An Overview of Sri Lanka’s Energy Sector

Sarith K. Malavisooriya
Chief Internal Auditor
Ministry of Power & Renewable Energy
Sri Lanka.
Location
## Basic Facts

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>20.8 Million</td>
</tr>
<tr>
<td>Population Density</td>
<td>323/km²</td>
</tr>
<tr>
<td>Official Languages</td>
<td>Sinhala, Tamil and English</td>
</tr>
<tr>
<td>Capital City</td>
<td>Sri Jayawardhanapura Kotte</td>
</tr>
<tr>
<td>Major Industry</td>
<td>Apparel Industry, Tea Industry</td>
</tr>
<tr>
<td>Major Exports</td>
<td>Apparel Products, Tea, Spices</td>
</tr>
<tr>
<td>Major Imports</td>
<td>Petroleum, Fertilizer, Chemicals</td>
</tr>
<tr>
<td>GDP</td>
<td>US$ 71 Billion (60% Services, 28% Industry, 12% Agriculture)</td>
</tr>
<tr>
<td>Per capita GDP / Annum</td>
<td>US$ 3,385</td>
</tr>
<tr>
<td>Energy / GDP</td>
<td>1162.1 toe/million US$</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>77.9 yrs (10% higher world avg)</td>
</tr>
<tr>
<td>Literacy rate</td>
<td>92.5% (computer literacy 35%)</td>
</tr>
<tr>
<td>Geography</td>
<td>costal plains, mountains (2,500 m)</td>
</tr>
<tr>
<td>Average Temperature</td>
<td>28 °C (17°C to 33°C)</td>
</tr>
</tbody>
</table>
NCRE Potential
Reference: Sustainable Energy Authority Sri Lanka (Web: www.energy.gov.lk)

- **Small Hydro**
  Economically feasible potential – 500MW (present installed capacity - 282 MW)

- **Wind** – 23,500 MW
  20,000 MW (6% of land)
  3,500 MW (lagoons, 700 sqkm)
  Offshore potential is unknown

- **Solar**
  4.0 - 4.5 kWh/sqm/day (two thirds of land)
  2.0 – 3.5 kWh/sqmm/day (high plains)
  Substantial potential exists
Energy Use

Individual energy consumption

- Primitive man (2,000,000 BC)
- Primitive farmer (5,000 BC)
- Hunter (100,000 BC)
- Developed farmer (1400 AD)
- Industrial man (1875)
- Technological man (1950)

Gigajoules per person per year

Sri Lanka
Today
21.65 GJ
Economic impact of Energy

- Energy is considered the mother of economic development
- Petroleum imports in 2011 amounted to 7.5% of GDP in market prices
- Petroleum imports annulled more than half of all our export earnings in 2012
  - Consumes around 41% of our export earnings by 2014
A different development path

![Graph showing energy intensity (TJ/LKR million) from 1978 to 2014. The graph compares primary and commercial sectors.](image-url)
Where are we headed..?

- We use less and less energy to produce economic output
  - Structure of the economy altered
- No major energy consuming industries setting up operations here
  - Not only due to high energy costs
  - Near absence of an Engineering infrastructure
- Electrification level reaching saturation
  - Energy consumption for non-economic activities expected to rise
Evolution of GDP
New challenges

Changing Structure of Economy

- Agriculture
- Industry
- Services
Is this a healthy trend..?

- Energy intensity of economy may not give the full picture of the situation
  - Only an indicator of how much energy input was made to produce one million LKR of output
  - A better indicator would be how much was spent on energy to produce one million LKR of output
- This will paint a gloomier picture
  - Nevertheless, lesser energy intensity in a national economy could be a survival trait in the medium term
Locally exposed…
Energy Balance of Sri Lanka 2014

A snapshot of where it came from, where, and where it went.
Another view – 2014 demand in PJ

Total Energy Demand 382.4

- Petroleum 112.5
- Electricity 26.1
- Industry 98.9
- Biomass 73.1
- Household, Commercial & Other 171.1
- Coal 2.6
- Transport 112.5

Energy measured in Peta Joules (1PJ ~ 8 days of electricity used in the country)
### Generators in the National Grid 2014

#### Installed Capacity

<table>
<thead>
<tr>
<th>Source</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Capacity</td>
<td>4,040 MW</td>
</tr>
<tr>
<td>Hydro</td>
<td>1,377 MW</td>
</tr>
<tr>
<td>CEB Thermal</td>
<td>1,444 MW</td>
</tr>
<tr>
<td>PPP Thermal</td>
<td>769 MW</td>
</tr>
<tr>
<td>NRE</td>
<td>437 MW</td>
</tr>
<tr>
<td>Net Metered</td>
<td>13 MW</td>
</tr>
<tr>
<td>Peak Demand</td>
<td>2,152 MW</td>
</tr>
</tbody>
</table>

#### Electricity Generation

<table>
<thead>
<tr>
<th>Source</th>
<th>Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Generation</td>
<td>12,830 GWh</td>
</tr>
<tr>
<td>Hydro</td>
<td>28.4%</td>
</tr>
<tr>
<td>Thermal-Oil</td>
<td>34.4%</td>
</tr>
<tr>
<td>Thermal-Coal</td>
<td>27.5%</td>
</tr>
<tr>
<td>NRE</td>
<td>9.6%</td>
</tr>
</tbody>
</table>

#### HHs Access to Electricity

<table>
<thead>
<tr>
<th>Source</th>
<th>Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>98%</td>
</tr>
<tr>
<td>National Grid</td>
<td>98%</td>
</tr>
<tr>
<td>Off-Grid</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

#### Grid Emission Factor

- In 2012: 0.7202 t-CO$_2$/MWh
- In 2013: 0.7193 t-CO$_2$/MWh
- In 2014: 0.7043 t-CO$_2$/MWh
Electricity Demand Profile

MW

0:30 1:30 2:30 3:30 4:30 5:30 6:30 7:30 8:30 9:30 10:30 11:30 12:30 13:30 14:30 15:30 16:30 17:30 18:30 19:30 20:30 21:30 22:30 23:30

Energy Demand

The graph illustrates the energy demand over the years from 1978 to 2014, categorized into Household, Commercial & Others (purple), Transport (orange), and Industry (gray). The demand has consistently increased over the years, with the Household, Commercial & Others category showing the highest demand.
Electricity Sector Emissions
NRE Programme, the success

![Graph showing the growth of renewable energy sources from 1996 to 2014.](image-url)

- **Wind**
- **Solar**
- **Biomass**
- **Combined heat and power**
- **Hydro**

The graph illustrates the significant increase in renewable energy production over the years, with a notable rise in hydroelectric power.
## NRE Programme, the success

<table>
<thead>
<tr>
<th>Status</th>
<th>Technology</th>
<th>Small Hydro</th>
<th>Wind</th>
<th>Biomass</th>
<th>Solar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>MW</td>
<td>No.</td>
<td>MW</td>
<td>No.</td>
<td>MW</td>
</tr>
<tr>
<td>Commissioned</td>
<td>144</td>
<td>296.97</td>
<td>15</td>
<td>128.45</td>
<td>6</td>
<td>23.50</td>
</tr>
<tr>
<td></td>
<td>168</td>
<td>450.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Permits</td>
<td>104</td>
<td>197.55</td>
<td>1</td>
<td>1.10</td>
<td>20</td>
<td>101.53</td>
</tr>
<tr>
<td></td>
<td>130</td>
<td>350.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisional Approvals</td>
<td>103</td>
<td>122.59</td>
<td>14</td>
<td>105.00</td>
<td>14</td>
<td>75.00</td>
</tr>
<tr>
<td></td>
<td>133</td>
<td>322.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Grid Electricity

**Mix of New Renewable Energy in 2014**

1,215 GWh, 9.5% of total Grid-electricity generation
Electricity Sector
Future Challenges & Targets

• Achieve 100% electrification (present 96%)
• Further improve reliability indices
• Esthetic aspects (UG system)
• Distribution automation/SCADA/Smart Grid
  Colombo & Kandy already completed (UG & SCADA)
• GIS (transmission & MV distribution)
• Low cost energy (oil reserves found in Mannar sea)
• Energy diversification & security (20% NCRE in 2020)
Sri Lankan Success Stories
Thank You

E-mail sarathkmalavi@gmail.com
Explore our site www.powermin.gov.lk