

EU SUSTAINABLE ENERGY WEEK



BRIDGE Initiative BATTERIES' ROLE IN ENERGY TRANSITION

Session#19

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



**SUSTAINABLE
ENERGY WEEK**
04-08 JUNE 2018

An initiative of the  European Commission

 **bridge**
HORIZON 2020



TILOS - Battery storage for renewable energy use on Tilos island



Jens Merten | EUSEW 4-8 June 2018
6 June 2018

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18

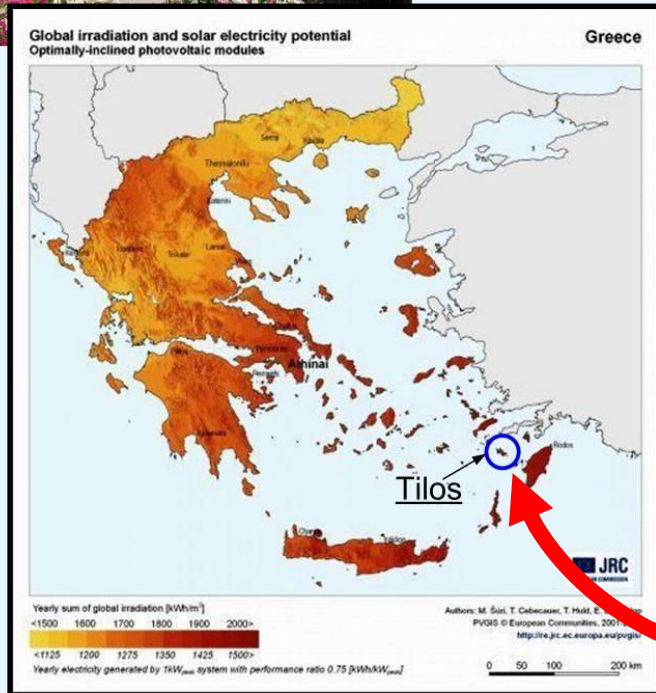
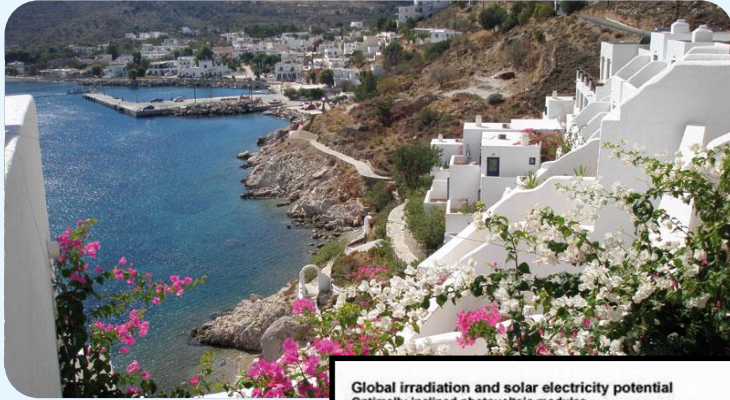


SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018

An initiative of the  European Commission



Tilos island



- Small scale, remote Aegean Island;
- Local population of ~500 people
- More than double during summer
- Increased environmental awareness 🐼
- Medium-quality wind potential – Average wind speed in the order of 6-7m/sec
- Excellent solar potential: ~1750kWh/m²yr

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018

An initiative of the  European Commission

 bridge
HORIZON 2020

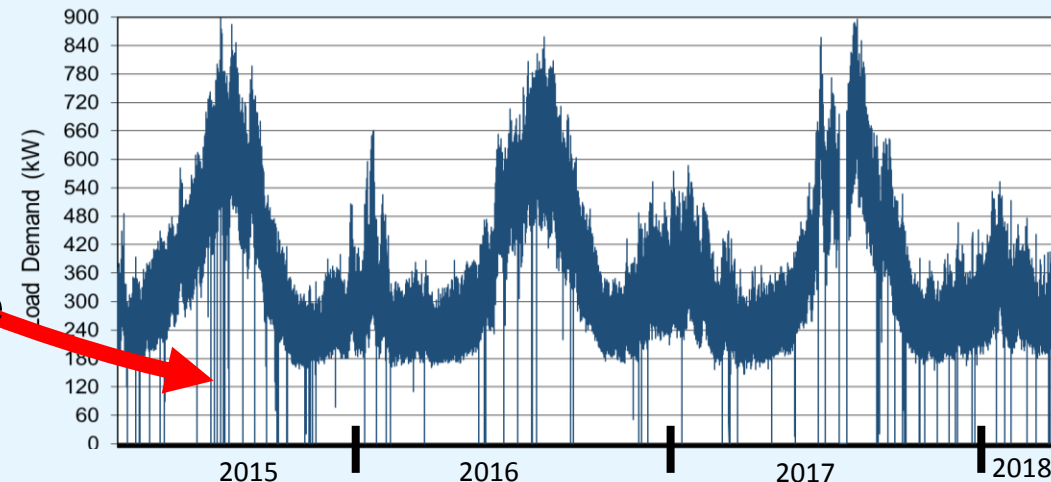


Electricity system before the project

- Peak demand of Tilos close to **1MW**;
Annual electricity demand of **~3GWh**
- The island belongs to the Kos-Kalymnos electricity system (**~100MW**)

Problems

- Mainly fossil fuel powered
- Subsea interconnection not reliable
- Frequent occurrence of faults cause power cuts
- Emergency diesel generator
Activated manually after severe power cuts



Objectives of TILOS project


Demonstration of an **integrated** approach with:

- **Battery Energy Storage System**
 - **First ever** MW-scale hybrid renewable energy station in Greece!
 - To allow for large-scale penetration of renewable energy
 - To form and control an island microgrid
- **Demand Side Management System**
 - Apply to centralized water pumping systems
 - Apply to domestic loads like domestic water heaters (~150 end-users)
- **Microgrid Energy Management System**
 - For the optimum integration of a hybrid RES (wind and PV) power station
 - For the implementation of multiple battery storage services
 - For optimizing interoperability between Renewable energy sources, storage demand side management and main grid connection

TILOS project

Budget:

14 M€

11 M€ H2020 














3 M€ Partners

Plus investment
into PV+wind
assets by
EUNICE

Duration:

4 years

2/2015-1/2019

Partner			Main Role
FZSonick 	IT	Industry	Battery System
Younicos 	DE		Energy Management System
EUNICE 	GR		EPC - RES Assets Investor & Operator
EUROSOL 	DE		Demand Side Management System
HEDNO 	GR		Distribution System Operator
TEIP 	GR	Research & Technology	Coordination & Replication Studies
CEA 	FR		Battery System Optimisation
ITC 	ES		Forecasting
UEA 	UK		Business Models
UCCP 	FR		PV Forecasting
RWTH 	DE		Simulators
KTH 	SE		Dissemination
WWF 	GR	NGO	Population Engagement

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018

An initiative of the  European Commission

 bridge
HORIZON 2020

Electricity system after the project



- **160kW** PV (financed by EUNICE)
- **800kW** Wind (financed by EUNICE)
- **800kW/2880kWh** Battery system
- **Energy Management System** running on SCADA
- Switch for **coupling/uncoupling** with subsea cable
- Demand side management platform and smart meters (~**15%** of island loads)

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018

An initiative of the  European Commission

 **bridge**
HORIZON 2020

Storage system – main features



- Technology: Molten salt Sodium Nickel
 - No cooling needed
 - Fully recyclable
 - Highly reduced maintenance
 - No calendar aging with heat
 - Made in EU by **FZSoNick**
- Capacity **2.88MWh**
 - 128 modules of 22.5kWh
 - All connected in parallel
 - DC voltage 620V
- Inverter power **800kW**
 - close to Tilos island peak demand
 - Works in both **grid forming** (stand alone) or **grid connection mode**
 - Made in EU by **IDT**

What is inside this container ?



LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018

An initiative
of the



European
Commission

bridge
HORIZON 2020

Storage system – services provided



Multiple services possible:

- **Load levelling:** Contributes to optimize generation, transmission & distribution assets
- **Stabilize renewable energy generation:** mitigate variability of supply
- **Power quality:** Compensates fast power fluctuations using active power from batteries in combination with the IDT inverter
- **Grid forming** operation to run in real island mode to ensure high grid availability
- **Black start** capability to start up the grid and feed the island network in case of black outs.

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018

An initiative
of the



European
Commission

bridge
HORIZON 2020

Storage system – Impact



- Storage is the enabler to replace fossil fuels on Greek islands: up to 100% possible!
 - Today: 15% only in Greek islands
 - Tilos island: 70% envisaged
- Robust and modular solution with increased life span
- Unaffected by hot climate
- Ideal for small and medium scale islands
- High replicability potential for stand alone systems
 - several 100MWs of fuel based power generation can be replaced in Greek islands
- Less environmental impact than pumped hydro power storage, better social acceptance
- Elimination of power cuts on Tilos island

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018
An initiative of the  European Commission

 bridge
HORIZON 2020

Impacts of the TILOS project

Investments in renewable energy sources

- Unlock private investment by EUNICE into 160kW PV and 800kW Wind

Achievement of a derogation of current regulations

- Two EUSEW17 awards (Energy Islands + Citizens')
- Support from local Distribution System Operator
 - ➔ Issuance of the **first Power purchase agreement** for a battery-based Hybrid Power Station

Dissemination on good practices

- Contribute to the internal debate in Greece to ensure transition towards novel market rules
- Chair the BRIDGE working group on regulation (Takis Ktenidis)



LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



**SUSTAINABLE
ENERGY WEEK**
04-08 JUNE 2018
An initiative of the  European Commission

 **bridge**
HORIZON 2020

Thank you for your attention!



Project Presenter
Jens Merten
Jens.Merten@cea.fr



Project Coordinator
Dimitrios Zafirakis
dzaf@teipir.gr



LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



SUSTAINABLE
ENERGY WEEK
04-08 JUNE 2018

An initiative
of the



European
Commission

bridge
HORIZON 2020



JOIN #EUSEW18



EUSEW.EU



EUENERGYWEEK



@EUENERGYWEEK

LEAD THE CLEAN ENERGY TRANSITION
#EUSEW18



**SUSTAINABLE
ENERGY WEEK**
04-08 JUNE 2018

An initiative
of the



European
Commission



bridge
HORIZON 2020