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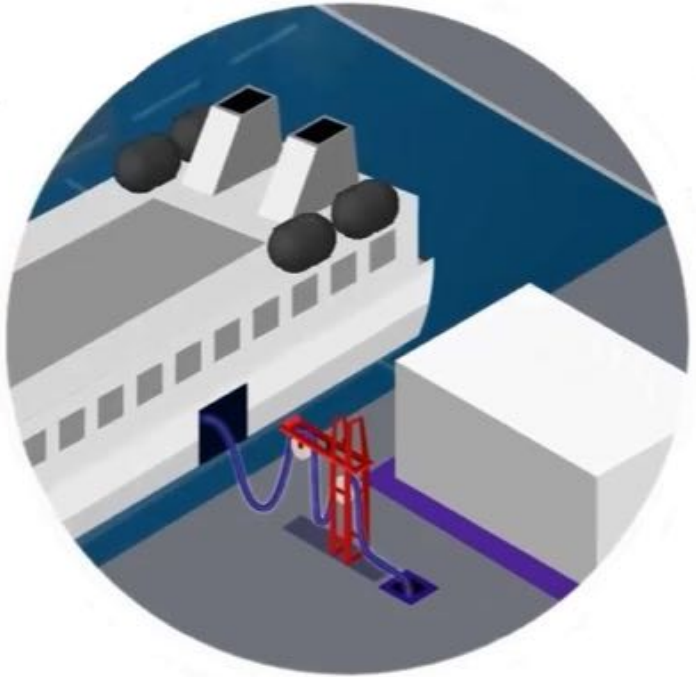
electrification
in the **e**astern
mediterranean

The 1st cold ironing installation in East Med



Stefanos Dallas

Senior Researcher

National Technical University of Athens

Powering zero-emission marine transportation

Athens, 27/2/2018

Co-financed by the European Union
Connecting Europe Facility

The Killini Port - Location

- The Killini Port is located 75.5 km from the town of Patras (Achaia) and 47 km from the town of Pyrgos (Ilia).
- The port connects Peloponnesus with the Ionian Islands Kefalonia and Zakinthos.
- The port of Killini ranks 3rd place nationwide in number of transported passengers.

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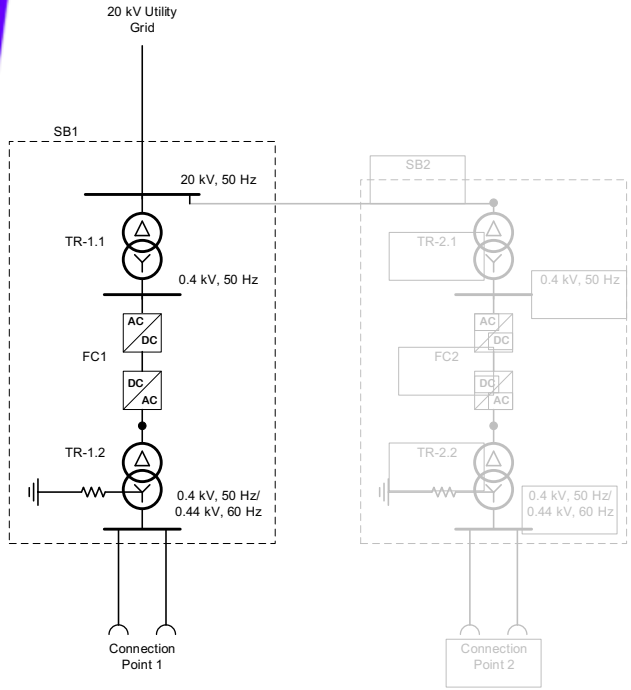
The Killini Port - History

- The port of Killini was first constructed in 1887.
- Its initial part of the windward pier had a length equal to 250 m and it was constructed with natural stone blocks. An expansion of about 350 m of the existing pier was built with artificial stone blocks during the years 1882-1892.
- By the year of 1930 both the initial part of the windward pier and its expansion were damaged by strong waves. The last two decades the restoration of the above mentioned damages took place and the entire outer side of the pier was shielded with natural blocks of stone, in order to elevate the exterior bumper wall.
- In 1938 was funded the Port Authority of Killini, which took over the development and management of the port up to the year 2003.
- In 2003 the Killini Port Auhority was renamed to Municipal Port Fund of Killini and it operates as a Public Legal Entity, according to the law N.3462/2006.

Pilot Installation – Technical Analysis



SB1 Pilot construction within the framework of ELEMED project

SB2 Future installation

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Shore Side Installation

The complete shore – side installation for Kyllini AMP project will consist of two shore side substations one per supply position. The first substation shall include:

- one medium Voltage Switchgear
- one Step Down Power Dyn Transformer of Dyn
- one Incoming Low Voltage Switchgear
- one static Frequency Converter

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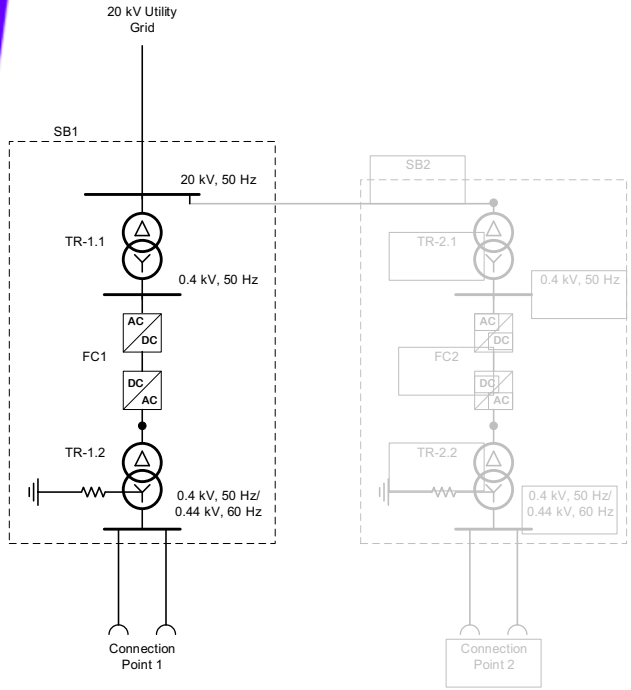
Pilot Installation – Technical Analysis



SB1 Pilot construction within the framework of ELEMED project

SB2 Future installation

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Shore Side Installation

The complete shore – side installation for Kyllini AMP project will consist of two shore side substations one per supply position. The first substation shall include:

- one Isolation Transformer dyn, 1:1 ratio which will provide galvanic isolation from other connected ferries and consumers;
- one Neutral Earthing Resistor (NER) installed at the neutral point of the isolation transformer for limiting the ground fault current between the shore box and the vessel's infrastructure;
- one Outgoing Low Voltage Switchgear which will supply the shore socket outlets

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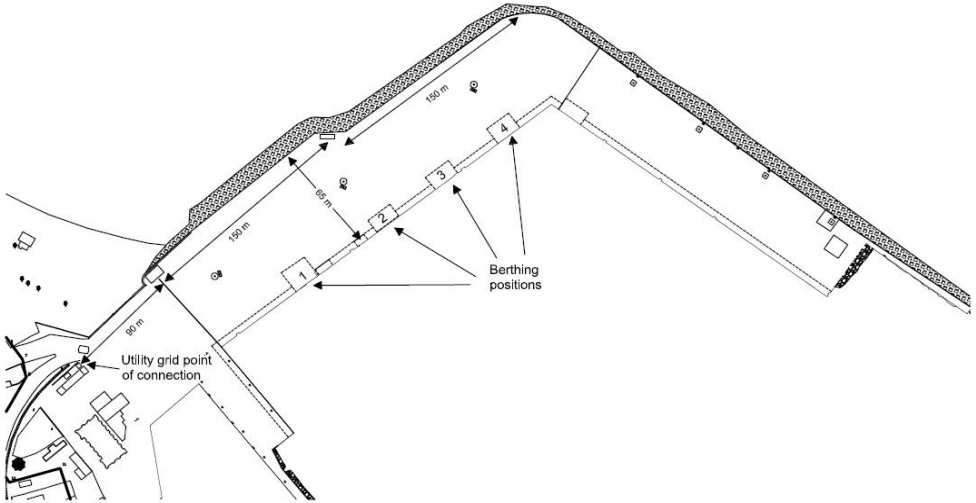
Pilot Installation – Technical Analysis

Topographical top view of the Kyllini port



Ship Name	Fior Di Levante
Rated Voltage	440 V
Frequency	60 Hz
Rated Power of the Generators	4x700 kVA
Power Factor	0.8 ind.
Power Consumption at berth	250kW
Generators operating point at berth	35.72% [a]
Rated Current	200 A
Fuel Consumption at berth	80 lt/hr
Period of berth	≈12 hr

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ACTIVITY 13: Pilot: Shore Power Installation in the Port of Killini

Sub-activity 13.1: Detailed Engineering Design of both Port and Ship

- 13.1.5 Authorities Permissions
  - Permission from Hellenic Navy General Stuff
  - Permission from Hellenic Ministry of Culture
  - Permission from Hellenic Ministry of Mercantile Marine and Island Policy
  - Assent from the Hellenic Ministry of Environment and Energy
  - Approval of small scale works

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ACTIVITY 13: Pilot: Shore Power Installation in the Port of Killini

Sub-activity 13.2: Procurement of material, Construction and Operation

- Public procurement on 23rd of November 2017
  - Bidder: "ANTAIOS S.A. CONSTRUCTION COMPANY"
  - Approval of the contractor on 23rd of January 2018 (decision No 1/2018)

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ACTIVITY 13: Pilot: Shore Power Installation in the Port of Killini

Sub-activity 13.2: Procurement of material, Construction and Operation

- Public network upgrade
  - Cost for the network upgrade from Low to Medium Voltage 50,072.92 €
- Sign of the contraction

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Further Perspectives

Development of the Kyllini Port as Energy Hub

- Constructions of hybrid electric driven shuttle ferries (for short sea transportation: battery based+ back up energy unit).
- Selective-collective co-operation of energy storage units deployed in port (and in ships interested).
- Interim solution of supplying islanded networks with electric energy based on environmentally friendly fuel (eg LNG): applicable to islands where the LNG network has not been deployed yet.
- Emergency supply of inland grids (e.g. in black-out situations of National Grids in Force Majeure cases).

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Further Perspectives

Development of the Kyllini Port as Energy Hub – Battery Based Transportation / Backup Energy Unit

- The shuttle vessels will be based on DC batteries
- Apply Direct Current cold ironing technology to interconnect ships with the port mains. This facilitates the frequency matching problems often encountered and the easy integration of any renewable energy sources in port or onboard the ship as no frequency converter is required.
- The port can be transformed into energy hubs, buying and selling energy from the central Grid to their clients (ships) and vice versa.

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our future charged

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Thank you

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