

POWER FOR ALL RESEARCH SUMMARY

Undergrid mini-grids will save millions of dollars for national utilities in Africa while providing better energy access



Thousands of undergrid communities across Nigeria that are within the Distribution Company's (DisCos) territory are currently underserved and receive unreliable, inconsistent or no electricity at all. Mini-grids have potential to close these electricity access gaps by providing improved energy supply, utilizing existing distribution infrastructure and incorporating distributed energy sources. In its latest report, Rocky Mountain Institute (RMI) detailed the different models for developing undergrid mini-grids, based on examples of the Nigerian energy sector.^{1,2}

200 million

POTENTIAL UNDERGRID
MINI-GRID USERS GLOBALLY

\$ 3-6 million

COST SAVINGS FOR
NIGERIAN DISCOS FROM
UNDERGRID MINI-GRID
DEVELOPMENT

\$ 0.15/kWh

POTENTIAL SAVINGS FOR
UNDER-GRID HOUSEHOLDS IN
NIGERIA

Undergrid mini-grids have the potential to provide high quality access to an estimated 40 million people in Nigeria, while saving DisCos US\$ 3-6 million and bringing new cost-saving and revenue potential to mini-grid developers.

- » Undergrid mini-grids can improve electricity service to 40 million rural residents across Nigeria and nearly 200 million households globally. (6)
- » Undergrid mini-grids can provide high-quality electricity service to local communities who have the ability and willingness to pay while saving them US\$ 0.15 per kWh by displacing backup diesel generation. (9)
- » By developing undergrid mini-grids, DisCos in Nigeria can save US\$ 3-6 million annually from reduced losses due to their limited capacity to deliver service and collect revenue in remote areas. (9)
- » Undergrid mini-grid owners could earn US\$ 1 billion by developing and operating 4,000 systems in Nigeria to serve 40 million people. (9)
- » Undergrid mini-grids could cut project capital costs by 12-30% through sharing distribution infrastructure with DisCos. (9)

According to industry stakeholders, there are 4 potential models to developing undergrid mini-grids: 1) the mini-grid operator-led model, 2) special purpose vehicle (SPV)-led model, 3) collaborative SPV-led model and 4) cooperative-led model.

- » In the mini-grid operator-led model, the mini-grid operator owns the generation assets, bills and collects revenue from customers, and pays usage fees to DisCos for their distribution infrastructure. (18)
- » In the SPV-led model, an SPV can be set up by DisCos to enable financing and limit risk for the undergrid mini-grid. The SPV is in charge of developing and operating the project and can partner with an existing mini-grid operator to leverage the operator's experience. (19)
- » In the collaborative SPV-led model, ownership of the undergrid mini-grid is shared among the mini-grid operator, a community cooperative and DisCo's investors. The mini-grid operator and the community share operation functions and the DisCo leases its distribution function. (24)
- » In the cooperative-led model, the community cooperative attracts capital, owns generation assets, maintains customer relations and bills and collects revenue. A mini-grid operator is contracted for O&M and a usage fee is paid to a DisCo for the distribution infrastructure. (21)
- » Among the 4 potential undergrid mini-grid development models, Nigeria has seen a successful example of collaborative SPV-led model in Torankawa, Sokoto State, which electrified 350 households and 20 small businesses with a PV-battery-diesel hybrid system interconnected with main grid. Another mini-grid operator-led project is under development. (28)

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By the Numbers:

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Each undergrid mini-grid development model has advantages and disadvantages including ease of fundraising, speed of deployment, community participation and legal structures.

- » The mini-grid operator model is the fastest to implement as the number of parties is limited and it leverages on the experience of the mini-grid operator for project development and operation. The mini-grid operator, however, bears the responsibility of raising capital and risks alone. The community has limited ownership. (18)
- » The SPV model unlocks investment from additional parties, limits project risk and leverages on reassigned staff from the DisCo but takes longer to develop due to the need to form a new legal entity. (19)
- » The collaborative SPV-led model has the benefit of inclusive ownership and leverages on the strengths of each stakeholder to attract investment and share risks. It has the disadvantages of slow decision-making process and disagreement between the parties. (19)
- » The cooperative-led model has the benefit of community ownership and could yield the most affordable customer tariffs. In this model, risk is also shared among members of the community. However, capital is difficult to raise without state support. The viability of this model will depend on local technical, operational, financial and legal capacity that may be absent. (6,22)

Governments can incentivize undergrid mini-grid development by putting in place clear tariff policies, clarifying differences between DisCo franchisees and undergrid mini-grids, and providing financial incentives.

- » DisCos have regulated tariffs in Nigeria that are not cost reflective and therefore, when undergrid mini-grid is interconnected with the main grid, complying with low national tariff poses risks on their financial viability. (33)
- » Designing a feed-in-tariff program can mitigate this risk for undergrid mini-grid projects. (38)
- » In Nigeria, a regulatory framework was proposed that allows DisCo franchisees to build, operate and maintain distribution assets, and collects payments from electricity users according to national tariff on behalf of the DisCos. Further clarification is needed to avoid confusion between these franchisees and undergrid mini-grids. (30)
- » Mini-grids have a lifespan of 25 years while DisCos have contract terms of 10 years with the Nigerian government. Aligning the contract terms with project lifetime can reduce risk of DisCo ownership change. (29)
- » Government and development partners can incentivize undergrid mini-grid development by providing import duty waivers, land leases, investment guarantees, foreign exchange risk reduction, and technical support when undergrid mini-grid is interconnected with main grid. (29)

Share the Message

- » Undergrid mini-grids can improve electricity access for 40 million people in Nigeria and 200 million globally, while cutting costs and bringing revenue potentials for DisCos and other developers.
- » DisCos, mini-grid operators and local communities can leverage each other's strength to raise capital, share risks, and develop and operate undergrid mini-grid projects.

Sources:

1. Sachiko Graber, Oladiran Adesua, Chibuike Agbaegbu, Ifeoma Malo, and James Sherwood. "Electrifying the Underserved: Collaborative Business Models for Developing Mini-grids Under the Grid." Rocky Mountain Institute, October 2019.
2. The report excludes urban customers because they are not organized in discrete geographic areas and have access to more reliable power.