

# Welcome to...



**energynautics**  
solutions for sustainable development

4<sup>th</sup> International  
Hybrid Power Systems Workshop

22 - 23 May 2019

Crete, Greece



**by Thomas Ackermann**

Energynautics, Germany

[www.energynautics.com](http://www.energynautics.com)

# Biography Thomas Ackermann

t.ackermann@energynautics.com



**energynautics**  
solutions for sustainable development



## CEO of Energynautics

German-based research and consulting company in the field of renewable generation and power systems

## Diplom Wirtschaftsingenieur

- (MSc in ME and MBA) - Berlin, Germany

## M.Sc. in Physics

- New Zealand

## Ph.D. Electrical Engineering (Power System Deregulation and Distributed Generation)

- Stockholm, Sweden

## Worked as a consultant in the Energy and Renewable Energy Industry for the past 25 years

- Germany, Sweden, Denmark, New Zealand, China, Croatia, Australia, USA, Oman, Chile, India, Philippines, Kenya, Seychelles, Japan, Costa Rica, Barbados, Guatemala, Honduras, Mongolia, Indonesia, Czech Republic, Estonia, Armenia, Lebanon, Vietnam, Austria, United Arab Emirates, Netherlands, Kenya, Bahamas

## Involved in Design of Hybrid Power Systems since 1994

# Motivation for the Hybrid Power System Workshop ?



**energynautics**  
solutions for sustainable development

# History – Hybrid Power Systems Workshop



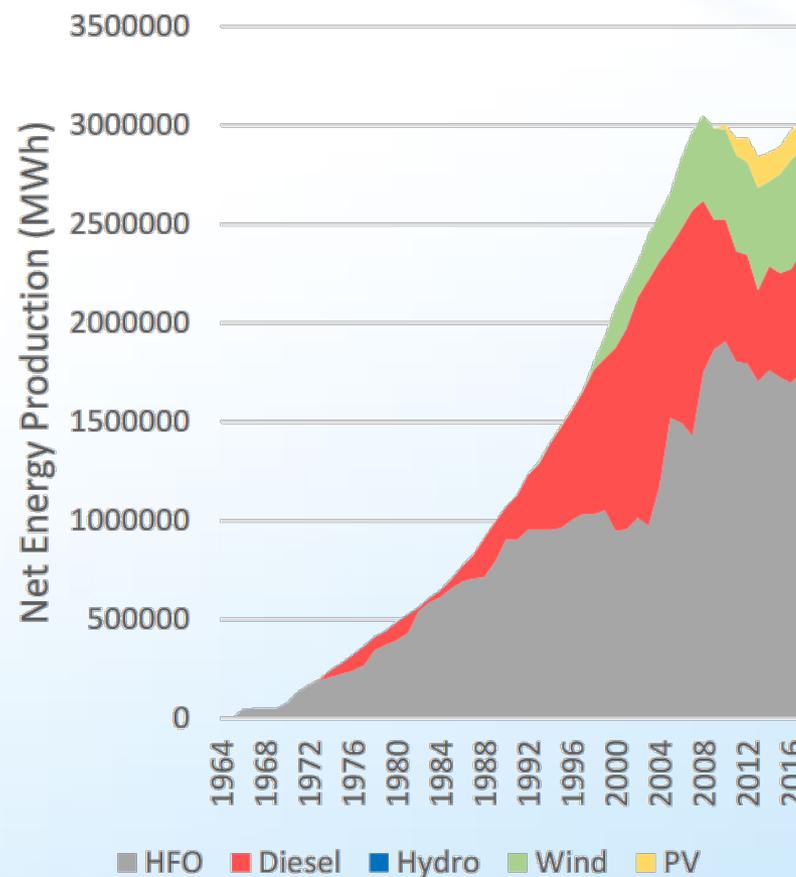


# Crete is not an Exception

- Largest of more than 60 Greek islands without mainland connection
- Below 20% renewable energy generation (expansion stop until connected to mainland, earliest in 3 years)
- High consumption seasonality (tourism)



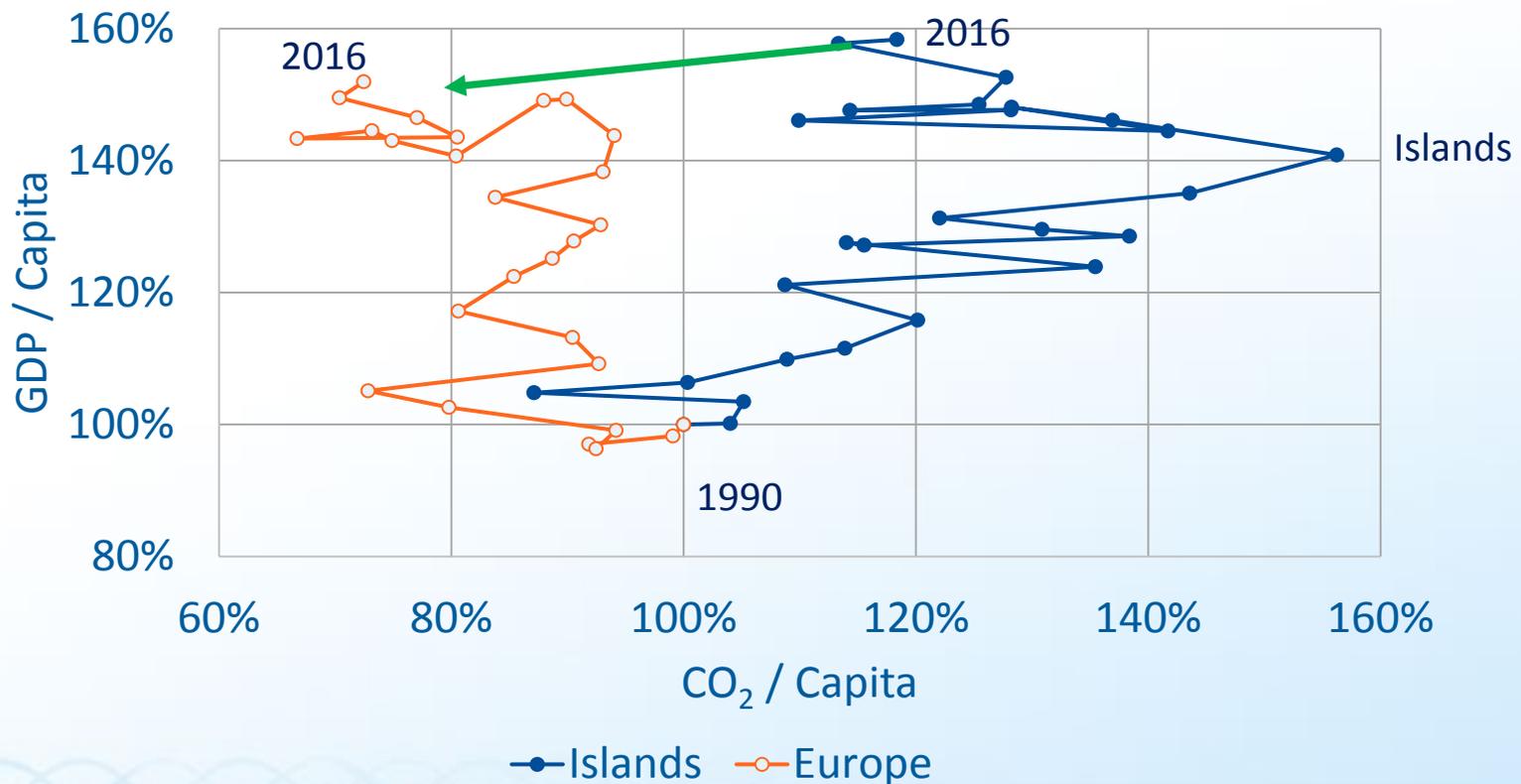
### Net Electric Energy Production by fuel 1964-2017



# Islands vs Mainland

Europe achieved almost same GDP per Capita as the Islands, while at the same time reducing CO<sub>2</sub>-emissions instead of increasing them.

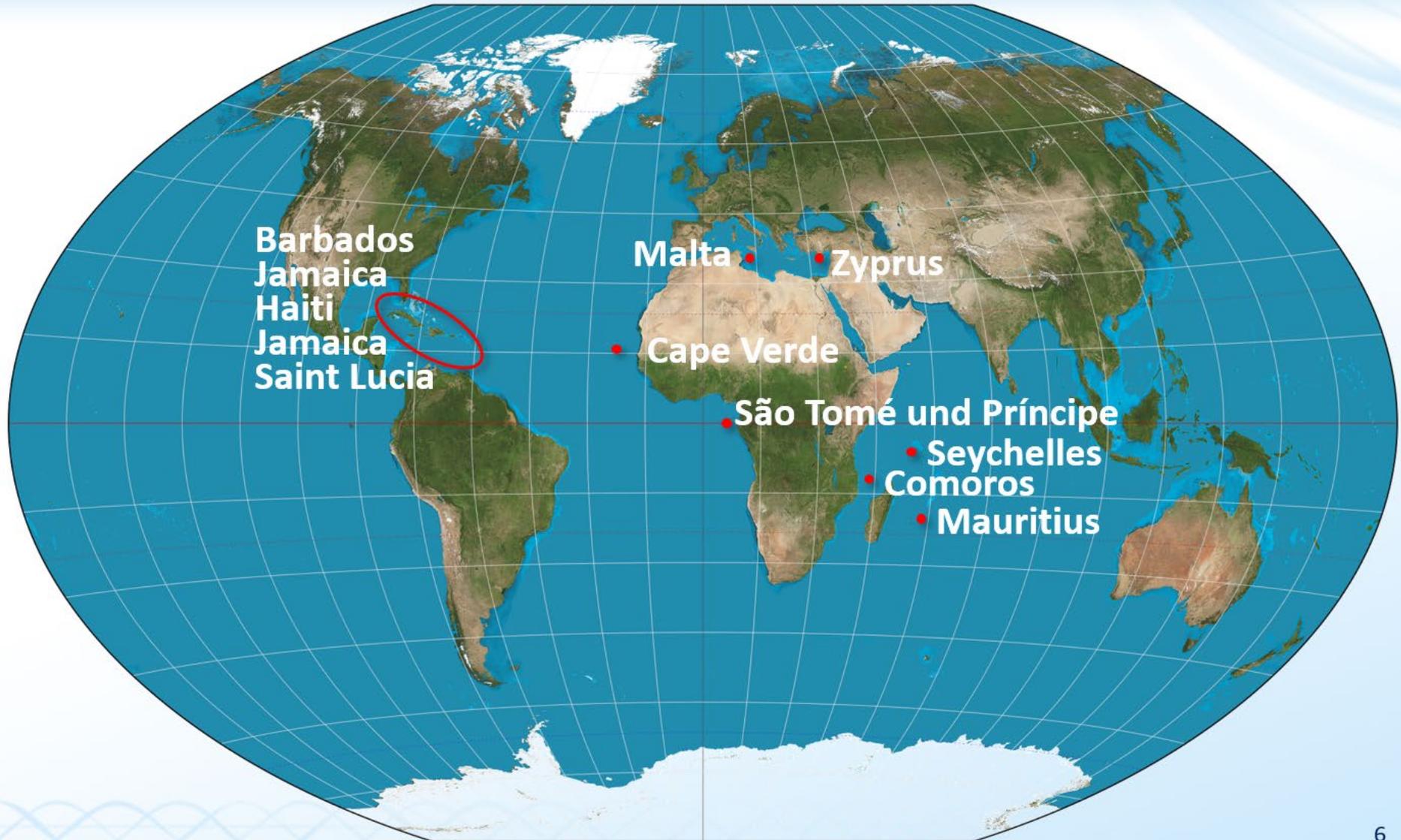
## Normalized Development



# Analyzed Island-States (Population below 1Mio.)



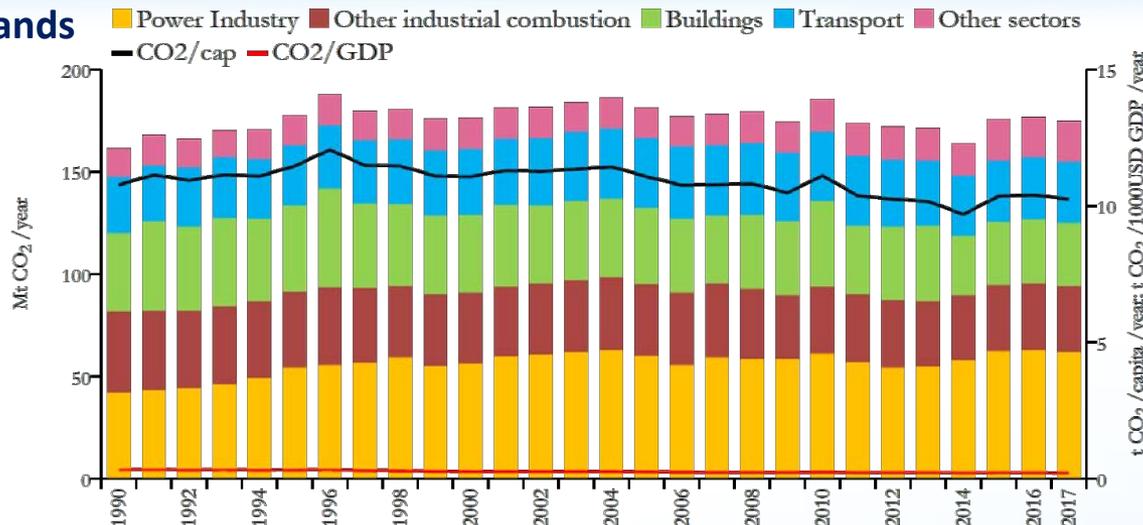
energynautics  
solutions for sustainable development





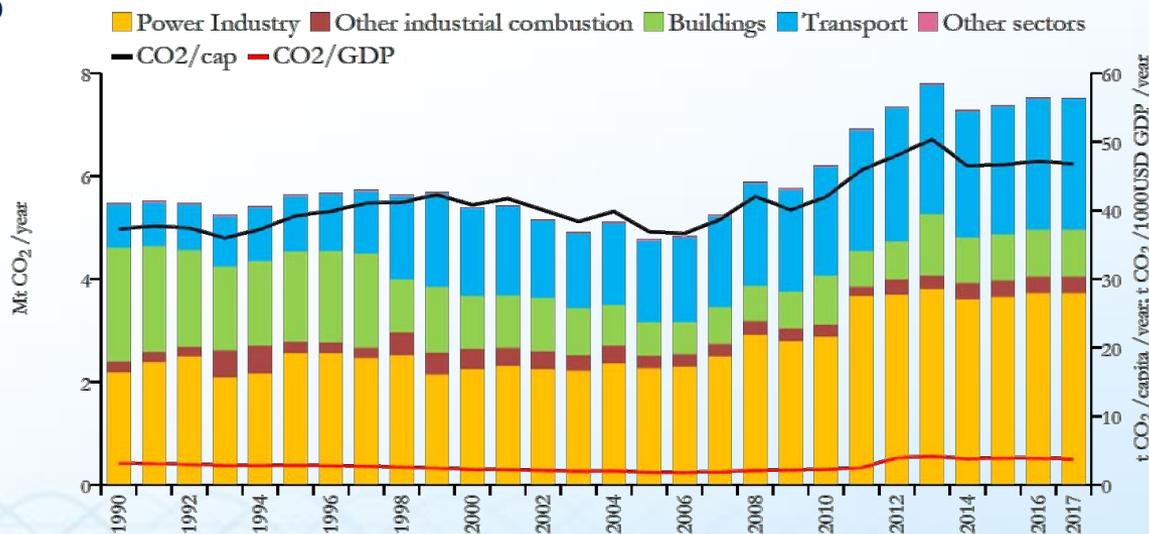
# CO<sub>2</sub>-Development Detail

## Netherlands



- 7% increase since 2007
- 47% increase since 1990

## Curaçao



- 64% increase since 2007
- 69% increase since 1990

4.5 times higher CO<sub>2</sub> emissions per capita

# The Energynautics Team



**energynautics**  
solutions for sustainable development

# Energynautics Team at the Workshop



## Peter-Philipp Schierhorn

Electrical Engineer R&D  
energynautics

- Electrical Engineering with focus on Power Systems, TU Darmstadt



## Dr. Nis Martensen

Senior Research Engineer  
energynautics

- Dr.-Ing. in Energiesystemtechnik, TU Clausthal

# Energynautics Team at the Workshop

## The Workshop Team:



Anke Ost



Ines Drewianka



Katharina Fischer

## The entire Energynautics Team:



# Selected Energynautics Clients & Partners



# Number of Participants of the 4<sup>th</sup> Hybrid Power Systems Workshop

Country	Number
Germany	40
Greece	21
United States	8
Denmark	5
France	5
Spain	4
Indonesia	4
China	4
United Kingdom	4
Sweden	3
Netherlands	3

Country	Number
Switzerland	2
Faroe Islands	2
Belgium	2
Finland	2
Australia	2
Réunion	1
Czech Republic	1
Canada	1
Ireland	1
Austria	1
<b>TOTAL</b>	<b>116</b>

# We thank our...



## Giga Sponsor

---

## Strategic Partner

---

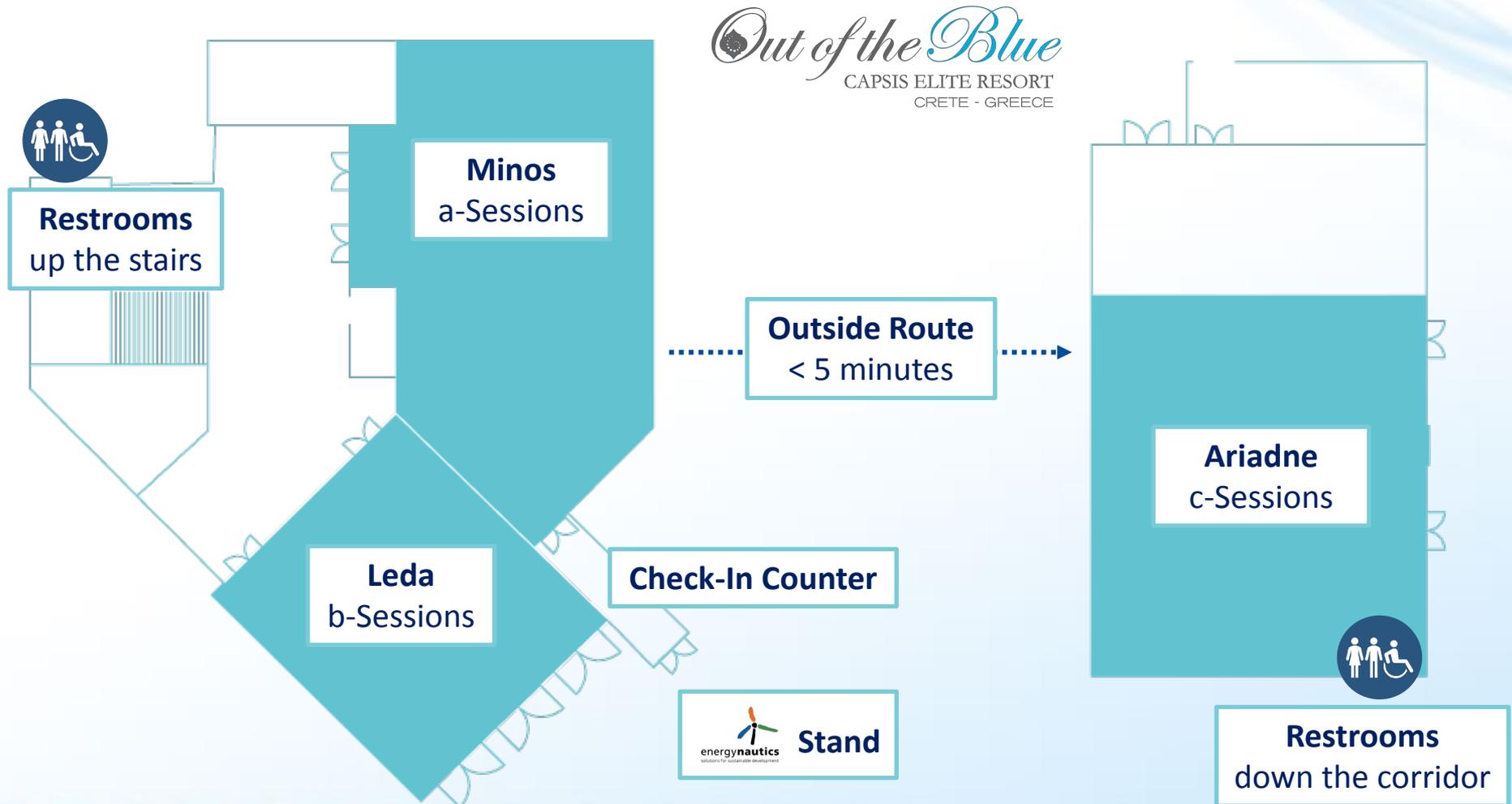


## Supporters

---



# Map of Conference Area



# Program – Wednesday, 22 May (Morning)

09:00 - 09:25

Room Minos

Opening | **Welcome and Introduction**

09:25 - 11:00

Room Minos

Session 1 | **Keynote Session**

11:00 - 11:30

Coffee Break

11:30 - 13:10

Room Minos

Session 2a

**Project Experience 1:  
Greece**

Room Leda

Session 2b

**Economic Evaluation and  
Regulations of Hybrid Systems**

Room Ariadne

Session 2c

**Hybrid System  
Technologies**

13:10 - 14:10

Lunch



Location: **Terrace - Outside Minos & Leda Rooms**



# Lunch Break & Group Photo



Location: **Seasalt and Rosemary Restaurant**



Group Photo: **Before lunch on Thursday**  
Terrace - Outside Minos & Leda Rooms



# Program – Wednesday, 22 May (Afternoon)

<b>14:10 - 15:50</b>		
<b>Room Minos</b> Session 3a <b>Project Experience 2</b>	<b>Room Leda</b> Session 3b <b>Modelling and Simulation 1</b>	<b>Room Ariadne</b> Session 3c <b>Energy Management Systems</b>
<b>15:50 - 16:15</b>		
Coffee Break		
<b>16:15 - 18:10</b>		
<b>Room Minos</b> Session 4a <b>Project Experience 3: Around the World</b>	<b>Room Leda</b> Session 4b <b>Control and Simulation</b>	<b>Room Ariadne</b> Session 4c <b>Forecasting Issues</b>
<b>18:15 - 18:45</b>		
<b>r.e.think ENERGY DIALOGUE</b>		
<b>20:00</b>		
<b>Workshop Dinner</b>		

# Workshop Dinner



Location: **Almyra Seaside Food & Cocktails**

Date: **Wednesday 20:00 – 23:00**

Meeting point: **19:30 at the check-in counter**

Ticket: **90 € incl. VAT**

**Last  
Tickets  
available**



# Program – Thursday, 23 May (Morning)

09:00 - 10:40	
Room Minos Session 5a Project Experience 4	Room Leda Session 5b High Share Inverter Based Systems
10:40 - 11:10	
Coffee Break	
11:10 - 12:50	
Room Minos Session 6a Project Experience 5	Room Leda Session 6b Modelling and Simulation 2
12:50 - 13:50	
Group Photo & Lunch	

# Program – Thursday, 23 May (Morning)

<b>13:50 - 14:50</b>	
<b>Room Minos</b> Session 7a <b>Design Aspects</b>	<b>Room Leda</b> Session 7b <b>Hybrid Power Plants</b>
<b>14:50 - 15:10</b>	
Coffee Break	
<b>15:10 - 16:10</b>	
<b>Room Minos</b> Closing Session <b>Panel Discussion</b>	

**Sold  
Out!**

Location: **Energy Control Center of HEDNO**

Date: **Friday, 24 May 2019 | 9:30 – 12:00**

Meeting Point: **9:15 at main hotel entrance**



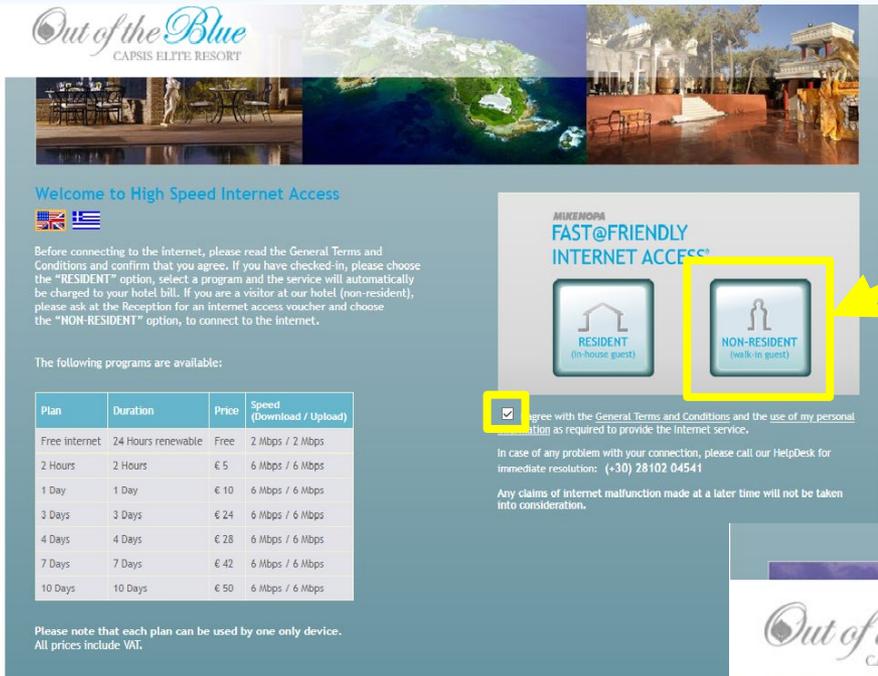
# Workshop Guidelines

## You can change sessions while they go on, but ...

- Carry your **name tag** all the time
- Please set your **phone on silent mode**
- If necessary, speakers **must** update their presentation **at least 15 min. before the session or during coffee break**
- **Go online** with Free Wi-Fi
- Please **mark your bags**
- Please **deposit your luggage** at the day of your departure at your hotel. Store your luggage unguarded in the back of the conference rooms.
- **No video** recording during sessions. If requested by the speaker, **photos** (using phone, tablet, photo camera, etc.) are also **forbidden**
- Please fill out the **online questionnaire** we will email to you



# Internet Access



**Out of the Blue**  
CAPSIS ELITE RESORT

### Welcome to High Speed Internet Access

Before connecting to the internet, please read the General Terms and Conditions and confirm that you agree. If you have checked-in, please choose the "RESIDENT" option, select a program and the service will automatically be charged to your hotel bill. If you are a visitor at our hotel (non-resident), please ask at the Reception for an internet access voucher and choose the "NON-RESIDENT" option, to connect to the internet.

The following programs are available:

Plan	Duration	Price	Speed (Download / Upload)
Free internet	24 Hours renewable	Free	2 Mbps / 2 Mbps
2 Hours	2 Hours	€ 5	6 Mbps / 6 Mbps
1 Day	1 Day	€ 10	6 Mbps / 6 Mbps
3 Days	3 Days	€ 24	6 Mbps / 6 Mbps
4 Days	4 Days	€ 28	6 Mbps / 6 Mbps
7 Days	7 Days	€ 42	6 Mbps / 6 Mbps
10 Days	10 Days	€ 50	6 Mbps / 6 Mbps

Please note that each plan can be used by one only device. All prices include VAT.

**FAST@FRIENDLY INTERNET ACCESS**

I agree with the General Terms and Conditions and the use of my personal information as required to provide the Internet service.

In case of any problem with your connection, please call our HelpDesk for immediate resolution: (+30) 28102 04541

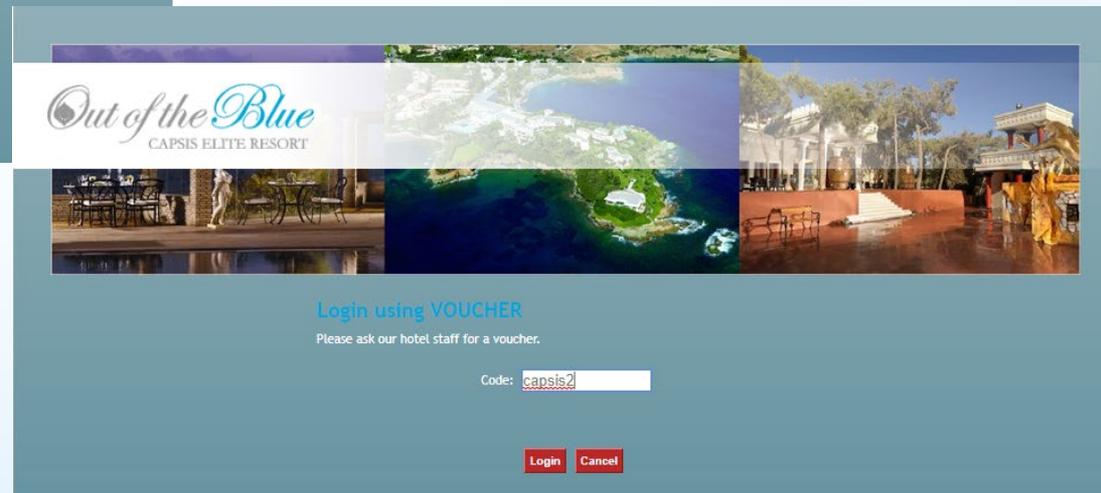
Any claims of internet malfunction made at a later time will not be taken into consideration.

**RESIDENT**  
(In-house guest)

**NON-RESIDENT**  
(walk-in guest)

Network: Capsis Wifi  
Button: "Non-Resident"

Code: capsis2



**Out of the Blue**  
CAPSIS ELITE RESORT

### Login using VOUCHER

Please ask our hotel staff for a voucher.

Code:

**Login** **Cancel**

# What do you expect to learn at this Workshop?

# What is in your opinion the most important tool to successfully integrate VRE into island power systems?

regulations

demand side management

grid code

ancillary services with VRE

smart grid solutions

flexible conventional generators (diesel)

good consultants

independent investors

# International Advisory Committee

- **Tom Acker**  
Northern Arizona University,  
USA
- **Thomas Ackermann**  
Energynautics, Germany
- **Francisco Boshell**  
IRENA, Germany
- **Julien Callec**  
EDF, France
- **Dimitrios Christakis**  
TEI Crete, Greece
- **Peter W. Christensen**  
Vestas, Denmark
- **Edward Coster**  
Stedin, Netherlands
- **Kaushik Das**  
Technical University of  
Denmark - DTU, Denmark
- **Jaap de Boer**  
Energy Watch, Netherland
- **Martin Dennenmoser**  
BayWa r.e. Solar Projects,  
Germany
- **Bernhard Ernst**  
Bernhard Ernst Energy  
Consulting, Germany
- **Ana Estanqueiro**  
LNEG, Portugal
- **Alain Forcione**  
Hydro Québec/IREQ, Canada
- **Daniel Fraile**  
WindEurope, Belgium
- **Michael Nørtoft**  
Frydensbjerg Vattenfall,  
Denmark
- **Paul Gardner**  
Paul Gardner Energy  
Consulting Ltd., United  
Kingdom
- **Jutta Hanson**  
Technical University of  
Darmstadt, Germany
- **Hannele Holttinen**  
Recognis, Finland
- **Dimitris Al. Katsaprakakis**  
Technological Educational  
Institute of Crete, Greece
- **Philipp Kunze**  
BayWa r.e. Solar Projects,  
Germany
- **Peter Lilienthal**  
HOMER Energy, USA
- **Julija Matevosyan**  
ERCOT, USA
- **Nickie Menemenlis**  
Hydro Québec/IREQ, Canada
- **Mahesh Morjaria**  
FirstSolar, USA
- **Terji Nielsen**  
SEV, Faroe Islands
- **Lise Nielson**  
Linie P, Denmark
- **Joao A. Peças Lopes**  
University of Porto, Portugal
- **Eckard Quitmann**  
ENERCON, Germany
- **Nigel Schofield**  
University of Huddersfield,  
United Kingdom
- **Dezso Sera**  
Aalborg University, Denmark
- **Charles Smith**  
ESIG, USA
- **Poul Ejnar Sørensen**  
DTU, Denmark
- **Derek Stenlik**  
Telos Energy, USA
- **Jian Sun**  
Rensselaer Polytechnic  
Institute, USA
- **Pieter Tielens**  
Tractebel (ENGIE), Belgium
- **Adrian Timbus**  
ABB, Switzerland
- **Helge Urdal**  
Urdal Power Solutions,  
United Kingdom
- **Julio Usaola**  
University Carlos III Madrid,  
Spain
- **Éric Vales**  
Vergnet, France
- **Costas Vournas**  
NTUA, Greece
- **Nikolaos Zografakis**  
Regional Energy Agency of  
Crete, Greece

**If you want to join  
the Advisory Committee  
next year,  
please contact  
Dr. Thomas  
Ackermann!**

**Access and download the Workshop Papers  
until 24 May 2019**



<http://tiny.cc/hybrid19>

# Thank you for your Recommendation!



**Matthias Luther, University of Erlangen**

**Lennart Petersen, Vestas & Aalborg University**

**Michael Raila, MAN Energy Solutions**

> Prize can be picked up at the check-in!

**ENJOY THE WORKSHOP!**



**energynautics**  
solutions for sustainable development