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?THE CARIBBEAN REGION ?

A CHALLENGE FOR ALTERNATIVE ENERGY

TECHNOLOGY TRANSFER AND DEVELOPMENT

by

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UNIVERSITY OF PUERTO RICO

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} CENTER FOR ENERGY AND ENVIRONMENT RESEARCH

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ABSTRACT

On a macroscopic scale, countries of the Caribbean Region, although politically and culturally diverse, do share 2 common energy problems, one overdependence on imported petroleum. In this Region where there is scarcity of petroleum, oil and coal reserves, alternative energy sources encompassing the technologies of

solar thermal and electric, biomass, wind and ocean thermal energy. all, have relatively excellent potential applications

This paper looks at the steps to effect an alternative energy technology transfer in terms of adaptation to local conditions. which include such parameters for evaluation as the influence of microclimates, social. and industrial patterns, their assessments and effects on natural resources, technology utilization, and training of local personnel. The key areas of study are

Programs. training, communication and information programs, and technological Projects are considered

RESUMEN

En una escala macroscópica, los países de la región geográfica del Caribe, aunque tanto política como culturalmente son diferentes, comparten sin lugar a dudas un problema energético común: La dependencia absoluta de petróleo importado. Es en esta región en donde, debido a la escasez natural de petróleo, gas natural y minas de carbón, existe un buen potencial para la aplicación de

Fuentes alternas de energía tales como las energías solares, térmica y eléctrica, la biomasa, la eólica y la energía oceánica

Este artículo está dedicado al análisis de las etapas necesarias para poder efectuar la transferencia de tecnología existente en fuentes alternas de energía, sobre todo en lo que se refiere a la adaptación a las condiciones de un territorio en particular. Algunos de los factores a considerar son la influencia de los microclimas locales; el impacto de las condiciones sociales y económicas de desarrollo industrial; la evaluación y efecto de estos factores sobre las fuentes naturales de energía; y el entrenamiento de personal local para la utilización de esta nueva tecnología. Exponemos en este artículo aquellas áreas clave relacionadas con programas de política energética, entrenamiento, comunicación e información y proyectos de desarrollo tecnológico

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AIL of the Caribbean Country

5 except Trinidad-Tobago, are petroleum

Importers, and the price increases on the international market during the last decade have had serious effects on the economies of these countries. The crude

petroleum and refined products share of total merchandise imports increased

from less than 9 percent in 1971 to about 25 percent in 1980.

In addition to sharing this problem, the Caribbean nations share several energy characteristics

(1) the subcritical sizes of most national energy systems precludes a choice of solutions;

(2) there are no markets for indigenous fuels:

(3) the use of indigenous fuels has been replaced by the use of imported petroleum;

(4) commerce:

Typically exploitable indigenous resources are lacking;

(5) there are few trained personnel to carry out energy assessments and develop alternative energy programs;

(6) national governments have not yet accepted regional cooperative efforts as the best ways to approach energy problems.

Realistic options include the devising of effective programs with careful balances in supply development, demand management, the structuring of energy

Institutions and sectors, and 91

9 policies. These options, though, require

bilateral or multilateral

support. This has been accomplished in the Caribbean

to some extent during the last two years through the good offices of several regional and international agencies.

This presentation focuses on 2 project concerning alternative energy solutions for the region that has received combined support from the United States Agency for International Development (USAID), Caribbean Community Secretariat (CARICOM), and the Caribbean Development Bank (COB). In particular, this project

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Is identified in the USAID Caribbean Regional Project Paper for Alternative Energy Sys

"The goal of the project is to develop capability to utilize renewable

This Project Paper states the goals and purpose as follows:

energy sources in the Caribbean as alternatives to imported fossil fuels and to encourage energy conservation measures. This goal is achieved by introducing cost effective, renewable energy technologies and conservation programs through

energy policy reviews, training of professionals and tech

fans, improved con

munications and testing of applications. The project responds to the desires of the MDC's and LOC's of the region to achieve energy self-sufficiency to alleviate the balance of payments problems all of them, except Trinidad and Tobago, are facing because of rising petroleum price

The purpose of the project is to establish an institutional capab!

ity in

the Caribbean region for carrying out energy planning, including conducting country energy needs assessments, and for designing, testing, adapting and disseminating alternative energy technologies."

The Center for Energy and Environment Research (CEER) of the University of Puerto Rico signed a Consultancy Agreement with CARICOM and the COB for the evaluation of this project at the end of its second year. The following is»

Presentation of the problems of de

joping technology capability in developing

countries 88 they were just recently observed First hand dur

18 extensive trips

through the region by the four members of the CEER evaluation team which visited

ine of the 12 member countries of CARICOM. The following map shows the Carib-

bean Region and the CARICOM member countries.

To meet the objectives of the project, two regional organizations, COB and

CARICOM are sharing the tasks of the project. Ideally, in order to develop the

technological capability needed for the region, one would first perform the

energy assessments of each country From which one could make rational decisions

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with regard to optimum placement of alternative energy projects, first as denon-

stration end then as follow-up for commercial application. Training of personnel

at all

levels and all phases would be ongoing throughout the duration. Strong

communication Tinks would also be interweaved for dissemination of information

to aid technology transfer and to reinforce the training effort. This presen-

tat

n reviews the actual situation as compared to the ideal

In evaluating such 2 project, the First step was to examine the overall

Project objectives to see if they wore being met and also to examine the pro=

Posed time schedule. The project as found to be behind schedule for some of

the following reasons

(1) This is a complex, pioneering, experimental type project involving @

dozen developing countries, none of which had ever approached energy in an inte=
grated, comprehensive manner before.

(2) There were di

sin recruiting personnel of the calibre desired

How mich of that was due to limitations of the resource poo! and how much to

locational factors has not been determined, but the evaluation team believes

both factors are significant.

(3) Assessments have taken longer than planned, for a number of reasons.

It was necessary to do a great 4

1 OF preliminary work to orient countries as

to what an assessment is, to assure them it would not be used against them by international lending agencies, and to obtain commitments to provide the national resources and the information required

(4) A number of local governments that were interested in cooperai

9 with

the Project had difficulty in deci

ng how they were going to deal with the

energy problem in organizational terms. Moreover, in some cases, the organiza-
tion of energy matters was delayed by reorganizations of unrelated government

activities. There were also problems in identifying suitable people at the

national level or in having them transferred from other activities.

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(5) In some cases, energy functions were assigned as additional duties to

persons in existing positions in national

governments. If the person was thereby

overloaded or was led to consider this as only a temporary assignment, he might

not dedicate enough time to these functions

In traveling through the various countries, one gains an increased appreciation

of both national and regional constraints on the project implementation.

Some of the

national constraints and their reasons for being follow:

(1) Small size of country, economy and energy systems

This will always be something of a problem because it limits the

national, human and financial resources available.

ability to develop desired specialized technologies, and makes

the local energy organization more vulnerable to the effects of turnover, political changes, brain drain, etc. However, once effective regional programs are in place and a good energy assessment has been prepared, the importance of this constraint should be substantially reduced. In particular, an appropriate portion of the analytical work will be undertaken by regional organizations and their consultants, and of the financing by regional and international institutions:

(2) Low national priority for energy

The leaders of a country may consider that certain other problems are even worse than the energy problem and may decline to make sufficient human and Financial resources available for the latter. This may occur even when there is a near term monetary advantage for the government in taking advantage of regional energy programs

(3) The "penny-

1¢ and pound-foolish" minister of Finance

The minister of Finance is unwilling to make "new" money available

for energy because he does not see any immediate financial benefits to the

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Government. The fact that the economy of the country may benefit handsomely in the long run does not impress him. For powerful reasons, he is primarily concerned about the here and now of the budget. So he tells the minister responsible for energy to cut back on something if the latter wants to spend money on energy.

(4) Lack of coordination between _m

This can happen in the most efficient countries, but it is particularly hard on energy which requires an above-average amount of coordination. For example, for good reasons field tests and demonstrations of alternate energy technologies may be parceled out to different ministries. If coordination is poor, the ministry in charge of energy may lose contact with many activities and may even lose control over programmatic and budgetary priorities within the country.

(5) The "agency

ional duty" problem

In many countries, it is common to assign energy functions as addi-

tional duties to one or more persons rather than to hire full-time energy persons.

However, if the persons so assigned are expected to perform their original duties as well with no increase in pay, morale is likely to be poor and some tasks will be neglected. If the person was overworked to begin with, not even a pay increase will help.

(6) Indifferent or risk-shy management in the private sector

Personnel who have worked on energy conservation studies have come

across a wide variety of attitudes towards energy conservation among both maintenance personnel and management. At one extreme is an almost total ignorance of the energy problem and the possibilities for saving energy by changing operating practices and/or equipment. Alternatively, there is awareness of energy

conservation coupled with indifference because management feels that energy cost

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increases can be readily passed on to customers. In still other cases, maintenance

personnel are aware of specific savings

198 which could be made. but manage-

ment is. um

ng to make changes. Then there are managers and owners who are

ing to invest in energy conservation measures and equipment because of
perceived political or economic risks. Finally, there are managers who are
enthusiastic "energy savers," who try new-fangled equipment and push their

employees to obtain greater energy efficiency!

ney. The foregoing implies that

Decisions about energy matters are usually made at several different levels

Within an organization, and that communication

mn about energy must be directed

at all these levels if it is to be effective on a national scale. We have

Identified these as being national constraints. The Caribbean area also has

serious regional constraints such as the following

(1) The inherent complexity of the energy problem and its solutions

In a number of places, the Project Paper identifies the smallness of

the participating countries, their economies and energy systems as an important,

and often decisive, constraint on national solutions to energy problems, and it

makes 9 powerful justifications

for a regional approach. It should be cheaper

to deal with the energy problems of a group of neighboring small areas on a

regional basis than on an individual basis, whether the small areas constitute

separate countries or sub-divisions within one large country. But this approach

will not be simpler; it will be more complex. And, unless this increased complexity

is specifically recognized and taken into account, many of the "economies

of scale" obtained by using a regional approach will be lost. Worse yet, poor

solutions will then prevail throughout the region. After all, if the energy

Problem was simple, a small, poor country could order a "solution" to its prob-

Tem out of an eq

pment catalog

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Unfortunately, developing technological capability to deal with inherent energy problems by using alternative solutions is very complex for reasons such as these:

(a) Alternative energy systems are usually based on distinct, complex or novel technologies. In the case of direct solar, wind, geothermal and OTEC, these are highly site specific: in the case of biomass, fairly so.

(0) Many of the technologies, pieces of equipment and methods may

be new and untried, at least under the con

ditions for which they are proposed

(c) An expert in one type of system is seldom an expert in another,

and there may be no time-tested standards by which to judge a person's

qualifications:

In brief, the bigger the area, the greater the variety of technologies,

equipment and site conditions which have to be considered. Even if the human

and financial resources were available, it would not be wise for the many offi

cial bodies in the Region to try to become all-knowing in energy matters. The

energy problem has so many facets that almost every country in the world has

something to cont

tribute to some other country. Part of the advantage of @

a regional approach is that one can afford to develop the skill of knowing when

to call in consultants and from where, within or without the Region.

Energy assessments, policy studies and conservation studies are of unusual importance as a basis for decision making. Considerable effort should be made to do them well and to assist countries to move from them to effective action.

Regional organizations should, of course, also encourage countries to follow up sub-project reports with recommendations for action. Every program and sub-project should have some specific training objective, even if it is not a training

activity per se.

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(2) Lack of coordination between international assistance agencies

Many multilateral and bilateral international assistance agencies are active in the Caribbean, and many of them include alternative energy activities

in them

Of these programs, The Project Paper identifies 19 agencies that have on-going projects or have completed or have proposed projects of this kind.

With 19 donor agencies, two Regional agencies, a dozen governments and

innunberable ministries in the picture, it is highly probable that sigat

cases of overlap, duplication or simple lack of coordination exist. Problems are particularly likely in the areas of training and "hardware type" projects, especially if certain donor agencies have preferences for particular educational institutions or manufacturers. Also, the number of field tests and demonstrations of a specific technology may be influenced more by the number of funding sources and manufacturers than by research design based on an analysis of a particular problem. In brief, existing arrangements invite persistence of the coordination problem

(3) The wide variety of conditions in the Region

There

is an unusual variety of conditions among the countries in the Caribbean mentioned by the Project Paper. Energy consumption in million BTU's per capita ranges from 5.9 in Haiti to 7.5 in Guyana. GDP per capita ranges from \$230 in Haiti to \$1,800 in Barbados. Population varies from 12,700 in Montserrat to 1.1 million in the Dominican Republic:

jean Republic. Thus the degree to which

@ given country can undertake energy work and the amount of regional assistance

Which it will require is Table to vary significantly from country to country.

This means that the national energy organizations may vary from one to Fifteen

people and will have to be "custom designed" in each case. Also, Regional

assistance will have to be "custom ty

lored* to the needs of each country, and

Regional organizations will have to be prepared to offer a va

jety of services

in different degrees of depths.

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Among the major areas that were evaluated, the following will be discussed briefly at this point. These areas are: Energy Policy Programs; Training Communication and Information; and Technology.

In the case of the Energy Policy Program, it was originally expected that the physical manifestations of the planning process would include: country energy assessments, country policy studies and Regional policy studies. There is no question that the assessments and their associated studies have improved the data bases in the countries where they were carried out, even in countries where considerable data work had been done in previous years. In addition, because of on the job training they have left behind some institutional techno=

logical capability. Moreover, a properly done assessment includes analyses of energy demand, trends and pricing. & series of assessments may also identify

energy issues which are best addressed on a regional basis. However, whether it initiates @ process of energy planning, whether this process is incorporated into national planning and whether there develops an understand

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Tion between economic development and energy is quite another matter. To a very considerable degree it depends on the national constraints on Project implemen=

tation. But it also depends heavily on programs of communication, information

and training. In the final analysis, if planning is to be more than an acodente

exercise, the results of planning must produce change in si

ty. The acid test

Of any assessment is whether it is used as 9 basis for policy studies, policy Secisions and programs of action; or whether it is filed away in a drawer and forgotten. There is 9 good chance that the assessments will lead to positive action in at least two or three of the four countries participating in the Pro=

gram to date, given the existing attitudes, enthusiasm and organization

Concerning the changes in technological capabilities

that have taken place

As a result of on-going activities, a very substantial one took place in the

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regional organization which now can boast of an experienced and promising energy

unit of its own. However, the degree and pace of change is not yet sufficient

at the national

nal level for such countries to ensure the attainment of the Project

objectives.

Concerning the second area, the Project recognizes the Importance of training, communication and information as a means of achieving its general goal.

There are few trained people in the area who can contribute to the attainment of the project goals, but there are institutions that can develop a capacity for training both energy policy makers and technical personnel. Considering

the expanse of the geographical area where the participating countries are

Perseid and the burden that this poses for the installation of a successful training system, one can appreciate the hope that every program and every sub-Project should have some specific training aspect and objective, even if it is not a training activity per se.

In the screening of training projects, it is

important to select those that

are addressed to national energy problems as long as a priority is given to those national problems which are common to more than one nation. National energy assessments will be useful to design the training projects and to maximize the regional character of the activity

Workshops are

important to the training project. It is essential that the training workshops be practical and well organized. Operational objectives

should be determined "a priori" and sent to the participants. In this way, an objective and valid self-evaluation of the activity will be assured. Also lecturers and group leaders should be selected with emphasis on their expertise as

educators. If possible, the personnel should be acquainted with the national

scenarios of the prospective participants so that educational material relevant

to the energy problems in these countries be chosen

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Thus for, the impact of the communication and information components has

not been felt. Normal start up difficulties are partly responsible for this

vation. Mostly, the complex nature of the communication activity addressed to a vast geographical region containing isolated areas with little or no

infrastructure on which to base information systems is the main Factor responsible for the lack of adequate impact up to this time. The information component has made adequate progress towards accomplishing procedural and organizational inputs. However, the net use by the participating countries of @ newly

established bibliographical service has not reached the level of sign

impact, although it is increasing

Whenever the national energy assessments are available, 2 total review of

the activities plan for the training, communication and information components

should be attempted, taking into consideration the results of the energy assessment and other recommendations included in this report. It would be advantageous to use the expertise of a communication/training consultant for this

purpose. In addition, the increase of technical assistance to the field inst

tutions is of paramount importance for the success of the individual activities,

for the success of the overall program, and for keeping the program within the scope of the program.

The last area that we will consider is the Technology area. For your information here are some of the key energy projects being conducted under the program.

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Projects Country of Bene

Wind and Solar Energy Resource Assessment Region

(08 Soler Passive Building Barbados

Design-Const ruction-Honi toring

Wind Power Denonst ration Antigua

Study of Comercial Viability of Grenada

Non=Conventional Water Heating

jn the Tourism Sector

Peot Resource Assessment Belize

Solar Drying of Chili Peppers Guyana

Solar Water Heater Test Facility- Region

Barbodos National Standards Institute (8S!)

Banana DeFibering Pilot Plant St. Lucia

Integrated Energy Program for an Estate St. Vincent

Promotion of Simple Domestic Solar Food Dryers Region

Food and Fertilizer from Protein Wastes Barbados

These projects are all progressing well, but the following general comments should be considered

There should be assurance that an institution requesting @ loan under the Program will receive adequate technical assistance to implement the activities before the loan is approved. The lack of Field technical assistance often

results in project delays which originate in the field countries. Field visits

to assist the ongoing activities should be made more often by project officers, The liaison should be # continuous assignment performed by the communication unit to assist the technical staff members In their duties

Some of the difficulties of the energy program and the lack of definite progress in some areas arise from the lack of institutional ized technical exper= tise in alternative energy sources at the regional organization and in the field institutions.

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With adequate energy policy programs, well planned training programs, more

effective networks of communication and readily access:

le information, the

newly tr

ged experts will form the backbone of 2 new institution of individuals

ready to affront the challenges of the energy problems that will face the Carib-

bean region for the remainder of this century and the beginning of the next one.

However, this new team of experts will soon acknowledge that there is no alters

native development strategy offering an easy escape from the constraints of

Wer energy costs.

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