



Utility-scale Solar PV and Battery Energy storage System (BESS) for Zanzibar Archipelago Renewable Energy Solution

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Zanzibar Archipelago-Background



1. PART OF United Republic of Tanzania
2. POP: 1.5M
3. ECONOMY: Agri. (spices, cloves, etc) + TOURISM

4. Two main Islands – Unguja and Pemba

5. RELIES POWER FROM MAINLAND TZ
 - PEMBA 20MW CAPACITY CABLE
 - UNGUJA 100MW

5. POWER DEMAND

PEMBA 9.5 MW peak 2019

UNGUJA 87 MW peak 2019

ELECTRICITY SUBSECTOR PROFILE

ELECTRICITY SUPPLY

1908 - COAL FIRED THERMAL GENERATION

1954 - DIESEL(IDO) THERMAL GENERATION

1980 - 45 MW CABLE CONNECTION TO

MAINLAND UNGUJA

2010 - 20MW CABLE CONNECTION TO

MAINLAND PEMBA

2013 - 100MW CABLE CONNECTION UNGUJA

PEAK DEMAND in 2019 : UNGUJA 87MW, PEMBA = 9.5 MW

Demand Growth rate 7 to 8 %

Annual Power Consumption per capita 340kWh/person (2019)

GRID INFRASTRUCTURE

TRANSMISSION/DISTR = 132kV (submarine), 33kv, 11kV

New 132kV transmission backbone on Unguja (design stage)

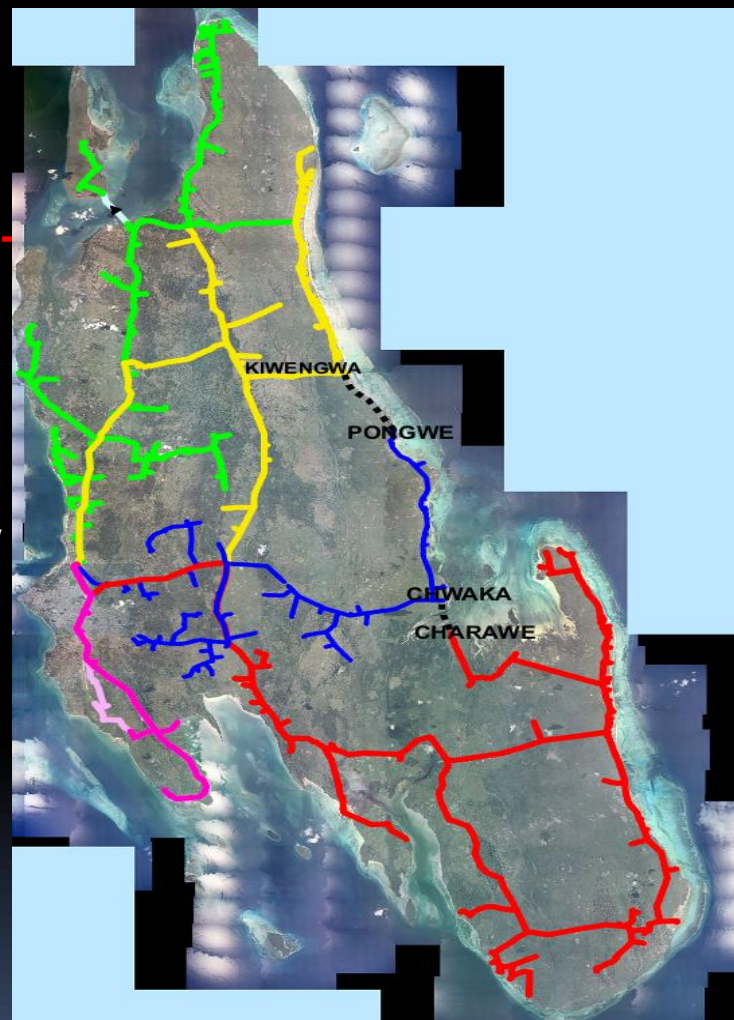
Power Total Loss = 21% 2010

Targeted = 19% 2020

GRID COVERAGE

CONNECTIVITY = 50% of pop.

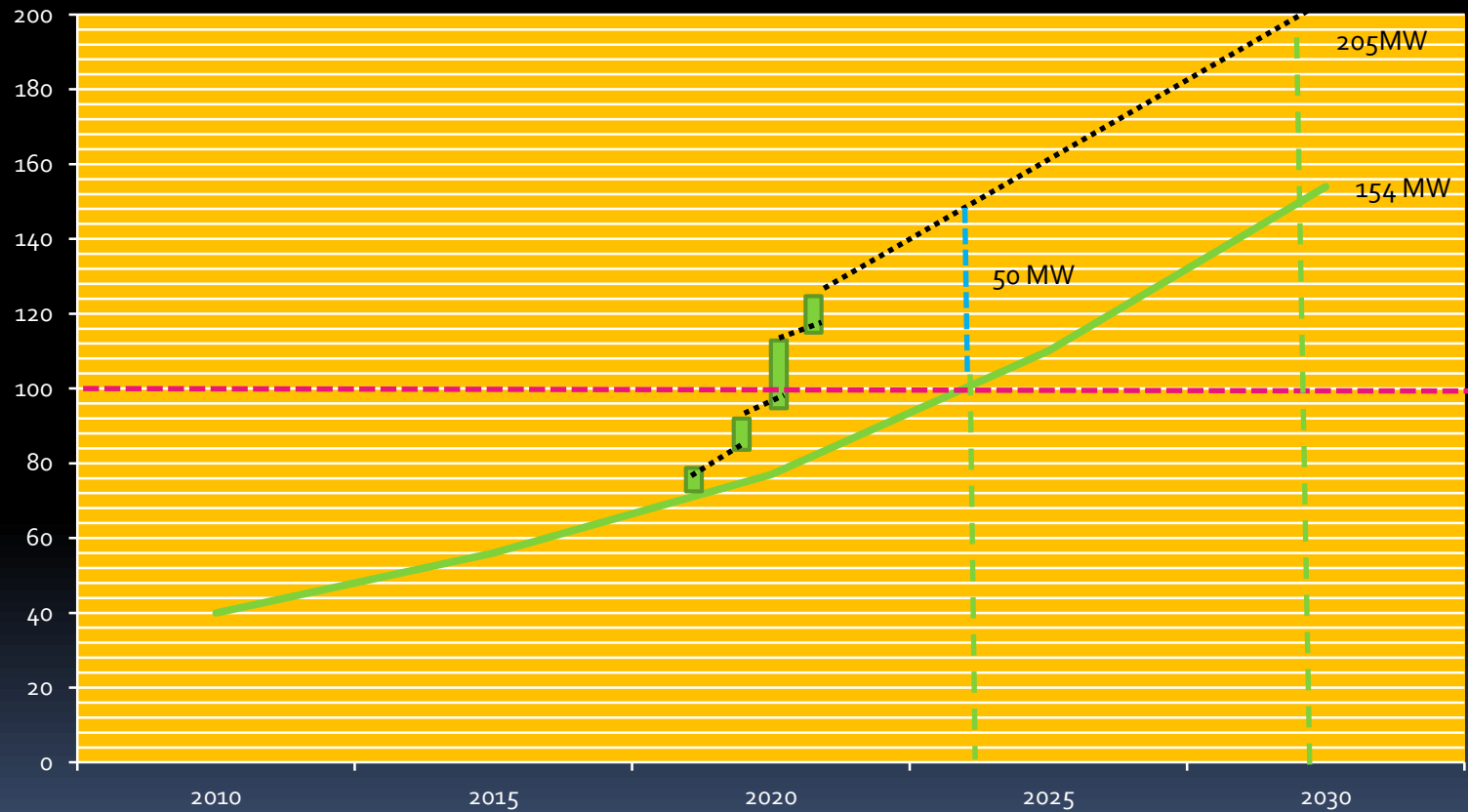
ACCESS = 80% country wide



Major development projects

- Sea port 2020 2 MW
- Airport T3 2020 4
- Fumba town 2021 12,5
- Pan Royal 2023 18
- Kwahani Investement phase 1 2020 1,5
- Kwahani Investement phase 2,3 and 4
2023 4,5
- ZSSF Mbweni 2020 1.5

PROJECTED POWER DEMAND UNGUJA ISLAND (MW)



ZANZIBAR ENERGY SECTOR MANAGEMENT

POLICIES:

I. ZANZIBAR ENERGY POLICY 2009 (UNDER REVIEW NOW)

- VISION:
- Energy to contribute to sustainable development of a prosperous society with independent, reliable and affordable to all
- MISSION:
- Guide stakeholders to achieve the vision by creating enabling environment

SPECIFIC OBJECTIVES:

1. Increase efficiency and supply using indigenous RE.
2. Increase the reliability, affordability and independence of modern energy sources.
3. Achieve free market principles within energy market based on transparent and strong regulated principles.

II. OTHER NATIONAL SECTORAL POLICIES

POLICY IMPLEMENTATION STRATEGY

STRATEGY 1

INDIGENOUS ENERGY RESOURCES

FOSSIL FUELS
EXPLORATION SUB-
SECTOR

RENEWABLE ENERGY
DEVELOPMENT SUB-
SUB-SECTOR

ELECTRICITY GENERATION IN THE ENERGY MIX
(20% RE BY 2030 INCREMENTAL)

VISION: ENERGY SECURITY, AFFORDABILITY AND RELIABILITY

THE RENEWABLE ENERGY AND ENERGY EFFICIENCY DEVELOPMENT PROJECT

OBJECTIVE

STRENGTHENING SUSTAINABLE
ENERGY SECURITY, RELIABILITY AND
ACCESS TO ZANZIBAR USING
RENEWABLE ENERGY SOURCES

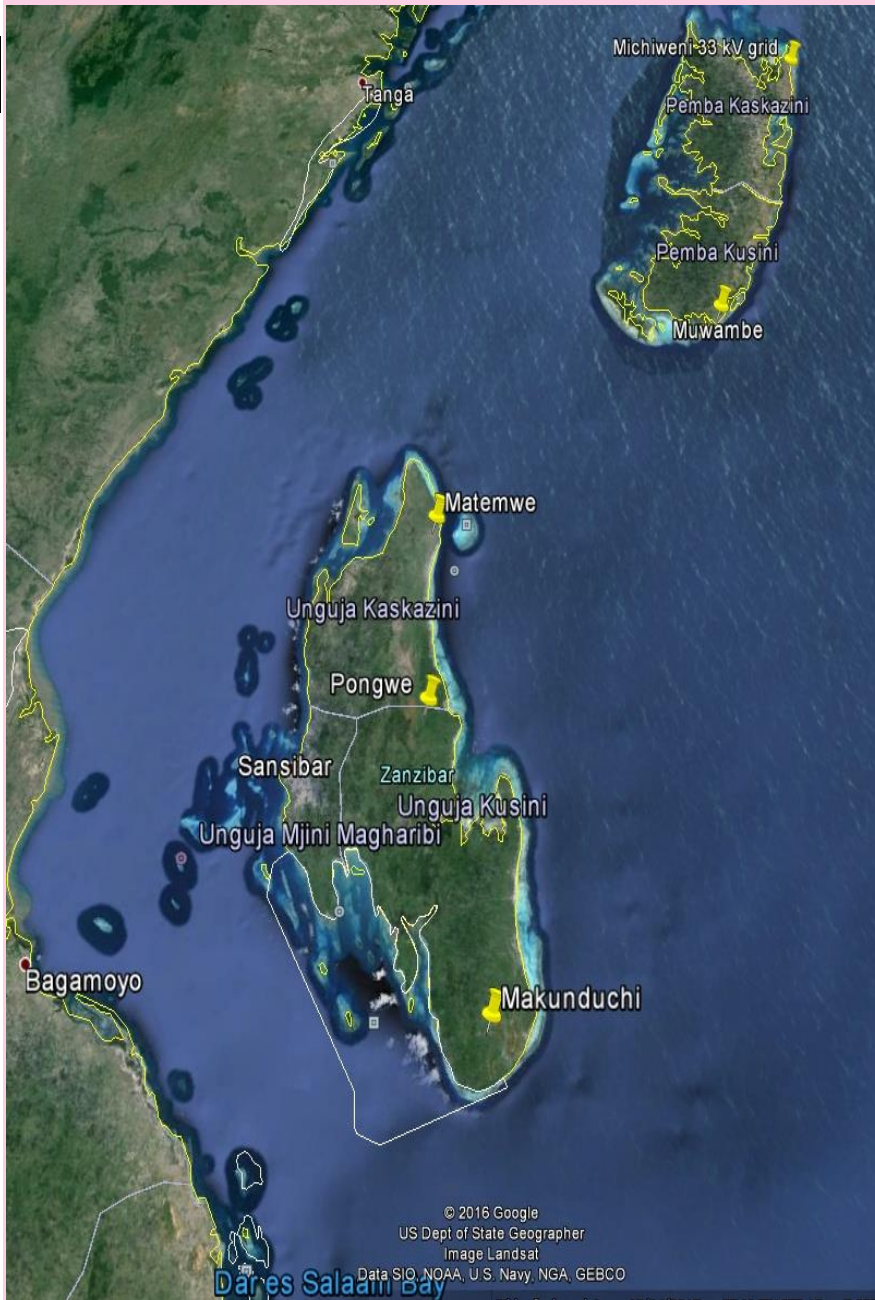
ZANZIBAR RENEWABLE ENERGY AND ENERGY
EFFICIENCY PROJECT

OCT 2015/ FEB 2017
1 REPORT AUGUST 2017

FIRST REPORT

1. BOTH SOLAR PV AND WIND GOOD RESULTS
2. SOLAR 2100 kWh/sqm/annual
3. Wind velocity 6.1 m/s
4. Solar PV Projects to be implemented
5. Wind measurement to continue for one year for bankable data.

RE AS COST EFFECTIVE ENERGY SOLUTION FOR ZANZIBAR DUE TO ITS GEOGRAPHICAL ASPECTS



- 2100 kwh/sqm annual solar irradiance
- > 6.1 m/s wind



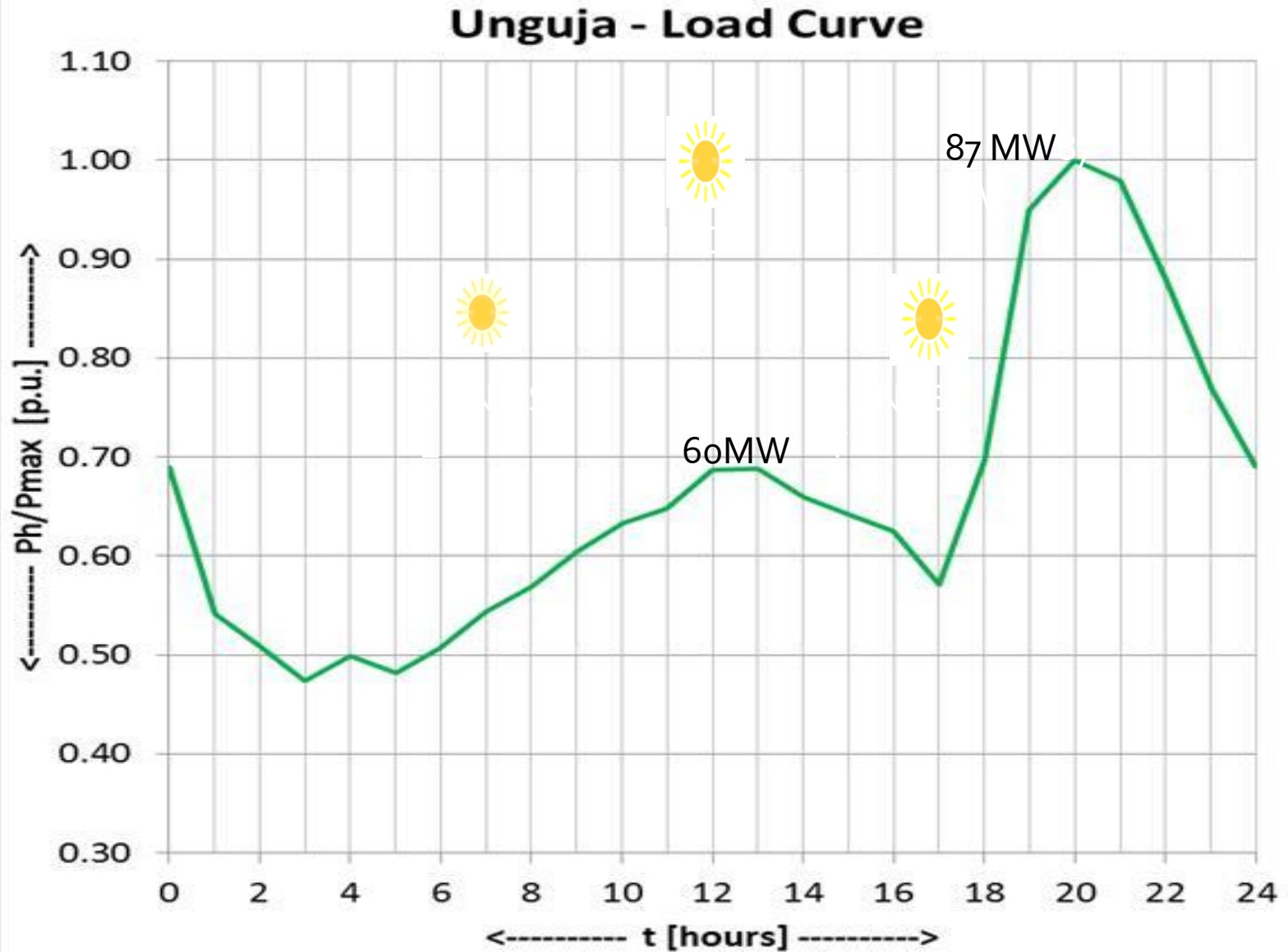
BATTERY STORAGE

DEFINITION AND SCALE OF
RELEVANCE:

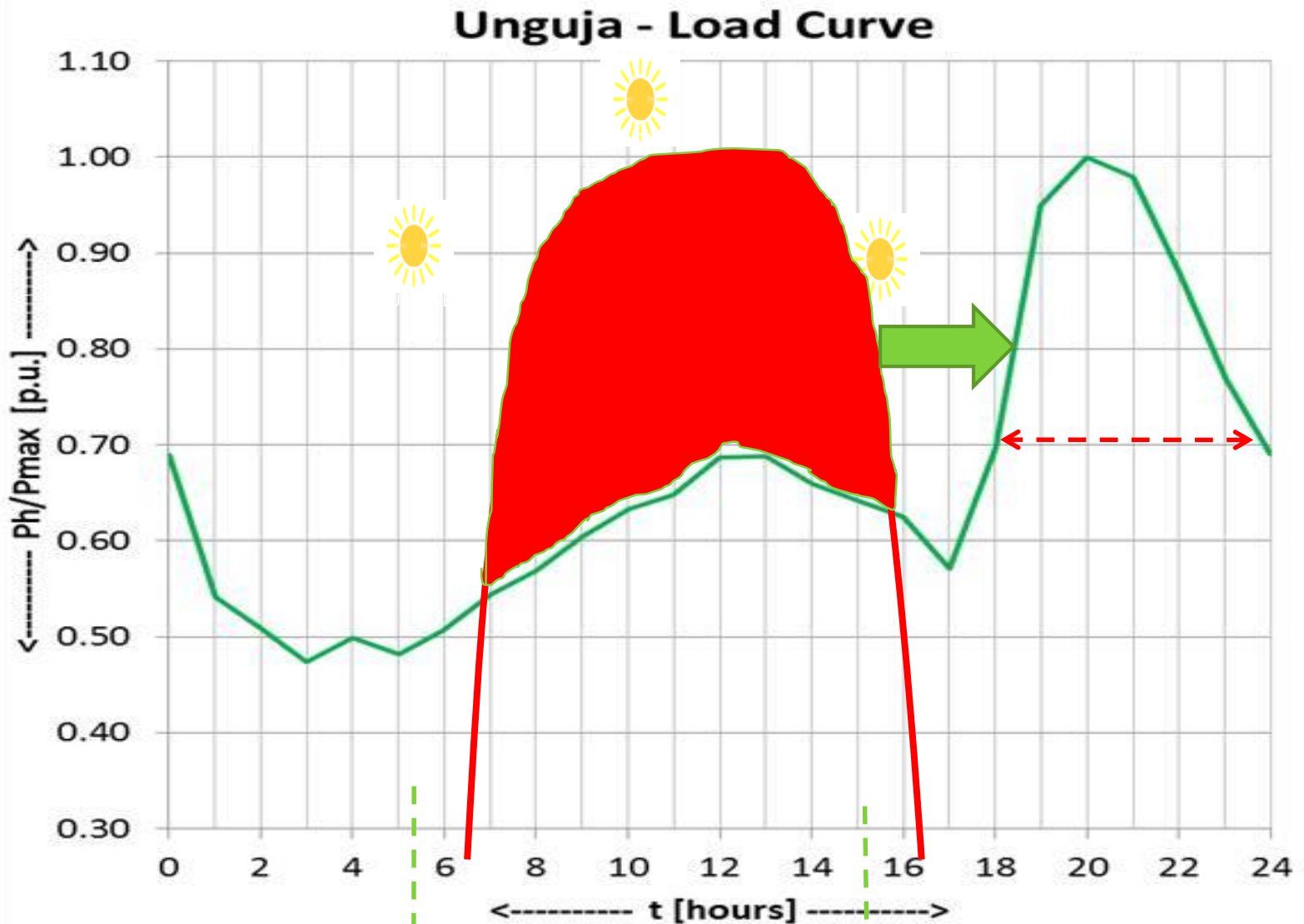
UTILITY-SCALE BATTERY
ENERGY STORAGE SYSTEM(BESS)

ONE MEGAWATT OR MORE

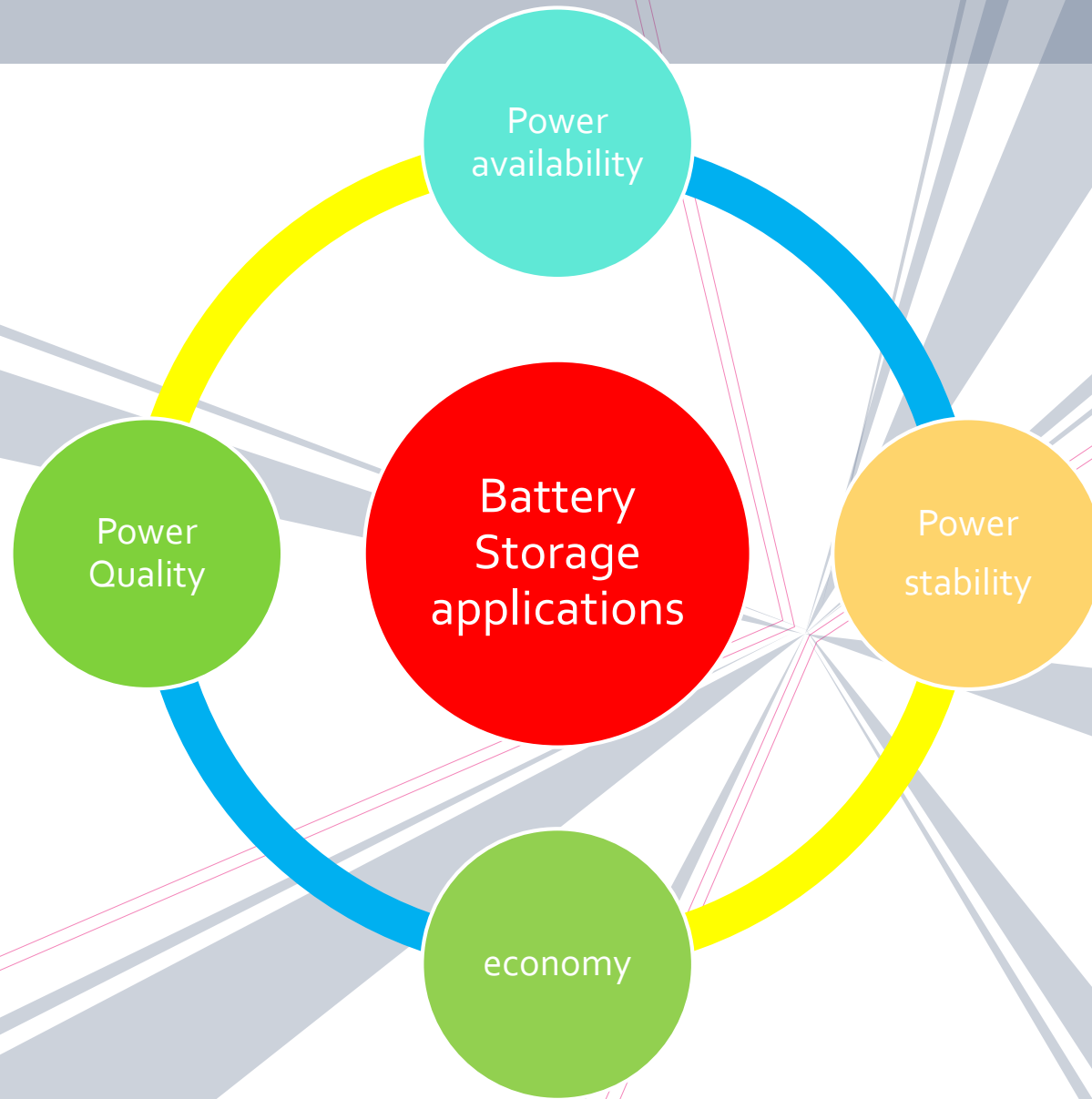
■ DEMAND CURVE



THE CONCEPT OF ENERGY STORAGE



EXAMPLES OF BATTERY STORAGE APPLICATIONS IN THE GRID





Zanzibar Energy Sector Transformation (ZEST) Project

Country Aspiration towards BESS

Objective: To expand access to reliable electricity services and enable private sector participation in the Zanzibar electricity sector

Component I: ENABLING RE GENERATION – SOLAR PV & STORAGE

- Enabling Infrastructure for the Solar PV IPP
- Battery Energy Storage System (BESS)
- TA support for solar and storage development
- Increase reliability through the security of supply and diversification of sources

Component II: GRID STRENGTHENING & ACCESS EXPANSION

- New 132-kV transmission infrastructure on Unguja
- Priority network strengthening and upgrade of 33kV and 11kV networks
- Access (connectivity) expansion through household connections
- Installation of SCADA
- Enable VRE integration, loss reduction, improved reliability/supply quality, load growth and access expansion

Component III: CAPACITY BUILDING AND SECTOR SKILL STRENGTHENING

- Technical assistance and capacity building for sector agencies: MoF, MoLHWE, ZECO, ZURA
 - Energy efficiency investments including equipment replacement/upgrade : energy efficient water pumps, AMR meters
 - Revenue protection program
 - Improve technical capacity of sector and ZECO's operational efficiency, load management
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COUNTRY ASPIRATIONS



HARNESS DOMESTIC RENEWABLE ENERGY RESOURCES FOR ENERGY SECURITY: APPROX. STARTING WITH 30MW

ACCOMPANYING BATTERY STORAGE CAPACITY TO ENBALE VRE PENETRATION AND OTHER GRID BENEFITS

100 PERCENT CONNECTIVITY IN ZANZIBAR BY 2032

POLICY: 20% RE PENETRATION RATE BY 2030

ABOUT 100 SQKM OF LAND ALLOCATED READY FOR RE DEVELOPMENT

**ONE STOP CENTER FOR INVESTMENT – ZIPA
ZANZIBAR INVESTMENT PROMOTION AUTHORITY**

CHALLENGES



1. THE EXTRA INVESTMENT & SUBSEQUENT O&M COSTS DUE TO UPGRADING OF EXISTING POWER LINES

2. STRENGTHENING OF REGULATORY AND POLICY FRAMEWORKS

3. SECTOR CAPACITY CONSTRAINTS TO INTEGRATE NEW TECHNOLOGY AND ENGAGE PRIVATE SECTOR

4. IMPACT ON ZECO TARIFF

THE BUSSINESS MODELS

**Public
Responsibility**

**Conventional
Procurement**

- ✓ The procurement of assets by the public sector using conventional funding

ZANZIBAR ROAD MAP IN ENERGY PROJECTS

**Public Private
Partnerships**

- ✓ Design, build, finance and transfer (DBFT)
- ✓ Design, build, finance and operate (DBFO)
- ✓ Build, operate and own (BOO)
- ✓ Build, operate and transfer (BOT)
- ✓ Build, own, operate and transfer (BOOT)


**Private
Responsibility**

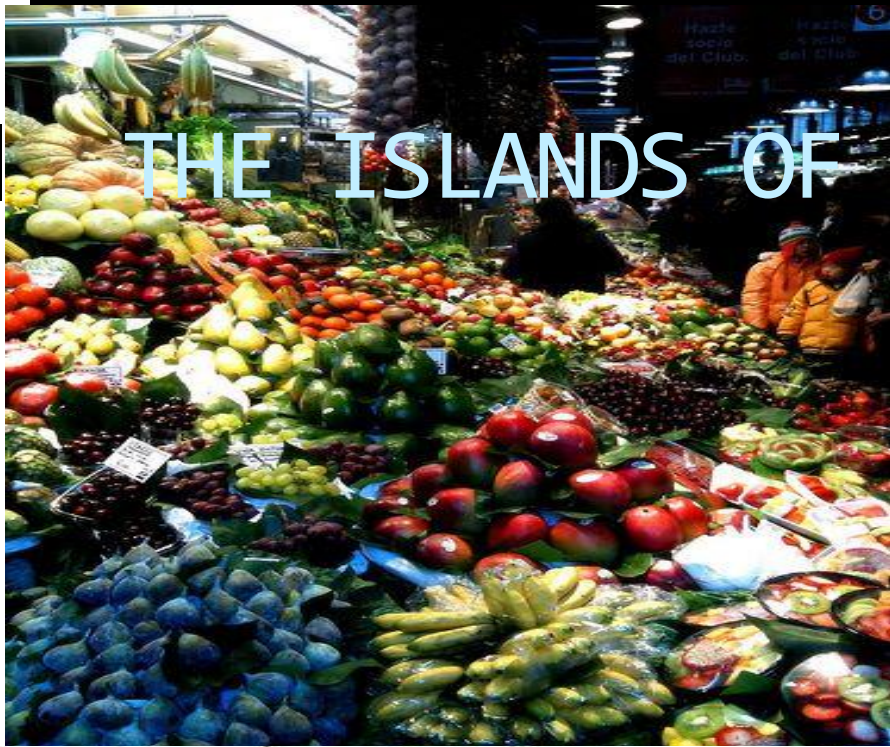
Full Privatisation

- ✓ Publicly regulated but privately owned in perpetuity



Status

- Various ownership and operation models being considered
 - Plan to develop Solar PV IPP of around 30 MW
 - Further technical studies planned
 - Grid Integration and Battery Storage Study Ongoing
 - Expecting to implement key investments in 2-3 year time frame
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THE ISLANDS OF SPICES



Welcome to
Zanzibar &
Thank you