Rural Electrification in Liberia: Progress Made on Mini-grids

Augustus V. Goanue
Executive Director
Rural and Renewable Energy Agency

www.liberiaruralenergy.org
Presentation Outline

- Electricity Sector Institutions
- Rural Electrification Planning in Liberia
- Five Programs of Liberia’s Master Plan
- Basic Planning Criteria
- Pilot Mini-Grid Projects in Liberia
- Funding for Mini-Grids
- Mini-Grid Implementation
- Challenges
- Feedback from Mini-Grid Experience
Electricity Sector Institutions

Ministry of Mines & Energy (MME): high level policy maker for the energy sector with political oversight.

Liberia Electricity Corporation (LEC): involved with grid connection but with potential to interconnect with mini-grids.

Rural and Renewable Energy Agency (RREA): facilitates the provision of modern energy services, including mini-grids with emphasis on renewable energy resources.

Liberia Electricity Regulatory Commission (LERC): independent regulator of the electricity sector involved in issuing licenses to operators.
The Rural Energy Strategy and Master Plan of Liberia was developed and launched in 2016, with a target to achieve 35% rural electrification access by 2030;

The Master Plan intends to benefit about 1.3 million people, and it contains a program specifically dedicated to mini-grids;

Mini-grids will contribute significantly to meeting the rural electrification target set in the Master Plan; and

The Master Plan sets renewable energy supply mix of 75% (micro/small hydro capacity of 52.2 MW, biomass 25.6 MW and solar 76 MW),
Five Programs of Liberia’s Master Plan (2030)

I. GTG Growing the National Grid
   - National Grid extension
   - 4 initiatives
     • 15 Projects

II. DG Decentralized Grids
   - Solar/Diesel transitional mini-grids, decentralized grids and renewable energy
   - 4 initiatives
     • 24 Projects

III. BTG Beyond the Grid
   - Small scale off-grid initiatives in non-grid and rural areas
   - 3 initiatives
     • 9 Projects

IV. OTP Other than Power
   - LPG and efficient cook stoves
     • Energy Efficiency
   - 4 initiatives
     • 12 Projects

V. BC Building Capacity
   - Building capacity and systems for implementation and operation
   - 6 initiatives
     • 32 Projects
Basic Planning Criteria 1/2

- Use of maps, geographic information system, and demographic data;

- Collect and analyse data for mini-grid solutions’ decision-making;

- Identify available energy resources and decide on applicable technology options; and

- Identify and define baseline scenarios including demand assessment and forecast, including technical and financial feasibilities.
Ensure requirements for all statutory regulations, guidelines and associated permits, are obtained;

Conduct “willingness and ability to pay” survey/analysis as the basis for developing a business case; and

Develop a business plan, including associated implementation plan.
## Pilot Mini-grid Projects in Liberia

<table>
<thead>
<tr>
<th>Mini-grid type</th>
<th>No. of mini-grids</th>
<th>Region/County</th>
<th>Year Commissioned</th>
<th>Installed Capacity</th>
<th>No. of Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-hydro</td>
<td>1</td>
<td>Lofa</td>
<td>2013</td>
<td>60 kW</td>
<td>213</td>
</tr>
<tr>
<td>Biodiesel (palm oil)</td>
<td>1</td>
<td>Lofa</td>
<td>2017</td>
<td>114 kW</td>
<td>205</td>
</tr>
<tr>
<td>Biomass (wood chips)</td>
<td>1</td>
<td>Nimba</td>
<td>2017</td>
<td>60 kW</td>
<td>250</td>
</tr>
<tr>
<td>Solar PV &amp; diesel hybrid</td>
<td>5</td>
<td>Lofa</td>
<td>2017</td>
<td>190 kWp</td>
<td>569</td>
</tr>
<tr>
<td>Solar PV &amp; diesel hybrid</td>
<td>1</td>
<td>Bong</td>
<td>2018</td>
<td>70 kWp</td>
<td>200</td>
</tr>
<tr>
<td>Solar PV with battery backup</td>
<td>1</td>
<td>Lofa</td>
<td>2017</td>
<td>20 kWp</td>
<td>175</td>
</tr>
</tbody>
</table>
Funding for Mini-grids

Funding methods:

❖ Grant (donors/development partners);
❖ Concessional loans (multilateral development banks);
❖ Equity financing (private investors);
❖ Commercial loans (commercial banks); and
❖ Public investment (government).
Mini-grid Implementation 1/3

- Public sector (Electricity agency & related actors);
- Public-Private Partnership;
- Private sector;
- Non-state actors (NGOs, Civil Society, donors and/or development partners);
Mini-grid Implementation 2/3

❖ **Engineering:** project engineers to verify and validate designs, standards, work requirements, applicable codes, etc.;

❖ **Supply requirements:** ensure design, specifications, testing, warranty, operational acceptance, and defect liabilities, etc.;

❖ **Construction requirements:** as per construction standards (obtain all relevant permits including, environmental, land ownership and compensation mechanisms, etc.).
Mini-grid Implementation 3/3

❖ **Commissioning requirements**: testing, certification (completion and operational acceptance, etc.); and

❖ **Operation & Maintenance**: sustainability through development of business and operational plans, competitive selection of operator, training, etc.
Challenges 1/2

❖ Lack of access to financing;
❖ Limited skills and experience in planning and organizing effective operation and maintenance of Mini-grids;
❖ Lack of strategies and guidelines to mitigate the impact of the arrival of the main grid to mini-grids operational areas/regions;
❖ Difficulty in getting customers to pay monthly tariffs;
❖ Low economic activities which affects customers affordability to pay for services;
Challenges 2/2

❖ Inability to replace damaged parts and carry out proper maintenance as a result of non-payment by customers;

❖ Results of willingness to pay surveys are usually deceptive and therefore the need to also consider ability to pay;

❖ Wrong choice of renewable energy technologies;
❖ Lack of productive use of mini-grids energy;
Feedback from Mini-grids Experience

❖ Mini-grid is the best and least cost option in reaching out to communities beyond the reach of the main grid;

❖ The installation of mini-grids lead to transformational impacts;
❖ Mini-grids lead to capacity development at local/grassroots levels;

❖ Mini-grids tend to attract more donors support than commercial lenders; and

❖ Renewable mini-grids relay exclusively on indigenous energy resources as fuel.
Mini-Grid Photo Galleries
Weir and intake of a Micro-hydro Mini-Grid in Yandohun, Liberia
Power House and Transformer Installation of a Micro-Hydro Mini-Grid in Yandohun, Liberia
Mini-grid Beneficiaries in Yandohun, Liberia
Biodiesel Mini-Grid Generation Power Plant in Sorlumba, Liberia
Solar Mini-Grid in Totota, Liberia
Thank you
Merci