StANCE Knowledge Sharing Workshop

Janathakshan – SRI LANKA

Sri Lanka...

The **climate is tropical and warm**, due to the moderating effects of ocean winds. Mean temperature ranges from 17 °C in the central highlands to a maximum of 33 °C in other low-altitude areas. **Average yearly temperature ranges from 28 °C to nearly 31 °C.**

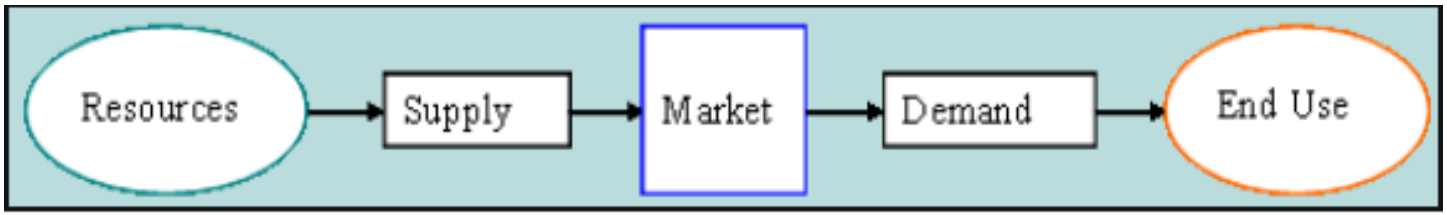
Rainfall pattern is influenced by monsoon winds from the Indian Ocean and Bay of Bengal. The "wet zone" and some of the windward slopes of the central highlands receive up to 2,500 millimeters (98.4 in) of rain each month, but the leeward slopes in the east and northeast receive little rain.

Population is 20,277,597 people, and an annual population growth rate of 0.73%

The country has 103 rivers. The longest of these is the Mahaweli River, extending 335 kilometers. These waterways give rise to 51 natural waterfalls of 10 meters or more.

Sri Lanka is **second** only to the Maldives in the **South Asian region in terms of per capita income**. It recorded a GDP growth of 8.3% in 2011. Economy is rapidly growing.

Lying within the Indomalaya Eco zone, **Sri Lanka is one of 25 biodiversity hotspots** in the world. Although the country is relatively small in size, it has the highest biodiversity density in Asia.

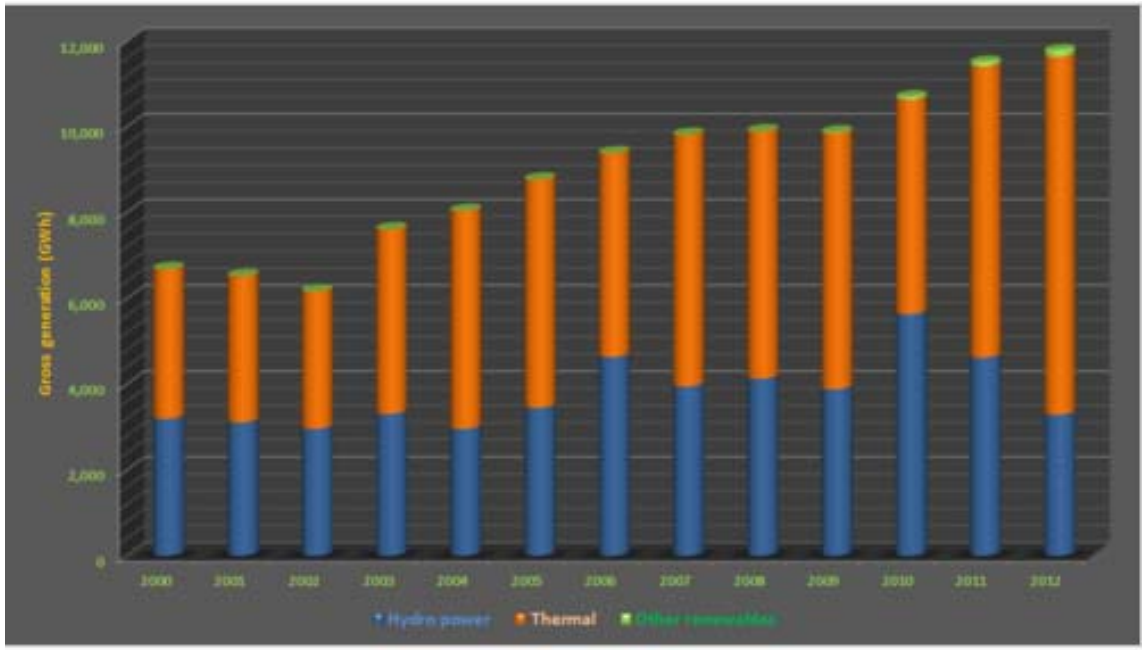


Indigenous Resources

- Biomass
- Hydro Power
- Solar and Wind
- Availability of petroleum within Sri Lankan territory is being investigated

Global Resources

- Petroleum
- Coal
- Natural Gas
- Nuclear Energy



Energy Supply

Mainly based on 3 primary resources, namely, **biomass, petroleum and hydroelectricity**.
Additionally, the non-conventional resources (mainly wind and solar).

Energy Demand Growth

With the increasing demand for energy to provide for the country's economic and social development, total primary energy demand is expected to increase to about 15,000 kTOE by the year 2020 at an **average annual growth rate of about 3%.**

Energy Sector Governance

Electricity and petroleum are the two main commercial energy supply sub-sectors in Sri Lanka. Both these sub-sectors, which are largely served by state-owned utilities, are presently undergoing process of reforms.

Biomass and wind are also emerging as significant forms of commercial energy

Energy Policies, Strategies, Targets…

- **National Energy Policy & Strategies of Sri Lanka** 10.06.2008

- **The "National Energy Policy and Strategies of Sri Lanka" has three main components**

- "Energy Policy Elements" consists of the fundamental principles that guide the development and future direction of Sri Lanka's Energy Sector.

- "Implementing Strategies" states the implementation framework to achieve each policy element.

- "Specific Targets, Milestones and Institutional Responsibilities" state the national targets, and the planning and institutional responsibilities to implement the strategies.

Energy Policy Elements

- **Providing Basic Energy Needs**
- **Ensuring Energy Security**- To ensure the continuity of supply, the future energy mix will be rationalized, considering important factors such as the **economic cost**, **environmental impacts**, reliability of supplies, convenience to consumers and strategic independence
- **Promoting Energy Efficiency and Conservation**
- **Promoting Indigenous Resources**
- **Adopting an Appropriate Pricing Policy**
- **Enhancing Energy Sector Management Capacity**
- **Protection from Adverse Environmental Impacts of Energy Facilities**

Implementing Strategies

- **Providing Basic Energy Needs**
  - Priority will be given to improving access by rural areas to commercial energy forms such as electricity and petroleum-based fuels.
  - Current modalities of providing basic electricity requirements of the entire population either through grid- extension or off-grid systems will be expanded and a systematic action-plan will be implemented to meet those requirements.

- **Ensuring Energy Security**
  - Fuel diversity in electricity generation
  - Fuel diversification in the transport sector
  - Regional cooperation will be promoted in different forms including viable cross-border energy transfer with neighboring countries
  - Development of bio-fuels for transport will be encouraged

- **Promoting Energy Efficiency and Conservation**
  - Supply side and end-use energy efficiency will be encouraged through financial and other incentives
  - Private sector participation in providing expert services on energy efficiency will be promoted and facilitated
  - The Energy Conservation Fund(ECF) will be entrusted to coordinate all the activities relating to energy conservation and management
  - A model shift towards larger-capacity vehicular transport modes, which are less energy intensive per passenger kilometer or freight-tonne kilometer, will be promoted.

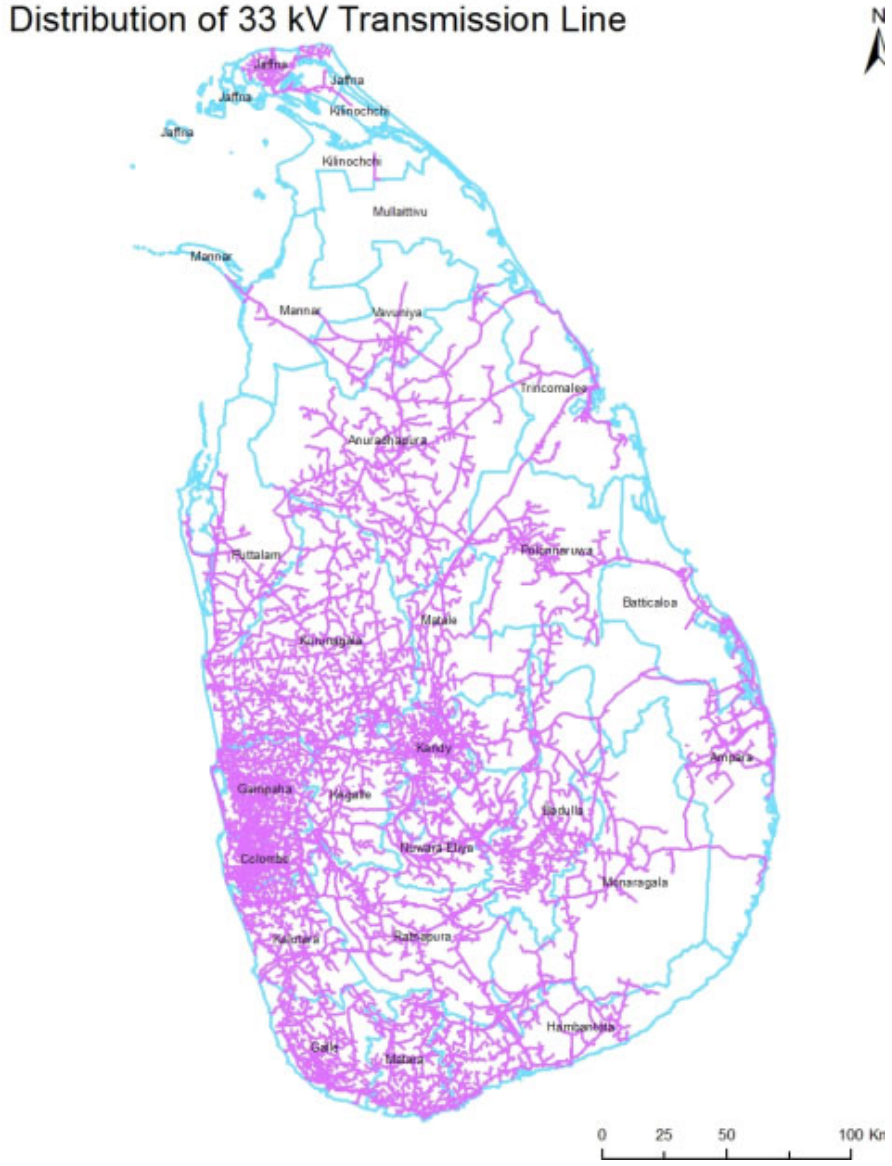
- **Promoting Indigenous Resources**
  - The use of economically viable, environment friendly, non-conventional renewable energy resources will be promoted by providing a level playing field for developers of non-conventional energy resources.
  - Necessary incentives will be provided and access to green funding including Clean Development Mechanism (CDM) will be facilitated to develop non-conventional renewable energy resources to ensure their contribution to the energy supply, even if their economic viability is marginal
  - A facilitation agency dedicated to the systematic planning and promotion of non-conventional renewable energy resources will be established
  - Biomass-based energy projects will be developed in areas where land resources are available
  - Research and development on adopting new technologies and practices, particularly in the use of non-conventional renewable energy to suit local conditions will be promoted.

Non-conventional Renewable Energy(NRE) Based Electricity in the Grid

- NRE Resources include small-scale hydropower, **biomass including dendro power, biogas and waste, solar power and wind power**. These are the leading sustainable, non-conventional forms of renewable energy promoted in Sri Lanka for electricity generation into the grid. In addition, other NRE resources such as wave energy and ocean thermal energy are also encouraged where appropriate

POLICY TARGETS

- The Government envisages reaching a 100% target in country-wide electrification by 2015.



- The growing electricity demand could be met only by adding adequate generation capacities. However, the present energy resources in Sri Lanka fail to meet these criteria and therefore, the need for several resources or an energy mix arises.

Year	Conventional Hydrolytic (%)	Maximum from Oil (%)	Coal (%)	Minimum from non-conventional renewable energy (%)
1995	94	6	-	-
2000	45	54	-	1
2005	36	61	-	3
2010	42	31	20	7
2015	28	8	54	10

The Government has also recognized the need to **elevate biomass** as both a commercial crop as well as the third fuel option for electricity generation and has accordingly declared *Gliricedia sepium* as the fourth plantation crop after tea, rubber and coconut in 2005. Biofuels as an important constituent of the transport energy will be developed to take a 20 % share by 2020.

National Climate Change Adaptation Strategy for Sri Lanka 2011-2016 (NCCAS)

- Sri Lanka is a negligible contributor to global warming. However, as a nation, we are highly vulnerable to the impacts of climate change, which include: increases in the frequency and intensity of disasters such as droughts, floods and

1.landslides; variability and unpredictability of rainfall patterns;

2.increase in temperature; and

3.sea level rise, among others.

- Mainstream Climate Change Adaptation into National Planning and Development
- Enable Climate Resilient and Healthy Human Settlements
- Minimize Climate Change Impacts on Food Security
- Improve Climate Resilience of Key Economic Drivers
- Safeguard Natural Resources and Biodiversity from Climate Change Impacts

Energy Management Plan 2012 - 2016

- Regulatory Interventions
- Energy efficiency services
- Enhancing awareness on energy conservation
- Facilitating funding schemes for energy efficiency improvement

Networks….

CLIMATE CHANGE SECRETARIAT

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மத்திய சற்றாடல் அதிகாரசபை
Central Environmental Authority

Sri Lanka Sustainable Energy Authority

"**An environment conscious nation and a prosperous Sri Lanka with a high level of resilience to global climate change**"

Carbon Fund – assist in the following areas Renewable Energy,
Energy Conservation,
Sustainable Transport,
forestry .....
National Climate Change Adaptation Strategy for Sri Lanka 2011-2016 (NCCAS)

- Environmental Protection Licensing
- EIA/IEE
- Environmental Recommendation
- Public Complaints Related to Environment
- Scheduled Waste Management Licensing
- Water Quality, Air Quality, Noise and Vibrations measurements by expert team

To guide the nation in all its efforts to develop indigenous energy resources and conserve energy resources through exploration, facilitation, research & development and knowledge management in the journey of national development, paving the way for Sri Lanka to gain energy security by protecting natural, human and economic wealth by embracing best sustainability practices.

Ceylon Electricity Board (CEB)

The Ceylon Electricity Board, is the largest electricity company in Sri Lanka. With a market share of nearly 100%, it controls all major functions of electricity generation, transmission, distribution and retailing in Sri Lanka.

LECO Home
Lanka Electricity Company (Pvt) Ltd

Lanka Electricity Company Private Limited is a company incorporated in 1983 for the electricity distribution in Sri Lanka.

LTL HOLDINGS

LTL is a dynamic engineering enterprise engaged in Manufacturing, Construction & Service industries spanning across Electrical, Mechanical and Civil engineering fields.

- Sri Lanka Energy Managers Association
- International Energy Agency
- Janathakshan
- Energy Forum
- HELPO Eco Green Biogas Company
- Arpico

- **The challenge: Generation mix and three questions to ask**

  Overall, it seems Sri Lanka's capacity for further expansion of hydroelectric potential – in both large and small developments – is limited. As such, Sri Lanka's electricity generating system (currently dominated by oil-fired electricity generation) is likely to be led by coal-fired power plants in the future – being the cheapest alternative to oil-fired generation.

  The share of hydropower is estimated to reduce from 40.2 percent in 2007 to 19.5 percent by 2020, while coal-fired thermal generation is estimated to reach 70.9 percent by 2020[v]. Furthermore, there is ample evidence to suggest that Sri Lanka's climate has already changed. Variability of both southwest monsoon and northeast monsoon rains and rains of convectional origin during inter-monsoon seasons has increased significantly in recent decades. These changes will have direct impacts on water availability for hydro power generation.

  Meanwhile, the dependency on coal may also increase electricity prices and negative environmental externalities. A recent study done by Harvard University reports that the life-cycle effects of coal, and the waste stream generated, is costing the U.S. public between a third to over half a trillion dollars annually[vi]. Moreover, many of these externalities are cumulative. When the environmental damages are accounted for, the price of a unit of electricity generated by a unit of coal is higher than any other renewable resource, especially hydro. Therefore, leaning towards coal as a long-term solution needs rethinking.

  Against this backdrop, it is essential to ask some basic questions – (1) Are there any management practices that can be employed to increase the efficiency in hydro power generation?; (2) What are new innovations that could boost the efficiency of hydro power generation?; and (3) How can the adverse impacts that climate change would have on generating power through hydro be addressed?. - See more at: http://www.dailymirror.lk/business/features/44934-hydro-power-and-sri-lankas-energy-challenge.html#sthash.BEWMyU0i.dpuf

- **Policy options: Managing catchment areas, adopting new technology**
  Even though it is widely believed that the major hydro systems have reached their potential, there could be ways to improve efficiency. Better management of 'catchment areas and upper catchment areas' can be one option. A catchment area is the area drained by the water body or the reservoir, while an upper catchment area is just above that and is generally covered by forests. Deforestation in upper catchment areas causes heavy soil erosion and causes siltation in the catchment area.

  Better management of these areas could improve water storage of existing reservoirs, allowing more water to be available for power generation over a longer period of time. Today, deforestation and soil erosion has caused siltation in many of the major reservoirs, significantly reducing their water holding capacities. Therefore, it might be useful to protect these catchments areas, and manage them properly to ensure larger storages during rainy seasons.

  Many new innovations that are emerging can boost the performance of hydro power generation systems, for instance Pump Water Storage Power Plants (PWSPP). These systems allow the pumping of water from lower reservoirs to upper reservoirs using renewable energy such as solar power. These storage mechanisms have been reported to possess efficiency levels of around 85 percent[vii]. Some studies on implementing this in Sri Lanka are now underway. Potential capacity improvements have been assessed for sites such as Samanalawewa (Keriketi Oya), Maussakele (Adam's peak falls), Randenigala (Halgran Oya), Kotmale (Maha Oya, Gurugal Oya, Kada Oya) and Upper Kotmale (Dambagatalawa, Agra Oya)[viii].
  - See more at: http://www.dailymirror.lk/business/features/44934-hydro-power-and-sri-lankas-energy-challenge.html#sthash.BEWMyU9i.dpuf

Potential and Business….

Currently, ten large hydroelectric power stations are in operation, with the single largest hydroelectric source being the Victoria Dam.
Also the government continues to issue small hydro development permits to the private sector, for projects up to a total installed capacity of 10 MW per project.

Thermal power stations are the largest source of power in Sri Lanka, taking a share of nearly 54% of the total available capacity. Thermal power stations in Sri Lanka runs either on diesel, gas or other fuel oils.

Kerawalapitiya power plant Sri Lanka

Turbines of the Ambewela Aitken Spence Wind Farm; the first multi-megawatt wind farm in the Central Province.

- The first commercial grid-connected wind farm is the 3 MW Hambantota Wind Farm, located northwest of Hambantota.
- Fully private, grid connected wind farm was commissioned in Mampuri of the Puttalam District, Sri Lanka on March 22, 2010.

Biogas Technology

Solar Net Metering

Solar parks

The SLSEA would establish the first ever grid connected solar energy park in Baruthaknda of Hambantota, which also promises to be the first solar energy park in Asia.

The total capacity of the project is 900 kW and amounts to USD 14.5 million. The project spans an extent of 20 acres of the 50 acre energy park area demarcated for the purpose.

The goal of the project is to provide clean energy through solar power generation. The project is estimated to generate 558,600 kWh per annum and this is capable of offsetting 860 tonnes of CO2.

RENEWABLE ENERGY FORECAST

The SEA proposes the following sector-based RE development targets to meet the policy target of generating 10% of power from non-conventional RE resources by 2015.

Cumulative RE Capacity Additions (MW)						
Year	Biomass	Hydro	Wind	Other	Total	%Energy
2007	1	119	3		123	4.0
2008	11	155	3		169	4.5
2009	15	165	14		194	4.7
2010	15	200	34	1	250	6.4
2011	20	225	34	1	280	6.8
2012	20	280	35	1	336	9.1
2013	20	295	85	2	402	9.8
2014	30	310	85	2	427	9.9
2015	40	330	85	5	460	10.0

- Conventionally, wind as an energy resource was used only in power generation, and agricultural water pumping, that too in small quantities. Activities concerning the development of wind energy resources were first initiated by the CEB on small scale technologies, primarily, for water pumping and electrification of remote areas. Systematic studies on large scale wind power generation too were conducted throughout this period. These activities led to the launching of the first ever detailed wind monitoring programme in the south eastern part of the country in 1998 by the CEB with the technical and financial assistance from the Government of Netherlands.

NON CONVENTIONAL WIND

Since Sri Lanka has substantial wind resources, developing it has become an important strategy in meeting the goal of generating 10% of grid power from non-conventional renewables by 2015.

The 10 MW wind farm in Puttalam

The first ever private, grid connected wind farm was commissioned in Mampuri of the Puttalam District, Sri Lanka on March 22, 2010. When in operation, this farm would add 10 MW to the national grid.

Net-metering is a policy that allows an electricity customer to use renewable energy sources within his premises to generate electricity and utilise it within his premises, and to export it to the national grid if excess power is being generated, to be recovered when needed. Therefore, the grid acts like an energy bank for the customer.

Technically, any renewable resource like hydro, wind, solar and biomass can be net-metered. But at household level, solar PV systems are the preferred option, owing to resource availability, smaller space requirements and ease of operation and maintenance.

Biomass

Exploitation of biomass foe electricity generation is gaining a new momentum in Sri Lanka. The concept of biomass based electricity generation – commonly referred to as Dendro – holds much promise to Sri Lanka.

Biomass is the most common source of energy supply in the country, with the majority usage coming from the domestic sector for cooking purposes. Due to the abundant availability, only a limited portion of the total biomass usage is channelled through a market and hence the value of the energy sourced by biomass is not properly accounted. Biomass comes in different forms. The most common forms in Sri Lanka are, fuel wood, municipal waste, industrial waste and agricultural waste.

Energy Plantation

Approximately 0.72million ha of marginal land has been deemed suitable for energy plantations, especially for *Gliricidia sepium*, which can yield 25tonnes of fuelwood from a hectare. These biomass resources could prove to be the most vital component in meeting non-conventional renewable energy targets, as it offers the luxury of despatchabliliy of power as and when demanded.

Challenges

- Information Gap – Limited portfolio of renewable energy distribution in the country
- Dissemination of renewable energy into large scale is not taken place into a significant level
- Need of a proper financial mechanism to consider the marginalized community when switch to the renewable energy practices
- Lack of awareness
- Macro level urban planning and climate change mitigation / renewable energy promotion should be integrated
- Need of a decentralized approach to broaden the use of renewable energy
- Commercialized supply of renewable energy sources by private sector need to set with the general targets of national policy
- Still local authorities should be educated energy efficiency practices or to use the renewable energy resources
- The government is burdened with numerous fiscal and monetary difficulties to find extra resources for promoting the renewable energy. In this connection, innovative strategies of resource mobilization should be identified for mobilizing resources from sources other than public funds

Programs, Targets…

- Government

  - **Development of Energy Educational Programme**
  - Programme on “Energy Efficient Kitchen”
  - **School Awareness Programme on Sustainable Energy City**
  - Energy Management in Tea Sector
  - National Programme on Energy Efficient and Environmentally Sustainable Transport (E3ST) System in Sri Lanka
  - Training programme for preschool teachers
  - A Workshop on assembling LED bulbs
  - Vidulka Energy efficiency exhibition
  - Energy Efficient Lighting Guidelines for Residential Applications
  - Solar Net Metering programme
  - A Country Lush with Vegetation - A Bright Future “Deyata Sevana” National Tree Planting Programme
  - Vanaduru Sevana

- Greening Sri Lanka Hotels Programme
- **NAMA - National Appropriate Mitigation Action (Promotion of low-carbon transformation)**
- **Up-scaling biogas technology for sustainable development and mitigating climate change in Sri Lanka**
- **Researches by University of Moratuwa on Biogas technology**

We Act to Meet Urgent Challenges

Janathakshan has vast experience developing **domestic/large scale biogas systems, micro/pico hydro, wind energy and energy efficient cook stoves**. Janathakshan specializes in promoting viable and decentralized renewable energy options particularly in remote areas. With a special focus on biomass and other renewable energy options Janathakshan is working towards making Sri Lanka less dependent of imported fossil fuels.

THANK YOU…..