MORE Microgrids - Demonstration sites

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Demonstrating sites
WPF. Tasks & Deliverables

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**TF1:** Functionalities to be tested ........................................ NTUA  

**TF2:** DEMO LABEIN: Interconn.mode..................................... LABEIN  

**TF3:** DEMO CRES: Islanded mode........................................... CRES  

**TF4:** DEMO EDP: Transition mode........................................... EDP  

**TF5:** DEMO CONTINUON: Islanded mode & storage............... CONTINUON  

**TF6:** DEMO MVV: Transition mode........................................... MVV  

**TF7:** DEMO CECI: Alternative topologies............................... CESI RICERCA  

**TF8:** DEMO KOFUZ: Islanded Mode........................................... FYROM  

**TF9:** DEMO BORNHOLM: Island - microgrid.......................... DTU  

**DELIVERABLES DF1-D9 : One report per demonstration case.**
Scenario for the demonstration of decentralized Microgrid control algorithms based on a Multi Agent System.
OBJECTIVES

- Test centralized and decentralized control strategies in grid interconnected mode.
- Test communication protocols and components including aspects related to energy trading.
- A control and monitoring system built around WPE outcomes (from IEC 61850 standard) will be designed and prototyped.
- Control strategies resulting from agent software will make use of these control and monitoring functions.
- ZIV based on its newest line of hardware and software for distribution controllers will develop the intelligent modules embedding the required functions to allow a full integration of each generating/load unit into the system.
TF3. Demo CRES

Load: 12 houses connected on a single phase 230 Vac grid.
Generation: 5 PV units connected via standard grid-tied inverters. A 9 kVA diesel genset (for back-up).
Storage: Battery (60 Volt, 52 kWh) through 3 bi-directional inverters operating in parallel.
Monitoring: Data logging equipment
RESOURCES
CRES (22), SMA (12), ISET (12), ICCS (3?), ANCO(9)

SITE
LV grid of Kythnos

OBJECTIVES
- Replacement of Sunny Island 4500 inverters with next generation ones, capable to deal with the strenuous conditions of islanded mode control.
- Installation of a 5kW aeroSmart wind turbine.
- 1 year monitoring & analysis of the system's performance.
- Adaptation & installation of the agent-based software for centralized and de-centralized control (WPB).
- Demonstration of the functionalities of the intelligent load controller developed in WPA.
- Dynamic simulation study of the new Gaidouromantra microGrid.
• Innovative Portuguese project for integration of a Microturbine in a swimming-pool building

• Micro CHP application for water heating and electric power generation with connection to the EDP’s LV public network

• In normal operating conditions (Microturbine in connected mode with the LV public network)
  ✓ Low load periods : supply the pool facilities and export the remaining power to the public network
  ✓ Peak load periods – Pool facilities have to demand power from the public network
RESOURCES  EDP (12), INESC (12)

SITE  Municipal Swimming-pool - Ilhavo

OBJECTIVES  • Analysis of the microgrids behaviour in connected and island mode with several levels of load and generation

• To demonstrate the possibility of transferring from connected to island mode under several operating conditions

• Analysis of the microturbine in order to identify its simulation parameters

• Analysis of the interaction of the microturbine and the diesel gen-set in island mode
• 108 cottages with PV roofs
• Installed solar power 315 kWp
• Peak load 150 kW
• Energy balance over 1 day during sunny summer day (present situation)
RESOURCES  CONTINUON (12), GERMANOS (10), EMFORCE(10)

SITE  Bronsbergen holiday park, Zutphen, NL

OBJECTIVES
1. Maintaining islanded mode for 24 hours
2. Automatic isolation from and reconnection to MV network
3. Ensuring fault level to ride through MV fault and microgrid feeder faults
4. Reduced harmonic distortion, damping of resonances
5. Develop optimal energy management for service life optimization of battery system
6. Parallel operation of inverters
7. Black start demonstration
TF6. Demo MVV

Mannheim Wallstadt ecological estate

Users with interest in efficient energy use: Co-operation can be expected
480 households, further houses are under construction
5 PV systems installed
1 CHP installed. Option for further CHPs
Grid structure suitable for microgrid option
**RESOURCES**  
*MVV (12)*

**SITE**  
*Mannheim Wallstadt ecological estate*

**OBJECTIVES**

- Cooperate with the users in the settlement
- Optimization of energy flow and power quality in the selected grid segment in connected mode.
  - Install and test load controllers (WPA)
  - Test concept of decentralized control with agents (WPB)
- Zero energy flow at the transformer in connected mode
- Evaluate islanding option to improve security of supply. Evaluate controllers and control strategies.
- Demonstrate transition from grid connected to islanding model in an iterative process
TF7. Demo CESI RICERCA

Test Facility Data
Total Electric Power: 350 kWe
Total Thermal Power: 250 kWe
Automated Grid

LAN, wireless, powerline

Supervision and data acquisition system
RESOURCES
CESI RICERCA (18), I-POWER(19)

SITE
Test facility of CESI RICERCA

OBJECTIVES

- Tests to evaluate islanding operation at steady state: Study of power quality impact in terms of harmonics, flicker, voltage fluctuations, unbalances;

- Specific tests for generators and storage characterization;

- Experimentation, demonstration and validation of an actual Microgrid with different grid topologies (radial, meshed);

- Installation and test of the I-Power Inverter (RTI system), that will be used to represent a weak utility generator, with programmable output characteristics.

- The Test Facility will be able to operate with different voltage and frequency levels (45Hz to 65Hz, 360V to 440V) and under conditions of unbalance of the phases.
Pork producer farm "Agria"

- 30 000 animals
- Daily amount of manure: 450 m3
- Bio-digester, capacity 50m3
- Generator, capacity 15 kW
- Expected biogas production 20m3/m3 manure
- Calorific value of the biogas 1.2 kWh/m3
RESOURCES

INCO partners

SITE

Pork producer farm "Agria"

OBJECTIVES

• From the aspect of Microgrid concept and advanced RES technologies the aim is to provide an example for inclusion of a biogas plant into a microgrid;
  • Optimal design, construction & monitoring of the biogas plant
• To introduce and test the microgrid concept in the power system of a country from WB region.
  • To establish a microgrid with biogas based generation
  • To define functionalities to be tested
  • To validate the islanding mode of operation
• To increase the potential and awareness of Microgrid option in non-EU regions (through dissemination)
28,000 Customers
55 MW Peak Load
16 60/10 kV Transformers
39 MW Diesel (Oil)
39 MW Steam (Oil)
37 MW Steam (Coal/Oil) CHP
30 MW Wind
4 District heating systems
6 Heat generators
TF9. Demo OESTKRAFT

RESOURCES

DTU(12)

SITE

Bornholm Island Multi-microgrid

OBJECTIVES

- Describe all elements, data collection in the Multi-Microgrid
- Analysis of the system
  - Establish a computer model
  - Establish the normal security functions (based on loadflows)
  - Simulate the operation of the grid (screen for static constraints)
  - Analysis of results (simulations against measurement, describe system's ability to balance active/reactive power, to blackstart and reconnect to main grid)
- Establish the forecasting functions: Load and Production
- Demonstrate procedures for transition to/from island mode. (ability to balance the active and reactive power, WT questions) -> How to increase renewables in island mode?
- Demonstrate forecasting functions (generation + load)
Thank you for your attention