INVEST IN ENERGY

MADAGASCAR,
THE BOUNDLESS ENERGY ISLAND
MADAGASCAR,

Thanks to the abundance and diversity of its resources, Madagascar is an ideal destination for investments in renewable energies.

Located in the crossroads of Africa, Asia and Middle East, the country also has privileged relationships with Europe and the United States.

Solar, wind and hydro potentials are exceptional and unrivaled with the European or Chinese resources, yet in advance on renewable energy volumes used. Rich of an abundant and young manpower, Madagascar has skills throughout the value chain, proposing conditions of optimal development.

Madagascar therefore has the necessary assets to become a reference in renewable energy projects.

Key figures (2017)

Area: 587,295 km²
4th largest island in the world

Population: 24.5 million

Official languages: Malagasy, French

Rate of growth: 4.3%

GDP per capita ppp (USD): 1,600

Coastline: 4,800 km

Source: www.cia.gov
In the face of the global Climate Change issue, renewable energies have a major role to play in the energy transition and in the reduction of greenhouse gas (GHG) emissions. Energy production accounts for 26% of global GHGs (IPCC 2007). Madagascar is particularly concerned by these climatic changes. The Big Island is positioned in 3rd position of the countries most exposed to the effects of the Climate Change.

The Malagasy electrical installed capacity is today dominated by 50% of thermal energy sources (heavy fuel oil, gas oil), whose price is fluctuating and rising and whose consequences on the environment and health are harmful. Beyond an undeniable environmental and societal emergency, renewable energies today offer significant economic and technical opportunities. They are part of the sustained development of the country, through the strengthening of energy independence, cost control and strengthening of the national economy.
A POLITICAL AND REGULATORY ENVIRONMENT GETTING MORE AND MORE MATURE

The Malagasy economy in the electricity sector has been liberalized since 1998, promoting free competition in the production sector. The New Energy Policy (NEP) of 2015, gives the framework and the objectives of deployment of renewable energies. The new Electricity Code, in development since 2017, completes a simplification of procedures and the strengthening of market liberalization, particularly on transport and distribution. The support of the international community strengthens the dynamics of the sector and helps securing investments.

A GROWING ECONOMY

With a growth rate of 4.3% in 2017, one of the highest in Africa, the economic situation in Madagascar follows a positive and promising trend. The growth rate is expected to reach 5.1% in 2018. Several sectors related to electricity (agriculture, tourism, industries, telecom, etc.) are following a similar trend.

A STRATEGIC TRADE POSITION IN THE INDIAN OCEAN

Positioned in the very heart of the Indian Ocean, Madagascar constitutes a strategic hub for exchange (equipment, materials, raw materials, products) between Asia, Africa and the Middle East. Member of regional commercial areas - COMESA, SADC, IOC and EPA - Madagascar has strong arguments for economic exchanges with its neighbors.

% SOURCE OF PRODUCTION BY 2030 (NEP)

- 15% Thermal
- 5% Wind
- 5% PV Solar
- 75% Hydroelectricity

Source: ORE
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GOOD REASONS TO INVEST IN MADAGASCAR IN RENEWABLE ENERGIES

<table>
<thead>
<tr>
<th>Source</th>
<th>Production (%)</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydroelectricity</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>PV Solar</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Thermal</td>
<td>15%</td>
<td></td>
</tr>
</tbody>
</table>

Source: ORE

RURAL AREAS WAITING FOR INNOVATIVE SOLUTIONS

Madagascar is a country large like France and Benelux whose population is divided between urban and peri-urban consumption poles and large rural areas where more than 65%* of the population is concentrated. With a density of 41.4 inhabitant/km², the Malagasy population is spread over the entire territory. The deployment of innovative and sustainable decentralized solutions is a major challenge.

THE KWH TARIFF: A REAL CHALLENGE

The massive use of fossil fuels implies a strong dependence on external raw materials whose prices are very fluctuating. In addition, the high maintenance costs of thermal installations, coupled with lower prices for renewable technologies and Climate Change issues, allow renewable energies to become competitive solutions that can challenge the current kWh costs, which vary, for industries and manufactures, from 0.08€/kWh (day) to 0.25€/kWh (day), depending on the zone on the territory.

At the same time, as part of the JIRAMA restructuring program supported by the World Bank (PAGOSE program), it is planned to standardize the tariff’s rate across the country as well as to increase the tariff so that it becomes more representative of the investments made by the national operator.

* Source: https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=MG
A DIVERSIFIED POTENTIAL WITHIN EASY REACH

HYDROELECTRIC POTENTIAL

SOLAR POTENTIAL

WIND POTENTIAL

Average annual sum, period 1994-2010

Average speed winds

< 3 m/s
4 m/s
5 m/s
6 m/s
8 m/s
9 m/s
10 m/s
11 m/s

HYDROELECTRIC POTENTIAL SITES < 60 MW

HYDROELECTRIC POTENTIAL SITES > 60 MW

1700 1900 2100 kWh/m²

A DIVERSIFIED POTENTIAL WITHIN EASY REACH
A huge hydroelectric potential offering many opportunities

The hydroelectric potential has been estimated at about 7.8 GW. Today, only 2% of this potential is exploited. More than 800 hydropower sites with high untapped potential have been identified, ranging from 10 kW to 600 MW located throughout the country. The World Bank (through the ESMAP project) is implementing technical assistance for mapping the potential for small hydropower projects (<20 MW). One study has identified 2,045 small hydropower sites and has prioritized about 30 promising sites from 1 to 20 MW.

An exemplary and evenly distributed solar resource

Almost all regions of Madagascar receive more than 2,800 hours of sunshine a year. Average annual production is about 1,600 kWh/kWp. The Malagasy potential is among the highest potentials in the world. Even the less endowed areas show solar potential which is on average 3 to 4 times higher than the potential in Western Europe.

An untapped wind potential

The Northern part (around Antsiranana) and the Southern part (around Taolagnaro) show wind speeds from 3 to 8 m/s to 20 m/s, with a potential capacity of around 2,000 MW for electricity generation. The demand for hybridization with other technologies for commercial purposes is high.

The biomass, an energy still to be exploited

More than 80% of the Malagasy population lives from the agricultural sector, a sector that produces many unexploited vegetable waste. Combined with an efficient collection system, the biomass electricity generation technology could represent a significant economic and ecological opportunity, especially for rural areas. The potential varies, depending on the site and the raw materials, from a few kWs to more than 150 MW.
VARIOUS MARKET OPPORTUNITIES

PUBLIC OFFERS

Madagascar has regulatory channels of incentives for different types of projects:

- International calls for tenders for PV solar hybridization of sites historically operated by the JIRAMA with diesel gensets (Call for Tenders for big cities, 2017; Call for Tenders for intermediate cities, 2017)
- International Rural Electrification Calls for Projects (Call for Projects 1 Hydroelectricity, 2015; Call for Projects 2 Solar/Wind/Hydroelectricity, 2017; Call for Projects 3 Solar/Hydroelectricity 2018)
- Spontaneous applications for rural electrification

PUBLIC-PRIVATE AND PRIVATE-PRIVATE PARTNERSHIPS

Malagasy institutions are multiplying public-private partnerships.

Many players in the electricity and renewable energy sector are present in Madagascar or wish to set up shop there. Many invest in the creation of high added value synergies and partnerships.

Many related sectors including tourism, agriculture or telecoms keep an eye on the electricity sector to prepare for boosting their growth.
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THEY SEIZED THE MALAGASY OPPORTUNITY AND ARE NOW HAVING THE WIND ON THEIR SAILS

- **MAJIKA**
  - Rural electrification
  - 35 kW hybrid solar
  - Since 2017

- **NANOE**
  - Pre-electrification
  - Solar nano-grid
  - Since 2017

- **FIRST ENERGY**
  - JIRAMA Hybrid PV-Diesel
  - 365 kW Solar PV hybridized with 600 kW of GenSet
  - Since 2017

- **BETC NANALA**
  - Interconnected grid
  - 2.3 MW hydro
  - By 2018

- **HERi Madagascar**
  - Pre-electrification
  - 120 solar kiosks distributed in several regions of Madagascar
  - Since 2012

- **TOZZI GREEN**
  - Interconnected grid
  - 15 MW hydro
  - Since 2008

- **SAHOFIKA PROJECT**
  - Interconnected grid
  - 300 MW hydro
  - By 2020

- **EOSOL Madagascar**
  - Rural electrification
  - 75 kW solar (100%)
  - Since 2014

- **ENERGIE TECHNOLOGIE**
  - Rural electrification
  - 15 kW hybrid solar
  - Since 2017

- **ASSOCIATION ASA**
  - Rural electrification
  - 12 kW eolian
  - Since 2008

- **TOZZI GREEN**
  - Interconnected grid
  - 15 MW hydro
  - Since 2008
The New Energy Policy (NEP, 2015): An ambitious policy

- 70% of households have access to modern energy
- 85% of energetic mix represented by renewable energies
- 70% of households use improved cookstoves
- 60% of industries and businesses adopt energy efficiency and thermal measures
- 75% Hydroelectricity
- 5% PV Solar
- 5% Wind

The Electricity Code (in process 2017-2018): On the road to renewable energies

- Introducing the renewable energies in the law
- Transparency and equal treatment
- Introducing the "green supply" license for the sale of 100% renewable energy, without prejudice to a thermal supply provision whose capacity is < 10% of the annual production in MWh
- Reviewing and simplifying thresholds for concessional documents (declaration, authorization, concession)
- Introducing the Grid Code
- Promoting the connection to the grid

The 2017 Finance Law: Supporting the Electricity Sector

- Tax reduction of -50% possible for investments made in the production and supply of renewable energy as well as in the agricultural, tourist, industrial, building and public works sectors
- Exemption from duties and taxes on various renewable energy equipment: PV panels, solar kits, 2V batteries, etc.

The National Fund for Sustainable Energies (FNED, in process 2017-2018): A suitable tool

- National fund dedicated to sustainable energies including renewable energies
- Offers guarantees, debt and subsidy
### 3 AUTHORIZATION SCHEMES

#### Declaration regime

<table>
<thead>
<tr>
<th>Source of Energy</th>
<th>Power Limit</th>
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<tbody>
<tr>
<td>Hydroelectricity</td>
<td>$P \leq 500 \text{ kW}$</td>
</tr>
<tr>
<td>Wind</td>
<td>$P \leq 250 \text{ kW}$</td>
</tr>
<tr>
<td>PV Solar</td>
<td>$P \leq 150 \text{ kW}$</td>
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</tbody>
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#### Authorization regime

<table>
<thead>
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<th>Source of Energy</th>
<th>Power Limit</th>
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<td>Thermal</td>
<td>$P \leq 500 \text{ kW}$</td>
</tr>
<tr>
<td>Hydroelectricity</td>
<td>$500 \text{ kW} &lt; P \leq 5 \text{ MW}$</td>
</tr>
<tr>
<td>Wind</td>
<td>$250 \text{ kW} &lt; P \leq 5 \text{ MW}$</td>
</tr>
<tr>
<td>Solar thermal</td>
<td>$P \leq 5 \text{ MW}$</td>
</tr>
<tr>
<td>PV solar</td>
<td>$150 \text{ kW} \leq P \leq 5 \text{ MW}$</td>
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<tr>
<td>Biomass</td>
<td>$P \leq 5 \text{ MW}$</td>
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<tr>
<td>Geothermal energy and marine energy</td>
<td>$P \leq 10 \text{ MW}$</td>
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<tr>
<td>Waste</td>
<td>$P \leq 5 \text{ MW}$</td>
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</table>

#### Concession regime

Beyond these thresholds, it is the Concession Regime that applies.
The renewable energy sector and the electricity sub-sector have four main components in their value chains:

1. **Manufacturing and Supply of Goods**
2. **Project Development**
3. **Construction and Installation**
4. **Maintenance and Operation**

In addition to existing graduating training courses, alternative education and training projects are emerging. This is the case of the Barefoot College project developed by WWF or that of the United Solar School developed by EOSOL Madagascar/GC Solar/SMA Sunbelt.
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2. PROJECT DEVELOPMENT
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<table>
<thead>
<tr>
<th>IST ANTSIRANANA</th>
<th>Degree</th>
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<th>2</th>
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<td>Grid communication and distribution</td>
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<th>IST ANTANANARIVO</th>
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<td>Automation and Energetic Engineering</td>
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<td>Industrial production and maintenance</td>
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<td>Telecommunication</td>
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<tr>
<td>Electrical Engineering</td>
<td>Master degree</td>
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<tr>
<td>Construction and civil works</td>
<td>Master degree</td>
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<tr>
<td>Automatic, Electronics, Applied Informatics</td>
<td>Master degree</td>
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<thead>
<tr>
<th>UNIVERSITÉ MAHAJANGA</th>
<th>Degree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Energy conversion</td>
<td>Master degree</td>
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</table>
MADAGASCAR : DIRECTIONS DEVELOPING AN ACTIVITY IN RENEWABLE ENERGIES

KEY CONTACTS

Ministry of Water, Energy and Hydrocarbons (MEEH):
• Ensures the conceptual design, the management, the coordination, the harmonization and the implementation of the National Development Plan (PND) and the General Policy of the Government (PGG), particularly in the energy sector (NPE 2015);
• Grants licenses and concessions for the operation, production, transport and distribution of electricity.

Regulatory Authority of Electricity (ORE):
• Determines, publishes and monitors the price of electricity;
• Ensures that the quality of service standards is respected;
• Controls and ensures a fair competition;
• Provides mediation actions;
• Ensures the compliance with the Grid Code and its implementation.

Development Agency for Rural Electrification (ADER):
• Implements the Government’s policy for rural electrification;
• Promotes the supply of electricity services in rural areas;
• Supervises and finances rural electrification projects;
• Monitors projects and supports rural development initiatives.

JIRAMA (JIro sy RAno MAлагasy) :
• State-owned water and electricity company;
• Responsible for most of the production, transport and distribution of electricity as well as water services;
• Operator of the 3 interconnected grids (Antananarivo, Fianarantsoa, Toamasina);
• It is placed under the supervision of the Ministry in charge of Water, Energy and Hydrocarbons and the Ministry in charge of Finance and Budget.

Economic Development Board Of Madagascar (EDBM):
• It supports investors and entrepreneurs in the creation of their businesses;
• Improves the business climate, promotes and facilitates investments.
**MADAGASCAR : PROCESS TO DEVELOP A RENEWABLE ENERGY PROJECT**

### Step 1
**EDBM**
- Creation of a project company/special purpose vehicle (SPV)

### Step 2
**MEEH/JIRAMA/ADER/PRIVATE CLIENT**
- Expression of interest: Call for Tenders, Call for Projects, Call for Expression of Interest, spontaneous application

### Step 3
**MEEH/JIRAMA/ADER/PRIVATE CLIENT**
- Preliminary summary project, Pre-detailed project

### Step 4
**Land services**
- Land authorizations

### Step 5
**MEEH/ADER**
- Instruction

### Step 6
**National Office for the Environment (ONE)**
- Environmental impact study (according to the texts in force)

### Step 7
**MEEH**
- Declaration/Authorization/Concession

### Step 8
**Investor/Entrepreneur**
- Civil works and construction

### Step 9
**MEEH**
- Standardization certification

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**AFTER CREATION**

**NATIONAL SOCIAL WELFARE FUND (CNAPS):**
Compulsory membership of the employers and the employees. Can be done in the one-stop shop of the EDBM www.cnaps.mg

**INTER-COMPANY HEALTH ORGANIZATION (OSTIE):**
Compulsory membership of the employers and the employees.
Average duration process

1 to 2 years
Solar projects

2 to 5 years
Wind projects

3 to 7 years
Hydro projects
The international community alongside Madagascar

Technical and financial partners such as GIZ, UNIDO, the European Union, KfW and AfDB, work with the licensing authorities and operators to operationalize the energy transition and to participate in the harmonization of the sector. In addition, the World Bank and its partners, together with the government, stakeholders and the JIRAMA, participate through the PAGOSE project to restructuring the governance of the state-owned water and electricity operator. International donors are more than ever committed to the sustained development of Madagascar.

- World Bank: $150M fund for micro and meso finance (PAYG system, mini-grid, etc.)

- French Development Agency: SunRef program under development, offering loans to local partner banks, investment bonuses and technical support (that can be free) for green investment projects (energy efficiency, renewable energy)

- International banks (EXIMBANK): guarantees, insurance and concessional incentive rates up to 7 years, and setting up buyer credit schemes

- Central Bank of Madagascar: member of international banking groups with extensive experience in renewable energy project financing

A dynamic local market

Competition bidding between banks (BOA/BNI/Groupe BPCE/Société Générale Group) and credit guarantee institutions (Solidis/ACEP) to provide, in particular, either capital support or portfolio loan guarantees.

Microcredit and crowdfunding => 80% of the local banking sector, active support to VSEs/SMEs through direct impact project financing and consulting programs.

Impact investment funds (MIARAKAP) or venture capital funds (ADENIA PARTNER/MDP): supporting green projects from their starting point to their scaling-up.

National Fund for Sustainable Energies (FNED): guarantees, debt, subsidy.
Useful links

PRESIDENCY OF THE REPUBLIC OF MADAGASCAR
www.presidence.gov.mg

MINISTRY OF WATER, ENERGY AND HYDROCARBONS
www.meeh.gov.mg

NATIONAL WATER AND ELECTRICITY COMPANY
www.jirama.mg

REGULATORY AUTHORITY OF ELECTRICITY
www.ore.mg

DEVELOPMENT AGENCY FOR RURAL ELECTRIFICATION
www.ader.mg

MINISTRY OF FOREIGN AFFAIRS
www.diplomatie.gov.mg

CENTRAL BANK OF MADAGASCAR
www.banque-centrale.mg

GENERAL DIRECTORATE OF CUSTOMS
www.douanes.mg

NATIONAL ENVIRONMENT OFFICE
www.pnae.mg
The Economic Development Board of Madagascar (EDBM) is the partner of reference for investors in Madagascar. As an investment promotion agency, the EDBM has set itself the following objectives: to strengthen the competitiveness of the Malagasy private sector, increase foreign direct investment, develop incentives linked to private investment in Madagascar, accompany investors in their implementation by providing them with dedicated services through a one-stop shop for business creation and specialized advisors.

EDBM’S SERVICES
- **Provision of economic and sector information**
- **Liaison with central and local authorities**
- **Identification and connection with local potential private partners**
- **One-Stop Shop: facilitation of establishment and support for your activities**

**10 YEARS**
Decree 2007, renewed in 2014

**ONE-STOP SHOP:**
Representation from 10 ministerial departments involved in company creation

**CLEAR MISSION:**
Business climate, promotion, facilitation

**MULTI-SECTOR:**
Board members from the public and private sectors. Personalized support for companies

**NATIONWIDE:**
8 regional offices across Madagascar

**DIRECTLY ATTACHED TO THE PRESIDENCY OF THE REPUBLIC**

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"Improving the business climate in Madagascar, promoting local and foreign investment, facilitating the implementation of investment projects"