SUSTAINABLE WATER AND ENERGY SOLUTIONS NETWORK WEBINAR on Ocean Energy

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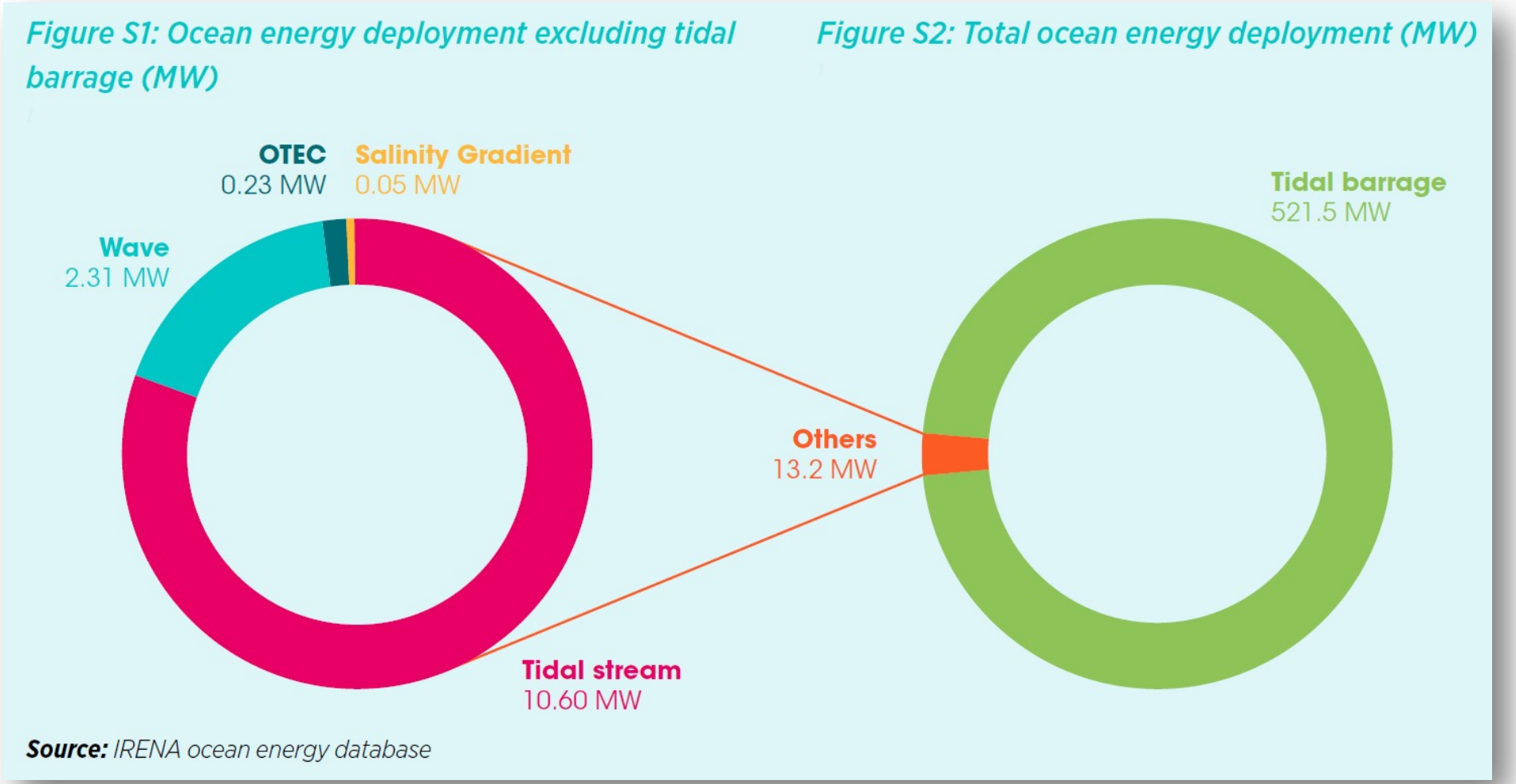
Tuesday, 29 June 2021 9:00-10:30am (New York Time)

Status Ocean Energy markets

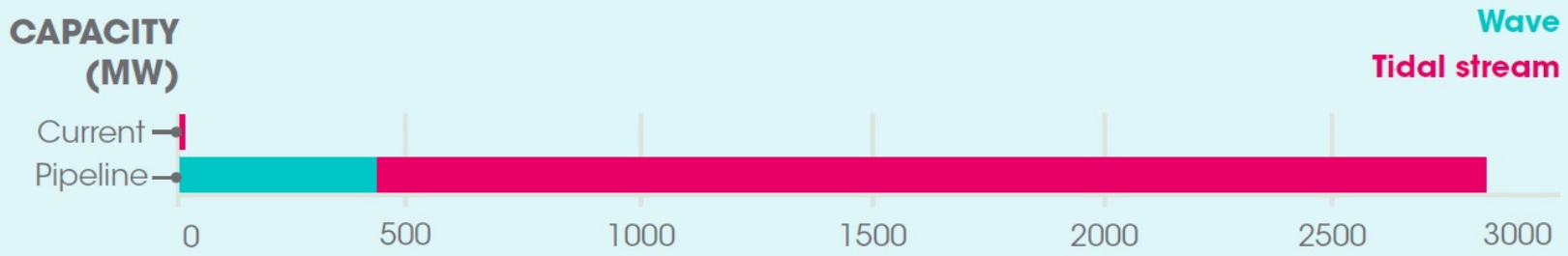


Source: IRENA (2020), Innovation Outlook: Ocean Energy

Outlook Ocean Energy markets

Current pipeline of projects

Figure S3: Active and projected tidal stream and wave capacity beyond 2020



Note: *While their capacity is too small to appear on this chart, additional projects are planned for the other ocean energy technologies beyond 2020. For example, a 2 MW ocean thermal energy conversion plant and a 1 MW salinity gradient energy plant are planned in the Netherlands (Johnson, 2019).*

Source: *IRENA ocean energy database*

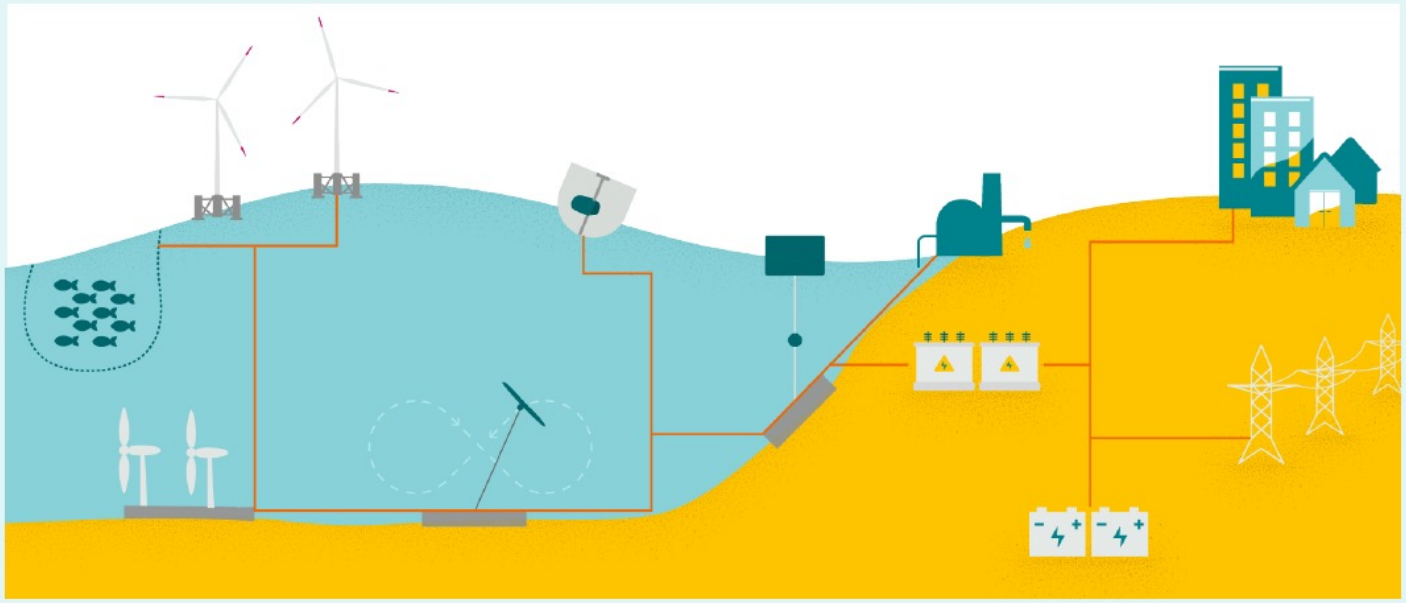
Market outlook

- **2030 – 10 GW**
- **2050 – 100 GW**

Source: IRENA (2020), Innovation Outlook: Ocean Energy

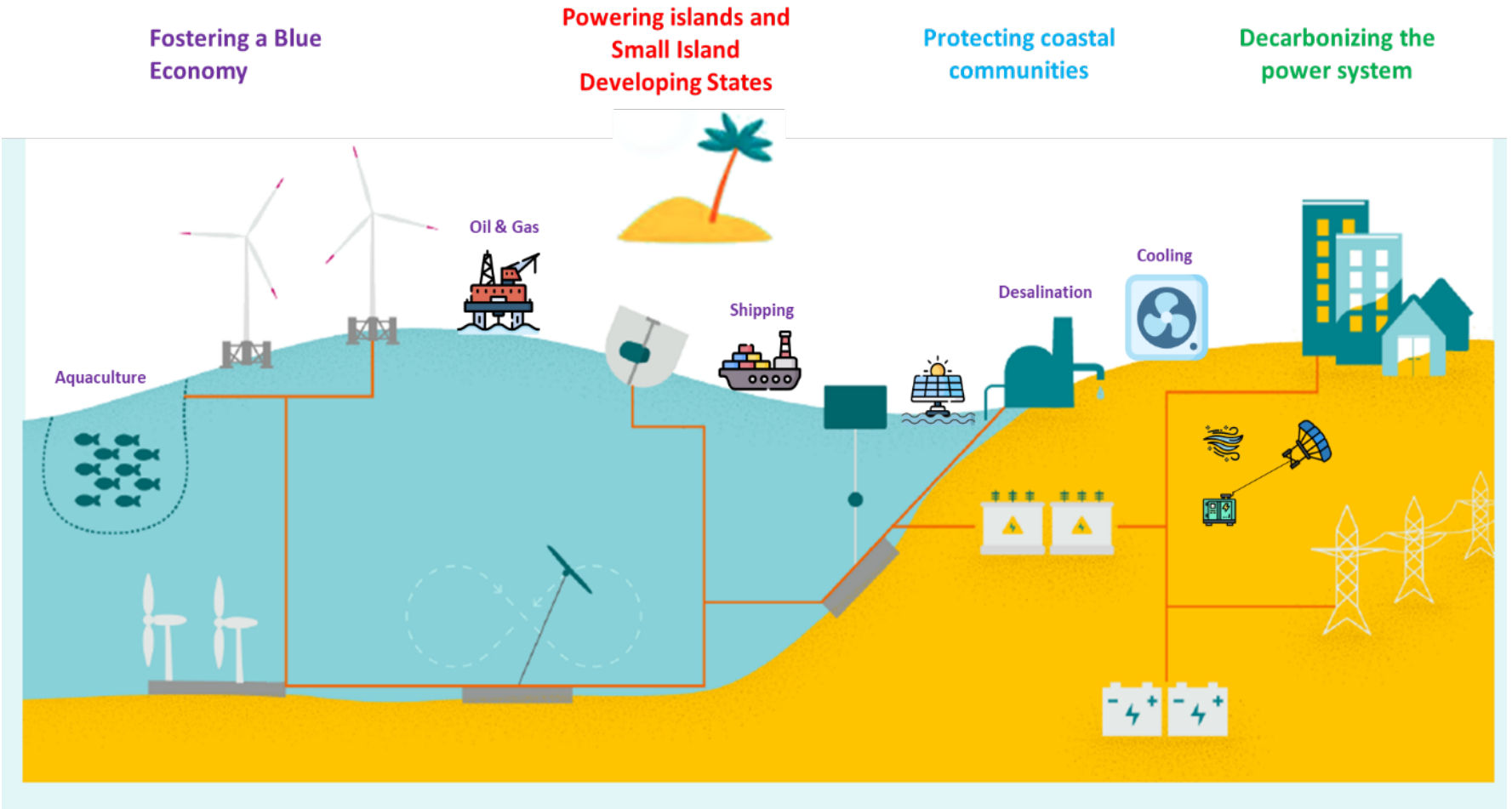
Innovative Business Model 1: Offshore renewables powering a Blue Economy

Figure 33: Ocean energy coupled with other renewable energy sources to power the blue economy



Source: IRENA (2020), Innovation Outlook: Ocean Energy Technologies

Contributions of offshore renewables to the Blue Economy and the Energy Transition



Example

Fostering a Blue Economy

BIG HIT Orkney project in the north of ***Scotland*** which couples **tidal energy** with other renewables for electricity and hydrogen production used for shipping and powering ports

Powering Islands and Small Island States (SIDS)

Seychelles is planning the installation of **5.8 MW** FPV array on a lagoon on the East African nation's main island

Protecting coastal communities

The ***Netherlands*** installed an array of **five tidal turbines** in the opening of the Eastern Scheldt Storm Surge Barrier

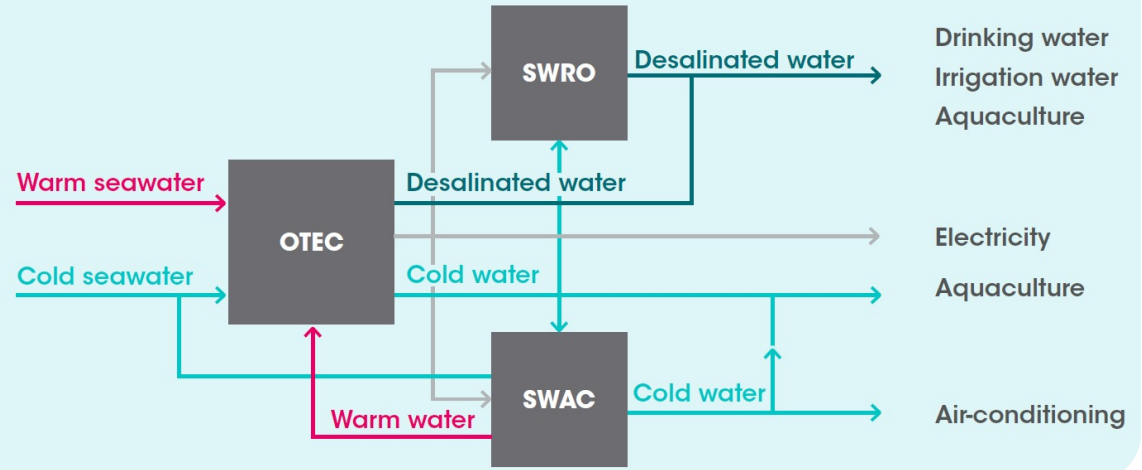
Decarbonizing the power system

Two artificial offshore wind energy hubs in ***Denmark*** with a capacity of **12 GW** are planned

Example 1 - OTEC coupled with cooling and water desalination in islands

OTEC: electricity (kWh) + other revenues

Figure 38: Ways of coupling OTEC, desalination, cooling and aquaculture



OTEC technical potential in the Caribbean

Country	Maximum Technically Exploitable Resource (MW)					Average electrical demand (MW)
	Fixed offshore wind	Floating offshore wind – conventional	Floating offshore wind – deep sea	OTEC	Total	
Antigua & Barbuda	4 935	1 477	11 718	100	18 230	38
The Bahamas	10 955	6 321	16 723	220	34 219	220
Barbados	0	112	7 063	140	7 315	104
Grenada	2 618	476	7 196	110	10 400	25
Jamaica	1 211	1 848	9 709	180	12 948	498
Saint Kitts & Nevis	399	196	9 135	40	9 770	24
Saint Lucia	105	224	4 025	90	4 444	46
Saint Vincent & the Grenadines	3 227	385	3 017	70	6 699	17
Trinidad & Tobago	16 597	12 460	4 963	50	34 070	1 064
Total	**40 047**	**23 499**	**73 549**	**1 000**	**138 095**	**2 036**

Source: *Johnston, 2019*

Source: IRENA (2020), Innovation Outlook: Ocean Energy

Innovative Business Model 2: Hybrid electricity generating systems

IRENA
International Renewable Energy Agency

Table 7: Projects coupling ocean energy with other renewable energy sources

	SOLAR	WIND	FLOATING WIND	PUMPED HYDRO	STORAGE	MICROGRID	HYDROGEN	Examples	Country	Status
Tidal		✓					✓	BIG HIT / Surf 'n' Turf	Scotland	In operation
Tidal					✓			Bluemull Sound Shetland	Scotland	In operation
Tidal	✓				✓			San Antonio	Philippines	Research
Tidal	✓	✓			✓	✓		PHARES Ushant Island	France	Planning
Tidal				✓				KIOST	Republic of Korea	R&D
Wave	✓	✓			✓	✓		King Island	Australia	Planning
Tidal					✓	✓		KIOST	Republic of Korea	R&D
								Dent Island	Canada	Test completed
Wave	✓				✓	✓		Garden Island	Australia	Planning
								KIOST	Republic of Korea	R&D
Wave			✓					Canary Islands	Spain	Research
								Bombora and MEECE	Wales	Research
Salinity							✓	REDstack	Netherlands	Planning
Wave	✓							GEPS Techno		Full-scale testing
								Eco Wave Power		Installed (Gibraltar and Israel)
								Wave for Energy		WEC full-scale testing completed
								GIEC		Open-sea testing completed
Wave	✓				✓			Ocean Power Technologies		Full-scale deployment announced
Wave	✓	✓						SINN Power		WEC prototype testing completed
Wave			✓					Floating Power Plant		Previous model testing completed
		✓						Marine Power Systems		WEC 1:4 scale testing completed
								Seabased		WEC tested, wave-wind resource assessment conducted
								Havkraft		WEC full-scale testing completed
Wave					✓			BOLT Lifesaver		Small-scale testing completed
Tidal					✓		✓	HydroWing (Tocardo Turbine)		Patenting

Note: *WEC = wave energy converter*

Source: *IRENA ocean energy database*

Source: IRENA (2020), Innovation Outlook: Ocean Energy Technologies

Example 2: Tidal energy + solar PV & wind for green hydrogen production (floating wind explored)

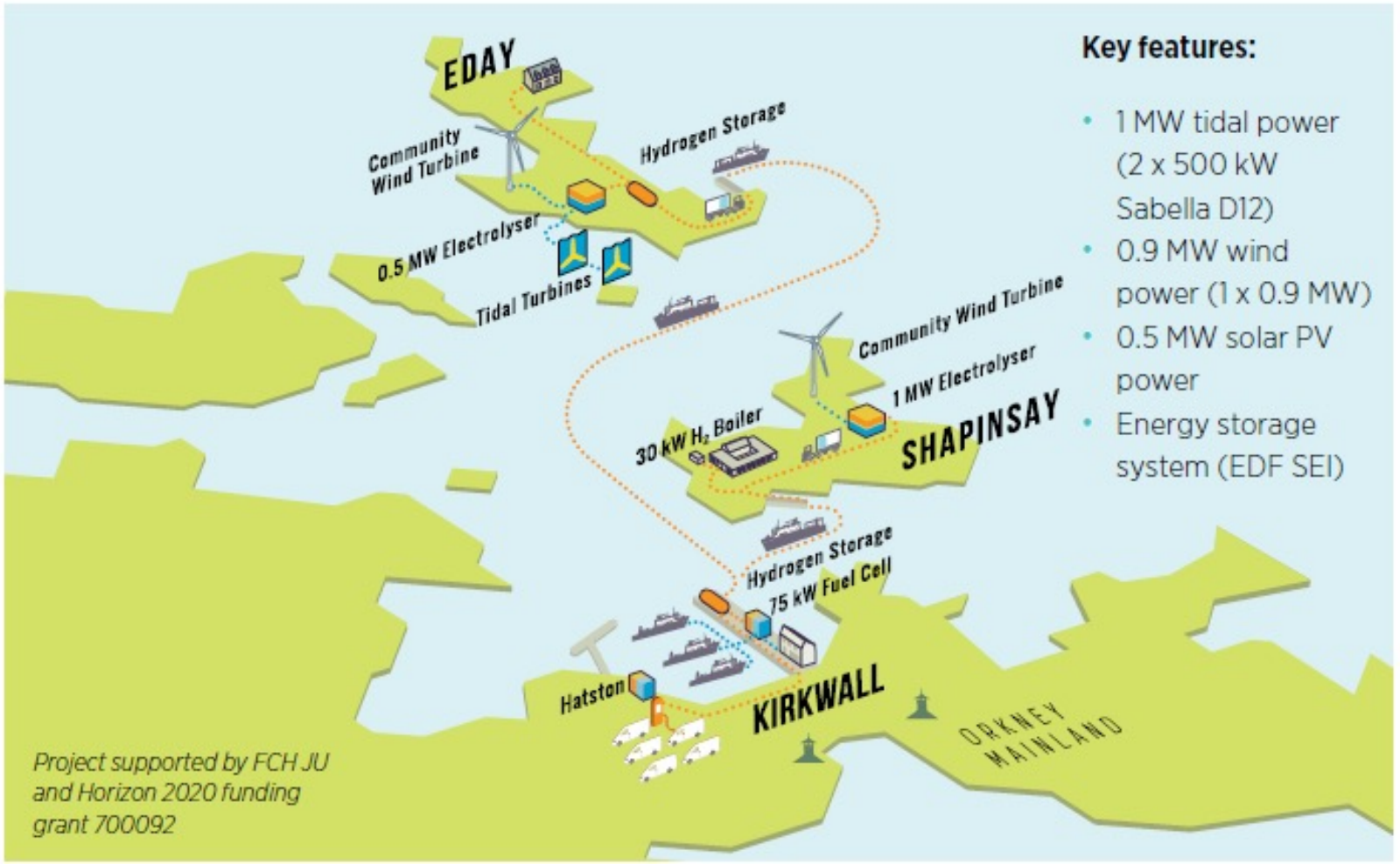


Figure 39: BIG HIT project in Orkney

Image source: *BIG HIT Orkney*

Source: IRENA (2020), Innovation Outlook: Ocean Energy Technologies

Unlocking OE potential in islands

Key Recommendations

Technology:

Technology convergence and standardization

Conduct resource assessment campaigns

Support test centres

Capital grant funding for R&D

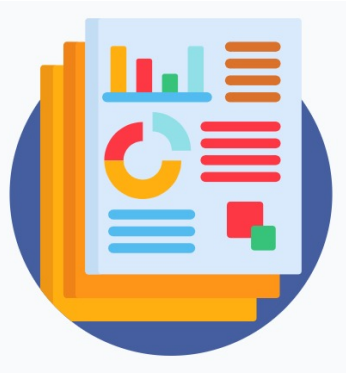
Policy:

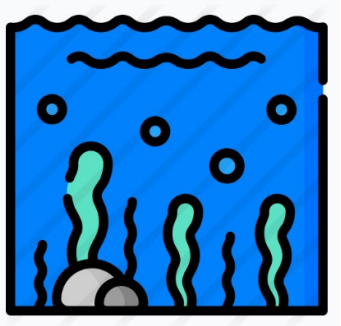
Premium price MWh

Promote innovative business models

Compensate additional services (regulation)

Innovative financial structures





Environmental and Social:

Improve access to baseline data

Consult and engage the public

Infrastructure:

Availability of Networks

Engage and inform the emerging supply chain

Synergies with other RE technologies – firm generation

Source: IRENA (2020), Innovation Outlook: Ocean Energy

IRENA Collaborative Framework Ocean Energy & Offshore Renewables

Aim:

- Agency to proactively function as a global network hub
- Facilitate **government peer-to-peer collaboration** and exchange of knowledge

In brief:

- Collaborative Framework on Ocean Energy/Offshore Renewables covers:
  - Offshore and floating wind technology; **ocean energy technologies**; and Floating solar photovoltaic.
- Co-facilitated by the **Kingdom of Tonga and Italy**
- **40 member countries** engaged at last three meetings + engagement from industry associations
- Suggested areas of work include exchange of good practices on: Marine spatial planning; Foster collaborative R&D programmes; Coupling of offshore renewables with power-to-X technologies; and Grid interconnection for offshore generation
- Next meeting at IRENA's Assembly 2021

Recommendations for a G20 Offshore Renewables Action Agenda

G20 strengths to push an Offshore RE Global Agenda

- **Acknowledge** the key role of offshore renewables at G20 ministerial level.
- G20 to **cooperate** with IRENA's Collaborative Framework to **collect** and disseminate key data on Offshore Renewables.
- **Promote** G20 countries to include offshore renewables in national energy and climate policies -e.g. NDCs.
- **Support** increase public investments in RD&D for all offshore renewable technologies.
- **Design** and **implement** joint RD&D projects at commercial scale
- **Promote** public-private partnerships for innovative offshore renewables like offshore wind-to-hydrogen generation units.
- **Identify** and **promote** innovative financing mechanisms for offshore renewable technologies within the "Finance Track" of the G20.

Thank you

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