



INNOVATIVE SOLUTIONS FOR OFF-GRID ACCESS TO ENERGY

Projects led by
French companies
or NGOs for off-grid
communities



MISSION INNOVATION
Accelerating the Clean Energy Revolution



« Innovative Solutions for Off-Grid Access to Energy » Call for Proposals launched by France

Main results January 2018

MISSION INNOVATION
Accelerating the Clean Energy Revolution

Mission Innovation, launched at COP 21, gathers 23 countries aiming at reinforcing public R&D investments for the development of innovative clean energy technologies. Among the 7 Innovation Challenges identified by Mission Innovation, the Challenge on “Off-grid Access to Electricity” is co-led by France and India.

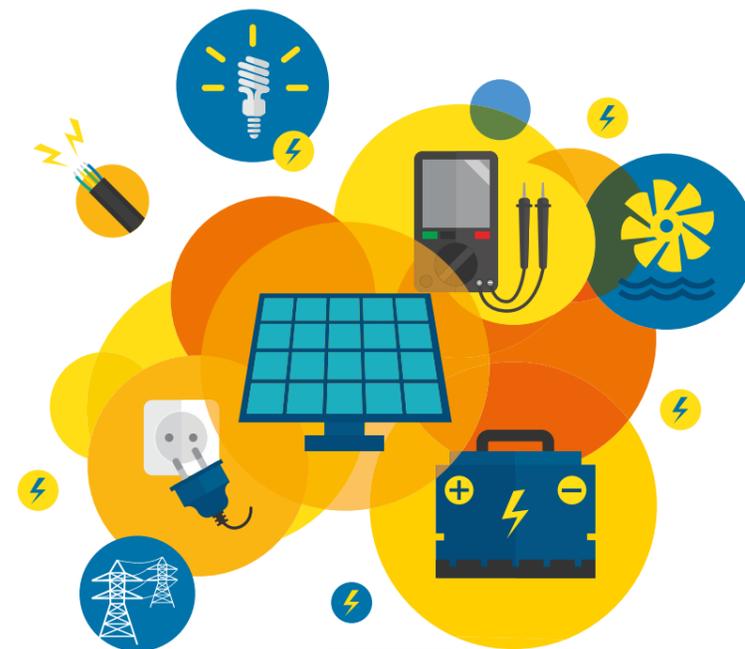
In July 2017, France organized an international workshop on this Innovation Challenge IC#2 “Off-grid Access to Electricity” in Paris with the International Energy Agency. This workshop gathered more than 100 stakeholders involved in off-grid access to electricity (large and small enterprises, NGOs, governments, funding institutions) in order to exchange on innovations needed to address this Challenge.

The main conclusions of the workshop highlighted the need to direct innovation efforts towards technology improvements in electricity production systems (including storage and system management) and in the use of efficient equipment for electricity consumption, but also on new business models, maintenance and empowerment of local professionals.

The French Ministry for an Ecological and Solidary Transition asked ADEME (the French Environment and Energy Management Agency) to launch a call for proposals (CFP) on innovative solutions for off-grid access to energy. The CFP was launched on July 12th 2017 and closed on November 20th. More than 90 projects have been received. On January 11th and 12th 2018 a selection was made by a jury that included French Ministries (energy, research and economy), the French Development Agency (AFD), the International Energy Agency and ADEME. The jury selected 9 projects for funding, with a global budget of 5.8 million Euros and ADEME's aid of 1.8 million Euros.

The selected projects develop several innovative technologies (hybrid electricity production, solar PV, river stream generator), innovative uses of electricity enhancing local economic development (irrigation, agriculture, desalination, mobility...) and electricity payment models (pay as you go, leasing...). The projects also explore new business models and institutional innovations through governance models that are adapted to the local needs and realities.

This document presents the 9 selected projects.



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EMPER PROJECT

Independent energy producers

Project

Benoo allows African entrepreneurs to become independent energy producers.

This is possible thanks to two solutions:

- The energy agency, which is a solar kiosk equipped with a storage system that allows the entrepreneur to sell the services induced by the production of energy: telephone charging / freezing / lighting / multimedia. These are priority services for the villages. The entrepreneur can rent the agency or buy it under financial lease.
- A mobile application that allows the entrepreneur to carry out predictive surveys on village needs, manage mobile payments, record his turnover and monitor his installation. Benoo uses Artificial intelligence (AI) to analyze a diverse set of data on rural electrification and to predict how to deploy the next rural electrification solutions.

Partner



Project localisation

Togo (SSA Region): Haho prefecture, Plateaux Region
75% of the households without access to energy

Project leader's contact

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SISAM

An enhanced solar irrigation solution for market gardening

Project

Improved access to irrigation water for small market-garden holdings (<1ha)

- Poverty reduction and reinforced food availability
- Benefits mainly women and children

Solution constructed by and for local actors (rural associations, private companies, institutions...)

- Innovative technology
- Local production: pump assembly with local components
- Performance: new technologies adapted to soil depth and to small surface areas for irrigation
- Usage: solar powered motors with the possibility of manual use
- Lifespan: over 20 years

Better access to finance

- Costs: decrease of acquisition and running costs
- Micro-financing: improved credit conditions
- Management: support before and after equipment acquisition
- Delays: the reality of agricultural constraints taken into account

Maintenance

- Training of distributors and end-users
- Maintenance kit available
- Easy availability of spare parts

Environment

- Evaluation of water resources
- Good irrigation practices encouraged
- 100% renewable energy (solar)
- Possibility of recycling wearing parts

1000 direct beneficiaries (more than 100 family farms; private-sector capacity building). A sustainable irrigation solution made available to 70 000 farmers.

Partners



Project localisation

Burkina Faso: Center-East Region; Togo: Savannah Region; Benin: Atacora Region

Project leader's contact

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BTI

Industrial Typha Bio-charcoal

Project

Implementation of a pilot industrial production line: sustainable biomass energy using typha

The Senegal River borders the South of Mauritania, a safe Sahelian country whose deserts have inspired travelers for generations. This river is the nation's main source of potable water and irrigation. Yet, an invasive reed, the typha, has spread into this precious lifeline between Sahel and Sahara: typha clogs over 40 000 hectares, causing the abandonment of farmland, rural exodus and an increase in waterborne diseases.

On the other hand, the most vulnerable urban dwellers depend on charcoal for cooking, which represents a high and unavoidable cost for their food security: it generates energy poverty and accelerates the deforestation of an already extremely arid natural environment.

Since 2011, Gret and ISET have developed and tested technologies to transform typha into charcoal. This renewable fuel has been tested in market conditions and revealed itself perfectly fit to replace wood charcoal to a large extent. Additionally, its usage is healthier and cheaper.

From 2011 to 2016, a pilot semi-industrial production line has been developed, tested and calibrated at ISET. All the technical and maintenance issues are handled locally: this solution is ready to be transferred to the private sector.

The BTI project will transfer the production technology from ISET to a Mauritanian private company and create the enabling environment for its commercial success.

In particular, the project will:

- secure access rights to typha at scale, with due respect to the water environment and its traditional users;
- set up a stable and reliable raw material supply for the sustainable fuel company;
- install a production capacity of 1000T of green charcoal per year;
- promote the product to consumers and distribution partners;
- foster a supportive regulatory environment to speed up its development.

Partner

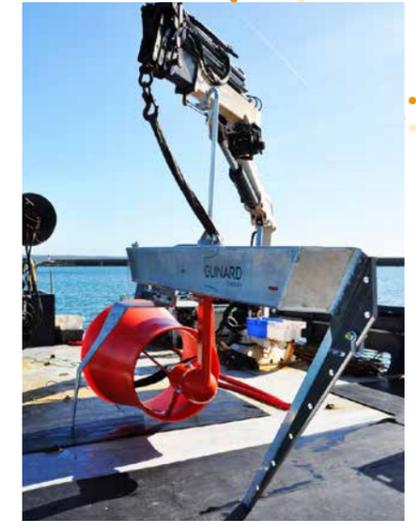


Project localisation

Mauritania

Project leader's contact

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AMBATOLOANA

Hydrokinetic river turbine

Project

Madagascar energy access through a hybrid system including a hydrokinetic river turbine

Step 1 : demonstration project of a hybrid electricity generation system including the hydrokinetic turbine P66.

The hydrokinetic device produces 24h/24. Combined with panels and batteries, the system provides stable and continuous electricity access.

Step 2 : Assessment of the hydrokinetic energy potential of remote locations in the North-east of Madagascar and realization of a business analysis.

River current measurements :

- Site location with GIS tools
- Measurement during dry and wet seasons
- Yearly electricity production assessment

Business :

- Business model
- Financial analysis
- Economic field evaluation

The project will thus :

- Promote Guinard Energies hydrokinetic turbine potential
- Reduce GHG emissions and protect the environment
- Provide energy access through hydrokinetic turbines in off-grid areas of the North-East of Madagascar

Partners

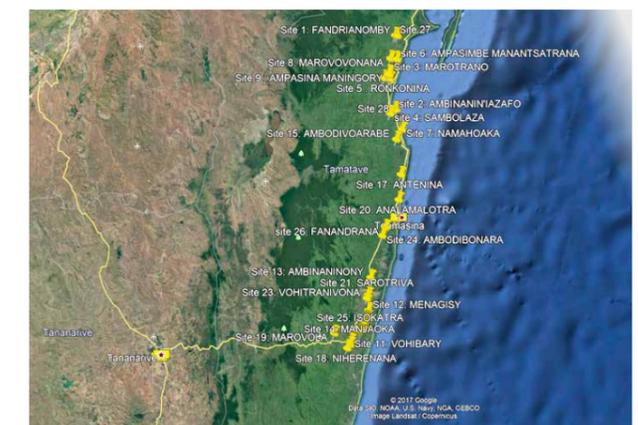


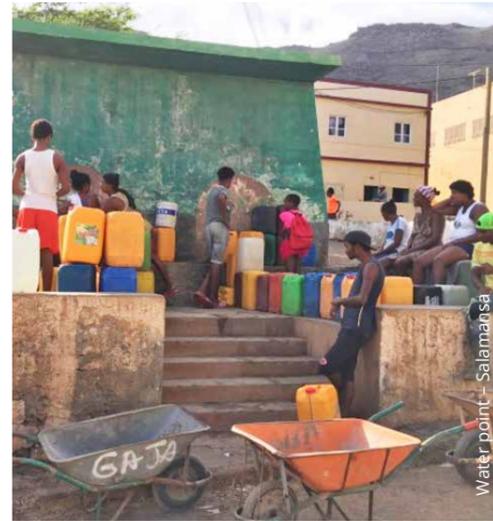
Project localisation

North-east of Madagascar, Analamanga Region
Amboarakely : 100 households, 600 people

Project leader's contact

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DESOLSA

Mascara Renewable Water

Project

Construction of a 20m³ /day sea water solar desalination plant in Salamansa: OSMOSUN@20

- Designed for autonomous operation in isolated sites with few technical and logistical infrastructures : low maintenance needs
- 100% powered by a 22 kwp solar generator and no battery: no fuel consumption
- Drinking water production cost: 1,5€ / m³

The involvement of local partners will guarantee the success and durability of the water supply in Salamansa. OSMOSUN@20 projects-like will be replicated in the several isolated islands of Cape Verde and the Pacific, as well as in the Caribbean Region.

Partners

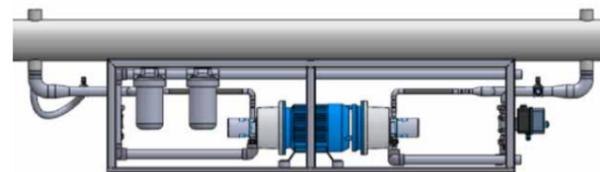
ELSEG
CAMARA SALAMANSA

Project localisation

SALAMANSA Village, Sao Vicente Island, CAPE VERDE

Severe water stress: only 6 liters of unsanitary water available per person per day, at the prohibitive price of 6€/m³.

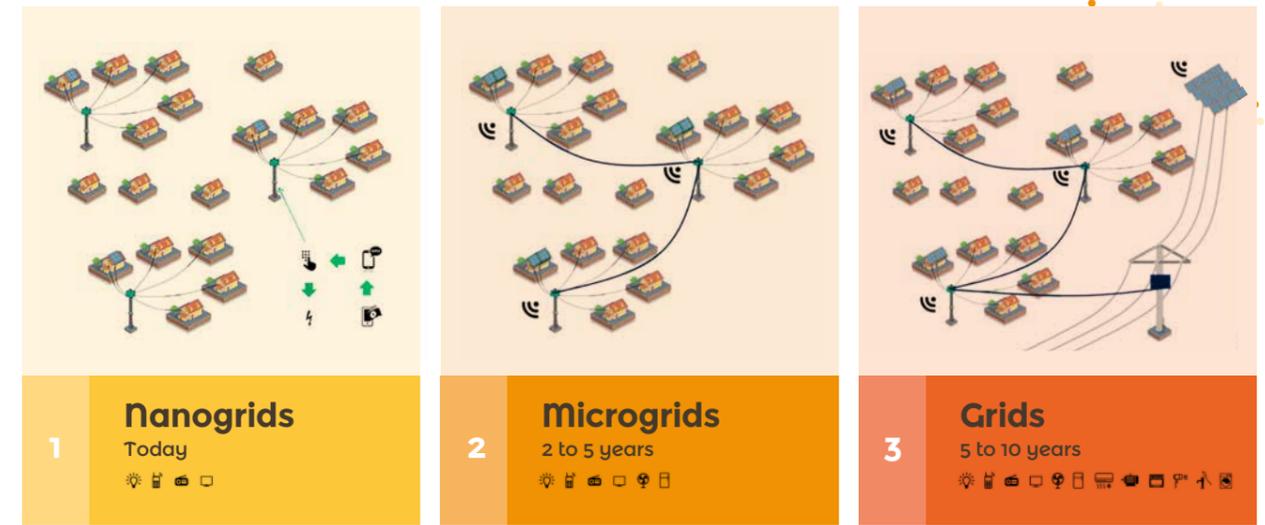
This has a negative impact on the population's health and prevents the island's touristic and economic development.



OSMOSUN@20

Project leader's contact

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Lateral Electrification

Towards a new power infrastructure development path for Africa

The project aims to implement in the North of Madagascar an innovative electrification model for rural Africa, based on the collaborative building of smart power grids from the bottom up.

Project

What ?

Lateral electrification is a process of diffusion and progressive interconnection of basic smart units of power production, storage and distribution called "Nanogrids", owned and operated by local entrepreneurs.

Why ?

To answer off-grid households' basic energy needs more rapidly, flexibly and affordably than individual solar systems, while participating in the progressive building of 21st century infrastructures in Africa (decentralized, decarbonized and smart).

How ?

Thanks to innovative technological (apps, mobile payment solutions, Smart energy management systems) and organizational (franchising, access to finance, ad hoc PPP) solutions developed by the Project's partners.

Partners



Project localisation

The Project aims to connect over 5 000 households in the Diana region (Madagascar) and train over 100 local entrepreneurs by June 2019.

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Pay as you go and microfinance in Benin

Project

PAMIGA (Participatory Microfinance Group for Africa), a French NGO providing technical assistance to microfinance institutions in sub-Saharan Africa, will lead the project.

The project will develop innovative partnerships between ARESS, MyJouleBox and local microfinance institutions allowing each partner to focus on its field of expertise: access to renewable energy for ARESS, research and development for MyJouleBox and financing for microfinance institutions. The financing of the solar solutions will be provided by microfinance institutions instead of the pay-as-you-go distributors, reducing their financial burden and the responsibility of credit management. ARESS will ensure marketing, distribution, installation and after-sales services of PAYGO solar solutions, through the development of a rural network of Energy Entrepreneurs that will tackle the "last mile" issue.

The PAYGO meter developed by MyJouleBox is backed by a digital platform for monitoring customers, payments and consumption in real time. It offers a technical flexibility allowing a gradual increase of the system capabilities and financial flexibility: pay-per-view via mobile phone services and microfinance networks, while securing the loan through remote deactivation of the system.

Partners

ARESS is a Beninese distributor of pay-as-you-go solar solutions specialized in renewable energy.

MyJouleBox is a French start-up that is developing an innovative pay-as-you-go meter for developing countries.

Project localisation

The project will be implemented in Benin, where the national electrification rate is 29% and drops down to 5.5% in rural areas. More than 7 million people do not have access to the grid.

Many marketing studies highlight the following facts:

- the use of polluting energy sources is high and rural households are not satisfied with their current access to energy,
- the lack of proper access to energy hinders the development of productive activities and the education of young people.

Project leader's contact

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Pivert

Rural Enterprise Clusters for Green Innovation, Energy and Processing

Project

The project aims to demonstrate an innovative solution for energy access in off-grid rural areas in Africa.

This solution called PIVERT is a rural cluster of enterprises with access to energy and farming services. The project will implement 10 pilots in Benin to optimise the model and prepare the upscaling process.

PIVERT's features address the key challenges for energy access in remote rural areas in Africa:

- **Entrepreneurship:** energy and farming services are provided by enterprises to guarantee their quality and sustainability to the beneficiaries (other enterprises or households of the village).
- **Economic viability:** a PIVERT systematically implies agroprocessing activities relying on energy services that will create an added value in the village. It secures margins for the energy services providers and boosts the revenues and solvability of its clients.
- **Sustainable cooperation:** the infrastructure and main equipment of a PIVERT are managed by one entrepreneur according to the rules and commitments established with all its users. The users of a PIVERT are enterprises or individuals whose activities are interdependent, which reinforces their tendency to cooperate.
- **Services upgrade:** a PIVERT gets technical assistance from SENS Bénin to adapt and gradually develop its services offer to its village, while ensuring its viability at any stage. The most developed stage of a PIVERT is the mini-grid one.

Partners

Solidarités Entreprises Nord-Sud (SENS), a group of two social businesses (SENS France and SENS Bénin) as leader and local operator of the project.

Local authorities (at the municipality and the department level) and Investi'SENS Bénin, a group of local impact investors, will also contribute to the project.

Project localisation

Rural off-grid areas of Benin in the departments of Borgou, Collines and Zou.

Project leader's contact

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NOTES

ZEMBO

Leasing of electric motorcycles to taxi drivers

Project

Millions of motorcycle taxi drivers are present in sub-Saharan Africa. This is a revenue generating activity for young people and their families and an affordable transport solution for low-income people, which is adapted to African roads and is often the only available solution. Yet, there is a problem: the drivers rent their vehicle, putting a strain on their revenues. Moreover, this activity is very polluting.

In this context, the project focuses on 2 complementary activities:

- the leasing of electric motorcycles to taxi drivers
- the battery charging through a network of solar stations

The advantages of the project's electric solution are the following:

- improvement of the drivers' revenues (who become owners of their vehicle after 2 years)
- environmentally clean solution (lowering CO₂ and particles emissions, reducing noise)
- better service, including security training and equipment for drivers and passengers.

After the pilot phase in 2018, the objective is to go over 200 vehicles in 2019 and 2000 in 2020.

Partners

- ZEMBO France (R&D and financing)
- ZEMBO Uganda (operations)

Project localisation

Uganda

Project leader's contact

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INNOVATIVE SOLUTIONS FOR OFF-GRID ACCESS TO ENERGY

At the beginning of 2018, the Call for Proposals « Innovative solutions for off-grid access to energy » has led to the selection of 9 projects from companies and NGOs working on this topic. These projects, which are presented in this document, develop technological, organizational and business models innovations that are likely to ensure a decrease of the solutions' costs and a stronger involvement and appropriation by the concerned populations.

Nowadays, direct off-grid access to energy can guarantee economic development through the implementation of reliable and lasting solutions, going beyond the lighting needs of households: irrigation for agriculture, energy services at the village level, water desalination... Micro-grids and nano-grids projects prove to be solutions that in some situations are more competitive and accessible than the extension of national grids.



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