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Report No: PAD2635

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR 107.9 MILLION

(US$150 MILLION EQUIVALENT)

TO THE

REPUBLIC OF MADAGASCAR

FOR THE

LEAST-COST ELECTRICITY ACCESS DEVELOPMENT (LEAD) PROJECT

February 6, 2019

Energy and Extractives Global Practice
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective December 31, 2018)

Currency Unit	=	Malagasy Ariary (MGA)
MGA 3,490	=	US$1
US$1	=	SDR 0.71901581

FISCAL YEAR
January 1–December 31

ABBREVIATIONS AND ACRONYMS

ADER	Rural Electrification Agency (*Agence de Développement de l'Electrification Rurale*)
AfDB	African Development Bank
ARELEC	Electricity Sector Regulator (*Autorité de Regulation de l'Electricité*)
ASA	Advisory Services and Analytics
BNM	Bureau of Standards of Madagascar *(Bureau des Normes de Madagascar)*
CPF	Country Partnership Framework
CSB	Basic Health Centers *(Centre de Santé de Base)*
CSBF	Banking and Financial Supervision Commission *(Commission de Supervision Bancaire et Financière)*
DC	Direct Current
DPO	Development Policy Operation
EHS	Environmental, Health and Safety
EIPM	Malaria Indicator Survey *(Enquête sur les Indicateurs du Paludisme)*
EIRR	Economic Internal Rate of Return
ESIA	Environmental and Social Impact Assessment
ESMAP	Energy Sector Management Assistance Program
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESOGIP	Electricity Sector Operations and Governance Improvement Project
FIP	Financial Inclusion Project
FIRR	Financial Internal Rate of Return
FM	Financial Management
FNE	National Fund for Electricity *(Fonds National de l'Electricité)*
FNED	National Sustainable Energy Fund *(Fonds National de l'Énergie Durable)*
FOREX	Foreign Exchange
FY	Fiscal Year
GBV	Gender-based Violence
GDA	Grid Densification Account
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
GIZ	German Agency for International Cooperation (*Deutsche Gesellschaft für Internationale Zusammenarbeit*)

GoM	Government of Madagascar
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
GSM	Global System for Mobile Communication
IDA	International Development Association
IPF	Investment Project Financing
IPP	Independent Power Producer
IVA	Independent Verification Agent
JIRAMA	Madagascar's Electricity and Water Utility (*Jiro sy Rano Malagasy*)
KTH	Royal Institute of Technology *(Kungliga Tekniska Högskolan)*
kWh	Kilowatt Hour
LEAD	Least-Cost Electricity Access Development Project
LMCP	Last Mile Connectivity Program
LV	Low Voltage
M&E	Monitoring and Evaluation
MGA	Malagasy Ariary
MEH	Ministry of Energy and Hydrocarbons (*Ministère de l'Energie et des Hydrocarbures*)
MFD	Maximizing Financing for Development
MFI	Microfinance Institution
MTF	Medium-term Framework
MV	Medium Voltage
NDC	Nationally Determined Contribution
NDP	National Development Plan
NEIP	National Electrification Investment Plan
NEP	New Energy Policy
NES	National Electrification Strategy
NGO	Nongovernmental Organization
NPV	Net Present Value
O&M	Operation and Maintenance
OGS	Off-grid Solar
OMDF	Off-grid Market Development Fund
PAYGO	Pay-as-you-go
PCB	Polychlorierte Biphenyle
PDMC	Least-cost Development Plan *(Plan de Développement à Moindre Coût)*
PDO	Project Development Objective
PEFA	Public Expenditure and Financial Accountability
PIU	Project Implementation Unit
POM	Project Operations Manual
PPCU	Planning and Program Coordination Unit
PPSD	Project Procurement Strategy for Development
PV	Photovoltaic
RAP	Resettlement Action Plan
RBF	Results-based Financing
RPF	Resettlement Policy Framework
SCD	Systematic Country Diagnostic
SDG	Sustainable Development Goal

SEA	Sexual Exploitation and Abuse
SHS	Solar Home System
SMEs	Small and Medium Enterprises
STEP	Systematic Tracking of Exchanges in Procurement
ToR	Terms of Reference
UN	United Nations
VAT	Value Added Tax

Regional Vice President: Hafez Ghanem

Country Director: Mark R. Lundell

Senior Global Practice Director: Riccardo Puliti

Practice Manager: Sudeshna Ghosh Banerjee

Task Team Leaders: Jan Kappen, Joern Huenteler

TABLE OF CONTENTS

DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Madagascar	Madagascar - Least-Cost Electricity Access Development Project - LEAD	
Project ID	**Financing Instrument**	**Environmental Assessment Category**
P163870	Investment Project Financing	B-Partial Assessment

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Disbursement-linked Indicators (DLIs)	[ ] Small State(s)
[✓] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	

Expected Approval Date	Expected Closing Date
01-Mar-2019	30-Jun-2024

Bank/IFC Collaboration

No

Proposed Development Objective(s)

The Project Development Objective is to increase access to electricity services for households, enterprises, and health facilities in Madagascar.

Components

Component Name	Cost (US$, millions)
Grid Electrification	80.00
Off-grid Electrification	55.00
Technical Assistance and Project Implementation Support	15.00

Organizations

Borrower:	REPUBLIC OF MADAGASCAR
Implementing Agency:	JIRAMA Ministère de l'Eau, de l'Energie et des Hydrocarbures

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	150.00
Total Financing	150.00
of which IBRD/IDA	150.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Development Association (IDA)	150.00
IDA Credit	150.00

IDA Resources (in US$, Millions)

	Credit Amount	Grant Amount	Guarantee Amount	Total Amount
National PBA	150.00	0.00	0.00	150.00
Total	**150.00**	**0.00**	**0.00**	**150.00**

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2019	2020	2021	2022	2023	2024
Annual	1.07	9.85	14.87	27.50	43.46	53.25
Cumulative	1.07	10.92	25.80	53.29	96.75	150.00

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?	
a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF	Yes
b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment	Yes
c. Include Indicators in results framework to monitor outcomes from actions identified in (b)	Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	High
2. Macroeconomic	Substantial
3. Sector Strategies and Policies	High
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Substantial

8. Stakeholders	Substantial
9. Other	Moderate
10. Overall	High

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04		✓
Forests OP/BP 4.36		✓
Pest Management OP 4.09		✓
Physical Cultural Resources OP/BP 4.11	✓	
Indigenous Peoples OP/BP 4.10		✓
Involuntary Resettlement OP/BP 4.12	✓	
Safety of Dams OP/BP 4.37		✓
Projects on International Waterways OP/BP 7.50		✓
Projects in Disputed Areas OP/BP 7.60		✓

Legal Covenants

Sections and Description

FA, Schedule 2, Section I, A, 5: The Recipient shall, not later than three (3) months from the Effective Date, appoint an independent verification agent, with qualifications, experience and under terms of reference acceptable to the Association.

Sections and Description

FA, Schedule 2, Section I, E, 4a: The Recipient shall, and shall cause JIRAMA and/or any pertinent Project service providers, at all times throughout the period of Project implementation to take all measures necessary on its part to collect, compile, and furnish to the Association through Project Reports, and promptly in a separate report or reports, if so requested by the Association, information on the status of compliance with the ESMF and RPF and the management tools and instruments referred to therein, all such reports in form and substance acceptable to the Association, setting out, among other things: (i) the status of implementation of the ESMF/RPF; (ii) conditions, if any, which interfere or threaten to interfere with the implementation of the ESMF/RPF; and (iii) corrective and preventive measures taken or required to be taken to address such conditions.

Sections and Description

FA, Schedule 2, Section II: The Recipient shall furnish to the Association each Project Report not later than one month after the end of each calendar semester, covering the calendar semester.

Conditions

Type	Description
Disbursement	FA, Schedule 2, Section III, B, 1b: No withdrawal shall be made under Category 1, unless and until JIRAMA shall have prepared and, thereafter, the Recipient and JIRAMA shall have adopted a new national connection policy, in form and substance satisfactory to the Association.
Disbursement	FA, Schedule 2, Section III, B, 1c: No withdrawal shall be made under Category 3, unless and until an independent Fund Manager is selected and appointed as provided in Section I.A.6 of this Schedule.
Effectiveness	The Subsidiary Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Recipient to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled.
Effectiveness	The Project Operations Manual has been adopted by the Recipient and JIRAMA, in form and substance acceptable to the Association.

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
Jan Friedrich Kappen	Team Leader (ADM Responsible)	Senior Energy Specialist	GEE01
Joern Torsten Huenteler	Team Leader (ASM Responsible)	Energy Specialist	GEE01
Sylvain Auguste Rambeloson	Procurement Specialist (ADM Responsible)	Senior Procurement Specialist	GGOPF
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David Loew	Team Member	Young Professional	GEE01
Ewa Katarzyna Klimowicz	Team Member	Consultant	GEE07
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Rhonda Lenai Jordan Antoine	Team Member	Energy Specialist	GEE01
Sofia De Abreu Ferreira	Team Member	Senior Counsel	LEGEN

I. STRATEGIC CONTEXT

A. Country Context

1. **Development in Madagascar, a low-income country of 25 million people with a gross domestic product (GDP) of about US$10 billion (2017), has been on a downward trajectory for decades.** As of 2012, approximately four-fifths of Malagasy live in extreme poverty, while over 90 percent live under the general poverty line, defined as per capita purchasing power of under US$1.90 and US$3.10 per day, respectively. The average Malagasy is 42 percent poorer today than he/she was in 1960,[1] the year of Madagascar's independence. According to the Human Capital Index[2], a child born in Madagascar today will be 37 percent as productive when she grows up as she could be if she had enjoyed complete education and full health. Madagascar is also highly vulnerable to natural disasters, including cyclones, droughts, and flooding. Madagascar's challenging topography, mostly characterized by thin coastlines separated by a rugged high plateau cut by deep gorges and waterfalls, complicates the establishment of regional transport infrastructure and interconnected power grids.

2. **The country's development vision, laid out in the National Development Plan (NDP) 2015–2019, is aligned with the multidimensional approach to development set out in the United Nations (UN) Sustainable Development Goals (SDGs).** National reconciliation, reinforcement of democratic institutions, and better management of the economy are the NDP's high-level objectives for 2019. The presidential election held at the end of 2018, the results of which appear clear and accepted, marks significant progress towards these objectives. Further progress will depend on reinforcing the rule of law, improving governance (including at the local level), ensuring a stable macroeconomic framework, promoting inclusive growth in combination with poverty reduction, investing in human capital, and valorizing the natural resources of the country. Mining, tourism, agriculture, and fisheries, supported by comprehensive infrastructure development, are identified as the key productive sectors expected to fuel growth with spillovers for the overall economy. The NDP is the Government's medium-term planning tool to progress on the overarching ambition of the General Policy of the State (*Politique Générale de l'Etat*) to transform Madagascar into a modern and prosperous nation, characterized by sound governance, strong and stable growth, and wide access to high-quality public services.

3. **Madagascar's fiscal space to achieve its development objectives is compromised by subsidies to state-owned enterprises, including in the power sector.** Tax revenue, as a share of GDP, has historically been among the lowest in the world, with a low point of 9.9 percent of GDP in 2014 and reaching a projected 12.1 percent in 2018 after three years of reform efforts. Strategies for increasing tax revenue have been elaborated and efforts are under way, but they have yet to produce concrete results. Furthermore, the Government still allocates a large share of discretionary spending to unaffordable and poorly targeted fuel subsidies and transfers (estimated at 4.1 percent of GDP in 2017), mostly to finance the losses of troubled state-owned companies including, most importantly, Madagascar's Electricity and Water Utility (*Jiro sy Rano Malagasy*, JIRAMA), the public water and electricity utility (estimated at 1.2 percent of GDP in 2017). The constraints of the Government's fiscal space in combination with legacy

[1] Measured in real GDP per capita. Only the Democratic Republic of Congo and Liberia fared worse than Madagascar over 1960–2010.
[2] Madagascar ranks 140 out of 157 economies.

distortions from the transition period continue to limit the administration's margin of maneuver for infrastructure investment, particularly in the power sector.

B. Sectoral and Institutional Context

4. **Public electricity service in Madagascar is provided by JIRAMA, a vertically integrated state-owned utility that operates most of the country's grid infrastructure.** Grid-based electricity in three larger networks covering the major urban centers of Antananarivo, Toamasina, and Fianarantsoa is provided by JIRAMA, which is responsible for distribution, transmission, and roughly half of generation. JIRAMA also owns and operates (along with the Rural Electrification Agency [*Agence de Développement de l'Electrification Rurale*, ADER]) about 130 isolated mini-grids. The Ministry of Energy and Hydrocarbons (*Ministère de l'Eau, de l'Energie et des Hydrocarbures*, MEH) sets government policy and provides strategic coordination of the energy sector and oversight of JIRAMA's electricity sector activities. The Electricity Sector Regulator (*Autorité de Regulation de l'Electricité*, ARELEC) regulates tariffs and market entry. ADER is responsible for rural electrification through grid extension and/or off-grid and mini-grid systems. Other important sector agents include private companies that supply power to JIRAMA under independent power producer (IPP) and rental power arrangements. The current legal and regulatory framework of the sector was developed in the last decade, starting with the Electricity Law of 2000 and its regulations, which provided for private investment in the sector.

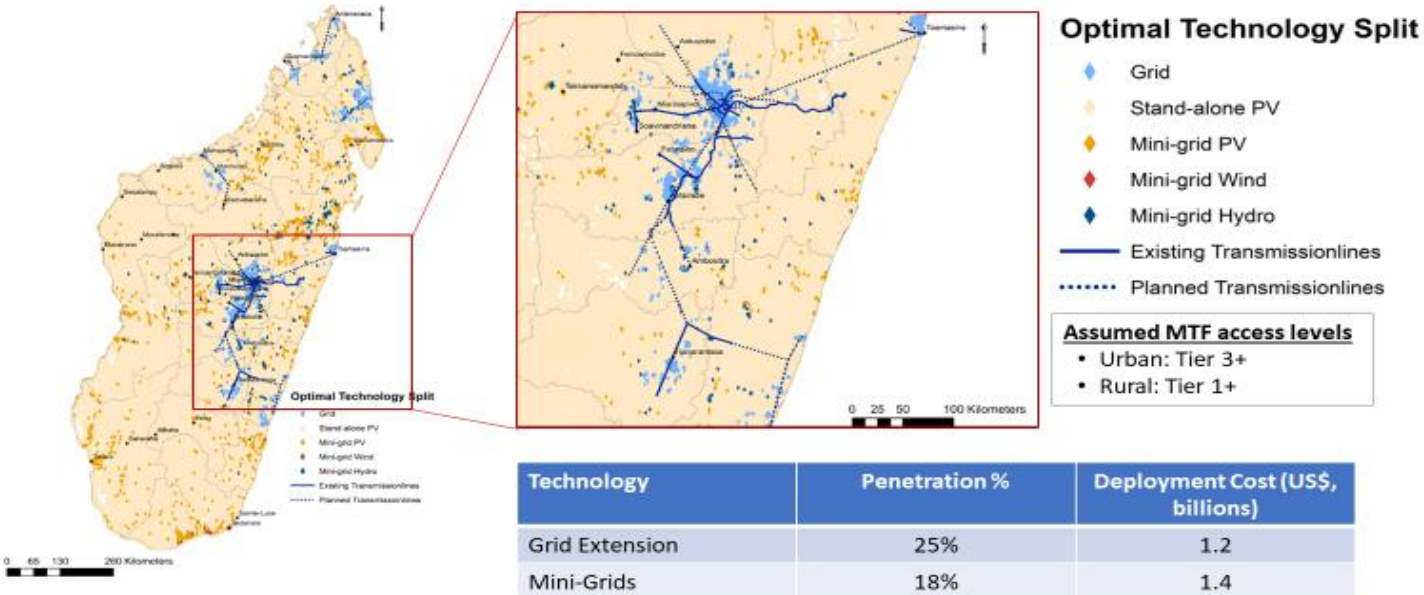
5. **The Government of Madagascar's (GoM) electrification agenda is laid out in the 2015 New Energy Policy (NEP 2015-2030), which aims to raise electrification to at least 70 percent by 2030 and make progress towards SDG7[3] through both grid and off-grid solutions.** The GoM's new electrification policy framework under the NEP is underpinned by three principles: (a) 'Least-cost'—the electrification of specific sites and localities based on the most economical technology option for providing the needed minimum service level and resulting economic benefits; (b) 'Grid-based renewable energy solutions'—the prioritization of grid-based renewable energy solutions; (c) 'Social justice'—introduction of the notion of 'modern lighting solutions' (i.e., energy-efficient electricity-based lighting as opposed to kerosene lamps or candles) as economically and financially viable means to accelerate efforts to reduce inequality and close the persistent gap between urban and rural electricity services. In terms of grid access, the project follows a least-cost approach guided by geospatial analysis to maximize the number of new connections.[4] The GoM acknowledges that this approach will necessarily involve the large-scale deployment of off-grid solutions to serve the millions of households residing in large areas of the country that will likely remain beyond the technical and economic reach of both national grid and mini-grid schemes.

6. **In line with the NEP, the recently approved National Electrification Strategy (NES 2015-2030), puts a strong emphasis on expanding off-grid electrification technologies.** Supported by the IDA-funded "Electricity Sector Operations and Governance Improvement Project" (ESOGIP, P151785), the recently approved NES defines the key technical, financial, and institutional parameters of the GoM's electrification approach. In line with the directives of the NEP, the NES attributes a strong priority to

[3] https://sustainabledevelopment.un.org/sdg7.
[4] Achieving SDG7 (universal access to electricity) by 2030 requires a dramatic increase in the number of new connections per year (an average of 420,000 new connections added per year through 2030). By comparison, over the past decade, JIRAMA has never managed to connect more than 20,000 new customers. These numbers illustrate the need for a profound paradigm shift in the way electrification efforts are planned and implemented.

support the development of rural growth poles and lays out a least-cost electrification strategy that relies significantly on off-grid technologies.

Figure 1. Results of 2030 Geospatial Least-cost Electrification Analysis



Technology	Penetration %	Deployment Cost (US$, billions)
Grid Extension	25%	1.2
Mini-Grids	18%	1.4
Stand-alone Solar	58%	0.6

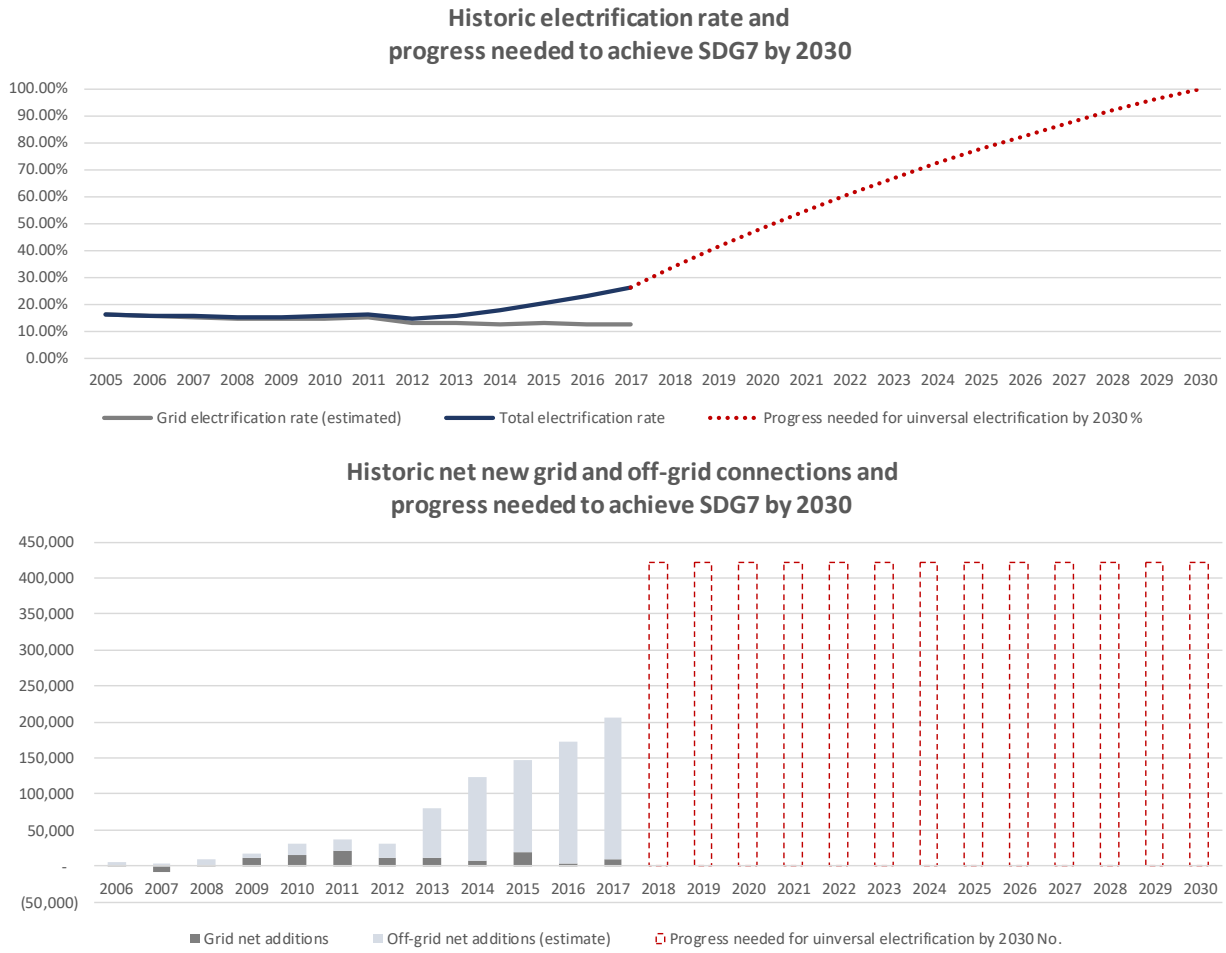
Source: KTH (2018).

7. **Geospatial analytics are being used to maximize the contribution of different supply technologies to expand electricity access.** Supported by the World Bank, the deployment of geographic information system (GIS) planning tools has enabled the identification of least-cost technology solutions for electrification based on the location of demand centers. The GIS tools determine how to optimally expand the electrical grid while identifying potential locations for economically viable mini-grid sites and suggesting priority focus areas for private sector stand-alone solar companies. A country-wide high-level geospatial analysis identifying optimal technologies for different regions has already been performed by the Royal Institute of Technology (*Kungliga Tekniska Högskolan*, KTH).

8. **The preliminary geospatial analysis shows that optimally, about 75 percent of new connections under the NEP should be provided through the large-scale deployment of off-grid technologies.** Total Investments would amount to US$2 billion mostly in mini-grids and stand-alone solar devices (see Figure 1). Interestingly, diesel-powered mini-grids, with their high operating costs, are completely absent in the least-cost scenario for 2030 while grid-based electrification plays a secondary role with only 25 percent of new connections or a total investment of US$1.2 billion by 2030. Nonetheless, grid connections constitute the least-cost solution in the central and northern parts of the country due to the existence of basic grid infrastructure in the Antananarivo, Fianarantsoa, and Toamasina central areas and the ongoing expansion of the northern grids including Mahajanga, Antsiranana, Nosy Be, and Sambava. A more detailed follow-up study, which will allow for planning and prioritization of specific grid extension projects, is currently under preparation. The third is an off-grid market assessment study. Supported by the World Bank, this study mapped out areas that could be served by off-grid solutions; estimated the size of the potential commercial off-grid market through countrywide household and small and medium enterprises (SMEs)

surveying; took stock of electricity access and energy needs in social institutions (for example, schools and clinics); identified barriers/risks across the local off-grid solar (OGS) value chain; and reviewed the regulatory structure as it pertains to the products and range of distribution models.

Figure 2. Historic Progress in Electrification in Madagascar and Future Progress Needed to Achieve SDG7 (Universal Access to Electricity) by 2030



Source: World Bank staff estimates based on data through 2017 from JIRAMA, ARELEC, UN COMTRADE and the National Institute of Statistics (Institut National de la Statistique).

9. **Stand-alone OGS systems, distributed and operated by the private sector, have started filling the service gap left by the slow expansion of public electricity service in Madagascar and are now estimated to already serve almost as many households as the grid.** Household surveys conducted as part of the Malaria Indicator Survey *(Enquête sur les Indicateurs du Paludisme*, EIPM) suggest that about 10 percent of the population, or around 560,000 households, had access to electricity through off-grid energy systems in 2016. The survey data show a recent uptick in self-reported access to electricity from 12.9 percent to 22.9 percent between 2013 and 2016 (when the most recent EIPM was conducted), especially in rural areas, while the rate of grid-based access declined slightly between 2011 and 2016. This development is consistent with what has been observed throughout East Africa, where increasingly

affordable household off-grid systems became available over the past decade. The market study completed as part of the preparation of this project estimated that around 830,000 solar systems have been sold in Madagascar to date, which appears consistent with EIPM data, especially if continued growth after 2016 is assumed. However, quality and after-sales service of the market are still underdeveloped, and the footprint of OGS providers in remote areas of the country is extremely limited (most systems are sold to higher-income households in cities and rural towns). The market study has also shown that given the consumption patterns and willingness to pay of the overwhelming majority of rural Malagasy households, the current off-grid technology including Pico Solar and solar home systems (SHSs) can provide the same or better electricity service quality than mini-grids or grid connections at a fraction of the cost.

10. **Targeted government support under the proposed project will be critical to generate momentum in the high-quality OGS market and overcome market failures relating to product quality and access to consumer finance.** The market study identified that low-quality imitation products are undermining consumer confidence. At appraisal, only two businesses were identified as consistently selling Lighting Global-verified[5] products, Baobab+ and HERi. Baobab+ grew out of Microcred, a pan-African microfinance institution (MFI) headquartered in France and offers Tier 1 Greenlight Planet Sun King systems to consumers on a pay-as-you-go (PAYGO) basis in multiple francophone African countries. HERi operates a micro-franchise kiosk model, in which local women entrepreneurs run solar-powered community kiosks that offer lanterns and small SHSs on a rental basis—it is also preparing to launch PAYGO sales of pico-photovoltaic (PV) products. In parallel, the mobile telecom operator, Orange, has launched a pilot offering *d.light* SHSs on a rental basis (that is, the 'solar as a service' model), and its primary competitor, Telma, is considering entering the market through a PAYGO approach. In cooperation with local microfinance providers, both operators plan to drive sales through their own mobile money-based payment and consumer financing platforms. The market study identified several critical market failures that constrain growth in the off-grid solar market, including on the demand-side—low purchasing power among consumers, exacerbated by the limited availability of consumer finance, and limited consumer awareness—and on the supply-side, including lack of access to SMEs finance for solar distributors, high costs of rural distribution due to Madagascar's large size, low population density, and poor transport infrastructure, inconsistent application of value-added tax (VAT) exemption incentives for solar products, lack of differentiation of fiscal incentives between low- and high-quality products and the lack of local human capital to fill management and key technical positions.

11. **The potential for cost-effective grid-electrification is highest in urban and peri-urban areas, where over half of the population is without electricity access despite their relative proximity to the grid.** Grid connections in urban and peri-urban areas can be achieved at a comparatively low cost per connection through grid 'densification'. However, progress in densifying and regularizing urban and peri-urban connections has been slow to date, and Malagasy electrification programs have mostly focused on grid extension to rural areas, leaving out opportunities for increasing access in already electrified communities. Several factors continue to impede the growth of urban and peri-urban grid connections, including the following:

[5] Lighting Global is the World Bank Group's platform to support sustainable growth of the global off-grid lighting market (https://www.lightingglobal.org/). Lighting Global maintains quality standards that set a baseline level of quality, durability, and truth in advertising to protect consumers. Meeting the standards is a requirement for participation in Lighting Global support programs.

- **Low consumer affordability.** JIRAMA currently passes on the full cost of connection to its consumers, including wiring, meters, labor, and the construction of new poles where necessary. These costs range from US$240 to US$420 per connection in urban and peri-urban areas. Many unelectrified urban and peri-urban consumers—who tend to be poorer than existing connected consumers—are unable to afford this cost.

- **Limited financial incentive for JIRAMA to connect previously unconnected households.** For residential connections, which consume an average of around 85 kWh per month, JIRAMA currently incurs an average loss of US$0.065 per kWh sold or an estimated deficit of around US$65 per connection per year against marginal cost. Because each new residential connection further exacerbates JIRAMA's already precarious financial position, JIRAMA has little incentive to add large numbers of mostly low-consumption, low-tariff urban and peri-urban consumers.

- **Limited financial incentive for JIRAMA to regularize households that share connections.** Many urban and peri-urban consumers are connected to local 'meter lords', who possess a regular JIRAMA connection and on-sell power to nearby households on an informal basis, typically at a higher price than a legitimate JIRAMA connection. Because these 'meter lords' consume not only power for themselves but also for their 'customers', their higher consumption tends to place them in a higher residential tariff category. Bypassing the meter lords and fitting their customers with legitimate JIRAMA connections would place the individual connections into a lower-tariff category and reduce the revenues JIRAMA earns from the same set of households consuming the same amount of power. Thus, while regularization could lead to rapid increases in the number of JIRAMA customers and official access rates, it comes at a financial loss for the utility.

12. **Investments in rural areas will have to include significant expansion of the medium-voltage (MV) and low-voltage (LV) grid, as currently less than 10 percent of the rural population is connected.** This is due in part to the country's high poverty levels and low population density outside urban areas. Of the households in the bottom income quintile—most of whom live in rural areas— currently just 1 percent have access to grid electricity.[6] Electrification efforts in this context are particularly challenging given the difficulty of recouping the relatively high costs of grid extension from a large majority of low-income households that typically consume only small amounts of power. These circumstances, in combination with the adverse effects of the political crises of 2002 and 2009 and the general deterioration of JIRAMA's financial situation, are why the country has made very little progress in electrification since the early 2000s and continue to present severe challenges for the traditional (grid-based) electrification approach.

13. **JIRAMA's financial performance will continue to be the key obstacle to grid densification and extension efforts.** The utility's financial health has significantly declined over the past decade, leaving insufficient resources to invest in access expansion. Between 2008 and 2015, tariff revenues fell from US$0.20 per kilowatt hour (kWh) to US$0.12 per kWh in nominal terms, bill collection fell from an average of 95 percent in 2007–2009 to 79 percent in 2014–2016, and the financial cost of service increased from US$0.20 per kWh to US$0.22 per kWh despite falling global oil prices as the share of expensive thermal

[6] World Bank staff analysis of household surveys.

power production increased from 11 percent to over 40 percent today. Government transfers, while significant,[7] fell short of closing the cash flow gap. As a result, JIRAMA's cost recovery rate (based on cash collected) fell from 84 percent to 47 percent, its operating margin declined from 13 percent to −59 percent, and its liabilities climbed from 1.3 percent of GDP to 5.6 percent of GDP. The precarious financial situation left JIRAMA unable to invest in and maintain its infrastructure. Between 2008 and 2015, system losses rose from 23 percent to 34 percent, the availability of installed generation capacity declined from 71 percent to 55 percent, and its reserve margin fell from +35 percent to −5 percent. Barely able to maintain its existing service level, investment in access expansion has been deprioritized, leading to a decline in the grid access rate as population growth outpaced new connections. Between 2008 and 2015, JIRAMA completed only around 12,000 connections per year, falling far short of the growth in the number of households of about 130,000 per year. The result is that the grid access rate declined from 15 percent in 2008 to 13 percent in 2015.

14. **A Government reform program initiated in 2015 under the NEP has halted the downward trend of JIRAMA's performance but has not yet been successful in accelerating access.** The NEP aims to put the sector on a sustainable path, to be achieved through a series of tariff reforms, utility modernization measures, and sector governance reforms that started in 2016[8] with support from the World Bank-funded ESOGIP. Under ESOGIP, the GoM restructured JIRAMA and completed the competitive hiring of new senior management in 2017, and provided funding to reduce commercial losses through improved metering and billing mechanisms, conduct a detailed tariff review to better align pricing with customer consumption profiles and service costs, adoption of a least-cost development plan (PDMC), improve operational efficiency by streamlining JIRAMA's administrative cost base, and reduce technical losses through rehabilitation and reinforcement of urban MV/LV infrastructure. In addition, to increase available generation capacity and reduce costs in the short term, ESOGIP is currently supporting the reconversion of diesel to heavy fuel oil while the ongoing Scaling Solar Program (P166925) is expected to further reduce JIRAMA's dependence on expensive thermal power in the medium term. These efforts will be complemented by World Bank-executed technical assistance supporting JIRAMA in the development and implementation of a detailed financial recovery plan. These interventions are starting to show results. Since 2015, five tariff reforms raised seasonally adjusted revenues in the first two months of 2018 to 46 percent above the level of 2015 and 23 percent above the level of 2016. In parallel, the GoM scaled up its budget transfers to 1.3 percent of GDP in 2017 to cover the utilities' cash deficit and slow down the accumulation of arrears to suppliers. As a result, JIRAMA's operating margin improved from −59 percent in 2015 to −12 percent in 2017. System losses started recovering from a decade-long downward trend, reaching an average of 32 percent over 2016–2017 compared to 34 percent in 2015.[9] However, further measures by the Government are urgently needed as JIRAMA's costs have continued to rise as a result of the utility's ever-increasing reliance on expensive rental power (reaching 64 percent of available generation capacity and 38 percent of production in third quarter (Q3) 2018) and higher oil prices,

[7] Over 2014–2017, on average, fiscal resources equivalent to 1.1 percent of GDP per year have been transferred from the Government budget to JIRAMA to compensate for the financial hemorrhage. The power sector's contribution to the Government's quasi-fiscal deficit reached 2.15 percent of GDP in 2016.

[8] These measures were also seen as critical in the Systematic Country Diagnostic (SCD, Report No. 99197) and the Country Partnership Framework (CPF, Report No. 114744-MG).

[9] Under the ongoing IDA-funded ESOGIP, JIRAMA has also started implementing a new commercial management system to improve billing and collection performance and is rehabilitating some of the most overloaded transmission lines. However, the benefits of improved customer management will only materialize gradually from first quarter (Q1) 2018 on, and far more investment will be needed to upgrade sector infrastructure and reverse the continued aggravation of technical losses and system outages.

reaching US$0.32 per kWh in 2017. JIRAMA's cost recovery rate (based on cash collected) fell further from 47 percent to 34 percent between 2015 and 2017. The resulting cash shortfall has led to a further decline in new connections completed, which averaged just 7,000 in 2016–2017 (bringing the total to just over 500,000), and the grid access rate fell further from 13 percent in 2015 to 12 percent in 2017 (less than half the average of Sub-Saharan Africa). By contrast, an estimated 420,000 new connections per year will be required to meet the GoM's target of 70 percent access by 2030 (see Figure 2).

15. **Complementing JIRAMA's grid expansion, the GoM has been granting mini-grid concessions to private operators to electrify rural villages since 2004, but so far, these cover only a very small fraction of the population.** Thirty organizations now operate mini-grids that provide electricity to around 200 villages, serving approximately 7,000 consumers in total. They generate power using diesel, biomass, or small hydro generators with capacities ranging from 40 kW to slightly more than 200 kW. The majority obtained their authorization contracts through bottom-up proposals to ADER, as allowed under the law. Now, with the costs of solar PV hardware, battery storage, and metering technology dropping precipitously, there are opportunities to hybridize and densify existing systems and build new solar-powered mini-grids that could promote both rural economic development and electricity access. However, to date, and despite falling technology cost, the construction of new mini-grids is still significantly hampered by the high and often prohibitive cost of connections resulting from the need to build expensive distribution networks for small numbers of poor customers living in sparsely populated regions.

C. Relevance to Higher Level Objectives

16. **The proposed project will support the GoM's key energy policy objective, 'to guarantee universal access to reliable, sustainable, and modern energy services at affordable cost'.** This is in line with the strategic priorities and implementation approach of the GoM's electrification policy framework and the technical, financial, and institutional parameters currently defined in the NES. Through the extensive use of geospatial analysis and land-use planning tools, the project aims to maximize the number of households provided with electricity services while fostering local economic industrial development as well as attracting private investment.

17. **The proposed project is closely aligned with the SDGs and the World Bank's twin goals.** By providing financing for expanding electricity access in Madagascar, one of the least-electrified countries in the world, the project represents a critical intervention for achieving SDG7 of ensuring access to affordable, reliable, sustainable, and modern energy for all. By improving households' livelihoods, including in rural and peri-urban areas, which are home to a disproportionate share of Madagascar's poor and vulnerable, the supported intervention contributes to the World Bank's twin goals of eliminating extreme poverty and boosting shared prosperity.

18. **The proposed project directly contributes to Focus Area II 'Promote Inclusive Growth' of the current Country Partnership Framework (CPF) (FY2017–21)[10] and will contribute to the achievement of the area's Objective #8 ('Improved Access to Energy and Transport').** The CPF for Madagascar highlights that, of all household and community-level factors, electrification is one of the most robust predictors of welfare gains with electrification efforts recognized as a critical success factor for the country's overall poverty reduction strategy. Accordingly, the CPF puts electrification among its key priorities while

[10] Report No. 114744-MG.

stipulating that (a) additional resources that may materialize during the CPF period be dedicated to electrification programs and (b) the programs be sustained beyond 2021. The proposed project contributes to the GoM's target of doubling electricity access in the country by 2021 through efficient least-cost investments in both grid and off-grid solutions and to the objective of further streamlining sector governance in the interest of scaling up private sector investments in electricity access.

19. **The proposed project would create one of the largest OGS market funds in Sub-Saharan Africa to harness private sector financing for electrification and maximizing finance for development (MFD) in the electricity sector in Madagascar.** The project leverages private financing along the OGS supply chain to make electricity access solutions accessible and affordable. Increasing private financing for electrification will free up Government resources for grid-based electrification and other public priorities, including spending on human development. Most importantly, private financing will be mobilized by creating and scaling up market opportunities that will be commercially self-sustaining, thereby contributing to the MFD agenda beyond the lifetime of the project.

20. **The proposed project will contribute to the Human Capital agenda directly through the electrification of 750 rural health centers.** The lack of well-equipped rural health centers is a major challenge for public health in Madagascar. It disproportionally affects rural areas, the poor, and female-headed households.[11] By electrifying 750 rural health centers (60 percent of unelectrified Basic Health Centers [*Centre de Santé de Base*, CSB] II health centers) across the country—mostly through off-grid technologies—the project will directly contribute to increasing the types and quality of health services available to the most vulnerable parts of the population. The project will also raise the productivity of schools, water supply and sanitation facilities, and other public facilities that will be grid-connected as part of the grid extension component.

21. **The proposed project makes strategic use of new and disruptive technologies to promote faster and lower-cost electrification in Madagascar.** Satellite imagery and geospatial planning tools are used to prioritize localities for grid extension. OGS kits with advanced battery technology will be supported to reach lower-income households and peri-urban or rural areas faster and cheaper than would be possible through the grid. Mobile payment systems will be encouraged for OGS kits to make servicing consumer micro credits easier for those outside the formal banking system. Global System for Mobile Communication (GSM) based remote monitoring tools will be used to monitor the performance of solar PV systems on the roofs of supported health clinics to minimize fiduciary risks and make operation and maintenance (O&M) of the systems more cost effective.

22. **The proposed project will also contribute to meeting Madagascar's greenhouse gas (GHG) targets under its Nationally Determined Contribution (NDC) to the Paris Agreement (2015).** Access to sustainable energy is a core element of Madagascar's NDC under the Paris Agreement, which prioritizes the following six measures in the energy sector: (a) facilitate access to energy by strengthening existing systems and by promoting renewable and alternative energies;;(b) rehabilitate the grid and power plants, (c) promote renewable energy (hydropower and solar); (d) improve energy efficiency; (e) support rural electrification; and (f) disseminate improved stoves. The project will directly contribute to measures (a)–

[11] World Bank. 2014. *Face of Poverty in Madagascar: Poverty, Gender, and Inequality Assessment.* Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/18250 License: CC BY 3.0 IGO.

(c) and (e) and is estimated to result in net avoided emissions of 619,361 tCO_2 due to the displacement of fossil-fueled energy sources.

II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

23. The Project Development Objective (PDO) is to increase access to electricity services for households, enterprises, and health facilities in Madagascar**.**

PDO-Level Indicators

24. **The PDO-level results indicators are the following[12]:**

(a) People provided with new or improved electricity service (CRI, Number)
(b) Enterprises provided with new or improved electricity services (Number)
(c) Health centers provided with new or improved electricity services (Number)

B. Project Components

25. **Consistent with the implementation approach of the NEP to prioritize socially equitable and grid-based renewable energy solutions at least cost, the project will consist of the following components (see Figure 3):**

- **Component 1** will finance cost-effective, priority investments in grid extension and densification to connect households, enterprises, and health facilities. The component separates funding for grid densification (mostly in urban and peri-urban areas) and grid extension (mostly in rural and peri-urban areas) in line with the NEP priorities and JIRAMA's grid extension plan.

- **Component 2** will engage financial institutions, OGS companies and contractors to scale up the rollout of stand-alone solar PV systems for households, enterprises, and health facilities. This will expand access to electricity to lower-income households and areas that do not have sufficient density or load diversity to justify grid or mini-grid extension given prevailing costs or those that are simply too far from the existing grid or mini-grid network.

- **Component 3** will assist the MEH, ADER, JIRAMA, and ARELEC in building technical expertise and operational capacity of their staff and help the four agencies devise enabling policies and regulatory frameworks to further their respective mandates. Therefore, the component will provide a broad range of technical and financial support in access planning, implementation support, and capacity-building activities. The component will also fund

[12] "Improved electricity services" in this context refers to either (a) reaching higher energy access tiers as defined in the MTF, or (b) regularizing illegal connections.

consumer awareness and citizen engagement and market development activities for the OGS market.

26. **Table 1 summarizes the overall expected connections added through the project components.**

Table 1. Connections Added through LEAD

Component	Households	Enterprises	Health Centers
1: Grid Electrification	**100,000**	**8,000**	**250**
1a: Grid and Mini-Grid Densification	70,000	—	—
1b: Grid and Mini-Grid Extension	30,000	8,000	250
2: Off-Grid Electrification	**300,000**	**2,000**	**500**
2a: Off-Grid Market Development Fund	300,000	2,000	—
2b: Off-Grid Electrification of Health Centers	—	—	500
TOTAL	**400,000**	**10,000**	**750**

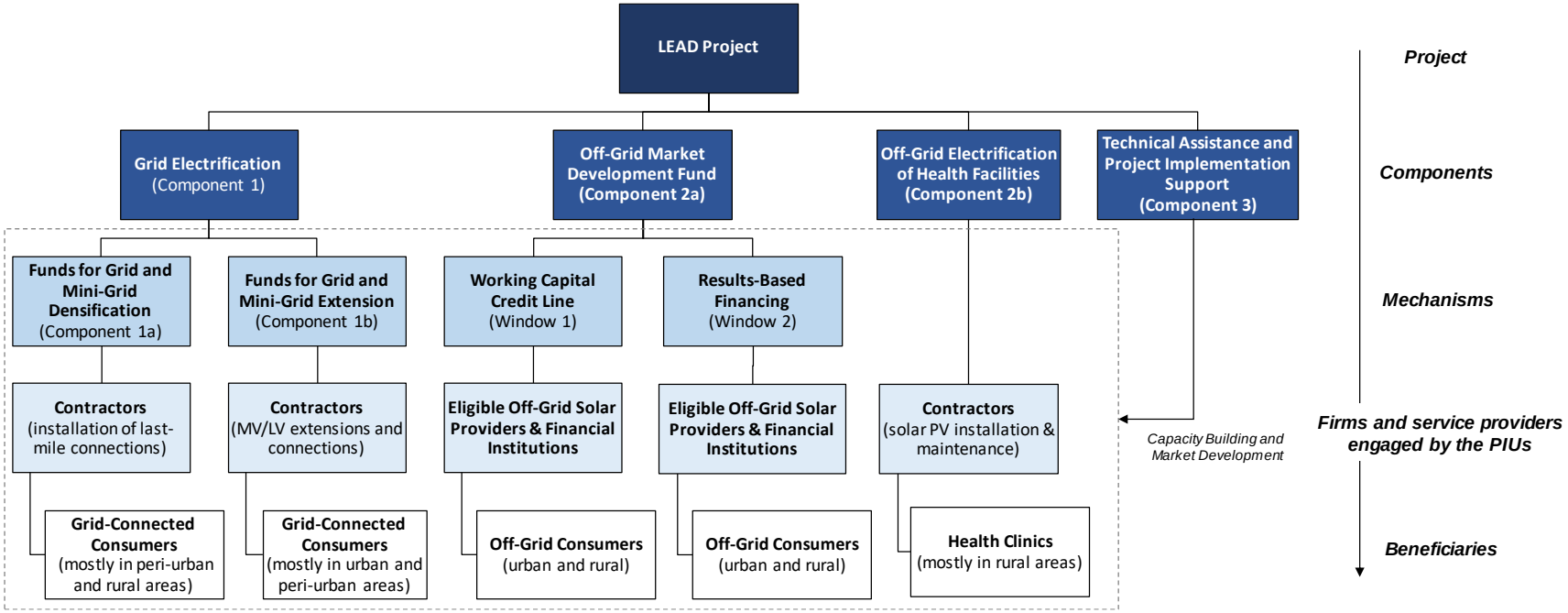
Component 1: Grid Electrification (US$80 million equivalent)

27. **By financing cost-effective, priority investments in grid extension and densification, this component is expected to dramatically increase the number of new household grid connections every year by funding at least an additional 100,000 connections.** In addition, Component 1 is also expected to lead to around 8,000 newly connected micro, small, and medium enterprises and around 250 newly connected health centers. These connections will largely come from grid extension investments under Component 1b in rural and peri-urban areas, where a significant number of enterprises and health centers remain without access to electricity. Technical assistance provided under the parallel ESOGIP is helping JIRAMA extend its management capacity to manage this expansion in new connections per year.

28. **Despite the ambitious scope of new JIRAMA connections, the resulting additional load for the JIRAMA grid and generation capacity is expected to be manageable.** Mitigating factors include: (a) many 'new' connections will in fact be from regularization of existing illegal connections that are already consuming power; (b) most actual new connections will be from low-income consumers in low tariff categories and at low demand; and (c) available generation is expected to increase concurrently as the World Bank is currently working on upgrading thermal capacity to manage peak demand under ESOGIP.

29. **Ongoing complementary activities under a Development Policy Operation (DPO) under preparation (P166572; expected to be presented to the Board in Q4FY2019), ESOGIP, and World Bank-financed technical assistance activities will ensure that grid-based electrification efforts will not impose a further burden on JIRAMA's already precarious financial condition.** These measures include technical assistance for tariff reforms, improved planning and implementation of generation investments, operational performance and efficiency improvements, and a revenue protection program. Through ongoing Energy Sector Management Assistance Program (ESMAP) financed technical assistance, the World Bank is also supporting the preparation of a short- and medium-term sector financial recovery plan.

Figure 3. Project Structure and Components



Source: World Bank staff.
Note: PIU = Project Implementation Unit.

30. **The World Bank is currently supporting the GoM and the sector regulator in developing and adopting a new national connection policy.** The Government prefers a new nationwide connection policy over project-specific arrangements for reasons of social equity. Approval of the new connection policy will be a disbursement condition for Component 1. The connection policy is expected to specify who has a right to be connected at what cost and what are the procedures and roles and responsibilities, in a way that is consistent with the project objectives. Specifically, it is expected that (a) the connection charge will be sufficiently subsidized to be affordable for low-income households; and (b) residential customers within short distance of the low-voltage grid will have access to at least one connection option under which connection charges can be paid over time and be proportional to their consumption.

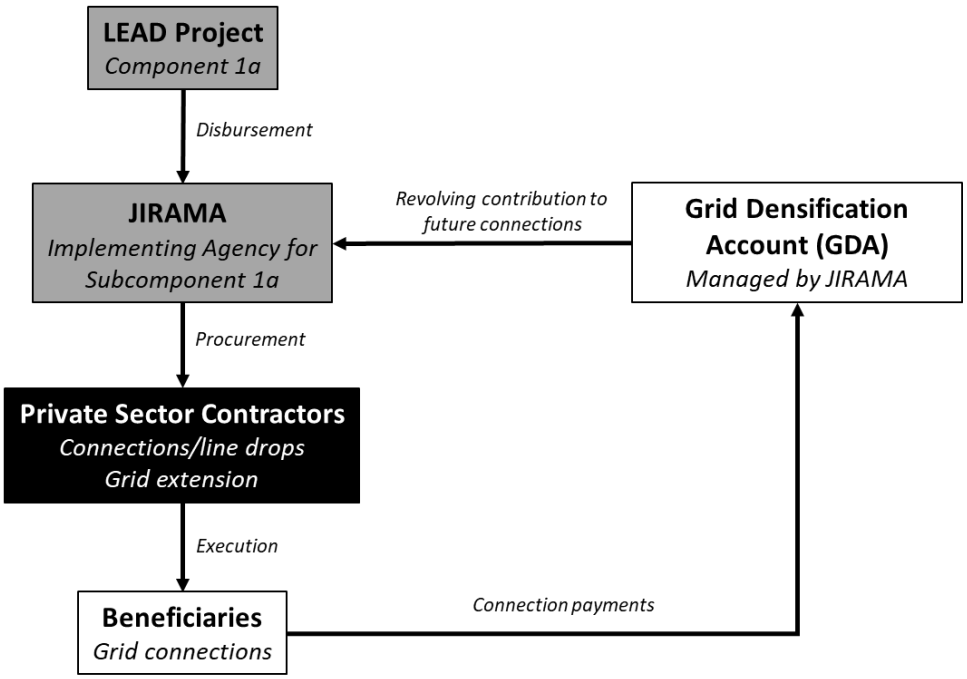
Subcomponent 1a: Grid and Mini-Grid Densification

31. **This subcomponent will increase the number of (mostly urban and peri-urban) connections within existing JIRAMA grids and isolated systems, focusing on consumers who are close to existing LV infrastructure.** Based on the results of the geospatial analysis mentioned earlier, an estimated 415,000 households in urban and peri-urban areas are not formally connected to the grid, the majority of which are located in and around Antananarivo. Among these officially unconnected households, a significant portion receive grid power through illegal connections or shared connections with neighbors or other households. Additional households receive power from so-called 'meter lords', who typically on-sell power received from a legitimate JIRAMA connection to clusters of nearby households and small businesses, acting as de facto 'mini utilities'. Even when consumers are paying for power, irregular connections distort both consumer prices and JIRAMA revenues. In addition to the negative economic implications, irregular connections also pose a significant safety risk to households with hundreds of often fatal incidents reported every year. Within this context, grid densification and regularization present high-value opportunities for World Bank support, as the potential for connecting large numbers of poorer urban and peri-urban households at comparatively low cost is high, with basic LV lines and infrastructure already in place.

32. **The project will provide funding to cover the full cost of new connections and regularized connections including the cost of grid extension and densification.** This will help mitigate the effect of low consumer affordability and the limited incentive to regularize shared connections. In parallel, the World Bank's support under the proposed DPO, ESOGIP, and technical assistance activities will ensure that grid-based electrification efforts will not impose a further burden on JIRAMA's already precarious financial condition, thus addressing the limited financial incentive to connect previously unconnected households.

33. **To ensure that connection charges paid by beneficiaries are channeled back into grid densification, the Government will establish a ring-fenced Grid Densification Account (GDA) that will be subject to regular auditing under the project.** Newly connected consumers will pay for connection costs through a connection fee. Proceeds from connection fees will flow back into the GDA, which will then continue to finance new connections on a rolling basis (Figure 4). This revolving GDA will be established either as a treasury account or as an account a commercial bank and will be subject to regular auditing under the project to ensure that reflows are exclusively used for new connections.

Figure 4. Detailed Flow of Funds under Subcomponent 1a



Source: World Bank staff.

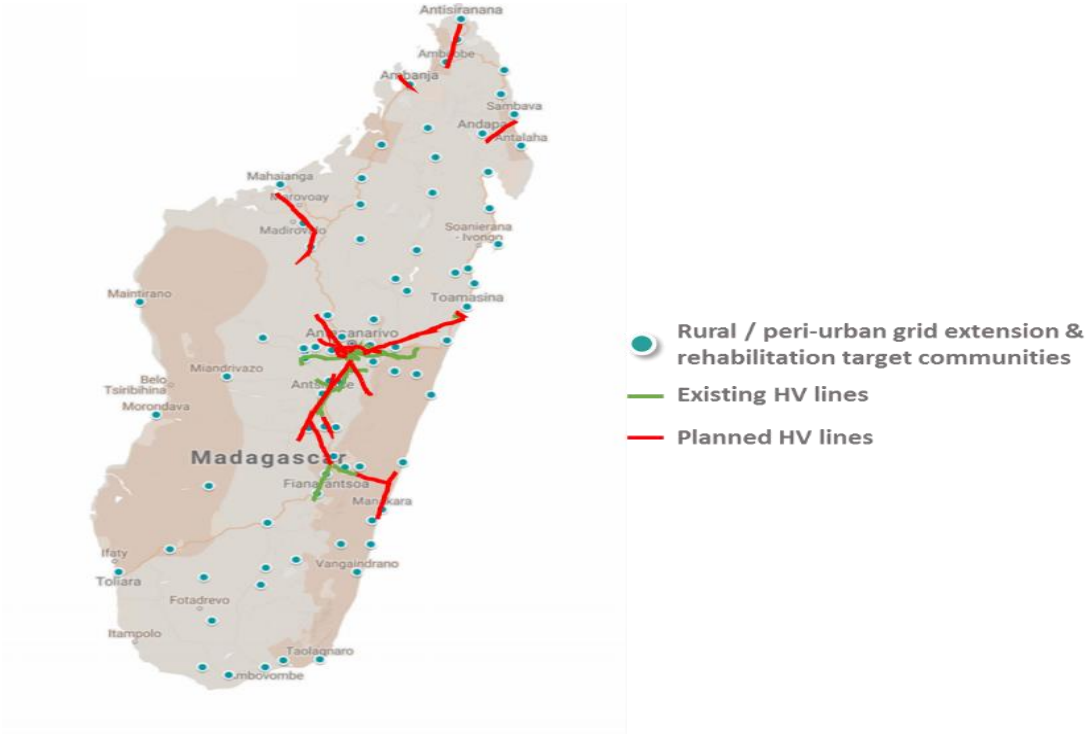
Subcomponent 1b: Grid Extension

34. **This subcomponent will support the connection of new rural and peri-urban consumers to JIRAMA's interconnected grid and isolated systems by constructing new distribution lines, substations, service drops, and street lighting for rural and peri-urban customers.** This will fund specific MV/LV grid extension projects to reach previously unelectrified or under-electrified rural and peri-urban areas. These activities will also be complemented by, and closely coordinated with, ongoing grid reinforcement efforts under ESOGIP, focused on providing improved quality of service, network flexibility, reduced losses, and increased network transit capacity in these areas.

35. **JIRAMA has prepared a long list of priority investments for grid extension and reinforcement covering 85 rural and peri-urban districts close to either the main grid or local JIRAMA-operated isolated systems.** Figure 5 shows the map of the target districts. Depending on the needs of each individual community, infrastructure to be funded through these investments includes various combinations of extension and rehabilitation of MV distribution lines (sub-63 kilovolt (kV) only), construction and rehabilitation of MV/LV substations, extension and rehabilitation of LV distribution lines, and final service drops to consumers, using smart and prepaid metering technology as appropriate. The list of investment priorities will be finalized in collaboration with JIRAMA and based on the outcomes of the detailed geospatial analysis. If overall investment needs ultimately exceed project funds available for this subcomponent, the project will preferentially finance the subset of projects that maximize the number of rural and peri-urban connections per U.S. dollar invested.

36. **This subcomponent is expected to result in not only newly connected households but also enterprises and health centers.** Expected results include 8,000 newly connected micro, small, and medium enterprises and around 250 newly connected health centers in rural and peri-urban areas, where a significant number of enterprises and health centers remain without access to electricity.

Figure 5. Geographic Range of 85 Priority Rural and Peri-Urban Grid Extension Interventions



Source: JIRAMA; KTH (2018).

Component 2: Off-Grid Electrification (US$55 million equivalent)

37. **This component will support the private sector-led rollout of stand-alone solar PV systems to about 300,000 households, 2,000 enterprises, and 500 health centers.** The zones targeted are those that, given the prevailing costs, do not have sufficient density or load diversity, and those who are simply too far from JIRAMA's existing interconnected network or isolated systems to justify grid extension. The component combines targeted financial support to the solar value chain as well as direct support to connect rural health centers.

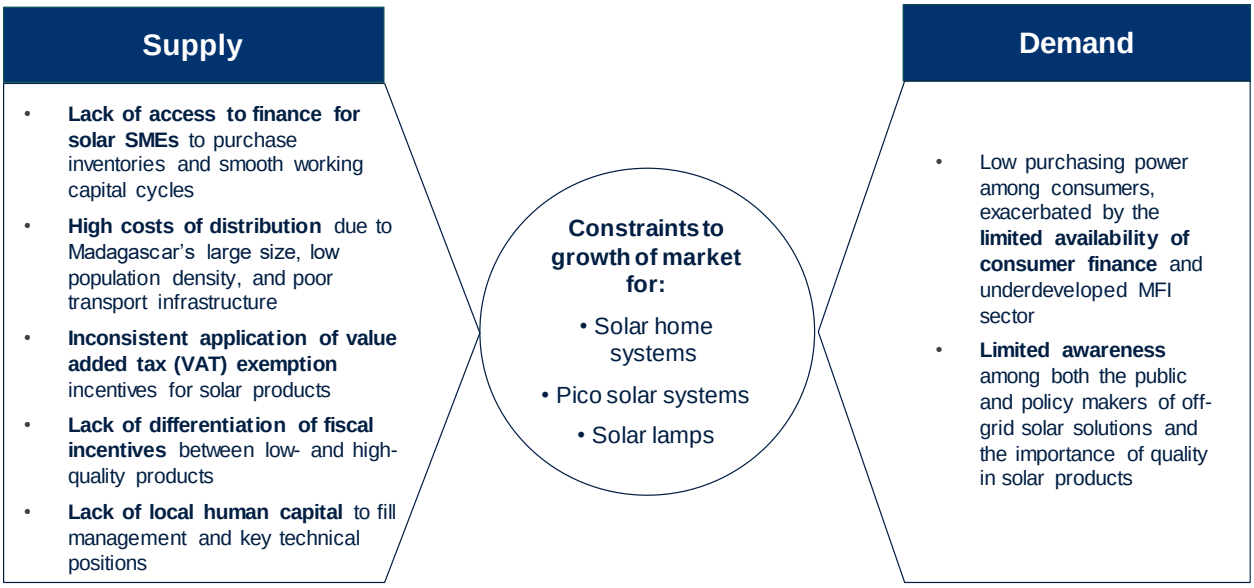
Subcomponent 2a: Off-Grid Market Development Fund (US$40 million equivalent)

38. **The Off-grid Market Development Fund (OMDF) will address access to finance and other constraints preventing the accelerated growth of the OGS market in Madagascar.** A series of financial mechanisms will target the most critical enterprise development bottlenecks identified through the off-grid market assessment, including the need for tenor-matched working capital, PAYGO (that is, lease-to-own or rental) cost recovery support, and support for expanding customer engagement and distribution footprints. Together, these will enable OGS companies and MFIs to extend credit and sell OGS products to households and micro, small, and medium enterprises. The subcomponent will leverage these

mechanisms to facilitate access to finance for households and businesses, improve affordability of solar electricity services, and maximize geographic coverage.

39. **The OMDF and the accompanying technical assistance will tackle the most critical market failures that constrain growth in the off-grid solar market**. Figure 6 summarizes the main market failures identified in a market study conducted during project preparation. Component 2a will provide financing to address the high costs of distribution due to Madagascar's large size, low population density, and poor transport infrastructure and the limited availability of consumer finance and underdeveloped MFI sector. The design of Component 2a also addresses the lack of differentiation of fiscal incentives between low- and high-quality products. The accompanying technical assistance under Component 3 aims to address the limited awareness among both the public and policy makers of the importance of quality in solar products; the complex customs procedures and inconsistent application of VAT exemption incentives for solar products; and the lack of local human capital to fill management and key technical positions.

Figure 6. Market Failures and Rationale for OMDF Intervention in OGS Market



Source: World Bank staff.

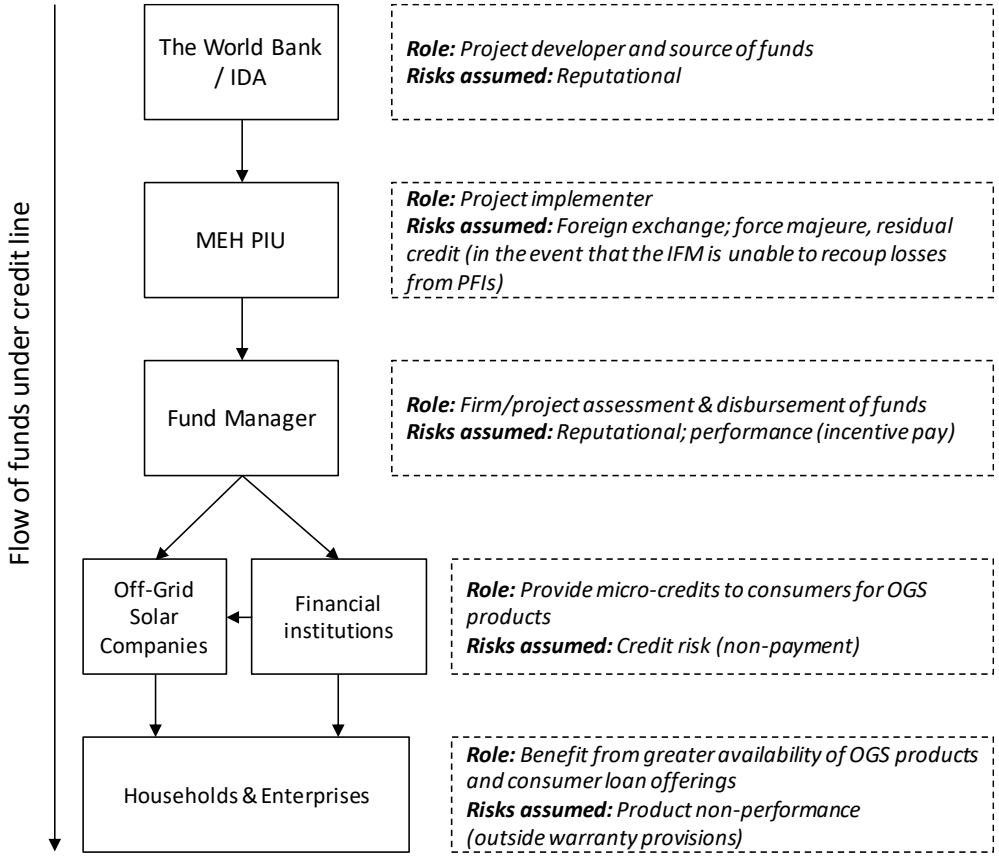
40. **The OMDF will be implemented by the MEH who will competitively source a Fund Manager to oversee two discrete windows to support OGS companies.** A compliance assessment for financial intermediary financing based on the World Bank Directive for Investment Project Financing (IPF) will be carried out for the Fund Manager.

(a) **Window 1: Local Currency Working Capital for Enabling Scale-up of OGS Product Sales.** OGS companies that sell products on a PAYGO basis typically run into liquidity issues as they scale their operations and sales. This occurs because once a product changes hands from a distributor to customer, it can take many months before the company recoups its costs. Therefore, OGS companies in growing markets are constantly in search of new funding to allow them to procure additional product stock (both in local and foreign currency). Moreover, while companies typically purchase products from abroad in hard currency,

repayments from customers occur in local currency, resulting in significant foreign exchange (FOREX) risk.

Window 1 will take the form of a credit line to eligible OGS companies and financial institutions. The window will provide credit at different tenors to cover the specific needs of (a) working capital for importers of solar products (shorter tenors); and (b) working capital for providers of financing services for solar products (longer tenors). With many liquidity-constrained Malagasy MFIs interested in offering loans to customers for OGS product purchases, Window 1 may also provide these institutions with refinancing. The flow of funds under the window are illustrated in Figure 7. Activities under Window 1 will be subject to *force majeure* risks (from floods, drought, storms, other exogenous events). The Project Operations Manual (POM) will clearly define these, with the baseline assumption that the project will assume these risks as opposed to households or SMEs which are poorly positioned to do so. Reflows from extended credit will be returned into the fund under a revolving structure.

Figure 7. Detailed View of Flow of Funds and Allocation of Risks under Window 1 of the OMDF



Source: World Bank staff.

(b) **Window 2: Results-based Financing to Accelerate the Sustainable Growth of Off-Grid Markets.** Well-administered results-based financing (RBF) schemes are increasingly popular tools for rapidly expanding the reach of OGS markets. They work by offering clear and

predictable financial incentives to distributors for the sale of high-quality (that is, Lighting Global quality-verified) products on a first-come, first-served basis. Typically, companies are forbidden from using the incentive to lower product prices, thus minimizing market distortion. Instead, the RBF is helping cover expansion costs, including finding and training new agents, improving supply chains, and acquiring new customers (for example, through marketing and consumer engagement campaigns). Existing RBF schemes have typically taken a one-size-fits-all approach to OGS sales, simply using a formula to calculate incentive payments based on the access provided by each system sold.

Under LEAD, payments under the RBF facility will be structured to achieve three main objectives. The LEAD RBF scheme builds on the best practices and lessons learned from similar RBF schemes in Africa and worldwide. The project will offer RBF to eligible OGS businesses selling Lighting Global quality-verified products. These RBF payments will help companies to expand faster and serve more remote and poorer clients who otherwise could not be served. The RBF scheme will therefore have a strong pro-poor impact. Eligible OGS businesses will be able to apply for RBF-based grants that will be structured to achieve three objectives, which have been identified as the most impactful based on the detailed market assessment carried out during the project preparation:

(i) **Promote quality and service.** The RBF will reward companies for helping 'clean up' the Malagasy OGS market by exclusively selling Lighting Global quality-verified products and providing adequate after-sales service. The continued dominance of low-quality imitation products in the Malagasy OGS market poses a major threat to market development by eroding consumer confidence and demand in the technology. The RBF will therefore level the playing field for distributors of quality products through per-product payments directly proportional to their sales. Moreover, firms will be required to keep and share complete records of product sales and commit to providing quality after-sales services to receive support from this facility. An independent verification agent (IVA) will be tasked with ensuring that companies meet their obligations to customers and remain in compliance with Lighting Global product and after-sales service requirements at all times (see Subcomponent 3d).

(ii) **Incentivize business models that combine solar product sales with consumer micro credits (PAYGO).** The RBF payments will be structured to incentivize OGS to scale previously tested sustainable rental and rent-to-own approaches by sharing the uncertain cost associated with consumer nonpayment and repossession of products. The precondition for OGS companies to successfully adopt sustainable PAYGO business models is accurately estimating and pricing the uncertain cost of customer nonpayment and repossession of PV products. The reality is that many—if not most—new PAYGO OGS customers in Madagascar are unbanked and, as such, have no formal credit history. Therefore, during the first years of operations, companies are often forced to develop 'makeshift' systems and algorithms for estimating nonpayment and default rates based on information gleaned from customers, such as the size and quality of their house, their profession, and their relationship status. Consequently, PAYGO companies are forced to remain very selective when targeting market segments and conservative when estimating the cost of customer default on payments.

Payments will be determined by a simple formula that, based on documented and independently verified 'Free on Board' prices and consumer loan tenors, will calculate expected repayment performance relative to a carefully calibrated benchmark. The RBF will partially compensate distributors for payment shortfalls against this benchmark during the PAYGO piloting phase, allowing companies to collect sufficient data to estimate the cost of customer defaults much more accurately and price their PAYGO schemes accordingly. Payments will be capped both on a per sale and per company basis to ensure that the incentive to collect payments will always exceed the benefits provided by the PAYGO RBF facility.

(iii) **Help overcome entry barriers.** The RBF mechanism will make part of the payments upfront to qualified firms—including those working with marginalized groups as well as women entrepreneurs and sales agents—to partially cover the costs of the initial setup, marketing, and consumer-awareness activities including training of sales agents, to help new market players overcome the up-front cost of market entry. This is to ensure that the results can be achieved and to enable broader participation in the RBF mechanisms (less well capitalized small enterprises and new entrants would have difficulty benefiting from the RBF if payments would only be made once sales are confirmed).

41. **The project will cooperate with the existing IDA-funded Financial Inclusion Project (FIP)** (P161491) **to explore opportunities for the solar market to benefit from the FIP's partial portfolio credit guarantees and Fintech solutions.** Under the Madagascar FIP, IDA supports commercial banks' lending to underserved SMEs through partial portfolio credit guarantees; and provides funding to 'Fintech' solutions that use new (and existing) sources of data to appraise borrowers in innovative ways, which can be a powerful tool to increase access to credit. Currently, neither OGS companies nor SMEs that invest in solar are attractive segments for lending by commercial banks or MFIs. Once the OGS market has scaled up to become sufficiently attractive for large-scale financing from commercial banks and MFIs, the World Bank will work to help the solar market gain access to these solutions provided by the FIP.

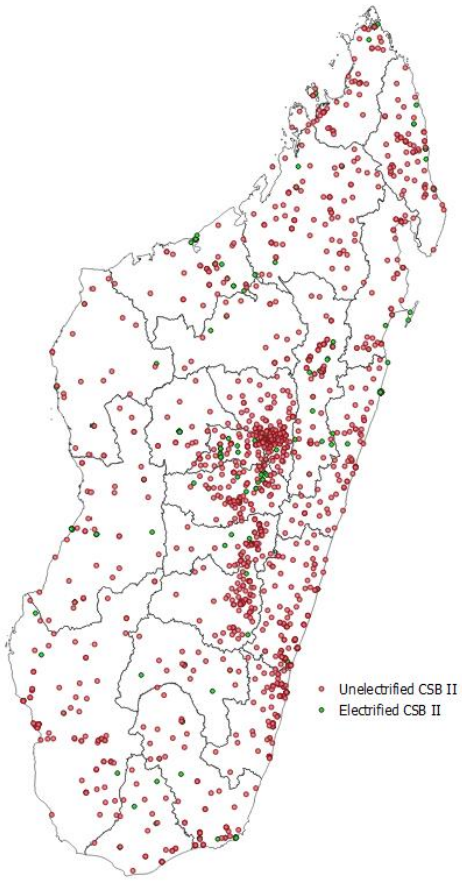
Subcomponent 2b: Off-Grid Electrification of Health Centers (US$15 million equivalent)

42. **This subcomponent will support the electrification of approximately 500 of the 1,250 public CSB II that remain unelectrified (see Figure 8).** These health centers are mostly located in rural areas with each serving an average of 10,000 inhabitants and providing a similar breadth of service as the 70 district-level hospitals, including maternity care. By supporting the procurement and installation of larger component-based, stand-alone solar systems at these facilities, the project will enable lighting, refrigeration, sterilization, and other services that can significantly improve the quality of rural health care provision. Health centers that serve the largest number of inhabitants and thus have the highest suppressed energy demand will be prioritized, as well as those with the lowest likelihood of receiving grid or mini-grid connections in the medium to long term. This prioritization exercise and subsequent system design work is currently being initiated to ensure that electrification activities can begin soon after project effectiveness.

43. **To ensure efficient procurement, CSBs will be grouped into geographical clusters and contracts awarded for each cluster.** Clusters will be sized and geographically grouped to reduce O&M cost and maximize economies of scale while facilitating partnerships between international and local companies.

Moreover, clusters will target synergies and further minimize transaction cost though an initial focus on those regions where the ongoing World Bank Health and Nutrition Project (Improving Nutrition Outcomes Using the Multiphase Programmatic Approach - P160848) is underway. Finally, tender documents will be structured to ensure the long-term sustainability of results, requiring seven years of guaranteed O&M in combination with the mandatory usage of remote monitoring technology.

Figure 8. Map of Electrification Status of CSB II Health Centers



Source: ADER (2018).

Component 3: Technical Assistance and Project Implementation Support (US$15 million equivalent)

44. **This component will assist the MEH, ADER, JIRAMA, and ARELEC in building technical expertise and operational capacity of their staff and help the four agencies devise enabling policies and regulatory frameworks to further their respective mandates.** Therefore, the component will provide a broad range of technical and financial support in access planning, implementation support, and capacity-building activities.

Subcomponent 3a: Electrification Planning

45. **This subcomponent will finance planning tools and training to inform future investment decisions in grid extension and the localized promotion of mini-grid and stand-alone solar solutions to advance the electrification goals of the GoM:**

(a) **Geospatial analysis and planning platform.** This activity will help the MEH, ADER, and JIRAMA identify and differentiate between areas most suitable for grid extension and densification, mini-grids, and stand-alone solar systems. The activity will involve the generation and employment of a range of relevant GIS layers for the country as a whole, mapping the existing MV electrical grid infrastructure, household and business locations, renewable energy resources, and potential productive uses and anchor clients. The platform will allow to have a consolidated repository for data sets and update the key parameters for least-cost planning as they become available and/or as they change over time (for example, connection costs with different technology solutions) at the lowest administrative unit allowed by data availability. The platform and planning tool(s) will be established, chosen, and populated in close cooperation with all three agencies that will also receive adequate training and assistance needed to 'own' and update the tool independently, fully master the benefits of geospatial planning for access provision, and understand how GIS information could be beneficial to improve asset and data management, as well as commercial efficiency and customer care. The establishment of the platform responds to the needs to (a) track and monitor progress (or lack thereof) in grid and off-grid rollout; (b) ensure the adequate updating of the least-cost plans over time to dynamically respond to changing local realities (from access provision to demand loads) and inform policy making; and (c) build sustainable geospatial planning and engineering capacity.

(b) **National Electrification Investment Plan (NEIP).** This activity will support the key actors in the establishment of the country's first NEIP covering the entire national territory. The plan will draw on the above subactivity as well as conclusions of the ongoing work on Madagascar's NES and findings of ongoing geospatial studies—all of which are funded by the World Bank. The NEIP will provide the MEH, ADER, and JIRAMA with an optimized least-cost investment pipeline to maximize electricity access across the national territory and form the crucial basis for investment and budget planning, fund raising, and donor coordination.

(c) **National Electricity Access Planning and Program Coordination Unit (PPCU).** The mandate of the PPCU, to be established within the MEH, will be to provide effective centralized coordination and oversight in terms of policy development, strategic planning, and project design and implementation. The unit will set the strategic direction for national electrification, including preparation and updating of the abovementioned NEIP for both on- and off-grid electrification. The PPCU will coordinate donor and GoM-funded studies, regularly update the sector's key performance indicators, and act as a repository of sector data and studies, including hosting and updating the geospatial platform.

Subcomponent 3b: Off-Grid Fund Manager

46. **Under this activity, the MEH will competitively source the Fund Manager in charge of overseeing the OMDF and its two discrete windows supporting OGS companies.** The subcomponent will also fund

all supervision-related activities of the steering committee composed of representatives of the GoM who will provide strategic guidance to the OMDF and review progress, provide policy guidance, and resolve any high-level challenges facing the fund.

Subcomponent 3c: Market Development Support

47. **This subcomponent will support the improvement of the enabling environment for the development of the OGS market in Madagascar through the following:**

(a) **Minimum product standards and quality assurance.** This subcomponent will help the MEH, ARELEC, and the Bureau of Standards of Madagascar (*Bureau des Normes de Madagascar,* BNM) establish an adequate policy and regulatory framework for the OGS sector, with the intention of providing clear rules to companies and their investors, protecting consumers, and ensuring subsidy and taxation regimes are optimized. The Government has already made efforts to exempt small stand-alone solar systems from import duties and VAT; the associated cost-savings are expected to be passed, in large part, on to the low-income Malagasy households that purchase these products. To do so, the World Bank will support the Government in the adoption of Lighting Global's OGS quality standards, which have already been adopted in a number of Sub-Saharan African countries including Kenya, Ethiopia, and Tanzania. These international standards were developed by the World Bank Group and ensure that products that conform are of high quality (as verified through testing at international labs) and offer at least a two-year warranty to consumers. Following adoption, the Lighting Global team intends to offer training to the Malagasy customs authority, helping them streamline processes, detect knockoff products, and ensure duty and VAT exemptions are consistently and fairly applied. The result should be an import environment that is consistent and predictable and that aligns well with the import regimes in East Africa, thus preventing unnecessary conformity issues.

(b) **Consumer awareness.** This subcomponent will support the consumer education and awareness raising activities under LEAD. Global experience demonstrates that such activities can help overcome consumers' lack of understanding of the comparative advantages of OGS products over fuel-based lighting, their initial reservations regarding the adoption of new technology, their inability to make informed purchasing decisions and identify quality products, their potential for productive use and income generation, and a lack of information on how to access the said products, particularly when combined with efforts to support the distribution of quality products. Consumers in Madagascar are unlikely to be sufficiently aware of OGS technologies being supported under the project and have a right to expect clear, thorough information about the advantages of the services and how to access them. The activities supported under this subcomponent will provide recurring opportunities for consumers to interact with service providers to share their feedback and concerns. For those who have some knowledge of the products, these outreach activities will provide them with the necessary guidance on how to get the best out of the products in the way they use and maintain them. The consumer education and citizen engagement program will employ both 'above the line' (mass media tools) and 'below the line' (one-on-one) channels to reach out to different target audiences while ensuring opportunities for two-way dialogue, including face-to-face, experiential events such as forums and roadshows

as well as efforts leveraging mass media including print, radio, and billboards. Awareness efforts will be coordinated closely with OGS distributors to ensure that sensitization occurs only in regions where high-quality products are available in the market.

Subcomponent 3d: Independent Verification Agent

48. **This subcomponent will finance the services of a fiduciary services firm with a proven track record as an IVA.** The selected firm will be required to have experience in managing grants and similar interventions for large-scale international donor or development finance programs. The firm will be responsible for monitoring the Fund Manager's performance under Component 2 and verifying that disbursed funds in Component 2 have been appropriately used with preconditions for disbursement fully met.[13]

Subcomponent 3e: Project Coordination, Implementation Support, Capacity Building, and Sector Studies

(a) **Project coordination, implementation, and capacity building.** This subcomponent will strengthen the capacity of both existing PIUs for access project planning, coordination, and management. Activities will include the hiring of dedicated project coordinators and additional fiduciary and support staff within both PIUs, the creation of an electricity access PPCU within the MEH, and capacity-building and training activities for all key staff in the MEH, JIRAMA, ADER, and ARELEC.

(b) **Off-grid services quality control and supervision.** ADER, as the executing agency of the MEH and ARELEC, will be mandated with monitoring the off-grid electricity service quality of both SHS distributors and mini-grid operators including compliance with technical standards, warrantee services, and reactivity to customer complaints. For this purpose, the component will support the establishment of a regional network of six to eight ADER units to be created within existing MEH regional offices, including their equipment with needed office and mobility infrastructure.

(c) **Capacity building and sector studies.** This subcomponent will finance ongoing support in the form of training and capacity building. Example activities will include support on development and management of the National Sustainable Energy Fund (*Fonds National de l'Énergie Durable*, FNED), financial impact analyses on JIRAMA and the GoM of future energy access projects, and improved energy access data management. Some funding will also be set aside for another medium-term framework (MTF) access study at the end of the project. The capacity building will include a program under which women entrepreneurs will receive technical, business literacy, and enterprise development focused training to strengthen their capacity to build sustainable ventures in the off-grid sector activities. Moreover, the subcomponent will assist off-grid businesses to enhance customer engagement with female beneficiaries.

[13] See Sections III.B - Results Monitoring and Evaluation Arrangements and Section IV.C - Fiduciary for a detailed description of the IVA's roles and responsibilities.

C. Project Beneficiaries

49. **The project's main beneficiaries are households, SMEs, and health centers that currently have extremely limited access to affordable and reliable power sources and will gain access through the project.** Beneficiaries will benefit directly from electricity access in their premises and indirectly through improved access to economic opportunities and public services that come with electrification. As outlined in the following paragraphs, the project is designed to reduce gender gaps related to women's access to energy and finance, thus benefiting women and girls in particular. In addition, with an estimated 20–30 percent of the investment value expected to remain in the local economy, the project will contribute to the creation of jobs and benefit the Malagasy economy.

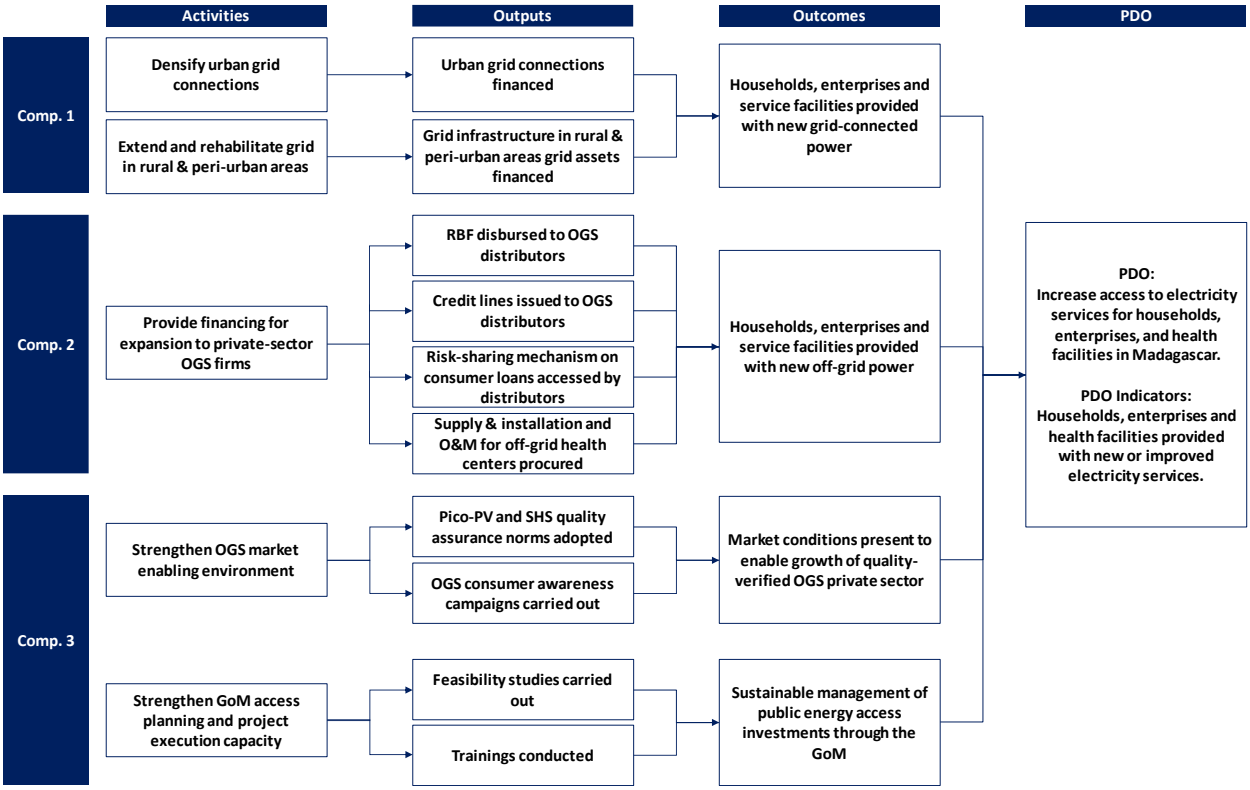
50. **The Malagasy utility, JIRAMA, will also benefit significantly from activities funded under this project.** Without external funding for grid extension and densification, JIRAMA incurs significant losses on each additional connection, especially low-consumption household connections, and has faced conflicting pressures of extending grid access to unprofitable consumers on the one hand while attempting to redress its highly precarious financial position on the other. The interventions funded under this project will (a) reduce the pressure on JIRAMA to extend connections in remote areas by developing a private-sector led market for off-grid solar solutions that are most cost-effective for small consumers and those far from the existing grid; (b) help improve existing distribution infrastructure; and (c) provide external funding to cover the entire cost of grid extension and densification to mitigate at least the up-front part of the additional cost incurred through new connections. The project thus ensures that the Government's electrification agenda will become more consistent with JIRAMA's continuing financial recovery efforts.

51. **The private sector will benefit significantly, both directly and indirectly from the project.** Under Component 1, contractors providing infrastructure services may qualify for additional contracts, while SMEs that receive grid connections will benefit from lower-cost electricity service (relative to diesel generators). Purveyors of the OGS systems for households, SMEs, and institutional applications will also be supported in a variety of ways, allowing them to grow their businesses. Meanwhile, hundreds of thousands of previously off-grid SMEs could benefit from off-grid energy services that are both cheaper and more reliable than alternatives.

D. Results Chain

52. **The theory of change underpinning the proposed project is presented in Figure 9.** The project aims to increase access to new or improved electricity services to households, SMEs, and community facilities through a range of market-building interventions as well as direct support to the utility for grid extension and reinforcement. In parallel, support to key Government agencies will strengthen project execution and lay a foundation for sustainable future access planning beyond the life of the project.

Figure 9. Theory of Change and Results Chain



Source: World Bank staff.

E. Rationale for Bank Involvement and Role of Partners

53. **Putting in place a technically, financially, and operationally sound electrification program that builds on global experience is critical for expanding electrification in Madagascar and making progress toward SDG7.** The World Bank, with its ability to support the design of a customized electrification program drawing from decades of global experience, and its ability to harness recent technological advancements to provide reliable, affordable, and sustainable energy services to consumers, is well placed to assist the GoM in designing and implementing a least-cost electricity access program.

54. **The World Bank's main value added in electrification lies in helping set up comprehensive, coordinated, and well-planned programs and provide anchor financing to accelerate implementation.** Funding needs to achieve universal access far exceed the financial resources of international finance institutions and bilateral donors. The World Bank's focus is therefore on setting up scalable electrification programs (or 'platforms') to synergize public funding from various sources and attract large volumes of private sector financing. Recently, with support from the World Bank, the Government of Rwanda prepared an Electricity Access Rollout Program (P111567) that helped scale up access from 6 percent in 2009 to 43 percent in 2018. A GIS-based spatial network plan was developed to optimize expansion in the country through 2020. Kenya has also been remarkably successful in its electrification efforts: the country's electricity access rates increased from 23 percent in 2009 to more than 50 percent in 2016. With the support of the World Bank, the Government of Kenya designed and adopted the Last Mile Connectivity Program (LMCP) as the primary grid densification vehicle to speed up access in grid-connected areas,

which has the potential of reaching about 70–80 percent of consumers. The LMCP has assembled close to US$700 million in donor resources and has helped connect more than 1 million consumers per year in the past five years.

55. **Recent developments in the OGS sector, if supported adequately through quality control and targeted financial interventions by the World Bank, represent an unparalleled opportunity for Madagascar to reach out to a large part of the country bereft of modern energy services.** The World Bank's involvement will (a) ensure the electrification program's design and corresponding policy reform reflect principles of sustainability; (b) support best-practice analytics, such as least-cost geospatial electrification planning; (c) enable pooling of resources from diverse donors for access expansion; (d) advise on effective competitive procurement processes that provide added benefit during project implementation; and (e) draw on global experiences in utility operations and utility management to support the design of a robust electrification program. The proposed technical solutions would be least-cost options for the country and informed by a number of ongoing studies (funded through ESOGIP or World Bank-executed technical assistance).

56. **The proposed project will be implemented in coordination with other donors engaged in the energy access sector.** In addition to World Bank activities, energy access in Madagascar is supported by several donors, including the African Development Bank (AfDB), German Agency for International Cooperation (*Deutsche Gesellschaft für Internationale Zusammenarbeit*, GIZ), and the European Union. Table 2 shows the active donors and activities in electrification. The World Bank will help to seek parallel financing from development partners to scale up the program as opportunities arise.

Table 2. Donor Support for Electrification in Madagascar

Donor	Activities
World Bank	• Financing grid extension and densification • Financing off-grid electrification • Technical support for electrification planning • Improving utility performance
AfDB	• Providing legal support to the MEH
GIZ/*Kreditanstalt für Wiederaufbau*	• Financing PV mini-grids • Technical support to the MEH and ADER

F. Lessons Learned and Reflected in the Project Design

57. **Lessons from experience with energy access projects in Sub-Saharan Africa have informed the design of this project.** Project design and preparation also build on lessons learned from the preparation of ESOGIP and the ongoing country dialogue.

Overarching Lessons from Electrification Projects

58. **Geospatial least-cost plans have become best practice in electrification planning.** After the successful experiences of Kenya, Rwanda, Myanmar, and Nigeria, the use of geospatial planning for grid and off-grid access rollout has been expanded at the African continent level with the Geospatial Electrification Planning in the Africa Region Project (P165617). Geospatial plans constitute a data-driven approach to planning for the efficient and effective deployment of limited resources, particularly aimed

at supporting countries with high access deficits. Spatial modelling delivers a least-cost plan identifying the optimal grid or off-grid technology tailored to local circumstances and appropriate in its technical feasibility and economic viability, while integrating social and economic planning objectives. At the same time, geospatial plans allow for identifying communities that may require pre-electrification solutions in the short to medium term while waiting for higher service standard connections. Key to ensuring the effectiveness, sustainability, and dynamism over time of the geospatial approach is the establishment of GIS monitoring capacity within the country to track progress and facilitate updates of the least-cost plans.

Lessons from Grid Extension and Densification Projects

59. **Consumer awareness campaigns are important not just for off-grid access expansion but also for new grid-based connections.** Many World Bank-funded OGS projects, including LEAD, include allocations for consumer awareness campaigns to educate households on the benefits and correct usage of OGS products. Experience in other countries has shown, however, that enhancing consumer awareness is equally important for the success of grid-based access expansion. New consumers in unelectrified areas often do not understand the grid connection process well enough to make an informed decision on whether or not to connect. For instance, households may not be aware of connection charges, typical monthly costs for given power usage profiles, or the type of connection and service offering that best suit their power consumption needs. The project will therefore ensure that grid extension and densification activities are accompanied by well-designed communication programs.

60. **Grid densification (also referred to as last-mile electrification) programs need sufficient autonomy to disburse rapidly and reliably.** The purpose of last-mile electrification funding is to compensate the utility for losses it would otherwise make on the connections for new consumers. If disbursement arrangements are unclear, or if there is uncertainty around whether compensation to the utility will occur in a reliable and timely manner, the incentives the program is intended to provide ceases to exist. For instance, some last-mile electrification programs in Sub-Saharan Africa are managed and financed directly by the Government, which has led to considerable delays in reimbursement to utilities and thus the accumulation of substantial government receivables on utility balance sheets. To mitigate this, last-mile electrification for LEAD will be financed through a ringfenced account (the GDA).

61. **Internal wiring should be included in grid densification.** Connection costs should also cover internal wiring of households not only to improve connection affordability but also to ensure both the quality and safety of electrical wiring.

Lessons from Off-Grid Projects

62. **Over the past decades, the World Bank and other development partners have supported off-grid energy access projects providing access to modern energy services to more remote households, businesses, and institutions that could not be reached by conventional grid expansion.** The Lighting

Africa[14] program in particular has provided a set of early successes in supporting off-grid access. Among the most cited successful examples are projects in Sri Lanka,[15] Bangladesh,[16] Mongolia,[17] Bolivia,[18] Peru,[19] Argentina,[20] and Ethiopia. Lessons learned from these projects include the following:

- **Off-grid solutions should be fully and strategically integrated into a country's electrification program and planning process.** New technologies, falling costs, and innovative business models mean that off-grid solutions provide an opportunity to reach a much wider spectrum of the population, including the poor, in a much shorter time. Geospatial planning, such as that conducted under LEAD, can help optimize the deployment of off-grid intervention as a complement and/or interim solution to grid electrification.

- **Empowering the private sector is the best approach to deliver quality off-grid access.** Projects that allowed the private sector to distribute solar PV technologies in a commercially oriented market achieved results faster and in a sustainable manner. When financial intermediaries are part of the design, systems should be put in place to ensure necessary sectoral and operational knowledge is acquired. If necessary, technical assistance should be provided to the private sector to facilitate their cooperation with financial intermediaries. A platform should be put in place allowing for ongoing knowledge and experience sharing between participating entities in the project. The OMDF Fund Manager will ensure that these responsibilities are effectively carried out under LEAD.

- **The design of the project needs to be flexible to quickly respond to any changes and developments on the ground, especially in untested, developing off-grid markets.** The proposed project has been designed to be flexible to adapt to changes in market conditions and consumer needs. Most of the off-grid electrification programs have evolved over time with important design features changed or new features introduced midcourse. In Bangladesh, both microfinance and fee-for-service models were introduced, but the microfinance model was much more effective to reach households and the fee-for-service model was abandoned. Over time, smaller systems were also introduced to serve poorer market segments, as technology advancements reduced the cost and increased the efficiency of SHSs. In Ethiopia, in contrast, the original focus was to support distributors of solar lanterns, but over time, the project began moving toward supporting larger systems. In the Philippines, the dealer-based model of selling SHSs fell short of achieving the access targets set by the Government, and a fee-for-service model was adopted. The same was the

[14] The International Finance Corporation-World Bank Lighting Africa Program catalyzes and accelerates the development of commercial markets for OGS lighting products in Sub-Saharan Africa. It is part of the World Bank Group's wider efforts toward the goal of Sustainable Energy for All initiative by 2030. Lighting Africa mobilizes the private sector to build sustainable markets that provide affordable, modern solar lighting products to families that are not connected to grid electricity, most of whom are low-income rural families.
[15] Govindarajalu, C., Raihan Elahi, and Jayantha Nagendra. 2008. *Electricity Beyond the Grid: Innovative Programs in Bangladesh and Sri Lanka.* Energy Sector Management Assistance Program, World Bank.
[16] Sadeque, Z., Raihan Elahi, and Dana Rysankova. *Scaling Up Access to Electricity: The Case of Bangladesh*. World Bank Livewire.
[17] Jayawardena, M., Salvador Rivera, and Chrisantha Ratnayake. 2012. *Capturing the Sun in the Land of the Blue Sky: Providing Portable Solar Power to Nomadic Herders in Mongolia*. World Bank.
[18] Reiche, K., Dana Rysankova, and Susan Goldmark. 2007. "Output-Based Aid in Bolivia: Balanced Tender Design for Sustainable Energy Access in Difficult Markets." OBA Approaches, Global Partnership on Output-Based Aid.
[19] http://www.worldbank.org/en/results/2014/09/24/peru-brings-electricity-to-rural-communities.
[20] World Bank. 2013. *Argentina, Renewable Energy in the Rural Market Project, Implementation Completion and Results Report.*

case in Cambodia, where the initial pace of SHS installation was very sluggish, primarily because rural households could not afford the up-front payments to the suppliers. The model was then changed to a 'hire-and-purchase model'. Under LEAD, OMDF eligibility criteria are purposefully left broad and flexible to accommodate a variety of business models and new approaches.

- **Government ownership in quality control matters.** It is crucial to establish quality assurance of product performance at the beginning of a project to establish credibility and consumer confidence. The need for quality assurance for SHSs was determined early in the Bangladesh project. Procurement of the SHSs was the responsibility of the MFIs and nongovernmental organizations (NGOs), which were to follow established commercial practices. Stringent quality standards were set, including a five-year warranty for batteries, and these quality standards were strongly enforced. In Mongolia, as a result of adoption of international standards for SHSs as well as robust after-sales service and warranties, the credibility of these products in the eyes of the consumers was enhanced. The impressive efforts of Lighting Africa in establishing and certifying products has been instrumental in kick-starting the East African market. At the same time, in the fast-evolving technology environment, it is important that the quality standards adapt to reflect the latest available technologies so that they do not become a barrier to introducing more efficient technologies. The task team has already begun working with the BNM to adopt Lighting Global standards for OGS systems and, most importantly, foster sector ownership among key GoM institutions.

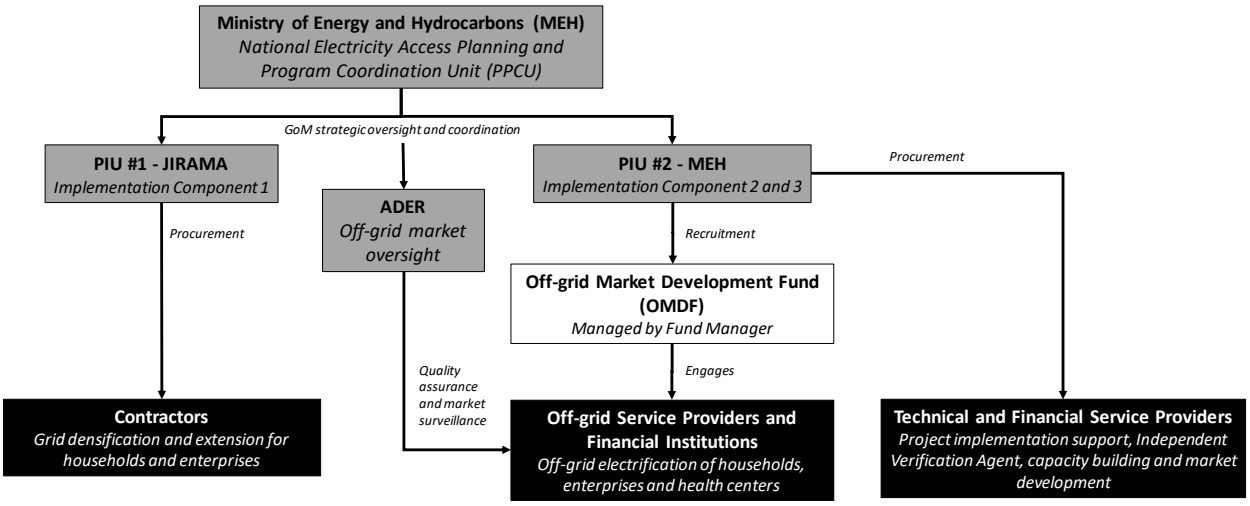
III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

63. **Project implementation and oversight.** The project's overall coordination and oversight will be ensured by the MEH, while JIRAMA's existing PIU for ESOGIP will implement Component 1, and the ESOGIP PIU created within the MEH will implement Components 2 and 3. Both existing PIUs will be reinforced to meet the increased workload. The MEH has gathered substantial implementation experience with the ongoing ESOGIP, though its implementation capacity has been weakened by a recent reshuffling of senior staff. Therefore, the recruitment of a dedicated project coordinator and fiduciary staff familiar with World Bank procurement and financial management (FM) procedures will be necessary. ADER's role will be to ensure the market supervision and consumer protection mandate of ARELEC for the off-grid segment of the power sector, as discussed in the following paragraphs.

64. **Project link to National Access Planning.** The GoM's strategic oversight and coordination of both the PIUs will be ensured by the National Electricity Access PPCU within MEH as further detailed in the POM. The PPCU, as described under Subcomponent 3a, will provide effective centralized coordination and oversight in terms of policy development, strategic planning, and project design and implementation. The unit will set the strategic direction for national electrification, including the preparation and regular updating of the NEIP for both on- and off-grid electrification. The PPCU will coordinate donor and GoM-funded studies, regularly update the sector's key performance indicators, and act as a repository of sector data and studies, including hosting and updating the geospatial platform.

Figure 10. Implementation Arrangements for the LEAD Project and Roles of the MEH, JIRAMA, and ADER



Source: World Bank staff.

65. **Technical implementation capacity at JIRAMA is considered appropriate as the utility's senior and middle-management staff in both the planning and construction departments mainly consist of experienced and well-trained technicians.** Technical assistance provided under the parallel ESOGIP is helping JIRAMA extend its management capacity to manage this expansion in new connections per year. Moreover, most of the traditionally politically appointed top management echelons are in the process of being replaced with competitive hires, many of which are from the private sector. Consequently, JIRAMA is expected to need relatively little implementation support. In line with the team's assessment, a project focal point at JIRAMA will be appointed, and existing procurement, financial, and technical staff will ensure implementation of project activities of Component 1 as well as timely reporting to the project coordinator at the MEH.

66. **Off-grid market oversight.** As the executing agency of ARELEC and the MEH, ADER will coordinate all quality assurance and market surveillance activities under Component 2. ADER's mandate will include the oversight of installation, service, and maintenance operations for both the household OGS market as well as the market for larger PV systems through which public sector facilities will be electrified under the project. Working closely with the IVA to be recruited by the MEH PIU, ADER will be monitoring compliance with technical and consumer service standards of all the PV distributors and service companies receiving funding from the project's OMDF. Based on the continuous and extensive point-of-sale spot checks, customer visits, and verification phone calls of an IVA recruited by the MEH, ADER will provide quarterly reports on the development of the off-grid market to continuously monitor progress and recommend adjustments as needed to ensure both efficiency and effectiveness of all support mechanisms provided through the OMDF. Enabling ADER to meet this important mandate will require the continuation of targeted technical assistance, trainings, and workshops to build the agency's capacity and knowledge on market development and quality standards for off-grid technology. Under the ESOGIP technical assistance component, ADER staff have already benefited from a multitude of trainings and workshops on off-grid technology, standards, geospatial analysis, and other key areas. These capacity-building activities will be continued and reinforced before project effectiveness. Moreover, ADER's institutional capacity and rural presence in the project's target areas for off-grid development will be bolstered though the creation of

local ADER units to be stationed and operating from the MEH's regional offices. For this purpose, Component 3 will provide the agency with the necessary funding for the office equipment, utility vehicles, and limited additional staffing needed to create six to eight local ADER units.

67. **OMDF Fund Manager.** The OMDF Fund Manager will be independent in its investment decisions, but with the MEH oversight as a contracting entity. In addition, all key GoM stakeholders (including the MEH, the Ministry of Finance, ARELEC, and ADER) will be represented in a steering committee that will provide strategic guidance to the OMDF. The steering committee will meet regularly to review progress, provide policy guidance, and resolve any high-level challenges facing the fund. The OMDF Fund Manager will provide regular progress reports to both the steering committee and the PIU, providing updates on investment decisions, disbursements, results, and any challenges encountered.

B. Results Monitoring and Evaluation Arrangements

68. **The two project implementing agencies, the MEH and JIRAMA, will be responsible for collecting and verifying data, and the MEH will consolidate the information and submit progress reports to the World Bank.** The progress reports will be submitted on an annual basis for PDO indicators and on a semiannual basis for the intermediate indicators at the component level. The Results Framework section in this document specifies the results indicators for the project as a whole as well as for each of its components.

69. **The MEH will monitor the results of Subcomponent 2a (the OMDF) with the help of the Fund Manager and the IVA recruited under Subcomponents 3b and 3d.** Regular reporting requirements for the participating OGS companies and financial institutions that benefit from the OMDF will be part of the grant or loan agreements signed between them and the Fund Manager. The Fund Manager will aggregate these data and report on the overall progress to the PIU at the MEH. The IVA will report independently on the results from the activities of the participating OGS companies and financial institutions.

70. **Besides the project-specific results monitoring, the World Bank is also supporting the Government to establish a better data on the nationwide electrification rate which will be helpful for evaluation of the project's broader impacts on Madagascar's state of electricity access.** The survey, which applies the multitier framework methodology for energy access and is expected to be completed by mid-2019, will provide detailed information on the energy access situation of households, including quantity and quality of services provided by all available (main and backup) sources of electricity, magnitude and frequency of energy expenditures, and willingness to pay. The baseline and the follow-up survey at the end of the project will allow for the quantification of improvements in energy service delivery in the country and could also be used for impact evaluation of development outcomes.

C. Sustainability

71. **For the on-grid component, the sustainability of the Malagasy power sector and the investments financed under this project will depend upon (a) the financial health of JIRAMA and its ability to generate sufficient revenues to fully cover its expenditures; (b) JIRAMA's ability to maintain and operate the assets sustainably; and (c) the GoM's continued commitment to support a power sector reform program.** ESOGIP, currently under implementation by the World Bank, has improvement of JIRAMA's operations and financial position as one of its key objectives. The scope of this project has been prepared in close coordination with ESOGIP.

72. **Technical sustainability of the off-grid component will be ensured by supporting the technology most appropriate to the Madagascar off-grid context, as well as ensuring ongoing quality assurance.** All supported household off-grid energy solutions will be required to demonstrate adherence to Lighting Global quality standards. Quality assurance and consumer awareness enhancement activities under Subcomponent 3c will support implementation and acceptance of these standards.

73. **Financial and fiduciary sustainability of the off-grid component will be ensured through the transfer of the OMDF into the 'FNED' at the end of the project.** In 2002, a National Fund for Electricity (*Fonds National de l'Electricité,* FNE) was created to advance the GoM's rural electrification agenda mainly by providing investment subsidies to mini-grid operators. In 2016, with the FNE's support mechanisms and operating principles no longer meeting the requirements of the sector, the GoM requested support from GIZ to restructure the FNE to enable it to operate with greater independence and flexibility to meet the needs of a greater variety of electricity service providers as well as potential funding sources. Within this context, GIZ hired an international consultant firm to develop, in close collaboration with all sector stakeholders, a concept for a new facility named the FNED, including its new mission, shareholding, project cycle, and business plan. During the first half of 2018, all preliminary legal and regulatory actions for the creation of the FNED have been completed, including the promulgation of Law No. 2017-021 for the reform of FNE and the drafting of a decree defining the operating procedures of the facility. The GoM wants to avoid the creation of parallel and ultimately redundant facilities, use LEAD as an opportunity to more actively participate in ongoing efforts to develop a flexible and efficient structure of the FNED, and contribute to the FNED's capitalization once it is operational. Therefore, and in the interest of enabling a swift start of the OMDF operations and disbursements while securing the robust institutional embedding needed for the OMDF to outlive the project's five-year duration, the World Bank has agreed with the Client to work on a sequenced solution that would involve the transfer of the OMDF from a Fund Manager to the FNED at the end of the project.

IV. PROJECT APPRAISAL SUMMARY

A. Economic and Financial Analysis

74. **An economic and financial analysis for the project was performed based on a simple cost-benefit framework.** The main impacts of the project are: increased access to electricity through increasing the number of connections within existing JIRAMA grids in urban areas; constructing new distribution lines, substations, service drops, and street lighting for rural and peri-urban customers; supporting the private sector-led rollout of stand-alone solar PV systems; and improved access to electricity through electrification of health centers.

75. **Economic analysis.** The Economic Internal Rate of Return (EIRR) for the project is 11.3 percent with a net present value (NPV) of US$41.1 million, assuming a discount rate of 6 percent. The economic benefit also accounts for savings in GHG emissions. A total of 619,361 tCO_2 of emissions are avoided through the project. The GHG emission reductions are due to the lower emission factor of the grid and SHSs compared to traditional lighting sources. Overall, new grid connections account for an emissions reduction of around 108,269 tCO_2 and new SHSs and health clinic solar installations account for an emissions reduction of around 511,093 tCO_2.

76. **Project and utility financial analysis.** The Financial Internal Rate of Return (FIRR) and NPV for the project is estimated at 15 percent, with an NPV of US$55.3 million at a discount rate of 10 percent. The

utility financial analysis suggests that JIRAMA's total losses are expected to decline to 28 percent by 2022, consistent with the targets set as part of the World Bank's ESOGIP, and JIRAMA will reach cost recovery for the first time in 2023. These developments are reflected in the projections as positive gross and operating profits from 2023 onward, as well as a reversal in declining cash balances. However, JIRAMA will continue to require significant financial support in the interim.

B. Technical

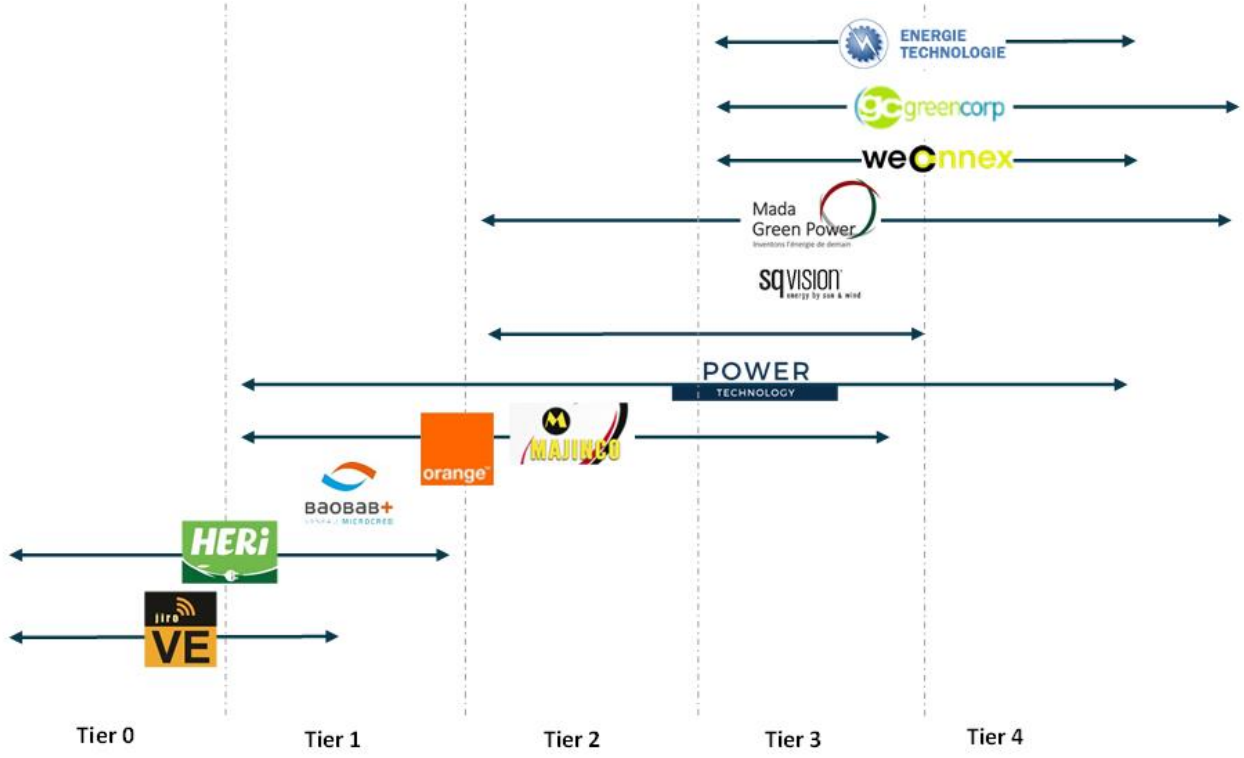
77. **The investment components under Component 1 uses well-proven technologies and presents no unusual installation, commissioning, or operational challenges.** The equipment and the technologies to be used in the construction and operation of lines and transformers will be of international standards. JIRAMA has successfully implemented similar activities in the past. Cost estimates are derived from recently completed installations in Madagascar and in other similar countries under projects financed by the World Bank or by other donors and aligned with current market prices. Regarding project implementation, international consultants will be hired to support the design of activities under Component 1 in line with best practices and supervision of the implementation of key contracts.

78. **The project will contribute to raising technical standards in the OGS market in Madagascar as solar PV systems supported under Component 2 of the project will have to meet strict quality standards.** While there is already a range of OGS distributors in the market that offer a range of service levels, the growth in the quality-verified market segment still lacks momentum compared to regional peers such as Kenya and Tanzania (see Figure 11 and Table 3).

79. **For Subcomponent 2a, all systems deployed directly or indirectly through the project will need to meet Lighting Global quality standards that ensure high performance and reliability.** These include factors such as lighting output and run time, durability in terms of physical ingress and water and battery protection, and truth in advertising. The vast majority of existing deployed OGS systems in Madagascar do not meet these standards, but in market surveys, consumers have clearly indicated a strong desire for high-quality solar systems that are safer and more economical than alternative lighting sources.

80. **For Subcomponent 2b, the larger solar systems for health center electrification and their individual components will need to meet rigorous design specifications.** A variety of relevant International Electrotechnical Commission standards will apply for this purpose (to be detailed during implementation). This will ensure that O&M requirements are kept to a minimum, thus increasing the likelihood of system uptime over the longer term.

Figure 11. Overview of OGS Market in Madagascar by Electricity Access Tier Provided



Source: Task-team market research.

Table 3: Detailed Overview of Business Models and Estimated Sales in the OGS Market in Madagascar

Formal Distributors	Product Tiers	Product Types	Business Model(s)	Credit/PAYGO Offered	3-Year Cumulative Customers
Jiro-ve	0–1	Non-QV solar lanterns	Small solar lanterns rented to customers through 31 franchisees	Yes	7,000
HERi	0–1	QV solar lanterns	Variety of solar lanterns rented to customers through 110 kiosks; PAYGO sales to be launched soon	Yes	30,000
Baobab+	0–1	QV pico-PV systems	Pico-PV products sold through MFI top-up loans and through agent network	Yes	20,000
Orange	1–2	QV pico-PV and SHS	Pico-PV and SHS products rented to consumers through a subset of Orange agent network	Yes	<5,000
Majinco	1–3	Non-QV, QV pico-PV, SHS	Pico-PV and SHS products sold on a cash basis through store network	No	6,000

Formal Distributors	Product Tiers	Product Types	Business Model(s)	Credit/PAYGO Offered	3-Year Cumulative Customers
Power Technology	2–3	Non-QV SHS	SHS sold on a cash basis through single outlet and 20-person sales agent network	No	<5,000
SQVision	2–3	Non-QV SHS	SHS sold on a cash basis through a network of sales agents; PAYGO sales being investigated	No	6,000
MadaGreen	2–5	Non-QV SHS	SHS sold on a cash basis to wealthier households and SMEs	No	<5,000
WeConnex	3–4	Non-QV SHS	SHS sold through partner outlets on a cash basis	No	<5,000
Totals by Product Tier		**Distributor Type**		**Market Share (%)**	**3-Year Cumulative Customers**
Tier 0–1		Informal		54	150,000
		Formal		25	70,000
Tier 2		Informal		7	20,000
		Formal		7	20,000
Tier 3+		Informal		4	10,000
		Formal		4	10,000
Totals		**All**		**100**	**280,000**
		Of which Informal		**64**	**180,000**
		Of which Formal		**36**	**100,000**

Note: QV = Quality verified. Sales/clients figures are estimates generated from research performed by Enclude for the World Bank in 2017/2018. Market share numbers may not sum to 100 percent due to rounding. Informal firms are those that typically sell low-quality solar system components and do not provide installation or warranty service.

C. Fiduciary

Financial Management

81. **The FM assessments of the MEH and JIRAMA as the PIUs were carried out in September 2018 to assess whether they have acceptable FM arrangements in place.** The assessments have considered the degree to which (a) reasonable records are maintained and financial reports produced and disseminated for decision making, management, and reporting; (b) funds are available to finance the project; (c) there are reasonable controls over project funds; and (d) independent and competent audit arrangements are in place.

82. **The overall conclusion of the assessments is that the FM arrangements in place within JIRAMA and agreed to be established under the MEH are acceptable.** In view of the country context[21] and the PIU assessment, the overall FM risk has been assessed as Substantial. Mitigation measures have been proposed to address some of the issues identified. Mitigation measures have been proposed to address the fiduciary risks identified:

(a) The two PIUs under the MEH and JIRAMA will be reinforced with experienced staff to coordinate activities of the project.

(b) Under Component 1, the revolving GDA will be established either as a treasury account or as an account in a commercial bank for JIRAMA and will be subject to the auditing procedures of the project.

(c) Under Subcomponent 3b, the MEH will appoint a Fund Manager to manage the funds allocated to the OMDF, applying the criteria outlined in Annex 3 to ensure compliance with the provisions in the World Bank's Directive for IPF on financial intermediary financing; outsourcing the implementation of the off-grid component to a more experienced fund will address the GoM capacity constraints and lack of experience with the off-grid sector.

(d) Under Subcomponent 3c, an IVA will be appointed not later than three months from the project effectiveness in accordance with terms of references (ToRs) to be reviewed by the World Bank. Its main mission will consist in verifying the transparency and compliance on the part of selected vendors and MFIs.

(e) The PPCU will provide effective centralized coordination. This unit will rely on a qualified coordinator and its members will receive adequate training to ensure adequate oversight of activities under Components 1 and 2.

(f) A POM will be developed before project effectiveness and will define the role of the various stakeholders involved in the project as well as the funds flow process between them.

83. **Staffing and budgeting.** For the need of this project, both JIRAMA and the PIU under the MEH will recruit qualified staff including one finance officer and one accountant. The same planning and budgeting process as for ESOGIP will apply for LEAD. The PIU under the MEH will consolidate financial information (the PIU within the MEH and JIRAMA) to prepare the annual budget of the project. The PPCU will review the budget before its submission to the World Bank and will take part in its follow-up by reviewing quarterly financial reports. The budget execution will be monitored by the PPCU in accordance with the POM. The budget forecast shall be reliable and based on the best assumptions and aligned with the work program, technical constraints, and the Procurement Plan.

[21] The overall country fiduciary risk including fraud and corruption risk is High. The 2014 Public Expenditure and Financial Accountability (PEFA) self-assessment indicates that limited progress has been made on improving the credibility of the budget. A 2017 PEFA self-assessment was carried out in 2017 covering FY14–16. The report reflected the impact of the political crisis on public financial management reforms' implementation, resulting in weaknesses of the budget reliability and the management of assets. Nevertheless, improvements were noted in various areas as the transparency of public finances, management of liabilities, and reporting. The Government must continue to respond to these challenges.

84. **Disbursements will be made in accordance with the World Bank Disbursement Guidelines for Projects, dated February 2017.** The project will use a Statement of Expenditures-based disbursement method. One Designated Account denominated in U.S. dollars will be opened by each PIU at the Central Bank. A secondary U.S. dollar account per PIU will be opened at an acceptable commercial bank to enable payment of eligible expenditures. The Designated Account will receive an initial advance equivalent to four months of forecasted expenditures and will be replenished on a monthly basis. Given the substantial financing allocated to Subcomponent 2a, the Fund Manager's contract will clarify (a) the use of a segregated bank account for the management of the proceeds of the financing; (b) the disbursement scheduling process; and (c) the required reports for disbursement purpose. The POM will broadly describe the disbursement process.

85. **For the GDA, JIRAMA will open a ring-fenced account to receive and manage funds to finance grid extension.** The transactions under this account will be reported as part of the quarterly interim financial reports. Signatories and disbursement process for the use of funds will be defined in the POM.

86. **Reporting and Auditing:**

(a) **Internal controls, accounting, and reporting.** The current practices on accounting and reporting under ESOGIP will be applied for this project. The POM will clearly define the role of each stakeholder involved in the implementation (PIUs, PPCU) as well as the funds flow related to the execution of each component activities. In addition, the project will strengthen the control environment by hiring an IVA and Fund Manager with ToR cleared by the World Bank.

(b) **Internal audit.** The internal audit department of JIRAMA will include the review of Component 1 in its audit plan.

(c) **Independent verification.** For Component 2, the IVA will be competitively appointed to regularly verify that disbursed funds are used properly with respect to the financing provisions.

(d) **External financial audit**. The external audit of the project financial statements will be carried out by an auditor appointed according to ToR agreed with the World Bank. The audit will comply with the International Standards on Auditing. The audit report will be transmitted to the World Bank within six months after the fiscal year end date.

(e) **Implementation support and supervision plan**. Considering the current overall residual FM risk level, Table 4 describes the supervision plan.

Table 4. FM Supervision Plan

Action	Description	Frequency
Desk reviews	Interim financial reports review Review of the audit report on the financial statements of the project Review of other relevant information such as internal audit reports	Quarterly Annually Continuous as they become available
On-site visits	Review of overall operation of the FM system Monitoring of actions taken on issues highlighted in audit reports, auditors' management letters, internal audit, and other reports Transaction review (if needed)	Twice a year As needed As needed
Capacity-building support	FM training sessions for staff (PIU and staff at the regional level)	During implementation and as and when needed

Procurement

87. **Procurement under the proposed operation will be guided by the following documents:** (a) the 'World Bank Procurement Regulations for IPF Borrowers' dated July 1, 2016, revised in November 2017 and August 2018 (Procurement Regulations); and (b) the World Bank's Anti-Corruption guidelines called 'Guidelines on Preventing and Combatting Fraud and Corruption' dated October 15, 2006, revised in January 2011 and as of July 1, 2016. The POM will be drafted in accordance with these documents and submitted to the World Bank for approval. The POM would also include a complaint management system in accordance with Annex III of the World Bank Procurement Regulations for IPF Borrowers. The procurement approach and methods for all contracts will follow approved selection methods and market approach options in the regulations. No activity is envisaged to involve departure from policy thresholds or need additional oversight or Operational Procurement Review Committee (OPRC) review levels. All goods and non-consulting services will be procured in accordance with the requirements set forth or referred to in Section VI. Approved Selection Methods: Goods, Works, and Non-Consulting Services of the Procurement Regulations abovementioned, and the consulting services will be procured in accordance with the requirements set forth or referred to in Section VII. Approved Selection Methods: Consulting Services of the Procurement Regulations, as well as according to the Project Procurement Strategy for Development (PPSD) and the Procurement Plan approved by the World Bank.

88. **A recent procurement assessment of the two agencies implementing Component 1—MEH and JIRAMA—renewed the rating of the two agencies as 'Substantial'.** The two agencies are currently implementing ESOGIP and its Additional Financing, which is already governed by the New Procurement Regulations for Borrowers Applying for IPF. Any outstanding risk will be mitigated through the training of the two agencies' staff in the implementation of the PPSD. The risk will also be mitigated through the involvement of internal auditors in the verification of project expenditures, with proposals for corrective measures for possible irregularities. Appropriate fiduciary arrangements will be put in place to ensure smooth implementation of the project. Ongoing monitoring and mitigation of any potential risks will be made possible through regular reporting on the progress and implementation of fiduciary activities, World Bank supervision, and further capacity building.

89. **A PPSD that covers all project activities and an initial 18-month Procurement Plan was developed, covering all procurement activities for the entire project.** The PPSD serves as the cornerstone for ensuring that the procurement approach is properly planned and designed to avoid issues in contract delivery. This will enable the selection of the most appropriate suppliers of infrastructure services and consultant firms. The Procurement Plan will specify for each contract (a) a brief description of the activities/contracts; (b) the selection methods to be applied; (c) the estimated cost; (d) time schedules; (e) the World Bank's review requirements; and (f) any other relevant procurement information. Any updates of the Procurement Plan and the PPSD shall be submitted for the World Bank's approval. The project will be using the World Bank's online procurement planning and tracking tools, Systematic Tracking of Exchanges in Procurement (STEP), to prepare, clear, and update its Procurement Plan and to carry out all procurement transactions. The MEH PIU and JIRAMA's staff have been trained to use STEP. After the project is approved by the Board, it will be published on the Ministry of Finance and Budget's website and the World Bank's external website. The Procurement Plan will be updated in agreement with the World Bank at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

90. **Under Component 1, JIRAMA will procure civil works and electrical works for low- and medium-voltage grid extension and grid densification.** Based on the PPSD analysis and a review of the lessons learned under the ESOGIP, there is likely to be no serious supply market risk as well as competition risk, provided that the delivery model takes into account appropriate risk allocation and security arrangements. Therefore, the procurement approach and methods will follow open competition. The following lessons learned from the ESOGIP Project are incorporated into the PPSD for Component 1:

(a) **Mitigating risks of delays.** Risk allocation will be designed in a way that penalizes delays caused by inadequate staffing and resources mobilized by the contractor. The bidder will have to provide a complete list of staff they will hire in addition to their existing country teams working on other projects, and the JIRAMA PIU will hire an additional team member to monitor compliance.

(b) **Creating opportunities for local companies.** Tenders will be designed smartly to maximize opportunities for local companies by (i) sensibly packaging works and (ii) conducting regular market scoping and due diligence of relevant companies.

91. **Under Component 2, procurement activities by the PIUs are limited to the hiring of consultants to help design standardized service packages for public health centers.** The OGS companies will use working capital loans from the OMDF to procure inventories, and the RBF to fund a variety of operating expenses including but not limited to works at new distribution centers and training of new sales agents, in accordance with the provisions of the Operating Guidelines and the pre-approved company business plans. The involved procurement transactions will be made by the OGS distributors and installers themselves, using commercial practices and following technical standards defined by the project.

92. **The procurement of solar PV systems for health centers (Subcomponent 2b) will be managed by the PIU under the MEH.** The installation and maintenance services for the solar PV systems will be selected competitively. Procured systems will have to meet strict criteria related to quality standards and service delivery. Maintenance contracts will be for a period of seven years. Any maintenance service to be provided beyond the closing date of the project, as included under Subcomponent 2b, will be prepaid

to the contractor against a letter of credit from a local bank acceptable to the GoM to mitigate the risk of default and nonperformance of the contractor after receipt of the prepayment.

93. **Under Component 3, the MEH will apply standard procurement procedures for consulting and other market development services.** This includes the procurement of the Off-Grid Fund Manager (Subcomponent 3b), which will be selected competitively according to World Bank policies by the PIU under the MEH, whose procurement capacity is generally satisfactory.

D. Financial Intermediary Provisions

94. **Madagascar's commercial banks and MFIs as well as the potential participating solar firms have the capacity to fulfil the role envisioned under the project, contribute to achieving the objectives of the project, manage credit risk, and effectively report on project activities.** An evaluation of Madagascar's financial sector, conducted during project preparation and following the guidelines of the World Bank Directive for IPF, concluded that the sector will be able to comply with the requirements for financial intermediary financing. A portfolio approach to the selection of participating firms will be pursued to mitigate risks and draw on the respective strengths of the different institutions. More details on the project's approach to ensure compliance are provided in Annex 3.

95. **The Fund Manager will be required to satisfy financial intermediary financing requirements that are prescribed under the World Bank Directive on IPF.** These include a competitive selection process, clear selection criteria and scope of work for the Fund Manager, market-based pricing of the project proceeds that will be lent to participating financial institutions and final beneficiaries, and assurances that the FOREX risk will not be passed on to the final beneficiaries. These requirements underscore the importance of responsible lending that operates in a context conducive to efficient resource allocation.

96. **Financial intermediaries accessing project funds will be subject to strict eligibility criteria and be required to maintain minimum performance criteria over the course of the project.** All participating firms will have to prove upfront the professionality of their operations (e.g. quality of staffing, robust IT, accounting systems and financial planning, adequate after-sales service, etc.) and that funds will strictly be used to supports the sale of Lighting Global quality-verified products. Firms that provide products to consumers on credit (i.e. via PAYGO schemes supported under the project) will be subject to additional requirements, namely regarding past and present quality of their portfolio and portfolio management systems. The POM will set out additional eligibility requirements as well as specific circumstances under which waivers may be granted.

E. Safeguards

Environmental Safeguards

97. **Environmental and social risks and impacts of the proposed operation are considered "Substantial".** The project has a large geographical scope including rural and urban areas nationwide, but JIRAMA's Environment Department is experienced in implementing World Bank funded-investments through the ongoing ESOGIP. The project is classified as Category B and three Environmental and Social Safeguard Policies are triggered: OP/BP 4.01 (Environmental Assessment); OP 4.11 (Physical Cultural Resources); and OP/BP 4.12 (Involuntary Resettlement). The project design initially approved in February 2018 has been modified several times to simplify its activities, namely that the project will not build new

transmission lines. Therefore, the safeguards category has been downgraded from A at concept stage to B at appraisal.

98. **The project is committed to complying with all triggered safeguards policies and preparing the required safeguard instruments.** Activities under Component 1 (investments in grid extension; densification and reinforcement of existing distribution infrastructures; upgrading or constructing substations) will be in residential and industrial zones without any environmentally sensitive areas such as wetlands or forests. The areas selected from JIRAMA's long list are located in areas with no sensitive habitat or high biodiversity. However, Component 1 could potentially induce risks and adverse environmental and social impacts, including the effects related to: general nuisances such as noise, dust, and vibration; community health and safety risks such as increased HIV/AIDS transmission; risks related to the influx of workers and local recruitment, gender-based violence (GBV), sexual exploitation abuse (SEA) risks; increased risk of accidents during civil works; environmental and public health risks from improper disposal of solar home system batteries or old generators with Polychlorierte Biphenyle (PCB); and harm to potential chance finds of physical cultural resources during the civil works and temporary/ permanent land acquisition and economic displacement. Regarding Component 2, funds provided through the OMDF will support the private sector to provide approximately 300,000 households, 2,000 businesses and 500 basic health centers with autonomous rooftop solar PV system. These activities could generate waste from depleted SHS batteries and accidents during the installation process. To address these risks, the Borrower has prepared an Environmental and Social Management Framework (ESMF) disclosed on January 8, 2019 and the Resettlement Policy Frameworks (RPF) disclosed also on January 8, 2019. The Borrower-prepared framework instruments as the detailed locations of distribution lines and works will only be known once the technical studies that need to be prepared or updated during the first year of implementation have been completed.

99. **Project activities have been designed—and will be implemented—in a way that minimizes potential environmental and social impacts.** In compliance with OP 4.01 (Environmental Assessment), an ESMF has been prepared to screen sub-project proposals for environmental, social, gender, and health and safety impacts by using its Environmental and Social Screening Form (ESSF) checklist for Component 1 activities. The ESMF has taken into account the environmental and social review and described the environmental and social profiles in the urban and peri urban project target areas. The screening outcomes will determine the need to prepare an Environmental and Social Impact Assessment (ESIA), and a freestanding Environmental and Social Management Plan (ESMP). Moreover, ToRs for specific environmental and social studies with the related ESMP for each group of activities that JIRAMA could launch in parallel with the technical studies have been provided. All contracts to be issued under the project will include the environmental and social clauses annexed in the ESMF necessary to ensure adequate environmental and social management practices during the project implementation phase. Regarding the risks from solid waste under Component 1, the assessment of JIRAMA has established that the utility had ceased importing transformers containing PCB since 1985. Moreover, the ongoing ESOGIP Project has already put in place action plans for the collection and storage of old transformers in an operational secured site In Antananarivo. With regard to Component 2, the project's support for distributors of standalone solar rooftop technology could generate waste in the form of depleted SHS batteries thus creating the need for a nationwide used battery management plan. While Madagascar thus far has no legislation on used battery management, the country could apply international standards as defined by Decree No. 2004-167 of 2004 and Decree No. 99-954 of 1999 on rendering investment compatible with the environment ("*Décret Mise en Compatibilité des Investissements avec*

l'Environnement – MECIE"). Therefore, it was proposed that used batteries will be collected by the private sector (including distributors and resellers), stored in plastic containers in a secure location until a more rational method can be found. The battery management plan will be supervised by the Environmental Unit of the MEH with the support of Ministry of Environment. In addition, the ESMF has proposed specific Environmental, Health and Safety (EHS) measures for OGS companies to further reduce the already limited risks of accidents during the mostly "plug-and-play" installation of solar systems. Moreover, private resellers and distributors must have a realistic Environmental and Social Charter to reduce electronic waste and used batteries (batteries and solar panels with long-life cycle) including a Management and Collection Plan for used batteries / used panels with a Communication and Awareness-Raising Plan for the households and enterprises. These approaches are in line with GoM and World Bank policies and guidelines on environmental and social impact management (see the EHS guideline). Public consultations and field visits have confirmed that no archaeological vestiges or any sites defined as physical cultural resources will be impacted following the socio-economic survey developed in the ESMF. For more assurance, the ESMF has made provisions for cultural resources management in the event that the Physical Cultural Resources OP 4.11 is triggered during the implementation phase and comprises "chance finds" procedures for inclusion in the contractor contract.

100. **Environmental and social safeguards capacity building.** The proposed operation will be implemented by JIRAMA for the Component 1 and by MEH for the Component 2. The capacity assessment conducted as part of the ESMF and the RPF concluded that the current environmental and social institutional arrangement to implement Component 1 is operational and could be maintained by JIRAMA's Environment and Risk Prevention Department. The Department gained significant knowledge and experience managing social and environmental safeguards risks with the ongoing ESOGIP operation. The permanent staff of the Department is supported by an environmental consultant firm to prepare of required safeguard instruments for identified subprojects. Under ESOGIP, key instruments such as ESIA and Resettlement Action Plans (RAPs) were prepared by JIRAMA in a timely fashion and appropriately implemented by contractors under the supervision of the said Department. It is proposed that the World Bank task team will continue to provide hands-on training in management of environmental and social safeguards risks, including the new Environmental and Social Framework (ESF). For Component 2, MEH disposes of an Environmental Unit which was created by the Ministry of Environment more than 10 years ago to ensure the appropriate consideration of environmental issues of energy projects. This unit will be in charge to ensure environmental and social compliance of activities under Component 2. This unit will be supported by a consultant to conduct: (i) the screening of private companies with the screening form in Annex 12 of the ESMF; (ii) the review of Environmental and Social Charter for Private Resellers and Distributors of stand-alone solar systems and (iii) supervise Environmental and Social Compliance and the implementation of ESH measures in the contracts of OGS involved in Component 2. The ESMF and RPF include institutional arrangements outlining the roles and responsibilities for the various stakeholder groups involved, for screening and approval of activities, as well as implementation and monitoring of mitigation measures and capacity building activities needed.

Social Safeguards

101. **Social impacts have been assessed, and mitigation measures identified** as part of the development, consultation and disclosure of an Environmental and Social Management Framework (ESMF) in accordance with OP 4.01 Environmental Assessment. Social risks and impacts of the proposed operation are considered "substantial to moderate". OP 4.12 Involuntary Resettlement is triggered for

this project due to land acquisition and involuntary resettlement emanating from Component 1 of the project. The potential negative social impacts during site preparation and construction of new substations and distribution lines are mainly small-scale and related to substations and the construction of distribution lines and acquisition of rights-of-way. Impacts will be limited to partial loss of crop land, loss of property (boxes, kiosks, pavilions, fences,), and loss of sources of income or livelihoods. These potential impacts are expected to be small to moderate, temporary, and site specific, and resettlement measures can be readily designed and implemented.The total number of people affected by Involuntary Resettlement is estimated at 875 households.[22] A RPF has been prepared in compliance with the World Bank's OP 4.12 and the related Malagasy legal requirements, consulted and disclosed to guide the resettlement in this component and includes specific guidelines on screening activities for minimizing resettlement, including a negative list of activities. Since the technical studies of activities under Component 1 will be prepared or updated when the financing is available, the RPF proposes specific ToR for resettlement action plans for each group of activities, related to Component 1, that JIRAMA could launch in parallel with the technical studies. These requirements contain a description of the types of social baseline studies to be prepared for resettlement plans, including collection of gender-disaggregated data on project-affected households and persons. They also contain provisions related to the assessment and compensation of affected assets and to resettlement supervision, monitoring, reporting and gender-disaggregated indicator tracking.

102. **Labor influx and gender violence prevention.** The project should pay particular attention to worker safety and develop specific actions to prevent and address possible GBV as a result of mobilization of workers from outside local communities for the implementation of activities of Subcomponent 1b. Under Component 1, the project will include civil works and will pay particular attention to worker safety and develop specific actions to prevent and address possible GBV as a result of mobilization of workers from outside local communities for the implementation of activities of Subcomponent 1b. Measures that have been or will be taken to address the challenges of labor influx will include, but are not limited to, (a) an assessment of labor influx risks in the ESMF; (b) based on the risk levels, development of appropriate mitigation instruments such as a Labor Influx Management Plan, as needed; (c) a requirement that the Borrower includes clauses on workers' conditions and management, child protection, and GBV prevention in all contracts; (d) provision of technical assistance and training to the Borrower and awareness raising on GBV among all contractors, workers, and local residents; and (e) the setting up of an accessible and accountable grievance redress mechanism (GRM) to ensure that any incident related to labor influx and GBV will be addressed in an effective manner with sufficient social sensibility.

Safeguard Monitoring and Evaluation

103. **Safeguard monitoring.** The monitoring and evaluation (M&E) system of the project includes the monitoring of safeguard impacts and measures related to safeguard policies. JIRAMA, as an implementing agency for Component 1, under its Environment and Risk Prevention Department will be responsible for the preparation and supervision of ESMF implementation. This department will carry out ESMPs/RAPs to ensure that the mitigation measures are being effectively implemented and will conduct field visits on a regular basis. Monitoring checklists will be prepared on the basis of the mitigation plans for this purpose. Progress reports shall document the progress of ESMF implementation. Finally, the project will engage specialists/firms to conduct detailed environmental and social studies (ESIA/ESMP and RAP). The

[22] Calculated on the basis of persons who could be affected by district as well as well as similar data from the EGOSIP project.

Environment and Risk Prevention Department of JIRAMA will ensure regular liaison with the National Office of Environment, local authorities, and communities. The JIRAMA-related staff have received adequate training on the safeguard instruments to be applied to the project under the ongoing IDA-funded ESOGIP.

104. **Public consultation and information disclosure.** The affected people and communities and other relevant stakeholders have been consulted during the elaboration of the ESMF and RPF. The feedback from the consultations has been incorporated into the project design, the final draft ESMF, and RPF. Likewise, during project implementation, JIRAMA is expected to consult project-affected groups, local governmental organizations, and NGOs on all environmental and social aspects of the project and take their views into account accordingly. Preparation of stand-alone environmental and social safeguards instruments of potential subprojects (ESMP and RAP) when needed will also be prepared through a consultative and participatory process involving all stakeholders at the local, regional, and national levels. The draft ESMF and RPF were received at the World Bank in October 2018. The final versions of these documents have been disclosed both in-country and at the World Bank's website on January 8, 2019.

105. **Budget for safeguards implementation.** Satisfactory calendar, budget, and clear institutional responsibilities have to be prepared for the implementation of measures related to safeguard policies. Costs related to safeguard policy measures have to be included in the project cost. The ESMF has assessed the funds necessary to prepare and implement the required ESIAs, ESMPs for Component 1 and to conduct Component 2 activities in compliance with environmental and social measures for a total amount of US$152,432. This budget must be included in the project costs.

F. Gender

106. **Social inclusion and gender integration.** Relevant inequalities between women and men still persist in the country, and although there is significant potential to positively contribute to the country's development, women still represent a vulnerable group in many cases.[23] In this context, the project is designed to reduce gender disparities and further foster social inclusion and gender integration.

107. **Financial inclusion is a key challenge in Madagascar and women appear to be more affected than men by poor access to credit.** About 41.8 percent of adults in Madagascar are fully financially excluded (41 percent of females), without access to formal or informal financial services (2016 Finscope survey). Access to finance was ranked the second most problematic factor for doing business in Madagascar (after political instability) in the World Economic Forum Executive Opinion Survey 2017, and Madagascar ranks at 133 out of 190 countries in terms of 'Getting Credit' in the 2018 World Bank Doing Business. Only 6.5 percent of men and 4.6 percent of women had an account at a financial institution in 2011, and 2.3 percent of men and 1.4 percent of women used an account at a financial institution for business purposes. About 56.4 percent of women and 58.4 percent of men borrowed any money in the past year, while 10.5 percent of women and 14.8 percent of men borrowed to start, operate, or expand a farm or business (2014 data). The share of people borrowing from a financial institution however was only

[23] In the last decades, Madagascar has engaged in several efforts at the national level to promote gender equality and foster women's empowerment. However, gender-based inequalities persist. Based on the 2010 data, women's earnings are on average 34 percent lower than those of men with the same characteristics. In addition, according to a World Bank study (2014), over 2005–2010, the ratio of extreme poverty rates by gender (male/female) passed from 3.2 percent to −2.4 percent, with female heads of households more deprived in comparison to male heads. In some areas, land acquisition is still subject to strict traditional laws that exclude women, notably in the south and southeast (African Economic Outlook, Madagascar, 2014).

1.8 percent for women and 2.2 percent for men (World Development Indicators). While credit usage is roughly gender-neutral, female-led companies are more likely to report credit access as a major problem—about 20.8 percent of female against 9.3 percent of entrepreneurs and managers. Women rely on credit as much as men, but they are more likely to report access to credit as a problem (2013 Enterprise Survey).

108. **Improving access to financial services can promote energy access and create employment and business opportunities, particularly for women.** Financing has proven to be one of the most important constraints of clean energy development. Relatively high up-front costs are preventing price-sensitive consumers—either households or businesses—with limited budgets from accessing off-grid energy solutions. Access to finance—with a focus on women's finance—is key to the development of the off-grid market. Financing opportunities and frameworks are often different for women and men, with women often relying more on informal networks and lending groups. Microfinance is particularly important for women. Female membership in MFIs has been steadily increasing from 46 percent in 2011 to close to 50 percent of their total outstanding portfolio in 2017. Women have also been found to be reliable bank customers. Therefore, financial institutions can profitably expand services to female entrepreneurs.

109. **The OMDF and Fund Manager's key performance indicators will be designed to ensure that men and women equally benefit from the project's intervention, thus closing the gender gap in access to finance.** The project will require firms to outline their experience in targeting the women's market segment and firms that can demonstrate expertise in this area shall be preferred. The winning firm shall select relevant actions based on local circumstances. Some best practices on helping boost women's financial inclusion include tailored products and services (savings, loans, and skills training) to meet the needs of different segments of women in the market; use of psychometric testing as an alternative form of collateral for women clients and digital financing services as convenient and comparatively less expensive ways to make payments and transfer funds; consumer education and awareness activities actively involving women's participation; and training for credit officers to challenge norms they may hold and ensure sufficient outreach and engagement with the women's segment and women's groups. To track the outcome of efforts to ensure equal access to finance, the project will track the number of female beneficiaries, with a target of 50 percent of the total (75,000).

110. **Integrating women into value chains has the potential to lead to more effective energy access initiatives.** Women are more than passive users of energy at the household and enterprise level. With proper capacity building, they can be empowered to expand access to off-grid energy products and services, thereby creating jobs and reducing poverty. There is increased evidence that a diverse salesforce can lead to better results, for example, data indicates female sales agents often have a higher sales performance than their male peers, along with a greater ability to build and maintain relationships in local communities. In the clean cooking market, for example, about 72 percent of companies that involve women in their supply chains stated that their investments in women were already increasing profits or were expected to do so soon.[24]

111. **Components 2 and 3 are designed to promote equal opportunities for men and women in the OGS value chain.** Specifically, Component 2 will include gender considerations in the allocation of grants under the RBF to promote female entrepreneurship and accelerate women's employment in the off-grid

[24] Global Alliance for Clean Cookstoves (2013). Scaling Adoption of Clean Cooking Solutions through Women's Empowerment. https://cleancookstoves.org/binary-data/RESOURCE/file/000/000/223-1.pdf

value chains including though business skills training and mentorship schemes. Component 3 will include job-focused training activities aiming to reach female beneficiaries (with a target of reaching at least 50 percent female participation in the overall job-focused training program).

G. Citizen Engagement

112. **Citizen engagement.** For Component 1, the project will use the same citizen engagement indicator used in the energy project ESOGIP and Additional Financing (P164318) and contribute to develop periodic (annual) public dissemination/debate on the customer satisfaction survey report to reinforce participatory M&E of JIRAMA and the project. For Component 2, consumer engagement is vital to effective implementation, and the project will support a multiyear program for consumer education and citizen engagement (Subcomponent 3c). Consumers are unlikely to be aware of the new technologies being presented and will benefit from information about the services, explanation about how the services can be accessed, and the opportunity to interact with service providers to share their feedback and concerns. The citizen engagement and consumer awareness activities will provide beneficiaries with the necessary guidance on how to get the best out of the products in the way they use and maintain them; these activities will also help service providers better understand the needs and concerns of their customers. The citizen engagement program will employ a variety of messaging tools and personal interaction to reach various audiences while ensuring opportunities for two-way dialogue. To monitor the responsiveness to citizens, the project's results framework includes an indicator that measures the response rate to complaints submitted to the project's Grievance Redress Mechanism (GRM).

H. Grievance Redress Mechanisms

113. **Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS).** The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service.
For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

114. **The project will benefit from the Grievance redress mechanism (GRM) developed under the World Bank-funded ESOGIP operation.** The project will use a transparent, equitable, complaints-management mechanism accessible to all actors during the project cycle. All complaints received by the project's GRM will be processed and will be subject to periodic reports and disseminations. The complaints and grievances related to Component 1 will be managed by JIRAMA, and those related to Component 2 will be the responsibility of the MEH. Appointed officials will be designated by each entity. Consolidation of data on project complaints will be consolidated and reported periodically by the Project Management Unit.

V. KEY RISKS

115. **The overall risk rating for the operation is High.** The key risks to the PDO are the (a) political and governance risk; (b) macroeconomic risks; (c) sector strategies and policies risk; (d) technical design risk; (e) institutional capacity risk; (f) fiduciary risk; (g) environmental and social risk; and (h) stakeholder risk. However, the potential benefits of the proposed operation far outweigh the residual risks and warrant IDA's assistance.

116. **Political and governance risk (High).** Continued tensions and weak governance present high risks to political stability. The country has deep-rooted governance challenges that contribute to political fragility. Key drivers of fragility include influential networks that shift alliances to access rents, as well as social fragmentation, growth of a trafficking economy, and a nascent system of checks and balances, as discussed in the CPF. With the presidential elections at the end of 2018, the country has just experienced its first constitutional and peaceful change in power since its independence. This is an indication that political and governance risks might be declining, but they are still considered "High" at this stage. ***Mitigation****:* To mitigate these risks and ensure ownership by all key stakeholders, the project is developed through broad-based consultations with all line ministries, the private sector, and key development partners and within the framework of the NEP.

117. **Macroeconomic risk (Substantial).** Macroeconomic risks relate to (a) the availability and timely provision of GoM support to JIRAMA, which will continue to require significant fiscal support in the interim; and (b) the impact of foreign-exchange fluctuations on the off-grid market. ***Mitigation:*** The macroeconomic risks relating to the fiscal sustainability of transfers to JIRAMA are being addressed through the parallel engagement under the Madagascar Fiscal Sustainability and Energy DPO under preparation (P166572). The macroeconomic risks relating to the off-grid sector will be addressed by making local-currency financing available under the credit line.

118. **Sector strategies and policies risks (High).** Financing for Component 1 is ring-fenced from JIRAMA's financials but continued weak financial performance of JIRAMA would still put the project at risk. While the overall sector policy on electricity is clear, some areas of the business plan of JIRAMA (March 2018) may be overly overoptimistic including the pace of the reduction on operational losses and of the progress in energy mix, which are critical for the sustainability of investments in the sector. In addition, the current tariff policy of JIRAMA is not financially sustainable and if not adequately addressed, risks deterring ongoing progress. ***Mitigation:*** These risks are mitigated through the parallel engagement under the Madagascar Fiscal Sustainability and Energy DPO under preparation (P166572)—which includes critical measures to accelerate the implementation of JIRAMA's business plan and the PDMC—as well as technical assistance under the ESOGIP and a separate advisory services and analytics (ASA), through which the World Bank is supporting JIRAMA in preparing a financial recovery plan.

119. **Technical design risks of off-grid component (Substantial).** By operating flexibly and on a first-come, first-served basis, the OMDF will be able to respond and adapt quickly to changes in the off-grid market environment. However, Malagasy MFIs and banks have limited knowledge of the off-grid sector and little to no experience in partnering with SHS distributors or mini-grid developers. In addition, as local distributors will need to offer warranty services matching the tenor of consumer loans extended by MFIs and banks, there is a risk they may not be able to immediately serve the demand generated through the OMDF and banks due to challenges raising working capital financing. ***Mitigation:*** To mitigate these risks,

the proposed project will include working capital support in combination with targeted technical assistance and capacity-building activities.

120. **Institutional capacity risks (Substantial).** While technical capacity at the MEH and JIRAMA is good, capacity is overstretched given the immense challenges facing the sector. Because project coordination and implementation are integrated into the existing duties of staff at the MEH and JIRAMA, the project may face delays in implementation. Delays in implementation of reforms due to lack of political support are a risk already described that may constrain the ability to assure efficiency and accountability in the sector. ***Mitigation:*** To strengthen the MEH's and JIRAMA's existing implementation capacity, procurement and FM expertise has already been recruited and is available to the MEH; additional expertise will be contracted by JIRAMA with the support of the project as needed (for example, for preparation of bidding documents, in the area of preparation and implementation of safeguards studies, and for oversight of rehabilitation and construction works). The project will further strengthen the existing PIU at the MEH and allocate substantial resources for technical assistance and capacity-building support to the MEH and participating entities to help educate the various actors about the sector and ensure that the abovementioned risks are surmounted. Regarding the mitigation of risk emanating from the sector's poor overall performance, the project's focus on private sector-led efforts will both insulate key activities of the project from JIRAMA's financial issues and help improve the utility's operational performance through investments in grid rehabilitation and modernization.

121. **Fiduciary risk (Substantial).** Fiduciary risk may arise from both the challenging scale and scope of activities under Components 1 and 2 and the compliance risk related to the activities led by the Fund Manager. ***Mitigation:*** Fiduciary risks relating to the PIUs' financial management will be addressed through adequate staffing, training and supervision. Risks relating to the fiduciary compliance of the Fund Manager and participating financial intermediaries will be addressed by closely monitoring implementation of the measures laid out in Annex 3. The Independent Verification Agent will support fiduciary monitoring by independently verifying compliance and results.

122. **Environmental and social risks (Substantial).** Environmental and social risks of the proposed project are considered 'Substantial' because of its large geographical scope and the type of investments it will support. However, JIRAMA's Environment and Risk Prevention Department has significant experience in implementing World Bank-funded investments through the ongoing ESOGIP. In particular, the proposed activities under Component 1 (investments in grid extension and densification including the reinforcement of existing distribution infrastructures and upgrading or constructing substations) and Component 2 (accelerating the growth of a high-quality OGS market and the off-grid electrification of rural health centers) will be in residential and industrial zones without any environmental-sensitive areas such as wetlands, forests. Moreover, all localities selected from JIRAMA's long list will exclude any areas with sensitive habitats or high biodiversity. Therefore, risks and adverse environmental and social impacts, will be limited to effects related to general nuisances such as noise, dust, and vibration; community health and safety risks such as risks to increased HIV/AIDS transmission; risks related to the influx of workers and local recruitment, GBV, and SEA risks; increased risk of accidents during civil works; environmental and public health risks that might arise from improper disposal of SHS batteries or old generators with PCB; harm to potential 'chance finds' of physical cultural resources during the civil works; and temporary/permanent land acquisition and economic displacement. ***Mitigation:*** These potential environmental and social risks and impacts are site-specific, local, reversible, and mainly temporary during the civil works and could be reduced to an acceptable level after the adoption of specific

mitigation measures. The safeguards framework documents—ESMF and RPF—have been prepared and disclosed both in-country and at the World Bank's website**.**

123. **Stakeholder Risks of off-grid component (Substantial).** The key stakeholder risks of Component 2 is the possibility that vested interests in the power sector, including JIRAMA, power producers, and others invested in the status-quo (e.g., so-called 'meter lords' benefiting from informal connections), may undercut activities under the off-grid component because they perceive off-grid and mini-grid expansion as a threat to their business. Moreover, reformed procurement procedures to be employed for the project at JIRAMA (developed under the parallel ESGOP project) will benefit the project but may face resistance internally. ***Mitigation:*** To mitigate this risk, the project will (a) clearly communicate that the proposed least-cost approach will bolster JIRAMA's financial position by only extending the grid where it makes economic sense; and (b) engage the public and widely communicate the benefits from cost-effective electrification through a combination of on-grid and off-grid solutions to generate legitimacy and support for the project's approach.

124. **Disaster and climate change risks to the project outcome are Moderate.** Madagascar is already among the world's most vulnerable nations when it comes to disaster and extreme weather-related hazards and, as a result of climate change, extreme temperatures, droughts, and cyclones are all likely to become either more frequent or more intense in all or parts of the country. Further, Madagascar's power sector institutions are already overstretched and have limited ability to respond to disasters and crises, and the socioeconomic conditions in Madagascar are such that households are particularly vulnerable to disaster- and climate-related risks. Grid infrastructure built under the project will thus be vulnerable to hazards that are likely to become either more frequent or more intense due to climate change, and droughts and increased evaporation from reservoirs may reduce hydropower availability and hurt JIRAMA's financial performance. These impacts may negatively affect project performance. However, the supported infrastructure investments—mostly last-mile connections and OGS solutions—are among the most resilient types of electricity infrastructure, and the project will help improve system planning and general institutional capacity in Madagascar's power sector. Therefore, while exposure is high, the moderate potential impacts and the risk-reducing effects of the project's activities mean that the overall risk is Moderate.

VI. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY: Madagascar
Madagascar - Least-Cost Electricity Access Development Project - LEAD

Project Development Objectives(s)

The Project Development Objective is to increase access to electricity services for households, enterprises, and health facilities in Madagascar.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Households electricity access				
People provided with new or improved electricity service (CRI, Number)		0.00	504,000.00	1,680,000.00
Enterprises provided with new or improved electricity services (Number)		0.00	3,000.00	10,000.00
Health centers provided with new or improved electricity services (Number)		0.00	225.00	750.00

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Grid Electrification				
Households provided with new on-grid electricity access (Number)		0.00	30,000.00	100,000.00
Enterprises provided with new on-grid electricity service (Number)		0.00	2,400.00	8,000.00
Health centers provided with new on-grid electricity service (Number)		0.00	75.00	250.00
Public availability of customer satisfaction survey (Yes/No)		No	No	Yes
New connection policy for grid connections approved (Yes/No)		No	No	Yes
The Board of JIRAMA approves a financial recovery plan for the company (Yes/No)		No	No	Yes
Off-grid Electrification				
Households and businesses provided with new off-grid electricity access (Number)		0.00	120,000.00	300,000.00
Enterprises provided with new off-grid electricity service (Number)		0.00	800.00	2,000.00
Health centers provided with new or improved electricity access (Number)		0.00	200.00	500.00
Beneficiaries reached with financial services (CRI, Number)		0.00	60,000.00	150,000.00
Beneficiaries reached with financial services, of which: female borrowers (Number)		0.00	30,000.00	75,000.00
Number of SMEs with a loan or line of credit (CRI, Number)		0.00	1.00	3.00
Volume of results-based financing channeled to private companies (Number)		0.00	8,000,000.00	20,000,000.00
Volume of debt financing extended to private		0.00	4,000,000.00	10,000,000.00

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
companies (cumulative) (Number)				
Number of participating participating firms and financial Institutions under the OMDF (Number)		0.00	3.00	5.00
OMDF has operational tracking system to monitor portfolio quality of loans/credit extended by participating FIs and OGS companies (Yes/No)		No	No	Yes
Generation capacity of energy constructed or rehabilitated (CRI, Megawatt)		0.00	1.00	3.00
Renewable energy generation capacity (other than hydropower) constructed under the project (CRI, Megawatt)		0.00	1.00	3.00
Technical Assistance and Project Implementation Support				
Beneficiaries of job-focused interventions (CRI, Number)		0.00	60.00	150.00
Monitoring in place of follow-up actions by participants of job-focused interventions (Yes/No)		No	No	Yes
Consumer awareness campaign completed (Yes/No)		No	No	Yes
Lighting Global quality standards for solar home systems adopted and published (Yes/No)		No	No	Yes
Response rate to GRM complaints (Percentage)		0.00	40.00	100.00
Geospatial analysis and planning platform established and operational (Yes/No)		No	No	Yes
National Electrification Investment Plan developed and adopted (Yes/No)		No	No	Yes

Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
People provided with new or improved electricity service		Quarterly	JIRAMA / Fund Manager	Surveys	JIRAMA / Fund Manager
Enterprises provided with new or improved electricity services	Measures number of enterprises with new or improved electricity services through LEAD	Quarterly	Fund Manager / JIRAMA	Surveys	Fund Manager / JIRAMA
Health centers provided with new or improved electricity services	Measures number of health centers with new or improved electricity services	Quarterly	MEH	On-site verification	MEH

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Households provided with new on-grid electricity access	Measures number of households provided with new on-grid electricity access	Quarterly	JIRAMA	JIRAMA reporting on new connections, independent verification if necessary	JIRAMA
Enterprises provided with new on-grid electricity service	Measures number of enterprises provided with new on-grid electricity service	Quarterly	JIRAMA	JIRAMA reporting on new connections, independent verification if necessary	JIRAMA

Health centers provided with new on-grid electricity service	Measures number of health centers provided with new on-grid electricity service	Quarterly	MEH	MEH reporting on new systems installed	MEH
Public availability of customer satisfaction survey	Citizen engagement indicator that captures the public availability of JIRAMA's customer satisfaction survey.	Continuous.	JIRAMA's website.	n/a	MEH as responsible Government line ministry.
New connection policy for grid connections approved	Measures whether the GoM has approved a new connection policy that will be applicable nationwide and will provide the process for, and cost to consumers of connections under Component.	Once	JIRAMA	n/a	JIRAMA
The Board of JIRAMA approves a financial recovery plan for the company	Approval of the outcome of the interagency working group on the financial recovery of JIRAMA.	Once.	The minutes of the Board of Directors of JIRAMA.	n/a	JIRAMA.
Households and businesses provided with new off-grid electricity access	Measures number of households and businesses provided with new off-grid electricity access	Quarterly	Fund Manager	Surveys	Fund Manager
Enterprises provided with new off-grid electricity service	Measures number of enterprises provided with new off-grid electricity service	Quarterly	Fund Manager	Surveys	Fund Manager

Health centers provided with new or improved electricity access	Measures number of health centers connected to off-grid solutions	Quarterly	MEH	Surveys	MEH
Beneficiaries reached with financial services		Quarterly	Fund Manager	Surveys	Fund Manager
Beneficiaries reached with financial services, of which: female borrowers		Quarterly	Fund Manager	Fund Manager reporting	Fund Manager
Number of SMEs with a loan or line of credit		Quarterly	Fund Manager	Fund Manager reporting	Fund Manager
Volume of results-based financing channeled to private companies	Measures amount of funding disbursed to solar distributors in the form of RBF	Quarterly	Fund Manager	Fund Manager reporting	Fund Manager
Volume of debt financing extended to private companies (cumulative)	Measures amount of funding disbursed to solar distributors in the form of working capital finance	Quarterly	Fund Manager	Fund Manager reporting	Quarterly
Number of participating participating firms and financial Institutions under the OMDF	Measures total number of solar distributors that have drawn down either on the RBF or the working capital facilities of the OMDF	Quarterly	Fund Manager	Fund Manager reporting	Fund Manager
OMDF has operational tracking system to monitor portfolio quality of loans/credit extended by participating FIs and OGS companies	Measures whether the OMDF has operationalized a risk tracking system to monitor the portfolio quality of participating FIs and OGS companies.	One-off	PIU	PIU reported	PIU

Generation capacity of energy constructed or rehabilitated		Quarterly	Fund Manager / PIU	Computed from sales / systems installed	Fund Manager / PIU
Renewable energy generation capacity (other than hydropower) constructed under the project		Quarterly	Fund Manager / PIU	Computed from sales / systems installed	Fund Manager / PIU
Beneficiaries of job-focused interventions		Quarterly	PIUs	PIUs	PIUs
Monitoring in place of follow-up actions by participants of job-focused interventions	Measures if follow-up actions by participants of job-focused interventions are being monitored by PIU	Discrete	PIUs	Qualitative	PIUs
Consumer awareness campaign completed	Measures whether the consumer awareness campaign on solar household technology has been completed	One-off	PIU	PIU reporting	PIU
Lighting Global quality standards for solar home systems adopted and published	Measures whether Lighting Global quality standards for solar home systems have been adopted and published	One-off	Bureau des Normes	Bureau des Normes reporting	Bureau des Normes
Response rate to GRM complaints	Measures response rate to GRM complaints	Quarterly	PIUs	PIU reporting	PIUs
Geospatial analysis and planning platform established and operational	Measures whether geospatial planning platform used during detailed geospatial exercise has been transferred to JIRAMA and relevant JIRAMA staff have been trained on its use	One-off	JIRAMA	JIRAMA reporting	JIRAMA

National Electrification Investment Plan developed and adopted	Measures whether National Electrification Investment Plan has been developed and adopted	One-off	MEH	MEH reporting	MEH

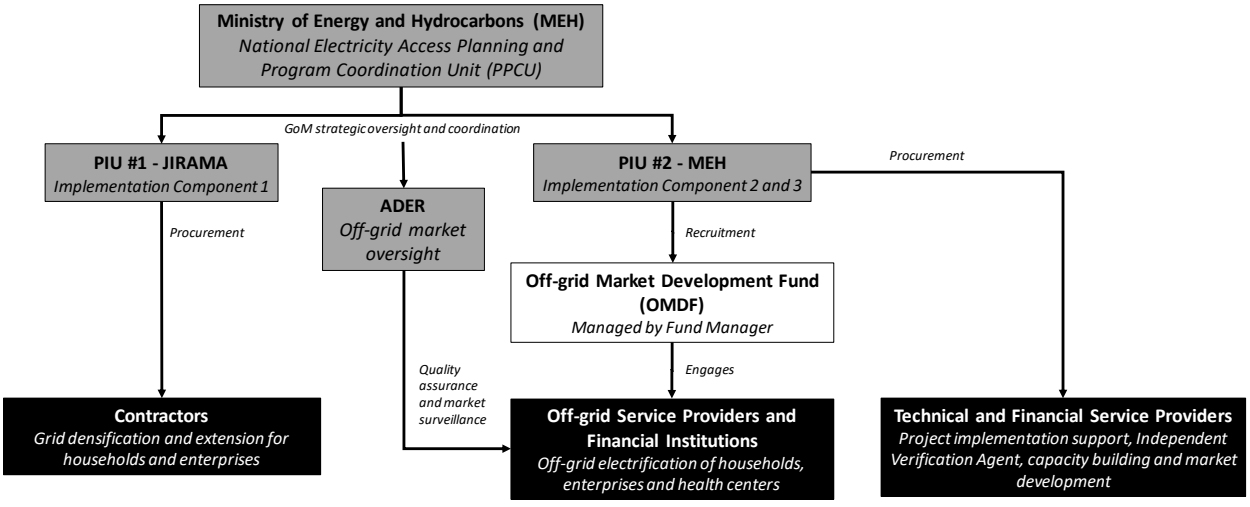
ANNEX 1: IMPLEMENTATION ARRANGEMENT AND SUPPORT PLAN

Institutional and Implementation Arrangements

1. **Project implementation and oversight.** The project's overall coordination and oversight will be ensured by the MEH, while JIRAMA's existing PIU for ESOGIP will implement Component 1, and the ESOGIP PIU created within the MEH will implement Components 2 and 3. Both existing PIUs will be reinforced to meet the increased workload. The MEH has gathered substantial implementation experience with the ongoing ESOGIP, though its implementation capacity has been weakened by a recent reshuffling of senior staff. Therefore, the recruitment of a dedicated project coordinator and fiduciary staff familiar with World Bank procurement and financial management (FM) procedures will be necessary. ADER's role will be to ensure the market supervision and consumer protection mandate of ARELEC for the off-grid segment of the power sector, as discussed in the following paragraphs.

2. **Project link to National Access Planning.** The GoM's strategic oversight and coordination of both the PIUs will be ensured by the National Electricity Access PPCU within MEH as further detailed in the POM. The PPCU, as described under Subcomponent 3a, will provide effective centralized coordination and oversight in terms of policy development, strategic planning, and project design and implementation. The unit will set the strategic direction for national electrification, including the preparation and regular updating of the NEIP for both on- and off-grid electrification. The PPCU will coordinate donor and GoM-funded studies, regularly update the sector's key performance indicators, and act as a repository of sector data and studies, including hosting and updating the geospatial platform.

Figure 10. Implementation Arrangements for the LEAD Project and Roles of the MEH, JIRAMA, and ADER



Source: World Bank staff.

3. **Off-grid market oversight.** As the executing agency of ARELEC and the MEH, ADER will coordinate all quality assurance and market surveillance activities under Component 2. ADER's mandate will include the oversight of installation, service, and maintenance operations for both the household OGS market as well as the market for larger PV systems through which public sector facilities will be electrified under the project. Working closely with the IVA to be recruited by the MEH PIU, ADER will be monitoring compliance

with technical and consumer service standards of all the PV distributors and service companies receiving funding from the project's OMDF. Based on the continuous and extensive point-of-sale spot checks, customer visits, and verification phone calls of an IVA recruited by the MEH, ADER will provide quarterly reports on the development of the off-grid market to continuously monitor progress and recommend adjustments as needed to ensure both efficiency and effectiveness of all support mechanisms provided through the OMDF. Enabling ADER to meet this important mandate will require the continuation of targeted technical assistance, trainings, and workshops to build the agency's capacity and knowledge on market development and quality standards for off-grid technology. Under the ESOGIP technical assistance component, ADER staff have already benefited from a multitude of trainings and workshops on off-grid technology, standards, geospatial analysis, and other key areas. These capacity-building activities will be continued and reinforced before project effectiveness. Moreover, ADER's institutional capacity and rural presence in the project's target areas for off-grid development will be bolstered though the creation of local ADER units to be stationed and operating from the MEH's regional offices. For this purpose, Component 3 will provide the agency with the necessary funding for the office equipment, utility vehicles, and limited additional staffing needed to create six to eight local ADER units.

4. **OMDF Fund Manager.** The OMDF Fund Manager will be independent in its investment decisions, but with the MEH oversight as a contracting entity. In addition, all key GoM stakeholders (including the MEH, the Ministry of Finance, ARELEC, and ADER) will be represented in a steering committee that will provide strategic guidance to the OMDF. The steering committee will meet regularly to review progress, provide policy guidance, and resolve any high-level challenges facing the fund. The OMDF Fund Manager will provide regular progress reports to both the steering committee and the PIU, providing updates on investment decisions, disbursements, results, and any challenges encountered.

Results Monitoring and Evaluation Arrangements

5. **The two project implementing agencies, the MEH and JIRAMA, will be responsible for collecting and verifying data, and the MEH will consolidate the information and submit progress reports to the World Bank.** The progress reports will be submitted on an annual basis for PDO indicators and on a semiannual basis for the intermediate indicators at the component level. The Results Framework section in this document specifies the results indicators for the project as a whole as well as for each of its components.

6. **The MEH will monitor the results of Subcomponent 2a (the OMDF) with the help of the Fund Manager and the IVA recruited under Subcomponents 3b and 3d.** Regular reporting requirements for the participating OGS companies and financial institutions that benefit from the OMDF will be part of the grant or loan agreements signed between them and the Fund Manager. The Fund Manager will aggregate these data and report on the overall progress to the PIU at the MEH. The IVA will report independently on the results from the activities of the participating OGS companies and financial institutions.

7. **Besides the project-specific results monitoring, the World Bank is also supporting the Government to establish a better data on the nationwide electrification rate which will be helpful for evaluation of the project's broader impacts on Madagascar's state of electricity access.** The survey, which applies the multitier framework methodology for energy access and is expected to be completed by mid-2019, will provide detailed information on the energy access situation of households, including quantity and quality of services provided by all available (main and backup) sources of electricity,

magnitude and frequency of energy expenditures, and willingness to pay. The baseline and the follow-up survey at the end of the project will allow for the quantification of improvements in energy service delivery in the country and could also be used for impact evaluation of development outcomes.

Support Plan

8. **To support implementation of Component 1, additional technical assistance will be provided under the parallel ESOGIP project to further enhance JIRAMA's capacity to oversee the grid expansion works.** Technical implementation capacity at JIRAMA is considered appropriate as the utility's senior and middle-management staff in both the planning and construction departments mainly consist of experienced and well-trained technicians. Moreover, also under the ESOGIP project, most of JIRAMA's former politically appointed senior management has been replaced with competitive hires, many of which are from the private sector. Consequently, JIRAMA is expected to need relatively little implementation support. In line with the team's assessment, a project focal point at JIRAMA will be appointed, and existing procurement, financial, and technical staff will ensure implementation of project activities of Component 1 as well as timely reporting to the project coordinator at the MEH.

9. **To support implementation of Component 2a, an external OMDF Fund Manager will be hired to provide the required technical and financial expertise.** The OMDF Fund Manager will be competitively selected to ensure the independent management of funds allocated to the OMDF according to the objectives and KPIs defined in the Fund Manager's terms of references (ToRs). The Fund Manager will be bound to strictly apply the criteria outlined in Annex 3 to ensure compliance with the provisions in the World Bank's Directive for IPF on financial intermediary financing. Outsourcing the implementation of the off-grid component to an experienced Fund Manager will address the GoM capacity constraints and lack of experience with the off-grid sector.

10. **To support monitoring of results and fiduciary compliance, the MEH will engage an IVA. U**nder Subcomponent 3c, an IVA will be appointed no later than three months from the project effectiveness in accordance with the ToRs to be reviewed by the World Bank. Its main mission will consist in verifying the transparency and compliance on the part of selected vendors and MFIs.

ANNEX 2: ECONOMIC AND FINANCIAL ANALYSIS

Project Economic and Financial Analysis

1. **The economic analysis is based on a simple cost-benefit framework.** The main impacts of the project are the increased access to electricity through increasing the number of connections within existing JIRAMA grids in urban areas; constructing new distribution lines, substations, service drops, and street lighting for rural and peri-urban customers; and supporting the private sector-led rollout of stand-alone solar PV systems. Table 1.1 summarizes the main assumptions and input parameters used for the analysis.

Table 1.1: Assumptions and Inputs for Economic Analysis

LEAD Project Analysis Specifications	Unit	Value	Comments
Carbon price	—	Low	2017 Guidance note on shadow price of carbon in economic analysis - World Bank
Economic analysis discount rate	%	6	—
Financial analysis discount rate	%	10	—
Component 1			
Average residential electricity consumption per household - urban	kWh per month	40	2016 Tariff Report
Average residential electricity consumption per household - rural	kWh per month	20	2016 Tariff Report
Average connection fees for densification	US$ per connection	330	Calculated from JIRAMA numbers
Average connection fees for grid extension	US$ per connection	1,000	Calculated from JIRAMA numbers
O&M cost of installed grid lines	%	2	Assumption
Generation cost (2015)	US$ per kWh	0.03	2015 actuals
Component 2			
Household Solar PV			
Household solar system size	Wp	4	Market interviews
Retail price for solar system less tax	US$	100	Market interviews
% system failure	%	14	Assumption
Average energy expenditure for off-grid households	US$ per month	4	Based on average expenditure data and 10 percent energy budget share
Emissions reduction for tier-1 SHSs	tCO_2 per household per year	0.374	World Bank Greenhouse Gas Methodology for Energy Access Investment Operations
Health clinics			
Institutional system health clinic-system size	Wp	3,000	Assumption

LEAD Project Analysis Specifications	Unit	Value	Comments
Total cost for 3 kw system	US$	12,960	Energy Needs Assessment Report for ACIMI Health Center, Uganda
O&M cost	%	2	Assumption
% of system failure	%	2	Assumption

2. **The analysis focuses on the quantifiable benefits and costs deriving from the project.** Both costs and benefits are set up as cash flows over the 20-year lifetime of the project associated with investments under Components 1 and 2, including the construction and operation periods. The following main sources of benefits have been identified:

(a) **Component 1.** The economic benefits are estimated based on residential electricity consumer surplus to account for the significant increase in kWh consumption arising from a grid connection. The analysis assumed monthly consumer surplus is US$11.22 per kWh, which is calculated based on monthly residential electricity consumption bundles and an average emission reduction for each grid-connected household of 0.8 tCO_2 each year. The associated economic costs for Component 1 are connection costs for households through grid densification and grid extension.

(b) **Component 2.** Component 2 consists of providing at least 300,000 households and businesses (Subcomponent 2a) as well as 500 clinics (Subcomponent 2b) with new or improved off-grid electricity access. Quantifying consumer benefits based on the consumer surplus from additional power consumption is less applicable here because the efficient Direct Current (DC) devices supplied with solar systems typically reduce kWh power consumption even while greatly increasing access to energy. Instead, the analysis assumes the deployment of solar electricity results in avoided costs of 100 percent of kerosene under Subcomponent 2a and 100 percent of diesel generator fuel under Subcomponent 2b.

3. **The economic and financial analysis in this section considers two scenarios based on two different assumptions for the economic cost of Subcomponent 2a.** The first scenario assumes that over the lifetime of the project, the OMDF breaks even on working capital loans, that is loan disbursements plus defaults are exactly balanced by loan repayments plus interest. In this case, the economic cost of the working capital facility is zero because it is assumed that the GoM can recoup funds in full. Therefore, the economic cost of OMDF activities is equal to US$60 million (total Component 2 allocation and US$5 million provision for Fund Manager fees and implementation of the OMDF-related Gender Action Plan under Component 3) less US$25 million (allocation for health centers) less US$10 million (allocation for cost-neutral working capital), totaling US$25 million. The second, more pessimistic scenario assumes that working capital loan defaults mean that only 50 percent of the working capital, equal to US$5 million, is ultimately recovered, increasing the economic cost of OMDF activities to US$30 million.

4. **When the economic cost of OMDF activities is assumed to be US$30 million, the EIRR for LEAD as a whole is 10.7 percent, with a NPV of US$37.3 million, assuming a discount rate of 6 percent.** When the economic cost of OMDF activities is assumed to be US$25 million, the EIRR for LEAD as a whole is 11.3 percent, with an NPV of US$41.1 million and assuming a discount rate of 6 percent. The Financial Internal Rate of Return (FIRR) and NPV for the project were based on a financial cost-benefit analysis for

households and health centers electrified under LEAD. The FIRR for the project as a whole is 15 percent, with an NPV of US$55.3 million at a discount rate of 10 percent. Table 1.2 and Table 1.3 summarize these results.

Table 1.2: Economic Analysis Summary

	Cost of SHS US$30 million		Cost of SHS US$25 million		GHG Emission Reduction (tCO_2)
	EIRR (%)	NPV (US$, millions)	EIRR (%)	NPV (US$, millions)	
LEAD Project	10.7	37.3	11.3	41.1	619,361
Component 1	10.9	30.9	10.9	30.9	108,269
Component 2	10.0	6.4	12.8	10.2	511,093

Table 1.3: Financial Analysis Summary

	FIRR (%)	NPV (US$, millions)
LEAD Project	14.5	55.3
Component 1	10.5	28.2
Component 2	—	27.1

5. **The analysis conservatively estimates the benefits of rural electrification as the avoided cost of kerosene consumption.** This is a conservative estimate as it does not account for the fact that modern electricity sources allow for significant additional energy uses (cell phone charging, radios, TVs, and so on) and provide significantly higher energy quality for lighting purposes. The economic cost of SHSs is also measured conservatively as consisting of both the project costs incurred through the OMDF RBF as well as the retail price (less tax) spent by consumers on the system. This implicitly assumes that the OMDF RBF funding will be used for investing in sales and distribution infrastructure required to reach households. If some of this infrastructure is already in place (as is the case for many existing solar distributors), a proportion of the RBF is likely to be used to cover additional system inventories, thus reducing the overall economic cost of the project.

6. **The economic benefit also accounts for savings in GHG emissions.** A total of 619,361 tCO_2 of emissions are avoided through the project. The GHG emission reductions are due to the lower emission factor of the grid and SHSs compared to traditional lighting sources. Overall, new grid connections account for an emissions reduction of around 108,269 tCO_2 and new SHSs and health clinic solar installations account for an emissions reduction of around 511,093 tCO_2.

Utility-Level Financial Analysis

7. **Between 2008 and 2015, the performance of Madagascar's power sector deteriorated, imposing a burden on the country's scarce public resources.** As a key adverse effect of the political crises of 2002 and 2009, the utility is still tied to a large number of costly rental and IPP contracts, mainly those that were awarded on political grounds with little planning and few competitive tendering procedures. Moreover, due to an overall neglect of maintenance and rehabilitation investment, system losses climbed from 23 percent to 34 percent, tariffs fell from US$0.20 per kWh to US$0.12 per kWh in nominal terms, bill collection fell from an average of 95 percent in 2007–2009 to 79 percent in 2014–2016, and the

financial cost of service increased from US$0.20 per kWh to US$0.22 per kWh, despite falling global oil prices. As a result, the cost recovery rate of JIRAMA (based on cash collected) fell from 84 percent in 2008 to 47 percent in 2015, and its operating margin declined from 13 percent to −59 percent. JIRAMA's financial situation presents a considerable fiscal burden for the state, with the utility's liabilities reaching 5.6 percent of GDP in 2015, up from 1.3 percent in 2008, including US$470 million of accumulated trade and other payables,[25] much of it to fuel and power suppliers. From 2014 to 2017, fiscal resources equivalent to an estimated 4.4 percent of GDP have been transferred from the Government budget to JIRAMA to compensate for the financial hemorrhage. JIRAMA's estimated annual quasi-fiscal deficit reached 2.15 percent of GDP in 2016.

Table 1.4: Historical Financial Performance of JIRAMA

Income Statement	Unit	2014	2015	2016	2017
Operating revenue	MGA Billion	449	466	556	650
Government subsidy	MGA Billion	0	0	233	447
Revenue	**MGA Billion**	**449**	**466**	**789**	**1,097**
Power cost	MGA Billion	−65	−78	−95	−104
Non-power cost	MGA Billion	449	466	556	650
Gross profit	**MGA Billion**	**−201**	**−217**	**−157**	**−28**
Other operating revenues	MGA Billion	18	17	20	26
Other operating charges	MGA Billion	−3	−7	−1	−8
Reversal of impairment loss	MGA Billion	25	40	42	30
Depreciation & amortization	MGA Billion	−94	−107	−102	−97
Operating earnings	**MGA Billion**	**−255**	**−274**	**−198**	**−78**
Finance income	MGA Billion	0.1	0.2	3	4
Finance cost	MGA Billion	−39	−22	−14	−7
Profit before income tax	**MGA Billion**	**−294**	**−296**	**−209**	**−81**
Income tax (expense)/credit	MGA Billion	−2	−2	−6	−4
Profit for the year	**MGA Billion**	**−296**	**−298**	**−215**	**−85**
Balance Sheet	**Unit**	**2014**	**2015**	**2016**	**2017**
Current assets	MGA Billion	505	586	730	902
Non-current assets	MGA Billion	1,198	1,537	775	816
Total non-current liabilities	MGA Billion	1,369	1,758	1,017	1,046
Total current liabilities	MGA Billion	1,134	1,477	1,213	1,111
Cash Flow Statement	**Unit**	**2014**	**2015**	**2016**	**2017**
Cash from operating activities	MGA Billion	151	216	527	−381
Cash from investing activities	MGA Billion	−184	−220	−430	526
Cash flow from financing activities	MGA Billion	6	0	−3	−6
Net increase (decrease) in cash	MGA Billion	−27	−4	94	138
Cash balance at end of year	**MGA Billion**	**24**	**25**	**32**	**30**

Source: JIRAMA (2018).

8. **A program of challenging energy reforms initiated in 2015, including major tariff reforms, has halted the downward trend of JIRAMA's performance and is starting to show results.** The GoM laid out

[25] Accumulated trade and other payables refers to outstanding and overdue bills.

a new approach to electricity sector governance in its 2015 NEP and subsequent policy documents, which aims to put the sector on track to raise electrification to 70 percent by 2030 through implementing difficult measures on tariffs, utility management, and corporate governance. These measures were also seen as critical in the SCD and the CPF. JIRAMA has increased its average tariff rates five times since mid-2016 and twice since July 2017. Seasonally adjusted revenues in the first two months of 2018 were 46 percent above the level of 2015 and 23 percent above the level of 2016. The Government scaled up its budget transfers from 0.9 percent of GDP in 2015 to 1.2 percent of GDP in 2017 to cover the utilities' cash deficit and slow down the accumulation of arrears to suppliers. As a result, JIRAMA's earnings before interest and taxes margin improved from −59 percent in 2015 to −12 percent in 2017. System losses started reversing a decade-long downward trend, reaching an average of 32 percent over 2016–2017 compared to 34 percent in 2015. The GoM also restructured JIRAMA and completed the competitive hiring of new senior management in 2017.

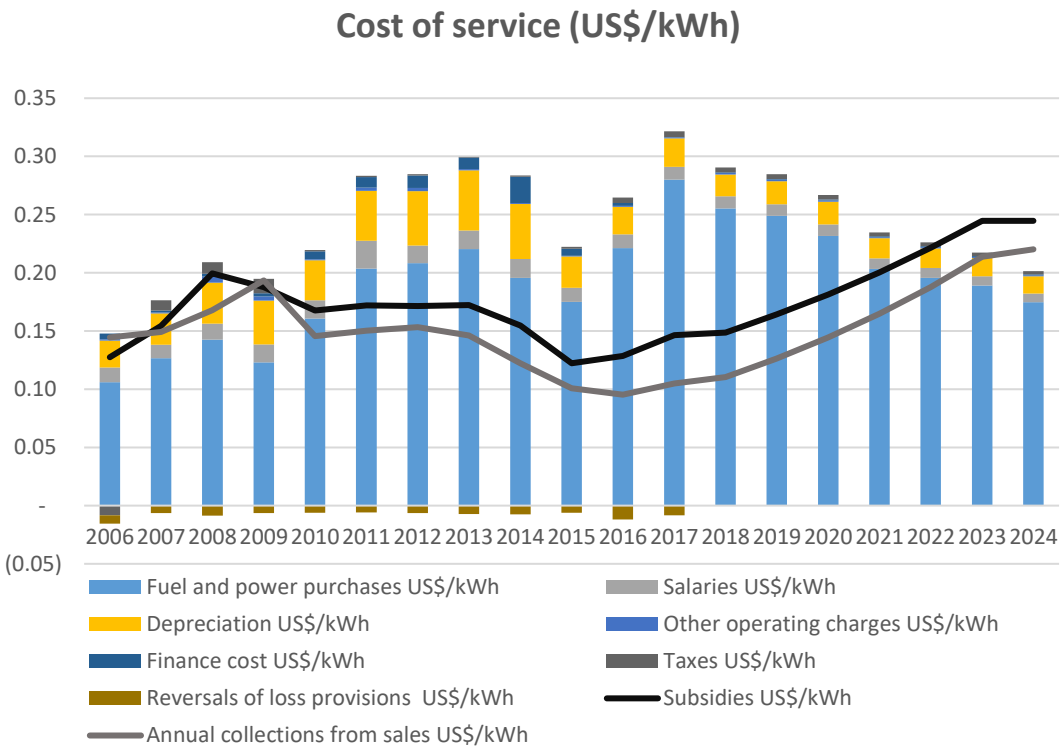
9. **The World Bank is supporting a Government program to address JIRAMA's financial and technical challenges through a DPO and through a parallel Power Sector Financial Sustainability ASA.** Despite some limited progress recently, the Government urgently needs to address the root causes of JIRAMA's high cost of service and improve the management of its short-term liabilities. JIRAMA's costs have continued to rise as a result of increasing reliance on rental power (reaching 48 percent in 2017) and higher oil prices, reaching US$0.32 per kWh in 2017. The utilities' arrears are estimated at 4.5 percent of GDP at the end of 2017, a liability that may fall upon public finances. The two challenges are interlinked, as reducing the cost of high service provision will require large-scale investment in renewable energy, especially hydropower, which in turn requires a credible off-taker and adequate management of utility finances in the energy sector. These measures are being addressed through a parallel DPO, which is currently under preparation (approval expected in Q3 FY19) and a parallel ASA on JIRAMA's financial recovery plan.

10. **Table 1.5 presents high-level financial projections for JIRAMA for 2018 through 2024.** The projections assume an acceleration of grid connections and a significant reduction in transmission and distribution losses, consistent with the GoM's plan to increase the electrification rate and improve power supply. Under the projection assumptions, JIRAMA is expected to invest US$325 million in transmission and distribution infrastructure by 2024, including US$80 million for new connections and grid extension under LEAD Component 1 and an additional US$35 million for new connections outside of the LEAD Project. Together, these investments are expected to account for an additional 150,000 new connections. An additional US$210 million is expected to be invested in backbone transmission and distribution infrastructure and grid rehabilitation. As a result, JIRAMA's total losses are expected to decline to 28 percent by 2022, consistent with the targets set as part of the World Bank's ESOGIP, and JIRAMA will reach cost recovery for the first time in 2023. These developments are reflected in the projections as positive gross and operating profits from 2023 onward, as well as a reversal in declining cash balances. As is also shown in Table 1.3, however, JIRAMA will continue to require significant financial support in the interim.

11. **The power supply mix and electricity demand levels were projected based on the PDMC base-case scenario.** To address Madagascar's current and projected power supply deficit, the PDMC calls for the rollout of new hydro projects as soon as possible, as well as continued addition of hydro capacity in subsequent years. Following these recommendations, the supply mix assumed for the projections in Table 1.5 is based on an ongoing shift from thermal power to hydropower. The proportion of power supplied to JIRAMA through IPPs and rental power arrangements is expected to remain relatively constant

throughout. Given the continued importance of thermal power in Madagascar's energy mix, JIRAMA's financial situation is particularly vulnerable to oil price fluctuations. JIRAMA's costs have continued to rise as a result of increasing reliance on rental power (reaching 48 percent in 2017) and higher oil prices, reaching US$0.32 per kWh in 2017. Fuel and power purchase cost will continue to account for over 80 percent of the generation costs during the forecast period.

Figure 1.1: Historical and Future Cost of Service



12. **Electricity tariffs increased by an average of 5 percent per year between 2006 and 2017, but nonetheless consistently remained below the cost of service.** Given oil price forecasts,[26] if JIRAMA continues to increase its tariff by an average of 5 percent while serving the PDMC base-case energy demand, JIRAMA will incur a negative growth though improving gross margin over the next five years. By 2022, JIRAMA's operating revenue is expected to be US$0.22 per kWh, increasingly approaching the US$0.24 per kWh cost of service. If the additional hydropower capacity envisaged in the PDMC successfully comes online, JIRAMA will eventually achieve cost recovery in 2023.

13. **Tariff adjustments or additional Government subsidies needed to avoid a reduction in average tariff revenue for JIRAMA as a result of connections under LEAD are expected to be insignificant.** By the end of the project, LEAD will have added an estimated 100,000 new connections. Given that these connections are expected to mostly serve 'lifeline tariff' customers, consuming less than 25 kWh per

[26] http://pubdocs.worldbank.org/en/823461540394173663/CMO-October-2018-Forecasts.pdf

month, these new connections would lead to an increase in no more than 24 GWh per year, or less than 3 percent of total current demand.

Table 1.5: JIRAMA Projections [a,b]

Income Statement	Unit	2018	2019	2020	2021	2022	2023	2024
Revenue	**MGA Billion**	**632**	**724**	**830**	**1,042**	**1,194**	**1,367**	**1,478**
Power cost	MGA Billion	−1,092	−1,108	−1,074	−1,078	−1,077	−1,079	−1,104
Non-power cost	MGA Billion	−91	−92	−94	−96	−95	−94	−94
Gross profit	**MGA Billion**	**−552**	**−476**	**−338**	**−132**	**22**	**194**	**280**
Other operating revenues	MGA Billion	21	21	21	21	21	21	21
Other operating charges	MGA Billion	−5	−5	−5	−5	−5	−5	−5
Depreciation and amortization	MGA Billion	−74	−82	−83	−85	−86	−83	−84
Operating earnings	**MGA Billion**	**−609**	**−541**	**−405**	**−201**	**−48**	**128**	**213**
Finance income	MGA Billion	2	2	2	2	2	2	2
Finance costs	MGA Billion	−3	−3	−4	−4	−4	−4	−4
Profit before income tax	**MGA Billion**	**−611**	**−543**	**−407**	**−203**	**−51**	**126**	**210**
Income tax (expense)/credit	MGA Billion	−4	−4	−4	−4	−4	−4	−4
Profit for the year	**MGA Billion**	**−614**	**−547**	**−411**	**−206**	**−54**	**122**	**206**
Balance Sheet	**Unit**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Current assets	MGA Billion	359	−112	−496	−490	−246	132	530
Non-current assets	MGA Billion	844	864	883	900	915	934	952
Total non-current liabilities	MGA Billion	1,757	1,764	1,700	1,718	1,879	1,981	2,083
Total current liabilities	MGA Billion	1,114	1,135	1,109	1,116	1,116	1,113	1,137
Cash Flow Statement	**Unit**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Net increase (decrease) in cash	MGA Billion	−733	−636	−548	−331	−182	−6	127

Note:

a. JIRAMA's original balance sheet is unbalanced in 2017. To forecast JIRAMA's performance, an adjustment was made to balance 2017 numbers by adding the excess in assets to the grant liability, assuming additional funding was needed to build these assets. The forecast is then based on these adjusted numbers.

b. Unlike JIRAMA's historical financials, projections do not include a Government subsidy revenue account, accounting for the large drop in revenue, profits, and cash flows compared to 2017 numbers.

ANNEX 3: FINANCIAL INTERMEDIARY POLICY COMPLIANCE

Participating Financing Institutions and Off-grid Solar (OGS) Companies

14. **Madagascar's commercial banks and MFIs as well as the potential participating solar firms have the capacity to fulfil the role envisioned under the project, contribute to achieving the objectives of the project, manage credit risk, and effectively report on project activities.** The evaluation of the financial sector followed the guidelines of the World Bank Policy for IPF. In general, the country's financial soundness indicators show an underlying robustness of the banking sector with capital adequacy above the required level, high profitability and sufficient liquidity. However, the non-performing loan (NPL) ratio for banks remains elevated at around 11 percent (as of March 2016), although it is starting to decline. The MFIs have experienced rapid growth, though some institutions face governance issues and the sector is likely to require consolidation. Individual accounts of 22 MFIs increased from 0.4 million in 2009 to about 1.4 million in June 2016. While most MFIs have until recently focused on reaching the urban SMEs, efforts are now under way to reach micro enterprises as well as more remote rural locations. The rapid growth of the sector has come with a deterioration of credit portfolio quality at some MFIs. While the off-grid solar sector is more nascent with limited data available on portfolio health, eligibility requirements will ensure that only firms that have implemented appropriate systems for managing portfolio risk will be able to participate. A portfolio approach to the selection of participating firms will be pursued to mitigate risks and draw on the respective strengths of the different institutions.

15. **The project will require that all participating firms maintain compliance with the criteria summarized in Table 2.1.** Firms which do not meet the evaluated criteria may be considered for the program, subject to a detailed institutional development plan and in conjunction with the detailed assessment procedures as covered in the POM. Additional requirements may be set out in the POM. Once they qualify, the participating firms will be expected to continue meeting the minimum performance criteria throughout project implementation, with compliance reviewed annually. The POM will include a certification and decertification process for participating financial institutions.

Table 2.1: Minimum Eligibility Requirements for Participating Firms

Criteria for all participating firms	• **Established local operations** - companies must have, at a local level, at least a one-year track record of selling OGS products. • **Audited financial statements** - including a balance sheet showing a positive net asset position at a local or group level. Required at a local and, if relevant, consolidated group level. • **Quality products** - eligible companies will be selling Lighting Global quality-verified solar products up to 350 Wp with a list price not more than US$500. • **Quality of operations** - appropriate staff or commitment to deploy appropriate staff at a functional level. • **Warranty and after-sales service** - must offer a warranty in compliance with Lighting Global requirements for pico-PV and SHS products and have an established and active after-sales service capability. • **Business plan and profitability** - including a minimum one-year forecast balance sheet and profit and loss statement showing a well-managed cost structure and a clear path to break-even and profitability. • **Compliance with relevant national regulations** pertaining to licensing, tax, legal, and accounting. • **Adequate management information and accounting systems and well-organized information technology support** - these systems should provide good accounting, bookkeeping, management reports, and adequate system software support. • **Recycling** - must have a policy and a plan for the recycling of system components at end of life, particularly batteries.
Additional criteria for firms offering OGS products on credit	• **Track record of financing operations** - companies must have at least 12 months of operations financing OGS products; consideration will be given to equivalent financing activities at a group level. • **Funding** - a defined funding strategy with no obvious gaps or constraints on additional funding. • **Acceptable risk profile** - well-defined policies and written procedures for management of financial risks at local or group level (liquidity, credit, currency, interest rate and market risk, as well as risks associated with balance sheet and income statement structures). • **Collections and portfolio management** - metrics and procedures to track portfolio quality, including a minimum of PaR 30, and adequate collection practices.
Additional criteria for firms registered as MFIs or commercial banks	• **Legal and regulatory compliance** - must comply with the prudential norms established by the *Commission de Supervision Bancaire et Financière* (CSBF) for the respective type of institution (MFI or commercial bank).
Additional criteria for firms offering electronic banking services	• **Legal and regulatory compliance** - must comply with Law No. 2016-056 on e-money and electronic money institutions, which regulates the issuance of electronic money and defines the regime of issuers of electronic money.

16. **The eligibility criteria for the OGS product vendors receiving support under the OMDF will depend on the type of support being received.** More onerous criteria will be leveled on firms accessing funds through the working capital facility, particularly when onlending to final consumers, while requirements for those only participating in the RBF scheme will be more limited. The specific criteria for each support window will be laid out fully in the POM. A number of these criteria are already listed in Table 2.1 including minimum amount of time operating in Madagascar, audited financial statements, Lighting Global-verified products, business plan with clear path to breakeven/profitability, minimum warranty and after-sales service, recycling policy for products, and appropriate collections and portfolio management systems.

Fund Manager

17. **The Fund Manager of the OMDF will serve as the apex financial institution, will be competitively selected, and subject to selection criteria to ensure compliance with the World Bank Directive on IPF.** The MEH PIU will select for the Fund Manager a firm or consortium with demonstrated experience working with OGS businesses in Sub-Saharan Africa, particularly on issues related to working capital and RBF. The selection criteria for the Fund Manager will also include (a) the need to be licensed by the CSBF or, alternatively, form a partnership with an existing, appropriately licensed entity; (b) have ownership and management that is 'fit and proper' and exhibits quality governance; (c) have good standing with the supervisor; (d) exhibit sufficient capital adequacy, liquidity, profitability, and asset quality and provisions; (e) have established policies and risk management practices; and (f) employ an adequate management information system and internal audit and controls. These requirements underscore the importance of responsible lending that operates in a context conducive to efficient resource allocation.

18. **The ToR for the Fund Manager of the OMDF will ensure compliance of on-lending terms with the World Bank Directive on IPF.** Onlending of project proceeds by participating OGS companies and financial institutions to final beneficiaries will be on market-based loan terms and the FOREX risk will not be passed on to final beneficiaries. The ToR will also include provisions to mitigate the risk of an oligopoly with only few companies benefiting from the OMDF and therefore dominating the market and hampering competition. The POM will provide details on the following topics, among others: (a) design details (for example, on the flow of funds); (b) detailed eligibility criteria for the Fund Manager and participating financial institutions, in addition to those listed earlier (including adequate profitability, capital, and portfolio quality; acceptable levels of loan collections; appropriate capacity; capacity to mobilize domestic resources; adequate managerial autonomy and commercially-oriented governance; and appropriate prudential policies, administrative structure, and business procedures); (c) market efficiency issues (for example, macroeconomic environment, financial sector framework, interest rates, directed credit, and subsidies); (d) on-lending terms (including potential market distortions, determination of interest rates at all levels, and other specifics of financial intermediation); and (e) M&E arrangements.

19. **To avoid any conflict of interest, the Fund Manager will be separate from financial actors that engage in direct private sector lending in the OGS market.** Further, it should have a credible track record in refinancing local financial institutions such as commercial banks, MFIs, or cooperatives. Finally, the institution should already have strong links with external development partners to help mobilize their funding, especially for the longer term.

20. **The Fund Manager (potentially with the help of a specialized institution) will also play an advisory role to mobilize private finance for energy access in Madagascar.** The Fund Manager will use its position as an apex institution of the OMDF to lead the identification of potential financing opportunities with international lenders able to offer longer-tenor loans. In this capacity, the Fund Manager will provide introductions between project developers and potential financiers. Subsequent discussions and formal financing arrangements will be strictly between the developer and the financier, with no further role of the Fund Manager.