AGNES

*The **A**driatic **G**reen **N**etwork of **E**nergy **S**ources*

The opportunities for offshore wind deployment in Italy

April 5th, 2022 - Ravenna

Gian Luca Vaglio - C.O.O. Agnes S.r.l.

CONTACT DETAILS

Gian Luca Vaglio
Date of Birth: April 30th, 1994
Residence: Ravenna, Italy
g.vaglio@agnespower.com
Via Del Fringuello, 28 (Ravenna)

WORK EXPERIENCE

Chief Operating Officer
Agnes S.r.l.
Apr. 2020 - Present
Ravenna, Italy

Project Manager
Qint'x S.r.l.
Aug. 2019 - Apr. 2020
San Francisco, CA, United States

Digital Strategist
ENEL Group
Aug. 2018 - Aug. 2019
Rome, Italy

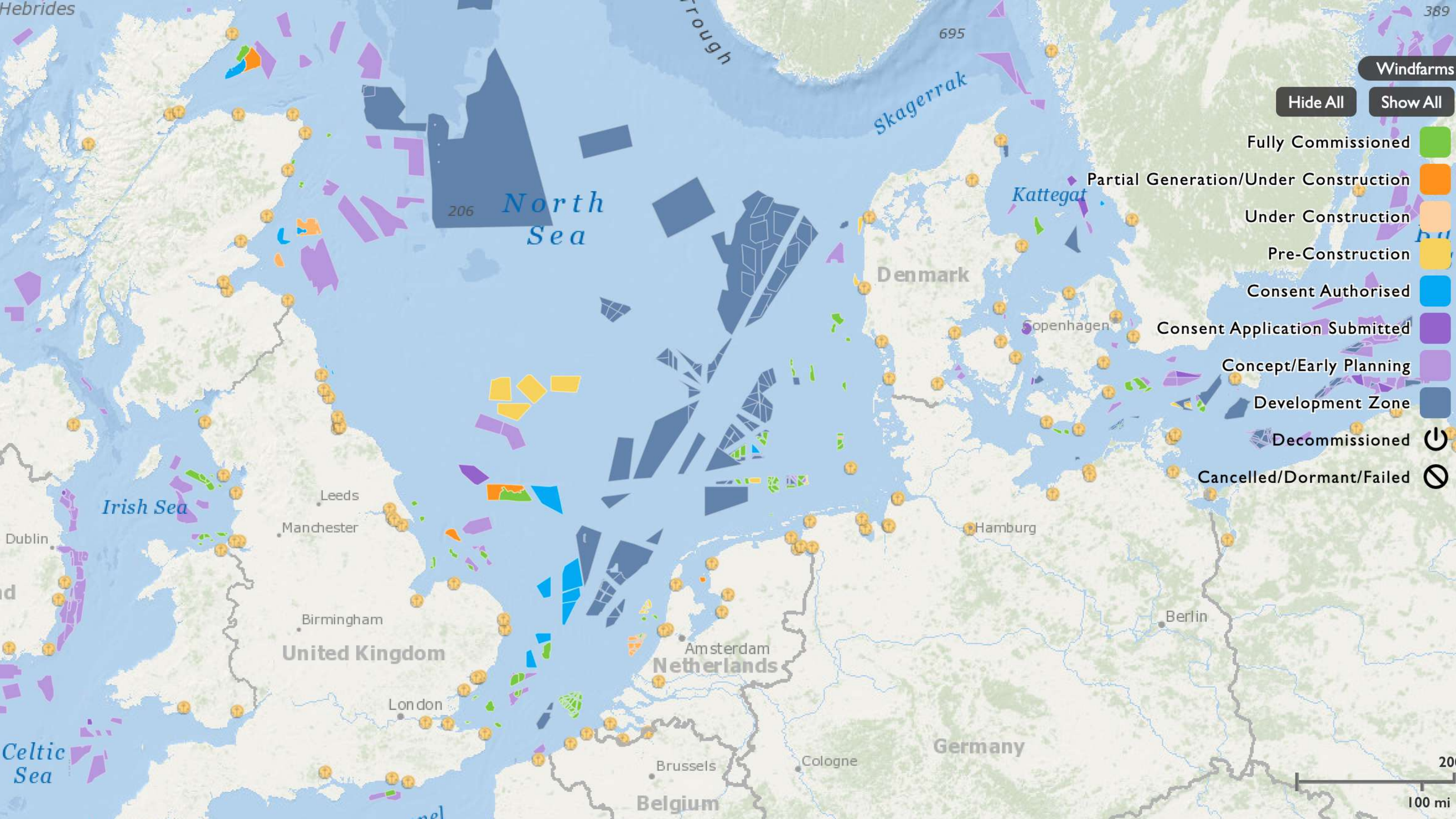
EDUCATION

Msc in Management of Innovation
Copenhagen Business School
Sept. 2017 - Feb. 2020
Copenhagen, Denmark

Study course in AI & Deep Learning
Stanford University
Oct. 2019 - Dec. 2019
Stanford, Santa Clara, United States

Bsc in Management & Marketing
University of Bologna
Oct. 2013 - Oct. 2016
Bologna, Italy


France
Switzerland
Hungary
Romania
Slovenia
Zagreb
Croatia
Milan
Torino
Gulf of Venice
Belgrade
Bosnia and Herzegovina
Serbia
Sarajevo
Ligure Sea
Adriatic Sea
Golfe du Lion
Corso-Ligurian Basin
Pristina
Sofia
Rome
Italy
F. Y. R. O. Macedonia
Barcelona
Western Basin
Naples
Albania
Balearic Sea
Illes Balears
Sardinia
Golfo di Taranto
Tyrrhenian Sea
3990
Greece
Aegean Sea
3213
3235
Strait of Sicilia
Sicily
Athens
Ionian Sea
Tunis
Algiers
5272


Windfarms
Hide All
Show All
Fully Commissioned
Partial Generation/Under Construction
Under Construction
Pre-Construction
Consent Authorised
Consent Application Submitted
Concept/Early Planning
Development Zone
Decommissioned
Cancelled/Dormant/Failed
North Sea
Skagerrak
Kattegat
Denmark
Copenhagen
Irish Sea
Celtic Sea
United Kingdom
Netherlands
Germany
Belgium
Leeds
Manchester
Birmingham
London
Dublin
Amsterdam
Brussels
Cologne
Hamburg
Berlin
Hebrides
206
695
100 mi

NEW INNOVATIVE GREEN ENERGY HUBS IN THE ADRIATIC SEA

AGNES is a startup company created in Ravenna in 2019 to **develop renewable energy projects in the Italian Adriatic Sea**.

The company was born from **over twenty years of experience of Qint'x S.r.l.** in the renewable energy sector and it has the goal of enacting **a transition of the Italian Adriatic Sea from oil & gas to renewable energy.**

We have vertical competences that range from the project's ideation to the FEED and authorization processes.

Our projects' pipeline **AGNES**

Our company is developing 4 renewable energy projects in the Adriatic Sea near-shore and off-shore, in different stages of development, for more than 3.000 MWp.

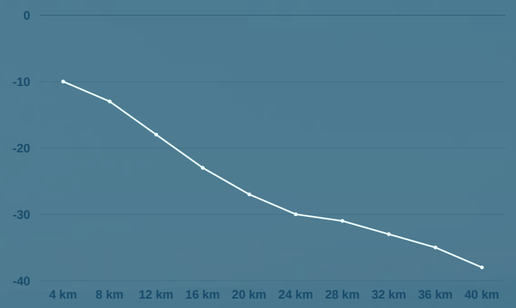
- **RAVENNA: two offshore wind farms, one floating PV plant, and onshore/offshore green hydrogen systems (700 MW). Approval expected for Q4 2023.**
- VENEZIA: fixed and floating PV plant (145 MW). Authorization process ready to start.
- PORTO TOLLE: one offshore wind farm (640 MW). Pre-feasibility assessment.
- PESCARA: one offshore floating wind farm with PV plants integrated into the foundation (800 MW). Pre-feasibility assessment.

For the realization of these projects, Agnes can count on existing partnerships with leading multinational companies such as Saipem, Goldwind & Mingyang.

AGNES PROJECT_RAVENNA

First green energy hub in the Mediterranean Sea with wind, solar and hydrogen plants

WHY THE NORTH ADRIATIC SEA?



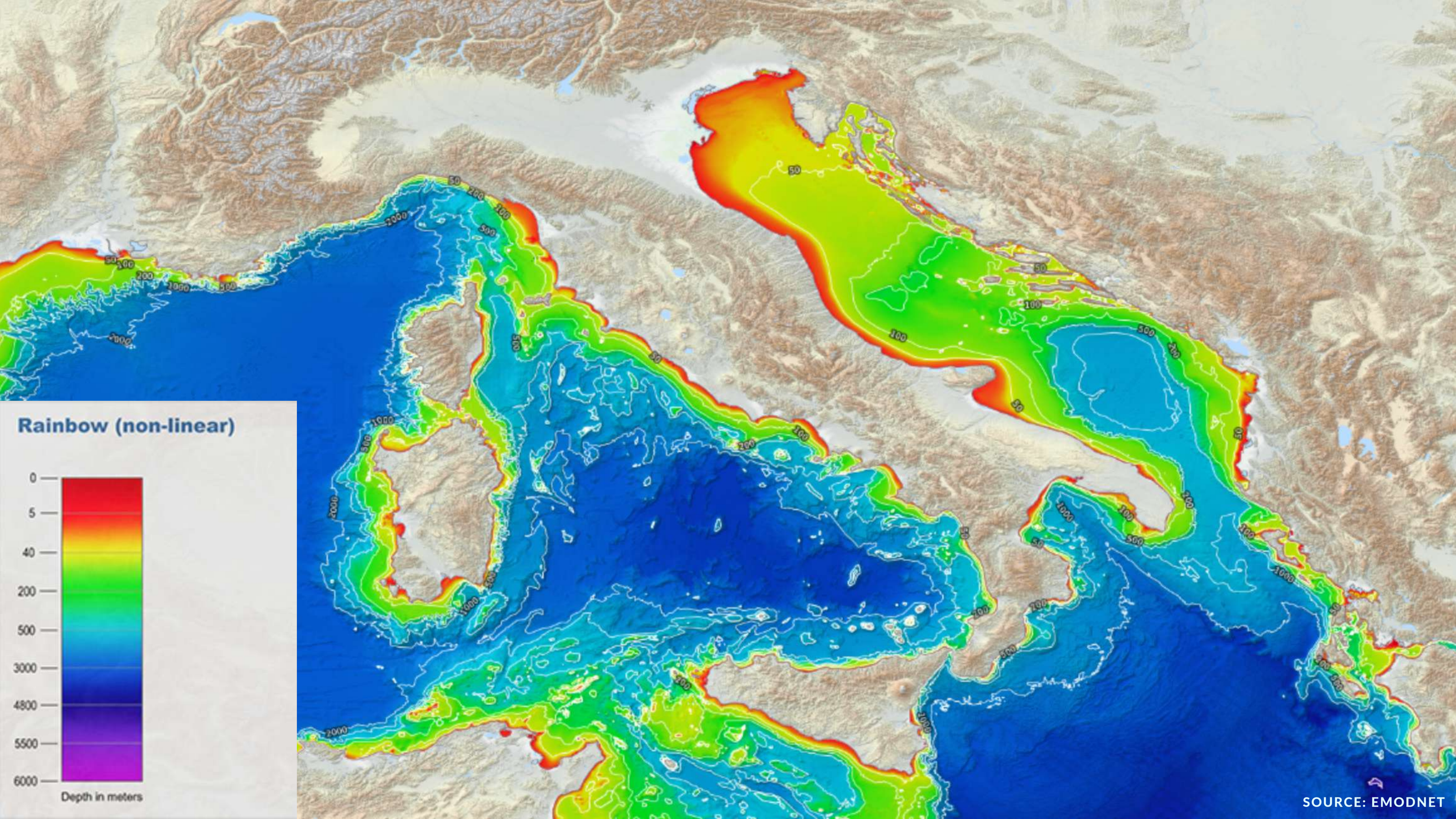
BATHIMETRY

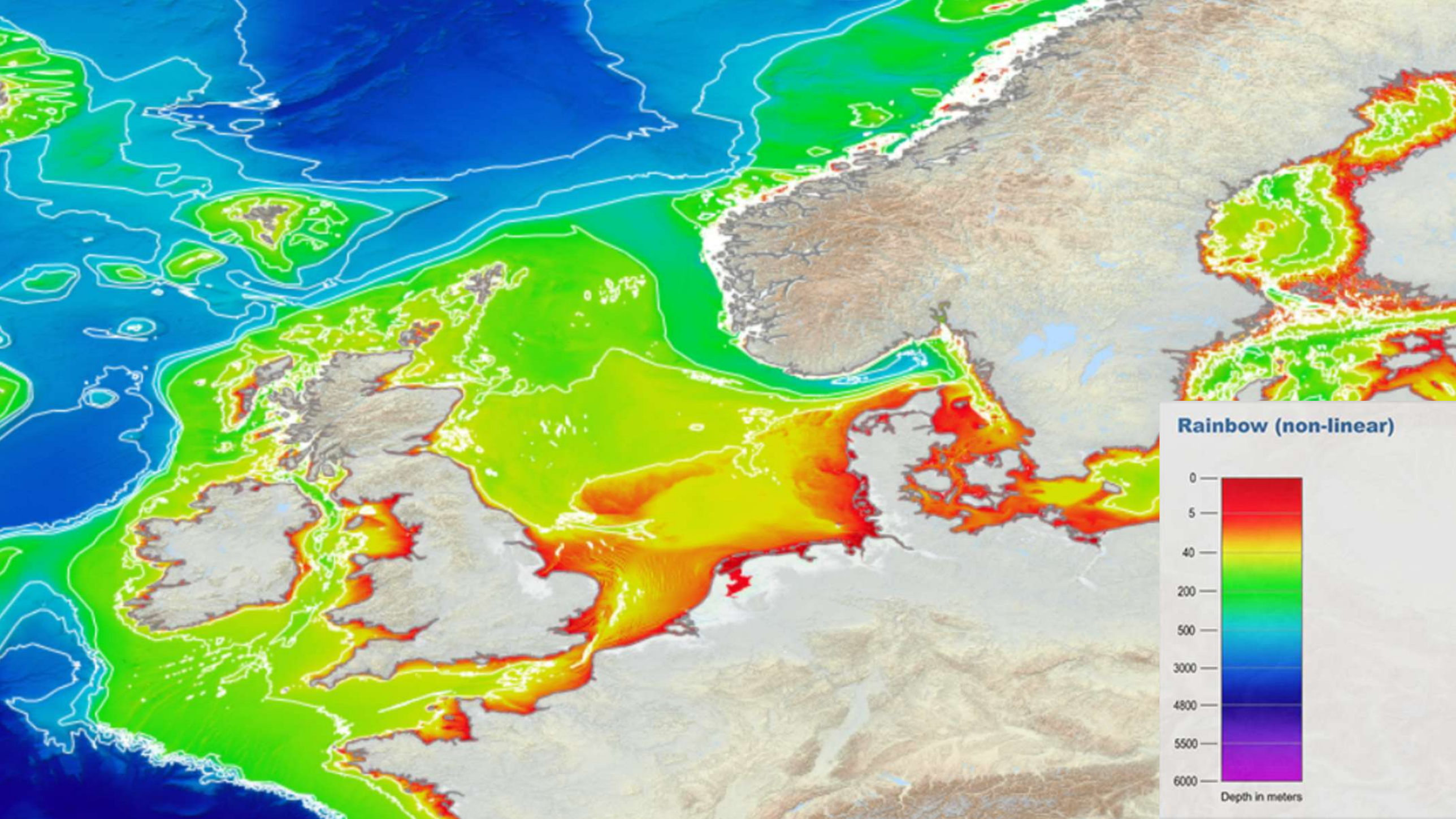
WIND CONDITIONS

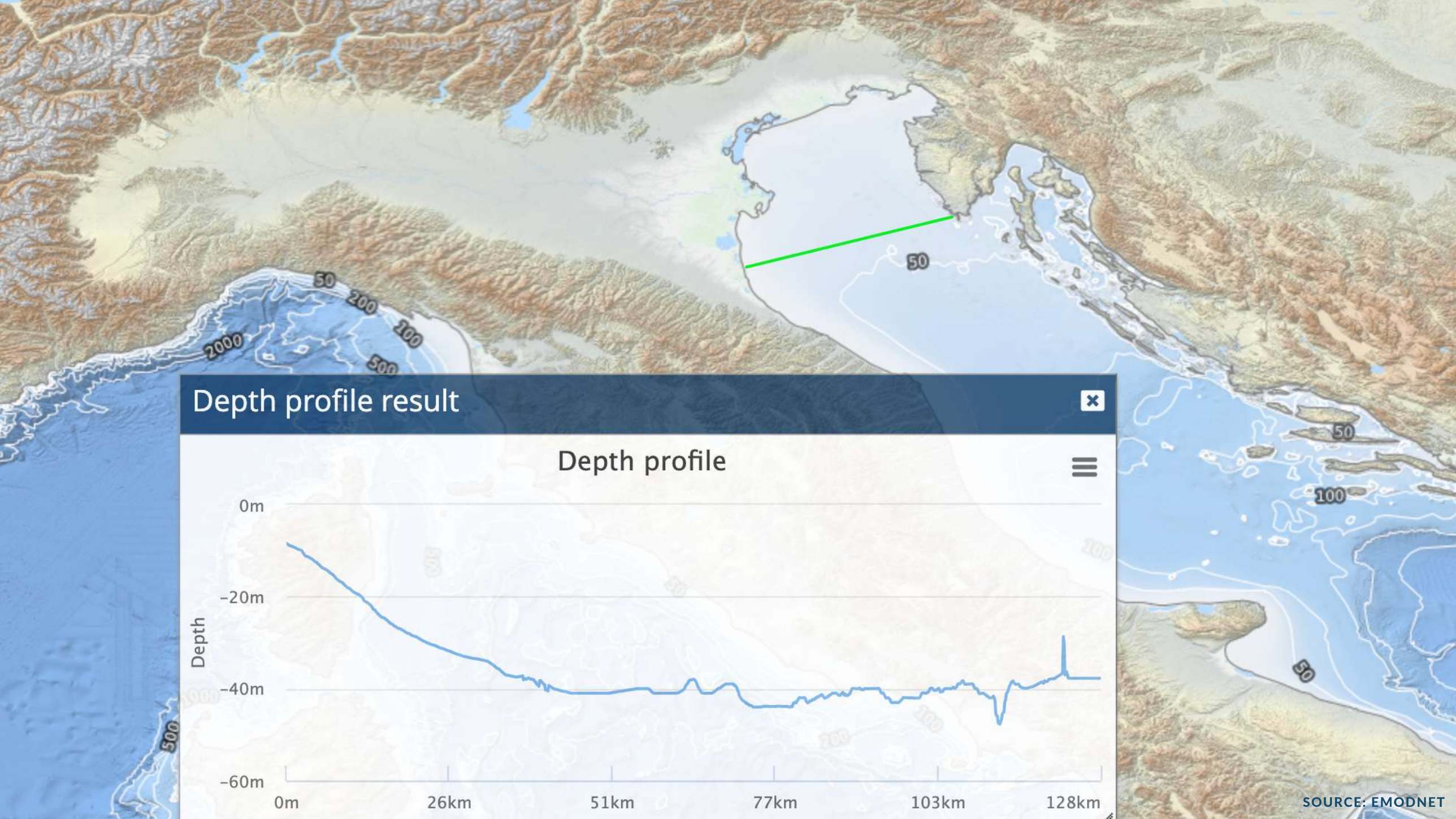
RAVENNA ENERGY HUB

Thanks to the recent technological advancements in the wind sector and socio-economical factors,
it is now possible to develop sustainable offshore energy projects in the Adriatic Sea.

ILLUSTRATION BY JOSH BAUER, NATIONAL RENEWABLE ENERGY LABORATORY (NREL)

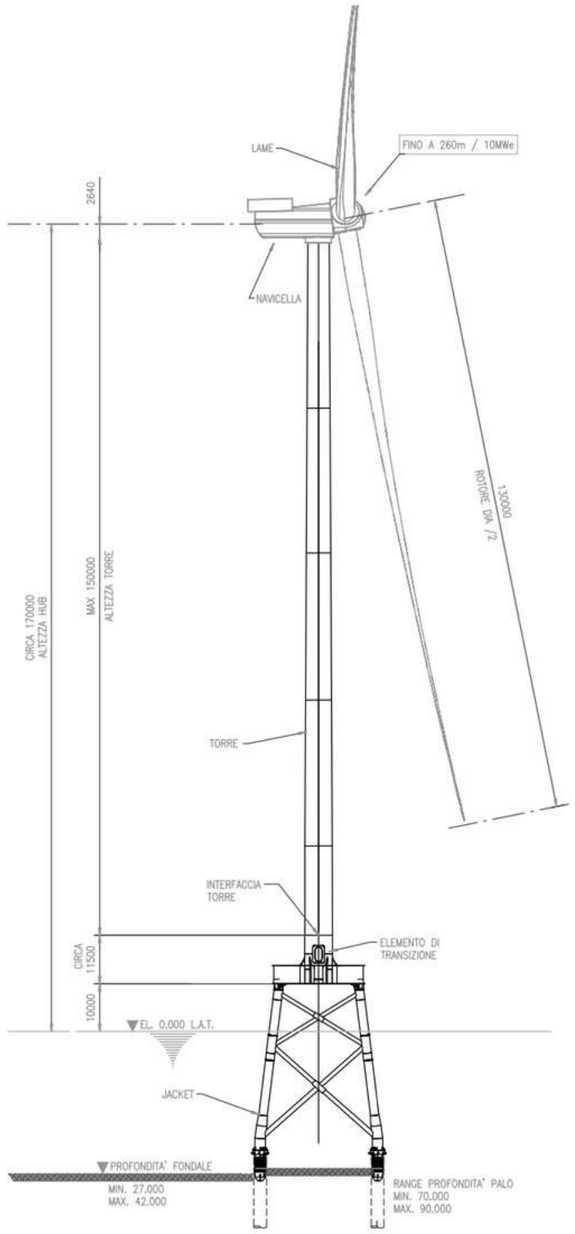

Rainbow (non-linear)
0
5
40
200
500
3000
4800
5500
6000
Depth in meters
SOURCE: EMODNET

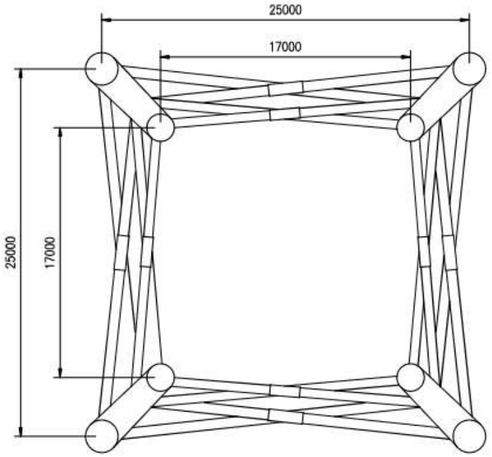

Rainbow (non-linear)
0
5
40
200
500
3000
4800
5500
6000
Depth in meters

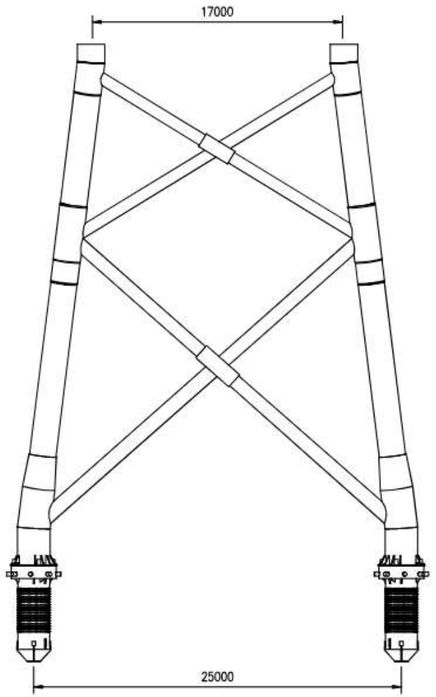

Depth profile result
Depth profile
0m
-20m
-40m
-60m
Depth
0m
26km
51km
77km
103km
128km
50
200
100
2000
500
50
100
50
500
SOURCE: EMODNET

$$P = \frac{1}{2} * d * A * v^3 \begin{cases} A = swept\ area\ \ (A = \pi\, r^2) \\ d = air\ density \\ v = wind\ speed \end{cases}$$

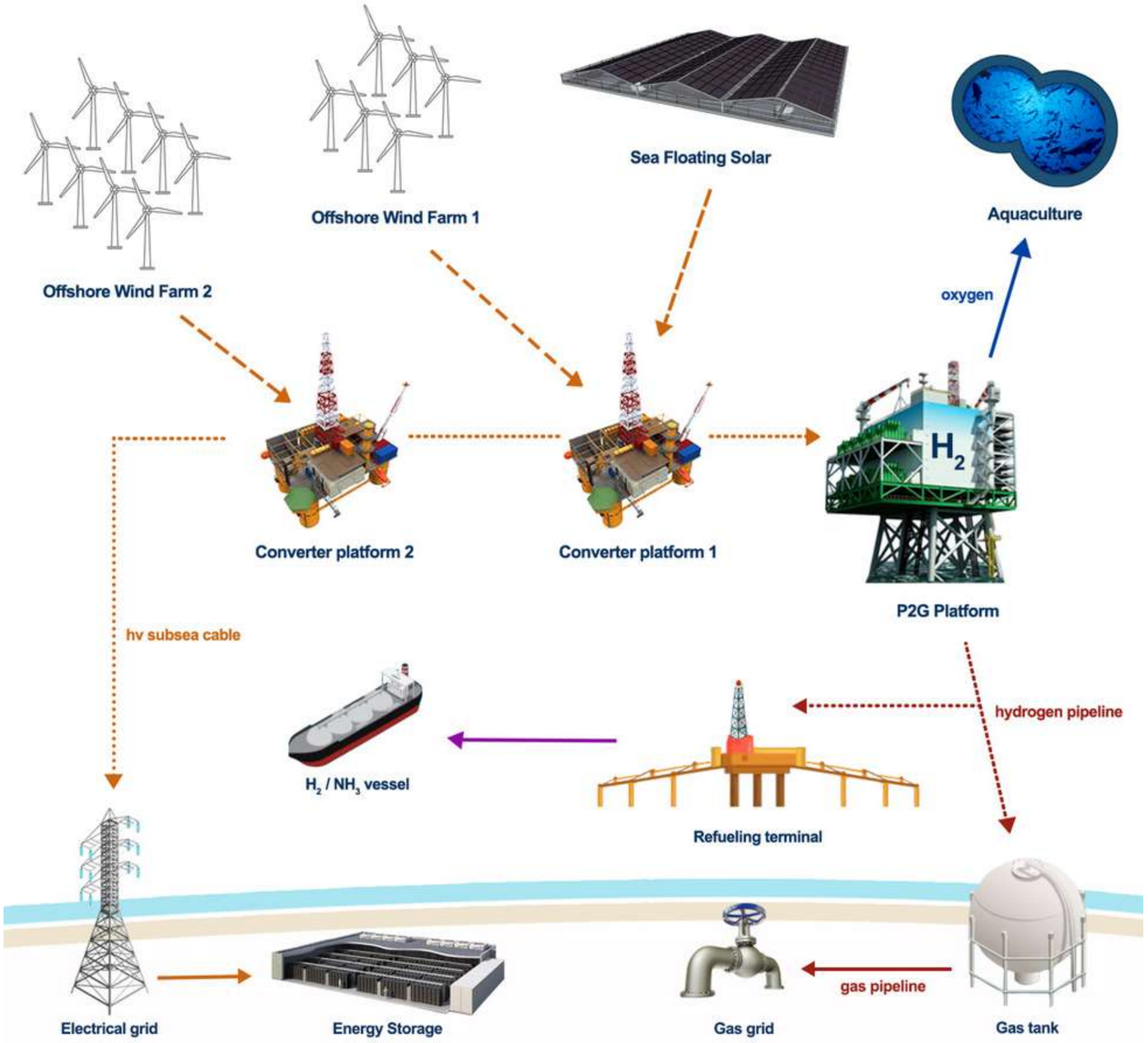
Company	Model	Rated Power [kW]	Wind Class IEC	Cut-in wind speed [m/s]	Cut-out wind speed [m/s]	Rotor diameter	Swept area [m^2]	sA/rP
Ming Yang	MySE 10-242	10000				242	45972.74	4.597
Envision	EN200-7.0	7000				200	31400	4.486
Ming Yang	MySE5.0-166	5000	S	2.5	25	166	21631.46	4.326
Goldwid	GW184-6.45	6,450	S	3	21	184	26576.96	4.120
Ming Yang	MySE 6.45-180	6450	S	3	30	180	25434	3.943
Goldwid	GWH 242-12	12000				242	45972.74	3.831
Envision	EN190-8.0	8000				190	28338.5	3.542
Ming Yang	MySE5.5-155	5500	IB	3	30	155	18859.625	3.429
Swiss Electric	Y7160/6.0	6000	III			160	20096	3.349
GE	Haliade-X	12000	IB			220	37994	3.166
Siemens Gamesa	SG 14-236 DD	14000	I-S (High wind and low wind)			236	43721.36	3.123
Ming Yang	MySE 8.3-180	8300	S	3	30	180	25434	3.064
Goldwid	GW175-8.0	8000	S	3	25	175	24040.625	3.005
GE	Haliade 150-6	6000	IB	3	25	150	17662.5	2.944
Ming Yang	MySE 11-203	11000	IB			203	32349.065	2.941
GE	Haliade-X	13000	IC			220	37994	2.923
Vestas	V236-15.0	15000	S-ST	3	30	236	43721.36	2.915
Ming Yang	MySE 16-242	16000				242	45972.74	2.873
Siemens Gamesa	SG 11.0-200 DD	11,000	I-S (raccomended high wind)			200	31400	2.855
Swiss Electric	YZ190/10.0	10000	III	2.5	25	190	28338.5	2.834
Siemens Gamesa	SG 14-222 DD	14000	I-S (raccomended high wind)			222	38687.94	2.763
Siemens Gamesa	SG 8.0-167 DD	8,000	IB-S (raccomended high wind)			167	21892.865	2.737
GE	Haliade-X	14000	IC			220	37994	2.714
DongFang	FD211-13000	13000				211	34948.985	2.688
DongFang	D10000-185	10000		4	30	185	26866.625	2.687
Vestas	V117-4.2	4000	IIA-IB-ST	3	25	117	10745.865	2.686
Siemens Gamesa	SWT-7.0-154	7000	I-S (raccomended high wind)			154	18617.06	2.660
Vestas	V174-9.5	9500	IB-IBT	3	25	174	23766.66	2.502
Vestas	V164-9.5	9500	S	3	25	164	21113.36	2.222
Vestas	V164-10	10000	ST	3	25	164	21113.36	2.111







sA/rP higher than 5 to achieve a capacity factor of 35% or more


Offshore Wind Farm 2
Offshore Wind Farm 1
Sea Floating Solar
Aquaculture
oxygen
Converter platform 2
Converter platform 1
H_2
P2G Platform
hv subsea cable
hydrogen pipeline
H_2 / NH_3 vessel
Refueling terminal
Electrical grid
Energy Storage
Gas grid
gas pipeline
Gas tank

AGNES *Key Numbers*

750 MW

total installed capacity between floating solar, wind and batteries

→ 75 offshore wind turbines, 1 offshore floating solar farm

16 TONS

hydrogen produced daily by on-shore/off-shore electrolyzers

→ considering a target capacity of 50 MW

> 1.6 TWH

electricity produced yearly by wind and solar power plants

→ enough to power 500.000 households

€2 BILLION

total investments for the realization of the onshore ad offshore infrastructures.

→ thousands of professional figures involved.

Key Facts AGNES

TECHNOLOGICAL INNOVATION

unique integration of avant-guarde power plants
one-of-a-kind project on commercial scale in the Italian market

RAVENNA O&M AND CONSTRUCTION HUB

the proximity of the industrial port creates technical/financial advantages
local value chain, highly skilled companies in the O&G sector

LOW ENVIRONMENTAL IMPACT

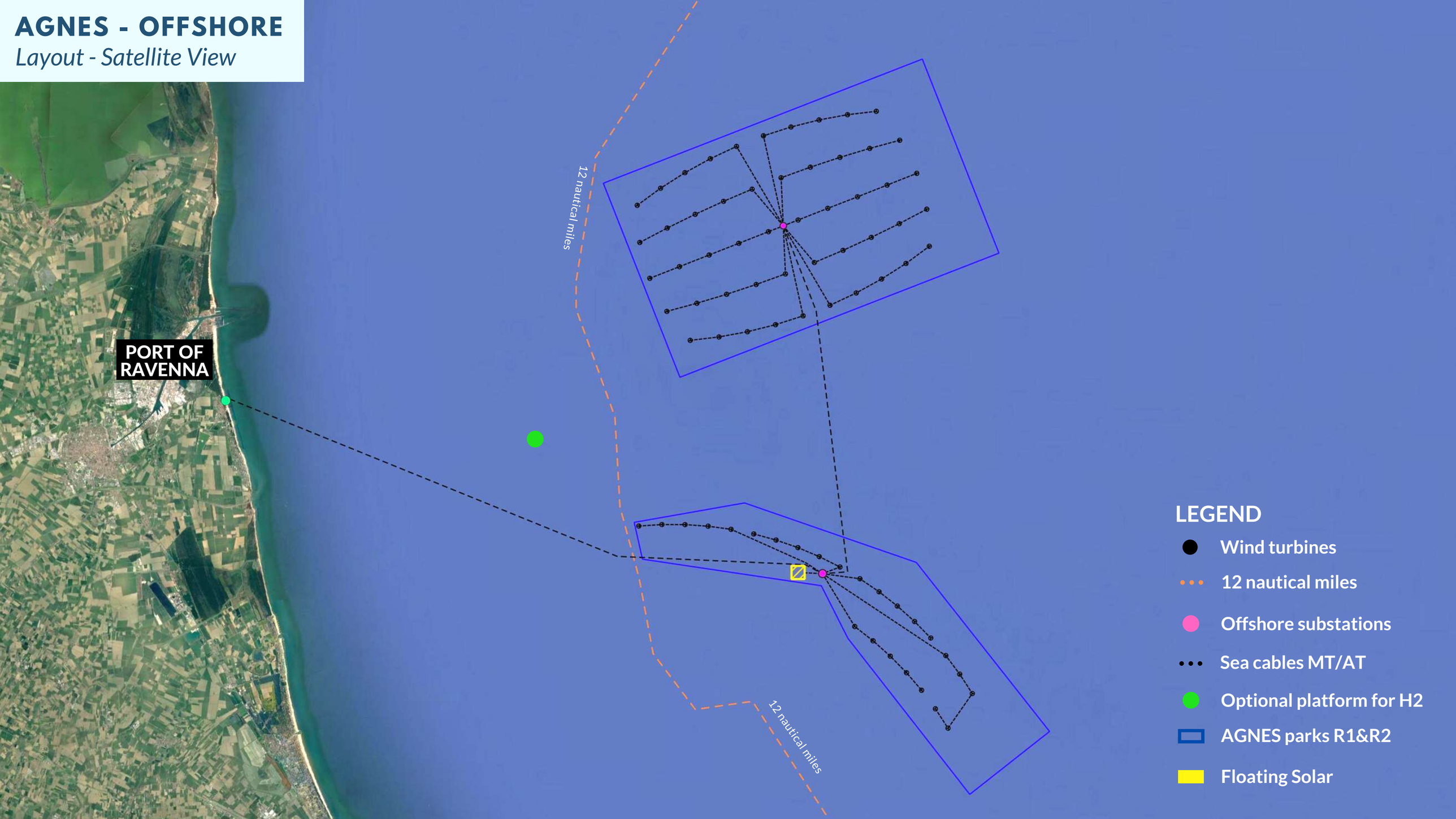
careful preliminary study of the maritime space
low visual impact thanks to the distance from the shore

ALIGNED WITH ENERGY STRATEGY

the project is in harmony with Italian and European targets
great endorsement from the public administrations, locally and nationally

AGNES - OFFSHORE

Layout - Satellite View



AGNES - ONSHORE

Layout - Satellite View

PROJECT'S ROADMAP 2020 > 2024

2020

PARTNERSHIP & PRELIMINARY PROJECT

- Request for connection to the national grid, operated by Terna, of 670 MW
- Start of the **official collaboration with Saipem S.p.A.**
- **Completion of the Preliminary Project**
- Start of the stakeholder engagement campaign

2021

START OF PERMITTING PROCESS

- **670 MW connection to the national grid officially secured**
- **Official start of the permitting process with Italian Ministeries**
- **Start of permitting process and opening of the Services Conference**

2022

PRESENTATION OF THE PROJECT & EIA

- **Front-End Engineering Design** & relationships with suppliers
- Surveys for **Environmental Impact Assessment**
- Start of the wind measurement campaign in project's area
- Submission of **EIA** to the Italian Ministry of Ecological Transition

2023

ACQUISITION OF ALL PERMITS & FID

- Conclusion of **Environmental Impact Assessment (EIA)**
- **Presentation of the Project** to Italian Ministry of Transport
- **Evaluation of EIA** from Italian Ministry of Ecological Transition
- **Start of tender for EPCI contracts**

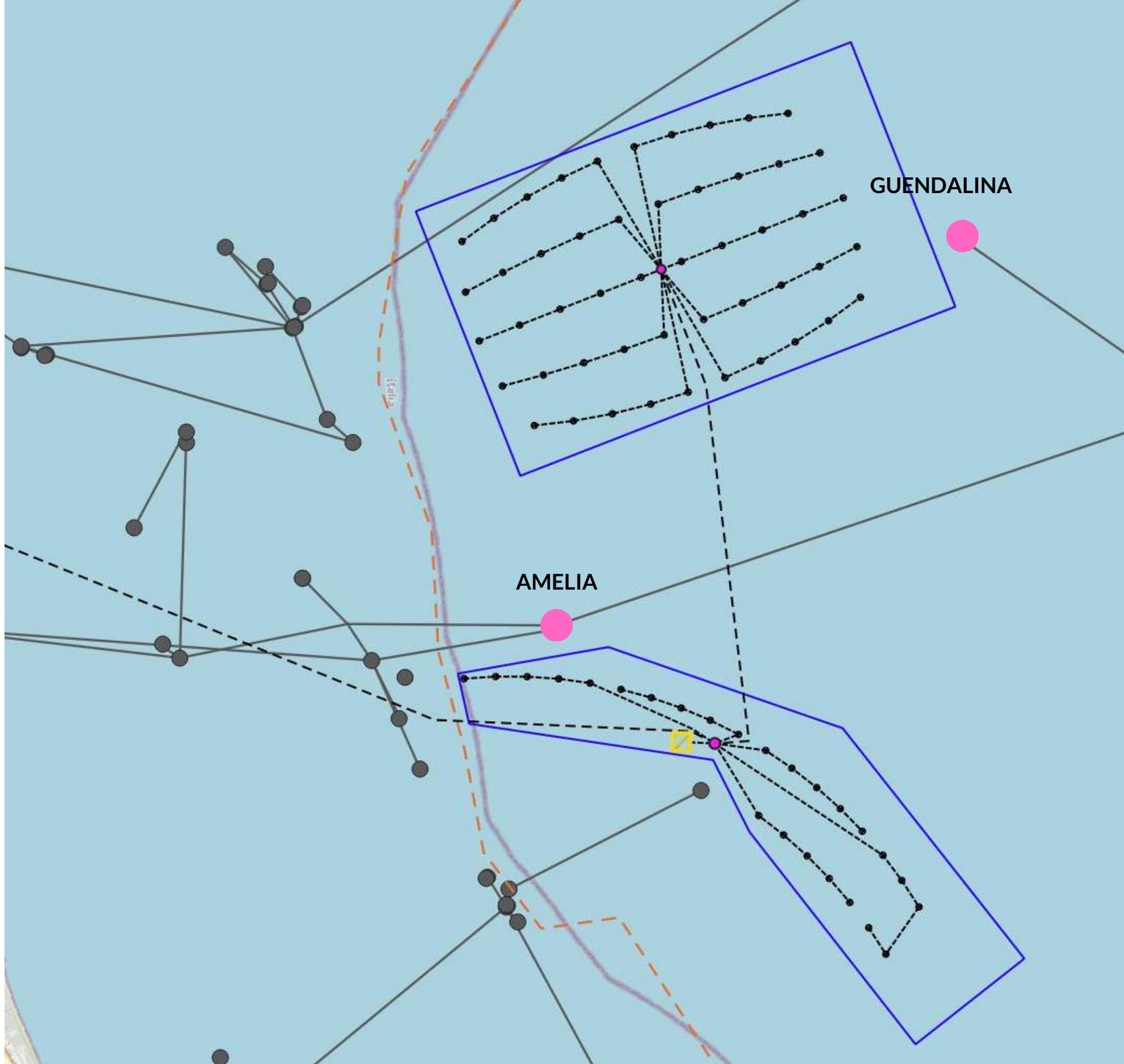
2024

FINAL INVESTMENT DECISION & EPCI

- **Acquisition of all permits from Italian authorities**
- **FID** Date - **Final Investment Decision**
- Start of the Executive Project

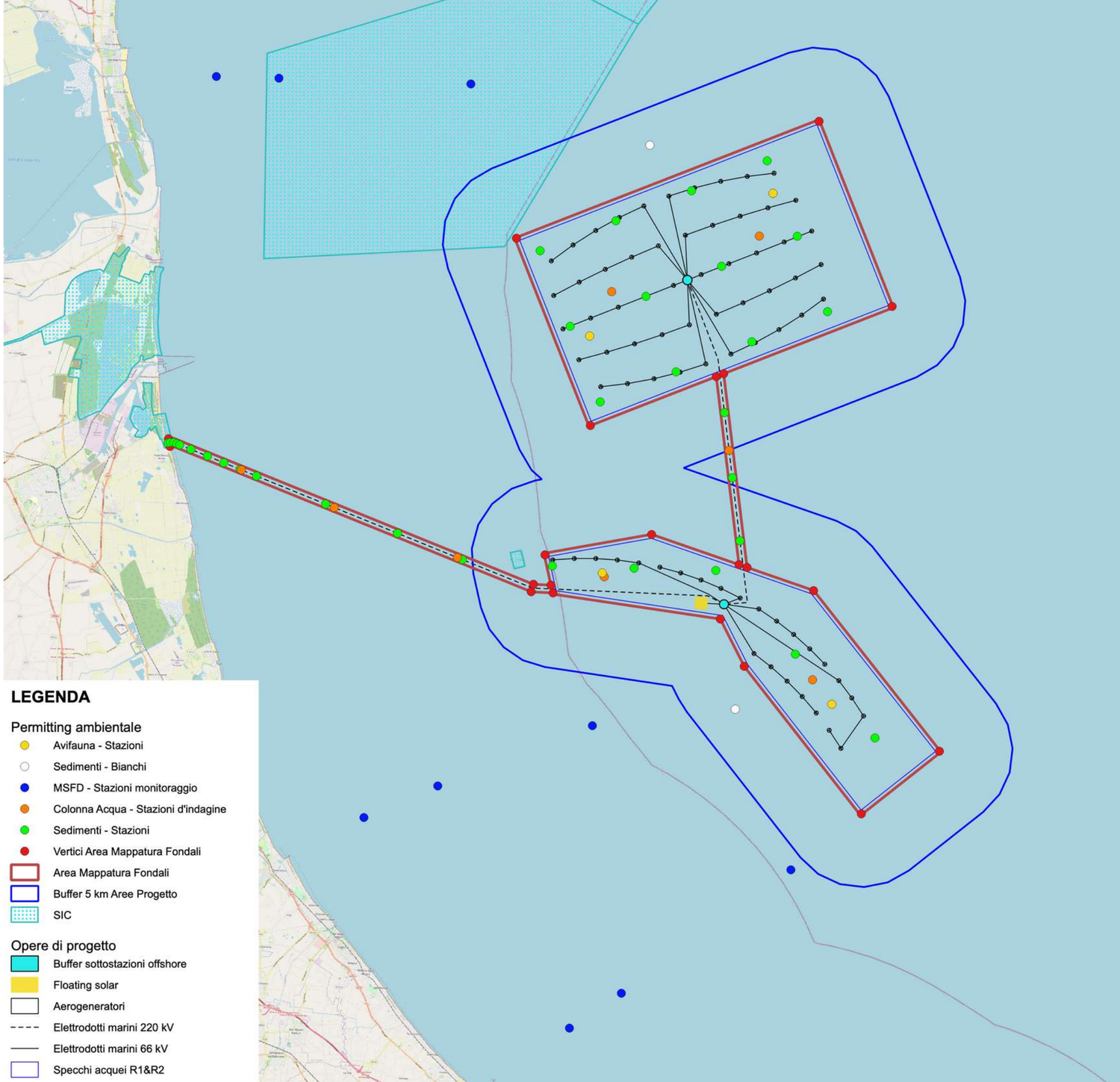
WIND MEASUREMENT CAMPAIGN

- **Two fixed lidars** on two O&G platforms in close **proximity to Romagna 1 and Romagna 2 areas**
- Starting of **wind measurements campaign** by the **end of 2021**
- **Duration of campaign:** 12-24 months



ENVIRONMENTAL IMPACT ASSESSMENT

- **Geomorphological surveys on Q2 2022 (SBES, MBES, SSS and MAG)**
- Birds and marine fauna surveys
- Water and sediments analysis
- Countless desktop studies
- **Duration of campaign: 6 months**
- **Presentation of EIA to the authorities on Q1 2023**



STAKEHOLDER ENGAGEMENT

The company that created and promoted the project, Qint'x, together with the development partner Saipem, has carried out over the last two years an intense stakeholder engagement campaign aimed at facilitating the AGNES authorization.

Today the project enjoys the **great endorsement of municipal and regional policy.**

In addition, the AGNES project is **unique at the national level**, as it can **bring together environmental and industrial associations**, historically in contrast.

This represents a **great advantage** for the success of the project**,** as demonstrated by the recent **allocation of €70 million for the project** within the Complementary Fund to the PNRR voted by the Italian Parliament in July 2021.

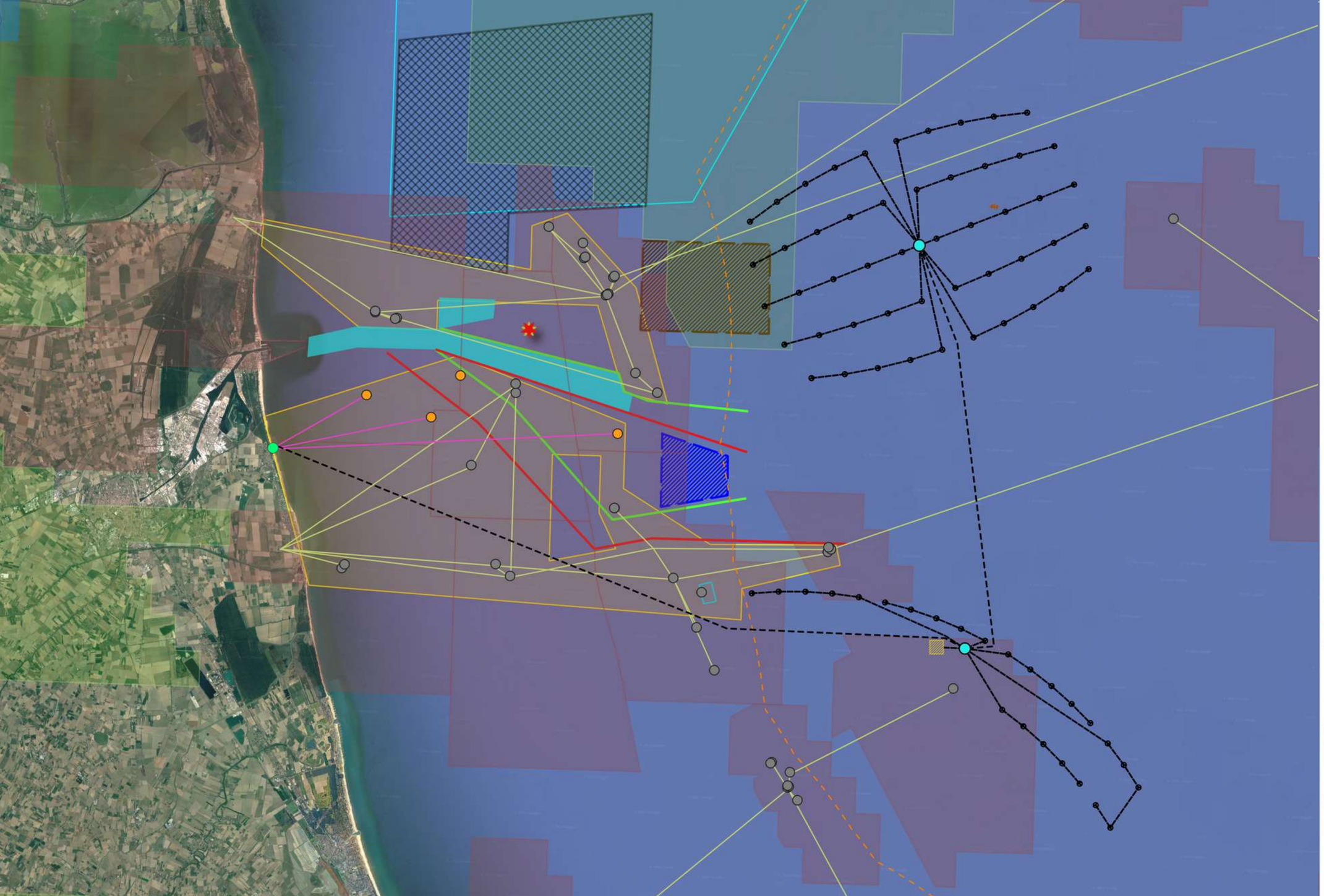
Comune di Ravenna

Regione Emilia-Romagna

LEGAMBIENTE

CONFINDUSTRIA

RAVENNA OFFSHORE CONTRACTORS ASSOCIATION
ENERGY CONTRACTORS



LEGENDA

Progetto AGNES Ravenna

Layout definitivo 2° istanza

Opere a mare

- Punto di sbarco su linea di costa
- Buffer sottostazioni offshore
- Aerogeneratori
- Floating solar
- Elettrodotti marini 66 kV
- Elettrodotti marini 220 kV

Limiti amministrativi

- Limite acque territoriali (ISPRA)

Idrocarburi

- Terminali marini
- Piattaforme estrattive

Condotte (ARPAE)

- Sealine metanifera
- Sealine petrolifera
- Istanze di concessione
- Permessi di ricerca
- Concessioni

Cumulative Analysis

Nuovo TSS

- Corridoio Ingresso Nord
- Corridoio Ingresso Sud
- Corridoio Uscita Nord
- Corridoio Uscita Sud
- Canale di accesso al porto
- Anch point
- Area B1 - Zona ECHO 346
- LTA zone
- SIC Marini
- Relitto
- Scarico dragaggi
- Aree di divieto ancoraggio

Mappe di base

Google Satellite

AGNES WIND FARMS

260 meters

ROTOR DIAMETER

170 meters

HUB HEIGHT

600 MWp

TOTAL POWER

12 e 14 mn

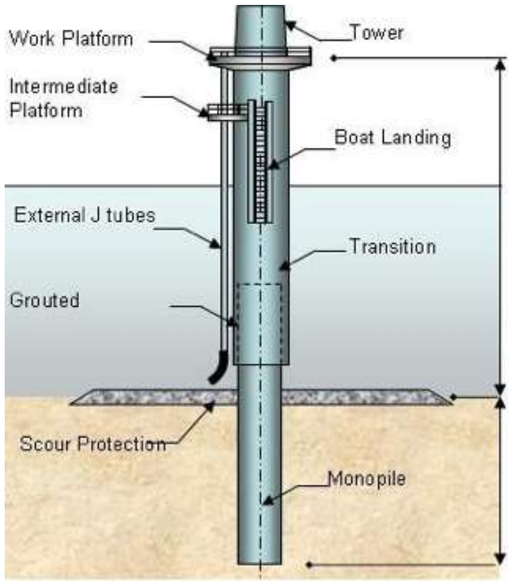
SHORE DISTANCE

Agnes wind component is divided into two offshore parks named "Romagna 1" and "Romagna 2", for a total of 75 wind turbines with a rated power of 8 MWp, a hub height of 170 meters, and a rotor diameter of 260 meters:

- **Romagna 1: it's composed of 25 wind turbines, of which 10 off-grid to power the electrolyzers;** the **layout is a double arch located at 12 nautical miles from the shore;**

- **Romagna 2: it's composed of 5 lines with 10 wind turbines each;** the **layout is characterized by a cluster, located 14 nautical miles from the shore in order to mitigate the visual impact.**

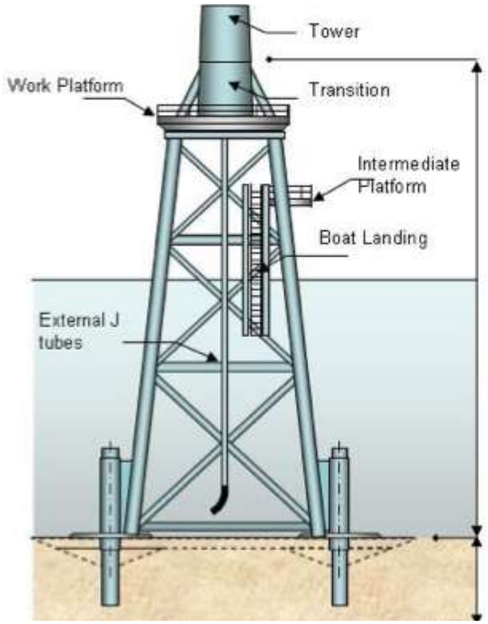
AGNES WIND FARM FOUNDATIONS



MONOPILE

PROS: easy to build, lower costs of manufacturing, well proved.

CONS: limited water depth, lower resistance to waves, highly sensitive to soil conditions.



JACKET

PROS: higher resistance to waves, lesser sensitivity to soil conditions.

CONS: higher costs of manufacturing.

SUCTION BUCKET

PROS: reduced impact on environment, easier installation.

CONS: higher costs of manufacturing, less mature technology.

AGNES WIND FARMS PRODUCTION

WIND FARMS R1 & R2: SUMMARY OF 1st YEAR PRODUCTION WITH ERA-5 WIND DATA ACCORDING TO THE LAYOUTS						
Turbine type	Rated power [MW]	Average wind speed [m/s]	Wind Loss [%]	Net AEP [MWh/y]	Equivalent hours [hh]	Degradation rate [%, per year]
65x GH-FD 202	600	5.46	4.32	1.204.180	2007	0,54
65x GH-FD 220	600	5.46	4.54	1.312.111	2187	0,54
65x GH-FD 250	600	5.46	5.19	1.479.324	2466	0,54
65x GH-FD 260	600	5.59	5.57	1.533.711	2556	0,54
65x Myng Yang 203	600	5.44	4.43	1.200.343	2001	0,54

WIND FARMS R1 & R2: SUMMARY OF 1st YEAR PRODUCTION WITH AWS WIND DATA ACCORDING TO THE LAYOUTS						
Turbine type	Rated power [MW]	Average wind speed [m/s]	Wind loss [%]	Net AEP [MWh/y]	Equivalent hours [hh]	Degradation rate [%, per year]
65x GH-FD 202	600	6.72	3.22	1.720.243	2867	0,54
65x GH-FD 220	600	6.72	3.45	1.862.944	3105	0,54
65x GH-FD 250	600	6.69	3.93	2.022.089	3370	0,54
65x GH-FD 260	600	6.88	4.27	2.056.343	3427	0,54
65x Myng Yang 203	600	6.69	3.27	1.717.125	2862	0,54

AGNES FLOATING SOLAR PLANT

63 ha

SURFACE AREA

100 MWp

INSTALLED POWER

2-3 meters

MAX HEIGHT A.S.L.

12 nm

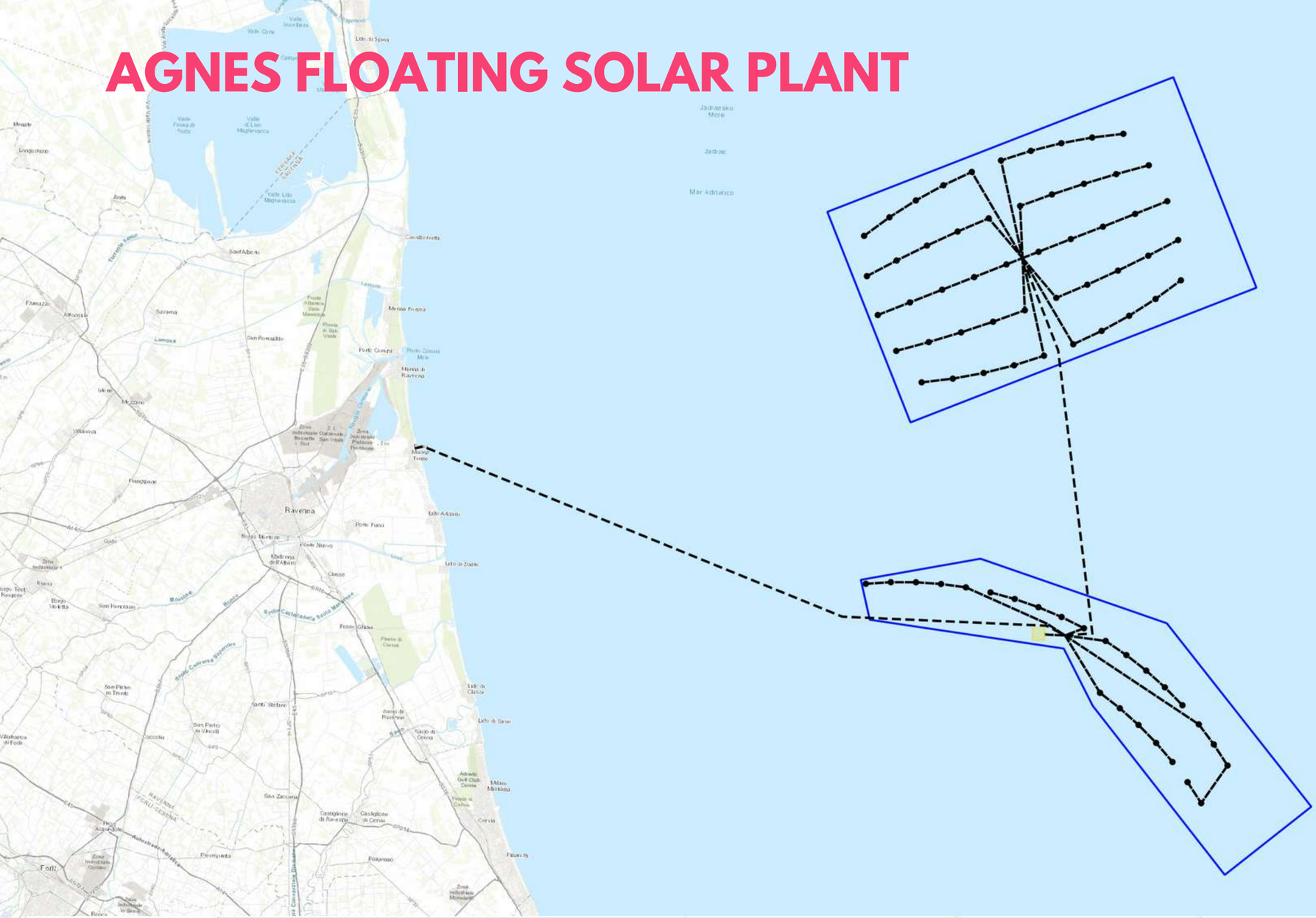
SHORE DISTANCE

Floating solar is a technology with **huge potential** that is being adopted all around the world and **Agnes is set to be one of the first offshore projects in the world regarding this technology.**

The **High Adriatic Sea presents ideal conditions** for the testing and maturity of this technology:

- low sea depths,
- low waves,
- and a good level of solar radiation.

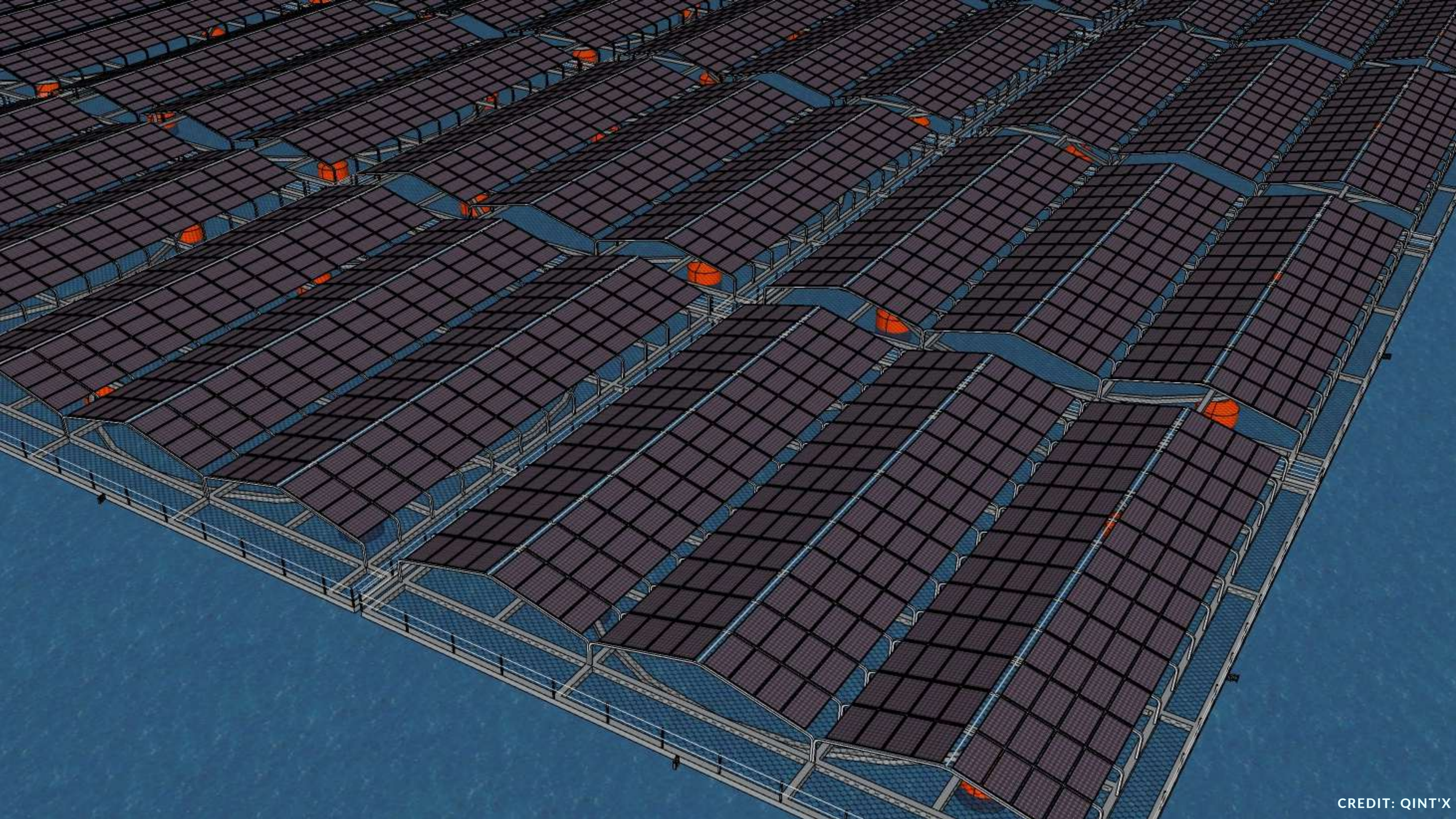
AGNES FLOATING SOLAR PLANT



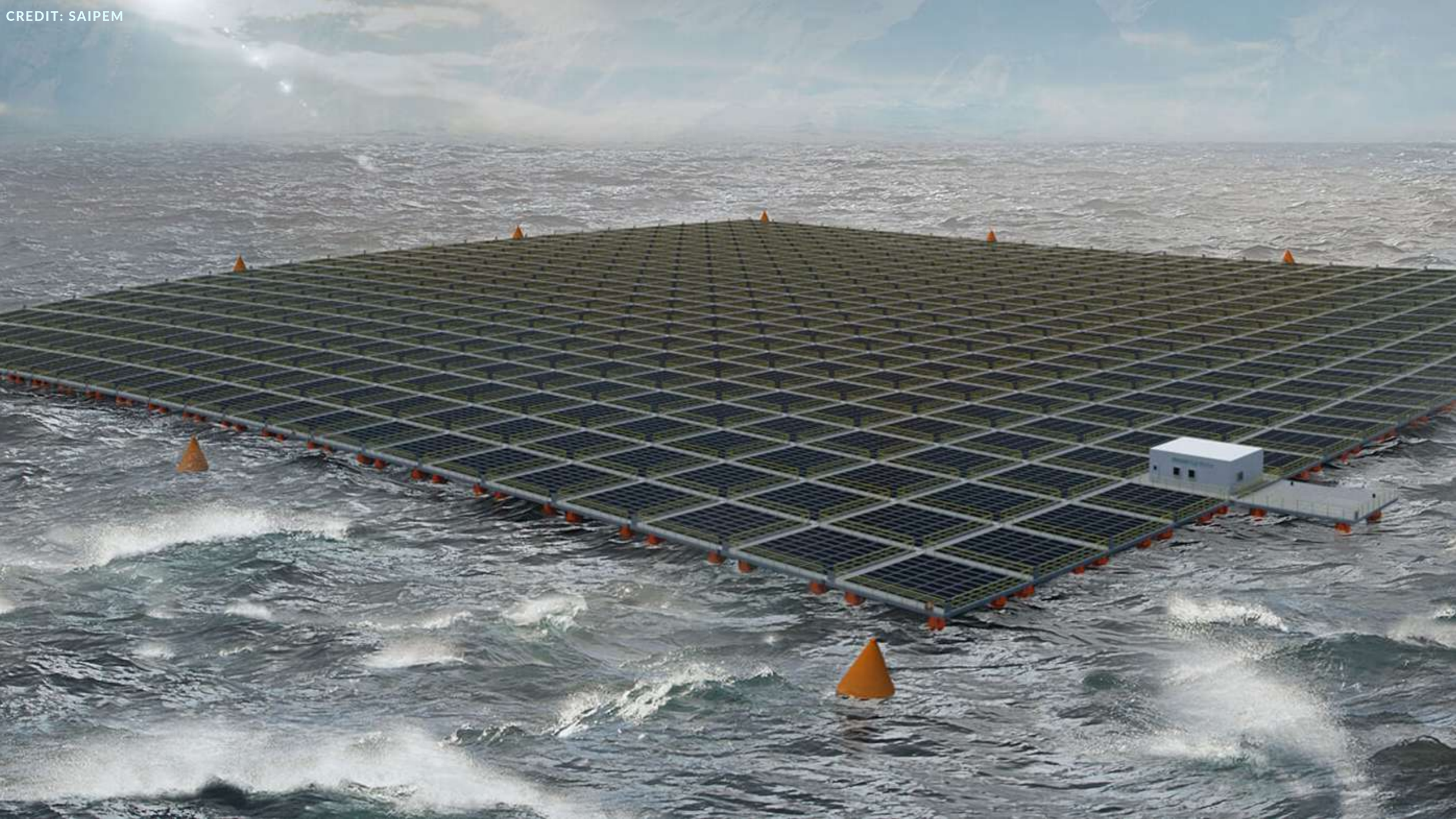
	AREA OCCUPIED (sm)	INSTALLED CAPACITY (MW)	FIRST YEAR NET AEP (MWh)	AREA OCCUPIED/MW	AREA OCCUPIED/MWh
FLOATING SOLAR	1,690,000.00	100.00	111,800.00	16,900.00	15.12
WIND	396,403,996.00	600.00	1,600,200.00	660,673.33	247.72

List of countries by length of coastline

Country	*The World Factbook*[2]		World Resources Institute[1]		Land area km² (*TWF*)[3]	Coast/area ratio (m/km²)		Coast/area$^{0.5}$ ratio
	Rank	km	Rank	km		(*TWF*)	(WRI)	(TWF)
World[Note 2]	—	356,000	—	1,634,701	148,940,000	2.39	11.0	29.2
Canada	1	202,080	1	265,523	9,093,507	22.2	29.2	67
Norway	2	83,281[Note 3]	7	53,199	304,282	274	175	151
Indonesia	3	54,716	4	95,181	1,811,569	30.2	52.5	40.7
Greenland[Note 4]	—	44,087			2,166,086	20.4		30
Russia	4	37,653[Note 5]	3	110,310	16,377,742	2.30	6.74	9.3
Philippines	5	36,289	8	33,900	298,170	122	114	66.5
Japan	6	29,751	12	29,020	364,485	81.6	79.6	49.3
Australia	7	25,760	6	66,530	7,682,300	3.35	8.66	9.29
United States	8	19,924	2	133,312	9,147,593	2.18	14.6	6.59
Antarctica	—	17,968			14,200,000	1.27		4.77
New Zealand	9	15,134	17	17,209	264,537	57.2	65.1	29.4
China	10	14,500	11	30,017	9,326,410	1.55	3.22	4.75
Greece	11	13,676	19	15,147	130,647	105	116	37.8
United Kingdom	12	12,429	16	19,717	241,930	51.4	81.5	25.3
Mexico	13	9,330	14	23,761	1,943,945	4.80	12.2	6.69
Italy	14	7,600	28	9,226	294,140	25.8	31.4	14
Brazil	15	7,491	9	33,379	8,358,140	0.896	3.99	2.59
Denmark	16	7,314	44	5,316	42,434	172	126	35.5
Turkey	17	7,200	31	8,140	769,632	9.36	10.6	8.21
India	18	7,000	18	17,181	2,973,193	2.35	5.78	4.06
Chile	19	6,435	5	78,563	743,812	8.65	106	7.46
Micronesia, Federated States of	20	6,112	92	1,295	702	8,710	1,840	231



CREDIT: QINT'X


CREDIT: SAIPEM


CREDIT: OCEAN SUN

AGNES GREEN HYDROGEN

100 MW

MAXIMUM CAPACITY

32 tons

MAX H2 PRODUCED DAILY

+8000

POTENTIAL BUS FUELED

114.000 TONS

CO2 SAVED YEARLY

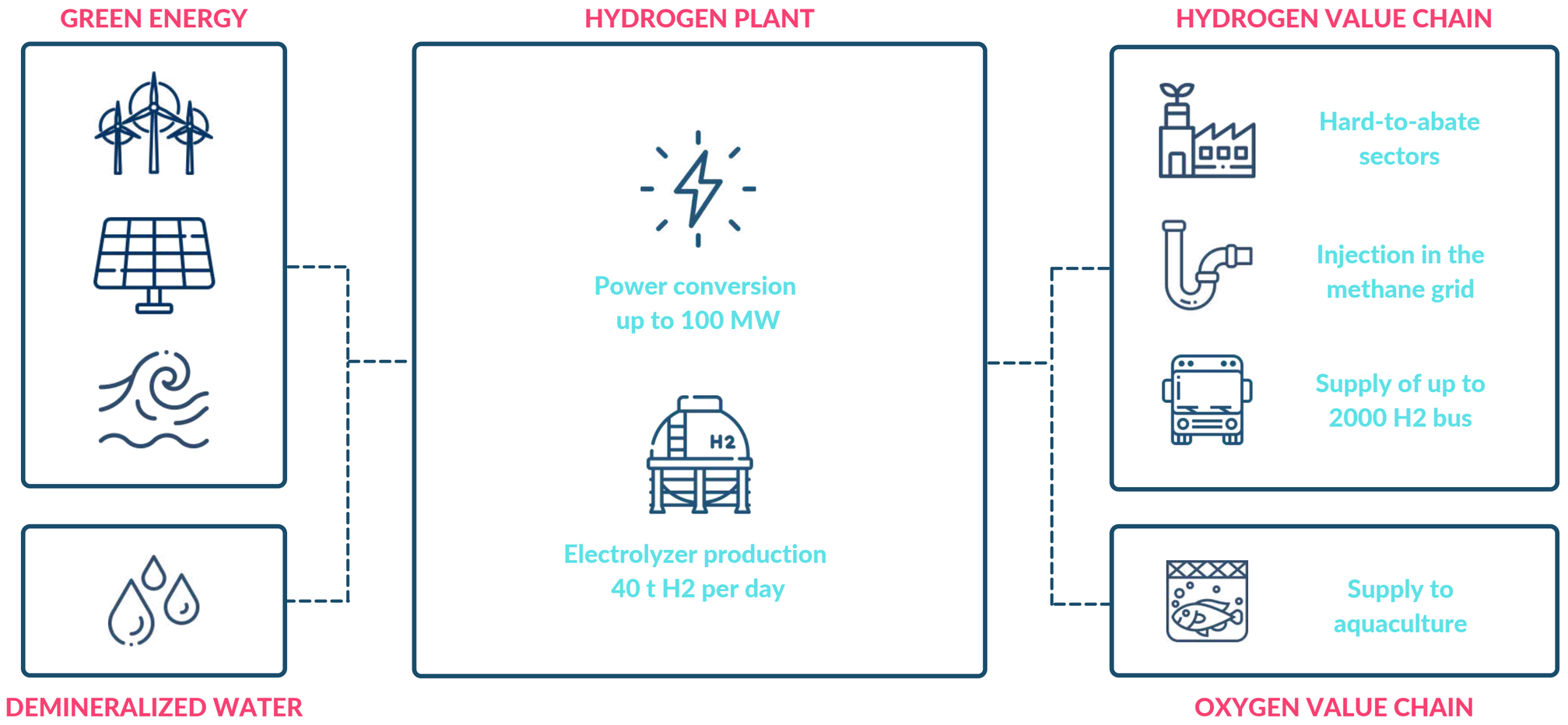
The **Agnes project has the goal to produce green hydrogen, generated by the electrolysis process, from seawater and renewable energy** from wind and solar power plants.

PEM (Polymer Electrolyte Membrane) will be installed:

- up to **4 MW off-shore on an existing O&G platform;**
- up to **100 MW on-shore in an area still in definition.**

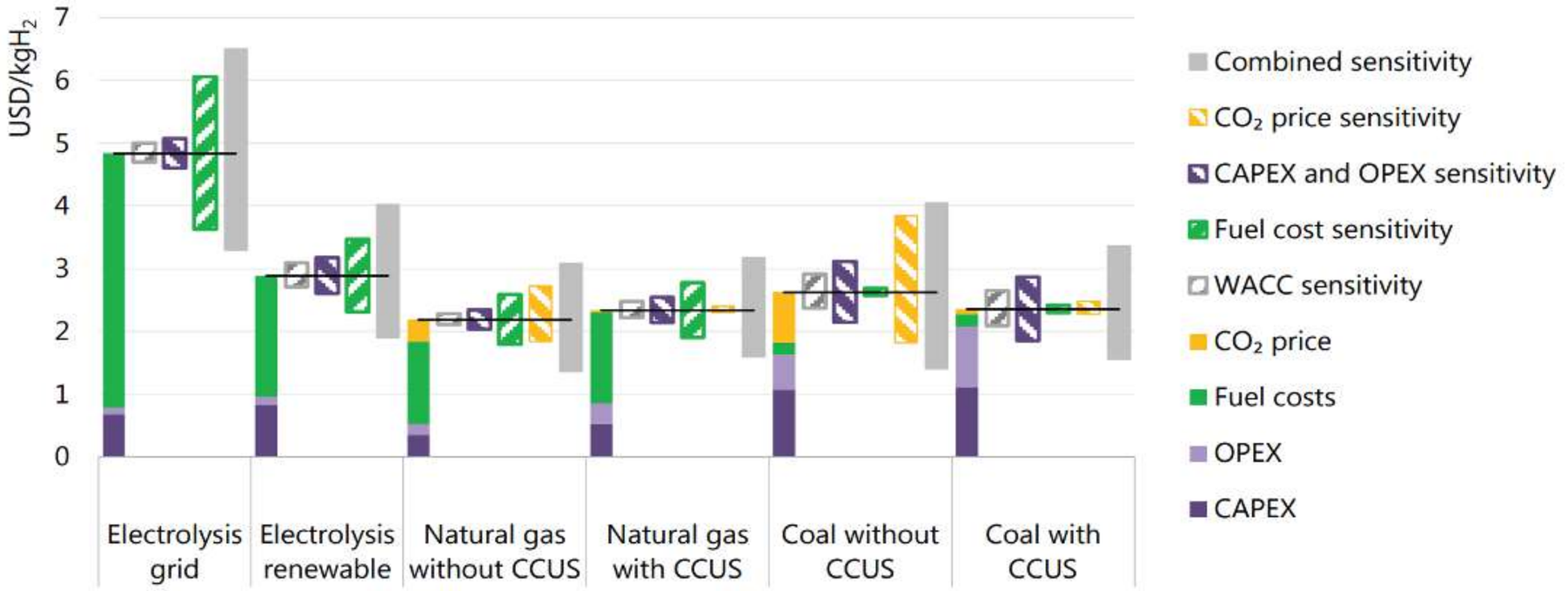
Source: EU Hydrogen Strategy, July 2020

AGNES GREEN HYDROGEN



AGNES GREEN HYDROGEN

Figure 16. Hydrogen production costs for different technology options, 2030



Notes: WACC = weighted average cost of capital. Assumptions refer to Europe in 2030. Renewable electricity price = USD 40/MWh at 4 000 full load hours at best locations; sensitivity analysis based on +/-30% variation in CAPEX, OPEX and fuel costs; +/-3% change in default WACC of 8% and a variation in default CO_2 price of USD 40/tCO_2 to USD 0/tCO_2 and USD 100/tCO_2. More information on the underlying assumptions is available at www.iea.org/hydrogen2019.

SOURCE: IEA

THANK YOU FOR YOUR ATTENTION & LET'S KEEP IN TOUCH!

AGNES

The Adriatic Green Network of Energy Sources

Gian Luca Vaglio - C.O.O. @ Agnes

g.vaglio@agnespower.com

Via Del Fringuello, 28 (48214) Ravenna - Italia

www.agnespower.com info@agnespower.com