



Clean Energy for EU Islands



**Sustainable Transformation of Greek Islands
into Energy Neutral or Positive Islands.**

Problems and Prospects

March 2022
Heraklion Greece

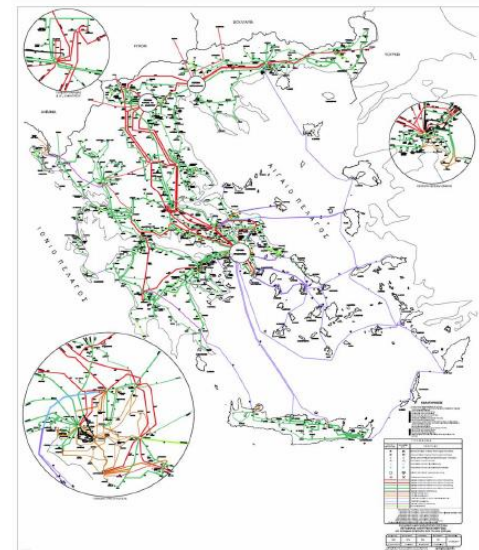
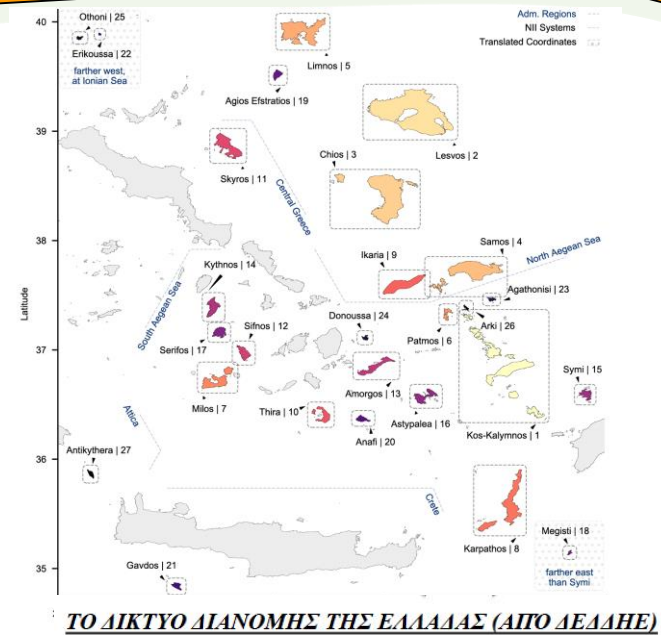
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Introduction

Energy Vulnerability Index

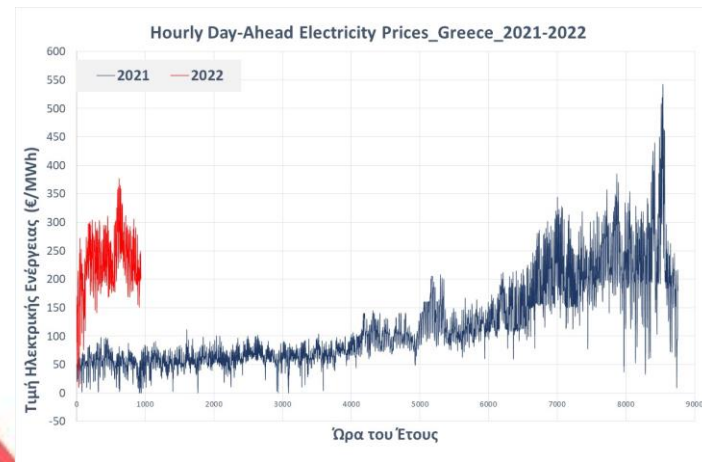
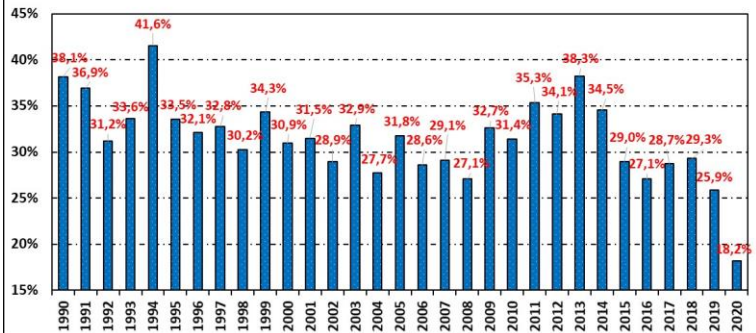
- Climate crisis affects strongly the islands, with small-scale islands perceived as the most vulnerable environments.
- Greece has a large number of islands of various sizes, with more than two hundred (≈ 227) being inhabited.
- **Greek islands are divided in two large categories**, i.e. the electrically interconnected to the mainland and the non-interconnected ones.
- Under the Territorial Just Transition Plan for the islands, a variety of actions is proposed for these islands including energy transition and climate neutrality, circular economy and efficient use of resources, sustainable urban mobility etc.



Ενεργειακή Επιλογή-Ενεργειακό Τρίλημμα

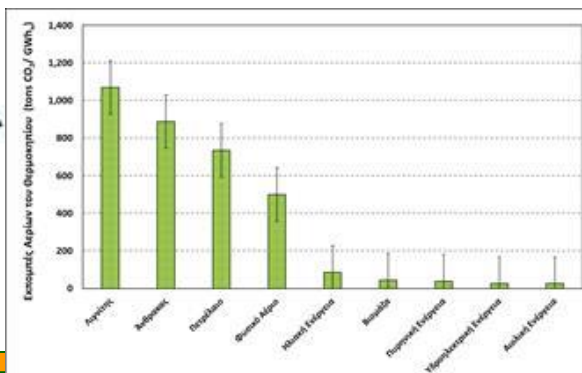
ΕΠΑΡΚΕΙΑ ΕΝΕΡΓΕΙΑΚΟΥ ΕΦΟΔΙΑΣΜΟΥ

Ενεργειακή Ανεξαρτησία Ελλάδα (1990-2020)



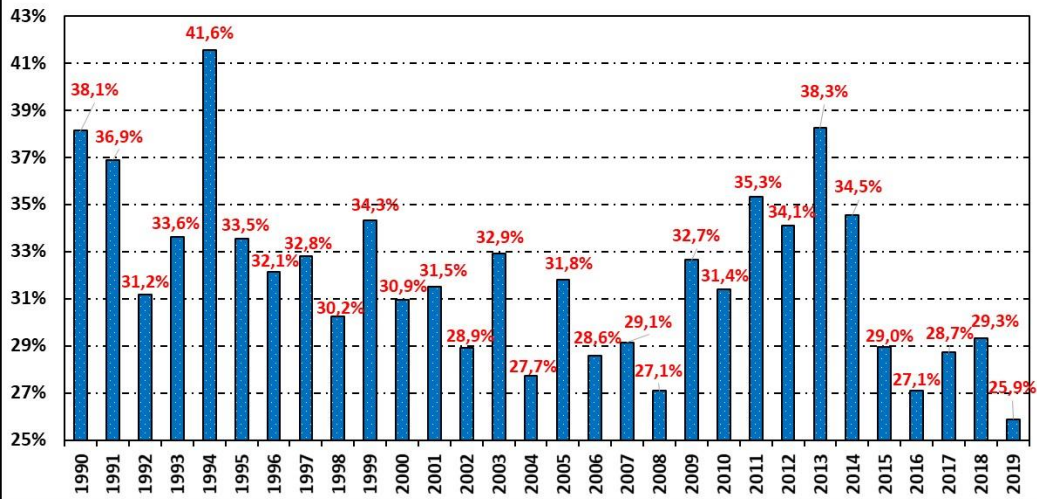
**ΠΡΟΣΒΑΣΙΜΟΤΗΤΑ
ΣΤΗΝ ΕΝΕΡΓΕΙΑ /
ΧΑΜΗΛΟ ΚΟΣΤΟΣ**

**ΠΕΡΙΒΑΛΛΟΝΤΙΚΗ
ΑΕΙΦΟΡΙΑ / ΠΡΟΣΤΑΣΙΑ
ΤΟΥ ΠΕΡΙΒΑΛΛΟΝΤΟΣ**



Ενεργειακή Επιλογή-Ενεργειακό Τρίλημμα

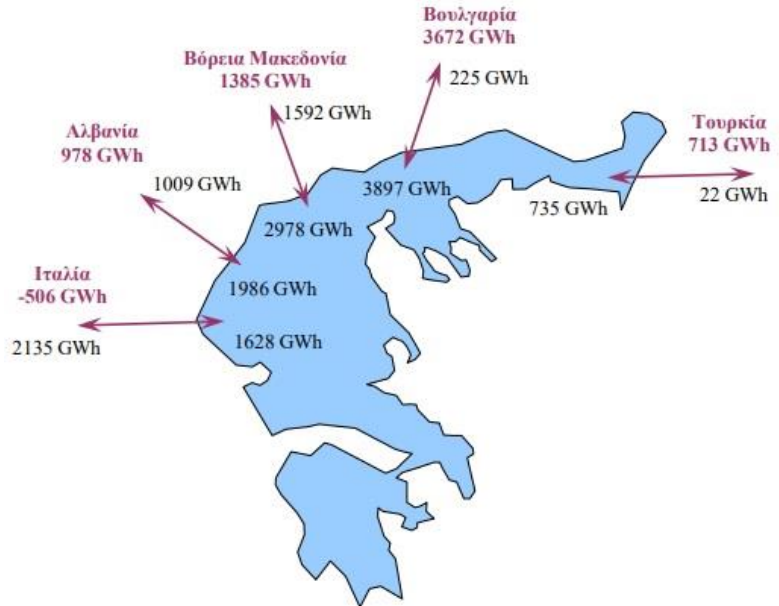
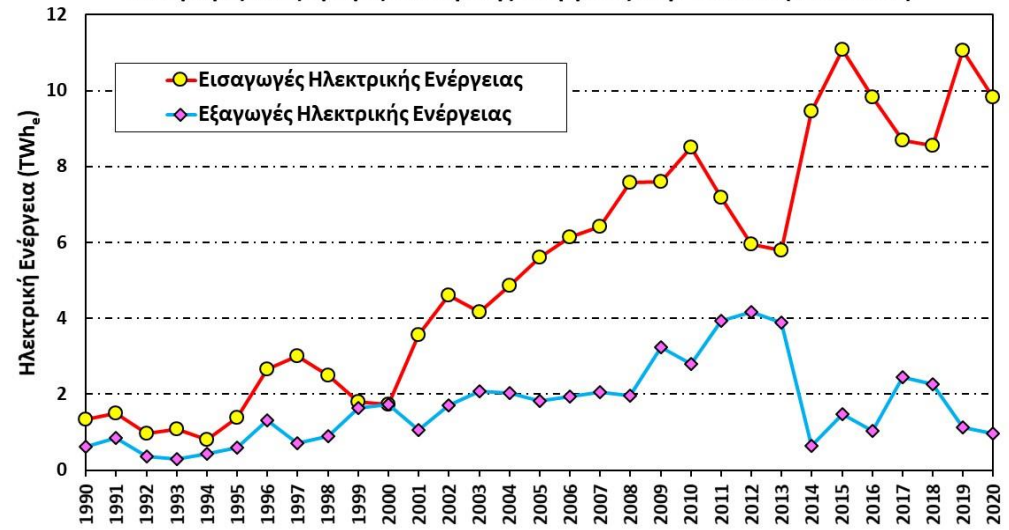
Ενεργειακή Ανεξαρτησία Ελλάδας (1990-2019)



Οι αγωγοί φυσικού αερίου μέσω Ελλάδας



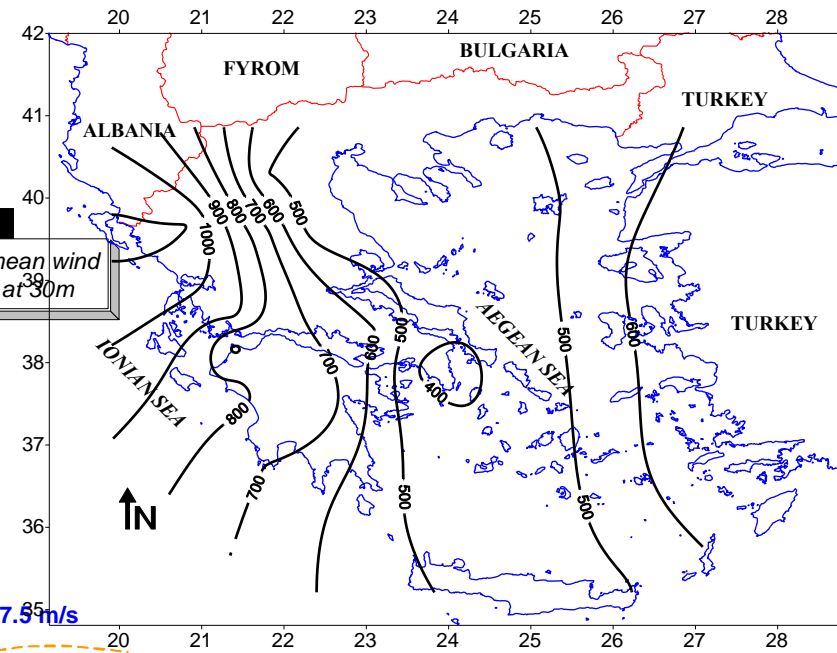
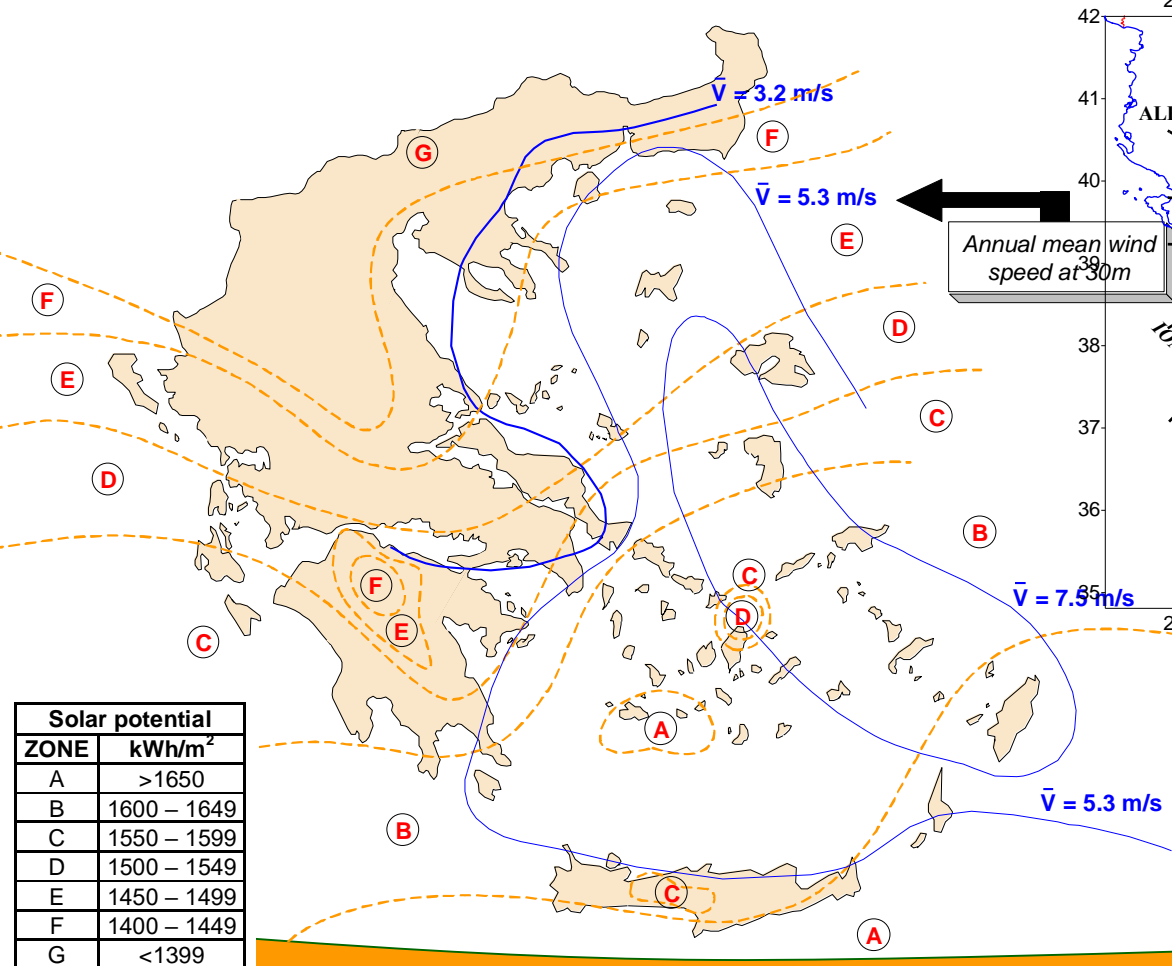
Εισαγωγές vs Εξαγωγές Ηλεκτρικής Ενέργειας στην Ελλάδα (1990-2020)



Main Islands Characteristics

The majority of Aegean and Ionian Archipelagos islands have an excellent wind potential (the annual mean wind speed at 10m height exceeds 9m/s) and very high solar potential

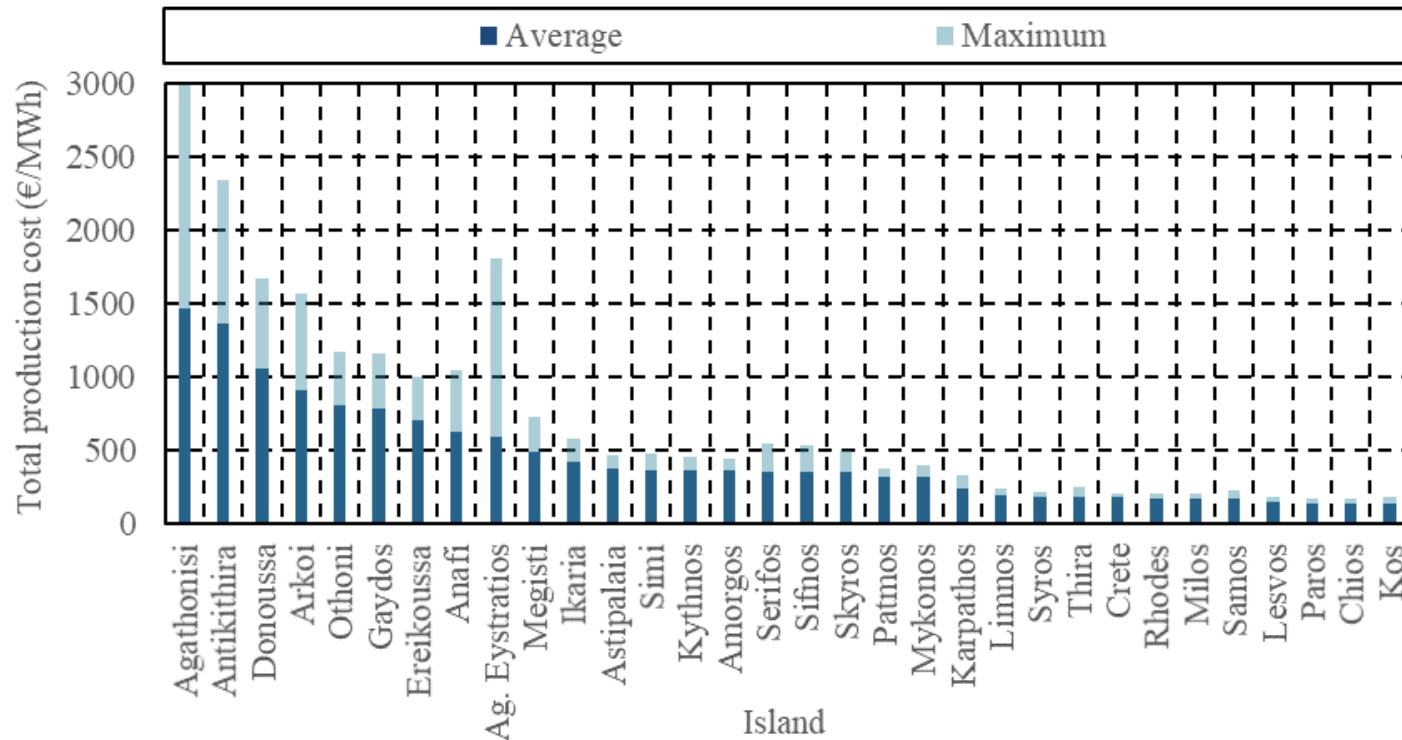
WIND & SOLAR ENERGY IN GREECE



Solar potential	
ZONE	kWh/m ²
A	>1650
B	1600 – 1649
C	1550 – 1599
D	1500 – 1549
E	1450 – 1499
F	1400 – 1449
G	<1399

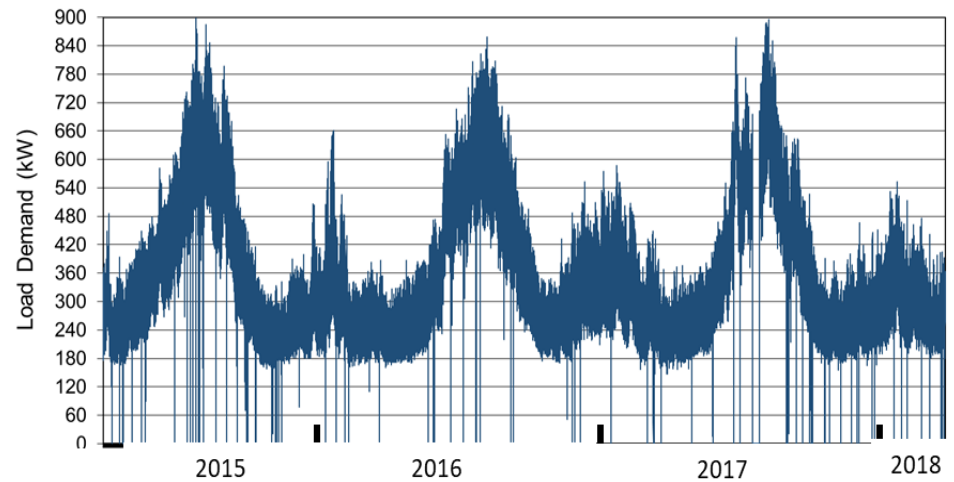
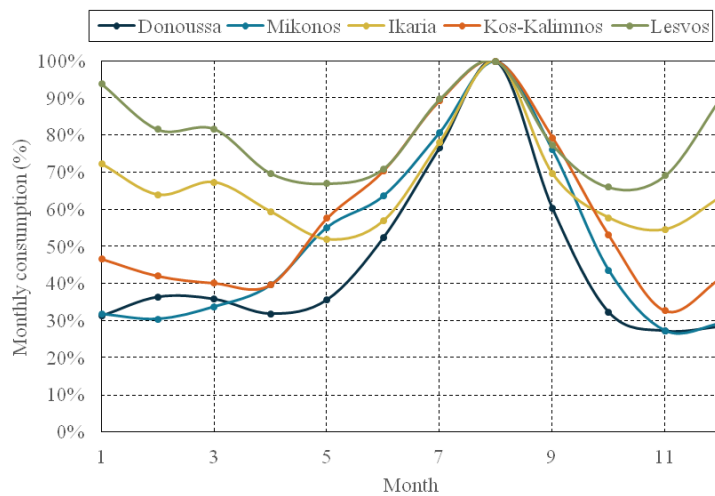
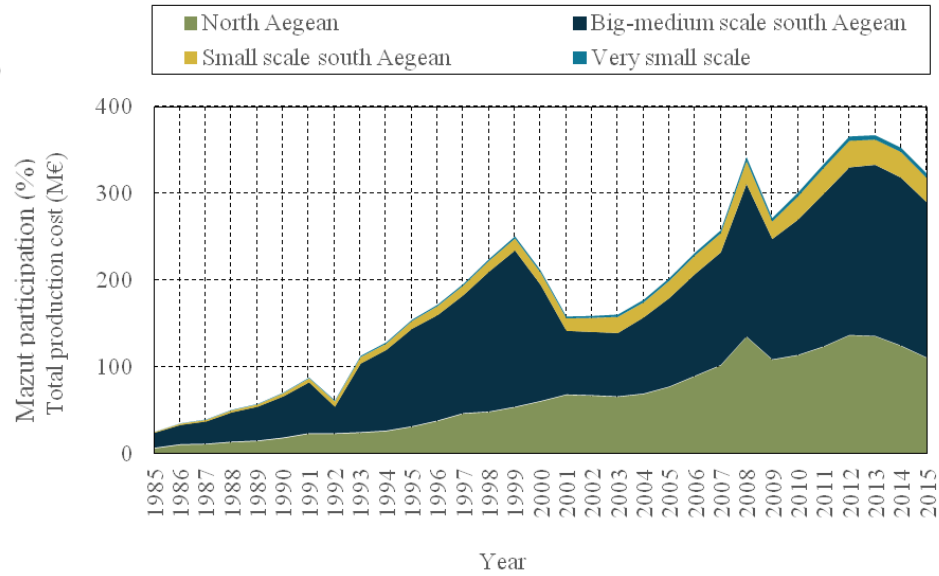
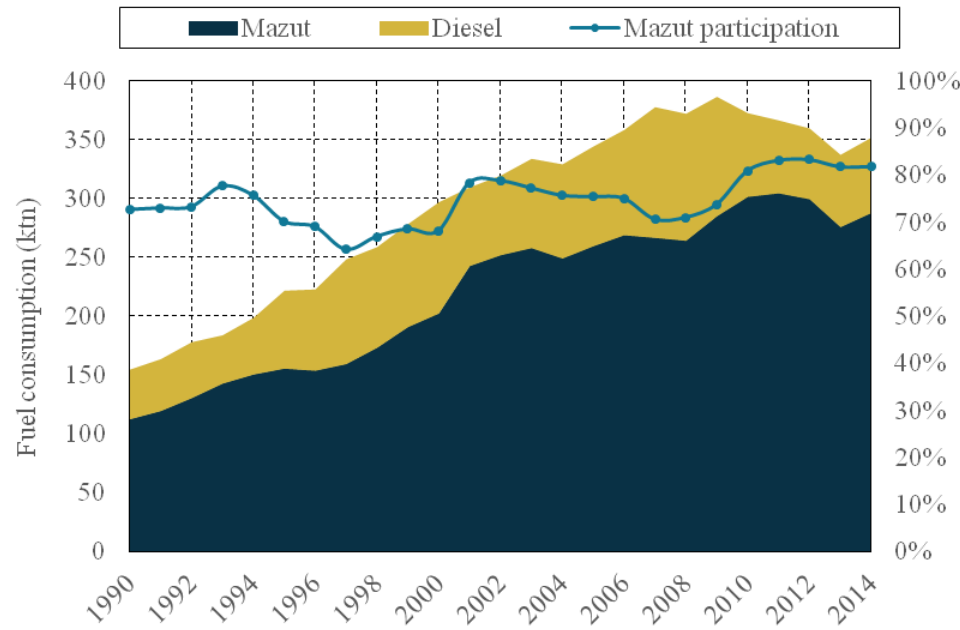
Current Situation-Electricity

- Up to now, the electricity requirement has been **hardly fulfilled** by the existing outdated autonomous power stations, at very high fuel consumption values

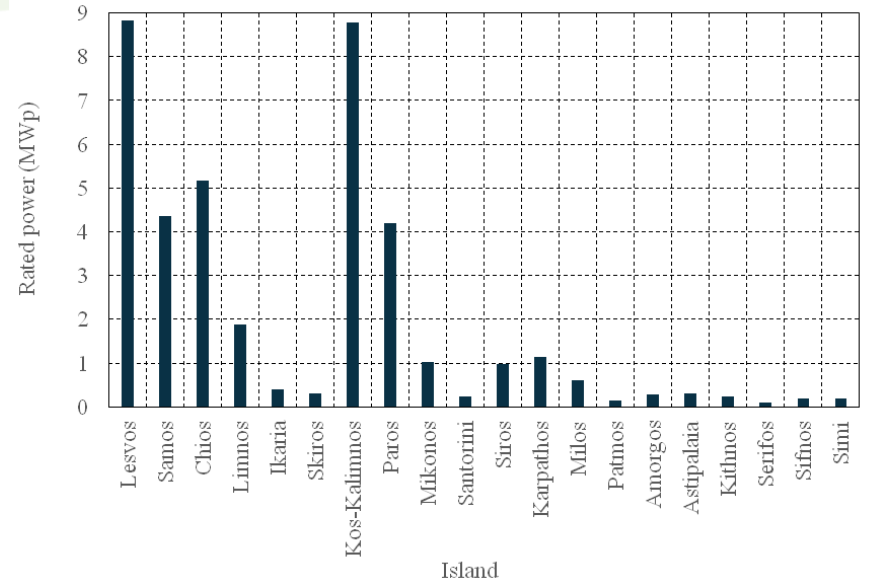
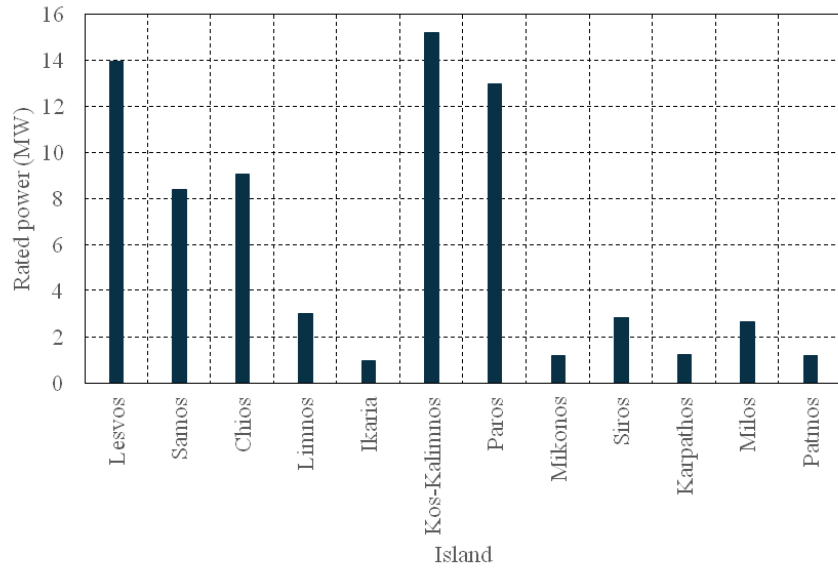


- For the near future, the establishment of new electricity production plants is an **extremely urgent** engagement

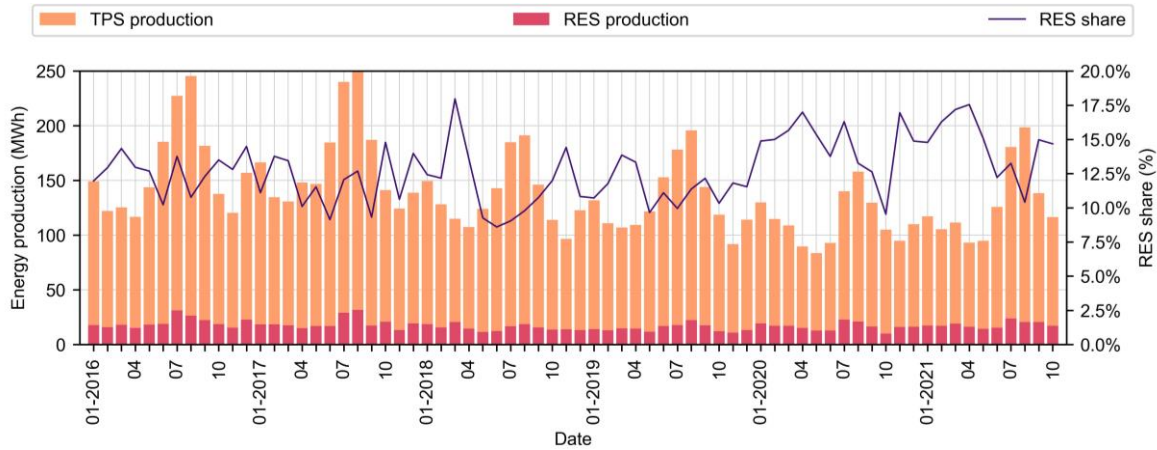
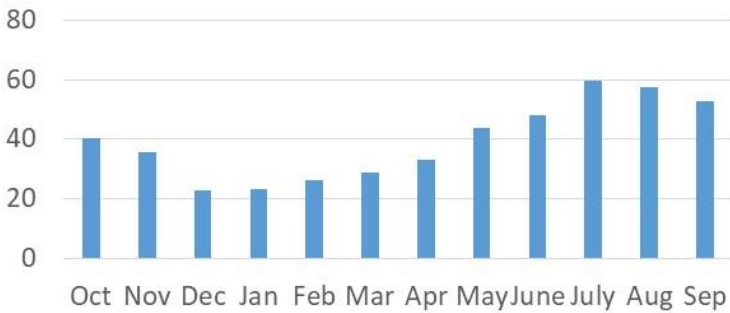
Current Situation-Electricity



Current Situation-Electricity

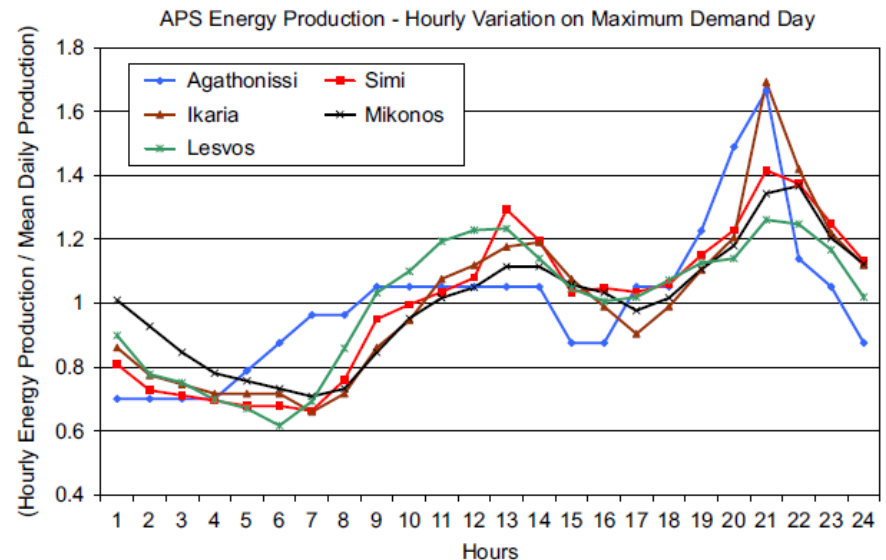
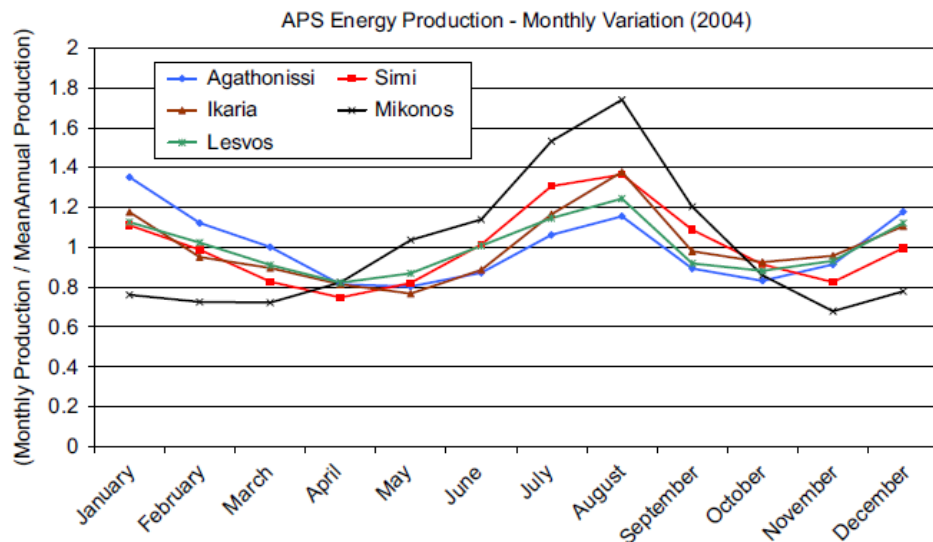


Desalination Plant Energy Consumption (MWh_e)



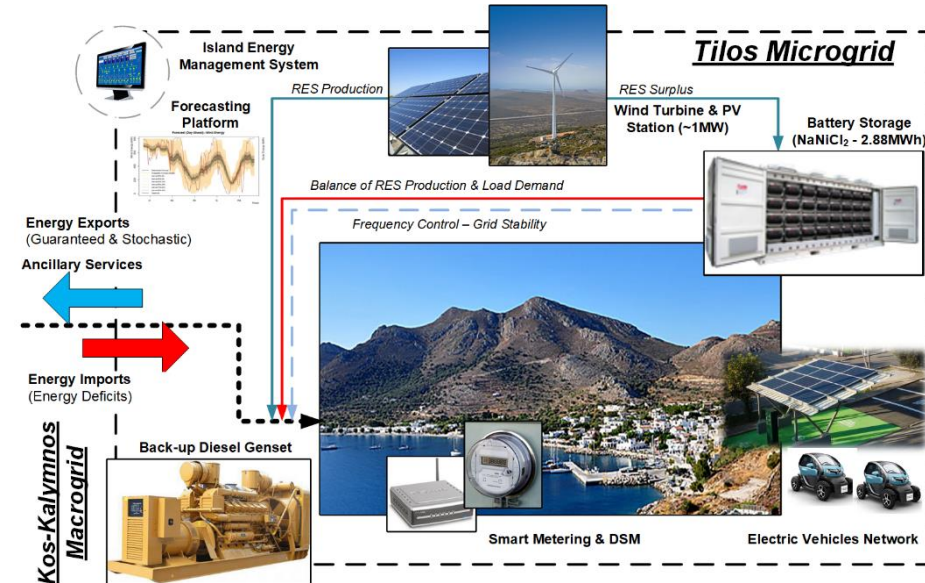
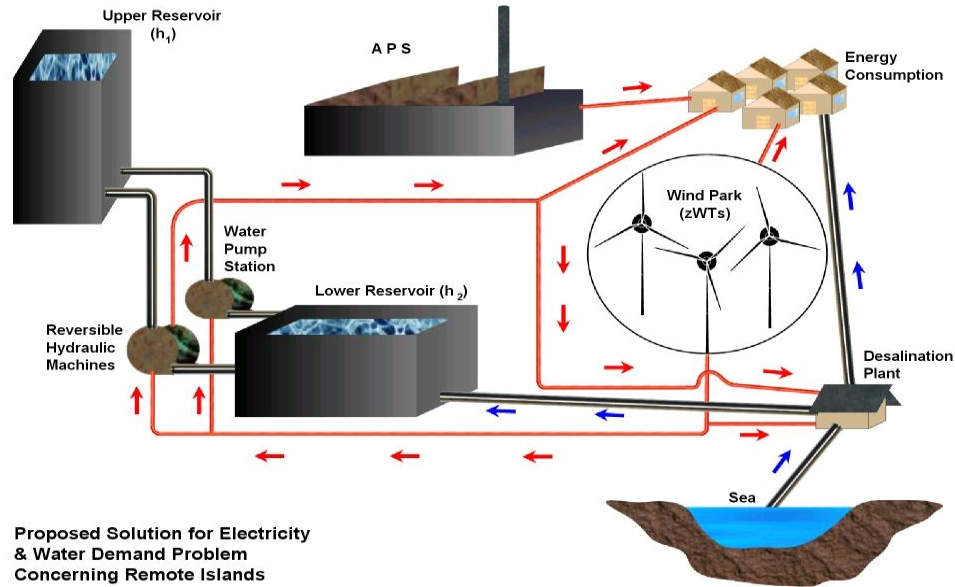
Main Islands Characteristics

- The stochastic availability of wind energy and the limited availability of solar irradiance
- The limited local electrical network capacity
- The daily and seasonal electricity demand fluctuations
- The electricity consumption during summer season (June-August) which in most islands represents **more than 40%** of the total annual consumption
- The corresponding peak load demand which is usually **two or even five** times greater than the mean annual electricity demand



result in serious restriction of the maximum RES penetration

Ενίσχυση Αξιοποίησης των ΑΠΕ στα Νησιωτικά Δίκτυα



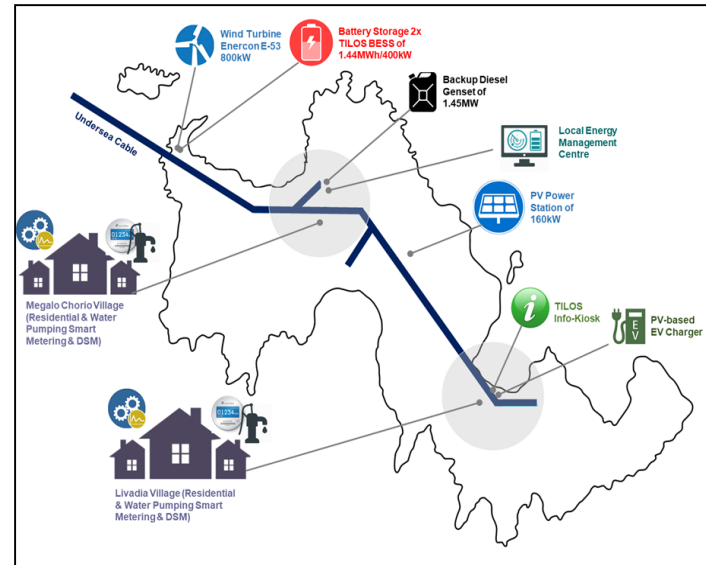
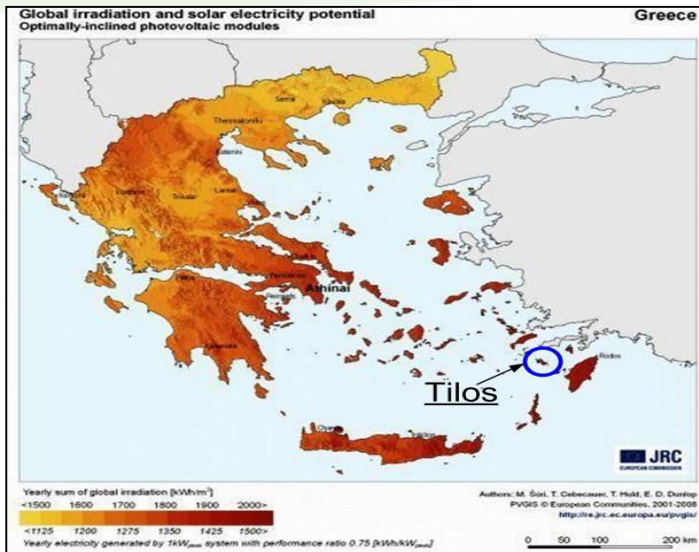
Μεγάλα & Μεσαία Νησιωτικά Δίκτυα

Μεσαία & Μικρά Νησιωτικά Δίκτυα

Existing Projects-Lessons to learn (1/5)

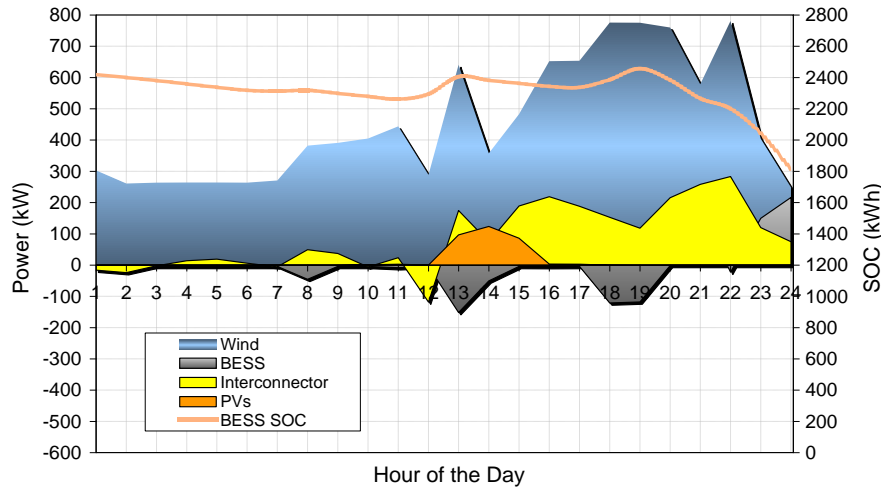
- "TILOS" project. It was an innovative European demonstration project under the European funding Horizon 2020 program, with its main objective being the development of an integrated RES energy system supported by local-scale battery storage and advanced energy management.
- The pilot project "Ai Stratis - Green Island" is included in the Operational Program "Competitiveness-Entrepreneurship-Innovation 2014-2020". The project aims 85% of the Agios Efstratios island's energy consumption to come from RES.
- The water- PHS station of Ikaria island has been developed by PPC Renewables. This hybrid power station is based on the operation of a small wind park of 3MW in collaboration with an appropriate pumped hydro storage installation.
- The ambitious partnership of the island of Astypalea with Volkswagen (*to implement a model for smart, emission-free mobility*) and the Green island project in Halki, supported by the Greek government are two new projects.
- Unfortunately, ...

Existing Projects-Lessons to learn (2/5)

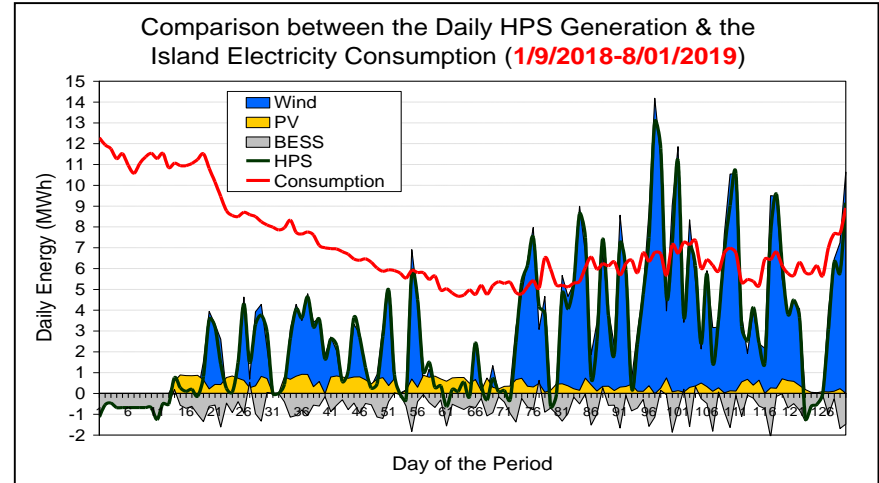


Existing Projects-Lessons to learn (4/5)

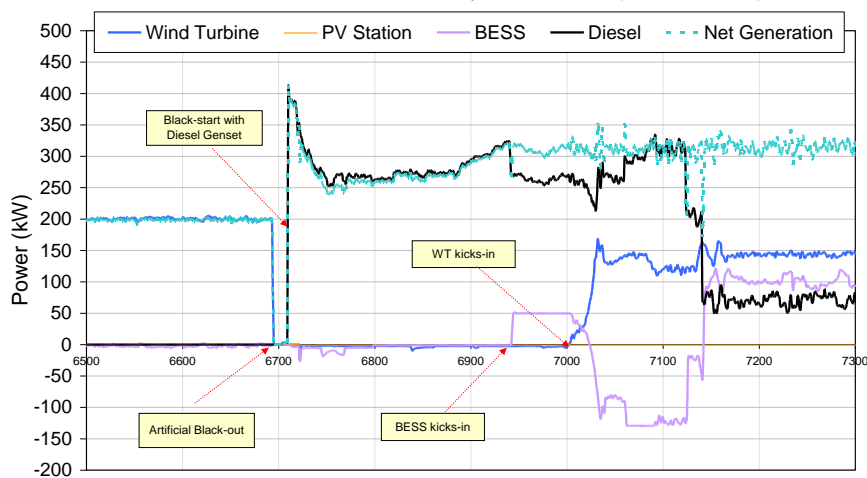
Load-Following + Exports Test_16 January 2019_Tilos Balance



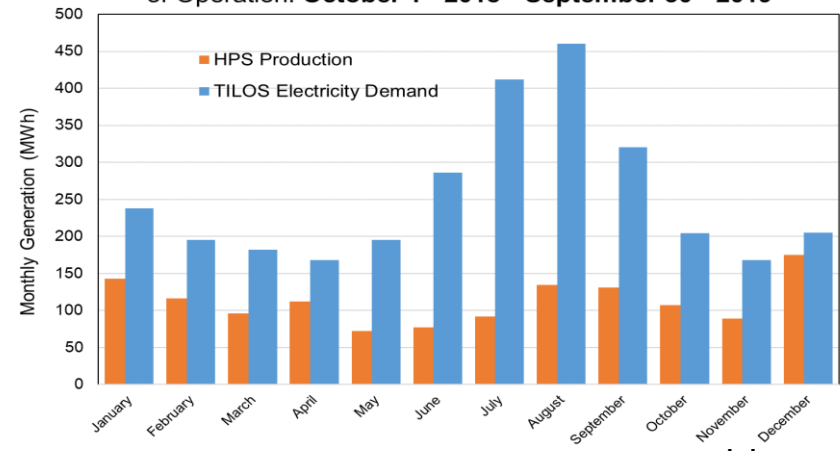
Comparison between the Daily HPS Generation & the Island Electricity Consumption (1/9/2018-8/01/2019)



Island Tests - Tilos Recovery_31012019 (11:00-11:15)



Monthly HPS Absorbed Energy Output - 1st Year of Operation: October 1st 2018 - September 30th 2019



Existing Projects-Lessons to learn (5/5)



Greco-Islands Initiative (1/2)

- To address the above challenges related to local people status of living and the attraction of high quality touristic activity, radical changes are required in energy and water consumption, energy production, mobility and the available tourism infrastructure. For this reason, development of a **holistic concept** for **sustainable** tourism should be explored.
- A consensus has been reached that the opportunities offered by the ERDF and the Cohesion Fund, in combination with the significant budget made available through the Recovery and Resilience Facility, offer a unique opportunity for a **considerable shift towards sustainable energy** production and more efficient energy consumption.

Greco-Islands Initiative (2/2)

- The **concept of “GReco Islands”** aims to make a number of tourism-dependent islands **energy neutral** or energy positive. In combination with decisive actions towards the greening of tourism, state of the art waste and water management and e-mobility, this would allow for the establishment of a **circular economy profile** that could also be used as part of the **branding** and destination management for these islands.
- The establishment of a **Task Force on Green Islands** has been agreed, with the following **main objectives** :
 - *Identify certain islands (small islands in particular at the beginning) in order for a holistic approach (energy / environment) to be implemented.*
 - *Facilitate the project maturation process, so as to create a project pipeline ready for implementation.*
 - *Facilitate the attraction of investors in the field of energy and the environment.*
 - *Prepare a realistic roadmap to be used in case that similar island cases.* 17

Objectives

The objectives of the entire project include the **motivation of all Greek islands** that are willing to take part in the **GReco-islands initiative**, under the condition that after the completion of the operations funded through the initiative, the selected islands will have achieved **specific targets** in all the predefined categories of actions.

After the implementation of the aforementioned actions, the specific islands will receive the **label "GReco-island"**, to be used as an element to characterize the island as an **ideal and special** tourist destination.

For the successful implementation of the "GReco-islands" initiative three **critical steps** are identified:

- ✓ *The need to obtain and maintain/sustain a true and **long-term** local ownership and commitment (Tilos style)*
- ✓ *The necessity for the agreement of a multi-annual investment strategy with pre-determined **project deliverables/objectives***
- ✓ *The requirement for **support** during implementation*

Conclusions

The GReco-islands initiative is an **optimum development occasion** for the reviving of several **remote** medium and small size **islands** of Greece (and EU) scattered all around Aegean and Ionian Archipelagos.

In view of the **GReco-islands concept**, all these islands may obtain **clean-green** electricity on the basis of local RES potential, improving at the same time their **water reserves**. Moreover, the introduction of clean electro-mobility, optimum waste and water management and improved telecommunication services will strongly **support the economic and touristic activities** of the local communities.

The project under preparation targets to **contribute** in this entire GReco-islands initiative, minimizing the **environmental impacts** and inverting the **climate change**, via a close collaboration with EU and National authorities as well as in accordance with the choices of the local authorities, stakeholders and most importantly **respecting the will of the local people**.

GReco-Islands Initiative Support

by Prof J.K. Kaldellis

Thank you very much
for your time and your attention...

