REPORT OF RECONNAISSANCE TEAM'S ASSESSMENT OF THE NEAR-TERM ROLE OF THE NATIONAL ENERGY UNIT

USAID

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PREFACE

The Government of Guyana requested USAID to provide a consultant team to advise the newly created National Energy Authority (NEA) on its structure, staff and operational responsibility. As a first step, USAID's Office of Energy in Washington arranged a reconnaissance visit to identify more fully the areas in which USAID could help. The team, which was in Guyana March 22-April 1, was composed of:

Dr. Jerome J. Bosken, Deputy Director, Office of Energy
Dr. Eric D. K. Melby, Energy Planner, Office of Energy
Dr. Harold E. Klein, Department of Management, Temple University

The team worked closely with the Ministry of Energy and Natural Resources and with the National Energy Unit (NEU) in particular. The team received full cooperation from the many Guyanese officials and representatives that were met. The team is especially indebted to the following for their assistance during the visit:

Hon. Hubert Jack - Minister of Energy and Natural Resources
Mr. Bernard Crawford - Director, National Energy Authority
Mr. Abel Felix - Consultant, National Energy Unit
Ms. Karen Eversley - National Energy Unit

The team met with representatives of several other governmental agencies and of various corporations and made field visits to facilities of GUYSUCO*, GUYMINE and the Guyanese Rice Board. A complete listing of persons contacted and a schedule of the team's activities are given in Appendix B. From these contacts the team was impressed by the deep appreciation that all had of the urgency of the energy problem and by the consensus for the establishment of an effective organization to give guidance and direction to necessary governmental action in the energy area.

The team believes its observations are sound. It recognizes, however, that its reconnaissance, while intensive, was too short to develop the data and analysis required for an unqualified report. Further work will demonstrate where certain conclusions or recommendations need to be reconsidered and modified. The team also wishes to acknowledge that it probably made no bold, new discoveries. The insights and understanding set forth in the report are already a part of the knowledge of several persons in Guyana. However, the team hopes that the expertise and experience of its members made possible the preparation of a coherent approach to Guyana's next steps and that, where differences of opinion exist, the report serves a useful purpose in focusing attention on important issues.

*See Appendix C for a complete listing of acronyms used in this report.

I. Findings, Conclusions and Recommendations

This section summarizes the results of the team's visit to Guyana. The team has synthesized the many observations, impressions and considered judgements into this report which, in part, simply presents again what is widely known about the energy situation in Guyana. It is trusted however that, by incorporating the knowledge and experience of approaches that other countries are using to solve their energy problems, the report will prove useful to the Government and the people of Guyana as they evolve their own solution to their own particular situation.

A. Findings

The Government of Guyana and public and private officials have recognized the criticality of the energy problem, the need to reduce the nation's dependence upon imported oil, and the importance of moving expeditiously to exploit the potential of its own vast energy resources, including biomass and hydropower.

The Government of Guyana recognizes the need for a central body to formulate energy policy, coordinate the energy activities of various donor countries, be a central reference point for energy data and analysis and handle other responsibilities related to the energy sector.

The National Energy Unit (NEU) is a prudent step toward the creation of the appropriate central body. Further work is required to define responsibilities and organize the nation's approach to energy. The National Energy Unit needs to be strengthened; NEU staff needs to be expanded and a wider range of expertise is required. This additional staff and expertise can be a part of a permanent unit or available to it on a temporary contractual or other basis.

Conservation activities already initiated are reasonable and are yielding good results. Conservation programs can be intensified and new and effective ways of monitoring conservation efforts can be developed.

Guyana's approach to the development of alternative technologies is realistic in terms of its capacity and given its resource endowment which points to hydropower as the major route to reducing oil imports. The division of labor between NEU and the Institute of Applied Science and Technology of the University of Guyana is an example of good coordination and efficient use of resources. Because of the possibility of delays in moving to hydropower and because other energy sources in addition to hydropower will be required, it is essential that the development of alternative technologies be sustained and made a part of a coherent national energy plan.

B. Conclusions

Exploitation of the nation's hydropower offers the best route to reducing Guyana's dependence on imported oil. Thus, over the next few years, as Guyana moves from an energy regime dominated by imported oil to an energy structure where hydropower replaces oil as the nation's electric power source, Guyana's policy, institutional and organizational approach to energy must be flexible. It must facilitate transition, encourage adaptation, and promote the adoption of policies, activities and institutional arrangements to secure the best allocation of resources and an optimum energy regime.

The production of energy from Guyana's forests has great potential. Fortunately, Guyana's forests are renewable. Guyana should avoid the error of many other countries, including a few of the major developed ones, by developing policies and programs which protect against waste and the permanent loss of this considerable natural resource.

Although work on alternative energy sources will have relatively modest impact on the energy sector in the near future in Guyana, alternatives to hydropower and oil will have a growing role and increasing influence in the long run. By the 1990's, Guyana's energy matrix should reflect success in reducing its dependence on imported oil and a diversity of energy sources which should provide the country with opportunities to rely on the energy sector as a productive contributor to the nation's growth and development.

The team found wide recognition that the present status of electricity generation and distribution in Guyana requires improvement. Because of the significance of this system to the country's growth and to the quality of life, it is important that the government develop a program for remedial action as promptly as possible. Such a program should include consideration of how the Guyana Electricity Corporation (GEC) should fit into the government's evolving organizational approach to energy, how and by whom GEC should be monitored, and other matters relating to the objective of achieving an effective electric utility.

A number of issues remain to be sorted out in the area of organizational roles and responsibilities. Should the proposed National Energy Authority be created? When? With what powers and duties? Should the NEA or the NEU have regulatory and/or operational responsibilities? What are the roles of GEC and GUYSTAC? It is suggested that the following considerations should be taken into account when decisions in this area are undertaken:

(a) It is important to assure that no conflict of interest occurs when defining agency responsibilities; for example, a regulatory body should not have operating responsibilities in the sector to be regulated;

(b) There should be a reasonable marriage between tasks and duties on the one hand and staff capacity on the other;

(c) Because of the transitional and evolving nature of Guyana's energy situation, care should be taken to provide for flexibility in whatever institutional or other steps are taken; to reduce instability and minimize costly shifts and changes in organizational direction, permanent rearrangements should be avoided unless it is certain that they will be valid for at least two years.

The importance of increasing NEU's capacity to perform its present assigned functions and to undertaken any new essential responsibilities is so great that urgent attention should promptly be given to alternative methods of achieving this objective. This might include the employment of expatriate individuals or firms to perform a variety of staff functions, including studies and analyses.

C. Recommendations

1. The energy sector is effected by and impinges upon many elements of the national economy. Trade-offs among national objectives are sometimes involved; interests and pressures need to be harmonized; priorities have to be established. To assist in dealing with these important and complex matters, a National Energy Advisory Committee should be established. This committee should include representatives from the various government organizations concerned with energy, and representatives of the private sector and of the research community. The Ministry of Energy and Natural Resources should chair the Committee. The Committee would consider and advise the government on energy policy issues, a national energy plan, and on ways to inform and motivate the nation with respect to energy questions - for example, the need for conservation.

2. Within the government, an Inter-Agency Energy Committee, possibly functioning as a sub-committee of the Cabinet, should be formed. This Committee, chaired by the Minister of Energy and Natural Resources, will prepare for Cabinet decision major matters affecting the energy sector such as the national energy plan, energy policy, energy budget (including investment in the sector), organization of the government with respect to energy, energy legislation, Guyana's relations with other countries on energy issues, and so on. The State Planning Commission (SPC) should be represented on this Committee and it may be useful for the SPC representative to serve as Vice-Chairman.

3. The National Energy Unit would liaise with and provide staff support to the National Energy Advisory Committee. Staff for the Inter-Agency Energy Committee would be drawn chiefly from the NEU and SPC, and possibly, from other government units. This staff would be supervised by the Director of the NEU.

4. The Government of Guyana should engage the services of one or more consultants to assist the NEU in its efforts to establish itself. These consultants would help the NEU to:

(a) Establish an effective data gathering system on energy production and consumption;

(b) Develop an energy balance for the country;

(c) Design and install an energy planning process;

(d) Identify NEU's staff requirements, including the need for recruitment, training and outside consultants;

(e) Establish a system for acquiring information on energy programs in other countries, with emphasis on conservation and alternative energy technologies;

(f) Establish procedures to coordinate Guyana's involvement in regional programs such as those of CARICOM and the Caribbean Development Bank and,

(g) Develop operations and management systems for the NEU in line with its present and planned responsibilities.

II. Understanding the Guyanese Situation

A. The Energy Sector

In many respects Guyana differs from most developing countries. Although complete data are unavailable, national energy use is dominated by conventional fuels with firewood and charcoal for cooking and subsistence activities making only a small contribution. The overall population density of the country is low. The population itself is heavily concentrated with the majority of the people living within twenty-five miles of the coast. The interior of the country, densely forested with the exception of the Rupununi Savannahs, is sparsely populated. Over a third of the country's population (which was estimated to be 820,000 in 1978) live in the three principal cities - Georgetown, New Amsterdam and Linden. The geographic concentration has eased general electrification and an estimated seventy-four percent of all households are electrified. Untapped energy resources of significant potential include hydropower, forestry and other biomass as well as direct solar radiation. The combination of resource base, energy use patterns and relatively small population offers fortunate prospects of successfully coping with the energy problem in the long run.

Currently, Guyana's energy needs are satisfied mainly by imported petroleum. Oil imports in 1979 were five million barrels, a level similar to 1978. However, the fuel bill rose from $66.7 million in 1978 to $153 million in 1980 (estimate). Petroleum needs are determined by a limited number of users: Two users consume 75% of all imports (GUYMINE with 50% and the Guyana Electricity Corporation with 25%); the transportation sector requires 11% and all other users combined need only 14% of the total oil imports.

Renewable resources also meet a significant portion of the nation's energy needs, although the total energy value of these resources (or the barrel-of-oil-equivalent) has not been determined. Bagasse is used extensively in the sugar industry to generate electricity and process heat. Rice chaff formerly was used to generate steam and electricity but currently all chaff is burned unproductively. Waste wood from timber operations is burned off, although the IDB is planning a project to use waste wood in electricity generation. The use of other non-commercial fuels such as charcoal, firewood or dung and the domestic use of agricultural waste are poorly documented but believed to be very minor.

Hydropower represents Guyana's largest potential energy resource. A survey in 1976 by Montreal Engineering Company estimated a potential of 7600 MW of hydropower existed. Although economics and technical issues would determine how much of the power can be used productively, the potential is vastly in excess of existing electrical power demand (estimated to be less than 200 MW).

A key element in Guyana's energy future is the intent to exploit hydropower on a large scale. The principal proposal is for a large scale development (up to 1000 MW) of the Upper Mazaruni. The Government continues its extensive discussions with the World Bank and other financial institutions on this project, which involves the financing and construction of an aluminum smelter in addition to the power production and transmission facilities. The situation is best described as evolving and dynamic, with important decisions being made every few weeks. Alternatives to this proposal involve exploiting small hydro sites (in the 100-150 MW range) without building the smelter or undertaking the Upper Mazaruni project in phases. Regardless of which approach is taken, hydropower is clearly Guyana's best avenue to reducing its dependence on imported oil. Any serious exploitation of hydropower will not only change radically the energy supply situation, it will become the major determinant of energy policy. Institutional arrangements for exploiting hydropower will affect the Ministry of Energy and Natural Resources, the Guyana Electricity Corporation (GEC) and major electricity consumers such as GUYSUCO and GUYMINES. The analysis and recommedations in this report are made without benefit of which hydro development will be selected. As any project will take five to seven years to come on stream, there is a need to deal now with the institutions and policies necessary for the transition to a full utilization of hydropower potential. The institutions and policies may continue to be appropriate, with modifications, in the late 1980's. However, we cannot be confident of this and counsel flexibility to ensure any necessary adaption.

For today, as well as for the future, electricity generation is a crucial issue of the energy sector. The Guyana Electricity Corporation (GEC) is the prime producer and distributor of electricity, relying on imported oil to fuel its generators. Its customers include industrial, commercial and residential users. The usage of electrical power by the various customer classes is as follows:

Class	Number of Customers	Portion of Total Power Consumed
General Residential	66,000	29%
Enhanced Residential	15,000	19%
Commerce and Light Industry	3,300	26%
Heavy Industry	80	26%

(Figures refer to December 1979)

GEC operates six separate power systems, with ten separate generation sites and a total of 20 separate generating units. The total installed capacity is 110 MW. Because of long term maintenance and repair efforts currently underway, the actual generating capacity is 75 MW to be compared to a peak electricity demand of 27 MW. These numbers, totals for the entire corporation, should not be construed to imply that there is sufficient reserve capacity in individual systems to assure continuous electric power when individual generating units are shut down for maintenance. In fact the individual systems generally do not have the appropriate mix of equipment generally desired by power system planners who prefer that no single unit provide more than 15-20% of the total system need.

In addition to GEC, electricity is generated by GUYMINE and GUYSUCO. GUYMINE uses imported petroleum to produce its own power with enough surplus to provide power to GEC. GUYSUCO produces its own power from bagasse and, at times, imported petroleum. It does not currently produce a surplus that could be sold to GEC however.

A number of other enterprises as well as isolated operations like timber mills, mining works and ranches generate their own electricity.

Several organizations are involved with the import of petroleum. GUYMINE and GEC purchase petroleum products on a contractual basis directly from the Trinidad-Tobago Oil Company (TRINTOC). The fisheries industry also purchases fuel directly from available sources.

For general use, local affiliates of Exxon, Shell and Texaco service the domestic industrial, commercial and consumer markets. Exxon accounts for 40% of imports, Shell and Texaco each account for 25%. The State-owned Guyana Oil Company (GUYOIL) provides less than 10% of petroleum products. GUYSUCO and Guyana Rice Board are large customers of these companies with GEC and GUYMINE (for some of their needs) as other important purchasers.

There has been some local work undertaken in alternative energy sources, primarily at the Institute of Applied Science and Technology. Although this work will provide energy sources and technologies to meet selected needs, it will have little impact on national energy needs in the near future. As global development of renewable energy resources and technology continues however, one can expect that such resources will have a growing role and increasing influence on the national energy picture.

B. Governmental Decision-Making Process

The organization of the national government is expected to be changed in the near future when the new Constitution is made effective. The current national government structure, organized administratively along British lines, will be replaced by an Executive Branch lead by an Executive President.

While significant changes will result in some areas of governmental operations, it is unlikely that major alterations will be made in the way that economic activities are carried out. The discussion below represents the governmental decision-making process at the time of the team's visit. Certain details of the process will need to be modified when the new executive structure is instituted, but the basic character of the process will probably not change.

In the current governmental organization, although there is an Office of the President, decision-making authority and responsibility reside with the Prime Minister, his Cabinet, a one-house Parliament, the Ministries and State-controlled corporations. Through the Ministries and State-controlled corporations all major economic activities are carried out. The Ministries are organized internally along British lines (e.g., each has a permanent secretary, minister of state and parliamentary secretary). In addition, the recently-created State Planning Commission (SPC) acts as a highly important adjunct to the Cabinet.

Important decision-making and policy formulation tend to be highly centralized at the Prime Minister and the Cabinet levels with staff support provided by the Secretariat of the State Planning Commission (the SPC itself is comprised of Cabinet officials and other senior public servants). However, policy implementation and operating control tends to be pluralized among the important State-owned corporations and within various ministries. The Guyana decision-making structure is still evolving. The State Planning Commission was created in 1978 and is still defining is role. Some ministries, such as Agriculture, have a reasonably clear administrative structure and role; others are still in the process of establishing their formal structural arrangements. The Ministry of Energy and Natural Resources falls in the latter category.

The administrative structure and decision-making systems of the State-owned corporations are reasonably well-established and of longer duration, being something of a continuation of the administrative structure of companies that were nationalized after independence. The major State-owned corporations that both generate and consume most of the country's energy operate relatively independently from an administrative standpoint. The key companies in this category are the Guyana Electricity Corporation (GEC), Guyana Mines Corporation (GUYMINE), Guyana Sugar Corporation (GUYSUCO) and the Guyana Rice Board (GRB). GUYSUCO and the GRB are

under the jurisdiction of the Ministry of Agriculture; GEC and GUYMINE are the formal responsibility of the Ministry of Energy and Natural Resources.

Strategic direction and managerial control of these State-owned corporations are not uniform. Both GEC and the Guyana Rice Board also come under the administrative responsibility of the Guyana State Corporation (GUYSTAC) which exercise administrative and financial control over forty-six publicly-owned enterprises in all sectors. GUYSTAC usually does not involve itself with the internal operations of its component companies; rather it monitors financial performance and sets administrative policies that apply to all its companies (e.g., personnel policies, health practices, retirement, etc.). GUYSTAC companies need GUYSTAC approval for any extension in their scope of activities.

Although GUYMINE technically reports to the Ministry of Energy and Natural Resources and GUYSUCO reports to the Ministry of Agriculture, it is through the mechanisms of the SPC that critical review and control of State-owned enterprise takes place. The financial performance of both State companies must be reported to the SPC quarterly. Capital expenditure and major policy alterations are considered by the SPC through the annual budgeting process. All prospective company overdrafts (i.e., deficit spending) must first be approved by the monitoring subcommittee of the SPC. The monitoring subcommittee is composed of the Ministers of Finance, Economic Development and Trade, the Deputy Prime Minister and other senior public officials. In actual practice, it is the SPC Secretariat that performs the analyses that are submitted for review to the monitoring subcommittee. The Secretariat is headed by a professional economist, Carl Greenidge, Chief Planning Officer.

The degree of operating control exerted by the various Ministries differs considerably due to the differences in their functions and sectoral responsibility, differences in capabilities and informal influence structures. Ministry influences over the State-owned companies, however, are not limited by their formal relationship. Each company has a Board of Directors which invariably includes the appropriate Minister or his representatives, other Ministers, adjuncts of the Office of the Prime Minister and other public officials. As each usually serves on more than one board, in effect these corporations have interlocking Boards of Directors. These arrangements appear to facilitiate lateral communications among the Ministries as well as the independent State corporations. Thus, any intracorporate or even intraministerial decision or policy change passes through several reviews by a variety of public and corporate officials. These reviews take place within the Board, in the respective ministry, at the Cabinet and by the SPC. The final administrative sanction for any major course of action is provided by the Cabinet. Figure 1 shows the interrelationships among the key administrative units discussed above.

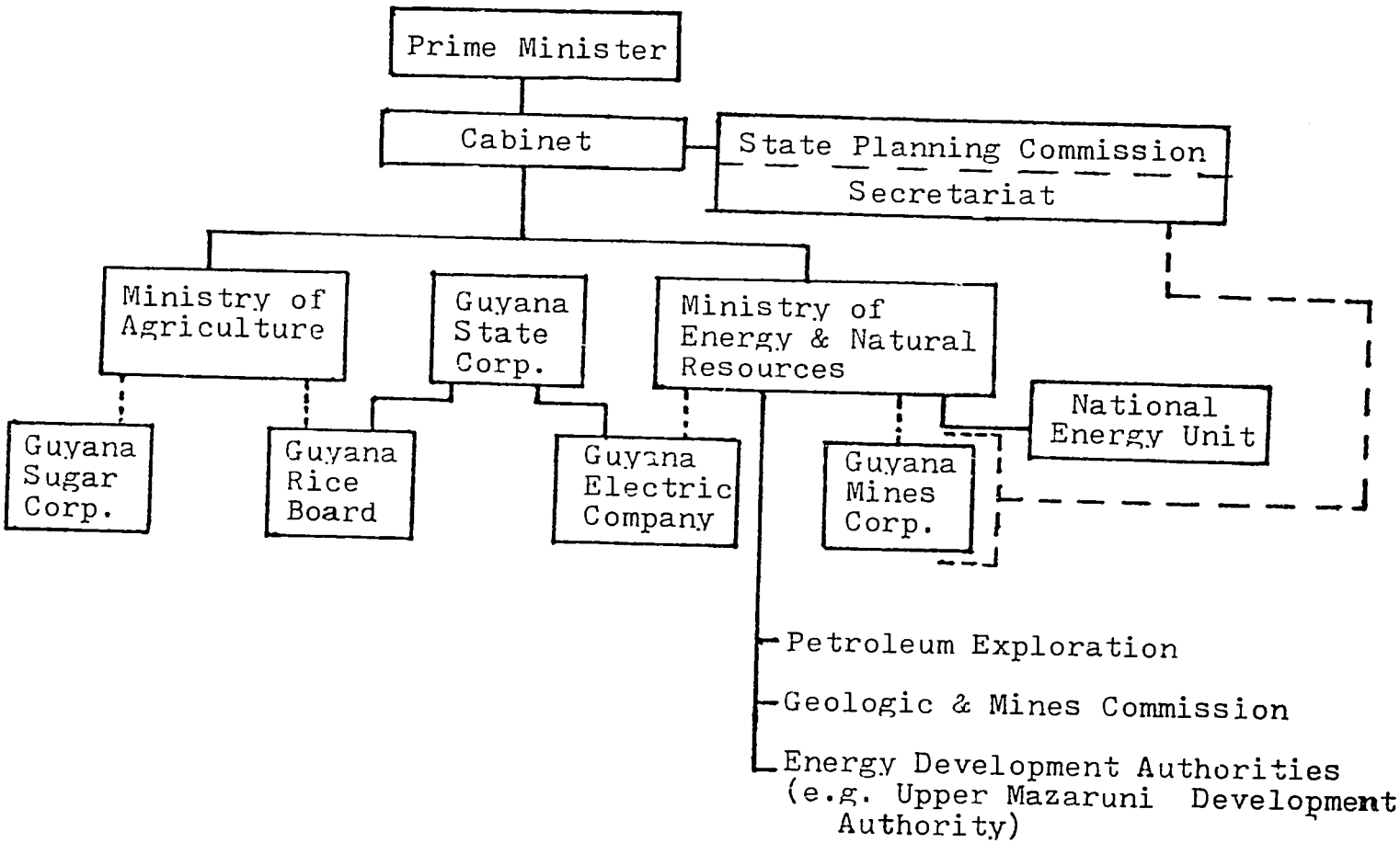

FIGURE 1

INTERRELATIONSHIPS AMONG KEY ADMINISTRATIVE UNITS

Importation of petroleum products is monitored and regulated by the Government's Ministry of Trade. Oil product pricing also comes under its domain. Currently the oil companies are limiting oil deliveries to 1978 restrictions. The Government presumably could impose its own oil import restrictions, as it does with most other goods. In sum, virtually all aspects of decision-making concerning energy generation and consumption is currently within the Government's domain.

Any major changes in energy use policies or actions that would require significant capital investment would trigger policy review and control mechanisms that would not affect these companies under ordinary operating circumstance. The SPC could be expected to play a significant role in assessing such prospective capital expenditures. Where competing demands for capital investment were the case, the SPC and subsequently the Cabinet would probably make final decisions. However, there is no current attempt to consider energy as a separate issue, making allocations among the sectors or within sectors concerning energy use priorities. SPC officials have stated that they do not have any particular energy policies nor is there any current interest in dictating such policies directly to the State-owned companies. The SPC looks to the newly created NEU to provide guidance and recommendations in this area.

In addition to the high degree of formal lateral relationships among these administrative units, informal information flow and consultation appears to be very good. This is facilitated by the movement of administrators and technical personnel both among the State companies as well as between these and the various ministries. The central administrative units of all levels of government as well as the corporations are in Georgetown, further improving communication.

C. Organization of the Ministry of Energy and Natural Resources

The Ministry of Energy and Natural Resources is essentially a technical ministry. The Ministry's primary roles appear to be in

(1) providing policy direction in the area of natural resources development and energy,

(2) providing various support services for these areas,

(3) developing and maintaining the area's infrastructure, and

(4) data gathering and analysis of energy and natural resource-related matters.

The Ministry has some implementation responsibilities, particularly in energy generation through its development authorities, if the latter become operational.

Thus far, no domestic or off-shore oil reserves have been identified, all petroleum products being imported from abroad. The Ministry supervises and coordinates petroleum exploration activities conducted by foreign companies through licensing agreements, but does not have technical capabilities to perform these functions itself. The Ministry's Geologic and Mines Commission also supervises a limited gold-mining activity carried out through a number of small operations scattered through the interior (all use alluvial mining techniques).

Any energy development projects or authorities currently appear to be under the Ministry's direction. The most notable of these in terms of its prospects is the Upper Mazaruni Development Authority. Other potential hydroelectric power development presumably will also be coordinated through this Ministry. Wood, the other major domestic fuel source, is also the Ministry's responsibility. A recently-launched lumber operation, the Upper Demerara Forestry project is under the Ministry's control. The project will generate electric power for its operations by burning wood. However, it is contemplated that responsibility for forestry will be transferred to the Ministry of Agriculture.

The Ministry of Energy and Natural Resources is not rigidly organized; its operational procedures are rather fluid with personnel shifted to various jobs as required. This reflects the still evolving role of the Ministry and the changing energy situation in the country. The essential units of the Ministry and the interrelationships among the Ministry and other key administrative bodies are depicted in Figure 1.

D. Status of the New National Energy Unit (NEU)

The National Energy Unit has existed since July 1979. The unit was proposed in a memorandum from the Minister of Energy and Natural Resources, Mr. Hubert Jack, dated 8 June 1979, and issued by the Cabinet. This memorandum proposed enabling legislation that would create formally the Guyana National Energy Authority reporting to the Minister of Energy and Natural Resources. A broad range of powers and responsibilities were envisaged originally for the proposed authority. As stated in the memorandum these included:

(1) liaison with the State Planning Commission and other State agencies concerned with energy policy;

(2) a variety of energy gathering activities concerned with energy factor inputs, supply and demand;

(3) preparation of reports for various energy-interested State agencies;

(4) identification of and enforcement of technical performance and standard specifications;

(5) promulgation of import regulations;

(6) specification of and financing research and/or alternative energy sources, setting prices and other incentive mechanisms to encourage conformance to energy policy; and

(7) inspection authority to assure compliance with energy-related regulations.

The memorandum states that these responsibilities would be phased in as the authority became equipped professionally to fulfill its role. A more recent paper issued by the National Energy Unit in January 1980, "Prospects for Energy Management in Guyana during 1980 (and Beyond)", underscored the difficulties the NEU has had in undertaking its role. Limited benchmark data on importation and actual fuel use, the limited technial capability within the unit and poor prospects for obtaining qualified personnel domestically were noted. In addition, the paper raised the question of the appropriate role of a National Energy Authority with respect to policy formulation and implementation.

The current staff of the NEU totals eight, with six professionals and two administrative assistants. Two people are detailed to the NEU from other agencies. The professional staff is as follows:

- Head of Unit - Mr. Bernard Crawford
- Consultant Engineer - Mr. Abel Felix
- Statistician - Ms. Karen Eversely
- Information Officer - Mr. Dundis
- Technical Officer - Mr. Rogers
- Planning Engineer - Mr. Keith Richards

III. Review and Assessment of the Current Situation

A. Current Activities of the NEU

Data Collection

As of March 1980, the NEU has been occupied primarily with data gathering on all aspects of the energy issue, focusing on the critical limitations of petroleum supply and its utilization in the country. NEU personnel appear to have made contact with all major energy-producing and consuming organizations in the country. All have been requested to provide energy-related information. Although responses have not been uniform, much data had come into the NEU - and the unit has become the nation's major repository for such data.

Both formal and informal requests have been made for energy use data from major users and suppliers. The oil importing companies (Texaco, Exxon, Shell and GUYOIL) were sent a data collection form requesting information on the imports, sales and storage on a monthly basis. Other data were requested on a weekly basis. For the most part, these data requests have been honored.

The major industrial consumers of petroleum are themselves direct importers. GUYMINE and GEC both buy their fuel oil from Trinidad-Tobago Oil Company (TRINTOC). These State corporations, however, have not been as forthcoming in providing timely data on the various oil products consumed. However, there appears to be sufficient data on hand to assembly a benchmark data base on imports and aggregate sales by type of petroleum product of the last six months of 1979.

Conservation

The NEU has begun to encourage conservation. The unit has an on-going program to alert the public to the critical energy situation. Gasoline retailing on weekends has been prohibited. Through meetings and directives aimed primarily at the major consumers of energy, an effort was made to convince these entities to cut energy use five percent during the last four months of 1979. Benchmark data for a comparison period was not available; thus, the degree to which this conservation effort has been successful is not known. Both GUYMINE and GUYSUCO appear to monitor energy use very closely and indicate their serious intent to reduce energy consumption while maintaining industrial output. Based upon results of similar efforts in similar enterprises in other countries, these two goals can be met and energy efficiency can be signficantly improved.

Alternative Technology Development

The NEU and the Institute of Applied Sciences and Technology of the University of Guyana have reached tentative agreement on the types of activities appropriate to each organization. The Institute will concentrate on developing, testing and demonstrating

alternative energy technologies such as solar water heaters, crop dryers, wind electricity generators, biogas digesters and charcoal. The focus of this work will be on small-scale, rural applications, removed from existing electricity sources. It will stress innovation and experimentation rather than large-scale application of proven technology.

B. Ability and Response of Other Organizations Visited

The team met with a large number of people representing a variety of Guyanese institutions. In all cases the critical nature of the energy problem was clearly perceived. Coupled to this however was a concern about economic productivity and development and a strongly held position that reducing energy consumption should be done in such a way that productivity is not adversely affected. The representatives were aware of the need to manage more efficiently the energy usage in their own organizations as well as in the nation as a whole.

They recognize the need of a central energy unit that would serve as a central source of energy data and statistics and that would monitor national and agency energy use. They were not clear however as to its full role and function. In order to assist this unit to fulfill the basic role of monitoring the energy picture, they are eager to provide necessary information. The various agencies keep detailed records to serve their needs and are able to respond to necessary information requests for NEU needs. These requests must be properly structured to avoid assemblying, transmitting and analyzing quantities of irrelevant data. This issue was of particular importance to the various oil companies which stress their desire to work with the NEU but also their concern about providing unnecessary and useless data.

Through field trips to three sites - the bauxite mine at Linden, LBI sugar estate and the rice mill at Burma - the team was impressed by the ability of these industries to monitor their operations in order to determine energy usage, relate it to desired level of productivity and, through internal operational decisions, implement appropriate conservation practices.

The Institute of Applied Sciences and Technolcgy likewise appeared qualified to undertake the necessary technology research and development that will be needed as Guyana seeks long-term alternatives to imported oil.

C. Assessment of the Situation

There are essential differences between "energy" as a sector and, for example, "agriculture" as a sector. One can easily describe the agriculture sector in terms of its products and develop appropriate policies, regulations and operational systems to assure an appropriate level of productivity in the agricultural sector. One can measure agricultural productivity directly, objectively and consistently.

In contrast to this situation, energy is both an economic product itself (for energy producing nations) and - more importantly - an input into other economic and social activities. Energy is produced, consumed and conserved. Alternative approaches to generating and using energy can have significant impact on the character of a nation's socio-economic system and on the progress of a nation's development efforts. Energy issues include financial, technical, social and economic considerations.

Even in a sector such as agriculture, formulating a simple goal like increasing sugar production can raise important issues extraneous to the sector itself. In the complex field of energy however, the interconnections among various sectors assure that an energy goal, such as reduced energy consumption, will conflict with an essential goal of another sector - such as increased agricultural productivity or improved social services.

This linking of energy to almost all human activity requires that a nation develop a national energy policy that takes account of the complete dependence of a nation's growth on energy availability. It precludes, moreoever, treating energy as a single sector with all responsibility concerning energy given to a single individual or organization.

The Government of Guyana has recognized the need for some concerted effort with respect to energy. The country is wholly dependent on imported crude oil as its primary energy source. At the same time, the country has abundant potential for exchanging this dependence for reliance on domestically-produced alternative energy sources, namely wood-based products, and hydroelectric generation. There is great exploitation potential for both in Guyana.

The Government has formally stated its commitment to a large magnitude hydroelectric generating facility on the Upper Mazaruni River - and the development authority to foster this potential project is already established. However, the manner in which such an effort should be integrated into the total energy sector and its organizational relationship to the existing GEC and the State corporations that are the major consumers of energy have been explored only in preliminary fashion. Such hydroelectric generating capacity is at best seven to ten years away from realization. Smaller scale hydroelectric and alternative energy generation may be practical in the nearer term.

As of yet however, the administrative and policy infrastructure for organizing and implementing a large-scale energy development program does not exist. A number of activities have been suggested for the proposed National Energy Authority, ranging from relatively passive data gathering functions to regulatory functions marked by a high degree of interventionism. Independent of the ultimate role such an authority might have, the NEA's role will need to evolve over time as the financial and investment decisons are made concerning the Upper Mazaruni project. This role should reflect the clear and important differences among essential governmental activities in policy development, regulatory responsibility and operations.

In this regard, one must realize that "energy" is a much broader field than electric power. Important as electric power is to a nation's progress, it is only one part of the total national energy needs. In the case of Guyana, although the future structure of the nation's energy organizations will be strongly influenced by the decisions on hydroelectric generation and electricity distribution, this cannot be the sole determining factor.

It is widely recognized that the present status of electricity generation and distribution in Guyana demands improvement. The need for an effective electric utility, the lack of public confidence in GEC and the numerous ongoing and proposed activities of extra-national organizations that relate to GEC all argue for a disinterested monitoring of GEC by an effective outside body.

Four general areas of prospective activities can be identified for an appropriate national energy organization:

(1) information data gathering and monitoring,

(2) objective setting and policy guidance,

(3) coordination, and

(4) control.

Each is discussed below.

(1) Data Gathering and Monitoring

Energy use in Guyana is highly concentrated, mostly within the industrial sector. Household consumption is modest, limited to lighting and basic household appliances. Households with large electrical appliances (e.g., refrigerators, washing machines, etc.) are roughly 20 percent of the country total. Energy production similarly is concentrated among the State corporations which produce for their own use and one utility, GEC, supplying electrical power to the rest of the economy. Four companies import and distribute all petroleum products.

This concentration at all levels facilitates data gathering and the establishment of an information data base. Large amounts of data are available, enough to construct an adequate benchmark information data base for policy planning purposes. The data are available with a minimum amount of effort to determine cross-sectionally for a six-month or year period aggregate import and use of oil products by type of product and their respective allocations by State corporation and sector; energy generation by sector and subsector and major State corporations; and energy production by each major producer. It is possible to produce an energy balance for the country.

The NEU has the capability to collect relevant energy. Periodic data collections from, at most, twenty units would easily account for more than 90 percent of energy generation and use. Data collection should not be complicated nor time consuming.

(2) Objective Setting and Policy Guidance

The Cabinet's initiative in setting up a National Energy Authority is indicative of its interest in rational energy policies. A number of issues and options confront the Government in the energy areas, virtually all of which involve the Government's top-level decision-making apparatus (as opposed to intraministerial decisions within the Ministry of Energy and Natural Resources itself). The current policy of the SPC as voiced by its chief planning officer is to decentralize energy-related decision-making to the sectoral and sub-sectoral level. Energy policies relevant to the operations of individual State companies and activities in, for example, agriculture or mining will be formulated in the respective ministries. However, any major policy change of capital investment would need review by the SPC and ultimate approval of the Cabinet.

There is a recognized need, however, to assess realistically the prospects for energy conservation and production. Such an assessment needs to be done on a centralized basis and is an appropriate task for the National Energy Unit.

There is also a need for a central unit to assess the energy implications of proposed developments and projects in the various ministries. Decision-makers need to know the energy requirements of proposed industrial projects, agricultural programs and social programs.

Once a comprehensive data base is established that provides a benchmark against which to measure future performance, energy goal setting becomes realistic. This implies capability to forecast energy demand, production and consumption. These are appropriate near term tasks for the energy unit and any contemplated national energy authority.

A capable forecasting activity is crucial to alternative energy policy analysis. Given the current structure of the Government, it is unlikely that the NEU or a superceding Authority would have policy making and objective setting for energy matters vested solely in itself. The unit can play a significant role - one that is not currently accomplished - in examining the implications of various energy strategies and providing forecasts of energy-related factors reflecting these respective policy alternatives. As noted in the unit's own memorandum of January 1980, the degree to which its analyses would be taken seriously by the SPC and the Cabinet will depend upon the unit's technical competence.

The process of objective setting and policy guidance should be based on strategic planning concepts. The separate expectations of major non-governmental and of governmental interests should be

considered, the data base should be analyzed and the strengths and weaknesses of the various agencies/bodies/organizations should be evaluated. The result of the review would be the development of a master energy strategy - the mission, purposes, objectives and policies of a Guyana energy plan - and program strategies for the various energy sector.

The major interest groups whose expectations need to be considered include the general public, the financial and business community, governmental development agencies, educational and research institutions, international investors and donor agencies. An analysis of the data base would include examination of past requirements, the current situation and forecasts for the furture. Evaluation of the strengths and weaknesses would include a review of legislative inducements and restrictions, investment needs and opportunities, manpower requirements and availability.

The result of this process would be a master strategy articulating the interrelationships among the various sectors involved in energy planning, production consumption and operations and setting goals and priorities in the various sectors. Flowing from the master strategy would be program strategies for each of the sectors. The definition of specific operational plans in each sector to meet the strategic objectives would be achieved subsequently and would be essentially the responsibility of the separate operational agencies.

These strategic objectives and policies would need to be evaluated periodically and updated as required by this review.

The process of strategic energy planning involves - ultimately - the entire political process because energy consumption and production is so closely entwined with all national activity. Nevertheless, the formulation and articulation of plans to be considered require a discrete organization with specific skills. The National Energy Authority, properly staffed, would be the appropriate organization for this responsibility.

(3) Coordination

The proposed National Energy Authority can play a vital role in coordinating the various energy generation development activities. From a technical standpoint, prospective energy generation projects independent of the GEC need to be reconciled and linked to the latter where relevant. A UNDP/World Bank sponsored study of hydroelectric power prospects for Guyana recognized the need for a coordinating agency.

Although a national power authority was considered as one approach, the study prepared by Montreal Engineering Company recommended that energy sector planning be placed with GEC with licensing and regulation in the Ministry of Energy and Natural Resources. In their recommendation, the Board of Directors of GEC would be expanded, presumably to include representation of a variety of national interests

not there already. The Canadian study further recommended that any large-scale hydroelectric power development take place initially as a project under a River Development Authority until the power generating unit was operational. At that point, GEC would take over operating responsibility for generation and transmission. GEC would be removed from GUYSTAC's administrative control and the Ministry of Energy and Natural Resources would be given this responsibility.

If the Ministry were to be charged with exercising administrative and financial control over GEC at this time, it is clear that a change in the organization and operation of the Ministry would be required. However, there is a clear need for some ministerial technical oversight function with respect to GEC. GUYSTAC officials cannot and do not want to assume this responsibility. The question is where to locate such responsibility organizationally within the Ministry of Energy and Natural Resources. This technical oversight function would not entail operational control of GEC, rather it would be of a regulatory nature and include objective evaluations of GEC operations. This function has been suggested for the prospective National Energy Authority. However, the extent to which the NEA assumes this role should be determined by the need to kep regulatory responsibilities separate from operational responsibilities. The NEA should certainly advise on organizational, monitoring and control issues in the electric power sector and propose solutions to the central questions. However its direct involvement in this sector should not detract from its national responsibility of planning, policy making and coordinating in energy matters.

The examination of alternative energy sources, particularly fuels derived from wood, is currently taking place at the Institute of Applied Sciences & Technology (partly funded by UNDP). The proposed NEA can help coordinate these alternative energy programs. There should be some central unit that assesses the implications of alternative approaches to energy self-sufficiency, minimizes duplication of effort and assures the government of a consistent development effort. The NEA should be in a position to identify prospective alternatives that have not yet been investigated and for which research and development ought to take place.

The NEA should also coordinate Guyana's involvement in regional programs such as those of CARICOM and the CDB.

(4) Control

There are some reasonably clear alternatives with respect to structuring control over the energy sector. One alternative, as proposed in the Canadian study, handles the electric power sector by centralizing electricity generation operations in the GEC which in turn would report solely to the Ministry of Energy and Natural Resources; regulation and licensing responsibilities and authority would reside in the Ministry. It is unclear as to just where in the Ministry this authority would reside. The currently amorphous nature of the Ministry

clearly indicates that a formal unit would need to be established which would have such regulatory and licensing authority. Additionally, an administrative unit would need to have formal responsibility for supervising GEC (in place of GUYSTAC). While both regulatory and supervising units could be the same, such dual responsibility probably is not desirable. Rather, the public interest would usually be better served by a balance of power between separate regulatory and supervisiory bodies.

Any extended administrative and planning responsibilities for GEC is itself problematic. Confidence in the company's management is low throughout the country and at all levels of government. It might be doing a disservice to their current efforts in electricity planning to add the burden of total sector energy planning.

Administrative control over GEC would necessitate a business-oriented staff capability that is very different from the current capabilities profiled for the NEU. Direct involvement in GEC operations would, in addition, require so many technical expert/technicians that their numbers would detract from the overall planning role of the NEU.

Regulatory responsbility would be easier for the NEA to assume than more operational duties, would be more appropriate to the existing planning and policy elements of the NEU, would require a smaller staff, would permit more focused and disciplined activities and would be more compatible with the existing capabilities of the unit than more direct involvement. As noted above however, the degree of NEA responsibility in this area should respect the need to address the national energy sector (as opposed to just the electric power sector), the need to conduct planning, develop policy and effect coordination (as opposed to exercising operational control) and the desire to locate regulatory and operational responsbilities in any sector in separate bodies to best serve the public interest.

If any major hydroelectric develoment project is undertaken, it will most likely operate as a self-contained, independent unit, typical of internationally-funded capital projects. Which administrative unit is to have operating control over generating capacity is one that need not be addressed immediately. There is a clear need, however, for an administrative unit that will reconsile the national energy meeds with the independent energy projects which are sure to come about during the next few years. This further bolsters the need for a strong coordintion activity within the Ministry - a role that could be fulfilled by the NEA.

IV. Recommendations

The functional role and responsibilities of the National Energy Authority will need to evolve over the next few years. Notwithstanding the latitude of the mandate received by the NEA, the practical current limitations of the unit's staff personnel constrain the near term scope of its activities. Furthermore, the planning and decision-making process of the Government of Guyana itself is evolving. The Ministry of Energy and Natural Resources can be expected to become more formalized with respect to its internal structure, requiring alterations to hard and detailed prescriptions for the NEA's role. Because of the above uncertainties - but reinforced by the difficulty of combining policy/regulatory responsibilities with operational duties in the same organization - the team recommends that the role of the National Energy Authority be one of national planning and priority setting. Operational responsibilities, particularly in specific sub-sectors such as electricity generation, will serve to detract the NEA from this larger purpose. As further decisions are made on organizational structures required for control and operational responsibilities in the energy sector, the Ministry of Energy and Natural Resources in particular, and the Government of Guyana in general, will have to create the necessary agencies to implement these decisions and will have to assure the proper interrelationships between these agencies and the National Energy Authority.

The current National Energy Unit can be expected to play an important role in this process and in particular in three of the four areas mentioned above - data gathering and monitoring, objective setting and policy guidance and coordination. Some tasks can and should be performed by the unit during the next six months to one year. Other tasks and functions can be assumed by the authority as its mandate becomes more formalized and its position and role recognized. Added technical capabilities will be necessary to assure competent execution of its role.

A. National Energy Plan

The first goal of the National Energy Unit should be to develop a national energy plan. This plan should be a long range (or strategic) plan, identifying the directions in which the nation should go, indicating the areas in which more detailed information is needed and outlining the roles and responsibilities of the various organizations that will be involved in furthering the Government's energy policy. This plan should not be a detailed implementation plan, rather it should define the types of more detailed action plans that will need to follow. An acceptable national energy plan should be completed in at least two years, preferably one year. To achieve this goal

the current National Energy Unit should undertake the tasks outlined in Table 1 below. These tasks fall into three areas:

(a) data collection and monitoring,

(b) objective setting and policy guidance, and

(c) coordination.

The proposed near term tasks should be completed within two years at which time the national energy plan should be available. The longer term tasks should be completed within two to five years. The completion of these tasks will require significant upgrading of the abilities of the National Energy Unit. The task schedule for both and near and longer periods assumes the availability of foreign technical assistance in the form of a resident adviser and various consultants to assist in the performance of these tasks.

For the near and longer term, tasks are indicated for all areas except control. It is not anticipated that the currently comprised National Energy Unit will engaged in any control activities during the next years. The ultimate governmental role in the management of energy generating activities will depend upon the structure of the Ministry of Energy and Natural Resources and its subunits. As one or more hydroelectric generation development projects become reality, the issue of reporting responsibility will be manifest and, undoubtedly, confronted by the Ministry and the Government. This current study can only suggest that, given the current and prospective limitations on resources of the NEA and for the reasons suggested above, longer term control activities of the NEA lie in the area of regulation as opposed to direct operating control.

The National Energy unit will need to be strengthened significantly to be able to undertake the activities presented in Table 1. The current staff does not have the breadth and depth of experience to conduct the wide range of tasks recommended for Near Term action. The Longer Term tasks will require even added skills. The question of staff skills and requirements is discussed below.

TABLE 1

Recommended Activity Schedule for the
Proposed Guyana National Energy Authority

Responsibility: Data Gathering and Monitoring

Near Term:

1. Establish cross-sectional data base for:
   - fuel importation, by product
   - energy generation, by organization unit
   - energy use, by unit, bysector and subsector, by function (e.g, transportation, industrial, household)
2. Establish monitoring system, with necessary data collection instruments
3. Produce national energy balance
4. Identify further studies needed to refine data and improve energy balance

Longer Term:

1. Establish early warning system for perspective energy use:
   - assess major industrial and other demands
   - collect energy data on anticipated economic and industrial development

Responsibility: Objective Setting and Policy Guidance

Near Term:

1. Forecast energy demand by sector and major economic activities
2. Forecast power generating capacity
3. Establish benchmark (baseline) energy usage data by appropriate category
4. Propose short term energy conservation goals
5. Conduct initial national energy analyses on behalf of the Cabinet
6. Prepare analysis of manpower needs and capabilities. Prepare manpower training program

Longer Term:

1. Analyze development policy from energy perspective
2. Analyze implications of alternative policies for energy production/utilization.
3. Assess impact of perspective energy-generating projects
4. Recommend alternative energy policies and projects
5. Propose long term energy production and usage goals
6. Establish priorities for energy conservation
7. Measure effectiveness of conservation efforts and sector and subsector performance.
8. Review legislative issues relating to energy
9. Establish priorities for energy research and technology development

Respondibiity: Coordination

Near Term:

1. Maintain central file of all energy developmental activity
2. Inform relevant organizations of other development activity that complements or contradicts their respective activity
3. Indicate possible direction for activities of appropriate agencies
4. Report on a periodic basis to the Cabinet on the status of energy development and conservation activities
5. Assist in the establishment of recommended energy committees - National Energy Advisory Committee and Inter-Agency Energy Committee (see below)
6. Advise on institutional roles in formulating and implementing national energy plan

Longer Term:

1. Monitor energy generation projects
2. Recommend appropriate role/organizational structure for management, monitoring, technical and financial oversight of GEC
3. Establish technical and administrative links among energy generating projects and organizations
4. Review progress of other agencies in developing inputs to national energy plan and in implementing plan once developed and approved
5. Provide staff to and liason with energy committees recommended below

B. Establishment of Energy Committees

The nation needs a coherent national energy policy, a realizable energy plan and effective energy programs. Energy pervades the economic and social fabric of a country. It is simply too important and too complex to be the responsibility of a single organization. Just as the Government of Guyana, as a government, needs to establish overall national policies, the entire Government needs to be involved with establishing national energy policies. In addition, representatives of the private sector and of the research community should have a voice in addressing the energy problems and choices facing the country.

To achieve the objectives of broad representation in national energy discussions and of comprehensive governmental involvement in energy decisions, we recommend the establishment of two related committees: a National Energy Advisory Committee and an Inter-Agency Energy Committee.

The National Energy Advisory Committee should include representatives from the various government organizations concerned with energy and representatives of the private sector and of the reseach community. The Ministry of Energy and Natural Resources should chair the committee. The Committee would consider and advise the government on energy policy issues, a national energy plan, and on ways to inform and motivate the nation with respect to energy questions - for example, the need for conservation.

Within the government, an Inter-Agency Energy Committee, possibly functioning as a sub-committee of the Cabinet, should be formed. This Committee chaired by the Ministry of Energy and Natural Resources, would prepare for Cabinet decision major matters affecting the energy sector such as the national energy plan, energy policy, energy budget (including investment in the energy sector), organization of the government with respect to energy, energy legislation, Guyana's relations with other countries on energy issues, and so on. The State Planning Commission should be represented on the Committee and it may be useful for the SPC representative to serve as Vice-Chairman. Other members might include appropriate representatives of the Ministries of Agriculture, Economic Development, Education, Finance, Regional Development, Trade and Works and representatives of GUYSTAC and GEC.

The National Energy Unit would liaise with and provide staff and support to the National Energy Advisory Committee. Staff for the Inter-Agency Energy Committee would be drawn chiefly from the NEU and SPC and possibly from other government units. This staff would be supervised by the Director of the NEU.

C. Relationship to the Institute of Applied Sciences and Technology

There are fundamental differences between governmental action programs and scientific research and technology development programs. In simple terms, the government official has the responsibility to deliver goods and services to the people. His success is measured by a low percentage of program failures; he is a pragmatic applier of proven approaches. On the other hand, scientific research and technology development efforts are measured in different terms - what has been learned, what is technically possible. In almost all cases close government management of basic research and technology development efforts is detrimental to the innovation, experimentation and adaptation needed to produce and prove technological systems for the future. Nevertheless government funded research should be controlled by national policy and plans.

The existing relationship between the NEU and the Institute of Applied Sciences and Technology appears to be a healthful one, respecting the different goals of the two organizations and the different technical skills of their staffs. This relationship should be formalized. The Institute of Applied Sciences and Technology should have the responsibility for the efforts needed to develop and prove a wide range of new technologies and for testing these in field applications. This work should proceed under the policy guidance of the NEU and should conform to the requirements of the national energy plan (when prepared). Large scale programs to apply proven technologies should be administered by the appropriate action Ministries with the technical support from the Institute when such technologies are sufficiently proven that they can be confidently utilized.

The Institute should also have the prime responsibility for developing appropriate technical training programs to train the technicians needed in the area of renewable energy. The actual implementation of technician training programs would be done in coordination with the Ministry of Education and the several technical institutes.

D. Relationship to Guyana Electricity Corporation

Ultimately, the relationship of the NEU to GEC will be determined by the development of the country's hydroelectric power potential. If the Upper Mazaruni project proceeds as proposed, then a possible organizational arrangement would be a single body which would have responsibility for development of the hydroelectric system and would exercise administrative, financial and technical control over GEC. GEC would have operational responsibility for generation, transmission and distribution of the power. There are other alternatives however and the final decision would depend on many factors that are still evolving. The resolution of this question must be an important part of the indepth analyses required for the financing decision.

However, it is clear that there is a serious current demand for a disinterested outside body to exercise some technical oversight of GEC. Without doubt this body must be in the Ministry of Energy and Natural Resources.

Its role would include a review of GEC sector planning efforts; coordination of the efforts of various international donors with respect to GEC; investigation and evaluation of critical aspects of GEC operations such as equipment maintenance schedules and training requirements of operators; recommendations as to improvements in the technical operations of GEC; liaison with foreign consultants working with GEC, such as the deputy General Manager that the U.K. ODA anticipates providing or the maintenance engineers currently assisting GEC; and leadership of ad-hoc examinations of GEC operaions that demand special public scrutiny.

This relationship would assure that GEC's sector planning is coordinated with the overall national energy planning process and the electricity requirements of economic development plans, could assist in restoring public confidence in GEC and could help to improve the operations
of GEC.

The NEA should play a part in this area. However, it is not clear that the NEA is the best body to effect this oversight function. As is clear from the rest of the report, the team strongly recommends that the NEA be primarily a planning, policy development and coordination agency. Its operational control should be minimized to assure maximum effectiveness regarding the other areas. Its regulatory role should not become so sector (electric power) specific as to detract from its broader perspective. At this stage of evolution of the government's energy structure, the NEA should certainly be involved with evaluating and recommending appropriate organizational roles and responsibilities in the area of oversight and control of GEC. The progress of events will dictate later the extent to which the NEA should become more actively involved in exercising such oversight and control.

E. Staffing Requirements for the National Energy Authority

The recommended task schedule given in Table 1 above suggests the need for a small, tightly knit staff for the National Energy Authority. Fewer than fifteen individuals in total should be required by the NEA during the next three to four years. The proposed activity schedule for the NEA was in fact designed with a limited staff size in mind. Both the study team as well as NEU personnel concurred in the belief that amassing a qualified staff even of limited size would be very difficulty. The two technical personnel of the NEU have been seconded to the unit from other posts. One is still exmployed actively by the GEC.

In addition to the Director of the NEU, seven types of personnel are needed.

(a) an electrical or power engineer,

(b) an economist with energy planning skills,

(c) a financial analyst with capital budgeting and cost/benefit analysis capability,

(b) a statistician,

(e) a general technology specialist, with a background in physical science or engineering, and

(f) a planning specialist, with a background in management science or business administration,

(g) an executive assistant responsible for management and operational issues.

Given the range of tasks to be performed, these individuals will need to be broad-gauged as opposed to being narrow specialists.

This staff would need to draw upon the help of external consultants and advisers to conduct studies and assist in the broad range of duties of the NEA.

During the next year or two, the NEU or the proposed Authority would be considered adequately staffed if it had one individual with each of the first five specialties in addition to its director and appropriate supporting personnel (e.g., administrative assistants, secretaries, etc.). The tasks listed in Table 1 for near term performance by the Authority could be performed by this core staff. This staff would be a minimum cadre of full-time personnel. Their capabilities would need to be augmented by extensive use of qualified external consultants and advisers, seconded personnel and contracted studies and analyses. The scope of the necessary activities precludes their accomplishment through the efforts of a small staff alone, no matter how highly skilled such a staff might be.

For performance of longer term tasks, further depth in these specialty areas and the addition of the planning specialist and the executive assistant would be required. If in addition, the Authority takes on full-scale regulatory responsibilities for electrical power generation, its staff may have to be increased substantially. This contingency, however, would not be encountered realistically for at least several years.

The current number of personnel of the NEU seems adequate for the near term needs of the proposed Authority - if they are available on a full-time basis and provided with extensive technial support. This support should take the form of both consultant/ advisers working with the unit and additional training for unit personnel.

F. Next Steps for the NEU

To assist the NEU establish itself as a competent analytic and monitoring organization, the team recommends that the Government of Guyana engage the services of one or more energy consul- tants. These consultants, working with the Director and staff of the NEU, would help the NEU on the following:

(a) establish an effective data gathering system on energy production and consumption;

(b) develop an energy balance for he country,

(c) design and install an energy planning process,

(d) identify NEU's staff requirements including the need for recruitment, training and outside consultants;

(e) acquiring necessary information on energy programs in other countries, with emphasis on conservation and alternative energy technologies;

(f) establish procedures to coordinate Guyana's involvement in regional programs such as those of CARICOM and the CDB; and

(g) develop operations and management systems for NEU in line with its present and planned responsibilities.

USAID is prepared to help the NEU secure the consultant services. It is expected that these services could be completed in four-to-six months.

The NEU should prepare analytical reports on energy demands of the major industries (bauxite, sugar, rice) and work with these industries to disseminate available information on improved energy efficiency.

APPENDIX A

World Bank (IBRD)

The major energy project the World Bank is considering is the Upper Mazaruni hydroelectric project. The dam site can provide power up to 2800 MW, although discussions are centering on a 750-1050 MW plant. The Government proposes to build an aluminum smelter in conjunction with the project. The World Bank is discussing the entire project concept with the Government. Initial steps are likely to be a load study to determine the size of the plant, with and without a smelter. Estimated electrical demand (wihtout a smelter) by 1987 is 325 MW. Electrical power currently costs 60 mill/Kwh. The World Bank estimates that a 750 MW, even operating at 1/2 capacity could produce power at 35 mills/Kwh.

This project is the major activity on the energy scene in Guyana. If agreement is reached by 1981, it will be 5 to 7 years before it comes on stream.

In January 1980, the World Bank sent a team to Guyana to look at oil and gas potential. Areas for donor assistance appear to be a review of existing geological and geophysical data and indentification of data gaps; geological and geophysical surveys; and technical education of geologists and petroleum personnel.

Inter-American Development Bank (IDB)

The main energy project the IDB is considering for Guyana is a $7 million loan for a 5 MW plant using waste wood to generate electricity. The plant would be built by Guyana Timbers Limited, a Government-owned corporation. Sufficient electricity would be produced for plant operations and for possible sale to the Guyana Electricity Corporation. The first stage in the project is a $250,000 feasibility study.

The feasibility study should be of great interest to other timber operators in Guyana. The Courantyn Saw Millers Association operates 12 mills. In 1979, $2 million was spent for diesel fuel, while waste wood was burnt in open air. This association would like to use its waste wood productively.

The IDB is also considering an off shore geophysical survey of all South and Central American and the Caribbean. When this project is approved, Guyana should be able to participate.

U.K. Overseas Development Administration (ODA)

The ODA is working closely with the Guyana Electricity Corporation to improve management and maintenance operations. Engineers from Foster and Wheeler are helping put GEC boilers at the Kingston plant back into operation. The ODA, as part of a project to improve GEC management, will provide a deputy General Manager. It will also help GEC with general electricity sector planning, concentrating on the 1980-85 period.

CIDA

CIDA, with CARICOM, is building a 110 mile, 69 kV transmission line along the coast from Georgetown to Unverwaagt, Canefield and Corentyne. Construction should be finished by 1982.

UNDP

The UNDP is providing technical assistance and consultants over two years to the recently creaed Institute of Applied Sciences and Technology. The Institute, part of the National Research Council, is undertaking R&D in solar, wind, biogas, charcoal and pedal power. In addition to its renewable energy program, the Institute has programs in mineral and natural sciences.

CARICOM

Under USAID funding, CARICOM will assist its member countries to develop national energy policies, to train energy technical experts and to facilitiate the transfer of information on the results of applications of renewable energy technologies. The program is in its initial stages.

Caribbean Development Bank (CDB)

Under USAID funding, the CDB will provide financing for the application of renewable energy technologies and technical assistance to member countries to develop and adapt appropriate technologies. The program is in its initial stages.

APPENDIX B

PERSONS CONTACTED

Ministry of Energy and Natural Resources

Hon. Hubert Jack	- Minister
Bernard Crawford	- Director, National Energy Unit (NEU)
Abel Felix	- Consultant, NEU
Karen Eversley	- NEU
Mr. Dundes	- NEU
Keith Richards	- GEC engineer detailed to NEU
Clem Pellydore	- Petroleum Engineer
J. Punwasee	- Commissioner, Geology and Mines Commission

Others

Sheik M. A. Hanif	- Operations Manager, Shell Oil Co.
J. M. De Abrew	- District Manager, Texaco
Ian Blasford	- Supervisor, Sales, Texaco
Ulrich Trotz	- Director, Institute for Applied Sciences and Technology (IAST)
Ralph Arnold	- Consultant, IAST
Bishu Ghosh	- IAST
George Walcott	- Dean, Faculty of Sciences, University of Guyana
Carl Greenidge	- Chief Planning Officer, State Planning Commission
Lance Tyrell	- General Manager, Guyana Electricity Corporation
Anthony Lopes de Garca	- Manager, LBI Sugar Estate
Robert Alexander	- Factory Manager, LBI Sugar Estate
Stephen Chandley	- GUYSUCO
Desmond Chaves	- Coordinator, Engineering and Development Group, GUYMINE
Samuel Hinds	- GUYMINE
Morris Lawrence	- Guyana Rice Board
Ozzie Baptiste	- Deputy Chairman, GUYSTAC
Terrence Glavin	- IDB Representative, Guyana
Cesare Granger	- CARICOM

Embassy/USAID

Ambassador George Roberts	- U.S. Ambassador to Guyana
Nick Mariani	- Acting Mission Director
Brent Gatch	- Engineer/Energy Officer
Dwight Steen	- Agriculture Officer
Andrew Haynal	- Health Officer

SCHEDULE OF MEETINGS

Schedule in Georgetown

Sat.	3/22	11:00 p.m.	Arrive Georgetown
Sun.	3/23	11:00	Meet with USAID - Mariani, Gatch
Mon.	3/24	9:00	Meet with Minister of Energy/ Natural Resources
		10:00	Meet with Shell & Texaco representatives (NEU)
		2:00	Further discussions with NEU
Tues	2/25	9:00	Meet with CARICOM representatives.
		10:00	Meeting with Shell & Texaco representatives (NEU)
		3:00	Visit Inst. of Applied Science & Technology
		7:30	Meet with IDB personnel
Wed	3/26	9:00	Meet with State Planning Commission
		2:00	Meet with Guyana Electricity Corporation (GEC)
Thurs	3/27	9:00	Visit Le Bon Intention (LBI) Sugar Estate
		1:30	Visit GUYMINE at Linden- Bauxite/Aluminum Petroleum Divisions of MENR
		3:30	Meet with American Ambassador Roberts
Fri	3/28	8:30	Visit Rice Mill at Burma
		2:00	Meet with Geological - Petroleum Divisions of MENR
Mon.	3/31	2:00	Meeting with Bernard Crawford, Head of NEU
		3:30	Meeting with Dr. Haynal, USAID Medical Officer
		4:00	Final meeeting with USAID, N. Mariani and B. Gatch.

APPENDIX C

ACRONYMS

CARICOM	Caribbean Common Market
CDB	Caribbean Development Bank
CIDA	Canadian International Development Agency
IDB	Inter-American Development Bank
GEC	Guyana Electricity Corporation
GRB	Guyana Rice Board
GUYMINE	Guyana Mines Corporation
GUYOIL	Guyana Oil Company
GUYSTAC	Guyana State Corporation
GUYSUCO	Guyana Sugar Corporation
NEA	National Energy Authority
NEU	National Energy Unit
SPC	State Planning Commission
TRINTOC	Trinadad-Tobago Oil Company
UNDP	United Nations Development Program
USAID	United States Agency for International Development