ENERGY SECTOR: CENTRAL AMERICA

I. ENERGY OVERVIEW AND TRENDS.

A. ENERGY USE

1. Overview

Although the following brief discussion of the problem, and possible approaches, emphasizes energy in terms of fuels--petroleum, electricity and wood--which are consumed in the process of human activity, it must be recognized that the ecosystem is the major contributor to the economic vitality of the region. Questions such as population increase versus carrying capacity of the land, loss of production due to deforestation and erosion, soil loss, and land lost to urbanization are also critical to a more complete discussion of the energy situation in Central America.

Petroleum and fuelwood are the predominant sources of energy in Central America with each representing more than 40 percent of energy consumption. Hydroelectricity accounts for most of the remaining use and is the fastest growing segment of the energy sector. Total energy consumption increased about 5% annually through the 1970's.

The residential/commercial sector accounts for approximately half the total energy consumption. The industrial sector uses 25 percent of total energy consumed and the transportation sector about 20 percent.

2. Energy Sector Trends

In most countries in Central America energy "intensity" increased during the 1970's, i.e., the percentage growth in energy use exceeded the growth in gross domestic product. This trend may continue because the shift from traditional economies to modern industry, transport and agriculture requires increased use of petroleum and electricity. However, the impact of the currently depressed economies and rising energy costs is also likely to affect the structural relationship between energy use and GDP over the coming years.

Hydropower will continue to expand in Central America as major production facilities begin operation in the next two years. Costa Rica is now generating almost all of its electricity from hydro and exporting surplus power through Nicaragua to Honduras. Honduras will also generate all of its electricity from hydro when the El Cajon Dam starts in late 1985. The Chixoy Dam starting operation in Guatemala will also greatly reduce oil use. With the continued interconnection of the Central American countries' electrical grids, the excess generation may be moved around to displace oil-based generation. Plans for interconnections are proceeding despite the current problems. New lines are planned or nearing

completion between Guatemala and El Salvador, El Salvador and Honduras, and Costa Rica and Panama. There even may be a problem of how to use the surplus hydropower generation. The availability of this new hydroelectricity could reduce petroleum imports to the region by almost 100%. However, a major challenge in energy planning will be to use the newly-developed hydro capacity in industry without permanently subsidizing equipment that is otherwise uncompetitive, e.g., electric boilers.

There is a close interrelationship between the use of petroleum, hydropower and fuelwood and this will continue. Increasing fuelwood use and consequent deforestation can easily lead to reliance on oil. However, hydropower expansion reduces the use of heavy petroleum products and facilitates some shift from fuelwood to electricity. On the other hand deforestation threatens the watershed and thus the viability of the substantial hydropower capital investments.

The links between sources of energy and other sectors are also critical. Energy is critical to economic expansion. Unmet fuelwood needs can cause a shift to use of agriculture residues and animal wastes which slowly depletes soil and agricultural productivity. Pricing policies which subsidize kerosene and diesel for welfare reasons may, in fact, favor

middle and higher income groups because the poor predominantly use traditional fuels.

II. ENERGY SECTOR PROBLEMS

A. ENERGY POLICY ANALYSIS AND PLANNING

The inability to analyze energy problems and options and make sound economic energy decisions is a significant problem. Energy pricing decisions for oil and electricity are made without a full understanding of their impact on efforts to develop indigenous resources, energy conservation efforts, the generation of domestic investment capital and upon the low income population. Major power facility expansion decisions are often based on uncertain projections of demand and incomplete knowledge of available resources and technologies. The inadequacy of energy supply and demand data and lack of information on domestic resource potential inhibits good decision-making.

B. PETROLEUM DEPENDENCY

With the exception of Guatemala which produces about 25 percent of its oil needs, all petroleum is imported. Over the last decade the foreign exchange required for oil imports has increased 10 fold, from $100 million in 1973 to $1 billion in 1981. Oil imports as a percent of export earnings rose from 6 percent in 1973 to 22 percent in 1981, despite overall

increases in absolute foreign exchange earnings during the period. Central America's ability to purchase oil has worsened as the terms of trade on the sale of traditional commodities has decreased. The result has been a severe squeeze on the ability to import critical goods for development and extensive external borrowing resulting in the current serious debt situation.

Petroleum use by sector (on a regional average) in 1978 was:

Sector	Petroleum Use
Transport	43.4% (in 1982 this exceeded 50%)
Industry	24.4%
Utility	21.7% (in 1982 this was about 10%)
Residential/Comm.	8.6%
Other (Agriculture)	1

Pricing policies are varied and subsidies are common for diesel fuel and kerosene in response to political pressures to curb the rising cost of public transportation and cooking fuel. Gasoline is high priced and heavily taxed. Consequently, the transport fleets have been converted to use subsidized diesel, thus worsening the imbalance between domestic refinery

production and end use consumption

C. FUELWOOD DEPLETION

Eighty percent of all the households in the region depend on wood for cooking their daily meals. In addition, many small-scale, mostly rural, industries also use wood as their primary source of fuel.

Prior to the mid-1970's there was a growing trend to substitute kerosene and LPG for fuelwood. As petroleum prices rose the trend halted and may be reversing. At the same time population growth in the region requires more fuelwood as it grows scarcer due to extensive clearing for crop and pasture land.

Traditional fuel costs (i.e., for wood and charcoal) have risen in tandem with fossil fuel costs. In some areas of Central America, the cost of daily firewood requirements is equivalent to 20 to 50 percent of the average daily wage. The increased cutting of fuelwood in some populated areas is not only diminishing the tree stock but also contributing to the degradation of watersheds, agricultural land and hydropower production.

D. ELECTRICAL GENERATION

The benefits of displacing of oil with hydropower and other energy sources are substantial. The costs and risks,

however, have become apparent only recently. Foreign debts incurred for construction of hydro facilities are a burden after currency devaluation, particularly when domestic utility rates are not sufficient to cover operations and debt payments. Uncertain future demand for electricity raises the risk for big capital intensive projects that require large amounts of foreign exchange. The comparative analyses of large versus small hydro, geothermal, conservation and rural electrification are difficult.

III. MAJOR DONOR AND LENDER ACTIVITY

The major lenders and donors in the region are the Central American Bank for Economic Integration (CABEI), the Inter-American Development Bank (IDB), World Bank (IBRD), and the Agency for International Development (AID). The Organization of American States (OAS), the Latin American Energy Organization (OLADE) and United Nations Development Program (UNDP) carry out smaller activities and the Italian government provides assistance for geothermal activity. The French, Japanese and Taiwanese governments are also involved in energy assistance to the region.

The IDB is the major lender in the region. Their stated strategy is to direct at least 20-25 percent of total loans to the energy sector. During 1982 the IDB approved loans

to Latin America totalling $2.744 billion of which $797 million (29%) was for energy, by far the largest sector of Bank lending. The IDB is involved in major hydropower facilities in every country. Geothermal lending by both entities goes on in Guatemala, El Salvador, Nicaragua, Costa Rica and Panama.

The World Bank, the second largest regional lender, has stepped up its overall lending for power in the last four years, but commitments for oil and gas development have shown the greatest increase. Lending in Latin America and the Caribbean in 1982 totalled $496.4 million for energy, $394.4 for power and $102 for oil and gas.

The World Bank has initiated some small loans to support petroleum exploration in Panama, Costa Rica and Honduras.

The third largest is AID with three regional grant projects totalling $19.5 for Fuelwood Research, Industrial Energy Conservation and Watershed Management.

AID provides technical assistance through grants from its Regional Office for Central American Programs (ROCAP) for Fuelwood Research ($7.5 million), Industrial Energy Conservation ($6.0 million) and in the near future Watershed Management ($6.0 million). AID bilateral project activity is minor. It consists of an Energy Policy Development Project ($1 million)

in Costa Rica and an Alternative Energy Project ($800,000) nearing completion in Panama. There is no bilateral energy assistance in Guatemala, Honduras, Nicaragua or El Salvador or Panama.

The OAS, OLADE and UNDP provide some assistance in alternative energy and, in the past, energy planning. (Initial energy planning assistance by UNDP lapsed two years ago; some minor additional support is contemplated.) Occasionally, the development banks provide technical assistance as part of their loan packages also.

In summary, the banks provide the major capital funding for energy development projects in the region and AID has provided to date the primary technical assistance on a regional basis. Little has been done on a bilateral basis to support energy policy analysis, energy resource assessment, and institution building.

IV. RECOMMENDATIONS

Actions taken to address the energy problems must recognize the interrelationship of energy with each country's ecological, economic, and social systems. The petroleum, hydropower and fuelwood sectors influence each other and the ecosystem in which they exist. In combination, these elements are pivotal segments of economic growth, the balance of

payments, and the modern and traditional (subsistance) economic sectors.

The larger questions concerning the integration aspects of energy are not well defined at this time. Thus, the major recommendations discussed below are limited to: (1) improve energy policy and planning, (2) shift to non-oil based electrical generation, and (3) expand fuelwood supply and watershed management.

A. IMPROVE ENERGY POLICY PLANNING AND TRAINING

With high energy costs and increased uncertainty and risk, it becomes critical to make the correct energy policy and project decisions. The limited financial resources place a premium on correct and timely decisions.

It is necessary to undertake or complete assessments of the availability and economic feasibility of indigenous energy resources such as fossil fuels, geothermal, mini-hydro and biomass. In addition to resource assessment, it is necessary to support adaption of energy technologies through testing and demonstrations in order to develop sound data on technical performance and economic viability. Without this information, decision makers have limited choice with respect to energy supply development.

It is necessary to improve the basis for and ability to make energy capital investment decisions. Better assessment

of resource availability and better energy demand data and forecasting combined with decision-making tools will optimize use of the limited financial resources. Institution building is necessary to establish these capabilities on a long-term basis.

To develop the necessary skills, training is needed in energy policy analysis and planning, utility system planning and in the disciplines related to the resource assessment needs of each country. Technical assistance must also be provided to assist in many of the activities described above. The resource requirements of this institution building and technical assistance is small compared to the magnitude of resources subject to inadequate decisions.

Energy pricing is the most important step with respect to encouraging energy conservation in both the petroleum and power sectors. The relative prices of fuels influence consumers' choices and the decisions to develop fuel alternatives. It should be recognized that fuel price increases are often difficult to achieve politically and the results are mixed in the region.

Although appropriate energy pricing is essential to a successful energy conservation effort, pricing alone may not be a sufficient action: 1) Knowledge about the potential of

energy conservation, 2) the skills to determine available technical alternatives and install or implement the alternatives and 3) financing for conservation investments as opposed to the traditional inventory or production investment, are also needed.

B. SHIFT TO NON-OIL BASED ELECTRICAL GENERATION

The development of alternatives to oil-based electrical generation should continue. The significant expansion of hydropower through the construction of large 200-300 MW dams has made an impact on reducing oil consumption and promoting economic development. However, some of the disadvantages of the larger facilities have become more evident in recent years such as the higher risks of large construction projects and the financial costs of delay, greater risk because of the uncertainty of electricity demand, and siltation from deforestation.

Future assistance should be directed toward small and medium hydropower and incremental geothermal development. The economic uncertainties suggest that it is more appropriate to pursue a course that favors the development of small and medium facilities that can produce electricity in a shorter period at less technical and financial risk. These facilities also economize on the limited financial resources by not tying up

investment capital for such a long period. Like large facilities, the smaller units also reduce oil use but are less damaging to the environment.

In addition to the development of small and medium hydro and geothermal power, it is necessary to support adaptation of economic alternative technologies in areas without access to the current or planned electric grid. The substantial biomass resources present worthwhile energy production opportunities that should be explored.

Financial assistance is needed for the smaller and medium hydro and geothermal development. Concessionary financing and technical assistance are needed for feasibility studies and adaptation of alternative technologies.

C. EXPAND FUELWOOD SUPPLY AND WATERSHED MANAGEMENT

It is necessary to expand fuelwood supply and promote efficient household and industrial fuelwood use. This will require strengthened institutional capabilities to deal with the fuelwood and watershed problems which can be complex and involve difficult land tenure, market incentives and technical issues.

Technical assistance is needed for forestry/fuelwood research, reforestation, watershed management, forestry institution building and end use demonstration and dissemination

(stoves, kilns, etc.) Concessionary financing is needed for widespread tree planting.