Oceans of Energy

Offshore Solar

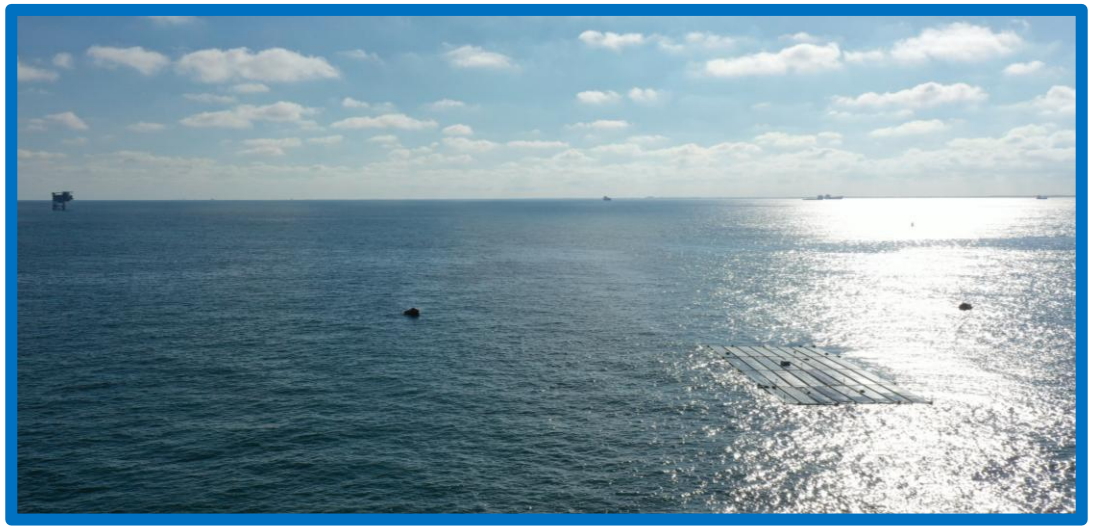
Johnny Meit, Head of Sales, BusDev, and Project Dev

HAEE – 10th Energy Transition Symposium

4th of June 2025

Paper:
Regulatory- and Market screening analyses of offshore solar in EU Med Countries

North Sea Success Story #1: North Sea Two



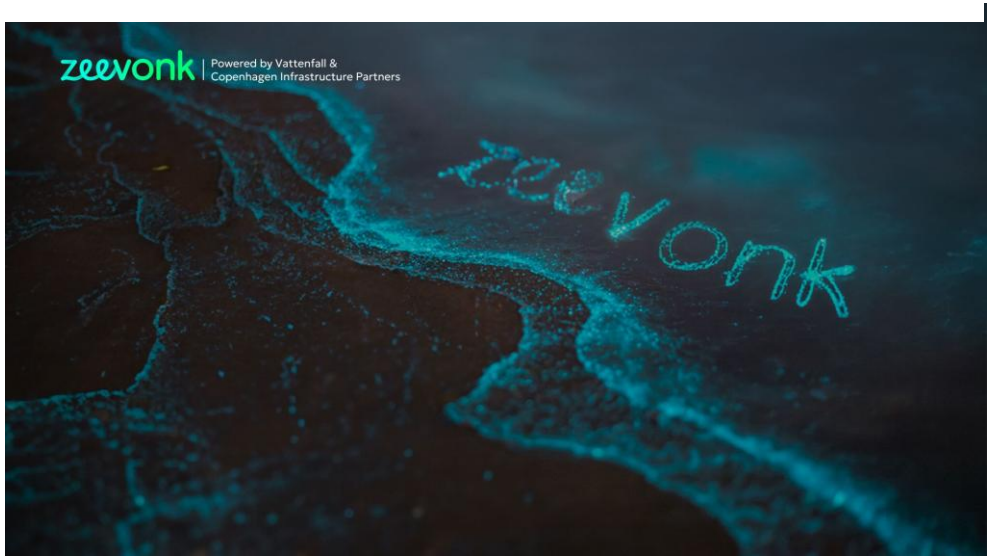
Our *Oceans of Energy* team is the first in the world to have tested offshore solar farms

And the system surpassed 4-years testing in high waves, incl. during 10+ ‘named’ storms

North Sea Success Story #2: IJmuiden Ver Beta

PRESS RELEASE • WIND • 11 JUNE 2024, 18:01 CET • 3 MIN

Zeevonk, a joint venture of Vattenfall and Copenhagen Infrastructure Partners (CIP) through its Energy Transition Fund, has been awarded a permit to build wind farm IJmuiden Ver Beta in the Netherlands. This 2 GW offshore wind project will include a 50 MWp floating offshore solar farm on site and a new electrolyzer at the Port of Rotterdam which will convert electricity of IJmuiden Ver to green hydrogen.



Offshore Solar has become part of everyday life in Amsterdam

North Sea Success Story #3: ‘Gebiedspaspoort’ Permit

Dutch Permitting Authority “Rijkwaterstaat” has published for the Dutch Wind Farms “Gebiedspaspoorten” for multi use activities

In the Hollandse Kust Zuid offshore wind farm, dedicated area of 12km2 is ready for offshore solar, and +16km2 is feasible for application

The 28km2 available surface for offshore solar, can account up to 5.6 GW offshore solar, about 4x as much as the offshore wind capacity!

North Sea Success Story #4: HKN1 offshore solar farm!

April 2023: Award of the first commercial offshore solar project in the world “HKN1”

August 2024: Unwrapping of our first “HKN1” offshore solar floater

November 2024: Start of Transport to port of the offshore solar farm

Summer 2025: The First Of A Kind grid connected offshore solar project delivered!

Now Happening!

Offshore Solar is a solution for space challenges on land

+ Save capital outflow on importing (fossil) energy
+ Save costs on national defense by increasing energy security
+ Save costs on tax payments in emission trading schemes
+ Save costs on the offshore wind energy system by increasing utilization
+ Save imbalance costs in offshore wind projects
+ Save investments on energy infrastructure to connect remote renewable energy
+ Save land use, for other, more valuable practices
+ Invest locally in the manufacturing, logistics, and maritime industries
+ Invest in the knowledge economy and export opportunities
+ Provide nature enhancing services for the marine ecosystem

Offshore Solar: cover offshore area for solar collection.

- Use sea surface to rest on, like a waterlily
- Simple, low material usage
- Slim, flat, low hydrodynamic loads
- Modular, very scaleable

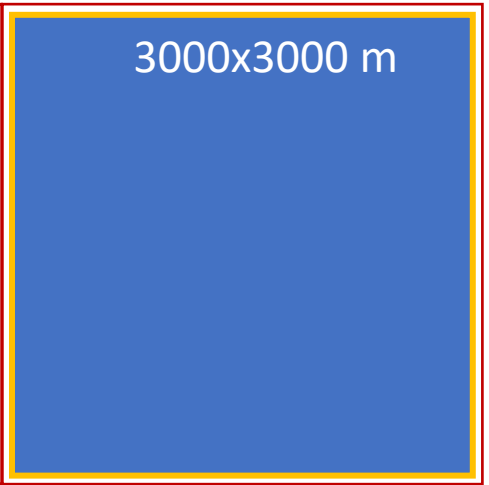
- Tested and proven in rough North Sea since 2019
- Able to survive heaviest storms
- Self-cleaning of panels using seawater
- Easy access for human, no climbing, no falling hazard

OOE offshore solar system, only system in the world in high waves

Oceans of Energy system: large cost reductions when scaling up

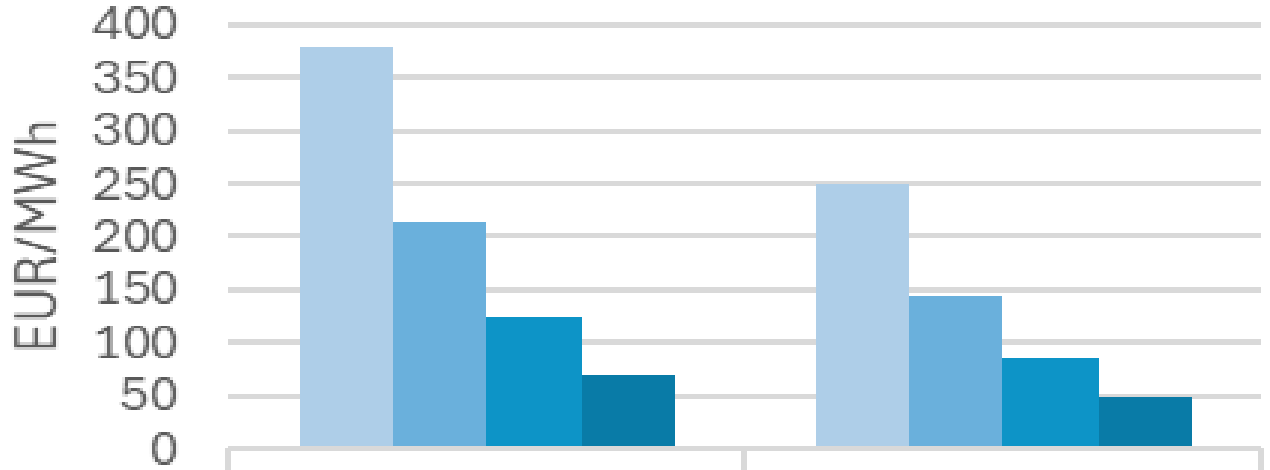
Thanks to the waterlily design approach, the *Oceans of Energy* system can scale to any size while reducing costs

This cost-down is not the case in elevated designs

100x100 m	250x250 m	700x700 m	3000x3000 m
			

Costs per MW	1 MW (index = 100)	10 MW	100 MW	1000 MW
Material use farm	100 / MW	75 / MW	45 / MW	15 / MW
Mooring & anchors	100 / MW	40 / MW	10 / MW	3 / MW
Export cables	100 / MW	10 / MW	2 / MW	1 / MW
Offshore installation	100 / MW	60 / MW	30 / MW	10 / MW
Offshore operations	100 / MW	40 / MW	20 / MW	10 / MW
LCOE total farm	100 / MWh	57 / MWh	33 / MWh	17 / MWh

Oceans of Energy - 2030 Offshore Solar LCOE



	North Sea EUR/MWh	Mediterranean EUR/MWh
1 MW	380	250
10 MW	215	145
100 MW	125	85
1000 MW	70	50

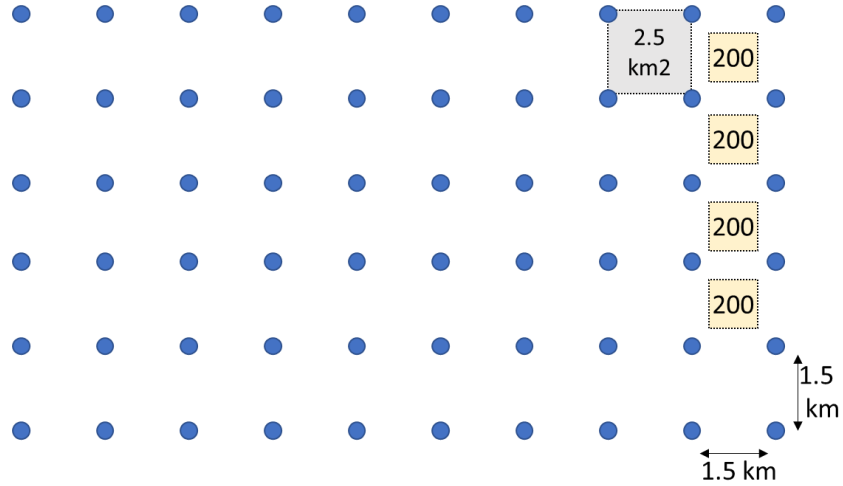
Typical Market Applications in Mediterranean Sea

A) Standalone Offshore Solar projects:

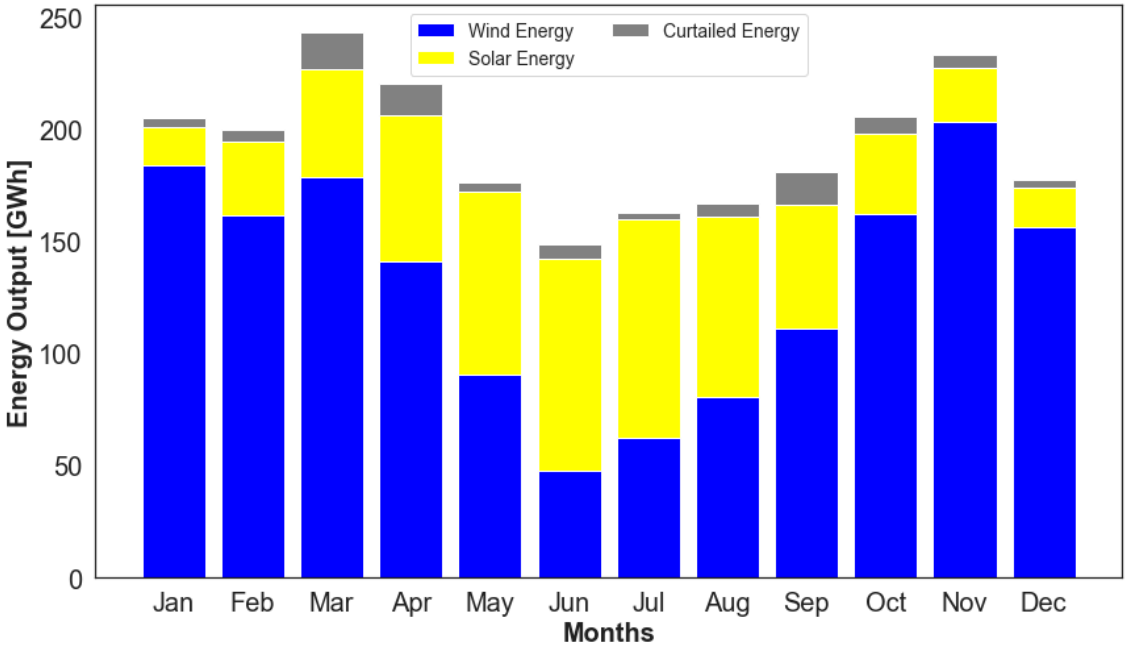
- Many sites in Mediterranean have limited wind resources or aesthetic conflicts
- Offshore Solar is here a low cost alternative for offshore renewable energy generation without

B) Offshore Solar enhanced offshore wind projects:

- Offshore Solar generates energy during (summer) periods with minimal wind outputs
- Complementarity of solar increases offshore wind farm output up to 50% by 1 : 1 combination



Results: ~1.5 BLN Added Value for 600 MW offshore solar



	Wind Farm only	Offshore Solar added	Combined energy supplied	Percentage enhancement
Adriatic Italian Site	1538 GWh/year	+650 GWh/year	2188 GWh/year	+42% More energy

	Value (EUR)
Annual Revenues solar yield	82.6 MLN
Lifetime Revenues solar yield	1025.7 MLN
Added Value Savings (conservative)	443.7 MLN
Added Value Savings (realistic)	621.1 MLN
Economic Added Value (conservative)	1469.4 MLN
Economic Added Value (realistic)	1646.8 MLN
Estimated Economic Added Value	**1500 MLN**

Assumptions used:

600 MW capacity for offshore substation, offshore wind farm, and offshore solar farm; Discount rate 7%, 127 EUR/MWh, 25 Years lifetime, Infrastructure costs 2.5 BLN/GW (conservative) & 3.5 BLN/GW (realistic), site North-East Italy

EuroMed 9: 204,5 MLN Citizens

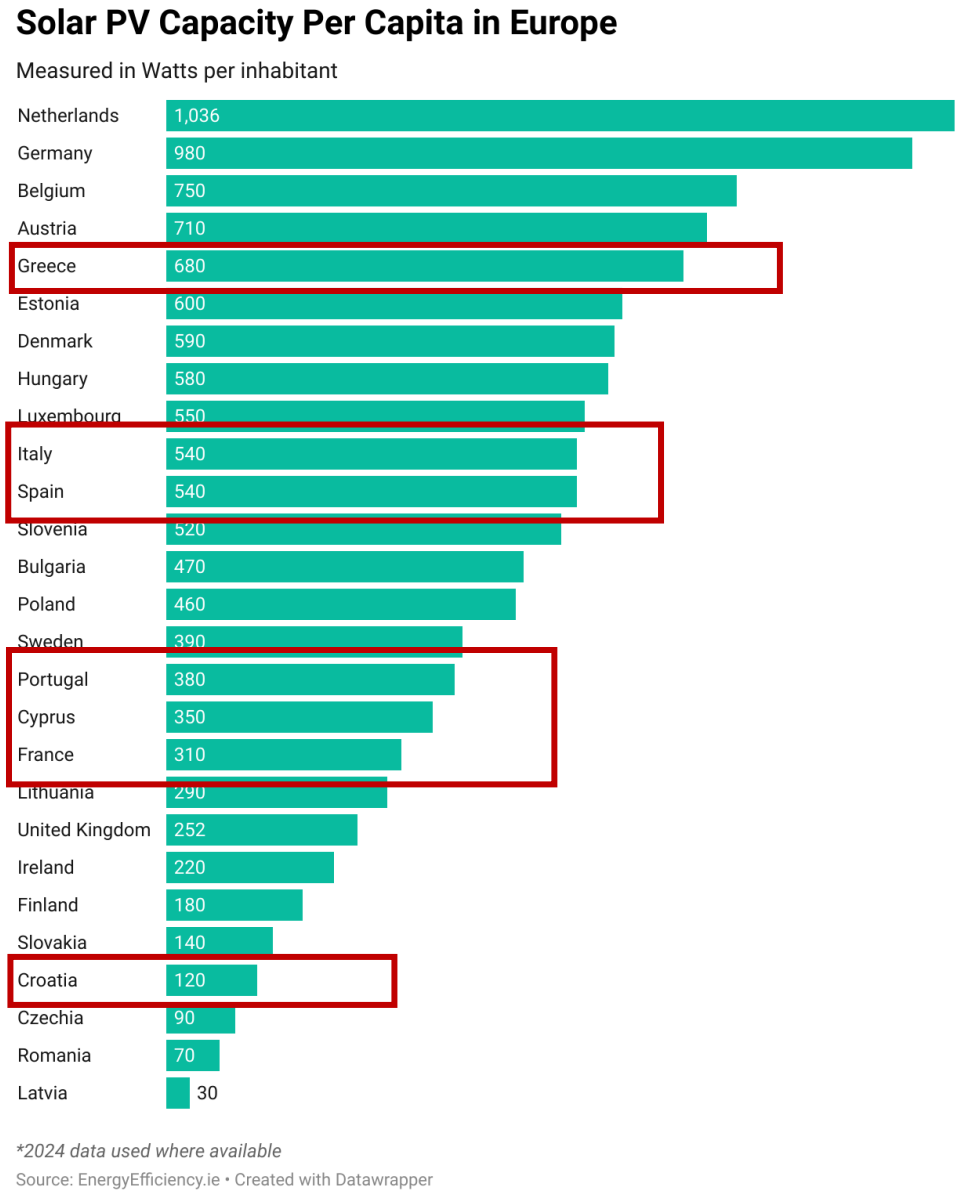
Countries with best solar resources and a lot of sea, are not the European solar frontrunners

The reason is not about economic feasibility, it is about space on land, permitting, consenting

Annually, more than 100 BLN EUR in fossil energy is imported, resulting in large capital outflows, making Europe poorer and more dependent

By using only 0.2% of the Mediterranean Sea, 1000 GW offshore solar can be installed

This adds 4.700 installed PV Watt per inhabitant in EuroMed 9, which is a factor 10x compared to present situation



Regulatory development in the EU-MED: Case Studies

Greece:

13,500 km coastline, 2.5 toe energy consumption per capita, 20% renewable energy

Permit frameworks adopted for 1 MW offshore solar pilots

Italy:

7,600 km coastline, 3.0 toe energy consumption per capita, 18% renewable energy

Offshore Solar Feed-in Tariffs at FER2 decree!

Malta:

196 km coastline, 2.1 toe energy consumption per capita, 15% renewable energy

Public Market Consultations for 50 MW offshore solar project

AssoAero position Paper → LINK

The potential of offshore floating solar

In a world defined by the growing need for clean and sustainable energy, it is crucial to develop solutions that can address both environmental and economic challenges, in order to build a greener and more resilient future for all.

In this context, floating solar emerges as a promising technology with extraordinary potential in the renewable energy sector. When combined with other clean sources, such as offshore wind, it has the potential to strengthen sustainable energy production in our country, while also encouraging the development of a national supply chain and stimulating both local and national economies. The benefits are evident across several areas: from reducing greenhouse gas emissions and creating new jobs to strengthening logistical and port infrastructure.

Through this document, our Association aims to actively promote the adoption of these technologies, with the goal of ensuring that future generations live in a world where access to clean and renewable resources improves quality of life and creates new opportunities for growth. We aim to foster a reality in which development and protection of the planet can coexist.

Italy now has the opportunity to establish itself as a global leader in the implementation of floating solar technology, creating a replicable international model and enhancing its market competitiveness. In this way, our country will be able to make a meaningful contribution to the global energy transition, reinforcing its role in the fight against climate change and generating significant environmental, social, and economic benefits.

Fulvio Mamone Capria
President, AERO

Why this technology is important for our country

1. **The abundance of solar energy convertible into electricity in our seas creates great opportunities for faster decarbonization**

According to AERO's estimates, up to 1 GW of offshore PV capacity could be installed in our seas over the next five years, enough to supply electricity to around half a million households annually, contributing to the achievement of Italy's ambitious sustainability targets.

2. **Mitigating the landscape impact is crucial in a country with an immense cultural and natural heritage**

Considering the modest height above sea level for floating solar systems and their position beyond 10 kilometers, the curvature of the Earth ensures that these structures become invisible to an observer on the coastline, excluding other mitigating factors.

3. **We are a peninsula, surrounded by the sea: our coastline is longer than Brazil's. The future of renewable energy also lies offshore**

With 7,600 km of coastline and abundant maritime space, our country has the possibility to harness marine resources in a synergistic and efficient way. Land-use issues are neutralized by the construction of large-scale plants far from the coast.

4. **Italy's manufacturing and industrial tradition, combined with know-how in the Oil & Gas, positions us as an international leader**

Italy has long been a landmark for hydrocarbon production in the Mediterranean, thanks to its unique engineering and industrial expertise. Today, many businesses have already begun an ecological transition, shifting their focus to support the growth of offshore renewable energy.

5. **The ambitious targets for offshore wind farm installations present great opportunities for coexistence with floating solar**

AERO's goal is to promote the implementation of 1 GW of offshore wind farms up to 2030. The installation of floating solar panels among the wind turbines will optimize the use of maritime space and improve grid stability by providing more complementary energy production.

Main Takeaways:

- Offshore Solar is a solution relieving pressure for space on land, and it thereby provides large societal benefits
- Oceans of Energy is the single developer of offshore solar that has yet mastered the offshore conditions and is now into commercialization
- The technology concept of Oceans of Energy is based on capturing the spatial benefits of the sea – like a waterlily and can scale to large systems
- Our team has been successful since 2016; we can leverage our capabilities to support floating solar projects and floating solar developers
- In Mediterranean Sea region alone, at least 1000 GW offshore solar is needed, as land space is too limited and too complicated. The 1000 GW of offshore solar is 0.2% of the Mediterranean Sea space
- Policy regulations in EU-Mediterranean are starting up, but more remains needed to kickstart the industry

& follow Oceans of Energy this Summer for the establishment of the first offshore solar project within an offshore wind farm in the world!

Fonds voor rechtvaardige transitie

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SENSE Hub
Solar Enhanced North Sea Energy Hub

Ministerie van Economische Zaken en Klimaat

Funded by the European Union

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Questions? Reach out to us at: offshore.solar@oceansofenergy.blue

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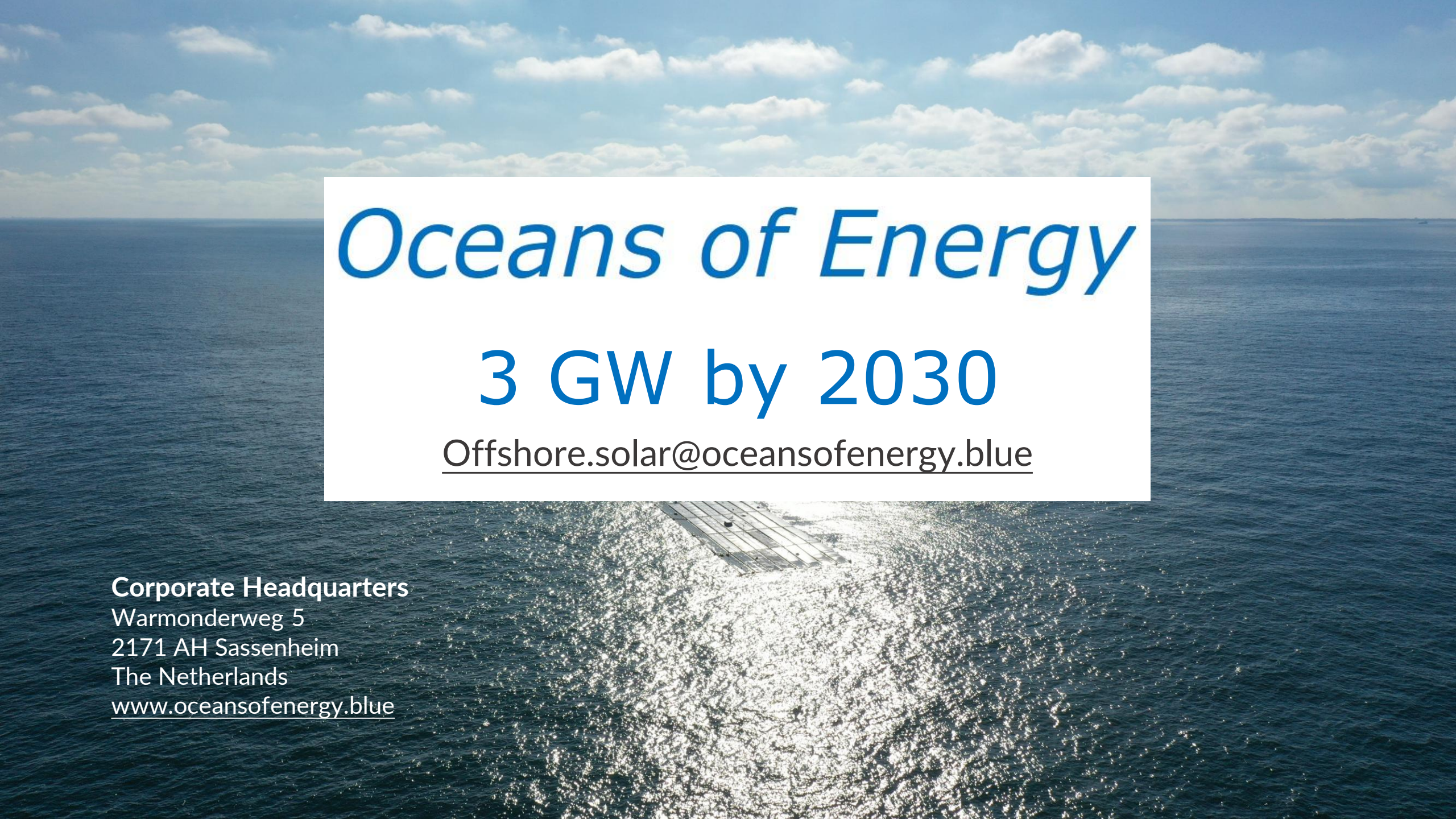

Oceans of Energy

3 GW by 2030

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