

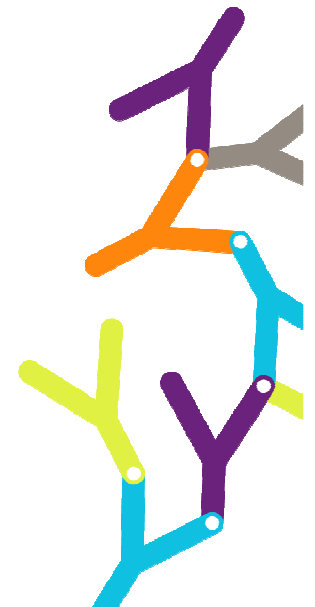
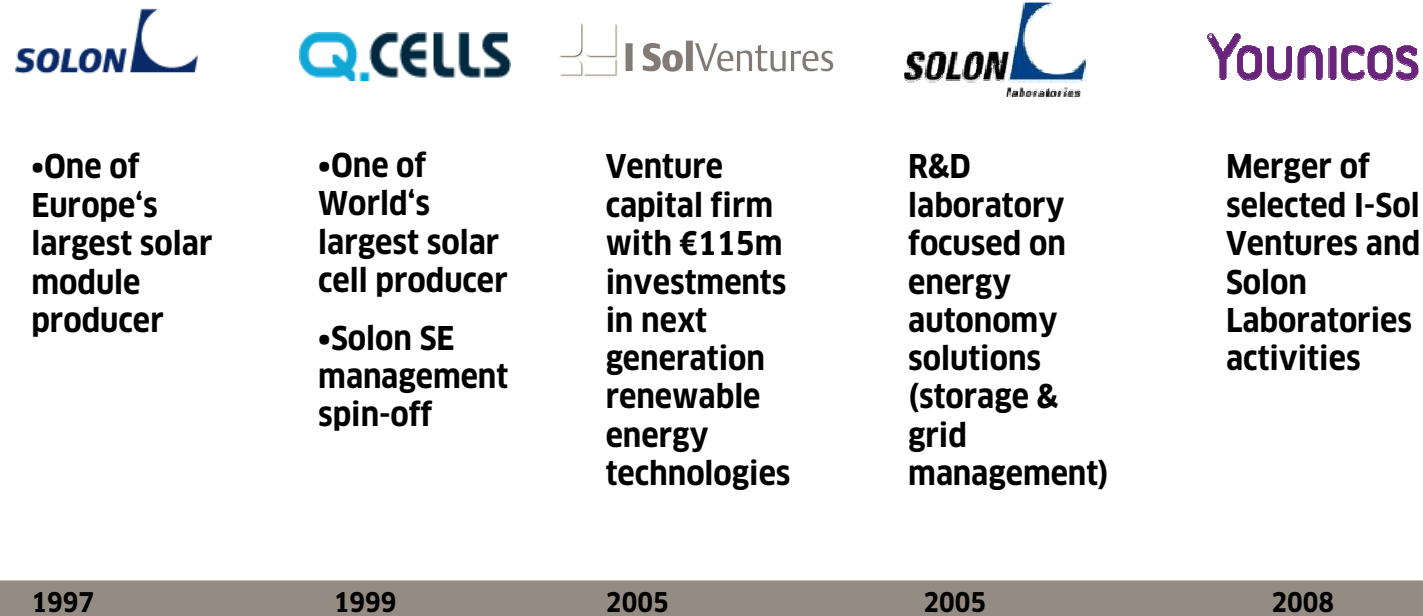
Younicos Company Overview

Muscat 03 Nov. 2009



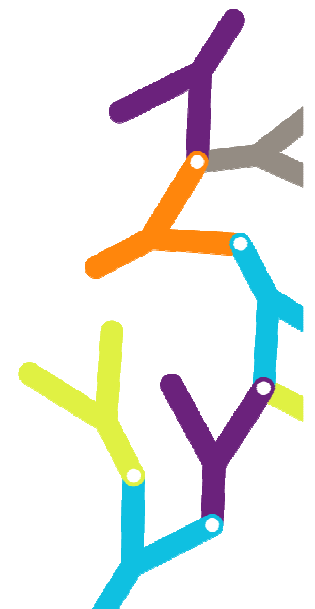
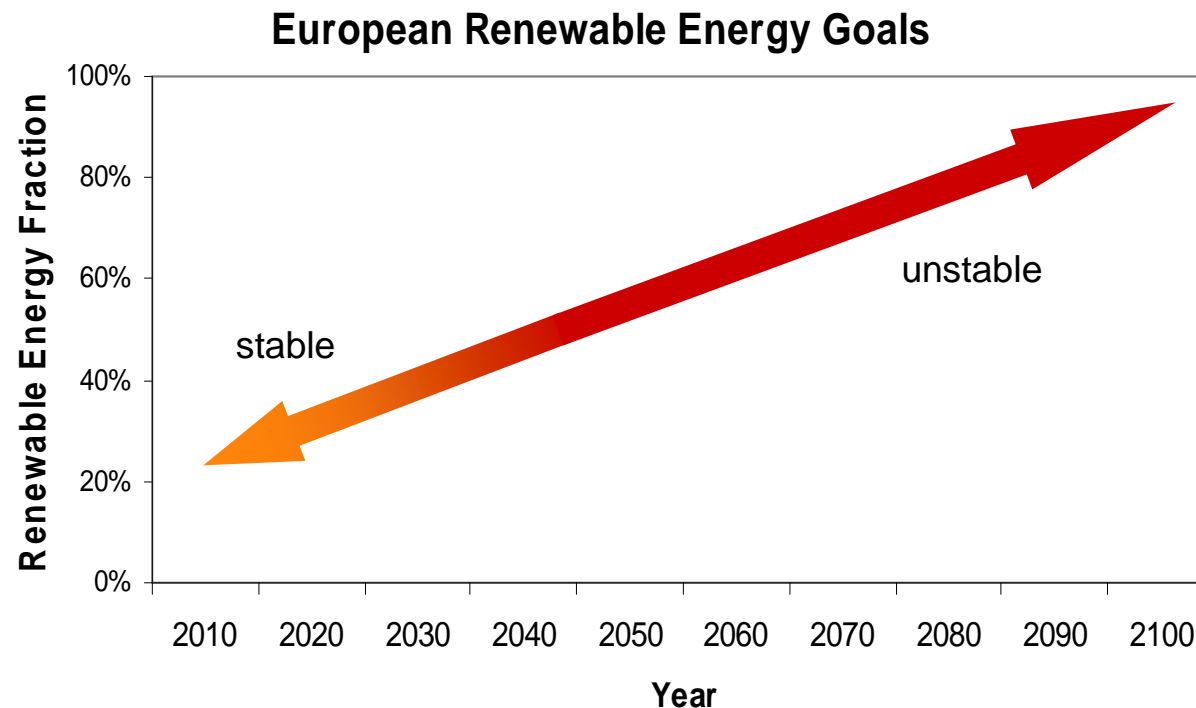
Gerhard Perlot
Mohamed Mostafa
03 November 2009

Younicos' founders have a successful history as renewable energy pioneers



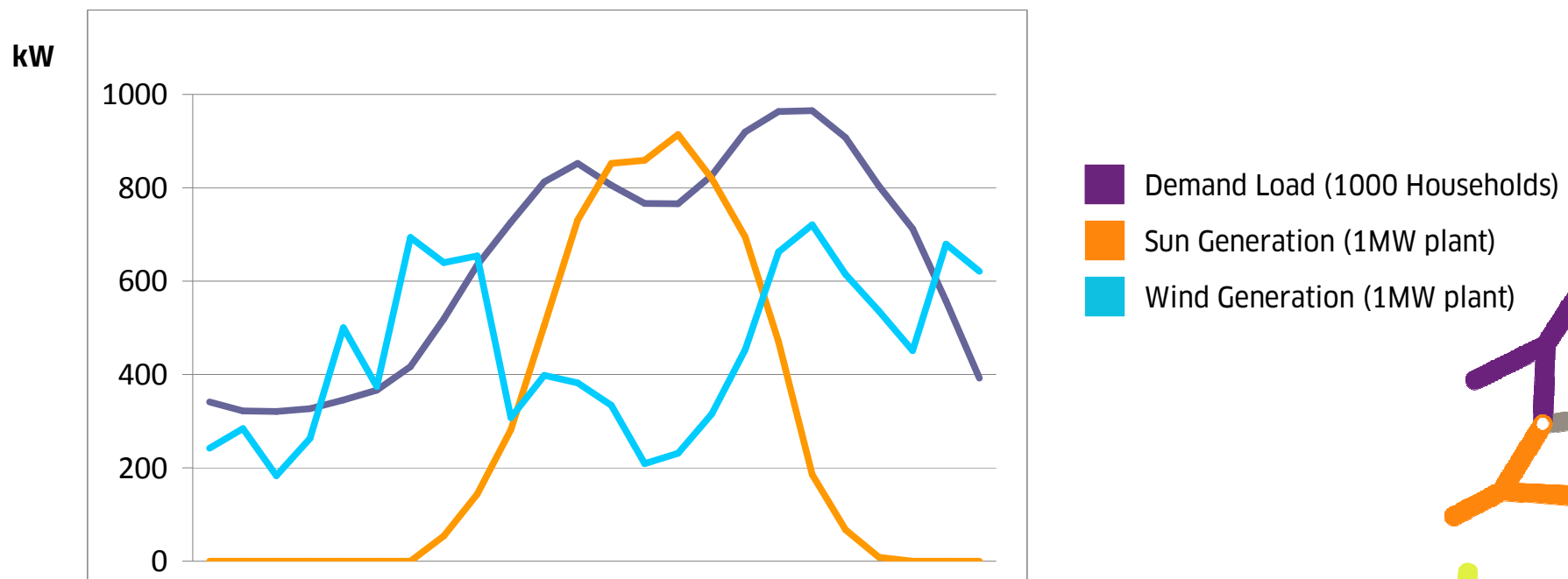
Future energy supply shall rely on Renewable Energy (RE) worldwide

Example: European RE targets

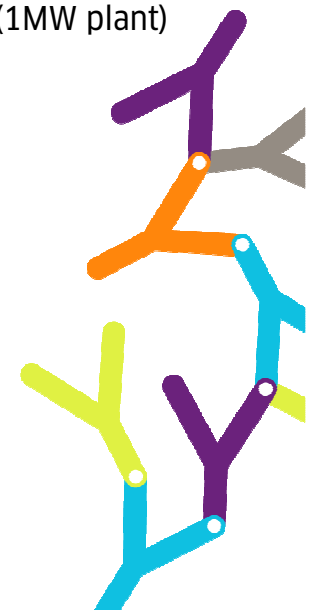


To achieve this vision, we are working to remove critical technical barriers

Renewable generation sources, intermittent and random by nature, require **energy storage** and **grid management technologies** to guarantee stable supply

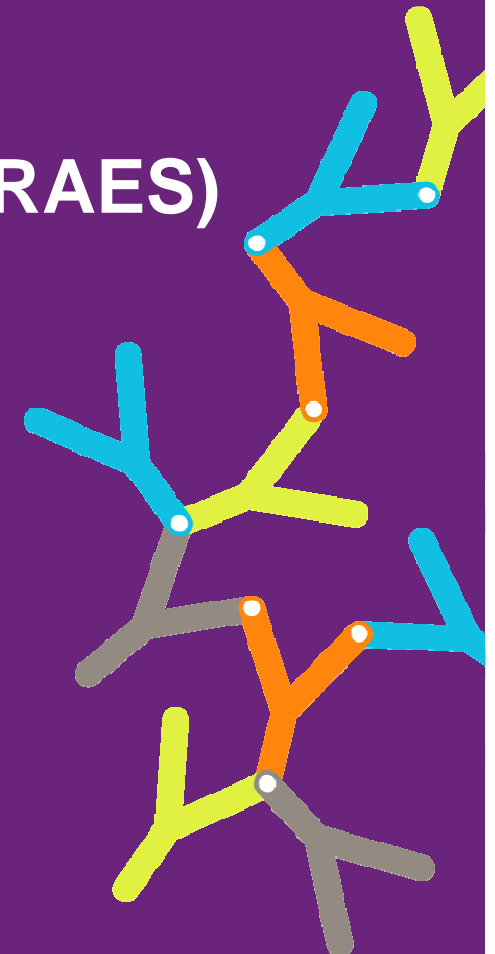


Typical European Daily Load Profile



System Focus

Remote Autonomous Energy Systems (RAES)



Medium to Large RE Energy System

Example: Graciosa Island (Azores, Portugal) #1

Islands experience these future challenges of the European grid already
TODAY

Inhabitants: 4500

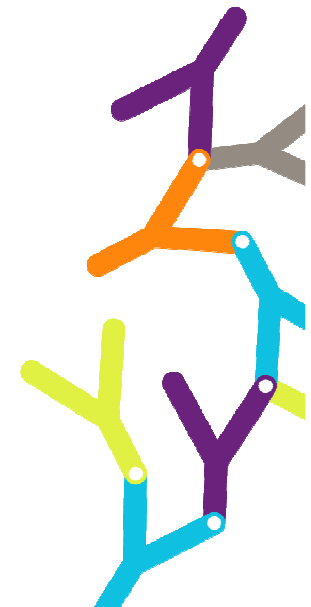
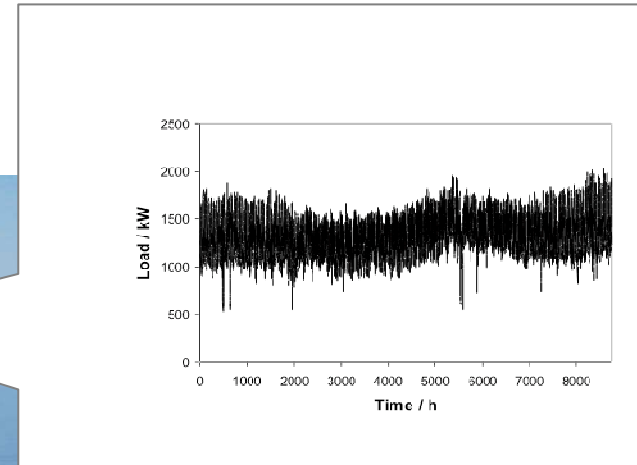
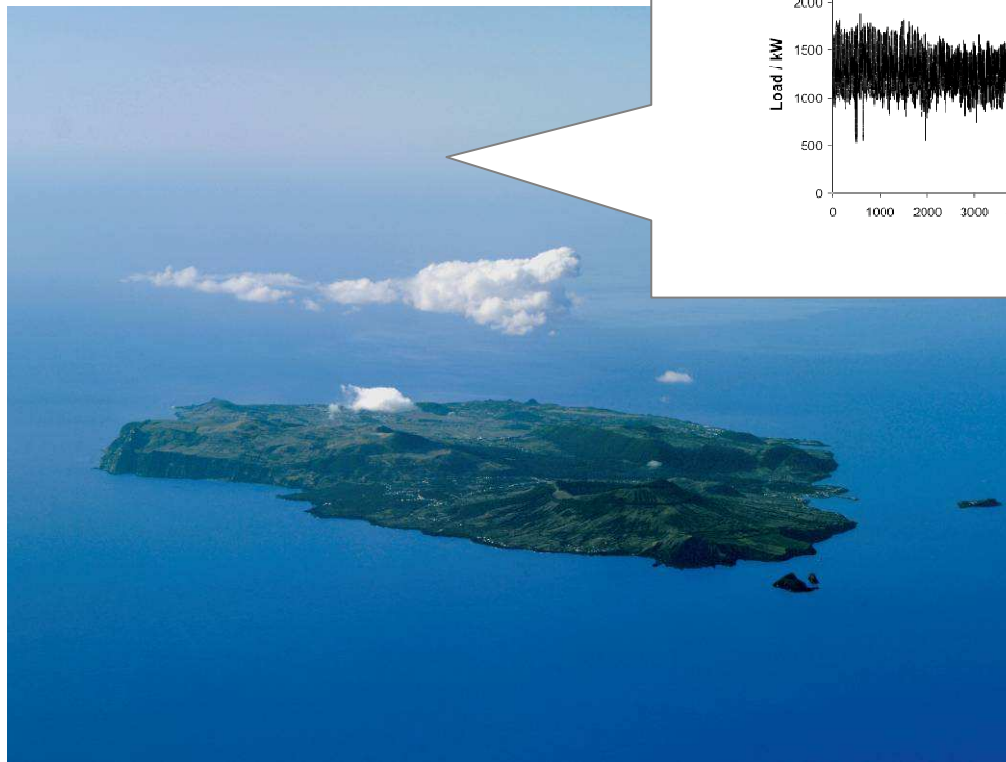
Area: 67 km²

Peak load: ~ 3 MW

Electricity consumption:
~14 GWh

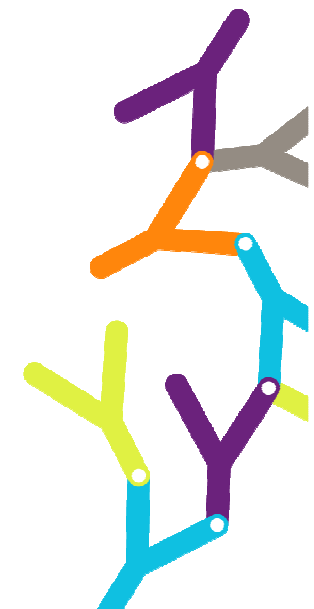
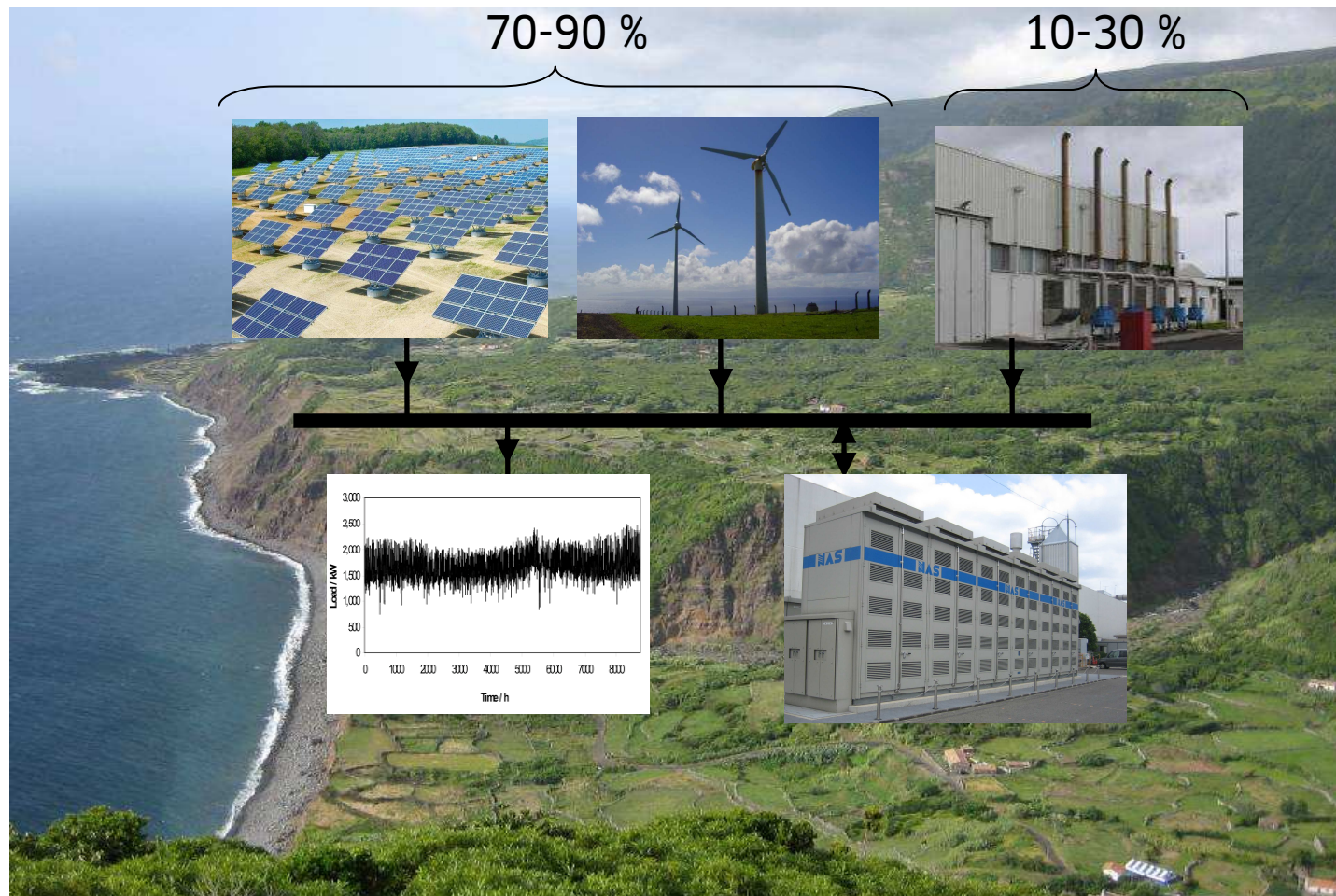
Current Energy supply:
Fossil fuels

Local Utility: EDA Portodal



Example: Graciosa Island (Azores, Portugal) #2

Target Renewable Energy Supply System Layout



Mini to Medium Renewable Energy Systems Example



EISENSTADT

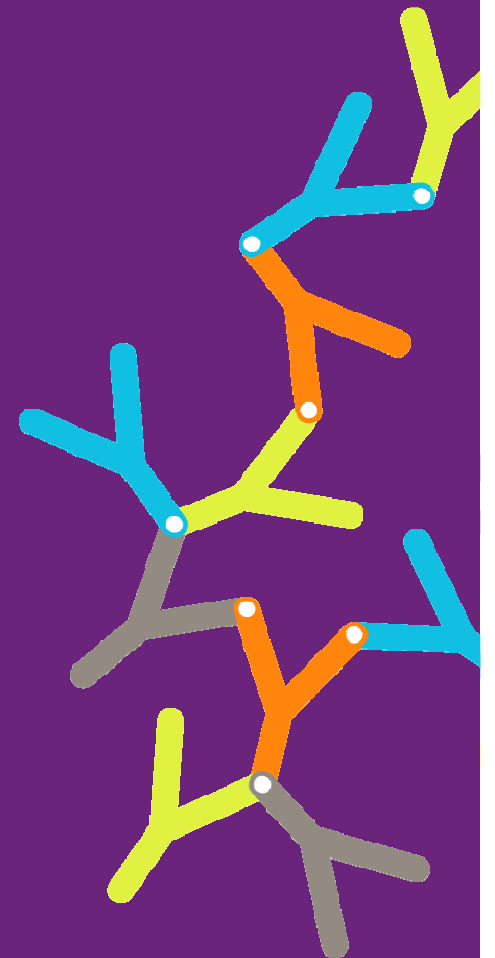
PERUGIA

MERIDA

BERLIN



Technology



NaS Battery

1-2MW NaS battery improves load frequency control

Discharging 6 Hours at 100% or
8 Hours at 75%

Up to 15 years, 4500 cycles

85% DC Efficiency

270 MW installation records

Inspection every 3 years only

2 ms

300 °C

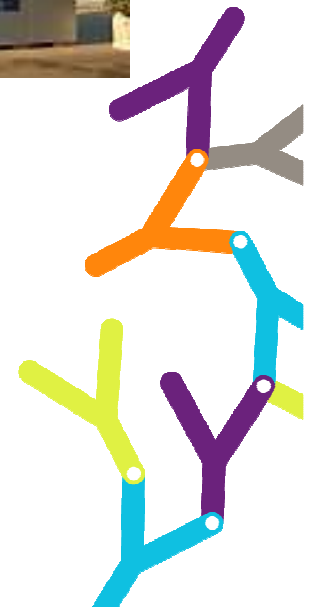


Vanadium Redox Flow Battery

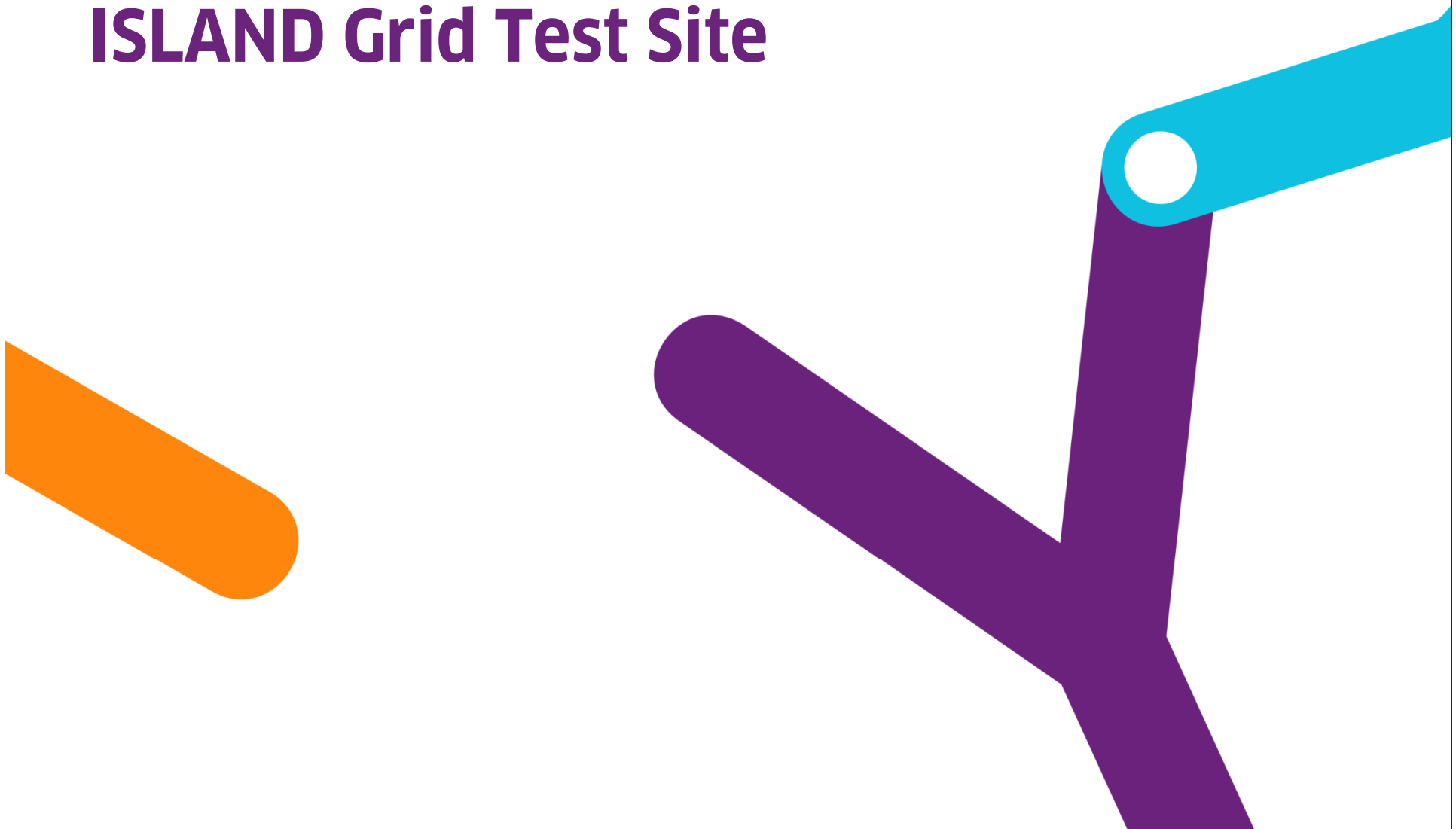
10Kw/100KwH electrochemical flow reactor energy storage system

Ideal for various stationary applications

- Only battery solution separately scalable in power and/or energy
- High cycle rate
- Persistent against deep discharge
- No chemical reaction

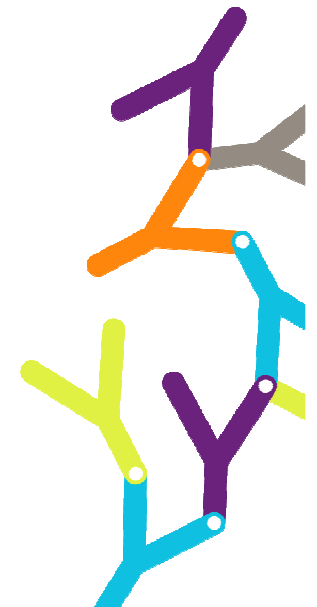


ISLAND Grid Test Site

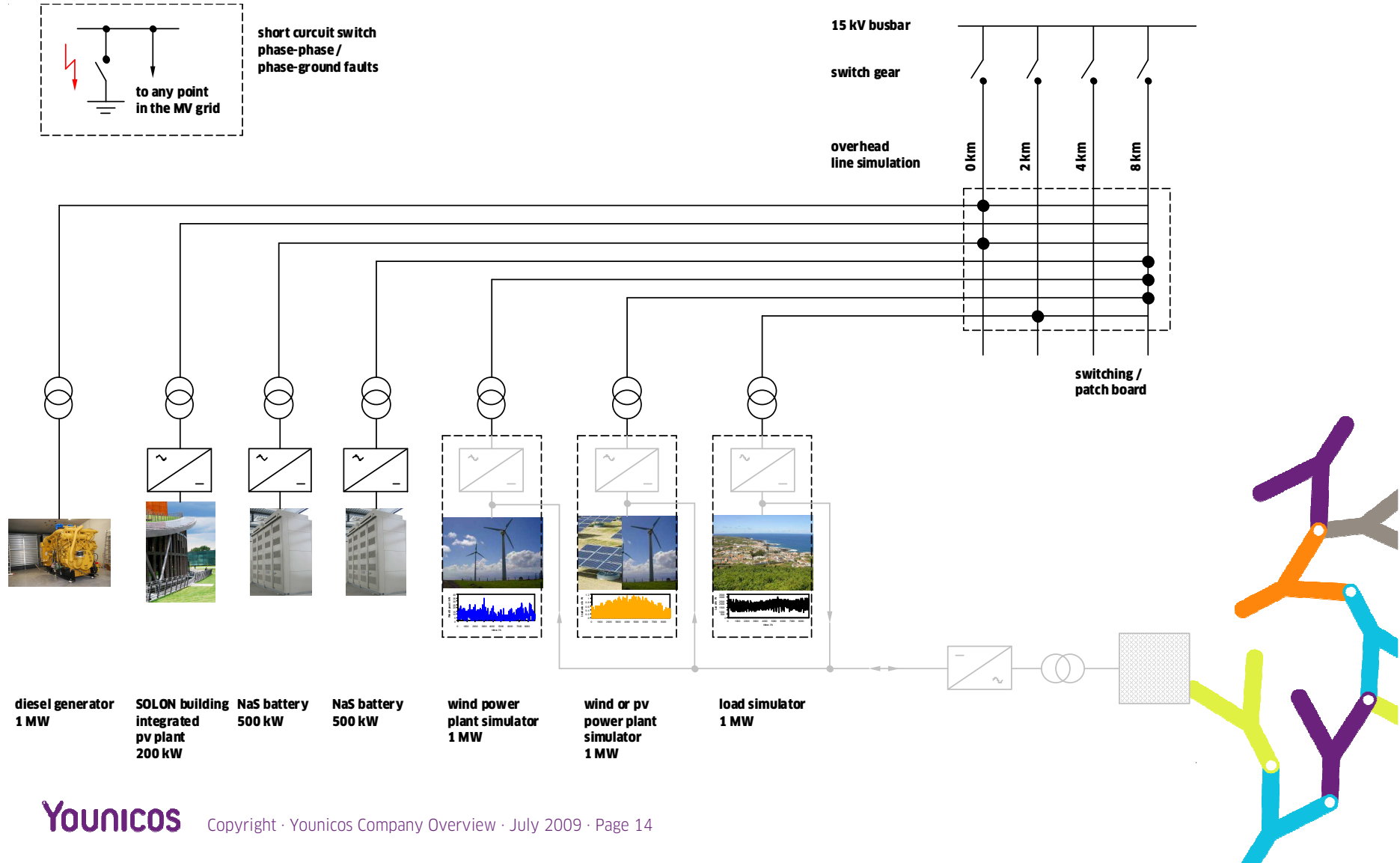


ISLAND Test Site

To address the technical issues in island projects, Younicos is setting up the ISLAND Test Site to simulate up to 100% renewable energy based grids, using wind, irradiation and load measurement from any location



ISLAND Test Site Electrical Scheme



Example Remote Area Application in Oman

Al Zhaiah (1). Input Data

Based on load data from Al Zhaiah, current energy costs and intensity of solar irradiation.

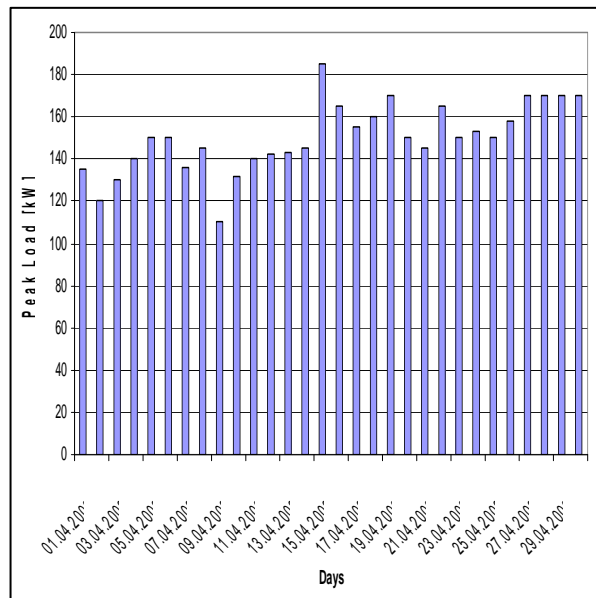
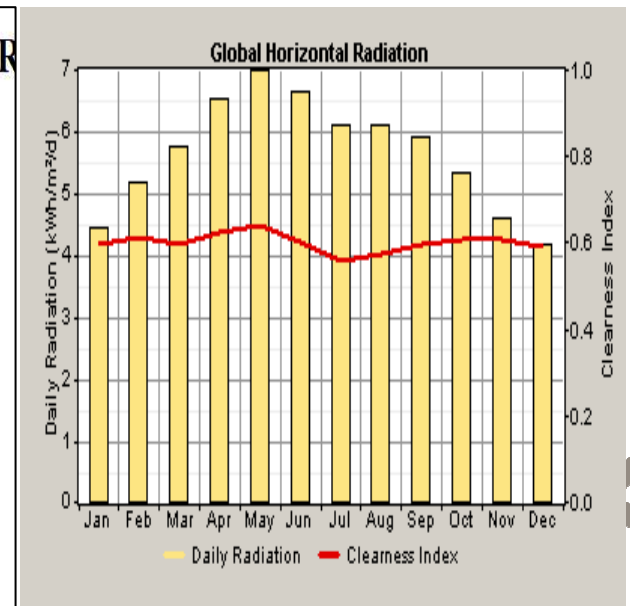
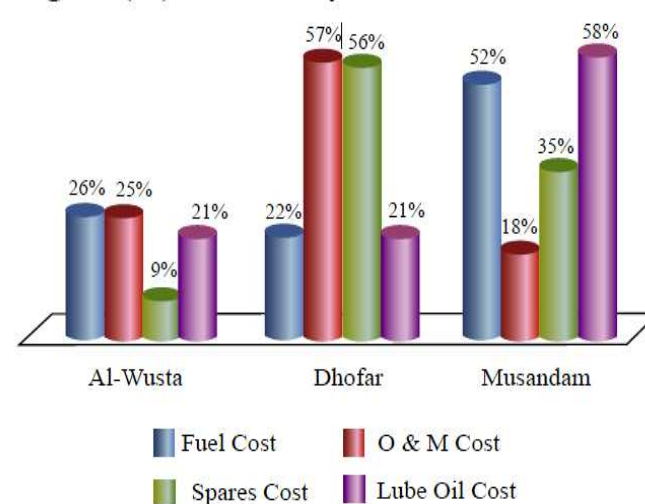
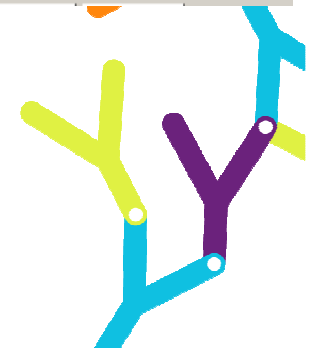


Figure (11): Electricity Generation Costs for R

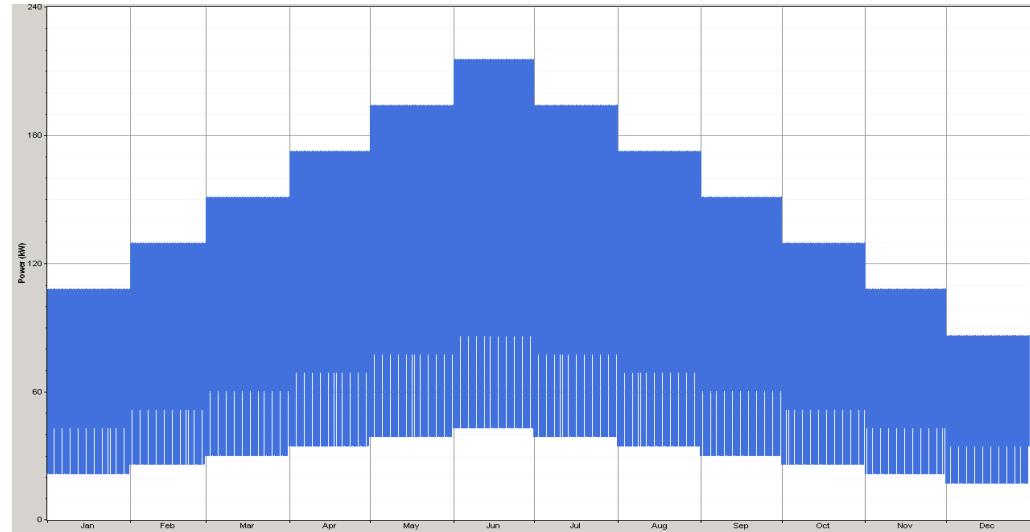
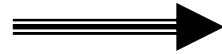


...and including the social, economical and ecological targets



Al Zhaiah الزاهية (2). Design Steps

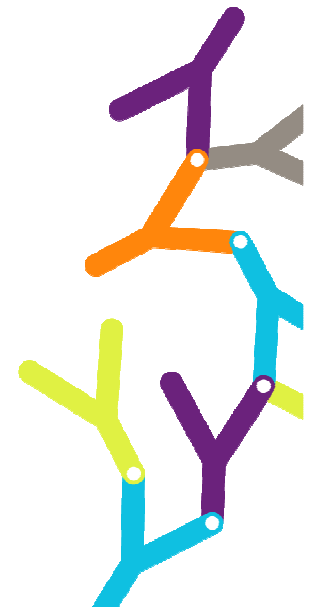
1- *Assuming* a load profile



2- Define search ranges for **optimization** according to requirements

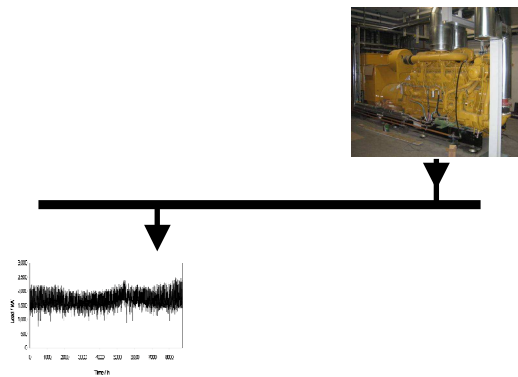
3- Calculate the energy parlance *economical* optimum with adequate *dispatching strategy*

4- Doing real simulation on the Island Test Side

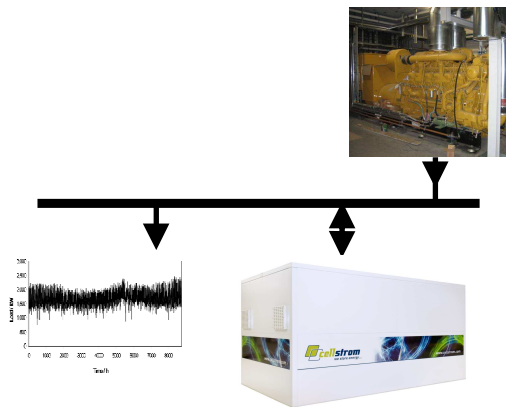


Al Zhaiah الزاهية (3). Solution

Example of project development steps



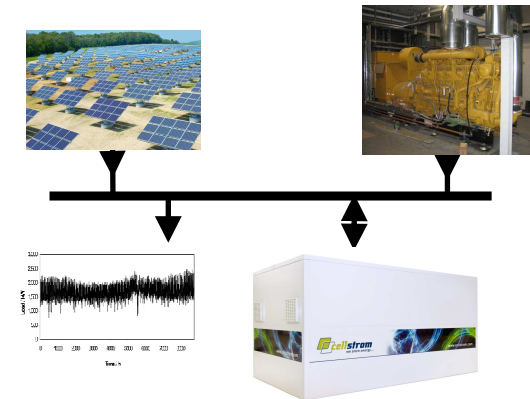
Current structure
2 x 200kW Diesel Generators



Proposed structure #1
1 x 200kW Diesel Generators
50 kW/500 kWh Battery
0 PV

Saving

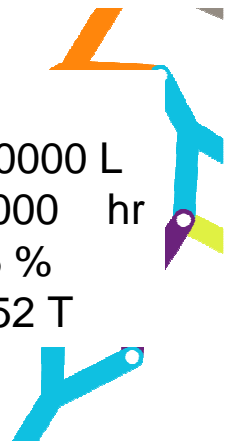
Fuel	36000 L
Operation hours	3000 hr
Electricity cost	15 %
Co2	93 T



Proposed structure #2
1 x 200kW Diesel Generators
50 kW/500 kWh Battery
50 kWp PV

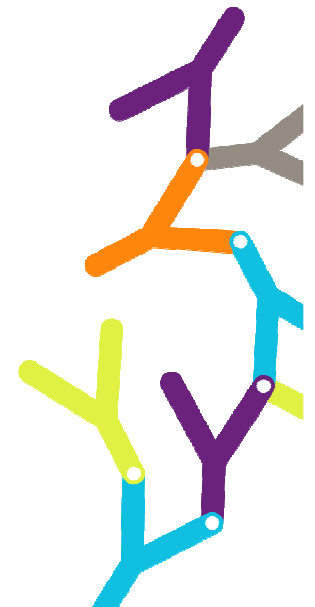
Saving

Fuel	40000 L
Operation hours	4000 hr
Electricity cost	15 %
Co2	152 T



Al Zhaiah الزاهية (4). Benefits and Suggestions

- Benefits
 - Saving fuel costs
 - Longer diesel generator life-time of diesel generator due to optimized operation
 - Increase the renewable source in the grid saving Co2 and stabilize the electricity prices
 - The battery can establish the grid in case of generator maintenance
 - Qualified local jobs will be generated
 - Help the social developments of the rural areas
- Suggestions
 - Incentive based electricity prices → Load shifting
 - Using efficient appliances and lighting
 -



**Thanks for your attention
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**Please direct questions, comments or
requests for further information to:**
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