institute for Theoretical Atomic Physics)
Nordic Working Group for Reactor Safety

COUNTRY DATA--FINLAND
KEY REFERENCES

DLR 23 DEC 77

	LOCATION
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COUNTRY DATA--FINLAND
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3-AREA HANDBOOK FOR FINLAND, Foreign Area Studies, American University, 1974 (3C, p.189-90; 3F, p.189)	--
4-State Dept Background Notes on Finland, MAY 75 (1A, 1B, 2B)	--
5-State Dept Airgram A-147 from AMEMBASSY STOCKHOLM 25 MAY 75 Unclassified (4A, p.8-9; 4F, p.9; 5B, p.90	IA
6-Finland Atomic Energy Program Summary, SEP 75 (2B, 3C, 4E, 4F, 5A, 5B)	IA
7-State Dept Telegram 00097 from AMEMBASSY HELSINKI 15 JAN 76 Unclassified (4B, 4C)	IA
8-State Dept Telegram 00344 from AMEMBASSY HELSINKI 20 FEB 76 Unclassified (2A, 3A, 4F, 5A)	IA
9-Description of the Solar Energy R&D Programs in Many Nations, Atlas Corporation, Santa Clara, California, FEB 76 (3E, 4A, 4E)	IA
10-NATIONAL BASIC INTELLIGENCE FACTBOOK, C1A, JUL 76 (1A, p.65; 1B, p.64-5)	IA
11-Survey of Energy Resources, World Energy Conference, 1976 (3C, p.296, 303, 341)	--
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15-ENERGY BALANCES OF OECD COUNTRIES 1973/75, OECD, Paris, 1977 (3D, p.71; 3F, p.71)	--
16-Finland, International Energy Accounts (data base), International Studies Branch, Interfuel Statistics Division, Dept of Energy, 28 OCT 77 (3F)	IA

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WENDS COUNTRY DATA

FR: FRANCE

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COUNTRY DATA--FRANCE
ENERGY POLICY: BASIC LEGISLATION

MAS 19 JAN 78

1-Compagnie Francaise des Petroles (CFP) formed to manage French interest in Turkish Petroleum Company and serve as arm of government in developing a national oil policy. Government now owns only 35 percent. CFP established 1924.
2-Parliament passed Loi Poincare in 1928 which laid foundation for the administrative structure of the petroleum industry. Government monopoly established for oil imports into French territory.
3-Commissariat a l'Energie Atomique (CEA) created in 1945.
4-Law of April 8, 1946 nationalized production, transportation, and distribution of natural gas under Gaz de France.
5-Decree covering the building of reactors passed 1963, modified 1973.
6-Central service on the safety of nuclear installations, which reports to the Ministry of Industry and Research, established 1973.
7-Government-owned company, Entreprise de Recherches et d'Activites Petrolieres (ERAP) formed 1966.
8-Decree dealing with effluents of radioactive gases and their control passed 1974.
9-Decree dealing with radioactive liquid effluents and their control passed 1974.
10-Establishment of Interministerial Committee on Nuclear Security, 1975. Committee reports to the Prime Minister.
11-Procedures outlined for public review of proposed sites of public utilities, either fossil fuel or nuclear, established 1976.
12-Energy Conservation Agency created (Agence pour les Economies d'Energie) 1976.
13-Interministerial Council on Nuclear Export Policy established September 1976, chaired by President of the Republic.

COUNTRY DATA--FRANCE
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DRC 09 SEP 77

LEGISLATIVE--PARLIAMENT
Sovereign areas limited to civil, fiscal, electoral, penal, labor, amnesty and the budget.

Composed of two houses called National Assembly (485 deputies) and Senate (283 senators).

EXECUTIVE--PRESIDENT(Valery Giscard D'Estaing)
Controls all other areas not cited under parliament.

Cabinet appointed by President which includes the following Ministries: Prime(Raymond Barre), Industry & Research(Michel D'Ornano), Defense(Yvon Bourges), Foreign Affairs(Raymond Barre), Justice, Economy & Finance, Education, Cooperation, Supply, Agriculture, Quality of Life, Labor Health & Commerce, Handicrafts, Small Business.

Planning Council created 25 SEP 74 is chaired by President and includes the following Ministers: Prime, Finance, Labor, and staff of the Five Year Plan.

Planning Council responsibilities:
1-Make principal decisions on overall energy policy.
2-Define mid-term and long-term program for energy needs with respect to economic policies.
3-Implement decisions via Staff of Five Year Plan.

Ministry of Industry and Research--responsible for implementing energy R&D policies, and its Delegation Generale a l'Energie is responsible for proposing measures on current energy needs and supplies and directs several operational offices.

Involvement of other ministries:

MINISTRY	RESPONSIBILITIES
Defense	Contribute policy direction to military nuclear research activities.
Prime Minister	Directs activities of the interministerial committee on safety and protection.
Health	Contributes to safety and protection policies.
Quality of Life	Contributes to safety and protection policies.
Foreign Affairs	Overseas international activities.
Finance	Financing.

COUNTRY DATA--FRANCE
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/MAS 19 JAN 78

PLANNING COUNCIL--chaired by President and makes principal decisions on overall energy policy. Implements decisions through the staff of the Five Year Plan and Ministry of Industry and Research.

MINISTRY OF INDUSTRY AND RESEARCH

Delegation Generale a l'Energie--Proposes measures on current energy needs and supplies, directs the following offices:

Fuels
Gas, Electricity and Coal
New Energies (Created 04 SEP 75 to promote energies not yet on an industrial basis)
Conservation (Created 29 NOV 74 to propose policies on energy conservation, encourage industrial measures and inform the public)
Commissariat a l'Energie Atomique (CEA)

The Ministry is also assisted by various advisory bodies, the most important are:

1-Advisory Committee on Research and Development of Energy
2-Advisory Commission on Energy
3-The Commission on the Production of Electricity by Nuclear Power

Commissariat a l'Energie (CEA)--responsible for coordinating all nuclear energy programs. CEA structure is as follows: General direction by an Administrator, senior technical advice by a High Commissioner and general policy developed by a Senior Central Staff.

Operational units include:

Military Application
Nuclear Materials through COGEMA (Compagnie Generale Des Matieres Nucleaires)
Reprocessing through United Reprocessors (UK, FRG, France)
Institute of Fundamental Research
Institute of Safety and Protection
Industrial Nuclear Application through:
Technicatome (small reactors)
Framatome (PWR)
Novatome (LMFBR and HTGR)

COUNTRY DATA--FRANCE
ENERGY POLICY AND OBJECTIVES MAS 19 JAN 78

Energy policy cites following objectives:

1-Improvement of existing technologies;
2-Introduction of fast breeder power reactor on a commercial basis by 1980;
3-Diversification of sources of imported energy products;
4-Security of supply;
5-Maximum utilization of refinery capacitites;
6-Adaptation of refining and distribution patterns to meet the new economic conditions.

To meet these major objectives, the following R&D areas are stressed:

1-Support the conventional nuclear power program, develop advanced reactors and promote commercialization of nuclear energy.
2-Develop technology for exploration and exploitation of deep off-shore oil deposits.
3-Develop means to exploit other national fossil fuel reserves.
4-Support industry in developing means to conserve energy.

Council on Nuclear Export Policy presented the following policy guidelines on 11 OCT 76:

1-Since nuclear energy represents a competitive energy source necessary for development, France will remain prepared to contribute to the implementation of peaceful use of nuclear energy.
2-France intends to keep full command of its nuclear export policies in accordance with relevant international agreements.
3-France does not favor proliferation of nuclear arms and will itself reinforce safeguards through its nuclear export policy.
4-France will assure the security of nuclear fuel supplies for plants it has sold and will meet the legitimate needs of others for access to nuclear technologies.
5-The Government of France is of the opinion that it is necessary that all suppliers of nuclear equipment, materials and technologies avoid proliferation of nuclear arms through commercial competition.
6-France is prepared to discuss these problems with supplying and/or receiving countries engaged in substantial nuclear programs.

COUNTRY DATA--FRANCE
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY MAS 19 JAN 78

The need for France to reduce dependence on imported energy is clearly vital when it is considered that the nation currently imports nearly 75 percent of its energy needs. The target set for 1985 is to reduce this dependence from 75 to 60 percent. To this end efforts are being concentrated in three areas: energy conservation, development of indigenous resources, and intensified research.

The energy consumption level is expected to total 240 million tonnes and involve the following sources.

	Percent of Total	Consumption (million tonnes oil equivalent)
NUCLEAR	25	60
OIL	41	98
COAL	13	30
HYDRO	5	13
NATURAL GAS	15	36
OTHER	1	3
TOTAL	100	240

COUNTRY DATA--FRANCE
INDIGENOUS ENERGY RESOURCES

MAS 19 JAN 78

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
COAL (million tonnes)	1,547	478	Nord, Lorraine, Pas-de-Calais
CRUDE OIL (million tonnes)	7.9	7.9	Aquitaine, Parentin, Alsace
SHALE OIL (million tonne)	--	--	--
NATURAL GAS (cubic km)	154	154	Aquitaine, Lacq
URANIUM (thousand tonnes U308)	112.3	65.0	Lozere, Cvense, Morbihan, Massif Central, Bretagne Lodeve, Haute-Vienne Cantal
RENEWABLE			
HYDRO POWER (twh/year)	270.0	61.9	Seine, Rhone, Saone, Gauonne, Loire
GEOTHERMAL	--	--	Parisian basin, Alsace, Limanne, Pyrenees

--not available

COUNTRY DATA--FRANCE
PATTERNS OF ENERGY SOURCES AND USES

MAS 20 JAN 78

	CONSUMING SECTOR				
RESOURCE	HOUSEHOLD AND COMMERCIAL	INDUSTRIAL	TRANSPORTATION	ELECTRICAL GENERATION	TOTAL
Coal (million tonnes)	6.64	14.37	0.07	18.0	39.08
Petroleum (million tonnes)	27.75	25.58	27.20	10.41	90.94
Natural Gas (cubic km)	6.93	7.32	0.01	2.98	17.24
Nuclear Power (TWh)	0	0	0	17.45	17.45
Hydro Power (TWh)	0	0	0	59.89	59.89
Geothermal Power (TWh)	0	0	0	0	0
Utility Electricity Distributed (TWh)	73.70	81.96	6.16	22.43	184.25

COUNTRY DATA--FRANCE
PROJECTIONS OF DEMAND

MAS 19 JAN 78

RESOURCE	STANDARD PHYSICAL UNITS (million tonnes oil equivalent)			TRILLION BTU		
	1975	1980	1985	1975	1980	1985
COAL	27.5	30	30	1091.75	1191	1191
OIL	101.7	117.2	96	4037.49	4652.0	3811.2
NATURAL GAS	17.5	26.5	37	694.75	1052.1	1468.9
HYDRO AND NUCLEAR POWER	17.7	30.8	74	702.69	1222.8	2937.8
NEW SOURCES OF ENERGY	0	0.5	3	0	19.9	119.1

COUNTRY DATA--FRANCE
PROJECTIONS OF ENERGY SUPPLY, IMPORTS, AND EXPORTS MAS 19 JAN 78

RESOURCE	1975	1985	2000
COAL (million tonnes)			
INDIGENOUS SUPPLY	25.19	--	--
IMPORTS	20.07	--	--
EXPORTS	1.21	--	--
CRUDE OIL (million tonnes)			
INDIGENOUS SUPPLY	1.84	--	--
IMPORTS	105.99	--	--
EXPORTS	0	--	--
NATURAL GAS (cubic km)			
INDIGENOUS SUPPLY	7.57	--	--
IMPORTS	12.54	--	--
EXPORTS	.14	--	--
URANIUM (Kilotonnes U308)			
INDIGENOUS SUPPLY	2.0	--	--
IMPORTS	3.85	--	--
EXPORTS	3.77	--	--

COUNTRY DATA--FRANCE
ENERGY R&D: STATUS AND OUTLOOK MAS 20 JAN 78

Beyond 1985, the French are emphasizing:

1-Controlled thermonuclear fusion (both magnetic confinement and laser-induced methods).
2-Hydrogen production (by disassociation of water by electrolysis using off hour electrical capacity and by use of high temperature gas reactors).
3-Limited application of solar heating and cooling in new buildings.

NUCLEAR ENERGY

Heavily involved in development of Liquid Metal Fast Breeder Reactor with commercialization by 1982. Continuing to build pressurized water reactors-25 to begin by 1982. Under EURATOM built world's largest tokomak (magnetic confinement fusion reactor).

FOSSIL FUELS

Despite nuclear, fossil fuels will dominate energy sources even in 1985 (69% fossil fuels compared with 25% nuclear in 1985) with most fossil fuels being imported.

Discovery of large off-shore oil deposits have prompted the pursuit of extraction technology for depths to 500 meters by 1980 and 1000 meters by 1985.

Attention given to shale oil deposits on Parisian Basin but low quality deposits pose severe economic/environmental extraction problems.

ENERGY STORAGE/TRANSMISSION/CONSERVATION

Ongoing study of electricity transmission to conserve on loss, improving industrial processes and electrical equipment, and to a lesser extent, domestic conservation.

TIDAL POWER

Only tidal power station in the world operating in La Rance estuary. Recommendations for construction of station in Bay of St. Michel, but economic constraints raised doubts. No plans to actively expand program.

COAL

As a result of the rapid decline in France's coal industry, the only noteworthy R&D program is a cooperative venture with other members of the EEC in the production of sintered coke.

NATURAL GAS

Reserves of natural gas could produce about 280 billion cubic feet per year, but are expected to diminish after 1983. Ongoing R&D programs emphasize efficiency of use of current supplies and alternative forms.

COUNTRY DATA--FRANCE
ENERGY R&D: STATUS AND OUTLOOK MAS 20 JAN 78

(CONTINUED)

SOLAR ENERGY

The solar program assigns highest priority to the development of helio-thermal electrical plants. The 64 KW plant at Odeillo is operational and a 2 MWe test bed, as well as an 800-KWe central receiver and a 300 KWe distributed collector prototypes are planned. Development of photovoltaic solar energy and solar water heating and house heating also are actively pursued. An evaluation program comprising ten houses heated only by electrical energy is in progress.

COUNTRY DATA--FRANCE
ENERGY R&D: BUDGET

DRC 09 SEP 76

	1975	1976
	(IN MILLIONS OF DOLLARS)	
Nuclear Energy	$ 276.0	$ 311.0
Fossil Fuels	8.0	17.0
Solar	6.0	9.0
Geothermal	3.0	4.0
Hydrogen	1.7	2.6
Sea & Wind	0.6	0.6
Fucion	8.8	1.2
Miscellaneous		
Energy Conversion		
Fundamental Research	42.0	56.0
TOTAL	$ 346.0	$ 401.0

The agencies receiving the amounts budgeted are as follows

Nuclear -- CEA
Fossil Fuel -- DGRST, CNEXO, BRGM and OTHERS
Solar -- DGRST, CEA, CNRS, CNES
Geothermal -- DGRST, CEA, BRGM, CNRS
Hydrogen Production -- DGRST, CEA
Sea & Wind -- CNEXO
Fusion -- CEA
Energy Conversion/Basic Research -- CNRS and UNIVERSITIES

ACRONYMS ARE DEFINED BELOW

CEA - Commission on Atomic Energy
DGRST - Delegation for Scientific and Technical Research
CNEXO - National Center for Oceanographic Research
BRGM - Bureau for Geological & Mining Research
CNRS - National Center for Scientific Research
CNES - National Center for Space Research

COUNTRY DATA--FRANCE
ENERGY R&D: PRIORITIES

DRC 13 SEP 76

Almost all 1976 energy-related R&D funds directed to improving existing technologies while only 1% directed toward "new" energy technologies (e.g., solar, geothermal, tidal and wind).

Nuclear R&D by far most heavily stressed (77% of energy R&D budget) with fast breeder development most heavily stressed followed by civil and military proposals, uranium enrichment, light water reactors and high temperature gas cooled reactors in order of importance.

Nuclear energy expected to satisfy most domestic needs in mid-term future.

Discovery of off shore oil deposits is prompting considerable research into off shore extraction techniques. France hopes to export these fuels.

Photovoltaic cells are being developed for exportation but little domestic use.

COUNTRY DATA--FRANCE
GOV'T SUPPORTED ENERGY R&D IN INDUSTRY, UNIV & NATL LABS/MAS 20 JAN 78

LABORATORIES	PROGRAM/AREA	KEY INDIVIDUAL
Commissariat a l'Energie Atomique (CEA)	Enrichment technology--diffusion; lmfbr-Phenix and Super Phenix; Waste Management; Radioecology	
Alsthom Research & Development Laboratory	Fuel Cells	
Institute Francais Petrole	Fuel Cells	
Centre Recherches Co.	Fuel Cells	
Laboratorire d' Electrolyse	Fuel Cells	
Gaz de France	Burner designs, carbon monoxide production, adaptation to different qualities of gas, quality of space and water heating equipment, transportation of liquefied natural gas by sea	
Agence nationale pour la valorisation de la recherche (ANUAR) and Electricite de France (EDF)	Solar energy research--domestic heating. Experiments in Odeillo, Chauvenoy-le-Chateau and near Le Havre	
Centre National de la recherche Scientifique	Supports project aimed at producing solar heating system at 5-10 percent of cost of total building construction; directs project for solar furnace at Odeillo	Jean DeFlandre
UNIVERSITIES		
Lille University	Evaluation of impact of nuclear power plant moratorium from 1978-80.	Prof. Maillet

COUNTRY DATA--FRANCE
INVOLVEMENT IN INTERNATIONAL ENERGY ORGANIZATIONS LRA 15 OCT 76

Active directly/indirectly in most international energy R&D organizations and Programs.

Active Member Of:
- CERN (European organization for nuclear research)
- IAEA
- NEA
- EURATOM(Common Market)
- CCMS (Committee on the Challenges of Modern Society)

NOT a member of IEA but well informed of its activities and is a member of some pilot organizations for specific projects.

COUNTRY DATA--FRANCE
ASSESSMENT OF INTERNATIONAL ACTIVITIES MAS 20 JAN 78

In a statement before the Committee for Energy Policy of the OECD, a representative of the government stated that France has no intention to "go it alone" and will make every effort to fit into the broader international context. The country participates actively in the OECD as well as the European Economic Community. Accordingly, French policy promotes farther-reaching cooperation with the developing countries whether they import or export oil and in particular with those with the biggest energy deficits. This cooperation could relate to energy investment.

With one of the largest nuclear programs and every intention to go commercial with LMFBRs by 1982, the French nuclear policy is of great concern in the international world. President Giscard D'Estaing recently reiterated the French committment to an independent policy which will attempt to help satisfy world energy needs while trying to avoid proliferation to the maximum extent possible.

France is active in international R&D activities, and because of recent (CY 1976) cutbacks in energy R&D budgeting, it is predicted that a greater all-fronts push for "sharing" of US basic and applied research funding, activities and results will occur. This "push" will range from increased cooperation-project participation to extensive licensing commitments and joint commercial R&D enterprises. Projects in 1977 include cooperation with the U.S. in solar research and joint investigation with the United Kingdom of an electricity project to link electricity networks across the English Channel.

COUNTRY DATA--FRANCE
KEY REFERENCES

MAS 20 JAN 78

	LOCATION
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2-Wayne H. Ferris et al. ENERGY POLICIES IN THE EUROPEAN COMMUNITY. Prepared by the International Research Group for U.S. Energy Research and Development Administration, February 1975.	IA
3-OECD--Summary of Statement by Mr. Mentre at 2nd Session (22 July 1976) of Committee for Energy Policy.	IA
4-ERDA-76-14, The LMFBR Program in France, March 1976.	IA
5-State Dept. Telegram 14112 from AMEMBASSY PARIS, 12 May 1977 (unclassified).	IA

COUNTRY DATA--FRANCE
NOTES AND EVALUATIONS

MAS 20 JAN 78

	LOCATION
1-State Dept Telegram 22601 from AMEMBASSY PARIS 03 SEP 75 (confidential).	IA
2-State Dept Telegram 26100 from AMEMBASSY PARIS 07 OCT 75 (limited official use).	IA
3-State Dept Telegram 30110 from AMEMBASSY PARIS 18 NOV 75 (limited official use).	IA
4-State Dept Telegram 05393 from AMEMBASSY PARIS FEB 76 (unclassified).	IA
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6-State Dept Telegram 08825 from AMEMBASSY PARIS MAR 76 (unclassified).	IA
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9-INTERNATIONAL ENERGY R&D: A PICTURE COMPILED FROM OPEN SOURCES. Livermore, Calif: Lawrence Livermore Laboratory, January 16, 1975. (4A,4E).	IA
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14-State Dept Telegram 14112 from AMEMBASSY PARIS, 12 May (unclassified). (5C)	IA
15-"UK, France Study Electric Link Under English Channel," ENERGY DAILY (August 2, 1977). (5C)	--
16-Memorandum to Nelson F. Sievering from Theodore Beresovski, DOE Scientific Representative, 6 September 1977. (4A,4E)	IA
17-ROLE OF FOREIGN GOVERNMENTS IN ENERGY INDUSTRIES, DOE, October 1977, pp.111-22. (2A,3D)	IA
18-INTERNATIONAL DATA COLLECTION ANALYSIS, Task 1.B. Prepared by Nuclear Assurance Corporation for U.S. DOE, December 1977. (3C,3D,3F)	IA

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WENDS COUNTRY DATA

GE: EAST GERMANY

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COUNTRY DATA--EAST GERMANY
ECONOMIC DATA PROFILE

CJB 29 MAR 78

GNP (CURRENT million $)-62,500 INFLATION RATE--
PER CAPITA INCOME ($)-- DISPOSABLE INCOME ($)--
MONETARY UNIT- East German Mark EXCHANGE RATE (1US$=) 2.35(March 1975)
TOTAL ENERGY R&D BUDGET (million $)--

TRANSPORTATION SYSTEM DESCRIPTION

East Germany's transportation system is extensive, and natural physical features offer few restraints to construction. There is easy access to all parts of the country by both rail and road. The roadway system consists of approximately 12,400 km of government-maintained trunk roads and 1,392 km of Autobahn (limited-access, divided highway). The railroad has 13,560 km of railroad lines, standard gauge and double track, with about 1,200 km electrified.

East Germany also has approximately 2,160 km of navigable rivers and 400 km of canals.

COUNTRY DATA--EAST GERMANY
DEMOGRAPHIC DATA PROFILE

CJB 29 MAR 78

LAND (million sq km)- 108,178
POPULATION (millions)- 16.95
LITERACY- 99%
LIVE BIRTHS/THOUSAND- 10.8
MEDIAN AGE/MALES- 38
AVERAGE FAMILY SIZE--
PRIMARY SCHOOL GRADS--
INDUSTRIAL WORKERS--
AGRICULTURAL WORKERS--
POPULATION GROWTH %- 0.2

ARABLE LAND (million sq km)- 62,743
POPULATION DENSITY (/sq km)- 1060
% RURAL POPULATION--
DEATHS/THOUSAND- 14.3
MEDIAN AGE/FEMALES- 40
NET MIGRATION (million/yr)--
SECONDARY SCHOOL GRADS--
PROFESSIONAL WORKERS--
COLLEGE GRADS--
UNEMPLOYED--

COUNTRY DATA--EAST GERMANY
PROFESSIONAL LABOR FORCE PROFILE

CJB 29 MAR 78

In 1971 the percentage distribution of qualified persons in the labor force was:

- University Graduates- 4.4%
- Technical College Graduates- 7.4%
- Senior Craftsmen (Meister)- 3.3%
- Skilled Workers- 43.1%
- Unskilled and Semi-skilled Workers- 41.8%

It should be noted that one of the priorities of the GDR government in its 1971 five-year plan Directive was to upgrade and reinforce the educational system, especially in providing scientific backgrounds for its energy-associated personnel.

COUNTRY DATA--EAST GERMANY
KEY TECHNICAL EDUCATIONAL RESOURCES

CJB 29 MAR 78

There are over 50 institutions of higher learning in East Germany. The major institutions include:

	LOCATION
Humbolt University (1809), (formerly Friedrich-Wilhelm University)	East Berlin
Karl Marx University, (formerly University of Leipzig)	Leipzig
Martin Luther University	Halle & Wittenberg
Friedrich Schiller University, (formerly University of Jena)	Jena
University of Rostock	Rostock
Ernst-Moritz-Arndt University, (formerly University of Greifswald)	Greifswald
Dresden Technical University	Dresden

In addition, there are approximately 47 other colleges whose primary purpose is to train technical personnel.

COUNTRY DATA--EAST GERMANY
ENERGY POLICY: BASIC LEGISLATION

CJB 29 MAR 78

1-During the 7th SED (Socialist Unity Party of Germany) Congress meeting in 1966, the need for implementing a nuclear energy program was recognized.
2-Law of planned development (1970) passed which imposed stringent controls for keeping air and water clean as well as reclaiming exhausted soil. Socialist Environmental Policy Group established by the Council of Ministers.
3-The Five-Year Plan for the Development of the National Economy of the GDR (1971-75)included provisions for development of the energy and power needs of the country through increased efficiency both for research technologies and daily use. Priority was given to the further development of the nuclear potential and the maximum use of raw materials. Provision also made for two additional VVER-440 reactors in the Greifswald plant and construction on a second power plant at Magdeburg.
4-Yearly national plans include energy policy and goals.

COUNTRY DATA--EAST GERMANY
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D CJB 29 MAR 78

EXECUTIVE--The Council of State as a collective body serves as the titular head of state, though in fact it has no effective power. The de facto power base lies with the Council of Ministers. The most important in terms of the development of energy policy are:

1-Ministry of Foreign Affairs--Oskar Fischer
2-Ministry of Science and Technology
3-Ministry of Coal and Energy
4-State Planning Commission
  a-Bureau of Standards
  b-Bureau of Invention and Patents
  c-DDR Bureau of Measurements
  d-DDR Bureau of Glass Instruments
  e-Bureau of Nuclear Research and Technology
5-DDR Research Council (responsible for overall direction of scientific research.

LEGISLATIVE--unicameral parliament (Volkskammer) with no effective power; essentially functions as a rubber stamp for communist party apparatus.

COMMUNIST PARTY (SED)--Executive power is directed through the Communist Party apparatus. The major organs for policy formulation are:

1-Secretariat
2-Politburo
3-Central Committee

The government system is composed of a complementing network of party leaders and administrative government personnel. Every position of power is held by an SED party member. Policy formulation is through the Politburo and the Secretariat of the Central Committee Policy is implemented through the Council of Ministers with the concurrence of the parliament. The main party officials include:

First Secretary--Erich Honecker
Chairman, Council of State--Willi Stoph
Chairman, Council of Ministers--Horst Sindermann
First Deputy Chairman, Council of Ministers--Guenter Mittag
First Deputy Chairman, Council of Ministers--Alfred Neumann
Secretary for International Relations--Hermann Axen
Secretary for Security Matters--Paul Verner
Chairman, State Planning Commission--Gerhard Schuerer
Chairman, Scientific and Technical Subcommittee
  of US-GDR Trade and Economics--Verner Srohn
Director, Central Committee Department
  of International Relations of GDR--Konrad Grote

COUNTRY DATA--EAST GERMANY
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/CJB 29 MAR 78

The Council of Ministers heads the organization for implementation of energy policy, and has responsibility for assigning the tasks to the appropriate ministries. The Ministries of Foreign Affairs, Science and Technology, and Coal and Energy bear the major burden for energy matters.

Other government bodies integrally involved in implementing policy include:
1-State Planning Commission (in contact with regional offices and directs Research Council)
2-National Research Council (responsible for the direction of all research)
3-Academy of Sciences (assigns specific research projects to the 100 member institutions, as well as to the other 2,200 scientific institutions and research centers in the country)

On all major research projects there is very close collaboration with the Soviet Union.

COUNTRY DATA--EAST GERMANY
ENERGY POLICY OBJECTIVES CJB 29 MAR 78

East Germany's energy policy objectives are based on the concept of providing maximum production at minimum cost. Included in the overall energy plan are conscious efforts to encourage industry to conserve energy in daily use. The major policy objectives include:

1-enhance production in the short-term through greater use of oil and lignite coal;
2-develop alternate sources of energy for present and future, specifically natural gas and nuclear;
3-conserve energy in existing production techniques;
4-increase R&D in scientific and technological disciplines to aid in modernizing existing production techniques;
5-apply advanced technology to improve efficiency in energy industries;
6-attain self-sufficiency.

Since 1966, heavy emphasis has been placed on nuclear power development, and it will probably continue given the probable phase-out of the USSR petroleum trade. The GDR currently imports 90% of the oil it uses.

COUNTRY DATA--EAST GERMANY
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY CJB 29 MAR 78

At the present time self-sufficiency is a distant reality. The GDR is deficient in natural resources and dependent on external sources. It is, however, striving to attain the greatest degree of self-sufficiency as possible through increased development of nuclear power as well as searching for alternate resources. Current emphasis is on the optimum use of existing resources in the most efficient manner possible. Conservation is also a high-priority item.

COUNTRY DATA--EAST GERMANY
INDIGENOUS ENERGY RESOURCES

CJB 29 MAR 78

NONRENEWABLE (NOTE 1)

	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
COAL (million tonnes)		30,200	Cobutz & Dresden Districts Halle and Leipzig; south
CRUDE OIL (million barrels)		5	
SHALE OIL (million tonnes)			
NATURAL GAS (billion cubic feet)		100	
URANIUM (thousand tonnes U3O8)			

RENEWABLE

HYDROELECTRIC (billion kwh/year)			
GEOTHERMAL (billion kwh/year)			

Note 1- East Germany, the world's largest producer and user of lignite and potash, has developed it as a major source of energy.

COUNTRY DATA--EAST GERMANY
PATTERNS OF ENERGY SOURCES AND USES

CJB 29 MAR 78

	CONSUMING SECTOR				
	HOUSEHOLD & COMMERCIAL	INDUS-TRIAL	TRANSPOR-TATION	ELECTRICAL GENERATION	TOTAL
COAL (million tonnes)	411	1043	951	1512	3917 (1975)
PETROLEUM PRODUCTS (million tonnes)	0	--	--	--	13.920 (1975)
NATURAL GAS (billion cu ft)	0	.108	0	.046	.154 (1974)
HYDRONUCLEAR (million tonnes)					.577 (1975)
ELECTRICITY (GWH)	24116	28340	1476	0	53932 (1975)

COUNTRY DATA--EAST GERMANY
PROJECTIONS OF DEMAND

CJB 29 MAR 78

RESOURCE	STANDARD PHYSICAL UNITS 1975	1985	2000	Trillion Btu 1975	1985	2000
COAL (million tonnes)	83.588	--	--	2.3		
OIL (million tonnes)	21.253	--	--	.6		
NATURAL GAS (million tonnes)	9.750	--	--	.3		
HYDRO/NUCLEAR POWER (million tonnes)	.577	--	--	.2		

COUNTRY DATA--EAST GERMANY
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS, AND EXPORTS CJB 29 MAR 78

RESOURCE	1975	%US	1985 (Note 1)	%US	2000 (Note 1)	%US
COAL (million tonnes)						
INDIGENOUS SUPPLY	30,200					
IMPORTS	10.144 (MMTce)					
EXPORTS	1.611 (MMTce)					
CRUDE OIL (million tonnes)						
INDIGENOUS SUPPLY	5 (mill. barr)					
IMPORTS	17					
EXPORTS	-					
NATURAL GAS (billion cu ft)	100					
IMPORTS	27.559 thousand teracalories					
EXPORTS	.645 thousand teracalories					

Note 1- Data for projections is unavailable. At the present time percentage of trade with the United States is negligible or nonexistent.

COUNTRY DATA--EAST GERMANY
ENVIRONMENTAL CONSIDERATIONS CJB 29 MAR 78

The Socialist Environmental Policy Group was established in the early 1970s to coordinate the work of environmental conservation. The group is presently headed by a Deputy Chairman of the Council of Ministers.

In 1970 action was taken to insure clean air and water, and in 1972 the chemical industry spent 270 million marks to combat pollution. In 1971, 137 million marks was spent on the treatment of water waste. In 1974 at the UN Ninth World Energy Conference, the GDR submitted various papers extolling the many efforts made within the country to safeguard the environment despite high priority energy production increases.

In the nuclear field precautions for the transportation of fuel elements are in accordance with the recommendations and rules of the IAEA and CEMA. An old salt mine near Morsleben was taken over in 1970 for use as a repository for solid and liquid radioactive wastes, and has a capacity to accommodate liquid wastes for several decades.

Environmental concerns do not seem to have in any way limited or obstructed the application of technological advances.

COUNTRY DATA--EAST GERMANY
COMMERCIAL APPLICATIONS

CJB 29 MAR 78

Commercial application of advances in the scientific and technological fields is one of the goals for development in the GDR. Between 1971-1975 GDR publications pointed out the failures of the system to encorporate advanced technology sufficiently (probably because of the lack of trained personnel). However, as time passed and education efforts succeeded, greater efficiency resulted in applying new technologies to productions systems.

Accordingly, application of new methods of production resulted in increased lignite production in 1974 and 1975; electrical power production increased from 4.8% in 1972 to 5.2% in 1975.

According to GDR statistics and impressions, the development and improvement of science and technology has greatly aided the attainment of development targets. Close cooperation with the USSR is emphasized.

Information on R&D progress in industry is distributed through organizations such as the Engineering Chamber, which has over 100,000 members including workers, scientists, technologists, and economists. Apart from this, there is no central body responsible for the overall coordination, collecting, and publishing of research reports.

COUNTRY DATA--EAST GERMANY
POWER PRODUCTION AND ENERGY CAPABILITY CJB 29 MAR 78

A specific breakdown of power capability is unavailable except for one specific district, Cottbus:

POWER STATION	CAPACITY	TURBINE CAPACITY (MW)
Trattendorf	450 MW	6x25;4x75
Luebbenau	1300 MW	6x50;10x100
Vetschau	1200 MW	12x100
Schwarze Pumpe	1050 MW	11x50;4x25;4x100
Boxberg-1st stage	1260 MW	6x210
Total	5260 MW	

Installed Nuclear Power Generating Capacity in 1976 was 1.0 mill.KWe
Rheinsberg- 70 MW VVERreactor
Greifswald- 2x440 MW VVERreactors (Nord 1 and 2) EXISTING
Greifswald- 2x440 MW VVERreactors -- PLANNED
Magdeburg- construction planned for second power plant

TYPE PLANT	POWER PRODUCTION
COAL	42,143 thousand tonnes coal equivalent, 1973
GAS	48,408 teracalories, 1973
OIL	15,703 thousand tonnes coal equivalent, 1973
GEOTHERMAL	80,493 thousand million KWh, 1975
HYDROELECTRIC	1,272 thousand million KWh, 1975

ENERGY PRODUCTION

SOURCE	OUTPUT LAST YR (1975)	RESERVES	TOTAL OUTPUT TO DATE
COAL MINES	247,263 thousand tonnes	30,200 million tonnes	
OIL WELLS	64 thousand tonnes	5 million bbls	
NATURAL GAS	21,878 teracalories	100 Mcft	
GEOTHERMAL SOURCES	83,235 KWh		
HYDRO SOURCES	1,270 KWh		

REFINING CAPACITY - Allegedly 10 refineries at 400,000 b/d

COUNTRY DATA--EAST GERMANY
ENERGY INDUSTRIES

CJB 29 MAR 78

The energy industries, as with any critical industry in a command economy, are controlled and operated by the government. Private enterprises are generally specialized and often act as subcontractors to the state industry.

Adequate information on the specific energy industries in the GDR is not available.

COUNTRY DATA--EAST GERMANY
ENERGY R&D: STATUS AND OUTLOOK CJB 29 MAR 78

The National Research Council is responsible for overall direction of scientific research, while the Academy of Sciences assigns projects to the various research institutions. The basic philsosphy guiding scientific research is that it should meet the needs of society by contributing to economic growth.

Numerous national documents relating to the state of the economy delineate the importance of increased R&D to help maximize the use of existing raw materials; help develop more efficient alternative energy resources (nuclear energy); and maintain increased growth with decreased energy needs.

Additionally, under existing conditions, R&D efforts focus on improving extracting methods (lignite), developing safe and effective nuclear electric capacity and production, and maintaining open cooperation with the USSR in expanding R&D projects.

R&D is considered a high priority item by the Communist Party apparatus.

COUNTRY DATA--EAST GERMANY
ENERGY R&D: BUDGET

CJB 29 MAR 78

Basic funding for R&D comes primarily through two sources:
- 40% from the Ministry of Science and Technology
- 60% from Industrial Ministries and Universities

In 1972 the research and development potential was expanded according to plan, with a total of 5,200 million marks spent for this purpose. Additionally a total of 18,400 million marks were invested in the industrial field, a 4% increase over the year before. These increases include a 31% increase for the Ministry for Coal and Energy and 14% increase for light industry.

COUNTRY DATA--EAST GERMANY
ENERGY R&D: PRIORITIES CJB 29 MAR 78

The most definitive statement on R&D priorities was released in a section of the Directive of 8th Party Congress (SED) as part of the Five-Year National Economic Plan. The top priorities are:

1-Concentrate on the development of technologies that have the optimum existing use value at the lowest possible cost by using GDR raw materials;
2-Develop more efficient means of recovering and processing raw materials (i.e., lignite, natural gas);
3-Further develop production plants, machines and apparatus as well as power station equipment, electronic apparatus, and standardize parts;
4-Research on energy production, conversion and transmission;
5-Concentration on exploration, development and use of domestic natural resources;
6-Increase and stabilize the generation of electricity by using lignite power stations;
7-Develop big block units supplied by open-case mines equipped with modern means of extraction and conveyance;
8-Install and activate additional nuclear power station plants;
9-Use modern gas turbines to increase stable supply of electrical energy in cases of short-term load fluctuations.

COUNTRY DATA--EAST GERMANY
GOVERNMT. SUPPORTED ENERGY R&D IN IND., UNI. & NAT LABS CJB 29 MAR 78

Government support is directed through the State Planning Commission, implemented by the Research Council of the GDR. All R&D is to be structured to support the State Plan for Economic Growth. The government supports R&D efforts in all aspects and phases of the economy, whether private, collective, state run or a combination. Ultimately, all contracts are dispersed by the Research Council of the GDR.

Heavy emphasis is placed on University research, industry laboratories, and to a lesser extent small private research activities.

Fundamental research in Energy is the sole task of:
1-DDR Academy of Sciences in Berlin
2-Saxony Academy of Sciences
3-Leopolding Academy of Natural Sciences

COUNTRY DATA--EAST GERMANY
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS CJB 29 MAR 78

East Germany is a member of the International Atomic Energy Agency and the Council for Mutual Economic Assistance. The latter helps in coordinating R&D programs in areas such as: electrical energy, nuclear energy, and nuclear engineering.

COUNTRY DATA--EAST GERMANY
ASSESSMENT OF INTERNATIONAL ACTIVITIES CJB 29 MAR 78

To date, GDR international activities have focused on trade with other Eastern European countries, primarily those in CMEA and with the Soviet Union. The GDR does, however, have economic, scientific, and technological links with Egypt, Syria, Iraq, Algeria, Yemen, Sri Lanka, Guinea, the Congo and Chile.

The GDR has historically been dependent on the Soviet Union for 90% of its oil imports. The supply is assured at least through 1990, though overt pronouncements indicate that it may not be guaranteed beyond that date. The general feeling is that the GDR will have to look elsewhere for alternate sources of oil.

It is expected that as it expands its dependence on nuclear energy, the GDR will become more active internationally--particularly in the nuclear field. Assistance may be sought outside of the Eastern European bloc.

COUNTRY DATA--EAST GERMANY
KEY REFERENCES

CJB 29 MAR 78

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2-The GDR's National Economic Plan and How It Was Fulfilled in 1972, GDR publication.	IA
3-The Results of the 1974 Plan are the Basis for Further Advance along the Path Chartered by the 8th SED Congress, GDR publication, 1975.	IA
4-A Successful Year of Economic and Social Development, GDR publication, 1976.	IA
5-Area Handbook For East Germany. Washington, D.C.: American University Press, 1972.	--
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8-UN Statistical Yearbook 1976. Statistical Office, Department of Economic and Social Affairs, 28th issue, New York: United Nations, 1977.	--
9-Unpublished Department of Energy documents, 1977.	IA
10-Background Notes: German Democratic Republic, Department of State publication. Washington, D.C.: Government Printing Office, May 1975.	IA

COUNTRY DATA--EAST GERMANY
NOTES AND EVALUATIONS

CJB 29 MAR 78

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2-The GDR's National Economic Plan and How It Was Fulfilled in 1972, GDR publication. (2A; 3A; 3H; 4A; 4B; 4D; 5B)	IA
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18-UN Demographic Yearbook, 1975. New York: United Nations, 1976. (1B)	--

WENDS COUNTRY DATA

GW: WEST GERMANY

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COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ECONOMIC DATA PROFILE

DLR 12 JAN 78

GNP (1975, billion $)-423
PER CAPITA INCOME ($)-
EXPORTS (1975, billion $)-90
MONETARY UNIT-Duetsche Mark
TOTAL ENERGY R&D BUDGET (1977, million $)-601.2

INFLATION RATE-
DISPOSABLE INCOME-
IMPORTS (1975, billion $)-75
EXCHANGE RATE (1US$=)-2.36 DM

TRANSPORTATION SYSTEM DESCRIPTION

Frankfurt's international airport is a center of European air traffic. There are a number of international express trains. Germany has an extensive network of roads. Express highways (Autobahnen) connect most major cities. Mass transportation facilities are crowded but efficient.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ENERGY POLICY: BASIC LEGISLATION DLR 10 JAN 78

1-Atomic Energy Law regulates licensing procedures for nuclear facilities, transportation conditions for radioactive materials and other nuclear matters.
2-Radiation Protection Law.
3-Energy conservation law requires improved heat insulation and the rational use of heating installations in houses.
4-The third law on the use of hard coal by electric power stations ensures that the share of domestic coal used in generating electricity remain of sufficient volume to secure electric power supplies.
5-Energy Industry Act ensures that utilities meet the actual energy demand at favorable overall costs.
6-Law on investment aids for energy conservation measures in old buildings.
7-Various environmental protection laws.

The Second Revision of the Energy Policy Program, scheduled for later 1977 will include legislative and administrative measures in the areas of:

1-enforced information for industry and consumers
2-labelling of household machines
3-accelerated introduction of energy conservation technologies, products and processes
4-enforced use of waste heat of power stations in connection with district heating
5-additional investments for energy conservation in old buildings
6-information for consumers in the transportation area and a revised automobile tax

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DLR 11 JAN 78

LEGISLATIVE-PARLIAMENT

Federal laws are passed by a legislative body known as the Bundestag which is composed of 496 elected representatives. The Parliament has three committees which monitor energy activities within their jurisdiction as follows:

1-Economic matters
2-Research and technology
3-Internal affairs (including reactor safety)

The FEDERAL ASSEMBLY composed of members of the Bundestag and representatives of the member states of the Republic meets only to elect the FEDERAL PRESIDENT (Walter Scheel) who represents the Republic in international relations.

EXECUTIVE-FEDERAL CHANCELLOR (Helmut Schmidt) is elected by Parliament on the proposal of the President and heads the cabinet composed of FEDERAL MINISTERS.

The following Ministries have energy responsibilities:

MINISTRY	RESPONSIBILITY	KEY INDIVIDUALS
Research and Tech. (BMFT)	Energy R&D; advanced reactor systems, reactor safety, fuel cycle, administration of the German nuclear institutes, non-nuclear energy.	Hans Matthofer Minister
Economic Affairs	Energy policy and analysis, mineral resources, petroleum, electricity, nuclear power, coal, hydropower, stockpiling, IAEA and OECD affairs.	Hans Friderrich Minister
Interior (BMI)	Safety of nuclear facilities, radiation protection, nuclear regulation, environmental affairs.	Werner Maihofer Minister

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ENERGY POLICY AND OBJECTIVES DLR 11 JAN 78

Energy policy in the Federal Republic of Germany rests on the conviction that fundamental energy policy decisions of all countries can only be taken efficiently in the context of worldwide developments in the energy field and in a long-term perspective. Thus, the Government highly advocates close cooperation at the international level in solving world energy problems.

The overall energy policy is outlined in the Energy Policy Program of 1973. A first revision was published in 1974 and a second revision was scheduled for late 1977. The basic energy policy issues of the second revision were approved by the Government in March 1977. The major goals are:

1-Reduction of oil use in energy consumption in order to reduce the risks of supply interruptions.
2-Enforced energy conservation in order to diminish the growth of energy consumption.
3-Maintenance of current production capacity of coal mining and provision for coal use in power stations.
4-Continued installation of nuclear power with safety of the population receiving priority.
5-Continuation of research in the energy field in order to improve the long-term condition of the above goals.

The energy program lays particular emphasis on nuclear energy, which is described as indispensable in meeting Germany's long-term energy needs. However, Germany's nuclear program has encountered increasingly effective opposition during the last 2-3 years, focused primarily on concern over nuclear waste management. A state court has challenged the constitutional right of the Federal Government to license reactors. The matter is now under review by the German Supreme Court. The net result of opposition has been the cancellation, deferral or legal delay of many reactor projects.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY DLR 11 JAN 78

Although the Federal Republic of Germany cannot realistically hope to achieve self-sufficiency in its total primary energy requirements, it hopes to:

1-Diversify the sources of energy.
2-Maintain good bilateral relationships with oil producers.
3-Share the risk by cooperating in IEA programs.

Although it is encountering opposition, nuclear energy is expected to account for the following percentages of total electric power generated:

1975 - 5%
1980 - 25%
1985 - 45%

These increases in nuclear energy usage will be instrumental in the following reduction in the percent of primary energy supplied by petroleum:

1973 - 55% (95% imported)
1985 - 45%
1990 - 42%

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
INDIGENOUS ENERGY RESOURCES

DLR 12 JAN 78

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVE
COAL (million tonnes)	99521	40472	
CRUDE OIL (million tonnes)	--	45	
NATURAL GAS (billion cubic feet)	--	7500	
URANIUM	see note 1		Menzenschwand, Murgtal, Belchen, Feldberg
RENEWABLE			
HYDROELECTRIC	see note 2		Danube, Rhine, Elbe and Weser Rivers

NOTE 1: Reserves are estimated to total between 10,000 and 160,000 tonnes of U_3O_8

NOTE 2: As of 01 JAN 77, hydroelectric capacities were as follows:

Operating	2940 MW
Under construction	215 MW
Planned	1253 MW

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
PATTERNS OF ENERGY SOURCES AND USES

DLR 11 JAN 78

CONSUMING SECTOR-1975

	INDUSTRIAL	TRANSPORTATION	ELECTRICAL GENERATION	OTHERS	TOTAL
COAL (million tonnes)	13.0	0.3	-	5.2	18.5
PETROLEUM (million tonnes)	37.8	31.7	-	44.2	113.7
NATURAL GAS (trillion cu. ft.)	0.5	0	-	0.3	0.8
NUCLEAR (billion kWh)	0	0	59.8	0	59.8
HYDROELECTRIC (billion kWh)	0	0	44.5	0	44.5
UTILITY ELECTRICITY DISTRIBUTED (billion kWh)	138.3	7.0	-	112.5	257.8

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
PROJECTIONS OF DEMAND

DLR 11 JAN 78

RESOURCE	STANDARD PHYSICAL UNITS			MTOE		
	1975	1985	2000	1975	1985	2000
COAL (million tonnes)	50.9	53.9	(a) 64.3 (b) 69.8	72.7	77.0	(a) 91.9 (b) 99.8
CRUDE OIL (million tonnes)	128.1	156.0	(a) 179.0 (b) 208.9	128.1	156.0	(a) 179.0 (b) 208.9
NATURAL GAS (trillion cu. ft.)	1.3	2.4	(a) 2.4 (b) 2.5	34.5	63.0	(a) 63.1 (b) 65.5
NUCLEAR (trillion kWh)	0.1	0.5	(a) 2.1 (b) 2.6	5.1	46.0	(a) 179.2 (b) 224.8
HYDROELECTRIC (billion kWh)	41.0	93.8	(a) 41.0 (b) 41.0	3.5	8.0	(a) 3.5 (b) 3.5
OTHER (Mtoe)	-	-	(a) 1.1 (b) 1.1	-	-	(a) 1.1 (b) 1.1

Figures for year 2000 are (a) Low Case and (b) High Case estimates calculated from the National Data Appendix for the Final Report on Phase I, IEA Systems Analysis Studies.

COUNTRY DATA --FEDERAL REPUBLIC OF GERMANY
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS AND EXPORTS DLR 11 JAN 78

RESOURCE	1975	1985	2000-a	2000-b
COAL (million tonnes)				
INDIGENOUS SUPPLY	62.0	58.1	71.1	76.7
NET IMPORTS	-6.1	-4.2	-6.8	-6.8
CRUDE OIL (million tonnes)				
INDIGENOUS SUPPLY	5.7	5.0	1.5	1.5
NET IMPORTS	122.5	152.0	177.5	208.9
NATURAL GAS (trillion cu ft)				
INDIGENOUS SUPPLY	0.6	0.5	0.6	0.6
NET IMPORTS	0.7	1.9	1.7	1.8
HYDROPOWER (billion kWh)				
INDIGENOUS SUPPLY	41.0	46.9	41.0	41.0
NET IMPORTS	--	--	--	

Figures for year 2000 are (a) Low Case and (b) High Case estimates calculated from the National Data Appendix for the Final Report on Phase I, IEA Systems Analysis Studies.
--not available

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
COMMERCIAL APPLICATIONS DLR 12 JAN 78

In the Government's plan to involve industry at a very early stage of R&D, a market-oriented development of the technologies should be achieved, thus facilitating the transfer of the results to commercial use. Specific measures to facilitate energy R&D and application in the private sector include:

1-Tax incentives and subsidies of up to 30% for R&D activities. The cost-sharing between government and industry varies depending on how fast the transfer of results into commercial use can be expected.
2-Use of new energy technologies for the construction of public buildings.
3-Large-scale investigations to enable industry to assess the chances for market penetration of new major technologies.
4-Funding research centers which carry out, among other things, R&D on request of small- and medium-sized enterprises.
5-Public information projects on energy-saving possibilities in the residential sector.
6-Dialogue between public and government on general energy problems and nuclear power in particular.

For the time being, major impediments in enhancing energy R&D and commercial applications exist in the case of nuclear power. A strong public debate on the pros and cons of this new energy source has caused considerable delays in the construction of many nuclear facilities. In the non-nuclear area, financial and economic aspects are predominant impediments for increasing R&D activities.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ENERGY R&D: STATUS AND OUTLOOK DLR 16 JAN 78

In April 1977 the Government launched a comprehensive Program for Energy Research and Energy Technologies 1977-1980. The program combines and continues the two previous energy research programs, the Fourth Nuclear Program 1973-1976 and the Non-Nuclear Energy R&D Program 1974-1977.

NUCLEAR
The Government stated that the priorities in the nuclear energy sector are reactor safety, the nuclear fuel cycle and advanced reactor systems. Nuclear energy is meeting a growing proportion of demand for electric energy. At the end of 1977 just under 10,000 MW were on-stream, approximately another 10,000 MW are under construction. Main R&D items are the fast breeder, high temperature gas cooled reactor, reactor safety research, reprocessing and radioactive waste management. The focal point of the fast breeder program is the 300 MW SNR-300 plant under construction at Kalkar. A strong public debate on the pros and cons of nuclear energy is currently causing considerable delays in the progress of nuclear power development.

COAL
FRG possesses sizeable reserves of hard coal and lignite. Mainly for geological and technical reasons, production costs are high. However, the Government has committed itself to maintain the production capacity for hard coal at 94 million tonnes per year and to subsidize construction and operation of coal-fired power plants. Optimum use of domestic coal is viewed as an important element in securing national energy supply. R&D is aimed at coal gasification and liquefaction, improvement in mining techniques and environment-oriented production methods.

SOLAR
FRG has considerable solar energy potential. However, for economical and technical reasons, exploitation is presently limited. Technologies For Use of Sun Energy 1977-1980 is an R&D program designed to reduce these constraints. R&D is being conducted in solar electricity, solar heating, marketing, systems analysis studies and development of standards for commercialization.

WIND
More knowledge is needed to assess wind potential. Therefore, demonstration and pilot facilities are planned for construction, the largest with an electric power output of 1-3 MW. A large part of the national program will be carried out within the IEA.

HYDRO AND GEOTHERMAL
All appropriate rivers and lakes for generating energy are already used. Several smaller hydro plants are under construction in connection with the Rhine-Main-Danube Canal which will be completed in the early 1980's. FRG is pursuing geothermal R&D mainly through the IEA framework. The hot dry rock method appears to hold the most potential.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ENERGY R&D: STATUS AND OUTLOOK DLR 16 JAN 78
CONSERVATION

Conservation has received much less attention than supply. R&D includes systems studies, energy-saving designs for houses, heat pumps, heat recovery, heat storage and materials for heat insulation and storage.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ENERGY R&D: BUDGET

DLR 11 JAN 78

	MILLIONS $US 1977
CONSERVATION	22.0
OIL AND GAS	5.5
Enhanced oil	(1.7)
Oil shale and tar sands	(0.8)
Others (including gas)	(3.0)
COAL	72.0
Coal combustion	(19.9)
Coal conversion	(32.6)
Others	(19.5)
NUCLEAR FISSION	270.7
LWR, reactor safety	(63.9)
HTR	(74.3)
Fuel cycle	(132.5)
SOLAR	11.0
WIND	2.5
GEOTHERMAL	0.9
FAST BREEDER	158.1
NUCLEAR FUSION	35.1
OTHER SOURCES	0.6
SUPPORTING TECHNOLOGIES	22.9
TOTAL GOVERNMENT ENERGY R&D BUDGET	601.2

Exchange rate used is 2.36 Deutsche Marks to 1 US dollar.
Fiscal year equals calendar year.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ENERGY R&D: PRIORITIES DLR 12 JAN 78

The establishment of priorities for various energy technologies is mainly based on the energy demand structure of the Federal Republic of Germany and the small domestic resource base of raw energy materials. It also takes into account the country's ability to handle more advanced technologies and the dependence of the German economy on highly developed technical products. The Government stated that when establishing priorities for energy R&D activities the FRG did not intend to limit itself to fostering techniques that will be needed primarily by the FRG and comparable industrial countries, but took also into account the need of the Third World for energy technologies meeting their special demands and circumstances. In giving consideration to this goal and to the situation prevailing in the FRG, the Program for Energy Research and Energy Technology indicates the following priorities:

1-Rational energy use in application and secondary energy sectors
2-Coal and other primary energy sources
3-New energy sources
4-Nuclear energy

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
GOV'T SUPPORTED ENERGY R&D IN IND, UNIV AND NAT'L LABS DLR 12 JAN 78

Major non-government organizations for energy R&D are research centers privately organized but funded 90% by the Federal Government and 10% by the government of the respective Federal States.

ORGANIZATION	PROGRAM AREAS
Nuclear Research Center at Karlsruhe (GFK)	Fast breeder, reactor safety, physical protection, reprocessing, waste conditioning, final storage, super conductors, fusion
Nuclear Research Center at Julich (KFA)	High temperature reactors, coal gasification, new secondary energy systems, fusion
Research Center at Geesthacht (GKSS)	Nuclear safety, nuclear ship propulsion, off-shore technology
Research Center for Aviation and Space Sciences (DFVLR)	Solar energy, wind energy
Research Center for Environmental Science (GSF)	Final storage of radioactive waste
Plasma Physics Institute of the Max Planck Society (IPP)	Center of the German fusion research activities
Society for Reactor Safety	Carries out and coordinates reactor safety R&D

Research on energy conducted at universities is focused primarily on basic problems.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 12 JAN 78

The German nuclear reactor industry, entirely private, includes the following companies:

COMPANY	PROGRAMS
KWU (Kraftwerk Union AG)	Development and design of nuclear and conventional power stations and steam and gas turbines
INTERATOM (Internationale Atomreaktorbau GmbH)	Development of the sodium cooled fast breeder reactor
INB (Internationale Natrium-Brutreakor Bau GmbH)	Overall development of LMFBR technology
NUKEM GmbH	Conversion of enriched uranium hexafloride to oxide, production of MTR fuel plates and uranium elements, reprocessing of spent fuel
ALKEM GmbH	Development and production of plutonium fuel elements
RBG (Reactorbrennelemente GmbH)	Conversion of uranium hexafloride to uranium dioxide, production of uranium oxide fuel elements

In addition, some industrial institutions exist in the areas of coal and electricity generation carrying out specific energy R&D projects.

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
INVOLVEMENT IN INTERNATIONAL ENERGY ORGANIZATIONS DLR 12 JAN 78

ORGANIZATIONS	AREAS OF INVOLVEMENT
IAEA	Technical aid, training programs, safeguards
NEA	Reprocessing, waste, uranium production and demand
EUROCHEMIC	Reprocessing, waste
IEA	See below
EEC	Nuclear safety, fusion, waste, hydrogen, safeguards, solar
CCMS	Solar and geothermal, conservation

DETAIL ON INTERNATIONAL ENERGY AGENCY

The following IEA Implementing Agreements have been signed by Germany:

TECHNOLOGY AREA	LEVEL OF SUPPORT-1977 (Estimates in 1000 $US)
COAL	
Technical Information Service	227
World Coal Reserves and Resources Data Bank	296
Mining Technology Clearing House	55
Economic Assessment Service	152
Fluidized Bed Combustion Project	8,946
Coal Gasification	7,200
Coal Liquefaction Fuels Refining	10,000
Coal Hydrogen	Information exchange
NUCLEAR POWER	
Exchange of Technical Information on Nuclear Reactor Safety	Information exchange
SOLAR HEATING AND COOLING	
Performance of Systems	125
R&D Coordination on Components	75
Testing Collectors	262
Instrumentation Package	105
Use of Meteorological Information	75
SMALL SOLAR POWER	
Design of two 500 KW power stations	208
WIND	
Cooperation in Large Scale Wind Energy Conversion Systems (WECS)	4,000
Environmental and Meteorological Aspects of WECS	52
Integration of Wind Power	86
Rotor Stressing of Large-Scale WECS	156
GEOTHERMAL	
Man-made Geothermal Energy Systems	120
CONSERVATION	
Project Demonstrating Energy Conservation Applications to Building Complexes	2,116
Energy Cascading	135
Heat Pumps	50
TOTAL	34,433

COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
KEY REFERENCES

DLR 16 JAN 77

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COUNTRY DATA--FEDERAL REPUBLIC OF GERMANY
NOTES AND EVALUATIONS

DLR 16 JAN 77

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3-ERDA Telegram from Ministry of Research and Technology FRG, FEB 76. (5A, p.3; 5B, p.3)	IA
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17-Base Document:Germany, Committee on Energy Research and Development, National Energy R, D and D Program Reviews, IEA, 22 SEP 77. (2A, p.3, 6; 3A, p.2; 3D, table 1; 3E, table 1; 3F, table 1; 3H, p.13, 18-20; 4A, p.4, 7-13, 20; 4B, table 2; 4C, p.4-5; 4E, p.17; 4F, p.18; 5A, p.20-21)	IA
18-Vener to Sievering Memorandum on Items of Possible Interest, 30 SEP 77. (5B)	IA
19-The Role of Foreign Governments in the Energy Industries, Office of International Affairs, Dept of Energy, OCT 77. (3A, p.133; 4F, p.132; 5B, p.134)	IA
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21-Vener, R.E., DOE Scientific Representative, Bonn, Germany, Monthly Report, 01 NOV 77. (5B)	IA

WENDS COUNTRY DATA

GR: GREECE

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COUNTRY DATA--GREECE
ECONOMIC DATA PROFILE

DLR 20 OCT 77

GNP (1974, $Million)-18000
PER CAPITA INCOME (1974, $)-2000
EXPORTS (1974, $Million)-1800
IMPORTS (1974, $Million)-4700
MONETARY UNIT-drachma
EXCHANGE RATE /US$ - 35 drachmas

TRANSPORTATION SYSTEM DESCRIPTION

Main streets in Athens and the main highways in Greece are macadam, but secondary roads are sometimes rough and ungraded. Foreigners who wish to drive must have an international driver's license. The international car insurance card is valid if Greece is listed on the card.

Except for rush hours, the bus system provides adequate, inexpensive local transportation. Taxis are plentiful and rates are reasonable.

COUNTRY DATA--GREECE
ENERGY POLICY: BASIC LEGISLATION DLR 21 OCT 77

1-Greek Atomic Energy Commission reorganized 1968.

2-Office for Scientific Research and Development established 1971 for purpose of funding research projects in all fields of activity. This law is presently under revision and the above Office will be replaced by the new Science and Technology Administration.

3-National Energy Council established 1975.

4-Guidelines for the exploration and exploitation of hydrocarbons outlined 1975.

COUNTRY DATA--GREECE
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DLR 25 OCT 77

LEGISLATIVE-a unicameral Parliament called the Vouli consists of 300 members.

EXECUTIVE-in the final analysis the Prime Minister (Constantine Caramanlis) is accountable to Parliament for formulation and implementation of energy policy in Greece. In practice, however, the Ministry of Coordination and Planning (Panayotis Papaligouras) exercises the key role in the determination of energy programs, with the Ministry of Industry (Constantine Konofaghos), and of Culture and Sciences (Constantine Trypanis) playing subsidiary roles.

The National Energy Council (NEC) was created in 1975 to strengthen and coordinate the energy planning function and its Secretariat is in the Ministry of Coordination.

COUNTRY DATA--GREECE
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 25 OCT 77

MINISTRY OF INDUSTRY
MINISTER-Constantine Konofaghos

Under its jurisdiction are the following:

NATIONAL PETROLEUM SERVICE--controls local refining and petro-petroleum product distribution.

PUBLIC PETROLEUM CORPORATION--semi-governmental agency responsible for the identification and development of domestic petroleum resources

PUBLIC POWER CORPORATION(PPC)--semi-governmental electric power utility reports nominally to the Ministry of Industry, but presently major decisions are more likely to be cleared through the Ministry of Coordination. In addition to producing virtually all electric power, the PPC is planning future energy production and performing research on the local development of hydro, lignite, geothermal and nuclear power.

MINISTRY OF CULTURE AND SCIENCES
MINISTER-Constantine Trypanis

Under its jurisdiction are the following:

GREEK ATOMIC ENERGY COMMISSION--responsible for nuclear safeguards and licensing.

DEMOCRITUS RESEARCH CENTER--operates a small nuclear research program, participates in a uranium exploration project with the U.N. Development Program in northern Greece, and is following overseas research in solar energy.

NATIONAL INSTITUTE OF GEOLOGICAL AND MINERAL RESEARCH--semi-governmental agency which is responsible for mineral prospecting and research, including lignite.

COUNTRY DATA--GREECE
ENERGY POLICY AND OBJECTIVES

DLR 25 OCT 77

The Greek Government has not yet explicitly defined an overall energy R&D policy and its objectives. New legislation for defining and implementing national programs for research, development and demonstration for science and technology, in general, is under preparation.

The keystone of current policy is minimization of dependence on foreign energy resources, through the rapid identification and development of local energy sources, especially lignite and oil.

COUNTRY DATA--GREECE
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY DLR 25 OCT 77

Greece relies entirely at present on imports for oil requirements and liquid fuels which account for about 75 percent of primary energy inputs. Hope for increased self-sufficiency in the future is based on the recent discovery of oil and natural gas near Thassos. As the result of accelerated development, the share of indigenous supply to meet the increasing demand is expected to grow from 24.2 percent in 1975 to 40.2 percent in 1985.

COUNTRY DATA--GREECE
INDIGENOUS ENERGY RESOURCES

DLR 26 OCT 77

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
LIGNITE (million tons)	--	2	Megalopolic and Ptolemais
OIL (million tons)	--	11.4	Thassos Island
NATURAL GAS (see note below)	--	--	Thassos Island Nestos River Delta
RENEWABLE			
HYDROELECTRIC (thousand GWH/yr)	20.7	15.6	West Sterea

NOTE: The extent and commercial feasibility of newly discovered deposits have not yet been determined.
--not available

COUNTRY DATA--GREECE
PATTERNS OF ENERGY SOURCES AND USES

DLR 26 OCT 77

CONSUMING SECTOR

	INDUSTRY	TRANSPORT	OTHERS	TOTAL
SOLID FUELS	0.7	0	0	0.7
OIL	1.9	2.1	2.0	6.0
ELECTRICITY	0.7	0	0.5	1.2
TOTAL	3.3	2.1	2.5	7.9

All figures are for 1975 and all units are in million tonnes of oil equivalent (Mtoe).

COUNTRY DATA--GREECE
PROJECTIONS OF DEMAND

DLR 26 OCT 77

MILLION TONNES OF OIL EQUIVALENT

RESOURCE	1975	1985
SOLID FUELS	2.9	8.5
OIL	8.6	14.7
HYDRO	0.5	1.2
TOTAL	12.0	24.4

COUNTRY DATA--GREECE
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS AND EXPORTS DLR 26 OCT 77

RESOURCE	Million Tonnes of Oil Equivalent 1975	1985
OIL		
INDIGENOUS SUPPLY	0	1.3
NET IMPORT	7.1	13.4
COAL		
INDIGENOUS SUPPLY	2.4	7.3
NET IMPORT	0.6	1.2
HYDRO		
INDIGENOUS SUPPLY	0.5	1.2

COUNTRY DATA--GREECE
COMMERCIAL APPLICATIONS

DLR 26 OCT 77

Major impediments in the way of enhancing industrial energy R&D activities in Greece are derived, first, from the general shortage of capital and reduced investments in the present economic climate. Secondly, R&D has been considered up to now as a high risk activity by industry, and has traditionally yielded a low return. Finally, various existing price controls create disincentives for investing in energy conservation R&D insofar as price ceilings in some industries are set as a rigid function of historical cost.

Environmental concerns, and public acceptance factors have not constituted important impediments up to the present time.

COUNTRY DATA--GREECE
ENERGY R&D: STATUS AND OUTLOOK DLR 27 OCT 77

HYDROPOWER

Current production is about 2 billion KWh (roughly 14% of estimated potential), and current installed capacity is 1400 MW. Plans call for installation of additional units totalling 1300 MW. However, new units are designed only to service peak loads, and the overall share of water-generated power is expected to remain roughly at current levels through 1980 (11-13%).

NATURAL GAS

Deposits have been found near Thassos Island, but the extent and commercial feasibility have not yet been determined. National Energy Commission (NEC) has proposed a feasibility study on economic implications of natural gas imports into Greece and on intensified exploration for indigenous deposits. NEC officials have indicated that natural gas will have an increasing role in meeting energy requirements. In the first phase, imported and possibly indigenous gas would be used as fuel by a small number of major industrial units. Subsequently, plans call for expansion of the natural gas distribution network to serve household fuel requirements.

NUCLEAR

Greece's first nuclear power plant, which would add 600 MW to the electric generating capacity is scheduled to begin construction in 1980 and production in 1986. The site of the plant will be announced in 1977. The plant will provide 2% of Greece's generated power during its first year of operation, with a gradual increase to 9%. If successful, planners are considering subsequent construction of additional nuclear units and view nuclear power as the natural successor to lignite as Greece's main source of electric power.

COAL

Government policy is to use known large deposits of lignite and peat for electricity generation, and to promote local industrial uses or in situ conversion for the existing smaller deposits. Plans include the installation by 1985 of eight new 300 MW lignite units. The role of lignite in power generation is expected to increase from 55% in 1976 to 66% in 1990. Recent assessments indicate lignite resources can support the existing plants, plus the eight units scheduled for operation by 1985, until about 2020, after which they will be depleted.

OIL

Oil was discovered off the coast of Thaos in 1973 and with the most recent estimates, annual production of 25,000 b/d in 1985 is expected, pending further exploration and development of the fields. In addition, onshore exploration is being conducted in the Nestos River Delta. Use of oil is expected to increase from 61 million barrels per year in 1975 to 90 million barrels in 1980.

SOLAR

Greece has a goal to cover 4% of the country's energy requirements by 1985 through solar energy, mainly through the installation of solar systems for heating water. By the year 2000 the target is 15%. A pilot community which would use solar energy for power, heat, irrigation and water supply is being considered.

COUNTRY DATA--GREECE
ENERGY R&D: STATUS AND OUTLOOK (CONT) DLR 27 OCT 77

GEOTHERMAL

Exploration has been conducted at several places, and two wells have been drilled. Tests are under way to determine their potential.

COUNTRY DATA--GREECE
ENERGY R&D: BUDGET

DLR 27 OCT 77

KNOWN PROJECTS	IN MILLIONS OF U.S. DOLLARS 1976
Public Power Corporation	
LIGNITE EXPLORATION	6.5-7.0
GEOTHERMAL EXPERIMENTATION	.5
NUCLEAR POWER PLANT PLANS	.5
Public Petroleum Corporation	
EXPLORATORY DRILLINGS	4.0
Democritus Research Center	
NUCLEAR RESEARCH	.5
URANIUM EXPLORATION	.8

Fiscal year corresponds to calendar year; rate of conversion $1 equals 35 drachmas.

COUNTRY DATA--GREECE
GOV'T SUPPORTED ENERGY R&D IN IND, UNIV AND NAT'L LABS   DLR 27 OCT 77

INDUSTRY	PROGRAM AREA	KEY INDIVIDUAL
Public Power Corporation	Lignite exploration, hydro development, geothermal, nuclear feasibility	Dr. Angelopoulos Governor
Public Petroleum Corporation	Oil and natural gas development	
LABORATORIES		
Democritus Research Center	Uranium exploration, nuclear research	
UNIVERSITIES		
University of Patras	Solar cells and collectors	

COUNTRY DATA--GREECE
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 27 OCT 77

The role of private industry in the energy sector has been limited. Activities in industry are concentrated in production methods and technology for energy conservation with some minor activity in solar technology development.

COUNTRY DATA--GREECE
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS   DLR 27 OCT 77

ORGANIZATION	DEGREE OF INVOLVEMENT
IAEA	Active
IEA	$50,000 in 1977
Cooperation Mediterranceene Pour L'Energie Solaire (COMPLES)	Active
International Solar Energy Society	Active

COUNTRY DATA--GREECE
KEY REFERENCES

DLR 27 OCT 77

	LOCATION
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COUNTRY DATA--GREECE
NOTES AND EVALUATIONS

DLR 27 OCT 77

	LOCATION
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2-Greece Atomic Energy Program Summary, September 1973 (5B, p.4)	IA
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4-State Dept. Background Notes on Greece, March 1976 1A, p.1, 6; 2B, p.1, 4-6)	--
5-State Dept. Telegram 00905 from AMEMBASSY ATHENS 28 JAN 77 Unclassified (3C, 2 of 2 p.1, 4; 4A, 2 of 2 p.1, 3-4, 1 of 2 p.4)	IA
6-Standing Group on Long-Term Co-operation: Review of Greece, IEA, 01 MAR 77 (3F, p.6; 4A, p.3)	IA
7-Energy R and D National Programme Reviews: Base Document, Greece, Committee on Energy Research and Development, IEA, 30 SEP 77 (2A, p.5-6; 2B, p.3-4; 3A, p.5; 3B, p.3; 3C, p.1; 3D, p.2; 3E, p.2; 3H, p.10-11; 4A, p.7-8; 4F, p.9, 5A, p.11)	IA

-References thus indicated are generally available at public libraries

WENDS COUNTRY DATA

GV: GUINEA

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COUNTRY DATA--GUINEA
ECONOMIC DATA PROFILE

CAV 09 MAR 78

GNP (current million $)-700
PER CAPITA INCOME ($)-150
EXPORTS (million $)-272
MONETARY UNIT-Syli
TOTAL ENERGY R&D BUDGET (million $)--

INFLATION RATE--
DISPOSABLE INCOME ($)--
IMPORTS (million $)-206
EXCHANGE RATE (1US$=)21.5

TRANSPORTATION SYSTEM DESCRIPTION

In 1974 the principal functioning arteries of transportation were designed to carry bauxite, alumina or other major exports to the ports. These few routes are modern and well maintained, but the remainder of the transportation system is in poor condition. Data on roal mileage and maintenance, motor vehicles in operation, and other transport features are fragmentary and conflicting. Estimates range between 3,200 and 4,800 kilometers of improved main road, of which about 800 km had been asphalt surfaced by 1974. Paved highways include one from Conakry to Farecarian and the main national highway from Conakry via Mamoy to Kissidougou. In 1971 an agreement was signed to pave the remaining 217 miles to Nzerekore in the course of the ensuing four years. Other highways are under construction from Boke to Mali and from Mamou to Kankan.

--not available

COUNTRY DATA--GUINEA
DEMOGRAPHIC DATA PROFILE

CAV 09 MAR 78

LAND (sq km)-245,857	ARABLE LAND (million sq km)-7,376
POPULATION (millions)-5.695	POPULATION DENSITY (/sq km)-23.1
LITERACY %-5% to 10%	% RURAL POPULATION-80%
LIVE BIRTHS/THOUSANDS-46.6	DEATHS THOUSANDS-22.9
LIFE EXPECTANCE/MALES-39.4	LIFE EXPECTANCE/FEMALES-42.0
AVERAGE FAMILY SIZE-(see note)	NET MIGRATION (millions/yr)--
PRIMARY SCHOOL GRADS--	SECONDARY SCHOOL GRADS--
INDUSTRIAL WORKERS--	PROFESSIONAL WORKERS--
AGRICULTURAL WORKERS-1.6 million	COLLEGE GRADS--
POPULATION GROWTH %-3%	UNEMPLOYED-25%

Note: Due to the polygamous nature of the social infrastructure, as well as the prevalence of extended families, there are no concrete figures for average family size.

--not available

COUNTRY DATA--GUINEA
PROFESSIONAL LABOR FORCE PROFILE CAV 09 MAR 78

ENGINEERING MANPOWER

Aeronautical--
Chemical--
Mechanical--
Nuclear-0

Architectural--
Civil--
Electrical--
Metallurgical--

SCIENTIFIC MANPOWER

Biologists--
Ecologists--
Mathematicians--

Chemists--
Economists--
Physicians-188

--not available

COUNTRY DATA--GUINEA
KEY TECHNICAL EDUCATIONAL RESOURCES

CAV 09 MAR 78

	LOCATION
Gamal Abdel Nasser Polytechnic Institute	Conakry
Julius Nyerere Polytechnic Institute	Kankan

COUNTRY DATA--GUINEA
ENERGY POLICY: BASIC LEGISLATION CAV 09 MAR 78

1-National Electricity Company (Societe Nationale d'Electricite) established in 1961 with the nationalization of the electric power system.

COUNTRY DATA--GUINEA
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D CAV 09 MAR 78

EXECUTIVE--President

Executive power is vested solely in the President; the cabinet is nominated by and subordinate to him.

Economy and Finance Domain: Minister of Industry and Energy (Mamady Kaba) is responsible to the Minister of Economy and Finance (Ismael Toure), who is in turn responsible to the President for all actions.

COUNTRY DATA--GUINEA
ENERGY POLICY AND OBJECTIVES

CAV 09 MAR 78

The Government of Guinea does not appear to have formulated any formal energy policy. The following objectives have, however, been derived from secondary sources:

1-Development of hydroelectric potential (high priority);
2-Exploration for possible oil deposits on offshore continental shelf (currently by Buttes Resources International in conjunction with the Guinean government).

To date, there exists no comprehensive energy plan, though a request has been made to the World Bank for a Bank-administered investigation of the country's energy resources, potential, and projected energy needs.

COUNTRY DATA--GUINEA
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY CAV 09 MAR 78

Guinea has almost no identified energy resources other than hydroelectric and geothermal--which to this point appear to have satisfied local energy needs. The future remains unsure, and a request has been made for the World Bank to evaluate Guinea's energy potential, energy resources and projected energy needs. The extent and type of development experienced by Guinea will have significant impact on the degree of the country's energy independence.

COUNTRY DATA--GUINEA
INDIGENOUS ENERGY RESOURCES

CAV 09 MAR 78

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
COAL (million tonnes)	0	0	
CRUDE OIL (million tonnes)	0	0	
SHALE OIL (million tonnes)	0	0	
NATURAL GAS (billion cubic feet)	0	0	
URANIUM (thousand tonnes U308)	0	0	
HYDROELECTRIC (billion kWh/yr)	40,680	--	Grandes Chutes-Kale Kinkan, Donke, Labe Macenta, Seredau, Tinkissa
GEOTHERMAL (billion kWh/yr)	68,209	--	Fria, Conakry, Grandes Chutes-Kale Kipe, Kankan, Mamou Labe, Bake, Macenta Siguiri, Gaoual, Nzerekore, Seredou, Kamsar, Sangaredi

Guinea has no measured indigenous energy resources other than hydro and geothermal.

--not available

COUNTRY DATA--GUINEA
PATTERNS OF ENERGY SOURCES AND USES

CAV 09 MAR 78

CONSUMING SECTOR

	HOUSEHOLD & COMMERCIAL	INDUS-TRIAL	TRANSPOR-TATION	ELECTRICAL GENERATION	TOTAL
COAL (million tonnes)	0	0	0	0	0
PETROLEUM (million tonnes)	--	--	--	--	0.263
NATURAL GAS (billion cubic ft)	0	0	0	0	0
NUCLEAR POWER (billion Kwh)	0	0	0	0	0
HYDROPOWER (billion Kwh)	--	--	--	--	20,000
GEOTHERMAL POWER (billion Kwh)	--	--	--	--	105,000
UTILITY ELECTRICITY DISTRIBUTED (billion Kwh)	--	--	--	--	--

--not available

COUNTRY DATA--GUINEA
ENERGY R&D: STATUS AND OUTLOOK

CAV 09 MAR 78

Buttes Resources International is currently conducting offshore explorations for petroleum and estimates that chances of finding oil are 80 percent.

COUNTRY DATA--GUINEA
ENERGY R&D: PRIORITIES

CAV 09 MAR 78

The Government of Guinea has not identified any priorities for energy R&D--primarily because no comprehensive assessment of the country's energy resources has ever been done. A request has recently been made to the World Bank for the completion of a systematic evaluation of the country's resources, potential and projected needs. In light of this, Guinea's top priority is the identification of energy resources; and subsequent to the completion of the assessment, the exploitation of those resources.

COUNTRY DATA--GUINEA
GOVERNMT. SUPPORTED ENERGY R&D IN IND., UNI. & NAT LABS CAV 09 MAR 78

INDUSTRY	PROGRAM AREA	KEY INDIVIDUAL(S)
Buttes Resources International	Oil Development & Exploration	--

--not available

COUNTRY DATA--GUINEA
ENERGY R&D: ROLE OF PRIVATE INDUSTRY CAV 09 MAR 78

Energy R&D is primarily implemented by the government alone or in conjunction with international agencies such as the World Bank. Any involvement of private industry usually takes the form of a joint enterprise as in the case of Buttes Resources International. The joint venture is named Guinean Petroleum Company (Societe Guineenne de Petrole-Soquip). As a consequence of Guinea's current level of development, there are no significant R&D programs at this time. Any investment in the energy sector is primarily in exploration, not in R&D.

COUNTRY DATA--GUINEA
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS CAV 09 MAR 78

ORGANIZATION	DEGREE OF INVOLVEMENT IN 1977
IBRD	Moderately active

COUNTRY DATA--GUINEA
ASSESSMENT OF INTERNATIONAL ACTIVITIES CAV 09 MAR 78

Guinea has in the past and apparently continues to receive aid for R&D activities from West Germany, Yugoslavia, USSR and People's Republic of China. It is difficult to determine to what extent these countries are aiding Guinea since the Guinean government restricts the distribution of this information. Information which is released is questionable in its accuracy.

Given the fact that Guinea is attempting to assess her energy situation with the assistance of the World Bank, it would appear that the Government is taking constructive efforts to unify the otherwise fragmented energy policies of the past.

COUNTRY DATA--GUINEA
KEY REFERENCES

CAV 09 MAR 78

	LOCATION
1-International Bank for Reconstruction and Development. "The Economy of Guinea," available through the World Bank, International Development Association.	IA
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4-WORLD BANK ATLAS: PRODUCTION, PER CAPITA PRODUCT, AND GROWTH RATES. Washington, D.C.: World Bank, 1977.	IA
5-Legum, Collin ed. AFRICA CONTEMPORARY RECORD--ANNUAL SURVEY AND DOCUMENTS, 1977-78. (New York: Africana Publishing Col, 1977)	--
6-AFRICA SOUTH OF THE SAHARA, 1977-78. (London: Europa Publications Limited, 1977)	--
7-United Nations. WORLD ENERGY SUPPLIES, 1971-75. (New York: United Nations, 1977)	--

--References thus indicated are generally available at public libraries

COUNTRY DATA--GUINEA
NOTES AND EVALUATIONS

CAV 09 MAR 78

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8-AFRICA SOUTH OF THE SAHARA, 1977-78. (London: Europa Publications Limited, 1977). (1B, 2B)	--
9-Legum, Collin ed. AFRICA CONTEMPORARY RECORD--ANNUAL SURVEY AND DOCUMENTS, 1977-78. (New York: Africana Publishing Co. 1977). (1B)	--
10-Gerard P.A. Boulch, The World Bank (Personal interview, 2/23/78) (3A, 3B, 4A, 4C, 5A, 5C)	IA

--All references thus indicated are generally available in public libraries

WENDS COUNTRY DATA

IN: INDIA

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COUNTRY DATA--INDIA
ECONOMIC DATA PROFILE AVL 30 SEP 78

GNP (1975 billions $)- 80.5
Exports (1977 billion $)- 6.03
Per Capita GNP ($) (1975)- 130
Monetary Unit- Rupee
Total R&D Budget (Millions $)--

Inflation Rate (%) - 8.5 (1976-77) (Consumer Prices)
Imports (1977 Billions $)- 6.2
National Income/Capita ($)-130
Exchange Rate - 1US$= 8.33 Rps. (June 1978)

TRANSPORTATION SYSTEM DESCRIPTION

1-RAILWAYS: The total length of Indian railways in 1977 was approximately 60,600 route kilometers. An underground railway for Calcutta is scheduled for completion by 1985. It is expected to serve more than one million people and total 17 Km in length.

2-ROADS: In 1974 there were 1,264,000 kilometers of roads (metalled 520,000 kilometers, unmetalled 740,000 Km.) India has a system of National Highways with an aggregate length of about 28,819 Km in 1974 running through the length and breadth of the country, connecting the state capitals and major ports and linking the highway systems of its neighbours. This system includes 55 highways and they constitute the main trunk roads of the country. There are also good express highways.

3-SHIPPING: India is seventeenth on the list of principal merchant fleets of the world. At the end of 1976 the shipping tonnage was over 5 million g.v.t. and 39 vessels, totalling 1.3 million d.w.t. were on order. The major ports are Bombay, Calcutta, Cochin, Kandla, Madras, Mangalore, Marmagoa, Paradep, Tuticorin, and Vishakapatnam. An auxilliary port to Calcutta is under construction at Haldia and was open to international shipping in March 1977. Its coal berth is complete and will eventually have an annual throughput of 5 million tonnes.

4-INLAND WATERWAYS: Of the 8,000 Km of navigable waterways, 2,500 Km are open to power driven craft and 2,500 Km are navigable by large country boats. Services are mainly on the Ganges and Brahmaputra and their tributaries, the Godavami and Krishna.

5-CIVIL AVIATION: There are four international airports in India, located at Bombay, Calcutta, Delhi and Madras. There were over 80 other airports in 1974.
6-AIR INDIA: Founded in 1953, is a state corporation, responsible for international flights, extensive services to 27 countries covering five continents.

7-INDIAN AIRLINES: Founded in 1953, is a state corporation responsible for regional and domestic flights. Services throughout India and to Afghanistan, Bangladesh, Nepal, Sri Lanka are available. It has an unduplicated route length of 39,171 Km.

COUNTRY DATA--INDIA
DEMOGRAPHIC DATA PROFILE

AVL 30 SEP 78

Land (million sq. km)- 3.3
Population (millions)- 610 (1976)
Literacy (%)- 35 (1971)
Live Births/Thousand- 35.1 (1972-75)
Median Age/Males- 15 (1974)
Average Household Size- 5.6 (1971)
Primary School Enrollment (1975 millions)- 66
Industrial Workers (1971 millions)- 33.9
Agricultural Workers (1971 millions)- 130
Population Growth (%)- 2.18 (1971-75)

Arable Land (million sq. km)- 1.6
Population Density (/sq mile)- 185 (1976)
% Rural Population- 80 (1976)
Deaths/Thousand- 14.4 (1970-75)
Median Age/Females- 15
Net Migration- Not Available

Secondary School Enrollment (1975 millions)- 27.9
Professional Workers (1971 millions)- 16.5
College Grads- 368055 (1968)
Unemployed (million)- 8.9

COUNTRY DATA--INDIA
PROFESSIONAL LABOR FORCE PARTICIPATION PROFILE AVL 30 SEP 78

Total Manpower of Scientists Engineers and Tehnicians (1971)	1,174,500
Total R&D Manpower (1973)	96,954

COUNTRY DATA--INDIA
KEY TECHNICAL EDUCATIONAL RESOURCES

AVL 30 SEP 78

INSTITUTION	LOCATION
Annamalai University	Tamil Nadu State
Baharas Hindu University	Uttar Pradesh
Bangalore University	Karnataka State
Baroda University	Gujarat State
University of Bombay	Bombay
Calcutta University	Calcutta
Indian Institute of Technology	Maharashtra State
Indian Institute of Technology	Uttar Pradesh
Indian Institute of Technology	Madras
Indian Institute of Technology	West Bengal
Indian Institute of Technology	New Delhi
Indian Institute of Science	Bangalore
Kanpur University	Kanpur
Kashmir University	Kashmir
Kerala University	Kerala State
University of Madras	Madras
Panjab University	Union Territory
Roorkee University	Uttar Pradesh

COUNTRY DATA--INDIA
ENERGY POLICY: BASIC LEGISLATION

AVL 30 SEP 78

1- 1976: April 17: Lok Sabha (Lower House of Parliament) passed the Coal Mines (Nationalization) Amendment Bill, which enables termination of all privately held coal mine leases, replacing the ordinance promulgated earlier.

2- 1976: April 29: The Government of India issued an ordinance cancelling all private leases for coal mining.

3- 1976: January 17: The Burmah-Shell (Acquisition of Undertakings in India) Bill was passed by Parliament.

4- 1976: February: Parliament enacted the Clean Water Act and was in the process of framing an Air Pollution Act.

5- 1974: October: The Government of India constituted a new Ministry of Energy by bringing together from the various ministries those departments dealing directly with energy related issues. The Ministry is responsible for the optimum development and utilization of energy resources.

6- 1948: The Atomic Energy Act was passed which was responsible for the establishment of the Atomic Energy Commission. The development and control of atomic energy in India is regulated by the Atomic Energy Act (Act No. 33 of 1962).

COUNTRY DATA--INDIA
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D AVL 30 SEP 78

Executive authority is vested in the President, to be exercised on the advice of the Council of Ministers. The Council of Ministers is led by the Prime Minister (Head of Government) and is responsible to Parliament. The Prime Minister, Mr. Morarji Desai, oversees programs for Planning and Atomic Enegry.

OTHER PARTS OF THE ENERGY STRUCTURE
Responsibility for the formulation and execution of energy policy programs is shared. The planning commission coordinates all programs in the five year development plans.

Agencies dealing with energy include:

1-Ministry for Energy: Responsible for optimum use of energy resources.
Minister for Energy: Mr. P. Ramachandran

The Central Power Commission: Plans and executes hydroelectric projects.

2-The Department of Power: Responsible for formulating policy and programs for conservation, development, and regulation of power resources and coordinating development of non-traditional resources.

The Central Electricity Authority: Develops a national power policy and coordinates activities of agencies which oversee national power resoures.

The Central Power Research Institute: R&D in generation, transmission and distribution of electric energy.

3-The Department of Coal: Responsible for planning and developing coal resources including coal mines.

4-The Department of Petroleum: Responsible for petroleum development including import of crude.
Minister for Petroleum: Mr. H. N. Bahaguna

5-The Department of Atomic Energy: Responsible for research, development, and construction of atomic power plants.
Minister for Atomic Energy: Mr. Morarji Desai.

6-The Department of Science And Technology: Responsible for coordinating and financing energy R&D programs and dealing with foreign collaboration.
Minister for Science and Technology: Mr. Morarji Desai

COUNTRY DATA--INDIA
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D AVL 30 SEP 78

NUCLEAR
1-The Planning Commission, Ministry of Energy, Central Electricity Authority, Central Power Research Institute, Department of Atomic Energy, Department of Science and Technology and Fuel Policy Committee are all responsible for implementation and R&D.

2-The Atomic Energy Commission, under the Chairmanship of Dr. Sethna is responsible for training, nuclear development and research.

3-The Indian Rare Earths Limited, established in 1950 is responsible for survey.

4-Atomic Minerals Division at Hyderabad, the Bhabha Atomic Research Centre at Trombay near Bombay, and the Reactor Research Centre, at Kalpakkam Tamil Nadu, are responsible for the scientific and technical work of the Department of Atomic Energy.

NON-NUCLEAR
1-The Indian Oil Corporation, under the Ministry of Petroleum, is largely responsible for the import of crude oil and petroleum products.

2-The Oil and Natural Gas Commission under the Ministry of Petroleum is responsible for the import of off-shore and on-shore oil field equipment.

3-The Coal India Limited, under the Ministry of Energy, is responsible for the purchase of coal mining equipment.

4-The National Power Thermal Organization is responsible for thermal power generation.

5-The Central Mine Planning and Design Institute, in Ranchi, is responsible for preparing project reports for development of mines.

6-The National Environmental Engineering Research Institute has set up a network with monitoring stations in Bombay, Calcutta, Madras, Delhi, Hyderabad, Kanpur, Jaipur, Ahmedabad, and Nagpur for continuing study of air pollution.

7-Bharat Heavy Electricals Ltd. Ranchi, is the major industrial enterprise which manufactures hardware for power production in India.

COUNTRY DATA--INDIA
ENERGY POLICY AND OBJECTIVES AVL 30 SEP 78

Work on a national energy policy was initiated in 1975 by the Ministry of Energy.

NUCLEAR
1978 - 1,000 MWe of nuclear capacity already installed is expected to double within the next three years, but no plans exist for heavy reliance on nuclear power until at least the beginning of the next century. In 2000, only 10% of the generating capacity is expected to be supplied by nuclear plants. India has embarked on a program to build a prototype breeder and plans to centre their energy program on the Pu-Th fuel cycle.

The following special schemes are being undertaken during India's Fifth Plan.
a-Study of radiation induced changes in chemical and biological components.
b-Development of a process of production of uranium hexaflouride.
c-R&D in laser.
d-Development of nuclear medical electronics.
e-Setting up an engineering base for development of software.
f-Expansion of critical facilities.
g-Liquid Helium plants to be set up.
h-Fission products.
i-Ancillary facilities to be manufactured in India.

NON-NUCLEAR
1-Petroleum: Total Government of India investment in the exploration and development of oil and natural gas reserves rose from US $212 million to US $373 million from 1974 to 1975 and will rise to US $558 million by 1978.

2-Coal: The Fifth Plan target (1978-1983) is 124 million tons of coal and 2.5 million tons for export.

3-The Oil and Natural Gas Commission aims for a rate of 80,000 B/D equivalent to 4 million MT per annum from 20 wells by April, 1978.

4-The Prime Minister, Morarji Desai, has said (July 21,1978) that his government gives a high priority to utilization of solar energy for a wide variety of applications with special emphasis on its use in rural India.

5-1975- India wanted to have 30,000 biogas plants established by 1975-76.

COUNTRY DATA--INDIA
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY AVL 30 SEP 78

In nearly all programs of national development the Indian philosophy has been to achieve self-sufficiency. India has sought foreign collaboration with other countries to satisfy domestic demand.

1- 1976-77: India's installed power capacity totalled 23,700 MW, an increase of 8.2% over 1975-76, but well below the target. India wants to achieve 45,000 MW by 1981, largely through the establishment of coal based power plants and hydroelectric projects.

2- 1977: The prospects for gaining self-sufficiency within the next decade remain very remote at this juncture, for any increase in domestic production will largely be offset by the rise in demand.

COUNTRY DATA--INDIA
INDIGENOUS ENERGY RESOURCES

AVL 30 SEP 78

ECONOMICALLY	RECOVERABLE RESERVES	RESERVES	LOCATION OF IDENTIFIED RESERVES
NON-RENEWABLE			
COAL (megatonnes)	11,580		Deccan, Bengal, Bihar, Bombay High, Kutch, Basin, Kharsang
CRUDE OIL (megatonnes)	130		Assam, Gujarat, Logama, Galeki, Bombay High
SHALE OIL (million tonnes)	-		
NATURAL GAS (million G. cal)	599		Assam, Gujarat, Kusijat
THORIUM (Elemental) (thousand tonnes)	302.4		
URANIUM (U308) (thousand tonnes)	33.2 ($77/Kg)		Jaduguda, Narwapabar, Blatin, Uttar Pradesh, Singhbaum
RENEWABLE			
HYDROELETRIC (Gwh/yr)	280,000		These are located on the major river system in North, South, West, Central, and East India.
GEOTHERMAL	0	0	Cambary, Korkan

COUNTRY DATA--INDIA
PATTERNS OF ENERGY SOURCES AND USES

AVL 30 SEP 78

1976	HOUSEHOLD & COMMERCIAL	INDUSTRIAL	TRANSPORTATION	ELECTRICAL GENERATION	TOTAL
COAL (thousand tonnes)	5,679	49,352	20,955	18,507	97,921
PETROLEUM (thousand tonnes)	4,207	7,254	1,752	6,585	24,287
NATURAL GAS (Tera Calories)	0	7,544	0	3,081	10,625
NUCLEAR POWER (million KWh)				3,253	
HYDRO POWER (million KWh)				34,827	
GEOTHERMAL (MILLION KWh)				0	
UTILITY ELECTRICITY DISTRIBUTED (million KWh)	10,675	63,480	953	-	168,343

N.B. The total included non-energy uses, transformation losses, and energy sector uses.

COUNTRY DATA--INDIA
PROJECTIONS OF DEMAND

AVL 30 SEP 78

RESOURCE	Standard Physical Units 1976	1985	2000	Thousand T.C.E. 1976	1985	2000
COAL (thousand tonnes)	97,921	130,000	240,000	97,921		
CRUDE OIL (thousand tonnes)	19,660	43,100	67,500	33,460		
SHALE OIL (thousand tonnes)	-					
NATURAL GAS (Tera Calories)	9,400 (1975)	16,000	29,000	1,518		
HYDROELECTRIC POWER (million KWh/year)	34,827	38,900	56,000	4,283		
GEOTHERMAL (billion KWh/year)	0			0		
OTHER (See Note) (billion KWh/year)						
URANIUM (U308) (kilotonnes)	0.07 (1975)	0.29				
HEAT RATE (Btu/KWh)						

Note: Wind Energy, Tidal Power, Biomass

COUNTRY DATA--INDIA
PROJECTIONS OF ENERGY SUPPLY, IMPORTS, AND EXPORTS

AVL 30 SEP 78

RESOURCE	1976	%US	1985	%US	2000	%US
COAL (thous tonnes)						
INDIGENOUS SUPPLY	100,870		116,400		167,700	
IMPORTS	0		13,300		73,000	
EXPORTS	507		-			
CRUDE OIL (thous tonnes)						
INDIGENOUS SUPPLY	8,659		8,810		2,200	
IMPORTS	14,032		34,290		67,280	
EXPORTS	0					
SHALE OIL						
INDIGENOUS SUPPLY	-					
NATURAL GAS (Tera Calories)						
INDIGENOUS SUPPLY	10,625					
IMPORTS	0		600		5,800	
EXPORTS	0					
URANIUM (kilotonnes U308)						
INDIGENOUS SUPPLY						
IMPORTS						
EXPORTS						

COUNTRY DATA--INDIA
ENVIRONMENTAL CONSIDERATIONS AVL 30 SEP 78

1-Environmental degradation from industrial development and power stations is not an immediate problem in India except in large cities. However, Parliament has enacted a Clean Water Act and in 1976 began discussion about an air pollution act.

2-Under a Government of India Water (Prevention and Control of Pollution) Act, 1974, a 17 member Control Board has been constituted to:
a-promote cleanliness of streams and wells.
b-co-ordinate activities of State Boards, providing them with technical assistance and guidance.
c-sponsor investigations and research on problems of water pollution.
d-plan and execute a country-wide program for the prevention and control of water pollution.

3-The National Environmental Engineering Research Institute(NEERI) has set up a network with monitoring stations in Bombay, Calcutta, Madras, Delhi, Hyderabad, Kampur, Jaipur, Ahmedabad and Nagpur for a continuing study of air pollution and to lay down realistic standards for the permissable level of pollutants in the air.

4-The Department of Atomic Energy is responsible for country-wide radiation safety in India.

5-A National Committee on Environmental Planning and Co-ordination exists under the Department of Science and Technology.

COUNTRY DATA--INDIA
COMMERCIAL APPLICATIONS

AVL 30 SEP 78

1-Since 1956, it has been the policy of the Government of India that all industries of basic and strategic importance, or in the nature of public utility services be in the public sector. This policy inhibits the early commercial applications of R&D results in the country. However, the Oil and Natural Gas Commission (ONGC) may with Central Cabinet approval, enter into contractual agreements with outside companies as and when the required equipment and/or expertise for commercial application is not otherwise available.

2-The commercial applications of the ONGC's explorations depend heavily on the inflow of capital and technical know-how.

3-Lack of co-ordination among the various governmental agencies hampers the commercial applications of R&D in the country.

COUNTRY DATA--INDIA
POWER PRODUCTION AND ENERGY CAPABILITY

AVL 30 SEP 78

POWER PRODUCTION

PLANT TYPE	TOTAL (MWe)	
COAL	460	Existing
	0	Planned
GAS	69	Existing
	0	Planned
OIL	-	Existing
	-	Planned
GEOTHERMAL	8,525	Existing
	1,365	Planned
HYDROELECTRIC	7,497	Existing
	2,046	Planned
NUCLEAR	600	Existing
	1,000	Planned
SOLAR	-	Existing
	-	Planned
OTHERS	-	Existing
	-	Planned

N.B. Planned includes under construction and planned.

OIL

TOTAL WELLS (1975)	TOTAL FOOTAGE (1000 ft)	TOTAL WILD CATS (1975)	SUCCESSFUL WILD CATS (1975)	TOTAL WELLS (1974)	TOTAL FOOTAGE (1974)	TOTAL WILD CATS
0	0	0	0	5	31	0

NUMBER OF RIGS

Sept 30, 1977	June 30, 1977	Sept 30, 1976
42	44	40

COUNTRY DATA--INDIA
ENERGY INDUSTRIES

AVL 30 SEP 78

	NUMBER
Major Hydro Power Stations in India(1974)	82
Petroleum Refineries	16
Electrical Machinery	443
Iron and Steel Basic Industries	704
Electric Light and Power	350
Coal Extraction Operators	1
Coal Transportation Firms	1

COUNTRY DATA--INDIA
ENERGY R&D: STATUS AND OUTLOOK AVL 30 SEP 78

NUCLEAR-The Indian nuclear program has achieved high standards of scientific excellence. The power station program began with LWRs but now uses exclusively heavy water type which India can build without importing enriched fuel or reactor components. CANDU-type HWRs can now be 100% Indian made. 6000MWe of capacity is now in operation, an equal amount under construction and 400 MWe additional have been announced. A breeder reactor based on indigenous thorium (India's largest reserve) is now being developed. India plans to establish, with French assistance, a Reactor Researh Center at Kalpakkam. The center will include a 10-MW, plutonium-fueled, sodium-cooled fast breeder reactor for developing thorium based technology.

OIL-Indian oil is a very limited resource. The current 5-year plan (1974-1977) calls for as much as $1 billion in exploration and development by government agencies. The plan also calls for refinery capacity to grow from 500,000 to 800,000 b/d by March 1979.

SOLAR-Dept. of Science and Technology has completed a feasibility report on a wind mill of 1 KW suitable for power generation and for pumping purposes. The aim is to design 5-10 KW wind mills eventually. India has signed an agreement with FRG to acquire mini solar power plants of 100 to 1000 KW. A wide variety of solar projects are being conducted at universities and research institutes.

CONSERVATION-A half-ton battery powered commercial vehicle which could run up to 60 km. an hour for a distance of 60 km. is being developed. The first prototype is expected during 1977. A factory is being set up in Mysore to produce battery operated scooters and motor cycles. They are expected to achieve speeds of 50 to 60 km/hr and operate for 90 kms before needing a recharge.

COAL-Coal represents 37% of total energy use. This fraction has been diminishing since production is static. The Fuel Policy Committee (FPC) has recommended that power stations be set up at mine-mouths to ease transport problems. Coal liquefaction and gasification are also being considered.

ELECTRICITY-Seventeen new projects were initiated in 1973-74 to meet India's current shortage of power. When completed, they will add 2100 MW to the present generating capacity. In addition to building generators, India is building a power grid which ties customers to a number of synchronized generators.

TIDAL-A feasibility study is being conducted on the west and east coasts of India. One estimate suggests that about 1000MW of power may be available from the Gulfs of Gombay and Kutch and from the Bay of Bengal.

GOBAR GAS-Research and commercial application is in progress. Target of 30,000 plants to be established by 1975-76.

COUNTRY DATA--INDIA
ENERGY R&D BUDGET

AVL 30 SEP 78

The following figures are presented in the draft Five Year Plan for 1978-83(in rupees).

	Plan (Millions) 1974-79	% of Total Outlay	Plan (Millions) 1978-83	% of Total Outlay	% Increase
Energy, Science and Technology	12704.9	26.2	25679.0	30.00	102.1
Power	8661.7		19444.4		124.5
Petroleum	2087.7		3148.1		50.8
Coal	1417.3		2284.0		160.0
Science & Technology	538.3		802.5		49.1

Exchange Rate Used: 1 US $ = 8.1 Rupees

COUNTRY DATA--INDIA
ENERGY R&D: PRIORITIES

AVL 30 SEP 78

The government of India has yet to formulate a national energy policy, while experts continue to differ on priorities for various energy resources. A committee of Secretaries of the concerned Ministries is currently engaged in identifying priorities and ensuring coordination in energy R&D.

COUNTRY DATA--INDIA
ENERGY R&D: IMPACT

AVL 30 SEP 78

Source-	1985	2000
Coal(million tons)		
Indigenous Supply	116.4	167.7
Imports	13.3	73.0
Crude Oil (million tonnes)		
Indigenous Supply	8.81	0.22
Imports	34.29	67.28
Natural Gas (millcubic Kilometers)		
Indigenous Supply	1.54	2.32
Imports	.06	.58
Nuclear Power (MWe) net	1660.00	10160.00

DATA--INDIA
GOVERNMT.SUPPORTED ENERGY R&D IN IND., UNI. & NAT. LABS AVL 30 SEP 78

UNIVERSITIES	PROGRAM AREAS
Annamalai University	Solar paddy driers
LABORATORIES	
National Aeronautical Laboratory	Vertical shaft wind generator
Forest Research Institute	Solar Kiln for seasoning wood
Indian Institute of Technology	Solar air conditioners, water heaters, agricultural dryers and devices to desalinate sea water.
Central Arid Zone Research Institute	Solar water heaters
Association for Science and Technology in Rural Areas	Wind generators using sails
Central Salt and Marine Research Institute	Desalination with solar energy, solar cells, solar cycles, cookers and solar radiation measurements.
Indian Institute of Management	Potential role of solar pumps for heating.

COUNTRY DATA--INDIA
ENERGY R&D: ROLE OF PRIVATE INDUSTRY

AVL 30 SEP 78

Governmental laboratories situated all over the country are mainly involved in research and development. As a result, very little is done by private industry.

COUNTRY DATA--INDIA
INVOLVEMENT IN INTERNTIONAL ENERGY R&D ORGANIZATIONS AVL 30 SEP 78

Organization	Degree of Involvement
1- IAEA - member of the IAEA	Very Active

1975: The U.S.-India subcommission on science and technology was established in January 1975. Of particular interest in the energy field are small integrated energy systems for rural areas and methods for coal extraction.

COUNTRY DATA--INDIA
ASSESSMENT OF INTERNATIONAL ACTIVITIES

AVL 30 SEP 78

1- The main difficulty pertaining to international activities is the delay and lack of co-operation in the domestic sphere.

2- India's committment to a policy of equidistant non-alignment has led it to seek development technology from any willing supplier.

3- The other difficulty is domestic co-ordination of activities, resulting in brain-drain and wastage for India.

4- No efficient man-power planning exists.

COUNTRY DATA--INDIA
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AVL 30 SEP 78

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-- Denotes Public Library material
LDC Denotes material from WENDS Project Library

COUNTRY DATA--INDIA
NOTES AND EVALUATIONS

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-- Denotes Public Library material
LDC Denotes materials from WENDS Project Library

WENDS COUNTRY DATA

ID: INDONESIA

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COUNTRY DATA--INDONESIA
ECONOMIC DATA PROFILE

AVL 30 SEP 78

GNP(1976 billion $)-36.23

INFLATION RATE-14%(1976-77)
(GDP deflator)

EXPORTS(1977 billion $)-10.85
PER CAPITA GNP(1976$)-260
MONETARY UNIT=RUPIAH

IMPORTS(1976 billion$)-6.23
PER CAPITA INCOME(1976$)-240
EXCHANGE RATE(June 1978 US$)
-415 RUPIAH

TOTAL R&D BUDGET--

TRANSPORTATION SYSTEM DESCRIPTION

RAILWAYS

In 1976 there were about 4,100 miles of railways in Indonesia, over half in Java, and the rest in Sumatra and Madura. Traffic has continued to fall from 7,322 million passengers/kilometer in 1965, to 3,378 million in 1970, and 2,727 million in 1973. Under the second five-year plan, the government plans to invest Rupiah 63 billion on improving the railways.

ROADS

The road network consists of about 30,000 km. of main roads and 50,000 km. of minor and local roads. Only about a fifth of these are paved. In 1976 there were about 419,000 passenger cars and 260,000 commercial vehicles in use.

INLAND WATERWAYS

Navigable rivers are an important means of communication in eastern Sumatra and Kalimantan, and ferry services are being extended.

SHIPPING

The Indonesian merchant fleet(mainly operated by state-owned P.T.Jakarta Lloyd) is growing steadily, and now amounts to about 2 million DWt, of which about 600,000 consists of tankers, and 400,000 DWt of inter-island vessels(of which 23 are operational). Under Repelita II, it is planned that the inter-island and ocean going fleets will be expanded by 50%, while there will also be considerable expenditure on improving port facilities. It is envisaged that $940 million is to be spent on rehabilitation of the fleet.

AIRLINES

Because of inadequate surface communication and physical obstacles, air links are beginning to play a vital role in Indonesia. In 1976 55 million km. were flown and 28 million passengers carried. Garuda Indonesia Airways is the main airline, and is state owned. There are also a number of privately owned airlines, of which the most important are Merpati Nusantara, Mandala, and Bouraq, which provide a comprehensive service between all the main islands. A new international airport at Tanggerang(12 miles from Jakarta) is planned to be operational by 1980. Most of the existing 38 national civil airports need massive improvements.

COUNTRY DATA--INDONESIA
DEMOGRAPHIC DATA PROFILE

AVL 30 SEP 78

LAND(million sq km)-1.9

POPULATION(millions 1976)-136

LITERACY(% 1977)-56.5
LIVE BIRTHS/THOUSANDS-42.9
MEDIAN AGE/MALE-17 IN 1971
AVERAGE HOUSEHOLD SIZE--
PRIMARY SCHOOL ENROLLED(1975)-14,280,157
INDUSTRIAL WORKERS(1971)-8.9 million
AGRICULTURAL WORKERS(1971)-25 million

POPULATION GROWTH(% 1970-75)-2.6

ARABLE LAND(million sq km)-0.13
POPULATION DENSITY(/sq-km)-354 in 1975
% RURAL POPULATION-83
DEATHS/THOUSAND-16.9
MEDIAN AGE/FEMALE-18 in '71
NET MIGRATION(million/yr)--
SECONDARY SCHOOL ENROLLED (1975)-2,565,053
PROFESSIONAL WORKERS(1971)-5.8 million
COLLEGE GRADUATES(1975)-21,286

UNEMPLOYED(millions)-0.089

--data not available

COUNTRY DATA--INDONESIA
KEY TECHNICAL EDUCATIONAL RESOURCES

AVL 30 SEP 78

UNIVERSITIES	LOCATION
Universitas Diponegora	Semarang
Universitas Gadjah Mada	Jogjakarta
Universitas Hasanuddin	Makassar
Universitas Indonesia	Jakarta
Universitas Mulawarman	Samarinda
Universitas Sam Ratulangi	Manado
Universitas Sjiah Kuala	Banda Aceh
Universitas Sriwihaya	Palembang
Universitas Sumatera Utara	Medan,S.V.
Universitas Tandhungpura	Pontianak
Universitas Kristen Petra	Surabaja
Universitas Merdeka	Timur
Universitas Triskati	Jakarta

INSTITUTES	
Institut Teknologi Bandung	Bandung
Institut Teknologi Surabaja	Surabaja

COUNTRY DATA--INDONESIA
ENERGY POLICY: BASIC LEGISLATION AVL 30 SEP 78

LEGISLATION IN THE FIELD OF ENERGY

1-Oil and gas Law.
2-The Institute for Atomic Energy was established in 1971.
3-PLN (State Electricity Enterprise) was created in 1961 through merger of three nationalized utilities.
4-In 1964 the Atomic Energy Law was enacted.
5-Institute for Atomic Energy transformed into the National Atomic Energy Agency in 1965.
6-The mining law was revised 1967.
7-Law Number 18 was enacted in 1971, also known as the "Pertamina law". Pertamina(the national oil company) was given the sole responsibility for all petroleum activities in the country, including negotiating with foreign investors and contractors.
8-In 1974 a National Seminar on Energy was organized. The overall picture of possible energy developments was brought to light for the first time.
9-In December 1975, Presidential Decree Number 44 was issued, which established stricter governmental control over Pertamina.
10-In 1975 the National Committee on the Inventory and Evaluation of National Resources was established by the government.

Basic legislation governing R&D programs in resources and national energy strategy is being drafted by the National Committee for Inventorying/Evaluating National Resources.

COUNTRY DATA--INDONESIA
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D AVL 30 SEP 78

EXECUTIVE
The President(General Suharto) occupies the most powerful position in government and presides over a personally appointed Cabinet. The Minister of State for Research and Technology (Minister Habibie) presides over the National Committee for Inventorying/Evaluating National Resources, which is composed of 8 Ministries and 5 institutions. The Committee prepares policy guidance for natural resource strategy. The Ministry of Mines and Energy (Minister Subroto) has responsibility for all matters relating to energy.

NATIONAL REPRESENTATIVE BODIES
1-PARLIAMENT, which legislates, is composed of 460 members.
2-PEOPLE'S CONSULTATIVE ASSEMBLY, which sets broad guidelines of national policy, includes the members of Parliament plus an equal number of government appointed representatives. It sits at least every five years and elects the President.

The following ORGANIZATIONS/MINISTRIES have specific energy R&D functions as broken down by energy sources:

OIL AND GAS
Directorate of Oil and Gas(MIGAS),Ministry of Mines and Energy.
Indonesian Petroleum Institute(LEMIGAS),Ministry of Mines and Energy
Directorate for Exploration and Production,Pertamina(State oil company).

COAL
Directorate of Planning, Ministry of Mines and Energy.
P.N.Batubara (STATE COAL COMPANY).

HYDROELECTRIC
Power Research Institute(LMK),at State Electric Co.(PLN).

NUCLEAR
National Atomic Agency (BATAN).

GEOTHERMAL
Geothermal Division, Pertamina (State Oil Co.).
Indonesian Geological Survey (GSI).
Institute of Geology and Mining (ITB).

GENERAL
PLN- State Electricity Enterprise is responsible for the public supply of energy power.

COUNTRY DATA--INDONESIA
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/AVL 30 SEP 78

The Ministries responsible for energy are:

MINISTRIES	FUNCTIONS	MINISTERS
Research and Technology	Coordinates research	Habibie
Mines and Energy	Responsibility for all matters involving energy	Subroto
Development and Environmental Control		Salin

The Organizations responsible for energy are:

Energy Technical Committee formulates national energy policy.

National Atomic Energy Agency (BATAN).

Policy Directives for BATAN are reviewed on regular basis by the Council for Atomic Agency chaired by the President(Suharto).

BATAN is administered by a Secretariat headed by the Secretary of BATAN, and comprising the Departments of Development, Finance, External Matters, Legal Matters and Personnel.

PLN(Perusahaan Umum Listrik Negara State Electricity Enter prise) is responsible for the supply of electric power for public use.

Directorate of Geological Survey supervises all uranium exploration activities.

Directorate of oil and gas monitors the state oil company.

The Directorate of oil and gas(MIGAS) is divided into five operational divisions: Exploration and Production, Planning, Safety and Calibration, Economics and Finance, and Future Development.

Pertamina(State Oil Co.) is responsible for all petroleum activities in Indonesia, including exploration, production,re-fining and marketing. The President-Director of Pertamina is Major General Piet Haryono.

COUNTRY DATA--INDONESIA
ENERGY POLICY AND OBJECTIVES

AVL 30 SEP 78

Indonesia is in the midst of developing a comprehensive and integrated energy policy, and is urging foreign contractors to take advantage of new opportunities.

According to Indonesia's new Minister of Mines and Energy, Dr. Subroto, the new policy will further tap the country's non-oil energy resources, but will also rely on petroleum as a major source of domestic energy and foreign exchange for the next fifteen years.

The new energy policy will be the responsibility of a national energy board and will, among other things, balance Indonesia's growing domestic energy consumption with the need to increase petroleum export levels.

Indonesia's intention to maintain export levels while containing domestic consumption will be guided by the three key elements of the new energy policy:

a) A Sound Conservation Scheme- use energy only when necessary, and making use of the most appropriate form of energy whenever and wherever possible.

b) Active Diversification- into other fields of energy, including the intensification of traditional(conventional) source development, as well as the expansion of research in the non-traditional(non-conventional) fields such as solar and wind power.

c) Investigation- an active process of "indexation" of all of the country's resources, their quantity, location, utilization characteristics and the optimum plan for their application.

However domestic energy consumption has been rising at an average rate of 10% since 1960. Unless new, non-oil energy resources are rapidly developed, larger quantities of oil will have to satisfy these domestic requirements at the expense of exports.

COUNTRY DATA--INDONESIA
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY AVL 30 SEP 78

Indonesia is virtually self-sufficient in energy. A small amount of crude oil and products are imported, primarily as refining feedstock. In the modern sector, oil and gas resources account for over 90% of consumption. In the traditional sector, wood remains the major source of fuel, accounting for about two-thirds of the total energy consumption.

The government plans to develop alternate sources of energy in order to reduce dependence on oil. 90% of all commercial energy consumed in Indonesia is supplied by petroleum products.

Indonesia has the equivalent of some 50 billion barrels of oil in coal reserves and will bring a 750 megawatt coal-fired power plant on stream in 1984. By the year 2000, about 4,000 megawatts of electricity will be produced from hydro-power and 400 megawatts from geothermal. There are also plans to develop uranium reserves and solar and wind power as well. The purpose is to free petroleum products for necessary domestic uses and for exports.

COUNTRY DATA--INDONESIA
INDIGENOUS ENERGY RESOURCES

AVL 30 SEP 78

	ECONOMICALLY RECOVERABLE RESERVES	RESERVES	LOCATION OF IDENTIFIED RESERVES
COAL (megatonnes)	1060		Ombilin, South Sumatara, Bukit Asam, West Sumatra
CRUDE OIL (megatonnes)	1456		Minas Field, Sumatra
SHALE OIL (megatonnes)	-		
NATURAL GAS (million G. calories)	817		Arun Field
URANIUM (thousand tonnes U308)	-		
RENEWABLE			
HYDROELECTRIC (Gwh/year)	150,000		Sumatra, Kalimantan Irian Jaya
GEOTHERMAL (Gwh/year)			

COUNTRY DATA--INDONESIA
PATTERNS OF ENERGY SOURCES AND USES

AVL 30 SEP 78

1976 RESOURCES	HOUSE-HOLD & COMMERCAL	INDUSTRY	TRANSPORT	ELECTRIC	TOTAL
COAL(mill-ions tonnes)	Not Avail-able	Not Avail-able	Not Avail-able	Not Avail able	Not Avail.
PETROLEUM (million tonnes)	3.59	1.08	3.14	1.17	8.98
NATURAL GAS (cubic km)	Not Avail	Not Avail	Not Avail	Not Avail	Not Avail
NUCLEAR POWER (TWh)	-	-	-	-0-	-0-
HYDRO POWER (TWh)	-	-	-	1.850	1.850
GEOTHERMAL POWER(TWh)	-	-	-	-0-	-0-
UTILITY ELECTRICITY DISTRIBUTED	1.833	0.823	-	0.959	3.62

Note: - means not applicable
Totals incluse non-energy uses, transportation losses, and energy sector uses.

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COUNTRY DATA--INDONESIA
PROJECTION OF DEMAND

AVL 30 SEP 78

RESOURCE	STANDARD PHYSICAL UNITS 1976	1985	1985	THOUSAND TONNES COAL EQUIVALENT 1976	1985	2000
COAL (thousand tonnes)	209			209		
CRUDE OIL (thousand tonnes)	15,257			22,831		
SHALE OIL (thousand tonnes)	-			-		
NATURAL GAS (tera calories)	30,480			4,356		
NUCLEAR POWER (million kwh/yr)	-0-			-0-		
HYDROELECTRIC POWER (million kwh/yr)	1,820			224		
GEOTHERMAL (million kwh/yr)	-0-			-0-		
OTHER (million kwh/yr)-see note						
URANIUM (kilo-tonnes U308)						
HEAT RATE (Btu/kwh)						

NOTE: WIND ENERGY, TIDAL POWER, BIOMASS.

Blank spaces indicate not known.

COUNTRY DATA--INDONESIA
PROJECTION OF SUPPLIES,IMPORTS, AND EXPORTS AVL 30 SEP 78

RESOURCE	1976	%US	1985	%US	2000	%US
COAL(thousand tonnes)						
INDIGENOUS SUPPLY	193					
IMPORTS	21					
EXPORTS	5					
CRUDE OIL(thousand tonnes)						
INDIGENOUS SUPPLY	74,195					
IMPORTS	329					
EXPORTS	59,267					
SHALE OIL INDIGENOUS SUPPLY	-					
NATURAL GAS (tera calories)						
INDIGENOUS SUPPLY	30,480					
IMPORTS	-0-					
EXPORTS	-0-					
URANIUM(kilo-tonnes U308)						
INDIGENOUS SUPPLY						
IMPORTS						
EXPORTS						

Blank spaces indicate not known.

COUNTRY DATA--INDONESIA
ENVIRONMENTAL CONSIDERATIONS

AVL 30 SEP 78

In Indonesia, there is growing awareness of the need for protection against pollution of the marine environment.

In March 1973 the Ministry of Mining issued pollution control regulations specifying that Pertamina, any company having a relationship with Pertamina, or any service company engaged in oil or gas activities "is obliged to prevent the occurence of water pollution, and to control any that occurs."

In 1974 Regulation Number 17, on the control of Mineral Oil and Natural Gas Exploration and Exploitation of Offshore Areas, was issued. It specified offshore operating standards, pollution control requirements, and penalties for violation.

In early 1974 Pertamina established an Environmental Protection Coordinating Committee (BKKL) to implement the new regulations.

The tradeoff between offshore oil drillings and environmental safeguards is crucial in Indonesia because the waters of the archipelago are rich in plant and animal life, and provide basic protein to millions of Indonesians. The recent offshore oil boom has created within the government, a growing consciousness of the need for protection against pollution of the marine environment. It is planned that a series of pollution monitoring and control bases will be established throughout the archipelago.

The Government of Indonesia is aware that promotion of the mining industry will lead to pollution of the natural environment. During Repelita II, an inventory will be made of various environmental problems that appear as a consequence of the mining activities. It is planned that conservation of the environment will commence as the new mining project operations commence.

In 1978 the State Ministry for Development Supervision and the Environment was established. The Minister is Dr. Emil Salim.

COUNTRY DATA--INDONESIA
COMMERCIAL APPLICATIONS   AVL 30 SEP 78

The Pertamina financial crisis of mid-1975 produced unprecedented debts, and led the government to revise the oil contracts. The objective was immediate government revenue; the subsequent changes in the spring and summer of 1976 came only after long and arduous discussions with the oil companies. The new terms produced an additional $640 million in government revenues. In the aftermath, however, exploration activities stagnated and doubts about Indonesia's investment surfaced.

The most significant changes involved the production-sharing contracts. Heretofore, companies had operated on the basis of a 40% in-kind cost recovery allowance (40% of total production) and a 65/35 equity split of net operating income.

The new terms issued in July and August of 1976 completely revised both. For the recovery of costs, companies were divided into two categories: Group I (contractors with proven reserves with seven or fewer years of remaining production), or Group II (reserves with more than seven years of remaining production). Capital costs were to be depreciated using a double declining balance(DDB) method over a seven or fourteen year period for Group I or Group II contractors respectively.

The revised profit sharing split of the remaining net operating income was set at 85/15. The obligation of the contractor to provide pro-rate oil at cost plus $.20/barrel remained unchanged.

The "effective" split, including the pro-rate oil,amounted to 89/11 in favor of Pertamina.

COUNTRY DATA--INDONESIA
POWER PRODUCTION AND ENERGY CAPABILITY

AVL 30 SEP 78

SUMMARY OF ENERGY GENERATION FACILITIES IN EXISTENCE AND PLANNED

YEAR	CAPACITY-MWe(net)
1975	1,260
1980	3,676
1985	6,653

Total electricity production in 1976 was 4,041(mil kwh).

WELLS COMPLETION:	Total wells	Total wildcat	Total footage	Successful wildcats
1974	630	176	2,830	
1975	588	185	2,263	47

NUMBER OF RIGS:	Sept 30,1977	June 30,1977	Sept 30,1976
	41	45	44

COUNTRY DATA--INDONESIA
ENERGY INDUSTRIES

AVL 30 SEP 78

REFINERIES
There are at present nine refineries operating in Indonesia. Pertamina(national oil company) owns and operates eight.

Exact data for other energy industries not available.

COUNTRY DATA--INDONESIA
ENERGY R&D: STATUS AND OUTLOOK
AVL 30 SEP 78

OIL

Oil is the primary commercial energy source in Indonesia, accounting for more than 90% of total commercial energy production since 1965. Production rate in mid-1977 was 1.7 million barrels per day, mainly due to the rapid development of offshore production which has increased its share of less than 1% of total petroleum output in 1970 to an estimated 31% in 1977. Estimates of proved crude oil reserves are put at 10.5 billion barrels, or about 2% of the world's proven reserves. Refining capacity in 1976 was 427,000 b/d. Planned refineries will add another 550,000 b/d.

COAL

Indonesia has substantial, high quality coal deposits. Presently Bukin Asam and Ombilin mines are being rehabilitated. The Bukin Asam mine is expected to produce 250,000 tons by 1982, and 2.5 million tons of coal by 1985. By the year 2000, coal is expected to be the primary energy source for the generation of between 8000 and 16,000 MW.

NUCLEAR

The Indonesian Government has announced plans for its first nuclear reactor(500MW) to be in operation by 1985. BATAN has carried out intensive surveys and explorations for radioactive minerals. Both France and West Germany have concluded contracts with BATAN for Uranium exploration in Kalimantan and West Sumatra. It is hoped that nuclear power should begin to supply a certain portion of the electricity generation in 1985, and an estimated 37% by the year 2000.

HYDROELECTRIC

Before the end of the Second Five Year Plan (Repelita II) in 1978,7 additional hydrostations are expected to be commissioned and 11 units started. By 1985, total hydroelectric capacity will leap to 2100 MW - 5 times more than the present capacity. Currently more than 90% of the installed capacity is concentrated on Java, but surveys indicate that most of the hydro reserves are on the islands outside Java.

NATURAL GAS

Indonesia's proved natural gas reserves are presently estimated at 983 billion cubic meters. Production of natural gas is expected to grow faster due to the government's decision to increase LNG exports and domestic supply to substitute for oil. By 1980, natural gas is expected to become a significant foreign exchange earner for Indonesia. Pertamina (Nat'l Oil Co.) has already undertaken development of natural gas on Sumatra and Java.

LIQUIFIED NATURAL GAS(LNG)

The Badak LNG plant, the first of its kind, was opened in 1977 in East Kalimantan. Exploratory drilling in the Badak LNG field has determined that inplace gas reserves amount to 6.18 trillion cubic ft-more than sufficient to supply the LNG plant for 20 years with an inlet volume of 530 million standard cubic-ft per operating day.

COUNTRY DATA--INDONESIA
ENERGY R&D:STATUS AND OUTLOOK AVL 30 SEP 78

GEOTHERMAL

Although total geothermal potential is not yet available, exploratory drillings are still being carried out, rough estimates of Pertamina and other foreign agencies range between 5,000 MW and 7,000 MW. For future geothermal energy development, a pilot plant with 30 MW capacity is planned for operation in West Java by the end of Repelita II (1978). Some preliminary surveys and drillings are being carried out in Central Java. The Kamojang geothermal project in West Java will begin generating electricity by the end of 1980, producing some 150 MW of power.

TIMBER

Forestry represents one of Indonesia's major assets. Official estimates put the total forested area of the main islands at 123 million rectares. Timber has become the country's second biggest export earner after petroleum. PT International Timber Corporation Indonesia (ITCI) has begun construction work on one of the biggest sawmills in the country. It is in East Kalimantan and will have a production capacity of 90,000 cu. m. of timber a year. The mill is expected to be completed in 1978.

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COUNTRY DATA--INDONESIA
ENERGY R&D:BUDGET

AVL 30 SEP 78

According to a draft of the budget for the Government of Indonesia FY 1978/79, the industry and mining sector will receive Rupiah 221 billion, an increase of 45% over the current budget which is 148 billion.
Power and electricity sector will receive Rupiah 266 billion, a 19% increase over the current budget.

More precise figures of the budget are not presently available.

COUNTRY DATA--INDONESIA
ENERGY R&D: PRIORITIES AVL 30 SEP 78

Principal attention is to be paid to using coal and wood/charcoal in place of oil wherever possible. The Government of Indonesia is planning to concentrate future electric power development on coal.

The nuclear energy priorities appear to be as follows:
- Carry out a technical and economic feasibility study of the first nuclear power plant.
- Develop a fuel fabrication capability.
- Carry out R&D in heavy water production and design instrumentation.
- Conduct exploration of radioactive materials.

According to a press statement made by the State Electricity Authority Planning Director, hydroelectric projects will receive priority treatment in Indonesia's plans for alternate energy development to reduce its reliance on fuel oil. Pertamina(the national oil company) has already undertaken the development of natural gas on Sumatra and Java, and the West Java geothermal resources are also being tapped.

COUNTRY DATA--INDONESIA
ENERGY R&D: IMPACT

AVL 30 SEP 78

Indonesia does not seem to have a systematic energy R&D program whose impact may be felt on the overall energy consumption and supply patterns of the country.
The long-run effect of conservation scheme currently advocated is hard to project in the face of persistent secular rise in energy consumption (average annual rate of 10% since 1960).
More attention is paid to the composition of domestic energy consumption and supply.
Successful development of non-oil energy resources is crucial for Indonesia not to jeopardize its oil exports.

COUNTRY DATA--INDONESIA
GOVERNMT.SUPPORTED ENERGY R&D IN IND.,UNI.& NAT LABS AVL 30 SEP 78

LABORATORIES	PROGRAM AREAS
Bandung Research Center	Neutron physics, neutron activation analysis
Pasar Djumat Research Center	Applications of radioisotopes in technology and industry
Gadjah Mada Research Center	Mutation breeding studies
INSTITUTES	
Institut Teknologi Bandung	
Institut Teknologi Surabaja	Technical education
Universities	
Diponegoro University	Technical education and nuclear studies
Gadjah Mada University	Research Center and Library

Indonesia will have its own national research center by 1985, called the National Center for Research, Science and Technology (NCRST). It will be equipped with laboratories for research in physics, chemistry, electronics, energy sources and technology. All existing research institutes in Indonesia will become a part of the new complex. The project is under the direction of the newly appointed Minister of State for Science and Technology, Dr. Burhanuddin Habibie.

COUNTRY DATA--INDONESIA
ENERGY R&D: ROLE OF PRIVATE INDUSTRY AVL 30 SEP 78

Indonesia has welcomed the use of foreign technology and capital in the development of the petroleum sector, with the stated understanding that Indonesians should play as large a role as possible in this development.

The Government of Indonesia has recently instituted new procedures and guidelines on the role and participation of foreign investors. Essential ingredients of this policy are the expanded participation by local companies as equity partners in joint venture companies (the so-called P.T. firms), and greater use of Indonesian human resources.

Oil companies in Indonesia operate under two basic forms of contractual agreements. The first method is the "contract of work" system; a semi-concessional arrangement developed prior to 1967. Caltex and Stanvac operate under this agreement. The other is the "production sharing agreement". Pertamina(the national oil company) has signed 60 production sharing agreements with 30 oil companies.

Some of the prominent companies involved in energy R&D are:

P.T.Caltex Pacific Indonesia(CPI). It includes affiliates of Texaco Inc., and Standard Oil Co. of California. These conduct onshore exploration on Sumatra Island.
Caltex also operates Minas oilfield.

P.T.Stanvac, a partnership of subsidiaries of Mobil Oil Corp., and Exxon Corp., is a long time operator in Indonesia.

Asamera Oil(Indonesia)Ltd., is involved in active exploration work.

Roy M.Huffinton Inc. group, operates in East Kalimantan conducting explorations. Its main activity is the development of the Badak field.

Mobil Oil Corp., will have a Liquified Natural Gas(LNG) plant in production in 1979.

Petromer Trend Group is involved in Irian Jaya exploration.

ARCO Group conducts exploration work on four producing structures known as the Ardjuna fields.

COUNTRY DATA--INDONESIA
INVOLVEMENT IN INTERNATIONAL ENERGY ORGANIZATIONS AVL 30 SEP 78

ORGANIZATIONS	AREA OF INVOLVEMENT
IAEA	
OPEC	
ASEAN(Association of Southeast Asian nations)	
ASCOPE(Asian Council for Petroleum- a part of ASEAN)	Encourages cooperation among its members states in the areas of petroleum development, and joint research.
NUCLEAR NON-PROLIFERATION TREATY	Signed but not ratified
UNDP	Member of the Committee for the Coordination of Joint Prospecting for Mineral Resources in the Asian Offshore Area.

COUNTRY DATA--INDONESIA
ASSESSMENT OF INTERNATIONAL ACTIVITIES AVL 30 SEP 78

Indonesian petroleum resources have brought the country into a variety of new international relationships. In addition to the foreign corporations that have established themselves in the country, Indonesia has become affiliated with several petroleum related international organizations. Indonesia is a member of OPEC, but has often maintained an independence from OPEC with regard to policy decisions, it did not support the 1973 oil embargo.

Indonesia maintains close links with other ASEAN member states, and is also a charter member of the Asian Council for Petroleum(ASCOPE).

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IR: IRAN

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COUNTRY DATA--IRAN
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DLR 12 JUL 77

The ultimate decision-maker in Iran is the Shah (Mohammad Reza Pahlavi), and he is very much involved in the determination of Iran's energy policies.

LEGISLATIVE

Legislation is enacted by the Iranian Parliament which consists of two houses, the Senate (60 member Upper House) and the Majles (268 member Lower House). Although the smaller Senate does not have a committee designated for energy questions, there is an Energy Committee in the Majles chaired by Dr. Gholam Reza Adl. Parliamentary committees usually pass, with little change, legislation presented to them by the ministries.

EXECUTIVE

The executive branch is headed by the Prime Minister (Amir-Abbas Hoveyda), who, under the Shah's close scrutiny, executes Iran's energy policies.

The following Ministries and agencies have energy responsibility:

MINISTRIES/AGENCIES	RESPONSIBILITY	KEY INDIVIDUAL
Ministry of Energy	Determine energy policy, plan and supervise energy use; carry on research in all energy forms; provide liaison with foreign energy agencies.	Dr. Iraj Vahidi Minister
Atomic Energy Agency of Iran (AEOI)	Supply of electricity to nat'l grid from nuclear power plants; pure and applied nuclear research; training of specialists; nuclear application in medicine and agriculture; relations with other national and international nuclear agencies.	Dr. Akbar Etemad President
Ministry of Science and Higher Education	Develops general science policy; administers a fund for research grants.	Dr. Hossein Samii Minister

Other Agencies:

National Iranian Oil Company (NIOC)-is a major, if not the major, element in energy policy and R&D in Iran. All of its shares are owned by the government of Iran. Policy is set by a General Meeting of the NIOC, which contrary to its name, is a meeting of a select group of individuals in the power structure. It is chaired by the Prime Minister and includes the following Ministers:

Energy	Economic Affairs and Finance	Interior
Industries and Mines	Labor and Social Services	

National Iranian Gas Company (NIGC)-is a wholly-owned subsidiary of NIOC responsible for gas development.

COUNTRY DATA--IRAN
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 12 JUL 77

MINISTRY OF ENERGY

Dr. Iraj Vahidi, Minister

Department of Planning and Research (Mazafar Ameri)

Mr. Omidsalar is directly responsible for supervision of energy R&D involving solar energy, hydrogen, methane gas from bioconversion, and the rejuvenation of traditional small power sources.

Electric Department (Ghalam-Reza Astiani)

Water Department (Azizollah Kah-Keshani)

ATOMIC ENERGY ORGANIZATION OF IRAN (AEOI)

Dr. Akbar Etemad, President and Research Director of the AEOI
Under the Research Directorate are:
Tehran Nuclear Research Center
Radioactive Materials Research Center
Nuclear Technology Center (planned)

HIGH COUNCIL OF ATOMIC ENERGY (governing body of AEOI)

Prime Minister (Amir-Abbas Hoveyda)
Minister of Energy (Dr. Iraj Vahidi)
Minister of Economy and Finance (Hushang Ansari)
Minister of Agriculture and Natural Resources (Mansur Rouhani)
Minister of Science and Higher Education (Dr. Hossein Samii)
Director of the Plan and Budget Organization(Abdol Majid Majidi)
Director of Environmental Conservation Department
President of the AEOI
Four atomic experts

COUNTRY DATA--IRAN
ENERGY POLICY AND OBJECTIVES

DLR 13 JUL 77

At the present time Iran does not have a well defined science policy nor an overall energy policy set forth in a policy statement. The government of Iran anticipates that a national science policy will be ready by the summer of 1977. In addition, the Stanford Research Institute has been retained for a second study of domestic energy supply and demand, which will make recommendations for a coherent national energy policy. What follows is Iranian energy policy as perceived at present by the American Embassy in Tehran.

Iran's present policy is to try to maximize oil revenues in order to prepare for the future when yields decline. The government of Iran is using oil and gas revenues to:

1-promote general economic development.
2-seek alternate energy sources to replace oil in domestic consumption.

The government of Iran presently favors nuclear power as a means of reducing domestic petroleum consumption.

COUNTRY DATA--IRAN
INDIGENOUS ENERGY RESOURCES

DLR 22 AUG 77

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
CRUDE OIL (billion barrels)	--	70	Southwestern Iran
NATURAL GAS (trillion cubic feet)	570	374	Southwestern Iran
COAL (million tons)	--	120	Tehran and Elburg areas
RENEWABLE			
HYDROELECTRIC (thousand MW)	--	14.5	Karun and Dez Rivers

COUNTRY DATA--IRAN
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS, AND EXPORTS DLR 22 AUG 77

RESOURCE	1975	1985
CRUDE OIL (billion barrels)		
INDIGENOUS SUPPLY	1.9	2.8
IMPORTS	0	0
EXPORTS	1.8	2.2
NATURAL GAS (trillion cubic feet)		
INDIGENOUS SUPPLY	2.1	8.3
IMPORTS	0	0
EXPORTS	0.46	0.73

COUNTRY DATA--IRAN
ENERGY R&D: STATUS AND OUTLOOK DLR 13 JUL 77

OIL

A program to inject natural gas into depleting reserves of Iran's 12 major oil fields is planned. With these injections, remaining recoverable oil reserves may be increased by 30%. Iran had 4 major refineries in 1975 with a total capacity of 735,000 b/d and one additional refinery is to be built every 2 years. By 1980 Iran is expected to have a refinery capacity to 1.7 million b/d and perhaps about 2.9 million b/d by 1985.

NATURAL GAS

Iran has the second largest proven gas reserves in the world, most of which are gas caps of oilfields. Industrial use in petrochemicals and metallurgy is to be rapidly expanded during the 1980's. A major program to transport gas to Western Europe through a Soviet gas trunkline is planned. The largest planned project (at least $2 billion) calls for injecting 14.5 billion cubic feet of gas into depleting oil fields to increase recoverable reserves.

NUCLEAR

Iran is intensely interested in nuclear power and has undertaken an extensive development program. Atomic Energy Organization of Iran announced that 10,000 experts will be trained during the next 5-6 years in various fields related to nuclear energy. Uranium deposits have been found near Yasd and Anarak, but grades have not been reported. Iran has signed a contract with Federal Republic of Germany for the construction of 2 1200 MWe light water power reactors to be completed in 1981 and 1982. A letter of intent has also been signed with France to build 2 reactors of 900 MWe each to begin operation 1983 and 1984. Iran has abandoned plans for a domestic reprocessing facility in favor of making bilateral and multilateral reprocessing agreements.

HYDRAULIC

Hydroelectric potential is large by Middle Eastern standards. As of December 1975 generating capacity was less than 1000 MW, but some 20 other dams were under study. Iran's projected generating capacity of 15,000-23,725 million MW by 1985 does not seem within reach.

SOLAR

Iran has extensive solar energy potential. A solar energy laboratory, the Materials and Energy Research Center (MERC), has been established and supported by a seven-year $44 million budget. A principal interest of MERC is the development of total energy systems for small remote villages. Government of Iran is committed to a program of putting flat-plate collectors on 1000 buildings.

COUNTRY DATA--IRAN
ENERGY R&D: BUDGET

DLR 14 JUL 77

The Iranian national budget is not sufficiently broken down to provide a figure for R&D as a whole. The best guess of the American Embassy at Tehran, arrived at by aggregating scattered and contradictory data, is that total energy R&D funding for FY 1975-76 (beginning 21 Mar 75) is about $20 million, believed to be allocated approximately as follows:

ORGANIZATION	MILLIONS OF DOLLARS
Ministry of Energy	
Solar	3
Total	10
Atomic Energy Organization of Iran (AEOI)	
Fission	4
Fusion	1
National Iranian Oil Company and affiliates	4
National Iranian Gas Company	1

Exchange rate used: 69.15 Rials to one dollar

COUNTRY DATA--IRAN
ENERGY R&D: PRIORITIES

DLR 14 JUL 77

It appears evident that government of Iran priorities in energy R&D are approximately as follows:

1-Petroleum
2-Natural gas
3-Nuclear fission
4-Nuclear fusion
5-Solar energy
6-Geothermal energy
7-Hydrogen

It is possible that solar energy is accorded precedence over nuclear fusion in Iranian R&D, but practically all less-traditional energy sources have received little attention in Iran as yet.

COUNTRY DATA--IRAN
GOV'T SUPPORTED ENERGY R&D IN IND, UNIV & NAT'L LABS DLR 23 AUG 77

LABORATORIES	PROGRAM AREAS	KEY INDIVIDUALS
Tehran Nuclear Research Center	Nuclear physics, radio-isotopes, physical archeology, radio-biology agricultural research, material sciences, electronics.	Dr. Bahman Parsa, Director; Mehdi Sarram, Chief Reactor Engineer
Radioactive Materials Research Center	Applications of radioactivity.	
Esfahan Nuclear Technology Center	Tentative completion date is 1978. Technology development in all phases of the nuclear fuel cycle.	
Materials and Energy Research Center (MERC)	Combined R&D in electronics, materials science and economics for the solution of solar power problems.	Dr. S. Vojdani, Director
UNIVERSITIES		
Pahlevi University Solar Energy Research Center	Paper studies on one and ten MW thermal systems.	

COUNTRY DATA--IRAN
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 14 JUL 77

All energy R&D is carried out either in government or university facilities. Thus far private industry plays no appreciable role in any R&D in Iran.

COUNTRY DATA--IRAN
INVOLVEMENT IN INTERNATIONAL ENERGY ORGANIZATIONS DLR 14 JUL 77

ORGANIZATIONS

IAEA
OPEC

COUNTRY DATA--IRAN
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COUNTRY DATA--ITALY
ENERGY POLICY: BASIC LEGISLATION DLR 02 DEC 77

1-National Council for Nuclear Research (CNRN) established in 1952 and changed in 1960 to the National Committee for Nuclear Energy (CNEN).
2-National Hydrocarbons Agency (ENI) established 1953 as a holding company for equities owned by the Italian government in the petroleum industry.
3-Laws passed in 1962 and 1975 assigned protection and safety tasks to CNEN.
4-Interministerial Economic Planning Committee (CIPE) established 1967 for control, coordination and orientation of scientific and technical research.
5-Structure of CNEN was changed and its functions were oriented towards applied research and the development and promotion of nuclear energy 1971.
6-Establishment of the state electricity producer, the Electric Energy Agency (ENEL) 1972.

COUNTRY DATA--ITALY
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DLR 28 NOV 77

LEGISLATIVE- bicameral Parliament is composed of the Chamber of Deputies (630 members) and the Senate (323 members). Legislative bills may originate in either house and must be passed by a majority in both. Parliament is ultimately responsible for providing policy lines and approving funding for GOI (Government of Italy) energy policy. However, in practice, ministries and state-controlled entities have considerable autonomy in energy matters.

EXECUTIVE-composed of a Council of Ministers (Cabinet) and headed by the President of the Council (Prime Minister). The Cabinet, which in practice is composed of members of Parliament, must retain the confidence of both houses. The President of the Republic (Giovanni Leone) is elected for 7 years by Parliament. He nominates the Prime Minister (Andreotti), who chooses the other ministers.

As of 1977, there is no single department or individual of ministerial rank whose sole responsibility is Italy's oil policy. Government agencies establish policy at various levels depending on the subject matter.

The Ministry of Industry (particularly the Directorate General for Energy Sources and Basic Industry) despite a virtually unlimited mandate is understaffed and lacking in technological resources and expertise.

The most important institutions include:

AGENCY/KEY INDIVIDUAL	ENERGY INVOLVEMENT
Ministry of Industry	Determines and coordinates domestic energy policy, regulates oil co. operations, supervises National Electricity Agency, directs domestic energy conservation effort, provides experts for Italian delegations to international energy bodies.
Ministry of Foreign Affairs/Mariano Rumor, Minister	Coordinates, without in-house expertise, international aspects of GOI energy policy in IEA, EEC, IAEA, EURATOM, etc. Technical input furnished by other GOI entities.
Ministry for Coordination of Scientific Research and Technology	Impressive title is offset by lack of solid organizational structure and jurisdictional conflicts with other GOI bodies and the specialized research institutions which perform actual research.
National Hydrocarbons Agency (ENI)	Controls operating companies in petroleum and natural gas exploration, production and distribution; chemicals; and nuclear fuel cycle. ENI exercises an important influence on GOI energy policy. ENI in-

COUNTRY DATA--ITALY
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D (CONT) DLR 06 DEC 77

AGENCY/KEY INDIVIDUAL	ENERGY INVOLVEMENT
	fluence in nuclear area is expected to increase.
Electric Energy Agency (ENEL)/Arnoldo Angelini, President	Major domestic electricity producer, ENEL also performs research in geothermal and other fields related to electricity production and distribution. ENEL is severely limited by financial problems.
National Nuclear Energy Committee (CNEN)	Nuclear research and regulation. Due to restructuring, operational responsibilities in nuclear fuel cycle have been transferred to ENI. ENEN is expected to increase efforts in applied research.
National Research Council (CNR)	Identifies and sponsors research projects researches energy conservation projects, and represents Italy on CCMS programs
Interministerial Economic Planning Committee (CIPE)	A key committee consisting of cabinet ministers with responsibility for GOI economic decisions. Once approved by CIPE, measures may be implemented administratively or sent to Parliament for ratification. CIPE does not initiate programs, but it is a major forum for resolving differences among ministries involved in economic affairs, including energy.

COUNTRY DATA--ITALY
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 20 NOV 77

NUCLEAR

There are three government-controlled energy producing companies involved in the nuclear industry:

1-Electric Energy Agency (ENEL)
2-National Committee for Nuclear Energy (CNEN)
3-AGIP Nucleare; subsidiary of National Hydrocarbons Agency (ENI)

ENEL and CNEN share responsibility for financing and operating the nuclear plants, while AGIP Nucleare is charged with procuring and importing uranium and providing ENEL with fuel elements.

NUCLEAR AND NON-NUCLEAR

NATIONAL HYDROCARBONS AGENCY (ENI)

The state-owned holding company carries out energy R&D through The following operating companies:

1-AGIP (integrated petroleum operations)
2-ANIC (petrochemicals)
3-SNAM (natural gas operations and engineering)
4-Nuovo Pignone (pumps and industrial products)
5-AGIP Nucleare (nuclear fuel cycle)
6-SAIPEM (engineering and construction)
7-TESCON (textiles)
8-SOFID (financial subsidiary for the group)

ELECTRIC ENERGY AGENCY (ENEL)

The Central Research and Development Department carries out R&D in the following centers:

1-Electric Research Center
2-Automation and Computing Research Center
3-Hydraulic and Structural Research Center
4-Thermal and Nuclear Research Center
5-Geothermal Research Center

NATIONAL COMMITTEE FOR NUCLEAR ENERGY (CNEN)

CNEN Laboratories:

1-Casaccia Nuclear Studies Center-applied nuclear research, radiation studies
2-National Frascati Laboratory-high energy and nuclear physics
3-Center for Nuclear Studies at Ispra-jointly run by CNEN and

COUNTRY DATA--ITALY
ORG. FOR IMPLEMENTATION OF ENERGY POLICY AND R&D (CONT) DLR 20 NOV 77

NATIONAL COMMITTEE FOR NUCLEAR ENERGY (CNEN)

CNEN Laboratories:

EURATOM for studies on the physics of materials by slow neutron spectrometry
4-Bologna Calculatious Center
5-Fiascherino Laboratory-radioactive contamination of the sea
6-Saluggia Laboratory-uranium enrichment
7-La Trisaia Nuclear Research Center-reprocessing

COUNTRY DATA--ITALY
ENERGY POLICY AND OBJECTIVES DLR 02 DEC 77

In October 1977, the Chamber of Deputies approved a national energy plan. It is scheduled to be submitted to the Interministerial Economic Planning Committee (CIPE) for final approval and will serve as the basis on which the government will formulate its directions for implementation.

The proposed hydrocarbons program changes the old National Petroleum Plan of 1974 and the first National Energy Plan of 1975 in several significant respects:

1-a less rigid supply policy
2-an enhanced role for the private sector
3-a liberalized price policy

The objective of the supply policy is to secure a reliable and convenient crude supply through:

1-diversification of supply among oil producing countries
2-an exchange of industrial plans, technologies, manufactured goods and services with crude exporting countries for petroleum supplies and products

In addition, the plan envisages industrial goods exchange with developing countries to obtain needed energy and other raw material products.

The role of private companies in the petroleum industry is to be maintained. (Domestic companies currently hold over 65% of the domestic market.) Both the public and private sector must operate within the framework set by CIPE.

The plan recommends a more flexible and timely price policy with the following features:

1-more frequent adjustments to changes in real supply costs
2-greater reference to price quotations on the European market

The objective of the Italian nuclear program is to supply 6 GWe by 1980 and 44 GWe by 1990. The latter figure is projected to be 43% of the total 1990 installed electrical power. One long-term goal is the development of an economically competitive LMFBR to be built commercially by the early 1980's.

COUNTRY DATA--ITALY
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY DLR 02 DEC 77

Italy's degree of self-sufficiency in energy for 1973 was as follows:

	Percent of Self-sufficiency
COAL	3.7
OIL	1.1
GAS	84.8
ELEC	95.1
TOTAL	18.5

Although there are signs of improvement, Italy's energy situation is and will remain very difficult due to the absence of domestic primary energy sources with the exception of natural gas which currently covers 50% of domestic gas requirements. Since the energy crisis of 1973, Italy has been compelled to develop its relations with oil producing countries through the negotiation of commercial agreements (mainly covering exports of services and technology) and to give greater attention to export promotion to offset the increase in its foreign exchange expenditures for energy imports.

COUNTRY DATA--ITALY
INDIGENOUS ENERGY RESOURCES

DLR 02 DEC 77

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
CRUDE OIL (million tonnes)	--	43	Adriatic and Ionian Seas
NATURAL GAS (billion cubic meters)	--	187	Adriatic and Ionian Seas
COAL (million tonnes)	110	33	
URANIUM (thousand tonnes)	--	1.1	North of Viterro
RENEWABLE			
HYDROELECTRIC (billion kWh/yr)	44	44	

COUNTRY DATA--ITALY
PATTERNS OF ENERGY SOURCES AND USES

DLR 05 DEC 77

CONSUMING SECTOR-1975

	INDUSTRY	TRANSPORTATION	OTHER	TOTAL
COAL (million tonnes)	3.5	.06	.7	4.2
PETROLEUM PRODUCTS (million tonnes)	22.65	18.44	21.77	62.86
NATURAL GAS (billion cubic meters)	10.02	.25	6.0	16.27
NUCLEAR/HYDRO/GEOTHERMAL (billion kWh)	76.9	4.9	45.0	126.8

COUNTRY DATA--ITALY
PROJECTIONS OF DEMAND

DLR 30 NOV 77

	STANDARD PHYSICAL UNITS		MILLION TONS OF OIL EQUIVALENT	
	1972	1985	1972	1985
COAL (mill. tons)	11.4	25.7	8.0	18.0
OIL (mill. tons)	89.5	153.0	89.5	153.0
NATURAL GAS (bill. cu. meters)	16.7	55.7	12.9	43.0
ELECTRICITY (GW)	6.6	28.8	10.5	49.0

COUNTRY DATA--ITALY
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS AND EXPORTS   DLR 05 DEC 77

RESOURCE	1975	1985
COAL (million tonnes)		
INDIGENOUS SUPPLY	.9	0
IMPORTS	6.7	23.2
EXPORTS	.4	0
CRUDE OIL (million tonnes)		
INDIGENOUS SUPPLY	1.07	--
IMPORTS	95.86	137.7
EXPORTS	0	0
NATURAL GAS (billion cubic meters)		
INDIGENOUS SUPPLY	12.0	4.0
IMPORTS	7.2	51.9
EXPORTS	0	0

COUNTRY DATA--ITALY
ENERGY R&D: STATUS AND OUTLOOK DLR 05 DEC 77

NUCLEAR
Two power reactors have been in operation since 1964, and a third since 1965. A fourth is expected to begin operation in 1977. These four reactors have a combined output of 1387 MWe. Current plans call for 12,000 MWe to become operational by 1985. The eventual goal is for 20,000 MWe of installed capacity. The first four units of about 1000 MWe each were ordered in 1974. The ordering of the remaining reactors has been deferred, in part due to financial constraints. It is expected that the additional reactors will be divided between Westinghouse PWR's and General Electric BWR's, although some consideration is being given to other suppliers and types. Italy plans to introduce two CANDU heavy water reactors in 1978. One long term goal is the development of an economically competitive LMFBR to be built commercially by the early 1980's. Studies have been initiated in fast reactor fuels and sodium-cooled reactor components. Italy has been working with France and FRG on construction of the 1200 Super Phenix fast reactor power station to begin construction in Germany during the 1980's.

OIL
Exploration is continuing both on and offshore by AGIP and over 50 foreign companies. Discovery of the Malossa oil and gas field in the Po Valley significantly brightened Italy's prospects for reducing energy imports. The field is expected to produce 50 to 60 thousand barrels a day of high quality oil. Several discoveries of oil and/or gas have been made in the Adriatic and Ionian seas but their commercial potential remains to be proven. Italy's excessive refining capacity (total capacity is over 4 million barrels a day) continues to plague the petroleum industry. Refiners have had difficulties maintaining an adequate profit margin because of reduced runs and the low rate of capacity utilization. Foreign companies are reluctant to undertake large investments because they consider government regulations too restrictive and their return on investment less than attractive.

NATURAL GAS
Domestic production of natural gas meets approximately half of Italy's demand for 2 billion cubic feet a day. The Malossa gas field discovered in 1974 is expected to produce 350 million cubic feet a day. During 1976 a gas deposit expected to produce 50,000 cubic meters a day was discovered near Reggente. Italy is negotiating on a project to import Algerian natural gas via a pipeline under the Mediterranean from Tunisia to Sicily to the mainland.

COAL
Coal supplied 8% of Italy's energy needs in 1975, and is expected to contribute only 6.5% in 1985. Almost all of Italy's solid fuel demand is met by imports, as only two coal mines have been in operation since 1970.

SOLAR
Interministerial Economic Planning Committee (CIPE) which assigns funds for solar R&D has designated it as a "minor energy". A recent study indicates solar energy is expected to supply no more than two percent of Italian energy requirements by year 2000. Research in building heating and cooling is being conducted. Plans call for a photovoltaic cell project to begin in 1977. Future government R&D

seems to be aimed more at the Middle East and North African markets than at domestic application.

COUNTRY DATA--ITALY
ENERGY R&D: BUDGET

DLR 05 DEC 77

	$US-Millions
NATIONAL RESEARCH COUNCIL (CNR) for CY 1975	
General Energy	1.5
Geothermal/Solar/Wind Energy	3.8
Total CNR	5.3
National Nuclear Energy Committee (CNEN) for CY 1975	
Nuclear Energy	1065.7
National Hydrocarbons Agency (ENI) for CY 1975	
Oil and Drilling Research	15.5
Traditional Fuel Research	86.2
Nuclear Fuel Research	93.0
Total ENI	194.7
ELECTRIC ENERGY AGENCY (ENEL) for CY 1974	
General Energy (conservation, transportation)	92.8
Geothermal	23.1
Nuclear	54.6
Total ENEL	170.5

Note: Fiscal year is same as calendar year. Exchange rate for 1975 is Lire 653 equals $1, for 1974, Lire 650 equals $1.

COUNTRY DATA--ITALY
ENERGY R&D: PRIORITIES

DLR 05 DEC 77

Judging from budget allocations, nuclear energy appears to have top priority. The Third CNEN (National Nuclear Energy Committee) Five Year Plan established the following priorities in nuclear energy R&D:

A-Reactor Development

1-Proven designs (LWR)
2-CIRENE (HWR)
3-PEC (FBR)

B-Fuel Cycle Research

1-Uranium enrichment
2-Fuel element development
3-Fuel reprocessing
4-Radioactive waste management

COUNTRY DATA--ITALY
GOV'T SUPPORTED ENERGY R&D IN IND, UNI AND NAT'L LABS DLR 05 DEC 77

LABORATORIES	PROGRAM AREAS
National Nuclear Energy Committee (CNEN) laboratories	
Casaccia Nuclear Studies Center	Applied nuclear research, radiation
National Frascati Laboratory	High energy and nuclear physics
Ispra Nuclear Studies Center	Physics of materials by slow neutron spectrometry
Fiascherino Laboratory	Radioactive contamination of sea
Saluggia Laboratory	Uranium enrichment
La Trisaia Nuclear Research Center	Reprocessing
Industrial Reconstruction Institute (IRI)	Reactor development
NIRA (Nucleare Italiana Reatlori Avanzati)	Development and construction of advanced and fast breeder
Military Center for Applied Nuclear Energy (CAMEN)	Reprocessing, nuclear protection, nuclear ship design
UNIVERSITIES	
National Institute of Nuclear Physics (IFIN)	Leading Italian research center for fundamental nuclear physics
Work carried out by universities: Rome, Padua, Milan, Turin, Bologna, Pisa, Genoa, Naples Catania, Florence, Trieste, Bari and Pavia	Elementary particles using visual and electronic techniques, nuclear and theoretical physics, technological research

JOINT GOVERNMENT/INDUSTRY

FIEN (Italian Nuclear Energy Forum) serves as the meeting place for scientists from the three pillars of the national nuclear sector: CNEN (R&D), Electric Energy Agency (power generation) and industry.

Italian Group for Uranium Enrichment (headquartered at CNEN) involves as participants FIEN, CISE (Information Study and Experiment Center at Rome U.), ENI (National Hydrocarbons Agency) and the following industrial groups: SNIA Viscosa, Montedison, FIAT and AGIP Nucleare.

COUNTRY DATA--ITALY
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 06 DEC 77

Italian private industry is active in nuclear R&D. Projects include development of light-water and boiling-water reactors and uranium enrichment processes based on gas diffusion, ultracentrifuge and advanced separation techniques. The private industries most noted in the nuclear field in Italy are:

FIAT (nuclear energy section)
Montedison
Carlo Gavazzi
Franco Tosi
Ercole Marelli
TERNI
Breda
CIMI
SNIA Viscosa
Technomasio

COUNTRY DATA--ITALY
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS DLR 06 DEC 77

ORGANIZATION	DEGREE OF INVOLVEMENT
EURATOM	Contributes to R&D effort at the nuclear research facility located in Ispra, Italy
CCMS	
NEA	
IEA	See below
IAEA	
EURODIF	Italian agencies have a 28% share in this French-led uranium enrichment effort.

DETAIL OF IEA PARTICIPATION

WORKING PARTY MEMBERSHIP	PROJECT TITLE
Coal Technology	Mining Technology Clearing House Service World Coal Resources and Reserves Data Bank Service Economic Assessment Service for Coal
Conservation	Energy Cascading Thermal Energy Storage
Fusion	
Geothermal	Italy serves as lead country
Nuclear Safety	Information Exchange Agreement Power Burst Facility (PBF) Operations Safety Research Index Safety Studies at the Steam Superheat Reactor (HDR)
Ocean Thermal Energy Conversion	
Radioactive Waste Management	
Small Solar Power Systems	
Wind Power	

COUNTRY DATA--ITALY
KEY REFERENCES

DLR 06 DEC 77

	LOCATION
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2-Guide to World Science, Vol. 4: Italy, Francis Hodgson Publishing Co., Guernsey, British Isles, AUG 75	--
3-The Role of Foreign Governments in the Energy Industries, Office of International Affairs, Dept. of Energy, OCT 77	IA
4-State Dept. Airgram A-347 from AMEMBASSY ROME 28 OCT 77 (unclassified)	IA

-References thus indicated are available at public libraries

COUNTRY DATA--ITALY
NOTES AND EVALUATIONS

DLR 06 DEC 77

	LOCATION
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2-Energy Balances of OECD Countries 1973/1975 (3D, p.89; 3F, p.89)	--
3-State Dept. Background Notes on Italy MAY 75 (2B)	--
4-ENEL-Central R&D Department Organization Chart, no date (2C)	IA
5-ERDA-51, Energy Policies In the European Community, FEB 75 (3A, p.142; 3B, p.12; 3E, p.64; 3F, p.87)	IA
6-Guide to World Science, Vol. 4: Italy, Francis Hodgson Publishing Co., Guernsey, British Isles, AUG 75 (2A, p.25; 2C, p.108-9; 4E, p.108-9, 112, 114, 116)	--
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15-State Dept Airgram A-231 from AMEMBASSY ROME 06 JUL 77 Unclassified (4A)	IA
16-State Dept Airgram A-122 from AMEMBASSY ROME 17 MAR 77 Unclassified (2B)	IA
17-International Cooperation in Energy R&D, ERDA 12 MAY 77 (5B)	IA
18-Helfrich to Bergold Memo, 26 JUL 77 (2B, p.1, Attachment)	IA
19-Metzler to Vanderryn Memo on Meeting Between OLADE and GE and AIA, 23 SEP 77 (5B)	IA
20-The Role of Foreign Governments in the Energy Industries, Office of International Affairs, Dept of Energy, OCT 77 (2A, p.139, 142; 2B, p.143, 145; 2C, p.139, 142-3; 3C, p.143; 4A, p.143, 144, 146)	IA
21-State Dept Airgram A-347 from AMEMBASSY ROME 28 OCT 77 Unclassified (2C, p.17; 3A, p.15; 3B, p.4; 5B, p.13, 17)	IA

-References thus indicated are available at public libraries

WENDS COUNTRY DATA

JA: JAPAN

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COUNTRY DATA--JAPAN
ECONOMIC DATA PROFILE

DLR 17 JAN 78

GNP (1975, billion $)-488
PER CAPITA INCOME ($)--
EXPORTS (1975 billion $)-54.8
MONETARY UNIT-Yen

INFLATION RATE--
DISPOSABLE INCOME--
IMPORTS (1975, billion $)-49.7
EXCHANGE RATE (1US$=)-266.7 yen in JUL 77

TOTAL ENERGY R&D BUDGET (1977, million $)-520.69

TRANSPORTATION SYSTEM DESCRIPTION

Japan has a well-developed international and domestic transportation system, although highway development still lags. The major cities have subways, interurban surface and elevated trains, buses and taxis. The national railway system serves most of Japan and is widely used by foreigners. Japan is served by a number of international airlines and steamship companies and has several domestic airlines.

--not available

COUNTRY DATA--JAPAN
DEMOGRAPHIC DATA PROFILE

DLR 17 JAN 78

LAND (thousand sq km)-377.5
POPULATION (millions)-112.8
LITERACY (%)-98
LIVE BIRTHS/THOUSAND-17.1
MEDIAN AGE/MALES--
AVERAGE FAMILY SIZE--
PRIMARY SCHOOL GRADS--
INDUSTRIAL WORKERS-18,230,000
AGRICULTURAL WORKERS-6,150,000
POPULATION GROWTH (%)-1.1
--not available

ARABLE LAND (thousand sq km)-60.4
POPULATION DENSITY (/sq km)-299.2
% RURAL POPULATION--
DEATHS/THOUSAND-6.3
MEDIAN AGE/FEMALES--
NET MIGRATION (millions/yr)--
SECONDARY SCHOOL GRADS--
PROFESSIONAL WORKERS--
COLLEGE GRADS--
UNEMPLOYED-990,000

COUNTRY DATA--JAPAN
ENERGY POLICY: BASIC LEGISLATION DLR 17 JAN 78

Most of the legislative measures dealing with energy R&D are related to the organizational set up. It is usual practice in Japan that administrative measures such as promotion of R&D programs, payments of commission fees, subsidy, etc. are budgetary appropriations. In the following is given a list of major legislation in the areas related to energy R, D and D.

GENERAL

1-Establishment Act of Science and Technology Agency (May 1956).
2-Establishment Act of the Council for Science and Technology (February 1959).
3-Establishment Act of the Agency of Industrial Science and Technology (August 1948).
4-Establishment of the Ministerial Council on the Promotion of General Energy Policy (February 1977).

NUCLEAR ENERGY

1-Atomic Energy Basic Act (January 1956). The Act provides the basic principles and other basic matters of research, development and use of atomic energy.
2-Establishment Act of the Atomic Energy Commission (January 1956).
3-The Long Term Plan of the Development and Utilization of Atomic Energy (latest edition in June, 1972). The plan deals with the long term plan for research, development and use of atomic energy.
4-The Japan Atomic Energy Research Institute Act (May 1956).
5-Japan Nuclear Ship Development Agency Act (June 1963).
6-Power Reactor and Nuclear Fuel Development Corporation Act (July 1967). This corporation (often called DONEN) is in charge of development of fast breeder reactors and advanced thermal reactors, production and possession of nuclear fuel materials, reprocessing of spent fuel, exploration of nuclear source materials, etc.

OTHERS

1-Establishment Act of the Advisory Committee for Energy (June 1965).
2-Japan Petroleum Development Corporation Act (July 1967).
3-Act for Promotion of Power Resources Development (July 1952).
4-Special Account Act for Promotion of Power Resources (June 1974).
5-Formulation of Indicative Plan for Sunshine Project (July 1974): Long term targets are set for R&D of new energy.

COUNTRY DATA--JAPAN
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D DLR 17 JAN 78

LEGISLATIVE-a bicameral legislative body known as the DIET is the highest organ of state power and is the sole lawmaking body of the government. It is composed of the House of Representatives (491--member Lower House) and House of Councillors (252--member Upper House).

EXECUTIVE-power is vested in a Cabinet composed of the Prime Minister (Takeo Fukuda) and the Ministers of State. The Prime Minister, who must be a member of the DIET, has the power to appoint and remove his Ministers, the majority of whom must be from the DIET.

Ministerial Council on Promotion of General Energy Policy was established for coordination among related Ministers concerning important issues on the promotion of general energy policy and is chaired by the Prime Minister. Energy R&D is regarded as one of the main elements of the general energy policy.

Council for Science and Technology is the supreme advisory organ to the Prime Minister for basic science and technology policy. The Council is now deliberating on "a basic plan of energy R&D" under the direction of the Prime Minister.

OTHER PARTS OF THE ENERGY STRUCTURE

1-Atomic Energy Commission (AEC) is an advisory organ to the Prime Minister for policy of atomic research, development and use. It is chaired by the State Minister of Science and Technology.
2-Science and Technology Agency (STA) is one of the external agencies of the Prime Minister's office and its major functions are the coordination of governmental R&D activities and the promotion of national projects in such new fields as atomic energy, space, ocean and life science. Director General is Sousuke Uno.
3-Agency of Natural Resources and Energy (ANRE) is in charge of overall administration concerning production, distribution, consumption, etc., of mineral resources and various forms of energy including electricity.
4-Advisory Committee for Energy (ACE) studies and deliberates over important issues concerned with overall and long term policies for ensuring stable and rational energy supply.
5-Agency of Industrial Science and Technology (AIST) is in charge of R&D in industry. It is promoting "Sunshine Project", large scale R&D of solar, geothermal, coal gasification and liquefaction and hydrogen.
6-Council for Industrial Technology deliberates how to promote development of industrial technology including a basic policy line of Sunshine Project.

COUNTRY DATA--JAPAN
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 20 JAN 78

SCIENCE AND TECHNOLOGY AGENCY (Minister of State for Science and Technology, Sousuke Uno; Science Counselor, Mikiro Isetani)--responsible for coordination of government R&D in nuclear, ocean and space programs.

MINISTER'S SECRETARIAT (Deputy Vice-Minister for Administration, Haruo Hanzawa)

PLANNING BUREAU (Director General, Hiroyuki Oosawa)

RESEARCH COORDINATION BUREAU (Director General, Shigemchi Sonoyama)-overall research coordination and implementation of space and ocean development policies.

PROMOTION BUREAU (Director General, Hiroshi Sugiura)--responsible for public information and promotion of international cooperation.

ATOMIC ENERGY BUREAU (Director General, Masato Yamano)--responsible for nuclear development in Japan.

POLICY DIVISION (Director, Keiichiro Murano)--overall coordination of the divisions.

RESEARCH AND INTERNATIONAL AFFAIRS DIVISION (Director, Masahiro Kawasaki)--international cooperation.

POWER REACTOR DEVELOPMENT DIVISION (Director, Isao Uchida)--development of FBR and ATR, supervision of Power Reactor and Nuclear Fuel Development Corporation (PNC).

TECHNOLOGY PROMOTION DIVISION (Director, Takashi Matsui)--planning and promotion of R&D.

NUCLEAR FUEL DIVISION (Director, Hisayasu Tanaka)--planning and promotion of nuclear fuel R&D.

ADMINISTRATOR OF ATOMIC ENERGY DEVELOPMENT AGENCIES (Takuya Hirano)--supervision of Japan Atomic Energy Research Institute

NUCLEAR SAFETY BUREAU (Director General, Nobuyuki Makimura)--nuclear regulation in Japan.

NUCLEAR SAFETY DIVISION (Director, Hiroyuki Nakato)--overall coordination of the divisions.

OFFICE OF ENVIRONMENTAL RADIOACTIVITY (Director, Kooji Yonemaoto)-radiation monitoring.

REACTOR REGULATION DIVISION (Director, Yasushi Matsuda)--regulation of reactors.

NUCLEAR MATERIAL REGULATION DIVISION (Director, Mitsugu Ishizuka)--regulation of nuclear materials.

SAFEGUARDS DIVISION (Director, Hiroyoshi Kurihara)--safeguards.

COUNTRY DATA--JAPAN
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/DLR 20 JAN 78

(CONTINUED)

RADIATION PROTECTION DIVISION (Director, Takahira Kanehira)- regulation of radioisotopes

COUNTRY DATA--JAPAN
ENERGY POLICY AND OBJECTIVES DLR 18 JAN 78

Japan's current energy policy was defined on the basis of the "Basic Direction of General Energy Policy" adopted by the Ministerial Council on General Energy Policy (reorganized as the Ministerial Council for the Promotion of General Energy Policy in February 1977) in December 1975.

The fundamental concept underlying the Basic Direction is the emphasis on diversification to non-oil energy. The following directions were given:

1-Effective use of domestic energy, promotion of the development of nuclear energy as quasi-domestic energy, dispersion of risks through diversification of imported energy sources.
2-Stable supply of oil as the mainstay of energy supply for the time being.
3-Promotion of energy conservation (development of technology for energy conservation, advancement of heat control, etc.).
4-Development of technology for new energy (the technology for nuclear fusion, solar energy, geothermal energy, coal liquefaction and gasification, hydrogen energy, etc., as well as new types of nuclear reactors such as advanced thermal reactors, fast breeder).

In the light of changes in the energy situation that have since taken place, a review of the Basic Direction is underway and the Advisory Committee for Energy (ACE) to the Minister of International Trade and Industry (MITI) has recently presented a detailed and comprehensive interim report in which energy R, D&D is emphasized as one of the following "seven basic pillars":

1-Promotion of energy conservation in all areas of energy consumption.
2-Maximum use of domestic energy resources such as hydropower, oil, natural gas, coal and geothermal energy.
3-Promotion of overseas development and import of alternative energy resources with high supply potential such as nuclear power, coal and LNG.
4-Assurance of secure and stable supply of primary energy resources through diversification of supply sources and enhanced cooperation with supplier countries.
5-Maintenance of stockpiles of various energy resources commensurate with the demand situations.
6-Promotion of smooth siting processes for the energy-related facilities through better understanding and cooperation by the public.
7-Pursuit of maximum contributions of energy technology in the development of alternative energy resources, conservation and new energy R, D&D.

COUNTRY DATA--JAPAN
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY DLR 18 JAN 78

On 19 DEC 75, the "Basic Direction of General Energy Policy" was adopted by the Ministerial Council on General Energy Policy (reorganized as the Ministerial Council for the Promotion of General Energy Policy in February 1977).

As policy guidelines, the Council prepared projections of Japan's energy self-sufficiency as follows:

	PERCENTAGE
JFY 1973 (actual)	9.9
JFY 1978 (estimate)	12.4
JFY 1985 (estimate)	17.5

The target figures presuppose success in the government's administrative efforts and industrial as well as public cooperation on matters relating to energy suppliers and consumers.

Japan's fiscal year: 01 APR - 31 MAR

COUNTRY DATA--JAPAN
INDIGENOUS ENERGY RESOURCES

DLR 18 JAN 78

NONRENEWABLE	RESOURCES	RESERVES	LOCATION OF IDENTIFIED RESERVES
COAL (million tonnes)	8628	1026	Kyushu, Hokkaido
CRUDE OIL (million tonnes)	94.8	5.1	Honshu, Hokkaido
NATURAL GAS (cubic km)	--	12.9	Honshu
URANIUM (thousand tonnes U308)	9.1	9.1	Ningyo Toge, Okayama and Gifu
RENEWABLE			
HYDROELECTRIC (billion kWh/yr)	670	133	Honshu
GEOTHERMAL (billion kWh/yr)	--	0.38	Onuma, Matsukawa, Kowakidani

The reserve figure for geothermal energy represents the energy produced in 1975.
--not available

COUNTRY DATA--JAPAN
PATTERNS OF ENERGY SOURCES AND USES

DLR 18 JAN 78

CONSUMING SECTOR-1975

	HOUSEHOLD & COMMERCIAL	INDUS-TRIAL	TRANSPOR-TATION	ELECTRICAL GENERATION	TOTAL
COAL (million tonnes)	5.62	44.1	0.04	15.6	65.36
PETROLEUM (million tonnes)	32.13	64.0	40.22	69.3	205.7
NATURAL GAS (cubic km)	0.04	0.1	0	0.09	0.23
NUCLEAR POWER (billion kWh)	0	0	0	85.9	85.9
HYDROPOWER (billion kWh)	0	0	0	0.38	0.38
GEOTHERMAL (billion kWh)	0	0	0	0.38	0.38
UTILITY ELECTRI-CITY DISTRIBUTED (billion kWh)	126.51	281.5	13.84	53.95	475.79

COUNTRY DATA--JAPAN
PROJECTIONS OF DEMAND

DLR 18 JAN 78

	STANDARD PHYSICAL UNITS			TRILLION Btu		
	1975	1985	2000	1975	1985	2000
COAL (million tonnes)	80.3	90.6	125.0	2230	2517	3470
CRUDE OIL (million tonnes)	192.9	285.2	552.9	8192	12116	23529
NATURAL GAS (cubic km)	9.9	36.8	107.1	359	1321	3850
HYDROELECTRIC (billion kWh)	85.9	87.9	135.6	977	1000	1543
GEOTHERMAL POWER (billion kWh)	0.4	0.4	0.7	4	5	8
NUCLEAR POWER (billion kWh)	25.1	188.9	542.4	286	2150	6172
URANIUM (thousand tonnes U3O8)	2.3	10.5	-	-	-	

--not available

COUNTRY DATA--JAPAN
COMMERCIAL APPLICATION DLR 18 JAN 78

As an important element in Japan's technology and industrial policies, there are long established measures common to all technologies for promotion of R, D&D in private industry and commercial application, including:

1-Susidies for R, D&D efforts.
2-Tax credits applicable to increases in R, D&D expenditures since 1966.
3-Low interest loans for the industrialization of new technology.
4-Establishment of the Research Development Corporation of Japan to aid development and the commercial application of results of scientific research.
5-Research Association System established in 1961 to promote joint efforts in mining and manufacturing.
6-Industrial Standardization Act enacted in 1949 to promote improvement in the quality of mining and industrial products.

In addition to the price competitiveness of energy produced by the new technology, the following items are identified by the Japanese Government as the principal obstacles to enhancement of industrial energy R, D&D activities and commercial application:

1-Risks inherent in R, D&D in general.
2-Lack of qualified personnel in new energy technology areas.
3-Lack of funds for long-term large-scale energy R, D&D.
4-Siting of energy R, D&D facilities and environmental problems due to high population density.
5-Public acceptance of nuclear technology.
6-National Park Law restricting geothermal and nuclear activities.

COUNTRY DATA--JAPAN
ENERGY R&D: STATUS AND OUTLOOK

DLR 20 JAN 78

NUCLEAR

The Japanese Government aims at achieving an installed capacity of 49 GW in 1985. Of this total, 7.4 GW are in operation, 9.7 GW under construction and construction will begin shortly on an additional 3.7 GW. Another 14.4 GW are now being considered by utility companies and will hopefully be constructed.

In the developmental power reactor field, an experimental FBR, "Joyo", has been constructed. It reached criticality in April 1977. Initial power is 50 MWt and its increase to 100 MWt is planned. Design of the prototype FBR "Monju" (300 MWe) has been completed. Monju construction is scheduled to begin in 1978. Prototype ATR "Fugen" (165 MWe), a heavy water moderated, boiling, light water cooled pressure tube type reactor is scheduled to reach criticality in 1978.

In the uranium enrichment field, the first centrifuge cascade (180 centrifuges) began producing 1.5 to 2% enriched uranium in 1974. A second cascade (250 machines) began operation in 1975. A pilot plant of 10,000 machines was planned for 1977. By 1985 an internationally competitive plant is planned for operation.

In order to develop reprocessing techniques, R&D will be conducted in a 210 tonne/year-capacity reprocessing plant of the "purex process" type which has been completed.

NON-NUCLEAR

Japan has plans to launch a large-scale program for energy conservation in 1978 called Project Moonlight. It will complement Project Sunshine, a large-scale R&D program for solar energy, geothermal energy, hydrogen use and coal processing which is already in progress.

COAL

R&D programs include synthetic natural gas (SNG) with plans for manufacturing plant by the late 1980's, low-calorie gasification with plans for a power generation plant by the early 1980's, and development of synthetic crude oil from coal with plans for a manufacturing plant by the early 1990's.

SOLAR

Four demonstration systems for heating and cooling in houses and large buildings began construction in 1974 and were scheduled to be completed by the end of 1977. Photo electric R&D focuses on materials for solar cell components. Two 1 MWe thermal electric pilot plants are under development.

GEOTHERMAL

R&D programs are being conducted in exploration and extraction, power generation using hot water, volcanic power, generation systems, multi-purpose use of geothermal energy, and environmental preservation.

(CONTINUED)

HYDROGEN

A wide-ranging program was established in the following five areas with the aim of developing large-scale hydrogen production and utilization system by the year 2000:

1-production of hydrogen;
2-transportation and storage of hydrogen;
3-use of hydrogen;
4-safe handling of hydrogen;
5-hydrogen energy system.

CONSERVATION

The major R&D items of Project Moonlight include large-scale energy conservation technologies (including super-high temperature gas turbines for power generation), energy conservation on household electric and gas appliances, and fundamental energy conservation technologies (super-conductive applications of liquefied helium, new types of storage batteries, and power storage).

COUNTRY DATA--JAPAN
ENERGY R&D: BUDGET

DLR 18 JAN 78

	MILLION US $ FY 1977
CONSERVATION	42.25
Industry	(28.32)
Subsidy for private industry	(0.3)
Residential and Commercial	(0.11)
Transportation	(12.63)
Transportation subsidy for private sector	(0.03)
Others	(0.86)
OIL AND GAS	0.53
Oil Shale and tar sands	(0.07)
Others (including gas)	(0.46)
COAL	3.81
Coal conversion	(3.79)
Others	(0.02)
NUCLEAR FISSION	178.59
LWR	(51.63)
ATR	(4.39)
Other convertor reactors	(51.74)
Fuel Cycle	(70.83)
SOLAR	5.65
Heating and cooling	(2.40)
Photo electric	(1.03)
Thermal electric	(1.67)
Other	(0.55)
WIND	0.01
OCEAN	0.62
BIOMASS	0.29
GEOTHERMAL	11.10
FAST BREEDER	88.06
NUCLEAR FUSION	30.25
OTHER SOURCES	2.10
SUPPORTING TECHNOLOGIES	156.85
Electric power conversion	(1.82)
Transmission and distribution	(0.08)
Energy Storage	(0.23)
Energy Systems Analysis	(0.37)
Others	(154.35)
TOTAL GOVERNMENT R&D BUDGET	520.69

COUNTRY DATA--JAPAN
ENERGY R&D: PRIORITIES RVW 01 FEB 77

Ministry of International Trade and Industry (MITI) report "Energy Stabilization Policy for 1975-84 Period" stresses R&D in the following fields:

1-nuclear technology;
2-new kinds of energy and storage technologies;
3-energy saving technology (without lowering living standard);
4-environmental integrity technology;
5-underground natural resources.

The policy stresses active government leadership and international cooperation.

Science and Technology (STA) nuclear program for JFY 1975 (April 1975 through March 1976) places emphasis on the following:

1-Safety and environmental integrity to eliminate public misgivings and assist in locating nuclear facilities--
a-large-scale demonstration tests,
b-safety of new power reactors,
c-prevention of radiation hazards.
2-Nuclear fuel cycle--
a-uranium enrichment by centrifuge process,
b-studies on recycling plutonium,
c-reprocessing of spent fuel,
d-waste disposal.
3-Power reactors (nearly one-third of JFY 1976 nuclear energy increase will be used for FBR and ATR)
4-Nuclear fusion (critical plasma experimental facility begun)

MITI has recently begun to take a very aggressive posture in nuclear fuel matters.

Non-nuclear priority is given to the following items in the form of "Project Sunshine" (started 01 JUL 1974):

1-solar energy electric systems;
2-geothermal energy;
3-coal gasification and liquefaction;
4-hydrogen energy.

COUNTRY DATA--JAPAN
GOV'T SUPPORTED ENERGY R&D IN IND, UNIV AND NAT'L LABS DLR 19 JAN 78

LABORATORIES	PROGRAM AREAS
Government Institute of Metals	Overall testing on metallic materials
National Institute for Radiological Sciences	Studies of human hazards due to radiation
Japan Atomic Energy Research Institute (JAERI)	Extensive experimental facilities in atomic energy from fundamentals to development
Tokai Establishment	Reactor and fuel technologies, health physics, radioisotope production, multipurpose HTGR, nuclear fusion
Tokasaki Establishment	Radiation chemistry, food irradiation
Oarai Engineering Center	FBR and ATR development
Power Reactor and Nuclear Fuel Development Corp. (PNC)	Extensive facilities related to development of Fast Breeder Reactor and Advanced Thermal Reactor; production, enrichment and reprocessing of fuels; exploration for nuclear source materials
Tokai Establishment	Uranium enrichment by centrifuge process
Oarai Establishment	Irradiation experiments, radioisotope application technologies
Tokai Spent Fuel Reprocessing Plant	Reprocessing
Mechanical Engineering Laboratory	Fundamental R&D of new mechanical engineering technologies and products
National Chemical Lab for Industry, Tokyo	Wide range chemical R&D including sea water usage and hydrogen development
Gov't Industrial Research Institute, Osaka	Pollution control, preparation, storage and combustion of hydrogen
Gov't Industrial Research Institute, Nagoya	Solar energy, applications of radioisotopes and radiation
Electrotechnical Lab	Electricity R&D, solar, hydrogen
Gov't Industrial Research Institute, Kyushu	Coal liquefaction
Gov't Industrial Research Institute, Shikoku	Extraction of metals including uranium and lithium
Gov't Industrial Research Institute, Tohoku	Geothermal

COUNTRY DATA--JAPAN
ENERGY R&D: ROLE OF PRIVATE INDUSTRY DLR 19 JAN 78

NUCLEAR

There are five major nuclear industrial groupings in Japan.

ASSOCIATION	LEAD COMPANY	NUMBER OF AFFILIATES
Mitsubishi Atomic Power Committee	Mitsubishi Heavy Industries	28
Mitsui (Nippon Atomic Industry Group)	Toshiba	35
Tokyo Atomic Industrial Consortium	Hitachi	23
Daiichi (First Atomic Power Industry Group)	Fuji Electric	22
Sumitomo Atomic Energy Industries	Sumitomo Industries	36

Other organizations involved in nuclear energy include:

Japan Atomic Industrial Forum promotes nuclear industry through liaison, coordination, surveys, publications and research meetings.

Atomic Energy Relations Organization--public enlightenment from third party point of view, cooperation with local community.

Thermal Aquaculture Development Society--warm effluent studies and utilization.

NON-NUCLEAR

Japan Geothermal Energy Association--research on prospecting, equipment, utilization and legal matters.

Geothermal Technical Development Company--association of 25 companies which develop prospecting and other geothermal technologies.

Japan Solar Energy Society--solar energy science and technology promotion and dissemination, from fundamentals to applications.

COUNTRY DATA--JAPAN
INVOLVEMENT IN INTERNATIONAL ENERGY R&D ORGANIZATIONS DLR 19 JAN 78

ORGANIZATION	LEVEL OF SUPPORT (US $)
IAEA	1,994,000 (1975)
NEA	--
IEA	see below

DETAIL ON INTERNATIONAL ENERGY AGENCY

Japan has signed the following IEA Implementing Agreements:

Agreements	Contributions to Date (US $)
Coal Technical Information Service	101,200
Solar Heating and Cooling Systems (Annexes I, II, III)	464,040
Intense Neutron Source	167,000
Reactor Safety	Information exchange
Hydrogen Production from Water (Annex I)	Not yet decided
TOTAL	732,240

The Japanese Government participates in all Working Parties except the Working Party on Wind Power. It also participates in the IEA Systems Analysis Projects on a full-time basis.

COUNTRY DATA--JAPAN
KEY REFERENCES

DLR 20 JAN 78

		LOCATION
1-	State Dept Airgram A-113 from AMEMBASSY TOKYO 05 APR 76 (unclassified).	IA
2-	Base Document: Japan, Committee for Energy Research and Development, National Energy R, D&D Program Review, IEA, 17 OCT 77.	IA

COUNTRY DATA--JAPAN
NOTES AND EVALUATION

DLR 20 JAN 78

	LOCATION
1-State Dept Background Notes on Japan, AUG 75. (1A, 2B)	--
2-"Japan", The Far East and Australasia 1976-1977, Europa Publications Limited, London, 1976. (1B)	-
3-State Dept Airgram A-113 from AMEMBASSY TOKYO 05 APR 76 Unclassified. (2B, p.1-6; 2C, p.1-6; 3B, p.7; 4A, p.13-14; 4C, p.7-8; 4E, p.9-11; 4F, p.12)	IA
4-Review of Japan, Standing Group on Long Term Cooperation, IEA, 07 MAR 77. (4A)	IA
5-Japan's Policies and Programs in the Nuclear Field-Inputs TO ERDA's WENDS System, RAND, 1977, Draft. (2B, 5A, 5B)	IA
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9-International Data Collection and Analysis (Draft), Nuclear Assurance Corporation, DEC 77. (3C, p.136; 3D, p.138; 3E, p.140)	IA
10-National Basic Intelligence Factbook, CIA, JUL 76. (IA, 1B)	IA
11-ERDA, International Cooperation in Energy R&D, MAY 77. (5B)	IA

-References thus indicated are available at public libraries

WENDS COUNTRY DATA

KS: SOUTH KOREA

TABLE OF CONTENTS

COUNTRY DATA--REPUBLIC OF KOREA
ECONOMIC DATA PROFILE

AVL 30 SEP 78

GNP CURRENT(1977 billion $)-31.5

PER CAPITA GNP(1977 $)-880

EXPORTS(1977 billion $)-10.05

MONETARY UNIT-WON

TOTAL ENERGY R&D BUDGET-$90.6 million (1977-81)

INFLATION RATE-31% (1977-GNP Deflator)

NATIONAL PER CAPITA INCOME(1976 $) -640

IMPORTS(1977 billion $) -10.8

EXCHANGE RATE(/US$)- 484 WON

TRANSPORTATION SYSTEM DESCRIPTION

In 1976 there were 5,653 km. of railway track and 45,514 km. of roads reaching all parts of the country. The first line of the Seoul underground railway system opened in 1974 and the network will eventually cover 140 km. Surrounded by the sea on three sides and with the Demilitarized Zone forming an impassable barrier across the overland route to the north, sea transport is vital to the Korean economy. Chief ports are Pusan, Inchon, and Masan; and expansion of harbor facilities at Ulsan, Pohang and Yeosu is in progress. There were seven airports in 1977, out of which only Kimpo Airport in Seoul is international.

In 1975 total freight of 139.1 million tons was carried by the following three modes of transportation:

Railway: 42.8 million tons.
Highway: 84.5 million tons.
Coastal shipping: 11.8 million tons.

--data not available

COUNTRY DATA--REPUBLIC OF KOREA
DEMOGRAPHIC DATA PROFILE

AVL 30 SEP 78

LAND(million sq km)-0.098

POPULATION(millions)-35.9 in 1976
LITERACY-87.6%
LIVE BIRTHS/THOUSANDS-24 in 1975
MEDIAN AGE/MALES-18 in 1975
AVERAGE HOUSEHOLD SIZE-5.13 in 1975
PRIMARY SCHOOL GRADS-5,559,074 in 1975
INDUSTRIAL WORKERS-3,272,000 in 1976
AGRICULTURAL WORKERS-5,601,000 in 1976
POPULATION GROWTH %-1.64 in 1976

ARABLE LAND(million sq km)-0.0224
POPULATION DENSITY(/sq km)-362.9 in 1976
%RURAL POPULATION-53 in 1976
DEATHS/THOUSANDS-7 in 1975

MEDIAN AGE/FEMALES-19 in 1975
NET MIGRATION--

SECONDARY SCHOOL GRADS-3,176,154 in 1975
PROFESSIONAL WORKERS-3.7 million in 1976
COLLEGE GRADS-208,986 in 1975
UNEMPLOYED-505,000 in 1976

--data not available

COUNTRY DATA--REPUBLIC OF KOREA
PROFESSIONAL LABOR FORCE PARTICIPATION PROFILE/ AVL 30 SEP 78

SCIENTISTS AND ENGINEERS -	460,037
TECHNICIANS -	989,335 (1975)
R&D MANPOWER	
NATURAL SCIENCES -	1,652
ENGINEERING AND TECHNOLOGY -	1,718
MEDICAL SCIENCES -	676
AGRICULTURE -	1,700
SOCIAL SCIENCES AND HUMANITIES -	568 (1974)

COUNTRY DATA--REPUBLIC OF KOREA
KEY TECHNICAL EDUCATIONAL RESOURCES

AVL 30 SEP 78

INSTITUTION	LOCATION
Busan National University	Busan
Choong-nam National University	Chungcheng Namdo
Dankook University	Seoul
Dong-A University	Busan
Kon-Kuk University	Seoul
Korea University	Seoul
Gyeong-Bug National University	Gyeongsang Bugdo
Kyung Hee University	Seoul
Hanyang University	Seoul
Hongik University	Seoul
Inha University	Inchon
Jeonbug National University	Jeolla Bugdo
Joen-nam National University	Jeolla Namdo
Joseon University	Jeolla Namdo
Chung-ang University	Seoul
Seoul National University	Seoul
Sungjeon University	Seoul
Ulsan Institute of Technology	Gyeongsang Namdo
Yeungnam University	Gyeongsang Bugdo
Yonsei University	Seoul
Sokang University	Seoul

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY POLICY: BASIC LEGISLATION

AVL 30 SEP 78

Major legislation concerning energy policy includes:

Mining Business Law (1951 as amended)
Atomic Energy Law (1958 as amended)
Electricity Business Law (1973)
Petroleum Business Law (1973)
Heat Management Law (1976)
Electricity Resources Development Law (planned to be enacted in late 1978)

Ministry of Energy and Resources was established in January 1978.
Under existing legislation the government has broad authority to formulate and execute energy policy.

Major institutions created by the government to this end are:

Office of Atomic Energy, 1959
Atomic Energy Research Institute (AERI), 1959
Radiological Research Institute (RRI), 1966
Korea Atomic Industrial Forum, Inc. (KAIF), 1972
Korea Atomic Energy Research Institute (KAERI), 1973 incorporating AERI, RRI, and Radiation Research Institute in Agriculture
Atomic Energy Bureau (AEB), 1973 superceding Office of Atomic Energy
Dae-Duk Engineering Center, 1975 as branch institute of KAERI
National System of Safeguards and International Cooperation Directorate, 1976 in the Ministry of Science and Technology (MOST)
Korea Nuclear Engineering Services, Inc. (KNES), 1976
Korea Nuclear Fuel Development Institute (KNFDI), 1976 created from KAERI and reorganizing Dae-Duk Engineering Center
Korea Institute of Energy Conservation (KIEC), 1977 under the Ministry of Commerce and Industry (MCI)

COUNTRY DATA--REPUBLIC OF KOREA
GOVERNMENTAL STRUCTURE FOR ENERGY POLICY AND R&D AVL 30 SEP 78

LEGISLATIVE
The unicameral National Assembly is composed of 219 members. Two-thirds are elected by universal suffrage and one-third are nominated by the President of the Republic and elected by the National Council for Reunification.

EXECUTIVE
All real political power as well as executive authority is centered in the President (Chung Hee Park), who was re-elected for another six-year term on July 6, 1978. The Deputy Prime Minister (Duck Woo Nam), who is concurrently Minister of Economic Planning Board, is responsible for the overall national economic policy framework within which Korean energy programs operate.

Ministries with energy responsibilities include:

Ministry of Energy and Resources (Ye Chun Chang)- Main responsibility is to contend with problems associated with securing stable energy supplies.

Ministry of Commerce and Industry (Hyung Sup Choe) - Responsibility for nuclear energy and R&D on all types of energy rests with this Ministry. It also grants licenses, and regulates and supervises nuclear power projects.

The design, procurement, construction and operation of nuclear power plants, however, falls under the responsibility of Korea Electric Company (KECO), a separate government owned corporation.

Various interagency committees, which include appointed non-ministry experts, play an advisory and review role.
These include:
Atomic Energy Agency - headed by the Minister of Science and Technology.
Electricity Development Coordination Committee- Headed by the Deputy Prime Minister/Minister of the Econonic Planning Board.
Coal Development Committee - headed by the Vice Minister of Commerce and Industry

Korea's atomic power is placed under the Korea Electric Company (KECO). KECO handles all affairs relating to the construction and operation of nuclear power plants, including the procurement of nuclear fuel.

R&D activities in nuclear fuel cycle were transferred from KAERI to KNFDI in December 1976.

NOTE:
Detailed information on the full scope and functional responsibilities of the Ministry of Energy and Resources is not yet available.

COUNTRY DATA--REPUBLIC OF KOREA
ORGANIZATION FOR IMPLEMENTATION OF ENERGY POLICY AND R&D/AVL 30 SEP 78

MINISTRY OF ENERGY AND RESOURCES (MER)
Detailed functions and functional divisions within the Ministry yet to be known. (See the note in 2B)

MINISTRY OF COMMERCE AND INDUSTRY (MCI)
Office of the Assistant Minister for Resources supervises all MCI energy activities.
Energy Development Bureau has the following divisions:
- Energy Development
- Oil Refining
- Electric Power Generation
- Rural Electrification

Mining Bureau is responsible for coal.
MCI also controls the National Geological and Mineral Institute of Korea (GMIK).

MINISTRY OF SCIENCE AND TECHNOLOGY (MOST)
Atomic Energy Bureau reports directly to the Vice Minister of MOST
Planning Division- responsible for developing basic policies on energy source development, developing applications and utilization of atomic energy, and international cooperation.

Radiation Safety Division- Supervision of radiation and radiosotope handling, management of radiation & nuclear materials, licensing radiosotopes and other materials.

Nuclear Reactor Division- plans and implements policies for reactor development, management of fuels and reactors, compensations for nuclear damages and operation of the Nuclear Indemnity Council.

Resource Development Office is responsible for energy R&D and gives assignments to government supported research institutes such as:
- Korea Atomic Energy Research Institute (KAERI)
- Korea Institute of Science and Technology (KIST)

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY POLICY AND OBJECTIVES

AVL 30 SEP 78

The objectives of the Fourth Five-Year Economic Development Plan (1977-1981) regarding energy are as follows:

1. To establish a stable energy supply and demand system.
2. To explore and utilize domestic energy sources to the maximum possible extent.
3. To apply the science of energy utilization and saving of energy consumption in daily life.

Furthermore, in early 1978 the government summarized its long-run energy policy as follows:

1. Maximum exploration of domestic energy resources.
2. Emphasis on nuclear power development.
3. Increased hard coal production for household use in order to lower oil demand.
4. Maintenance of rational pricing with regard to energy, and the promotion of energy conservation.

Since the beginning of FY 1977, government officials have renewed the call for a reduction in total energy consumption by 10%.

As of 1978, official plans are for two more nuclear plants, with a capacity of 900 Mw each, for completion by 1986. By then Korea will have a combined nuclear power production capacity of 5.5 million kw, accounting for 27% of the nation's overall power production target for that year.

Importation of hard coal is planned beginning 1979.

COUNTRY DATA--REPUBLIC OF KOREA
DESIRED DEGREE OF ENERGY SELF-SUFFICIENCY

AVL 30 SEP 78

Korea presently (1976) uses domestically available hard coal, firewood and hydropower to meet 40% of its total energy requirement. Increased energy self-sufficiency in the medium and long-run will depend largely on whether oil is discovered in commercial quantities.

The government plans to increase the number of nuclear plants, so that by the year 2000 there will be 46 nuclear power plants completed, with combined production capacity of 50.8 million kw. Estimated power requirement by 2000 at 80 million kw, these stations will be producing 63% of total requirements.

The Minister of Energy and Resources, Mr. Chang reportedly said in February 1978 that South Korea would not be building oil-fueled power stations owing to the price and "other uncertain factors" in the international oil supply.

Nuclear energy and imported energy will account for the following percentages of total energy supply:

YEAR	NUCLEAR ENERGY	IMPORTED ENERGY			
		TOTAL	OIL	SOFT COAL	GAS FOR URBAN USE
1976	0	60	56.7	1.9	0
1981	1.8	71.2	64.2	8.0	0
1986	10.1	72.2	55.0	17.2	0
1991	15.6	75.0	50.0	22.0	3

Note: Gas made from LPG is included in oil.

COUNTRY DATA--REPUBLIC OF KOREA
INDIGENOUS ENERGY RESOURCES

AVL 30 SEP 78

	ECONOMICALLY RECOVERABLE RESERVES	TOTAL INDIGENOUS RESOURCES	LOCATION OF IDENTIFIED RESERVES
HARD COAL (mega tonnes)	544	1,434	Dispersed: Sanchuk, Danyang, Kaekyung, Chungnam, Gangreung
SOFT COAL (mega tonnes)	0	0	
CRUDE OIL (million tonnes)	0	0	
SHALE OIL (mega tonnes)	0	0	
NATURAL GAS (million G. cal)	0	0	
URANIUM (thousand tonnes U308)	2.84	2.84	Daeduck
HYDRO POWER (Gwh/year)		7.7	Concentrated on four main river systems (Han, Nakdong, Kum and Sumjin).
GEOTHERMAL (twh/year)	0	0	

COUNTRY DATA--REPUBLIC OF KOREA
PATTERNS OF ENERGY SOURCES AND USES

AVL 30 SEP 78

1976 CONSUMING SECTOR

	HOUSEHOLD & COMMERCIAL	INDUSTRIAL	TRANS-PORTATION	ELECTRICAL GENERATION	TOTAL
COAL (thousand tonnes)	13,879	1,786	0	1,004	17,008
PETROLEUM (thousand tonnes)	903	1,845	2,425	7,017	15,085
NATURAL GAS (tera calories)	0	0	0	0	0
NUCLEAR POWER (million kwh)	a	a	a	0	a
HYDRO POWER (million kwh)	a	a	a	1,789	a
GEOTHERMAL (million kwh)	a	a	a	0	a
UTILITY ELECTRICITY DISTRIBUTED (million kwh)	2,125	18,246	244	-	27,859

Note: Totals include non-energy uses, transformation losses and energy sector uses.

a - not applicable

COUNTRY DATA--REPUBLIC OF KOREA
PROJECTIONS OF DEMAND

AVL 30 SEP 78

RESOURCE	STANDARD PHYSICAL UNITS 1976	1985	2000	THOUSAND TONNES COAL EQUIV. 1976	1985	2000
COAL (thousand tonnes)	17,008	18,700	34,000	17,008	-	-
CRUDE OIL (thousand tonnes)	18,298	32,600	96,600	26,898	-	-
SHALE OIL (thousand tonnes)	-	-	-	-	-	-
NATURAL GAS (tera calories)	0	-	-	0	-	-
HYDROELEC-TRIC POWER (million kwh/yr)	1,789	1,800	4,900	220	-	-
GEOTHERMAL (million kwh/yr)	0	-	-	0	-	-
OTHER(million kwh/yr) -see note	-	-	-	-	-	-
URANIUM(kilo-tonnes U308)		1.15	-	-	-	-

Note: Wind energy, tidal power, biomass.

COUNTRY DATA--REPUBLIC OF KOREA
PROJECTIONS OF ENERGY SUPPLIES, IMPORTS, AND EXPORTS AVL 30 SEP 78

RESOURCES	1975	%US	1986	%US	1991	%US
COAL (thousand tonnes)						
INDIGENOUS SUPPLY (hard coal)	15,945		23,364		20,670	
IMPORTS (soft coal)	1,010		27,705		57,089	
EXPORTS						
CRUDE OIL (thousand tonnes)						
INDIGENOUS SUPPLY						
IMPORTS	29,733		88,790		130,113	
EXPORTS						
SHALE OIL						
INDIGENOUS SUPPLY	-		-		-	
NATURAL GAS	-		-		-	
INDIGENOUS SUPPLY						
IMPORTS	-		-			
EXPORTS						
URANIUM (kilotonnes U308)						
INDIGENOUS SUPPLY	-		-		-	
IMPORTS						
EXPORTS						

NOTE: Gas made from LPG is included in oil.

- not known

COUNTRY DATA--REPUBLIC OF KOREA
ENVIRONMENTAL CONSIDERATIONS

AVL 30 SEP 78

The Pollution Prevention Law of 1971 set a framework to the nation's environment considerations. The law empowers the Minister of Health and Social Welfare (Hyon-hwak Sin) to determine the level of permissible pollution as well as the use of various emission devices.

COUNTRY DATA--REPUBLIC OF KOREA
COMMERCIAL APPLICATIONS

AVL 30 SEP 78

Technological Development Encouraging Law was established in 1976 in order to encourage and aid industry to develop its technical capabilities. Financial and tax support for industry's R&D activities is provided under the law.

In addition, the government established a financial support system, supplying long-term, low interest funds to corporations applying research results to production on a commercial level.

The Korean Institute of Science and Technology (KIST), founded in 1966, is the prime mover of industrial technology.

COUNTRY DATA--REPUBLIC OF KOREA
POWER PRODUCTION AND ENERGY CAPABILITY

AVL 30 SEP 78

PLANT TYPE	TOTAL (thousand kw)	POWER PRODUCTION 0-499	500-800	800+thousand kw(plants in each range)	
COAL	700				EXISTING
	1,600				PLANNED
GAS					EXISTING
					PLANNED
OIL	4,075				EXISTING
	6,370				PLANNED
GEOTHERMAL					EXISTING
					PLANNED
HYDROELECTRIC	711				EXISTING
	806	10			PLANNED
NUCLEAR	0				EXISTING
	3,723		3	2	PLANNED
SOLAR					EXISTING
					PLANNED
OTHER	400	1			EXISTING
					PLANNED

As of September 1977 Korea had one active rig.
In 1975 there were two wells with a total footage of 21,000 ft.
Existence of two wildcats was reported for the same year.

Blank spaces indicate not known.

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY INDUSTRIES

AVL 30 SEP 78

REFINERIES

Yukong--Gulf

Honam--Caltex

Kying In--Union

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY R&D: STATUS AND OUTLOOK

AVL 30 SEP 78

NUCLEAR

An ambitious plan to install nuclear power plants is being pursued. Five plants are scheduled for completion during the next decade. Construction contractors are WESTINGHOUSE and WELCO from the U.S., AECL and HPL from Canada, and GEC and CAP from the U.K. Low grade uranium ore has been discovered, and the government plans to step up on-going exploration while promoting joint development projects with Paraguay and Gabon in order to secure the uranium needed for nuclear power generation.

OIL

On-shore oil prospecting is the major immediate development priority, spurred by a recent show of oil at a site near Pohang. On the continental shelf to the west and south of Korea, exploration-drilling concessions have been granted to several international companies. Exploration activities are not currently active due to political and/or economic reasons. In June 1978, the Japanese Diet ratified the Korea-Japan Continental Shelf Treaty, allowing joint development of oil and gas in the East China Sea area. Applications for drilling rights have already been received from Korean, Japanese and international companies. Explorations are hoped to begin within a year.

Current refining capacity is 435,000 b/d. In addition to a 60,000 b/d Korean-Iranian refinery scheduled for completion in October 1978, the energy program calls for construction of new capacity totalling 180,000 b/d during 1977-81. To strengthen the storage function and capacity, the government plans to set up a state-run Korea Oil Development Corporation, which will deal with the storage problem and stabilize supply.

COAL

Only anthracite coal is produced domestically. Residential and commercial uses account for the bulk of the total anthracite coal consumption (87.4% in 1976 and 90.6% in 1977). During the FFYP period, $779.5 million is programmed for the development of the industry through modernization of coal dressing facilities, overhead capital improvements in power transmission and roads, and railway expansion. Small scale export ceased in 1975 and the government reportedly is considering import to meet the growing demand.

Soft coal (bituminous coal) is almost entirely imported. To obtain a secure long-term supply of this coal, which is used for power generation and smelting, joint venture "development/import" projects are under study in relation to overseas sources.

HYDRO-POWER

In 1977 the hydro-electric facilities in operation had a total capacity of 711 thousand kw. Over the next decade a total of 7 new plants are scheduled for construction with a total capacity of 801 thousand kw.

TIDAL POWER

The economic feasibility of the 8 west coast bays will be studied, followed by a survey of the most appropriate areas for power generation. A plant with 400 thousand kw capacity is scheduled to come into operation by the end of 1986.

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY R&D: STATUS AND OUTLOOK

AVL 30 SEP 78

THERMAL POWER

A total of 15 new plants are scheduled for completion by 1981, with a capacity of 3,970,000 kw. These will be supplemented by an additional 7 plants in the subsequent 5 year plan. Some of the plants will use a combination of coal and oil.

CONSERVATION

A large portion of the energy program is devoted to energy savings. Policy directions include the improvement of heat management and an increase in the efficiency of fuel using equipment. Measures designed to reduce energy consumption aim at a 10% reduction.

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY R&D: BUDGET

AVL 30 SEP 78

SUMMARY INVESTMENT PLAN FOR THE ENERGY SECTOR
(FOURTH FIVE YEAR PLAN: 1977-81)

	Amount (million US$)	%
1. ELECTRICITY	4,757.9	84.3
2. COAL	389.7	6.9
3. PETROLEUM	331.9	5.9
4. NON-COMMERCIAL ENERGY	6.7	0.1
5. R&D	90.6	1.5
6. ENERGY CONSERVATION	72.9	1.3
	5,649.7	100.0

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY R&D: PRIORITIES

AVL 30 SEP 78

Priorities for resource exploration, grouped in descending order, are as follows:

1- Assessment of on-shore oil at Yongil Bay
2- Coal and nuclear fuel
3- Hydroelectric (including magnetohydrodynamic power) and tidal power resources.
4- Wind power, solar energy, and geothermal energy resources

R&D priorities for energy technology follow in rank order:

1- Removal of carbon monoxide from coal briquette fumes which kill several hundred people each year.
2- Improvement of thermal factor of low-quality coal.
3- Construction of low-head magnetohydrodynamic dams and standard Korean made turbines and generators.
4- Utilization of solar energy and wind powered generators.
5- Utilization of waste heat and exhaust heat.
6- Improvement of heating systems in thermal sector.
7- Heat insulation and fire-proof material.
8- Intensive heat supply system (industrial complexes and large-scale apartment areas).
9- Improvement of energy factor in industrial plants.
10-Tidal power generation and oceanological and civil engineering.

Nuclear energy prioritied have been establishes as follows:

1- Development of nuclear power technology through local participation in design, construction, and operation phases of nuclear power projects.
2- Intensify exploration of uranuim and thorium.

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY R&D: IMPACT AVL 30 SEP 78

The energy conservation program was decided upon as early as November 1973. The program's objectives are for 10% fuel conservation in industry and power generation under the provision of the Heat Management Law (HML), and 2% and 17% fuel conservation in transportation and residential and commercial sectors respectively under a nationwide education and guidance program.

The HML is administered by the Industrial Advancement Administration (IAA) and the Korean Energy Management Administration (KEMA) under the supervision of the Ministry of Commerce and Industry. IAA and KEMA provide technical assistance to large energy users and recommend methods which could be used to improve efficiency and conserve energy.

Although IAA and KEMA's efforts have been useful, assessment of their efforts is made difficult by the relatively short period of time elapsed since the programs went into effect as well as by the secular increase in total energy consumption. Although the current rates of increase are lower than the historical trend, they are still considerably higher than the rates observed in other countries and the projected rate of growth for the period 1974-81.

Main factors contributing to the "excessive" demand seem to be the low level of fuel prices, the lack of incentives to implement the recommended improvements and inadequate coordination.

COUNTRY DATA--REPUBLIC OF KOREA
GOVERNMT. SUPPORTED ENERGY R&D IN IND., UNI. & NAT LABS AVL 30 SEP 78

INSTITUTES	PROGRAM AREAS	KEY INDIVIDUALS
Atomic Energy Research Institute	Neutron diffraction, radiation chemistry, wood plastics irradiation, plant breeding, control of diseases and pest insects on crops and livestock, preservation and processing of agricultural products, effects of radiation on living organisms, radiation protection, medical applications of radioactive isotopes.	Young Ku Yoon President
Korean Institute of Science and Technology	Conducts development work which can be utilized by the Korean industry	
Radiological Research Institute		
Korean Nuclear Engineering Services, Inc.	Performs all architect engineering services required for nuclear power projects.	
Korea Nuclear Fuel Development Institute	Chemical technology, fuel fabrication, chemical analysis and instrumentation, contamination control of radioactive material and entire nuclear fuel cycle, ore refining and conversion.	Chai Yang Choo Director
Korea Research Institute of Geoscience and Mineral Resources	Conducts geological research studies and exploration for minerals, energy and water resources.	
Korea Atomic Industrial Forum, Inc.	Training of nuclear personnel and inspectors.	

COUNTRY DATA--REPUBLIC OF KOREA
ENERGY R&D: ROLE OF PRIVATE INDUSTRY AVL 30 SEP 78

There is little involvement by private Korean industry in energy R&D except in the case of coal where the government works with state-run Dai Han Coal Corporation.

R&D work is carried out primarily in government supported institutions such as KAERI and KIST. There are three Korean companies, Hyun Dai, Dong Ah and Yu Yang, which have major roles as subcontractors in performing nuclear grade work. The government plans to gradually substitute for technological assistance with domestic ability.

COUNTRY DATA--REPUBLIC OF KOREA
INVOLVEMENT IN INTERNATIONAL ENERGY ORGANIZATIONS/ AVL 30 SEP 78

ORGANIZATION	DEGREE OF INVOLVEMENT
IAEA	ACTIVE
ECAFE	ACTIVE
ESCAP	ACTIVE
IEA	membership sought

COUNTRY DATA--REPUBLIC OF KOREA
ASSESSMENT OF INTERNATIONAL ACTIVITIES

AVL 30 SEP 78

Korea's main partners in R&D cooperation are the U.S., France, Canada, and Japan.

Due to its geopolitical situation, cooperation in nuclear field has been dominated by the U.S. It seems desirable, however, that more cooperation be sought with Japan whose resource base, or the lack thereof, is similar to Korea.

Cooperation with the Middle Eastern oil producing countries as well as African and Latin American countries is also being stepped up.

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--These documents restricted as explained on page 27.