Opportunity and Challenge

• Like many other countries, Tanzania faces financial limitations to extending the grid

• Government and other players have worked over past 5+ years to establish strong enabling ecosystem to support mini-grid penetration

• As a result, country has a unique legal and regulatory environment that should help attract a range of companies to support off-grid sector

• Based on recent analysis (Electrification Prospectus) in Tanzania mini-grids are considered to be technically- and commercially viable for high-density populations (>125 people per km²)

• This segment includes 9.1m residents (1.86m households) or 20% of population

How can we help companies to effectively capture mini-grid opportunity in Tanzania?
SREP components & programs

FOCUS

- Geothermal component supported primarily by AfDB
- RERE to be implemented by the World Bank Group
- Of the three programs within RERE, ‘Transaction Advisory Services Facility’ (TASF) is to be implemented by IFC

Source: SREP Investment Plan
**Overall Objective:** The Tanzania mini-grid program aims to develop a robust distributed power generation sector in the country. Implemented by IFC, in partnership with SREP.

**Advisory Approach:**

- Development of **Technical Standards and Specifications**
- Development of an **Information Portal for permitting and licensing**
- **Support financial institutions** to help them identify, analyze and finance mini-grid projects

To address market barriers to mobilize resource and investments so as to commercialize and scale up mini-grids; Sub key areas include:

- **Technical** (assessment of design and advice regarding capacity building)
- **Financial and Legal** (commercial advice, financial analysis and legal requirements to different capital supports)
- **Compliance and access** (registration of permits, and licenses for community engagement)
### Key Areas of Focus

#### Component A: Market Development

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<th>Focus Areas</th>
<th>Services</th>
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| Technical standards  | • Power flow  
• Frequency and voltage regulations  
• Disconnection and reconnection protocols  
• Fault protection  
• Coordination of single and multiple point of common coupling (PCC)  
• Safety and environmental considerations  
• Load requirements  
• Power quality and availability  
• Factors to consider in the event of interconnection with the grid |
| Information hub      | • Online, publically available, one-stop information hub for mini-grids to improve access to information on the policy, legal and regulatory requirements and processes by aggregating procedures: www.minigrids.go.tz |
| Financial institutions| • Support to financial institutions to help them identify, analyze and finance mini-grids project                                      |
Component B: transaction advisory

**SERVICES**

**Technical**
- Renewable energy resource assessments
- Market identification and selection
- Community engagement advice
- Pre-feasibility and feasibility studies
- Technical design and construction support
- Bundling services advice for sites with similar profiles
- Provide periodic training workshops on feasibility study preparation if there is sufficient demand

**Financial and legal**
- Advice on commercial, quasi-commercial, grant financing
- Corporate structuring, business planning and financial modelling
- Economic and financial analysis support that determines key bankability indicators and sensitivity of the business
- Assistance in management of legal requirements at various stages of the project cycle
- Linkages to other finance and capital support facilities

**Compliance and access**
- Business registration
- Environmental and social compliance to land access
- Generation licenses, distribution licenses, power purchase agreements (for grid-tied), construction permits, tax obligations
- Community engagement including establishment of community trusts or community energy management companies

**Transaction advisory facility**
- Aim is to address select market barriers to mobilize resources and investment to commercialize and scale-up mini-grids
- Vision is to work closely with other related initiatives, including capital support and technical assistance facilities
THE NEED FOR STANDARDS (BY NRECA)

Standards are required only if there is some sort of regulation (including safety) or financial involvement in a project.

Some of the proposed areas of standards:

1. Project Planning
2. Generation
3. Distribution
4. Customer Metering
5. Physical and Cyber Security
6. Performance Reporting
7. Grid Interconnection
8. Environmental

Recommendation is for standards to apply to systems between 10 kW and 1,000 kW of generation or distribution capacity, and that systems below 10 kW be specifically exempted from these standards.
1. PROJECT PLANNING

- Project developers should be required to state what levels of service they provide based on the World Bank / SE4ALL “Five Tier” system or the systems described by the Power Africa “Quality Assurance Framework”

- A template method for specifying the general size of the mini-grid opportunity should be provided.

- This document should also state the configuration of the system in a standardized format using the eight additional points described here.

- This standardized approach will allow both government agencies and investors to more readily compare opportunities.
2. GENERATION

- Most generation technologies are already covered by existing standards (example: PV -- TZS 877, TZS 878 and TZS 925)

- There is a need for a grid-connected inverter standard based on UL 1741 (US), IEEE 1547 and IEC 62019.

- This standard should focus on anti-islanding, but with the ability to relax specific setpoints to allow operation on less stable grids.

- Battery standards need to be updated to accommodate new technologies and non-battery energy storage systems.
3. DISTRIBUTION SYSTEM

- Systems involving medium voltage should be built to TANESCO equivalent construction standards but should allow use of appropriate voltages such as 11 kV and lower.

- Smaller systems using low voltage may have less formal requirements (including underground systems), but there should be some sort of minimum requirement for customer safety (ref IEC 62257-9) including grounding, clearances and insulation.

- Distribution system design is tied into #7 Grid Interconnection
4. CUSTOMER INTERFACE / METERING

- Some sort of customer metering should be required for all mini-grid projects. This is tied in with #6 Performance Reporting. Prepayment meters should be heavily encouraged.

- Metering standards should be updated to allow for new types of customer metering (e.g. mesh networks, power limiting and energy limiting in addition to simple prepay) which may be appropriate for mini-grids.

- These standards should focus on accuracy (potentially slightly relaxed from current standards) and safety.

- Question on whether EWURA household wiring standards apply to remote mini-grid systems.
5. SECURITY

- There should be a simple standard for physical security that requires potentially dangerous generation equipment (especially batteries) to be located in a limited access location.

- Project developers can go through the Cyber Security Assessment process defined by the “Guide to Developing a Cyber Security and Risk Mitigation Plan” developed by NRECA for the US DOE Smart Grid Demonstration Project for use by small utilities. This is an education / awareness tool and does not require adherence to formal standards.
6. PERFORMANCE REPORTING

- Project developers should be required to provide periodic reporting on system performance.

- Topic 1: Operational performance of the system vs. stated goals, including planned and unplanned outages.

- Topic 2: System losses – energy generated vs. energy sold.

- The reporting template should be standardized.
7. GRID INTERCONNECTION

- There are a number of scenarios for what happens when the national grid is extended to the area of a remote mini-grid. The options range from dissolution of the mini-grid to continued operation as a grid connected generation / distribution system.

- Need to facilitate development of appropriate SPP regulations for generation under 1 MW.

- There should be a formal option for distribution systems which are built to TANESCO standards (or equivalent) to be transferred to TANESCO with fair market compensation for the equipment.
8. ENVIRONMENTAL

- All electrification projects require an environmental impact assessment. Can this be streamlined so as not to be a burden to small village projects.

- Project should state the type and amount of energy received from renewable sources and the amount of fuel use / energy from non-renewable. Emissions standards for diesel and biomass engines?

- Recycling should be required as part of decommissioning at end of project.
SUMMARY

- **Standards / guidelines are needed** for mini-grid systems between 10 kW and 1 MW. Systems above 1 MW are already regulated by EWURA and systems below 10 kW should be specifically exempted from these standards.

- **Many standards / guidelines already exist** (e.g. inverters, batteries, meters), but may need to be updated to accommodate newer technologies.

- **Grid interconnection continues to be an area of high interest** to project developers.

- **Standards should apply** to systems in which the Government of Tanzania has a regulatory or financial interest.
Start of the Info Portal Development
- Inception
- Gathering Information
- Analysis
- Templates Designs

Develop Standards
- Inception
- Review local and global specs
- Establish needs, gaps, opportunities
- Recommend institutional arrangements
- Implementation

Info Portal and Technical standards
- Meetings with Government working Group
- Portal design
- Tech standard data collection and Analysis

Launching of the Info Portal
- Training of the hosting institutions
- Launching the Portal to the public

Project developer support and work with financial institutions (TASF)
- Business models
- Feasibility studies
- Scale-up approach
- Financing arrangements
- Links to strategic & operational partners

Host bi-annual partnership workshops
- Meet local and international financiers
- Introduce strategic and operational partners (esp. South South)
- Disseminate learnings

Source: IFC analysis
Thanks

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