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Madagascar: Opportunities for Solar Business

Subsector Analysis



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Abbreviations

ACP	Africa, Caribbean and Pacific
ADER	Rural Electrification Development Agency Rural (Agence de Développement de l'Electrification)
ADES	Association for the Development of Solar Energie (Association pour le Développement de l'Energie Solaire)
AIDER	Association of Engineers for the Development of Renewable Energy (Association des Ingénieurs pour le Développement des Energies Renouvelables)
EDBM	Economic Development Board of Madagascar
EF	Energy Facility
EU	European Union
FNE	National Fund for Electricity (Fonds National pour l'Electricité)
FONDEM	Foundation Energy for the World (Fondation Energie pour le Monde)
GDP	Gross Domestic Product
GEF	Global Environment Fund
GEM	Group of Companies of Madagascar (Groupement des Entreprises de Madagascar)
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GRE	Energy Reflexion Group (Groupe de Réflexion Energie)
IFC	International Finance Corporation
INDC	Intended Nationally Determined Contribution
IOC	Indian Ocean Commission
IPP	Independent Power Producer
JICA	Japan International Cooperation Agency
JIRAMA	Jiro sy Rano Malagasy - Malgache Power and Water
KfW	Kreditanstalt für Wiederaufbau – German Development Bank
MEH	Ministry of Energy and Hydrocarbons (Ministère des Energies et des Hydrocarbures de Madagascar)
NGO	Non-Governmental Organisation
NPE	New Energy Policy (Nouvelle Politique Energétique)
ORE	Electricity Regulatory Body (Office de Régulation de l'Electricité)
PAGOSE	Project for the Amelioration of Governance and Operations in the Electricity Sector (Projet d'Amelioration de la Gouvernance et des Operations dans le Secteur de l'Electricite)
PIC	Integrated Growth Poles Project (Projet Pôles Intégrés de Croissance)
PND	Plan National de Développement
PPA	Power-Purchase Agreement
PPP	Private-public partnership
PV	Photovoltaic
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organisation
USAID	US Agency for International Development
WBG	Word Bank Group
WWF	World Wildlife Fund

Executive Summary

After years of political unrest, a stagnating economy and diplomatic seclusion, Madagascar is now recovering. A democratization process, international aid and relaunching the private sector concur to make the “Red Island” an attractive market for investors, both on a national and on an international level.

Electricity provision represents a huge potential business opportunity in Madagascar: only 14% of the population have access to electricity and the private sector names insufficient electricity provision as a major obstacle to economic development. On the supply-side, the country has large untapped renewable energy resources of hydro, solar, biomass and other sources.

The Government of Madagascar has long understood the need to improve electricity provision and has embarked on an ambitious reform process. Building on the liberalisation of the sector in 1998, the Government established an agency and fund for rural electrification as well as a regulatory body. Following the return to democracy in 2014, the Government developed a “New Energy Policy” which promotes the use of renewable energy sources and provides exemptions from import taxes on products and components, including solar.

These developments create several opportunities for renewable technologies. Many of these opportunities profit from the limited capacity of the national power utility JIRAMA, which, in addition to the national grid, operates several scattered diesel mini-grids in the country. The service provided by JIRAMA is often unreliable and limited, especially in rural areas. This forces end-users to add capacity through domestic or industrial diesel generators that are expensive to run compared to other technologies such as PV. There is a fast-growing opportunity for operators to support commercial “fuel saving” projects ranging from a few kilowatts to several megawatts. These projects attempt to partly replace diesel or heavy fuel oil generation with solar power. Other key growth markets include household and institutional systems of up to a few kilowatts as well as solar products (lamps, phone chargers) which are sold or leased to rural and urban customers.

New projects can also take advantage of several national and international competitive calls aiming to promote private sector involvement in electrification projects. A number of calls have already been published and more are expected to follow soon. In this context, the domestic market is developing fast and local players are building capacities in the sector. This represents both an opportunity and a threat: new entrants will be able to find suitable local partners but may also encounter strong competition, non-competitive behaviour and low prices.

Assuming political stability can be maintained and entrenched, the country represents an interesting market for investments in the solar industry. Nonetheless, the energy sector reform process will need to maintain its momentum and bring about a private-sector-friendly and transparent investment climate in the sector.

1. Introduction

Political and Economic Factors

Since its independence from France in 1960, Madagascar experienced repeated internal political instability, including coups, violent unrest and disputed elections. The most recent coup in 2009 led to five years of political deadlock, international condemnation and economic sanctions. Democratic elections in 2013-2014 restored civilian rule.

The Malagasy economy is based on agriculture, especially the cultivation of paddy rice, coffee, vanilla, and cloves, and on tourism.. Years of poor political governance pushed Madagascar down to being the 7th poorest country in the world and made it heavily dependent on foreign aid (United Nations Statistics Division, 2016). However, the return to political stability since 2014 concurred with the relaunch of private investment and international aid. GDP growth is expected to sustain above 3% per year in the coming years (World Bank, 2016). As a result, companies and donors renewed their commitments to invest in the development of the Malagasy economy in general and its electricity sector in particular.

Therefore, while the country’s economy was hit hard by extreme weather and falling commodity prices in 2015, macro-economic stability, significant natural resources, and a growing tourism sector contributing to overall GDP growth promise positive long-term economic prospects. Thus, the improving general economic conditions as well as the “New Energy Policy” of 2014 recently boosted the potential of the Malagasy renewable energy sector.

Geographic Factors

The fourth largest island in the world is located in the tropical zone with two main seasons: a warm, wet season from November to April and a cooler, dry season from May to October. The tropical weather of the Indian Ocean brings occasional cyclones, torrential rains and floods, e.g. in 2000, 2004 and 2015.

Since the solar sector has particularly high potential (see chapter 3), irradiation is an important factor as well. Madagascar benefits from average annual sums of Global Horizontal Irradiation (GHI) in the range of 2,400 - 4,000 kWh/m2 (SolarGIS, 2016), as shown in figure 2. Daily averages span from 3,000 - 6,000 Wh/m2 in June and up to 5,000 - 7,800 Wh/m2 in December. Average daily values range from 4,000 - 6,500 Wh/m2 (European Commisssion, Mines Paritech/Armines, 2016). Almost all regions in the country benefit from more than 2800 hours of sunshine per year (Ministère de l'Energie - Madagascar, 2016). Not only the capital city Antananarivo, but also other major cities are characterized by a high solar irradiation and a high electricity demand. Mahajanga, the second most important seaport, sees eight months of hot, rain-free weather. The frequent sunshine of Toliara (Tuléar in French) and Antsiranana (Diégo Suarez in French) turned these two cities into booming international tourism destinations.

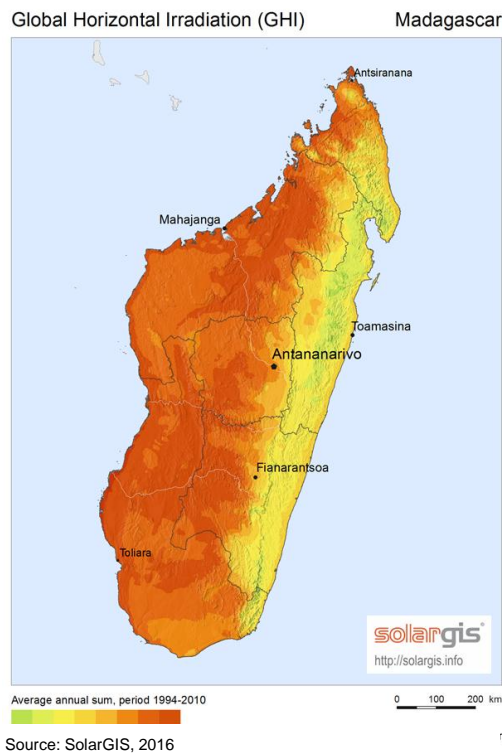
Figure 1: Country overview



Capital	Antananarivo
Official languages	Malagasy, French
Government	Semi-presidential republic
Area (km²)	587,041 ¹
Population	22,434,363 ² (2014, estimate)
GDP (nominal, billion US\$)	Total: 10,674 ³ Per capita: 453 ⁴
Currency	Malagasy Ariary (MGA); average inflation 6,95 %/y ⁵

Source: Wikimedia Foundation 2016

Figure 2: Average annual sums of GHI (kWh/m2), period 1994-2010



¹ 1,64 times the size of Germany
² 28% of the population of Germany (2014, estimate)
³ (IFM, 2015)
⁴ (United Nations Statistics Division, 2016)
⁵ (World Bank, 2016), period 2011-2014

2. Energy Market in Madagascar

Introduction

The recent development of the energy sector's legal framework can be broadly categorised into two phases:

- **The pre-crisis reform process of 1999-2005** began with the 1999 law which ended the national utility's monopoly and resulted in a number of decrees that established a concession-based, regulated private sector. This process was still underway when it was slowed down, but not stopped, by the 2009-2014 political crisis.
- **The post-crisis reform process began in 2014** and culminated in September 2015 with the White Paper ("Lettre Politique") on the New Energy Policy ("Nouvelle Politique de l'Energie", NPE). This document⁶ lays out a strategy to reach 70% of the population with electricity by 2030 through a range of technologies and public-private-partnership approaches. The initiative was supported by a detailed study on the national energy situation and perspectives released in August 2015. Further impetus derived from the initiation of numerous reforms which are mostly supported by multilateral and bilateral development partners. These actions aim at reinforcing and improving the concession-based energy sector structure currently in place.

Regulatory Framework of the Energy Sector

Overview

In an attempt to boost the electrification of the country, the Government of Madagascar liberalised the production, transport, and electricity distribution sector in 1998. It promoted a concession-based system which aims to reinforce the collaboration between the private and the public sector. In 2007, the Government laid the foundation for a business environment to facilitate private investments.

However, the political crisis of 2009-2014 inhibited any concrete actions, both by public and private parties, towards this goal. As a result, access to electricity in Madagascar, which reached 14% of the population in 2010, remains among the lowest in the world. While in urban areas as much as 36% of households are connected to the grid, this figure falls below 4% in rural areas. This results from the lack of a countrywide electricity grid; the national power utility JIRAMA operates grids only around major towns with the longest one stretching approximately 180 kilometers from the capital Antananarivo to Antsirabé. Lacking access to electricity is considered the second most important impediment (after political instability) to both private and public investment (World Bank, 2014). This negatively impacts the manufacturing sector and other productive sectors such as fisheries, mining, tourism, and agro-processing which represent the country's main sources of wealth.

Nation-wide power outages usually occur 6.7 times per month with an average duration of 1.5 hours which amounts to approximately 2.5 hours per week. The average firm loses the equivalent of 7% of its sales due to power outages (World Bank, 2015).

In response, the Government of Madagascar laid out a political strategy in 2015 to raise the population's access to electricity from 15% to 70% by 2030. The agenda plans for almost 15% of households to be supplied by solar power: 5% by solar lamps, 5% by solar home systems, 1% by solar mini-grids and 3.5% by grid-connected solar (République de Madagascar - Ministère de l'Energie et des Hydrocarbures, 2015). Also, Madagascar's energy sector provides several private-public partnership models and new legislation has recently been established to that effect.

The Government's active commitment to solar is confirmed by two solar concessions launched in 2015 via a tender and a call for expressions of interest. Several more are planned for 2016 (Rakotoarimanana, 2016). At the same time, private companies confirm that increasing solar PV for commercial, industrial and residential purposes is one way for them to reduce energy costs and guarantee stability of electricity supply (Irfane, 2016). In rural areas, some private households decided to purchase solar systems for domestic purposes at their own expense.

⁶ (ORE, 2015)

Finally, several bottom-up initiatives emerged in recent years. These involve NGOs and civil society, and open up a fast-paced new market for pre-electrification solutions such as solar home systems and solar lamps, especially in rural areas.

Chronological Overview of Legislative Initiatives

Law 98-032 on the reform of the electricity sector

This law forms the basis of the energy sector's current legal framework. The law liberalises the production, transport, and distribution of electricity which was and still remains dominated by the state-owned utility JIRAMA. It lays the basis for a regime of *Authorisations* and *Concessions* through public tenders and/or unsolicited applications. *Authorisations* and *Concessions* pertain to the production, distribution, and sale of electricity in a defined geographic area. Authorisations apply to smaller-scale projects of up to 150 kW hydropower or 500 kW thermal generator capacity and remain in force for a period of 7 to 15 years. Concessions apply to projects larger than these limits and remain in force for 15-30 years. The details of *Authorisations* and *Concessions* are negotiated on a per project basis with ADER under the oversight of ORE which was also established under this law.

Solar projects are not mentioned in the law itself. However, in practice and in subsequent decrees solar falls under the same regulation as hydropower.

Law 2007-036 on investments in Madagascar

This law aims to provide an enabling environment for private sector investment in Madagascar. It promotes the freedom to invest in Madagascar to any natural or legal person in compliance with laws and regulations. It also promotes equal treatment of investors and guarantees property rights, freedom of capital and financial transactions as well as the State's commitment to ensure stability for investors. The Economic Development Board of Madagascar (EDBM) was established under this law.

In summary, this investment law supports the:

- Establishment of a framework conducive to private sector investments in Madagascar;
- Simplification of administrative procedures to the achievement of business in Madagascar;
- Strengthening of the competitiveness of companies established in Madagascar;
- Access to land for Malagasy companies.

Unfortunately, the 2009 coup d'état led to a precipitous decline in the business climate and in practice, this law's effectiveness was limited. However, the post-2013 period has seen a significant improvement in the rhetoric between the Government and development aid partners. Also, the country's economy is recovering from the negative GDP growth rate of -4% in 2009 and had a GDP growth rate of 3.3% in 2014 (World Bank Data 2016). Similarly, Madagascar's position in important business indicators such as the Doing Business Index (2016) improved recently and now at position 164.

The new energy policy (2015-2019)

The New Energy Policy – NPE

Published in 2015, the NPE nominally supports the National Development Plan 2015-2019. Its most important objectives are:

- Ensuring access to modern energy services to 70% of the population of Madagascar by 2030 through the expansion of grid, mini-grid and off-grid solutions;
- Reducing dependence on energy imports (particularly diesel) and protecting national resources (particularly forests);
- Reforming the energy sector's regulatory environment to improve efficiency and facilitate public and private sector investment;
- Developing public and private financing structures as well as sources to provide long-term funding of energy infrastructure (such as public funding structures and investment promotion schemes).

- Project-calls
- Definition of standards
- Negotiations with third parties

Agency for the Development of Rural Electrification (ADER)		
Main Functions	Relations to Other Actors	Current Issues
Implements rural electrification projects through <ul style="list-style-type: none">- Planning projects- Subsidising projects- Ensuring compliance- Mediating disputes- Implementing studies	It negotiates and monitors projects on behalf of the MEH.	
National Fund for Electricity (FNE)		
Main Functions	Relations to Other Actors	Current Issues
It provides subsidies to rural electrification projects. <ul style="list-style-type: none">- Financed through private operators and JIRAMA	The Fund is managed and dispensed by ADER. JIRAMA is supposed to pay into the fund although due to its liquidity problems, it rarely does.	Currently undergoing a restructuring process
Electricity Regulatory Body (ORE)		
Main Functions	Relations to Other Actors	Current Issues
Assures regulation, control and monitoring of sector-related activities by <ul style="list-style-type: none">- Establishing standards- Monitoring and controlling- Preparing transfer orders based on audited fiscal statements	Permittees and licensees in the electric energy sector are required to report their turnover to ORE annually.	It lacks resources to effectively fulfil its mandate but is currently supported by various donors to build up capacity.
The Economic Development Board of Madagascar (EDBM)		
Main Functions	Relations to Other Actors	Current Issues
Facilitates investment projects by <ul style="list-style-type: none">- Providing assistance with administrative procedures	Assists investors with administrative procedures.	Currently limited through its lack of capacity.
National Water and Electricity Utility (JIRAMA)		
Main Functions	Relations to Other Actors	Current Issues
Responsible for electricity and water provision in urban areas, unclear responsibilities for grid-extension in rural areas.	Is supposed to pay into the FNE. Operates the urban areas while ADER is responsible for rural areas.	Major financial and technical problems limit its capacity to provide services to its clients or fulfil its obligations vis-à-vis the FNE.

Ministry of Energy and Hydrocarbons - MEH

The Ministry of Energy and Hydrocarbons acts as the authorization-granting authority of Madagascar. According to the provisions of the law, the Ministry:

- Is in charge of the national energy policy, the definition of the national tariff policy, and the planning of electrification projects on a national level;
- Grants concessions and authorization to produce and sell electricity;
- Launches calls for projects in the energy sector, including production, transport, and distribution;
- Defines the standards and the technical specifications applicable to facilities;
- Negotiates financing agreements with the private sector and donors.

To this end, the Ministry established the Agency for the Development of Rural Electrification (ADER) and the Electricity Regulatory Body (ORE). Other recent activities include an ambitious Intended Nationally Determined Contribution (INDC) towards the goals set by the Paris Conference in 2015, and a National Development Plan (PND) that prioritizes energy as a national priority over the next few years. The Malagasy Government is strongly engaged in the improvement of access to electricity.

Agency for the Development of Rural Electrification - ADER

ADER was created in 2002 by decree⁸ with the goal to promote and encourage the submission of projects related to rural electrification. The centrepiece of ADER's rural electrification plan is a series of Calls for Projects – ADER-AP – for hydropower, solar, biomass, and wind power electrification projects. Formally, ADER has a broad mandate within the implementation of rural electrification projects, encompassing:

- Subsidising rural electrification projects via a special fund set up for this purpose;
- Negotiating the terms of requests for authorizations and/or concessions on behalf of the Ministry of Energy and Hydrocarbons;
- Issuing certificates of compliance to operators and carrying out the inspection and monitoring on behalf of the Minister for Energy and Hydrocarbons;
- Ensuring legal and regulatory compliance of electrification projects in coordination with the regulatory body;
- Planning and preparing rural electrification programmes;
- Contributing to the development of a national energy policy and regulation;
- Mediating disputes among rural electrification actors (for example between mini-grid operators and their customers);
- Implementing studies, reviews and impact monitoring.

Figure 5: Definition of rural electrification

RURAL ELECTRIFICATION

Rural electrification is defined under the law as pertaining to areas that:

- Were not connected to the grid of the national power utility JIRAMA in 1998, and
- Are managed by JIRAMA through mini-grids smaller than 250 kW.

Source: Decree 2002-1550 of Dec 3, 2002 "on the establishment of the Agency for the Development of Rural Electrification – ADER"

The definition of rural electrification in figure 3 has two important consequences for ADER:

- Grid extension projects, even when extending the grid of JIRAMA, are planned, managed and financed by ADER;
- Electricity projects in off-grid urban areas unserved by electricity services or served by mini-grids smaller than 250 kW areas fall under ADER's mandate.

During the period 2003-2013, ADER supported rural electrification projects with an investment of US\$14.1m. Only US\$0.3m, or 2% of the disbursements were allocated to solar technology, which consisted of 19.6 kWp installed at an average cost of US\$14,286 per kW (GIZ, 2014). However, ADER has significantly increased the role of solar power in current and planned calls as well as in regional plans.

The National Fund for Electricity - FNE

The FNE was established in 2002⁹ as a further step in the Malagasy electricity sector reform launched in 1999. The FNE was created to cross-subsidise rural electrification through a levy on electricity sales. Under this rule, 1.25% of the net sales value of electricity is paid into the fund. The fund itself is managed and dispensed by ADER in the form of subsidies to electrification projects. In principle, the subsidies should be sufficiently high to ensure that electricity prices in rural areas are as low as those of areas covered by the national grid.

⁸ Decree 2002-1550 of Dec 3, 2002 "on the establishment of the Agency for the Development of Rural Electrification – ADER"

⁹ Law 2002-001 of Oct 7, 2002 "on the establishment of the National Fund for Electricity – FNE"

Levies paid into the fund are due from all electricity sector concessionaries. This includes private operators and JIRAMA with equal obligations. In practice, JIRAMA's severe liquidity problems mean that the company rarely, if ever, pays into the fund and currently has immense liabilities vis-à-vis the fund. Most payments are supplied by private operators and by the Government as part of a yearly budgetary allocation. It is unclear whether JIRAMA's liabilities will ever be paid and when payments can be expected to resume.

The FNE currently has no distinct legal structure and is in practice little more than a Government account which ADER can utilize to subsidise projects. The lack of a distinct legal structure means that subsidies are currently the only financial tool used to support projects. Equity investments, guarantees, low-interest loans, and mezzanine financing are not yet available. However, a number of studies have already been completed and reform initiatives, led by the MEH and supported by the World Bank and GIZ, are underway to convert the FNE into a distinct legal and organisational entity.

The Electricity Regulatory Body – ORE

ORE was created by decree in 2005¹⁰. Permittees and licensees in the electric energy sector are required to report their turnover to ORE annually. Subsequently, ORE prepares a transfer order on quarterly instalments based on the latest audited fiscal statements. Operators must pay these royalties to ORE and regularize the current year after auditing.

The regulatory body assures the regulation, control and monitoring of sector-related activities by:

- Establishing standards, including quality of service;
- Demarcating ranges for tariffs based on calculations, taking into account both the needs of the investors and the beneficiaries of the service;
- Monitoring and controlling activities to enforce the regulation, transparency and competition.

Currently, ORE plays a technocratic and mostly passive role in the energy sector since it does not have resources to perform verification or enforcement actions in case of non-compliance or underperformance. However, ORE is an active participant in the reform of the energy sector and can be expected to play an increasingly important role in the near future. A number of donors (GIZ, World Bank) have also planned to support ORE with expertise, human resources and strategic studies.

The Economic Development Board of Madagascar – EDBM

The role of this institution is to promote, facilitate and expedite the approval of all investment projects in Madagascar. It does so by assisting investors with administrative procedures necessary for the realization of investments and the creation of enterprises, both on a national and on an international level. However, the board currently disposes of scarce resources which limit its capacity for action.

The National Power and Water Utility - JIRAMA

JIRAMA (*Jiro sy Rano Malagasy* – National Water and Electricity Utility) is the earlier monopolist, now a fully state-owned limited liability company, responsible for electricity provision (production, transport, and distribution) and water services in the urban areas of the country. Activities concerning rural electrification have now been ceded to ADER; however, responsibilities regarding grid-extension in rural areas still remain unclear. JIRAMA faces major financial and technical problems regarding its capabilities to provide quality service to Malagasy clients.

Any interaction with JIRAMA is known to be complicated in terms of procedures and transparency. Also, the difficult financial situation of the company limits its capacity to comply with power purchase agreements. For these reasons, grid-connected PV is at the current state not considered an interesting sector.

¹⁰ Decree 2005-062 of Jan 25, 2005 “on the procedures for the collection of royalties on annual sales of permittees and licensees of the electric power sector by the Electricity Regulatory Body – ORE”

Further actors

The Group of Companies of Madagascar – GEM

The Group of Companies of Madagascar - GEM (Groupement des Entreprises de Madagascar) is an association of companies and professional bodies operating in Madagascar. The members of GEM comprise 42% of the Malagasy economic turnover and 41% of formal jobs. The group's purpose is to identify and resolve common challenges and issues faced by its members, as well as to provide a forum for networking and exchange. It has a number of sector sub-groups, although as of now none relating to energy.

The Energy Discussion Group – GRE

The Energy Discussion Group – GRE (Groupe de Reflexion Energie) is an independent discussion forum and advisory group of Governmental, civil society, and private actors. While the group includes actors of Government agencies, it has no formal power and acts as an informal advisory group only. This lack of formalism and the possibility of participants to speak as free individuals have created a valuable free forum for the exchange of ideas on policy and projects. The group issues position papers on the energy policy, performs independent research, and organises regular meetings and working group discussions on topics of relevance to the current policy process.

The Association of Engineers for the Development of Renewable Energy – AIDER

The AIDER is an association of some 30 researchers and engineers in different domains. They accumulated a high level of expertise and a deep knowledge of the energy sector, and collaborate with several national and international organisations in the field. Also, they provide engineering and consulting services and actively participate in the definition of sectoral strategies.

The Association of Professional Operators in Electrification of Madagascar – AOPEM

Until today, some 20 operators, mainly small and medium-sized companies, have realized approximately 80 projects in rural areas. Most of the private operators are members of the Association des Opérateurs Professionnels en Electrification de Madagascar (AOPEM).

Private companies

Several private actors operate in the solar market in Madagascar. They differ largely in capacity, size, and business model. In particular for national project calls and for final users in rural areas, the general trend is to favour low-cost over quality products. Different types of enterprises can be identified:

- Companies that raise funds abroad through international calls for grants. Their holding is usually based in Europe, they have a social vocation, target households and operate in several Sub-Saharan African countries using similar integrated business models, including development, contracting, sales, EPC and O&M. Normally, they integrate local subcontractors for procurement, logistics, construction, monitoring and evaluation. Their engagement with the public sector is limited. Examples: HERi, The Sun Factory;
- Companies that respond to calls for proposals launched by international organisations (such as UNICEF), local Governments or ADER for the provision of different services ranging from the supply and installations of small solar systems to the design, construction and management of mini-grids. These companies are usually based locally and face fierce competition. The lack of quality standards and a focus on price over quality favour products of lower quality. Examples: Freesolar, Tenema, Energie Technologie;
- Companies that operate through direct contracting with major power-takers such as telecommunications, industries, etc. They are very well established in the country and they favour partnerships with international firms. Examples: CAMUSAT, EDM, Henri Fraise Fils & Cie;
- Local companies that provide basic solar products in rural areas. These companies usually compete with the producers of cheaper offerings from China and South-Asia. Examples: MAJINCO, METAPLASCO.

A non-exhaustive list of private operators is presented in the Annex.

Bilateral and multilateral development partners

Several bilateral and multilateral development agencies operate in Madagascar. Although most efforts have so far been focused on hydropower, more initiatives in the solar sector are expected for the coming years. An overview is provided in figure 6:

Figure 6: Overview of development partners

GERMAN COOPERATION	
GIZ	KfW
GIZ operates in the sector through the programme “Promotion de l’Electrification Rurale par les Energies Renouvelables” (PERER) which cooperates closely with the Ministry of Energy and Hydrocarbons, ADER and ORE. GIZ is pursuing activities at different levels in order to ensure efficiency, effectiveness, and above all the quality of implementation of rural electrification projects. It intervenes in the following areas: strategy and policy for electrification of rural areas; improvement of regional energy planning; development of a planning process; promotion and monitoring of private sector activities through market enablement and consulting services for fund raising, capacity building and general assistance. GIZ also cooperates with the MEH, ADER, ORE and the private sector in order to improve the framework conditions for electrification through renewable energy sources. This cooperation includes consulting services concerning financing mechanisms, assistance with the implementation of energy policies, capacity-building for private and public actors and assisting with PPP-models and calls.	KfW is planning to co-finance rural electrification through ADER’s existing project pipeline with a tentative amount of €15m. A large part of this sum is foreseen to be invested in projects in the Sava region, mostly in hydropower.
THE WORLD BANK GROUP	
PIC 2	SCALING SOLAR
The objective of the Second Integrated Growth Poles and Corridors Program (PIC) for Madagascar is to contribute to increased economic activities and access to infrastructure services, measured by an increase in jobs and number of formal firms in different target regions. The major focus lies on the three regions of Atsimo-Andrefana, Anosy and Diana. Access to energy through solar PV plays a major role in the project.	The World Bank is present in the Malagasy energy sector. In early 2016, the Government of Madagascar has requested the assistance of the International Finance Corporation (IFC) to act as lead advisor for the selection of independent power producers (IPPs) to develop a total capacity of 30-40 MW of solar power across several sites. IFC will provide advisory services for the structuring of the transaction and the selection of suitable private investors through a competitive bidding process.
PAGOSE	SREP (through the CIF)
The project PAGOSE provides technical assistance to the development of a national strategy for access to electricity in Madagascar. It cooperates with the MEH and with JIRAMA regarding the analysis of the current situation and the design and co-financing of the new strategy. The objective of the programme is to address institutional, technical, and financial constraints that hinder the electrification of the country.	The Climate Investment Fund (CIF), through funds of the WB, the IFC, and the AfDB, supports the Government of Madagascar through the Scaling-Up Renewable Energy Program (SREP) Investment Plan. The programme is in its early stage and it addresses the institutional, financial and economic barriers to the scale up of renewable energy in Madagascar.
EUROPEAN UNION: EU ENERGY INITIATIVE (EUEI)	
The EUEI supports energy initiatives in Madagascar through the 11 th European Development Funds (EDF), following the ACP-EU Partnership Agreement. Its key instruments are: <ul style="list-style-type: none">• The Africa-EU Energy Partnership (AEEP)• The Africa-EU Renewable Energy Cooperation Programme (RECP);	

- The EU-Africa Infrastructure Trust-Fund (ITF);
- The EUEI Partnership and Dialogue Facility (EUEI-PDF)
- The ACP-EU Energy Facility (EF)
- The Global Energy Efficiency and Renewable Energy Fund (GEREF);
- The Electrification Financing Initiative (ElectriFi)

Open calls for each of these initiatives can be found on their respective websites.

UNIDO

UNIDO supports ADER with the implementation of its hydropower projects through financial and technical support. The main part of its financial support constitutes of co-financing subsidies supplied by the Global Environment Fund (GEF). Its technical support includes the training of technicians, policy studies, and advisory services to the Government. At the time of writing, UNIDO was restructuring and revising its energy intervention.

ADES (NGO)

ADES is a non-profit organization that was founded in Switzerland in 2001 (Association pour le Développement de l'Energie Solaire, Suisse-Madagascar). ADES advocates cooking with solar energy and developed a solar cooker project. It produces and distributes solar cookers in order to conserve forest resources and to reduce the use of expensive charcoal for cooking which strains the limited budget of poorer parts of the population. To date, it has produced around 6000 boxes of solar cookers that were sold at affordable prices.

FONDATION ENERGIES POUR LE MONDE (FOUNDATION)

FONDEM has been working in Madagascar since 1994 to expand access to electricity services by promoting the use of renewable energy. In 2012, the Foundation and its local partners initiated the new programme "BOREALE" ("Best Options for Rural Energy and Access to Light and Electricity") as part of the "Energy Facility 2" of the European Union that runs from March 2012 to February 2017. This programme aims at the sustainable electrification through PV plants ranging from 7 to 12 kWp in a maximum of seven locations in the Androy and Anosy regions.

EXPERTS SOLIDAIRES (NGO)

Experts-Solidaires is a French non-profit organization active in the field of environment and sustainable development. Experts-Solidaires is associated with Mad'Eole to conduct a rural electrification project in the region of Diana. Mad'Eole is a Malagasy association of professors from Diego Suarez which launches and operates rural projects based on solar and wind. A joint project aims to exploit local wind and solar resources to develop sustainable and affordable access to electricity in the villages of Ampasindava and Magaoka.

MAD'EOLE (NGO)

Mad'Eole is an NGO based in Antsiranana, in the Diana region. It is composed of professors and alumni of the University of Antsiranana and collaborates with the University. The NGO is very active in the field of wind and solar based mini-grids in rural villages.

WORLD WILDLIFE FUND – WWF (NGO)

In 2013, WWF-Madagascar developed a project with Barefoot College-India for a 6-month training course for seven elderly women ('grandmothers') from two villages in Madagascar. The training aimed to qualify them to build, install and maintain solar systems in their communities. Also, it is expected that they share their knowledge with other locals in their home villages and install more systems in the surrounding areas.

Source: MARGE, personal interviews with development partners 2016

Other bilateral partners are believed to enter the sector in the near future, e.g. from India and the USA.

Financial institutions

Almost all financial institutions in Madagascar are commercial in nature. Until the recent past, national banks were reluctant to invest in rural energy projects due to the lack of positive track-records of project sponsors. In order to deal with the high risk levels and the low quality of financial proposals submitted by developers, the institutions offered loans at conditions that were hardly competitive: short durations of typically 2-3 years, high-interest rates in the range of 16-20%/year, and risk reduction practices that involved requirements for collaterals of 120-200% of the amount of the loan.

Nonetheless, the financing sector is currently opening up to this market. In 2015, the Professional Banking Association (Association Professionnelle des Banques, APB) published an open letter in which it invited applications for renewable energy projects. Banks in Madagascar have also expressed such an interest in private conversations. However, no concrete investment materialized to date.

Some international institutions, such as the Bank of Mauritius and the Bank of Africa appear more supportive of the sector and base their risk assessments on project cash flows to reduce the requirements for collaterals.

Several former micro-finance institutes such as Access Bank Madagascar (supported by KfW) and MicroCred are now enlarging their scope and finance larger infrastructure projects which might include energy proposals.

The Agence Française de Développement (AFD) provides two instruments: ARIZ, a guarantee fund, and SUNREF, a green credit line that targets countries in the Indian Ocean, including Madagascar. The latter was developed jointly with the MCB and the SBM banks. Solidis Garantie, established in 2008, is another guarantee fund which specifically supports SMEs. The Solidis Garantie fund is supported by the Central Bank of Madagascar¹¹.

¹¹ CSBF, No 12/Ef/2011

3. Market Potential

Introduction

The post-crisis period in Madagascar is marked by the proliferation of public and private initiatives in the energy sector. The Government, donors and private sector companies have all announced significant new initiatives to develop new projects. The large majority of activities centre on the construction of new hydropower capacity and grid infrastructure. However, solar is increasingly included in plans to develop the energy sector, with private companies looking to reduce diesel generator expenses and the Government planning to use PV to develop off-grid areas with no access to hydropower resources. On-grid use of solar is also increasing, mostly through large projects co-financed by major development partners. In rural areas without access to electricity, solar products for pre-electrification could play a major role.

Key Sub-Sectors

In the absence of comprehensive market data, the information presented in this chapter is based on interviews with companies, experts and Government representatives active in the Malagasy solar sector.

The Malagasy solar market can be divided into four categories:

- Solar products (lamps, phone chargers) which are sold or leased to rural and urban customers;
- Household and institutional systems up to a few kilowatts;
- Commercial “fuel saving” projects in the range of few kilowatts to several megawatts which (partly) replace diesel or heavy fuel oil generation of private companies with solar power;
- Mini-grid projects from few hundreds kW to above 1 MW (a current call includes more than 350 projects, mostly solar).

Relays of telecom companies, small factories, and tourism facilities

The larger Malagasy equipment suppliers report a growing market for PV-based fuel-saving solutions. The average cost for diesel amounts to \$0.98 per litre. These solutions allow the integration of PV systems in diesel plants, often without the need for storage capacity. Installations can generally be found to be in the range of a few up to thousands of kW. Clients include businesses in the tourism sector (mainly hotels), agro-processing sites, and telecommunication companies.

The telecommunications sector has been the most prominent source of growth in this market, followed by the tourism sector. Due to the country's low population density, most of the new telecom relays are found in rural areas for which solar technology is proving to be the most cost-effective electricity supply solution. Existing diesel generators are converted to solar hybrid systems. Operators are mainly international (ORANGE, TELMA) and rely on international actors to provide turn-key solutions from system design to equipment supply.

Household and institutional PV systems

A steadily growing, yet limited market for smaller household and institutional PV systems can be identified which is mainly served by small, informal retailers. As a result, this market segment is hard to quantify. A sampling of vendors and clients indicates that some of the main clients of this market are:

- Businessmen or large-scale farmers in non-electrified rural, peri-urban and urban areas;
- On-grid customers seeking to increase the reliability of their electricity supply;
- Churches, schools and other private social infrastructure;
- Rural, usually second residences of wealthier citizens of Madagascar's main cities.

Solar lamps and SHS

The sale-lease of rechargeable lamps is a common approach in rural pre-electrification. A possible approach already explored by HERi involves the dissemination of "franchising solar energy kiosks" – small containerized buildings powered by solar solutions in the heart of little or non-electrified communities.

Other solutions include the door-to-door distribution of solar lamps charged during the day and used in the evening, e.g. provided by Jiro-Ve.

However, the market for solar lamps and solar kiosks is largely undeveloped in Madagascar and hindered by the weak purchasing power of rural customers.

Mini-grid projects

Several mini-grid projects have been developed across the country, for the most part privately-run and serving small rural communities. Financing is usually supported by international development agencies. Large solar parks following an IPP-model are also a potential market in Madagascar. Currently, a 30-40 MW solar park is planned and supported by the International Finance Corporation (IFC). A feasibility study currently undertaken by the African Development Bank (AfDB) examines the possibility to install solar parks that provide sufficient electricity to supply entire islands, more specifically Nosy Be and St. Marie.

Sector Trends and new Initiatives

Increasing demand of the residential sector

The demand for electricity in Madagascar is currently unmet. The country's industrial sector is still underdeveloped and accounts for only 28% of JIRAMA's sales. The 14% of the population that are connected to the national grid account for 56% of JIRAMA's sales. Small and medium enterprises operating at low voltage represent only 7% of its sales.

Typical consumption in Madagascar averages from 450 MWh/year for MV/HV subscribers to 1,246 MWh/year for LV residential customers. These values apply to the six major national networks which are characterised by constant power outages. It can be expected that higher levels of consumption will occur if the quality of supply improves (IFC, 2015).

An update on end user tariffs

The Government's end-user electricity tariff policy will be important to all projects. It is expected that a uniform tariff policy will be introduced later this year. It will be applied to all new concessions; those already awarded to date can expect terms to remain unchanged. ADER will adjust subsidy levels in negotiations to allow for profitable operations under national tariff regulations. However, details of this tariff study are not yet available. The study itself will be managed by the MEH and is financed through the World Bank programme PAGOSE.

Use of solar panels for street lighting

A number of solar-powered streetlights were deployed by ADER in rural municipalities. With the support of the MEH and through public-private partnerships, solar panels for public lighting were installed in some parts of Antananarivo.

Use of solar energy by public institutions and utilities in rural areas

Public buildings in rural areas such as health centres and police stations are often equipped with solar panels. The departments involved in these initiatives have opted for solar energy to compensate for the lack of electricity supply in these areas. These actions depend on local initiatives and are not carried out in a systematic way.

Solar hybridisation of diesel mini-grids run by JIRAMA in urban areas

JIRAMA operates a number of diesel-based mini-grids below 250 kW which currently supply important commercial and administrative centres around the country. Most of these concessions will expire in 2016 and new contracts will be tendered.

This represents an opportunity for the hybridisation of these systems through solar PV. Additionally, JIRAMA operates some diesel mini-grids above 250 kW which potentially could be hybridised and for which calls are ongoing.

ADER calls for projects – ADER-AP

ADER’s rural electrification plan contains a series of Calls for Projects – ADER-AP – for hydropower, solar, biomass, and wind power electrification projects. These calls for projects are launched in phases. So far, two calls have been launched as shown in figure 6:

Figure 7: ADER calls for projects

CALL	01-2015/ADER	02-2015/ADER
Regions covered	Sava, Sofia, Bongolava and Ihorombe	Anosy, Androy and Antsimo Andrefana
Population	3.00 million	2.72 million
Estimated population covered	244 000	Up to 401 000*
Total planned capacity	7.9MW	Up to 14.5MW*
Publication	April 2015	October 2015
Deadline Expressions of Interest	December 2015	February 2015
Deadline Proposals	May 2016	Not yet announced. Expected August 2016
Size range of projects	50kW-1.6MW	32kW-211kW
Size range of lots	390kW-5.3MW	250kW-4.7MW*
Total PV or PV hybrid capacity included	None	About 4MW*
Call format	Call in two phases with lots matching regional divisions. Companies are required to provide own feasibility studies in the proposal phase. Subsidies of up to 70% may be negotiated based on the projected profitability of the project.	Call in two phases. The Expression of Interest phase will be used to narrow down the number of sites and lots under consideration based on interest expressed by the private sector.

Source: MARGE, personal interviews and review of public tender documents

Future calls have not yet been announced but it can be expected that two further calls will be launched in 2016 and two more in 2017 to eventually cover the entire country. Given the long processing time for new hydropower studies, it can be assumed that PV, wind and hybrid power will be the dominant technologies proposed in the calls planned for 2016.

Scaling solar

Scaling Solar brings together a suite of World Bank Group services under a single engagement aimed at creating viable solar markets in each client country. The “one stop shop” programme aims to make privately funded, grid-connected solar projects operational at competitive tariffs within two years. When implemented across multiple countries, the programme will create a new regional market for solar investment (International Finance Corporation , 2016).

The World Bank offers a package that includes:

- Advice to assess the right size and location for solar PV power plants connected to the national grid;
- Simple and rapid tendering to ensure strong participation and competition;
- Fully developed templates of bankable project documents that can eliminate the need for negotiations and speed up access to financing;
- Competitive financing and insurance attached to the tender and available to all bidders, delivering competitive bidding and ensuring rapid financial closure;
- Risk management and credit enhancement products to lower financing costs and deliver power at lower tariffs.

Calls for proposal for the supply and installation of solar equipment

In addition to project calls for the electrification of entire regions by ADER, several smaller calls are published in national newspapers for the supply and installation of solar equipment.

They are intended primarily for community infrastructures such as health centres, schools, police offices, etc. Within this category, there are two further sub-categories: the calls that are fully financed by the Government and those that benefit from the support of donors, such as UNICEF for schools. For the former, the financial weight of the proposal is very high and low-cost solutions usually win; for the latter, higher quality and cost is usually taken into consideration. Both cases are characterised by intense competition among suppliers.

Calls for proposals – EU Energy Initiative (EUEI)

Through the issuing of calls for proposals on a regular basis, the EU Energy Initiative (EUEI) promotes energy initiatives through the 11th European Development Fund (EDF). Madagascar is one of the target countries, and open tenders can be found on EuropAid's website¹² and the official websites of the respective programmes under the EUEI umbrella listed in Chapter 3. Within this framework, new calls for projects are currently launched through the ElectriFi initiative.

Calls for proposals – Regional Organisations

Madagascar is a member of several regional organisations such as SADC (Southern Africa Development Community), COMESA (Common Market for Eastern and Southern Africa), IOC (Indian Ocean Commission), AU (African Union) and OIF (Organisation Internationale de la Francophonie). It is likely that regional programmes focussed on energy are launched within the next years through the websites of each organisation.

Virtual Power Plants

There are some ongoing discussions on how to integrate a high share of solar and hydro power generation into existing grids. One option that is currently under evaluation includes the creation of virtual power plants – solar fields that inject electricity into the grid and whose surplus is “absorbed” by hydro-pumped storage technology which are able to generate electricity during times of peak demand and/or low solar production. To this end, GIZ and a leading German company are currently discussing potential pilot projects with the Malagasy Government.

Human Capacity and Expertise

Madagascar benefits from a relatively high level of education and a well-developed educational system. The country counts a number of technical schools and universities which offer renewable energy and electricity courses at all levels.

As a result, professionals with qualifications in solar and other renewable energy technologies can be found in Madagascar. However, due to the limited size of the renewable energy market, most of these professionals have limited practical experience.

Some of the major educational institutions which are offering courses related to renewable energy technologies are described below:

- The Technical University of Antananarivo offers Bachelors and Masters in Engineering of Renewable Energy (LIER and MIER);
- The Technical Institute of Antsiranana (IST-D) and the University of Antsiranana both offer programmes in Renewable Energy;

¹² <https://webgate.ec.europa.eu/europeaid/online-services/index.cfm?do=publi.welcome>

- The Technical Institute in Antananarivo (IST-T) has recently introduced a Bachelor in Renewable Energy Technology;
- Several other schools offer courses, modules, and implement practical trainings in various technologies for renewable energy (turbines, solar panels, electric control systems, etc.).

Despite a growing number of courses and qualified students and schools, the business community and Government officials indicated a significant lack of experience and practical knowledge among graduates and professionals. This is explained by extremely limited facilities and laboratories in universities and ISTs, and by the limited size of the sector.

4. Constraints and barriers to entry

The following constraints are discussed in detail below:

Political

A number of political barriers result from the relatively limited experience of Government actors, low human capacity and a general lack of resources. The most relevant political barriers for solar companies are:

- **COMMON USE OF UNSOLICITED APPLICATIONS:** Although law 98-032 considers unsolicited applications an exceptional approach to calls for proposals launched by the Government, they are still common practice and undermine competition among private operators by favouring well-established firms to new players;
- **DURATION AND COMPLEXITY OF SELECTION PROCEDURES:** Another reason why unsolicited applications have become a common practice, especially among small IPPs, is the complexity and the duration of standard procedures which usually take several months. Also, they require a level of detail and complexity which might be unfeasible for small developers;
- **LIMITED CAPACITY OF ADER AND MEH:** The teams composing ADER and MEH hold a strong technical background which is not backed-up by financial and legal expertise. Furthermore, given the magnitude and number of tasks assigned to ADER and MEH, both institutions lack personnel. These are major handicaps hampering the capacity of the Agency to evaluate and approve new projects;
- **DEPENDENCY OF AGENCIES on POLITICS:** Both ADER and ORE are highly dependent on political orientations and on the interference of the MEH, limiting their scope and capacity for intervention in the sector.

Economic

The general weakness of the Malagasy economy poses several challenges:

- **LIMITED ECONOMIC ACTIVITY:** The Malagasy economy relies mostly on agriculture and tourism. The industrial sector is stagnating due to several detrimental circumstances such as extreme weather events, the lack of political transparency, and decreasing international commodity prices. Currently, the projections for future industrial electricity demand are highly unpredictable.
- **LIMITED AND SEASONAL PURCHASING POWER IN RURAL AREAS:** The low and often only seasonal purchasing power of households is an important issue for investors, especially in rural areas where most inhabitants make their living of agriculture with little diversification of economic activities. The low purchasing power poses a major challenge for the financial feasibility of off-grid projects.
- **DIFFICULT ACCESS TO FINANCE:** Most banks in Madagascar are commercial banks and reluctant to take major risks or provide large loans. They adopt a very conservative approach, particularly in rural areas and new sectors, and ask collaterals that can reach up to 200% of the required amount. Consequently, access to credit is a major issue in Madagascar, especially for small investors with limited track-records and guarantees. However, the presence of more than 20 banks involved in micro-financing also gives reason for an optimistic outlook.

Social

Social inequality, even at village level, is exacerbated further by wide-spread poverty that causes theft and insecurity especially in the Southern, more isolated part of the country.

Technological

Technological constraints for solar relate to unfavourable load curves and the lack of basic infrastructure:

- **UNFAVOURABLE LOAD CURVES FOR RESIDENTIAL DEMAND:** While the residential sector promises future growth, its demand patterns represent a major constraint to the viability of solar projects. Residential customers require a

high power capacity, with a demand peak during the evening and a low demand during the day. The need for storage capacity impacts the financial viability of projects.

- **LOW POPULATION DENSITY AND LACK OF INFRASTRUCTURE:** Rural areas in Madagascar are sparsely populated and access is constrained by poor infrastructure which results in high costs for transport, maintenance and operations of solar power plants.

Legal

The legal framework for renewable energy in Madagascar is currently under revision. To date, there still are major legal gaps:

- **DIFFICULT CONTEXT FOR POWER-PURCHASE AGREEMENTS (PPAs):** The current situation of JIRAMA and the lack of an appropriate legislation make it difficult for the national utility to sign and to abide by the terms of power-purchase agreements (PPAs) with independent power producers (IPPs);
- **LACK OF STANDARDS, AND COMPETITION WITH LOW-COST PRODUCTS:** The national legislation does not provide any minimum standards for solar equipment. Therefore, low-quality and low-cost lamps, solar home systems, solar panels and batteries are often favoured, especially in rural areas.
- **FUNCTIONING AND AVAILABILITY OF FNE:** The objective of the FNE is to centralize all sources of financing for the promotion of rural electrification. However, donors contribute directly to project financing for procedural reasons. The accounting rules of the FNE are often not compatible with the disbursement procedures of donors.

Environmental

Especially in the Eastern part of the country where weather conditions tend to be more extreme, PV installations are very vulnerable. Ironically, this makes the use of environmentally sound technologies more difficult in areas that are hit harder by the effects of climate change.

5. Conclusion

With an abundance of resources and a huge unsatisfied demand, the Malagasy market offers a significant potential for growing sales of energy products and services. Madagascar benefits from an insolation of 2,400 – 4,000 kWh/m²/year (SolarGIS, 2016). However, only 14% of the population have access to electricity. The need for electricity as a basic need for economic activity is even more acute in rural areas where less than 4% of the population profit from access. The wide-spread use of diesel generators offers a large potential for the hybridization with PV. In a survey of private sector participants, companies name the lack of a stable electricity supply one of the most important obstacles to doing business.

The market potential for the electrification of rural areas, the hybridisation of existing diesel mini-grids, and the provision of clean, reliable and affordable technology for the productive use, is largely untapped. As a result, a growing number of private operators with different skills, sizes, products and market strategies are active in the market, and competition is increasing. In absence of an effective quality standards regime, competition at the current state mainly focuses on price rather than quality. However, the regulatory framework and a new energy policy under development promise increasing international financing for projects with high-quality components.

The restructuring process of JIRAMA currently undertaken by the World Bank¹³ should lead to more transparency and an improved financial capacity of the national utility. It entails the improvement of electricity sector planning and financial sustainability, strengthening JIRAMA's operational performance and governance as well as investments to enhance the reliability of electricity. Furthermore, an International Development Association (IDA)* credit of US\$65m supporting Madagascar's electricity sector governance and operations was granted in March 2016. This will facilitate JIRAMA's engagement in power-purchase agreements and more effective private-public partnerships.

The Malagasy solar market, in the light of the country's economic growth and its ambitious policy-setting, triggered by the active involvement of a number of international donors, demonstrates an interesting potential and business opportunities for those looking for a long-term commitment in the market.

¹³ World Bank, March 2016.

Annex

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Interviewees

- Aimée Andrianasolo, Président Exécutif, ORE
- Alimamod Irfane, General Manager, SolarLand
- Andry Andrianstsilavo, Directeur de Planification, ORE
- Armin Krieger, ASENSE
- Bako Toky Niaina Andrianirinah, Executive Director, PATMAD
- Charles van der Straeten, Henri Fraise & Cie
- Daniel Raremby, Secrétaire Général Adjoint, Groupement des Entreprises de Madagascar
- Frederic Fourtune, Head of Infrastructure Programs, European Union
- Henri Daniel Ramanananarivo, Director, Green Power
- Herivelo Ramialiarisoa, Directrice du Développement des Énergies Renouvelables, Ministère de l'Énergie et des Hydrocarbures
- Hery Rakotonindrainy, Directeur Technique, ORE
- Louis Tavernier, UNIDO
- Marcellin Andrianarivelo-Razafy, Business Development Manager, Henri Fraise & Cie
- Nicolas Verbert, Directeur Technique, Henri Fraise & Cie
- Ottmar Werner, Senior Project Manager, KfW
- Rachid Mouhtajy, President, Professional Banking Association (Association Professionnelle des Banques, APB) and Director General of BM Madagascar.
- Rija N. Randrianarivony, GRET
- Rik Stamhuis, Managing Director, Jiro VE
- Sylvain Martin, General Manager, HERI Madagascar
- Yves Andrianaly, Power Technology
- Zakaria Rafaralahy Tovoarison, Directeur de l'Environnement, JIRAMA

Figure 8: List of companies active in the PV sector in Madagascar

COMPANY	CONTACTS	DESCRIPTION
ACQUA MARINE	Alarobia Route du Pape	Wind, Solar PV, solar thermal
ADES	Immeuble Imangakely next to Jirama Lalana, Rainandrianampandry	Solar PV, solar thermal
ASENSE	<i>E-mail:</i> armin.krieger@gmx.net	Solar PV (telecoms)
CAMUSAT	Ivandry	Wind, solar PV (telecoms)
CEKI (AKARI)	Suprem center Behoririka	Solar PV
DESIGN TECH	Imm “CATAELAN” 1er étage, Ankaditoho Tsimbazaza, BP 1478	Solar PV, solar thermal
EDM	Centre d’affaires Galaxy, Andraharo BP 12007. Antananarivo, 101	Solar PV (telecoms)
ENERGIE TECHNOLOGIE	Espace Conquete Antanimena	Wind, solar PV, solar thermal
FRESOLAR	Ivato	Solar PV
GREENCORP	Fitroafana, Talatamaty, Antananarivo 105 <i>E-mail:</i> info@gcenergies.com	Solar PV, consulting
HARENA BUSINESS	Route d’Ivato	Solar PV, wind
HENRI FRAISE & CIE	90, Lalana Ravoninahitriniarivo <i>E-mail:</i> Marcellin.andrianarivelo@hff.mg	Solar PV, diesel generators
HERi	Antananarivo <i>E-mail:</i> sylvain.beheri@gmail.com	Solar kiosks, solar lamps
JIRO-VE	BP 182 Ivato Aeroport, Antananarivo <i>E-mail:</i> info@jirove.com	Solar lamps
MADA BM	Behoririka	Solar PV
MADA LOYAL	Behoririka	Solar PV
MADA WATT	Ambohibao	Solar PV, wind
MAD’EOLE	5, rue François de Mahy/BP 639 201 Diego-Suarez <i>E-mail:</i> mad-eole@bluewin.ch	Solar PV, wind
MAJINCO	Tsaralalana	Solar PV, wind, solar thermal
METAPLASCO SARL	Ivandry Route des Hydrocarbures <i>E-mail:</i> direction@metaplasco.com	Solar PV, solar thermal
MIAHY	Behoririka	Solar PV
POWER TECHNOLOGY	Immeuble Malaky, Lot VF 7 Amparibe <i>E-mail:</i> info@pwr-t.com	Solar PV, Led lamps
SANIFER	Alarobia Route du Pape	Solar PV, solar thermal
SAS	Ankaditapaka Ankadifotsy	Solar PV
SOLARLAND	Ivandry, route des hydrocarbures.	Solar PV
SOLTECH	Mandrosoa, Ivato	Solar PV, solar thermal
SUN ENERGY	Lot VH 22 ter, Ambatoroka, Ambanidia	Solar PV
TANA TECH	VM 98 Androntra	Wind, solar PV, solar thermal
THE SUN FACTORY (EOSOL)	BATIMENT A Profilage LOT IVO 71 Bis A, Zone Zital Ankorondrano <i>Email:</i> info@eosol.mg	
TOM	Galaxy Andraharo	Solar PV (telecoms)

Source: Based on information from the Ministry of Energy and Hydrocarbons and personal interviews with companies

