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# São Tomé e Príncipe



## Solar PV Power Plant for the Island of Principe

**Executive summary and situation report**



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# São Tomé e Príncipe



## AGENDA

- Project History
- Project Starting Point
- Project Implementation Model
- Project Goals
- Project Structure
- Conclusion

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## Project History (1/2)

- 2015**
- The Prime-Minister of STP, Dr. Patrice Trovoada, simultaneously request to the EDP CEO consultancy support to define a national strategy for the energy sector.
  - HBD the principal private investor in the Island, requests to EDP a plan for a sustainable Electrification of the island.
  - A proposal is presented to the Regional Government of Principe for the upgrade and extension of the electrical grid.
  - A Protocol is signed with EMAE for a Partnership on generation, distribution and commercial management of electricity.
- 2016**
- The Regional Government appoints EDP as the “Project Developer” for a RE solution.
  - Multiple contacts with potential local investors and DFI’s, are established.
  - Technical assistance from RECP Finance Catalyst Assistance,(Africa-EU Renewable Energy Cooperation Programme) is given to the project.
  - UNDP subsidizes the study of renewable Resources potential in the Island: Hydro, Wind, Solar.

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## Project History (2/2)

- 2017**
  - Meteorological stations are installed by EDP, and UNDP studies are executed.
  - Government of STP reconfirm the interest to implement the project with EDP as the Promoter
- 2018/  
2019**
  - All studies are concluded, and EDP Renováveis, together with local private investors, present an investment proposal to the Government of STP for the design, construction, operation and management of a Solar PV Power Plant in Principe.

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## Project Starting Point (1/2)

The project is a key development initiative for the sustainable future of the island

The government and private investors in the island of Principe desire that the island implements a solid sustainable growth strategy:

- Develop better living conditions for the human inhabitants, income opportunities and employment;
- Maintain and protect the unique natural habitat of the island (a biosphere reserve);
- Develop responsible eco tourism as a mean to reach those goals.

However the current electric system in the island is blocking those objectives:

- It relies entirely on diesel fuel imports;
- Only covers part of the island, not reaching all the population, and the locations where ecotourism resorts are planned;
- It has low reliability, working around 20 hours per day and highly vulnerable to problems in the maritime transport of fuel;
- It is economically unsustainable with inadequate electricity tariff structure and significant technical and commercial losses.



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## Project Starting Point (2/2)

The characterization of the Island of Principe power system (in 2015) | A vulnerable system with a lot to gain from the introduction of new energy technologies

**Generation:** Supply exclusively from the city's 3,6MVA Diesel power plant. Relatively good operational conditions. Old Papagaio power plant is at total loss. The solar resource was measured and found to be sufficient for generation;

**Distribution:** Old grid in the city with many operational issues. Several important grid connections with bare cables, with frequent power cuts because of vegetation proximity due to improper maintenance. More recent rural connections outside of the city with good solutions and in good condition. Most resorts are to be connected (in the meantime some have already been) Some small villages and dwellings still without electricity;

**Supply:** fragile customer connections. No protective earth or differential device in most customer installations. 40% customers still without a meter, and the meters installed required local reading;

**Consumption:** 11 MWh/day, 4 GWh/year for the partial supply to the customers. Relatively high consumption per capita in the city area, due to the lack of incentives for the rational consumption of energy. With all the resorts connected, the total consumption can double to 8GWh/year.

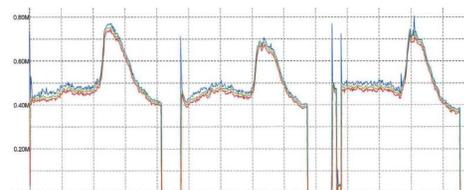
**Operational Expenditures:** 1 M€/year in fuel only which can more than double to 2,4M€/year with the resorts. Local EMAE team of 20 staff. Remaining costs with replacement components, equipment, vehicles, training, etc., not quantified.



Modern city power plant



Old parts of the grid with problems and more recent connections with good conditions



Measured load diagram with high baseload and nighttime peak

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## Project implementation model

### Project scope

- This project is a typical mini-grid Island project with medium scale: 1MVA, 2000 customers, 7000 inhabitants, 10 GWh/year;
- Even though the mini-grid is existing, it requires many improvements and significant renewable generation to be sustainable;
- The project is also to serve as a future model for the rest of the country, an Island mini-grid as well, at the larger scale: 30-40MW, 34.000 customers, 190.000 inhabitants, 100 GWh/year.

### Project size

- An independent Power Producer will be established in Príncipe, to build and operate a solar PV Power Plant – 4,75 MWp with 3,5 MWh storage, delivering all its production to the grid. Total CAPEX estimated at 4.895M€ and OPEX of 225 K€/year, including costs with personnel, management, technical services and sub-contractors;
- The size of the solar plant, results from the simulation of the electrical system to identify the mix of generation that minimizes the LCOE- levelized cost of energy. The solar power plant will at least secure 48% of the island consumption;
- It is also planned for a second phase to add to the system, the energy to be produced by the Papagaio Hydro-Plant, in order to reach 100% clean energy for Príncipe.



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## The Project Goals

To deploy the most efficient and economic practices /technologies in the power sector, with a substantial reduction of diesel fuel consumption

4.75 MWp Photovoltaic plant next to airport



- Distribution Grid extension and upgrade
- Remodeling and reinforcement of the existing MV Grid;
- MV grid extension to supply the new resorts;
- MV and LV Grid extension to connect villages still to be electrified;
- Establish the required conditions to improve Quality of Service and Security of supply;



Reform of Supply

- Installation of meters with remote communications and prepayment;
- Adjust tariffs that incentivize the efficient energy consumption;
- Digitalize the entire commercial process;
- Introduce mobile payments as a key payment method;



Energy Efficiency

- End customers energy audits about the efficiency of their consumption and how to save;
- Efficient light bulbs swap campaigns;
- Introduction of electric vehicles;
- Test self consumption PV systems;



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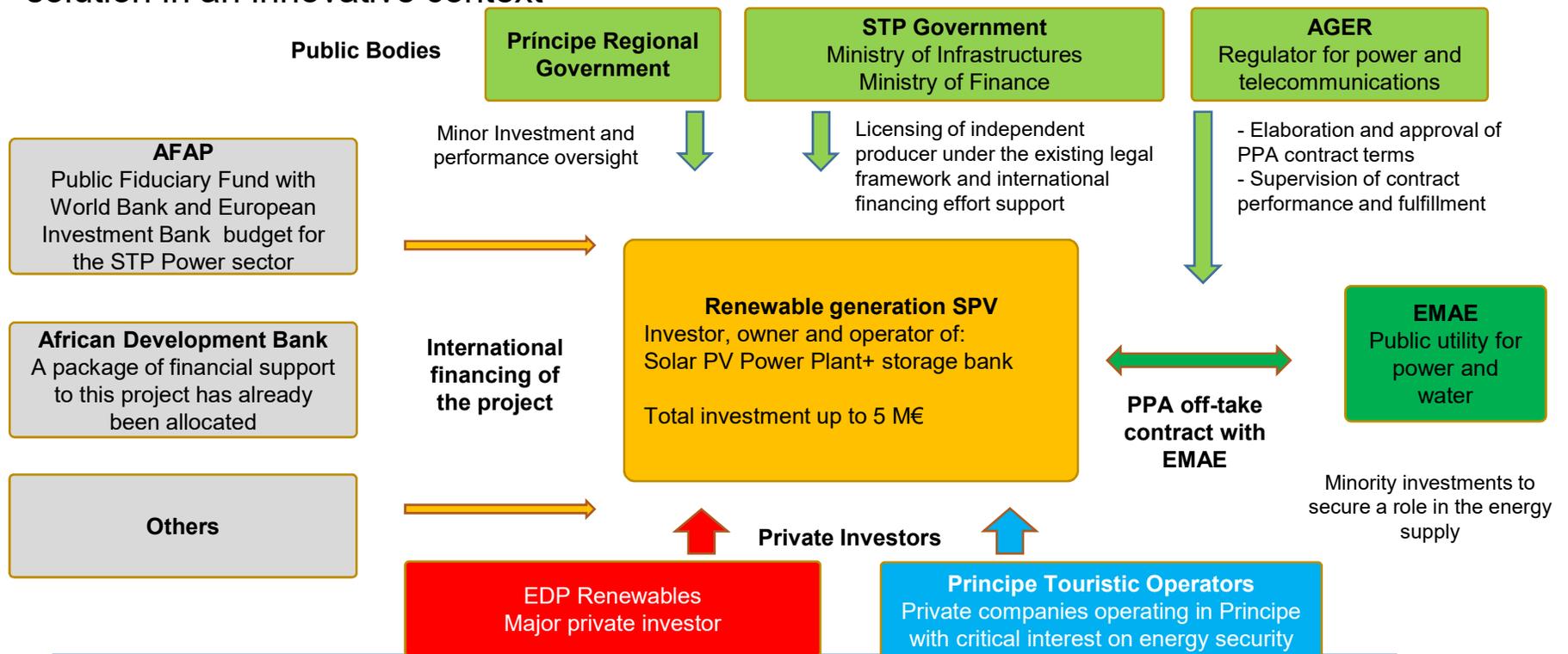
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## Project Structure (1/2)

Renewable generation SPV for Solar+Storage PPA | A proven model for a standard solution in an innovative context



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## Project Structure (2/2)

### Renewable generation SPV for Solar+Storage PPA

An SPV will be constituted in São Tomé, as soon as the “Regulatory Framework” is approved and based on the following documents: Implementation Agreement (engaging public and private stakeholders; PPA - Power Purchase Agreement (with EMAE as the off-taker); Shareholders Agreement (between public and private partners/investors).

This model for implementing the renewable component of the project has a number of advantages and some disadvantages:

#### Advantages

- Uses a commonly used PPA with a feed-in tariff arrangement, enabling the construction and long-term operation of renewable assets, at a cost of energy below the current diesel based one of 250 €/MWh;
- It brings in private capital investment to the country energy sector;
- It enables many sources of international financing that require private management in the implementation vehicles;
- It enables knowledge transfer and training of local staff;
- It is a very replicable model for the main island.

#### Disadvantages

- The revenues of the SPV could rely on payments from EMAE, a company under dramatic financial problems, so a securitization mechanism needs to be in place.

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## Conclusion

The project will have an important impact on the Island and its lessons learned can be replicated across the country

- A great public interest infrastructure will be established without major needs of public funding;
- Tariffs should be adjusted but the service that will be provided is greatly superior;
- A 24h/7 day service will be provided with high quality of service



- A substantial reduction of environmental and noise pollution in the city;
- Know-How transfer to local human resources through training and capacitation for long term management of the system;
- Removal of the constrains of intermittent electricity supply tying up the local economy;
- Promotion of the destination as an international showcase of sustainable tourism with a complete and sustainable energy solution.

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## Thank you!

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