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Global Energy Alliance for People and Planet
GEAPP

Partnerships for Power: The First Wave of Interconnected Minigrid Projects in Nigeria

Webinar

May 2025

About

RMI—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future.

RMI engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI's Africa Energy Program works in sub-Saharan Africa to increase access to and productive use of sustainable electricity.

GEAPP is an alliance of entrepreneurs, governments, technology, policy, and financing partners working together to support developing countries shift to clean energy model that ensures universal energy access while enabling the global community to meet critical climate goals during the next decade.

It was founded by Rockefeller and Ikea foundation, and the Bezos Energy Fund.

RMI's Africa Energy Program works with local partners to ensure renewable electricity access for sustainable development and a low-cost, low-carbon, climate-resilient future

SCALING DISTRIBUTED ENERGY & CLEAN ENERGY PORTFOLIOS

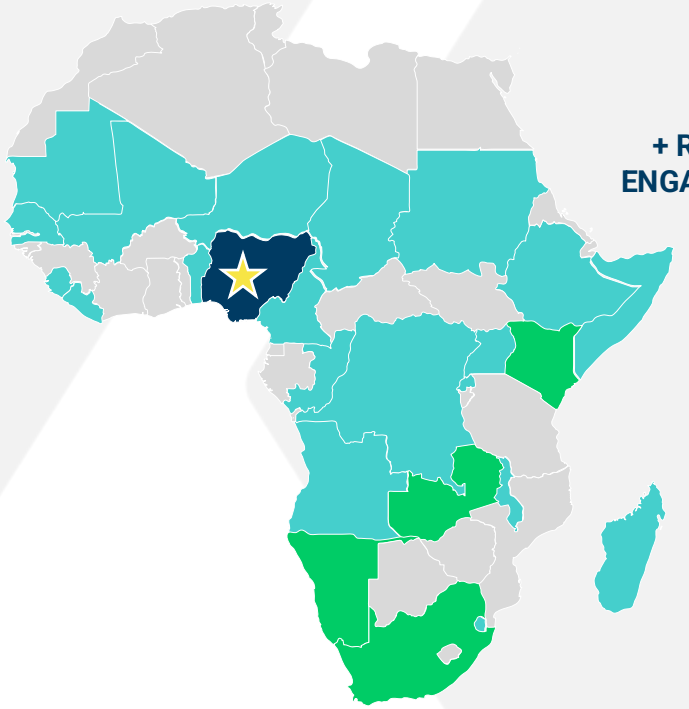
Closing the energy access gap and building affordable, resilient, reliable energy systems by scaling **DERs** and advancing **Clean Energy Portfolios**

GROWING GREEN ECONOMIES

Growing Green Economies that drive economic growth powered by a decarbonized energy supply, carbon-free transportation, and climate-tech innovation by Africans for Africa

CATALYZING PROGRESS

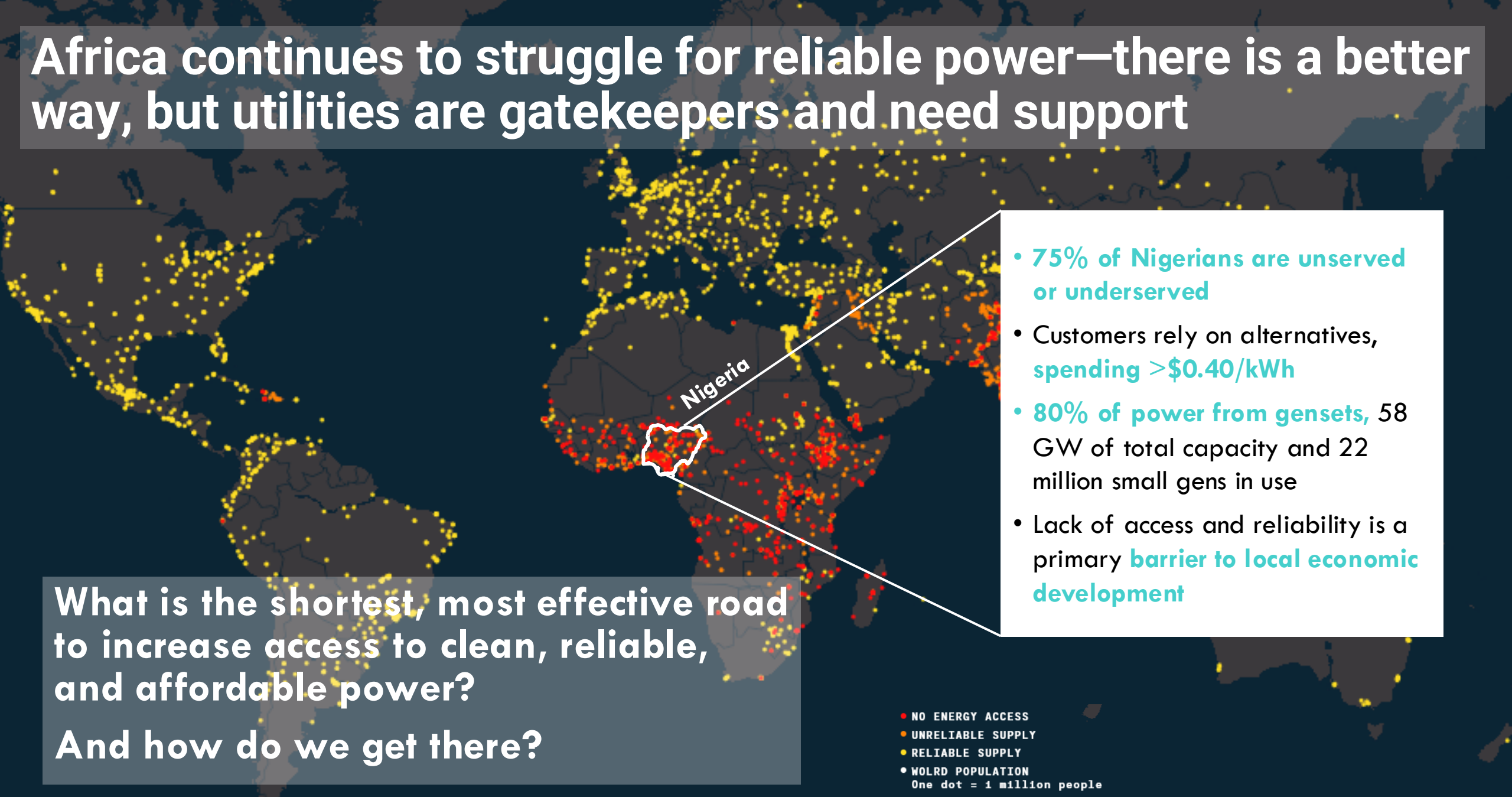
Catalyzing **investment** and equipping the **workforce** needed to drive the clean energy transition and clean economy



Our team currently focuses on core work in **Nigeria**, targeting expansion to **4 new countries**, and with existing regional partnerships **in 21 countries** for scaling.

RMI – Energy. Transformed.

Africa continues to struggle for reliable power—there is a better way, but utilities are gatekeepers and need support



- **75% of Nigerians are unserved or underserved**
- Customers rely on alternatives, **spending >$0.40/kWh**
- **80% of power from gensets,** 58 GW of total capacity and 22 million small gens in use
- Lack of access and reliability is a primary **barrier to local economic development**

What is the shortest, most effective road to increase access to clean, reliable, and affordable power?

And how do we get there?

Sources: RMI, 2018, *Under the Grid*; Afrobarometer, 2019, *Prerequisite for Progress;* A2EI, 2019, *Putting an End to Nigeria's Generator Crisis;* IEA, IRENA, UNSD, World Bank, WHO. 2023. *Tracking SDG 7: The Energy Progress Report; SE4All, 2024, Beyond Gensets: Advancing the Energy Transition in Lagos State.*

RMI & GEAPP IMG acceleration program

Direct support to IMG pilot project developers

Through tailored technical assistance and grant capital injections, accelerate the completion of 4 interconnected minigrid pilot projects

DisCo capacity: create DER officers

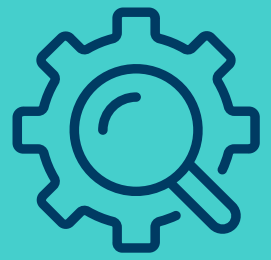
Create and appoint critical DER human resources at selected DisCos to help reduce the capacity constraints DisCos face when advancing utility-enabled DER projects

Pilots' data collection (M&E) and analytics

Collect remote data on generation, DisCo electricity, and end-user meters for pilot projects through a centralized dashboard. Insights and analytics shared with wider public

Project pipeline development support

Support selected DisCos in identifying projects and advancing project pipelines



Demonstrate proof-points for Interconnected Minigrids in Nigeria

Speakers and organizers

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Let's change energy

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Agenda

Start Time	End Time	Session
2:00 pm	2:15 pm	Opening remarks and Introduction • GEAPP welcoming remarks • REA welcoming remarks
2:15 pm	2:45 pm	Presentation: Insights and Learnings from First Wave of IMGs
2:45 pm	3:10 pm	Panel Discussion
3:10 pm	3:25 pm	Final Q&A
3:25 pm	3:30 pm	Closing Remarks

Please use the Q&A Zoom feature to ask questions throughout the webinar

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GEAPP remarks

REA remarks

What stakeholder group do you represent ?

Answer via zoom polls

1. Financier / Investor
2. Utility / DisCo
3. Technology Provider / OEM
4. Developer / EPC
5. Government Organization
6. Consulting/Technical Assistance Provider

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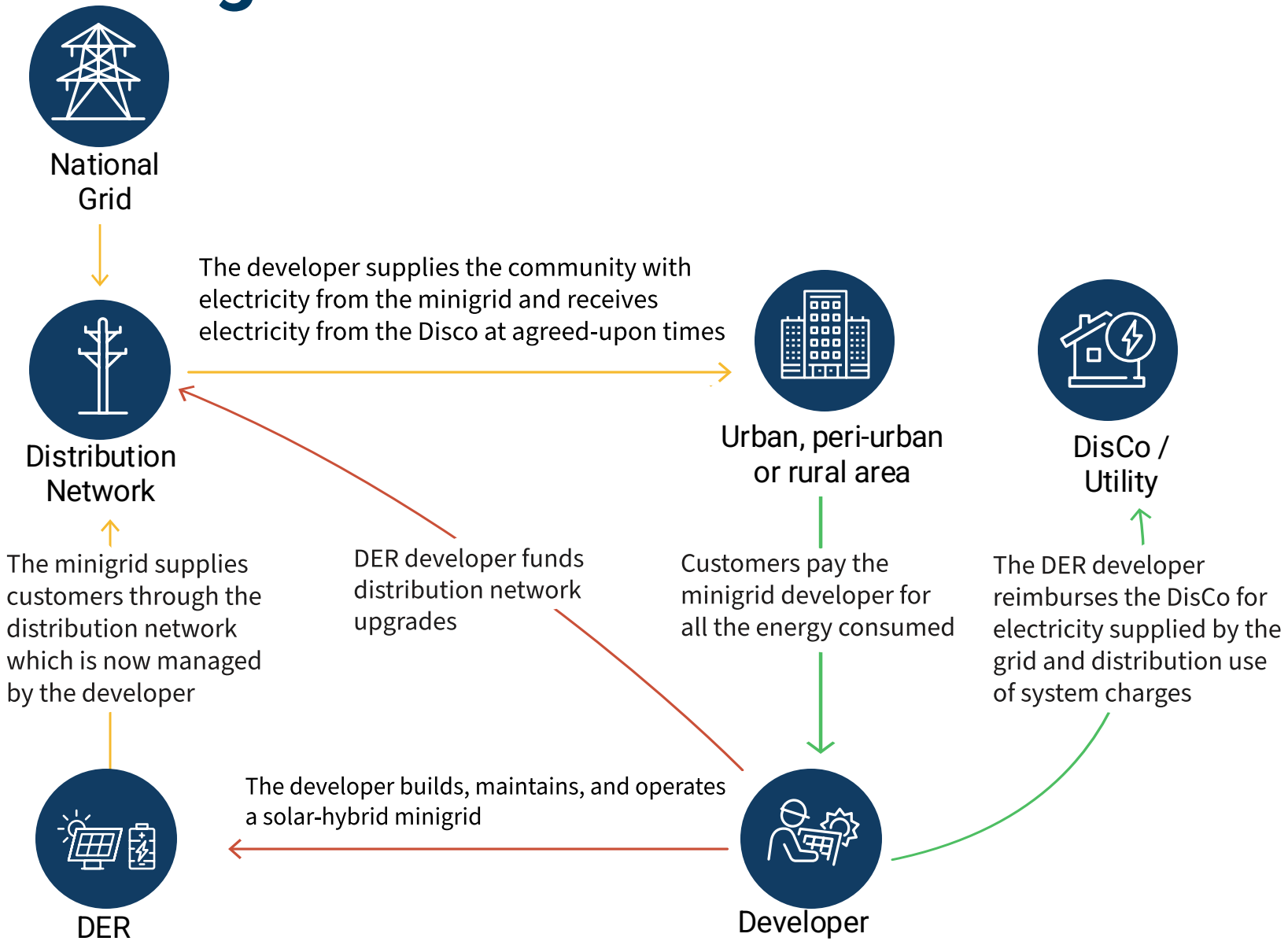
Key Insights and Learnings from the first wave of IMG projects in Nigeria

Interconnected Minigrids combine electricity from the main grid along with DERs situated near consumption



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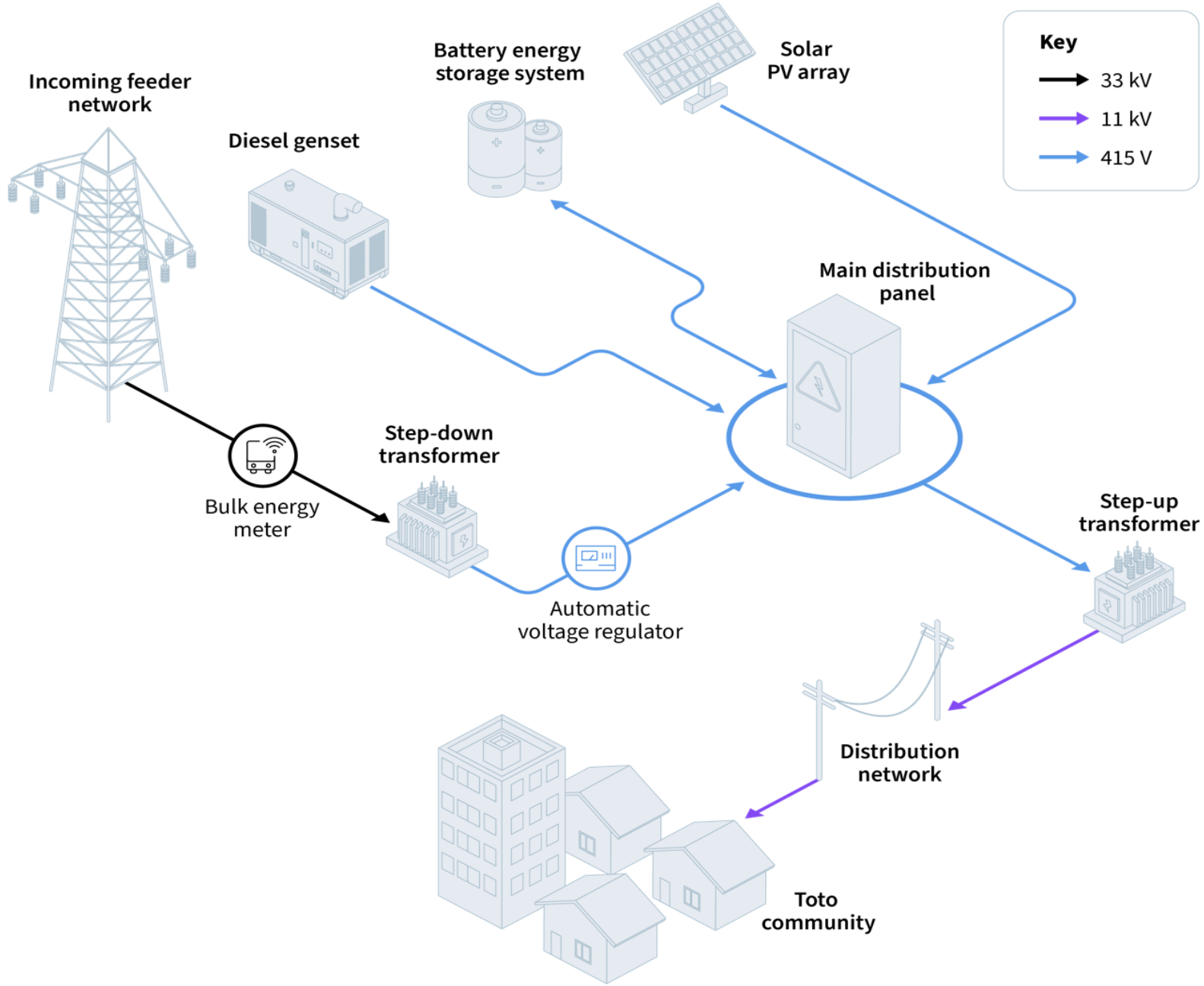

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Simple IMG Architecture

Why do IMGs offer win-win-win?

- Many DER projects are developed without utility participation—resulting in **lost revenue for utilities** as their best customers defect.
- Creates **higher costs for customers**—developers duplicate utility infrastructure and can't take advantage of low-cost grid power.

Interconnected Minigrids create a unique 'win-win-win' business model

DisCO/Utility

Utilities leverage private capital to **improve distribution infrastructure, increase generation,** and **retain customers.**

Developer

DER developers can leverage existing infrastructure and the utility's customer relationships to **access more viable customers at scale and lower cost**

Customers receive **cheaper* and more reliable** electricity, blending grid and DER supply.

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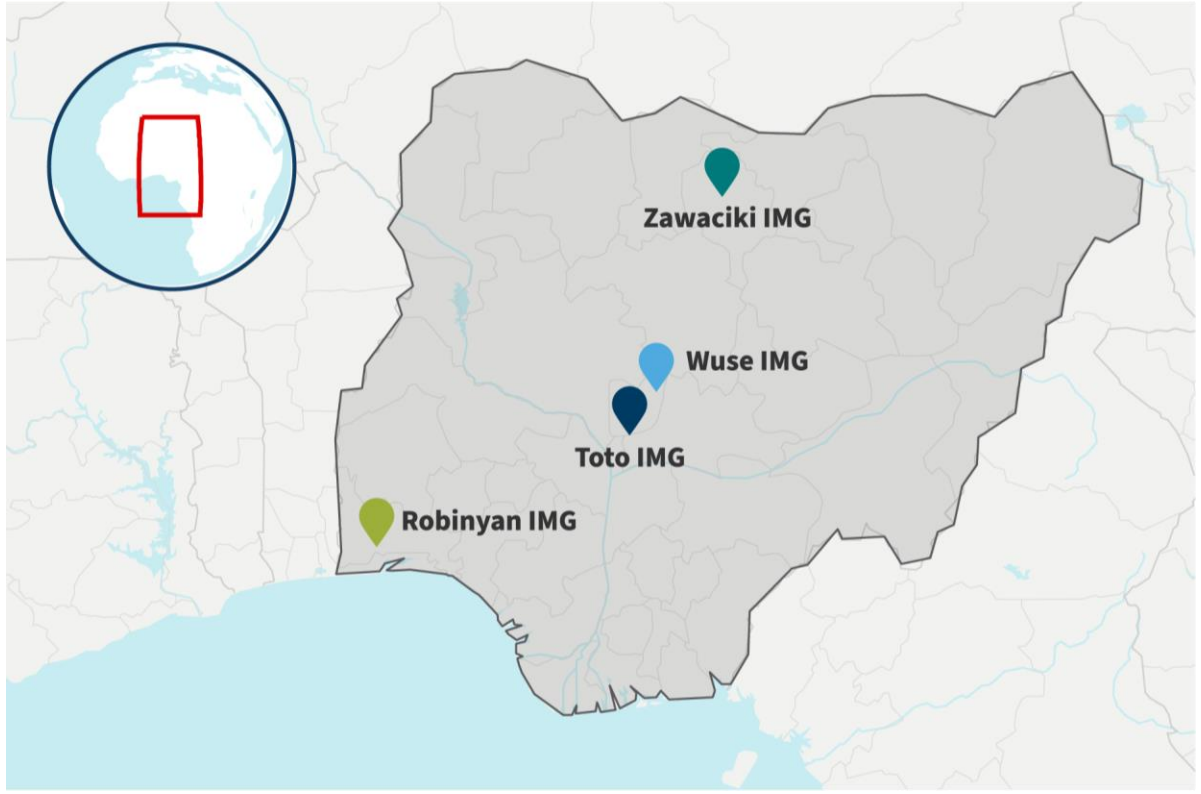
*Cheaper than the resulting blended tariff between unreliable grid and fossil-fuel generator expenses, RMI

Powering progress: 6,300 upgraded connections with 3MW/3MWh of new aggregated DER capacity displacing 70k MT CO2 emissions



Toto IMG | 2023
PV: 352 kW | BESS: 973 kWh | 1,700+ customers

Zawaciki IMG | 2024
PV: 1 MW | 1,000+ customers

Robinyan IMG | 2025
PV: 500 kW | BESS: 675 kWh | 1,400+ customers

Wuse IMG | 2025
PV: 1 MW | BESS: 1.2 MWh | 2,100+ customers

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AEDC PLC
KEDCO KANO ELECTRICITY DISTRIBUTION COMPANY
PowerGen
BAGAJA RENEWABLES
DarwayCoast
GVE "...Creating a Reliable Renewable Energy Future!!!"

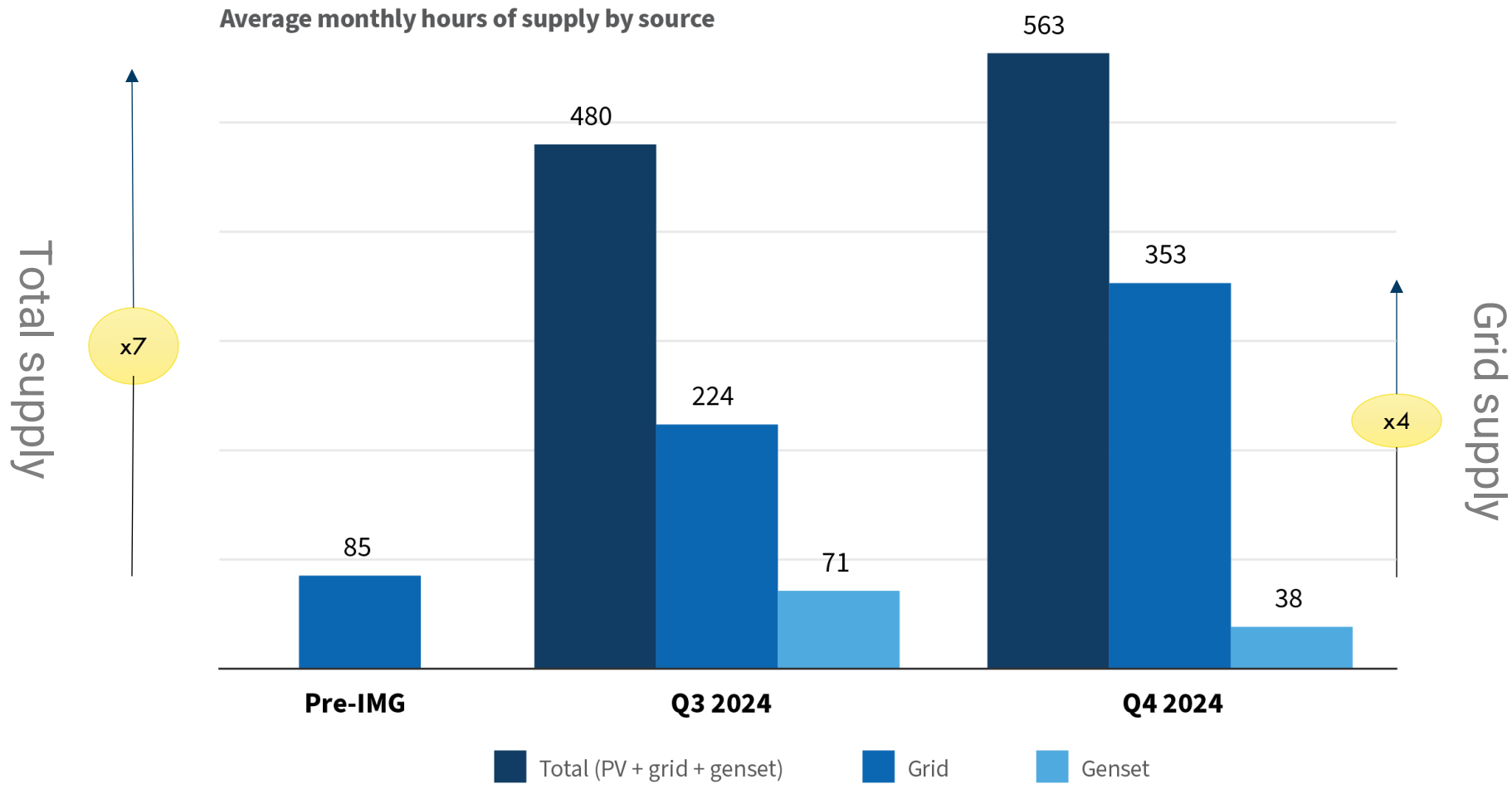
Communities had ~3 hours of daily supply before the IMGs. How many hours of daily supply did they average in Q4 of 2024?

Answer via zoom polls

1. 12 hours
2. 14 hours
3. 16 hours
4. 18 hours

IMG customers have experienced large improvements in energy supply and reliability

IMG communities' daily energy supply went from 2 to 3 hours to over 18 hours due to energy from the PV plants, and improved grid supply



*Average from Toto and Zawaciki

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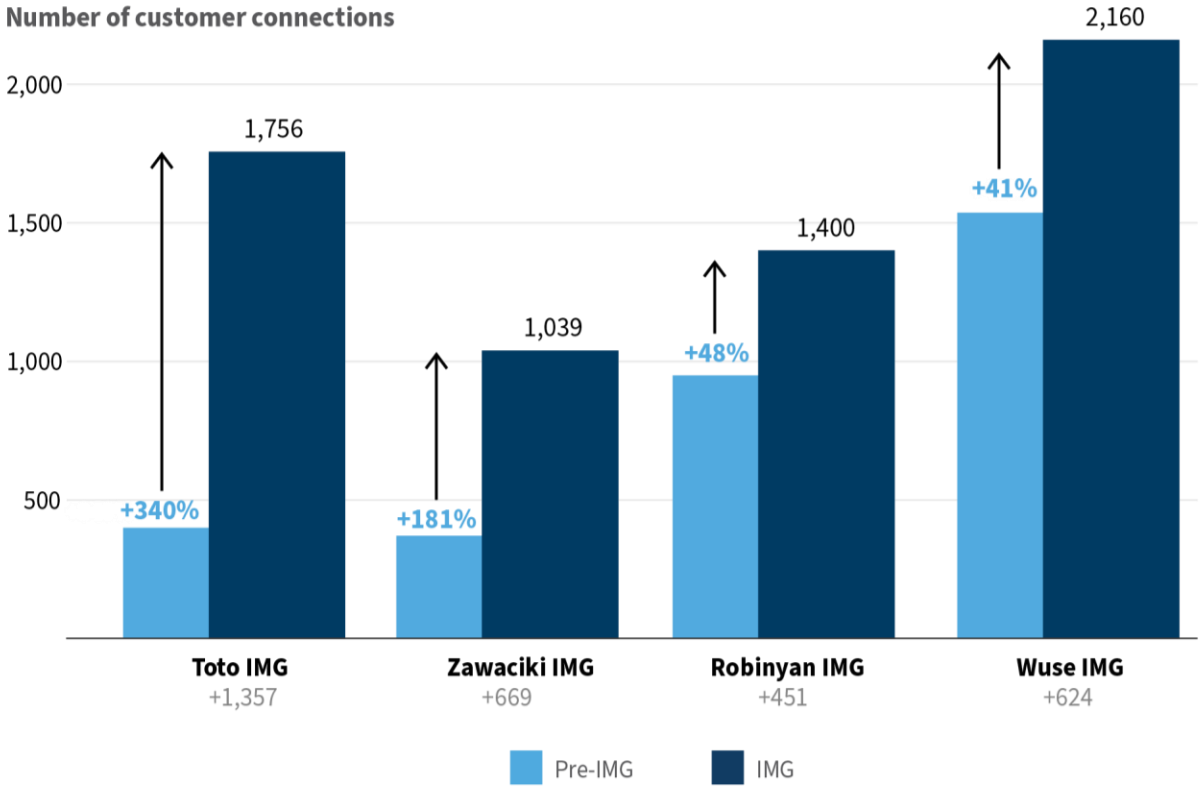
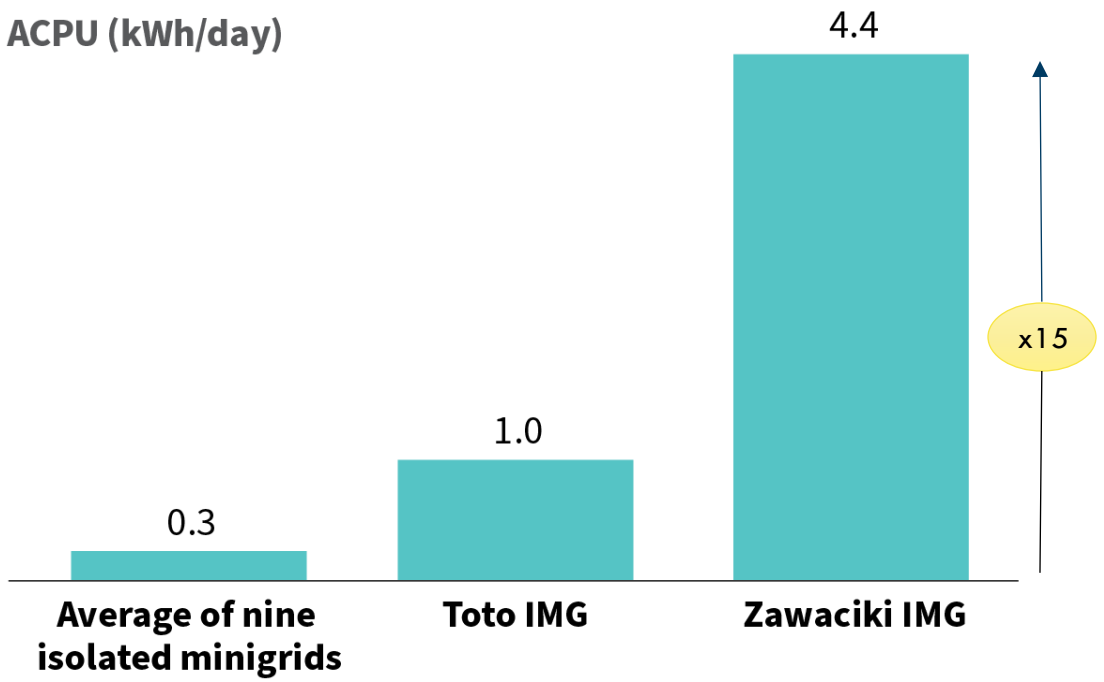
IMGs led to a 62% increase in connections and 15x ACPU of isolated minigrids

By providing all customers with meters, the IMGs have improved visibility into their customers compared to when DisCo served the communities. With more commercial customers and higher-income residential customers, the IMGs have significantly higher consumption compared to isolated minigrids.





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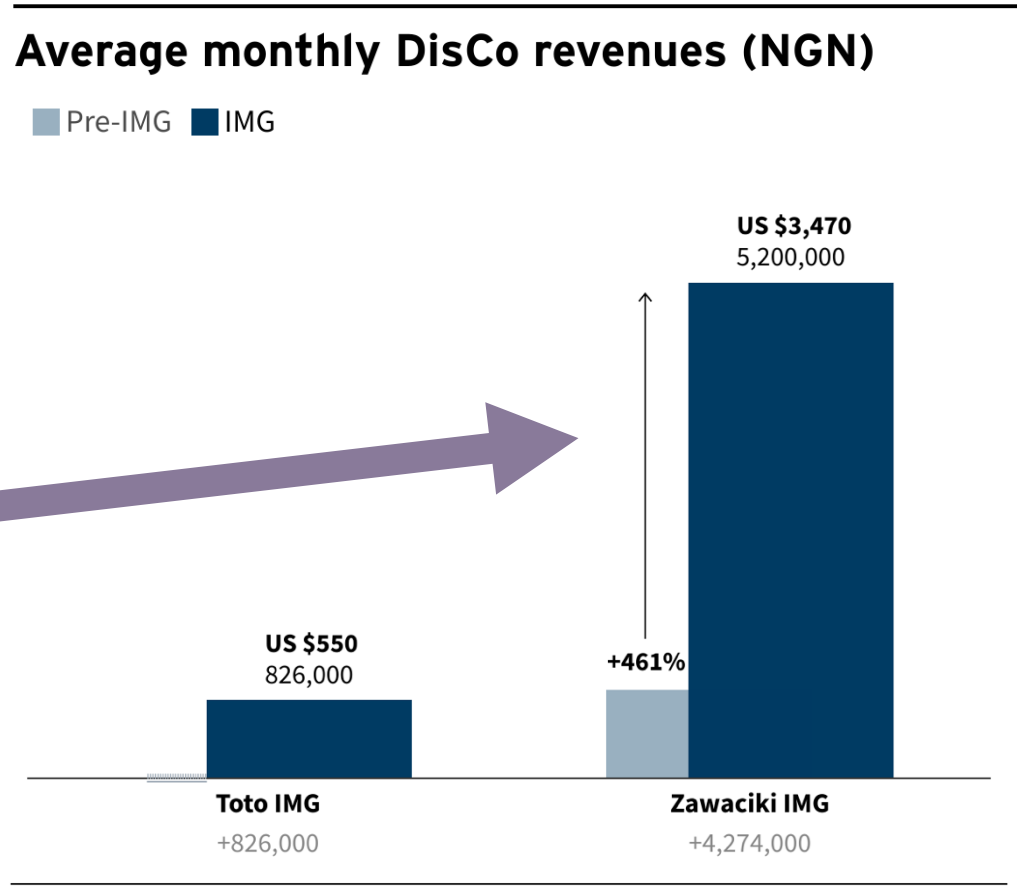
DisCos have also seen a significant increase in revenues and reduction in losses

These gains are driven by an improved distribution network, increased hours of supply to IMG community and a 100% collection rate. DisCos also save on operational costs, allowing it to reallocate resources and alleviate constraints elsewhere

	Losses (%)
Toto IMG	<10%
Rest of Nasarawa Toto feeder	50%
Zawaciki IMG	<30%
Rest of Angels feeder	57%

*In areas upstream of Toto served by the same feeder



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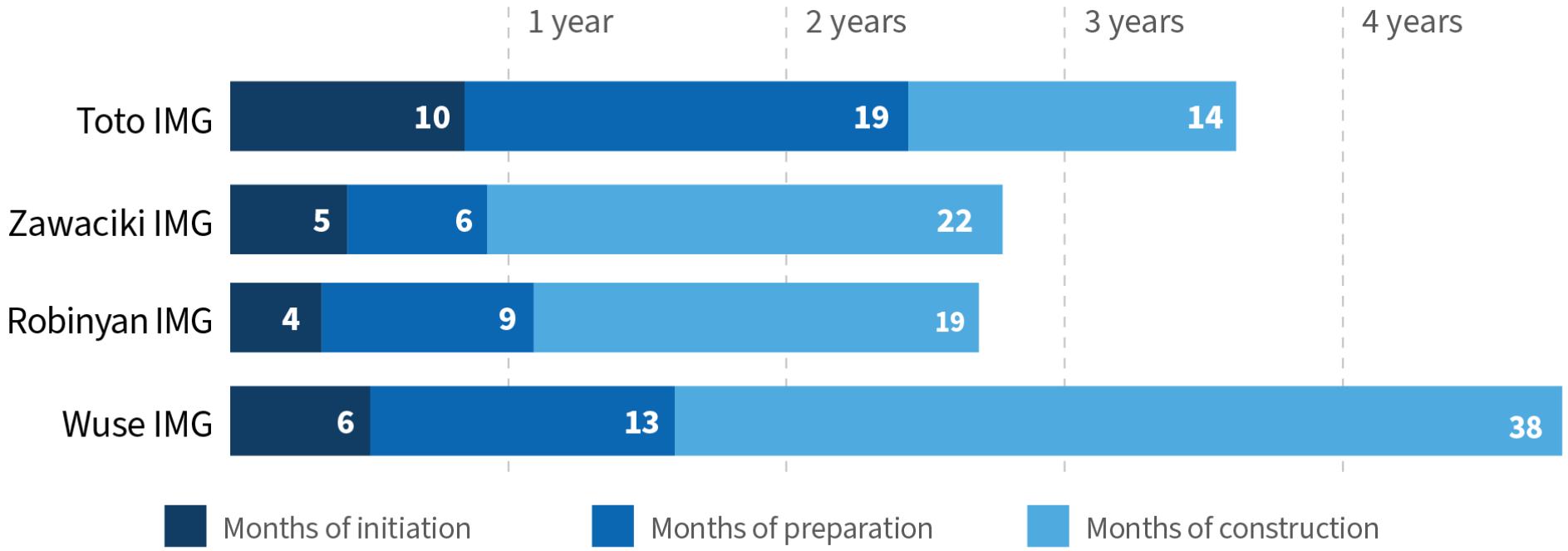
Projects faced several delays and took at least two years to complete

Delays in project implementation were primarily concentrated in four key areas: a) Project agreement negotiation, b) Equipment procurement, c) Interconnection, and d) Commissioning and Certification. Projects were also impacted by mitigating macroeconomic and external challenges (e.g., COVID pandemic)



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Lack of standardization in interconnection architecture, roles and responsibilities complicated projects

We observed various approaches, from developers taking full responsibility for interconnection to shared responsibility with the Disco. Misalignment on roles caused project delays. Additionally, equipment choices for connecting IMG to the utility network varied by project, indicating a need for some standardization.

Summary of how interconnection hardware roles and responsibilities were split between DisCos and developers

Task at each IMG	Toto	Zawaciki	Robinyan	Wuse
Bulk meter installation	DisCo	DisCo	Developer	DisCo
MV network rehabilitation	Developer	Developer	Developer	DisCo
MV/low voltage (LV) substation rehabilitation	Developer	Developer	Developer	Developer
LV network rehabilitation	Developer	DisCo and Developer	Developer	Developer
Point of interconnection equipment installation	Developer	Developer	Developer	DisCo and Developer

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DisCo Developer DisCo and Developer

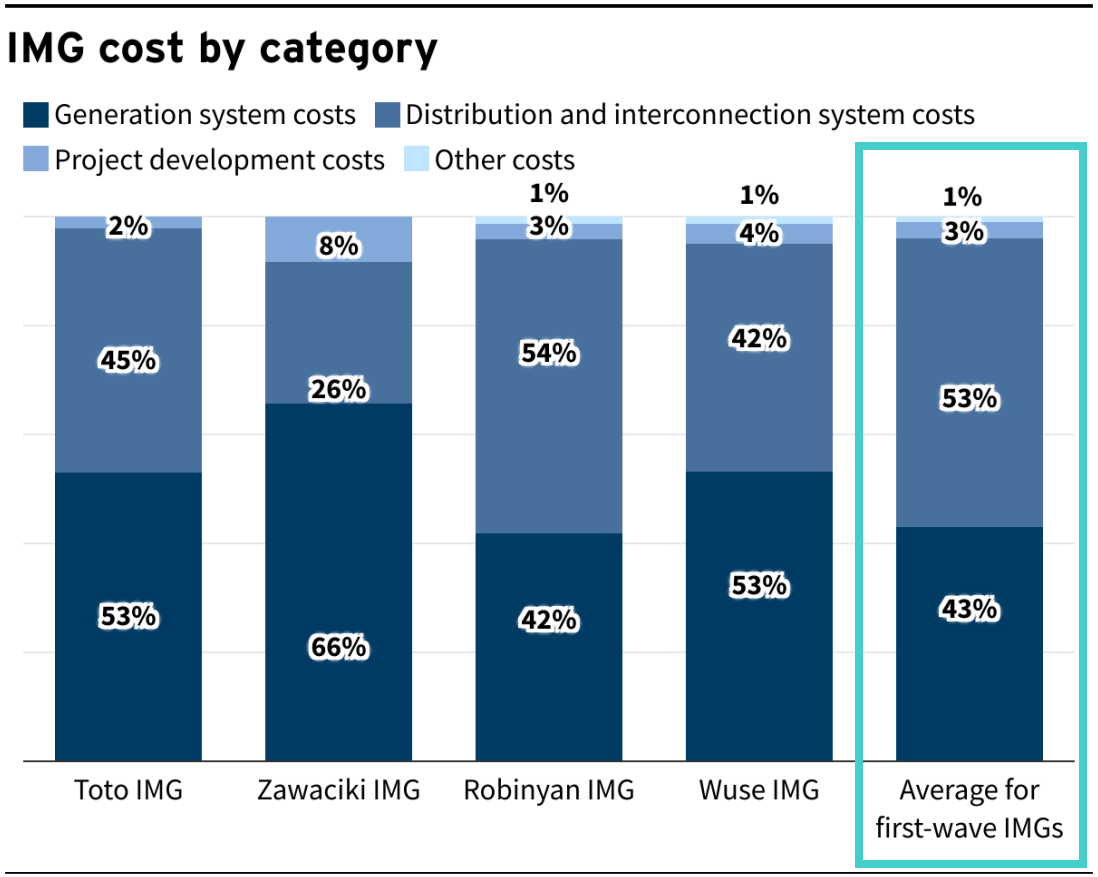
What percentage of project costs were distribution and interconnection costs in the first wave of projects?

Answer via zoom polls

1. 35%
2. 44%
3. 50%
4. 54%

Cost—Due to the pioneering collaboration distribution and interconnection represented up to 54% of total IMG CAPEX

The aging and inadequate distribution networks in IMG pilot projects, along with poor bulk grid power quality, required IMG developers to invest heavily in distribution and interconnection equipment. Along with refurbishing existing infrastructure, including, in some cases, new distribution networks.



Typical Distribution and Interconnection Cost Components

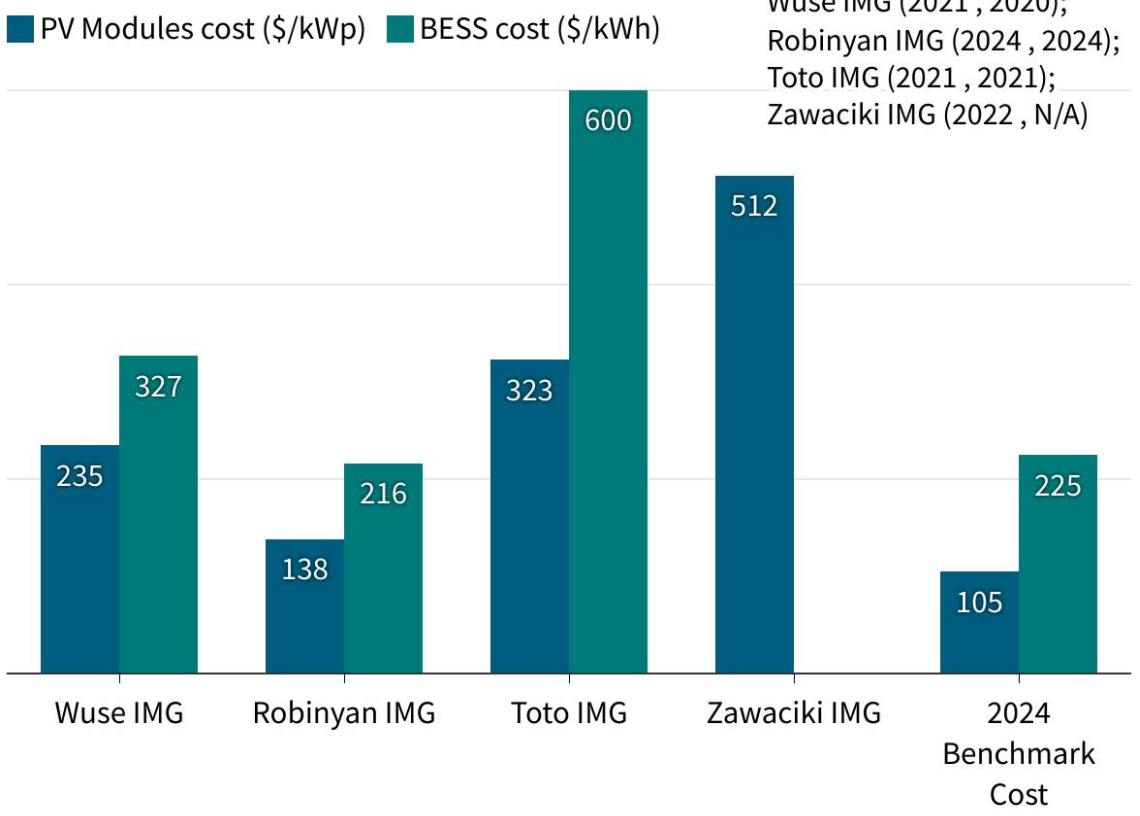
- Transformers (step-down and step-up)
- Substations
- Distribution network expansion and upgrades
  - Lines (conductors and cables)
  - Poles
  - Protection and Control Equipment
- Metering and Customer Connection
- Islanding and Grid Reconnection Mechanism

*Other costs include insurance, overheads, project management, and miscellaneous costs

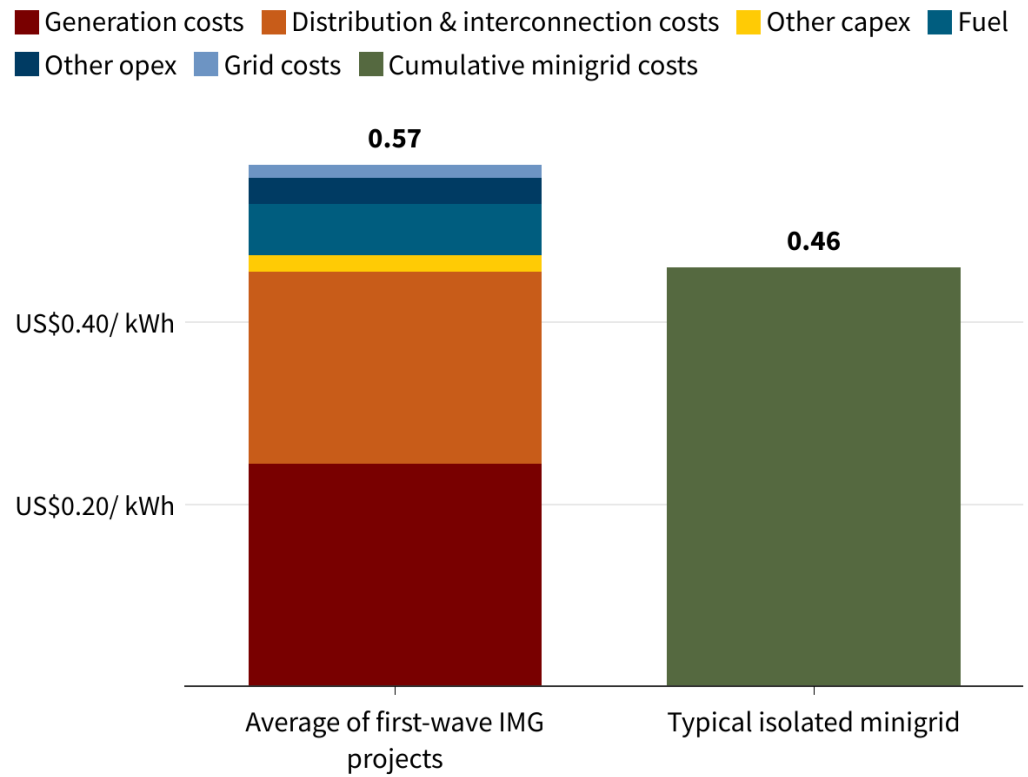
Cost—LCOE of first wave of projects

CAPEX generation costs were higher than 2024 global averages, contributing, along with high distribution network retrofits, to larger LCOE's than expected

Generation system costs



LCOE of first-wave IMGs compared to a typical isolated minigrid



LCOE = Levelized Cost of Electricity, CAPEX = Capital expenditure, PV= Photovoltaic, BESS = Battery Energy Storage System

Cost—There is an opportunity to reduce the LCOE of IMGs by 68% for future projects

High generation and distribution CAPEX costs and prolonged delays have contributed to the high LCOE of the pilot projects. Pathways for cost reduction are:

a) **Lower generation CAPEX**

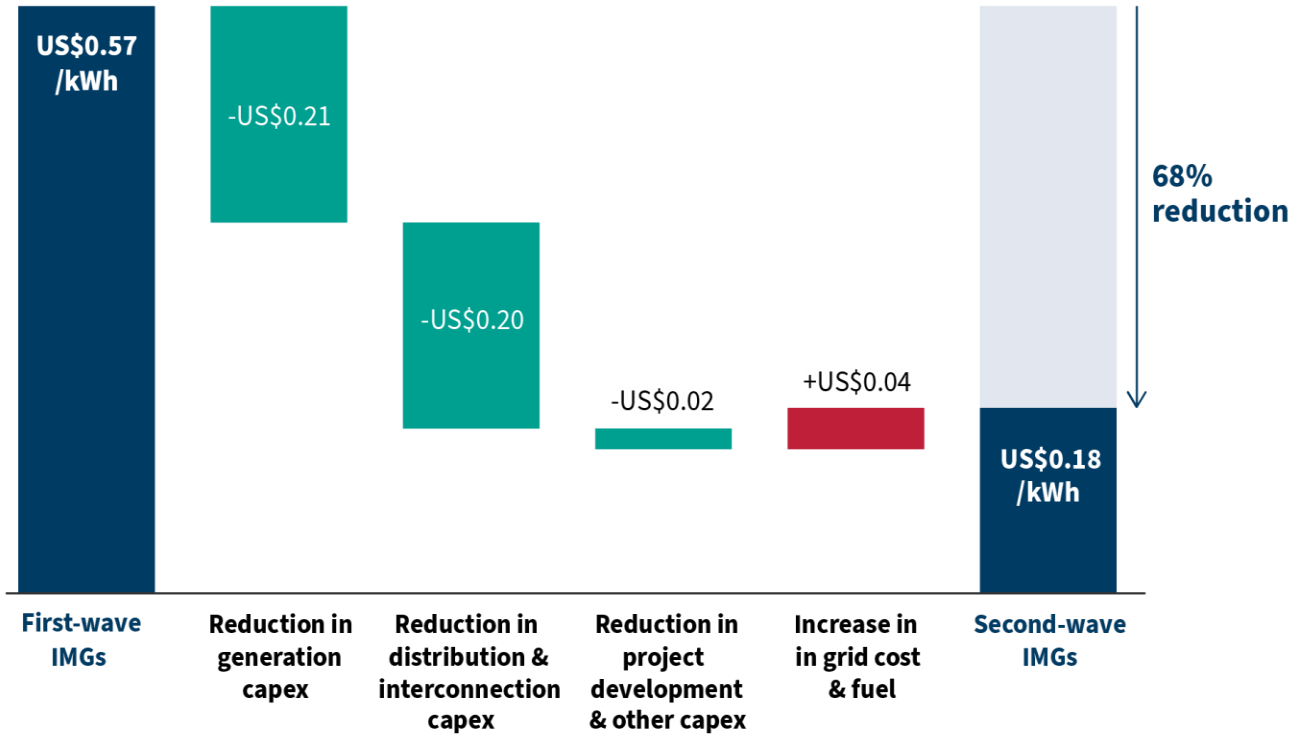
b) **Lower distribution and interconnection CAPEX**

c) **Build larger IMGs**

d) **Healthier distribution networks and higher grid availability to IMGs**

e) **Third-party project preparation and de-risking**

Cost Reduction Opportunities for Second-Wave IMGs: Achieving a LCOE of US$0.18/kWh



Note: increase in grid cost is due to the higher DisCo tariffs expected in future projects as the Nigerian power sector moves away from consumer subsidies and toward more cost-reflective tariffs. The increase in fuel cost is because these IMGs are expected to provide a minimum of 22h of daily supply

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To shift from incremental growth to exponential market expansion

1. DisCos and utilities should lead project development, select the right project sites and improve collaboration with developers to reduce costs and enhance project outcomes.
2. Developers should scale up IMG projects through larger portfolios, outsource specialized project life-cycle components to avoid delays, and leverage economies of scale to optimize costs.
3. Public funds should be allocated for network upgrades and financing to de-risk investments and lower costs.
4. Government should adapt policies to allow larger IMG capacities, and promote local clean energy manufacturing.
5. Public and philanthropic funds should be supporting workforce development and institutional capacity building critical for sustaining market growth.

Scan to download the full report

Panelists

Fatima Haliru, Ikeja Electric
Power Purchase Lead

Umar Muhammed, NERC
VP, Origination & Structuring

Henry Ureh, Darway Coast
MD/CEO

John Ufeoshi, PowerGen
Lead, Business Development

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Q&A

Use the Zoom Q&A feature in the chat

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Closing remarks

For adapting IMGs beyond Nigeria, the following enabling factors should exist

Policy Alignment	Openness to enabling private investment in energy infrastructure for win-win-win outcomes
Unreliable Grid Supply & High Losses	The current electricity system is not providing adequate service to customers or revenue to the utility
Significant Demand for Electricity	Customer demand for electricity is sufficient to support relatively large projects that can attract commercial capital
High Ability & Willingness to Pay	Customers have demonstrated ability to pay for power, even if the utility can't provide it (e.g., by existing gensets)

Scan to download the full report

Thank you!

Download the report at
rmi.org/insight/partnerships-for-power/