

Market study on available financial instruments in support of GMGs and assessment of GMG developer needs

Green Mini-Grids Market Development Program

SE4All Africa Hub

African Development Bank



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GREEN MINI-GRID MARKET DEVELOPMENT PROGRAMME

This paper, part the Green Mini-Grid Market Development Programme (GMG MDP) document series, analyses the financing issues involved with developing green mini-grids for rural electrification. These are mini-grids powered by renewable energy resources – solar radiation, wind, hydropower or biomass – either exclusively or in combination with diesel generation.

Mini-grids are not a new phenomenon in Africa. Almost all national utilities own and operate diesel-powered generating facilities not connected to the main grid, which supply electricity to secondary towns and larger villages. This solution to rural electrification inevitably results in significant financial losses for the utility, as it is required to sell power at prices much below the cost of production and delivery. Moreover, it leaves the most remote towns and villages unelectrified. The latest Sustainable Energy for All (SEforALL) Global Tracking Framework estimates that the urban-rural divide in access to electricity in Africa is as high as 450 percent (69 urban compared to 15 percent rural access).

There are three principal options for providing new connections to currently unserved populations in Africa, namely i) extension of the national grid, ii) installation of separate “mini” grids to operate independently from the main grid, and iii) stand-alone generating systems that supply individual consumers. The most cost-effective approach for powering mini-grids is to use renewable energy sources, which are widely available across Africa. However, the development of GMGs is not without challenges. Barriers to the growth of private sector mini-grids in Africa include gaps in the policy and regulatory framework, the lack of proven business models, the lack of market data and linkages, the lack of capacity of key stakeholders, and the lack of access to finance.

In response to these challenges, the SEforALL Africa Hub at the African Development Bank (AfDB)¹ designed and launched Phase 1 of the GMG MDP in 2015, with grant funding from the AfDB’s Sustainable Energy Fund for Africa (SEFA). The GMG MDP is a pan-African platform that addresses the technical, policy, financial and market barriers confronting the emerging GMG sector. It is part of a larger DFID-funded GMG Africa Programme, which also includes GMG initiatives in Kenya and Tanzania; country-specific GMG policy development through SEFA; and an Action Learning and Exchange component being implemented by the Energy Sector Management Assistance Program (ESMAP) at the World Bank.

The International Energy Agency (IEA) has predicted (in Africa Energy Outlook 2014) that by 2040, 70 percent of new rural electricity supply in Africa will be from stand-alone systems and mini-grids. The GMG MDP, SEforALL, SEFA, ESMAP and similar programmes, which are contributing to falling costs, technological advancements and more efficiencies in GMG development, will help to ensure that up to two thirds of this supply will be powered by renewables.

¹ The SEforALL Africa Hub partnership includes the African Union Commission, the New Partnership for Africa’s Development (NEPAD), the United Nations Development Programme (UNDP), and the Regional Economic Communities (RECs), which are represented on a rotating basis. <http://www.se4all-africa.org>

The goals of the green mini-grids programme, in all its aspects, are central to AfDB's mission of spurring sustainable economic development, social progress and poverty reduction in its regional member countries (RMCs). Indeed, off-grid and mini-grid solutions are a key component of the AfDB's New Deal on Energy for Africa, launched by the Bank's president in January 2016. The New Deal is a transformative, partnership-driven effort with an aspirational goal of achieving universal access to energy in Africa by 2025.

This report was prepared by the firm Innovation Energie Développement (IED) at the request of the AfDB. It was written by Bernard Jamet (Independent Consultant), Pascal Augareils and Elodie René (IED). IED (located in France) is an engineering consultancy firm incorporated in 1988 active in the renewable energy, energy efficiency and rural electrification sectors in more than 40 countries across Africa, Asia and Europe.

The content of this report was reviewed by Jeff Felten of the AfDB's GMG team and cleared by Dr. Daniel-Alexander Schroth, SEforALL Africa Hub Coordinator at the AfDB. The report was edited by Deborah Davis.



LIST OF ACRONYMS

A2E	Access to Energy
ABREC	Africa Biofuel and Renewable Energy Company
ADER	Rural Electrification Agency of Madagascar
AEC	Absolute Energy Capital
AECF	Africa Enterprise Challenge Fund
ADA	Austrian Development Agency
ADC	Austrian Development Corporation
ADFD	Abu Dhabi Fund for Development
AECID	Spanish Agency for International Development Cooperation
AFD	Agence Française de Développement
AfDB	African Development Bank
ARE	Alliance for Rural Electrification
AREF	African Renewable Energy Fund
ASER	Agence Sénégalaise d'Electrification Rurale
BGFZ	Beyond the Grid Fund for Zambia
BMZ	German Ministry for Cooperation and Development
BOAD	West African Development Bank
CAPEX	Capital expenditure
CDC/CDC Group	UK's Development Finance Institution
CGAP	Consultative Group to Assist the Poor
CSP	Concentrated solar power
DANIDA	Danish International Development Agency
DESCO	Distributed energy service company
DFAT	Australia's Department of Foreign Affairs and Trade
DFI	Development finance institution
DFID	UK's Department for International Development
EAV	Energy Access Venture
EBID	ECOWAS Bank for Investment and Development
ECOWAS	Economic Community of West African States

ECREEE	ECOWAS Center for Renewable Energy and Energy Efficiency
EE	Energy efficiency
EEP	Energy and Environment Partnership
EIB	European Investment Bank
EnDev	Energising Development
EPC	Engineering, procurement and construction
EPD	Energias de Portugal
EREF	ECOWAS Renewable Energy Facility
EUEI PDF	EU Energy Initiative Partnership Dialogue Facility
FFEM	Fonds Français pour l'Environnement
FiT	Feed-in-Tariff
FMFML	Frontier Markets Fund Managers
FMO	Entrepreneurial Development Bank of the Netherlands
FONERWA	Rwanda's National Fund for the Environment
FRES	Foundation Rural Energy Services
GAP	Green Africa Power
GCF	Green Climate Fund
GEEREF	Global Energy Efficiency and Renewable Energy Fund
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GMG	Green Mini-Grid
GW / GWh	Gigawatt / Gigawatt-hour
HIO	High Impact Opportunity
IDA	International Development Association
IDB	Islamic Development Bank
IEA	International Energy Agency
IED	Energie Développement Innovation
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency

ISFD	Islamic Solidarity Fund for Development
KfW	German International Development Bank
kW / kWh	Kilowatt / kilowatt-hour
LCOE	Levelised cost of electricity
LIRENAP	Liberia Renewable Energy Access Project
MDP	Market Development Programme
MFA	Ministry of Foreign Affairs of the Netherlands
MFI	Microfinance institution
MHP	Micro hydropower
MW / MWh	Megawatt / megawatt-hour
NAPTIN	National Power Training Institute of Nigeria
NESP	Nigerian Energy Support Programme
OeEB	Development Bank of Austria
OFID	OPEC Fund for International Development
OGE	Off-grid electricity
OPEX	Operating expenditures
ORE	Office de Régulation de l'Electricité
PAYG	Pay-As-You-Go
PEC	Persistent Energy Capital
PHP	Pico hydropower
PPA	Power purchase agreement
PV	Photovoltaic
RBF	Results-based finance
RE	Renewable energy
RE&EE	Renewable energy and energy efficiency
REAF	ResponsAbility Energy Access Fund
REEEP	Renewable Energy and Efficiency Partnership
REPoR	Renewable Energy for Poverty Reduction Programme
REPP	Renewable Energy Performance Platform
RREA	Rural and Renewable Energy Agency (Liberia)

<u>SE4All</u>	Sustainable Energy for All
<u>SEFA</u>	Sustainable Energy Fund for Africa
<u>SIDA</u>	Swedish International Development Cooperation Agency
SMEs	Small and medium-sized enterprises
<u>SNV</u>	Netherlands Development Organisation
SSA	Sub-Saharan Africa
<u>UNEP</u>	United Nations Environment Programme
<u>UNIDO</u>	United Nations Industrial Development Organization
<u>USAID</u>	United States Agency for International Development
<u>USTDA</u>	United States Trade and Development Agency
<u>WB</u>	World Bank

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INTRODUCTION

BACKGROUND AND OBJECTIVES

The African Development Bank has launched the Green Mini-Grids Market Development Programme (GMG MDP) to provide assistance to a range of stakeholders in overcoming the challenges of implementing sustainable GMG projects across the African continent.

The objective of the Green Mini-Grids Market Development Programme is to support the scale-up of investments in commercially viable GMG projects through a broad range of interventions aimed at improving the enabling environment. The project seeks to remove or reduce market barriers at a regional level, and strengthen the ecosystem for the emergence of a thriving GMG sector in Africa, thereby helping to achieve the objectives of the Sustainable Energy for All (SEforALL) programme.

INNOVATION ENERGIE DEVELOPMENT (IED) was selected to operationalize the Access to Finance business line of the GMG MDP programme. This business line is focused on overcoming the dearth of financing options for GMG projects by conceptualising a mechanism to channel financing to quality GMG projects with a potential for bankability, in order to unlock financial flows at scale from AfDB, other development finance institutions and donors, and private sector investors.

ACTIVITIES CONDUCTED

The activities under this business line are aimed at:

- I. Cataloguing the financial and risk mitigation instruments available and the gaps to be addressed;
- II. Identifying and conceptualising financial instruments (e.g., an equity/debt/venture fund, lines of credit, project pooling/aggregation vehicle) for GMG project development;
- III. Increasing the understanding of both equity investors and commercial lenders about the market opportunities presented by GMGs;
- IV. Facilitate contacts between project developers and financiers.

WORK ORGANISATION

As per the Terms of Reference and the proposal submitted, IED has conducted its assignment under two main tasks:

Task 1: Market study

- A supply-side analysis
 - Stocktaking of financial instruments and initiatives of relevance for GMG projects
- A demand-side analysis
 - Understanding the financing needs of GMGs
 - Providing information on real cases financed and best practices

Task 2: Conceptualisation of a financing facilitation mechanism

- First conceptualisation of a financing facilitation mechanism
- Presentation and discussion with stakeholders
- Final conceptualisation of a financing facilitation mechanism

This present report is the market study and fulfils Task 1.

SUPPLY-SIDE ANALYSIS: STOCKTAKING OF FINANCIAL INSTRUMENTS AND INITIATIVES OF RELEVANCE FOR GMG PROJECTS

DOCUMENTATION REVIEW

In order to prepare a scoping of existing public and private funding and technical assistance facilities applicable to GMGs operating in Africa, the Consultant began with a documentation review, using the recent High Impact Opportunity (HIO) mapping report of clean energy mini-grid support providers and programmes, the Africa-EU Energy Cooperation Programme funding database, as well as several other web resources (refer to sources in Annex 1).

The review focused on key international support organisations and institutions active in supporting GMGs, including:

- Fonds Français pour l'Environnement (FFEM)
- ECOWAS Center for Renewable Energy and Energy Efficiency (ECREEE)
- European Investment Bank (EIB)
- European Union Energy Initiative Partnership Dialogue Facility (EUEI PDF)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- International Renewable Energy Agency (IRENA)
- Global Lighting and Energy Access Partnership (Global LEAP)
- United Nations Environment Programme (UNEP).

The review also looked at key private companies, foundations and funds such as Energias de Portugal (EDP), FRES, Energy 4 Impact, Statera Capital, CrossBoundary LLC, Schneider Electric, Energy Access Venture Fund, Bloomberg New Energy Finance, and many others.

QUESTIONNAIRES AND INTERVIEWS

A questionnaire on the possible design of a mini-grid support facility was disseminated through the Secretariat of the CLUB-ER and the Alliance for Rural Electrification (ARE) network to the following support providers:

- ECREEE
- EUEI PDF
- FFEM
- GIZ
- IRENA
- UK Department for International Development (DFID)

- Agence Française de Développement (AFD)
- Sustainable Energy Fund for Africa (SEFA) – Secretariat
- Alliance for Rural Electrification (ARE)
- World Bank and United Nations – SE4ALL Clean Energy Mini-Grids High Impact Opportunity (HIO) Group
- Energy 4 Impact
- Foundation Rural Energy Services (FRES)
- Energising Development (EnDev)
- Netherlands Development Organisation (SNV)

The national rural electrification and renewable energy agencies interviewed for this study are listed in Annex 1.

KEY FINDINGS

FACILITIES AND PROGRAMMES DEDICATED TO GMG DEVELOPMENT AND IMPLEMENTATION

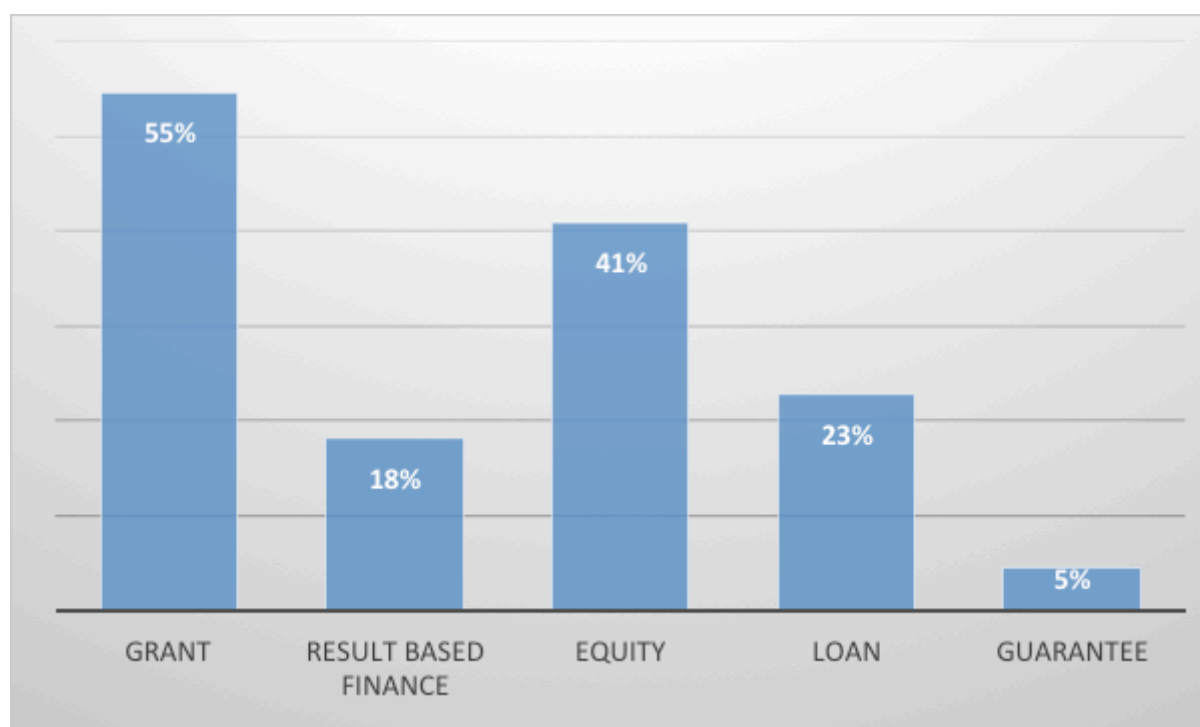
The analysis identified 84 different facilities dedicated to GMG development and implementation, including institutional programmes, private foundations, public and private funds. Thirty-four of these facilities, or about 40 percent, specifically target GMG projects; and of these, more than 60 percent provide direct or indirect funding to GMG developers/operators in sub-Saharan Africa. Grants account for about 55 percent of this funding, mostly from international development partners (e.g., DFID, World Bank, International Finance Corporation).

Results-based finance (RBF) represents about 18 percent of GMG funding, most of it through GIZ in partnership with EnDev. The new Renewable Energy Performance Platform (REPP) facility, a joint initiative of EIB and UNEP, is also planning to provide RBF to GMG project developers. Forty-one percent of the RBF programmes provide opportunities for equity participation (through a small number of private impact investors that have committed to invest in GMGs in Africa); however, few concrete projects have as yet been identified.

Finally, 23 percent of the facilities targeting mini-grids can propose loans under various conditions that still need to be assessed.

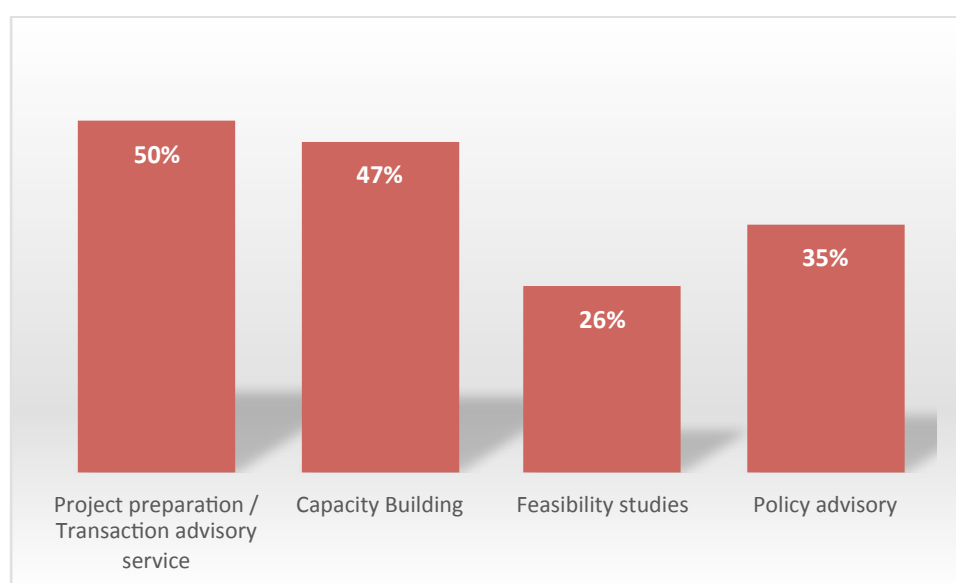
Only one facility, (Guarantco) was found to have provided guarantees for a GMG project in Africa, for a hybrid diesel-PV micro-grid (Figure 1).

Figure 1: Financial instruments supporting GMGs



Most of the financing facilities also provide technical assistance (TA), with priority given to project preparation and transaction advisory services (50 percent) through financial modelling, market and risk assessment and the marketing of projects to financiers and buyers (Figure 2). A significant number of initiatives also provide capacity building (47 percent), policy advisory services (35 percent) and feasibility studies (26 percent).

Figure 2: Types of technical assistance included in GMG support programmes



At the present stage of the study, it appears that most GMG financial support facilities have been initiated by international and regional institutions and development partners, which offer subsidies and TA to project developers through rural electrification agencies and local banks (especially in Kenya and Tanzania, where DFID has engaged with local banks for the implementation phase of its GMG facility).

Private investment in GMG projects has so far been limited, probably because risks are deemed too high and returns on investment are deemed to be too low. However, the level of private sector interest appears to be increasing. For instance, the new initiative of the Power Africa programme, “Beyond the Grid,”² is partnering with a number of private actors from Europe and the United States – including impact investors, venture philanthropists, clean energy enterprises, and practitioners – to invest more than USD 1 billion over the next five years to seed and scale up distributed energy solutions for millions of African homes, businesses, schools, and other public facilities. Other private investors in GMG projects in Africa include Acumen Fund, Energias de Portugal (EPD), and Absolute Energy Capital (AEC):

- ❖ Acumen Fund has teamed up with Opes Impact Fund, Persistent Energy Capital and Heri Africa to invest in a Tanzanian solar energy firm, Devergy, which builds and operates solar-powered electrical mini-grids in Tanzania (<http://devergy.com>). Acumen has invested about Euro 620,000 in Devergy, and Opes Impact Fund has co-invested Euro 100,000 in preferential shares. The amounts contributed by Persistent Energy Capital and Heri Africa have not been disclosed. Devergy was a small GMG developer that in July 2015 was managing six mini-grids installed in six different villages in Tanzania, for a total of 800 customers. With funds raised from its investors, Devergy plans to expand its activities to other geographic areas and install more than 330 mini-grids, serving 150,000 customers, by 2020.
- ❖ Energias de Portugal (EPD), in partnership with UNEP, is about to invest Euro 500,000 in equity in a mini-grid project in rural Mozambique. The project will provide electricity to about 4,000 inhabitants of the village of Titimane. Given the biomass potential of the region, biomass mini-grids will be constructed. The project will use an innovative mini-utility business model based on fee-for-service.
- ❖ Absolute Energy Capital (AEC) is about to finalize an equity investment in a solar PV mini-grid project in Uganda. The project aims at providing access to clean, reliable and affordable electricity to a community on Kitoboo Island in Lake Victoria, through a mini-grid solar PV power plant with a total generation capacity of 235kWp. AEC is also in

² Power Africa, a programme funded by USAID, launched its Beyond the Grid initiative in 2014, aimed at unlocking investment and growth in off-grid and small-scale energy solutions on the African continent. Beyond the Grid aims to leverage more than USD 1 billion in private sector investment in off-grid electrification in the six Power Africa focus countries (Tanzania, Kenya, Ethiopia, Ghana, Nigeria and Liberia). Following the innovative, transaction-based model of Power Africa, its goal is to galvanize collaboration and drive systemic reforms in order to facilitate private investment. So far, the programme has attracted more than 40 investors and practitioners, who have committed to invest more than USD 1 billion in Africa’s off-grid and small-scale energy market.

negotiations with Kenyan partners to develop similar projects at more than 10 sites in Kenya; and is in the process of identifying sites in Mozambique and Tanzania.

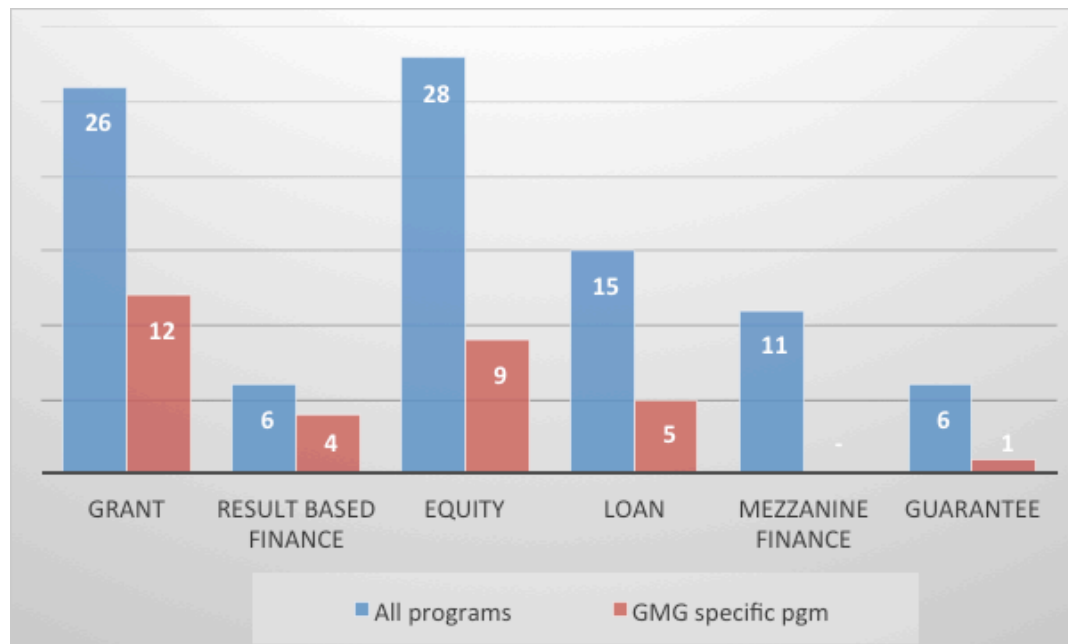
East African countries are the main beneficiaries of GMG financing facilities (both public and private), with Kenya, Tanzania, Mozambique, Rwanda and Uganda in the lead. Nigeria and Ghana are also important beneficiaries of such facilities, as well as of private initiatives in support of GMG projects. Only six of these facilities have global funding between Euro 15 to 50 million. Most other facilities have funding of between Euro 1 and 10 million.³

OTHER FACILITIES AND PROGRAMMES MORE BROADLY ENGAGED IN RENEWABLE ENERGY PROJECTS

This study also identifies facilities and programmes that are involved more broadly in renewable energy development in Africa, since GMG projects can be included in their portfolios. These facilities include several investment funds (both private and public), private foundations, and institutional programmes. Out of the total number of these facilities, about 50 percent are public and institutional initiatives, while the other 50 percent are private or joint public-private joint initiatives. However, there is little evidence so far as to concrete projects on the ground.

About 41 percent of the facilities and programmes provide grants for RE projects; 23 provide for senior debt; 17 percent for mezzanine debt; and 9 percent for results-based finance (mostly for dedicated GMG projects. Nine percent of the facilities and programmes offer risk guarantees to private investors. These instruments are used either individually or in combination, and may require (co-)investment by the private project developer or a third party (Figure 3).

Figure 3: Breakdown of facilities based on type of funding instrument



³ Based on disclosed figures, 7 (mostly private) facilities have a budget of up to Euro 1 million; 17 (mostly institutional) facilities have a budget between Euro 1 and 10 million; 21 (mostly institutional) facilities have a budget between Euro 10 to 50 million; 7 (mostly institutional) have a budget between Euro 50 to 100 million; and 17 of the largest (mostly public-private and multi-institutional) facilities have a budget above Euro 100 million. However, most of the largest facilities do not target GMGs.

The vast majority of GMG and RE programmes and facilities target East African countries (Kenya, Tanzania, Uganda, Mozambique, Ethiopia, Rwanda). In West and Central Africa, Nigeria and Ghana are important beneficiaries. A few facilities support projects in Mali, Burkina Faso, Liberia, mostly through technical assistance (rather than funding). Other facilities are in the planning stage, and there is no information on which countries they plan to target.

CATEGORIZATION OF GMG CAPITAL SUPPORT FACILITIES

GMG support facilities can be categorized by the type of funding they provide – grant, equity or debt financing.

Most of the public facilities provide grants for GMG development, while private companies are primarily equity investors and look for opportunities to invest in GMGs. These companies seek sustainable business models and often require risk guarantees. Several public-private facilities provide debt financing; these facilities also require sustainable business models and may require risk guarantees.

Table 1: Profile of capital providers in Africa and relevance for mini-grid sector

Grants	Equity	Debt
<ul style="list-style-type: none"> • ECREEE • Energising Development • DFID • SIDA • WB • EIB • UNEP • AFDB • SEFA • GIZ • REPP • OFID • FFEM • Africa Enterprise Challenge Fund • Fondazione ACRA-CCS • REPP • Electrification Financing Initiative (ElectriFi) • African Renewable Energy Fund (AREF) 	<ul style="list-style-type: none"> • EDP – Energias de Portugal, S.A. • Coperson-Hill Nigeria Limited • Persistent Energy Partners • Absolute Energy Capital • Actis Infrastructure • Lereko Metier Sustainable Capital fund (LMSC) • Acumen Fund • Ariya Capital Sub-Saharan Africa Cleantech Fund • Bamboo Energy Fund - Solar for All • Capricorn Investment Group • CrossBoundary Energy fund • Danish Climate Investment Fund (KIF) • DEG – Direct Investments • DFID Impact Fund • DI Frontier Investment • Energy Access Venture Fund • EU Africa Infrastructure Trust Fund (AITF) • FMO Infrastructure Development Fund • GRAY GHOST VENTURE • Inspired Evolution Investment – Evolution One Fund • Invested Development • LGT venture Philanthropy • Proparco FISEA : Invest and Support Fund for Businesses in Africa • Schneider Electric Energy Access impact investing fund • VITAL CAPITAL II 	<ul style="list-style-type: none"> • African Renewable Energy Fund (AREF) • Green Africa Power (GAP) • CrossBoundary Energy fund • DEG – Direct Investments • DEG upscaling • Electrification Financing Initiative (ElectriFi) • Emerging Africa Infrastructure Fund (EAIF) • Energy Access Venture Fund • FMO Infrastructure Development Fund/ Direct Investment • IRENA/Abu Dhabi Fund for Development (ADFD) Project Facility • Persistent Energy Partners

In green: focus on off-grid and mini-grid project development (statement of intention)

In red: equity participation in on-going GMG project

PUBLIC FACILITIES IN SUPPORT OF GMG AND RE PROJECTS IN AFRICA

Table 2: Listing of public facilities providing funds and/or technical assistance⁴

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
AECF	Africa Enterprise Challenge Fund managed by KPMG IDAS and funded by Dfid, DFAT, MFA, IFAD, CGAP, DANIDA and SIDA.	156 M USD	up to 1,5 M USD	SSA (23 African countries)	N/A	Grants and interest free loans	Development investment fund	AECF is a multi-donor funded financing vehicle that provides grants and interest free loans to businesses who wish to implement innovative, commercially viable, high impact projects in Africa. The AECF supports businesses working in agriculture, financial services, renewable energy and technologies for adapting to climate change.
Africa-EU Renewable Energy Cooperation Programme (RECP)	EU Energy Initiative Partnership Dialogue Facility (EUEI PDF)	NA	NA	SSA (focus on Nigeria, Rwanda, Kenya, Mozambique, Senegal, Uganda and Zambia)	Capacity building, market development, policy advisory	N/A	Intergovernmental Organisation (IOG) - Development Partner	RECP supports project developers in enhancing project documentation/ development quality with the aim of facilitating access to finance. The service is open to GMG projects. The specifics of how the services can be accessed are currently being designed.
African Renewable Energy Fund (AREF)	AfDB, CDC, GEEREF, EIB, GEF, SEFA, BOAD, EBID, FMO, Calvert Investments, CDC Group, BIO, OeEB - Development Bank of Austria	200 M USD	10 to 30 M USD	SSA (except South Africa)	Project preparation and transaction advisory	Equity, grants, debt mezzanine	Multi-institutional Fund	AREF invests into small hydro, wind, geothermal, solar, stranded gas and biomass projects across Sub-Saharan Africa, excluding South Africa. Berkeley Energy is the fund's managing organisation.
Beyond the Grid Fund for Zambia	SIDA	20 M EUR	N/A	Zambia	N/A	Results-based finance	Development investment fund	The Fund launched in January 2016, is financed by Sida, and implemented by the Renewable Energy and Efficiency Partnership (REEEP) and its partners.
Clean energy projects support program	African Trade Insurance Agency (in partnership the EIB and AfDB)	NA	up to 4.7 M EUR per transaction	SSA	N/A	credit insurance policies, guarantees	Export credit agency	ATI, Africa's Export Credit Agency, is mostly promoting large on-grid RE projects, and thus this facility seems irrelevant to off-grid/ micro-grid projects.
Danish Climate Investment Fund (KIF)	DANIDA	180 M EUR	2-50 M EUR	Nigeria, Ghana, Kenya, Egypt, South Africa	N/A	Equity, mezzanine finance	Development investment fund	The Danish Climate Investment Fund (KIF) offers risk capital and advice for climate investments in developing countries. There must be a Danish company involved. KIF has invested in the Lake Turkana Wind Power project, which will be the largest wind park in Sub-Saharan Africa (300MW).
DEG – Direct Investments	KFW	642 M EUR	10 to 30 M EUR	South Africa, Kenya, Ghana, Cameroon, Ivory Coast, Nigeria, Ethiopia, Uganda, Tanzania, Zambia and Mozambique	N/A	Equity, debt (senior loans), mezzanine finance	Investment Fund	DEG supports sustainable and profitable greenfield (new construction) or brownfield (expansion and refurbishment of existing plant) renewable energy projects. Project developers must have proven track record.
DEG Feasibility Study Financing	German Ministry for Cooperation and Development (BMZ)	NA	Up to 200 000 EUR	SSA	Feasibility study	Grants	Development investment fund	This DEG program co-finances feasibility studies of German and other European companies, aimed at laying the ground for developmentally sound investments in projects in developing countries.

⁴ Green font denotes support directly for green mini-grids
GMG Finance Supply and Demand

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
DEG upscaling	German Ministry for Cooperation and Development (BMZ)	NA	Up to 500 000 EUR	SSA	N/A	Convertible grants, debt mezzanine	Development investment fund	DEG Upscaling invests in SMEs that intend to scale up innovative business models with high developmental impact (company must be operational). The program addresses companies whose financing needs lie between microfinancing and the traditional financing by commercial banks. The planned investment should generate positive returns with high growth potential. Thus, it is likely not relevant for micro grid projects.
DFID Impact Fund	DFID	82 M USD	5 to 15 M USD	SSA	N/A	Minority equity	Development investment fund	Objective : provide finance to more than 100 enterprises in Sub-Saharan Africa and South Asia via impact investment intermediaries and catalyse additional private capital. The DFID Impact Fund has invested in Energy Access Ventures, an African energy dedicated fund (which can target micro-grids projects).
ECOWAS RE facility (EREF) and Renewable Energy SME advisory facility	ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)	1 to 10 M EUR	N/A	Burkina-Faso, Cape-Verde, Guinea, Guinea-Bissau, Niger, Sierra Leone	Capacity building	Grants, co-financing up to 50% of project value	Regional Insitution	Obective : provide grant co-funding for small to medium sized RE and energy efficiency projects and businesses in rural and peri-urban areas. The Facility undertakes regular demand driven calls for proposals, with established evaluation criteria: relevance, impact, effectiveness, feasibility and efficiency, as well as sustainability.
Electrification Financing Initiative (ElectriFi)	European Union - DCI Blending Framework	75 M EUR	1 to 10 M EUR	SSA	N/A	Convertible grants, equity, junior debt, senior debt	OIG	Electrifi will support both public and private organizations promoting new RE projects and pilots, the feasibility enhancement of projects in development, and the scaling up of existing projects. Projects must be promoted to Electrifi by another European entity, such as a DFI or development agency. Relevant for GMG, but concrete projects remains to be seen.
Emerging Africa Infrastructure Fund (EAIF)	Governments (UK, NL, Swiss), KfW, FMO, SBSA, Standard Charter, PIDG (Equity investor)	587 M USD	10-50 M USD	SSA	N/A	Debt mezzanine	Development investment fund	Objective : finance the construction and development of private infrastructure in 47 countries across sub-Saharan Africa. The Fund is not investing in project smaller than 10 Million USD, and is thus not fully relevant for most GMGs projects.
EnDev Ethiopia	Energising Development (EnDev) - GIZ	1 to 10 M EUR	NA	Ethiopia	Feasability study, policy advisory, capacity building	N/A	Development organisation	Objective : promote household electrification through pico and micro hydro power plants. So far it has supported four micro-hydropower plants: Gobecho 1, Gobecho-2, Ererte and Hagera Sodicha. Investment costs range between EUR 2000 and EUR 3000 per kWh installed capacity, and between an estimated EUR 726 and 2000 EUR per connected household.
EnDev Kenya	Energising Development (EnDev) - GIZ	1,6 M EUR	NA	Kenya	Capacity building	Results-based finance	Development organisation	Objective : promote the development of greenfield small and medium-sized solar-hybrid mini-grids. The programme aims at stimulating private sector investments through a combination of connection and production based incentives (CAPEX, customer connection, electricity delivered).

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
EnDev Mozambique	Energising Development (EnDev) - GIZ	Up to 1 M EUR	NA	Mozambique	Feasibility study, policy advisory, project preparation, capacity building	Grant, end user finance (micro credit)	Development organisation	EnDev Mozambique is involved in grid densification, pico and micro hydro power plants. 15 micro-hydro sites in the range between 15 and 30 kW have been developed in the mountains of the Manica province
EnDev Rwanda	Energising Development (EnDev) - GIZ	Up to 1 M EUR	NA	Rwanda	Feasibility study, policy advisory, project preparation, capacity building	Grant, results-based finance	Development organisation	Objective : support private sector in constructing and operating micro hydro power plants. 3 hydro power plants has been developed initially as off-grid sites for rural electrification; all sites have been connected to and are now feeding the main grid. Pre-financing of infrastructure with high investment and long construction period is the main bottleneck.
EnDev Senegal	Energising Development (EnDev) - GIZ	1 to 10 M EUR	NA	Senegal	Feasibility study, policy advisory, project preparation, capacity building	Grant	Development organisation	EnDev Senegal facilitates access to electricity in rural areas, thereby decreasing reliance on the already overburdened national grid. So far 49 mini-grids have resulted in more than 1,300 household connections. In total 88 mini grids will be finalised by the end of the project.
Energy Access Venture Fund	European Investment Bank (EIB) - Scheinder - DFID - AFD - FFEM - FISEA - PROPARCO - CDC group	55 M USD	0,5 to 4 M USD	Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia and Zimbabwe	Transaction advisory and project preparation	Equity, debt,	Intergovernmental Organisation (IOG) - Development Partner	The fund will focus on off-grid rural electrification, starting with innovative SMEs involved in providing electricity through small power generation systems (e.g. solar home devices and mini grids). Concrete investment in GMG projects remains to be seen.
Energy and Environment Partnership South & East Africa	Ministry of Foreign Affairs of Finland (lead donor), the Austrian Development Agency (ADA) and the UK DFID	60 M USD	0,1 to 1 M USD	Botswana, Burundi, Kenya, Lesotho, Mozambique, Namibia, Rwanda, Seychelles, South Africa, Swaziland, Tanzania, Uganda, Zambia.	capacity building, transaction advisory and project preparation	Grants (seed financing)	Development investment fund	The EPP is a challenge fund that promotes renewable energy, energy efficiency, and clean technology investments in the Southern and East African regions. EEP provides seed financing to cover part of the project costs which are necessary to start and develop a business. To qualify for EEP support projects should demonstrate high innovation in delivering energy services, facilitating technology transfer and capacity building. Eligible applicants are registered private companies, public or educational institutions, research organisations, charitable and non-profit organisations, NGOs and cooperative organisation
Energy for the Poor initiative	OPEC Fund for International Development (OFID)	1 billion USD	NA	SSA (except OFID member countries)	N/A	Grants up to 50% of project value, loan up to 50% of project value	Development organisation / Finance Institution	As a partner in the SE4ALL initiative and key actor in the global fight against energy poverty, OFID has aligned its programs with energy poverty eradication and earmarked substantial resources for its own Energy for the Poor initiative launched in 2008.
Energy Support Program	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	1 to 10 M EUR	NA	Tanzania	Capacity building, policy advisory	N/A	Cooperation Agency -Development Partner	GIZ provides policy advice to further develop national RE strategy, part of which are specific regulations for hybridization of existing diesel mini-grids (and developing greenfield RE mini-grids). Key regulatory and political aspects are currently under review (i.e. including FITs and electricity tariff provisions).

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
EU Africa Infrastructure Trust Fund (AITF)	European Investment Bank (EIB)	330 M EUR	NA	SSA	N/A	Grants, convertible grants, equity, guarantees	Intergovernmental Organisation (IOG) - Development Partner	Established in 2007, the EU-Africa Infrastructure Trust Fund (EU-AITF) aims to increase investment in infrastructure in Sub-Saharan Africa by blending long term loans from participating financiers with ITF grant resources. Both private and public sector co-financing is encouraged. EU-AITF focus mostly on on-grid projects.
FMO Infrastructure Development Fund/ Direct Investment	Dutch Ministry of Development and Cooperation	362 M EUR	5-50 M EUR	SSA	N/A	Senior debt, equity	Development investment fund	FMO focuses primarily on energy sector (generation and distribution, focus on RE), with additional projects on waste-to-energy, off-grid energy solutions, SHS, and EE. To assess eligibility, FMO reviews investment plans, market analyses, due diligence studies, expected returns and the commitment level of management and co-financiers. To complete an investment, FMO requires proper project documentation including business plan, signed PPA, signed construction and EPC agreements, and other legal project documentation and EIA reports.
Fonds Francais pour l'Environnement Mondial (FFEM)	FFEM	20 M EUR	NA	Developing countries	N/A	Grants, convertible grants	Finance institution	The FFEM secretariat and its financial management are entrusted to the Agence Française de Développement (AFD). The FFEM co-finances projects that encourage the protection of the global environment in developing countries. Its co-financing is used for the implementation of pilot projects that combine environmental protection and economic development in the recipient countries.
Rwanda's Green Fund (FONERWA)	Rwanda national Fund with DFID, UNDP and KfW contributions	100 M USD	N/A	Rwanda	N/A	Grants, credit line	Finance institution	The fund is an initiative of the Government of Rwanda to support environment protection and deal with the impact of climate change. Rwanda's Green Fund is the only fund in that mobilises financial resources from the government's own revenue sources. Private sector contributions are considered as grants and project co-financing in the short-term, and investment in the long-term, among others.
GMGs Africa Regional Facility	DFID	15 M £	NA	SSA	market development, access to finance, policy advisory	Grants	Development Finance Institution	DFID is working with the Sustainable Energy Fund for Africa (SEFA) (co-funded by Denmark and USAID/Power Africa) and the Sustainable Energy for All (SE4All) Africa Hub at the African Development Bank (AfDB), to provide a series of business lines of support to countries and the sector to develop GMGs markets.
GREEN MINI GRID support facility	DFID - AFD	30 M £	NA	Kenya	Project preparation and transaction advisory	Grant, loan, Results-based finance (in cooperation with EnDev)	Development Finance Institution	GMGs Tanzania is part of a comprehensive package of support on energy working with the Tanzanian Rural Energy Agency, the Swedish development agency SIDA and the World Bank, providing support to project preparation and capital/credit availability. So far, no disbursement have been realised, projects are under scrutiny.

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
GREEN MINI GRID support facility	DFID- SIDA- WB	30 M £	NA	Tanzania	project preparation and transaction advisory	Grants, loan	Development Finance Institution	DFID is working with the French development agency AFD, providing support to project preparation and capital/credit availability. The programme includes RBF, to be implemented by GIZ and SNV together with the Barclays Bank of Kenya Ltd (BBK). So far, no disbursements have been made, projects are under scrutiny.
IRENA/Abu Dhabi Fund for Development (ADFD) Project Facility	IRENA	350 M USD	5-15 M\$	IRENA member countries	NA	Loan (concessionary), debt mezzanine	Intergovernmental Organisation (IOG) - Development Partner	The IRENA/ADFD Project Facility is a funding facility for renewable energy projects in developing countries. The facility committee scores projects on the following three criteria: Technical merit; Commercial viability; and Socio-economic and environmental benefits.
Mini-Grid Program to Increase Energy Access in Tanzania	IFC	5 M USD	NA	Tanzania	Capacity building, transaction advisory, policy advisory (advise local bank on how to provide long term finance)	N/A	Development Finance Institution	The initiative aims to bring affordable, off-grid renewable energy to households and businesses in rural Tanzania, in order to promote commercially viable mini-grid business models. IFC will advise banks and financial institutions on how to extend long term finance to mini-grid developers. Concrete financing means remain to be defined and no disbursements have been made yet.
Mini-grid research (optimisation, simulation, GIS assessments)	Reiner Lemoine Institut gGmbH (RLI)	NA	NA	Cameroon, Nigeria, Tanzania	Feasibility study, project preparation	N/A	Academia / research institute	The RLI's off-grid division focuses on studies on rural electrification with renewable energies and the substitution of oil-based power generation with renewable energies in isolated energy systems. The RLI developed a mini-grid simulation tool, atomizes GIS assessments and works on a tool for least cost electrification approaches.
Nigerian Energy Support Programme	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	1 to 10 M EUR	NA	Nigeria	Capacity building, policy advisory	N/A	Cooperation Agency -Development Partner	GIZ aims at implementing rural electrification projects via decentralized applications including mini-grids (embedded generation approach) and complementing the national grid in rural areas through policy advisory on rural electrification with RE, and capacity building.
Off-Grid Renewable Energy Development Programme	REA (Uganda Rural Electrification Agency)	NA	NA	Uganda	Market development, feasibility study, policy advisory	grants, results-based financed	Electrification Agency	The programme identifies off-grid sites and provides grants for the distribution grid and connections.
Project Document for Mini-grids Development in Kenya (SREP Investment Plan)	Kenya - Ministry of Energy and Petroleum	Above 50 millions euros	NA	Kenya	Feasibility study, project preparation, capacity building, policy advisory	N/A	National Institution	The objective of the project is to increase access to clean energy, increase the contribution of renewable energy to the generation mix, and accelerate development in off-grid areas. SREP is active in 14 african states.
Project for decentralised rural electrification	World Bank - FFEM	7 M USD	NA	Guinea	Market development, policy advisory, feasibility study	Grants, loans	Development Finance Institution	The objective of this project is to develop institutional, technical and financial mechanisms for the promotion and support of small private operators for the provision of a sustainable electricity service to the village level, through decentralized solutions (generators, SPV, small hydro).

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
Promoting a Sustainable Market for Solar Photovoltaic Systems in the ECOWAS Region" (ProSPER)	IRENA - ECREEE (under the ECOWAS Program on Access to Sustainable Electricity Services (EPASES)	NA	NA	West Africa (ECOWAS members)	Capacity building and knowledge management, policy advisory	N/A	Intergovernmental Organisation (IOG) - Development Partner	Objective : strengthen and develop local capacities of policymakers, regulators and utilities, branch managers of financial institutions, trainers from educational or research institutions, and renewable energy entrepreneurs and technicians, to accelerate renewable energy and particularly solar photovoltaic (PV) systems' deployment.
Promotion of Renewable Energy and Energy Efficiency Programme, Uganda	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	1 to 10 M EUR	NA	Uganda	Capacity building, policy advisory	N/A	Cooperation Agency -Development Partner	Objective : develop mini-hydro community based mini-grids in Uganda. So far, 2 systems have been completed with capacities of 40 and 64 kW respectively.
Promotion of Rural Electrification through Renewable Energies, Madagascar	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	1 to 10 M EUR	NA	Madagascar	Feasibility study, project preparation, capacity building , policy advisory	N/A	Cooperation Agency -Development Partner	The GIZ is providing technical support to the rural electrification agency ADER. A database of potential hydro sites below 1 MW is now available. 12 feasibility studies for potential hydro power sites have been developed. Two hydropower based mini-grids have been commissioned. A new model for financing of small hydropower sites is at its pilot phase.
PROPARCO FISEA : Invest and Support Fund for Businesses in Africa	AFD	250 M EUR	1 to 10 M EUR	SSA	N/A	Equity	Development investment fund	FISEA targets regions that are more unstable or emerging from crisis situations, sectors bypassed by investors and vulnerable population groups, focusing on SMEs. The recipient entity must be managed by a skilled and experienced team and have a convincing business plan that could be profitable in the medium term. FISEA's financial exit is conceivable in the long term. There is no example of concrete investment so far.
Quality assurance framework for mini-grids project	Global Lighting and Energy Access Partnership (Global LEAP)	NA	NA	SSA	Policy advisory, capacity building and knowledge management	Results-based finance (in cooperation with EnDev, in East Africa)	International institution	Objective : develop a Quality Assurance Framework for mini-grids that will catalyse the use of standard technological and operational concepts in mini-grids sector, thereby addressing root barriers to aggregation, scale-up and investment.
Renewable Energy for Poverty Reduction	ISB - Islamic Solidarity Fund for Development	180 M USD	NA	SSA	NA	Grant, loans	International Development institution	Objective : promote sustainable, reliable and affordable electricity to households, commercial establishments to promote productive activities, and public facilities providing health, education and social services; enhancing the affordability of electricity access by employment of competitive renewable off-grid electrification solutions.
Scaling-Up Renewable Energy Program-Grant / SREP	AFDB - JICA - DFID	719,5 M USD	NA	Tanzania	Policy advisory, capacity building and knowledge management, transaction advisory	N/A	Development Finance Institution	Objective : scale-up renewable energies to reduce the energy sector dependance on fossil fuel sources. It comprises ambitious target for micro-grid development in collaboration with REA.
SUNREF	AFD	NA	NA	SSA	project preparation and capacity building	Grant, Loan, Guarantees	Bilateral development Finance Institution	Objective : to improve rural electricity access, promote renewable energy and off-grid projects, promoting small scale solar market development in Tanzania. TEDAP aims to provide long term (15 years) source of funds to financial institutions that lend to eligible rural or renewable energy projects.

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
The Africa electrification Initiative	EU-PDF - ESMAP - AFREA - GIZ- ENDEV	NA	NA	SSA	Capacity building and knowledge management	N/A	Development partner, multilateral initiative	Objective : create and sustain a living body of practical knowledge and a network of African practitioners in the area of design and implementation of electrification programs.
Tanzania Energy Development and Access Project (TEDAP)	World Bank	22,5 M USD	NA	Tanzania	Capacity building	Grants , credit lines (15 years)	Development Finance Institution	Establish a mini hydropower plant to benefit about 50,000 people, as well as small businesses, associations and public institutions in Lofa County through connections to the mini-hydro electric grid.
The Liberia Renewable Energy Access Project (LIRENAP)	World Bank	27 M USD	NA	Liberia	Capacity building, policy advisory, project preparation and transaction advisory, feasibility study	Grants	Development Finance Institution	Objective : mobilise private sector development activity and investment in small and medium scale renewable energy projects (up to 25MW) in sub-Saharan Africa. Project developers seeking support from REPP should be able to demonstrate sustainable development benefits for communities and the host country. As REPP is a recent initiative no projects have been launched yet. The fund could be interesting for GMG projects, if they are aggregated.
The Renewable Energy Performance Platform (REPP)	EIB - UNEP - United Kingdom (DECC)	48 M £	NA	Benin, Burkina-Faso, Burundi, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Togo,	Project preparation and transaction advisory, policy advisory	Results-based finance, convertible grant	Development Finance Institution	The programme provides liquidity insurance facility to enable Participating Financial Institutions (PFIs) to extend the tenure of loans, and Partial Risk Guarantee (PRG) to cover the cost overrun during the construction phase of the investment projects.
Uganda Energy Credit Capitalization Company Credit Support Facility	KFW	NA	NA	Uganda	Project preparation and transaction advisory	Credit lines, mezzanine financing, vendor financing, guarantees	Bilateral development Finance Institution	Objective : catalyze private sector investment in clean energy projects in Africa by providing support for early stage project development costs. Project developers or investors that require early stage support to develop their clean energy projects into bankable opportunities could potentially utilize OPIC financing or insurance products.
US AFRICA CLEAN ENERGY INITIATIVE	OPIC / USA Department of State / USDA / USAID	30 M USD	NA	SSA	N/A	Loans, guarantees, political risk insurance	Bilateral development Finance Institution	Objective : promote investments in energy and environmental services in developing countries. AFD and local banks identify the investment potential, select the most promising thematic areas and develop an action plan to reduce the barriers to investment in selected developing countries, using an innovative approach combining financial incentives (grant, loan, guarantees), technical assistance (eg. capacity building).

PRIVATE FACILITIES IN SUPPORT OF GMG AND RE PROJECTS IN AFRICA

Table 3: Private facilities providing funds and/or technical assistance

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
A2E- Access to Energy	EDP – Energias de Portugal, S.A.	Open	500 000 USD	Mozambique (project level)	Project preparation and transaction advisory	Equity to 60%	Corporate firm	EDP has partnered with UNEP for the implementation of a demonstration project in remote rural Mozambique, Titimane, to set up a commercially viable clean energy mini grid. EDP will invest 500.000€ in cash. The GMG will be fully operated by EDP.
GuarantCo	Private Infrastructure Development Group (PIDG)	300 000 USD	10 to 40 M USD	SSA (one concrete project in Uganda on Lake Turkana)	NA	Guarantees	Investment Fund	GuarantCo provided partial credit guarantee of USD 1.4 million, guaranteeing part of the financing for a 1.6 MW hybrid solar generation system and associated transmission and distribution systems of Bugala Island in Lake Victoria, Uganda.
Itanna Microgrid	Coperson-Hill Nigeria Limited	125,000	NA	Nigeria	Project preparation and transaction advisory	Equity 40%, loans 20%	Small and Medium Enterprise	Objective : put in place a metered micro grid in specific villages in Nigeria using lithium-Ion battery as the energy saving back-up for solar PV. No concrete projects regarding micro-grids have been developed yet under this facility.
Persistent Energy Capital (PEC)	Persistent Energy Partners (PEC)	300 000 000 USD	NA	Ghana, Tanzania, Togo, Benin, Nigeria, Zambia	NA	Commercial capital (equity), technical assistance, project preparation	Boutique investment bank	PEC invests in, incubates and builds businesses providing distributed renewable energy to off-grid customers. PEC also provides financial advisory services to companies and investors, fund management through its private equity funds and consulting services to governments and development organizations.
Rural Electrification in Sub-Saharan Africa	Absolute Energy Capital	NA	1 to 10 M EUR	Uganda, Kenya, Mozambique, Tanzania	NA	Equity - 50% of the project value	Independent investment platform	Just launched (december 2015) a request for tender for an Engineering Procurement and Construction (EPC) contract for Solar-PV power generation plant in rural area in Uganda. The project aims at providing access to clean, reliable and affordable electricity to the whole community of an island on Lake Victoria through a stand-alone mini-grid solar-PV power plant with battery storage system. Others projects are planned in Kenya, Mozambique and Tanzania.
Youth, Renewable Energy and Enterprise Creation Project	Sustainable Agriculture Community Development Programme (SACDEP-Kenya)	713 000 EUR	NA	Kenya	Project preparation and transaction advisory, feasibility study	Grants 60%, convertible grants 40%	NGO	This project aims at giving rural communities from Kenya an alternative source of energy by producing Commercial Biogas plants from the slaughter houses and selling it at affordable rates. Results to be achieved : 200 Households will benefit from sale of biogas from the 2 commercial Biogas units, 200 HH will benefit from use of Solar for pumping water for irrigation and about 90 Youth will benefit from employment creation. The idea of the project is to train young people to manage biogas energy mini grids.

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
Actis Infrastructure	200+ Limited Partners invested in Actis funds.	750 000 000 USD	10 – 50M	SSA	NA	Equity	Impact investor	Objective : bring RE into the mainstream of energy sources through the implementation of 2 commercial biogas digestors of 220 cubic meters using the slaughterhouse waste as a source of biomass for gas generation, 2 Youth Managed Biogas Energy Kiosks and 2 Solar Assembling kiosks.
Green Africa Power (GAP)	Private Infrastructure Development Group (PIDG) - DFID	£121 000 000	App 5 M USD	Kenya, Tanzania, Uganda, Togo, and South Africa.	NA	Debt mezzanine or contingent lines of credit	Investment Fund	Objective : stimulate private sector investment in RE in subsahara Africa (wind, solar, hydro, tides, waves, geothermal heat, sustainable biomass and biogenic gas) and the following activities would be covered: greenfield developments, expansions and upgrades of operating projects, conversion of existing power projects and associated grid connection infrastructure. GAP will also consider local mini grid systems but no projects have been selected yet (because minimum project level is about 5 M EUR)
GroFin SGB Fund	Shell Foundation, Federal Republic of Germany (KfW), The Norwegian Investment Fund for Developing Countries, Norfund, and the Dutch Good Growth Fund (DGGF), GroFin Risk Capital Facility, and GroFin MENA.	150 M USD	0.1 to 1.5 M USD	Nigeria, Ghana, Zambia, Egypt, South Africa, Kenya, Tanzania, Rwanda, Uganda	Project preparation and transaction advisory	Loan (5 years)	Impact investor	GroFin combines patient capital and specialized business support to grow emerging market enterprises. It focuses on local established businesses, with a strong focus on the entrepreneur, and favors high growth-high impact – healthcare, manufacturing, job creation are key metrics. Support entrepreneurs that create or sustain jobs – around 30 per investee, prefer entrepreneurs with 3-5 years experience in the industry. Start-ups need to be very experienced entrepreneurs.
Lereko Metier Solafrica Fund ('LMSF') under Lereko Metier Sustainable Capital fund (LMSC)	IFC, Lereko, FMO, DEG, South Africa PIC	120 M USD	10 to 50 M USD	Southern Africa	NA	Financing means : minority equity	Investment Fund	Targets investment: energy efficiency, RE, water and waste management businesses and projects. The Fund invests in advanced companies at advanced stages, with bankable activities and proven technologies.
Acumen Fund	Acumen Fund	64 M USD	0.25 to 3 M USD	Kenya, Uganda, Tanzania, Rwanda, Ethiopia, Burundi, South Sudan, Ghana, and Nigeria	Capacity building, project preparation and transaction advisory	Minority equity, loan, small amount of grants, guarantees, mezzanine credit	Impact investor	Acumen will seek to invest in 1) companies that manufacture and/or distribute household consumer energy products; 2) companies that generate electricity for off- grid communities through mini-grids that use renewable energy sources, such as biomass, solar, and hydro; and 3) companies that generate renewable energy for an existing grid in which the grid is unreliable or non-functioning. Renewable energy companies applying for capital from Acumen must have significant operation in East Africa or West Africa and be an early-mid stage company that is in the process of scaling.
Ariya Capital Sub-Saharan Africa Cleantech Fund	NA	150 M USD	3 to 10 M USD	SSA	NA	Equity	Investment Fund	The fund invest in innovative, high growth businesses that have the potential to become significant regional players, and with a strong, financially sound business plan, strong management committed to sustainable business practices that have measurable positive social and environmental impact. The fund will provide no more than 10% of the fund into a single company, and lower figures could be envisaged.

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
Bamboo Energy Fund - Solar for All	Bamboo Finance	20 M USD	0.5-4M USD	Kenya, Uganda, Tanzania, Ethiopia, Nigeria	NA	Equity	Impact investor	Bamboo Finance seeks to launch the Bamboo Energy Fund - Solar for All, a private equity fund investing in companies that provide access to energy in off-grid regions of Sub-Saharan Africa and South/South-East Asia. Objective in Africa : catalyze over US\$ 20,000,000 in investment for small scale energy service providers and energy projects in Power Africa countries over the next five years
Cameroon Renewable Energy Programme	Kaboni	NA	NA	Cameroon	Feasibility study, project preparation, policy advisory, capacity building	Mezzanine financing	SME - Development organisation	The Renewable Energy Rural Electrification (RERE) programme was developed with an NGO in South West Cameroon and involves grid connected - and off-grid small hydropower projects planning to connect local communities eventually. Therefore, the initiative uses the security of grid connection and PPA-backed sales to finance off-grid development and new connections.
Capricorn Investment Group	Capricorn Investment Group	NA	NA	Tanzania, Nigeria	NA	Equity	Investment Fund	Capricorn Investment Group commits to invest in companies providing solar power, hybrid power systems, mini-grid installations, energy storage systems, and mini-hydro power systems, expanding from Tanzania and Nigeria to two additional Power Africa countries. Concrete projects remain to be seen.
CrossBoundary Energy Fund	CrossBoundary Energy	10 to 50 M EUR	NA	Kenya	NA	Equity, loan, mezzanine financing, long term debt	Finance institution	CrossBoundary is a frontier markets investment advisory firm. They created an independant entity Crossboundary energy : dedicated fund for commercial and industrial products in Africa. The Fund is expected to deploy over 25MUSD into medium scale (0.2MW-5MW) solar installation that serve African enterprises over the next 2 years. Client firms pay for the electricity through PPAs, which remove solar adoption barriers by eliminating upfront cost and technical risk for the offtaker.
DI Frontier Investment	CDC, Pension Denmark, PFA Pension, Tryg Insurance, GEEREF, Danish Investment Fund for Developing Countries, Seed Capital Assistance Facility (SCAF) funded by AfDB and UNEP,	60 M USD	3 to 10 M USD	SSA	Project preparation and transaction advisory	Equity, mezzanine finance, short term loan	Investment Fund	Focus on renewable energy power projects in less developed emerging markets in Sub-Saharan Africa. They have invested in AKIIRA geothermal power project, a 140 MW geothermal power project developed in two phases of 70 MW utilizing the steam resources in the Kenyan Rift Valley. The project is located south west of Naivasha, Kenya. The project will be connected to the Kenyan national grid. They usually invest in 5-100 MW, Greenfield medium scale projects
GRAY GHOST VENTURE	GRAY GHOST VENTURE	50 M USD	NA	All over SSA	NA	Equity (seed financing)	Impact investor	Gray Ghost Ventures commits to raise \$50 million for early-stage equity investments, to build on current investments, including in Beyond the Grid partner d.light, which independently commits to deliver solar-powered lighting and energy products to more than 100 million Africans over the next five years

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
Inspired Evolution Investment – Evolution One Fund	CYANE HOLDINGS LTD, QUANTUM POWER, GEEREF, IFC, FINNFUND, SIFEM, NORFUND, AfDB, IDC, SCAF	250 M USD	10-20 M USD	Ghana, Nigeria, Kenya, Ethiopia, Tanzania, Uganda, Namibia, Botswana, South Africa (30% exposure), Mozambique, Gambia	NA	Equity	Investment Fund	Inspired Evolution is a specialised investment management business and authorised financial services provider located principally in South Africa. Inspired Evolution offers a dedicated team with a deep global track record positioned to lead clean energy and resource efficiency investments across Sub-Saharan Africa.
Invested Development	Invested Development	NA	up to 500 000 USD	SSA	Capacity building, transaction advisory	Equity	Impact investor	Investment focus on 3 areas: alternative energy solutions to bring safe and affordable electricity to the people worldwide who live off-grid; ICT and mobile technology solutions for small businesses and individuals in emerging markets; Agriculture technology innovations. Invested Development offers startups seed funding, mentorship, industry contacts, and access to a growing network of service providers and innovators.
Energy access development impact - CE3 – Connectivity, Electricity and Education for Entrepreneurship	Accenture Development Partnerships - University of Notre Dame	1,6 M EUR	NA	Uganda (northern Uganda) - South Africa (planning)	Capacity building and knowledge management	NA	Corporate firm - Academia	Objective : design, implement, and monitor a new model of rural energy access in rural Tanzania, starting with a pilot project implemented by the University of Notre Dame. The CE3 pilot project consisted in powering the university computer labs with solar micro-grids. The micro grids also provide power for activities at schools, agricultural cooperatives, and local micro enterprises, and are sized at a scale that will support new ventures by local entrepreneurs.
Khosla Impact	Khosla Impact	10 M USD	NA	Tanzania, Ghana, Nigeria,	Transaction advisory and project preparation	Debt, equity, end users financing	Impact investor	Khosla Impact commits to build on equity investments in Beyond the Grid partners BBOX and SunFunder with investment, strategic assistance, and connections for 2 to 3 additional businesses that expand the access and affordability of solar products for African consumers. It will catalyze at least \$10 million in debt from co-investors and take investee companies to profitable scale within five years. Concrete projects remain to be seen.
Fenix International	Fenix International	287 M USD	NA	Tanzania, Uganda, Kenya	Transaction advisory and project preparation	End users financing	Corporate firm	Founded in 2009, Fenix International is a venture-funded next-generation energy company with offices in East Africa and Silicon Valley. Fenix International core expertise is in renewable energy, mobile finance, and last-mile sales, marketing, distribution and customer service. Focus on solar kit.
Global Promotion of Clean Energy Mini-Grids	Alliance for Rural Electrification (ARE)	NA	NA	Worldwide	Policy advisory - capacity building	NA	NGO - Development Partner	As private sector partner recognised by SE4All, ARE has been co-founder of the High Impact Opportunity (HIO) on Clean Energy Mini-Grids and now leads its Secretariat together with the UN Foundation. Together with EUEI PDF and REN21, ARE developed a "Mini-Grid Policy Toolkit".

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
LGT venture Philanthropy	LGT venture Philanthropy	NA	NA	East and Southern Africa	Project preparation and transaction advisory	Equity	Impact investor	Objective : support organizations in their growth and expansion phase to implement effective solutions to a social or environmental problem. Organizations must have a proven model, an established track record, and are looking to scale their impact. The time of engagement ranges from three to seven years. LGT Venture investment managers advise the organizations throughout the engagement, and through the ICats Program additional expertise and management know-how are provided.
Green Mini-Grid	Statera Capital	up to 1 million Euros	NA	Ethiopia, Kenya, Tanzania	Project preparation and transaction advisory, policy advisory	NA	Corporate firm /impact investor	Statera Capital is a global advisory and impact investment banking firm with a focus on frontier markets and a specialization in Sub-Saharan Africa. Statera Capital has advised DFID in structuring its facilities regarding GMG projects in Kenya, and informally in Tanzania. They have not invested in GMG projects in Africa, but act as adviser.
Renewable Energy and Adaptation to Climate Technologies (REACT)	Africa Enterprise Challenge Fund	53 M USD	up to 1 M USD	Kenya - Tanzania - Mozambique - Rwanda - Uganda - Burundi	NA	Grants, interest free loans	Corporate firm	The Renewable Energy and Adaptation to Climate Technologies (REACT) window is a special fund of the AECF that is open to business ideas based on low cost, clean energy solutions that help smallholder farmers adapt to climate change.
Renewable Energy and Energy Efficiency programme	Plan International Spain	2,7 M EUR	NA	Ethiopia, Mali, Niger	NA	Grant up to 70% of project value, venture capital up to 30%	NGO	Using appropriate technologies to support rural isolated communities where Plan works, together with other intervention areas, such as education, health, resilience, etc.
Mini-grid research (optimisation, simulation, GIS assessments)	Reiner Lemoine Institut gGmbH (RLI)	NA	NA	Cameroon, Nigeria, Tanzania	Feasibility study, project preparation	NA	Academia / research institute	The RLI developed a mini-grid simulation tool, automizes GIS assessments and is working on a tool for least cost electrification approaches.
ResponsAbility Energy Access Fund	Shell Foundation & ResponsAbility	30 M USD	3 M USD	Africa	Advisory services to borrowers	working capital loans	Private Investment Fund	The responsAbility Energy Access Fund provides working capital to manufacturers and distributors of modern energy products to accelerate their growth and scale of impact (solar light and cookstoves). An additional technical assistance facility provides professional advisory services to borrowers (funded by the Swiss State Secretariat for Economic Affairs - SECO).
Schneider Electric Energy Access impact investing fund	Schneider Electric	NA	100 000 to 400 000 EUR	Benin, Cameroon, Central African Republic, Chad, Congo-DRC, Ivory Coast, Ethiopia, Ghana, Kenya, Namibia, Nigeria, Senegal, South Africa, Uganda, Zambia, Zimbabwe	Capacity building	Equity	Corporate firm	Within Access to Energy, Schneider Electric created the Schneider Electric Energy Access (SEEA) impact-investing fund. It supports small and medium companies with innovative energy access solutions.

Programmes	Institutions	Amount	Size of investment	Countries of intervention	Technical Assistance	Financing means	Institution Type	Comments
SUNFUNDER	SUNFUNDER	NA	NA	All over SSA	Project preparation and transaction advisory	NA	Solar finance business	SunFunder is a solar finance business based in San Francisco and Tanzania with a mission to unlock capital for solar energy in emerging markets. SunFunder aggregates capital through the Solar Empowerment Fund, a private debt offering that gives Accredited Investors an opportunity to invest in a diversified, vetted and high-impact portfolio of off-grid and grid deficit solar projects. With this capital, SunFunder provides short-term inventory and project finance loans to leading solar energy companies to help them scale deployments of solar energy systems.
VITAL CAPITAL II	Private Investors	500 M USD	10 to 50 M USD	SSA (except SA)	NA	Equity (majority stake)	Private Investment Fund	Focus on infrastructure. Key project requirements : positive financial returns and social/environmental impact. Vital is an active investor, and will therefore typically seek to establish a controlling stake in whatever venture or business it will invest in. The fund will consider investing in ventures and businesses in all life-stages, from pre-seed to late-stage mature operations, including turnaround projects, with an aim to achieve an effective and profitable exit within 5-7 years of initial investment.

PUBLIC/INSTITUTIONAL INITIATIVES

[ECOWAS RENEWABLE ENERGY FACILITY \(EREF\)](#)

The ECOWAS Renewable Energy Facility (EREF) is a grant facility managed by the Secretariat of the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) based in Praia, Cape Verde. It provides grant co-funding for small to medium-sized renewable energy and energy efficiency (RE&EE) projects and businesses in rural and peri-urban areas.

EREF was established with initial support from the Austrian Development Cooperation (ADC) and the Spanish Agency for International Development Cooperation (AECID), and with key technical assistance from the United Nations Industrial Development Organisation (UNIDO). It is also seeking the support of other donor partners.

The facility undertakes regular calls for demand-driven proposals. So far, two calls for proposals have been launched and a third will take place in the near future. During the first project cycle (2011 to 2014), 41 projects were approved; each was awarded a grant representing 75 percent of the project cost, or a maximum of Euro 50,000. The total available was about Euro 1 million.

The second project cycle (EREF 2) was officially launched with a call for proposals during the Clean Energy Mini-Grids High Impact Opportunity presentation at the Sustainable Energy for All (SE4All) meeting in New York from 2nd to 4th June, 2014. The overall amount available under this call is also Euro 1 million. EREF is providing up to 50 percent of the project cost, or a maximum of Euro 200,000 per project. So far, 20 projects have been shortlisted out of 51 proposals received. Of the shortlisted projects 5 are currently being co-funded by EREF:

1. Decentralized hybrid PV system in Burkina Faso – Construction of a reliable, decentralized hybrid photovoltaic/multifunctional platform and establishment of a sustainable management, operation and maintenance system to benefit the rural population of Gori

- ❖ Technology: Solar photovoltaic clean mini-grid and Solar Home Systems
- ❖ Total capacity to be installed: 38kWp
- ❖ Total energy production: 75,733 kWh/year
- ❖ Estimated cost of energy produced: 0.377€/kWh
- ❖ Storage: use of high quality batteries (lead-acid)
- ❖ Total estimated project cost: € 390,382.24
- ❖ Direct beneficiaries:
 - 900 inhabitants in rural areas
 - 126 households
 - Schools, health centre, worship place
 - Small and medium enterprises
- ❖ Management, operating and maintenance structure:
 - Private enterprises (leasing contract)
 - Greenfield project
 - Project promoters: Association Tin Tua – ATT

2. PEHGUI in Guinea – Small hydropower; management of a clean energy mini-grid powered by a hydro and solar PV hybrid system

- ❖ Technology: solar-diesel hybrid mini-grids
- ❖ Total capacity: 372kWp
- ❖ Total energy production: 31,630kWh/year

- ❖ Estimated cost of energy produced: N.A.
- ❖ Storage: use of high quality batteries (lead-acid)
- ❖ Total estimated project cost: € 262,731.41
- ❖ Direct beneficiaries:
 - 7,642 inhabitants in rural areas (three villages)
 - 105 households
 - Schools, health centre, worship place
 - Small and medium enterprises
- ❖ Management, operating and maintenance structure:
 - To be determined by the project
 - Greenfield project
 - Project promoters: Fondation Energies pour le Monde

3. Promotion of energy access through clean mini-grids in Niger⁵ – Improving quality of life in a rural community in the Sahel by promoting access to modern, affordable and sustainable sources of energy

- ❖ Technology: solar photovoltaic clean mini-grid
- ❖ Total capacity to be installed: 27.5kWp
- ❖ Total energy production: 44,200 kWh/year
- ❖ Estimated cost of energy produced: 0.37 €/kWh
- ❖ Storage: use of high quality batteries (lead-acid)
- ❖ Total estimated project cost: € 390,382.24
- ❖ Direct beneficiaries:
 - 4,412 inhabitants in rural areas
 - 105 households
 - Schools, health centre, worship place
 - Small and medium enterprises
- ❖ Management, operating and maintenance structure:
 - Private company and local association.
 - Greenfield project
 - Project promoters: Fundación Plan International España

4. Regional solar-diesel mini-grids in Cape Verde and Guinea-Bissau – Strengthening management and energy business models in existing micro-grids in Lusophone ECOWAS member states

- ❖ Technology: solar-diesel hybrid mini-grids
- ❖ Total capacity: 372kWp
- ❖ Total energy production: 31,630kWh/year
- ❖ Estimated cost of energy produced: N.A.
- ❖ Storage: use of high quality batteries (lead-acid)
- ❖ Total estimated project cost: € 262,731.41
- ❖ Direct beneficiaries:
 - 7,642 inhabitants in rural areas (three villages)
 - 105 households
 - Schools, health centre, worship place
 - Small and medium enterprises
- ❖ Management, operating and maintenance structure:
 - Will be determined by the project
 - Brownfield project
 - Project promoters: Instituto Tecnológico de Canarias, S.A. (ITC)

⁵ A call for proposals for the Engineering Procurement Commissioning part of this project has recently been launched.

5. Promotion of energy access in Sierra Leone – Extension of renewable energy hybrid mini-grid systems in Sierra Leone’s Western Area Peninsula

- ❖ Technology: Solar photovoltaic, wind and hydro powered clean mini-grids
- ❖ Total capacity to be installed: 26kWp
- ❖ Total energy production: 125,000 kWh/year
- ❖ Estimated cost of energy produced: N/A
- ❖ Storage: use of high quality batteries (lead-acid)
- ❖ Total estimated project cost: € 375,940
- ❖ Direct beneficiaries:
 - 2,000 inhabitants in rural areas
 - 200 households
 - 5 Public institutions (schools, health centre, worship place)
 - 40 secondary businesses
- ❖ Management, operating and maintenance structure:
 - Private company and local authority
 - Greenfield project
 - Project promoters: Welthungerhilfe - WHH

Because of the success of the second round, EREF 3 will again focus on clean energy mini-grids, with specific attention to initiatives that promote the productive uses of electricity.

Based on experience accumulated in the previous rounds, EREF 3 will aim to move in the direction of supporting the commercial viability of clean energy mini-grids. Therefore, EREF 3 will reduce the maximum grant co-funding to 30 percent and increase the maximum amount per project to Euro 300,000. This will allow for the co-funding of bigger projects and reduce the levelised cost of electricity by making use of economies of scale, thereby increasing the sustainability of the intervention. A budget of Euro 3 million is foreseen for this launch. This amount will enable co-funding of at least 10 projects (with an additional Euro 7 million or more leveraged from project promoters), and provide sustainable access to electricity for a minimum of 3,000 households, enterprises and public institutions through the installation of at least 1MW of additional renewable energy capacity.

ISLAMIC DEVELOPMENT BANK – RENEWABLE ENERGY FOR POVERTY REDUCTION PROGRAMME

The Renewable Energy for Poverty Reduction (REPoR) programme was launched by the Islamic Development Bank (IDB) and its poverty reduction arm, the Islamic Solidarity Fund for Development (ISFD). The programme aims to contribute to the alleviation of energy poverty and improve the living conditions of targeted rural communities through the provision of clean, reliable, sustainable and affordable electricity. Secondary objectives of the programme include: (a) providing sustainable, reliable and affordable electricity to households, productive enterprises (especially small businesses), and public health, education and social services facilities; (b) reducing the cost of electricity supply and increasing connection rates in rural areas through competitive off-grid solutions; and (c) strengthening the capacity of rural electrification authorities and other relevant public agencies and utilities to implement decentralized electrification plans based on renewable resources.

The REPoR programme will be implemented through decentralized renewable electrification projects in six IDB member countries (Indonesia, Mali, Tunisia, India, Nepal, and Kenya), in addition to a particular focus on solar off-grid solutions in two African countries (Nigeria and Burkina-Faso), over a period of three years. The programme will have three main components:

- Decentralized renewable electrification solutions for rural communities
- Institutional development, capacity building, and reverse linkages⁶
- Impact evaluation

The overall indicative programme envelope is Euro 160 million (USD 180 million). ISFD and IDB will together contribute Euro 110 million (USD 125 million) to the programme, and expect to raise at least Euro 48.7 million (USD 55.0 million) in concessional loans from various development partners and governments, as well as grants for project preparation and sector support.

GIZ-ENDEV – INITIATIVES IN SUPPORT OF GMG PROJECTS IN AFRICA

Energising Development (EnDev) is an energy access partnership currently financed by seven donor countries: the Netherlands, Germany, Norway, Australia, United Kingdom, Switzerland and Sweden. EnDev promotes sustainable access to modern, affordable energy services that meet the needs of the poor. As of June 2015, EnDev works in 26 countries in Africa, Asia and Latin America. Since its initiation in 2005, EnDev has taken a leading role in the Sustainable Energy for All (SE4All) programme, and is one of the first outcome-based and performance-based programmes in the energy sector. The German international cooperation agency, GIZ, closely cooperates with EnDev on several initiatives supporting mini-grid projects in Africa. Some key projects are described below:

Kenya

Through the project “Promotion of Solar-Hybrid Mini-Grids” (ProSolar) GIZ is assisting the Government of Kenya in promoting private sector participation in the development of greenfield small and medium-sized solar-hybrid mini-grids. The main objective of the project is to contribute to cost-effective, reliable and sustainable power supply in rural growth centres. In line with the technical assistance for micro-grids for village electrification from GIZ, KfW (German Development Bank) will finance medium-sized mini-grids through subsidies. Private sector participation has involved some challenges and only few private companies in Kenya are licensed to develop and operate mini-grids. A majority of the existing mini-grids in the country were fully funded and constructed by the Rural Electrification Authority (REA), and are operated by the state-owned utility Kenya Power. These mini-grids are diesel-fuelled but plans exist to retrofit them with solar and wind. GIZ has in cooperation with the County Government of Narok implemented a pilot mini-grid system at Talek. The project is now being operated by a private operator.

On behalf of EnDev and with funds from DFID, GIZ ProSolar is implementing a results-based financing scheme targeting micro-grids with up to 50kWp installed capacity. The programme aims at encouraging private sector investments through a combination of capital expenditure subsidies, as well as connection and production-based incentives. The financial incentives are managed and channelled through Barclays Bank of Kenya (BBK), a local bank. The first three sites have been selected, tendered and awarded in 2016. These sites are now being developed by private project developers. The programme will support up to 20 sites. The GIZ team is currently developing a handbook for project developers on financing mini-grids in Kenya.

⁶ Reverse linkages (RL) is a concept promoted by IDB referring to the South-South cooperation. Reverse linkages are specific cooperation activities whereby Member Countries themselves are primary forefront, and direct agents in the provision of specific expertise, knowledge, know-how, investments, success stories, best practices and other specialist services to address specific development constraints or exploit unique opportunities in other Member Countries in a mutually beneficial arrangement. Such partnerships are facilitated through a strategic alignment and enabled by the IDB Group. See Draft Guiding Note on Reverse Linkages, http://cso-effectiveness.org/IMG/pdf/idb_final_draft_-_reverse_linkages_-_ssc-trc.pdf

Tanzania

GIZ is providing policy advice to further develop the national RE strategy, including specific regulations for hybridization of existing diesel mini-grids and development of greenfield RE mini-grids. Key regulatory and political aspects are currently under review, including those related to user tariffs and feed-in tariffs.

Madagascar

GIZ is providing technical support to the rural electrification agency, ADER, on administrative, organisational, institutional and technical matters. GIZ is working with ADER on capacity development, technical support and training for the design, construction, operation and maintenance of hydro micro-grids. GIZ is also helping the agency to develop a standardised procedure for procurement and tendering of mini-grids.

This partnership has resulted in a database of potential hydro sites below 1MW, which has been made available to developers; 12 feasibility studies for potential hydro power sites, at different levels of detail, have been developed; several capacity building workshops for the private sector have been carried out; and 7 regional electrification plans have been established.

In more concrete terms, GIZ has intervened in two regions:

- In the Southwest (Tulear province), where four 15kWp sites are being developed, an operator was selected for two of the sites by ADER and the regulator, ORE (Office de Régulation de l'Electricité). According to the licensing agreement, the operator received a "permission" which allows it to generate, distribute and sell electricity. The normal structure for financing is up to 70 percent subsidy from the public sector and 30 percent contribution (equity or debt) from the private sector. The public sector portion is being covered by GIZ, which provides the generating assets as a grant to the public sector, which then "permits" the use to the private operator. The operator is currently in negotiations for the financing of the fixed assets.
- In the Northeast (Sava region), where ten sites are being tendered as part of a "Build Operate Transfer" licence, private operators are currently competing for three 2MW concessionary areas. The financial structure is more complex than in the Southwest, and is expected to be about 50-50 between private and public money. The public money will be part grant, part funded through international funds such as the Green Climate Fund (GCF). KfW will assist in the provision of the public funding. ADER and GIZ are expecting around 10-20 percent equity financing. The remaining 30 to 40 percent will come from debt financing, and potentially from available financing mechanisms (ElectriFI or others).

Given the size of the concessions in Sava, applications are coming from large-scale operators partially backed by international funds. The difficulty of the Sava project will be to achieve the right mix between public and private money, and in particular, getting banks to provide debt finance. Initial talks conducted by GIZ with local banks have shown that they are willing, in principle, to provide financing, but no agreements have been concluded.

Senegal

The aim of the GIZ-EnDev programme in Senegal is to extend the reach of energy services, particularly in rural areas, by strengthening the capacity of the Senegalese Agency for Rural Electrification (Agence Sénégalaise d'Electrification Rurale, ASER). In addition, the programme is developing, assessing and disseminating rural electrification models; and carrying out pilot projects to test productive uses. In one such project, a solar-powered ice machine has been installed in a women's cooperative in the fishing industry. So far, 49 mini-grids have connected a

total of more than 1,300 households. In total, 88 mini-grids will be finalized by the end of the phase. Most systems are identical solar-diesel hybrids with 5kWp installed capacity. One system is a solar-wind-diesel hybrid, and one runs completely on solar PV. In order to develop such projects, ASER is making subsidies available for project developers to cover up to 80 percent of capital investment. However, disbursement is conditional on licensing and tariff approval. EnDev has supported the development of a number of mini-grids under the same model, and has provided the subsidy component, with private sector companies raising equity or grants to finance the remaining share.

Ethiopia

The aim of the GIZ-EnDev programme in Ethiopia is to promote household electrification through pico and micro-hydro plants, by providing technical assistance and introducing appropriate low-cost designs for hydropower. EnDev trains local experts to promote hydropower and assist municipalities in identifying and developing suitable sites. EnDev provides financial resources to cover part of the investment costs. The local community contributes labour and materials for civil works, such as constructing the canal or the headrace, installing the penstock and building the machinery house and roads. EnDev so far has supported four micro-hydropower plants: Gobecho 1, Gobecho-2, Ererte and Hagera Sodicha. Investment costs range between Euro 2,000 and Euro 3,000 per kW of installed capacity, and between an estimated Euro 726 and Euro 2,000 per connected household. The projects were financed from the EnDev budget and the in-kind contributions from the communities. No further public or private sources of finance were used, as these are largely unavailable in Ethiopia.

Mozambique

In Mozambique, GIZ is involved in grid densification, pico and micro hydro power plants (PHP and MHP, respectively), small PV systems and improved cookstoves. The key strategic objective is to achieve a functional network of four pillars in these technologies: a knowledge base, a finance base, a private sector base and a village development base. Through a bottom-up approach, the project aims at creating functional structures that can be used to leverage government structures and policies. EnDev provided technical and financing support for the installation of mini-hydropower systems (power plants and mini-grids) with capacity in the range of 6 to 30kW in areas distant from the national grid, with in-kind contributions by the local communities. However, EnDev has since pulled out of supporting MHP development in Mozambique.

So far, 15 micro-hydro sites ranging from 15 to 30kWp have been developed in the mountains of Manica province, near the border with Zimbabwe, accounting for a total of 300kWp. Eleven sites were financed by EnDev, and four by the NGO Practical Action with technical assistance from EnDev. In addition, a private entrepreneur has completed a pico-hydro site of 2.5kWp with technical assistance from EnDev.

Additional GMG development in Mozambique has been problematic. The main reasons are:

- The private sector is small and capacities are limited to installation
- Local investors have very limited interest in mini-grids
- Mini-grids are an unknown asset and therefore perceived as risky by financial institutions.

In the absence of an active GMG market, many lodge and hotel operators in the province have self-financed investments in PV-hybrid solutions to meet their energy needs.

Rwanda

The main objectives of the GIZ programme in Rwanda are:

- establishment of a technical assistance facility for the development of micro/mini hydro grids ranging between 200 and 2000kWp, with private companies acting as independent power producers (IPPs);
- implementation of pilot projects in the micro-hydro sector implemented by private firms, through the launching of joint tenders with the national utility; and
- establishment of a results-based financing facility for micro-grids (5 - 50 kWp, minimum 40 customers), in cooperation with EnDev. So far, three hydro power plants have been developed by the private sector, initially as off-grid sites for rural electrification; now all sites have been connected to and are feeding into the main grid. New sites are under development, and tenders have been launched for private sector investors/operators.

EnDev, which is managing the tendering process, is supporting local entrepreneurs with technical assistance and financial incentives of up to 70 percent of investment costs (results-based financing via Urwego Bank). A call for proposals took place at the beginning of 2016 and the applications are currently under evaluation. The quality of proposals for financial support is fairly poor; even though the capacities of the private sector are developing, they are still limited. EnDev is planning to carry out a second call in the coming months.

Uganda

GIZ is financing the development of community-based hydro mini-grids in Uganda, with in-kind contributions from local communities (labour, construction materials). So far, two systems have been completed, with capacities of 40 and 64kWp, respectively.

There are several systems in the country that have been partly financed (mainly the generation assets) by private companies. Several systems have been fully financed by REA.

GIZ is also providing technical assistance to project developers and local authorities in order to enhance the licensing framework and non-financial support to private companies. So far, a vocational training curriculum has been successfully implemented, and 142 instructors from 59 technical institutions have been trained.

GIZ- NIGERIAN ENERGY SUPPORT PROGRAMME (NESP)

The goal of the GIZ programme in Nigeria is the implementation of a rural electrification strategy via decentralised applications, including mini-grids. The programme aims at pursuing an embedded generation approach for mini-grids, and complementing the existing but severely dysfunctional national grid(s) in rural areas through: (a) policy advisory on rural electrification with renewable energy; (b) promotion of innovative technologies; and (c) strengthening of national electrification institutions. NESP's activities are focused around the following topics:

- *Policy reform and on-grid renewable energy.* The programme is supporting implementation of the Electric Power Sector Reform Act, while helping to improve the legal framework for investment in renewable energy. Key stakeholders in the sector are also being supported to coordinate and harmonize their activities.
- *Energy efficiency.* The programme is supporting the design of strategies and standards for energy efficiency in accordance with international best practices, and encouraging implementation via support mechanisms and demonstration projects.
- *Rural electrification and sustainable energy access.* The programme is supporting a standardized approach at the national level to planning and promoting rural electrification. Five federal states are receiving assistance in the production of electrification plans and development of a data management system. The electrification of off-grid villages, social facilities and small businesses will demonstrate how renewable energy can help provide electricity access to rural areas.

- *Capacity development.* The capacity of organisations to deliver training is being strengthened by NESP. The National Power Training Institute of Nigeria (NAPTIN) and other training institutes will be better able to deliver a range of relevant training courses on renewable energy and energy efficiency for engineers, architects and technicians. Interventions will also train selected professionals of partner institutions, and enhance capacities in the power sector as whole.

DFID – GREEN MINI-GRIDS

The UK is providing total support Euro 94.2 million (£75 million) from the International Climate Fund, of which Euro 75.4 million (£60 million) is earmarked to support project preparation and leverage private investment in GMGs in Kenya and Tanzania. The remaining Euro 18.8 million (£15 million) is supporting a regional facility for market preparation and policy development, to prepare for wider scale-up of GMGs across Africa. Funding commenced in 2014 and will run until 2019.

As of late 2016 DFID has launched five main initiatives for GMG support in Africa:

- GMG Kenya
- GMG Tanzania
- GMG Market Development Programme
- SEFA Country Programmes
- ESMAP GMG Knowledge Development

These programmes aim to help transform the GMG sector in Africa from a nascent and sporadic series of pilot projects, to a thriving industry on track to contribute to the International Energy Agency's (IEA's) target of 40 percent of universal electricity access via mini-grids by 2030. This will be achieved by creating a critical mass of experience and evidence of mini-grid success in the first two pilot countries – Kenya and Tanzania – coupled with improved policy and market conditions for investment in mini-grids throughout Africa.

The programmes aim at the following outcomes:

- 135 GMGs installed, generating more than 81GWh/year of electricity from 44MW installed capacity; and providing at least 1.1 million people, enterprises and community service facilities with access to sustainable energy, while reducing or preventing at least 1.05 million tons of CO₂ emissions (mTCO₂e).
- A strengthened GMG sector in East Africa, including at least 500 jobs and at least five leading mini-utilities operating at scale.
- Additional public and private investment in the GMG sector.
- Leveraging of private sector investments in the GMG sector based on DFID investments, and new investment programmes in at least two additional African countries.

These outcomes would be achieved through:

- An increased pipeline of viable GMGs projects, developers and off-takers/communities in Kenya and Tanzania, through the provision of project preparation and transaction advisory support.
- Fully deployed credit lines for GMG projects and end-user finance through national banks in Kenya (e.g., Co-operative Bank of Kenya, CFC Stanbic Bank) and Tanzania (e.g., Tanzania Development Bank).
- Improved market and policy environments for GMGs in at least five additional countries in Africa.

- Evidence, capacity and experience of GMG technologies, business models and policies strengthened at the sectoral/regional level.

IFC – MINI-GRID PROGRAM TO INCREASE ENERGY ACCESS

Tanzania

This recently launched initiative aims to bring affordable, off-grid renewable energy to households and businesses in rural Tanzania. The IFC is working with project developers in Tanzania to promote commercially viable mini-grid business models, and will advise banks and financial institutions on how to extend long-term finance to mini-grid developers. The IFC aims to help develop a robust mini-grid market in Tanzania, which will create investment opportunities in the renewables sector and help fill the country's energy gap. IFC plans to mobilize the financial resources and expertise of the private sector to expand energy services to low-income communities; however, concrete financing remains to be defined.

Nigeria

IFC is sponsoring a USD 10 million debt fund for renewable energy in Nigeria through First City Monument Bank.

THE RENEWABLE ENERGY PERFORMANCE PLATFORM (REPP)

The Renewable Energy Performance Platform (REPP) is a recent initiative, launched in December 2015 that seeks to mobilize private sector development activity and investment in small and medium-scale renewable energy generation projects (up to 25MW) in sub-Saharan Africa. REPP works with financial product and service providers (known as REPP partners) to help bridge the gap between the levelised cost of electricity (LCOE) and the prevailing tariff in each country, by facilitating access to risk mitigation instruments and long-term lending. REPP also provides results-based finance (for example, in the form of top-ups to existing tariffs) where appropriate. Renewable energy technologies that are eligible for support under REPP include onshore wind, solar photovoltaics, concentrated solar power (CSP), geothermal, waste to energy (landfill gas and thermal waste to energy), tidal power, run-of-river hydropower, biomass and biogas. To be eligible for support, project developers must be able to demonstrate significant sustainable development benefits for communities and the host country, as well as contributions to poverty alleviation.

REPP supports early-stage projects and continues to support those projects to financial closing. A developer must demonstrate that the project has already attracted investment but would not reach financial close without the support of the REPP.

For projects of less than 1MW, REPP may aggregate multiple projects to reach the minimum threshold for support. REPP could be interested in GMG projects if they are aggregated. The managing organisation of the REPP Platform is Camco Clean Energy, which also manages the Green Africa Power (GAP) Fund in cooperation with the GreenStream Network Ltd. REPP has initial funding of Euro 60.3 million (£48 million) from the UK Department of Energy and Climate Change through the International Climate Fund, and is supported by the European Investment Bank and UNEP.

WORLD BANK – THE LIBERIA RENEWABLE ENERGY ACCESS PROJECT (LIRENAP)

The World Bank recently approved a financing agreement of USD27 million for the Liberia Renewable Energy Access Project (LIRENAP), which seeks to increase access to affordable and reliable electricity and foster the use of renewable energy sources in Liberia. This agreement comprises a USD25 million grant from the Strategic Climate Fund Scaling-Up Renewable Energy Program and an International Development Association (IDA) credit of USD2 million.

The project seeks to establish a mini hydropower plant to benefit about 50,000 people, as well as small businesses, associations and public institutions in Lofa County through connections to the mini-hydro electric grid. Major towns to benefit from the plant include Voinjama, Foya, Kohalun, Massambolahun/Bolahun and surrounding areas. The project will also provide an additional 100,000 people nationwide with access to stand-alone solar systems and lanterns. The pre-feasibility study of the power plant and the distribution system is currently at the final stage.

LIRENAP will be implemented by the Rural and Renewable Energy Agency (RREA), which will benefit from capacity building under the project. The RREA will coordinate with the Ministry of Lands, Mines and Energy to ensure consistency between the activities financed under this project and policies for decentralized electrification.

AFRICAN RENEWABLE ENERGY FUND (AREF)

AREF invests in development-stage renewable energy assets (small hydro, wind, geothermal, solar, stranded gas and biomass projects) across Sub-Saharan Africa, excluding South Africa. The total size of the fund is about Euro 200 million, with average investments ranging from Euro 10-30 million. AREF partners the African Development Bank, CDC Group, EBID, the Global Energy Efficiency and Renewable Energy Fund (GEEREF), EIB, Entrepreneurial Development Bank of the Netherlands (FMO), Global Environment Fund (GEF), SEFA, West African Development Bank (BOAD), Calvert Investments, and BIO.

Berkeley Energy manages AREF in partnership with Africa Biofuel and Renewable Energy Company (ABREC). Berkeley Energy is an investment manager founded in 2007 to invest private equity in renewable energy infrastructure in developing markets. It has been involved in more than 120 renewable energy and power engineering, construction and investment projects in Africa and Asia.

PRIVATE AND PUBLIC-PRIVATE INITIATIVES

ENERGIAS DE PORTUGAL, S.A. (EDP) – ACCESS TO ENERGY (A2E) PROGRAMME

EDP is partnering with UNEP to implement a demonstration project in remote rural Mozambique. Titimane is a clean energy mini-grid, in which EDP will invest Euro 500,000 in cash. The project will also receive grant funding from the OPEC Fund for International Development (OFID). The financial aid provided by OFID is intended to provide a de-risking mechanism for business ventures to stimulate replication and scaling up. The GMG will be fully operated by EDP, which has already engaged with the mini-grid's future customers to agree on the tariffs necessary to cover the project's investment, depreciation and operation costs, thus demonstrating the commercial viability of the project.

ABSOLUTE ENERGY CAPITAL – RURAL ELECTRIFICATION IN SUB-SAHARAN AFRICA

Absolute Energy Capital (AEC) is an independent investment fund focused on the renewable energy business. The company, headquartered in London, manages its operations in Italy and other European countries through its Rome office, providing specialized technical, legal and financial services across all proven renewable energy technologies. After a strong and rapid development over Europe, AEC is now targeting rural electrification projects in East Africa.

In December 2015, the Fund launched a tender for an Engineering Procurement and Construction (EPC) contract for a solar-PV power generation plant in rural Uganda. The project aims at providing access to clean, reliable and affordable electricity to a community on Kitoboo Island in Lake Victoria through a mini-grid solar PV power plant with a total generation capacity of 235kWp. Solar PV will provide 225kWp, and the remaining capacity will be from a 60kWp diesel generator, which will also serve as a back-up component.

Absolute Energy Capital is also currently in negotiations with Kenyan partners to develop a similar project in Kenya (in over ten sites); and is in the process of identifying future sites in Mozambique and Tanzania. AEC's objective is to become a major rural electrification facility in Africa.

BAMBOO FINANCE – GLOBAL ENERGY FUND - SOLAR FOR ALL

Bamboo Finance is a commercial private equity firm launched in 2007 with the goal of demonstrating that private capital can be profitably deployed as a tool for effective change. It has offices in Luxembourg, Geneva, Bogota, Nairobi and Singapore. It currently manages about Euro 220 million (USD250 million), representing two global funds and a combined portfolio of 46 investments operating in 30 emerging market countries. Bamboo Finance invests in business models that benefit low-income communities in emerging markets, using a market-oriented approach to deliver social and environmental value and provide attractive financial returns to investors. It aims catalyse more than Euro 18 million (USD20 million) in investment for small-scale energy service providers and energy projects in Power Africa countries over the next five years.

Bamboo's Global Energy Fund–Solar for All, a partnership with Ashoka and the Canopus Foundation, invests in companies that provide access to energy in off-grid regions of Sub-Saharan Africa and South/South-East Asia. It plans to invest about 60 percent of its assets in Sub-Saharan Africa, with a focus on Kenya, Tanzania, Uganda, Ethiopia, and Nigeria.

CAPRICORN INVESTMENT GROUP

Capricorn Investment Group is an impact investment firm created in 2000. It has offices in Palo Alto, California and New York. Capricorn manages the assets of the Skoll Foundation with the aim of leveraging market forces to accelerate large-scale impact. The firm invests in public equity, fixed income, private equity, and real assets markets across the globe.

As a partner in the Power Africa Beyond the Grid initiative, Capricorn has committed to investing in companies providing solar power, hybrid power systems, mini-grid installations, energy storage systems, and mini-hydro power systems, in Tanzania, Nigeria and two additional Power Africa countries. Such projects have not yet been realized.

CROSS BOUNDARY ENERGY FUND

The Cross Boundary Energy Fund is the first dedicated investment fund for commercial and industrial solar in Africa. It is a platform for aggregating finance for medium-scale renewable self-generation projects of 0.2MW-10MW that serve commercial customers such as off-grid light manufacturers, cell towers, farms, remote hospitals, eco-lodges and beverage bottlers. The goal of the Fund is to enable the delivery of energy-as-service and unlock the potential for renewable own-generation in Africa. Cross Boundary is a partner of the Power Africa Beyond the Grid initiative.

The Cross Boundary Energy Fund also offers a fully integrated solar power purchase agreement (PPA) product for commercial and industrial customers, and has raised an equity fund to finance these contracts. The Fund is currently exploring opportunities to provide long-term project finance to successful mini-grid developers.

ENERGY ACCESS VENTURE FUND

The Euro 54.5 million Energy Access Venture Fund (EAVF) is a private equity fund launched in 2015 to invest in small and medium enterprises (SMEs) that offer low-carbon and low-cost solutions to rural and peri-urban communities in Sub-Saharan Africa. The aim of the Fund is to provide reliable access to energy for one million low-income households by 2020.

The Fund invests in entrepreneurial businesses that address the lack of electrification in the region with new technology and innovative business models. It focuses specifically on off-grid rural electrification, starting with innovative SMEs involved in providing electricity and related services through off-grid power generation systems (e.g., solar home devices and micro-generation infrastructure), energy distribution and ancillary activities. The Fund will initially concentrate on East Africa (Kenya, Rwanda, Tanzania, Uganda) before expanding to West African countries (Côte d'Ivoire, Ghana, Nigeria and Senegal). Its first investment, of USD 2 million, was in the company Off Grid Electric, which develops and markets affordable solar energy systems in East Africa.

EAVF includes a technical assistance mechanism to help strengthen the companies in which it invests, thereby helping to increase their efficiency and social impact. AFD's Africa fund, FISEA (with PROPARCO as advisor) and the French Facility for Global Environment (FFEM) have allocated Euro 300,000 and Euro 500,000, respectively, to finance the technical assistance facility. This will allow the SMEs in which EAVF invests to receive training and expert advice in key areas such as management, governance, energy efficiency and environmental and social practices.

GUARANTCO

GuarantCo was established to help address constraints in the supply of local financing for infrastructure projects, and support the development of local financial markets. It is managed by Frontier Markets Fund Managers (FMFML), an investment fund sponsored by four European governments (the Netherlands, UK, Sweden and Switzerland), which arranges and structures transactions for GuarantCo and acts as its point of contact.

GuarantCo provides risk mitigation products for local currency loans, with the aim of enhancing debt issued by private, municipal and para-statal entities for infrastructure projects in lower-income countries. Its flexible products include partial credit and partial risk guarantees, first loss guarantees, tenor extension and liquidity guarantees. It can also provide joint guarantees or

counter guarantees as may be required for a particular project. GuarantCo's business model allows for risk transfer through its guarantee rather than following a model more typical of an insurance company, which offers risk mitigation rather than risk transfer.

GuarantCo's partial credit guarantee (in collaboration with other guarantors if required) is offered to the beneficiary or the provider of the debt. It covers the non-payment of scheduled debt service of the underlying loan up to the limit of the guarantee. A recourse agreement can be required between the borrower and GuarantCo to cover, among other provisions, the payment of fees to GuarantCo and the rights and obligations among the borrower, GuarantCo and the beneficiary following a call under the guarantee.

GuarantCo provided a partial credit guarantee of Euro 1.2 million (USD 1.4 million) covering part of the financing for a 1.6MW hybrid solar generation system and associated transmission and distribution systems on Bugala Island in Lake Victoria, Uganda. The guarantee was provided in collaboration with Nedbank Limited, EAIF and USAID (as co-guarantor) in order to increase access to electricity on an island with no operational grid-based electricity supply.

ACUMEN

Acumen was incorporated on April 1, 2001, with seed capital from the Rockefeller Foundation, Cisco Systems Foundation and three individual philanthropists. It raises charitable donations to invest in entrepreneurs who have the capability to bring sustainable solutions to the problem of poverty, in essence functioning as a venture capital fund for the poor. Acumen seeks to bridge the gap between the efficiency and scale of market-based approaches and the social impact of pure philanthropy by providing patient capital to beneficiaries. The provision of long-term capital is accompanied by a wide range of management support services to nurture the entrepreneurial venture to scale. Acumen's aim in investing patient capital is not to seek high returns, but rather to jump-start the creation of enterprises that improve the ability of the poor to live with dignity.

Since 2007, ACUMEN has invested more than Euro 30 million in East Africa, and currently has 23 active investments in the region that are focused on a wide range of sustainable, scalable businesses in energy, agriculture, low-cost housing, health, water and sanitation. These businesses use market-based approaches to deliver products and services to millions of low-income people in both rural and urban communities.

Acumen recently invested about Euro 620,000, together with Persistent Energy Capital, Opes Impact Fund, and Heri Africa, in the Tanzanian solar energy firm Devery, which is developing off-grid solutions for rural Tanzania, including several micro-grid projects.

PERSISTENT ENERGY CAPITAL

Persistent Energy Capital (PEC) was founded in 2012, when it took over the management of the African legacy assets of now-defunct E+Co, a clean energy NGO. PEC is a boutique investment bank with offices in New York and Dar es Salaam. The firm invests in, incubates and builds businesses providing distributed renewable energy to off-grid customers. It also provides financial advisory services to companies and investors; fund management services through its private equity funds; and consulting services to governments and development organisations. PEC has invested in, built and advised businesses with a commercial approach to providing energy services to low-income customers in frontier markets.

PEC is part of the Power Africa Beyond the Grid initiative. Under this commitment, the company intends to invest in and develop distributed energy service companies (DESCOs) that provide access to clean, affordable energy services to low-income, off-grid households and rural entrepreneurs in West and East Africa. Within the solar PV sector, it provides both debt and equity investments in mini-grids and grid-connected solar, with a particular focus on Senegal, Mali, Tanzania, Uganda and Ghana.

PEC's goal is to develop DESCOs that provide one million households and businesses with access to clean, affordable energy services by 2019. It aims to do so by catalysing more than Euro 265 million (USD300 million) in commercial capital for investment in DESCOs over the next five years. The company recently invested, together with Acumen, Opes Impact Fund, and Heri Africa, in the Tanzanian solar energy firm called Devergy, which is developing off-grid solutions for rural Tanzania, including several mini-grid projects.



DEMAND-SIDE ANALYSIS: UNDERSTANDING THE FINANCING NEEDS FOR GMGS

To complement the supply-side analysis in Section 2, a demand-side analysis was conducted to better understand the actual financing needs and demands of GMG project developers and investors.

The demand-side analysis was conducted through direct contacts with GMG developers at different events, meetings and conferences, including:

- The ARE-RECP Off-Grid Investment Forum 2016 in Amsterdam (12-13 April)
- The Action Learning Event 2016 – Upscaling Mini-Grids for Least-Cost and Timely Access to Electricity Services in Nairobi (23-27 May)

In addition, many others stakeholders were consulted through direct meetings in Nairobi (30 May-3 June), as well as through email exchanges and phone calls.

Business investments are typically financed with a combination of debt and equity, and the consultations found that GMG developers attempt to follow this traditional formula, albeit with debt being difficult to obtain and grants occasionally filling that gap. Further, they must meet different requirements for financing capital expenditures (CAPEX) and operating expenditures (OPEX). GMGs developers also face risks – especially currency risk – that greatly affect their financing.

As presented in detail in Section 2 above, there are a number of grant/subsidy facilities available to GMG developers. Offered by a number of bilateral and multilateral development partners (DfID, World Bank, Power Africa, just to name a few), these grants are sometimes managed by national rural energy agencies. GMG developers may look for grants to fund the early stages of project development, such as conducting resource or load assessments, feasibility studies, and environmental and social impact assessments. Developers also acquire grants to finance part of their capital expenditures, although grants for operating expenditures are rare. Results-based financing (RBF) is a form of grant that is paid ex post based on the realization of certain pre-determined targets, such as the number of new connections made by the mini-grid. RBF is especially sought after by GMG developers in order to subsidize or pay for the equipment required for consumer connections, as rural households frequently struggle to pay the real cost of a new power connection.

Although new start-up businesses are typically financed with 30 percent equity and 70 percent commercial debt, debt is almost never available to GMG developers. Debt represents the most important missing link in GMG financing. Commercial banks (and microfinance institutions, MFIs) are understandably wary of investments in GMGs, as margins appear small, payback periods appear long, and the ultimate customers of GMGs are rural communities with limited ability to pay. Further, most GMGs do not benefit from the guaranteed revenue that a power purchase agreement provides to grid-connected power projects.⁷ To some extent and in many cases, grants replace commercial debt in GMG financing. Sometimes export credit is available for the purchase of equipment manufactured in and purchased from a company based in a developed nation; most European countries, Japan, China and the United States governments have programmes that assist their national companies to export equipment by providing debt financing support.

Equity is the greatest source of GMG financing, either self-funded by a GMG developer or from investments by equity investors or funds. Increasingly, forward-thinking investors are convinced that there is an immense untapped rural electrification market; if rural populations in

⁷ PPAs are not always helpful for grid-connected projects, as there is no guarantee that the utility will pay the independent power producer in the manner prescribed by the PPA.

Africa are able to spend hundreds of millions of dollars on cell phones and communications, clearly they would be willing and able to spend similarly on electricity, if it were made available to them. GMG investors believe that the key to realising the potential of this market is to find the appropriate delivery method that ensures payment, and GSM and pre-payment technologies provide equity investors with this assurance. Equity available for GMGs is expected to continue to increase in the short and medium term.

GMG investments typically require both hard (80 percent) and local currencies (20 percent). As much as 80 percent of a GMG investment is made up of capital expenditures (CAPEX), such as solar PV equipment or the civil works of a mini hydropower development. As this equipment is invariably imported into Africa by the GMG developer, the CAPEX investment has to be made in hard currency, usually either in dollars or euros. The grid infrastructure – primarily lines and poles – is also an important part of a GMG’s CAPEX, and some of these grid costs are likely to be payable in local currency. GMGs’ operating expenditures (OPEX) are local and paid in local currency. OPEX costs include transport, personnel and fuel (in the case of diesel hybrid grids).

As noted above, a GMG’s CAPEX has two components: the financing required by the generation part of the project and that required by the power distribution network. Some stakeholders in the GMG community argue that grants should be provided to finance distribution infrastructure, while debt and equity should be mobilized for the generation assets. The reasoning is that some generation assets, such as those based on solar PV, for example, can be packed up and redeployed at an alternative location if necessary, while the distribution infrastructure is less mobile and would result in considerable losses to GMG developers if the main grid arrives. GMG stakeholders also compare GMG projects to grid-connected IPPs, which solely generate power and sell to the utility, without the need to invest in the transmission and distribution network. They argue that, like (other) IPPs, GMGs also should not have to finance the construction of their own distribution network.

An important issue for financiers and investors is the relative riskiness of GMG versus grid-connected projects. While grid-connected projects are more familiar, political and off-taker risks are actually higher for these projects, because they are more reliant on government and parastatal power utilities, which can change abruptly their plans or policies or not honour their obligations.

GMGs, on the other hand, are often in remote rural areas and are dependent on the communities they serve, with far less public sector regulation and involvement than that of grid-connected IPPs. By far the greatest risk facing GMGs is currency fluctuations, especially when the local currency loses a great deal of value relative to the hard currency mobilized for the CAPEX investment. While GMG investments are about 80 percent in hard currency, their revenue is entirely in local currency. If the local currency loses value, servicing the debt or remunerating the equity of a hard currency investment becomes more difficult, stretching out payback periods. From January 2012 to June 2016, the Zambian kwacha, South African rand and Ghanaian cedi all lost more or less 50 percent of their value compared to the US dollar, while the Tanzanian and Ugandan shillings lost nearly 30 percent of their value.

LESSONS LEARNED / UNDERSTANDING THE FINANCING NEEDS OF GMG PROJECT DEVELOPERS

In the context of this study, mini-grid financing was discussed with a number of GMG sector stakeholders, including developers, donors, NGOs, and funds and agencies supporting GMG development.

Energy 4 Impact, a London-based non-profit firm with more than a decade of experience in the Africa energy sector, made the following observations:

- Small (less than 100kWp), medium (100 Wp to 1MW) and large (greater than 1MW) GMGs have different structures and financing needs. Some GMGs are grid connected while others are not. Some generate DC power and others generate AC power, with the latter being more compatible with the main grid.
- There is a big difference between the financing needs of generation and distribution facilities. Generation can be a profitable business and less risky if a reliable power purchase agreement is in place. Distribution in rural areas is usually far more risky and less profitable, since the cost of connecting and providing electricity service to a scattered population does not necessarily match that community's ability to pay. Therefore, it could be logical to expect more subsidized financing for rural GMG distribution than for generation.

Other GMG developers described their operations and financing needs as follows:

Jumeme Rural Power Supply Ltd.

The company was founded in 2014 to develop, build, own and operate rural mini-grids in Tanzania. It is a partnership among INENSUS, TerraProjects (an Austrian company specialising in renewable energy project development) and St. Augustine University of Tanzania.

JUMENE has installed a solar-powered mini-grid on the Lake Victoria island of Ukara. This is the first of 30 mini-grid systems that it plans to install over the next two years. The systems will be predominantly solar PV, with limited diesel generator back-up facilities. The Ukara project had a total budget of Euro 16 million, including co-funding of Euro 7.4 million by the European Commission's ACP-EU Energy Facility. Fifty percent of the project cost was covered through private investment (JUMEME and partners' equity and debt), with the remaining 50 percent financed with a variety of grant awards.

The company's next mini-grid installation, in Bwisya, will supply reliable electricity to around 100,000 people. JUMEME is looking for senior debt for its projects to support further scaling. Additionally, it is seeking instruments to cover foreign exchange risk.

Africa Power Ltd.

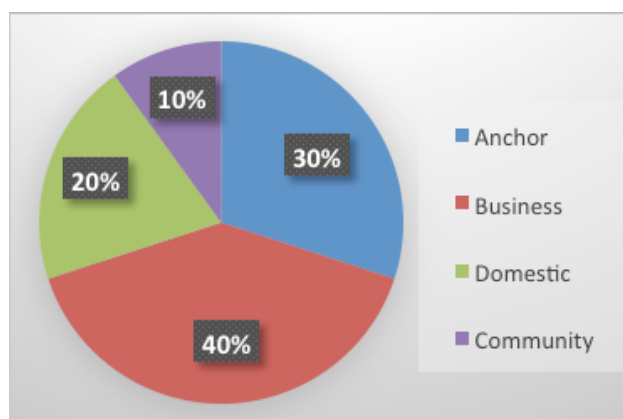
Africa Power is a distributed energy services company (meaning that it sells stand-alone solar PV systems), targeting four types of customers. Building on the well-known "ABC" model, Africa Power follows an "ABCD" approach: Anchor / Business / Community / Domestic. The only difference between this approach and the ABC model is Africa Power's addition of community service clients such as schools, health centres, government offices, and places of worship.

Africa Power does not install distribution lines. All systems are stand-alone solar PV systems with battery storage. The company also sells energy efficient appliances (water pumps, light bulbs, televisions) to end-users. No deposits are required and the company remains the owner of all installed systems, providing power on a prepaid pay-as-you-go (PAYG) basis. Customers may also choose a lease-purchase option on the system.

Africa Power began operating in Uganda and since has expanded to Tanzania and Zambia, where project preparations are well underway. Mozambique, Botswana and Malawi are targeted for the near future.

The ideal customer profile of an Africa Power network is presented in this graph:

- ❖ 30% anchor
- ❖ 40% business
- ❖ 10% community
- ❖ 20% domestic



Africa Power, together with a consortium of companies and organisations in Zambia, has benefitted from grant financing from the Swedish International Development Cooperation Agency (SIDA) under Power Africa's Beyond the Grid component. The Beyond the Grid Fund for Zambia will operate from 2016-2018, with a maximum funding level of Euro 20 million. The Renewable Energy and Efficiency Partnership (REEEP) manages the fund on behalf of the Swedish Embassy and in cooperation with Zambian partners. The grant funding complements USD 3 million in private investment. Operations of the Beyond the Grid Fund are scheduled to begin in 2017.

Africa Power is actively looking for equity investors and debt finance. Because it retains ownership of the majority of its power system assets, it believes that this external financing will help to underpin its own finances and lower the cost of debt.

PowerGen

PowerGen is a mini-grid developer in Kenya that allows customers to make upfront payments for energy consumption via mobile money. Through GSM metering technology, the PowerGen operator is able to switch off energy supply for non-payment.

PowerGen is 50 percent grant financed (primarily from USAID and Power Africa), and 50 percent with private equity. Its principle equity investor is Tomorrow Venture. As a Beyond the Grid partner, PowerGen intends to install more than 2MW of solar, wind, and hybrid projects for off-grid locations in Kenya and Tanzania by 2018. PowerGen is also interested in results-based financing arrangements that provide a bonus for each new connection. The company expects to leverage the revenue stream from future RBF arrangements to mobilize additional equity and debt financing.

MeshPower Ltd.

MeshPower is a private GMG developer active in Rwanda. Its GMG model involves setting up solar panels linked to a secure battery storage unit (called a "base station") in the centre of a village, typically in a customer's home. The customer receives free electricity in return for keeping the equipment safe. Businesses and households within 200 meters of the base station are connected via aerial cabling. MeshPower also installs biomass-based GMGs that are compatible with the main grid, in cases where the grid is expected to arrive in the GMG market area. MeshPower connects entire communities rather than individuals. The pay-as-you-go service model does not require customers to buy their own equipment or commit to expensive contracts. Rather, it gives all community members – not just those who can afford a system installed in their home – the opportunity to buy electricity.

Three MeshPower GMGs have been operating in Tanzania since 2013, and the company has identified 500 additional potential project sites throughout East Africa.

Like PowerGen, MeshPower is 50 percent grant financed (by Rwanda's National Fund for the Environment, FONERWA), with the other 50 percent coming from a variety of equity investors. The company is seeking to diversify its funding sources.

Devergy

Devergy is an energy service company that started operation in Tanzania in 2012 and currently has 12 GMG sites in the country, ranging in size from 1 to 10kWp. Devergy systems combine solar PV with battery storage, and each GMG serves between 50 and 400 customers.

Devergy's GMGs can be considered micro-grids, as they are suitable (at the low end) only for households that use one light bulb for a few hours a day, or have a television and a few phones to charge; or (at the higher end) for a business that uses energy-efficient refrigerators 24 hours a day. After a one-time payment for the Devergy meter, customers pre-pay for their energy bundles via mobile money or in person at the village store.

Devergy is financed by grants from the Energy and Environment Partnership (EEP) and the African Enterprise Challenge Fund (AECF), which together have provided 30 percent of Devergy's investment to date. The remaining 70 percent comes from investor equity.

Devergy's principal financial need is for CAPEX, to enable its current pace of expansion. It is seeking commercial debt finance, and is working to build the required track record to prove its bankability. The company is also seeking the support of a credit guarantee facility to help mobilise bank credit. The CEO of Devergy believes that banks need training in order to understand distributed energy power projects.

ANALYSIS OF GMG CASE STUDIES

As part of this study, specific case studies were conducted to provide the SE4All team with a more detailed and comprehensive view of the financing needs of GMG developers. The cases were selected based on the following criteria:

- Geography
- Technology
- Grid connection
- Size
- Type of business/financing model

Given these criteria, it was determined that the case studies would cover:

- East Africa, Central and West Africa
- Solar PV, hydropower and biomass
- Isolated mini-grids and mini-grids connected with a main grid
- GMG sizes ranging from kilowatts to megawatts

The five selected case studies are listed below, and are elaborated in a separate AfDB-SE4All report.⁸

- Burkina Faso – Sinco (Ziga), Solar PV, 69 kWp
- Cameroon – IED Invest (Mbakaou), Small Hydropower, 1.4 MW
- Mali – ACCESS (Bancoumana), Hybrid PV-Diesel, 33 kWp

⁸ Market study on available financial instruments in support of GMGs and assessment of GMG developer needs: Case Studies Report (Confidential), September 2016.

- Rwanda – ENNy (Mazimeru), Small Hydropower, 500 kW
- Uganda – Pamoja Energy Ltd., Biomass, 32 kW

The key findings of the case studies are summarized below.

KEY ISSUES IN GMG DEVELOPMENT

REGULATORY ASPECTS / ENABLING ENVIRONMENT

Although the purpose of the case studies was to look at the financing needs of GMG developers, the developers interviewed for the study pointed to other, more critical obstacles to GMG development. These are (a) the lack of an enabling environment for private sector development; (b) the lack of qualified human resources; and (c) an uncertain institutional and regulatory framework, particularly the absence of clear rules in the event of grid arrival, and their inability to set cost-reflective tariffs to cover their operational costs. Addressing these structural constraints to GMG development is a precondition for developers being able to access affordable, long-term finance.

ACCESS TO GRANT FUNDING FOR EARLY STAGE

Project developers noted the need for early stage grant funding for feasibility studies and preparatory costs. They also said that that grant funding for distribution networks is a critical component of GMG financing models, especially with regard to connection costs and internal wiring. In the absence of grant funding to cover at least some of the CAPEX for the distribution network, it may be difficult for GMGs to cover loan repayments and/or deliver a reasonable return on equity investment (especially in the first phases of the project). Some mentioned that results-based financing which rewarded the number of connections could help to finance the distribution network.

EQUITY TO STRENGTHEN THE DEVELOPER CAPACITY

In all cases, the GMG developers said that they aim for commercial viability and seek partnerships with equity investors. They noted, however, that venture capitalists often expect unrealistic returns on their investment. Another obstacle is the lack of working capital for the project identification and design phase. The difficulty of obtaining early phase capital from commercial banks leads developers, particularly those without a track record and/or collateral, to cover working capital needs with expensive equity investments.

It is clear from these cases that strategic equity investors are required for the emerging GMG market in Africa. With such patient investors, the market could begin to develop much more rapidly than it has in the past.

DEBT TO LOWER THE COST OF FINANCING

If a project relies too much equity and its equity ratio is high, project viability suffers because private equity funds commonly expect at least a 15 percent return on investment. Ideally, developers would like to achieve a high debt-to-equity ratio, with the debt at a low rate of interest (<10 percent), denominated in local currencies, and with long tenors (>10 years). Given an appropriate credit facility for GMGs, many developers are willing to take loans for as much as USD 10 million.

Developers are also increasingly recognizing the need to aggregate several mini-grid projects together into one portfolio, since larger projects (> 5MW) provide greater assurances to financiers.

SECURISATION AND RISK MITIGATION

GMG developers perceive foreign exchange risk as the most important financing risk, and would like to see solutions incorporated into the design of long-term financing and risk-sharing mechanisms. They also noted that political risks add another level of complexity to business-related risks in some African countries. Solutions could include partial guarantee mechanisms through funding provided by the donor community. These mechanisms could be triggered by events such as political instability, lack of or inability to access the renewable energy resource, or grid arrival where compensation is not mandated by national regulations.

NEXT STEPS

Following the delivery of this report (and a separate confidential case studies report), one more deliverable remains. That deliverable, the D2 Report, will provide recommendations relative to GMG financing instruments that the Green Mini-Grids Market Development Programme could potentially provide.

CONCEPTUALISATION OF AN INSTRUMENT TO FACILITATE GMG FINANCING

The final goal of the three Market Development Studies is to propose options for the design of a financing facilitation instrument adapted to the needs of the GMG market in Africa. During preparation of the final study, the consultant will consider, based on learning from the first two studies, how various aspects of GMG investments have been financed, and where developers may have encountered difficulties.⁹ In particular, the D2 report will consider the following funding modalities:

- Ratio debt/equity
- Use of mezzanine financing
- Loan characteristics (e.g., tenor, interest rate, grace period)
- Loan currency
- Loan cost (upfront fee, commitment fee)
- Financing for feasibility studies
- Subsidies received
- Guarantees, collateral, other risk mitigation mechanisms
- Other

The D2 report will consider these aspects for various parts of the investment (generation, distribution, feasibility studies, instrumentation and monitoring). It will also analyse funding for each of these aspects in light of the:

- Nature of the project sponsor
- Type of project
- Type of technology involved
- Country context
- Source of financing (local banks, investors, international donors)

⁹ As private developers may not have been willing to provide all necessary information for the case studies, some of this information may be incomplete.

Finally, the D2 report will consider ideas for effective GMG funding mechanisms that have emerged from recent donor events and conferences.

Depending on the outcome of the analysis, the D2 report may include either specific financial instruments, such as (a) dedicated credit lines granted by the AfDB to local banks or developers; or (b) more business-oriented approaches such as framework agreements with project sponsors or investors for the bundling of a number of small investments; or (c) a combination of similar products to be further elaborated. The study will also explore the possible positive impact of longer loan maturities; of granting of such loans in local rather than international currency; and/or of integrating risk mitigation mechanisms (e.g., first loss or partial risk guarantee) into a new type of risk-protected loan product.

LIST OF ORGANISATIONS CONTACTED

Support providers

PUBLIC:

- European Union (EU Energy Initiative Partnership Dialogue Facility (EUEI PDF) / Electrification Financing Initiative)
- The UK's Department for International Development (DFID)
- Agence Française de Développement (AFD)
- Fonds Français pour l'Environnement (FFEM)
- The Sustainable Energy Fund for Africa (SEFA) – Secretariat
- Alliance for Rural Electrification (ARE)
- Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- International Renewable Energy Agency (IRENA)
- World Bank – SE4ALL
- Energy 4 Impact (formerly GVEP International)
- Foundation Rural Energy Services (FRES)
- ECOWAS Center for Renewable Energy and Energy Efficiency (ECREE)
- Energising Development (EnDev)
- Netherlands Development Organisation (SNV)
- REPP Platform
- EU-Africa Infrastructure Trust Fund
- United Nations Environment Programme Finance Initiative (UNEP FI)

PRIVATE:

- Absolute Energy Capital
- Energias de Portugal (EDP)
- The Renewable Energy Performance Platform
- Green Energy Power
- Accenture
- Energy Access Venture
- Bloomberg New Energy Finance
- Energy 4 Impact

Implementation agencies at national level

National agencies in charge of rural electrification and/or renewable energy and, more broadly, the members of the Club-ER. Among all of Club-ER's members, the following were interviewed:

- Agence Béninoise d'Electrification Rurale et de Maîtrise de l'Energie (ABERME) - Agency for rural electrification and energy management
- Fonds de Développement de l'Electrification (Burkina Faso) - electrification development fund
- Agence d'Electrification Rurale (Cameroon) - Rural Electrification Agency
- Agence Nationale d'Electrification Rurale (Congo B) National Rural Electrification Agency
- Fonds de Développement du Secteur de l'Electricité (Congo B) electrification development fund
- Direction Générale de l'Energie (Ivory Coast) Directorate General for Energy
- CI-ENERGIES (Ivory Coast)

- Bureau de l'Electrification Rurale Décentralisée (BERD/Guinée) – Bureau of rural decentralized electrification
- Rural Electrification Authority (REA) Kenya
- Agence de Développement de l'Electrification Rurale (Mauritania) Rural Electrification Development Agency
- Agence Malienne pour le Développement de l'Energie Domestique et l'Electrification Rurale (Mali) - Malian Agency for the Development of Domestic Energy and Rural Electrification
- Cellule d'Electrification Rurale (Niger) – Rural Electrification Unit
- Rural Electrification Agency of Nigeria (REA)
- Commission Nationale de l'Energie (RD Congo) – National Energy Committee
- Ministry of Infrastructure (Rwanda)
- Energy, Water and Sanitation Authority (Rwanda)
- Agence Sénégalaise d'Electrification Rurale (ASER) – Senegalese Agency for Rural Electrification
- Rural Energy Agency (Tanzania)
- Rural Electrification Agency (Uganda)
- Rural Electrification Authority (Zambia)

Project developers

Operators / developers of GMG projects in Africa that could also be surveyed for case studies:

- Inensus (Tanzania / Senegal)
- Pamoja Energy Ltd (Uganda)
- Rift Valley Energy (Tanzania)
- Energie Nyaruguru (Rwanda)
- IED Invest (Cameroon)
- Sinco (Burkina Faso)
- ACCESS (Mali)