

CEER-X-160: PROBLEMS AND POSSIBILITIES IN THE DEVELOPMENT OF A CARIBBEAN BASIN EXERGY PROGRAM

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December 1982

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PROBLEMS AND POSSIBILITIES IN THE DEVELOPMENT OF A CARIBBEAN BASIN ENERGY

PROGRAM

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Summary and Conclusions

Various institutions, including international organizations, universities, and research centers, are concerned with expanding their roles as vehicles for energy and environmental technology transfer in the Caribbean Basin. Current United States policies as well as the needs and interests of the various Caribbean Basin nations make this an especially opportune time to consider and explore alternative strategies for delivery of such services in the region. The primary purpose of this report is not to offer suggestions for possible programs, although some recommendations are provided. Rather, it seeks to explore the multiplicity of impediments that various institutions might encounter as they expand their mission.

Developing an overall Caribbean Basin strategy will be necessary to decide early on what the institutional role should be in providing energy assistance to the nations in the Caribbean Basin. That role could be large and inclusive or it could be small and specific. In effect, it will be necessary for each institution to "stake out" its range. It will also be necessary to consider the needs and interests of the various Caribbean Basin nations. Perhaps the best way to do this would be to convene, at the earliest possible time, a conference or working group of private sector, university, and government personnel from the Caribbean Basin nations, the United States, and international organizations. The conference or working group should concentrate its efforts on: (1) defining the range of the problem; (2) cataloging existing data on energy supply, consumption, and demand in the region to determine further data needs; (3) considering future energy needs; (4) considering the variety of institutional problems each faces; (5) identifying the various donors and their agendas; (6) exploring cooperative agreements; and (7) determining the overall and individual needs institutions might respond to. Once the scope of needs is explored and the range of interests of each institution established, strategies can be developed to meet those needs.

PART 1: THE RANGE OF THE PROBLEM

Introduction: This report is concerned with the role that various organizations, universities, and research institutes might assume in developing programs to assist nations in the Caribbean Basin. It considers implementation problems each may encounter as it seeks to expand its role in technology transfer and the development of energy programs and policies. The report is neither prescriptive nor proscriptive, but seeks to: (1) map the range of problems; (2) identify the key actors; and (3) consider possible approaches. Given the resource and time constraints on the development of this study, the recommendations.

The text incorporated herein should not be considered exhaustive, but merely as points of departure. Problems of implementation cover a multitude of issues. First, the needs and resources of recipients must be considered. What is the indigenous resource base, the consumption patterns, the development stage of the domestic technical/scientific infrastructure? Each country has unique needs and resources. It's likewise necessary to explore the range of assistance these countries already receive in order to avoid duplication of effort and to provide assistance where it is needed in

the most efficient manner. There appears to be an ongoing proliferation of institutions to address either problems of development in general or the more particular energy issues. One good example of this is the recent creation of the Latin American Energy Development Bank. This report will suggest methods for dealing with such organizations. It's also desirable to consider the types of domestic institutions - be they scientific, technological, economic, social or governmental - and how these can be worked with to provide for these needs. And, because "People will prove to be the dominant single factor in technology transfer," the report will consider the various political, institutional, social, and economic problems and impediments which may exist in Puerto Rico, the Caribbean Basin and the United States. Finally, no effort will be made to evaluate any given technology, except insofar as implementation issues may be affected. Thus, neither general evaluations of the appropriateness of nuclear or fired electrical generation plants, nor arguments in favor of centralized or decentralized systems, will be made. Nor will "appropriate" or "high-tech" technologies be favored one over the other. These are issues which must be decided both by recipients and donors, and are too complex and important to be decided here. The General Problem - The link between energy and development is well known and documented. Though some would

The question of the continuing importance of the link in post-industrial societies is still relevant. However, the need for both "conventional" and "non-conventional" energy growth in developing societies is generally unquestioned. Efforts have been made to estimate energy growth patterns and energy needs of Latin America and of developing countries in general. The general, though not exclusive, conclusion is that demand will continue to increase for both liquid fuels and electricity. Planning for the Caribbean must not only consider local supply and demand patterns and future projections, but also the impact of policies in the West. It has been generally observed that the U.S. energy policy in particular may have serious consequences both for other developed countries and for the developing world.

Developing countries have adopted a variety of strategies to acknowledge this interdependence and to partially decouple from it. Several strategies have been developed to deal with changing energy problems. For example, Brazil has followed a "policy of energy substitution and export promotion," while Venezuela follows an import substitution program. Mexico is said to be following an "ambitious global development plan." Supply substitution and/or demand reduction have been employed to address current problems.

As development proceeds, these strategies may have to give way to conservation and attempts to increase supply. The solutions for these problems will in part follow from global energy issues, but they will also be significantly affected by domestic institutional, economic, and political issues. These issues will follow in part from domestic problems, but they will also contribute to those problems. Many developing countries have turned to the developed world for technology and other assistance. For example, the Tennessee Valley Authority (TVA) model has been exported to as diverse a group of countries as the People's Republic of China and Mexico. Some countries have purchased "high-tech" solutions.

The text could be corrected and rewritten as follows:

Technology, on a turn-key basis, has been adopted by several countries. For instance, Brazil's nuclear power program, which has its roots in Germany, is one such example. India has also

announced that it will accept a Soviet reactor. These high technology strategies, however, have been criticized for being overly complex, too capital intensive, too large, too politically sensitive, or inappropriate for the needs of developing countries.

Often, more decentralized and less technologically sophisticated systems are recommended. These so-called "appropriate" technologies are considered desirable in developing societies because they are easily understood and adopted by a generally unsophisticated population. The recommendations typically encompass simple and inexpensive changes in current practices, ranging from charcoal cooking stoves to design modifications for biogas digesters.

On the other hand, another approach is to find ways to adapt high technology economically and/or politically to developing regions. Brazil, Paraguay, and Argentina, despite their historical antagonisms, have found it possible to cooperate in the development of the hydro-electric potential of the River Parana. Once fully operational, the Itaipu complex will generate 12,600 MW from eighteen turbines.

Similarly, there may be institutional arrangements to make nuclear power both politically and economically feasible in developing countries.

There is also a middle way, one that does not necessarily eschew electricity but seeks to generate electric power and other forms of sustainable energy through decentralized and less complex systems. These systems can be learned by local populations, require far less capital, and allow users to make appropriate use and maintenance decisions.

Not only have three levels of technological sophistication been identified, but three types of technology transfer can also be described. This is the process whereby knowledge and know-how originating in one institutional context is brought to practical demonstration in another.

National settings are adapted for use and applied in another setting. The process may involve (a) the direct transfer without (or with minor) modification; (b) adaptation or modification of a basic process, plant design or product to local conditions, situations, and markets, and (c) the utilization of the know-how as a stepping stone to further creative indigenous or joint advances in the state of the art. What is appropriate in any given national or institutional setting will depend on the ability of the organization to absorb and adapt technology as well as the way in which the technologies are transferred.

A variety of technologies have been proposed, studied, and explored in the literature. Three general approaches have been mentioned above. Two things must be considered before a strategy for the Caribbean is developed. First, the countries of the Caribbean are quite diverse. They range from the Central American states of Costa Rica, El Salvador, Belize, Nicaragua, Guatemala, and Honduras to the relatively large island economies of the Dominican Republic, Haiti, Jamaica, and Trinidad and Tobago, to the microstates of Antigua to St. Lucia.

There is, in sum, no simple "fix" for the Caribbean Basin nations. Thus neither the "high tech," "no-tech," nor the "serious-tech" strategies should be embraced without flexibility. No single strategy is appropriate for the entire region.

Implementation Raises Infrastructure Questions

Let us recognize at the outset that "science and technology" have not rendered politics meaningless, as some nineteenth-century philosophers believed. Thus, the admonition that the solution to the world's problems is to give the engineers a free hand is neither possible nor workable. "People problems" create implementation problems. The National Academy of Sciences observes, for example, that learning to use energy in new forms and new ways may require years—perhaps even a generation or more—to break down the economic, cultural, social, and institutional barriers that impede progress.

"Technical changes in developing countries." Studies of energy cooperation in developed countries suggest that there is a wide range of barriers. They may include a sense of "not invented here," *juste retour*, nationalism, commercial applicability, and other factors. In sum, the idea that "...to meet projected crises, states will eventually cooperate or forfeit the advantages of economic growth and political stability has limited validity. There are problems of technology transfer between developed and developing countries, and these are even more complicated by dependency concerns. Implementation and infrastructure have special relevance for institutional and policy scientists. In simplest terms, does structure dictate function, or does function dictate structure? David Davis, in his examination of U.S. energy policies, concludes the latter. Use and physical characteristics of fuel have, he concludes, had the determining effect on federal policy over the years. The organization itself may have an impact on policy. It has been popularly argued, for example, that the Atomic Energy Commission, because it was both a regulator of the technology as well as its primary promoter, was unable or unwilling to adequately explore reactor defects. Larger political institutions may also contribute. For example, political arrangements in Canada—parliamentary government superimposed on a federal entity, coupled with inadequate representation of energy producers—almost led to political paralysis. Although probably resolved, the crisis could have led to national fracturing. National development policy may also be formulated to reflect open and not so hidden agendas. Program development will have to be sensitive to those possibilities, and hard political decisions may have to be made or precipitated in the process. Institutional science can contribute to the effectiveness of strategy. It can assist in determination of appropriate institutional arrangements and predict with some accuracy the types of...

"Policies and effects generated by that institutional type. It is recognized that there are many difficulties associated with implementation theory. For example, implementation success depends on various decisions; the implementation question dissolves into multiple aspects. These include demand and supply forecasts, their accuracy, and the coordination of programs. There are, likewise, a variety of reasons why there may be deviation from the plan. These include (1) problem disapprovals (2) unanticipated impediments; and (3) authority dissipation and competing interests. Second, the governments of the Caribbean Basin nations are widely diverse. They differ in form, political ideology, culture, language, colonial roots, temperament, and so on. Some are authoritarian, while others are democratic. This is an important distinction, for authoritarian-bureaucratic Latin American regimes tend to depoliticize social and political issues to 'technical' problems, while democratic regimes have a tendency to politicize technical problems to social and political issues. It is inherent in the authoritarian-bureaucratic leadership style that political order be maintained and that issues reach rationalization. Because of this and because most governments quest after permanence, there is a certain reluctance in some regimes to permit the benefits of development programs to reach the poor and needy. There is some theoretical justification for this. Ted Robert Gurr is perhaps the best known exponent of relative deprivation

theory. The absolutely deprived are not likely candidates for revolution because they lack the knowledge, know-how, and desire for change. More importantly, they are 'unaware' of their deprived status. It is only after persons become aware of their relative deprivation status that rebellion becomes possible. Education, communications media, nutrition, health care, public utilities all contribute to the improvement of the population, but they also raise the possibility of increased relative deprivation."

"Deprivation." My purpose in raising this issue is not to counsel against assisting certain developing countries, but to flag these concerns as possible impediments to program development. Some governments may be reluctant to follow plans which appear to have a liberalising effect or which may be perceived to undermine political legitimacy. Where this is the case, special efforts will have to be taken to mitigate those fears. There are other problems and issues which impede national energy planning. The case has been made that problems of energy policy making in the Caribbean are "aggravated by inappropriate policies and institutional constraints," which can take several forms. Ramsey and Shue, for example, examine three infrastructure variables they consider important to the implementation of decentralized new and renewable energy systems in developing countries: "local credit facilities, rural roads and transport, and repair and maintenance facilities." They conclude that the first is a necessary condition; the other two may or may not be important, depending on a number of factors. Another variable is the degree of government participation in the economic and energy sectors. Electric services tend to be government owned. Whether government owned or not, there has been a proliferation of regulatory boards and a general extension of government power since the early 1960s. Some of this results from a dissatisfaction with private sector contributions to development. But it is also linked to increased nationalism and policies to diversify sources of foreign capital. These developments have resulted in institutional overlaps, inefficiencies, and a continuing technical dependence on the developed countries. Finally, there is concern that some countries, particularly the English speaking, lack the necessary planning infrastructure to make decisions at all. This list should be expanded to include centralized and conventional energy systems as well. Clearly one option is to provide Caribbean.

Governments with policy advice aim to develop programs of public administration in energy, and to advise governments on the implications and impacts of policy proposals. Assistance could range from complex computer modeling to the drafting of legislation. We are concerned with infrastructural barriers to rational energy use. We must remain sensitive to technology transfer issues. We must remind ourselves of the interests of the recipient states. Wionezek provides an important distinction: "The developing world considers that technology transfer takes place only when know-how is incorporated into the stock of the available knowledge in such a way that the receiving society can use it for many purposes." He warns that if technology transfer is to be successful, each recipient state must decide which technologies to adapt and how they are to be incorporated into society. These must therefore be local decisions, local responsibilities. To develop these responsibilities, decisions, and skills to carry them through, participants from the receiving state should be made an integral part of any planning, and should participate in program development and delivery. Recipient organizations, to the degree possible and appropriate, should share in the manpower and financial needs and costs of projects, in part to inculcate a sense of importance, but also to develop continuity and cooperation. Research and development concern many developing countries. Alonso suggests that there are four phases to the innovation process: research, development, engineering, and production. Most developing countries profit only at the fourth. In order to develop strategies for technological innovation, to become more sophisticated, several infrastructural questions must be addressed. These are the engineering consulting and

research capacity of the country, informational services, and an adequate financial base. Several other infrastructural variables have been identified. A report prepared for the FEA and ERDA suggests.

The same applies to Alonso and several others. These include:

- (1) "Market demand",
- (2) "National policies, laws, and regulations",
- (3) "Corporate policies",
- (4) "Education",
- (5) "Information availability",
- (6) "Individual personalities and roles."

To this last point, one could add sensitivity to local norms, customs, and practices. The lack of depth in scientific, technical, and planning personnel is another infrastructural impediment to development. By lack of depth in personnel, I do not mean to imply that these people have personality deficiencies or that the depth of their training is insufficient. Rather, what is implied is that there are too few trained people in developing countries, and those who have received appropriate training tend to be found in government and other administrative positions rather than 'at the bench.' Thus, it is not only possible but likely that one will encounter technical personnel whose training has been inadequate for the task they are asked to perform.

Planners, moreover, tend to be slow and deliberate. One observer described Caribbean planners as competent but "still in training." All these factors together will render the decision process slow and at times tedious. Perhaps because of their training and perhaps for other reasons, there also tends to be a preference for highly sophisticated, complex technologies over the more simple, traditional ones. The possession of high technology contributes to a sense of prestige and power, may contribute to energy independence, and enhances a country's perception of scientific and technological development, among other things.

Recommendations, when made for the time-tested technologies, will have to take this "preference" into consideration. Of grave consequence is the tendency to ignore proper maintenance schedules and to follow repair procedures. Particularly as the systems employed become more complex, a sense of the need for routine maintenance will have to be instilled or inculcated in all concerned.

These three concerns, in addition to all...

The text should be corrected as follows:

The others require that any institution seeking to transfer technology to developing regions take them into consideration as it designs its program. Either the technologies being transferred will have to be kept to a minimum of complexity, or proper maintenance and repair will have to be built into the training, hence into the thinking, of those who will have to run them. These lists suggest immediately a number of potential impediments to the development of a cohesive program, but they also suggest a series of strategies. Through a variety of methods (literature review, elite interviews, country visits, etc.), other variables should be identified and examined. Some of these could be tax incentives and disincentives, zoning considerations, foreign and domestic capital investment

regulation, consumption patterns by sector and the potential for innovation, to name but a few.

Thus, one ongoing, long-term effort could be the identification, examination, and cataloguing of infrastructural variables. These, in turn, will serve as important tools in policy development. Data inadequacy is a concern - a number of studies have addressed energy demand and supply. These range from United Nations datasets to far more complex examinations by national and subnational entities. While the number and complexity of studies have increased and improved, data for developing countries, particularly sufficiently complex data of a comparative nature, remain inadequate. These data inefficiencies limit the effectiveness of decision-making and modeling.

One analyst of energy patterns in a small, developing island country finds the development of adequate and standardized statistics to be the sine qua non of energy planning. However, energy data alone are insufficient for policy development. Energy is an element, albeit an important one, of a development strategy. As a consequence, broader information will be required to plan energy usage in the future. For example, industrial and commercial plans in the short, medium, and long term must be entered into the energy planning.

Equations.

One of the more pervasive threads which ran through the interviews I conducted in October 1982 in Washington, D.C. was that energy data in the Caribbean are inadequate. As a first order requirement, methods by which an adequate, standardized data basis for the Caribbean Basin can be developed could be considered.

It might be useful to convene a meeting or series of meetings to explore these issues, to outline data requirements, and to assess the degree of need each country has for them. I am not going to belabor the energy data point by going into long and explicit detail of the types of data required. Suffice it to say that energy consumption, resources, and production data are required.

Moreover, it will be necessary to consider the range of substitutability (of, for example, alcohol for liquid petroleum fuels, or hydro for oil), the opportunity for more efficient use of energy (that is, "conservation"), and the availability of conventional and non-conventional resources. The latter range from idle agricultural land, to biological wastes, to under-utilized hydro potential.

In addition, the conservation value of passive and active architectural design should be considered. Data have their limits. Many discussions of solar and biomass energy alternatives presume the uniform and universal availability of resources, land, manpower, and other needed factors. Even when these factors are taken into consideration, resources may not be accessible.

For example, one study of woody biomass resources concluded that while there may be abundant "total" supply, because of ownership patterns, in circumstances there may be an inadequate exploitable supply. That conclusion was reinforced by the observation that many owners had purchased their property in order to maintain it in its pristine state, that they would vigorously oppose any effort to develop it.

Likewise, the nuclear industry often complains that regulatory regimes in the United States have contributed to a doubling of construction.

"Time of nuclear power plants. Recently, we have seen how other regulatory regimes have effectively hindered the construction of pipelines, landfills, and underscored the importance of other public works. These examples highlight the influence of various political, social, and economic factors in the development of energy policy. It is crucial that we develop an inventory of aggregate energy supply and demand. However, it is also necessary to understand the constraints on that supply and demand. Ignoring ownership patterns, intended uses, and regulatory structures as well as political and economic realities would be inviting failure. An effective development strategy for the Caribbean must include an analysis of these issues. They affect decision-making, the rational use of resources, and the political and economic realities affecting change.

Social impacts and environmental impacts deserve attention. Rural electrification has sometimes been portrayed as the harbinger of democracy in the third world, just as it was for Franklin Roosevelt in the U.S. in the 1930s and 1940s. It would be challenging to argue that these programs have not profoundly impacted the rural South of the United States. However, the argument has been made that rural electrification programs currently proposed for developing countries may have the opposite effect. They could further entrench existing elites and hinder the progress of social justice. These arguments are problematic but worth considering.

The development of energy policies will significantly impact the future. Some analysts adopt explicit and normative positions, while most suggest possible alternatives under varying assumptions. Analysts generally provide us with the implicit assumption that to maintain the status quo, certain scenarios will be required. Some long-term thinking is desirable to establish..."

"Premises from which to act.⁴" Social impact assessments are somewhat mundane but extremely important elements in any development strategy. Before any project is developed, assessments of the impacts of that project should be made.

'The literature on social impact assessments in developing countries is sparse, but nevertheless suggests that there are a number of important positive and negative results. These include increased demand for government and social services, increased employment opportunities, increased alcoholism, and so on. Moreover, project design may play an important role in mitigating negative impacts and in enhancing the positive. Thus, social impact assessments should be offered along with any in-country assistance, not only to help the recipient country but to expand understanding of these impacts and to further refine the methodology.

A policy issue: There is a potentially serious political impediment. Some Caribbean nations and the United States are at odds with one another. It's important to remember that security is an essential element of the Caribbean Basin Initiative; that in fact, security considerations gave rise to it. Cuba, Grenada, and Nicaragua may provide complications to the development of a comprehensive Caribbean energy plan. This is true if a pan-Caribbean presence is sought and if the plan is to be implemented in cooperation with other state actors or multinational international organizations in the area. In light of this, I believe there are essentially three choices.

The first is to address the problem exclusively in the context of the Caribbean Basin Initiative. To do so, however, is to make the program hostage to the political vagaries in Washington and may antagonize various Caribbean Basin governments which might question the underlying altruism of

the CBI. A second, equally unfortunate strategy would be to ignore the opportunities of the CBI, to seek to develop a program at arm's length to Washington. Clearly AID and perhaps the Department of...

Finergy will provide the majority of direct and indirect funding for any efforts in the ore. A third approach is to work closely with Washington as well as all other donors and recipients in the region. In doing so, institutions should develop their own programs, circumscribed by the political and economic realities of the moment. They should be sufficiently flexible to move into areas of opportunity and to work with a fairly wide range of participants. Each should provide services not offered elsewhere. In this fashion, the program can maintain a level of political and economic impartiality, yet remain responsive to policy changes.

PART II: THE KEY ACTORS

Regional and International Actors

There are a large number of actors whose interests must be taken into consideration in the development of a Caribbean strategy. Clearly, the various governments of the Caribbean Basin nations have to be consulted and considered before any strategy can be developed. There are, similarly, a number of other governments of concern. The interests of the United States, Britain, France, and the Netherlands must be considered since each of these countries has a continuing presence in the region. Other governments have shown an increasing interest as well, these include Colombia, Mexico, and Venezuela, three countries with marked regional interests. Canada, too, has shown increased interest, particularly in the Commonwealth Caribbean states.

Of great importance are the international organizations which have either global or regional interest in the Caribbean. Some of these are the more "general" international organizations like the United Nations (UN) or the Organization of American States (OAS). The World Bank has taken an active interest in the region as has the Inter-American Development Bank (IADB) and the Caribbean Development Bank (CDB). CARICOM and OLADE must be taken into consideration through consultation and coordination to ensure cohesive and rational Caribbean Basin energy policies. There

There are other actors of importance which should also be considered. The Brandt Commission and Mexican President José Lopez Portillo have called for the development of international energy centers. At one time, The World Bank sought to expand by developing a special bureaucracy dedicated to energy. The Canadian Prime Minister, Pierre Elliot Trudeau, pledged increased assistance to developing countries, perhaps most eloquently at the UN Conference on New and Renewable Sources of Energy in Nairobi in August 1961. The Organization of Petroleum Exporting Countries (OPEC) has made pledges which deserve consideration. Finally, the private sector in a number of countries as diverse as Japan, Brazil, and Sweden have shown an increasing interest in the development and marketing of technologies appropriate to the Caribbean.

Regional Government. The governments of the Caribbean Basin states are concerned and interested in the development of rational energy policies and programs. Their needs are so diverse and their infrastructures so varied, it is not possible to make sweeping generalizations. The

government of the Dominican Republic, for example, has for some time been actively engaged in the planning process, a process which has resulted in some interesting policy developments. Partially, for this reason, Dominican Republic energy policy and needs have been closely studied and reported. Trinidad and Tobago, a country possessing oil resources, faces problems different from those of Haiti. Martinique and Guadeloupe, because of their ties to France, will perceive their energy needs differently from Costa Rica. We understand these things on a visceral level, but it is essential that a more empirical and objective understanding be developed. Second, there are other governments with a regional interest in the Caribbean. The two most important are Mexico and Venezuela, which have been providing assistance in the form of discounted oil to Caribbean countries. The very nature of their fine gesture restricts the effect of the

"Marketplace on defining energy alternatives. By providing oil below world market prices, there may be less economic incentive to identify policy alternatives. However, given the current problems faced by the Mexican and Venezuelan economies, one should consider the possibility that each government might, in the medium term, withdraw favorable price treatment of oil exported to Caribbean countries. These considerations aside, any comprehensive program in the Caribbean may require some form of coordination with the Mexican and Venezuelan governments, if only to rationalize the use of scarce capital and technical resources. To this end, it would be useful to discuss these issues with the appropriate Mexican and Venezuelan officials in advance of final development of any strategy. In this context, these governments might be approached either to assist in the administration of aid programs or for support for ongoing programs.

Third, other hemisphere governments have shown an interest in the Caribbean. Canadian interests have already been mentioned, but it might prove fruitful to enter into discussions with appropriate officials in the Department of Energy, Mines and Resources and/or with the International Development Research Centre either at its Ottawa headquarters or its Boston office. One student of Canadian policy argues that bilateralism rather than multilateralism will guide aid policy in Latin America in the 1980s. There is an important exception however. Canada will most likely develop important multilateral assistance programs in the Caribbean, particularly for Commonwealth members. At a minimum, one should be familiar with Canadian policies in order to avoid technical or geographic redundancies.

U.S. Interests: The concerns of the United States government will play a very significant role in the development of any strategy. We can consider that President Reagan's February 24, 1982, speech before the Organization of American States sets..."

This administration's Caribbean Basin Initiative is designed to help "our neighbors help themselves." The program contains six policies under the CBI. According to Reagan, these are the points of interest for the development of a CEER strategy:

1. Free trade for Caribbean Basin nations for twelve years
2. Tax incentives for investments
3. A 350 million dollar assistance program
4. Provision for technical assistance and training to help the private sector in investment promotion, export marketing, technology transfer, Peace Corps assistance, and trained individuals, as well as enhanced competition assistance
5. Development of close work with Canada, Mexico, and Venezuela, and encouragement for others

6. Implementation of special measures for Puerto Rico and the U.S. Virgin Islands, so they can play a leading role in the development of the area

The Reagan Administration has expressed a strong interest in the region. As quoted from the President's speech: "Make no mistake, the well-being and security of our neighbors in this region are in our own vital interest."

Thomas O. Enders, Assistant Secretary of State for Inter-American Affairs, has provided further elaboration on the CBI. He argues that "because the peoples of the Caribbean Basin are our neighbors, we cannot turn our backs on their plight. Their troubles are inevitably our troubles." The basis of the CBI is to enhance the security of the region. To do so, he argues, it is necessary to recognise that "security, democracy, and economic development are clearly linked."

Economic development assistance will follow several paths. Among these are assistance to local businesses, U.S. firms, and private voluntary organisations. To meet these goals, Enders calls for development of strategies "to remove impediments to growth including lack of marketing skills, lack of manpower, poor regional transport, and inadequate infrastructure."

Enders also echoes the President's position on a special role for Puerto Rico and the Virgin Islands in the implementation of the CBI.

The Caribbean Basin Initiative, expressed by President Reagan and elaborated by Secretary Enders, provides a framework within which actors can develop their strategies, begin the creation of contacts with regional governments, and others, and establish a sound fiscal basis. The strong emphasis on private sector initiatives suggests that, where possible, programs should be targeted for the domestic private and semi-private sectors. Provision should also be made for education, training, and other programs to provide assistance to these private sector interests.

Programs done in cooperation with Caribbean Basin governments and universities should also contain as much private sector participation as possible. Because energy for energy's sake is not developed in the President's message, it will also be important to underscore the importance of energy for security and economic development. A sound energy system is an infrastructural variable essential to these nations.

Aside from the Caribbean Basin Initiative, there are a wide range of private and public aid granting agencies in the United States. Perhaps best known of all of these is the Agency for International Development (AID), which has funded numerous centers and projects. Despite appearances, there seems to be a general effort by AID to provide assistance to developing countries in a variety of areas, including energy. AID is, in fact, the most important of the U.S. Government agencies now providing such assistance. It does this directly and through a variety of subcontractors.

The list of subcontractors is long and impressive. It includes federal agencies like the Tennessee Valley Authority, trade associations like the National Rural Electric Cooperative, quasi-private organizations like the National Academy of Sciences' Board on Science and Technology for International Development (BOSTID), and private sector groups like the Institute for International Education. AID also funds international organizations. It has, for example, provided the

Organization of American States assistance for the tropical plant resources project. Because of this wide range of interests and client organizations, it will be incumbent on any actor to develop AID funding which is not duplicated through other AID programs to maintain a high level of success. Continuous monitoring of AID programs is therefore recommended to assure that redundancies do not occur and to retain familiarity with current AID priorities and interests. Moreover, it might prove useful to include various AID subcontractors on specific projects. If one were, for example, to undertake a hydroelectric project, it might prove useful to coordinate with the TVR. Finally, it is necessary to bear in mind that while AID can exercise a certain amount of latitude in the assistance it provides, it is nevertheless responsive to policy.

Another agency designed to assist developing countries is the Peace Corps. Expressly mentioned in the President's Caribbean Basin Initiative speech, the Peace Corps engages in a direct, person-to-person form of technology transfer. The Peace Corps is staffed by volunteers; as a consequence, there would be little demand for outside personnel to become directly involved in their in-country programs. However, training of Peace Corps volunteers in energy technologies appropriate for the tropics is a possibility. They, in turn, might transfer that knowledge to people in client countries. Finally, we cannot forget the Department of Energy and its national laboratories. The national laboratories have taken an active interest either in the analysis of energy issues in developing as well as developed countries (Argonne and Brookhaven in particular), but are also actively engaged in a variety of direct assistance programs (Oak Ridge, etc.). DOE, however, appears to be caught in a dilemma and may not yet be at a decision point. There continues to be a question whether the DOE developing country mission aims at assistance for development or for commercialization and...

"Development of U.S. export potential." Recent changes in the Office of the Secretary and the ongoing pledge of the Reagan Administration to dismantle the Department continue to make the DOE mission unclear. Moreover, there appears to be a de-emphasis of the Office of the Assistant Secretary for International Affairs (AS/IA) as well as in the federal support for energy technologies, except nuclear. All of this is not to say that the DOE in general or the Office of the AS/IA should be discounted or discredited. However, it is important to bear in mind that these ambiguities will create uncertainties and possible impediments to the development of a Caribbean energy policy for any organization. Developing close working relationships with the AS/IA, as well as maintaining existing good contacts with DOE, will assist the development of Caribbean interests.

The essential point is that federal, and particularly DOE policies, are in flux. There continues to be some question whether the President's Caribbean Basin Initiative will receive Congressional approval, and if so, what form the Initiative will ultimately take. Moreover, there appears to be some concern in the Caribbean about the usefulness and viability of the concept. To tie all one's hopes to the CBI would be a mistake, but it would be an equally fatal mistake to ignore it. One should attempt to find a middle ground, exploring the interests of recipient states and developing a program consistent with the interests of the donors. It must not be forgotten that the United States Government is, and will likely remain, the single most important source of support for U.S. based actors. Thus, efforts should be formulated within the spirit of the CBI, but the interests and needs of potential recipients should also be taken into account.

Finally, as discussed in the next section, there are also a variety of international governmental and non-governmental organizations interested in energy issues, either specifically in the Caribbean or

more generally.

Caribbean or in developing countries in Latin America in general. It may also be possible to find opportunities to work with these organizations as well.

International organizations: There are a variety of international organizations either directly or indirectly concerned with energy issues in the Caribbean. At least two, UNICEF and the Caribbean Development Bank, have as their primary concern Caribbean issues, but consider energy matters an element of development assistance. The Caribbean Development Bank has, however, considerable funding (\$8.4 million) earmarked for energy development in the region. There are a number of other general development agencies which do not service the Caribbean alone. The best known of these is the World Bank.

Between its creation in 1945 and 1976, the World Bank and its affiliates allocated 19% of their funds for electric systems and oil in developing countries. In July 1977, the World Bank established a five-year plan for mineral resource development. As late as 1981, the World Bank had proposed the establishment of a new bureaucracy, but opposition, primarily by the United States, led to its tabling. The World Bank is now considering a variety of programs in energy, including a regional program for the Caribbean.

The Inter-American Development Bank (IDB) has focused much of its energy efforts in electricity, concentrating mostly in areas of generation, transmission, and distribution. Included in its funding are projects in Barbados (non-conventional, mainly wind), the Dominican Republic (solar), and Jamaica (energy rationalization and solar).

There are a variety of United Nations agencies concerned with energy issues from a variety of perspectives. These include UNESCO, UNIDO, UNDF, FAO, PCI, and the Division of Resources and Energy. With the exception of ECLA, the scope of all these UN bodies is global. Generally, these UN agencies have been concerned with new and renewable sources of energy, as the Nairobi conference in August 1981 underscored. For these reasons, a good working relationship with these organizations is beneficial.

'Appropriate UN agencies could be useful and might lead to some form of cooperative work in the Caribbean. There are a variety of Latin American international actors. These include the Caribbean Development Bank, the Caribbean Commonwealth, UNICA, as well as organizations with either larger geographical or functional mandates. Most important among these are the Organization Of American States, OLADE, and OPANAL.

The OAS has a strong continuing interest, manifested mostly through its Department of Scientific Affairs. OLADE is the Latin American Energy Organization. It has shown much interest in solar and other renewables, perhaps best illustrated in its "Latin American Strategic Plan for the Development of Non-Conventional Energy." OPANAL is a Latin American based organization developed to inhibit and prohibit nuclear weapons proliferation in the region.

Closely associated with the Non-Proliferation Treaty of 1968 and the International Atomic Energy Agency, OPANAL has an interest in nuclear power for electricity generation. Since Caribbean countries are or can become party to the Treaty of Tlatelolco, it is probable that OPANAL will become an even more important actor in the development of a Caribbean nuclear energy policy.

There are also a number of international organizations whose concerns tend not to be in Latin America or the Caribbean. These include the Organization for Economic Cooperation and Development (OECD) and the European Economic Community (EEC). Each organization has pledged funds earmarked for energy (generally electric) projects in developing countries.

The OECD, in addition, through its International Energy Agency, is concerned with energy data and has developed an energy data collection system for developing countries. Finally, the Organization of Petroleum Exporting Countries (OPEC) has shown considerable interest in the problems of developing, energy-importing countries. According to Mureddin Farrag, Managing Director of the Arab Petroleum Investment Corporation, an

The autonomous body of OPEC has developed a long-term strategy to assist non-oil developing countries. It includes:

1. Assured security of oil supplies and priority access to such supplies in times of shortage.
2. Cooperation in financing their oil imports through direct grant-in-aid.
3. Cooperation in financing projects for the development of indigenous sources of energy.
4. Cooperation in direct investments in agriculture, processing, and manufacturing industries.
5. Encouragement of trade in manufactured and semi-manufactured goods and services with the LDCs.
6. Active support for the establishment of an equitable international economic order covering development, trade, aid, and international finance.

Farrag also develops OPEC's philosophy on energy self-sufficiency: A policy of energy self-sufficiency, regardless of costs in terms of money, manpower, and other resources, would be the last thing to encourage the energy deficient LDCs to embark upon. They can ill-afford the pervasive misallocation of the limited resources available to them with which such a policy would saddle them.

This, as well as Farrag's third point, above, are especially interesting, in part because of OPEC's interest in financing the development of indigenous energy in developing countries. It must also be remembered that most Caribbean countries fall well within the group of countries singled out for special interest. Finally, three OPEC countries have a presence in the region, and may therefore have an interest in directing OPEC interest towards it. To this end, OPEC could become a major donor of money as well as technical assistance to the region.

There are a large number of private enterprises in the Caribbean Basin. Because of the emphasis placed on utilization and development of the private sector in the President's Caribbean Basin Initiative speech, it is essential to consider their role and the interface between OPEC and the private sector. The problem of private sector-university cooperation has long been recognized.

The problem of interfacing can be reduced to its essentials: private companies are concerned with profit and the performance of specific, profit-oriented tasks. Universities, on the other hand, have different agendas, dictated by the diverse needs and interests of their faculties. Moreover, university research is usually not motivated by profit considerations. Most research centers are

goal-directed, with much of their activities, falling within widely defined but specific charters, generated through funding. In a sense, these institutions are also concerned with "bottom lines," meeting deadlines, and product delivery. This concern provides common ground between research centers and the private sector. Therefore, research centers can be used to bridge the gap between the academy and the "real world."

As part of a university, some research centers possess positive attributes which a corporate actor may not. These attributes could assist them in bridging another important gap. They would likely be perceived less as a vehicle for exploitation, and through these contacts with regional governments, universities, and local private concerns, they may find it easier to engage in work where multinationals would face difficulties. It might, therefore, be useful to consider ways in which university-based research centers could serve as a conduit for multinational participation in energy development.

One seemingly obvious option would be for these centers to make their facilities available to various companies for testing and development. In this way, they might make significant contributions in the host country, potentially reducing criticisms leveled against subsidiaries of foreign companies. The "branch plant" phenomenon has had an insidious, though often unintentional, impact on domestic scientific and technological capabilities.

To bring research, development, and experimental design (RDED) to the Caribbean would be to contribute to the development of indigenous scientific and technical cadres. These cadres, in turn, are a necessary infrastructural variable for development.

In order to promote development and disseminate energy technologies, it will be necessary to collaborate with local enterprises. Research centers can assist in various ways, from evaluating market potential and projecting market penetration, to providing energy audits for local industry, to training technical personnel. Furthermore, there may be a need to adapt some "off-the-shelf" technology to suit local conditions. Research centers could assist local interests in making these modifications.

One challenge with these suggestions is that they must account for a wide diversity of needs, traditions, and conditions in the Caribbean. It will be necessary to meet with representatives of both multinational and local companies to identify the range of needs and the types of responses appropriate to meet those needs. It might therefore be useful for a research center to convene a meeting of private sector representatives, as well as meet with them at their places of business to better understand those needs and develop a strategy to meet them.

I have recommended elsewhere that a meeting of government, university and private sector interests in the Caribbean Basin be convened to determine the scope of the energy problems in the region, explore solutions, and propose work strategies. Due to our vast information gaps, it might be appropriate to convene a broader meeting before focusing more specific attention on the private sector alone.

The United States is not alone in its concern for, and assistance to, Caribbean basin states. Canada, Colombia, Mexico, Venezuela, and several European countries have had a major presence in the region. There are a large number of interested international governmental and

non-governmental organizations, ranging from the World Bank and the United Nations to CLADE and OPEC. A useful first step could be to catalogue these various programs. This catalogue could be useful in two ways. First, ongoing programs could be identified,

The text can be fixed as follows:

Thus, avoiding redundancies and recognizing needs are important. Secondly, possible sources of funding could be identified and developed. This multiplicity of programs can, in fact, become an impediment to useful program development in the Caribbean. Several donors may knowingly or unknowingly provide similar assistance to a recipient. That assistance may prove to be contradictory or competitive, rendering the impact of the program less effective than it might have been. Moreover, some observers feel that international organizations, because they have their own agendas and needs, find it difficult to communicate or work together. This may confuse the recipient, who may not possess the technical infrastructure to decide among the competing organizations. Furthermore, various international donors may co-opt different departments and agencies of the domestic government, placing one department in competition or conflict with another. This conflict may result in paralysis of the decision process. Finally, because political systems and concerns play a role in establishing technical agendas, it may be equally necessary to provide advice and assistance of a more political nature. Recognition of the variety of international actors in the region may not be enough. There are four strategies which could be followed vis-a-vis these other actors. Firstly, they could be ignored. Secondly, all could engage in information sharing, at a minimum exchanging information on programs. Thirdly, the agencies could coordinate their programs. And fourthly, programs could be, where appropriate, integrated. Clearly, the first two strategies would require little effort. Ignoring other programs may result in duplication of effort, but more probably will result in a significant waste of resources and could contribute not to the solution of energy problems but to their confusion. The second strategy is therefore the minimum acceptable strategy. By developing an adequate program of contacts among donors, it should be possible to rationalize the

Program of donors. Given that resources are limited, redundancy should be avoided. Thus, it may prove possible that while agencies might compete for programs, once established, efforts would be coordinated to avoid redundancies. Finally, the energy problem is of sufficient magnitude that there will often be opportunities for cooperative work among donors. A system should be considered to make this possible, perhaps one comprising all directors who, with their appropriate staffs, would meet periodically to analyze and discuss the scope and dimensions of the problem, resources to meet it, and possible institutional and technical responses. In order to work effectively, to develop a strong fiscal basis, and to recognize and offer solutions for the many pervasive problems in the region, it will be necessary to coordinate, cooperate, and at times work closely with and/or for these other actors. Failure to do so may very well constitute an important impediment to the development of a comprehensive, workable program.

PART III: POSSIBLE STRATEGIES

Introduction:

The following section contains recommendations specifically designed for the Center for Energy and Environment Research of the University of Puerto Rico. There are numerous ways to provide

assistance to Caribbean Basin nations. In this section, we consider some of those options and the impediments which may be encountered. An assessment of the appropriateness of different strategies is also made, based largely on the practicability of those options. This section is not intended to be an exhaustive examination of possibilities. Instead, it should be considered a brief exploration of those options and an evaluation of some of the problems and possibilities associated with them. In addition, several policy options are considered in other portions of the report. As a consequence, they may not be treated in this section. The ensuing discussion is divided into two parts: 1) Energy Training Center, a concept to be created in Puerto Rico; and 2)

Outreach: An examination of in-country projects. Energy Training Center.

One role the CER could assume is to provide appropriate technical training at a variety of sites in Puerto Rico. Puerto Rico is particularly suitable for this as there are at least seven different tropical climates, ranging from the rainforest to the arid. Likewise, there is a diversity of soils, permitting training and experimental agricultural applications in a variety of methods and techniques. A training center could provide a variety of educational, information, and assistance services. It could (1) educate professionals, (2) teach the latest innovations to working professionals, and (3) disseminate technical information.

Educate Professionals

One effective mechanism for technology transfer is to educate the nationals of developing countries at various educational institutions and universities. Undergraduate, graduate, and post-graduate training in the natural sciences, social sciences, and engineering have been provided to a large number of these students by many universities, including the University of Puerto Rico. CEER should endorse these activities and provide space where appropriate. However, it would be inappropriate for CEER to undertake the professional education of scientists and engineers. Any increased effort Puerto Rico might wish to assume should find its locus in the appropriate academic departments of the University.

Aside from these considerations, CEER, as a DOE national laboratory, is part of a program coordinated by Oak Ridge Associated Universities to place American scientists and engineers in a laboratory environment. A similar set of opportunities could be extended to professionals from developing countries.

Innovation

There are already several programs which train engineers and other professionals in the latest technological developments. Among these are the many universities in the United States and the University of Puerto Rico. At the same time, AID, through the Institute for... [text cuts off]

International Education (ITE) and similar organizations have provided additional and specialized training for individuals from developing countries. Thus, ITE's role is to place individuals in industries, national laboratories (including CRER, where appropriate), and universities to receive the specialized training they seek. While CEER and other Puerto Rican institutions should provide a basis for these individuals when their needs match the institutions' capabilities, there is little likelihood that CEER could or should find adequate U.S. government backing to provide the extensive curriculum necessary either for the nationals of Caribbean Basin countries or in general.

However, CEER should provide resources to ATD fellows and others where appropriate.

Technical Training: Rather than providing basic education or sophisticated specialized training, CEER could provide practical training at the technical level in a wide range of energy skills. These could range from small head hydro repair to windmill construction. Because of the special tropical attributes of Puerto Rico, this training could be tailored to the various conditions found in the Caribbean Basin. The Assistant Secretary of Energy for International Affairs recently stated that DOE believes that efforts to educate scientists and engineers, as well as to provide specialized training, are already adequate. That sense of adequacy does not extend to technical training. The office of the AS/IA might therefore be willing to entertain a proposal to establish such a center.

Given the already extensive efforts to provide assistance and DOE's expressed interest in a technical training center, CEER would be well served to consider the option and to prepare a proposal for the same. Once funded, implementation of the Center should prove to be relatively easy. Equipment would have to be purchased, instructors found, and so on. However, CEER should be able to use the Rio Piedras and Mayagüez campuses of UPR as mixed, class, and technical sites.

Its own facilities across the island, A tentative curriculum, sufficiently flexible to respond to current needs and capable of being expanded, should be developed fairly quickly.

The experimental station, CHER, should also consider the establishment of a demonstration and experimentation center for various energy technologies. Perhaps modeled after the various international agricultural research institutes, CER would provide a unique tropical island environment in which to test and develop energy technologies appropriate to those environments. There is already expressed interest in demonstration, ranging from the aborted Kort Bank effort to the expressed desires of Mexican President López Portillo in 1979, the more recent endorsement by the Brandt Commission for a similar idea, to the concern of the Canadian Government. It might therefore be possible to identify a broad basis of political and financial support to establish such a research site. This could be made even more compelling by expanding the CEER focus beyond the Caribbean to other tropical island states. Thus, CEER could undertake research appropriate in the Pacific and the Indian Oceans as well. Members from the U.S. Trust Territories in the Pacific, as well as from Sri Lanka, Indonesia, the Seychelles, and Mauritius might benefit from a comprehensive experimental station.

Center for Science and Technology

Much interest was expressed for a Center for Science and Technology at the CEER twenty-fifth anniversary seminar in November 1982. The idea is a good one and deserves consideration. Several questions must be answered. First, should this materialize, what would be the role of CEER and its present programs? What of future programs? Are there other existing UPR programs it might conflict with, and how can those programs be incorporated under a new institutional umbrella? If established, how important would energy and environmental issues be considered? Moreover, if established, how would CEER staff interact with that of a new center? Would

Should the center be enveloped in it, would it provide the central seed of organization, or would it

become but an appendage of a larger organization? Before serious planning proceeds, these and similar questions must be answered or the potential for strain, disagreement, and intramural in-fighting could be great. It should nevertheless be possible to begin planning with the larger context in mind.

5. Technical Information

The center could serve as a central library for collection of technical and scientific studies focusing on energy and environmental issues in the Caribbean. It might, for example, be possible to tie in with the National Technical Information Center (NTIC) network and disseminate information from that channel. At least two significant problems might be encountered.

First, the Reagan Administration, already sensitive to technology transfer issues, might object. While much of the information is already in the public domain, some portions of the information contained in the NTIC network are embargoed and not. It is possible, moreover, that the transfer to foreign nationals might be restricted. However, the NTIC system does not contain programs to discriminate between embargoed and non-embargoed information.

The second problem is similar, but concerns private sector proprietary information. The direct transfer of proprietary information could expose the center to potential lawsuits and other sanctions. It might also be perceived as direct competition with American private sector efforts to locate markets in the Caribbean, efforts consistent with the Caribbean Basin Initiative.

A decision will have to be made as to the extent of the technical library. At minimum, the center might want to develop a comprehensive collection of technical information appropriate for the Caribbean. It might also wish to expand that collection to other areas and technologies, for these may be found to have either direct or indirect application in the area to be served.

It seems clear that such a technical library is necessary in order to

Outreach CEER could provide several programs to assist Caribbean Basin nations. These include: (1) establishment of an energy audit program: (2) an energy extension service: (3) a conference system: (4) policy solution: (5) social impact analysis; (6) environmental impact analysis; (7) data collection and evaluation and (8) other consulting. Energy audits CEER could assist Caribbean Basin nation governments and representatives of private concerns either with energy audit methodologies, or it could engage in in-country energy audits. The methodology is known and has been developed for developing countries.

Energy Extension Service CEER could assist in the development of an energy extension. An appropriate model could be the Agricultural Extension Service in the United States, administered by the many land-grant universities including the Mayaguez campus of UPR. Agents stationed at universities or other institutions could have available technologies appropriate for the region. They could assist locals in the use of these technologies. Energy extension would

The text operates on the principle of emulation. Various methods would be presented to people by

others, which could then be adopted. The training of energy extension agents could be the responsibility of CEER, which could also monitor their successes. This program could also be incorporated into the community. The success of these methods would be noted in technical training, a concept discussed in the preceding section.

Conferences at CEER could develop a series of workshops, traveling exhibits, and other means to educate and provide technical information and assistance to the people of the Caribbean Basin. This might be done in a variety of ways. CEER could publish a handbook series aimed at diverse audiences. The use of videotapes, teleconferencing, and other innovative technologies using state-of-the-art methods could make an outreach program even more effective.

A policy evaluation program could be developed along two main lines. The first would be to provide policy assistance based on experiences elsewhere. Second, CEER could assist governments in determining the impact of their policies on energy issues. Through careful monitoring, meaningful and useful recommendations could be given to various governments on the range of options open to them in establishing an energy policy.

To do these things, it would be necessary to create a policy library and engage in in-depth and long-term research into the policy process and energy. This library could be an essential part of the technical library discussed in the previous section.

Impact Analysis of the social impact of development has been conducted. Methodologies have been developed and tested in industrialized countries, and some attempts have been made to extend them to developing countries. As has already been discussed, the range of potential dislocations can be large. The revolution in energy technology is a discipline undergoing transition and may be an extreme example of the social impact of development. Other examples are more mundane.

Examples such as increased demand for social services, police, fire protection, educational facilities, public works, and so on, are all concerns that governments have and need to anticipate.

Environmental Impact Analysis: Environmental degradation is an issue of growing concern for developing countries. Caribbean Basin governments could be offered assistance in assessing the environmental impacts of energy and other developments.

Data Collection and Analysis: Detailed energy data collection and analysis is a relatively new discipline. These data are essential to the planning process. It is essential that information be collected that is useful in making national energy decisions and for policy making. Policy makers must be aware of the range of trade-offs and impacts a decision may have. Surveys must, therefore, be flexible and specific for the community in which they are to be administered. Because of its experience in the Caribbean, CER should be able to assume an important role in data collection and analysis for the region.

This list is by no means a complete catalogue of possible outreach programs. Others should be considered and developed. As outreach programs are developed, planners should keep in mind the diversity of problems and intricacy in the Caribbean and gear programs to need.

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