ROLE OF MINI GRID AND OFF-GRID SOLUTIONS IN ACHIEVING UNIVERSAL ACCESS

CHALLENGES & OPPORTUNITIES

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National Electrification Policy -1989

- National Electrification Scheme (NES) instituted in 1989 to achieve universal access of reliable electricity supply over a 30-year period (1990-2020)

RATIONALE

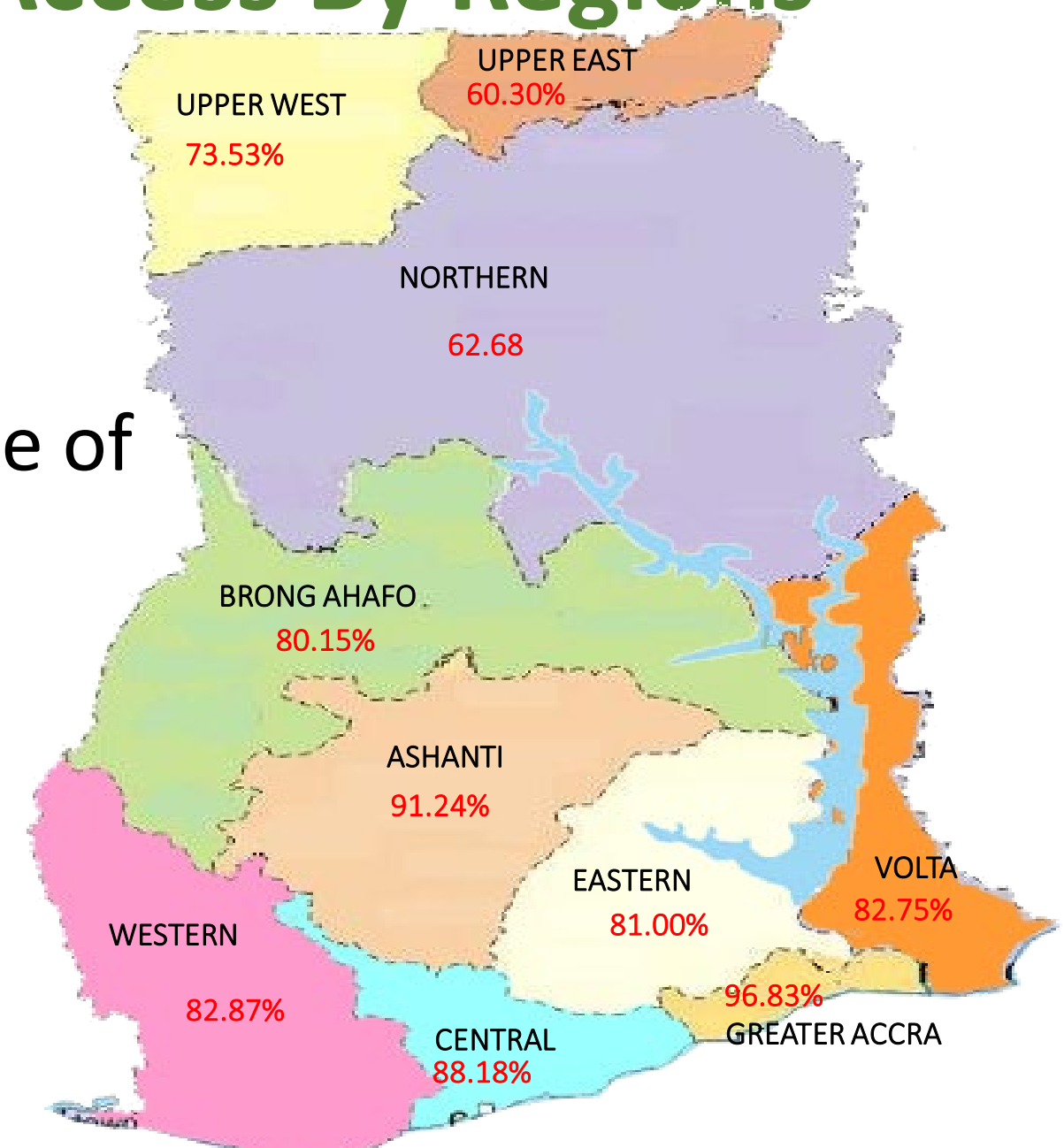
- Stimulate socio-economic development and promote growth of agro-based & small scale industries nationwide
- Reduce rural urban migration in search of jobs
- Improve quality of life and standard of living of rural folks

- In 1989 National Electricity Access was about 25% with only 5% Rural Penetration.

Electricity Access By Regions

National electrification rate of 84.3 %

(Ministry of Energy, Dec. 2018)

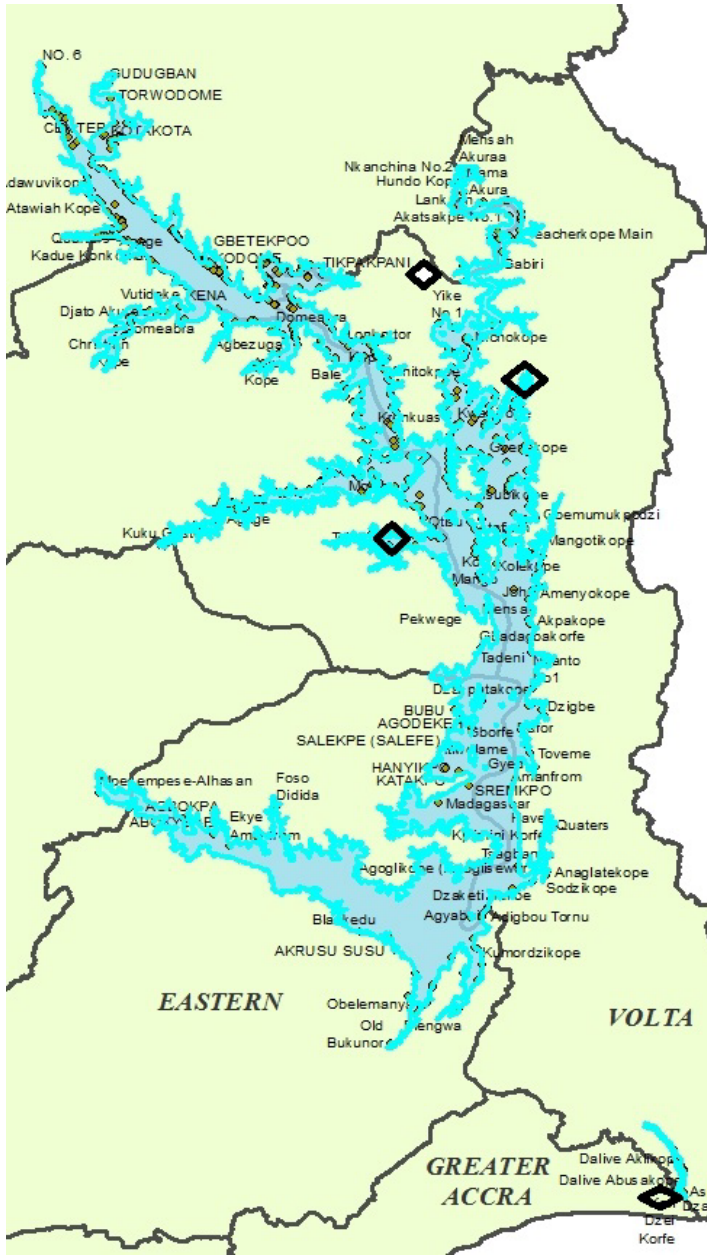


Rationale for Mini-grid In Ghana

- Significant number of island and lakeside communities with population between 500 and 2000 exist in Ghana.
- Grid extension (using submarine cables) economically not feasible.
- Mini grid electrification identified as technically and economically feasible option compared to Off-Grid system (solar home systems).

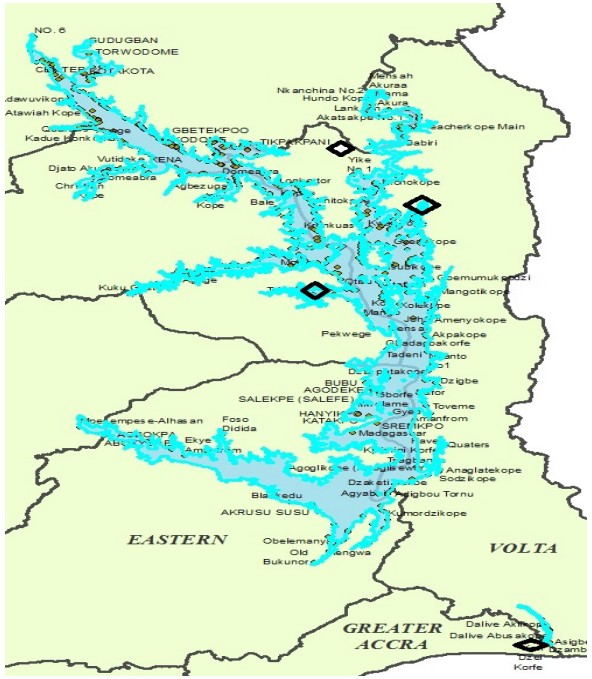
Opportunities for Mini-grid & Off-grids

- Cost of grid extension
- Evolution of smart technologies
- Markets
  - about 200 islands and 2000 lakeside communities with pop. above 350.
- Universal access goals (national and SGD/AU, etc.)
  - Potential of mini grids to provide electricity to 500 million people (*Mini Grids for 500 Million People* report)
  - Hybridization of diesel plants grids (Est. 1,101 known diesel generators in Africa not connected to national grids, thereby illustrating the opportunities for hybridization).



Opportunities for Mini-grid & Off-grids

- 650 million people will be without access to electricity in 2030, nine out of ten of them will be in sub-Saharan Africa
- How can the remaining frontier (islands in Lake Volta, or in isolated lakeside locations) be covered?
- Technical and economical plausibility of Mini grid electrification and standalone RET
- Flexible financing instruments



Challenges for Effective Rollout of Mini Grid and Off-grid Solutions

- Policies & Regulations frameworks
- Delivery models
- Human capacities and Institutional arrangement
- Cost and Tariff frameworks
- Social Acceptability
- Procurement Models
- Boundary issues for grid, mini-grid and standalone

Policy Choices & Delivery Models

- ***Public model*** – Ownership, operations and maintenance (O&M) of assets by parastatal GENSCO & DISCOS.
- ***Private model*** - Ownership of assets and O&M by one or more private firms.
- ***Mixed Model 1*** – e.g., DISCOS builds and owns systems; O&M is outsourced to the private sector, either through a concession or a management contract.
- ***Mixed Model 2*** *(PPA model)* - Private sector builds and owns the generation part and sells power under a power purchase agreement (PPA).
- ***Community Model –*** The community or a community-led cooperative builds, owns and operates the mini-grid, possibly with some functions being outsourced.

Pricing/Tariff Regulation and Trade-offs

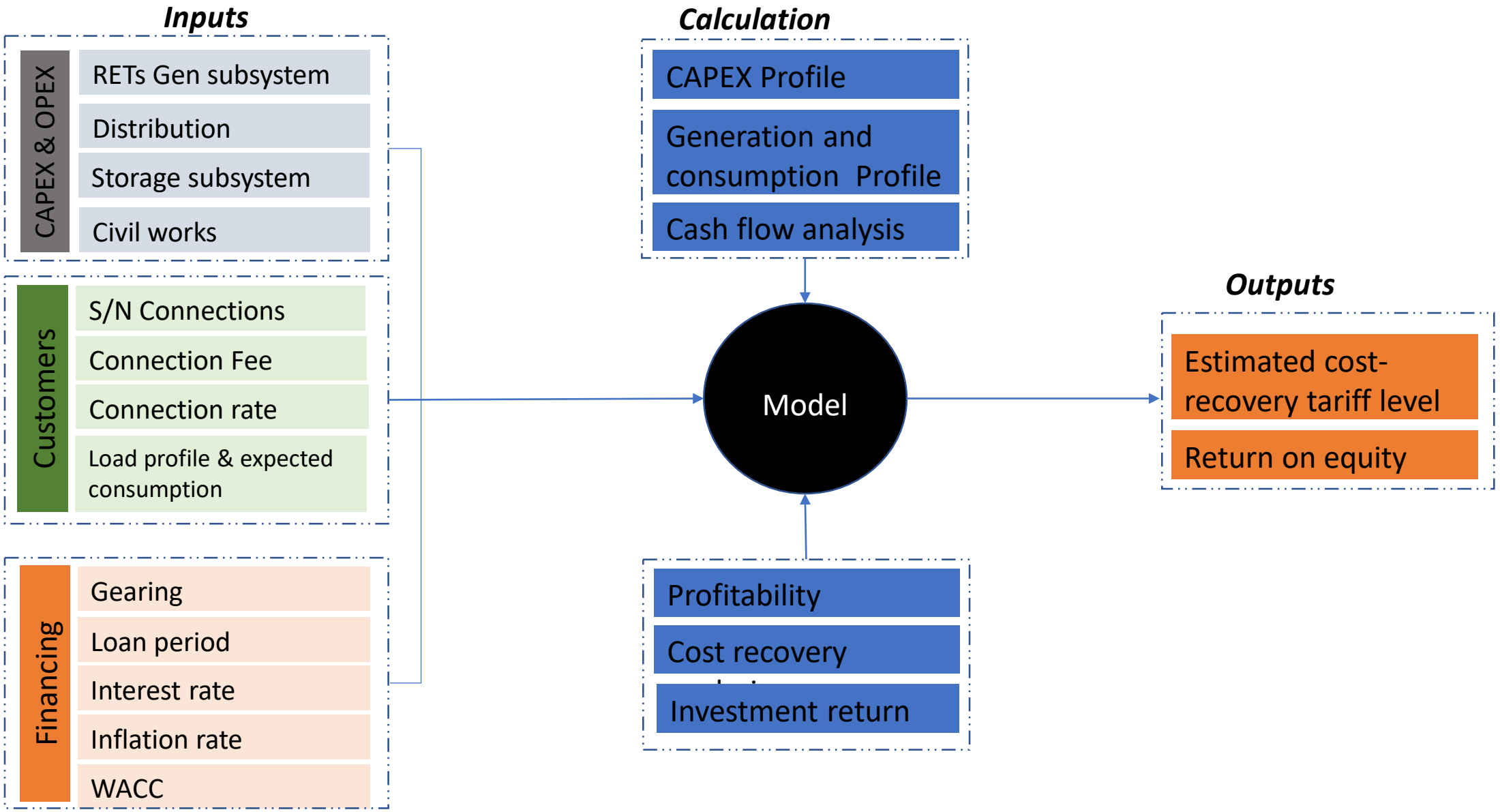
- A **cost-reflective tariff (C-RT)**, encompassing all costs necessary to develop and operated a mini-grid in a specific location for a given period, which is likely to be over $1.00/kWh.

- The **Uniform National Tariff (UNT),** which is applied to all of the customers in the lowest consumption category, which is around $0.05/kWh.

- Cost-Reflective Tariff (C-RT) >UNT

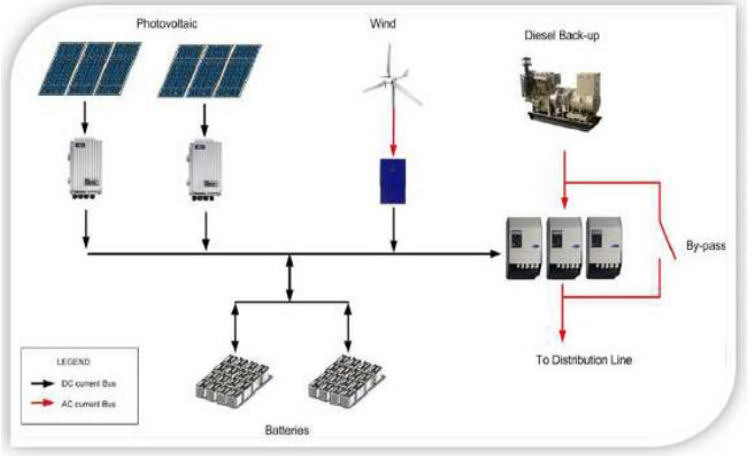
- Costs not met by tariffs have to be met by subsidies.
    1. Direct customers (increase towards C-RT)
    2. Indirect customers (cross-subsidy)
    3. Tax-payers (including non-customers) through external subsidy
    4. Donors through donor external subsidy.

Exploring MG & Off-grid Trade-offs



Threat of Grid Arrival on Mini – Grid System

- **Technical Compatibility**
- **Policy Choices & Delivery Models**
- **Contractual arrangements;**
  1. **Option 1: SPP stops generating and becomes a SPD**
  2. **Option 2: SPP stops distributing and sells power to Utility. Compensation required for the non-depreciated value of assets that are made obsolete (i.e. batteries and battery inverters).**
  3. **Option 3: SPP operates as combined SPP-SPD (grid main source of electricity, existing generation backup and/or sale at prevailing feed in tariffs)**
  4. **Option 4: Utility buys the SPP**
  5. **Option 5: SPP moves its generation equipment to a new site and abandons the distribution grid.**



Schematic Diagram

Beware of the risks

Social Acceptability

- Formed Community Energy Management Committee (EMC) in all communities
- Providing continuous capacity building to EMC members and community in general
- Mainstreaming gender in decision-making

Procurement Models

- EPC model
- Grant of Concession (normally 12-15 years) ownership of the fixed assets remains with the State
- Qualified Third Parties, (bid for a given subsidy, best value for money)

Summary of Ghana Mini-grid Policy

Intervention	Decision
Investment Policy	• Mini-grids mainstream into the National Electrification Programme. • Public sector led investment similar to Rural Electrification through Grid extension • Ministry of Energy facilitates the implementation of the Mini-grid scheme

Business Model	• Public Model option selected so that the existing Public Utilities take Over.
	  • VRA takes responsibility for the operation and maintenance of generating systems (until the establishment of the Renewable Energy Authority/Agency)
	  • ECG/NEDCo takes responsibility for the distribution network and collection of revenue.

Connection Policy	Zero connection fee for mini grid customers
Tariff Policy	• Uniform prizing tariff for residential and non residential consumers. • Cost of installation, operation and maintenance of entire system is to be embedded in the national electricity tariff process and approval by PURC

Conclusion and Way Forward

- Challenges in the MG and Off-grid sector present great opportunities for scale and acceleration for universal access.
- Demarcation of boundaries for grid, mini-grids and standalone systems essential for investment planning and execution.
- Mindful of the risks, policy choices and regulatory regimes should guide stakeholders particularly investors, developers and financiers in their decision making.


Thank You!