

**ENERGY SUPPLY, DEMAND AND RESEARCH**

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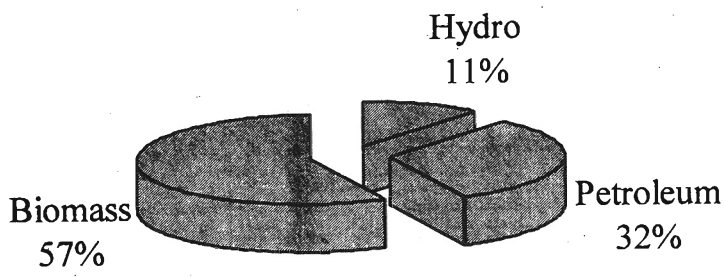
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**Abstract:** The current state of energy supply and demand in the country along with projections for future growth, in the conventional and renewable energy sectors are briefly reviewed. The development of energy sector related research since the inception of the National Science Council and its present state in the country with emphasis on the role of the National Science Foundation are addressed. The National Science Foundation has a major role to play in the future energy sector related research funding, particularly in selecting and financing priority areas.

**Key words:** Dendro power, energy, hydroelectricity, research funding, solar photovoltaics, wind energy.

**ENERGY SUPPLY AND DEMAND**

The primary energy supply in Sri Lanka has been dominated by the biomass that accounted for nearly 57% of the total of 6.8 million tonnes of oil equivalent (TOE) in 1996. The other sources are petroleum products and hydroelectricity which contribute 32% and 11% respectively.<sup>1</sup>



**Figure 1: Primary Energy Supply in Sri Lanka (1996).**

In addition to this there were 0.88 million TOE of direct imports of finished petroleum products such as liquid petroleum gas (LPG) and auto diesel. The energy consuming sectors consist of transport (20%), industries (21%) and household, commercial & others (59%).<sup>1</sup>

Of the biomass usage 86% is attributed to the domestic sector, which uses fuelwood and other forms of biomass mainly for household cooking, while the balance 14% is absorbed by the industrial sector. Electricity consumption is largely divided among the three main sectors, household (35%), industrial (44%) and commercial (19%). The electrification level in Sri Lanka ranges from about 95% of households in the Colombo District to less than 10% in some administrative districts in the north giving a country average of approximately 50%. Seventy percent of the consumption of petroleum products is seen in the transport sector with the balance being used in the industrial, household and electric power (in thermal plants) sectors.

On the average, the energy supply is expected to grow annually by 4-8% depending on the economic growth rate of the country.<sup>2</sup> Sri Lanka has to depend largely on the same traditional sources of energy for future energy needs. The coal imports are also expected to grow with coal based thermal plants being planned for base load electricity generation<sup>3</sup>.

Most of the alternative energy technologies are not applicable to Sri Lanka due to problems associated with their technical and economic viability. But those such as wind energy, micro/mini-hydro power<sup>4,5</sup> and solar photovoltaics<sup>4,6</sup> are likely to contribute to the local energy supply at least on a small scale. Dendro power may contribute to a very large extent depending on the success of initial trials presently being carried out with different plant species.<sup>2,4</sup> Ten pilot plantations are being grown in various parts of the country through an European Union grant to establish their physical and economic viability.

## **ENERGY RELATED RESEARCH**

The research activities in the energy sector in Sri Lanka have been undertaken by many organisations involved with the energy sector. They can be categorised into two main groups viz. those directly involved in the energy sector activities with in-house research facilities and those responsible for co-ordinating and funding of research in areas of work including energy. Institutions falling into the first category include the Ministries of Irrigation & Power, Science & Technology, Forestry & Environment, the Energy Conservation Fund, the Ceylon Electricity Board, the Ceylon Petroleum Corporation, Industrial Technology Institute (formerly CISIR) and National Energy Research & Development Centre. The National Science Foundation (formerly NARESA), and the universities dominate the second category. Non-governmental institutions such as Intermediate Technology Development Group, Energy Forum, Sri Lanka Energy Managers Association (SLEMA) and Lanka International Forum on Environment & Sustainable Development (LIFE) also carry out research in the energy sector on their own initiative or on behalf of other organisations, both national and international.

These research activities in the energy sector vary widely from narrow areas such as the development of efficient local turbines for small hydro plants, to policy level studies like the development of an energy policy for Sri Lanka or establishing linkages between providing energy services and poverty alleviation in developing countries. Funding for these research activities is made available by the government through an allocation in the annual budget or by other agencies such as UNDP, USAID, World Bank, ADB, SIDA and Asian & Pacific Development Centre (APDC).

## **NSF AND RESEARCH IN ENERGY**

Before establishing NARESA, energy sector activities were looked after by the Solar Energy Group formed in 1980 within the National Science Council (NSC) on a recommendation by the Specialist Panel on Physical and Engineering Sciences. The first Solar Energy Group was established mainly with the intention of bringing together the scientists involved in the studies on alternative energy sources. Within the same year, Solar Energy Group was called in by the minister-in-charge to prepare a report on the Pattiyapola Rural Energy Centre and later it submitted a report on Feasibility of Ocean Thermal Energy Conversion (OTEC) in Sri Lanka at the request of H.E. the President. In addition, in 1980 the NSC appointed a committee to investigate and report on the use of atomic energy for electricity generation in Sri Lanka, in response to a Presidential Directive.

With the reorganization of the NSC as NARESA in mid 1982, ten specialized working committees were identified to oversee different areas of research work which NARESA was expected to get involved in. The field of Energy was one of them. The first Working Committee on Energy consisting of eminent professionals from the energy field was established in 1985. In 1984, the Ministry of Science and Technology prepared a memorandum on "A national energy policy for Sri Lanka" which was later submitted to the Government through NARESA to ensure that the document was in harmony with the general science policy.<sup>7</sup>

## **PRIORITY RESEARCH AREAS IN ENERGY**

The Steering Committee on Energy identified priority areas of research to be funded in the energy sector, based on the impact of proposed research on the national economy. It was also decided that the proposed work should be such that the results will lead to significant savings in quantum of energy used, energy costs and therefore foreign exchange. Also such work was expected to give due consideration to social and environmental factors. Presently the approval of funding is primarily directed to projects which are linked to and in collaboration with the users, those based on utilisation of locally available natural resources, those dealing with applications of research making use of known and proven technologies and those involving final implementation of research on biomass energy, energy efficiency, waste conversion, energy in transport and new & renewable sources.

The Energy Committee has identified pyrolysis, the use and development of gasifiers, the recycling of bio-degradable urban waste to produce energy as one of the outputs, energy efficient methods to reduce post-harvest losses, cost effective methods of lift irrigation and cost saving energy devices/ studies as the preferred areas of commissioned research which can be supported. In these areas, the research leaders or supervisors are rewarded for their contribution in addition to providing finances for other research costs mainly to encourage more work in these important areas of work.

### **NSF SEMINARS, REPORTS AND OTHER PUBLICATIONS IN ENERGY**

The NSF regularly holds seminars and discussion sessions on most of their funded research in the energy sector. In addition, it has organised four major seminars in energy. They are

- International Workshop on Integrated Energy Systems for Rural Development, NARESA, April 1984
- Seminar and Exhibition on Practical Developments in the field of Energy, NARESA, June 1986
- Seminar on Energy Efficiency in Transport, NARESA, February 1991
- Consultative meeting on Renewable & Alternative energy sources and applications relevant to Sri Lanka, Division of Alternative Energy Sources, Ministry of Science and Technology and NARESA, May 1995.

A few important reports, are listed in Annex A. These were sponsored by the Steering Committee on Energy. In addition, there are many research papers and reports in journals and conferences by other national and international institutions on the output of research funded by the NSF.

### **NSF RESEARCH FUNDING AND ITS FUTURE**

The majority of the research projects administered by the NSF are directly funded by the NSF itself while a few others are funded by the external donor agencies. To date, twelve research projects in the field of energy with a total funding of over Rs 1.7 million have been supported by direct NSF grants while two other on-going projects amounting to Rs 8.8 million have been funded by the Swedish International Development Agency (SIDA). These are listed in Annex B.

The NSF will undoubtedly have a very important role to play with regard to the research activities in the energy sector in the areas of arranging finances and administering of projects. It is necessary that the energy sector research is properly

co-ordinated in such a manner that the available funding is efficiently utilised with no duplication of projects under different institutions. It is equally or more important to direct energy research projects to fall into the priority areas, which have been identified by the NSF after considering national priorities.

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9. *Report of the Regional Workshop on Selection of Pilot Projects* (1997). Asian and Pacific Development Centre, Malaysia.

**Annex A****NSF Reports on Energy**

1. Dayananda K.J. T., *Jatropha performance trial*, Forest Department
2. Sepalage, B.D. *Study to evaluate the feasibility of cultivating Jatropha and extraction of oil as a replacement of kerosene in lighting applications*, Energy Unit, Ceylon Electricity Board
3. Sepalage B.D., *Field evaluation of IDB and NERD fuelwood stoves*, Energy Unit, Ceylon Electricity Board
4. *A preliminary report on the feasibility of Ocean Thermal Energy Conversion (OTEC) power for Sri Lanka* (1980), Solar Energy Group, National Science Council, 1980.
5. de Silva M.A.T. (1981). *A compendium of research and development projects in Sri Lanka and energy related problems*, National Science Council
6. Wijesinghe L.C. de S. (1984). Biomass fuel consumption in Sri Lanka households, Biomass 5, pp 261-282.
7. *A Compendium of energy related technologies* (1989), NARESA,
8. *Proceedings of the Seminar on Energy Efficiency in Transport* (1992). NARESA
9. Kulasinghe A. N. S. (1993). *Use of steam heated air for tea drying*, NARESA,

## **Annex B**

### **Projects Funded by NSF**

#### **Completed Projects**

1. Socio-economic and energy survey at Watinapaha-Gampaha District. NARESA, 1985
2. Experimental work and field evaluation of IDB and SAVOOD hearth. NARESA, 1985
3. Monitoring field performance of Sarvodaya, CISIR, IDB and CEB stoves. NARESA, 1986
4. Energy survey in the industrial sector. NARESA, 1986
5. Suitability of Jatropha seed oil as a substitute for kerosene. NARESA, 1986
6. Design improvement to the bottle oil lamp. NARESA, 1991
7. Castor oil as an illuminant. NARESA, 1991
8. Laboratory model study and a survey to select a suitable area for ocean wave energy plants in the south and south-eastern coast of Sri Lanka. NARESA, 1993.
9. Improvement of mini/micro hydro turbines for local manufacture. NARESA, 1994 - terminated due to unsatisfactory progress.

#### **On-going Projects**

1. Geological and geophysical investigation of geothermal energy in Sri Lanka. NARESA, 1994.
2. Survey on utilisation of charcoal for domestic cooking in Sri Lanka and a literature survey of charcoal production and stoves available in other countries. NARESA, 1996.
3. Use of solar energy in tea drying. SIDA, 1995.
4. Development of codes for improved energy efficiency in buildings. SIDA, 1995.