

THE ROLE OF RENEWABLE ENERGIES IN THE DEVELOPING COUNTRIES AND THE POSSIBLE UNIVERSITY CONTRIBUTION

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ABSTRACT

The paper summarises the general picture of energy use and needs in the developing countries. Some comments are made of the contribution of Universities in contribution to the problem of increasing the energy availability. The setting up of special M.Sc. courses in regional centres is proposed.

ENERGY USE IN DEVELOPING COUNTRIES

In most of the less developed countries there is a significant consumption of biomass mainly as wood and charcoal. This consumption level is in many cases much greater than the commercial fuel use. Most (typically 90%) of the commercial fuel is in the form of petroleum and is imported. These oil imports represent a major component of the total import bill of the less developed countries, and the oil price increases of 1973-74 and 1979 have had a very marked effect on their economies, particularly since oil price escalation has far out-stripped the corresponding price increases for the mainly agricultural produce which these countries export.

The energy balance for Kenya (Table 1) is typical of most sub-Saharan countries (excluding South Africa): 75% of the energy source is wood and virtually all the remainder imported petroleum.

TABLE 1: Kenya's Energy Balance

Energy Source	quantity (PJ)	% of Total
<u>Indigenous</u>		
Wood	306.7	73.5
Hydro	3.3	0.8
Residue	8.6	2.1
<u>Imported</u>		
Crude Oil	95.3	22.8
Refined Oil	1.2	0.3
Coal	1.4	0.3
Electricity	0.9	0.2
Total	417.1	100

It is highly desirable at the national level to substitute local fuels for imported fuels. There are at present considerable resources of fossil fuels and hydro-power in many less developed countries, much of which is yet to be exploited.

Renewable energy sources can be expected to make an increasingly greater contribution in the long-term.

Universities, in developed and developing countries, have a major contribution to make to the planning for a long-term shift to the renewable energy technologies.

THE ROLE OF HIGHER EDUCATION INSTITUTIONS

Higher Education Institutions can make a useful contribution to renewable energy; university departments can develop new equipment, and in the early days some of us regarded this as our major role. Over the years, however, we have become much more aware of the importance of relevant training of overseas personnel. This includes:

- i. Training at technician level
- ii. Short courses
- iii. Taught Masters Courses
- iv. PhD by research
- v. Linked programmes
- vi. Research Programmes which involve staff exchange between two or more institutions.

A very effective way of both transferring technology and providing training is through "joint project" between two institutions, one in a developed country and the other in a less developed country. At Reading we have carried out a number of such projects of which a study of wind pumping in the Sudan using Sudanese personnel is a typical example. A survey of wind data, windmill experience, and water requirements was carried out, and then an experimental programme on pumping windmills was conducted by a Sudanese graduate who, on receiving his PhD degree, returned to head the Sudanese Wind Pump Programme. Similar programmes which we have carried out include solar ponds for the Sudan and the use of alternative energy resources for rice cultivation in Thailand.

Although these programmes are time-consuming in that they are linked to a three-year PhD course, they have been found to be valuable in providing trained personnel.

There is also a need for shorter and more intensive courses, and at Reading we offer a one-year MSc course in Alternative Energy for Developing Countries. The syllabus covers all aspects of alternative energy, including implementation, small industry, and economic project evaluation. The major component of the course is an experimental project which, where possible, is chosen in collaboration with the student's home institution. In this way it is possible for the student to commence his new job whilst completing his course, thus contributing to a useful technology-transfer. The course is proving to be popular and was over-subscribed for the current year. Projects in progress in the year 1982/83 are as follows:

<u>Topic</u>	<u>Country of origin of student</u>
Wood combustion	Thailand
Charcoal stove	Zambia
Biogas for cooking	Tanzania
Wind power	Kenya
Pumping windmill	Grenada
Biogas generator with external heating	Sri Lanka
Concentrating photovoltaic cells	Ethiopia
Water pumping	Greece
Low cost solar water heater	Iran

The provision of relevantly trained personnel meets only one of the needs for the implementation of national programmes for exploiting local energy resources. It is, however, an essential requirement and one which the University system in both developed and developing countries can contribute to. There is much to be said for the setting up of courses such as the one described above at regional centres, for example, in East Africa where the content can be directed to areas of particular local importance.