ENERGY PLANNING ACTIVITIES IN ZAMBIA

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INTRODUCTION

Zambia like most other African countries achieved her independence during the early 1960s and embarked on major development plans to increase industrial output and also to exploit the vast untapped resources in rural areas. This involved massive investments in plant and equipment requiring large amounts of energy and capital. Like most other countries Zambia was and is still a monoeconomy and during those days the price of copper (the most important foreign exchange earner) was high enough to support these development plants. The price of oil at that time was reasonably cheap.

Since 1973, the cost of oil imports to Zambia increased dramatically from nearly 50 million kwacha in 1975 to 225 million kwacha in 1983 - an increase of nearly 450%. In 1975, these imports only accounted for 8.2% of the total imports. In 1983 this figure had risen three times to 25.6%. At the same time oil use has actually gone down due to the slowed industrial capacity (Table 1).

Between 1964 and 1983, the urban population has increased from 20% to 43% and is rising. This means that more commercial energy is going to be used.

In 1982, a World Bank team visited Zambia to carry out an energy assessment programme. One of their recommendations was that Zambia should re-examine its energy programmes and potential so that long term investment, and other facilities could be planned. They also reinforced the government view that the nation should through careful planning reduce this overdependence on petroleum products which have to be imported.

SCENARIO

According to preliminary data shown in Table 2, among the three major commercial fuel supplies, hydroelectricity contributed 67.8%, coal 11.6% and oil 18.5% in 1983. In the same year the major consumers were industrial processes such as mining. Because of the emphasis placed on the agricultural sector by the government the energy consumption in agriculture has been increasing steadily.

In 1984 the University of Zambia in conjunction with the government Department of Energy and the National Energy Council instituted an energy plan of action to study the pattern of energy supply and demand in the country and to make projections up to 1995.

The objectives were:

a. To develop a diversified energy supply system which will reduce dependence on oil.

b. To maximise the use of renewable resources.

c. To maximise the use of indigenous resources.

d. To provide energy for optimum industrial development.

e. To reduce non commercial fuel use and resulting deforestation.

The first step was to collect demand and supply data for 1970-84. About 4000 questionnaires were sent out during August-October 1984. The data are still being evaluated. Some difficulties in the balancing of supply and demand figures were experienced but this is still being checked, and where possible data are being recollected.

THE MODEL

The model being developed for the analysis of data, particularly for future predictions and rationalisation, is based on experiences in Zambia. But some of the features in other models like the Energy Supply and Planning Model and the Argonne Energy Model are also incorporated.

The model is a network representing the energy-producing sector and energy prices based on the relative costs of various energy supply alternatives. All the energy resource production, conversion, transport and demand activities in existence as well as those having potential for use are incorporated in the network as nodes and referred to as processes. The network links represent energy flows between processes. The network can be used to project future energy flows and prices on the links. Projection based on engineering cost, technological availability and acceptability can be made. These energy demands are then matched with supplies with least cost. The model can be used also to analyse effects of government policy. Details of the model will be available when it is fully developed.

RENEWABLE ENERGY RESOURCES - THEIR ROLE

From the scenario it is quite clear that some measures are needed immediately:

a. A comprehensive energy conservation programme must be instituted. Conservation is widely regarded as a resource and its encouragement if possible by legislation, will save a lot of investment. This is already being done under the 2nd phase of the National Energy Plan of Action.

b. A systematic study of renewable energy resources in the country and their possible exploitation particularly in the substitution of commercial fuels.

Because one cannot wait for the energy plan to be completed, work is already in progress in a number of areas, some of which have been reported at this meeting by other colleagues from Zambia. These include:

a. hydropower
b. solar heating and cooling
c. solar pumping
d. wood stoves and their improvement
e. alcohol production for fuel
f. wind energy
g. coal utilisation

Although the main aim is to reduce the commercial fuel consumption, traditional fuels such as wood which constitute an improvement in the quality of life and a major part of the fuel supply for the rural areas still form quite a significant portion of current studies. Only by proper monitoring of this fuel consumption can deforestation be arrested.

Preliminary findings indicate that apart from conservation in most of the industries there will be a need for proven renewable technologies to save even more power. Options such as process steam by utilising solar energy preheaters, biomass and other forms of renewable energy, are being actively considered.

FUTURE WORK

a. Since demand projections will have to be met by adequate supply of energy; it is important to take stock of the amount of renewable energy resources available in the country.

b. Analysis of the current demand and supply patterns is in progress and it is hoped that this will be available to the government in the near future.

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TABLE 1: Oil importation in Zambia

Year	Quantity tons	Value K'000	% total imports
1975	852,075	49,228	8.2
1976	907,615	63,540	13.6
1977	776,926	67,388	12.6
1978	780,154	68,107	13.8
1979	699,328	97,144	16.3
1980	761,832	153,963	17.6
1981	750,543	185,000	21.0
1982	748,150	198,000	21.6
1983	608,228	225,189	25.6

TABLE 2: Supply and demand contributions of the various energy types

SUPPLY	% Contribution to commercial energy supply
Hydroelectricity	67.8
Coal	11.6
Oil	18.5
DEMAND	**% Contribution of sector**
Mining	47.5
Commerce and services	23.0
Transport	11.7
Manufacturing and construction	10.6

APPENDIX I

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