





Sri Lanka

The Sri Lankan economy is driven by food processing, textiles and apparel, food and beverages, telecommunications, and insurance and banking. In 1970, plantation crops made up 93 percent of the exports, that figure dropped to 15 percent in 2003. That same year, textiles and garments constituted 63 percent of exports. In the early 1990s, GDP grew annually at a rate of 5.5%. there was a slump in 2006 due to worsening security issues, growth dropped to 3.8 percent that year.

The economy picked up in the years that followed, averaging 5.3 percent growth. It went south again in 2001 due to power shortages, budget problems, civil strife, and a global slowdown, growth that year slowed to 1.4 percent. The following years saw an improvement in the country's fortunes but the problems caused by the Tamil Tigers continues to threaten the economy.

Sri Lanka has no fossil fuel reserves and is dependent on fuel wood and hydropower. The current installed capacity of 2,231MW comprises 1,172MW hydropower, 1,056MW thermal and 3MW wind power. It is susceptible to rainfall fluctuations as it relies heavily on hydropower. Annual consumption is 6,500GWh and there is no export or import of electricity. The government aims to provide electricity to 80% of the population by 2010.

Electricity demand is growing annually at the rate of 8 percent and is expected to grow at the same pace in the foreseeable future. At present, hydropower is the main source of commercial

energy in the country. However, almost all economically sound and environmentally acceptable major hydropower sources have been harnessed over the last two decades. Such constraints have increased the country's dependence on thermal power, which increased from 21% in 1990 to 35% in 2000.

According to the government-owned and controlled utility, Ceylon Electricity Board's (CEB) Long-term Generation Plan (1999-2013), power generation will need to be increased from 6,800GWh in 2000 to about 15,000GWh in 2013. The share of hydropower is expected to decrease to 32 percent. The balance will be met by thermal power generation.

In an effort to diversify, the Sri Lankan government has put more emphasis on the power and energy sectors. Foreign investors have been invited to construct independent thermal power plants. It is estimated that the country requires around US\$2.5 billion of investment over the next decade for the development of the sector, including US\$1 billion for generation and the balance for distribution and transmission.

Previously, the CEB has been able to expand to meet load growth. However, allowing a single entity to finance and control the power sector is not an ideal framework for the future. Financing the power sector development should depend less on concessionary foreign aid and more on commercial loans and private sector investment.

Sri Lanka opens its doors to international and local investors in power projects with a range of

PROFILE

Capital	Colombo	Installed Capacity	2,231MW
Area	65,610 km	Population Electrified	62%
Population	20.6 million	Main Voltages (kV)	220, 132
GDP	US\$80.85 billion	Natural Resources	hydropower
Currency	Sri Lankan Rupee (LKR)		

fiscal incentives. Opportunities exist for investors in, and developers of, private sector Build-Own-Operate (BOO) power projects, project consultants and suppliers of equipment. Thermal power generation projects will be utilising private sector finance on BOO/Build-Operate-Transfer (BOT) bases.

Operators

The CEB dominates the power sector, in the year 2000 it generated 78 percent of the power supply. IPPs and hired plants make up the balance. The CEB controls all transmission, and it distributes 85 percent of the power produced. The remaining 15 percent is distributed by the Lanka Electricity Company (LECO).

Established in 1969, CEB's directive was to develop power generation, transmission and distribution throughout the country. In 1984, the government, together with the CEB, local authorities and the Urban Development Authority jointly set up LECO. This organisation took over the distribution of power supply to the outer suburbs of Colombo, and has since extended

its operations to encompass the western and southern parts of the island.

CEB's National Grid System distributes the power. Presently, the transmission system operates at 220kV and 132kV, but work is underway to convert 90 percent of the grid to 132kV. Both CEB and LECO control delivery to larger customers (mostly at 11kV and 33kV, with a few at 132kV), with all bulk suppliers and sales handled within respective franchise areas. Deliveries from the CEB to LECO are mainly at 33kV. Retail sales are at 440v (3 phase) and 230v (single phase).

Restructuring Program

With aid from the Asian Development Bank (ADB) and the World Bank, the Sri Lankan government is undertaking a restructuring programme for the power sector to promote competition and to encourage private sector participation. The existing vertically integrated power sector is to be unbundled so that power generation, transmission and distribution will be administered by separate entities. In view of the increased participation





of the private sector in the power sector, the demand for an effective regulatory framework has also been acknowledged. The restructuring programme includes preparation of a power sector reform bill, establishment of a regulatory commission, and other institutional reforms. A power sector reform office has been set up and has commenced work.

Although currently small, private sector participation in the power sector in the form of independent power producers (IPPs) will continue to expand. Details of recent IPP projects are as follows:

- Lakdhanavi has a 22.5MW diesel power plant at Sapugaskanda. This is a joint venture between CEB and Lanka Transformers (of which ABB is a shareholder), and it runs on furnace oil;
- Asia Power (an international consortium which includes KHD of the UK and the Commonwealth Development Corporation), situated at Sapugaskanda, has a capacity of 51MW. Developers have submitted plans to extend this plant by a further 51MW;
- 60MW barge mounted power plant, constructed in Japan and moored at the Colombo Port on a BOO basis was commissioned in June 2000;
- An 8MW diesel power plant by Kool Air in Kankasanturai was established in 2000;
- Construction is underway for the American Energy Services, (AES) 163MW combined cycle power plant at Kelanitissa. This is to be commissioned in two stages, the first in mid 2002 and the second in mid 2003;
- Initial construction work has been completed on two diesel power plants of 20MW by a consortium of investors led by Ace Power, a local company (investors include Wartsila NSD Power Development of Finland and Commonwealth Development Corporation);
- In addition, there are 14 mini hydropower projects with a capacity of 36MW already commissioned or under various stages of construction. CEB has also issued Letters of Intent (LOI) for a further 49 small power projects with a combined capacity of 147MW.

Constraints

The current hydro electricity generating system is inadequate generating capacity to meet the demand at peak periods, and being dependent on the environment, they are not able to ensure continuous supply throughout the whole year due to unreliable rainfall patterns.

New hydro projects are handcuffed by environmental concerns arising from the construction of reservoirs, such as soil erosion, silting of reservoirs and the inundation of fertile lands. The advantages of thermal power development projects have been recognised in terms of cost effectiveness, environmental consequences, capacity and reliability. The downside is its generation cost is higher than that of hydro.

Because of the increasing reliance on thermal power, along with higher fuel prices and private power supplier prices, CEB's average cost of electricity generation has gradually increased from US\$0.021 per unit in 1991 to US\$0.064 per unit in 2000. Presently, Sri Lanka's average electricity price applicable to the industrial sector (US\$0.074 per kWh) is considerably higher than that of most other Asian countries. To combat this, the authorities are considering building a coal-powered station.

According to the CEB, coal is the most economical option when compared with other fuels such as diesel/fuel oil, liquefied natural gas (LNG), wind power, solar energy, wave energy, biomass, geothermal energy and saw dusts.

Wind power is an option and a wind power plant of 3MW was commissioned as a pilot project in Hambantota. However, wind energy is viable only in limited areas and installation costs can be prohibitive.

The CEB is of the view that solar energy is too expensive for large-scale electricity generation, but could be economical in remote areas, where the costs of extending the national grid would be more expensive.

These applications of other forms of renewable energy sources such as geothermal energy, biomass, wave energy and sawdust are at the demonstration stage. However, they could play a critical role in the decentralisation of electricity generation to meet electricity needs of rural and remote areas.

Renewables

Despite the constraints, the generation of electricity using renewable energy sources is increasing. However, no renewable targets have been set for the next 10 years, and power expansion is still leaning towards coal generation.

Power expansion planning towards more sustainable and more benign electricity supply is presently not in consideration. However, it is recognised that the Carbon Dioxide (CO₂) emission figures from power generation can be minimised if careful considerations were taken to introduce more sustainable generation options and to minimise power wastage.

According to the CEB generation planning report, the future power generation in the country will become predominantly fossil fuel based.

Proposed Generation Plans

The main drive for a sustainable electrical supply is the reduction of energy wastage.

According to CEB estimates, power loss in wires is about 22% to 25%. Most of the industrial processors use highly inefficient systems, thus wasting lot of energy. The situation in the commercial and domestic sectors is the same. Therefore, to ensure a sustainable electricity supply, power loss minimisation in wires, demand side management (DSM), and energy conservation should take priority while utilising all the possible schemes of small-hydro and wind. Moreover, it is critical to evaluate the existing hydro reserve and sustainability of these schemes.

The following main factors were incorporated into the proposed power generation expansion plan:

- Use DSM options and power conservation in industrial, commercial and domestic sectors, thus reducing anticipated electricity demand by 4%, 7% and 10% in the periods 2003–2005, 2006–2008 and 2009–2012 respectively;
- Expand and reinforce the existing power transmission and distribution systems, thus minimising the power loss in wires to 14% by the end of 2012;
- About 10% to 20% of the total demand to come from renewable/distributed generation schemes by the end of 2012, which include

hydro schemes less than 50MW and wind generation scheme.

- As the power generation of the country is mainly dependent on the existing and proposed hydro reserve, it is important to consider the contribution from hydro towards power generation

Conclusion

Any sustainable power generation option should include energy efficiency/DSM options, power flow loss reduction options, and renewable/distributed generation options.

Three scenarios for power generation planning for the next decade were considered. One of which was based on the CEB power generation expansion plan and was used as the base case scenario. Two other scenarios incorporating avoided generation options were presented.

One was based on high-hydro situations where rain fall figures in a three-year period are sufficient to maintain 75% of the reservoir level above their minimum. The other was based on a low-hydro case where only 40% of installed capacity of hydro contributes to the energy production.

It was shown that CO₂ emission for the proposed new scenarios especially after the period 2006 to 2008, has come down with respect to the base case, indicating power planning leading to a more sustainable future.

Recommendations

The following recommendations may be proposed for a sustainable electrical supply for the country:

- Intensify the present DSM programme carried out by the CEB and make it more attractive to customers;
- Encourage energy conservation, and possibly offering rebates to organisations;
- Prepare a transmission and distribution expansion plan incorporating options to reduce power losses in the wires, and also to facilitate the energy export from present autonomous schemes, which can export power to the grid;
- Prepare a committed long-term power generation expansion plan while incorporating sustainable energy sources;



- Identify the changes in hydro resources with climate change;
- Expansion of micro and mini-hydro power plants will improve the social standards of part of the 40% of the people who have no access to electricity.

Solar Electric Light Fund

Since 1991, the Solar Electric Light Fund (SELF) has supported solar rural electrification in Sri Lanka via two non-profit organisations. It helped launch SoLanka Associates, a service-oriented, non-profit organisation devoted to the promotion of solar photovoltaics (PV). On top of that, the SELF organised a two-year solar “introduction and development” project in association with Sri Lanka’s largest NGO and self-help organisation, the Sarvodaya Shramadana Movement.

In both programmes, SELF utilised locally-made “SUNTEC” modules and components to support domestic Solar Home Systems (SHS) component manufacturing. SELF aims to bring SHS to the 70% of rural Sri Lankans without access to electricity.

SoLanka and SELF organised the country’s first “solar co-op”, the SoLanka Sun Society of Morapatawa Village, to manage a revolving-credit fund to finance SHS 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 eight 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, the solar electrification programme was introduced to other villages. SoLanka founder Priyantha Wijesooriya founded the Renewable Energy Service Company Asia (RESCO-Asia) to expand the country’s rural electrification work on a commercial basis.

SELF has also developed a solar rural electrification programme for Sarvodaya, a large Sri Lankan non-governmental organization. The Sarvodaya Shramadana Movement is a national rural development organisation with over 3 million members. SELF worked with Sarvodaya to develop a “Solar Seed” programme, which introduced solar electricity to over 100 Sri Lankan villages. The programme, in conjunction 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 the installation and maintenance of the SHS was provided to rural technicians. SELF then organised and capitalised a pilot revolving-credit fund to provide financing to Sarvodaya members interested in purchasing systems. The Sarvodaya/SELF solar programme initially served over 300 households. In 1994, a “million home” solar programme was proposed, to be funded by international donors.

The World Bank approved an Energy Services Delivery loan worth US\$24 million to help rural Sri Lankans acquire solar electricity. SELF initially contested for multilateral development assistance to support solar rural electrification, and will work with Sarvodaya and RESCO to help implement the programme. A substantial portion of the loan is targeted for solar PV rural electrification, to be implemented through organisations such as 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 system installation in Sri Lanka is estimated to be 450,000 rural households.

