

## Country Paper – Sri Lanka

### **Vision of the Energy Sector**

Sustainable development of energy resources, conversion facilities and delivery systems to enable access to and use of energy services by the entire population, and the safe, reliable delivery of such energy services at a regionally competitive price through commercially viable institutions subjected to independent regulation.

### **Current Status**

Biomass (47%), hydropower (8%) and petroleum (45%) are the main energy resources used in Sri Lanka, with per-capita consumption about 0.4toe. Thus indigenous, renewable sources of energy provide 55% of the national primary energy needs. All petroleum products are imported, and used for transport, electricity generation, household, commercial and industrial requirements. Electricity and petroleum products are the main forms of commercial energy, and an increasing amount of biomass is also commercially grown and traded.

#### **Biomass:**

An estimate 70 % of the national biomass consumption is in the informal sector, for household cooking, small commercial and industrial applications. Biomass use in industry is growing, as a result of price increases in petroleum fuels. A significant number of agricultural processing systems (particularly in tea processing) are switching-over from oil biomass for thermal energy requirements. In addition to the power plants using waste sugar cane in the sugar industry, which have been in operation for some time, one power plant rated at 1MW is already using grown biomass for power generation. The Government has announced a new initiative to grow biomass as a commercial fuel, and an incentive scheme is already operational to grow biomass as under-crop in coconut plantations.

#### **Petroleum and Gas:**

Ceylon Petroleum Corporation (CEYPETCO) imports crude oil and finished products, operates the 50,000 barrels per day refinery, and markets the products in bulk and through retail outlets. Lanka Indian Oil Company (LIOC) imports products and markets them in bulk and through its own retail outlets. Ceylon Petroleum Terminals Ltd (CPSTL), jointly owned by CEYPETCO and LIOC, operate the two main petroleum storage facilities. The Liquefied Petroleum Gas (LPG) industry has two suppliers.

## **Electricity:**

Ceylon Electricity Board (CEB) and eight independent power producers generate electricity in Sri Lanka, using hydropower and petroleum fuels. Over fifty privately-owned renewable energy-based small power producers, mostly small hydropower, also sell their electricity to the national grid. CEB operates the high voltage (HV) transmission system and grid substations. Both CEB and Lanka Electricity Company (LECO) distribute electricity. In 2005, the total electricity sales were 7201 GWh, at an average price of 7.71 LKR/kWh (CEB average) excluding VAT. The national grid serves electricity to an estimated 73.2% of the households, while about 3 % of the households are served by off-grid systems based on solar power or community small hydro/wind/biomass power plants.

## **Imminent Crisis in Electricity Generation:**

The electricity generating system is presently operating with a constraint on capacity. For a reliable supply, the generating system should have had the planned Kerawalapitiya (300 MW) power plant operational by the mid of 2007.

## **Energy Policy, Strategies and Targets**

Sri Lanka recently revised National Energy Policy and Strategies consists of (a) Energy policy Elements (b) Implementing Strategies and (c) Specific Targets, Milestones and Institutional Responsibilities.

The major guiding policy elements are the following:

1. Providing Basic Energy needs
2. Ensuring energy security
3. Promoting energy efficiency and conservation
4. Promoting indigenous resources
5. Adopting an appropriate pricing policy
6. Enhancing energy sector management capacity
7. Consumer protection and ensuring a legal playing field
8. Enhancing the quality of energy services
9. Protection from adverse environmental impacts of energy facilities

## **Key Problem areas**

The problems facing the energy sector are many. The priority issues that require to be resolved urgently are the following:

Non-availability of electricity – About 25 % of the population have no electricity at home

Inadequacy and high cost of electricity generation- The generating system is presently facing a severe crisis and the generation costs are high.

Inadequacy of transmission and distribution – under investment and delayed investments are causing severe constraints to the operation, reliability and the quality of electricity supply.

High cost and price of electricity – The cost of producing and delivering electricity exceeds 14 LKR/kWh. The average price of electricity is presently 10.75 LKR/kWh, while being high, is grossly inadequate even to cover the recurrent costs of supply.

High debt burden of the electricity sector – The electricity supply industry is burdened with a total debt in excess of LKR 90,000 million most of which is not being serviced.

High price of petroleum products- The rapid increase in petroleum prices is affecting all sections of the society and the economy.

### Key Issues, Strategies and Targets in the energy sector

Issue	Strategy	Indicator	Present status	Interim Target	Target for 2016
Access to electricity	Invest on grid extensions and off-grid energy systems	Households electrified	Grid: 75% Off-grid: 4%	Grid: 80% Off-grid: 6% by 2010	Grid: 85% Off-grid: 10%
Electricity tariff rationalization, debt and targeted subsidies	Introduce cost-reflective tariffs, re-structure sector debts to minimize burden, a common subsidy for energy used for lighting	CEB profitability, level of debt reflected in tariffs, elimination of cross-subsidies	Large cross-subsidies to household electricity customers, kerosene	Remove both electricity and kerosene subsidies and replace with a targeted subsidy for energy use for lighting by 2008.	
Fuel diversity and energy security in bulk power energy	Moratorium on oil/oil-related fuel burning power plants, diversification to coal and NCRE	Resource diversity, average production cost of electricity, share of indigenous energy for electricity production	Hydro: 37.7% Oil: 58.2% NCRE: 4.1%	Hydro: 21.4% Oil: 3.3% Coal: 65.2% NCRE: 10.0% by 2015	Hydro: 19.9% Oil: 2.2% Coal: 67.3% NCRE: 10.7%
Renewable energy for electricity generation	Relieve grid constraints, arrange finances to accelerate NCRE development	Share of NCRE on the grid, impact on average generation cost	NCRE share: 4.1%	NCRE share: 7.5% by 2010 10.0% by 2015	NCRE share: 10.7%

Transmission and distribution network development	Invest on T&D to ensure safety, quality and reliability of supply	Compliance with reliability indices, optimum network losses. Statutory limits on quality of supply	Widespread violations of reliability criteria	Essential reliability levels will be established by 2010	Endeavour to reach international norms of reliability and supply quality
Supply-side energy efficiency	Accelerate investments and management efforts to reduce technical and non-technical losses	Technical loss in transmission, technical loss in distribution, non-technical losses.	Total T& D loss 16.7% of net generation	Total T& D loss 13.5% of net generation Total	Total T& D loss 12.0% of net generation
Demand side energy efficiency	Mandatory labeling of appliances, consumer education, energy efficiency services, CFL popularization, investments on energy efficiency	Energy Efficiency (EE) codes and appliance labeling-efficiency appliance popularization, customer investments on energy efficiency	Two devices carry EE labels, One EE financing project	All appliances labeled by 2010, selected appliance-labeling mandatory by 2008, EE building code mandatory by 2009	All codes and labels will be mandatory
Energy sector knowledge management, planning and funding	Development of integrated national energy plan, enhanced energy sector database and analyses, establish SLEF to channel funds to energy and NCRE, facilitate rural energy development	Publication and regular updates of the integrated national energy plan, publication of Sri Lanka energy balance, establishment of SLEF, establishment of provincial energy bureau.	Sub-sectoral plans only, Energy balance published, SLEF operational	Provincial energy bureau by 2007, Integrated national energy plan by 2008, Disaggregated energy demand database by 2008, formally constitute SLEF	Continuation of work to ensure development and dissemination of knowledge on the energy sector.
Reforms and regulatory development	Establish a state-of -the art operations management, energy accounting and management information system for CEB	Accurate energy accounting across CEB divisions, transparent dispatch of power plants	Transfer metering, inadequate dispatch procedures based on off-line, manual systems	Boundary metering installed by 2008, transparent dispatch system operational by 2008	

## **Non-Conventional Renewable Energy (NCRE)**

The national energy policy has identified fuel diversity as a strategic objective and renewable energy development to be a part of this strategy. NCRE generating facilities have been commercially developed by private investors since 1996, based on a standard power purchase agreement with CEB. This concession is offered to all power plants using a renewable source of energy or waste heat. The capacity should be less than 10 MW, and the power plants are embedded in the MV distribution network (i.e. they are not connected to the HV network, as in the case of large power plants). These facilities, mostly small hydroelectric power plants, now provide 3.2 % of grid energy (2005). By April 2006, there were 52 such facilities producing 94 MW. A further 40 projects of capacity 105 MW have signed agreements, and some of these are in various stages of the construction process. Many more project applications are awaiting clearances from CEB and other regulatory agencies. Recent increases in price of oil, on which CEB's electricity is largely based, would make the three leading sources of NCRE i.e. small hydro, biomass and wind energy, to be economically attractive to CEB in the immediate future. Cautious development and management of the NCRE portfolio can assist CEB to cushion the customer prices in the face of high oil prices, particularly over 2007-2009, while contribution to fulfill the policy of fuel diversity.

## **Rural Energy Programmes**

### **Energy Conservation Fund**

Mission of the Energy Conservation Fund is to -

- (a) Promote efficiency of energy use in domestic, industrial, transport, commercial and other sectors;
- (b) Control and minimize energy wastage of all consuming sectors; and
- (c) explore the potential alternative energy resources and undertake technology development for commercial use

National budget has allocated a lump sum provision in Rs. 10 million for administration of this Fund and to carry out projects in relation to the above mission. The ECF in 2004 has accordingly implemented following activities utilizing a sum of Rs. 12 Mn from the total projected budget of Rs. 14.27 Mn in order to achieve the objectives by adopting the following two broader strategies. Total expenditure for administration was Rs. 8.44 Mn.

- (1) The programme of awareness raising directed at the general public;
- (2) Advising specific groups belonging to industrial and commercial operations.

The overall aimed of the objectives of these two activities was to introduce effective measures and methodologies to save energy by the consumers in order to achieve at least 10% reduction in energy use during the first five years.

The awareness programmes for the general public totaling a number of 24 was conducted with a collection of success stories arising as a result of providing opportunities to discuss and exchange of information between the consumers and us, the energy conservation promoters.

The Fund also made use of the opportunities provided at various exhibitions conducted by other agencies to deliver the message of the importance of conserving energy for future generations.

Additional mass-media programmes on Radio, Television and Print Media were also used regularly to convey the message and in particular Wishwa-Dharani programme broadcasted over SLBC programmes received much praise from all sectors.

The Fund, as a further measure introduced the subject energy conservation to the school curriculum and printed the teachers' guide book to distribute among all the government schools all over the country.

A series of energy audit programmes were conducted by the Fund in order to provide advice to the industrialists to realize substantial energy savings running to 20-30% (saving) potential in most of the local industrial organizations. 13 such programmes were conducted realizing a national saving of Rs. 23.4 Mn worth energy.

For the benefit of all sections of the society the Fund has launched a dedicated web site [www.energy.gov.lk](http://www.energy.gov.lk) providing easy access to any needy to enter and search for information on ECF activities, energy audit news, national energy balance, and conservation technologies etc.

To provide information on energy efficiency of general appliances to the customers a scheme of energy labeling was initiated. This programme has already covered ballasts of Fluorescent bulbs and CFL bulbs, the programme has now been extended to electric fans, water pumps and refrigerators. The purpose of this scheme is to provide the customers the required information in order to make informed decisions before buying.

In the area of bio-mass technology the Fund has launched a Vigorous Campaign for legislators and the investors to promote bio-mass technology as third indigenous source of energy for power generation and thermal applications. In this regard, the Fund has been appointed by the Cabinet of Ministers as the project office and the chairman of the Inter-Ministerial Committee to work out an appropriate strategy to implement the bio energy programme. This programme will include establishment of energy farms, sourcing technology holders, manufacturers of machinery and equipment in order to achieve 30MW of electricity generation during the first 3 years, thereby changing the socio economic structure and the cultural civilization of the rural peasant families.

In the same area of bio energy programme the Fund has initiated the fabrication of a wood chipping machine aimed creating a business opportunity to market wood chips required to use smokeless kitchen wood a gas stove recently developed on an alternate cooking capable of substituting the costly LP gas.

The Fund will continue to work in this area during the year 2005 with an increased momentum and with increased investment required to replace some of the vary energy inefficient machinery and equipment used by the local industry.

The Fund has planned to assist the industry by making available lending facilities through the Fund's own sustainable Guarantee Fund which will be established making use of the reserves. The Fund has also successfully seeking Japanese Bank, JBIC for assistance to enhance this lending facility to provide soft loans for the industry to invest on new and efficient equipment that are capable of totally achieving the ECF target of reducing the demand for electricity by 30%.

### **Global Village Energy Partnership (GVEP)**

The Global Village Energy Partnership Program (GVEP) was announced as one of 14 Presidential Initiatives announced at the Sustainable Development Summit in Johannesburg, South Africa in August 2003. The GVEP Program seeks to reduce poverty and enhance sustainable development through the accelerated provision of modern energy services to those un served or underserved. This is made possible through a partnership of developing and industrialized country governments, international development agencies, donor organizations, private firms, consumers, NGOs and others committed to addressing energy-poverty. This document sets forth a Statement of Principles for partners to the Global Village Energy Partnership, including responsibilities, services and proposed activities.

Under funding from USAID, CORE International, Inc. has been supporting the GVEP activities in Sri Lanka and Zambia.

Sri Lanka is one of the initial nations that joined GVEP at the World Summit on Sustainable Development held in Johannesburg, South Africa in August 2003. To move forward with its participation in GVEP, the Government of Sri Lanka (GOSL) has designated the Ministry of Power and Energy as its lead ministry for coordinating the development of its initial rural development program under GVEP. In November, 2003 CORE initiated provision of assistance to the Ministry of Power and Energy to facilitate near-term actions to enhance Sri Lanka's process of active participation in GVEP.

Specifically, CORE's support to the Government of Sri Lanka included (i) a review and assessment of the current rural electrification (RE) and rural energy services (RES) setting and the role of various entities and institutions in adapting a multi-sector approach to rural development; (ii) in-country consultation among all major RE/RES stakeholders at the national level, and the establishment of a multi-sector Rural Electrification Working Group as an initial stakeholder body to be eventually formalized as the GVEP Working Group; and (iii) the development of an initial action plan for Sri Lanka's participation in the GVEP initiative.

CORE also assisted the Government of Sri Lanka in the development a final proposal to formalize a sustainable GVEP Working Group and to provide financial support to the Working Group for the development of a GVEP Action Plan and the facilitation of a National Workshop on GVEP. The GVEP coordinator in Sri Lanka is closely working with the GVEP Secretariat in facilitating a National GVEP Consultation Workshop in Sri Lanka .

SELF has supported solar rural electrification in Sri Lanka since 1991 through two non-profit organizations. It helped launch SoLanka Associates, a service-oriented, non-profit organization devoted to the promotion of solar photovoltaics in Sri Lanka. In addition, SELF organized a two-year solar "introduction and development" project in association with Sri Lanka's largest NGO and self-help organization, the Sarvodaya Shramadana Movement. In both programs, SELF utilized locally made "SUNTEC" modules and components, helping to support domestic SHS component manufacturing. SELF is continuing to help bring solar home systems to the seventy percent of rural Sri Lankans without access to electricity.

SELF assisted in the formation of SoLanka Associates, a development-focused, non-profit organization devoted to the promotion of solar photovoltaics in rural areas of Sri Lanka. SoLanka and SELF organized the country's first "solar co-op", the SoLanka Sun Society of Morapatawa Village, to manage a revolving-credit fund to finance solar home systems for its members. Sun-Society members paid a small down payment for their systems, and repaid the balance to the fund in monthly payments over 8 years. As the fund grew, other families were able to access the fund and finance their own SHS. After five years, the initial 48 families had repaid enough into the revolving credit fund to allow an additional 25 families to purchase SHS. Following the success of Morapatawa, SoLanka expanded the solar electrification program to other villages. SoLanka founder Priyantha Wijesooriya has recently founded the Renewable Energy Service Company Asia (RESCO-Asia) to expand Sri Lanka's rural electrification work on commercial basis.

SELF also developed a solar rural electrification program for Sarvodaya, a large Sri Lankan NGO. Formed by rural development visionary, Dr. A.T. Ariyaratne, the Sarvodaya Shramadana Movement is a national rural development organization with over three million members. SELF worked with Sarvodaya to develop a "Solar Seed" program, which introduced solar electricity to over 100 Sri Lankan villages. The program, in partnership with Sarvodaya Rural Technical Services (SRTS), installed demonstration systems throughout rural Sri Lanka, in various Sarvodaya community centers, primary schools, and Buddhist temples. In addition, training in installation, and maintenance of the SHS was provided to rural technicians. SELF then organized and capitalized a pilot revolving credit fund to provide financing to Sarvodaya members interested in purchasing systems. The Sarvodaya/SELF solar program initially served over 300 households. In



1994, Dr. Ariyaratne called for a "million home" solar program to be funded by international donors.



The World Bank approved a \$24 Million Energy Services Delivery Loan to assist rural Sri Lankans in acquiring solar electricity by providing them with financing. SELF initially campaigned for multilateral development assistance to support solar rural electrification in Sri Lanka, and will work with Sarvodaya and RESCO to help implement the program. A substantial portion of the loan is targeted for solar PV rural electrification, to be implemented through organizations like RESCO and Sarvodaya, which has undertaken a pilot stage for the World Bank to electrify 2,200 homes with SHS. The near-term solar home systems in Sri Lanka is estimated to be 450,000 rural households.

### **Wood Energy Sources**

Traditional biomass fuel, primarily wood fuel, continues to play an important role in the energy balance of Sri Lanka. The share of traditional biomass fuel in total primary energy consumption for the year 2001 is estimated at about 50-51 percent by the Energy Conservation Fund of Sri Lanka. The contributions of wood fuel and other biomass (crop residues, etc.) are estimated to be about 49 percent and 1.5 percent, respectively. Available statistics also suggest that between 1981-1995 the average annual growth in traditional biomass fuel consumption was about 1.9 percent. The household sector is by far the largest consumer of traditional biomass fuel and accounts for about 81 percent of total consumption. The second largest consumer is the industrial sector (tea, coconut, rubber, brick, lime and pottery industries), followed by the commercial sector (hotels and restaurants, bakeries and local food vendors).

Non-forest lands, mostly private farms, homesteads, home gardens, tea estates, rubber and coconut plantations, etc. supply as much as 70-75 per cent of the annually consumed wood fuel in Sri Lanka, hence constitute a very important fuel wood supply source. Though important, the forest and forest plantations in the public sector only meet about 11-12 per cent of the annual wood fuel demand in the country. The role of wood fuels in the national economy and environment of Sri Lanka is increasingly recognized as being important, not only for its contribution to the energy balance but also, and perhaps even more significantly, for its contribution to the rural socio-economy through income-employment generation in wood fuel trade related activities. The estimated economic value of the wood fuel consumed in the country, using the 1990 average price of wood fuels, amounts to over 440 million US\$.

Over the past seven years, RWEDP has collaborated with a number of national agencies such as the Forest Department, the Energy Conservation Fund, Peradeniya University, etc. to implement different sustainable wood energy development activities in Sri Lanka. This report documents one of those activities designed to raise awareness and promote

the integration of wood energy development issues into the policies, programs and training and education curricula in related sectors like forestry, agriculture, education, rural development etc.

### **Sri Lanka Energy Services Delivery Project**

The project was set up in 1997 to finance renewable energy implementation in Sri Lanka.

One of the major components of the ESD was a national solar home system promotion and implementation programme. This was a promotional campaign to raise awareness of solar technologies. Other components include community micro hydro mini-grids, pilot wind farms and national capacity building.

The SHS programme involved several stakeholders and service providers at various levels. Other players included the SHS dealers and participating credit and microfinance institutions. Financing of the SHS was provided through a loan from the World Bank that was distributed through financial institutions and a grant provided by the Global Environment Facility to subsidize the cost of each system.

The Sri Lankan government has linked its rural electrification programme to the market based SHS programme, thus lending credibility to the private sector and increasing consumer acceptance.

Consumer financing has been the most challenging component of the SHS programme.

### **Lessons learned**

- Using existing financial infrastructure for awareness building, microfinance and technical support.
- A financing model that offers both installation and financing as a package deal through the same well established NGO.
- Sufficient front end funding to set up the programme and build capacity.
- Quality assurance to ensure that all installed systems are installed properly
- Government support for the programme