

ENERGY RESEARCH 6

# ENERGY AFTER THE EIGHTIES

A COOPERATIVE STUDY BY COUNTRIES  
OF THE INTERNATIONAL ENERGY AGENCY

EDITED BY

G. TOSATO, J. BRADY, P. ESSAM, M. FINNIS, G. GIESEN,  
S. RATH-NAGEL, H. VOS and D. WILDE

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# **ENERGY AFTER THE EIGHTIES**

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OF THE INTERNATIONAL ENERGY AGENCY**

## **ENERGY RESEARCH**

- Vol. 1 Geophysical Aspects of the Energy Problem (Rapolla, Keller and Moore, Editors)**
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- Vol. 6 Energy after the Eighties: A Cooperative Study by Countries of the International Energy Agency (Tosato et al., Editors)**

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## **PREFACE**

This report is the product of an international study which was initiated by the **International Energy Agency (IEA)** of the **Organisation for Economic Cooperation and Development (OECD)**. The objective is to provide a quantitative framework for assessing the potential benefits of new energy technologies and their markets in participating countries. The fourteen countries<sup>\*</sup> which, since 1980, have chosen to participate actively in the **Energy Technology Systems Analysis Project**, as it has been called, will be referred to as the ETSAP Group, or simply the Group.

The prime impetus of the study was the massive rise in oil prices in the recent past and its effect on the world's energy sector. It was quickly realized that the tools and methodology of energy systems analysis could be developed and applied to the problem of assessing R&D options in the circumstance or an uncertain energy future.

The IEA Energy Technology Systems Analysis Project has passed through three phases. Each of these had a different study objective but used a common approach for all project member countries.

In Phase I, conducted in 1976/1977, the energy balances of a number of the IEA countries were examined and compared in a systematic way. Some of the methods of systems analysis were applied. It was decided to proceed with a more detailed examination of the national energy sectors and to tackle the economic as well as energy-balance possibilities.

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Phase II, ending in 1980, resulted in the design and use of a generalized energy systems analysis model called MARKAL (for MARKet ALlocation). The work with the model was performed as a cooperative project between Kernforschungsanlage Jülich (Germany), Brookhaven National Laboratory (USA) and fifteen participating countries. An initial set of national studies using the model approach had been carried out by the conclusion of Phase II.

Systems analysis results derived from the project Phase II have to some extent been used as a background for energy R&D planning. The IEA used, among other criteria, some of the results as a quantitative appendix to its Group Strategy for Energy Research, Development and Demonstration, issued in 1980.

In Phase III, which terminated in 1983, the ETSAP Group extended the systems analysis on a national basis. The Group retained and improved the common methodology, established a large technological data base, and evaluated the impact of new technologies for a range of possible energy futures. Results of this phase are reported here.

We feel that the results represent a significant improvement on the knowledge base required for the development of the national energy systems in an international context.

As this report is addressing not only systems analysts but also readers who are engaged in energy R&D policy or other long term energy policy, energy R&D planning in government or industry, a word of warning concerning the limitations of systems analysis is in place:

Systems Analysis does not give you a plan for the future, but it helps you to become aware of and to understand quantitative relationships between different parts and different times of a complex system under widely varying conditions. It also helps you to understand contingencies and to compare risks.

Furthermore, the environmental and health problems and the corresponding costs related to the future use of energy is an area where quantitative information is available only to a small extent. New information is sought and produced continuously, and it might alter some conclusions considerably.

The results now presented have been achieved through dedicated individual and cooperative efforts within participating countries, the operating agent KFA/STE, the executive committee and the drafting group. Particularly I would like to thank the former project leader Stefan Rath-Nagel, the present project leader Heinz Vos and the drafting group members Mike Finnis and Giancarlo Tosato.

Sigfrid Wennerberg

**Executive Committee Chairman**

of the

**Energy Technology Systems Analysis Project (ETSAP)**

## LIST OF FIGURES

- Figure 1.1 : ETSAP Member Countries and Distribution of  
1980 World Primary Energy Consumption
- Figure 1.2 : Fossil Fuel Prices
- Figure 2.1 : Principal Flowchart of the Energy system
- Figure 2.2 : Reference Energy System
- Figure 3.1 : Schematic of MARKAL Application in National  
Case Studies
- Figure 4.1 : Development of ETSAP Final Energy Consumption  
by Sectors (Percentages)
- Figure 4.2 : Development of Regional Final Energy  
Consumption
- Figure 4.3 : Development of ETSAP Final Energy Consumption  
by Fuel
- Figure 4.4 : 1980 Total Primary Energy Distribution among  
ETSAP Countries
- Figure 4.5 : Development of ETSAP Primary Energy Supply Mix
- Figure 4.6 : Development of Regional Primary Energy  
Consumption by Fuel
- Figure 4.7 : Development of Oil Import Dependence by ETSAP  
Countries - High Demand Case
- Figure 4.8 : ETSAP Group Energy Conservation, High Demand  
Case
- Figure 4.9 : Uranium Resources and ETSAP Cumulative  
Requirements
- Figure 5.1 : Extraction of Liquid Fuels in the USA
- Figure 5.2 : Development of ETSAP Electricity Generating  
Capacity
- Figure 5.3 : ETSAP District Heat/Process Heat Generating  
Mix
- Figure 5.4 : ETSAP Electricity Gerating Mix
- Figure 5.5 : Electricity Generating Cost vs. Annual  
Operating Hours for Germany
- Figure 5.6 : Components of Electricity Generating Cost for  
Peak, Medium, and Baseload for Germany
- Figure 5.7 : Electricity Generating Cost vs. Year of  
Operation, Germany



- Figure 5.8 : ETSAP Electricity Generation form Renewable  
Energy Sources - Low Demand Case
- Figure 5.9 : Expected Cost Reduction in Silicon  
Solar Cell Production
- Figure 5.10 : Economics of Hard Coal Conversion
- Figure 5.11 : Economics of Brown Coal Conversion
- Figure 5.12 : Economics of Space Heating and Insulation  
Technologies (Swedish Data Base)
- Figure 5.13 : Economics of Privat Cars (Australia)
- Figure 5.14 : Economics of Privat Cars (Germany)
  
- Figure A.1.1 : Deatail Block Diagram of German Energy System
- Figure A.1.2 : Balance between Production and Consumption of  
Fuels
- Figure A.2.1(a) : Unit Prices of Input Fuels
- Figure A.2.1(b) : Unit Product Costs
- Figure A.2.2(a) : Maximum Available Quantities of Input Fuels
- Figure A.2.2(b) : Upper Bounds on Possible Installed Capacities
- Figure A.2.3(a) : Total Level of Demand versus Cumulative  
Contribution of Technologies
- Figure A.3.1 : A Simplified Representation of the Refining  
Sector

LIST OF TABLES

Table 1.1	: Primary Energy Consumption and Reserves of the ETSAP Group in 1980
Table 1.2	: Primary Energy Consumption of the World in 1980
Table 1.3	: Growth in Useful Energy Demand Assumed by Each Country of the Group for High (H) and Low (L) Cases
Table 1.4	: Nuclear Net Output Electricity Generating Capacity of the Group
Table 1.5	: World Oil Balance Adapted from 'World Energy Outlook'
Table 3.1	: Fossil Fuel Price Assumptions
Table 3.2	: Assumed Economic Growth Rates in ETSAP Countries for the Low and High Oil Price Increases
Table 3.3	: Growth in Useful Energy Demand, GDP and Oil Price for the ETSAP Group
Table 3.4	: Demand Sectors Defined in the Model of the United States
Table 3.5	: Categories of Technology Characterized
Table 4.1	: ETSAP Final Energy Consumption by Sector
Table 4.2	: Final Energy Supply Mix for ETSAP Group
Table 4.3	: 1980 Primary Energy Supply for World Regions
Table 4.4	: ETSAP Primary Energy Supply Mix by Fuel
Table 4.5	: Domestic Fossil Fuel Production for ETSAP Group - High Demand Case -
Table 4.6	: Fossil Fuel Net Imports for ETSAP Group - High Demand Case -
Table 4.7	: ETSAP Group GDP Specific Energy Conservation and End-use Technologies Efficiency Improvements in Industry & Non Energy Use, R & C and Transportation Sectors (High Demand Case)
Table 4.8	: Comparison of Total Primary Energy Development for ETSAP and OECD Countries
Table 4.9	: Uranium Reserves and Resources
Table 4.10	: World Oil Balance
Table 5.1	: Electricity Generating Capacity (Net) of Fossil Plants for the Group
Table 5.2	: Additions of Fossil Electricity Generating Capacity (Net) for the Group
Table 5.3	: Economic Data of Coal Power Plants

Table 5.4	: Nuclear Electricity Generating Capacity (End 1981)
Table 5.5	: Nuclear Electricity Generating Costs, IWR Switzerland)
Table 5.6	: Fraction of Electricity Generated by Nuclear Power - High Demand
Table 5.7	: The Contribution of Hydro Power
Table 5.8	: Supply of Energy to the Group from Geothermal Sources - Low Demand
Table 5.9	: Energy to the Group from Biomass
Table 5.10	: Electricity from Wind Generators - Low Demand
Table 5.11	: Electricity from Photovoltaics
Table 6.1	: ETSAP Energy Costs and GDP
Table 6.2	: Fuel Net Import Cost
Table 6.3	: Energy System Cost 1980 and 2010
Table 6.4	: Energy R&D Costs and Primary Energy Contribution

## COUNTRY TABLES

### **Australia**

Table 7.1.1:	Proven Reserves, Production and Consumption 1980
Table 7.1.2:	Total Primary Energy Demand Ratios
Table 7.1.3:	Primary Energy Supply Mix
Table 7.1.4:	Sensitivities of System Costs and Oil Imports
Table 7.1.5:	Fuel Consumption of Private Automobiles
Table 7.1.6:	Final Energy Input to Industrial Devices

### **Austria**

Table 7.2.1:	Domestic Production and Import
Table 7.2.2:	Main Determinators of Energy Consumption
Table 7.2.3:	Consumption Ratios
Table 7.2.4:	Primary Energy Supply Mix
Table 7.2.5:	Electricity Generation

### **Belgium**

Table 7.3.1:	1980 Primary Energy Consumption
Table 7.3.2:	Consumption Pattern
Table 7.3.3:	Primary Supply Mixes for Low and High Demand Cases
Table 7.3.4:	Industrial Fuel Mix for Low and High Cases

**Germany**

- Table 7.4.1: Domestic Production and Imports
- Table 7.4.2: Components of Residential and Commercial Final  
Energy Demand 1980
- Table 7.4.3: Consumption Patterns
- Table 7.4.4: Primary Supply Mix
- Table 7.4.5: Hard Coal Imports
- Table 7.4.6: Installed Capacities of Nuclear Plants
- Table 7.4.7: Electricity Generating Costs at Base Load
- Table 7.4.8: District Heat for Residential and Commercial  
Sector
- Table 7.4.9: Automobile Mix

**Ireland**

- Table 7.5.1: 1980 Primary Energy Consumption
- Table 7.5.2: Consumption Patterns
- Table 7.5.3: Primary Supply Mix
- Table 7.5.4: Primary Supply Mix
- Table 7.5.5: Residential Space Heating
- Table 7.5.6: Primary Peat Consumption
- Table 7.5.7: Renewable Supply

**Italy**

- Table 7.6.1: 1980 Indigenous Resources and Consumption
- Table 7.6.2: 1980 Final Energy Consumption
- Table 7.6.3: Consumption Ratios
- Table 7.6.4: Primary Supply Mix

**Japan**

- Table 7.7.1: 1980 Primary Energy Consumption
- Table 7.7.2: Energy Demand Ratios
- Table 7.7.3: Primary Supply Mix
- Table 7.7.4: Primary Supply Mix for Three Coal Availability  
Cases
- Table 7.7.5: Shares of Final Energy Consumption

**Netherlands**

- Table 7.8.1: Primary Energy Supply in 1980
- Table 7.8.2: Growth of Industrial Production (Value Added)  
and Useful Energy Demand by Industry



Table 7.8.3: Primary Energy Consumption per Capita and Unit of GDP

Table 7.8.4: Primary Energy Supply Mix

Table 7.8.5: Primary Energy Supply Mix in Sensitivity Cases

Table 7.8.6: Coal Fired Power Plants Capacity

Table 7.8.7: Renewable Primary Energy Supply

Table 7.8.8: Final Energy for Passenger Cars in the Low Demand Case

### **Norway**

Table 7.9.1: Proven Reserve and Consumption 1980

Table 7.9.2: Primary Energy Consumption Ratios

Table 7.9.3: Primary Supply Mix

Table 7.9.4: Electricity Production

### **Spain**

Table 7.10.1: 1980 Primary Energy Consumption and Reserves

Table 7.10.2: Useful Energy Demand Profiles

Table 7.10.3: Consumption Ratios

Table 7.10.4: Primary Supply Mix

Table 7.10.5: Installed Capacity of Nuclear Plants

Table 7.10.6: Installed Capacity of Power Plants Using Renewable Energy

### **Sweden**

Table 7.11.1: Final Demand for Energy

Table 7.11.2: Structure of Industrial Demand for Final Energy

Table 7.11.3: Primary Energy Supply

Table 7.11.4: Electricity Production by Fuel

Table 7.11.5: Technology Contributions to Space and Water Heating, Residential and Commercial Sector

### **Switzerland**

Table 7.12.1: 1980 Primary Energy Consumption

Table 7.12.2: Consumption Ratios

Table 7.12.3: Primary Supply Mix

Table 7.12.4: Oil Substitution Sensitivity

Table 7.12.5: Electricity Production