Aim and Content

The aim of the project is to draw up an action plan on energy end-use efficiency and energy services in accordance with Directive 2006/32/EC.

The bottom-up approach to be followed shall have a time-scale of nine years, it shall be broken down by sector and by use and shall be compliant with the general framework of energy saving measures set out in Annex IV to Directive 2006/32/EC.

The content of the project entails carrying out studies and calculations and finally compiling the EEAP as stipulated in Articles 4, 5 and 14 of the Directive.

In summary, the technical content of the project shall be as follows:

1. Collection and analysis of energy data and determining a national target for energy savings in GWh.
2. Analysis and forecast of growth in end-demand for energy by sector and use.
3. Available energy technologies and forecast of technological development.
4. Determination of economic potential for energy savings and planning of measures to improve energy end-use efficiency.
5. Determination of intermediate national target.

The relevant installations covered by the ESKDE (Second National Emission Rights Distribution Plan) shall be removed from all calculations.

Breakdown of individual units of the project

1. Collection and analysis of energy data and determining a national target for energy savings in GWh

For the purpose of determining a national target for energy savings, use shall be made of historical data collected in relation to annual domestic energy end-consumption for the last 5 years prior to the implementation of the Directive for which official published details exist (2001-2005). Average Annual Consumption (AAC) shall be calculated on the basis of the end-consumption data for the last five years. The national target shall be set at the product of AAC x 9%.

For the purpose of implementing units 2 (forecast of energy demand) and 4 (harmonization of the energy market with emphasis on the analysis of the

consumption sector) the following data which are already available to the KAPE (Centre for Renewable Energy Sources) shall be analyzed:

- The results of bottom-up statistical analyses regarding developments-trends in differences in historical indicators of energy end-consumption and
- The results of procedures for reviewing and monitoring sectoral studies and programmes in relation to bottom-up recording and evaluation of the results of MBEA trials.

2. Breakdown and analysis of energy demand by use

After completing the collection of the energy consumption data in unit 1, AAC will be analyzed by sector and use as follows:

1. Public sector (with analysis by consumer group)
- heating, refrigeration, air conditioning, ventilation
- hot water use
- lighting
- cooking and freezing food
- other uses

2. Domestic sector
- heating, refrigeration, air conditioning, ventilation
- hot water use
- lighting
- cooking and freezing food
- other uses

3. Tertiary sector (with analysis by consumer group, such as hotels, private hospitals, schools, sports centres, commercial centres etc.)
- heating, refrigeration, air conditioning, ventilation
- hot water use
- lighting
- cooking and freezing food

- other uses

4. Industry (with analysis by sector)
- engines and operating systems
- heated and refrigerated loads in the production process
- heating, refrigeration, air conditioning, ventilation of premises
- lighting
- other uses

5. Transport
- road
- air
- rail
- sea

An econometric calculation model will be used for forecasting the energy saving per sector of activity and for forecasting the energy end-use per energy product over a nine year timescale where the calculations exist. The model has been developed by the ΚΑΠΕ and is described in the Annex.

3. Available energy technologies and forecast of technological development.

The operational characteristics and the degree of penetration of the technologies currently employed in the various energy end-uses will be recorded. A forecast will be made regarding the development of the above technologies and of other technologies which are expected to come on stream over the nine year timescale. Possible measures for making energy savings will be organized in conjunction with groups of technologies.

4. Determination of economic potential for energy savings and planning of measures to improve energy end-use efficiency.

On the basis of the forecasts regarding the growth in end-demand for energy broken down by sector and use, the energy technologies available and the forecasts regarding technological development, the technical potential for energy savings by sector and by use will be calculated over the nine year

timescale. The portion of the technical potential which can be economically exploited will be determined as the economic potential for energy savings by sector and by use.

The analysis of the economic potential for energy savings will be used for designing measures-interventions to improve energy efficiency.

The methodology used will be the Integrated Plan of Energy Resources which is followed internationally for planning an integrated programme for energy savings. In this way, the lowest cost energy system for meeting energy demand will be calculated while, at the same time, achieving the energy savings provided for in the European Directive. The impact of the policy measures on cost and energy efficiency will be assessed in a number of scenarios:

For the purpose of implementing the above, use will be made of the following calculation models:

MARKAL

The MARKAL energy model is geared towards, in the medium to long term, the best mix of technologies which is to be introduced into the country's energy system, both in terms of energy supply and demand, so that national energy policy targets can be met (meeting demand, safety of supply, environment etc.) in the most economically efficient way. As regards consumption, in particular, since the model examines competition between the various technologies which meet the requirement for energy savings (more expensive/more efficient compared to cheaper/less efficient) and takes into account the limitations associated with the supply system, it determines on the basis of clear economic criteria the penetration which must be achieved by the various energy technologies in respect of different energy uses. Thus, this model determines the economic potential for energy savings in the various sectors of consumption (which must, in other words, be the goal).

COMPASS

The COMPASS model will be used in the context of the proposed project for the technical and economic assessment of specific programmes for making

energy savings and managing demand, both on the part of consumers and energy companies, as well as by the national economy. These programmes contain measures in relation to energy consumption, the cost of which either falls directly on consumers since it is often more beneficial to invest in energy equipment than to pay the energy cost, or on the energy companies which often benefit from investments by reducing energy and power demand instead of increasing power capacity, or both.

The model can assess specific scenarios or integrated energy saving measures. For each scenario (e.g. the replacement of traditional light bulbs with modern technology light bulbs in the domestic sector) the model takes into account the size of the market, the method of introducing the new technology onto the market, the technical and economic parameters of energy technologies, the shape of the load curve of the energy use under examination etc. and it calculates the penetration of the new technology into the market over the timescale we are considering, the energy and power savings, and the various indicators for the economic assessment of the investment required by consumers, energy companies and the national economy. For each scenario the model can also take into account incentives of various kinds (capital grant, loan etc.).

The model can also assess scenarios for changing the shape of the load curve (reducing/relocating peak etc.) by means of, for instance, the introduction of variable prices for electricity based on the time of use or contracts providing for interrupted use etc.

Finally, the model can calculate all the above for one group of such scenarios or measures, which constitute one programme.

In summary, the model will be used to propose suitable programmes for making savings and managing demand so that the potential savings calculated with the help of the MARKAL model can be achieved.

WASP IV

The WASP 4 model is used for calculating the investments required in the electricity generation sector so that the demand for electricity can be met in the most economic manner (best commercial investments) and with the desired conditions concerning the reliability of the system.

The WASP model will calculate data inputted into the COMPASS model regarding the cost of investments in electricity generation, which will be compared financially with measures for making savings and managing the load in the electricity sector or with measures for replacing electricity by natural gas.

More specifically, the methodology will involve the following steps:

- **Step 1:** The data regarding forecast demand will be inputted into the MARKAL energy model for the purpose of calculating over the 9 year timescale the mixtures of technologies and fuels which can meet demand in each scenario. The energy end-use results gained will then be compared with those calculated in unit 2.
- **Step 2:** The energy saving measures will be assessed, on the one hand, by using the appropriate calculation model which examines the economic preconditions of a given technology and, on the other, by using the COMPASS model which compares measures for managing energy demand either with investments in energy generation or with the replacement of fuels by other competing fuels. The COMPASS model will be used in general to compare groups of energy saving measures or measures for the management of loads. The data inputted into the COMPASS model regarding the cost of investments in electricity generation, which will be compared financially with energy saving measures and measures for managing loads in the electricity sector or with measures for replacing electricity by natural gas, will be calculated by the WASP model.
- **Step 3:** By means of this process, the MARKAL model will be corrected and the economic potential for savings will be recalculated on the basis of the packages of measures previously determined by the assessment carried out in step 2.

The result will be given in the form of measures, ranked in order of priority according to their energy, temporal and economic effectiveness for each sector of end-energy consumption other than the public sector. These measures will be based on the requirements of each sector, the experience gained in implementing corresponding measures in our country (energy reviews, investments in industrial programmes, research etc.), European guidelines and the experience of other countries. Owing to the exemplary role played by the public sector, it will be examined separately in accordance with Article 5 and Annex VI of the Directives. As regards the implementing methodology, for each measure a description will be given of the sector, the use, the group of consumers, the technology, the total energy outcome, the timescale for implementation, the total cost of implementation, the financial arrangements, the net economic benefit and the participants. The Energy Efficiency Action Plan will consist of the best combination of measures chosen with a view to achieving the national target determined in stage 1.

5. Determining an Intermediate National Target

Depending on the package of measures which is selected, the intermediate national target for the first three years of implementation will be determined.

Deliverables

The implementing body shall cooperate directly and closely with the relevant departments of the Ministry of Development throughout the entire project and on completion of each stage all the relevant material will be submitted to the Ministry.

The final deliverable will be the Energy Saving Action Plan for the next nine years in the form of measures ranked in order of priority according to their energy, temporal and economic effectiveness for each sector of end-energy consumption other than the public sector. Owing to the exemplary role played by the public sector, it will be examined separately. For each measure a description will be given of the sector, the use, the group of consumers, the technology, the total energy outcome, the timescale for implementation, the total cost of implementation, the financial arrangements, the net economic benefit and the participants.