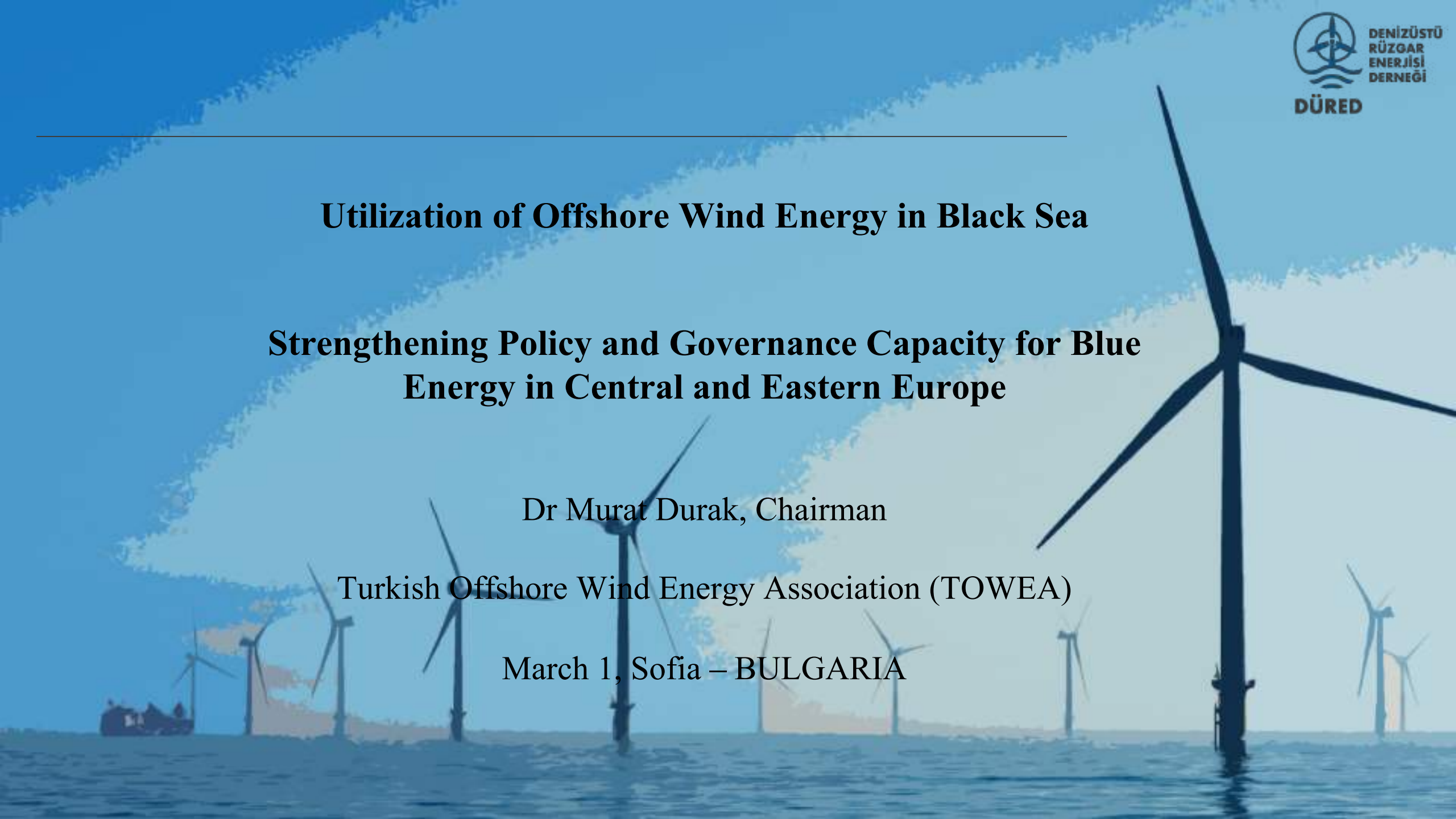


Utilization of Offshore Wind Energy in Black Sea

Strengthening Policy and Governance Capacity for Blue Energy in Central and Eastern Europe

Dr Murat Durak, Chairman

Turkish Offshore Wind Energy Association (TOWEA)

March 1, Sofia – BULGARIA

Titles

1. Turkish Offshore Wind Energy Association of (DÜRED)
2. Activities of DÜRED
3. Offshore Wind Road Map for Türkiye
4. Black Sea Offshore Wind Energy Federation (BASOFWED)
5. Offshore Wind Energy Education, R&D and Test Center
6. Conclusions

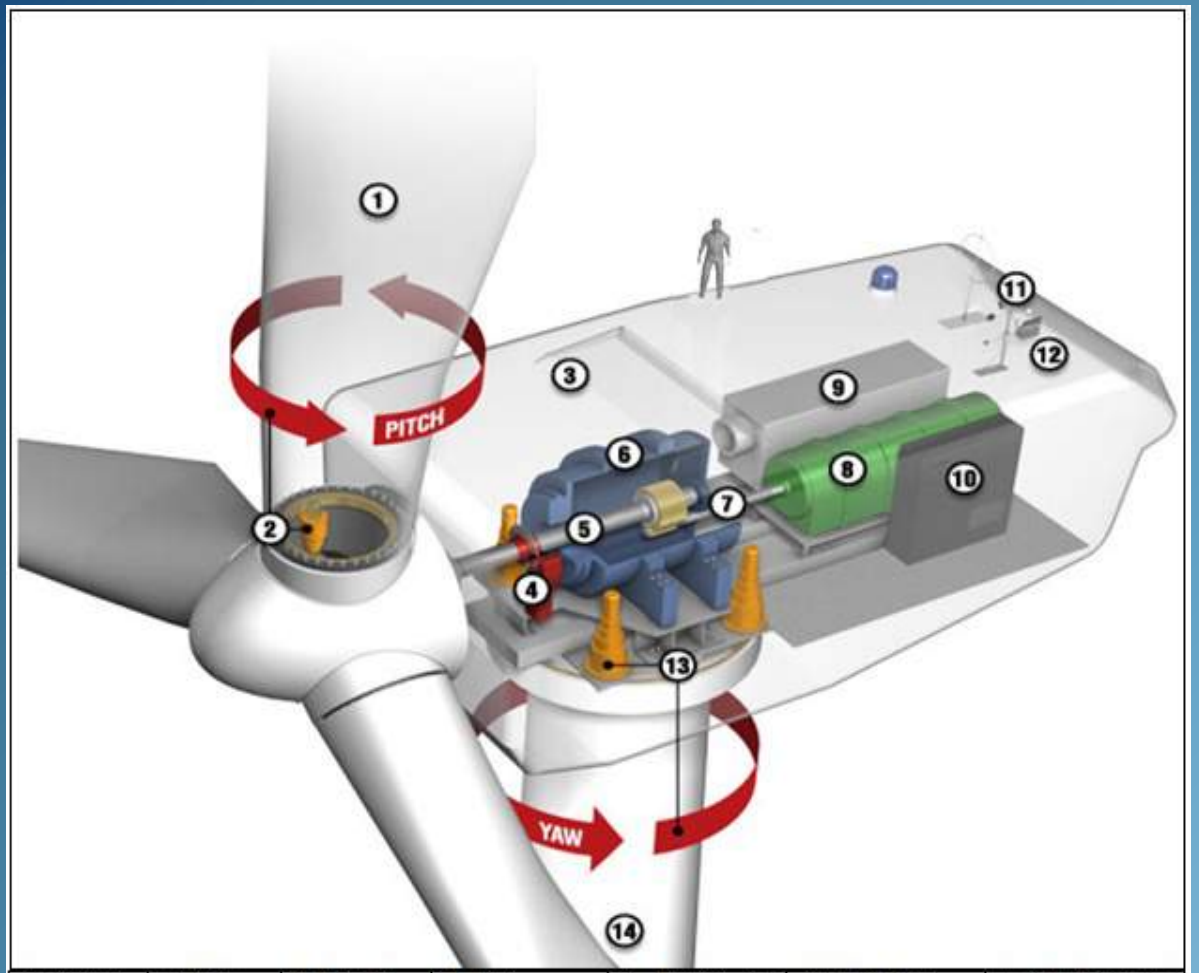
Denizüstü Rüzgar Enerjisi Derneği (DÜRED)
Turkish Offshore Wind Energy Association of (TOWEA)

Turkish Offshore Wind Energy Association was founded in April 05, 2021, in order to increase and develop investments on offshore wind energy in Turkey, to bring Marine and Energy industries together and to coordinate their collaboration.

Association is based in Ankara and has branch offices in Istanbul, Yalova, Balikesir and Izmir cities.

The goal of the Association is to develop public activities regarding offshore wind energy, support people and organisations with same purpose and utilise public institutions as well as universities in these activities to create awareness.

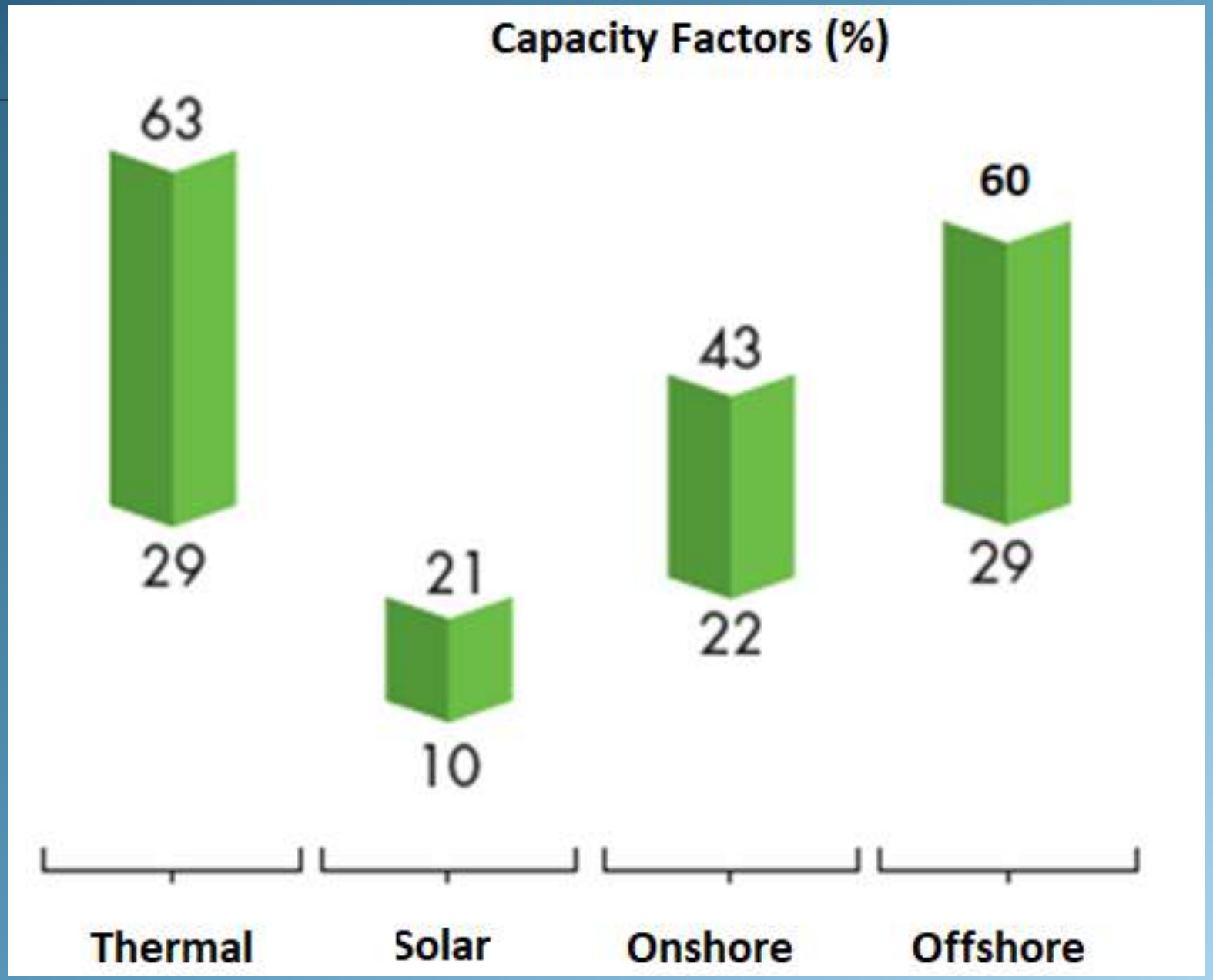
OFFSHORE WIND TUBINE
May be soon 25 MW unit?????



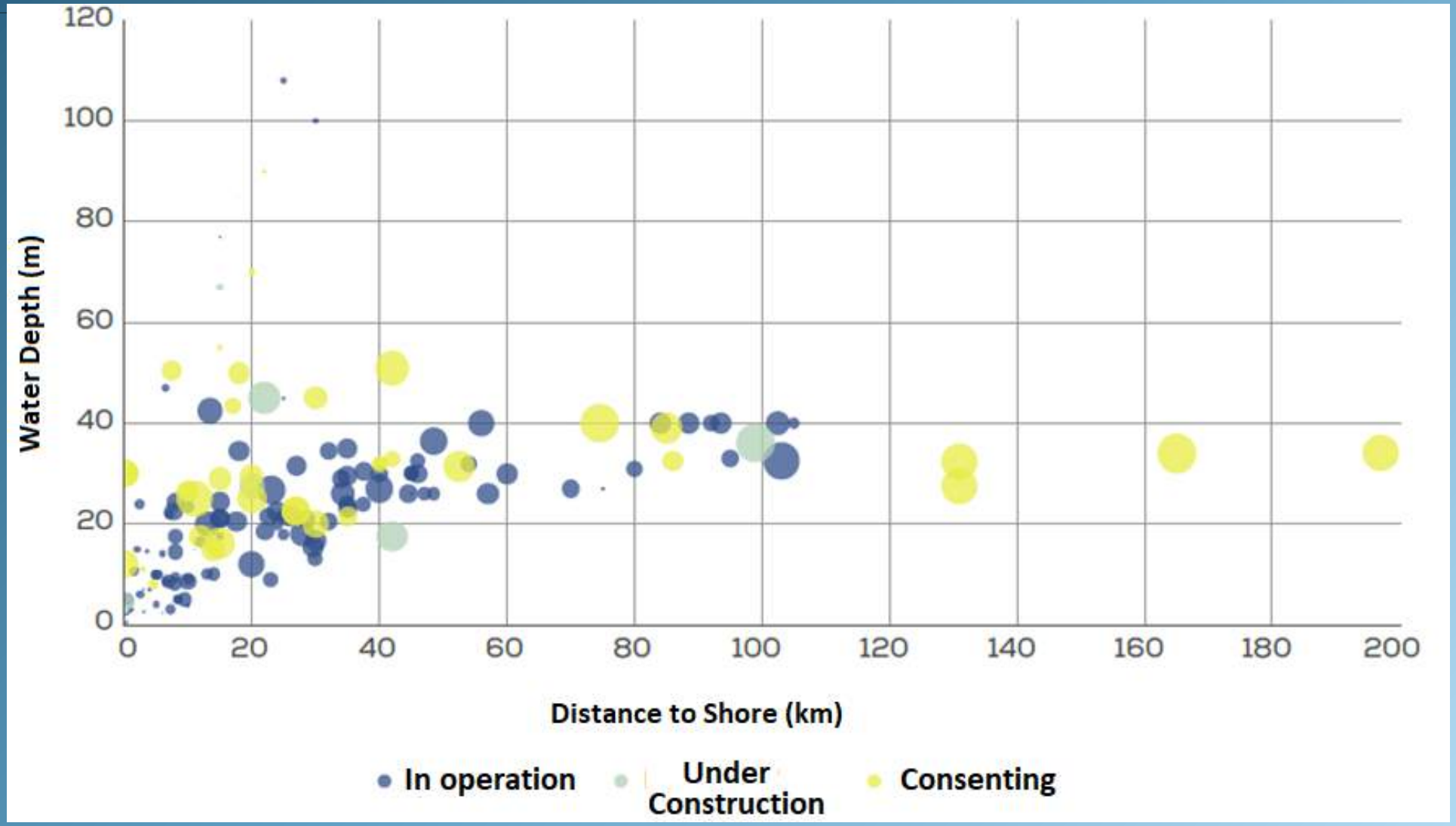
1. Pervane	2. Pitch	3. Nacelle	4. Fren	5. Düşük hız şaft	6. Dişli kutusu	7. Yüksek hız şaft
8. Jeneratör	9. Eşanjör	10. Kontrol sistemi	11.Anemometre	12.Yön sensörü	13.Yaw sürücüsü	14. Kule

Haliade-X	12 MW	13 MW	14 MW
Output (MW)	12	13	14
Rotor diameter (m)	220	220	220
Total height (m)	248	248	248
Frequency (Hz)	50 & 60	50 & 60	50 & 60
Gross AEP (GWh)	~68	~71	~74

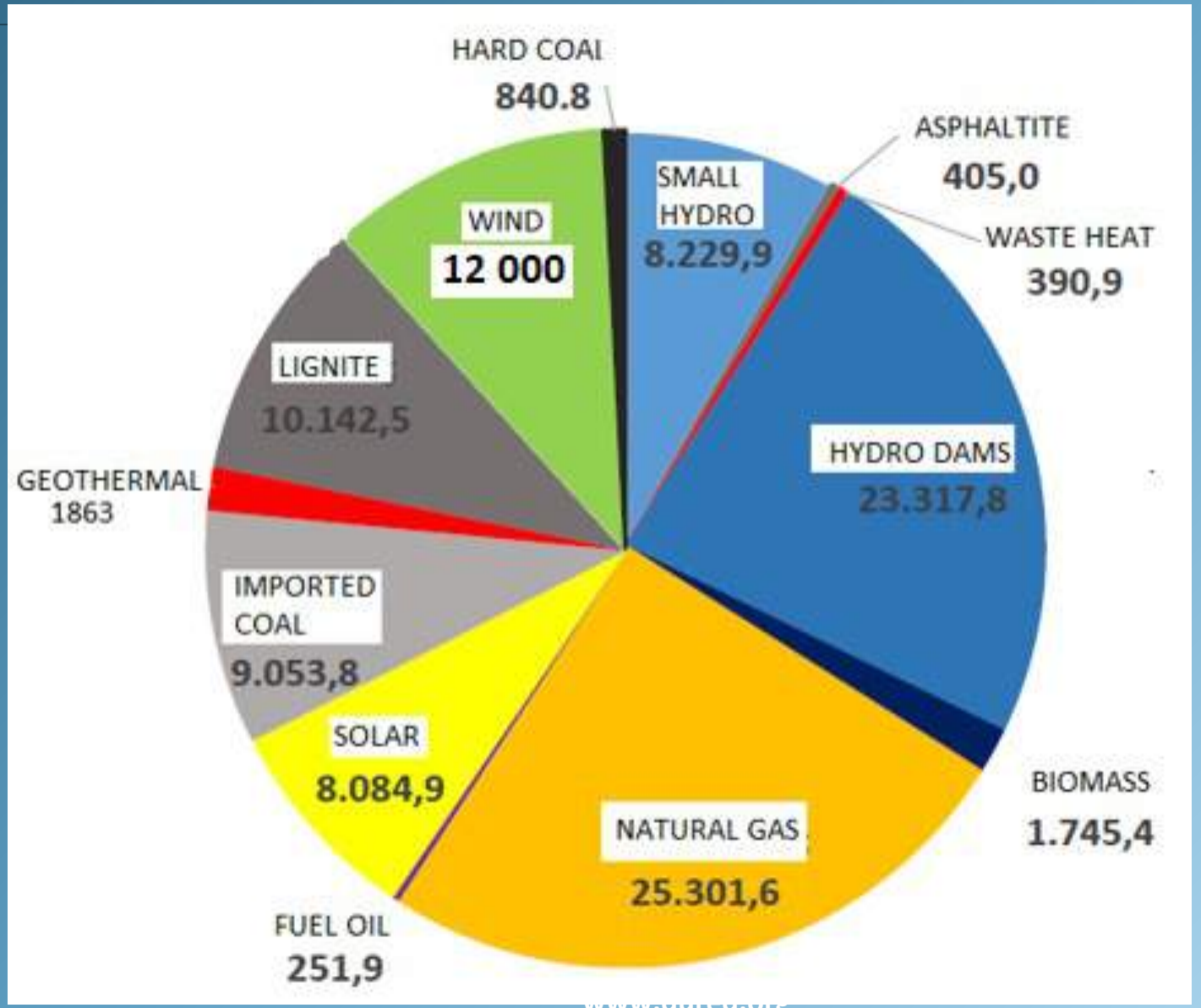
DÜRED


Capacity Factors (%)
63
29
21
10
43
22
60
29
Thermal
Solar
Onshore
Offshore

Some Selected European Projects Water Depth and Distance to Shore



INSTALLED CAPACITY OF TURKIYE: 102 341 MW



TURKISH NATIONAL ENERGY PLAN TARGETS TILL 2035

DENİZÜSTÜ RÜZGAR ENERJİSİ DERNEĞİ
DÜRED

The Ministry of Energy and Natural Resources has published the National Energy Plan of Turkey covering the period 2020-2035. In the scenario prepared by the Ministry, in the period 2020 – 2035, primary energy consumption will reach 205.3 Mtep (Million tons of oil equivalent), electricity consumption will reach 510.4 TWh (Terawatt Hours), while the electricity installed capacity will reach 189.7 GW in total.

Wind energy: 24.6 GW onshore + **5 GW offshore** totalling 29.6 GW wind

Solar energy: 52.9 GW

Hydroelectric power: 35.1 W

Other renewable energy: 5.1 GW

Nuclear power: 7.2 GW

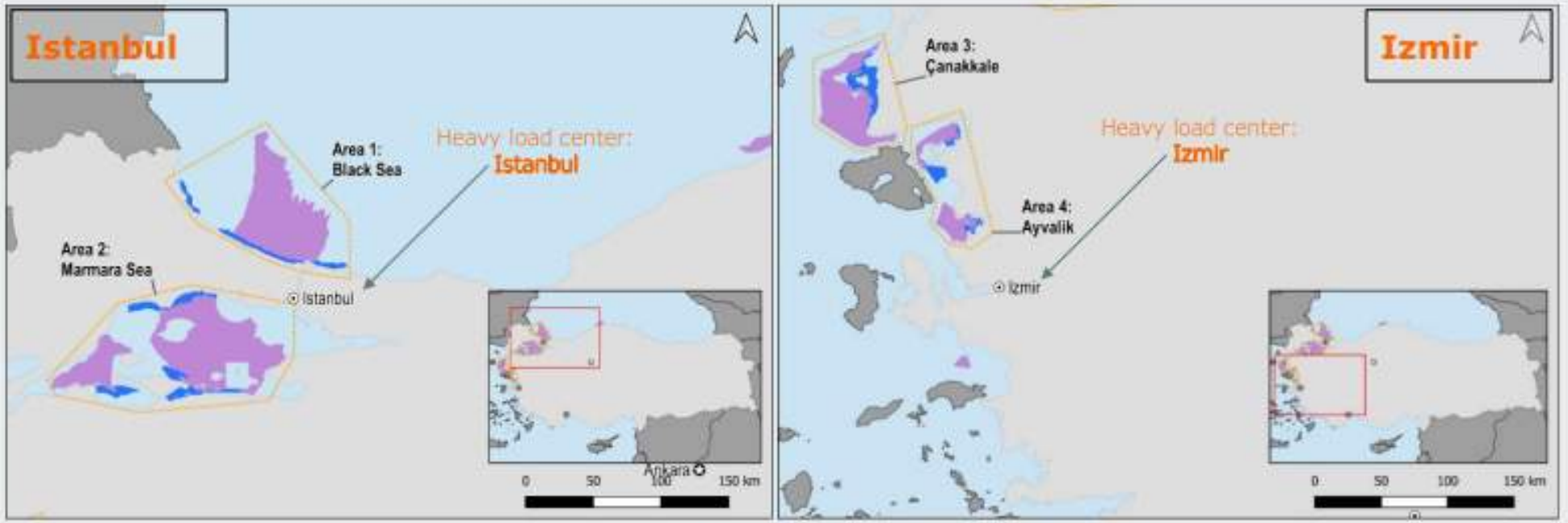
Conventional sources: 59.8 GW

Electrolyzer capacity: 5 GW

Offshore Wind Development Roadmap for Turkey

Potential Development Areas – Zooming in

- The combination of data sets on wind speed, environmental/social constraints and bathymetry, shows sparse suitable areas for bottom-fixed, **but larger for floating**.



Offshore Wind Development Roadmap for Turkey

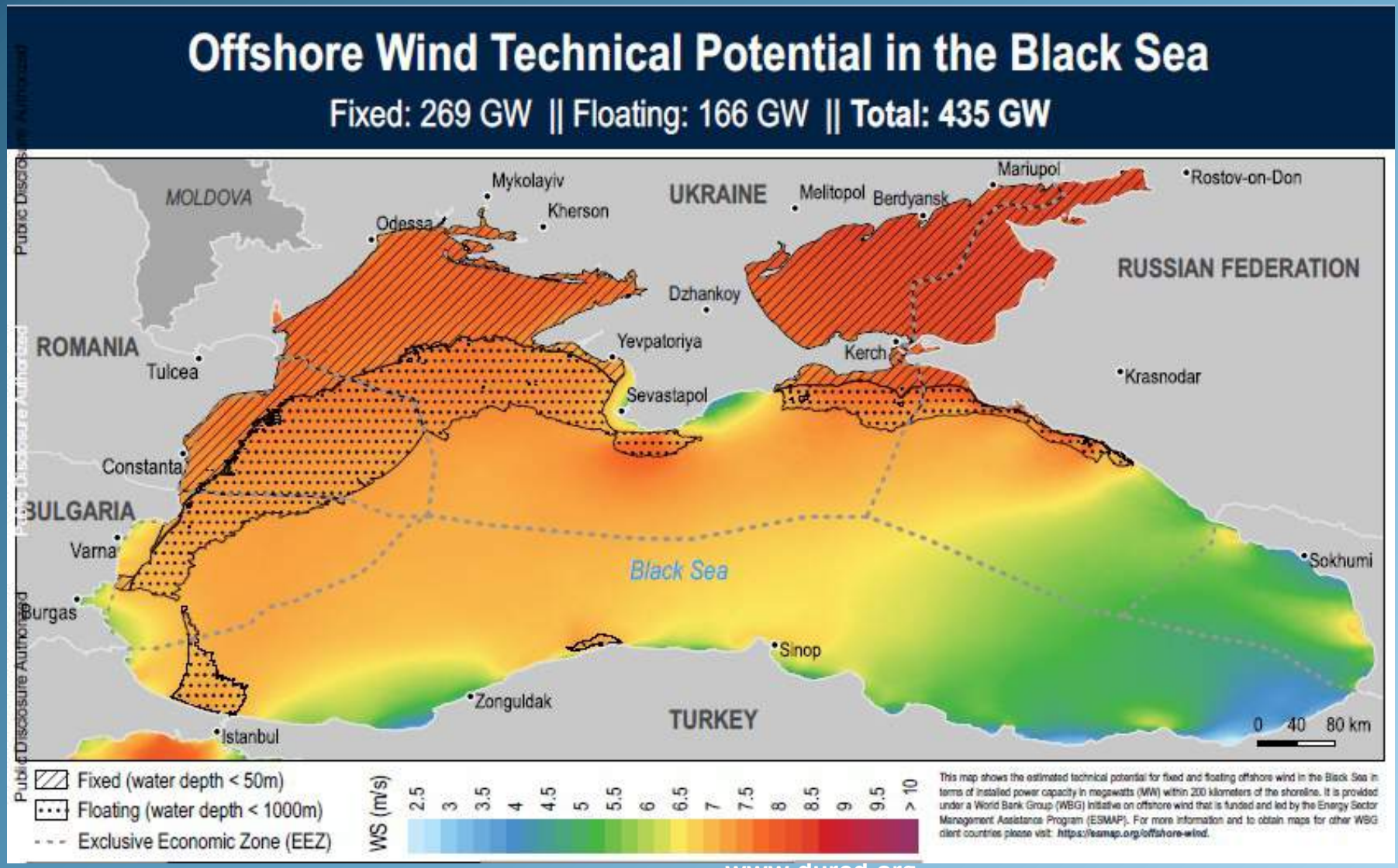
Potential Development Areas - Capacity

- Total Bottom-fixed and Floating potential for Area 1, 2, 3 and 4:

		Floating Potential		Fixed Potential		Wind speed
		km²	GW	km²	GW	m/s
Istanbul	Area 1: Black Sea	3,100	13.9	300	1.3	7.0 – 7.5
Istanbul	Area 2: Marmara Sea	4,270	19.2	620	2.8	7.0 – 8.5
Izmir	Area 3: Çanakkale	1,660	7.5	350	1.6	8.5 – 10.0
Izmir	Area 4: Ayvalik	620	2.8	225	1.0	7.0 – 9.5
	Minor areas	710	3.2	-	-	7.0 - 8.5
	TOTAL	10,360	46.6	1,495	6.7	

BLACK SEA OFFSHORE WIND POWER POTENTIAL

Offshore Wind Power Hub in Black Sea???



DENİZÜSTÜ RÜZGAR ENERJİSİ DERNEĞİ
DÜRED

Black Sea Countries Offshore Wind Power Potential

(World Bank Report)

Countries	Fixed (GW)	Floating (GW)	Total (GW)
Bulgaria	2	24	26
Romania	22	54	76
Türkiye	12	63	75
Ukraine	183	68	251
TOTAL (GW)	**269**	**166**	**435**

Black Sea Countries Offshore Wind Energy Federation (BASOFWED)

Black Sea Countries Offshore Wind Energy Federation (BASOFWED) together with the Ukrainian Wind Energy Association (UWEA). We had already signed the Protocol with UWEA and Bulgaria, Georgian already. **Romaina is still pending**. The purpose of such Federation is as follows;

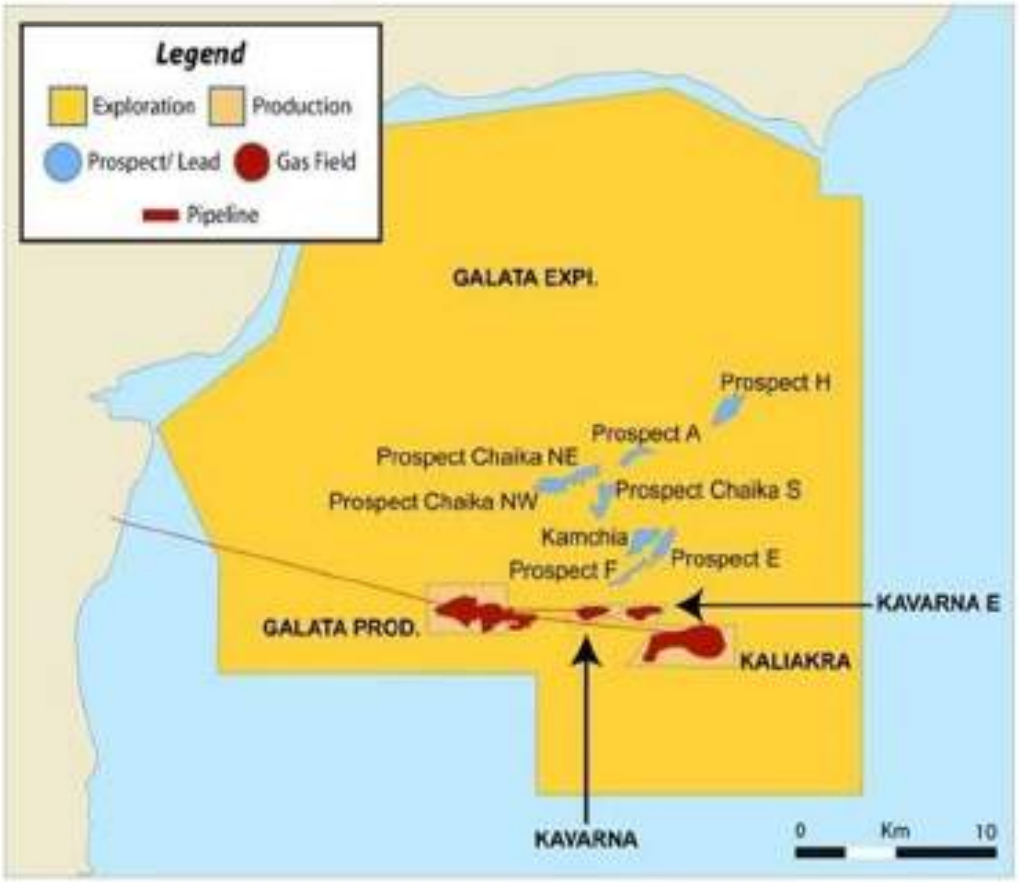
- To make aware public awareness of offshore wind projects in Black Sea Region,
- To promote the development of offshore wind energy market in Black Sea Region,
- To serve as a meeting point of all key wind market players and act as an important contact for politicians, business, science and the media.
- To organize joint Webinar, symposium, conference, fair and exhibition
- To maintain close cooperation with global and European professional associations and organizations.

Black Sea Countries Offshore Wind Energy Federation (BASOFWED) Protocol Signing Ceremony in May 2022, Izmir City- During Marentech Expo

TOWEAAWARDED EU PROJECT HORIZON-CL5-2021-D3-03-12 BLack Sea Offshore Wind (BLOW)

DENİZÜSTÜ RÜZGAR ENERJİSİ DERNEĞİ
DÜRED

Site specifications - (Bulgarian Black Sea)



Location of the Galata, Kavarna, Kavarna East and Kaliakra gas fields

- WGS84 coordinates 43.04463° / 28.19325°
- Distance to Eastern Port of Varna: 23 Km
- Water depth: 35m (tbc)
- Average wind speed: 6.5 - 7.0 m/s
- Demo Size: 5MW Unit
- Site total size: 60 Kmq
- Permit: running until 2025, under renewal for +15 years
- Active Energy trading license

DURED Scope

1. Site selection for floating offshore wind turbine (FOWT) Developing floating foundation wind turbine,
2. Report on Integration of FOWT into Maritime Spatial planning and cross border policy development,
3. EU Synergies & other sea basins partnership,
4. Report on partnership activities.

About the Consortium

The consortium is led by José Luis Domínguez, head of the Power Systems group at IREC, while the partners of BLOW include Eolink, Petroceltic Bulgaria, Gsp Offshore, Universitatea Maritima Din Constanta, Beia Consult International Srl, the Centre For European Policy Studies, Bexco, Mce Gmbh, Sivas Cumhuriyet Universitesi, **Denizustu Ruzgar Enerjisi Dernegi**, Fraunhofer Gesellschaft Zur Forderung Der Angewandten, Forschung Ev, Acciona Generacion Renovable, and Minno-Geolozhki Universitet St Ivanrilski as well as two Associated Partners as Brunel University London and the European Marine Energy Centre (EMEC).

DENİZÜSTÜ RÜZGAR ENERJİSİ DERNEĞİ
DÜRED

Regulatory and Policy Framework

Challenge: There is no full regulatory framework for OWF in Black Sea Countries

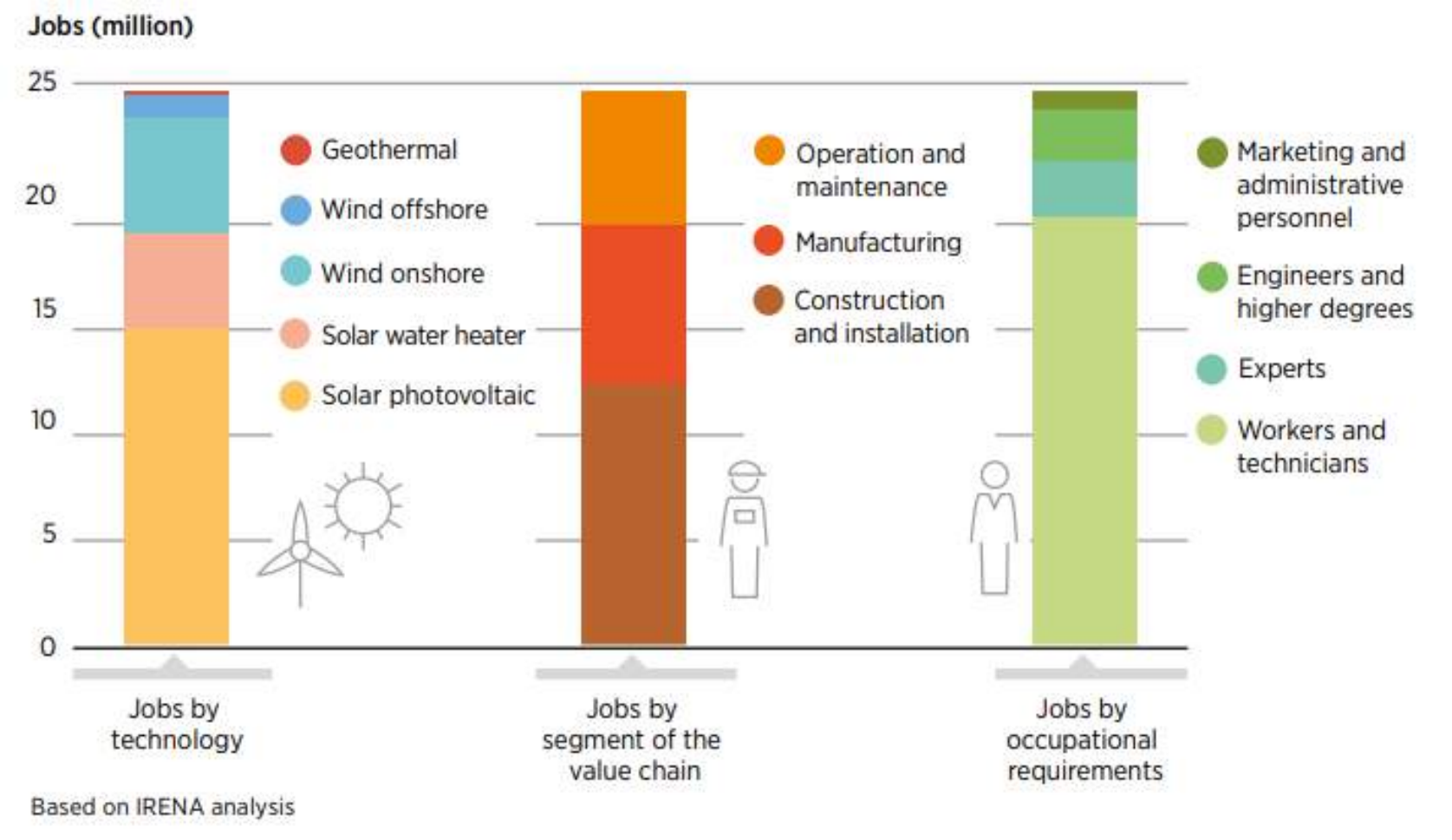
Need: Raise concern on the uncertainty for lacking regulatory framework to attract investors

- Marine spatial planning
- Grid enforcement for potential sites
- Countries should act together

Opportunities for Black Sea Countries

IRENA (2020), Global Renewables Outlook, International Renewable Energy Agency

Jobs in selected renewable energy technologies by value chain segment and occupational category in 2050



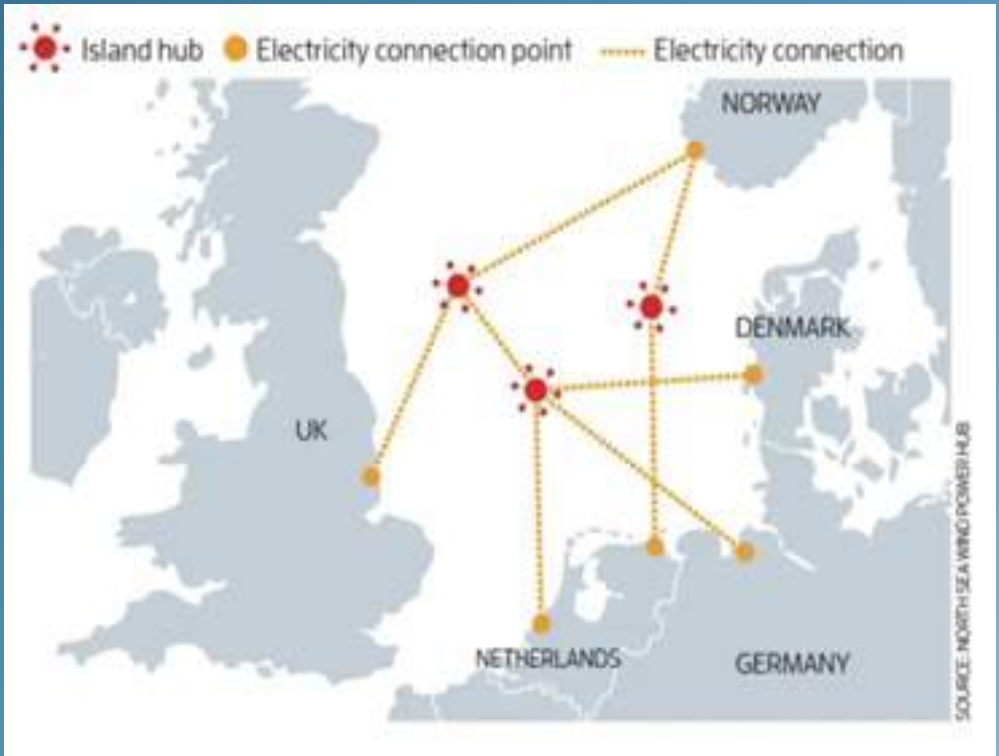
DENİZÜSTÜ RÜZGAR ENERJİSİ DERNEĞİ
DÜRED

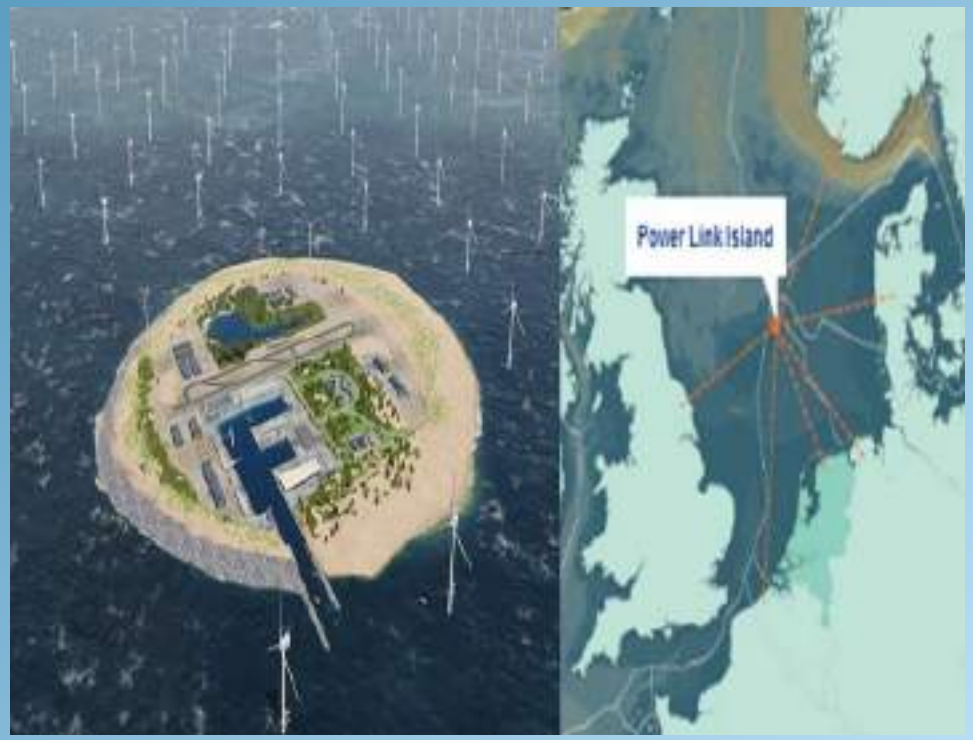
A new energy island that built in the North Sea off the coast of Denmark, could be the first in a network of hubs that connect far offshore wind farms to North Sea Countries' energy markets, as envisioned by the North Sea Wind Power Hub Programme. The ambition of the Danish Government is that an energy island should connect at least 10 Gigawatts offshore wind. (https://northseawindpowerhub.eu)

ENERGINET Energinet

Gasunie Gasunie

TenneT TenneT



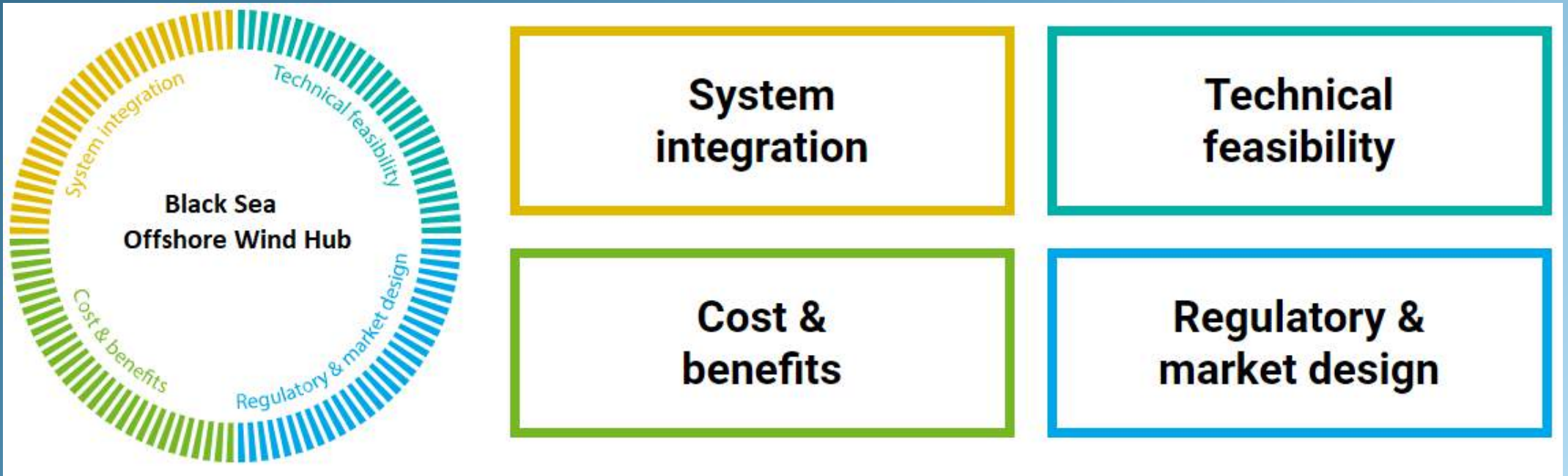


DENİZÜSTÜ RÜZGAR ENERJİSİ DERNEĞİ
DÜRED

DENİZÜSTÜ RÜZGAR ENERJİSİ DERNEĞİ
DÜRED

Black Sea Wind Power Hub

Today, climate policy is not national anymore but international. We need a new approach to effectively realize the potential of the Black Sea and reach the goals of the Paris Agreement. Harnessing the power of the Black Sea requires a region countries approach.



Opportunities for Black Sea Countries

1. Stable (base) power

2. Development maritime sector,

3. Developmen of Shipyard sector,

4. Development of ports

7. Conclusions

1. 2050 vision for a nationwide decarbonized energy system, including consideration of the impact of market reform and analysis of the offshore development zones, milestone plans for 2030 and 2040 should be announced; sound political commitment is required,

2. We need to ensure that offshore wind can co-exist with other economic sectors. Industrialization of offshore wind energy sector has to be planned in advance,

3. Offshore Wind Farm PPA terms to be attractive to multilateral international lending and consider risk guarantee mechanisms that reduce investor risk and the cost of finance,

4. Marine Spatial Planning (MSP) process has to fasten,

5. Industry, Government and Associations have to work together to encourage women employment into the sector, including in engineering, design, management, and operations.

Thank you for listening.

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