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UNITED NATIONS CONFERENCE ON NEW AND RENEWABLE  
SOURCES OF ENERGY

Report of the Secretary-General

CONTENTS

	<u>Paragraphs</u>	<u>Page</u>
I. INTRODUCTION . . . . .	1 - 3	2
II. PROGRESS OF PREPARATIONS TO DATE AND APPROACH TO PREPARATORY PROCESS AT THE GLOBAL LEVEL . . . . .	4 - 11	3
III. CONSIDERATIONS REGARDING THE PREPARATORY PROCESS AT THE REGIONAL AND NATIONAL LEVELS . . . . .	12 - 14	6
IV. ENHANCING THE READINESS OF DEVELOPING COUNTRIES FOR THE CONFERENCE . . . . .	15 - 17	7
V. ACTIONS THAT MIGHT BE TAKEN BY THE UNITED NATIONS SYSTEM, PENDING THE HOLDING OF THE CONFERENCE, TO ASSIST DEVELOPING COUNTRIES IN THE AREA OF NEW AND RENEWABLE SOURCES OF ENERGY . . . . .	18 - 21	8
VI. ROLE OF NON-GOVERNMENTAL AND INTERGOVERNMENTAL ORGANIZATIONS . . . . .	22 - 23	9
VII. INFORMATION PROGRAMME . . . . .	24	9
VIII. INTERGOVERNMENTAL PREPARATORY BODY . . . . .	25	10

ANNEXES

- I. COMPOSITION OF TECHNICAL PANEL OF EXPERTS
- II. TERMS OF REFERENCE FOR THE TECHNICAL PANELS FOR THE 1981 UNITED NATIONS  
CONFERENCE ON NEW AND RENEWABLE SOURCES OF ENERGY

## I. INTRODUCTION

1. At its thirty-third session, the General Assembly, by its resolution 33/148 of 20 December 1978, decided to convene a United Nations Conference on New and Renewable Sources of Energy in 1981. In that resolution, the General Assembly, inter alia, requested the Secretary-General, after consultations with Member States, to appoint a Secretary-General of the Conference before the thirty-fourth session of the General Assembly; to entrust the Director-General for Development and International Economic Co-operation with the responsibility of providing over-all guidance, orientation and co-ordination of the contributions from the relevant secretariats of the United Nations system to the preparations for the Conference; and to initiate the process of preparations for the Conference on the basis of paragraphs 2 and 4 (of resolution 33/148), through the preparation of studies by the relevant secretariats of the United Nations system and by meetings of technical panels of experts nominated by Governments and appointed by the Secretary-General on the basis of equitable geographic distribution and their knowledge of the subject, for submission to the General Assembly at its thirty-fourth session and to the preparatory committee. It also decided to consider, at its thirty-fourth session, further preparations for the Conference under a separate agenda item entitled "United Nations Conference on New and Renewable Sources of Energy", in the light of a progress report to be submitted by the Secretary-General to the General Assembly.

2. At its second regular session of 1979, the Economic and Social Council reviewed the initial progress report of the Secretary-General on the preparations for the United Nations Conference on New and Renewable Sources of Energy (E/1979/98), together with the additional information provided in his oral statement by the Secretary-General of the Conference in his introduction of the report. The Council also considered the report of the Chairman of the Committee on Natural Resources on the Committee's work in relation to this subject. The Council debated in particular the arrangements which should be recommended to the General Assembly for an intergovernmental preparatory body. It adopted resolution 1979/66, paragraph 4 of which contains a recommendation on this question. Similarly, the Council was concerned that preparations for the Conference were not proceeding with sufficient speed, particularly in relation to the convening of the first meetings of the technical panels. In this connexion, these concerns were reflected in paragraph 3 of resolution 1979/66. The position in this regard is reported on in paragraphs 5 to 9 of the present report.

3. In its resolution 1979/66, the Economic and Social Council emphasized the importance of the preparations for the Conference at the national, subregional, regional and global levels, and indicated its awareness of the importance of developing new and renewable sources of energy in order to meet requirements for continued economic and social development, particularly in the developing countries. It called upon all appropriate organizations, organs and bodies of the United Nations system to extend their fullest support to the preparatory process and to the Conference secretariat; recommended that States should consider designating national focal points which would co-ordinate preparation for the Conference at the national level and provide a link to the Conference secretariat in its

preparatory activities; requested the Secretary-General, in consultation with Member States, to proceed speedily with the appointment of the technical panels, in accordance with paragraph 9 of General Assembly resolution 33/148; recommended that the Assembly at its thirty-fourth session should designate an intergovernmental preparatory body for the Conference which would be open to the participation of all States as full members and would report to the Assembly through the Council, taking into account in this connexion the corresponding recommendation contained in the report of the Chairman of the Committee on Natural Resources on the work of its sixth session (E/C.7/112, para. 28, and chap. I, draft resolution II); recommended that the Assembly at its thirty-fourth session should consider measures to enhance the readiness of developing countries for the Conference, and should consider ways in which, pending the holding of the Conference, the United Nations system could more effectively assist the developing countries in the area of new and renewable sources of energy, including research and information relating to the latest technologies and development in this vital area. Finally, the Council requested the Secretary-General of the Conference "to submit to the General Assembly at its thirty-fourth session a comprehensive report on the preparatory process for the Conference, including a detailed programme and calendar of proposed activities and of other measures which may be required to meet fully the objectives of General Assembly resolution 33/148". Accordingly, the present report has been prepared in response to paragraph 11 of General Assembly resolution 33/148 and to paragraph 7 of Economic and Social Council resolution 1979/66.

## II. PROGRESS OF PREPARATIONS TO DATE AND APPROACH TO PREPARATORY PROCESS AT THE GLOBAL LEVEL

4. As requested by the General Assembly, after consultations with Member States, the Secretary-General appointed Mr. Mohamed Habib Gherab Secretary-General for the Conference. A nucleus of the Conference secretariat, drawing to the extent possible on the existing substantive capabilities of the Centre for Natural Resources, Energy and Transport of the Department of Technical Co-operation for Development, has begun to organize the preparatory process. The Director-General for Development and International Economic and Social Co-operation has established arrangements to assist him in his responsibilities of providing over-all guidance, orientation and co-ordination of the inputs of the concerned secretariats of the United Nations system. In this connexion, he has established a Co-ordinating Committee composed of senior officials of the relevant United Nations units at Headquarters most closely associated with various aspects of the preparatory requirements for the Conference and under that Committee a United Nations Secretariat Task Force composed of representatives of the concerned Departments and organizations of the United Nations to harmonize the substantive preparations and contributions of the relevant units and organizations, including the regional commissions, within the United Nations proper. The Co-ordinating Committee had convened three times at the time of submission of this report and the Task Force had met once from 9 to 10 July in New York. The Director-General has also convened two interagency meetings, the first on 1 March in New York and the second at Geneva on 1 and 2 October. On the basis of these meetings, the concerned

organizations and agencies of the United Nations system are co-operating fully with the Conference secretariat in the elaboration of the requirements for the Conference preparations and have indicated their readiness to contribute in a major and concrete way to the preparatory process for the Conference.

5. As requested by the General Assembly, the Secretary-General solicited nominations for the respective technical panels to be convened as part of the preparatory process through a note verbale forwarded to Member States on 9 March 1979. Since very few responses were initially received, the Secretary-General of the Conference sent a follow-up request to Governments with a new deadline of 31 July 1979. By the end of September 1979, a total of 64 Governments had responded to the request for nominations for the technical panels. From the nominees submitted by Governments, the Secretary-General has appointed the members of the eight technical panels on the basis of equitable geographic distribution and on the basis of their knowledge of the subject, in accordance with paragraph 9 of resolution 33/148. In reaching his decision on the composition of the panels, it became evident that the originally envisaged panel sizes as suggested to and approved by the General Assembly at its thirty-third session were too limited to permit the necessary geographic distribution and technical expertise for each panel. Accordingly, the over-all number of panel members has been increased by 19 which the Secretary-General deemed essential to achieve the most desirable composition possible. The composition of the respective technical panels as decided by the Secretary-General is presented in annex I for the information of Member States.

6. In addition to the appointment of the members of the respective technical panels, dates have now been established for the first meetings of each panel. In order to benefit as much as possible from the special competences of the concerned organizations and agencies of the United Nations system, and also in part because of the difficulty of holding meetings in New York during the General Assembly session, it was decided to hold four of the first series of panel meetings at the headquarters of those organizations most substantially concerned with the subject-matter of the particular panel. In this way, the Conference preparatory process has begun to draw actively upon the co-operation of the organizations of the system as requested by the General Assembly in paragraph 7 of resolution 33/148. The eight technical panels approved by the General Assembly at its thirty-third session (A/C.5/33/109, annex III) are scheduled to have their first meetings as follows:

- Technical Panel on Ocean Energy  
(Tidal and Wave Power and Thermal  
Gradients) . . . . . 5-9 November 1979, UNESCO, Paris
- Technical Panel on Wind Energy . . . . . 12-16 November 1979, WHO, Geneva
- Technical Panel on Geothermal  
Energy . . . . . 10-14 December 1979, New York
- Technical Panel on Oil Shale  
and Tar Sands . . . . . 7-11 January 1980, New York
- Technical Panel on Fuelwood and  
Charcoal . . . . . 21-25 January 1980, FAO, Rome

Technical Panel on Solar Energy . . . . . 28 January-1 February 1980, New York  
Technical Panel on Biomass. . . . . 4-8 February 1980, New York  
Technical Panel on Hydropower . . . . . 18-22 February 1980, UNIDO, Vienna

7. Substantive preparations are in an advanced stage for the first meetings of the technical panels. Background issue-oriented papers for the use of the respective panels have been prepared or are under preparation by the secretariat with the assistance of consultant specialists from around the world. In addition to these papers, comprehensive terms of reference have been formulated to guide the work of the panels, in accordance with paragraph 4 of General Assembly resolution 33/148, to ensure consistency of approach to the work of each panel while taking into account the particular considerations that should be addressed for each energy source. These are presented in annex II. The objective is to ensure that the results of each panel will be in a form that will permit synthesis at a later stage. It is expected that the respective panels, drawing upon the documentation at their first meetings as well as on their own technical expertise, will then determine the additional information and preparatory inputs required for the completion of their work at their second meetings. It is anticipated that a second round of panel meetings will take place in the period from November 1980-February 1981. As it will be necessary for the secretariat to ensure the integration of a wealth of information received from the organizations and agencies of the United Nations system, consultants, and non-governmental and intergovernmental organizations during the period between panel meetings, appropriate arrangements will need to be devised to facilitate the successful conclusion of the work of the respective panels.

8. Of the 14 energy sources comprising the scope of the Conference as defined by the General Assembly in paragraph 3 of resolution 33/148, 12 of the sources will be examined by the technical panels, as indicated in paragraph 6 above. The prospects and potential of peat and draught animal power will be assessed through the preparation of comprehensive studies undertaken by consultants. In the case of draught animal power, however, because of its widespread use in many developing countries in particular, it may be necessary to consider additional measures for dealing fully with this source of energy. These studies will be completed by the time the second meetings of the panels convene in order to ensure that the reports and results pertaining to each energy source can be properly synthesized into a cohesive and integrated document for the Conference in 1981.

9. In addition to these substantive preparations, the secretariat expects to undertake, in co-operation with the concerned organizations and agencies of the United Nations system, special studies on those major issues that cut across all panels and energy sources. These special studies will draw to the fullest extent possible upon the previous or ongoing work done elsewhere in the system. To carry out these studies properly it is envisioned that an expert group would be convened on each of these subjects during 1980. In addition, it will be necessary to make appropriate arrangements, in co-operation with the organizations and agencies most concerned, to ensure that other factors affecting the development and full use of the various new and renewable sources of energy be adequately dealt with. This would involve considering, for example, the education and

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training of the skilled personnel required for all stages of the development and use of these sources. These studies would also be required by the time the second meetings of the panels convene to ensure their availability for integration with the results of the respective panels and the comprehensive analyses of peat and draught animal power.

10. One of the more critical stages of the preparatory process will be the synthesizing phase. It is here where the results pertaining to each energy source will have to be weighed against each other and placed in the context of the over-all energy supply/demand perspective in the light of, inter alia, paragraph 4 (c) of resolution 33/148. It is planned that this synthesis process which should lead to the evolution of the recommendations that could eventually be placed before the Conference would be carried out by bringing together the chairmen of the respective panels and a number of eminent energy specialists including economists, energy planners and scientists from around the world. Having gone through this process, the documentation for the Conference would be prepared. It would appear, given the scheduling of the preparatory process, the synthesis exercise would have to take place in late 1980 or very early 1981 with a potential target date for the Conference itself of late August 1981.

11. Thus, at the global level, the preparatory process leading up to the Conference could be envisaged along these lines. The General Assembly at its current session and the preparatory body, once established, may wish to provide further guidance on this approach.

### III. CONSIDERATIONS REGARDING THE PREPARATORY PROCESS AT THE REGIONAL AND NATIONAL LEVELS

12. The General Assembly in resolution 33/148 provided the framework for defining the preparatory process at the global level. The Economic and Social Council by resolution 1979/66 drew attention to and emphasized the importance of preparations for the Conference at the regional, subregional and national levels, in addition to the preparatory process at the global level which has already been clearly elaborated.

13. In this connexion, there are several types of activities that might be undertaken at the regional level under the auspices of the respective regional commissions within the over-all framework established by the General Assembly in resolution 33/148. As one approach, each commission could convene expert groups composed of specialists from their respective regions to prepare assessments of the potential and prospects for new and renewable sources of energy of most interest to the countries in the regions concerned. It could be expected that the results of these assessments would be integrated into the over-all preparatory process at the synthesis phase. Sufficient travel and consultancy funds for the commissions would be required to carry out such an assessment. At the same time or alternatively, the commissions could be given the financial resources for consultants and possibly additional expert groups to prepare in-depth case studies on a subregional basis covering a particular energy source based on the common interest or resource potential among several countries within the region. These

case studies could be directed to the appropriate technical panel dealing with the energy source concerned. The regional commissions have informed the Conference secretariat that, if they are to carry out substantive preparations for the Conference along one or more lines as described here, they will require the assistance of the Conference secretariat and resources for temporary assistance, travel and consultants.

14. The active involvement of Governments in the preparatory process is essential to the success of the Conference. It is, therefore, important for Member States in the General Assembly at its current session or the preparatory body at its first meeting to identify the types of preparations that could most usefully be undertaken by Governments for the conference at the national level. In the light of paragraph 4 (b) of General Assembly resolution 33/148, Governments might wish to undertake an internal assessment of how new and renewable sources of energy could potentially contribute to meeting at least part of their energy requirements. The issue centres on the most effective means of achieving this objective. Member States will wish to note, in this connexion, the recommendation of the Economic and Social Council contained in paragraph 2 of resolution 1979/66 "that States should consider designating national focal points which will co-ordinate preparations for the Conference at the national level and provide a link to the Conference secretariat in its preparatory activities". One way in which preparations at the national level could perhaps be reflected would be in national papers which could be prepared within the framework of any guidelines that the General Assembly or the preparatory body might wish to establish. These papers could then possibly be submitted to the respective regional commissions. An objective analysis of the contents of the papers could then be prepared and subsequently be integrated into the over-all preparatory process at the synthesis stage or transmitted directly to the Conference.

#### IV. ENHANCING THE READINESS OF DEVELOPING COUNTRIES FOR THE CONFERENCE

15. In paragraph 5 of resolution 1979/66, the Economic and Social Council recommended that "the General Assembly at its thirty-fourth session should consider measures to enhance the readiness of developing countries for the Conference". In considering appropriate means of achieving this objective, the Assembly might view the matter on two levels. In the first instance, Member States can envisage extensive consultations on the part of the Secretary-General of the Conference with senior government officials to mobilize national preparations, to exchange views on possible policy and programme recommendations of the Conference, and to brief senior officials on the critical issues to be taken up at the intergovernmental Conference in 1981. The Secretary-General of the Conference would undertake such consultations with as many Governments as possible.

16. At the second level, the General Assembly might consider appropriate measures that could be taken to assist developing countries in preparing their substantive contributions for the Conference. In this connexion, technical advisory services could be made available either through the staff of the Conference secretariat or by consultants to assist Governments, at their request, for providing guidance

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to national authorities in undertaking internal policy and substantive reviews of the potential of new and renewable sources of energy for meeting their energy requirements as part of their preparations for the Conference. If the General Assembly supported such an approach, the staff of the Conference secretariat would have to be appropriately strengthened and adequate travel funds appropriated as well as resources made available for the required technical advisory services. Similarly, this type of assistance could also be provided under the auspices of the respective regional commissions.

17. The General Assembly could also urge that ongoing and planned bilateral and multilateral activities in the survey and utilization of new and renewable sources of energy in developing countries be intensified and expedited in conjunction with the preparatory process for the Conference.

V. ACTIONS THAT MIGHT BE TAKEN BY THE UNITED NATIONS SYSTEM,  
PENDING THE HOLDING OF THE CONFERENCE, TO ASSIST DEVELOPING  
COUNTRIES IN THE AREA OF NEW AND RENEWABLE SOURCES OF ENERGY

18. In a related action, the Economic and Social Council in paragraph 6 of resolution 1979/66 recommended that "the General Assembly at its thirty-fourth session should consider ways in which, pending the holding of the Conference, the United Nations system could more effectively assist the developing countries in the area of new and renewable sources of energy, including research and information relating to the latest technologies and development in this vital area". In this connexion, there are several courses of action which the General Assembly might wish to consider at its current session.

19. At the most modest level, substantive information on new and renewable sources of energy which may be available among the concerned organizations and agencies of the United Nations system could be transmitted to Governments or their national focal points upon request, pending the completion of the comprehensive analyses undertaken in the preparatory process. This type of information dissemination activity could be co-ordinated through the Conference secretariat with the co-operation of the concerned elements of the United Nations system.

20. Another assistance measure that could be considered, with the co-operation of UNDP, would be the convening of regional or interregional symposia and workshops on various aspects of new and renewable sources of energy for representatives of developing countries to channel information on research in progress and on latest technological developments in this field.

21. A third option which would have perhaps the most significant impact would involve the launching of several demonstration projects in interested countries to assess on a practical basis the potential for harnessing in developing countries different energy sources covered by the Conference. The experience gained through such projects could provide valuable information for consideration at the Conference while, at the same time, assist a number of developing countries to test various technologies for developing and utilizing their new and renewable energy potential. One constraining factor to this approach would be the feasibility



of establishing such projects quickly. The second major consideration concerns the availability of funding to support an initiative of this nature. In this regard, the General Assembly might wish to invite the World Bank and UNDP to examine the possibilities for undertaking several demonstration projects in co-operation with the Conference secretariat.

#### VI. ROLE OF NON-GOVERNMENTAL AND INTERGOVERNMENTAL ORGANIZATIONS

22. The General Assembly, in its resolution 33/148, invited the technical panels of experts to give appropriate consideration to the technical inputs within the scope of the Conference that might be made by the relevant intergovernmental organizations and non-governmental organizations in consultative status with the Economic and Social Council. In order to ensure that the respective technical panels may have the benefit of the views of these organizations, the Secretary-General of the Conference is planning to send a letter to all interested intergovernmental organizations and non-governmental organizations in consultative status with the United Nations inviting them to submit written contributions to the respective panels.

23. At the second interagency meeting, the organizations and specialized agencies of the United Nations system indicated that there were a number of non-governmental organizations which had consultative status with them but not with the Economic and Social Council. These organizations and agencies have indicated that, in their preparations for the Conference, they would make every effort to draw upon the inputs of these bodies.

#### VII. INFORMATION PROGRAMME

24. While the fundamental objective of the Conference is to elaborate measures for concrete action to promote the development of new and renewable sources of energy, particularly with a view to contributing to meeting the energy requirements of developing countries, the Conference should serve as an important educational initiative to increase the awareness of the international community, government energy planners and the public of the possibilities offered by new and renewable sources of energy. To this end, in support of the preparations for the Conference, a comprehensive information programme is required. The Department of Public Information, after consultations with the Conference secretariat, has prepared such a programme. The envisioned programme would employ a range of information activities involving the preparation of a variety of written materials addressed to various audiences (e.g., a newsletter, a monograph series, articles by science writers), study tours and encounters for journalists from developing countries, radio programmes and television "vignettes" for the use of all Member States, the production of a film to portray visually how the sources of energy covered by the Conference could be developed and effectively utilized to meet energy needs, particularly those of developing countries. Apart from the availability of centrally produced information material, the regional commissions will need to prepare activities and produce information material

geared to the specific needs and possibilities of each region relating to the Conference. In addition, DPI will co-operate with the other organizations and agencies of the system through JUNIC in an interagency programme of activities in order to maximize the effect of the complementary information activities undertaken by the various organizations in support of the Conference objectives. The proposed programme and its anticipated financial implications are being presented in detail in the A/C.5 document that will be considered by the Fifth Committee.

#### VIII. INTERGOVERNMENTAL PREPARATORY BODY

25. If the General Assembly accepts the recommendation of the Economic and Social Council in paragraph 4 of resolution 1979/66 to establish an intergovernmental preparatory body for the Conference at its current session, it would also be necessary for the dates of its first session to be agreed upon. In view of the likelihood that the Conference itself will have to be convened not later than August 1981, it would be desirable for the intergovernmental preparatory body to be convened as early as possible after it is established, and if possible before the end of the first quarter of 1980. The Assembly will also wish to give consideration to what further meetings of the preparatory body will need to be envisaged to enable it to give effective direction to the subsequent preparations leading up to the Conference.

ANNEX I

Composition of Technical Panels

Technical Panel on Ocean Energy

Mr. PUJOL (France)	Mr. VARAS (Chile)
Mr. MIYAZAKI (Japan)	Mr. SINGH (India)
Mr. NAEF (United States of America)	
Mr. CLARKE (United Kingdom of Great Britain and Northern Ireland)	

Technical Panel on Wind Power

Mr. TEMPLIN (Canada)	Mr. TUDOR (Barbados)
Mr. JOHANSSON (Denmark)	Mr. ZHANG GUOCHENG (China)
Mr. DIVONE (United States of America)	Mr. TIWARI (India)
Mr. MUSGROVE (United Kingdom of Great Britain and Northern Ireland)	Mr. CIANTAR (Malta)
	Mr. AL-KAWAM (Syrian Arab Republic)

Technical Panel on Geothermal Energy

Mr. PALMASSON (Iceland)	Mr. KHELIF BOUALEM (Algeria)
Mr. CERON (Italy)	Mr. ISMET-AKIL (Indonesia)
Mr. TAKASHIMA (Japan)	Mr. WAIREGI (Kenya)
Mr. BOLTON (New Zealand)	Mr. MERCADO (Mexico)
Mr. BROWNLEE (United States of America)	Mr. MIOSIC (Yugoslavia)
Mr. MISLIN (Union of Soviet Socialist Republics)	

Technical Panel on Solar Energy

Mr. FANINGER (Austria)	Mr. CARABATEAS (Greece)
Mr. CHARTERS (Australia)	Mr. BHIDE (India)
Mr. VAUGE (France)	Mr. SANGSTER (Jamaica)
Mr. TARRALBO (Spain)	Mr. ABUGHRES (Libyan Arab Jamahiriya)
Mr. PAGE (United Kingdom of Great Britain and Northern Ireland)	Mr. RAKOTOBARISON (Madagascar)
Mr. MARVIN (United States of America)	Mr. TRAORE (Mali)
Mr. POPOV (Union of Soviet Socialist Republics)	Mr. FERNANDEZ (Mexico)
	Mr. AKINSETE (Nigeria)
	Mr. HAMID (Sudan)

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Technical Panel on Biomass

Mr. O'BRIEN (Ireland)	Mr. GNIDEHOU (Benin)
Mr. TROUGHTON (New Zealand)	Mr. BEZERRA (Brazil)
Mr. HEDEN (Sweden)	Mr. QIAN SHUZE (China)
Mr. HALL (United Kingdom of Great Britain and Northern Ireland)	Mr. GHOSE (India)
Mr. BROWN (United States of America)	Mr. MARTINEZ (Mexico)
Mr. NYNS (Belgium)	Mr. BELDESCU (Romania)
	Mr. THAVORNJATURAYAT (Thailand)
	Mr. KAROUI (Tunisia)
	Mr. BALCAR (Uruguay)

Technical Panel on Hydropower

Mr. NECHLEBA (Czechoslovakia)	Mr. ZEIG (Afghanistan)
Mr. DARLOT (France)	Mr. ZHU XIAOSHANG (China)
Mr. BOHDE (Germany, Federal Republic of)	Mr. CASELY-HAYFORD (Ghana)
Mr. VINJAR (Norway)	Mr. CRAWFORD (Guyana)
Mr. WAYNE (United States of America)	Mr. FERNANDO (Sri Lanka)
Mr. HRENOV (Union of Soviet Socialist Republics)	Mr. GONZALEZ (Venezuela)

Technical Panel on Fuel Wood and Charcoal

Mr. SILVERSIDES (Canada)	Mr. CARMO (Brazil)
Mr. HAKKILA (Finland)	Mr. DELVI (India)
Mr. FERGUSON (Netherlands)	Mr. KAWEPT (Kenya)
Mr. STEENBERG (Sweden)	Mr. MNZAVA (Tanzania)
	Mr. NACRO (Upper Volta)

Technical Panel on Oil Shale and Tar Sand

Mr. EDWARDS (Canada)	Mr. FREITAS (Brazil)
Mr. DECORA (United States of America)	Mr. GIAN JIAGUAN (China)
Mr. PYATKIN (Union of Soviet Socialist Republics)	Mr. EBEID (Egypt)
Mr. BURGER (France)	Mr. SAEED (Iran)
	Mr. CHBIHI (Morocco)

ANNEX II

Terms of Reference for the Technical Panels for the  
1981 United Nations Conference on New and Renewable  
Sources of Energy

1. The general framework for the work of the respective panels is delineated in paragraph 4 of General Assembly resolution 33/148 which reads:

"Decides also that, in the light of the foregoing and with a view to formulating recommendations for concrete action, the Conference should concentrate, inter alia, on the following:

"(a) Analysis of the state of technology related to new and renewable sources of energy;

"(b) Identification of the potential, particularly in the developing countries, for utilization of new and renewable sources of energy;

"(c) Assessment of the economic viability of the use of new and renewable sources of energy in the light of the technologies now available and those being developed;

"(d) Identification of measures for promoting, particularly in the developing countries, development of the technology required for exploration, development, exploitation and utilization of new and renewable sources of energy, taking into account the relevant results of the United Nations Conference on Science and Technology for Development;

"(e) Identification of the measures necessary for the transfer to developing countries of the relevant technologies available, taking into account the results of negotiations relating to the transfer of technology in the United Nations Conference on Trade and Development, the United Nations Conference on Science and Technology for Development and elsewhere;

"(f) Promotion of adequate information flows regarding all aspects of new and renewable sources of energy, especially to the developing countries, taking duly into account their special conditions and requirements;

"(g) Question of financing the activities necessary for promoting the identification, development, exploitation and utilization of new and renewable sources of energy;"

2. Generally speaking, it is foreseen that the first meeting of each panel will make a preliminary identification of issues relevant to the assessment of the energy source(s) within its competence and define studies and information it will require to carry out its responsibilities. Within the over-all framework elaborated by the

General Assembly, the studies undertaken by members of the panel, by the Secretariat, by competent specialized agencies and bodies of the United Nations, and by consultants, should address in-depth the following considerations:

(a) Availability of the energy source

As most of the renewable sources of energy are either diffuse, intermittent and seasonal like solar energy, wind power, biomass and ocean energy, or highly localized like geothermal, hydropower, oil shales and tar sands, it is of utmost importance for the panel to evaluate the potential of the availability of a particular source on a local, regional and global basis. In this connexion, maps of the resource potential for each source should be prepared for each country within a geographical region, and of the world at large, and be incorporated in the report of each panel.

(b) Availability and state of technologies - applications and uses

In examining the availability, state, potential applications and uses of technologies, the harnessing of the respective new and renewable sources of energy should be assessed from the perspective of production and conversion into basic end use forms such as:

- (i) Heat or thermal energy
- (ii) Light or photo-energy
- (iii) Mechanical energy
- (iv) Electric energy.

For all practical purposes, applications and end uses for energy produced from new and renewable sources can be categorized under the following six main sectors:

Agriculture,  
Industry,  
Domestic,  
Commercial,  
Transport,  
Telecommunications.

Whether a particular source of energy under consideration by a panel can be used in any or all of the six major sectors mentioned above must be clearly brought out in the reports of the panels. Further, all technological devices which are considered as appropriate for a specific end use, like a windmill for pumping water or photovoltaic cells for solar power generation should be determined to be technically viable, economically feasible, socially acceptable

and environmentally sound. These criteria should invariably be applied to energy supplies from a particular source on a centralized as well as decentralized basis. The contribution to energy supply on a centralized or decentralized mode should be explicitly elaborated.

(c) Over-all viability

The determination of the realistic application potential of various technologies to exploit the respective new and renewable sources must rest on the aggregate assessment of:

(i) Technical viability

Before the prospects of production/conversion/utilization of energy from a particular source, through a technological device or process involved, are considered, its viability from a purely scientific and technical point of view, within a time frame, should be clearly brought out in the report of the panel. For example, some technologies relating to a source of energy may be at the laboratory stage of development, while others may have been tested only on a pilot scale without proven demonstration under field conditions. Finally, there may be yet others which are commercially available, though not yet mass-produced. These aspects must be examined and commented upon by the panel for each source.

(ii) Economic feasibility

For a new and renewable source of energy to play a significant role in the planning of an energy strategy or policy, it must be economically feasible and cost effective. Economic feasibility must take into account operating and maintenance costs of specific technologies as well as the final cost of energy produced to end users.

(iii) Time frame

Both economic and technical feasibility of harnessing energy from each source must be explicitly identified within a specific time frame. Accordingly, each panel should assess prospects for each source (1) immediately, (2) in the short term (next five years), (3) in the medium term (next 10 years) and (4) over the longer term to the year 2000 and beyond. This will have to encompass a comparison of currently available as well as expected emergent technologies with current and projected future cost streams for other energy sources (conventional or non-conventional).

(iv) Social acceptability

Certain sources of energy though available may not be considered as socially acceptable in certain communities. For example, certain technological devices like parabolic "solar cookers", operable only during

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the day, cannot create any impact in countries where the main family meals are cooked at night. Thus social constraints, if any, inherent in the production, conversion and utilization of energy from the source under consideration should be highlighted. Social benefits of the use of the source should also be given due weight.

(v) Environmental impact

All technological devices employed for the production and utilization of energy, including those relating to new and renewable sources, have an environmental impact on physical elements like land, water and air which are tangible and affect the quality of life. The environmental impact of the utilization of the source of energy under consideration by the panel must be considered on the physical as well as the social elements and over-all consequences of such impact examined. A comparison with the environmental impact of the most competitive conventional and non-renewable source of energy should then be made.

3. At its second meeting, the Panel will review studies commissioned at its first meeting as well as relevant studies submitted by Member States, by specialized agencies and bodies of the United Nations and by intergovernmental and non-governmental organizations. Based on this review the Panel will make technical recommendations which will be transmitted by the chairman to a joint meeting of the chairmen of all the technical panels. These recommendations should concern, inter alia:

- (a) Measures to promote the development and use of the particular energy source under consideration, including appropriate actions to spur the development and application of relevant technologies, especially in the developing countries;
- (b) Priority areas for intensified research and development and demonstration activities, including means of promoting greater international co-operation between developed and developing countries as well as between developing countries themselves;
- (c) Measures to facilitate the transfer of technologies to developing countries, assist in their adaptation for local use and to encourage their local manufacture, where feasible, on a progressive basis within the developing countries;
- (d) Training of developing country personnel in national and regional institutions as well as in those of developed countries with a view to creating the technical and managerial human infrastructure for handling the technologies involved;
- (e) Creation of an institutional base for the promotion of new and renewable sources of energy within the administrative structure of the countries concerned;



(f) The question of financing the above activities;

(g) Measures for promoting information flows relevant to the exploration for, development, exploitation and use of the energy source and on available and emerging technologies in particular;

(h) Role of national Governments, international organizations and non-governmental organizations.

4. Subsequent to the first meetings of the respective panels, a format for synthesizing and integrating the results for presentation to the Conference will be decided.

#### A. Technical Panel on Solar Energy

5. In its analysis of the state of technology of solar energy, the Panel will review the following technologies and applications:

(a) Agriculture, food and water

The application of solar energy to the improvement of agriculture and food supply through:

Greenhouses and water conservation (including "plastic" agriculture),

Crop (and fish) drying,

Ice-making and refrigeration,

Water pumping for drinking, cattle watering and irrigation,

Water desalination,

Sterilization of potable water and food,

Cooking.

(b) Habitat

The use of solar energy for the improvement of human habitations through:

Space heating both direct (passive) and indirect (active systems),

Cooling and air conditioning including vapour compression,

Absorption, evaporation and dessicant systems.

(c) Mechanical and electrical power

The conversion of solar energy into mechanical and electrical power through:

Flat plate (and non-tracking) collector-type solar thermal engines (organic vapour Rankine cycle engines),

Small concentrating and sun tracking type (dish, trough, fresnel lens) solar thermal engines (organic vapour or steam Rankine cycle or Stirling cycle engines),

Large central tower type solar thermal engines (Rankine or Brayton cycle engines including hybrid fuel fired engines).

(d) Solar ponds

The use of solar ponds to supply low grade heat for industrial processing, desalination, and small-scale mechanical and electrical thermal engines.

(e) Industrial process heat and steam:

Low temperature flat plate collectors for heating and drying,

Solar assisted heat pumps,

Intermediate temperature concentrating collectors for heating and steam,

Solar furnaces and high temperature applications.

(f) Photovoltaics:

Fabrication technology including monocrystal, ribbon, polycrystal and amorphous silicon type cells, cadmium sulphidetype, MIS type and gallium arsenide type cells,

Photovoltaic cells with concentrators,

Small-scale device applications including communications applications and small water pumps,

Community power supplies.

(g) New technologies

A number of technologies now in the research stage, such as, photogalvanic cells, photolysis cells and composite photovoltaic cells having more than one band gap should be reviewed.

(h) Solar power satellites

(i) Energy storage:

Thermal storage including sensible heat and latent heat storage,

Mechanical storage including pumped water, compressed air, flywheel and elastomer storage,

Chemical binary storage systems, including hydrates and analogous types (e.g., sulphuric acid/water), and catalytic dissociation type storage (e.g., sulphur trioxide),

Electromagnetic including superconducting storage,

Electrochemical battery storage,

Chemical or electrolytic hydrogen and fuel cells.

6. In its identification of the potential of solar energy the Panel should review the adequacy of existing solar radiation data records and observation networks. It should consider the possibility of establishing criteria for the conditions under which particular solar technologies are applicable, to assist countries in determining the priorities among alternative technologies.

7. Assessment of the economic viability of different solar technologies should take account of alternative technologies both conventional and non-conventional. It should take full account of possible hidden costs, and make use of consistent assumptions (interest rates, load factors, etc.) in comparing different technologies. Assessment should be based primarily on currently available and proven technologies, although cost projections will be necessary in projecting future viability.

B. Technical Panel on Biomass Energy

5. In its analysis of the state of technology of biomass energy the Panel will review the following technologies and applications:

(a) Biomass resource base

Wood and forest industry wastes,

Animal and crop wastes,

Urban and industrial wastes,

Tropical grasses,

Aquatic plants and algae.

(b) Biomass collection and processing

This will cover the problems of collection of the biomass resource and initial processing by chopping, chipping and pelletizing.

(c) Energy conversion technologies

Direct combustion of dry biomass (including fluidized bed combustion and gasification) and, through steam motors and turbines, to mechanical and electrical energy,

Pyrolysis or gasification of dry biomass to produce a variety of solid, liquid and gaseous fuels and combination of fuels, including charcoal, oil and fuel gas,

Thermochemical conversion of dry biomass to oil, methanol and methane,

Anaerobic fermentation of wet biomass to methane or to oil and associated fertilizer values,

Aerobic fermentation of carbohydrate biomass to ethanol.

(d) Rural energy supply from biomass

This is closely related to the work of the fuelwood and charcoal panel but would concentrate on biogas as an alternative to burning crop and animal wastes.

(e) Urban waste conversion

This would cover the general topic of municipal solid waste collection and disposal with particular emphasis on energy recovery but including alternatives:

Collection and separation of non-combustibles,

Incineration with heat recovery,

Refuse derived fuel,

Pyrolysis to low calorific value gas or to oil,

Anaerobic fermentation to methane, whether in situ in landfill, or in a mechanical digester,

Composting or pulverizing for fertilizer values.

(f) Liquid fuels from biomass:

Pyrolysis and thermochemical conversion of pyrolysis gases to methanol,  
Aerobic fermentation of sugars and starches to ethanol,  
Enzymatic conversion of cellulose to wood sugars and subsequent  
fermentation to ethanol,  
Anaerobic fermentation of biomass to oil,  
Hydrogenation of biomass to fuel oil.

(g) Energy plantations

Proposals for breeding fast growing or coppicing tree species, grasses,  
aquatic plants or kelp for methane, methanol, oil or electric power.

(h) Fuel cells

The outlook for converting biomass derived liquid or gaseous fuels into  
electric power through fuel cells.

(i) Hydrocarbon plantations

The outlook for breeding hydrocarbon yielding tree species for the  
plantation production of oil fuel.

(j) Photobiological production of hydrogen

The outlook for the photosynthetic production of hydrogen from  
photosynthetic bacteria or algae or from man-made membranes mimicking biological  
systems.

6. In the identification of the potential of biomass energy the Panel will have to  
assess a number of difficult problems including:

Land areas available for biomass,  
Competing land use for food, animal grazing, fibres, and wood products,  
Fresh water and sea water available for biomass,  
Nutrient and fertilizer requirements for sustained biomass yields,  
Collection and harvesting problems,  
Potential for improving biomass yields by selective breeding.

7. Assessment of the economic viability of different biomass energy technologies should take account of alternative technologies both conventional and non-conventional. It should take full account of possible hidden costs, and make use of consistent assumptions (interest rates, load factors, etc.) in comparing different technologies. Assessment should be based primarily on currently available and proven technologies, although cost projection will be necessary in projecting future viability.

### C. Technical Panel on Wind Energy

5. In its analysis of the state of the technology of wind energy, the Panel will review the following technologies and applications:

(a) Small wind machines. The use of small wind machines (fanmills, sailing machines, savonius rotors) for generating mechanical energy, primarily for pumping water.

(b) Small wind generators. Small horizontal and vertical axis wind turbines for generating electrical energy.

(c) Large-scale electric power from the wind. Such technical problems as:

Large horizontal axis wind turbines,  
Large vertical axis wind turbines,  
Vortex effect and shrouded turbine generators,  
Energy storage,  
Electric grid interconnexions,  
Offshore wind generators.

6. In its identification of the potential of wind energy the Panel should review the adequacy of existing wind energy data records and observation networks. In evaluating wind energy potential attention should be paid to such factors as:

Offshore wind potential,  
Height dependency,  
Optimum array configurations for extracting maximum energy.

7. Assessment of the economic viability of wind technologies should take account of alternative technologies both conventional and non-conventional. It should take full account of possible hidden costs, and make use of consistent assumptions (interest rates, load factors, etc.) in comparing different technologies. Assessment should be based primarily on currently available and proven technologies, although cost projections will be necessary in projecting future viability.

D. Technical Panel on Hydropower

5. In its analysis of the state of technology of hydropower, the Panel will review the following technologies and applications:

(a) Micro hydraulic machines (0-100 kW):

Water wheels for mechanical power,  
Vertical axis river turbines for mechanical power,  
Banki, Pelton, Francis, and propellor type machines for micro electric power generation,  
Small dams.

(b) Small hydraulic machines (100-1000 kW):

Pelton, Francis, and propellor type machines for small-scale power generation,  
Pondage for small hydropower,  
Electrical grid interconnexions.

(c) Medium and large hydraulic projects:

Large hydraulic turbines,  
Large dams,  
Electrical power generation and transmission from large hydraulic projects.

(d) Multipurpose river basin projects:

Electric power,  
Irrigation,  
Navigation,  
Fishing, recreation and other uses,  
Environmental effects.

(e) Pumped storage

(f) Tidal power

This will be undertaken in collaboration with the Ocean Energy Panel.

6. In its identification of the potential of hydropower the Panel should review the adequacy of existing stream gauging networks and data records. It should take account, on the one hand, of the potential for micro and small hydropower projects which have been neglected in recent years and, on the other hand, for the possibilities for large hydro projects based on special geographic or topographic features.

7. Assessment of the economic viability of different hydropower technologies should take account of alternative technologies both conventional and non-conventional. It should take full account of possible hidden costs, and make use of consistent assumptions (interest rates, load factors, etc.) in comparing different technologies. Assessment should be based primarily on currently available and proven technologies, although cost projections will be necessary in projecting future viability.

#### E. Technical Panel on Fuelwood and Charcoal

5. In its analysis of the state of technology of fuelwood and charcoal, the Panel will review the following technologies and applications:

(a) Fuelwood:

For rural domestic cooking and heating,

For industrial process heat.

(b) Small wood stoves and furnaces

Possibilities for improving fuelwood economy by improved design of stoves and furnaces.

(c) Charcoal:

For domestic cooking and heating,

For industrial heating,

As a metallurgical reductant,

Activated charcoal.

(d) Charcoal kilns

The technology of charcoal production and possibilities for improved efficiency.

(e) Fuelwood resource creation and management

The creation of woodlots of fast growing tree species, including multiple use species and coppicing species.



(f) Potential of forest industry wastes for fuelwood and charcoal

(g) Alternatives to fuelwood and charcoal

A review of possible alternatives in rural areas to fuelwood and charcoal, including solar cookers, kerosene stoves, butane stoves and methanol stoves.

(h) Social barriers

The social barriers, on the one hand, to improved wood stoves, solar cookers, and kerosene stoves and, on the other hand, to sustained yield woodlot management.

(i) Environment problems

The environmental problems of present fuelwood use, and possible solutions.

6. In the identification of the potential of fuelwood and charcoal the Panel should estimate fuelwood resources and also the fuel resources of crop and animal residues, taking account of both formal resource estimates and informal estimates. It should attempt to identify the sustained yield resource potential given the creation and management of improved woodlots.

7. Assessment of the economic viability of different fuelwood and charcoal technologies should take account of alternative technologies both conventional and non-conventional. It should take full account of possible hidden costs, and make use of consistent assumptions (interest rates, load factors, etc.) in comparing different technologies. Assessment should be based primarily on currently available and proven technologies, although cost projections will be necessary in projecting future viability.

F. Technical Panel on Geothermal Energy

5. In its analysis of the state of the technology of geothermal energy, the Panel will review the following technologies and applications:

(a) Exploration for geothermal energy sources

This will cover the pre-drilling reconnaissance and surface surveying and phases including such techniques as:

Remote sensing,  
Geochemistry,  
Resistivity surveys,  
Temperature gradient surveys,  
Microseismic surveys.

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(b) Drilling for geothermal energy

(c) Reservoir evaluation

(d) Electric power generation

The technology for electric power generation will vary according to the geothermal source and includes:

Dry steam direct turbine generation,

Wet steam direct turbine generation,

Wet steam and hot liquids driving reaction turbines, vane expanders or screw expanders,

Wet steam or hot liquids driving an organic vapour (binary cycle) engine.

(e) Non-power applications

To cover the use of geothermal energy (steam or hot water) for other than power generation:

Space heating,

Industrial process heat,

Agricultural uses.

(f) Hot dry rock

Potential for extracting geothermal energy from hot dry rock sources.

(g) Geopressured zones

The energy potential and resource outlook for geopressured zones which contain methane dissolved in hot brines.

(h) Environmental problems

6. In its identification of the potential of geothermal energy the Panel should review the resource outlook based on present survey knowledge, and review the more promising geographical areas and survey techniques for further work. Account should be taken of both power generation and low temperature heat resources. Some attempt should be made to evaluate the potential of deeper sources, geopressured zones, and hot magma where this seems feasible.

7. Assessment of the economic viability of different geothermal energy technologies should take account of alternative technologies both conventional and non-conventional. It should take full account of possible hidden costs, and make use of consistent assumptions (interest rates, load factors, etc.) in comparing different technologies. Assessment should be based primarily on currently available and proven technologies, although cost projections will be necessary in projecting future viability.

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G. Technical Panel on Ocean Energy

5. In its analysis of the state of technology of ocean energy conversion the Panel will review the following technologies and applications:

(a) Ocean thermal energy conversion

The status of technology for harnessing of the energy potential of ocean thermal gradients will be reviewed including the following topics:

Suitable sites,

Thermal engines,

Heat exchangers,

Possible collateral utilization of bio-nutrients brought to the surface for ocean farming,

Possible collateral desalination of water,

Use of ocean energy derived electrical energy for the production of hydrogen or ammonia,

Possibility for harnessing the temperature gradient energy potential of large bodies of freshwater impounded by hydropower dams.

(b) Tidal power

The status of tidal power should be reviewed in collaboration with the Hydropower Technical Panel.

(c) Wave energy

Different technologies for harnessing waves should be discussed including:

Mechanical conversion systems,

Pneumatic conversion systems,

Basin filling systems.

(d) Ocean current energy

The conversion of the energy of major ocean currents or of tidal currents in narrow channels into electrical energy using large vertical axis turbines anchored to sea bed.

(e) Salinity gradient energy

The harnessing of the energy of the salinity difference between river water and ocean water or between ocean water and underground salt domes, using either retarded osmotic pressures and water flow turbines or dialytic batteries for the direct conversion of salinity gradient energy to electrical energy.

(f) Offshore wind energy

The potential of offshore wind energy should be reviewed in collaboration with the Panel on Wind Energy.

(g) Ocean biomass energy

The potential for the culture of ocean biomass especially kelp for the production of fuels, food-stuffs and other raw materials should be reviewed in collaboration with the Biomass Energy Panel.

6. In the identification of the potential of ocean energy there should be a review of the most promising sites and their individual potentials. Data requirement for the evaluation of ocean energy potentials should be indicated.

7. Assessment of the economic viability of different ocean energy conversion technologies raises considerable problems since, with the exception of tidal power, these technologies are still in the early developmental stage. The Panel should, however, attempt this assignment for specified future dates using clearly specified and consistent assumptions.

H. Technical Panel on Oil Shale and Tar Sands

8. Tar sands are fine grains of mineral material impregnated with a petroleum-like oil similar in nature to heavy crudes. This oil can be extracted with hot water or solvents and no synthetic processes are involved.

9. Kerogen marlstones, the material commonly misnamed as oil shales, is composed of an inorganic carbonate matrix intermingled with a three-dimensional high molecular weight mineraloid organic polymer called kerogen. The solid kerogen when heated is pyrolysed and a very viscous oil is then recovered in the condensate.

10. The study of heavy crudes, oil shales and other pyrolysis primary materials, and liquefied coal, can reach a higher degree of unified goals at the stage when one deals with the refining processes, but so far as the production of a substitute for crude goes one has to study each source separately.

11. In the identification of the potential of tar sands and oil shales the priorities for future exploration and resource evaluation will be assessed. Also, the assessment of the economic viability of oil from tar sands and shale oil, and the comparisons of proposed projects with projects based on heavy oils and liquids from coal, and other sources of petroleum alternatives, will be addressed.

12. The Panel will review the following subjects:

- (a) Resource Base: a review of the nature and known occurrences of tar sands and oil shales.

- (b-1) Chemistry and geochemistry of tar sands.
- (b-2) Chemistry and geochemistry of oil shales.
- (c-1) Geology of tar sands.
- (c-2) Geology of oil shales.
- (d) Resource evaluation techniques: different technologies used for resource evaluation will be studied with special emphasis on tar sands and oil shales.
- (e) Production technologies for the exploitation of tar sands:
  - Surface mining and extraction,
  - Pure in-situ technologies,
  - Underground mining combined if necessary with enhanced recovery and surface extraction.
- (f) Production technologies for the exploitation of oil shales:
  - Above ground retorting,
  - Pure in-situ technologies,
  - A combination of above ground retorting and further in-situ recovery.
- (g) Upgrading and refining of tar oils and shale oils.
- (h) Direct combustion of oil shales.
- (i) Environmental problems linked to the exploitation of tar sands and oil shales.
- (j) Transport problems of energy production materials with emphasis on tar sands and oil shales.
- (k) A comparison of the economics of commercialization of the tar sands and oil shale resources with alternatives taking into account possible obtainable by-products.

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