



POWER  
AFRICA



# SOLAR ELECTRIFICATION (SÃO TOMÉ AND PRÍNCIPE)



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# MAECI & Africa Energy Future



MAECI is a United States company that has over 100 years of collective experience in Africa. MAECI has formed very successful project partnerships, both as lead firm and as sub-consultant, with government ministries and departments, universities and colleges, non-governmental organizations and private sector companies more specifically in developing and emerging countries and completed projects totaling more than \$2 billion



# SãoTomé and Príncipe - Meetings with EMAE



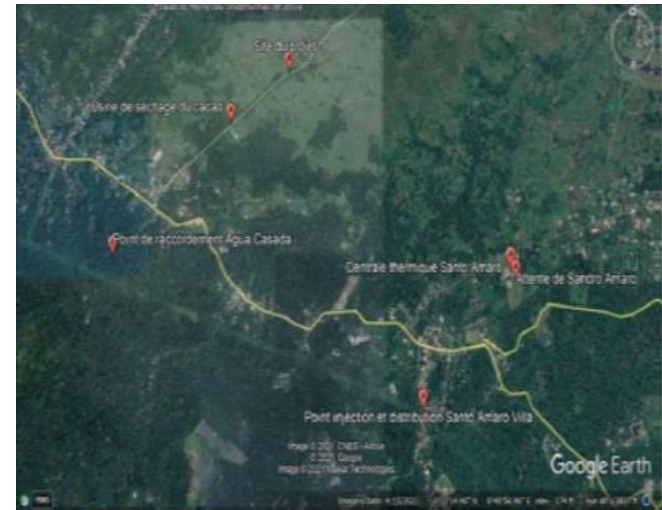
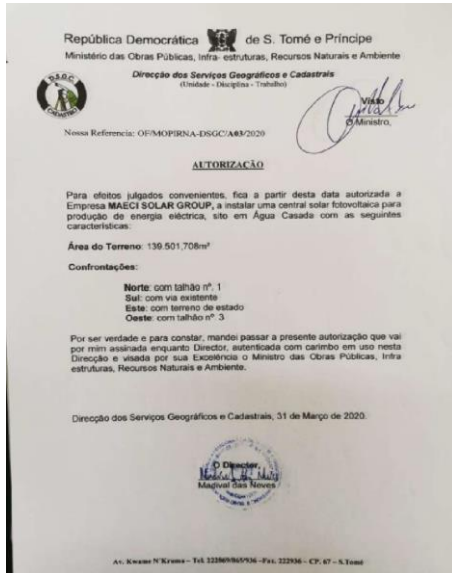
❖ Began in 2015 - Representative visits Philadelphia's (USA) Grid-Star Facility





# Project Location – Agua Casada

- ❖ The land has 139501.708 square meter, and it is close to (2KM) EMAE power station of Santo Amaro.



# Proposed Solutions for São Tomé and Príncipe

## Storage & PV – 5MW initial installation with capacity to increase to 10MW

- ❖ Production of 5MW total Energy (pilot project) only based on Solar Panels in combination with Storage to ensure 24 Hours use
- ❖ Tariff Analysis: 70%-80% reduction in cost (approximately 5-7¢/kWh for solar - only 14-15¢/kWh vs. 50-80¢/kWh for Diesel) or even more for future considering the ongoing conflict between Russia and Ukraine which is untenable for many developing countries such as Sao Tome & Principe

## Hybrid Plant

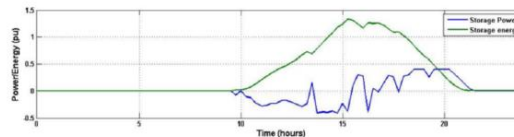
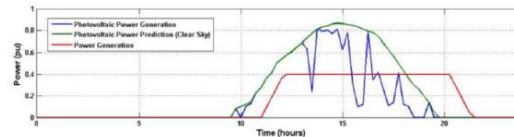
- ❖ Production of total Energy needs with a combination of 70% Renewable Energy with storage and diesel generators to supply the 30%.

# Why Energy Storage System for Solar?

- ❖ **Efficient Integration of Variable Generation**
  - Integrated System Optimization for Solar + Battery Storage
  - Ramp control according to grid code
  - Energy Shifting
- ❖ **Reduce Emission & Increase Renewable Penetration**
  - Curtailment Avoidance
  - T&D Infrastructure Reinforcement Avoidance
  - Spinning Reserve -> Greenhouse reduced for peaking energy
- ❖ **Power Quality Issue**
  - High Speed Frequency Regulation for Improved Response
- ❖ **System Costs**
  - Reduced thermal stress on generators for extended asset life

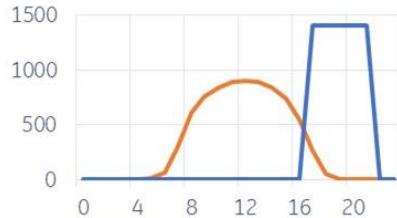


## Challenges facing Solar Integration

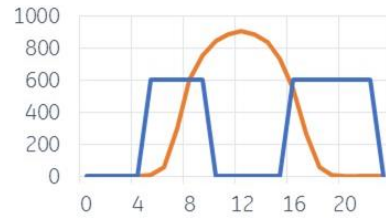


# Solar + Storage: System of Systems Approach

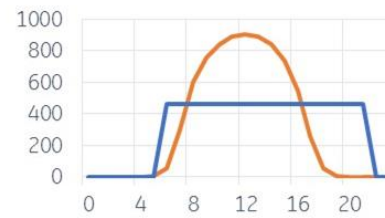
**A1) Full PM Shift**



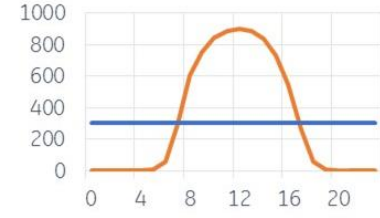
**A2) Full AM & PM Shift**



**B) Partial PM Shift**

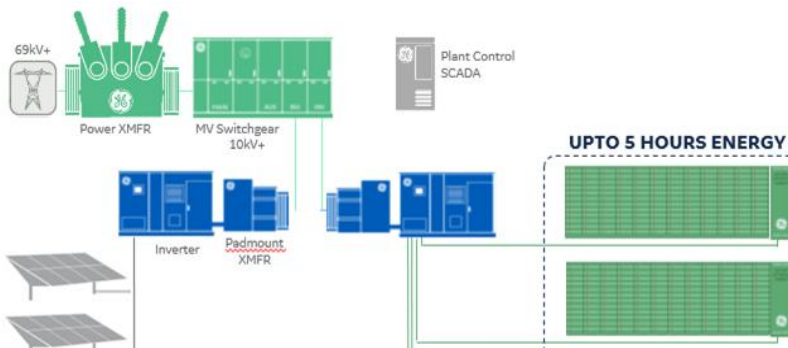


**C) Continuous Shift**



— Hybrid Output (MW) — Solar Production (MW)

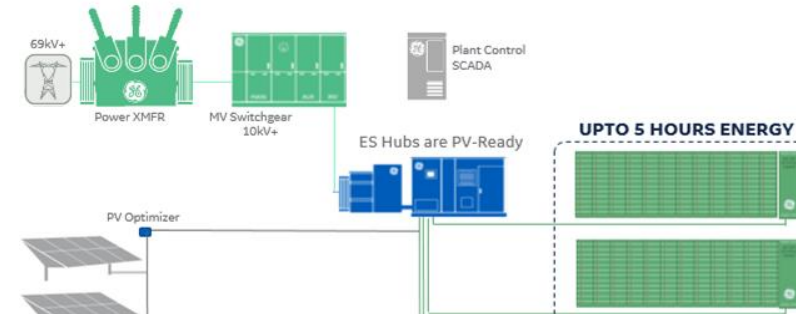
**A) AC Coupled - PV and ES "Separate" Systems**



**B) DC Coupled - PV and ES "Hybrid" System**

ES CAPEX: **-15%**  
Total CAPEX: **-20%**

- ✓ Optimized Power Electronics
- ✓ Silicon Carbide technology





# Project Timeline

- ❖ Installation complete 12-months after close of financing





# Additional Projects for São Tomé and Príncipe

## Príncipe – 5MW Solar PV & Storage

- ❖ Production of total Energy need for the island – 24/7 - only based on Solar Panels in combination with Storage to ensure 24 Hours use for homes and Hotels/Resorts

## Voice of America

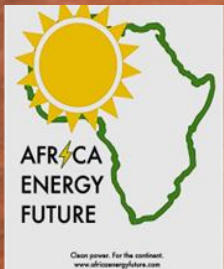
- ❖ Current power resource – (5) – 950 KW CAT 3516 Generators – Diesel
- ❖ Solar Farm Solution: 2 MW peak Solar PV Plant – 7 – 10 acres of space needed
- ❖ Battery storage of 6 – 7 MW required



# Demand Side Management

- ❖ LED Solar Street Lighting





**Thank you.**



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