

# COMMISSION OF THE EUROPEAN COMMUNITIES

COM(81) 3 final

Brussels, 16<sup>th</sup> February 1981

## UNITED NATIONS CONFERENCE ON NEW AND RENEWABLE SOURCE OF ENERGY

The European Economic Community's contribution

COM(81) 3 final

- 1 -

## I. FORECASTS RELATING TO NEW AND RENEWABLE SOURCES OF ENERGY IN THE COMMUNITY

In accordance with the European Communities Council Resolution of 13 May 1980 on the objectives for 1990 (1), the Member States have sent the Commission the figures for new and renewable sources of energy, under the annual review of the energy programmes of the Member States. The forecasts about those energies (hydro, geothermal, biomass, solar, wind, sea) refer to 26 to 28 m toe in 1990, as compared to 13,9 m toe in 1979, for the ten Member countries (2).

With regard to the new energy targets of the Community for 1990, the Council places, through its Resolution of 9 June 1980, a growing importance on the new and renewable sources for Community supply : they will cover an average of 2.2 % of gross energy consumption in 1990 for the Community as a whole (hydro, geothermal, biomass, solar, wind, sea), whereas they represent only 1 % of consumption in 1979.

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(1) OJ C 149 of 18 June 1980.

(2) Hydro and geothermal electricity conversion rate into toe is based on the thermal equivalent of electricity (3600 kj/kwh).

## II. PRINCIPAL TECHNOLOGIES FOR PRODUCING AND USING NEW AND RENEWABLE SOURCES OF ENERGY

The interest shown by the Member States of the European Community in the new and renewable sources of energy being discussed at the UN conference (1) varies according to the type of energy concerned. The utilisation and exploitation of hydroelectric power and peat have long since come of age. The main limiting factors here are potential (deposits in the case of peat, sites in the case of hydropower), about which most is already known, and the cost of the energy produced. The economic exploitation of these sources depends to a great extent on local conditions, but no great gains should be expected from increasing exploration and/or research, which are already considerable in certain cases.

The other sources - biomass, geothermal energy, solar energy, wind power, energy from the sea, shales and sands - are more extensive, however, and relatively little is known about their potential. With a few exceptions, the technologies which would allow them to be exploited economically have not yet been developed. Increased exploration, research, development and demonstration may substantially enhance the contribution (hitherto very small) which these sources can make to the energy balance of the Community, at least within the next twenty years. The research, development and demonstration programmes, are evidence of the interest which the Member States are showing in the utilisation of these sources. Actually, nine of the Member States of the Community funded the research, development and demonstration in the field of geothermal, solar, wind ocean and biomass energy with approximately 102 MioECU in 1978.

In addition to the efforts by the Member States (2), there are those carried out at Community level through the common R & D programmes on the one hand, the demonstration projects on the other hand, financed by the budget of the European Communities (about 17 MioECU in 1978).

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(1) Biomass, wood and charcoal, geothermal, hydro, solar, oil-shales and tar sands, ocean, wind, peat and draught animal power.

(2) See the national documents submitted to the Conference.

The energy R & D programme of the European Communities - covering, i.a., solar and geothermal - aims by means of a sustained effort, at developing substitutable sources of energy so that they will contribute substantially in the medium term (up to 1995) and long term (beyond 1995), to Community supply.

Such action is achieved by the granting of financial support to demonstration projects in all fields where, beyond the research stage, it is possible to prove their industrial and commercial viability, to promote confidence in these sources and hence encourage their use.

The projects and programmes currently being carried out at Community level are as follows :

A. SOLAR ENERGY (including biomass and windpower)

The progressive introduction of solar energy will largely depend on the strengthening of research, development and demonstration work, not only to accelerate the improvement of solar technologies but also to make possible a possibly substantial contribution of this energy to requirements after 2000. This programme gives an important part to solar electricity production, mainly based upon solar cells, but also, in some European regions, upon power stations based on thermodynamic cycles and biomass.

Research and development projects

1. Four-year (1979 - 83) indirect action programme (contracted research), 46 MioECU (1), covering the following projects :

- the application of solar energy to dwellings :  
systems study, high and low temperature collectors, heating of buildings, mixed active and passive systems, refrigeration, stock piling, etc.;
- thermodynamic solar power stations :  
completing and testing of the 1MWe tower power station built by a European consortium in Sicily - preliminary studies for possible substitution cycles;
- generation of electricity from photovoltaic conversion :  
improvement of the cell production technology, concentration systems, development of new semi-conductor materials, carrying

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(1) average conversion rate of the European Account Unit (ECU) during the considered period : 1.25 %.

out of pilot projects;

- photochemical, photoelectrochemical and photobiological processes :
  - study of photoconversion mechanism; production of hydrogen, study of artificial systems;
- energy from biomass : assessment of biomass as a resource, direct use and conversion to gas, methods of conversion, photosynthetic breeding;
- data relating to solar radiation :
  - coordination of national actions, standardization of instruments, production and distribution of maps and data records;
- wind power : assessment and feasibility studies;
- application of solar energy to agriculture and industry : assessments.

2. Four-year (1980-83) direct action programme (research carried out by the Joint Research Centre of the European Communities), 26.2 MioECU covering the following projects :

- Community installations simulating solar radiation (ESTI) :
  - operation of a large testing installation in conditions of natural or simulated radiation for thermal and photovoltaic systems;
- use of solar energy for dwellings and low temperature applications :
  - complete solar systems study, combining heating and refrigeration and allowing seasonal heat storage;
- equipment for solar power stations :
  - development and analysis of selective equipment and surfaces for tower concentration power stations and thermodynamical assessment of advanced conversion cycles;
- photoelectrochemical and photochemical conversion :
  - basis research in new solar energy conversion processes.

#### Demonstration projects

Granting financial assistance (up to 40 % and possibly refundable) for demonstration projects by Community firms : in all 22.5 MioECU over a five-year period to cover the following projects :

- desalination
- space and swimming-bath heating (hot water)
- agro-industrial uses (glasshouses, pumping water, drying, etc.)
- generating electricity from biomass.

## B. GEOTHERMAL ENERGY

The possible impact of geothermal energy depends on the existence of a number of conditions linked to the site but it might nevertheless allow the saving of a rather considerable amount of energy. The programme aims at identifying and assessing new geothermal sources, which can be operated by demonstration projects. In the longer run, the problems linked with the use of hot dry rocks should be solved in order to use high temperature geothermal energy; therefore an important part will be given to this subject in the R & D programme.

### Research and development projects

Four-year indirect action programme (contracted research), 18 MioECU, covering the following projects :

- integrated geological, geophysical and geochemical research in selected regions : collecting of data in certain regions in order to select possible testing sites;
- problems connected with underground natural hydrothermal resources : improvement of operating technology, definition of reservoir parameters, reintegration problems;
- problems connected with the surface utilisation of hydrothermal resources : fluid extraction, environmental effects;
- hot dry rocks : feasibility of heat extraction with easily renewable rocks; propagation of fractures, heat exchange, environmental effects.

### Demonstration projects

Granting financial assistance for demonstration projects by Community firms. In all, 22.5 MioECU over a five-year period to cover the following projects in particular :

- electricity generation
- heating of buildings
- heating of glasshouses
- industrial use.

In addition to these research, development and demonstration activities at Community level, which are intended to promote and exploit new and renewable energy sources in the Member States, there are those being conducted under the Community development cooperation policy, a detailed description of which is given in section IV below.

### III. CHIEF LIMITATIONS AND WAYS OF REMOVING THEM

Some new and renewable sources of energy may have many uses, and varying quantities of power outputs (1 W - several MW) and be suited to fairly different environmental conditions. Nevertheless, there are a number of limitations attached to their general utilisation.

As far as the Community is concerned three major limitations (and their corresponding remedies) merit examination. There are as many solutions as problems to be solved, for the state of technological development varies considerably, not just with regard to different sources of energy (hydro-versus solar power, for instance) but also with regard to the various ways of exploiting a single source (photovoltaic as apposed to thermal solar energy).

The first limitation applies to the underdeveloped state of certain technologies; feasibility, increased reliability and the fact that mass production methods which substantially reduce production costs are possible all have to be demonstrated. The Community is trying to meet these challenges by implementing joint research and development programmes in addition, and as a complement, to national programmes. As mentioned in section II, the objectives may be short, medium or long-term, but the programmes have one thing in common, namely the existence of technical problems which still have to be solved if the relevant technologies are to be exploited and used industrially on a wide scale.

The second limitation is mainly concerned with the economic profitability of the new technologies; once all the technical problems have been solved in principle, it merely remains to demonstrate the operation will be profitable and the cost of the energy thus produced competitive. The demonstration projects, which receive Community financial support, are designed to find answers to these questions and are the preliminary to commercialisation proper. The scale on which they are carried out and the time allocated to them make it possible to show more fully the influence of the new technologies on the environment and the degree to which they interact with it.

The third limitation resides in the problems of collecting the information and disseminating it to all parties concerned, i.e. those involved in developing and exploiting the new technologies. The main points for consideration are :

- (i) that those involved in R, D & D should exchange information on a wider scale, with a view to improving the effectiveness of their activities, and
- (ii) that manufacturers and users of R, D & D products should exchange information so that manufacturers can understand users' present and future requirements and users can be informed in good time of what is immediately available.

Worth noting is the special role which the exchange of information can play in highlighting non-technical obstacles (economic, financial, administrative, social, environmental, etc.) which may slow down the development of the new technologies. The exchange of such information should enable the policy-makers in these fields to draw up the appropriate strategies.

The Community therefore regularly organises a number of conferences, seminars, etc. under its R, D & D programmes. Among the most recent have been :

- (i) solar energy for development (Varese, March 1979). Researchers and policy-makers from all over the world met to discuss the problems of water, generators, solar heat utilisation, international and regional cooperation and the social implications of solar energy;
- (ii) The Photovoltaic Conversion of Solar Energy (Cannes, October 1980) (1). All the different aspects of exploiting this technology were covered, including in particular the prospects for its use in the developing countries, discussed at a special session;

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(1) Organised in conjunction with the Commissariat for Solar Energy, Paris and the Institute of Electrical and Electronics Engineers, New York.

- (iii) Energy from Biomass (Brighton, November 1980) (1). Here again, a special session was devoted to the problems of the developing countries;
- (iv) Non-Technical Obstacles to the Utilisation of Solar Energy (Brussels, May 1980) (2). Problems of costs, public awareness, institutional barriers and the rigidity of building regulations were among the items discussed.

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(1) Organised in conjunction with the Department of Energy, London

(2) Organised in conjunction with the US Department of Energy and with the support of the Canadian Department of Energy, Mines and Resources.

#### IV. OPPORTUNITIES FOR INTERNATIONAL COOPERATION

##### (a) Cooperation within OECD and other international organisations.

The Community has been associated with the OECD's activities concerning new and renewable energy resources. A few examples only need be mentioned e.g. : the working party set up in November 1978, the International Energy Technology Group or, more recently still, the high-level group for marketing energy technologies.

Moreover, a working party was set up by the OECD Council on 27 November 1978, aiming at a coordinated effort to help developing countries to operate the technologies linked to those energies. The report (1) drawn up by the group in May 1979 suggests the integration of the proposed measures in national programmes.

Finally, it is important to recall the considerable part taken by the Member States in energy development projects within the framework of organisations such as FAO, UNDP and the World Bank.

##### (b) The Community's policy for energy cooperation with the developing countries

The Community and its Member States are among the foremost world suppliers of aid to the developing countries in the field of energy cooperation whereas the World Bank is ahead in granting loans. The Community has considerable means to hand in the field of cooperation, and the energy facet will become increasingly important.

The means available are as follows :

- Lomé Convention I and II in respect of the ACP (Africa, Caribbean, Pacific) countries;
- bilateral agreements with the Mediterranean countries;
- aid to non-associated (Asia, Latin America) <sup>non-ACP Africa</sup> developing countries;
- financial support for non-governmental organizations (NGOS).

During the period 1975 - 1980 energy funding by the Community amounted to the considerable sum of 220 MioECU (approx. 275 Mio\$), which,

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(1) Doc. CE 5/79.31 revised 7 May 1979 (McPhail group report).

by means of joint financing, enabled projects costing 910 MioECU to be carried out. Classical hydropower represents, within this amount, 64 % of the total, i.e. 141 MioECU.

Alternative energy sources now account for 35 MioECU, or in other words 16 % of all energy cooperation ventures, the rest being devoted to other forms of energy.

Moreover, as regards the general and specific training actions linked with energy problems, an estimated amount of 30 MioECU has been spent during the considered period.

Although the level of financing in this sector has so far been fairly limited the Community nevertheless considers that the success of its activities vindicates the approach adopted, this being based on the six following basic criteria :

1. The new technologies put into practice were already sufficiently developed for the risk of failure to be minor. The Community declined to consider the developing States as a laboratory for testing the new technologies which could then be used in Europe. The opposite approach was adopted i.e. the technology was first developed and then tailored to local needs.
2. Investment in this field was deliberately optimized in order to lessen the risk, since the available money does not permit wast in any form.
3. Where possible "new energy forms" were incorporated into broader non-energy projects such as the irrigation by solar-powered pumps of a small perimeter within a major hydro-agricultural project.
4. The problems involved in adaptation to local conditions were carefully studied in order to avoid psychological difficulties which could even lead to outright rejection (as in the case of the study on the use of molasses in the production of ethanol

in Upper Volta, which takes the utmost account of culinary tradition).

5. Community-founded projects have been carried out as far as possible by existing research and executive bodies within the developing countries. Worthy of note is the high level of experience and know-how already displayed by a number of national research centres.
6. Training actions were incorporated within projects, where they were necessary for their success.

The projects thus financed can be broken down as follows (for detailed list see annex) :

	ACP ECU	Mediterranean countries ECU	non-associated developing countries ECU	NGOs ECU	TOTAL ECU
Study	1.285.000	-	-	-	1.285.000
Inventories	8.780.000	-	600.000	-	9.380.000
Research	1.100.000	11.980.000	-	-	13.080.000
Demonstration	1.120.000	-	1.500.000	-	2.620.000
Integrated projects	1.230.000	-	-	1.675.000	2.905.000
Installations	5.427.000	-	-	-	5.427.000
<b>TOTAL</b>	<b>18.942.000</b>	<b>11.980.000</b>	<b>2.100.000</b>	<b>1.675.000</b>	<b>34.697.000</b>

The breakdown per sector is as follows :

- Direct solar energy : 29 projects totalling 17,47 MioECU
- Indirect solar energy : 14 projects totalling 7.847 MioECU
- Geothermal energy : 2 projects totalling 9,38 MioECU

It should be noted here that the Joint Research Centre (JRC) is particularly qualified, through its multiannual solar energy programme, to implement scientific and technical cooperation with the developing countries. It helps to draw up expert reports identifying projects in countries and to carry out energy research programmes, particularly in the Mediterranean countries.

So much for the past. The new Lomé Convention offers wider prospects as regards energy cooperation. Its significance was fully recognised during the Lomé II negotiations by both the ACP and the

European nations and agreement was reached on the inclusion in the new convention of highly complex provisions relating to energy (Article 76). The aim of energy cooperation as defined in this article is to enable the ACP to achieve energy "self-sufficiency" by developing their "traditional and non-traditional energy potential". The new convention thus enables the energy problem to be tackled on all fronts, whether this means installing hydro-electric equipment, drawing upon conventional unexploited resources (such as the coal of Botswana or the peat of Ruanda and Burundi), or promoting new sources of energy.

In the new convention particular stress is placed on new energy sources, which are referred to in the text as "alternative sources of energy". The special appeal of alternative energy sources for the developing countries is therefore made explicit, especially since they are well adapted to the specific problems of these countries whereas the more traditional forms, in order to be cost effective, require concentration of the power generated. On the other hand, the isolation of most of the ACP countries and the low density of the populations to be served lead to a search for dispersed, low-output energy sources displaying a high degree of reliability and a low maintenance requirement. In addition, the physical conditions peculiar to the ACP often favour the development of new energy sources e.g. insulation conditions (Sahara and Sahel), wind force (Cap Verde, Comores), geothermal energy reserves (Ethiopia Somalia, etc.), vegetation cover and agricultural production (equatorial forest and sugar cane plantation favouring the development of biomass), potential offered by micro-hydraulics or the exploitation of ocean thermal energy conversion (Abidjan bay, etc.).

The whole gamut of financial resources provided for in Lomé II is available for promoting these ACP energy resources. They cover the range between subsidies and special-condition loans (0,75 - 1 %, 40 years with 10 years non-call period) by the EDF, and risk capital and subsidized loans managed by the Article 59 ever offers the possibility of the European Investment Bank (EIB) granting

non-subsidized loans for energy (or mining) investment considered by the ACP states and the Community to be "of mutual interest".

The sums available are considerable and within the overall totals from which energy-cooperation funds can be drawn they are subdivided as follows :

EDF	subsidies	2553	MioECU
	special loans	504	MioECU
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	total	3057	MioECU
	of which	2457	MioECU
	for national programmes		
	and	600	MioECU
	for regional cooperation		
EIB	risk capital	280	MioECU
	subsidized loans	68	MioECU
	non-subsidized loans	200	MioECU

These resources should enable projects to be financed in, above all, the following areas :

1. The drawing-up of inventories of the energy needs and resources of the ACP. Although the needs are generally well known, local energy potential is often underestimated or even unknown. It is essential that the LDCs should possess a clear knowledge of their own potential as regards both conventional (hydropower, coal, oil, perhaps uranium) and new forms of energy.
2. The expansion of scientific cooperation between the Community and the ACP countries. In this instance the Community would call upon the JRC and the national research centres while the ACP countries would use research structures either in existence or to be set up for training, technical backup and technology transfer purposes.

3. The financing of studies and projects on the production, transport and distribution of energy.
4. Boosting the capacity of the ACP states themselves to produce the equipment needed to produce, transport and distribute energy. Initial programming tours within the ACP area revealed that the percentage of the appropriations reserved for energy should be of the same order as that in Lomé I, i.e. 5 - 6 %. This figure takes no account of the appropriations earmarked for regional cooperation which, under Lomé II assume unusual proportions, since the amount allocated to regional projects has doubled compared with Lomé I (600 Mio versus 300 Mio ECU). As yet there has been no regional programming, but the national programming tours have already shown which direction the ACP hope they will take. It seems that energy should occupy a prime position, whether in financial support for the building of large dams or for joint action on new energy sources.

Finally : although the Community has available effective means of contributing to the development of new and renewable energy sources in the developing countries, any such development will nevertheless encounter an obstacle in the shape of a lack of information on both the level and structure of the future demand for energy in these countries and on their supply potential. With this in mind the Commission is taking specific practical steps in the energy programming field and has been joined by a large number of developing countries, particularly in the international conference on energy programming held in October 1980 in Brussels.

## PROJECTS AS AT 15 NOVEMBER 1980

Heading	Country	Amount allocated to project (ECU)	Remarks
<u>LOME I</u>			
1. Geothermal exploration 1st tranche	Ethiopia	4.100.000	in progress
2nd tranche	"	4.680.000	under review
2. Intensification of agricultural production in the Senegal Valley (one 10 kW solar pump)	Mauretania	475.000	in progress
3. Project for the construction of solar pumps and motors - Part 1 (one 10 kW and one 5 kW pump)	Niger	550.000	in progress
4. Second part (prototype thermodynamic-cycle solar motor)	Niger	550.000	under review
5. Village hydropower programme in Togo (one 1 300W pump)	Togo	80.000	in progress
6. Agricultural development (air-conditioning of a research centre)	Barbados	25.000	completed
7. Forestry project in Upper Demerara			
8. Electricity supply for a hertzian relay	Comoros	200.000	in progress
9. Creation of irrigated perimeters in Logone and Chari provinces (one 5 kW solar pump)	Cameroun	350.000	in progress
10. Hot water for a hospital	Malawi	100.000	under review
11. Use of molasses (study)	Upper Volta	80.000	in progress
12. Use of molasses (studies)	Sudan	115.000	completed
13. Thermal energy conversion	Ivory Coast	200.000	in progress
14. Ocean thermal energy conversion (study)	Netherlands Antilles	160.000	in progress
15. Use of sugar cane (study)	Ivory Coast	100.000	under review

16. Fermentation gas (joint NGO funding). Demonstration project	Ruanda, Burundi, Upper Volta	300.000	in progress
17. Pilot project for a producer gas electric power station in Polynesia	Marquesas Islands	170.000	in progress
18. Installation of five producer gas electric power stations in Polynesia	Tuamotua	382.000	under review
19. Regional solar energy centre	West Africa	100.000	under review
20. Integration of micro-hydraulics in Equatorial Africa	Cameroun, Congo, Central African Republic, Senegal, Zaire	100.000	in progress
21. Integration of (producer) gas generators in Equatorial Africa (demonstration project)	Ruanda, Burundi, Zaire	300.000	in progress
22. Appraisal of equipment extracting solar energy	Mali, Niger, Cameroun, Senegal	100.000	in progress
23. Varese Conference on Solar Energy	ACP	200.000	completed
24. Study of the use of biomass in the Caribbean	CDB	30.000	in progress
25. Technical assistance	Niger, Mauretania, Senegal, Mali	200.000	under review
26. Study on the use of biomass	Mali	150.000	in progress
<u>MEDITERRANEAN COUNTRIES</u>			
1. Scientific cooperation with the CERS	Syria	763.000	in progress
2. Support for national research programmes	Tunisia	930.000	in progress
3. Scientific cooperation with the RSS	Jordan	987.000	in progress
4. EREDO (setting-up of a centre for the application of renewable energy sources)	Egypt	8.000.000	under review

5. Cooperation with the ONRS (solar)

Algeria

1.300.000

under review

NON ASSOCIATED DEVELOPING COUNTRIES

1. Solar energy (demonstration)

Pakistan

1.500.000

under review

2. Geothermal energy (study)

OLADE (Latin American Energy Organization)

600.000

in progress

N. G.O.s.

1. Equipping of three boreholes with solar pumps using photo-voltaic cells (SAN district)

Mali

60.000

completed

2. Solar pumps project (1 kW) at Kanel

Senegal

75.000

completed

3. Solar pump project (1,3 kW) at Yangasso

Mali

85.000

completed

4. Solar pump project (1 kW) at Timbuktu

Mali

75.000

completed

5. Solar pump project (9x1 kW) at Thies

Senegal

250.000

completed

6. Solar pump project (1,3 kW) at Yangasso

Mali

21.000

completed

7. Equipping of a borehole with a solar pump (1,3 kW) at Safolo

Mali

35.000

completed

8. Improved cookers

Upper Volta

145.000

in progress

9. Fermentation gas (joint EDF financing)

Ruanda, Burundi

470.000

in progress

10. Installation of a solar pump at Gourcy

Upper Volta

24.000

under review

11. Production of three solar pumps

Upper Volta

89.000

under review

12. Ten solar pumps using photo-voltaic cells

Mali

306.000

under review

13. Two aerogenerator manufacturing facilities

Tunisia

40.000

in progress

34.697.000

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