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ECONOMIC COMMISSION FOR LATIN AMERICA
Office for the Caribbean

REPORT OF CARIBBEAN INTERAGENCY MEETING ON PREPARATIONS
FOR THE UN CONFERENCE ON NEW AND RENEWABLE SOURCES OF ENERGY

(10 - 12 December 1980, Bridgetown, Barbados)

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CHAPTER I

ORGANIZATIONAL ASPECTS

1. The Caribbean Inter-Agency Meeting was convened by the ECLA (CEPAL) Office for the Caribbean and hosted by the Caribbean Development Bank (CDB).

Attendance

2. The following organizations were represented: Caribbean Agricultural Research and Development Institute (CARDI), East Caribbean Common Market Secretariat (ECCM), Caribbean Community Secretariat (CARICOM), Caribbean Development Bank (CDB), Caribbean Meteorological Institute (CMI), United Nations Development Programme (UNDP), and the University of the West Indies. The List of Participants is given in Annex I.

3. The meeting had two objectives:

- (a) to support the "Caribbean" ^{1/} countries in preparing for the United Nations Conference on New and Renewable Sources of Energy by helping to identify their requirements for the development of New and Renewable Sources Of Energy; and
- (b) to make recommendations to governments and the United Nations Conference concerning the national, regional and international policies necessary to promote development of New and Renewable Sources of Energy in the "Caribbean" countries.

^{1/} Due to the different geographical coverage of the Agencies represented at the meeting it was decided that "Caribbean" countries referred to above and elsewhere in the text includes the following countries: Antigua, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts, Nevis, St. Lucia, St. Vincent and Trinidad and Tobago.

4. The opening session of the meeting commenced under the chairmanship of Mr. W. Whittingham, Economic Affairs Officer of the CEPAL Caribbean Office. After brief remarks, the Chairman requested Dr. Lewis Campbell, Director, Projects Department of the Caribbean Development Bank to make the opening Address.

Opening Statement

5. In his address, the Director of the Projects Department stated the importance the CDB attached to the field of energy, as evidenced, inter alia, by their financing of power utilities and establishment of a Technology and Energy Unit to promote alternative sources technologies. Dr. Campbell referred to the now unbearable burden of costs of oil imports into some Caribbean countries. He said that, apart from the economic cost, the acquisition of the necessary capabilities may be the greatest constraint to developing new and renewable sources of energy, for, without such capabilities, the total economic cost would be beyond the control of the people and governments of the ECCM and other CARICOM countries. Dr. Campbell noted that this meeting would help to ensure adequate representation of the CARICOM situation in new and renewable sources of energy, and would help agencies and governments to assess their own capabilities in New and Renewable Sources of Energy.

6. He concluded by expressing the hope that the meeting would be a catalyst for generating substantial plans and programmes that would accelerate the development of New and Renewable Sources of Energy in CARICOM States.

Agenda

7. 1. Opening Statement
2. Adoption of the Agenda
3. Scope and Status of Conference Preparations at the Global and Regional Levels
4. New and Renewable Sources of Energy in the Caribbean
5. Role of Caribbean Organizations in assisting Development of New and Renewable Sources of Energy

6. Identification of the Sub-regional, Regional and International Policies to support National New and Renewable Sources of Energy Activities in the Caribbean
7. Adoption of Report

8. The Provisional Agenda presented in Document E/CEPAL/CARIB/NRSE/1 as reflected above was adopted.
9. It was agreed to rotate the chairmanship of the various sessions among the Agencies present.

CHAPTER II

DISCUSSION ON AGENDA ITEMS

Item 3: The Scope and Status of the UN Conference Preparations

10. The Regional Technical Advisor for the UN Conference on New and Renewable Sources of Energy gave a review of the Conference Preparations at the Global and Regional levels.

11. He then stated that the findings and recommendations of this meeting would be incorporated in the CEPAL Regional position paper being prepared for the Regional Ministerial Meeting to be held in Mexico during the period 16 - 20 March 1981.

Item 4 (i): Present and Planned Activities of Participating Agencies in New and Renewable Sources of Energy

This session was chaired by Dr. L. Campbell of the Caribbean Development Bank.

12. The Conference Secretariat reviewed the scope and status of National preparations in the Caribbean to see how the activities of Agencies were related to these preparations.

13. The agencies then presented statements of their activities in New and Renewable Sources of Energy as requested, outlining relationship to the national preparatory activities. These statements appear in Annex III.

14. The concern expressed here was whether funds could still be made available to countries to assist in their preparatory process.

Item 4 (ii) (a): Identification of New and Renewable Sources of Energy of particular interest to the Caribbean countries

15. The meeting proposed that it could not discuss the requirements for the development of the various New and Renewable Sources of Energy in the absence of information on the main technologies of interest for the exploitation of these resources. It therefore

prepared a matrix of the technological applications of interest to CARICOM countries, to guide the discussion on the requirements for the development of New and Renewable Sources of Energy in the short, medium and long term. This matrix with an Explanatory Note is attached as Annex IV. Subsequently, the meeting outlined the following categories of requirements of the countries:

- (a) Physical Resource Requirements: incorporating physical facilities required for data collection and processing, maintenance, research and development, and commercialisation.
- (b) Human Resources Required: incorporating education and training in order to provide personnel requirements in each resource category.
- (c) Methodologies: incorporating all technical and administrative methodologies that form part of the capabilities to support New and Renewable Sources of Energy applications.
- (d) Procedures and Practices: incorporating all technical procedures, codes, laws or regulations that are necessary to promote the various New and Renewable Sources of Energy applications.
- (e) Finance: incorporating various financial measures and policies necessary to promote the various New and Renewable Sources of Energy applications.

Item 4 (ii) (b), and Items 5 and 6 of the Agenda

These discussions lasted for the next four sessions chaired by CARICOM, CMI, CARDI and the UWI respectively.

16. In view of the time constraint and relationship between Item 4 (ii) (b), and Items 5 and 6 of the Agenda, the meeting decided to discuss these Agenda Items simultaneously.

17. The meeting noted the special situation of CARICOM countries related to the development of New and Renewable Sources of Energy. It also noted the presently inadequate capabilities for the development of New and Renewable Sources of Energy, especially in the ECCM countries, particularly in the area of human resources.

CHAPTER III

RECOMMENDATIONS

18. The following policy recommendations arose out of these discussions:
The meeting, guided by the various New and Renewable Sources of Energy options of interest to "Caribbean" countries'

- present activities being undertaken by inter-governmental and other organizations on behalf of these countries;
- present capabilities of national and inter-governmental organizations;
- prospects for utilizing these energy sources in each country in the short, medium and long terms; and
- additional physical, human, methodological, procedural and financial resources that are required to accelerate the development of New and Renewable Sources of Energy in these countries, recommends to:

Governments and Inter-governmental Organizations:

- (i) that, the present capability of inter-governmental organizations involved in New and Renewable Sources of Energy evaluation be strengthened through the provision of financial support for instrumentation, training and operations, particularly in the areas of solar, wind, and small-scale hydropower;
- (ii) that, since a significant New and Renewable Sources of Energy technical capability for R and D already exists in the CARICOM sub-region that this capability be strengthened and extended wherever possible to support all solar applications of interest to "Caribbean" countries;
- (iii) that, in view of the importance of wind systems, especially to the ECCM countries, existing capabilities for R and D work in wind energy and the capability for adapting and integrating small-scale wind systems with

- other energy systems, be strengthened;
- (iv) aware of existing capabilities of various manufacturing organizations in some countries, recommends that this capability be assessed and, where appropriate encouraged with a view to producing components of New and Renewable Sources of Energy systems;
- (v) that, Governments need to incorporate fuelwood and charcoal in national energy planning with due regard to the adverse effects of indiscriminate gathering of fuelwood and the possible potential of planned woodlots and forests for the supply of fuelwood and charcoal;
- (vi) that, in view of the natural potential for biomass production in these countries, policies should be adopted in the areas of energy farming and agricultural waste utilization in order to take full advantage of this natural potential and, to this end, a programme of assistance to governments for biomass development is required;

The United Nations Conference on New and Renewable Sources of Energy
Secretariat and Preparatory Committee

- (vii) that, the meeting supports the CARICOM proposal that the United Nations Conference on New and Renewable Sources of Energy Secretariat make technical assistance funds available to the CARICOM Secretariat to conduct partial energy demand assessments for the Governments of the Caribbean States of Grenada, Dominica, St. Vincent and St. Lucia, in order that they may have quantitative information on their energy use patterns in time for the UN Conference in Nairobi;

The Latin American Regional Meeting in preparation for the United Nations
Conference on New and Renewable Sources of Energy

and

The United Nations Conference on New and Renewable Sources of Energy

(viii) that, in relation to large-scale hydro and geothermal resources, the meeting further recommends to the UN Conference on New and Renewable Sources of Energy that the criteria adopted by international financing organizations for the evaluation of these development projects should be re-assessed to promote such development;

(ix) that,

- aware of the difficulties of precisely quantifying the activities to be undertaken in the various New and Renewable Sources of Energy areas and the concomittant financial support required,
- in the absence of a reliable data base,
- taking into consideration the fact that the requirements and needs as currently identified by the inter-governmental agencies and the countries may change as this data base becomes clearer,
- noting that presently certain institutional arrangements exist within the Caribbean Development Bank (CDB) for administering funds; and further,
- noting that a number of national and inter-governmental institutions have already built up capabilities for executing services in various areas of New and Renewable Sources of Energy development, notably CARICOM, CMI, CDB, UWI, CARDI, and ECCM, further recommends that:

a New and Renewable Sources of Energy fund be created for the "Caribbean" countries to promote New and Renewable Sources of Energy development;

(a) the institutions named above be among the primary executing agencies in areas where they have specialized

capabilities;

- (b) arrangements be worked out where the institution administering the fund shall collaborate with the participating executing agencies in the administration of the fund;
- (c) any requests for assistance from the fund should have the approval of the governments, either directly or indirectly through the inter-government bodies on which they are represented;
- (d) technical advice and consultancy services should be sought from within the "Caribbean" sub-region and the Latin American Region, whenever possible.

CHAPTER IV

ADOPTION OF REPORT

This session was chaired by Mr. B. Gibbs of ECLA, Regional Technical Advisor to the United Nations Conference on New and Renewable Sources of Energy.

In considering the draft report the meeting decided that the matrix used to guide the discussions shall be included. It further agreed that a short Explanatory Note shall precede the matrix, all of which is included as Annex IV. The participants suggested that the matrix reflects their views on the preparedness of the countries to utilize the various technological applications of interest, in an effective way.

After incorporation of changes and corrections the meeting adopted the report and ended with the Chairman thanking the agencies and participants for their involvement, on behalf of ECLA (POS) and the United Nations Conference on New and Renewable Sources of Energy.

ANNEX IV

EXPLANATORY NOTE AND MATRIX

This matrix was developed and used by the meeting to provide a concrete basis for discussion of the various requirements for the development of New and Renewable Sources of Energy in the "Caribbean" countries. It is essentially a tool used to guide the discussion and reflects the collective intelligence of the agencies attending as well as subjective estimates and informed impressions of the participants.

CODES USED

1. Technology already applied - Mass application possible
 2. Technology considered to be in the pilot and demonstration stage - Mass application not immediately possible
 3. Technology considered to be in the research stage - Mass application not possible
-
- S - Possible mass application in the short term (less than 5 years)
M - Possible mass application in the medium term (5 - 10 years)
L - Possible mass application in the long term (more than 10 years)

1
2
3
4

COUNTRY	SOLAR								WIND			HYDRO		BIOMASS		OCEAN			
	HWS	DRYING	SPACE COOLING (ACT)	COOLING (PAS)	PONDS	PHOTOVOLTAICS (SS)	SOLAR THERMAL POWER	SALT PANS	MECHANICAL	ELECTRICAL (SS)	ELECT. GRID CONN.	LARGE-SCALE	SMALL-SCALE	GEOTHERMAL	FUELWOOD AND CHARCOAL	BIOGAS	ENERGY FARMING	THERMAL	WAVE
BARBADOS	S1	S1	M2	S1	L2	S1	L3	0	S1	0	S2	0	0	0	0	M2	S1	L3	M3
DOMINICA	M1	S1	M2	S1	0	S1	L3	0	S	M1	M2	0	S1	M1	S1	M2	S1	L3	0
ST. LUCIA	S1	S1	M2	S1	0	S1	L3	0	S1	M1	M2	0	S1	S1	S1	M2	M1	L3	0
ST. VINCENT	M2	S1	M2	S1	0	S1	L3	0	S1	S1	M2	0	S1	M1	S1	M2	M1	L3	0
GRENADA	S1	S1	M2	S1	0	S1	L3	0	S1	S1	M2	0	S1	M1	S1	M2	S1	L3	0
GUYANA	M1	S1	M2	S1	0	S1	L3	0	S1	M1	L2	S1	S1	0	S1	M2	S1	0	0
JAMAICA	S1	S1	M2	S1	0	S1	L3	S1	S1	M1	L2	0	S1	0	S1	M2	S1	L3	0
TRINIDAD AND TOBAGO	M1	0	L2	S1	0	S1	L3	0	0	0	L2	0	0	0	L1	L2	S1	0	0
BELIZE	M1	S1	M2	S1	0	S1	L3	0	M1	M1	L2	0	S1	0	S1	M2	S1	0	L3
ST. KITTS	M1	S1	M2	S1	L2	S1	L3	S1	S1	M1	M2	0	0	0	M1	M2	S1	L3	0
NEVIS	M1	S1	M2	S1	0	S1	L3	0	S1	S1	M2	0	0	0	M1	M2	M1	L3	0
MONTSERRAT	M1	S1	M2	S1	0	S1	L3	0	S1	M1	S2	0	0	0	S2	M2	M1	L3	0
ANTIGUA	S1	S1	M2	S1	L2	S1	L3	0	S1	M1	S2	0	0	0	S1	M2	S1	L3	L3



ANNEX III

STATEMENT FROM AGENCIES ON THEIR ACTIVITIES



CARIBBEAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE (CARDI)
ACTIVITIES IN NEW AND RENEWABLE SOURCES OF ENERGY

CARDI is a regional agency providing services in research, development, technical assistance and information for biomass for non-energy functions, namely for food. In this regard, it responds to the needs of and requests from its twelve member countries.

At present, CARDI cannot be regarded as energy conversant, but is involved in a number of energy-related projects which will increase its capability in this area of activity. These are:

- 1) Preparation of proposals for implementation of food/forests projects in St. Lucia and Nevis (in progress);
- 2) Assistance in land use planning and soil and water conservation and management for the LDC's (preliminary approval of funds);
- 3) Analysis and assessment of biomass resources (in planning with CEER of UPR);
- 4) Detailed characterisation of traditional small farming systems (in progress);
- 5) Use of draught animals (in progress);
- 6) Assessment of varieties of sweet sorghum in drier areas of Barbados for production of alcohol (advanced planning).

CARIBBEAN COMMUNITY SECRETARIAT
ACTIVITIES IN THE ENERGY SECTOR

The Caribbean Community Secretariat's primary interest in the field of energy is in the areas of policy planning and analysis and training. A pre-requisite to these activities is the building up of reliable data. In this regard, national energy assessments are a prime activity and a programme to have such assessments in all CARICOM states, except Trinidad and Tobago, has been formulated and is being implemented. Energy conservation is clearly an area for action and activity has commenced, especially through audit training.

National energy assessments, focusing on needs rather than resources, aim, in the first instance, to trace the energy flows within national economies, starting from the energy source through the conversion processes, noting the relevant efficiencies, the distribution among sectors, and the specific end uses and end-use devices within each sector. The methodology used goes beyond a static representation of what exists and permits the identification of:

- i) specific policy issues for further detailed study;
- ii) policy options for consideration by decision makers, including the potential for substitution among different fuels without affecting existing levels of production and productivity; and
- iii) the requirements for energy-related training.

At this time, national assessments are underway in Antigua, Barbados and Guyana. It is expected that assessments will be conducted in all CARICOM countries (except Trinidad and Tobago) by December 1981. It must be emphasized that the assessments are national activities with inputs from the Secretariat as requested.

A training programme is being formulated. Training has already been conducted for energy auditors, assessors and policy advisors. Further, a survey to determine the training capabilities of technical

high schools and other subprofessional institutions has already been done. A similar survey of regional universities, U.G. and U.W.I. (including the C.M.I) is scheduled to begin before the end of 1980. Such training, when undertaken, will include both the policy and technology aspects of energy. It must be noted that the Secretariat is totally convinced of the need to use regional institutions and personnel, so as to maximize the development of a regional competence in the field of energy.

The Secretariat has established an Energy Unit which is being geared to coordinate the activities and to provide technical advice to governments in the areas under consideration.

CARIBBEAN DEVELOPMENT BANK
ACTIVITIES IN NEW AND RENEWABLE SOURCES OF ENERGY

The Caribbean Development Bank is active in the financing of power utilities throughout the sub-region. It is expected to play a greater role in this as former external financing agencies progressively reduce their activities in this sector. The Bank has gone beyond the financing of power utilities within the last two years, with the establishment of a Technology and Energy Unit (TEU) which has, as one of its primary responsibilities, the identification and field testing of techniques which could enable the region to make more effective practical use of locally available alternative energy sources. The Unit is also geared to commissioning resource assessments, analysis studies and adaptive research and development, and pilot projects which seek to commercialize techniques which have good prospects of satisfying felt needs of the sub-region. Studies and projects funded by the TEU should normally support the following broad goals:

- (a) facilitate increased and more effective use of local manpower and material resources, and exploit any special advantages available to local entrepreneurs at all scales of operation with the aim of increased regional self-reliance;
- (b) reduce dependency on imported fossil fuel through conservation and the development and increased utilization of alternative sources of renewable energy;
- (c) facilitate increased participation by and benefits to small productive enterprises serving local and export markets;
- (d) direct benefits as far as possible to the lowest income groups through increased employment and/or incomes, access to housing and other basic needs, and reduced cost of essential goods and services.

Besides satisfying one or more of the above goals, projects and studies would be expected to satisfy the following specific criteria:

- It should introduce and/or stimulate diffusion of the technology in the region.
- It should be reasonably well-developed and the resource base exists.
- There should be a felt need for the output of the project and evidence of interest in, and a market for, the technology and its products among potential entrepreneurs and consumers.
- It should utilize and support existing research and/or development institutions and organizations in the region wherever possible, and complement ongoing Research and Development activities, develop or apply results of past Research and Development projects and/or developing new regional Research and Development capabilities.

The TEU has developed a technical Information Service and is developing a Communications Programme which seeks to create a network of regional organizations and individuals involved in alternative energy and small scale technology. As part of its communications programme it publishes a newsletter quarterly. Following is a listing of approved CDB projects and some projects being considered for 1981 in the field of alternative energy.

APPROVED PROJECTS AND STUDIES

A. RESOURCE ASSESSMENTS

1. Chemical Lime (Antigua)
2. Peat Resource Assessment (Belize)
3. Regional Wind and Solar (Barbados, Antigua, St. Kitts/Nevis, St. Lucia, others may be included later)

B. STUDIES

1. Non-Conventional Water Heating (Regional)
2. Integrated Energy Programme for a Large Estate (St. Vincent)
3. Salt Production by Solar Entrepreneur (St. Kitts)

C. FIELD TESTS AND PILOT PROJECTS

1. TEU Passive Solar Building (CDB)
2. Testing of Solar Collectors (Barbados)
3. Solar Drying of Chilli Peppers (Guyana)
4. Bagasse Study (Barbados)
5. Small Farm Banana Transportation by Aerial Cableway
6. Small Domestic Crop Dryers

PLANNED PROJECTS AND STUDIES

A. RESOURCE ASSESSMENTS

1. Biomass (Windwards + Leewards)
2. Mini Hydro (selected countries)
3. Arrowroot Bittie for Biogas (St. Vincent)
4. Bagasse (to be determined)
5. Peat (Guyana)

B. STUDIES

1. Prefeasibility Study of Wood Gas Generator Utilizing Sawmill Waste (Guyana)
2. Caribbean Experience with Passive Solar Buildings
3. Prefeasibility Study of Vegetable Waste Fired Boiler (Dominica)
4. Prefeasibility Study of Energy Conversion System to Utilize Municipal Waste
5. Feasibility Study of Biogas Fuelled Arrowroot Factory (St. Vincent)

C. FIELD TESTS AND PILOT PROJECTS

1. Mini-Hydro (Belize, Guyana, Dominica, Grenada)
2. Wind Turbine Demonstration (CDB)
3. Farm-size Biogas Units
4. Solar Water Pumping (Antigua) and others to be identified

CARIBBEAN METEOROLOGICAL INSTITUTE ACTIVITIES
IN RELATION TO NEW AND RENEWABLE SOURCES OF ENERGY

The Caribbean Meteorological Institute is responsible for the archiving and analysis of all long term meteorological records in the Caribbean. Such records form an invaluable data base for meteorological energy prospectives although originally collected mainly for agricultural and other purposes.

CMI is not engaged in supplementing these records with data collected specifically for Wind, Solar and Hydropower energy applications. With USAID funds obtained through CDB it is embarking on a 5-year programme to collect and analyse data on Wind and Solar Energy for the LDC's. Funds have been obtained for the first two and a half years of this programme which involved mapping and detailed investigation of promising sites.

In the field of hydropower CMI has, over the past few years, been in the process of seeking funds for the establishment of a hydrological network of stations throughout the Caribbean. It is now hopeful that these funds will be obtained jointly from UNDP, the Netherlands Government and the EDF.

Although the network was originally envisaged to obtain information on water resources primarily for agricultural and domestic purposes, an extension of this programme could easily provide the essential data for hydropower purposes.

A major portion of CMI activities is involved in training of technicians for the collection of data and maintenance of instruments - this activity is too often overlooked but represents, perhaps, the most important ingredient in energy resource assessment at the present time.

CMI is also upgrading its data analysis activities by acquiring a computer within the next three months.

EAST CARIBBEAN COMMON MARKET SECRETARIAT
PRESENT AND PLANNED ENERGY ACTIVITIES

I. Introduction

The activities of the Secretariat find their justification in the raison d'être in the establishment of the East Caribbean Common Market (ECCM) and institutionalized in the Agreement. Essentially, the Member States^{1/} are attempting to promote economic development through the development of certain common policies and adopting a harmonised approach to shared problems. The functions and activities of the Secretariat devolve from those aims and objectives and includes the collection, collation, analysis and distribution of data; policy formulation, advice and analysis, assistance in plan preparation and implementation. Any activities in energy would therefore fall within these parameters.

II. Scope of Present Activities

It can be said that since its inception, the Secretariat has been involved in energy activities. Until this year (1980) however, this involvement was limited to petroleum and consisted of collecting data on prices and demand and supply to provide background documentation for Governments in their negotiations with the marketing companies. This scope of activities was widened at the Fifteenth Meeting of the ECCM Council of Ministers in January when a resolution to develop a common approach to the current energy situation was adopted. The Meeting further mandated the Secretariat to work towards the formulation of a common energy policy.

At the time this decision was adopted, the Secretariat did not have in place the necessary institutional basis and capability to

^{1/} The Member States are Antigua, Dominica, Grenada, Montserrat, St. Kitts-Nevis, St. Lucia and St. Vincent.

effectively pursue this activity. The first task then was to establish the basic infrastructure including recruitment of personnel. In addition to these activities, work has been done on developing methodologies for collecting the data necessary to inform any attempt at formulating an energy policy for the sub-region.

III. Planned Activities

From the outset, it needs to be said that the Secretariat will not be limiting itself to concentrating on particular forms or sources of energy. The activities will include those forms of energy that are presently utilized and other forms which appear to hold promise of making an impact on the development of the Member States. As indicated above, the general scope of those activities will fall within the existing framework of the other Secretariat's activities. More specifically, those will include:

- i) information/data collection, collation, analysis and dissemination;
- ii) special studies and surveys;
- iii) policy formulation, advice and evaluation;
- iv) assistance in plan preparation and implementation;
- v) coordination of national activities.

IV. Conclusion

Hopefully, the Secretariat's "energy unit" will be fully established and operational within the first quarter of 1981. As has been said, the activities will range over all those sources of energy which have potential for promoting the economic development of the Member States. Those activities will be heavily biased towards policy and management of the energy sector within the national economies. In the general context

of regional activities, the role of the Secretariat would be to act as the focal point for the sub-region. Essentially, what the Secretariat should be doing, is coordinating the activities of other institutions and agencies as they relate to and impinge upon energy policy and planning in the ECCM and conversely, representing the interests of the Member States in those matters.

ACTIVITIES IN THE FIELD OF
NEW AND RENEWABLE ENERGY SOURCES BY
UNITED NATIONS DEVELOPMENT PROGRAMME

The United Nations Development Programme (UNDP) considers the development of energy sources in the Caribbean sub-region to be extremely important. In this regard, UNDP and the World Bank (IBRD) prepared a report entitled "Caribbean Energy Survey" in May 1979. In addition, UNDP/UNEP/OLADE undertook a capacity study of 12 Latin-American countries, which included data from Barbados and Trinidad and Tobago, entitled "Energy Alternatives in Latin America - Study of Capabilities for the Use of Non-Conventional Energy Sources".

Within the financial resources of UNDP's IPF system, the following country projects have been undertaken in the field of energy:

CAR - Multi-Island Fund

CAR/73/001 - (Biogas and Compost Technology Consultancies) UNIDO \$10,000. The project will develop production of biogas and compost from urban and vegetable waste, slurry, etc. This will lead into the introduction of pilot demonstration units in the Eastern Caribbean.

Grenada

GRN/80/002 - (Formulation and implementation of a National Energy Policy) UNDTCD \$130,700. The project will establish an energy information base with special emphasis on the development of alternative sources of energy. It will also provide assistance in connection with the formulation and promulgation of regulations to govern hydrocarbons exploration and development activities. The project will seek to design and establish effective institutional mechanisms for energy planning and the implementation of an energy policy.

Barbados

- (a) BAR/75/004 - (Natural Gas Technology) UNIDO \$103,824. The project was completed in June 1979. The project assigned an expert to work with the Natural Gas Corporation (NGC) to study its aims, potential demand for natural gas, marketing plans for gas appliances, design legislation to enable the Government to guide the whole gas industry through a period of change, draft standards, develop plans for pipeline construction and to train NGC staff.
- (b) BAR/78/008 - (Assistance in Petroleum and Energy) UNDP \$391,900. The project, which ends in December 1980, is to implement the recommendations made as a result of the first phase to reduce the wastage of natural gas and to develop increased cumulative oil production.

In addition to the UNDP financial resources, countries have sought other sources of funding for their energy development needs. Antigua, for example, has submitted three proposals for funding to the Interim Fund for Science and Technology for Development (IFSTD). These proposals, or requests, are as follows

- (a) Wind Power Evaluation - \$64,000. The purpose is to assess the feasibility of using wind energy to generate electricity in association with conventional means. It envisages the installation and operation of a pilot wind power unit connected into the existing grid network.
- (b) Energy Plantations - This activity will undertake the large-scale development of Giant Wild Tamarind trees for the production of biogas.
- (c) Wind Energy for Small Irrigation System - The purpose is to develop and test a small irrigation system which will pump water to head tanks and gravity feed to a trickle system using wind power.

In light of the above, IFSTD has the potential of becoming another mechanism for undertaking project activities in the development of energy resources. However, we are waiting for a concrete response to the meeting of officials which considered project proposals for funding by IFSTD at CARICOM last October.

UNDP has submitted a programme to the OPEC Fund, in the magnitude of 2-3 million dollars in the area of energy development, and is awaiting a response.

In conclusion, UNDP is working closely with the Conference Secretariat in responding to any individual country requests for technical assistance for the preparation of country position papers and the Conference which will be held in Nairobi next year.

Human Resource Development

The human resource base in the context of new and renewable energy resources will be required to:

- i) gather information on the energy use patterns and generate models descriptive of energy consumption. This will involve inter alia, measurements, understanding of the science and technology of energy use and flows, methodologies in energy audit systems etc.;
- ii) gather data on the energy resource base and to assess the potentials and possibilities of each and every resource. This will involve:
 - (a) measurement of the solar resource e.g, insolation, direct and diffuse components on horizontal and inclined surfaces;
 - (b) determination of wind potential: speed, direction, gusts, profiles;
 - (c) determination of biomass potential: soils and plant characteristics, agricultural and other waste generation and utilization, precipitation, sunshine, cloudiness;
 - (d) determination of the hydropotential: surface flow, volume flow and gravitational potential drops, topography, sunshine, precipitation, evaporation, seasonal variations;
 - (e) assessment of wave potential: wave amplitude, frequency, coastal profiles;
 - (f) assessment of geothermal potential: subterranean temperature profiles, volcanic topography, seismicity;
 - (g) Ocean Thermal Energy Conversion potential: ocean climate, temperature gradients, ocean depths, ocean currents, salinity transmissivity.

- iii) adapt existing technology or devise new technology to meet end energy uses from new or renewable energy resources. It may be noted in this connection that the end energy uses are unlikely to change significantly. Furthermore, the manufacturing/fabricational processes, i.e. the manufacturing technology, will essentially continue to comprise the same kinds of processes, e.g. sheet metal work, metal turning, metal forming, casting, forging, joining (welding, brazing, soldering), plastic processing etc. However, what will be necessary is an adaptive or innovative technology which will systematically examine, adapt or alter existing energy conversion devices and systems to better suit the new and renewable energy resources.

The human resource requirements may thus seem to range through the entire scientific and technical spectrum, not to mention the equally important areas of study of the cultural and social aspects of a new energy scenario.

An examination of the human resource base of the Caribbean indicates that:

- (a) there is a distinct weakness in the human resource base;
- (b) the available human resources are not necessarily distributed uniformly but in a manner reflective of the technological status of the various territories.

The technological capability to which each territory should be brought is a matter which may be the subject of a separate discussion. However, that there should be an increase in the technological capability of each and every territory is not in doubt.

The human resource development may therefore be seen to be required at all levels, starting from the artisan level and progressing through the technician, the subprofessional, the professional, the scientist and the researcher. It may be noted however that, as has been indicated earlier, the technology of fabrication/manufacture would continue to

use, in the main, established manufacturing/production processes and hence at the artisan/craftsman level what may be required is more in terms of numbers rather than training in a new process. At the higher levels however, where maintenance, operation, design, development and research are involved the training becomes progressively more specialized in the order indicated.

Training Capability of the University of the West Indies

Over the years the University of the West Indies, and in particular the St. Augustine Campus, has developed a capability for training and Research and Development in renewable energy resources with considerable emphasis on Solar Energy. At the Department of Mechanical Engineering, specifically, a strong programme in renewable energy resource development has become established over the last ten years. Appendix I indicates the kind of work that has been carried out. Appendix II indicates a list of staff who are actively engaged in Research and Development in renewable energy resources.

As can be seen from the attachments, solar energy utilization is now an integral part, though to a limited extent, of the undergraduate curriculum, while it forms a very strong component of the post graduate programme.

In the new laboratories being planned and scheduled to come into operation by the end of 1982 the following energy related laboratories are being designed:

Laboratory	Area m ²
Heat Engines	240
Refrigeration and Air Conditioning	193
Heat and Mass Transfer	166
Vapour Power Plant	150
Wind Tunnel facilities	6' diameter tunnel
Energy (covered)	184
Energy (Uncovered, roof)	1500

The above facilities should provide the Department with an excellent capability for Research and Development and training in the area of renewable energy resources. It is intended that formal courses in Energy Conversion will eventually be introduced at the undergraduate level. Though the University is not specifically required to undertake training at subprofessional or technical levels, subject to adequate arrangements being made there appears to be no reason why such training cannot in fact be made available. The University could also assist in strengthening the capability of other institutions/organisations in the region for achieving their training objectives in addition to assisting them in their Research and Development efforts.

DEPARTMENT OF MECHANICAL ENGINEERING

STAFF ENGAGED IN WORK ON RENEWABLE ENERGY RESOURCES

<u>Name</u>	<u>Position</u>	<u>Speciality</u>
Professor S. Satcunanathan B.Sc. (Eng) Ph.D., C. Eng. FIMechE, MASME, MinstE, MASHRAE, MAPE, MISES	Professor	Energy Resources
Dr. P. Gandhidasan B.E., M.Sc., Ph.D MISES	Lecturer	Solar Space Cooling
Dr. G.S. Kochhar B.E., M.S., Ph.D MASME, MASHRAE	Lecturer	Solar Refrigeration
Dr. T. Vinayagalingam B.Sc., M.Sc., Ph.D	Lecturer	Wind Energy
Dr. G.C. So'Brien B.Sc., Ph.D	Lecturer	Solar Space Cooling
Mr. P. Persad B.Sc. (Eng)	Assistant Lecturer	Solar Collectors
Mrs. M.E. Jagessar B.Sc. (Eng)	Research Assistant	Solar Radiation
Mr. P. Jolly B.Sc. (Eng)	Research Assistant	Solar Drying
Mr. K. Maynard B.A.Sc.	Research Assistant	Energy Conservation
Mr. M. Barrington B.Sc. (Eng)	Research Assistant	Energy Conservation
Mr. S. Tom Park B.Sc. (Eng)		Solar Refrigeration
Mr. S. Ramjattan B.Sc. (Eng)		Comfort Cooling

ANNEX II

LIST OF DOCUMENTS

LIST OF DOCUMENTS

<u>Document No.</u>	<u>Title</u>
	United Nations Conference on New and Renewable Sources of Energy, Methodological Guide to the Preparatory Process in Latin America
	Résolutions adopted at the Second Session of the Preparatory Committee for the United Nations Conference on New and Renewable Sources of Energy, 21 July to 1 August 1980
A/C2/35/L112	United Nations General Assembly, Draft Resolution on Development and International Economic Co-operation: United Nations Conference on New and Renewable Sources of Energy submitted to the Thirty-fifth Session
34/190	United Nations General Assembly Resolution on the United Nations Conference on New and Renewable Sources of Energy
E/CEPAL/CDCC/67	Economic Commission for Latin America, Office for the Caribbean, The United Nations Conference on New and Renewable Sources of Energy: Its Relevance for CDCC Member States
CEPAL/CARIB 80/8	Economic Commission for Latin America, Office for the Caribbean, The United Nations Conference on New and Renewable Sources of Energy: Information Note
E/CEPAL/CARIB/NRESE/2	Economic Commission for Latin America, Office for the Caribbean, New and Renewable Sources of Energy of Interest to Caribbean Countries and Potentially Attractive Applications - Draft Working Document
	Research and Development at the Faculty of Engineering of the University of the West Indies on the Utilization of Solar Energy - April 1970 - S. Sathunanathan - University of the West Indies, St. Augustine

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ANNEX I

LIST OF PARTICIPANTS



LIST OF PARTICIPANTS

CARICOM Secretariat

Byron Blake
Director
Sectoral Policy and Planning

Frank Granger
Head
Energy Unit

Caribbean Agricultural
Research and Development
Institute

John Cropper
Head, Planning Unit

Caribbean Development
Bank

Lewis Campbell
Director
Projects Department

Jeffrey Dellimore
Assistant Director
Head Technical Energy Unit

Basil Sutherland
Project Officer (Technology and Energy)
Technical Energy Unit

Carolyn Cozier
Project Officer (Communications)
Technical Energy Unit

Caribbean Meteorology
Institute

Littleton Ramsahoye
Co-ordinator of Research

Stephen Lamming
Wind Energy Specialist

East Caribbean Common
Market Secretariat

George Goodwin
Senior Research Officer

University of the West
Indies

Suppramaniam Satcunanathan
Head, Department of Mechanical Engineering

UNDP

Richard Church
Deputy Resident Representative

CEPAL Secretariat

Wilfred Whittingham
Economic Affairs Officer

Bernard Gibbs
UNCNRSE Regional Adviser

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ANNEX V

ADDRESS DELIVERED AT THE OPENING SESSION

OPENING STATEMENT BY DR. LEWIS G. CAMPBELL
DIRECTOR, PROJECTS DEPARTMENT
CARIBBEAN DEVELOPMENT BANK

I wish on behalf of the President and staff to welcome you most warmly to the Headquarters of the Bank for this important meeting which we hope will help this sub-region to address the issues concerned with developing new and renewable sources of energy and as far as possible identify the areas needing urgent attention and for which technical assistance will be required.

I wish to apologise for the inability of President Demas to be with us today to welcome you personally as I am sure he would have liked to do. He is away from Barbados at the moment.

I do not think it necessary to impress on you how important the Bank considers the subject of energy as we endeavour to assist in the economic development process of this sub-region. The subject has become extremely critical in these times of high and almost prohibitive cost of petroleum fuels which have been regarded as our traditional source of energy.

The Bank is already active in the financing of power utilities throughout the sub-region. It is however expected to be playing a greater role in this as the need for expansion in power plant capacities arise and as former external financing agencies progressively reduce on their activities in this sector. The Bank, as a matter of course, has to examine all the alternatives and decide on the most appropriate and cost effective approaches to assist in providing the various power utilities with the capacities they require to meet the demand.

The Bank has now gone beyond the financing of power development facilities. In the last two years we have established a Technology and Energy Unit in the Projects Department which has as one of its primary responsibilities, the promotion of appropriate technologies directed at assisting the sub-region to make more practical use of the alternative sources of energy within its grasp.

This unit is very capably staffed, and with the financial support it receives, particularly from USAID, we expect it to play a leading role with member states of the Bank in directing attention at the economic use of other forms of energy, particularly those locally derived. With one notable exception, the burden of oil imports on the foreign exchange resources of regional members of the Bank is at the stage where it is unbearable. The urgency to address this problem is real.

At this meeting, we must be mindful of the importance of developing New and Renewable Sources of Energy (NRSE), especially in the context of continuing economic and social development of the non-oil producing countries of the Caribbean. These countries presently have relatively small total demands for energy and relatively small populations. These factors, when compared with presently indicated New and Renewable Sources of Energy (NRSE) potential, especially hydro and geothermal, make the prospect of substitution an attractive one on the demand and supply side. Nevertheless, there exists a number of constraints to the significant development of these sources of energy. It would seem that apart from the economic cost, the acquisition of the necessary capabilities for such development may be the greatest constraint, for in its absence the final economic cost is beyond the control of the governments and people of the countries concerned.

It is therefore quite appropriate that this meeting, convened by ECLA and co-hosted by the Bank, in preparation for the UN Conference on New and Renewable Sources of Energy, will be examining the capabilities required, and those existing in the sub-region to accelerate the development of NRSE.

The inter-governmental agencies here represented ought to play an increasingly greater role in assisting governments to develop significant New and Renewable Sources of Energy (NRSE) that would contribute to continuing economic and social development of the countries concerned in the short to medium term. The mechanisms which would accomplish this goal need to be worked out and this meeting affords us the opportunity to

do so. At the same time, as preparation for the UN Conference, the meeting also affords us the opportunity to make precise recommendations about forms of regional and international cooperation and assistance which could complement the initiatives being taken in the sub-region.

As a sub-regional preparatory effort for the UN Conference, the meeting will help to ensure adequate representation of the situation facing the sub-region in rapidly developing New and Renewable Sources of Energy (NRSE). In the sub-region, the importance of the outcome of this meeting and its recommendations, is two-fold. Firstly, it can help agencies and governments alike to formulate a clearer picture of the extent to which their present capabilities will aid the development of New and Renewable Sources of Energy (NRSE). This should set the stage for strengthening these capabilities and for generating more programmes of assistance. Secondly, it can help governments to formulate joint policies in key areas where non-regional inputs are required, as an input to national and Latin American and Caribbean Regional preparations for the UN Conference. We should strive to achieve both purposes.

In the discussions during this meeting we must bear in mind that education and training as well as dependable information sources and flows form the core of the development of a capability. Due emphasis should be given to these aspects as well as to the problems involved with the identification, appraisal and financing of New and Renewable Sources of Energy projects.

The meeting should also focus on the medium to long term development of significant solar, wind and biomass energy alternatives. These form a considerably important indigenous resource in most countries on the sub-region. Short term developmental objectives in these areas where a significant economic or social impact could be achieved should not be overlooked.

While the ECLA input to the forthcoming regional meeting on New and Renewable Sources of Energy will be only in stating the requirements existing in the sub-region (CARICOM/ECCM States) and will not specify individual beneficiary states or implementing organisations, this meeting should serve as a catalyst for the development of costed programmes e.g. in education, biomass technology adaptation, etc. and for which governments could seek financing through the UN Conference. Such proposals should be ready by February 28, 1981 at the latest.

The results of this meeting will form part of the input in the form of a regional position paper for the March 1981 regional meeting to be held in Mexico at the Ministerial level.

Finally, I wish to express the hope that you will have found this a stimulating exercise, even if at times it may border on the difficult side. I also hope that there will be substantial benefits flowing from it as we proceed to make greater and better uses of the New and Renewable Sources of Energy in the member states of this sub-region.

Thank you.

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