Gridworks

A British International Investment company

# DEVELOPMENT REPORT

## DEVELOPING AND INVESTING IN AFRICA'S ELECTRICITY NETWORKS

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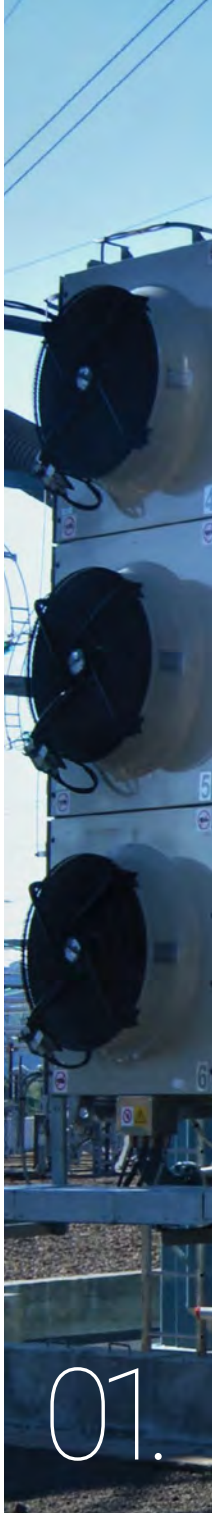



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Gridworks makes equity investments in transmission, distribution and distributed renewable energy in Africa. Wholly owned and supported by British International Investment, the UK Government's development finance institution, we develop and invest in critical power infrastructure, both on and off-grid. We are a partner to governments, utilities, and companies in the African power sector.

## INTRODUCTION FROM

# SIMON HODSON GRID-WORKS CEO

**This report is the first that Gridworks has produced. It sets out the progress made since we were established and outlines the ambition of our organisation to create impact.**

Despite recent investment and improvements in electricity generation, the lack of progress in developing the networks necessary to deliver that power to end users is a significant bottleneck to economic and social development across Africa.

We want our work to contribute to the evolution of viable electricity networks in Africa. These will be able to serve a larger proportion of the continent's population and provide African businesses with the quantity and quality of power necessary to underpin industrialisation and wider economic growth.

Each project we pursue has a clear impact thesis, where we articulate in detail how it will lead to improvements for people, the planet and the economy. Crucially, however, it takes time to develop infrastructure assets, particularly in a nascent market. The poor current state of the energy sector in Africa means we need to embark on a great deal of project development work, as well as wider work with the markets, to achieve positive outcomes. That means we are not yet in a position to report the achievement of impacts on the beneficiaries that we aim to serve. We will highlight these impacts in future reports, as our projects become operational.

Our role is to support the growth of the sector by developing projects and investing. When investing, we demonstrate that African transmission and distribution (T&D) and off-grid energy can be an investable asset class – an asset class that can attract commercial capital, as it does in Europe, the Americas and Asia.

By establishing precedents for new, financially sustainable business models that attract private-sector capital, our market-shaping impact can be transformational. This report sets out the impact we are already making and the ambition we have.

I am incredibly proud of the progress we have made since our launch in 2019. For example, Gridworks has established itself as a market leader, pioneering the importance of network investments, through our ground-breaking work in developing the Amari project in Uganda, one of Africa's first privately financed transmission projects. With an extensive pipeline of similar transmission projects, we believe funding transmission infrastructure with private-sector capital is on the cusp of becoming a newly investable sub-sector, mirroring the evolution of independent power producers (IPPs) over the last 25 to 30 years.

In the Democratic Republic of Congo (DRC), our work in developing Moyi Power will ultimately provide solar electricity to more than one million people. Moyi demonstrates an innovative and replicable approach to creating greenfield utilities and providing access to energy. It does this by not only showing the necessity for blended funding from donors, private and public sectors, but also emphasising the need for critical mass, strong regulatory underpinning and a sustainable business model. Moyi is a trailblazer in the wider distributed renewable-energy market and has triggered a cascade of donor and investor interest, both in DRC and across the continent more widely.

Gridworks is a young organisation operating in an embryonic market, and it's important we think about what we've learnt and share those lessons with other like-minded organisations. Notwithstanding the many positives achieved in our short existence to date, much remains to be done and the challenges have become clearer.

Put simply, most African utilities are losing money on every unit of energy they distribute. The sector needs much better coordination amongst donors, multilaterals and development institutions, to encourage the types of policy, economic planning and incentives that will unburden electricity systems in Africa from the current costly, negative economics they face. It needs a coordinated approach to drive the sector towards long-term sustainability, an aspiration that will not only unburden government balance sheets but will be the platform to turbo-charge energy-access programmes and accelerate the uptake of renewables.

In late 2022, we commissioned stakeholder research to help us understand the perspectives of others in the African electricity network sector. Our research looked at attitudes to investing in T&D; identified what is constraining and motivating investment; and assessed sentiment towards Gridworks. These perspectives are overwhelmingly positive and have been illuminated by quotations throughout this report. It's encouraging to hear words of support for our activities, market leadership and ground-breaking projects. More important still is the growing appetite of peer-group institutions to follow our lead by also investing in this sector, co-investing and lending to the projects we have developed.

Best wishes and thanks for reading,

**Simon Hodson**
April 2023

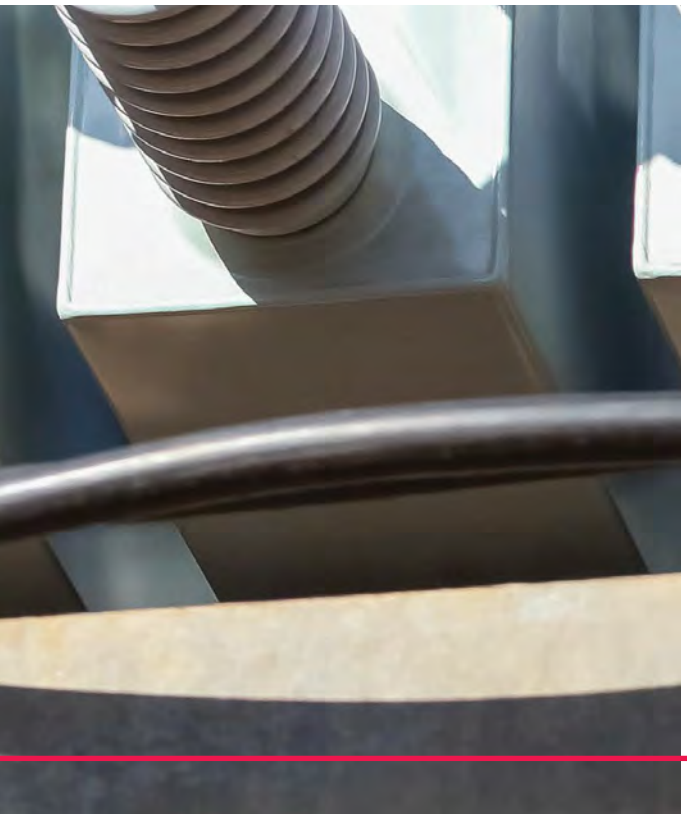
**There is a significant unmet need for investment in transmission and distribution** – McKinsey estimated in 2019 that US$345 billion of investment is needed in T&D in Africa by 2040, of which US$80 billion would be needed in transmission.

# EXECUTIVE SUMMARY

The International Energy Agency (IEA) has concluded that grids and minigrids can together address 75% of the energy access gap by 2030 but that

"IMPROVING THE FINANCIAL HEALTH OF STATE-OWNED UTILITIES AND MOBILISING PRIVATE CAPITAL WILL BE CRUCIAL TO PUTTING AFRICA'S ELECTRICITY SECTOR ON THE SUSTAINABLE PATH DEPICTED IN THE SUSTAINABLE AFRICA SCENARIO".

**Gridworks was established in 2019 in recognition of the need** – British International Investment (BII) established Gridworks in 2019 to address these needs. Gridworks was specifically set up to develop projects and invest equity in African electricity networks including T&D and off-grid infrastructure. BII explicitly recognised that identifying and structuring investible opportunities in this sector would require a long and costly period of project development and that there was no capitalised private-sector investor doing this type of active, early-stage project development.



BII realised that Gridworks would be able to develop projects with a high potential for development impact in a nascent sector where there is currently a shortage of specialist investment skills and suitably capitalised developers.

**Gridworks' mandate is to create impact across a range of T&D activities** – Gridworks mandate is to achieve positive impact through developing and making investments in electricity transmission projects, vertically integrated utilities, minigrids, distributed generation and other energy access / off-grid solutions, focused on Africa. Through developing projects in these areas and making them investable, Gridworks intends to contribute to the Sustainable Development Goals (SDGs) and in particular to SDG 7 (access to affordable clean energy), SDG 8 (decent jobs and economic growth) and SDG 13 (climate action). This report explains the importance of Gridworks' first projects, shows how Gridworks is hoping to achieve impacts on the SDGs through them, and outlines the metrics it will use to track progress in each case. However, it is too early to demonstrate impacts on beneficiaries: Gridworks will be able to provide these numbers in future reports.

**Gridworks also has an important market-shaping role** – Given the significant development work required, Gridworks was always expected to spend time engaging with governments, private developers, investors and others to help to shape the market. This report describes the work that Gridworks has done in its first four years in that respect. The changes in knowledge, attitudes and perceptions of the T&D space have been captured in a survey of individuals in the market. Quotes from the survey, confirming that Gridworks is playing a vital role, are scattered through the report. Gridworks' market shaping role also comes from developing and learning from its demonstration and pathfinder projects.


**Gridworks' current projects will make a significant contribution to energy access and will have demonstrable climate benefits** – The four projects that Gridworks is actively working with at present are examples of different pathways to impact in the T&D sector.

» **Moyi Power** involves developing large solar-hybrid minigrids to deliver access to clean energy for households and business in underserved urban areas in the DRC. Less than 20% of the population of DRC currently has access to energy. Over the 22-year concession, this project should provide a million people with reliable electricity for the first time.

» **Virunga Power** is a platform for smaller hydro backed minigrids to serve households and business in less-densely populated rural areas. It has a pipeline of projects in Zambia, Malawi, Kenya and Burundi that could improve energy access for more than 100,000 people in areas where current access is very low.

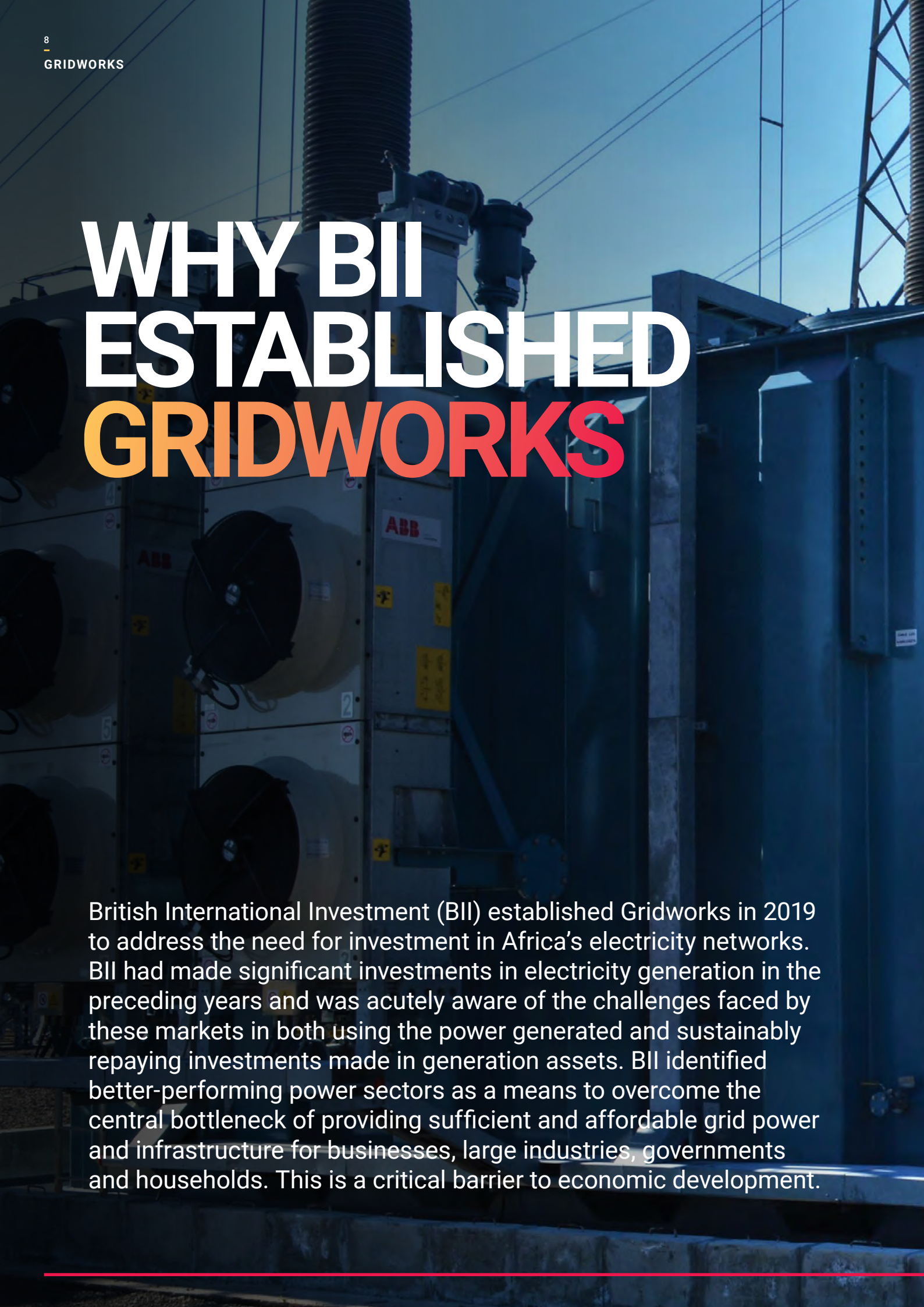
» **Amari** is likely to be the first private sector funded transmission project of its type in Africa. It involves investment in critical transmission projects to appropriately evacuate renewable hydropower generation on the grid in Uganda, increasing the security and safety of the network and increasing the reliability of energy supplies for businesses and households. Detailed metrics for tracking impact are being developed.

» **SPS** is a distributed renewable energy (DRE) company providing solar power and battery storage solutions to businesses. Much of its activity is in South Africa, where coal-fired energy generation makes the grid very carbon-intensive so replacement with solar panels can significantly reduce carbon emissions. SPS's solar installations save more than 80,000 tonnes of carbon emissions per annum and this will grow further as the business expands.

**Gridworks has learnt several lessons in its first four years** – Amongst the ones that stand out are:

- It takes time to build capacity and trust with Government agencies
- On-grid and off-grid solutions are increasingly intertwined and interdependent
- Increasing short-term access at all costs is unsustainable for electricity utilities that service customers
- Transmission infrastructure is capital-intensive and increasing available sources of finance for transmission is vital (including climate finance)
- A better balance between concessional and private finance is required for energy access and this will require more coordination between public and private sector funding sources.

**IN THE YEARS AHEAD, GRIDWORKS WILL CONTINUE TO FOCUS ON WAYS TO ENHANCE ITS IMPACT** – THIS WILL INCLUDE IDENTIFYING WAYS TO ENHANCE THE IMPACT OF THE CURRENT PORTFOLIO OF PROJECTS AND DEVELOPING THE PROJECTS THAT ARE CURRENTLY IN THE PIPELINE. IT WILL ENTAIL WORKING WITH OTHER ORGANISATIONS WITH FUNDING AVAILABLE FOR THE SECTOR AND SUPPORTING THEM. IT WILL ALSO INVOLVE ADVOCACY, THROUGH EVENTS, ARTICLES AND PARTNERSHIPS WITH ORGANISATIONS THAT SHARE GRIDWORKS' PRIORITIES. GRIDWORKS WILL ALSO COMMISSION RESEARCH INTO TOPICS THAT WILL INFORM AND FURTHER STRENGTHEN ITS APPROACH.



# WHY BII ESTABLISHED GRIDWORKS

British International Investment (BII) established Gridworks in 2019 to address the need for investment in Africa's electricity networks. BII had made significant investments in electricity generation in the preceding years and was acutely aware of the challenges faced by these markets in both using the power generated and sustainably repaying investments made in generation assets. BII identified better-performing power sectors as a means to overcome the central bottleneck of providing sufficient and affordable grid power and infrastructure for businesses, large industries, governments and households. This is a critical barrier to economic development.


# 01.

DEVELOPING AND
INVESTING IN AFRICA'S
ELECTRICITY NETWORKS

FINANCIALLY STABLE T&D BUSINESSES CAN ACT AS CREDIBLE OFF-TAKERS UNDER POWER PURCHASE ARRANGEMENTS WITH NEW GENERATORS, AND REDUCE RISK FOR FURTHER GENERATION PROJECTS. THIS CAN LEAD TO LOWER RETURN REQUIREMENTS FOR INVESTORS.

**Gridworks was the first investment platform set up by a Development Finance Institution (DFI) specifically to develop projects and invest equity in African electricity networks.** Most capital in the sector had been raised from donors or national balance sheets and had not been sufficient to deliver reliable power, sustainably, to all. Generalist infrastructure investors have not recruited the specialist skills and experience required and lack the focus necessary for such a challenging nascent sector.

Due to insufficient grid power, businesses rely on diesel generation or other alternative energy sources that are expensive, hinder business expansion, and are carbon intensive.

Greater access to grid electricity, improved availability, and increased consistency, materially reduces operating costs, improves the competitiveness of local businesses in comparison to imports, and enables them to hire more people as a result. Replacing diesel generators with less carbon-intensive grid power reduces carbon emissions, and a more stable and reliable grid enables the addition of renewable-energy sources, as well as reducing the amount of energy lost in the system.

Investment in T&D assets is necessary to expand electricity access to underserved populations. Investing in T&D opex and capex reduces power losses, increases the amount of money collected from users of the electricity, and reduces fraud and power theft.

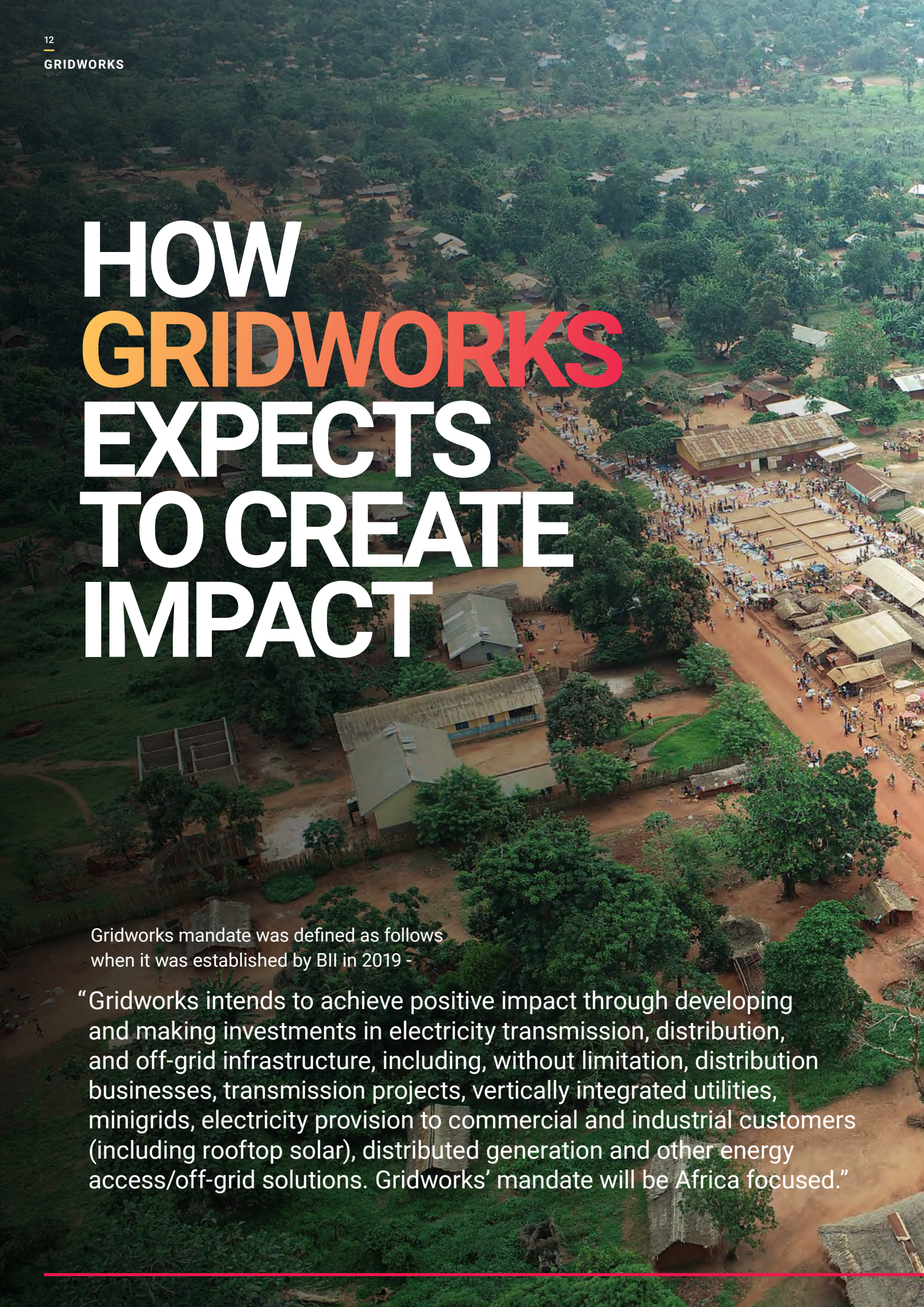
In addition, BII took the view that the presence of a well-capitalised, specialised and credible T&D investment platform would help mobilise funding for the sector by entering into joint ventures or co-investments with other investors, and by raising debt from commercial banks and DFIs in support of the projects it had developed.

BII explicitly recognised that identifying and structuring T&D assets would require a long and costly period of project development. Utilities are often large, complex and politically sensitive companies that require both technical and financial expertise to develop and turn around. BII identified that there was no capitalised private-sector investor doing this type of active, early-stage T&D project development. BII realised that Gridworks would be in a position to develop projects with a high potential for development impact, but which the market is not yet willing to fund in Africa.

Better-performing and more stable electricity networks also allow greater integration of renewable generation as part of a country's on-grid generation portfolio. This reduces carbon and expensive foreign currency fuel bills, and often lowers the cost of generation. Financially stable T&D businesses can act as credible off-takers under power purchase arrangements with new generators and reduce risk for further generation projects. This can lead to lower return requirements for investors and therefore cheaper power for industry and consumers. Encouraging regulatory discipline by engaging with relevant state entities reduces the risk to sector stakeholders which, in turn, facilitates investment in the entire power-sector value chain. These were all compelling reasons for BII to set up Gridworks.

## BII'S RATIONALE IS SUPPORTED BY SIGNIFICANT INDEPENDENT SECTOR RESEARCH:

- **McKinsey** estimated in 2019 that US$345 billion of investment is needed in transmission and distribution in Africa by 2040, of which US$80 billion would be in transmission.
- **The International Energy Agency** has concluded that grids and minigrids can together address 75% of the energy access gap by 2030 but that "improving the financial health of state-owned utilities and mobilising private capital will be crucial to putting Africa's electricity sector on the sustainable path depicted in the Sustainable Africa Scenario".
- Rigorous evaluation studies have found that **grid extension has a positive impact on people,** particularly where the impact of new employment opportunities is considered, and not solely the impact of household connections.



# HOW GRIDWORKS EXPECTS TO CREATE IMPACT

Gridworks mandate was defined as follows when it was established by BII in 2019 -

"Gridworks intends to achieve positive impact through developing and making investments in electricity transmission, distribution, and off-grid infrastructure, including, without limitation, distribution businesses, transmission projects, vertically integrated utilities, minigrids, electricity provision to commercial and industrial customers (including rooftop solar), distributed generation and other energy access/off-grid solutions. Gridworks' mandate will be Africa focused."

# 02.

DEVELOPING AND
INVESTING IN AFRICA'S
ELECTRICITY NETWORKS

In its first four years, Gridworks has been pursuing all elements of this mandate. BII has indicated that it may modify the mandate in the future to remove rooftop solar for commercial and industrial customers.

Gridworks' long-term aim is to enable increased access to energy, to improve the reliability of energy for business, and to reduce and avoid greenhouse gas (GHG) emissions. These are all important elements of the SDGs.


Each of the projects Gridworks is working on has a clear pathway to meaningful impact for people and the environment. This section describes the investment thesis for each one and highlights how it is expected to contribute over time to access to affordable and clean energy for the underserved; sustainable, reliable energy to support business growth and competitiveness; and a low-carbon energy system.

Each of the projects highlighted in this report showcases a different type of intervention with a different impact pathway:

» **Moyi Power** involves developing large solar minigrids to increase access for households and business in underserved urban areas.

» **Virunga Power** is a platform for smaller hydro minigrids to serve households and business in less-densely populated rural areas.

» **Amari** involves investment in critical transmission projects to connect generation with users.

» **SPS** is a distributed renewable energy (DRE) company providing solar power to businesses.

ACROSS THE WORLD, CONNECTING REMOTE RURAL LOCATIONS HAS REQUIRED CONCESSIONAL FINANCE (USUALLY FROM THE PUBLIC SECTOR). IN AFRICA, SOLVING THIS PROBLEM REQUIRES SIGNIFICANT FLOWS OF DONOR FUNDING BUT ALSO INNOVATION IN THE BUSINESS MODELS.

Deep and lasting impact in these areas requires a great deal of groundwork over a long period of time, in collaboration with others. The activities described in this report are essential building blocks to enabling finance to flow in a sustainable way.

For example, transmission infrastructure and improvements to the viability of utilities may not bring immediate access, nor reductions in GHG emissions, but investment in these less visible parts of the system is a necessary first step to enabling access and GHG impacts over time. Similarly, a greenfield transmission line will not necessarily add new connections on its first day of commissioning, but developing a national transmission spine that supports a better-performing network is a necessary step to delivering high-quality electricity to commercial and residential end users.

Investment in large minigrids – effectively mini-utilities – takes longer and is more complex than installing small-scale minigrids, but is a vital way of creating the scale necessary to ensure that infrastructure can be sustainable in the medium to long term, and can form the basis for future electrification efforts.

Reaching rural areas with affordable clean energy is another challenge that requires a long-term approach. Across the world, connecting remote rural locations has required concessional finance, usually from the public sector. In Africa, solving this problem requires significant flows of donor funding, as well as innovation in the business models.

Gridworks, with the patient capital provided to it by BII, can work in a way that can achieve deep and lasting impact in the sector. As well as working on activities that shape the market, Gridworks is developing and investing in demonstration projects in transmission, large minigrids and rural electrification.

This approach means that Gridworks selects many of its projects with long-term objectives in mind, rather than necessarily expecting them to have the most immediate impact on the key SDG metrics. Maximising these in the short term might not be aligned with the greatest impact over time, because they might affect the viability of the energy sector and its ability to attract appropriate private finance. Measuring impact, and setting short-term and longer-term targets, is therefore complex.

Gridworks tracks different metrics for each of its projects, depending on the impact pathway. The principal metrics can be mapped onto our target SDGs, as shown in the table below. The indicators are not all applicable to each project.

## PRINCIPAL METRICS MAPPED TO OUR TARGET SDGS

| | | | |
|---|---|---|---|
| **INTENDED IMPACT** | **Provide underserved people with new and improved access to affordable clean energy** | **Support economic growth by providing businesses with new and more reliable energy** | **Reduce and avoid greenhouse gas emissions from the energy system** |
| **METRICS TO TRACK IMPACT** | Number of people with new or improved access to on-grid and off-grid energy | Number of businesses with new or improved access to energy | Greenhouse gas emissions reduced or avoided |
| **OTHER METRICS TO TRACK PROGRESS** (sometimes within Gridworks control, depending on the project) | Additional kWh of energy supplied<br>—<br>Number of new connections | Reduced frequency and duration of outages<br>—<br>Change in energy costs for businesses<br>—<br>Jobs created within the energy sector (during construction and operations)<br>—<br>Jobs created in a specific area served | GHG reduction through replacement of diesel<br>—<br>GHG reduction through reduction in the carbon intensity of the grid<br>—<br>GHG emission reduction through reduction in energy system losses<br>—<br>More stable, reliable grid enabling renewable energy sources to be added |
| | Improved efficiency of the network + lower costs of energy generation + improved collection of revenues, potentially reducing pressure on tariffs and/or on government budgets<br>—<br>Improved evacuation of power from existing sources of generation, reducing deemed energy payments<br>—<br>Increase in investment flows into T&D<br>—<br>Replication of the model / approach | | |
| **WIDER IMPACTS TO BE EVALUATED OVER TIME** | Improved income and livelihoods resulting from the new or improved access to energy | Jobs created within the wider economy | More efficient sharing of renewable energy resource within and between countries |

There are various reasons why tracking impact in Gridworks' projects is complex. These challenges can broadly be characterised in four ways: project development, Gridworks' interventions as part of a country's broader energy system, the extent of Gridworks' influence and control, and Gridworks' role in market shaping.

**Firstly,** as outlined above and as will be clear from this report, Gridworks is sometimes involved in developing projects from an early stage and the full detail of the impacts only becomes clear as the project is subject to more detailed design. Estimates can be made at an early stage but the extent of the impacts, and the timeframe for achieving them, needs to be adjusted as the project evolves.

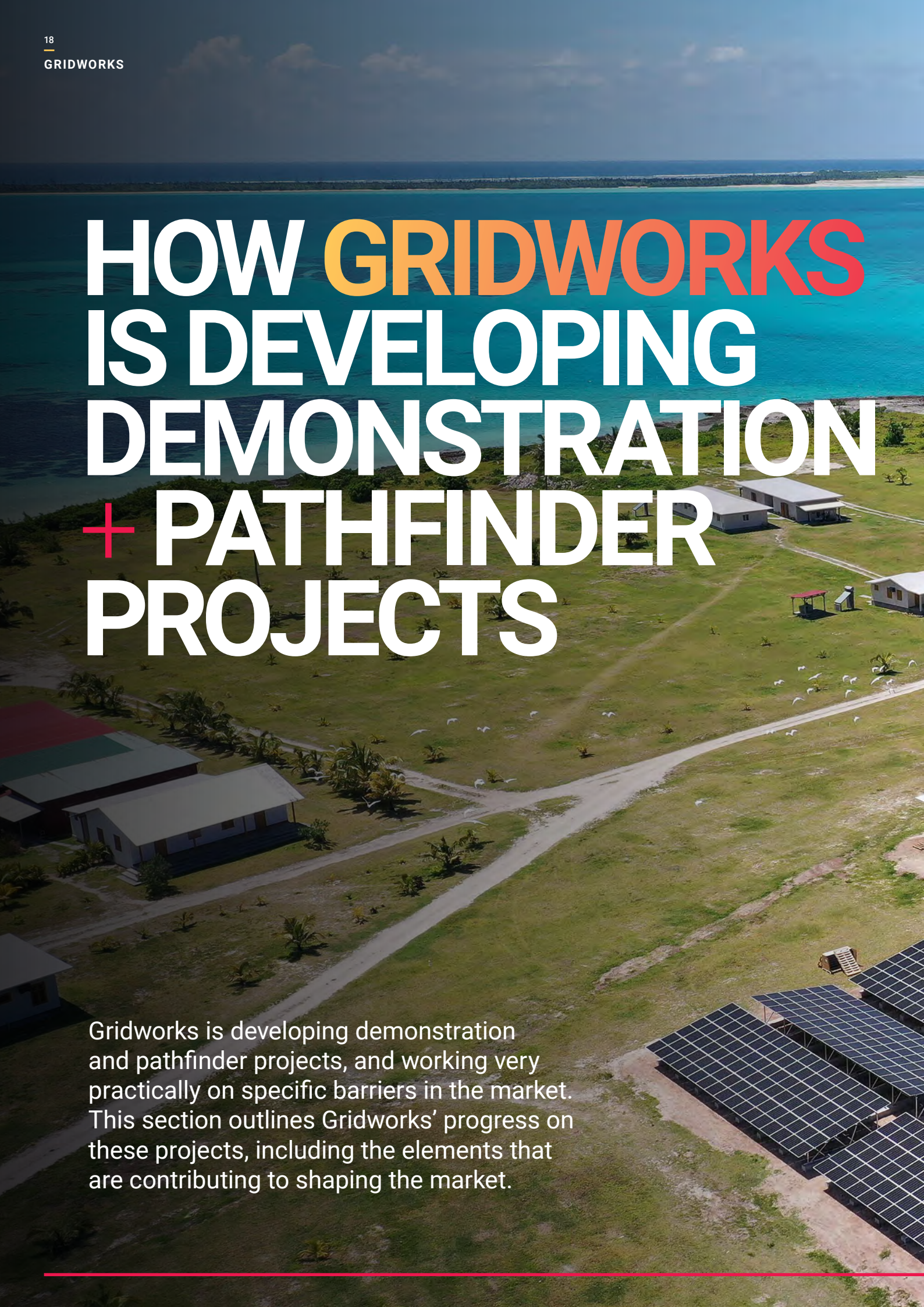
**Secondly,** because Gridworks is undertaking projects that seek to bring private finance to parts of the energy system that need it most, these projects often contribute to and enable a larger plan for a country's energy system, rather than operating in isolation. For example, transmission projects are a critical part of making the system function, but it is difficult to report the impact of a transmission project separately from the impact of the improved system as a whole. Investors in generation projects will usually report the impact of their investments on the assumption that the kWh generated by the plant will reach consumers. But, without transmission, energy generated cannot be evacuated from power plants and energy cannot reach consumers. Gridworks needs to assess how its intervention is enabling other things to happen, within a wider country plan.

**Thirdly,** Gridworks does not have control over all elements of the impact: one specific example of this is in the setting of tariffs. Gridworks' projects can help to reduce the pressure on tariffs in different ways, depending on the type of project (for example, improved efficiency, lower cost of generation, improved collection of revenues, or by enabling increased power sales) but the tariff is set by the government or regulator and there are legitimate policy decisions which can affect this.

**Fourthly,** Gridworks' mandate is to make interventions that will shape the market for investment in T&D and off-grid energy. This will have a significant catalytic effect, driving impact through scaling and replication. This report provides findings from a survey of market players to illustrate changes in knowledge, attitudes and perceptions of the market, as this is the principal way of tracking whether Gridworks is making progress in this respect.

Gridworks also applies an ex-ante tool to assess the need for interventions. The tool provides a rating for each project, based on its impact pathway and the country or countries in which it operates. The ratings are based on current data from independent sources on access to energy, the reliability of the energy system, the use of high-carbon energy sources, the carbon intensity of the grid and the viability of the energy sector. The weighting on each of these elements depends on the intended impact pathways. This provides additional assurance that each Gridworks project is clearly addressing a significant existing gap in delivery of the SDGs.

**The next section explores how Gridworks hopes to deliver these impacts through its projects.**



# HOW GRIDWORKS IS DEVELOPING DEMONSTRATION + PATHFINDER PROJECTS

Gridworks is developing demonstration and pathfinder projects, and working very practically on specific barriers in the market. This section outlines Gridworks' progress on these projects, including the elements that are contributing to shaping the market.

# 03.

DEVELOPING AND INVESTING IN AFRICA'S ELECTRICITY NETWORKS

"WE'RE SEEING THEM [GRIDWORKS] IN THE PRESS, WE'RE SEEING THEM LAUNCH PROJECTS IN DIFFICULT PARTS OF THE WORLD. [...] THEY'RE NAVIGATING AREAS THAT OTHERS CAN'T GO INTO, WHICH IS EXACTLY WHAT IS NEEDED."

**Sebastiaan Surie,**
Regional Head - Africa, Climate Fund Managers

# MOYI POWER

## GRIDWORKS' INTENDED IMPACT

Moyi Power is a pathfinder project involving minigrids. The project is designed to demonstrate the viability of a utility-scale concession and show that a large-scale hybrid minigrid can be developed, financed, constructed and operated successfully. This will deliver large-scale, clean, affordable power in a location that is remote from a transmission network. Its ultimate aim is to provide power to people in three cities in the Democratic Republic of Congo (DRC) that have not had grid access before. The DRC has one of the lowest electrification rates in sub-Saharan Africa (SSA); 20% of the population have access to electricity with considerable disparity between urban (50%) and rural (<1%). According to the World Bank Enterprise survey, 90% of firms experience electrical outages, costing 8% of annual sales.

The project is expected to provide electricity to 250,000 people after five years of operation, and more than a million by the end of the 22-year concession. A baseline survey in the three towns highlighted the need for energy to improve incomes and quality of life (see box).

**VIDEO: HOW THE MOYI MODEL WORKS**

A BASELINE SURVEY IN THREE DRC TOWNS

# HOUSEHOLD SURVEY GIVES MOYI POWER A BASELINE TO TRACK THE IMPACT OF ENERGY ACCESS


**90m**

**The DRC population of 90 million**

**US$1**

**average income per person in the three towns**

**43%**

**of children in DRC are malnourished**

**The DRC is the second largest country in Africa (after Algeria) in terms of its geographical area and the fourth largest in terms of population. It is estimated that 73% of its population of 90 million live on less than US$1.90 a day and that 43% of children in DRC are malnourished.**

The Moyi Power minigrids project in northern DRC is being developed to bring power to homes and businesses in the three towns of Gemena, Isiro and Bumba, where there is currently no connection to the national electricity grid. As part of the planning for the new hybrid solar PV minigrids, Moyi Power undertook a household survey, taking a representative sample of 700 households and businesses in each of the three towns.

This was in part to understand what people currently use for their energy, how much they pay, and how that compares with their household income. It was also to create a baseline so Moyi Power can try to assess the impact of energy access on people's livelihoods and quality of life over time.

There is no substitute, of course, for talking to people face to face, to understand about their lives. But from the survey we get some insight on what life is like for the people living in these towns. The average household income in the three towns is US$7 a day. Each household is home to an average of 8 people. So the average income per person in the three towns is around US$1 a day. More than half the people in the area are living on less than US$1 a day. About a quarter of people are in jobs that provide wages, but most are in the informal economy.

In Gemena, about two thirds of people are living in brick houses, while most houses in Bumba are made from mud, and in Isiro there is more of a balance between the two types. About two thirds of households currently get electricity from small solar appliances that enable them to power a light bulb and a radio, and charge a mobile phone.

One third of households have no source of power at home. Also, the survey found that only a small proportion of businesses have access to a generator, with most relying on solar PV powered appliances, limiting their scope for productive use.

In Gemena and some parts of Isiro, the national water utility provides water to stand-pipes, but people otherwise get their drinking water from wells or from the river. None of the sources are considered to be high quality and some are unsafe. Sanitation in all of the towns is provided through pit latrines.

It will be at least twelve months before Moyi Power begins construction, and some further months before the communities will begin to benefit from the reliable power supply that the minigrids will deliver. The survey highlights the urgent need for interventions that improve the lives of those living in northern DRC. Follow-up surveys in future years will assess the changes people have experienced, and how Moyi Power has contributed.

## MOYI POWER IMPACT METRIC TABLE

| Intended impact | Existing need | Metrics to track | Current estimated potential for impact |
|---|---|---|---|
| **Achieve large-scale affordable clean power** | » 20% of the population of DRC lack access to electricity<br>» 1% of the rural population in north DRC has access to electricity | » Number of people with new or improved access to clean energy | » 250,000 people by the end of 5 years<br>» > 1 million people by the end of the 22-year concession |
| **Grow energy access without growing carbon emissions** | » Economic growth would otherwise be achieved through fossil fuel generation | » Greenhouse gas emissions reduced and avoided | » > 100,000 tonnes of $CO_2$ emissions reduced or avoided over the life of the concession |
| **Demonstrate the viability of a utility-scale concession** | » Existing models require ongoing subsidy | » Replication of approach by other donors<br>» Commercial viability of Moyi Power when operational | » Significant potential for replication, multiplying the impact |

## CATALYSING THE PRIVATE SECTOR

Moyi Power is being developed by a consortium led by Gridworks. Gridworks' consortium partners are Eranove, a French company with a network of prominent West African businesses including both the water and electricity transmission & distribution networks in Cote d'Ivoire, and AEE Power, a Spanish-headquartered Engineering, Procurement and Construction (EPC) company with over 20 years construction experience in the DRC. Gridworks took the lead on building the consortium and on the technical and financial development of the project. Eranove will provide the operating expertise for the first five years of the concession, and AEE provides local presence and construction expertise and will be the construction contractor under an EPC arrangement. Gridworks has catalysed the specialist skills of its consortium partners for the project by leading the consortium for the development and financing phase as well as being the largest equity partner.

## CATALYSING DONORS AND DFIS

Moyi Power was developed following original project preparation funded by the UK Foreign Commonwealth and Development Office. The programme was designed to provide scale and appropriate regulation in the minigrid sector as a template for future projects in DRC and beyond. The Moyi Power consortium won a competitive tender to become the reference developer of the project. There was one other bidding group, but the Moyi Power consortium was assessed as having superior technical references, and a lower project cost (and therefore lower end-user tariffs) arising from a more efficient construction process.

The project is technically challenging to develop and will follow a multi-year process from tender award to financial close, followed by an approximately two-year construction process. The development work includes site, networks and demand studies in the three cities, technical design, environmental and social work streams, including a livelihood restoration plan, business operations design, and debt and grant financing.

The debt and grant financing are dependent on the other development activities being carried out to the standard required by donors, and necessary to support an international project financing. Gridworks achieved the end of the technical design process in early 2023, and has been working with prospective lenders and grant providers ahead of officially mandating the financiers. Due diligence work with donors has also been launched. The project received significant interest from the DFI lenders (including six written expressions of interest) and from three grant providers. Based on current estimates, the initial project cost will be about US$120 million, increasing to US$250 million by year 15. The initial project cost for phase one of the project will require approximately 40% of grants, 40% of debt and 20% of equity investment from the consortium. The ratio of grant funding to commercial funding will reduce as subsequent phases are constructed and over the lifetime of the concession the grant funding is projected to reduce to approximately 16%.

Since Moyi Power was launched, there has been significant interest in the concept of creating minigrids at this scale (or small greenfield utilities), and with strict regulatory frameworks or contractual protection for investors. In some quarters, these projects have been termed 'metrogrids'. Two further initiatives have been launched in DRC by the International Finance Corporation (IFC) – IFC's Scaling Minigrids programme – and by the Agence Francaise de Developpement (AFD). They are at earlier stages in their development and there are still significant challenges to both of these initiatives.

However, these interventions have been heavily influenced by the progress made to date on Moyi Power, and both IFC and AFD have consulted heavily with Gridworks to understand lessons from the Moyi Power process.

"IN THE DRC, THE FACT THAT GRIDWORKS HAS COME IN AND WON THE TENDER, AND TEAMED UP WITH SOME VERY GOOD PLAYERS, HAS ENABLED THEM TO BE MUCH MORE CREDIBLE AND INFLUENTIAL VIS-A-VIS GOVERNMENT NEGOTIATIONS. [...] HOPEFULLY ONCE THAT PROJECT IS SUCCESSFUL [...] THE DRC GOVERNMENT WILL ADOPT THE SAME MEASURES AND POLICIES ON FUTURE TENDERS."

**Emilio Cattaneo,** PIDG

The Global Energy Alliance for People and Planet (GEAPP) also adopted DRC as a country partner at a time when their only identified project in DRC was Moyi Power. DRC was not an initial focus country for GEAPP.

## HOW GRIDWORKS HAS ADDED VALUE

MOYI WOULD NOT HAVE HAPPENED WITHOUT GRIDWORKS CREATING THE CONSORTIUM, OR PERHAPS WOULD HAVE HAPPENED WITH A MORE EXPENSIVE SOLUTION AND A WEAKER CONSORTIUM. IT HAS INFLUENCED THE WIDER DONOR COMMUNITY AND INSPIRED FURTHER SIMILAR PROJECTS.

# AMARI POWER TRANSMISSION

## GRIDWORKS' INTENDED IMPACT

The Amari project is a pathfinder project in transmission investment. The project aims to solve the capacity constraints at four substations that have each been identified as a strategic priority by Uganda's national electricity utility, Uganda Electricity Transmission Company Limited (UETCL), in its latest Grid Development Plan.

The project will bring improved operating reliability and security of the substations and will enhance the quality of supply to industrial users. It will also improve the evacuation of power that is being generated from existing power plants in the vicinity of the sub-stations and of future renewable plants planned. This will therefore help mitigate the risk of deemed energy payments that result from poor system availability. In due course, the project may lead to enhanced regional trade through increasing the capacity and stability of the electricity supply to meet the requirements of neighbouring countries.

It has both important direct impacts and wider impacts as a model for private-sector investment in transmission.

In its National Development Plan, the Government of Uganda highlights the importance of investment in improving the capacity and stability of Uganda's national transmission and distribution networks, to enable increased household incomes and improved quality of life for Ugandans.

For this, a number of major transmission substations must be upgraded to transmit the right quality and quantity of power (existing and incoming) to the end users (industries, small-scale, medium and bulk consumers). Funding constraints have, however, hindered the timely commissioning of the required infrastructure and have resulted in short-term, piecemeal and temporary solutions, some of which, in Gridworks' view, add operational safety risks to the system.

The Amari project solves for this: it has been structured to mobilise the necessary funding to invest in the transmission network without affecting the sustainability of public-sector debt.

When Amari reaches financial close (expected in 2023), it is likely to be the first privately financed transmission project of its type in Africa. It follows and adapts the structure of an Independent Power Transmission (IPT) project. This approach is comparable to the Independent Power Production (IPP) market, which is now well established, and regulated effectively in most countries. The IPT structure has been very successful in attracting significant funding for greenfield transmission infrastructure elsewhere in the world, including in South America and India, at points in history when very significant grid expansion was necessary.

**The project also has major social and environmental benefits.**

**Firstly,** the project will support greater renewable energy source (RES) integration, and therefore a higher share of RES in the energy mix. This will happen both through the direct evacuation of hydro and solar power plants in the vicinity of the substations, and through additional renewables capacity added during the lifetime of the project.

**Secondly,** the more-reliable energy supply resulting from the project will lead to a reduction in $CO_2$ emissions, both because of reduced energy losses and because of a potential reduced use of back-up diesel generators.

**Thirdly,** in the impact on individuals, the enhanced security of the electricity supply will have an impact on business activities, supporting economic growth and offering greater opportunities for employment.

**Furthermore,** the project could save the Government of Uganda from paying for 'deemed energy' because currently inadequate grid infrastructure means it is paying for power that is not evacuated from independent power producers due to transmission constraints. As most of the projects in Uganda are contracted on a take-or-pay basis, any energy not served increases the cost of electricity and places a burden on the system. According to the Uganda Electricity Regulatory Authority, delays in investing in the transmission and distribution infrastructure would lead to unsustainable deemed-energy costs, expected to reach US$137 million in 2025 if no mitigation measures are taken. Investments in the transmission and distribution sector therefore contribute to reducing this burden for the end-users and the Government.

## MARKET SHAPING WITH GOVERNMENTS AND DONORS

The Gridworks team has been developing this project since 2020. It has involved working with Ugandan ministries of energy and finance, with the transmission utility and with the Electricity Regulatory Authority, to help make the case for private investment in the sector in general, and for this project specifically. The project commenced on an unsolicited basis and has been negotiated bilaterally with the Government. There is no existing framework for private investment in the transmission sector at present, and the Gridworks team therefore had to create a novel transaction structure and terms to fit with existing legislation.

The project has now been adopted as an official pilot for private investment in the sector. It is being carried out in tandem with a World-Bank-funded consultancy process to design a formal framework for transmission investment in Uganda. Gridworks created a suite of documents for the project which helped to inform the transmission framework which is being developed in Uganda. Gridworks will also pilot the regulatory process. The project will therefore, quite literally, shape the Ugandan transmission sector as well as serving as an example to other countries. Uganda currently has more than US$1.6 billion of additional sector funding required for T&D in its least-cost energy-expansion plan 2020-2030, and a large proportion of this will need to come from the private sector, meaning a reference project like Amari will serve a critical purpose in the country's medium-term infrastructure plans.

## AMARI POWER TRANSMISSION IMPACT METRIC TABLE

| Intended impact | Existing need | Metrics to track | Current estimated potential for impact |
|---|---|---|---|
| **Increased availability of private finance for the transmission sector in Africa** | » There is currently no private sector funding available for transmission projects in Africa<br>» The sector is currently funded solely using public routes and this form of capital alone cannot address the important investment | » Private finance mobilised (in US$ million) | » Assessment being undertaken as part of project development |
| **Improved operating reliability and security of substations** | » Uganda is in the top quartile in Africa for outage frequency and duration | » Unplanned outages<br>» Overloading of transformers | » Assessment being undertaken as part of project development |
| **Improved safety performance** | | » Number of fatalities (Environment and Health & Safety Statistics) | » Assessment being undertaken as part of project development |
| **Reduced deemed energy** | » Inadequate power evacuation and unreliable grid infrastructure have led to some power generators being incapable of producing to their full capacity and for Government or others having to pay for this energy not used | » Energy evacuated from generators through the substations – (MWh) | » Assessment being undertaken as part of project development |
| **Support access to electricity to industrial customers** | » Access to reliable and sufficient power is key to the development of industries and Uganda has commissioned and is planning several parks to bolster industrial activities | » Power served to Industrial demand served/supported – MW | » Assessment being undertaken as part of project development |
| **Enabling the penetration of renewable energy (Reduced GHG emissions)** | » Uganda generates energy through hydropower that is not currently being transmitted | » Additional generation capacity connected through the substations – MW<br>» [GHG emissions saved through additional renewable capacity supported] | » Assessment being undertaken as part of project development |

## CATALYSING INVESTMENT

Amari Power Transmission will eventually be refinanced with debt. Five DFI lenders, one international commercial bank and one local bank have asked to be considered as debt providers. The project involves government support arrangements and a risk apportionment similar to the IPP sector in Uganda, but will carry less resource risk and operating risk. We therefore consider it to have attractive risk-adjusted returns by comparison with generation projects. The transmission sector therefore has the potential to attract material private-sector funding if projects like this one can be developed successfully. Gridworks has a role in catalysing this investment.

Similarly, there is strong interest from DFIs and infrastructure funds for providing equity to projects of this kind.

Gridworks intended to fund the equity for Amari on its own. However, funding constraints from BII meant that Gridworks has explored the availability of co-investment in case it is necessary to manage liquidity. Gridworks began a co-investment process in Q4 2022. It approached three DFIs and two infrastructure funds to canvass interest in co-investment. All five institutions have issued letters of interest. This demonstrates strong investment appetite for the transmission sector, once projects have been developed to the point of financial close.

"[GRIDWORKS] ARE WORKING IN UGANDA - IF THEY CAN MAKE [THESE PROJECTS] WORK, THEN I'M SURE OTHER COUNTRIES WILL FOLLOW, AND THIS WILL SHIFT THE WHOLE T&D SECTOR ON THE CONTINENT."

**Huub Cornelissen,** FMO

## HOW GRIDWORKS HAS ADDED VALUE

AMARI IS THE FIRST PROJECT OF ITS TYPE ON THE CONTINENT. IT IS MARKET-SHAPING IN UGANDA AND BEYOND. AMARI HAS BEEN CARRIED OUT AHEAD OF THE REGULATORY REFORMS TO FACILITATE TRANSMISSION INVESTMENT, BEING CONSIDERED IN UGANDA WITH SUPPORT FROM THE WORLD BANK. IT WILL BE AN IMPORTANT STEP IN DEMONSTRATING THE MODEL. GRIDWORKS DEVELOPED AMARI AND IT WOULD NOT HAVE EXISTED AS A PROJECT OTHERWISE. IT IS NOW CONSIDERED COMMERCIALLY ATTRACTIVE TO LENDERS AND EQUITY CO-INVESTORS.

# VIRUNGA POWER

## GRIDWORKS' INTENDED IMPACT

Virunga Power is a platform seeking to tackle rural electrification by using run-of-river hydropower to build a portfolio of commercially sustainable assets across eastern and southern Africa.

Gridworks' investment will enable Virunga Power to build a portfolio of (primarily) hydropower DRE projects that serve rural users. The most advanced projects in the pipeline are in Burundi, Malawi, Kenya and Zambia, where access to reliable power is severely limited, especially in rural areas. Virunga Power will also have an impact through reducing carbon emissions in locations where the hydro-backed DRE replaces the use of diesel generators.

Beyond these very important impacts on people and the environment, Gridworks will support Virunga Power in growing into a sustainable company with commercial models for difficult locations.

Its model focuses on using the lowest-marginal-cost (baseload) generation source, in hydroelectric power, to serve rural customers. Projects typically have generation tariffs (which exclude the cost of the network) of c.7-15 $c/kWh, whereas solar hybrid projects' generation tariffs are typically greater than 20 $c/kWh. Affordability is key to building such projects and having the input cost materially lower is important. Virunga Power also manages demand risk – one of the most difficult issues with rural electrification – by agreeing offtake agreements (PPAs) that allow for sale of electricity to the grid as well as to local users. This allows them to grow their local distribution networks over time. A portfolio with a spread of projects like these will position Virunga Power as one of the first sustainable rural utilities in Africa once it achieves scale. This will demonstrate its effect and provide learning and replication opportunities.

In the medium term, Virunga Power will complete the advanced projects in its portfolio in Burundi, Kenya, Malawi and Zambia, and progress an opportunity in Burundi to build a national-scale rural utility. Elsewhere, Virunga Power will then build distributed utilities in rural areas using existing power projects as a seed of commerciality.

## VIRUNGA POWER IMPACT METRIC TABLE

| Intended impact | Existing need | Metrics to track | Current estimated potential for impact |
|---|---|---|---|
| **New and improved access to energy for households and businesses** | Rural energy access in VP's relevant project countries –<br>» Burundi – 3.4%<br>» Malawi – 10.4%<br>» Zambia – 11.0%<br>» Kenya – 71.7% | » Number of households and businesses with new and improved access to energy<br>» Price per kWh | Potential for rural connections depending on project development:<br>» 5,500+ in Zambia<br>» 10,000 in Malawi<br>» 100,000+ in Burundi |
| **Reduction in GHG emissions through replacement of fossil fuel with run-of-river hydropower generation** | » The projects are in rural areas where grid connectivity is poor or non-existent, thus requiring high-carbon diesel generation | » Carbon emissions reduced through replacement of diesel generation<br>» Carbon emissions avoided | » Assessed as part of project development |
| **Demonstration of a commercially viable platform for delivery of rural electrification projects** | » Currently there are no sustainable models for rural electrification to address the need outlined above | » Commercial viability of the platform<br>» Replication of the model | » Significant potential for impact if a sustainable platform can be developed |

## THE DETAILED PROJECT DEVELOPMENT WORK GRIDWORKS HAS UNDERTAKEN

Several years ago, Gridworks identified Virunga Power as a likely target. Gridworks has provided significant support to the management team in the last two years, including introducing GEAPP to the rural-utility concept in Burundi that led to GEAPP selecting Burundi for a country partnership. Gridworks also provides ongoing and detailed feedback on developing the company's other advanced projects, using its experience in the same countries, and finding synergies in technical, regulatory and development expertise with other portfolio companies, such as SPS and Moyi Power. Gridworks has lent credence and support to Virunga Power's discussions with the Government of Burundi especially, as well as with other relevant counterparts (US Government, UK Government, donors, and lenders).

## WORKING WITH GOVERNMENTS

Virunga Power is developing long-term rural-distribution concessions in countries such as Burundi and Malawi that could create new distribution concessions at scale. Material interventions in distribution always require close engagement and buy-in from national government. Virunga Power's work in Burundi is an example of the progress (though still early in development) that can be made with a receptive government. Gridworks has supported Virunga Power's efforts to build consensus with the government and donors on bringing private-sector capital and management to solve the rural electrification challenge. It now has a platform to develop a large-scale intervention in the form of a long-term concession, bringing international best practice for utilities, along with capital and a management team dedicated to creating the thesis.

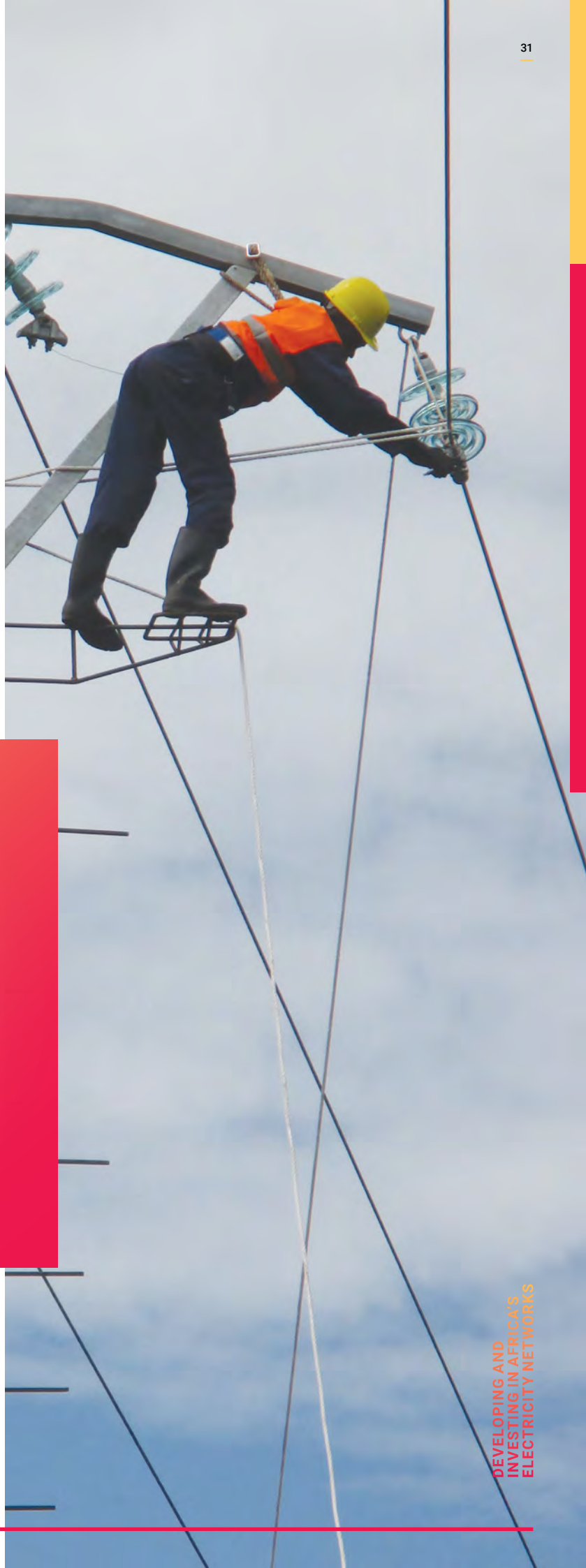
If the projects are successful, this early-stage project-development work will inform sector structure in host countries for the foreseeable future.

## CATALYSING GRANTS AND INVESTMENT

Virunga Power has a near-term pipeline of five projects, and a longer-term pipeline of a further 16+ projects. Many projects carried out by Virunga Power will involve raising debt from DFIs and local banks. Gridworks has also been required to start a process to catalyse further funding for Virunga Power at the holding-company level (as opposed to project level), due to funding constraints from BII during 2023. Gridworks began a co-investment process in Q4 2022. This resulted in interest from DFIs and infrastructure funds.

## HOW GRIDWORKS HAS ADDED VALUE

VIRUNGA POWER EXISTED AS A BUSINESS FOR SEVERAL YEARS, BUT FOUND IT HARD TO ATTRACT THE SORT OF INVESTMENT IT NEEDED TO FOCUS ON ITS RURAL-ENERGY-ACCESS THESIS. GRIDWORKS' INTEREST HAS HELPED ENCOURAGE THAT OF OTHER INVESTORS, LEND CREDENCE TO ADVANCED PROJECTS, AND IMPROVE THE QUALITY OF EXISTING PROJECT DOCUMENTS.



# SPS

## GRIDWORKS' INTENDED IMPACT

SPS is a DRE company, based in South Africa, that provides businesses across sub-Saharan Africa with high-quality solar panels and back-up battery solutions, combining financial and engineering expertise.

The impact thesis is that SPS provides access to affordable reliable energy for businesses, which helps to support economic growth (SDG 8), and that it contributes to efforts to combat climate change (SDG 13) by supporting and increasing the proportion of renewable energy in African countries' generation mix. In addition, SPS may demonstrate market shaping by catalysing the overall market in Africa for DRE and demonstrating innovative business models.

## SPS'S PERFORMANCE TO DATE

Between Gridworks' investment in November 2019 and February 2023, SPS installed 43 MW of solar DRE and 9 MWh of battery storage. The cumulative avoided $CO_2$ emissions, through a combination of replacement of diesel energy and replacement of carbon-intensive grid power, on SPS-funded installations between the start of Gridworks' investment and December 2022 amounted to over 165,000 tonnes.

SPS's business has grown in line with projections from when the original investment was made, and it is currently one of the larger companies of its type on the continent, in what remains an under-penetrated market. The market has seen significant growth in interest from both commercial and DFI investors over the past three years, but many businesses remain sub-scale and loss-making. SPS is one of the few profitable companies in the market at present, demonstrating a financially sustainable business model.

## SPS IMPACT METRIC TABLE

| Intended impact | Existing need | Metrics to track | Current estimated potential for impact |
|---|---|---|---|
| **Reduction in GHG emissions through replacement of grid power with solar generation and replacement of diesel gensets with off-grid solar** | The carbon intensity of the grid is high in SPS's countries of operation[1]:<br>» South Africa – 890g $CO_2$ per kWh (coal generation)<br>» Namibia – relies largely on imports from SA<br>» Seychelles – 713g/$CO_2$ per kWh (diesel generation)<br>And diesel gensets are also highly carbon intensive. | » Carbon emissions reduced through replacement of grid power or replacement of use of diesel gensets | » Reduction of >70,000 tonnes of $CO_2$ per annum |

1 IEA Emissions Factors 2022

CASE STUDY

# SPS SOLAR FARMS IN THE SEYCHELLES REPLACE CARBON-INTENSIVE DIESEL AND DELIVER CHEAPER POWER

**127K**
tonnes of $CO_2$ avoided over 20 years

**19 US$c**
reduced the cost of electricity from 42 $c/kWh to 19 $c/kWh

**6MW**
installed 6 MW of solar photo-voltaic panels across the Seychelles

**9MWh**
installed 9 MWh of Li-ion battery storage across the Seychelles

The electricity grid in the Seychelles is highly carbon-intensive because it relies on diesel. SPS has installed 6 MW of solar photo-voltaic panels and 9 MWh of Li-ion battery storage across the Seychelles, to support the Government's renewable energy targets. The five systems installed are expected to result in over 100,000 tonnes of $CO_2$ avoided over 20 years. On one of the islands, Desroches Island, 90% of fuel use has been avoided through installation of the 3MW system. At the same time, the solar plants have reduced the cost of electricity from 42 $c/kWh to 19 $c/kWh.

## SUPPORTING NEW TECHNOLOGIES AND APPROACHES

SPS uses battery-storage technology for its off-grid installations and is in a strong position to support the take-up of new battery systems for both on-grid and off-grid use. Improvements in the take-up of battery storage is an important component in achieving a greater share of renewables on the grid.

## EXPLORING NEW REGIONS

The South African market is the most advanced (and competitive) market for commercial and industrial (C&I) solar today. Utility performance is weak, corporate interest in C&I is increasing, and the regulatory environment is becoming more attractive. Businesses are also turning to C&I solutions in order to mitigate power security risks due to increased load shedding from national utility ESKOM. SPS has also been a pioneer of providing off-grid systems to businesses that are not connected to the grid. They have carried out projects in Seychelles (see box) and Kenya. Kenya is the most advanced market in East Africa, but penetration remains low. SPS has installed 3 MW of solar and 3 MWh of battery storage in Kenya, and has built a regional team based in Nairobi to add a further pipeline.

## FOCUS AREAS FOR FUTURE IMPACT – SECTORS

To date, SPS has focused on core relationships in the retail and off-grid tourism sector. It will now be exploring other sectors with large real-estate portfolios, including large-scale agriculture (pumping and irrigation) and medical facilities.

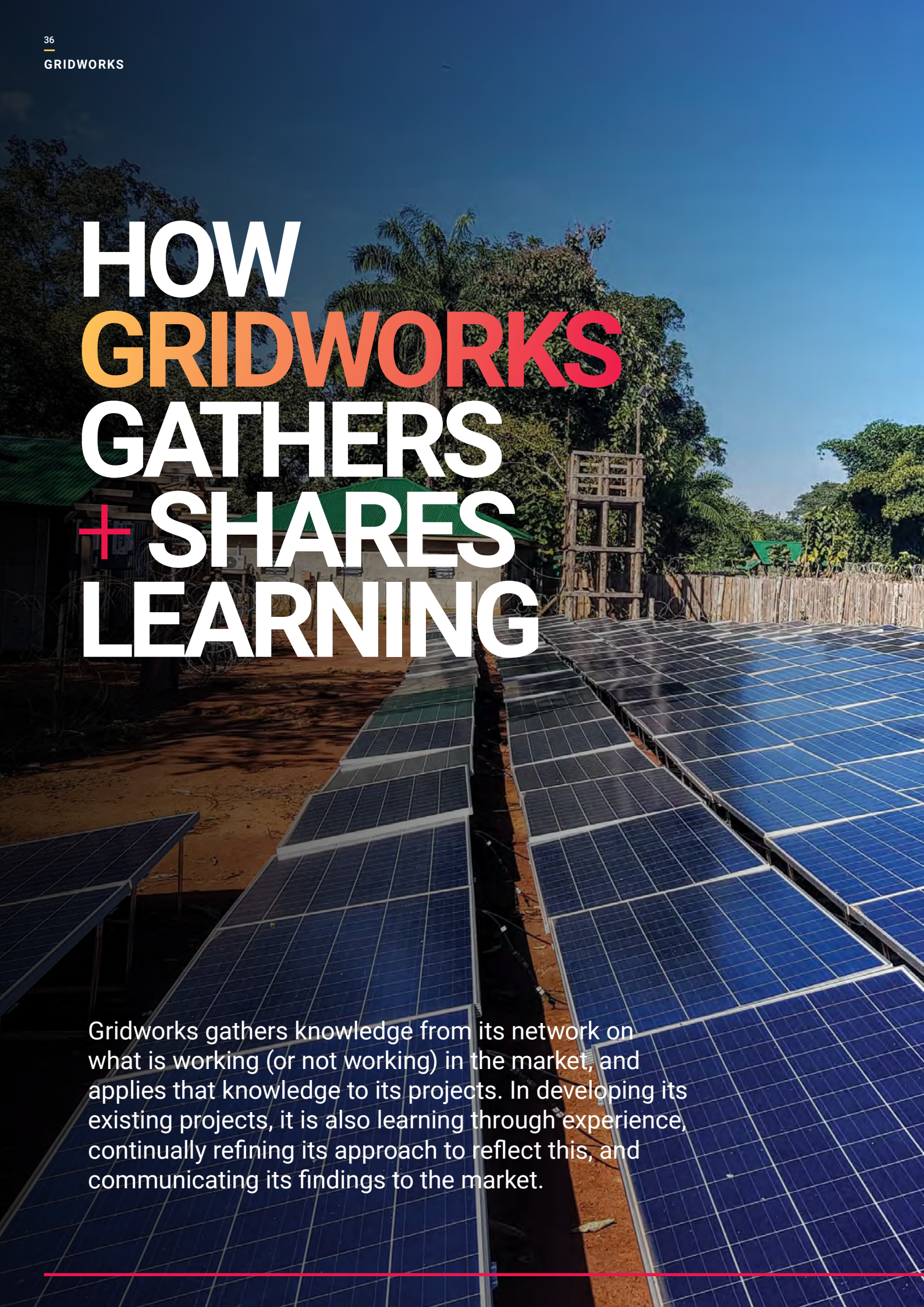
## FOCUS AREAS FOR FUTURE IMPACT – MARKET

The traditional model of grid expansion and densification assumes that large centralised generation systems connect to a national grid, through which all users are connected. However, this model has been challenged over time by reductions in cost of solar PV and storage; under-investment in the central grid leading to poor-quality power for users (especially businesses); and loosening regulation that is reducing the exclusive nature of electricity distribution for users. These trends mean that decentralised technologies are becoming more central to how users receive their electricity and how regulation is evolving to support the integration of formerly captive renewables into distribution systems.

In South Africa, ESKOM is failing to meet the needs of its customers, and this is the beginning of a more dynamic utility market. There are opportunities for private sector DRE companies to provide power to users through wheeling – where open access to the network allows a user to buy power from a producer other than the utility – and through power trading. SPS is well placed to begin wheeling power and power trading as the market develops, and is experimenting with these business models. This could lead to a reduction in the carbon intensity of the grid, but also form the basis of such integration into other power sectors. SPS building a track record of doing this will be an important credential for Gridworks as a leader in how power sectors evolve.

To date, SPS has implemented two projects that involve wheeling power from a generation installation to multiple customers on local distribution networks in South Africa. It has also obtained the first electricity wheeling licence ever granted in Namibia, to pilot a new business model that involves generating and transmitting energy to multiple clients. In this regard, SPS is at the forefront of a rapidly evolving market.

BETWEEN GRIDWORKS' INVESTMENT IN NOVEMBER 2019 AND FEBRUARY 2023, SPS INSTALLED 43 MW OF SOLAR CAPACITY AND 9 MWH OF BATTERY STORAGE.



# HOW GRIDWORKS GATHERS + SHARES LEARNING

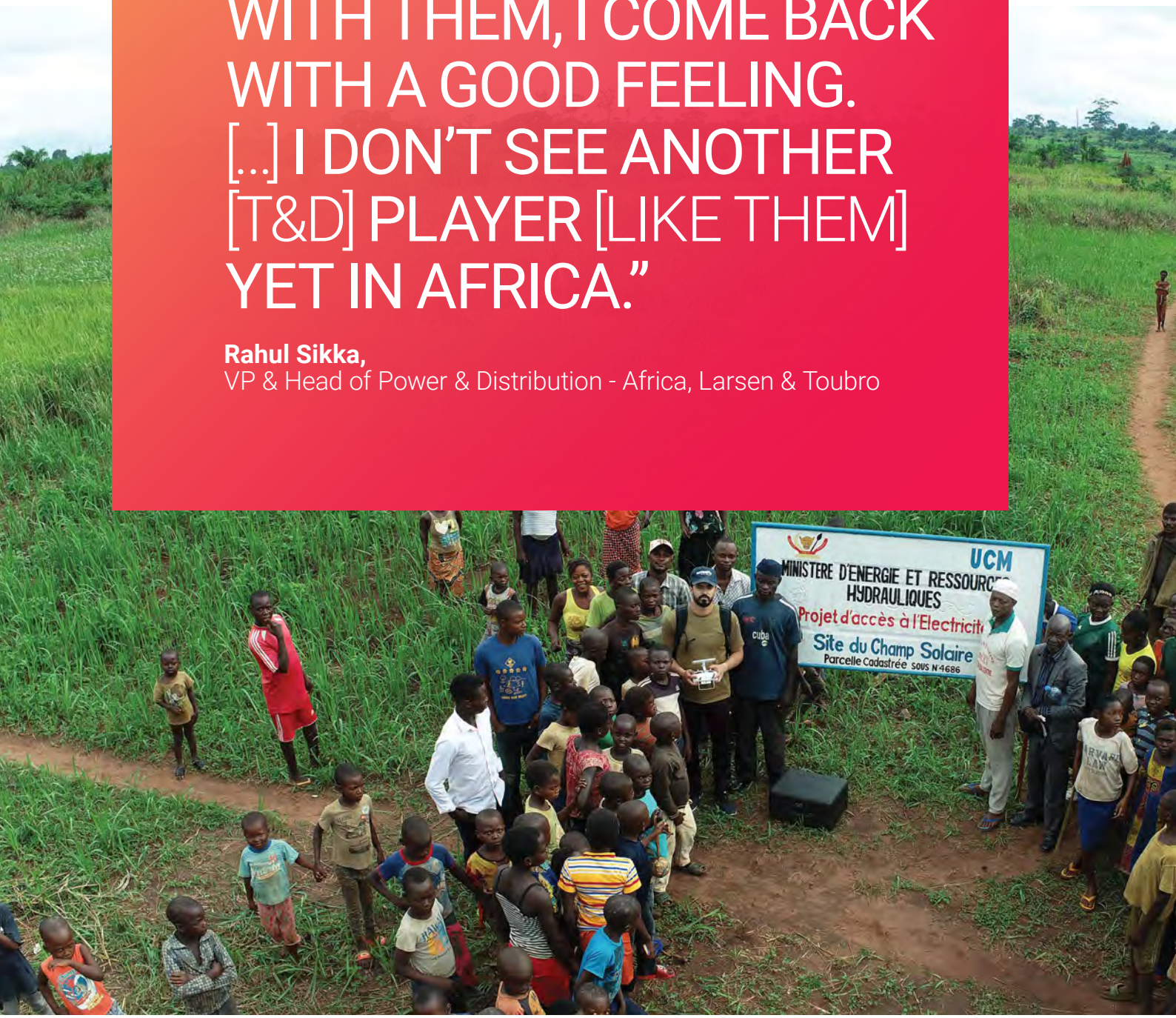
Gridworks gathers knowledge from its network on what is working (or not working) in the market, and applies that knowledge to its projects. In developing its existing projects, it is also learning through experience, continually refining its approach to reflect this, and communicating its findings to the market.

# 04.

DEVELOPING AND INVESTING IN AFRICA'S ELECTRICITY NETWORKS

"I AM VERY IMPRESSED WITH WHAT I KNOW OF GRIDWORKS. EVERY TIME I DISCUSS SOMETHING WITH THEM, I COME BACK WITH A GOOD FEELING. [...] I DON'T SEE ANOTHER [T&D] PLAYER [LIKE THEM] YET IN AFRICA."

**Rahul Sikka,**
VP & Head of Power & Distribution - Africa, Larsen & Toubro



Gridworks communicates frequently, to contribute to shaping sector policy in its markets and to support the impact projects can have. For example:

» **Senior staff from Gridworks regularly participate in, and present at, gatherings of sector stakeholders,** including government representatives, regulators, financiers and donors. The Gridworks team members have become sought-after sector commentators, and senior staff were keynote speakers at seven Africa energy conferences in 2022.

» **Gridworks formed and curates a "T&D Club" with Power Africa.** The Club has convened key players in the industry from energy policymaking, academic, legal and corporate backgrounds to share their perspectives. Attendees have included African regulators, government officials, developers and investors. The topics to date have been: The future of the grid: technology and the lessons from Delhi's successful grid development; Transforming Africa's electricity distribution sector – solutions to bring in new capital; and Understanding transmission finance.

» **Gridworks' Head of Business Development co-authored the Understanding Power Transmission Financing handbook** funded by Power Africa and provided on an open-source basis. The book has become the guiding text on private-sector funding for the transmission sector in Africa, and is frequently used by governments and their advisers to inform policy development. He has also written a series of related articles on how private-sector funding can be used to support transmission in Africa, co-authored with a partner at Hunton Andrews, a US law firm that frequently advises African governments on World Bank programmes.

» **Gridworks' Moyi Power team was heavily consulted by IFC and their advisers on IFC's Scaling Minigrids programme,** that is aiming to become the first large-scale programme to replicate many of the ideas central to the Moyi Power project.

» **Gridworks has provided support and feedback to several market-shaping initiatives,** including (i) the UK Government's Green Grids Initiative (ii) the Southern African Power Pool's Regional Transmission Infrastructure Facility (iii) the formation of the Global Energy Alliance for People & Planet (iv) the USAID/Power Africa-supported West Africa Energy Program and (v) the Alliance for a Just Energy Transformation with UNDP and WWF.

# 05.

# HOW GRIDWORKS IS HELPING SHAPE THE MARKET MORE WIDELY

The description of the existing projects in its portfolio highlights many of the market-shaping elements that emerge from Gridworks' project-development activities. In addition, Gridworks has an impact on the wider market outside of its current projects. These include engaging with governments on the potential structures for investment in T&D, providing feedback to private developers on how their projects might attract support and funding, and highlighting to investors the importance of T&D investment to the sustainability of the energy system. Each of these is explored below.

## ENGAGING WITH GOVERNMENTS ON ALTERNATIVE FINANCING AND OPERATING MODELS

Gridworks has conducted legal and regulatory reviews in a long list of countries that have been assessed for market entry, including Uganda, Cote D'Ivoire, Egypt, Ethiopia, Mozambique, Senegal, Tanzania, Ghana and South Africa. We have shared the results of our reviews with local governments, utilities and their advisers, and made a recommendation on how an ITP can be carried out within their existing legal and regulatory environment. This is a necessary part of project development for Gridworks, but it is also a market-shaping activity, as it provides a tangible example to governments of how a sector can be approached by an investor and how a new type of private capital investment can be facilitated.

Over the last four years, Gridworks has had success in interesting several governments in new financing and operating models. While the Amari project (described above) is the most advanced of the prospects, there is a pipeline of further projects in Uganda, and activities continue in several other countries. Gridworks has contracted exclusivity for a transmission project in Mozambique and is currently developing a project in Tanzania. These are transmission projects of significant scale. These aim to be the first privately financed transmission projects in their respective jurisdictions. The projects are commercially sensitive and have therefore not been announced publicly at the time of this report. Gridworks is also working on early-stage projects with the governments of Ethiopia, Cote d'Ivoire, and South Africa.

Carrying out the first projects of this type in a new country is time-consuming, and not all of them will reach financial close. However, completion of a successful project is likely to have a significant market-shaping impact in that country by establishing a model for further transmission projects in the sector and by demonstrating the value of privately funded projects to local governments. Replication will reduce the development periods required for subsequent transactions.

## SUPPORTING PRIVATE DEVELOPERS

Gridworks works closely with private developers to provide useful feedback about how a project can attract its funding and support. Gridworks' reputation in the sector as specialised T&D investors provides conviction to developers that may otherwise not be willing to pursue projects with high development impact, with limited available pools of appropriate equity and expertise available.

In later-stage projects, Gridworks' experience mobilising funds from others (lenders, grant providers etc), identifying the right partners, and building consensus for transactions is critical in making projects possible.

The feedback from the Gridworks stakeholder survey reinforces these points, with respondents highlighting the role Gridworks is playing in generating confidence and creating co-investment opportunities.

"THE PROJECT WE ARE DOING WITH GRIDWORKS IS A GAME CHANGER. ALTHOUGH WE HAVE BEEN WORKING FOR MANY YEARS IN AFRICA, WE NEVER SAW THE OPPORTUNITY TO REALLY INVEST IN A T&D PROJECT, AND GRIDWORKS IS THE PERFECT MATCH FOR US."

**Miguel Zaldivar Blanco,** General Manager, AEE Power Ventures

"THE BIG ISSUE [IN THE AFRICAN T&D SECTOR] IS FINANCING AND FUNDING, AND GRIDWORKS' APPROACH CURRENTLY IS THE IDEAL ONE. [THEY ARE] COMING WITH THE FUNDING AND IDENTIFYING THE KEY PARTNERS UP FRONT, THOSE WITH THE RIGHT EXPERIENCE, KNOWLEDGE AND TECHNOLOGY."

**Megandran (Megz) Naidoo,** Country Head - Transmission Service, Siemens Energy

## HIGHLIGHTING TO INVESTORS THE IMPORTANCE OF ADDRESSING T&D UNDER-INVESTMENT

The stakeholder survey provided some evidence to show that Gridworks' messages about the importance of T&D investment, and the impact of T&D under-investment, are increasingly being recognised.

However, there remains a serious mismatch between sector funding available for T&D and funding available for IPPs, even in markets that have moved into a period of oversupply and do not have grid capacity to evacuate more power. More advocacy is necessary in this area, to make the case with governments and policymakers at multilateral development banks that private investment and technical assistance for policy development should be more evenly balanced across the sector if energy-access targets are to be met and renewables projects supported.

"GRIDWORKS HAS REACHED OUT TO US [...] TO INTRODUCE US TO ONE OR TWO POTENTIAL TRANSACTIONS THAT THEY'RE LOOKING AT, AND THROUGH THAT IT NATURALLY OPENS UP YOUR MIND TO THEIR POTENTIAL LEADERSHIP POSITION IN T&D, AND ALSO TO CALIBRATE OURSELVES FOR POTENTIAL INVESTMENT INTO THAT SPACE."

**Herc van Wyk,** CEO, Pembani Remgro Infrastructure Managers

"THERE'S A HUGE NEED FOR MORE PRIVATE FINANCE IN T&D, [...] AND THEY [GRIDWORKS] ARE PLAYING A VERY IMPORTANT ROLE AS A FIRST-MOVER. [...] THEY'VE IDENTIFIED SOME OF THE FIRST PRIVATE TRANSMISSION PROJECTS ON THE CONTINENT, WHICH THEY'RE STARTING TO LOOK AT AND PILOTING."

**Jennifer Baldwin,** Team Lead, Transmission & Distribution - Power Africa | USAID

"GRIDWORKS [...] ARE PROFESSIONAL PEOPLE, WHO HAVE BEEN IN THE SECTOR FOR QUITE SOME TIME. I THINK THEY HAVE GREAT IDEAS TO MAKE FURTHER INVESTMENTS IN THAT SECTOR, AND MAKE IT MORE FEASIBLE FOR THE PRIVATE SECTOR TO GET INVOLVED - WHICH IS NOT AN EASY TASK."

**Huub Cornelissen,** Director Energy Department, FMO

"[WITH THE] WORK THAT GRIDWORKS DOES, WE WOULD BE HAPPY TO WORK WITH THEM ON ANY OF THESE TRANSACTIONS. FOR US, THEY ARE [...] AN ENABLER OF CREATING MORE T&D OPPORTUNITIES FOR THE PRIVATE SECTOR."

**Yann Burtin,** Senior Investment Guarantee Officer, MIGA

# WHAT HAVE WE LEARNT? KEY INSIGHTS FROM OUR FIRST FOUR YEARS

The practical work Gridworks has been doing, combined with the insights we have gathered from our network, and research undertaken by others (outlined in the Annex), have highlighted a number of key lessons.

# 06.

DEVELOPING AND
INVESTING IN AFRICA'S
ELECTRICITY NETWORKS

## IT TAKES TIME AND PATIENCE TO BUILD CAPACITY AND TRUST WITH GOVERNMENT AGENCIES

» It is not surprising that it takes time to build up capacity and trust, given Gridworks is trying to introduce new ways of investing in T&D, and to get new models, structures and even sometimes regulations in place. T&D projects are usually strategically important national projects, so Governments are naturally cautious in choosing delivery partners and trialling new approaches.

» Large-scale minigrids (which are required for there to be any chance of the 2030 access targets being achieved) take a long time to design, develop and become operational, but have potential to make a significant contribution, and there is growing sector buy-in for this.

» Large distribution and transmission projects take time to develop alongside government stakeholders (and donors where relevant) because of the lack of existing reference projects, and challenges in working with new concepts.

## ON-GRID AND OFF-GRID SOLUTIONS ARE INCREASINGLY INTERLINKED AND INTERDEPENDENT

» The distinction between off-grid and on-grid, C&I and minigrids is blurring, and there are interdependencies.

» Grid extensions are an important part of increasing energy access.

» The off-grid sector is currently very small, largely unsustainable and has developed very few connections to date. Moyi and Virunga Power need to show alternative models.

» Commercial and industrial customers on an off-grid minigrid play an important role in enabling that minigrid to make household connections within a commercially viable model.

## INCREASING SHORT-TERM ACCESS AT ALL COSTS IS UNSUSTAINABLE

» While there is an urgent need to increase access to energy for those who do not have it, sustainable access to energy will not be achieved through a singular focus on funding new connections. An energy system in Africa that enables sustainable growth and improved livelihoods is not met by requiring a loss-making utility to increase household connections, when each connection adds further losses.

## INCREASING AVAILABLE SOURCES OF FINANCE FOR TRANSMISSION IS VITAL (INCLUDING CLIMATE FINANCE)

» There is an enormous need for investment in the transmission sector, to improve the reliability of existing networks as well as to enable increased wheeling of power within and between countries, and large-scale capital is required.

- Investment in transmission is critical to enabling the growth of renewables on the grid, so existing criteria for qualifying for climate finance need to be reconsidered, because the current criteria tend to exclude countries that are starting from a low base and need to add dispatchable power alongside renewables[2].
- Transmission is particularly capital-intensive. Individual projects tend to be large, and the need is great. The investment necessary may test the depth of capital available in the market when the sector becomes mature.
- Transmission is likely to become an attractive asset class for investment. Well-structured transmission projects will be a good asset class and will offer suitable risk-adjusted returns to attract interest from commercial investors.

## A BETTER BALANCE OF CONCESSIONAL AND PRIVATE FINANCE IS REQUIRED FOR ENERGY ACCESS

- Many types of intervention in the energy system need concessional finance. Energy access in particular has required subsidy in most parts of the world while networks are being extended to new users.
- At present, too many projects are considered as either (i) concessional projects or publicly funded projects on the one hand, or (ii) private-sector projects on the other. There isn't enough concessional capital to do the heavily lifting required on the continent of Africa to meet access and climate targets, and many of these models lack robust operating solutions. On the other hand, few energy-access projects can lead to affordable tariffs if they are fully private-sector funded.
- Models that use some concessional funding to catalyse private-sector investment and operating capacity are required. All being well, Moyi Power will demonstrate the value of this approach.

2 Climate Finance for Grid Investments in Emerging and Developing Economies, Green Grids Initiative, COP26, Glasgow 2021 https://climatecompatiblegrowth.com/green-grids-initiative/

# WHAT IS OUR AMBITION ON IMPACT AND HOW WILL WE ACHIEVE IT?

The enormous need for investment in T&D and the off-grid sector requires a significant shift in thinking and in capital allocation. This is clear from research, from conversations Gridworks has with private and public sector across the energy sector in Africa, and from the practical experience of its projects. There is increasing recognition of the part Gridworks is playing – and can play – to raise the profile of T&D and the off-grid sector, highlight practical solutions, and develop pathfinder projects.

# 07

DEVELOPING AND INVESTING IN AFRICA'S ELECTRICITY NETWORKS

# GRIDWORKS' AMBITION IS TO PROVE THERE ARE COMMERCIAL OPPORTUNITIES TO INVEST IN T&D THAT WOULD OTHERWISE BE IGNORED OR AVOIDED.


## WORKING TO MAKE AN IMPACT

The projects highlighted in this report – **SPS, Moyi Power, Amari** and **Virunga Power** – are all valuable demonstration and pathfinder projects. Gridworks will report on the specific impacts of those projects, learn from them and apply the lessons to subsequent projects.

## MOVING FORWARD ON THE PROJECTS IN THE PIPELINE

**Transmission:** Gridworks' ambition is to continue to roll-out projects in its transmission pipeline, replicating the work done so far on Amari and catalysing further funding for the sector.

**Distribution:** Gridworks wants to catalyse a change in the way utilities are funded and managed, so they become more viable and more efficient, and more capital (private, national and concessional) can be deployed to them.

The distribution sector remains a key priority area of Gridworks mandate and progress on this will be reported in future development reports.

**Off-grid:** Gridworks aims to use SPS, Moyi Power and Virunga Power to show alternative business models for off-grid energy provision that can be financially sustainable while delivering high-quality affordable power both to commercial and residential customers. SPS will do this by continuing to experiment with business models and technology in rapidly evolving markets.

Moyi Power and Virunga Power will involve developing bankable off-grid utility projects through to financial close before constructing and operationalising new businesses.

**Succeeding as a business:** Gridworks was founded in part to demonstrate that T&D and the off-grid sector can be commercially viable as an asset class. Part of this demonstration effect will be achieved by Gridworks becoming a financially sustainable business with a healthy portfolio of investments.

## ADVOCACY

In some specific areas, Gridworks uses its voice to advocate for change. In particular, Gridworks will continue to call for greater focus on sustainable T&D investment. It will work with others, including the Green Grids Initiative, to explore how more climate finance could flow to transmission projects, the Alliance for a Just Energy Transformation to identify common ground to support a path to energy transition that is socially just and sustainable, and with others that have aligned mandates and credible platforms.

## RESEARCH

Gridworks will continue to gather and share the empirical research that emerges from its pilot projects, engaging with policymakers, academics, other developers and lawyers, through industry events and through the T&D Club. Gridworks will also seek to contribute to other forms of research relevant to investment in T&D. In consultation with others, Gridworks will identify research topics to improve knowledge of the impact pathways of investment in transmission and distribution.

# APPENDIX: A SUMMARY OF RELEVANT RESEARCH

# 08.

DEVELOPING AND INVESTING IN AFRICA'S ELECTRICITY NETWORKS

## US$345 BILLION IS NEEDED FOR INVESTMENT IN TRANSMISSION AND DISTRIBUTION IN AFRICA BY 2040, OF WHICH AT LEAST US$80 BILLION IS NEEDED IN TRANSMISSION[3].

**Grids and minigrids can together address 75% of the energy-access gap by 2030.** Estimates by the International Energy Agency (IEA) for their Sustainable Africa Scenario (SAS) indicate that extending grids is the least costly and most prudent option for addressing 45% of the current gap in access to energy in Africa by 2030, while minigrids may be appropriate for a further 30%[4]. Stand-alone solar home systems provide the remainder in the SAS, but it is recognised that these are only sufficient for a basic bundle of household services and not for productive household use or for other economic activity. Because of the limits to use, access to energy through solar home systems is not included in the IEA's totals for energy access.

**Commercial viability must be a factor in considering the appropriate energy-system solutions in each country.** The Global Commission to End Poverty's Integrated Distribution Framework emphasises the importance of including a pillar of financial viability alongside the pillars of universal access and integration of off- and on-grid solutions[5]. This does not mean an intervention will always have to prove it is viable without concessional finance, but there must be clarity and visibility on where that concessional finance comes from and, if an ongoing subsidy is required, how long it will be available.

**Private-sector investors have historically tended to focus on generation, and the balance needs to shift towards T&D.** Overall, more than 280 IPPs have reached financial close (operating or under construction) to date, and about US$41 billion received in total investment[6]. As the IEA stated in its Africa Energy Outlook Report 2022: "Improving the financial health of state-owned utilities and mobilising private capital will be crucial to putting Africa's electricity sector on the sustainable path depicted in the Sustainable Africa Scenario."[7]

**The operating losses typical of sub-Saharan African utilities means that innovative approaches to enabling private sector investment are required.** Governments can make policy choices to subsidise tariffs and, in some cases, they can afford to do so. Sometimes, however, those choices result in insolvent utilities. Research for the World Bank in 2016 concluded that, at that time, only two countries had tariffs that covered capital and operating expenditure without subsidies (the Seychelles and Uganda). It found that only 19 countries cover operating expenditure, while several countries lose more than US$0.25 per kilowatt-hour sold. Quasi-fiscal deficits average 1.5% of gross domestic product, and exceed 5% of gross domestic product in several countries[8]. This problem has been exacerbated further by the effects of COVID[9].

3 Powering Africa – McKinsey
https://www.mckinsey.com/~/media/McKinsey/Industries/Electric%20Power%20and%20Natural%20Gas/Our%20Insights/Powering%20Africa/Powering_Africa.pdf
4 Africa Energy Outlook Report 2022, IEA
https://www.iea.org/reports/africa-energy-outlook-2022/key-findings
5 Global Commission to End Poverty
https://www.endenergypoverty.org/2020-report
6 Prospects for Private Power Investment in Sub-Saharan Africa in the new Decade – UCT, GSB, Power Futures Lab
https://www.energyeconomicgrowth.org/sites/default/files/2020-07/Prospects_for_Private_Power_Investment_in_SSA_new_decade201205.pdf
7 Africa Energy Outlook 2022, International Energy Agency
https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf
8 Financial Viability of Electricity Sectors in Sub-Saharan Africa – Quasi-Fiscal Deficits and Hidden Costs Chris Trimble, Masami Kojima, Ines Perez Arroyo, Farah Mohammadzadeh Policy Research Working Paper 7788
https://openknowledge.worldbank.org/bitstream/handle/10986/24869/WPS7788.pdf?sequence=4
9 Africa Energy Outlook 2022, International Energy Agency
https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf

For example, utilities reported a drop in revenues of 8% in Sierra Leone and 25% in Uganda, with most of the losses coming from industrial and commercial consumers[10]. The IEA puts it this way: "Public utilities will need to be responsible for much of the investment in upgrading the electricity systems across the African continent. This is a daunting prospect, given their perilous financial state today: operating losses among all African utilities are thought to have exceeded US$150 billion in 2020."[11]

**With the right regulation and structures in place, it will be possible to structure investment in utilities in an appropriate way.** A new asset class of Independent Power Transmission (IPT) will develop in a way that is comparable to the Independent Power Production (IPP) market, which is now well established and regulated effectively in most countries. At present, this work is done bilaterally project by project, but each transaction will produce regulatory, financial and operational structures that can be replicated in a host country for future projects carried out by Gridworks or others.

**Grid extension has a positive impact on people, particularly where the impact of new employment opportunities is considered and not just the impact of household connections.** For example, a study by Burke et al concluded that "Our results suggest that villages who gain electricity grid access enjoy increases in asset wealth as compared to non-electrified communities…. and that treated communities grew more than twice as fast during the post-treatment period compared to unconnected communities."[12]

**Minigrids are also an important component of an energy system that provides universal access to clean, affordable power.** However, progress in developing connections to renewable minigrids has been slow to date, with only 78,000 connections achieved across the continent from 400 operational private-sector minigrid sites, according to a recent report from the African Minigrid Developers Association[13]. The World Bank indicates that Africa needs 140,000 minigrids by 2030, meaning 17,000 minigrids must be built every year. Yet, so far, only Sierra Leone has been able to license more than 50 minigrids in one year[14]. Power Africa's Beyond the Grid initiative has ambitious aims to achieve 20-25 million households and business minigrid connections by 2030 and mobilise US$948 million in financing[15]. So far, there is no evidence that infrastructure can be scaled at this rate. Annual targets announced by the donor community appear to be highly ambitious to the point where they are scarcely credible. There is also little evidence that there will be capital available to support an increase of the required scale, given that business models are still loss-making. Gridworks is therefore focusing on demonstrating that scale is important to individual projects and that high-quality regulation is a necessary cornerstone for commercial investment in the sector.

10 African Utilities during COVID-19: Challenges and Impacts – Balabanyan, A. et al. (2021) https://openknowledge.worldbank.org/handle/10986/36179
11 Africa Energy Outlook 2022, International Energy Agency https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf
12 Using Satellite Imagery and Machine Learning to Estimate the Livelihood Impact of Electricity Access, Ratledge et al https://kingcenter.stanford.edu/sites/g/files/sbiybj16611/files/media/file/wp1093_0.pdf
13 Benchmarking Africa's Minigrids Report 2022 – AMDA https://africamda.org/wp-content/uploads/2022/06/Benchmarking-Africa-Minigrids-Report-2022-Key-Findings.pdf
14 Benchmarking Africa's Minigrids Report 2022 – AMDA https://africamda.org/wp-content/uploads/2022/06/Benchmarking-Africa-Minigrids-Report-2022-Key-Findings.pdf
15 Beyond the Grid, Power Africa https://www.usaid.gov/powerafrica/beyondthegrid

**The cost of grid extension compared with the cost of minigrids depends on the circumstances.** Research in Tanzania indicates that minigrids have a lower cost of connection, finding that the average cost of extending the grid to a rural household is US$2,300, because of the high cost of running high-voltage lines out to remote areas (over US$30,000/km for >66kV lines). Other studies have indicated a similar level of cost, although this is highly dependent on distances and on how materials are sourced. For minigrid investments, the research cited a range of US$500-US$1,000[16]. However, this research does not stand up to detailed scrutiny as it does not take account of all the costs of running minigrid operations in Tanzania. It also does not take account of relevant additional factors such as how a consumer pays for an extension and how much energy they then consume at what price. Minigrids tend to have a higher cost per kWh, in part because of the remote nature of their operations and the need to use diesel generation and battery storage in most cases alongside solar PV. More research is needed in this area and much of the data provided by sector participants to support their arguments is not presented objectively at present.

**Provision of energy by solar home systems is not comparable with grids or large minigrids that can serve businesses and high levels of productive use within households,** although clearly they play an important role in enabling households to meet basic energy needs such as lighting and charging, and some, but not all, of the larger systems provide enough power to support small businesses.

US$2.3 billion of private-sector finance has been raised to date[17] for solar home systems, with seven large companies together accounting for 72% of the total investment. A recent report by the World Bank and GOGLA noted that fast-expanding Pay-As-You-Go giants may have overestimated the ability of their lowest-income customers to keep up with payment plans[18].

**Private sector investment in transmission can be managed effectively to achieve good results for government, customers and investors.** Viable opportunities for investment by the private sector can emerge both from whole-of-network concessions and from the IPT model. One significant advantage of the latter is that it takes less time to raise capital for ITPs using project finance techniques than it does to raise capital for whole network concessions, which typically require a significant sector restructure and increased regulatory capacity and independence. Countries can carry out discrete IPT projects as the need for those projects arises without embarking on structural reforms with long (sometimes up to ten years) implementation periods. IPTs have enabled major investment in transmission: IPT tenders in Brazil, Peru, Chile and India mobilized over US$24.5 billion from the private sector between 1998 and 2015, enabling close to 100,000 km of new transmission lines[19]. If correctly structured, IPTs can also bring very material efficiencies, as illustrated by the experience of Peru, where the winning bids for concessions came in at 36% below the expected cost[20]. Whole-network concessions are also an interesting investment opportunity when the conditions are right.

16 Building the Grid of the Future Today, Brookings Institution https://www.brookings.edu/blog/africa-in-focus/2017/10/10/building-the-grid-of-the-future-today/
17 Off-Grid Solar Market Trends Report 2022 – State of the Sector (page 134) https://www.gogla.org/off-grid-solar-market-trends-report-2022
18 Off-Grid Solar Market Trends Report 2022 – State of the Sector – https://www.gogla.org/off-grid-solar-market-trends-report-2022
19 Linking Up, World Bank Group and PPIAF https://openknowledge.worldbank.org/handle/10986/27807
20 Understanding Power Transmission Financing https://cldp.doc.gov/sites/default/files/2021-10/Understanding_Transmission_Financing.pdf

# LIST OF ABBREVIATIONS

| | |
|---|---|
| AFD | Agence Francaise de Developpement |
| BII | British International Investment |
| C&I | Commercial and Industrial |
| $CO_2$ | Carbon dioxide |
| DRC | Democratic Republic of Congo |
| DRE | Distributed Renewable Energy |
| DFI | Development Finance Institution |
| EPC | Engineering, Procurement and Construction |
| GEAPP | Global Energy Alliance for People and Planet |
| GHG | Greenhouse Gas |
| IEA | International Energy Agency |
| IFC | International Finance Corporation |
| IPP | Independent Power Producer or Independent Power Production |
| IPT | Independent Power Transmission |
| kW | Kilowatts |
| kWh | Kilowatt hours |
| MW | Megawatts |
| MWh | Megawatt hour |
| PPA | Power Purchase Agreement |
| RES | Renewable Energy Source |
| SAS | Sustainable Africa Scenario |
| SDG | Sustainable Development Goal |
| SSA | Sub-Saharan Africa |
| T&D | Transmission and Distribution |
| UETCL | Uganda Electricity Transmission Company Limited |

Gridworks

A British International Investment company

**DEVELOPING AND INVESTING IN AFRICA'S ELECTRICITY NETWORKS**