Clean-Green Energy Solution.The Tilos paradigm.

P. Ktenidis, D. Zafirakis, E. Kondili*, J.K. Kaldellis

Research Team

Soft Energy Applications and Environmental Protection Laboratory

Optimisation of Production Systems Laboratory

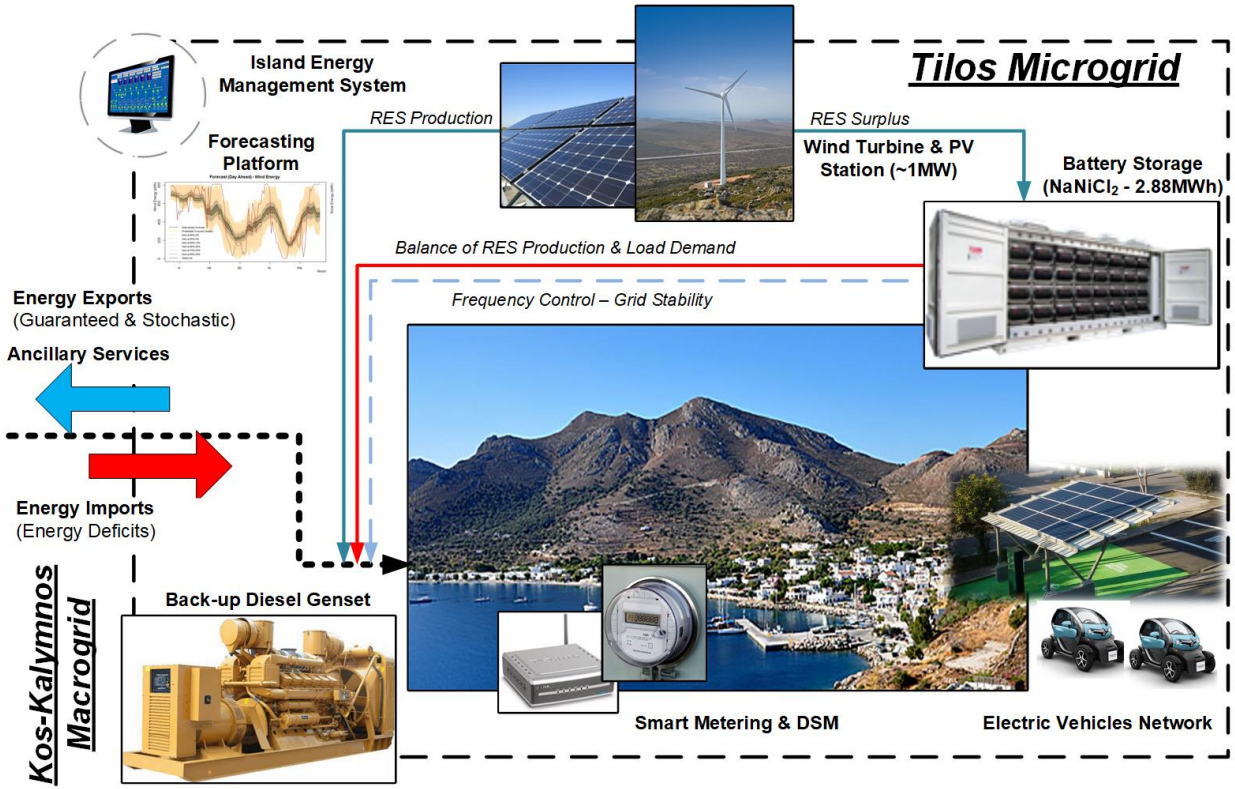
Dept. of Mechanical Engineering, University of West Attica

e-mail: jkald@puas.gr, www.sealab.gr

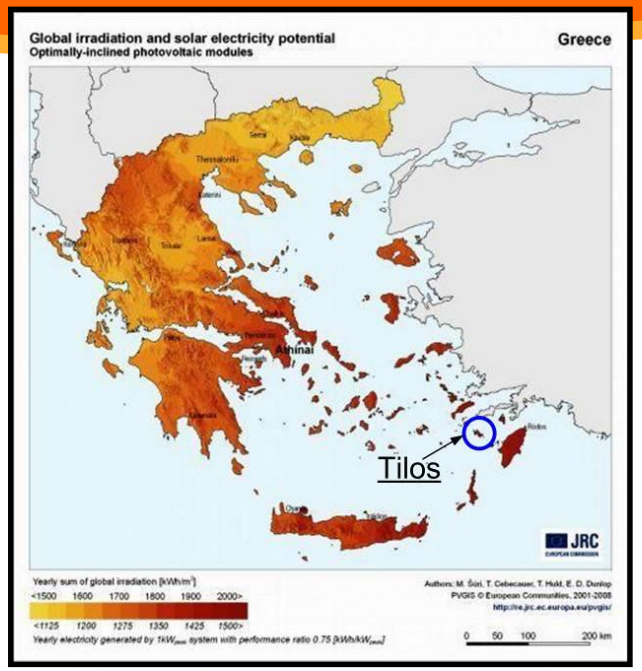
PROPOSED SOLUTION FOR THE AEGEAN SEA ISLANDS

In order to improve the energy autonomy and the energy supply security we propose the exploitation of the available RES (mainly wind and solar) potential in collaboration with an appropriate Energy Storage Installation

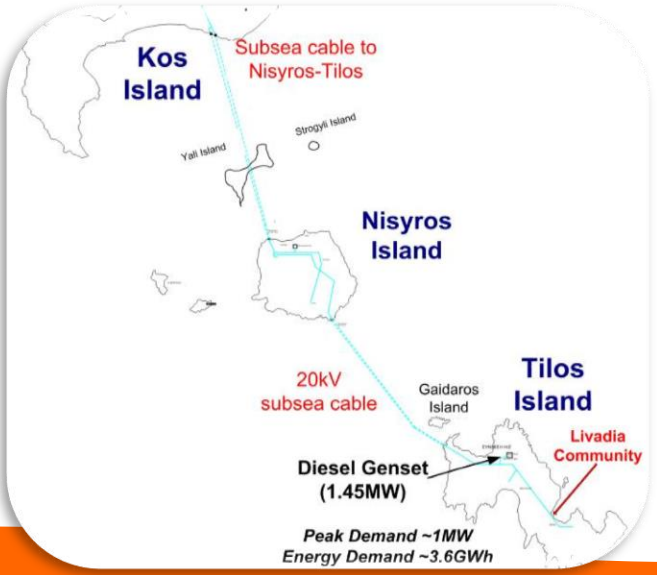
Moreover the proposed solution is supported by the DSM approval and the energy saving efforts of the local island communities.



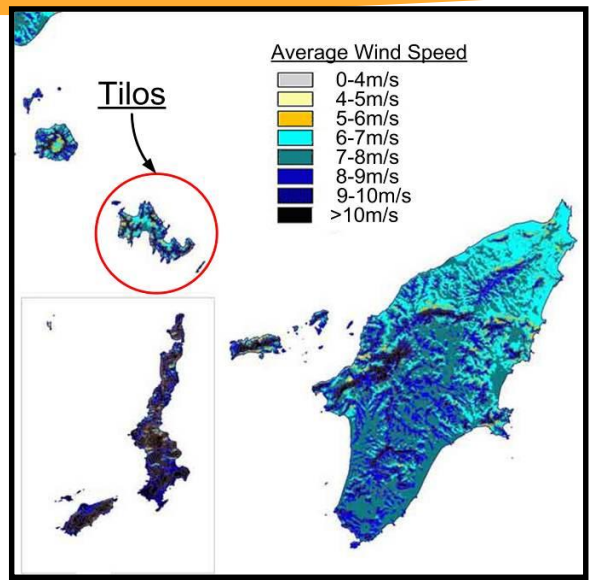
TILOS ISLAND CASE (1/2)

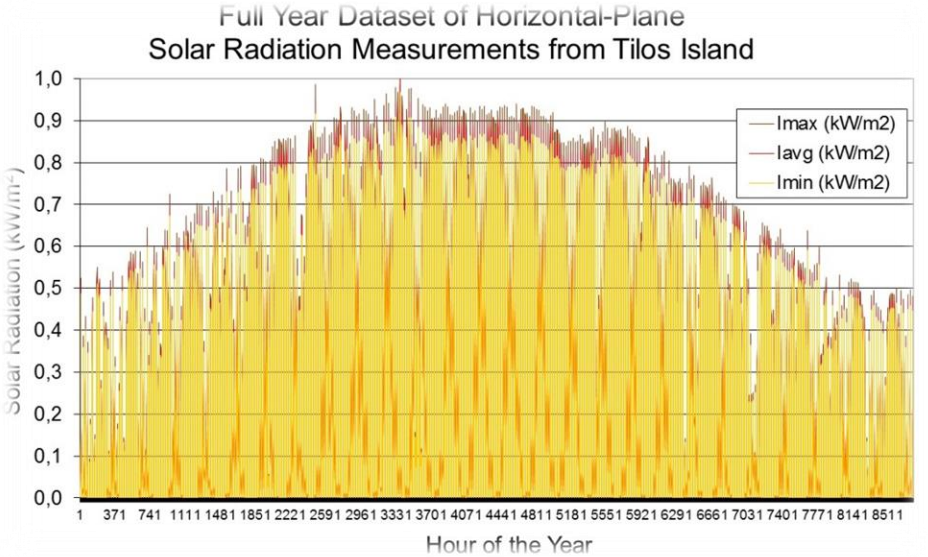


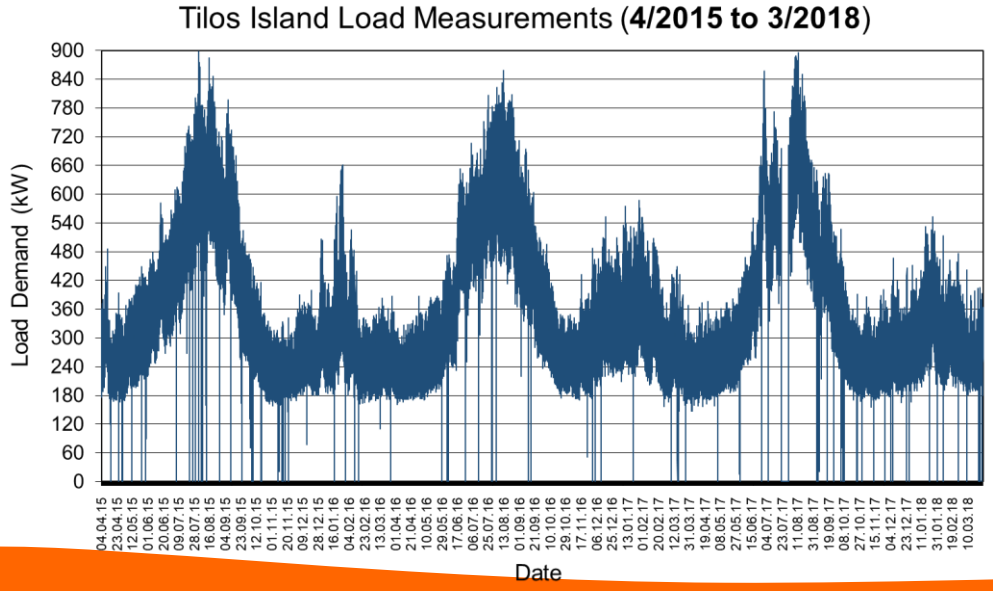
- Small scale, remote Aegean Island; complex of the Dodecanese
- Local population of ~500 people; Much higher during summer
- Peaceful island, environmentally-friendly profile- 100% Natura; Mild Mediterranean Climate
- Belongs to the Kos-Kalymnos electrical system (~100MW)
- Subsea interconnection with Kos through Nisyros; Tilos last in line



TILOS ISLAND CASE (2/2)







- Medium-quality wind potential – Average wind speed 6-7m/sec
- Excellent solar potential; ~1750kWh/m^2.a
- Tilos peak demand close to 1MW; Annual electricity demand ~3GWh

TILOS HORIZON 2020 PROJECT

- Score/Ranking: 1st among 80 proposals
- Budget: 15M€ (11 M€ funding)
- Duration: 4 years (2015-2019)
- Consortium: 13 partners / 7 European countries
- Coordinator: Laboratory of Soft Energy Applications and Environmental Protection, University of West Attica
- Greek Partners: HEDNO, Eunice, WWF Hellas, Eurosol
- Countries Involved:

  Greece, Germany,

  France, Italy, UK,

  Spain, Sweden

TILOS PROJECT IMPLEMENTATION STEPS AND TARGETS

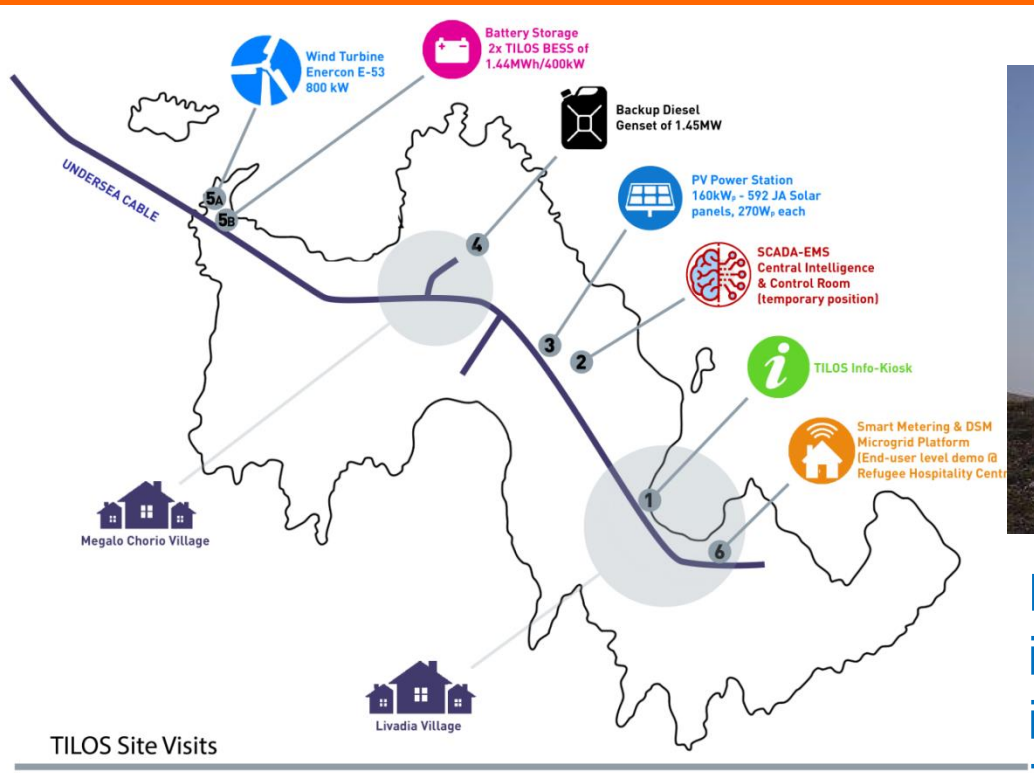
The main objectives of this pioneer solution include:

- The development of an integrated Smart Micro-grid on the island of Tilos.
- The development of the first ever battery-based island HPS in the Mediterranean area.
- The roll-out of Smart Meters and DSM Devices in the Tilos residential sector as well as in centralized deferrable loads (e.g. water pumps).
- The design and implementation of Novel DSM Strategies

The main targets of this project are:

- Support Energy Supply Security of Tilos island
- Achieve Energy Autonomy (oil reduction) in the order of 70%-75%
- Achieve Energy Exports to the system of Kos dedicated to Peak Shaving
- Demonstrate the Green Island Solution

TILOS PROJECT MAIN COMPONENTS (1/2)



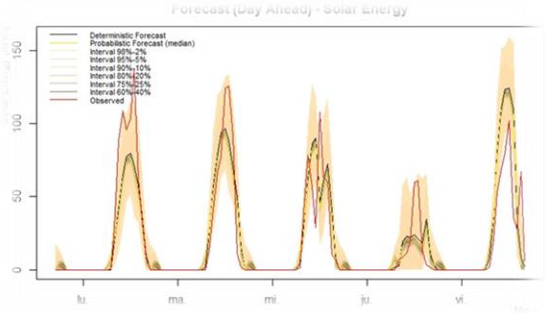
E-53 wind turbine of 800kW, installed July 2017, north side of the island, next to the subsea cable junction. Annual energy yield of ~2.1GWh, equal to 70% of Tilos island annual electricity demand

PV power station of 160kW$_p$, @30° tilt angle, June 2017, expected to contribute ~280MWh of clean energy on an annual basis, 10% of Tilos island demand

TILOS PROJECT MAIN COMPONENTS (2/2)

The advanced BESS of TILOS comprises of the FZSoNick NaNiCl2 Battery and the IDT Inverters, for both island and grid-connected applications. Battery capacity 2.88MWh, ~12h of autonomy for Tilos; nominal power of 800kW, close to island peak

TILOS SM & DSM Platform is a hardware /software one supporting advanced metering & control. 150 end-users (*mainly residential consumers*) and 8 pumping stations; Mesh Wi-Fi communication & 2 central collection points



TILOS (FP) supports the automatic execution of forecasting models for the prediction of load demand and RES power generation, facilitating smart management of the micro-grid

RECAPITULATION MAIN CONCLUSIONS

The majority of electricity demand of Aegean Archipelagos islands is still covered by outdated TPS using imported and heavy polluting oil, despite the excellent RES potential of the area. On top of this the electrical power offered is of medium quality, while the electricity supply security is problematic.

In this context, an integrated solution is proposed for most remote islands, incorporating the Tilos EU project experience in order to improve the life quality and the energy security of the local population at reasonable financial cost, significantly reducing the contribution of expensive-imported oil in the local fuel mix and ameliorating the environmental performance of the island.

To this end the integrated clean-green solution of TILOS project may be equally well be applied in most Aegean Archipelagos islands of any size.

Thank You
for Your Attention