

ENERGY PROGRAMMES IN DEVELOPING COUNTRIES

A review of the energy programmes drawn up
within the framework of international cooperation

Final report

for

the Commission of the European Communities
Brussels, Belgium

May 1981

XVII/266/81-En.

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0. Summary

1. Scope and objectives

On the basis of the contract which it concluded with the Commission of the European Communities on 5 August 1980, the German Association of Energy Consulting Engineers mbH (DECON) undertook to review the energy programmes of developing countries which had been drawn up or financed with international aid.

The main features of its task were as follows:

- to list all work being, or having been, carried out with bilateral or multilateral aid;
- to evaluate the energy programmes of countries in Asia, Africa, Latin America and around the Mediterranean;
- to compare the methods used and evaluate the results obtained.

The following international organizations and national authorities were contacted in the autumn of 1980:

- the competent departments of the US Administration in Washington:
 - the Department of Energy (DoE) (Dr. R. Summers, Director of Office of Country Energy Assessments; Mr. W. Porter, Office of International Affairs);
 - the Agency for International Development (AID) (Mr. A.B. Jacobs, Director, Office of Energy Development Support Bureau);
- the World Bank in Washington (Mr. J. Bharier, Senior Economic Adviser, Energy Department);

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- the United Nations Development Programme (UNDP) in New York (Mr. V. Baum, Director, Centre for Natural Resources, Energy and Transport);
- the National Academy of Sciences in Washington (Mr. G. Hurley, Deputy Director, Board of Science and Technology for International Development);
- the Inter-American Development Bank in Washington (Mr. E. Domenech, Plans and Programmes Department);
- the German organizations concerned with energy programming matters, with which regular contacts are maintained, especially the Federal Ministry for Economic Cooperation (BMZ) in Bonn and the German Society for Technical Cooperation (GTZ) in Eschborn, near Frankfurt;
- the Commission of the European Communities (CEC) (Mr. Renaud, Chief Adviser in the Directorate-General for Energy, and Dr. von Scholz, Principal Administrator, also in the Directorate-General for Energy).

Altogether, 33 reports, energy balances or programmes were analysed, as were other energy programmes established without international aid (e.g. Brazil) and general treatises (e.g. that by the National Academy of Sciences, Washington).

Data collection was completed in November, but one supplement has been added since.

Analysis lasted from September 1980 to 30 March 1981.

The final report of about 100 pages contains:

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- a summary of the findings;
- a methodological review;
- an assessment of each programme;
- conclusions for a Community approach.

Attached to the report is a detailed annex containing the most important documents used in the analysis. In addition, a collection of energy reports, balances and programmes (the subject of this inquiry) were sent to the Commission in the original.

2. Structure and scope of the programmes investigated

The following six international and national institutions/authorities deal with the problem of establishing energy programmes for developing countries:

- the World Bank (Energy Department);
- the United Nations Development Programme;
- the Department of Energy;
- the Agency for International Development;
- the Commission of the European Communities;
- the Federal Government in Bonn (in connection with the DGTZ).

Analysis of the UNDP began in 1977 (following discussions in committee), and the US Administration started its two programmes -

AID and DoE - in the following year.

The World Bank and the Commission of the European Communities began their activities in this field in 1979 and, finally, the Federal Republic of Germany in 1980 (the first Member State to do so).

The organizations/authorities spent US \$9 million on technical aid in the field of energy programming in 1980. Planned expenditure for 1981 amounts to about US \$13,300,000.

	US \$ million	
	1980	1981
World Bank	0.6	0.8
UNDP	1.5	2.8
DoE	3.5	3.5
AID	2.4	2.5
CEC	0.8	2.4
DGTZ	0.2	1.3
Total	9.0	13.3

The two figures of US \$9 and 13 million do give some indication of the total volume of aid: they amount to about 1% of the total non-repayable aid relating to energy cooperation world-wide, and the planned increase of 44% in 1981 is noteworthy. It is not possible, however, to use such general data to compare the aid-giving institutions, since their programmes are so different in approach and content.

International aid measures in the field of energy programming do in fact cover all areas:

- analytical reports;
- balances and forecasts;

- secondment of advisers in energy planning institutes;
 - instruction in the developing and industrialized countries;
 - conferences and seminars;
- method studies.

	Analytical reports	Balances, forecasts	Secondment of advisers	Instruction	Conferences, seminars	Method studies
World Bank	x					
UNDP	x	x	x	(x)	x	
DoE		x				x
AID	x	x	x	x	x	x
CEC		x	x	x	x	x
DGTZ		x	x	x		x

The commitment by the different aid-giving institutions ranges from one field (in the case of the World Bank) to all fields (in the case of AID).

Some of these happen to be supplementary measures, as is the case with the World Bank (analytical reports only) and the European Commission (all types of measure except analytical reports), but generally they are parallel measures.

As DECON is considering and evaluating only those energy programmes of developing countries which are financed by international technical aid, no more than the first two classes (analytical reports and balances/forecasts) are analysed.

The use of financial resources cannot be described exactly, since in many cases the experts appointed to draw up the energy programmes also exercise other functions (e.g. as instructors, conference rapporteurs, study collaborators, etc.).

The resources spent on energy reports, balances and programmes for 1980 and 1981 can be estimated approximately as follows:

- Analytical reports: US \$1.0 million (1980) US \$1.3 million (1981)
- Energy balances : US \$0.5 million (1980) US \$1.0 million (1981)
- Energy programmes : US \$4.5 million (1980) US \$6.7 million (1981)

In 1980, therefore, the six aid-givers made available US \$6 million, and in 1981 US \$9 million.

	US \$ million	
	1980	1981
World Bank	0.6	0.8
UNDP	0.5	1.5
DoE	3.5	3.5
AID	0.8	0.8
CEC	0.4	1.5
DGTZ	0.2	0.9
Total	6.0	9.0

The most apparent feature of the table is the significant financial contribution of the DoE: 58% in 1980, and 39% in 1981 (providing no cuts are made by the new American administration).

By spending US \$4.3 million, the USA financed 72% of the total in 1980 as opposed to 18% for the UN groups and 10% for the Europeans. In 1981 the proportions are as follows: US 48%, Europe 27% and the UN 25%.

The picture is different with regard to the number of projects. Until 1980, 22 projects for energy reports, balances and programmes were carried out, involving primarily the World Bank (eight projects) and the UNDP (five projects). The European Communities and the Federal Republic of Germany had one project each, the USA seven.

Number of projects	Before 1980	After 1980
World Bank	8	11
UNDP	5	12
DoE	2	3
AID	5	2
CEC	1	5
DGTZ	1	1
Total	22	34

The pattern will stay the same for the next few years, i.e. despite the strong American financial contribution, it is primarily the World Bank and the UNDP which have the greatest number of projects for the developing countries, namely 23, or 68%. The Europeans (the Community and the Federal Republic of Germany) with six projects have one more than the USA. It must be remembered, however, that this comparison is exclusively concerned with a country-by-country analysis. AID finances extensive instruction programmes on a wider, regional basis - and mostly in Latin America.

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	1980	1981
Africa	3	10
Asia	3	6
Latin America	15	12
Middle East	1	3
Southern Europe	-	3
Total	22	34

For the next few years, the Latin American area will still be the most important, although the number of recipient African countries will have risen from three to ten. For the first time Southern European countries are also included: Portugal (World Bank and DoE) and Turkey (CEC).

3. Common objectives and differences of approach

The general objectives and the subject of the investigation are more or less identical in all these approaches. They are determined primarily on economic and technical grounds.

Common to all approaches are the following investigative stages:

1. A review of energy demands.
2. A review of energy supply.
3. A description of the potential contribution of domestic resources.

Depending on the viewpoint adopted, and also on the financial resources available, these three main stages are supplemented by:

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4. Various information and methodology studies, e.g. on the economic situation of the country, the social background, population data, etc. (this is the case in almost every approach).
5. Studies of price and taxation policy, investments and investment demand (particularly with the World Bank reports).
6. Studies of instructional requirements and management problems (AID, CEC).

Finally, a number of reports and studies - related to the energy programming projects - analyse:

7. Practical associated projects, follow-up measures (World Bank, UNDP in part, AID and German technical assistance).

The narrowest range of investigation is undoubtedly that of the DoE, which is content merely to analyse energy factors and to convert these into supply models and strategies.

Much-needed secondary actions relating to instructional investment in individual energy sectors are not prepared. No advisory or organizational activity is undertaken which does not contribute to the "assessment", the end-product of the analysis.

Most noticeably, the perspective adopted is that of the technocrat/ economist, which makes much use of models and starts from a perfectionist approach elaborated for highly developed industrial countries. A correspondingly large volume of funds is used.

In contrast, the World Bank, UNDP and AID use simple, narrowly defined procedures attuned to specific analytical desiderata and to the basic data actually available.

While the former outlook concentrates on report and information work, the two latter organizations carry out advisory and instructional activities. This accords with the CEC approach.

4. The programmes' characteristics and main values

A study of the facts and figures supports the following conclusions can be drawn with regard to the various programmes:

1. All programmes are confined to collecting data or to drawing up guidelines, estimates and projections.

Primary investigations, fieldwork, test drillings and measures to develop resources, etc., are not included.

A slight exception, perhaps, is the CEC programme which includes a study of how to improve statistical instruments.

2. All programmes provide reports or documents such as balances, however:

- only with the World Bank is the report the main purpose of the measure;
- the DoE produces a very extensive analysis of a particular country's energy situation;
- AID, UNDP and the CEC attach just as much importance to advisory activities as to information work or producing reports, especially in those cases where the energy programmes are relatively inexpensive;

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- what the German approach amounts to is not yet clear.
3. All programmes rely on cooperation with the host country. The degree of cooperation and participation by specialists from the developing country varies from case to case: with the World Bank reports it is relatively low, but numerically significant in the case of the DoE.
4. Basic conceptual differences exist:
- DoE carries out an extensive analysis modelled on the US approach;
 - AID mixes rational analysis and the development of models with the pragmatic assessment of the information base available and the relativity of the project in evaluating the results;
 - UNDP mostly follows the suggestions of the host country and tailors its conceptual work to the occasion;
 - CEC provides expertise for the host country, so that it can analyse its problems itself and develop or improve its own planning institute;
 - the World Bank devotes its main efforts to producing information summaries and, sometimes, comprehensive reports;
 - comprehensive analyses seem to be the German approach as well, insofar as this can be determined.
5. In terms of labour expended, the programme requirements vary from 12 man-months in the case of the World Bank to 200 in the case of the DoE.

World Bank	12	man-months	
UNDP	12-18	''	''
AID	20-25	''	''
CEC	60	''	''
DGTZ	100	''	''
DoE	about 200	''	''

These are average values based on all the investigations evaluated. The data may vary considerably in individual cases.

6. The number of full-time experts varied less. Normally, two to five experts were assigned to a project, although the DoE sometimes seconded as many as 30. There was a greater variation in the number of part-time experts (mostly associated with German technical cooperation and AID).

World Bank	3-4 experts	3-4 months
UNDP	2-3 ''	± 6 ''
AID	2-3 ''	4-8 ''
CEC	2-5 ''	6-18 ''
DGTZ	2-3 ''	ca. 13 ''
DoE	±30 ''	3-24 ''

7. A similar pattern emerges with regard to the duration of the programmes. These were normally completed in 12 months (i.e. for the preparation of a report or energy balances, but not in the case of advisory or instructional activity); DoE programmes, however, required about 24 months.
8. Costs reflected the number of experts assigned (own payment by the institutions and contributions from the host countries are not taken into consideration). They vary from US \$70,000, on average, for a World Bank report to US \$2,500,000 for a DoE assessment.

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US \$

World Bank	70,000
UNDP	200,000
AID	250,000
CEC	300,000
DGTZ	1,000,000
DoE	700,000-2,500,000

These are average costs and relate, as far as possible, only to the task of producing an energy report or balance or programme. Further cost details are examined in the following sections.

5. Costs

This analysis looks at overall costs, the costs of the reports and individual cost factors.

5.1. Overall costs of the measures

The total amounts made available by the international organizations and national authorities out of their own budgets for measures to do with general energy programming in the developing countries vary considerably in amount, depending on when the particular measure starts: AID has spent the largest amount (about US \$5 million). The most modest contribution is that for German technical aid, which only started in 1980.

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	Allocation of resources up to 1980 (US \$)
World Bank (since 1979)	560,000
UNDP (since 1977)	1,800,000
DoE (since 1978)	1,400,000
AID (since 1978)	4,900,000
CEC (since 1979)	700,000
DGTZ (since 1980)	200,000
Total	9,560,000

Although the figures provide some information about the total volume of resources so far allocated to energy programming planning, they should not be taken as a basis for comparative analysis, for they contain too many different items.

The most important components in these lump-sum figures are:

- producing the reports (mainly travelling costs and fees);
- participation in compiling energy balances and programmes (fees, travel costs and some material costs);
- complementary measures in the instructional field (management, instructional programmes, etc.);
- seminars and conferences;
- studies and assessments.

Whereas some technical aids (AID, CEC and, in part, UNDP) include all these cost components, others only involve one (e.g. the World Bank and DoE).

US \$ million

	1980	1981	1981/80
World Bank	0.6	0.8	+ 33%
UNDP	1.5	2.8	+ 87%
DoE	3.5	2.8	0
AID	2.4	2.5	+ 4%
CEC	0.8	2.4	+ 200%
DGTZ	0.2	1.3	+ 550%
Total	9.0	13.3	+ 48%

As can be seen, the World Bank and UNDP have much increased their interventions, while those of US-DoE and US-AID have remained constant. In the case of the CEC and German aid, the increase in the initial (very small) contributions, in percentage terms, has been considerable.

5.2. The costs of energy reports, balances and programmes

A comparison of the costs of the projects undertaken by the different institutions and authorities can only be made, if the components themselves are rendered comparable.

This is only possible in respect of:

- analytical reports (from the World Bank and, in part, UNDP and AID),
- energy balances and programmes (all institutions, except for the World Bank).

Expenditure of this type amounted to US \$6 million up to, and including, 1980.

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US \$ mio

World Bank	0.6	8 reports
UNDP	0.5	5 reports and/or balances
DoE	3.5	5 programmes (of which 3 are not concluded)
AID	0.8	5 reports and/or programmes
CEC	0.4	1 balance
DGTZ	0.2	Balance in preparation

The average cost (for the World Bank) of the World Bank reports was between US \$60,000 and 80,000. A UNDP report costs between US \$150,000 and 250,000 (about three times this amount was spent in respect of Central America). If one includes the costs of involving experts from the host country, the effective total costs of these reports amount to approximately US \$400,000. Some of them, however, do contain comprehensive balances or sectoral analyses, as for instance of the role which non-commercial forms of energy could fulfil.

The DoE programmes (assessments of individual countries) cost about \$700,000 (in contributions actually accounted for in the departmental budget). In addition, there are the costs - broadly similar - of the services performed by the secondary institute and its officials. Together with the counterpart services, the overall costs range from US \$2.5 million to 3.0 million, depending on the country concerned.

In the case of AID and UNDP, average costs are comparable, amounting to about US \$250,000 per project. The actual range is considerable, however - from US \$60,000 to 600,000.

As for the European Community, it is too early yet to analyse costs in a meaningful way, since data are only available for a single, recently-started project in Ecuador. The costs

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incurred in producing energy balances can be estimated at about US \$200,000 plus a contribution from the host country of about the same amount.

No comparable figures are available for assessing the costs of German technical aid.

5.3. Staffing costs

The projects in the various programmes can be evaluated with regard to staffing - subject to the basic restriction, however, that the contribution by the host country's specialists must be left out of account. The nature and scope of such services are not precisely definable, and to include them would devalue the analysis.

The following table shows the outlay in man-time and dollars of the various institutions:

	Man-months	Total cost US \$	US \$ per man-month
World Bank report	12	70,000	5,800
UNDP reports/balances	12-18	200,000	13,000
AID reports/programmes	20-25	250,000	11,000
CEC balances/programmes	60	300,000	5,000
DGTZ programmes	100	1,000,000	10,000
DoE programmes	200	2,500,000	12,500
Mean value	65	720,000	11,000

The costs can be arranged in ascending order as follows:

CEC	5,000 US \$ per man-month
World Bank	5,800 US \$ per man-month
DGTZ	10,000 US \$ per man-month
AID	11,000 US \$ per man-month
DoE	12,500 US \$ per man-month
UNDP	13,000 US \$ per man-month

The EEC and World Bank programmes are 50% cheaper than the mean of US \$11,000 for one expert per month, while the DoE and UNDP are 16% more expensive.

A variation of this order merits closer inspection - the difference is obviously not just due to the size of the fees.

The following points should be borne in mind:

- In the case of the World Bank, the figure for fee-paid services does not include those incurred by the Bank's own staff.
- With CEC aid, however, the unit costs - which are low - need no adjustment, save in one respect: experts are not exclusively engaged in producing an energy balance, but are primarily concerned with planning, advisory and, to a lesser degree, instructional activities. The balance itself - qualitatively comparable with one drawn up by the UNDP or AID - thus assumes more of an incidental character.
- The values recorded for German, US and UNDP technical assistance simply represent the actual costs of employing energy-programming experts. One of the reasons why they

are so high is that nearly 50% consists of short-term amounts for part-time experts.

- Travel costs and remuneration on a daily basis are the most prominent items in these amounts (equivalent to about US \$20,000 per man-month!).

Despite all these considerations, the basic conclusions and trends remain unaffected, namely:

1. The approaches of the World Bank and the CEC are the most cost-effective, in terms of both unit costs and total outlay.
2. The costs can be considerably reduced to a tolerable level, if projects are undertaken in conjunction with other energy-programming projects.
3. Programmes should be limited in scope, at least in cost terms: costs of more than US \$1,000,000 per report, balance or programme for a developing country are no longer in line with ordinary international practice.

6. Results

A comparative analysis of the reports, balances or programmes leads one to ask whether the projects are practicable.

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This is definitely the main question: a realistic cost-benefit analysis depends on how the projects - some of which are expensive to implement - are used. For an analysis of the use of energy-programming projects to be valid, the competent authorities in the developing countries (i.e. the potential beneficiaries) must be interviewed.

DECON was not able to investigate this aspect, as no provision had been made for it and the contract could not be revised.

An alternative, less objective procedure would be for the relevant international institution or national authority to carry out the evaluation itself. The information resulting could be verified in part by comments from experts at occasional meetings, as for example on the occasion of an international conference on energy programming.

6.1. Investigating the application of the programmes

The use that is made of the projects can be subsequently evaluated in one of the following ways:

1. As a basis for the financial assessment of development projects. Three institutions do this in fact:

- the World Bank (this is generally the case and is also planned for future projects);

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- AID (generally the rule, also) planned for future projects;
- CEC, insofar as the projects are carried out in associated countries or countries for which the Commission makes project-financing resources available through financial protocols.

UNDP and DoE do not provide for any project financing; insufficient information is available in the case of German technical aid.

2. As a basis for planning operations in the developing country. Four institutions adopt this approach:

- both UNDP and AID have used it for concluded projects in some cases, and plan to use it for current projects;
- CEC has used it for the concluded part of the Ecuador project, and plans to use it for other new projects;
- DGTZ plans to use this approach.

As to DoE, the position is unclear.

3. As a basis for further in-depth studies (possibly as a complement to other sectors) - five institutions:

- planned by all institutions, except for DoE, where the position is unclear;
- already the case in part with World Bank, AID and CEC programmes/reports.

4. As a basis for all instructional programmes or seminars - four cases:

- UNDP, CEC and DGTZ provide an opportunity for organising instructional programmes;
- AID is already using this approach in some programmes.

The World Bank and DoE do not provide any follow-up of this kind.

5. Reassessing the project (three cases):

- provided for in the case of the World Bank and AID;
- provided for and actually carried out in the case of the European Community programme.

The position is still unclear in the case of German technical assistance; as yet, UNDP and DoE do not provide for any reassessment.

6.2. Final evaluation of the different approaches

The degree of success achieved by each institution's or authority's approach to energy-programming projects can be summarized as follows:

1. The World Bank's approach is fully commensurate with its objective. The reports are used in financing projects and as a basis for further work; they are updated as required.

Suited as it is to the modest resources available, the World Bank's work can be considered both successful and appropriate.

2. The UNDP's approach is broader in conception. The projects are not designed for financing UNDP investment projects, since this is not the function of the UNDP, but rather that of the World Bank or other UN financial institutions. In many cases, however, these projects serve as a basis for planning activities in the developing countries, or in-depth studies and instructional programmes.

3. It is hard to assess the overall results of the DoE's approach, especially with regard to its application. It was difficult to ascertain whether the findings of the analysis were passed on to the developing country in question to aid its planning work. In one case (Egypt), it does at least seem to have created greater cohesion between various government agencies and to have laid the basis for firmer energy programming.

This is far from true in another case (Peru). Both country-wide assessments were evidently not used as a basis for further sectoral projects, and AID shortly afterwards started a completely new project in the field of renewable energy sources. Since DoE cannot finance any ancillary projects on its own account - not even for instructional purposes - and the assessments are not re-evaluated, the projects undertaken with considerable financial resources have unfortunately not been followed up. The US Administration may have obtained some indication, however, of the availability of this particular developing country's resources and of the need to provide it with nuclear energy.

4. The results of AID's measures are quite clear. The opportunities for intervention and financing arising from the programming projects have been ideally combined by the agency. All five evaluation purposes mentioned in 6.1. above are fulfilled.

At the moment, only reassessment updating of the project is planned.

The fact that the financial resources are commensurate to the task makes the AID approach seem the best.

5. The same could be said, broadly, of the approach so far adopted by the CEC, with the following reservations:

- all the procedures have been provided for, but the (hitherto) short duration of the programme and a lack of experience have meant that with a few exceptions they have not yet been put into practice;
- the results are only now being used, either as support for further planning activities in the developing country, or as a basis for other sectoral activities;
- as a rule, projects can only be financed in those countries, to which resources have been allocated in financial protocols, whether or not under the Lomé Convention. This applies to countries in Africa, the Pacific and Caribbean areas and the Mediterranean region.

In special cases, project financing is also supposed to be possible through the budget allocation for non-associated countries (Latin America and Asia).

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6. Not enough experience of projects has been accumulated in the case of German technical aid for the results to be evaluated. It is planned, however, to increase intervention as part of a follow-up.

7. Conclusions with regard to a Community approach

The comparative analysis of the different international approaches to carrying out technical assistance projects in the field of energy programming prompts the following conclusions with regard to Community activities in this sphere:

1. Despite the already considerable number of reports, balances or programmes (20 actual projects), energy-programming activities need to be increased.
2. The necessary projects should be conceived in such a way, however, that they fit in with international activity in this area. In other words, it does not make sense to draw up country-by-country reports, as these are already done by the World Bank in respect of all important developing countries. (The Commission probably does not intend to do this anyway).
3. The basic comprehensive approach of the Commission should be retained and extended (counsel, balance compilation, instruction, seminars and studies). Resources and instruments will have to be properly matched to the requirements of the developing country and to the moment of intervention.

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4. Criteria and guidelines must be drawn up in detail so as to make possible the optimum use of resources.
5. It is obviously sensible to proceed stepwise, as the Commission has done hitherto, in cases where a central planning capacity needs to be reinforced (as for instance in Ecuador). If aid of a less general nature is required, however, as with sectoral measures, instruction or action in specific regions, the lack of basic rules will be a handicap.
6. The Commission should choose to proceed in accordance with an overall conception or with certain case types rather than simply by trial and error.
7. Consequently, certain typical individual cases should be developed to provide technical assistance guidelines for energy programming which would set standard criteria both for devising a practical procedure and for monitoring its implementation.
8. Such a range of intervention possibilities must accord with the objectives of the whole operation. A more thorough analysis of the objectives of the Commission's own projects would be appropriate here.
9. A prerequisite for any development of the Community's approach is that each opportunity for intervention must be appraised in terms of quantity. Conceptual quality must match the intended financial outlay.

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10. How far the Community's approach should match those of the Member States should be examined. The Commission's role here should be to develop plans in such a way that bilateral technical-assistance projects could be harmonised in approach.
11. The Commission's activities should be better publicised, thus serving those developing countries which have no information about the possibility of obtaining help in this sphere from Brussels. Further conferences should be held, therefore, and brochures printed.
12. Finally, the Commission should review how far the various existing Community instruments can be used effectively. Are certain specialisms (e.g. R & D) for energy models, instructional courses at Aspra) or financial measures (e.g. the use of the development fund for the Lomé countries and financial protocols for various other countries) complementary? The same question arises in the case of institutions, e.g. with regard to the activities of the EIB in the energy sphere: a Community approach here could very probably be modelled on the joint procedure agreed by the UNDP and the World Bank.

LIST OF ANNEXES

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