

# ENERGY OPTIONS FOR SUSTAINABLE DEVELOPMENT: Technological Solutions, Economic Impacts, and Emission Reduction Strategies

## *Annex 5*

to the Implementing Agreement of the International Energy Agency  
for a PROGRAMME OF ENERGY TECHNOLOGY SYSTEMS ANALYSIS

### **1. BACKGROUND AND OBJECTIVES**

#### **(a) Background**

The IEA Programme of Energy Technology Systems Analysis (ETSAP) has successfully developed a technology-based approach to examine energy options using a large linear program, MARKAL. The Commission of the European Countries has made use of the similar model, EFOM-ENV. MARKAL and EFOM-ENV have been used in many countries, in the DECO and outside, to identify the technical feasibility of meeting environmental requirements to reduce acid rain and greenhouse gases. They have provided substantial insight in the development of energy and environmental policy.

With the advent of the latest generation of powerful personal computers, the ETSAP partners have developed during Annex IV a user-friendly PC version of MARKAL with its User Support System (PC-MARKAUMUSS) that greatly facilitates its use in both OECD and other countries.

It is clear that it would be of advantage to examine the effect of the technological solutions identified for the energy sector on the other sectors of the economy, and to carry resulting estimates of energy prices and demands back into MARKAL modelling. Preliminary work in which MARKAL has been linked with economic models has shown considerable promise.

The work of the Intergovernmental Panel on Climate Change and the Convention on Climate Change signed by many nations at UNCED make it clear that substantial professional analytical effort will be required in industrialized countries, in economies in transition, and in developing countries if global society is to come successfully to terms with this issue.

ETSAP can make a substantial contribution to this effort. Annex V of ETSAP will build on and extend the work on greenhouse gases done in Annex IV.

#### **(b) Objectives**

The main objectives are to:

- (i) contribute to the development of systems analysis of energy technology options with a view to informing the development of policy;
- (ii) perform enhanced national and multi-national analyses of greenhouse gas reduction strategies, including assessment of economic impacts, international energy market implications, and the role of CO<sub>2</sub> vis-a-vis other greenhouse gases;

- (iii) expand the global coverage of consistent analyses by sharing methodologies, tools, insight and experience with other countries especially economies in transition.
- (iv) contribute through the IEA and national authorities to broader understanding of energy options for sustainable development.

The research will address such questions as

- what would be the macro-economic impacts of greenhouse gas reduction strategies on the energy and other sectors of the economy?
- what impacts would greenhouse gas reduction strategies have on regional or global energy markets. and thus on price trends and security of supply?
- how would the cost-effectiveness of national strategies vary between OECD countries and with other countries?

## 2. *ACTIVITIES*

The following activities will be undertaken to meet these objectives

- ongoing maintenance and development of the MARKAL model, in particular, agreed versions in OMNI and GAMS and the MARKAL Users Support System;
- linking of MARKAL with suitable macro-economic approaches and collection of relevant data;
- studies and comparisons of long-term technological options to meet environmental requirements. especially reductions in emissions of greenhouse gases;
- development of training courses, including a fully-documented demonstration programme.

## 3. *OPERATING AGENT*

The Operating Agent is the Netherlands Energy Research Foundation, acting through Policy Studies (ECN).

## 4. *SPECIFIC RESPONSIBILITIES OF THE OPERATING AGENT*

(a) *Project Staff.* For the purpose of carrying out the above objectives the Operating Agent shall establish, within sixty days *after* the Annex has entered into force, a Project Staff composed of a project head and such additional assistance as may be required, including external staff, to fulfill the Task. Activities requiring common work may include quality assurance review. development of the procedure for comparing and integrating the national models, preparing the final conclusions and report of the Task, and other activities that may be decided upon by the Operating Agent or the Executive Committee. The common work may be performed by the Project Head, by other Operating Agent staff. or by organizations or professionals from the participating countries.

Ir. Tom Kram will serve as Project Head and devote two-thirds of his time to the Task. Any change in this arrangement during the period of this Annex will be agreed between ECN Policy Studies and the Executive Committee.

(b) *Executive Responsibilities.* The Operating Agent shall be responsible for overall coordination of the Task. The main responsibilities will be:

- (1) to manage the common tasks,

- (2) to assure appropriate communication among the Participants.
- (3) with the approval of the Executive Committee, to represent ETSAP in various international conferences, bodies, and groups, and
- (4) to prepare and distribute a newsletter on the Task activities for outside distribution.

(c) *Meetings and seminars.* At the request of the Executive Committee, the Operating Agent shall organize workshops and seminars.

(d) *Validation.* At the request of the Executive Committee, the Operating Agent shall coordinate the work of a small group of experts charged with reviewing the consistency and accuracy of national models and the main results.

(e) *Preparation of Draft Programme of Work and Reports.* The Operating Agent shall prepare and submit to the Executive Committee, prior to its first meeting, a draft programme of work for the three-year period of the Task. The Operating Agent shall report to the Executive Committee at least once a year on the progress of the activities under this Task. Upon termination of this Annex, the Operating Agent shall prepare and submit to the Executive Committee for approval, a draft final report on the activities carried out during the period of this Annex. Following approval, the Operating Agent shall transmit the report to the Agency and to the members of the IEA Committee on Energy Research and Technology.

The Committee on Energy Research and Technology may, during this Task, propose additions to the Programme of Work. The Executive Committee shall decide whether these proposals will be added to the Programme, provided such additional work can be carried out within the resource levels set out in paragraph 7 below.

## **5. SPECIFIC RESPONSIBILITIES OF THE PARTICIPANTS**

Following criteria as agreed in detail from time to time during the Annex, Participants shall collect, assess and document:

- (a) data on technology characterizations, including control technologies and emissions from energy systems and related data
- (b) information on the structure of energy systems and related data

They will also

- (c) perform analyses of agreed economic cases and environmental scenarios using an energy systems model
- (d) participate in comparisons of national technology assessments, and
- (e) run national reference groups to discuss on the database, assumptions, methodologies, and results.

## **6. FUNDING**

### *1. Common Financial Obligations*

Common Task activities will be funded through the Operating Agent. The actual costs of the Operating Agent's activities during this Annex will be divided equally among all Participants. If the number of Participants changes, the share of contribution to the cost will be adjusted proportionally. New Participants will pay a full share of the costs beginning in the Task year in

which they become Participants. The 1993 budget of the Operating Agent for the core programme will be Dfl 504,000, based on 12 Participants at Dfl 42,000 each. If and when additional participants join, the Executive Committee will re-examine the budget, taking account of the benefits of supplementary work by the Operating Agent or its sub-contractors. The Executive Committee will decide the annual budget for subsequent years based on this amount, and taking into account inflation and any agreed changes in the work of the Operating Agent. Additional funding to provide assistance to non OECD members would be sought from other sources.

2. *Individual Financial Obligations*

In addition to the contributions set out in subparagraph (1) above, each Participant shall bear all costs it incurs in carrying out this Task, including the costs of participation in workshops and seminars.

7. **TIME SCHEDULE**

This Annex will enter into force on January 1, 1993 and will remain in force for a period of three years. It may be extended by agreement of two or more Participants acting in the Executive Committee and taking into account any recommendation of the Agency's Committee on Energy Research and Technology concerning the term of this Annex, which shall thereafter apply only to those Participants.

8. **INFORMATION AND INTELLECTUAL PROPERTY**

1. *Executive Committee Powers:* The publication, distribution, handling, protection and ownership of information and intellectual property arising from this Annex shall be determined by the Executive Committee acting by unanimity in conformity with this Agreement
2. *Right to Publish:* Subject only to copyright restrictions, the Participants in this Annex (referred to in this Annex as the "Participants") shall have the right to publish all information provided to or arising from this Annex except proprietary information, but they shall not publish it with a view to profit, except as agreed by the Executive Committee, acting by unanimity.
3. *Proprietary Information:* The Operating Agent and the Participants shall take all necessary measures in accordance with this Annex, the laws of their respective countries, and international law to protect proprietary information. For the purposes of this Annex proprietary information shall mean information of a confidential nature such as trade secrets and know-how (for example, computer programmes, design procedures and techniques, chemical composition of materials, or manufacturing methods, processes, or treatments) that is appropriately marked, provided such information:
  - Is not generally known or publicly available from other sources;
  - Has not previously been made available by the owners to others without obligation concerning its confidentiality; and
  - Is not already in the possession of the recipient Participant without obligation concerning its confidentiality.

It shall be the responsibility of each Participant supplying proprietary information to identify the information as such and to ensure that it is appropriately marked.

4. *Production of Relevant Information by Governments:* The Operating Agent should encourage the governments of all Agency Participating Countries to make available or to identify to the Operating Agent all published or otherwise freely available information known to them that is relevant to the Task. The Participants should notify the Operating Agent of all pre-existing information, and information developed independently of the Task known to them which is relevant to the Task and which can be made available to the Task without contractual or legal limitations.

5. *Production of Available Information by Participants:* Each Participant agrees to provide to the Operating Agent all previously existing information and information developed independently of the Annex which is needed by the Operating Agent to carry out its function in this Task and which is freely at the disposal of the Participant and the transmission of which is not subject to any contractual and/or legal limitations:
  - If no substantial cost is incurred by the Participant in making such information available, at no charge to the Task;
  - If substantial costs must be incurred by the Participant to make such information available, at such charge to the Task as shall be agreed between the Operating Agent and the Participant with the approval of the Executive Committee.
6. *Use of Proprietary Information:* If a Participant has access to proprietary information which would be useful to the Operating Agent in conducting studies, assessments, analyses, or evaluations, such information may be communicated to the Operating Agent in accordance with an agreement between the Operating Agent and the specific Participant setting forth the terms and conditions for such acceptance, but the proprietary information shall not become part of reports, handbooks, or other documentation, nor be communicated to the other Participants except as may be agreed in writing between the Operating Agent and the Participant which supplied such information.
7. *Acquisition of Information for the Task:* Each participant shall inform the Operating Agent of the existence of information known to the Participant that can be of value to the Task, but which is not freely available, and the Participant shall endeavour to make the information available to the Task under reasonable conditions, in which event the Executive Committee may, acting unanimously, decide to acquire such information.
8. *Reports on Work Performed under the Task:* The Operating Agent shall provide reports on all work performed under the Task and the results thereof, including studies, assessments, analyses, evaluations and other documentation, but excluding proprietary information, to the Participants.
9. *Copyright:* The Operating Agent may take appropriate measures necessary to protect copyrightable material generated under this Task. Copyrights obtained shall be the property of the Operating Agent in trust for and for the benefit of the Participants, provided, however, that Participants may reproduce and distribute such material, but shall not publish it with a view to profit, except as otherwise directed by the Executive Committee.
10. *Authors:* Each Participant shall, without prejudice to any rights or authors under its national laws, take necessary steps to provide the cooperation with its authors required to carry out the provisions of this paragraph. Each Participant will assume the responsibility to pay awards or compensation required to be paid to its employees according to the laws of its country.

## 9. **RESULTS**

The results of this Task shall be:

- (a) maintenance and improvement of an international capability for the analysis of energy technologies and their future prospects and extension of such capabilities within the context of energy and the environment, and in particular climate change;
- (b) periodic reports on workshops or seminars and on analytical studies undertaken in connection with the Task; and
- (c) a final report on the activities carried out under this Annex.

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### 13. *PARTICIPANTS*

The Contracting Parties that are Participants in this Task are the following

The Government of Belgium  
Environment Canada, on behalf of the Department of Energy, Mines and Resources  
The Forschungszentrum Juelich GmbH (Germany)  
The Ente per le Nuove tecnologie, l'Energia e ;Ambiente (Italy)  
The Government of Japan  
The Stichting Energieonderzoek Centrum Nederland  
The Royal Ministry of Petroleum and Energy (Norway)  
The Energy Research and Development Commission (Sweden)  
The Paul Schirrer Institute, on behalf of the Office Federal de l'Energie (Switzerland)  
The Department of Trade and Industry (UK)  
The Department of Energy (USA)  
The Commission of the European Community