Sectorial Crediting Program Under Carbon Partnership
Frameworks for Renewables Energy Projects

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Transmission Division
Ceylon Electricity Board
Sri Lanka
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Capacity Mix and Energy Mix (2017)

<table>
<thead>
<tr>
<th>Other Renewable Energy Technology</th>
<th>No of Projects</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mini Hydro Power</td>
<td>182</td>
<td>354.044</td>
</tr>
<tr>
<td>2 Biomass - Agricultural &amp; Industrial Waste</td>
<td>4</td>
<td>13.08</td>
</tr>
<tr>
<td>3 Biomass - Dendro Power</td>
<td>6</td>
<td>13.02</td>
</tr>
<tr>
<td>4 Solar Power- Parks</td>
<td>8</td>
<td>51.36</td>
</tr>
<tr>
<td>5 Wind Power</td>
<td>15</td>
<td>128.45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>213</strong></td>
<td><strong>560</strong></td>
</tr>
<tr>
<td>Solar Roof Tops as at June 2018</td>
<td></td>
<td>150</td>
</tr>
</tbody>
</table>
Renewable Energy Contribution

- Major Hydro
- Other RE
- Total RE Percentage


Energy (GWh):
- 2007: 3000
- 2008: 3500
- 2009: 4000
- 2010: 5000
- 2011: 5000
- 2012: 5000
- 2013: 7000
- 2014: 5500
- 2015: 7000
- 2016: 5000
- 2017: 4000

Percentage (%):
- 2007: 0%
- 2008: 10%
- 2009: 20%
- 2010: 30%
- 2011: 30%
- 2012: 40%
- 2013: 50%
- 2014: 40%
- 2015: 60%
- 2016: 30%
- 2017: 20%
ACTUAL AND FORECAST ENERGY/PEAK DEMAND

As per LTGEP 2018-2037

Estimation of avg. growth rate approx. 5%
Future RE Capacity Additions

Capacity Additions During the planning horizon of next 20 years:

As per the LTGEP 2018-2037

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Hydro</strong></td>
<td>240</td>
</tr>
<tr>
<td><strong>Other Renewable Energy</strong></td>
<td>2800</td>
</tr>
<tr>
<td>(Wind, Solar, Mini Hydro and Biomass)</td>
<td></td>
</tr>
<tr>
<td><strong>Pumped Storage Hydro</strong></td>
<td>600</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td>1200</td>
</tr>
<tr>
<td>Solar</td>
<td>1300</td>
</tr>
<tr>
<td>Mini Hydro</td>
<td>220</td>
</tr>
<tr>
<td>Biomass</td>
<td>100</td>
</tr>
</tbody>
</table>

- Government has approved policy on,
  - Firm power capacity of 30% from natural gas, 30% from coal, 25% from hydro and 15% from other firm sources.
  - Integration of 2500 MW of ORE (mainly solar and wind) by 2030 contributing of 20% of total energy
<table>
<thead>
<tr>
<th>Year</th>
<th>Cumulative Mini hydro Capacity (MW)</th>
<th>Cumulative Wind Capacity (MW)</th>
<th>Cumulative Biomass Capacity (MW)</th>
<th>Cumulative Solar Capacity (MW)</th>
<th>Cumulative Total ORE Capacity (MW)</th>
<th>Annual Total ORE Generation (GWh)</th>
<th>Share of ORE from Total Generation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>344</td>
<td>144</td>
<td>39</td>
<td>210</td>
<td>737</td>
<td>2103</td>
<td>13.0%</td>
</tr>
<tr>
<td>2019</td>
<td>359</td>
<td>194</td>
<td>44</td>
<td>305</td>
<td>902</td>
<td>2471</td>
<td>14.3%</td>
</tr>
<tr>
<td>2020</td>
<td>374</td>
<td>414</td>
<td>49</td>
<td>410</td>
<td>1246</td>
<td>3402</td>
<td>18.4%</td>
</tr>
<tr>
<td>2021</td>
<td>384</td>
<td>489</td>
<td>54</td>
<td>465</td>
<td>1392</td>
<td>3784</td>
<td>19.5%</td>
</tr>
<tr>
<td>2022</td>
<td>394</td>
<td>539</td>
<td>59</td>
<td>471</td>
<td>1463</td>
<td>4022</td>
<td>19.8%</td>
</tr>
<tr>
<td>2023</td>
<td>404</td>
<td>599</td>
<td>64</td>
<td>526</td>
<td>1592</td>
<td>4338</td>
<td>20.3%</td>
</tr>
<tr>
<td>2024</td>
<td>414</td>
<td>644</td>
<td>69</td>
<td>581</td>
<td>1708</td>
<td>4620</td>
<td>20.6%</td>
</tr>
<tr>
<td>2025</td>
<td>424</td>
<td>729</td>
<td>74</td>
<td>685</td>
<td>1912</td>
<td>5084</td>
<td>21.6%</td>
</tr>
<tr>
<td>2026</td>
<td>434</td>
<td>729</td>
<td>79</td>
<td>740</td>
<td>1982</td>
<td>5229</td>
<td>21.2%</td>
</tr>
<tr>
<td>2027</td>
<td>444</td>
<td>754</td>
<td>84</td>
<td>795</td>
<td>2076</td>
<td>5447</td>
<td>21.0%</td>
</tr>
<tr>
<td>2028</td>
<td>454</td>
<td>799</td>
<td>89</td>
<td>900</td>
<td>2242</td>
<td>5796</td>
<td>21.3%</td>
</tr>
<tr>
<td>2029</td>
<td>464</td>
<td>824</td>
<td>94</td>
<td>954</td>
<td>2336</td>
<td>6014</td>
<td>21.1%</td>
</tr>
<tr>
<td>2030</td>
<td>474</td>
<td>894</td>
<td>99</td>
<td>1009</td>
<td>2476</td>
<td>6365</td>
<td>21.2%</td>
</tr>
<tr>
<td>2031</td>
<td>484</td>
<td>929</td>
<td>104</td>
<td>1064</td>
<td>2580</td>
<td>6365</td>
<td>21.1%</td>
</tr>
<tr>
<td>2032</td>
<td>494</td>
<td>974</td>
<td>104</td>
<td>1119</td>
<td>2691</td>
<td>6844</td>
<td>20.9%</td>
</tr>
<tr>
<td>2033</td>
<td>504</td>
<td>1044</td>
<td>109</td>
<td>1173</td>
<td>2830</td>
<td>7193</td>
<td>21.1%</td>
</tr>
<tr>
<td>2034</td>
<td>514</td>
<td>1114</td>
<td>109</td>
<td>1229</td>
<td>2965</td>
<td>7509</td>
<td>21.1%</td>
</tr>
<tr>
<td>2035</td>
<td>524</td>
<td>1184</td>
<td>114</td>
<td>1283</td>
<td>3105</td>
<td>7860</td>
<td>21.2%</td>
</tr>
<tr>
<td>2036</td>
<td>534</td>
<td>1279</td>
<td>114</td>
<td>1338</td>
<td>3265</td>
<td>8252</td>
<td>21.4%</td>
</tr>
<tr>
<td>2037</td>
<td>544</td>
<td>1349</td>
<td>119</td>
<td>1442</td>
<td>3454</td>
<td>8670</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

As per LTGEP 2018-2037
Promotion of Other Renewable Energy

- Past 20 year ORE cumulative capacity addition: 558MW
- An aggressive renewable energy development is envisioned for the next 20 years by maintaining optimum energy contribution from ORE power plants and planned to implement total cumulative capacity approximately 3400 MW

Investment of USD 141 million per year for RE projects need to be raised from year 2018 onwards (Ex Rate: 156 LKR/USD)
### Environmental Aspect
Comparison of CO2 Emissions from Fuel Combustion

<table>
<thead>
<tr>
<th>Country</th>
<th>kg CO2/2010 US$ of GDP</th>
<th>kg CO2/2010 US$ of GDP Adjusted to PPP</th>
<th>Tons of CO2 per Capita</th>
<th>Total CO2 Emissions (Million tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sri Lanka</td>
<td>0.23</td>
<td>0.08</td>
<td>0.81</td>
<td>16.7</td>
</tr>
<tr>
<td>Pakistan</td>
<td>0.67</td>
<td>0.17</td>
<td>0.74</td>
<td>137.4</td>
</tr>
<tr>
<td>India</td>
<td>0.92</td>
<td>0.29</td>
<td>1.56</td>
<td>2019.7</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.46</td>
<td>0.17</td>
<td>1.72</td>
<td>436.5</td>
</tr>
<tr>
<td>Thailand</td>
<td>0.64</td>
<td>0.24</td>
<td>3.6</td>
<td>243.5</td>
</tr>
<tr>
<td>China</td>
<td>1.08</td>
<td>0.53</td>
<td>6.66</td>
<td>9134.9</td>
</tr>
<tr>
<td>France</td>
<td>0.10</td>
<td>0.17</td>
<td>4.32</td>
<td>285.7</td>
</tr>
<tr>
<td>Japan</td>
<td>0.21</td>
<td>0.27</td>
<td>9.35</td>
<td>1188.6</td>
</tr>
<tr>
<td>Germany</td>
<td>0.20</td>
<td>0.21</td>
<td>8.93</td>
<td>723.3</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0.06</td>
<td>0.09</td>
<td>4.61</td>
<td>37.7</td>
</tr>
<tr>
<td>USA</td>
<td>0.32</td>
<td>0.32</td>
<td>16.22</td>
<td>5176.2</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.20</td>
<td>0.16</td>
<td>2.31</td>
<td>476</td>
</tr>
<tr>
<td>Australia</td>
<td>0.26</td>
<td>0.36</td>
<td>15.81</td>
<td>373.8</td>
</tr>
<tr>
<td>World</td>
<td>0.44</td>
<td>0.32</td>
<td>4.47</td>
<td>32381</td>
</tr>
</tbody>
</table>


#### Total CO2 Emissions (Million tons) from Electricity – Actual and Predicted in Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2014</th>
<th>2025</th>
<th>2030</th>
<th>2037</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Future Coal</td>
<td>6.79</td>
<td>5.05</td>
<td>7.68</td>
<td>12.08</td>
</tr>
<tr>
<td>Coal Limited 1800 MW</td>
<td>6.79</td>
<td>6.41</td>
<td>10.72</td>
<td>17.05</td>
</tr>
<tr>
<td>Base Case</td>
<td>6.79</td>
<td>7.41</td>
<td>11.32</td>
<td>19.25</td>
</tr>
<tr>
<td>Reference</td>
<td>6.79</td>
<td>9.33</td>
<td>13.55</td>
<td>24.20</td>
</tr>
</tbody>
</table>

- **Electricity and heat production**
- **Other energy ind. own use**
- **Manufacturing industries and construction**
- **Transport**
- **Other sectors**
• Nationally Determined Contributions submitted to UNFCC
• Sri Lanka expects to reduce 20% GHG emission in energy sector by 2030 against the Business-As-Usual scenario as unconditionally 4% and conditionally 16%.
• Already Incorporated in preparation of LTGEP 2018-2037
Model for Institutional Arrangements for Carbon Financing

Policy Target: Increase the share of Non-Conventional Renewable Energy to 20% by 2020

Regulator: Public Utilities of Sri Lanka

Carbon Partnership Facility

A dedicated Carbon Fund

Supporting Agencies

Ceylon Electricity Board (CEB)

NCRE Portfolio Management

Wind Farm

NCRE Plant A

NCRE Plant B

NCRE Plant C

NCRE Plant D

NCRE Plant E

Financial Flows

Carbon Credits

Financial Flows

Policy Update

NCRE Update

Policy Support

Technical Support

Management Support

Financial Support

Carbon Credit Ownership

Partnership

Proposed Framework Boundary

Outside Boundary, but Closely Monitored

Financial Flow from the Program
Crediting Approach for the Proposed Program

AT 1: MWh equi. to X% NCRE
AT 2: MWh equi. to Y% NCRE
AT 3: MWh equi. to Z% NCRE

Total MWh increased = maximum creditable MWh

Creditable MWh

Aspirational NCRE generation
Actual NCRE generation
Baseline MWh

Start year (e.g. 2018)
Year
Y1
Y2
Y3

Additional own effort if SL decides to claim conditional target under the PA

= Max (MWh needed to meet Unconditional target, MWh generated under BAU)
MRV (Monitoring, Reporting, Verification) Arrangement

**Parameters to monitor**
- Type of the plant
- Plant capacity (MW)
- Electricity generated and exported (MWh)
- Type of fuel
- Amount of fuel used
- NCV
- Efficiency of the plant
- Date of commissioning

**CEB**
- Collects data
- Checks data accuracy (QA/QC)
- Calculates ERs
- Maintains registry

**SEA & CEA**
- Coordinates data collection from IPPs

**Third Party Verifier**
- Verifies ERs

**Climate Change Secretariat**
- Uses for national inventory and UNFCCC reporting
- Checks NDC progress
- Allows transfer of credits
- Supports informed decision making on policies

**Ministry of Power & RE**
- Monitors NCRE target
- Makes appropriate policy improvements
Role of Carbon Finance

• Development of tools and technological measures related to grid integration and technology promotion
  • Implementation of day ahead, hourly basis and accurate Wind and Solar PV energy forecasting system
  • 24 hour (round the clock), renewable energy desk has to be set up and output from each renewable energy sources have to be monitored (if existing plants are not equipped with communication facilities, measures have to be taken for establishing them)

• Development of new and innovative business models
  • Enabling policy environment and developing viable business models for solar and wind
  • De-risk the energy infrastructure projects and reduce cost

• Deploy measures to implement Demand Side Management activities

• Support to increase ambition level of NDC
  • Translate Sri Lanka’s NDC 2030 goals into annual targets to facilitate tracking progress

• Capacity building for,
  • Market readiness
  • Collecting GHG emission data and support monitoring, reporting and verification of GHG emissions
  • Scaling up of mitigation activities
THANK YOU

www.ceb.lk