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FINANCIAL AND TECHNICAL ASSISTANCE FROM MEMBERS OF THE OECD
DEVELOPMENT ASSISTANCE COMMITTEE FOR ENERGY DEVELOPMENT
IN DEVELOPING COUNTRIES, WITH SPECIAL REFERENCE TO NEW
AND RENEWABLE SOURCES OF ENERGY

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UNITED NATIONS CONFERENCE
ON NEW AND RENEWABLE SOURCES
OF ENERGY

Nairobi, Kenya, 10th-21st August 1981

FINANCIAL
AND TECHNICAL ASSISTANCE
FROM
MEMBERS OF
THE OECD DEVELOPMENT
ASSISTANCE COMMITTEE
FOR
ENERGY DEVELOPMENT IN
DEVELOPING COUNTRIES,
WITH SPECIAL REFERENCE
TO NEW AND RENEWABLE
SOURCES OF ENERGY

CONTRIBUTION FROM
THE SECRETARIAT OF THE ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

FINANCIAL AND TECHNICAL ASSISTANCE FROM DAC MEMBERS(1)
FOR ENERGY DEVELOPMENT IN DEVELOPING COUNTRIES, WITH SPECIAL
REFERENCE TO NEW AND RENEWABLE SOURCES OF ENERGY

(Note by the OECD Secretariat)

I. The Basic Policy Response of DAC Countries to the Rising Energy Needs of Developing Countries

1. A rapid expansion of domestic energy production has become a vital challenge for oil-importing developing countries. Reducing their oil import dependence and meeting, at the same time, the rising energy requirements associated with their expanding and modernising economies are a major challenge for international co-operation. The investment and associated planning, training, research and financing needs are enormous, and developing countries need assistance to develop their energy potential. Donors provide increased financial support through financial and technical co-operation and through co-operation with the private sector. They regard expanded co-operation in this area as a matter of mutual interest since it is essential for sustained economic and social development and contributes to better balanced international energy markets.

2. Energy co-operation is guided by the priorities which developing countries set for themselves - notwithstanding the scope for positive encouragement. Donors co-operate with their aid recipients to jointly identify obstacles to expanding aid activities for energy development, on the part of both donors and recipients, and to examine ways and means to overcome such obstacles (including an insufficient policy focus in donors' aid administrations and in developing countries, inadequate volumes of ODA, lack of bankable energy projects, and a lack of qualified experts).

3. Assistance agencies face difficult choices with respect to the allocative priorities for aid to energy development within their total aid programmes. The choices relate to such issues, as the overall balance within donors' assistance programmes, the relative importance to be accorded to different energy sub-sectors, the geographical distribution of energy assistance to developing countries in different income groups and, within developing countries, to different population groups (such as urban and rural), the relative emphasis to be placed on energy development for domestic use or to strengthen the recipients' export potential, the relationships between bilateral and multi-lateral efforts, official and private activities, financial and technical assistance.

(1) The Members of the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom, United States and the EEC.

4. Donor efforts to achieve an appropriate balance in aid programmes between the various energy sub-sectors are guided by the following considerations:

- (a) Effective energy planning by the developing countries is the key prerequisite for energy development within broader development orientations and provides a basis for effective choices between different energy sources and technologies.
- (b) Conventional energy sources (including oil, gas, coal, hydro) will remain the mainstay of energy development, given their importance as energy suppliers, the well-known technologies involved, and their capacity to make a relatively quick contribution to relieving energy scarcity in the medium term.
- (c) Effective energy conservation and demand management as well as more efficient use of energy offer considerable opportunities also in developing countries.
- (d) Traditional energy sources, e.g. firewood, charcoal, animal wastes, are of utmost importance in many developing countries, especially the poorer ones, and face rapid depletion, with grave consequences for rural development, the environment and meeting basic human needs.
- (e) New and renewable sources of energy provide an important challenge for satisfying decentralized energy needs in rural areas, and selected applications for commercial energy supply. The UN Conference on New and Renewable Sources of Energy will explore in depth the extent to which these technologies can make a significant contribution to commercial energy supply for the next 10-20 years and over the long run. The major obstacles appear to be the present stage of technical development and applications, the small-scale nature of the energy devices, uncertain economics, and the hesitant social acceptance in developing countries. While the energy problems of developing countries are too urgent to rely primarily on solutions with long lead times, new sources of energy deserve special attention for those applications with significant economic potential. Hydro and biomass have promising potential in meeting sizeable energy needs in certain areas.

II. External Financial Support for Energy Development

5. Table 1 provides a summary of each DAC Member's external financial commitments to the energy sector of developing countries in 1978 and 1979.

Table 1: External Bilateral Financial Commitments from DAC Members to the Energy Sector of Developing Countries in 1978 and 1979

	1978		1979			
	ODA(1)	Export Credits (2)	ODA(1)	Export Credits (2)	Energy financing as per cent of total external financing	
	\$ million				ODA	Export Credits
<u>DAC Members</u>	<u>968</u>	<u>6,181</u>	<u>1,606</u>	<u>6,844</u>	<u>7.2</u>	<u>14.6</u>
Australia	15	-	9	4	2.0	0.5
Austria	31	100	4	6	5.7	2.4
Belgium	..	6	-	6	-	0.8
Canada	104	667	169	658	25.0	..
Denmark	9	-	19	-	6.6	-
Finland	1	-	-	-	-	-
France	49	517	74	730	2.0	14.9
Germany	150	398	364	961	9.2	13.6
Italy	-	162	-	251	-	5.6
Japan	340	868	391	1,120	15.5	8.0
Netherlands	13	312	40	219	3.0	37.1
New Zealand	7	-	2	-	3.8	-
Norway	4	-	13	-	5.5	-
Sweden	7	43	13	5	1.7	7.1
Switzerland	14	389	6	312	3.6	41.8
United Kingdom	14	582	272	88	13.8	2.5
United States(3)	196	2,096	220	2,358	4.1	30.7
EEC	14	41	10	126	0.6	22.1

(1) Official Development Assistance (DAC definition).

(2) - Officially extended export credits with a maturity of one year or more.

- Officially guaranteed private export credits with a maturity of over 5 years.

(3) Refers to fiscal years and "renewables, fossil fuels, fuelwood, power generation and distribution".

6. The data shown understate the effective external support in that:

- (a) ODA commitments do not fully cover for all DAC Members their technical assistance activities, nor their research and other related programmes;
- (b) the export credit commitments shown (relating to the "contract value", including downpayments) are believed to cover, for DAC Members combined, roughly one-half of all their officially supported export credits to the energy sector (including also officially guaranteed private export credits with a maturity of 1-5 years) and one-third of total non-concessional commitments to the energy sector (including also non-guaranteed private export credits, foreign direct investment, bond and bank lending);
- (c) indirect support for energy development by DAC Members through their contributions to multilateral development financing institutions is not covered.

7. Notwithstanding these data limitations, the following salient features emerge:

- (a) DAC bilateral ODA commitments for energy development have shown a clear upward trend during the past years: \$507 million in 1976, \$841 million in 1977, \$968 million in 1978, \$1,606 million in 1979, and close to \$2,000 million in 1980;
- (b) in absolute terms, the main aid donors for energy development were in 1979: Japan, Germany, United Kingdom, United States and Canada; together, they provided 88 per cent of total DAC ODA commitments for energy development. Canada devoted as much as 25 per cent of its total bilateral ODA to this sector. Other DAC countries with a share above the DAC average (7.2 per cent) include Japan, United Kingdom and Germany;
- (c) non-concessional financial commitments (mainly export credits) constitute a major source of external energy financing from DAC Members collectively and individually. In 1979, the volume of export credit commitments was several times that of ODA commitments, and, for DAC Members collectively, the share of export credit supported energy financing in total export credit financing (14.6 per cent) was twice as large as the corresponding share in total ODA programmes.

8. Table 2 shows, for bilateral ODA commitments in 1979 from DAC Member countries as a group, the breakdown for different energy sub-sectors. It will be seen that the main emphasis of bilateral ODA financing was on hydro-electric and other power production as well as on power transmission and distribution. New and renewable sources of energy, other than hydro-power, received only marginal support - essentially for predevelopment activities(1). Over one-third of total bilateral DAC ODA support was in grant form - mainly as technical assistance.

9. With respect to the geographical distribution of energy assistance, over one-half of total bilateral DAC ODA commitments in 1979 was extended to low-income developing countries (including 17 per cent for least-developed countries). The remainder (44 per cent) benefited middle-income developing countries. There were no ODA commitments for energy development in newly-industrialising countries and hardly any for OPEC Members. Viewing the relative importance of ODA commitments for energy development in total DAC ODA commitments from the recipient side, the low-income countries obtained 8 per cent of their total ODA receipts for energy development, the least-developed countries among them 7 per cent, and the middle-income countries almost 9 per cent. These ratios, however varied greatly for individual developing countries - from around 2 to 20 per cent.

III. External Support for New and Renewable Sources of Energy

A. Main Policy Orientations

10. Several DAC countries have recently launched important aid programmes and activities in the area of new and renewable sources of energy. They aim at the provision of alternative sources of energy for sectors and places in developing countries where conventional sources of energy are either not available or could be competitively replaced by new energy sources.

11. Assistance policies towards these objectives aim at strengthening the scientific and technological capacity of developing countries and their R & D efforts to find technological solutions appropriate to their circumstances. Several DAC donors have also programmes designed to demonstrate new energy technologies in the technical, socio-economic and national context of developing countries in order to test their suitability and acceptance and thus pave the way for their widespread application.

12. For technologies and processes which have proved successful, DAC Members help developing countries to establish viable productive capacity for the production and assembly of such facilities. They also assist developing countries in the introduction and dissemination of new technologies, e.g. as part of integrated rural development programmes and in association with technical and commercial advisory programmes and appropriate financing models.

(1) The data shown in the table are essentially derived from Member's reports on individual transactions. Apart from under-reporting, the transactions are often not described with sufficient specificity to allow their allocation to individual sub-sectors. For these reasons, the data do not fully reflect the information contained in the country chapters in Section III.

Table 2: Bilateral ODA Commitments by DAC Members in 1979
for Energy Development in Developing Countries
By Energy Sub-Sectors

		<u>\$ million</u>
<u>Sub-Sector</u>		
I.	<u>Overall energy planning(1)</u>	-
II.	<u>Energy Conservation</u>	<u>9.8</u>
III.	<u>Resource Surveys</u>	<u>0.8</u>
IV.	<u>Oil</u>	<u>80.5</u>
	1. Predevelopment(2)	1.0
	2. Oil production	13.0
	3. Associated transport and storage	9.9
	4. Refineries	0.2
	5. Oil-fired power plants	56.4
V.	<u>Gas</u>	<u>8.2</u>
	1. Predevelopment(2)	-
	2. Gas production	3.0
	3. Associated transport and storage	-
	4. Gas-fired power plants	5.2
VI.	<u>Coal</u>	<u>263.3</u>
	1. Predevelopment(2)	-
	2. Coal production	14.2
	3. Associated transport and storage	-
	4. Coal-fired power plants	248.5
	5. Synthetic fuel production	0.6
VII.	<u>Nuclear</u>	<u>17.8</u>
	Of which: Uranium mining	17.8

(1) Including supply and demand management, research, institution building, training, extension services, etc.

(2) Including exploration, feasibility studies, testing, etc.

	<u>\$ million</u>
VIII. <u>New and Renewables</u>	<u>541.8</u>
1. Predevelopment(2)	4.3
2. Hydro	533.5
(a) large (over 1 mW)	(527.6)
(b) mini	(5.9)
3. Solar	-
4. Biogas	-
5. Fuelwood and charcoal	3.5
6. Alcohol	-
7. Peat	-
8. Geothermal	0.5
9. Oil shale and tar sands	-
10. Wind	-
11. Ocean	-
12. Drought animal power	-
13. Other	-
IX. <u>Power Transmission and Distribution</u>	<u>507.5</u>
- of which rural electrification	137.2
X. <u>Unspecified</u>	<u>176.4</u>
XI. <u>Total</u>	<u>1,606.1</u>

B. "New and Renewables" in DAC Members' Aid Programmes

AUSTRALIA

13. Australia is undertaking a variety of projects aimed at increasing utilisation of renewable energy sources. There was a significant increase in assistance to such projects in 1979. Examples are planning and design of hydro-electric projects in Indonesia, Malaysia, Fiji, Solomon Islands and Ghana. In Nepal, a charcoal production plant is being developed, and a windmill project in Tanzania. The Consultative Committee on Research for Development (CCRD) advises on research needs in developing countries including energy. Australia contributes to the Commonwealth Regional Renewable Energy Research Information System (CRRERIS) which includes a computer-based bibliographic information system for renewable energy technology, a document clearing house, and a published index.

BELGIUM

14. Energy co-operation with developing countries has recently received a higher priority in the Belgian aid programme. ODA commitments for 1980 total \$1.41 million and for 1981 an increase up to \$11.35 million is foreseen. Although the bulk of the co-operation is situated in conventional energy sectors, aid efforts are increasingly concentrated on developing new sources of energy, both through financing research in Belgium and pilot projects in developing countries. The latter include wind-power in Cape Verde Islands; solar power in Egypt and Zaire; biomass in Zaire; reforestation programmes in Burundi, Ecuador, Indonesia, Peru and Rwanda. In addition, small-scale hydro-plant projects are being planned in several developing countries, especially in rural communities.

CANADA

15. Canada's policy of co-operation with developing countries in the energy sector is based essentially on the major principles outlined in the 1975-1980 strategy which stipulates that "the Canadian International Development Agency (CIDA) will focus its assistance to a greater extent on the most crucial aspects or problems of development - (particularly) energy". The three major areas of Canada's bilateral aid programme in the energy sector are (a) resource evaluation, (b) energy policy and sector management, (c) energy production (mainly hydro-electric generation) and transmission. Apart from hydro-electric projects, CIDA also supports a number of small-scale projects, e.g. for wind-power/waterpump research in Botswana and Ethiopia, and research into afforestation and production of firewood in several African and Latin American countries.

16. The Federal Government through Department of Energy, Mines and Resources, has implemented a number of domestic programmes to develop geothermal, wind, solar, hydraulic, biomass and other renewable technologies. CIDA is currently studying the potential for adaption of Canadian technology in the renewable energy field to meet requirements of developing countries. In this regard CIDA's industrial co-operation programme had funded a number of projects in the renewable energy field designed to foster industrial co-operation between the Canadian private sector and developing countries through joint ventures, transfer of technology and other forms of collaboration. These projects relate to solar heating, wind, biogas, micro-hydro and pyrolysis. The International Development Research Centre (IDRC) has financed, since its inception in 1970, 39 energy projects, totalling some \$5 million. The projects currently under consideration include: crop, fish and meat drying; afforestation; firewood stove improvement; energy from aquatic biomass; rural energy/biogas production; solar energy/water distillation; rural energy policy studies; renewable energy information.

DENMARK

17. The Danish government fully recognizes the importance of an intensified co-operation with the developing countries in the energy field. So far it has only to a limited extent financed projects with the aim of improving development countries' access to energy. This is partly due to the firm principle that development assistance should be extended in accordance with the priorities of the recipient countries, partly to the fact that Denmark has only a limited technological capacity and experience in the field of traditional energy sources. However, recent requests included more proposals by developing countries in the energy field. Danish assistance is primarily extended in rural areas, e.g. three current projects in Tanzania for rural electrification and, in 1979, two loans totalling \$16 million for electricity production and distribution in Indonesia and Togo.

18. Some \$160,000 have been extended in 1979 for research projects in solar energy and hydro-power to be carried out in Sudan, Kenya, Tanzania. A loan of \$3.5 million is under consideration for a project in Gambia concerning briquetting of peanut shells.

FINLAND

19. An expert group within the Ministry for Foreign Affairs has identified, in 1979, specific areas in which Finland possesses expertise which could be adapted for use in developing countries: wood and other biomass, small-scale hydropower, peat, rural electrification, energy planning, energy conservation. ODA commitments for 1981 include four grants for feasibility studies in Burma, Kenya, Tanzania and Thailand for small-scale hydro plants amounting to \$1.8 million and a feasibility study on biomass in the Philippines (\$0.15 million).

FRANCE

20. France's energy support for developing countries is an integral part of a global development strategy which is defined in the light of existing constraints and specific local conditions. The French programme for energy development rests on three principles:

- (a) Energy co-operation must cover all stages of the energy chain, i.e. in addition to energy production, also the essential phases of energy planning and distribution.
- (b) The choices of energy sources must be adapted to both local conditions and needs; there is no generally applicable solution, and all energy sources have a role to play.
- (c) The solutions found must be able to be implemented by the recipient countries themselves; this requires an adaptation of the technologies to local users as well as an important training effort.

21. Consequently, the French assistance programme follows four principal orientations:

22. Firstly, France participates in the financing of investment in conventional sources of energy: thermal power stations, dams and hydro-power, development of hydro-carbons, electricity distribution. The type of financing is adapted to the project characteristics: while soft funds finance large-sized projects with long gestation periods (e.g. large dams in Africa), commercially viable projects, especially hydro-carbons, are financed by official funds at commercial terms.

23. Secondly, France supports training and technical assistance activities in all types of energy development, involving a variety of French institutions (Institut Français du Pétrole, Bureau de Recherche Géologiques et Minières, Electricité de France, Commissariat à l'Energie Atomique). Efforts to enhance energy planning in developing countries have recently been stepped up.

24. Thirdly, France attaches particular attention to new and renewable sources of energy which appear well suited to quite a number of situations in developing countries, e.g. the decentralised use of solar energy for rural populations, notably in Africa. French support is provided as part of an integrated programme, combining scientific research, the development of equipment, demonstration and training. Examples include: the "Sahel-Energies Nouvelles" programme, started in 1976 and since 1979 extended to other African countries; electricity production on the basis of sugar-cane waste in Réunion; production of windmills in Martinique.

25. Fourthly, France promotes international co-operation in the energy sector through such actions as: support for an enlarged role of the World Bank and for the proposal to create an

Energy Affiliate; active participation in the forthcoming U.N. Conference for New and Renewable Sources of Energy; contribution to the creation by FAO of a research network whose results in the field of renewable sources of energy are to be disseminated for the benefit of agriculture.

GERMANY

26. Following the Bonn Summit in July 1978, the German government decided to expand the scale of its energy co-operation with the developing countries. Consequently, financial commitments to the energy sector show a rising trend. Measures focus on three sectors in accordance with the new policy guidelines of 1980: (1) promotion of conventional energy sources to reduce the dependence of developing countries on oil imports (this sector includes hydro-power production and distribution); (2) support for afforestation programmes; (3) promotion of new technologies in the field of new energy sources, particularly solar, wind and biomass.

27. In 1979, the Federal Government established a "Special Programme for the Utilisation of Renewable Energy Sources". The basic aim was to develop and propagate energy technologies which are specially designed for use in developing countries. The Federal Ministry for Economic Co-operation and the Federal Ministry for Research and Technology are conducting joint research and development projects with interested developing nations. The basic features of this programme were initially discussed with 10 developing countries(1), but the programme now covers a total of 20 countries.

28. For 1980, a total amount of \$35 million was set aside under the Special Programme. The breakdown for sub-sectors financed is shown below, together with the comparative figures for the past five year period.

	<u>1975-1979</u>	<u>1980</u>
	\$ million	\$ million
- Institution building and energy planning	3.4	11.2
- Small-scale hydro	8.9	5.8
- Solar	19.1	7.7
- Biomass, incl. wood	4.5	6.1
- Wind	4.0	4.0
- Tidal	0.1	-
<u>Total</u>	<u>40.0</u>	<u>34.8</u>

(1) Colombia, Kenya, Mali, Niger, Peru, Philippines, Senegal, Sudan, Tanzania, Upper Volta.

29. In addition, Germany has set up global programmes to demonstrate and propagate (i) equipment and components for the utilisation of renewable sources of energy, particularly in conjunction with technical assistance projects (\$2.1 million), (ii) wood saving stoves and biogas plants (\$1.6 million).

30. All research and development projects are designed to achieve close co-operation with a local scientific institution or agency involved in the practical application of research findings. This is to ensure that the acquired technology can be used productively and further developed in the developing country itself. The special programme for the utilisation of renewable energy sources is made up of the following components for providing assistance:

- (a) Joint research and development of new energy technologies: adaptation and further development of current methods and techniques, as well as the testing of pilot facilities and prototypes at all levels, up to and including that of the actual production stage.
- (b) Strengthening of the scientific and technological capacity of the local partner in co-operation projects, both materially and with respect to personnel, in particular in high-priority countries with whom long-range co-operation is planned (reduction of technological dependence).
- (c) Employment of currently available energy technologies for demonstration purposes, in conjunction with both a technical (assembly, operation and maintenance of such facilities) and a commercial advisory programme (gathering of industrial-management and market outlet-oriented data, as well as the development of financing models for achieving the desired goal of putting products on the market on a nationwide basis).
- (d) Development of efficient national production capacities and promotion of a selective propagation of energy technologies, preferably within the framework of rural development programmes.

ITALY

31. The Italian government attributes, within a growing aid programme, a high priority to energy projects, including demonstration projects in the sector of new and renewable sources of energy. Out of some \$180 million set aside for energy financing in 1977-1980, \$6.5 million were committed for studies and technical assistance - almost exclusively for new and renewables, mainly geothermal, but including also solar, hydro and alcohol.

JAPAN

32. Japan considers energy development as a priority sector in the development assistance programme, attaching special importance to new and renewable energy such as hydropower, biomass, geothermal, solar energy, although there are still many technical problems to be solved in order to substantially expand cooperation in the field.

The performance in 1979 of Japanese aid in the sector of these new and renewable energies is described as follows.

33. Loans were extended through the Overseas Economic Cooperation Fund (OECF). Commitments in 1979 by OECF, all related to hydropower, are shown in the table below. In 1980 (Jan. - July) 13 official direct loans were committed in the energy sector. Among those approved were, Wuqiangxi Hydro-electric Power Project in the People's Republic of China and Jong Geothermal Power Plant Construction Project in the Philippines.

Official Direct Loans in the field
of Hydropower development in 1979
(commitments)

Country	Project	Amount (million \$)
Malaysia	Trengganu Hydro-electric Project	10.62
	Tenom Pangi Hydro-electric Project	34.84
Indonesia	Wonogiri Hydropower Plant Project	31.94
	Sadang Hydropower Plant Project	4.33
Papua New Guinea	Warangoi Hydro-electric Project	14.85
		96.58

As for grants, Japan made contributions amounting to \$3.85 million for construction of research centres of Kasetsart University in Thailand.

34. Receiving trainees from developing countries. The Japan International Cooperation Agency (JICA), which is a central executing agency of technical co-operation, carried out "group study and training" and "individual study and training" on hydro-power and geothermal energy. Training courses were provided for 9 trainees from 8 developing countries on hydropower and 20 trainees from 14 developing countries on geothermal energy. Under the new programmes for ASEAN countries, training courses on solar energy and biomass will also be provided.
35. Dispatching of experts. JICA dispatched experts to Guatemala (measurements and production of geothermal wells) and to Thailand (planning of hydro-electric power projects).
36. Dispatching of survey missions. In most cases, such surveys took the form of a preliminary or feasibility study of the project. Development surveys were implemented on hydropower in 9 developing countries, including Indonesia, Philippines and Columbia, on geothermal energy in 4 developing countries, including Indonesia, Kenya and Chile, and on solar energy in the United Arab Emirates (the last one in 1980).
37. Project-type technical co-operation. In 1980, project-type technical co-operation, that is integrated and longer-term technical co-operation, combining the above-mentioned receiving trainees from developing countries and dispatching of experts, as well as supply of equipment, was started for the research project on biomass energy of Kasetsart University in Thailand.

THE NETHERLANDS

38. The Netherlands government attaches great importance to energy co-operation, with emphasis on non-conventional energy resources, as set out in the 1980 Explanatory Memorandum on government policy "Development Co-operation and the World Economy". While bilateral conventional energy projects (e.g. electrification projects in Pakistan and Indonesia amounting to \$57 million in 1977-1979) still account for the bulk of funds disbursed in 1979, projects in new resource development greatly increased.
39. The research programme amounting to some \$4 million technical assistance grants in 1979 consisted mostly of the development and application of projects covering wind energy (\$1.6 million) for the use of windmills in five African countries, but also some biogas and solar energy projects (\$1.6 million for investigation into solar driers and biogas in Indonesia, \$26,000 for a solar ice production unit in Sri Lanka), and some \$900,000 for a gas generator fuelled by agricultural waste in Tanzania. Over the next few years, some \$10 million will be made available for further research, and an annual target for a separate energy programme of \$40 million, in particular for the implementation of afforestation programmes. Budgetary funds for the development of newer forms of energy amount in 1980 to \$5 million, rising to \$15 million in 1981.

NEW ZEALAND

40. New Zealand has been in the forefront of geothermal energy development in New Zealand itself, and is now extending this expertise to developing countries. Two geothermal projects on a comparatively large scale are being implemented - one in Indonesia and the second in the Philippines. The project in Indonesia is the largest single project financed by New Zealand

ODA and involves some \$24 million to be spent over the period 1974-1981. It covers scientific exploration, drilling, production drilling, design, supervision and provision of part of the equipment. In the Philippines, \$13.5 million is to be devoted mainly to provision of engineering services and drilling. Other ongoing projects in the new energy field include design-work on pilot small-scale hydro schemes (Solomon Islands, Fiji), as well as feasibility studies for ethanol production based on cassava (Fiji, Papua New Guinea).

41. The Geothermal Institute was officially opened in June 1979; 19 UNDP-sponsored students from developing countries participated in the inaugural one year course leading to a diploma in geothermal energy technology. A second group of 19 students enrolled during 1980.

NORWAY

42. Norway has almost a century's experience in the field of hydro-electric power production and distribution systems. The experience also includes a large number of small-scale power projects. A programme for renewal of the old small-scale power stations in the country has recently started, and Norwegian manufacturers have for this purpose developed a range of standardized and semi-standardized hydro turbines as part of complete packages of small scale hydro-power stations that seem well suited for developing countries. Hydro-electric power development and production is largely aid-supported and involves technical assistance for surveys of water resources and hydro-power development (including feasibility studies and design) as well as possibly supply of equipment. Small hydro-plants are being financed in the Philippines, Burma and Thailand. Other hydro projects are under study in Mozambique, Tanzania, Kenya, Lesotho, and Papua New Guinea. In addition Norway offers fellowships for hydro-electric power studies. Another field of energy co-operation is forestry production. Support is given to projects or research in Kenya, Sri Lanka and Tanzania.

SWEDEN

43. On the basis of the 1979 "Guidelines for Energy Assistance" the Swedish International Development Authority has set forth the following priorities:

- energy planning and policy analysis;
- forestry and fuel-wood supply, including the related aspects of wood stoves and charcoal production and distribution;
- large and small scale hydro-electric power;
- other types of new and renewable energy sources for which prospects appear to be favourable, as for example biomass, biogas, geothermal, solar and wind energy.

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43. On the basis of the 1979 "Guidelines for Energy Assistance" the Swedish International Development Authority has set forth the following priorities:

- energy planning and policy analysis;
- forestry and fuel-wood supply, including the related aspects of wood stoves and charcoal production and distribution;
- large and small scale hydro-electric power;
- other types of new and renewable energy sources for which prospects appear to be favourable, as for example biomass, biogas, geothermal, solar and wind energy.

In 1979 disbursements for the energy sector were \$10.5 million. Assistance continues to be concentrated on hydro-electric power and the forestry sector, including related infrastructure and training. Special attention will be paid to energy planning of the poorest countries within the framework of their national development planning and to fuel-wood supply and related problems.

SWITZERLAND

44. Switzerland gives priority to energy as part of its rural development projects. It aims at development of appropriate technology and utilisation of resources that are renewable and recipient based. The Swiss aid programme concentrates on re-forestation and mini-hydro projects, but also extends technical assistance to research on solar, biogas, and mini-hydro plants. In 1978, these research projects included \$100,000 for solar and biogas studies in Nepal, \$20,000 for energy research in Colombia, and \$170,000 for research on wind, solar and geothermal energy in Cape Verde Islands. In 1979, some projects using solar energy have been financed in India and Nepal.

UNITED KINGDOM

45. The United Kingdom has committed substantial aid funds to the energy sector in recent years. Its energy aid programme is concentrated on the poorest countries (65 percent of total British aid went to them in 1979). In 1979 the United Kingdom's aid commitments in the energy sector were \$272 million, mostly accounted for by a hydro-electric project in Sri Lanka.

46. The United Kingdom's aid in this sector has been chiefly concerned with large scale energy supply, mainly of electricity. These supplies have benefited primarily the urban and industrial sectors where geographically concentrated demand and good lead factors have enabled a good return on capital consistent with acceptable energy prices. Conventional technologies, developed initially for industrial countries, have been used. Such projects have accounted for 12 percent of the United Kingdom's bilateral aid disbursements classified by sector in recent years. The United Kingdom is aware that the small scale energy needs of rural communities have received less British aid funds as projects of this nature are inherently more difficult to identify and support. During the last few years consultancies on development of natural gas exploration strategy (Bangladesh) and on energy conservation (the Caribbean), have been supported, as has work on geothermal resources in St. Lucia.

47. Since 1978 the United Kingdom has sought to increase support under its bilateral aid programme for research and development related to the use of small scale alternative energy sources appropriate to the village level. An Energy Adviser has been appointed

and priorities for research and development have been suggested by specialised working groups on solar energy, wind and water power and biomass. An annual allocation of \$650,000 (roughly 0.1 percent of bilateral aid disbursements) has been made for this research and development since 1979/1980. Additional work in the renewable energy field is carried out by the Tropical Products Institute, the Institute of Geological Sciences, the Intermediate Technology and Development Group and, under contract, through the Energy Technology Division at Harwell.

48. The Overseas Development Administration hopes to widen the scope of future activities in this field.

UNITED STATES

49. The United States attaches high priority to energy assistance. A.I.D. energy programmes have evolved from a concentration in past years on electric power generation and distribution, to an increasing concern for the current and projected scarcity and high cost of both conventional and renewable energy resources. Programmes have stressed technical assistance activities, with major emphasis on national energy planning, renewable energy, and fuel-wood for rural applications. A.I.D. is now formulating a comprehensive policy for renewable and conventional energy, to guide future aid programming.

50. A.I.D. is the lead agency for bilateral energy assistance programmes, although the Department of Energy has supported energy assessments and research, and the U.S. Peace Corps is supporting fuelwood projects and rural energy surveys.

51. In the new energy area, United States' programmes initially seek to expand the information base in developing countries on renewable energy technologies and their potential role in meeting energy and development needs, as well as to further the development and application of viable technologies for utilizing renewable energy sources. Principal programme areas for co-operation with developing countries include:

- the analysis of energy needs, uses, resources and policies through studies, surveys and other technical assistance (e.g. in Indonesia, Thailand, Sudan, Dominican Republic, Argentina, Taiwan, Egypt, Peru, Korea);
- research, development demonstration and commercialisation of renewable energy technologies;
- training and institutional development including planning assistance.

52. A.I.D. renewable energy assistance grew from a level of \$20 million in FY 1978, to \$25 million in FY 1979 and to \$35 million in FY 1980. The planned programme for FY 1981 is \$70 million, and it is projected to expand to over \$100 million in FY 1982.

EEC

53. ODA commitments for new forms of energy amounted in 1978 to about \$4 million, rising to nearly \$8 million in 1979. The EEC finances e.g. solar-fuelled pumps for irrigation and solar-power for water-heating, a feasibility study for the utilisation of biomass (Upper Volta, Sudan), and the production of biogas as well as a geothermal project in Ethiopia. Some ACP-countries have used funds put at their disposal for research and application in new forms of energy.

54. For the next 5 years (1980-1985) the EEC expects to step up considerably its aid to the energy sector of ACP-countries, especially in the domain of better assessing the needs of these countries and financing new sources of energy for which the technologies are appropriate (wind, solar, hydraulic and geothermal).