SEALAB

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Εργαστήριο Ήπιων Μορφών Ενέργειας & Προστασίας Περιβάλλοντος
Τμήμα Μηχανολόγων Μηχανικών ΤΕ, ΑΕΙ ΠΕΙΡΑΙΑ ΤΤ

GENERAL INFORMATION (www.sealab.gr)

SEALAB is part of the officially approved ENERGY Lab (Off. Gaz, 1041, 03-06-2015) and belongs to the Mechanical Engineers Department of PIRAEUS UNIVERSITY OF APPLIED SCIENCES (former TEI of Piraeus)

SEALAB has been founded during the end of 80’s and practically starts its activities during 1991 with the support of Prof Pericles Koronakis.

The SEALAB collaborates with many Laboratories and Institutes in Greece and abroad. Its main partners are the Lab of Optimisation of Production Systems, the Lab of Fluids and Turbomachinery and the Centre of Technological Research of Piraeus and Islands, affiliated with PUAS.
Members of SEALAB and OPS Research and Educational Team are:

1. J.K. Kaldellis (Head of SEALAB) 7. Takis Ktenides
2. E.M. Kondili (Head of OPS Lab) 8. George Xydis
4. George Spyropoulos 10. Dimitrios Apostolou
6. Christiana Papapostolou 12. Rania Vardaki

SEALAB main activities include **EDUCATION, RESEARCH, CONSULTING ACTIVITIES**

We provide high level of education and we carry out applied research within the context of national and EU funded projects, in collaboration with public and private entities, for the last 25 years

Main research interests:

1. Wind, Solar Energy and Hydro
2. Energy Storage-Hybrid Energy Systems
3. Green Island / Smart Grid Concept
4. Building Energy Efficiency
5. Integrated Energy & Water Schemes
6. Electric Vehicles
**Under-Graduate Courses**

*SEALAB* supports several Theoretical and Laboratory Courses:

- Environment & Industrial Development (3rd Semester)
- Renewable Energy Sources (4th Semester)
- Hybrid Energy Systems-Energy Saving (5th Semester)
- Building Energy Saving and Auditing (6th Semester)
- Air Pollution and Antipollution Technologies (6th Semester)

*Participating also in several other courses in collaboration with the other Members of Mechanical Engineers Dept.*

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**MSc PROGRAMMES**

*SEALAB* supports two MSc Programs:

- **MSc in Energy Systems**, in collaboration with the UK-Heriot Watt University, since 2006 (Specialization *Renewable Energy Technologies OR Energy Systems Design*) [www.sealab.gr](http://www.sealab.gr)

- **MSc in Energy and Environmental Investments** (new autonomous program) [www.mbaenergy.gr](http://www.mbaenergy.gr)
BOOK PUBLICATIONS

**SEALAB** long-term experience in the field of RES and Environmental Protection supported by numerous journal publications and established national and international book editions such as the:

*Comprehensive Renewable Energy* by Elsevier  
Editor of Volume 2 (Wind Energy): John Kaldellis

*Stand-Alone and Hybrid Wind Energy Systems* by Woodhead

RESEARCH PUBLICATIONS

**SEALAB** long-term experience in the field of RES, supported by numerous journal publications and established national and international book editions such as the:
SEALAB is an:

**Accredited Educational Body** for the training of Building Energy Auditors

**Accredited Inspection Body** for the installation & operation of both roof & large-scale PV Power Systems

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**PV-BATTERY EV CARPORT**

Self-funded, stand-alone & grid connected solar-based EV charging station, with the contribution of Greek and foreign industrial partners

3kW of PVs and ~18kWh of battery storage

Station upgrade will welcome the introduction of an integrated hydrogen unit and a wind turbine along with smart interaction with the local grid
INTEGRATED WASTE MANAGEMENT SYSTEM FOR THE SOUTH ATTICA MUNICIPALITIES OF ALIMOS-ELLINIKO-GLYFADA-ARGYROUPOLI

PROJECTS WITH MUNICIPALITIES

SEALAB has contributed to the:

Bioclimatic Renovation of the TEIP
Budget of 3,500,000 €

Energy Efficiency Interventions in the TEIP
Budget of 3,000,000 €
STAND-ALONE PV-STORAGE SYSTEM

SEALAB has contributed to the study of:

Installation & Operation of a Stand-Alone PV-Storage System for Covering Electricity Needs of TEI Buildings
Budget of 1,200,000 €

Rooftop PV system (200kW)
Adjustable angle solar mounting
Distributed energy storage
Batteries (useful storage of 200kWh)
Fuel cell power generator (5kW)

ONGOING RESEARCH PROJECTS
**FP7 PROJECTS**

**CREATING INNOVATIVE SUSTAINABILITY PATHWAYS ACROSS EUROPE (CRISP)**

- **Framework:** 7th Framework Programme
- **Total Budget:** ~1.5M€
- **Duration:** 36 months

**NATIONAL PROJECTS – Archimedes III**

**COMPARATIVE EVALUATION BETWEEN HYDROGEN AND OTHER, CONVENTIONAL ENERGY STORAGE TECHNOLOGIES FOR THE SUPPORT OF RES-BASED POWER STATIONS**

- **Framework:** NSRF 2007-2013
- **Developer and Supplier of Integrated H₂ Solutions**
- **Total Budget:** 100.000€
- **Duration:** 36 months
NATIONAL PROJECTS – Archimedes III

DEVELOPMENT OF A DETAILED SOLAR MAP FOR THE ENTIRE GREEK TERRITORY

- Framework: NSRF 2007-2013
- Total Budget: 100,000€
- Duration: 36 months

COLLABORATIVE PROJECTS (Hellenic-French)

PROMOTION OF SUSTAINABLE ENERGY AND WATER MODELS FOR MEDITERRANEAN ISLAND REGIONS (NAPOLEON)

- Framework: NSRF 2007-2013
- Partners: University of Corsica
- Total Budget: 30,000€
- Duration: 24 months
**HORIZON 2020 - PROJECT TILOS**

**Project Title & ID**
TILOS - 646529
Technology Innovation for the Local Scale, Optimum Integration of Battery Energy Storage

**Project Budget**
EU Funding: ~11M€ - Total Grant: ~14ME

**Project Duration**
Duration of 4 years - Start Date: 1/2/2015

TILOS aims to demonstrate the optimal integration of local scale energy storage in a fully-operated, smart island microgrid that will be developed on the island of Tilos (South-eastern Aegean Sea) and that will also communicate with a main electricity grid through cable interconnection.

**MAIN OBJECTIVES of TILOS**

The main objective of TILOS will be the development and operation of a prototype battery system based on NaNiCl₂ batteries supporting multiple tasks, including:

- Synergy with wind and PV power
- Microgrid energy management
- Maximization of RES penetration
- Grid stability
- Export of guaranteed energy
- Ancillary services to the main grid
- Synergy with DSM

The battery will support both stand-alone and grid-connected operation, while proving its interoperability with the rest of microgrid components, such as smart meters, demand side management devices and distributed, residential heat storage.
PHAROS – ARISTEIA II RESEARCH PROJECT

AN INTEGRATED PLANNING TOOL FOR MEETING THE ENERGY AND WATER NEEDS OF AEGEAN SEA ISLANDS USING OPTIMUM RENEWABLE ENERGY SOURCES HYBRID SYSTEMS (PHAROS)

- Framework: NSRF 2007-2013
- Partners: OSMO (Developer & Supplier of RO Desalination Units)
- Total Budget: 300,000€
- Duration: 18 months

SEALAB Experimental Hybrid RES unit

The existing experimental hybrid RES unit (small wind turbine, PV, batteries) was upgraded, by adding a reverse osmosis desalination unit, suitable for the under scale experimental simulation of various RES hybrid schemes.

Existing Hybrid RES unit + RO desalination unit
A Database (Database-SL) Tool, with an Integrated GIS Tool is developed

- built in C# (C Sharp)
- Long-term meteorological data for many small and medium size islands of the Aegean Sea
- Water transfers data
- Load, heating, and fuel demand annual data
- Geographical information (Natura sites, protected areas, infrastructures etc) for the siting and installation of HS in the islands examined.

Reporting (deliverables):

- Report on green, state-of-the-art technologies for covering energy and water supply needs (del. 3.1)
- Tools implementation and Case Studies (del. 6.1)
- An integrated plan (final project report) for covering the energy and water demand needs of small and medium size Aegean island regions (del. 7.1)
- A number of conference announcements
- Peer-reviewed Journal publications on the way

In depth Analysis of Islands

Results for the Islands:

- Ag. Efstratios
- Donousa
- Karpathos
- Skynos
- Amorgos
- Astypalaia
- Anafi
- Silinos
- Kos
- Kalymnos
- Megisti
- Rhodes
An integrated planning tool for island RES hybrid systems (ESA tool)

- built in C# (C Sharp)
- Load: meteorological data, wind turbine, PV, Batteries, Diesel Gen, Desalination characteristics
- HS components’ economics
- HS components’ power range
- Analytical Calculations & Results
- Private Investors have already expressed their interest for the tool

WHO WE ARE