Wave energy in the Port of Civitavecchia (IT)

Workshop on RES and new technologies for energy production

Stefano Magaudda
stefano.magaudda@gmail.com

Malta
2nd-6th May 2017
BLUE ENERGY

• Blue Energy is a growing sector all over the world – research, pilot projects and fully operational plants are being developed, aimed to optimize the production of renewable energy from waves, tides, offshore wind, salinity gradients, etc.

• Blue Energy potential still remains largely untapped. For instance the global technical potential of wave energy is estimated at 11,400 TWh per year

• Almost 90% of the world’s marine renewable energy is produced in Europe, and Blue Energy is a growing industrial sector especially in the Atlantic regions

• EU considers marine renewable energy as a driver for employment, innovation and for the fight against climate change (see i.e. EU Directive 2009/28/EC)

• Renewable energy from marine sources will likely soon become an important component of the energy policies and strategies in the Mediterranean Sea.
WAVE ENERGY: A CASE STUDY

Resonant Wave Energy Converter REWEC3 in Civitavecchia harbour

Client: Port Authority of Civitavecchia

- U-OWC (Oscillating Water Column) device conceived and patented in Italy, able to obtain a natural resonance with random wind-generated waves, allowing to absorb a large amount of wave energy
- A prototype has been built in the Civitavecchia’s harbor (Italy) in the Tyrrhenian Sea (Central Mediterranean) for the enlargement of an existing breakwater (total length: 600m)
- The project was technically supported by the WAVENERGY.it S.r.l., a spin-off of the Mediterranean University of Reggio Calabria (IT).
REWEC3 LOCATION

Civitavecchia harbour
HOW DOES REWEC3 WORK?

- An U-OWC plant consists, on the wave-beaten side, by a **vertical duct (2)**, which is connected to the sea through an **outer opening (1)** and to an **inner room (4-5)** through a **lower opening (3)**. The inner room contains water (4) below and an air pocket (5) above. An **air-duct (6)** contains a **self-rectifying turbine (7)** connected to a **generator**

- Under wave motion the air in the chamber is alternately **compressed and decompressed**, so that the air produces a flow in the duct, which drives the turbine to produce electrical power.
TECHNICAL ASPECTS

The introduction of the U duct between the air pocket and the sea, allows:

• Absorbing **more wave energy** in every sea conditions

• Adapting the design to the peak period of the incident wave pressures to which the greater amount of wave energy is associated, thus **amplifying the plant performance**

• Achieving **high structural resistance** thanks to the two vertical walls partially overlapping on the wave-beaten side

**Average production for a 1 km-long REWEC3 plant in the Tyrrhenian Sea:**

4.000÷6.000 MWh/Km/year
POINTS OF ATTENTION

• Integration within port infrastructure
• Landscape/visual impact
• Noise mitigation
• Ongoing research and testing
• Economical feasibility/convenience
• Turbines maintenance
THANK YOU

Stefano Magaudda
stefano.magaudda@gmail.com