Summary presentation for CESP workshop

Development of regulations, revenue arrangements, and technical requirements for private sector renewable energy mini-grids

September 2016
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► Overview of report
  ● Review of existing framework
  ● Business models
  ● Technical standards
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Summary presentation for CESP workshop

Development of regulations, revenue arrangements, and technical requirements for private sector renewable energy mini-grids

Overview of the assignment

Summary presentation
Overview of the assignment

► Objectives

- Recommend business model(s) for private sector engagement in renewable energy hybrid mini-grids in Kenya;
- For the recommended business model(s), develop the regulatory framework, technical standards and financial compensation mechanism;
- Recommend a bidding and award strategy for competitively granting projects to the private sector, including bid evaluation criteria.

► Approach

- Wide-ranging consultation (national and international), case studies
- Appropriate application of key lessons to the Kenyan context
Draft final report (summary presentation)

Development of regulations, revenue arrangements, and technical requirements for private sector renewable energy mini-grids

Overview of the assignment

Summary presentation

Key topics for discussion
General approach

Maximise the opportunity for customers to benefit from electricity that is safe, reliable, secure, affordable and competitive, delivered as quickly as possible

- Regulations should be as light as possible, but preserve standards for customers and sustainability for operators.
Overview of our draft report

- Review of existing and proposed framework
- Business models
- Technical standards
- Procurement
- Economic regulation
Review of existing and proposed framework
Review of existing and proposed framework

1. Market Needs and Demand
   - To what extent can mini-grids meet demand vs main grid & standalone systems?

2. Technology Choice and Technical Regulation
   - Incentives for specific technologies? Main-grid compatible or site systems?

3. Ownership, Funding and Economic Regulation

4. Planning & Development Process Guidelines & Role Clarity
   - Diversity of business models? Regulation thresholds? Subsidies?

Transparency and fairness of mini-grid procurement
Review of existing and proposed framework

► Strategic framework
  ● New National Energy Policy and Energy Bill
    ○ Many provisions that support mini-grids, but no specific mini-grids policy and legal framework
  ● National Electrification Strategy
    ○ Coordinated by National Government with input from RERC, County Govts, KPLC
    ○ Expected role for mini-grids in national electrification strategy – main grid, mini-grid, standalone systems

► Institutional framework
  ● Policy direction from the Ministry of Energy and Petroleum
  ● Regulation by ERC (supported by RERC)
  ● RERC as ‘one stop shop’ coordinator and funding facilitator, but no development
  ● KPLC participate as a service provider
Business models
Business models

► Which business models should be allowed and promoted under the framework?

► Isolated and grid-connected
  ● Isolated models
  ● Business models when the main grid arrives
  ● Small power distribution (SPD; grid-connected from development)
    ○ Already allowed under licensing arrangements
    ○ Economic and technical regulation discussed separately

The costs of regulation should be less than the value of having flexibility to choose an optimal model
## Business models – isolated mini-grids

<table>
<thead>
<tr>
<th>Business model</th>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| **Utility**    | • KPLC owns and operates the mini-grid  
• Not currently allowed as KPLC is not allowed to own generation assets | • Release the restriction on KPLC for isolated mini-grids and mini-grids which subsequently connect to the main grid |
| **PPA**        | • Separate parties own the generation and distribution assets of a mini-grid  
• Distributor purchases power from the generator under a PPA  
• May be seen as a private generator selling power to KPLC as grid distributor and supplier under a small-scale energy PPA | • Adapt the small-scale renewable energy framework to cater for much smaller generation in isolated or subsequently mini-grids |
## Business models – isolated mini-grids

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</table>
| Management Contract  | • Different parties own and operate the mini-grid  
  • Focus is on RERC and the mini-grids it currently owns, which are operated by KPLC under service level agreements                                                                                   | • Already possible  
  • RERC should no longer develop sites                                                              |
| Private (concession) | • A single private entity *(or community co-operative)* owns and operates the mini-grid                                                                                                                    | • Already possible                                   |
| Public               | • One or more public entities owns and operates the mini-grid  
  • KPLC is not fully-public, therefore this model is not currently active                                                                                  | • County Governments should be allowed to develop prioritised sites  
  • RERC should not operate mini-grids                                                                |

All isolated business model options should be considered
## Business models – main grid interconnection

<table>
<thead>
<tr>
<th>Business model</th>
<th>Status / requirements</th>
</tr>
</thead>
</table>
| 1. SPD only                                 | • Framework already exists.  
• Bulk supply tariffs should be determined by ERA.  
• Generation assets sold to KPLC will require KPLC to get a generation licence for small-scale generation at mini-grid interconnection                                                                                               |
| 2. Generate only / sell distribution assets to KPLC | • Framework needed for transferring assets, including compensation calculations  
• Small-scale renewables framework can be used for power purchase, but adapted for scale of generation.                                                                                                                                 |
| 3. Combined SPD/SPP                         | • per Options 1 and 2 above, but net metering framework can be used for power sale and purchase                                                                                                                                                                                  |
| 4. Sell viable assets to KPLC              | • Per first part of Option 2                                                                                                                                                                                                                                                       |
| 5. Move or dispose of assets                | • Nothing needed                                                                                                                                                                                                                                                                |
Technical regulation
Technical regulation – kW, kVA and kWh

- **kW and kVA**
  - Power delivered to the loads (consumption) in an AC mini-grid is measured in VA and not in W, which is normally the power at the DC generation, not at the delivery point.

- **kW and kWh**
  - A mini-grid produces, distributes and supplies kWh (units of electricity).
  - Technical regulation and licensing/permitting should be more oriented to kWh (electricity supplied) than kW (generation capacity).
Technical regulation – output v input basis

- **Output basis preferred over input basis**
  - Measure the outputs of a system’s performance rather than the components used to develop it
  - General acceptance of this approach
  - Compliance with main grid code necessary?
    - Can be achieved with an addendum to the Distribution Code, if necessary
    - Best international practices
  - Will apply for reliability and security, but safety should remain input-based
Connection with the main grid

- Anything can connect
- Compliance with main code can be achieved through an addendum
- Define Point of Common Coupling – some connections may require a technical study, e.g. LV reticulation without transformers
- IEC and IEEE standards provide guidance
- Islanding should be allowed
- Ensure KPLC has capacity to operate assets if transferred
Technical regulation – power quality standards

Power quality standards

- Standards by size (in kVA): <5, 5 – 100, 100 – 500, >500
- Measures: voltage, frequency, power factor, harmonics, reactive power, flicker, grounding, SAIDI and SAIFI

Are these requirements easy for mini-grids to achieve?
Did the national utility achieved these level in 2015?
Procurement
Procurement

Top-down

- Coordinated by RERC as ‘one-stop-shop’
- Competitive bidding
- Pre-qualification
- Bidding documents
- Compete on price (tariff or subsidy)
- Winners to meet milestones

Bottom-up

- Speculative and proactive approaches to RERC
- Sites not specifically planned for development
- No additional support from RERC
- Developer milestones
## Role of Government of Kenya institutions

<table>
<thead>
<tr>
<th>Institution</th>
<th>Allowed to develop?</th>
<th>Allowed to bid?</th>
</tr>
</thead>
<tbody>
<tr>
<td>RERC</td>
<td>• No – conflict of interest with coordinator function</td>
<td>• No – conflict of interest with coordinator function</td>
</tr>
<tr>
<td>KPLC</td>
<td>• Yes – will be allowed to apply for an integrated licence</td>
<td>• Yes – will be allowed to apply for an integrated licence</td>
</tr>
<tr>
<td>County Governments</td>
<td>• Yes – can identify sites for development outside top-down process</td>
<td>• Yes (may be unlikely as should only develop least viable sites)</td>
</tr>
<tr>
<td></td>
<td>• Must coordinate with RERC on site identification</td>
<td></td>
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</table>
Economic regulation
## Economic regulation

- **Overall approach is to ensure all operators’ commercial sustainability and all customers’ affordability**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mini-grid type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A &lt; 50 kVA</td>
</tr>
<tr>
<td></td>
<td>B 50 – 500 kVA</td>
</tr>
<tr>
<td></td>
<td>C &gt; 500 kVA</td>
</tr>
<tr>
<td></td>
<td>D SPD</td>
</tr>
</tbody>
</table>

### ERA-reviewed tariff
- A: Not reviewed
- B: Cost-reflective
- C: KPLC main grid
- D: KPLC main grid

### Active regulatory protection
- A: Only if raised by customers or operator
- B: Periodic review
- C: Periodic review
- D: Periodic review

### Cost assessment / revenue requirement
- A: Not assessed
- B: Detailed assessment
- C: Detailed assessment
- D: Not assessed

### Tariff structure
- A: Not assessed
- B: High level assessment
- C: Detailed assessment
- D: Detailed assessment
## Economic regulation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mini-grid category</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<td>&gt; 500 kVA</td>
<td>SPD</td>
</tr>
</tbody>
</table>

| Capital subsidy                                    | • Should be available | • Should be available | • Should be available | • Should be available |
| Recurrent subsidy                                  | • Not available       | • Not available       | • Available           | • Not available       |
| Grid interconnection expected (if grid arrives)    | • No                 | • Yes                | • Yes                | • Not applicable      |
| Compensation payable if grid connects             | • Yes                | • Yes                | • Yes                | • Not applicable      |

- Operators may request to ‘upgrade’ their category
Economic regulation – tariffs

► What tariff framework can ensure cost recovery for the operator and affordability for the customer?

► Approaches to tariffs
  ● Cost reflective v national level (including subsidised national utility tariff)
  ● Willingness to pay to determine true affordability
  ● Primary focus on revenue requirement (total cost assessment) rather than tariffs
  ● Allowance for fixed charges (including fixed charge only)

Different considerations can determine the approach to tariffs
Economic regulation – subsidies

<table>
<thead>
<tr>
<th>Subsidy type</th>
<th>Purpose</th>
<th>Possible source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital subsidy</td>
<td>• Reduce up-front asset and construction costs</td>
<td>• New Consolidated Energy Fund and National Electrification Fund for Connections</td>
</tr>
<tr>
<td>Recurrent subsidy</td>
<td>• Reduce recurrent costs of mini-grid operation</td>
<td>• Existing Rural Electrification Fund</td>
</tr>
<tr>
<td>Transaction subsidy</td>
<td>• Cover costs of feasibility studies, ESIA, etc</td>
<td>• New Consolidated Energy Fund</td>
</tr>
</tbody>
</table>

Subsidies can improve affordability and ensure profitability
Economic regulation – main grid interconnection

- What arrangements will ensure that no party is any worse off?

- Tariffs for distribution assets retained
  - ERC determined bulk supply charge and applies KPLC tariffs

- Tariffs for generation assets retained
  - Use small-scale renewables framework when distribution assets are sold
  - Use net metering framework when distribution assets are retained

Existing frameworks should provide sufficient comfort for retained assets
Compensation for assets sold based on depreciated value of regulated assets

- Future tariffs are calculated from the regulated asset base, so their PV will equal the RAB
- Increases in assets for customer growth will be reflected in the RAB
- Critical to value all operator costs appropriately within building blocks framework
  - All tangible costs should be either classified as O&M or capitalised in the asset base
  - All risks to equity holders should be reflected in the cost of equity
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