Setting the scene: Ocean energy around the world

IRENA
International Renewable Energy Agency

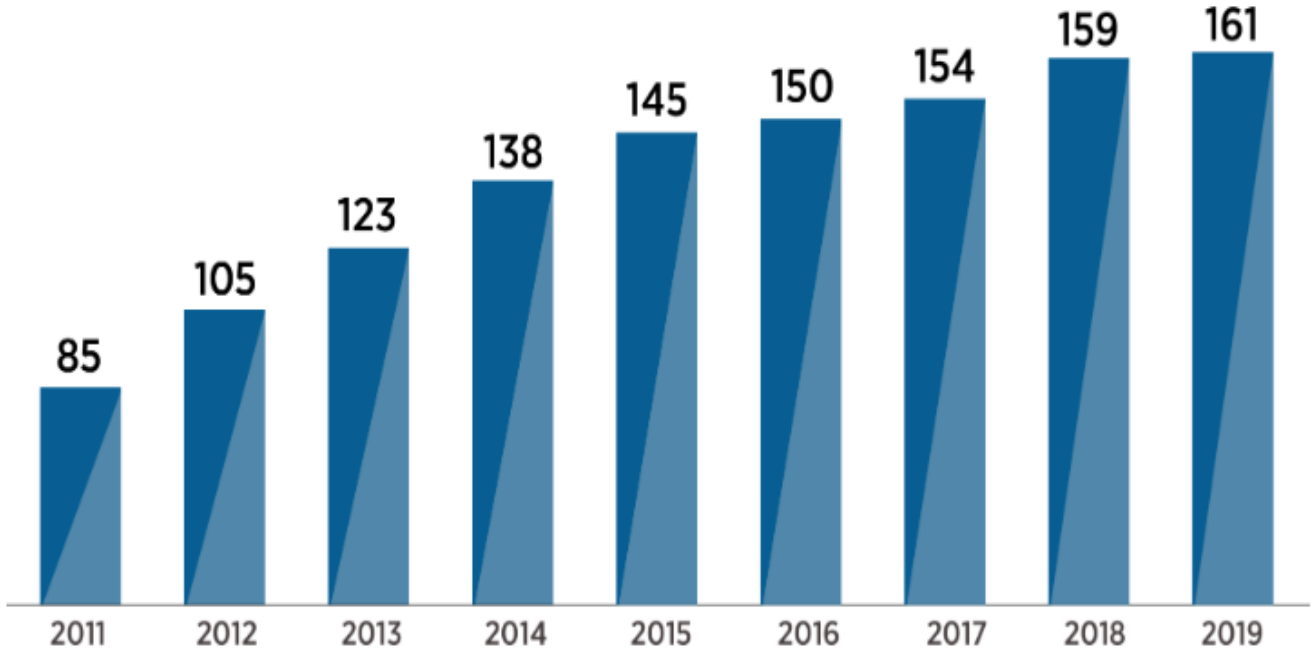
19 June 2020
EUSEW 2020 side event | OEE-IRENA webinar

IRENA at a Glance

Mandate

To promote the widespread adoption and sustainable use of **all forms of renewable energy** worldwide

- Intergovernmental Organization (IGO)
- Established in 2011
- Headquarters in Masdar City, Abu Dhabi, UAE
- IRENA Innovation and Technology Centre – Bonn, Germany
- Permanent Observer to the United Nations – New York, USA
- Director-General – Francesco la Camera



Membership

161 members + 22 in accession

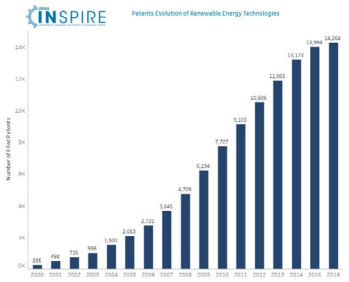
IRENA Work on Ocean

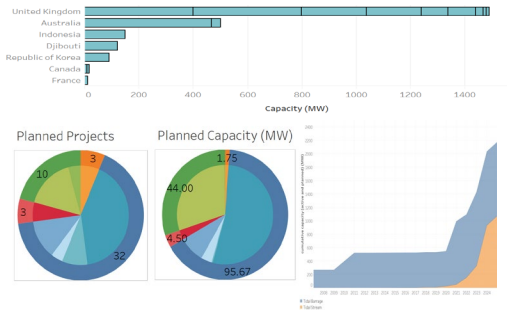
Publications

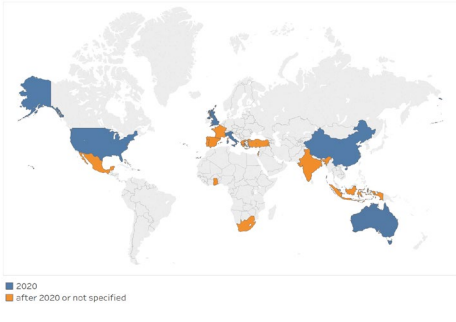
- Ocean Energy Technologies (2014)
  - Report
  - 4 Technology Briefs
- Upcoming Ocean Energy Report (2020)

Analytics

- Patent Database
- Project Database
- Market Analytics







Collaborative Framework

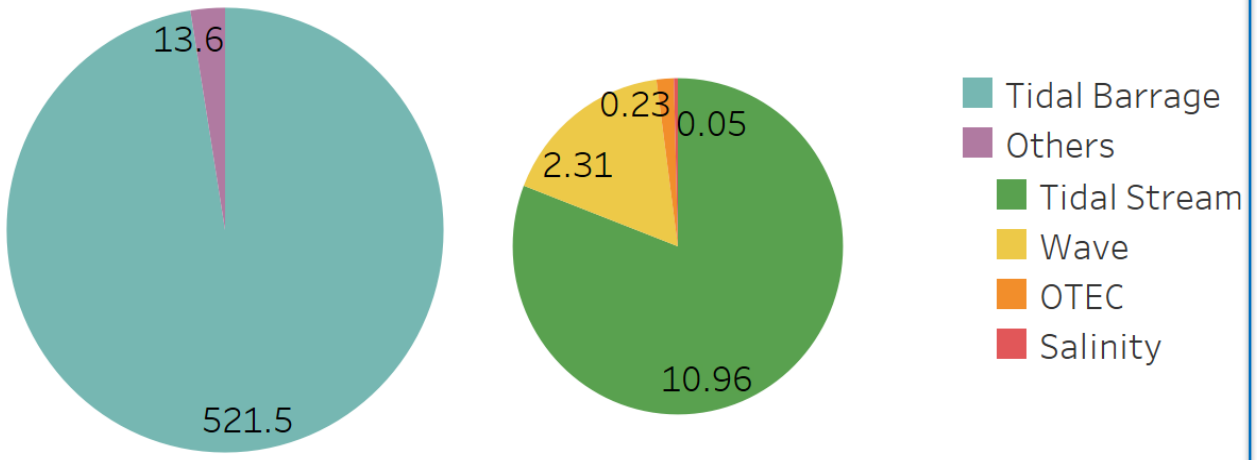
- Offshore Renewables – Member countries request. Under consolidation

Workshops and Webinars

- IRENA Insights Webinar (with OEE): Online, May 2020
  Oceans Powering the Energy Transition
- High level Session IRENA Assembly: Abu Dhabi, Jan. 2020
  Ocean Technologies in the Energy Transition
- Workshop Energy3 Canada: Canada, Oct. 2019
  Coupling ocean energy with other sectors
- Workshop OEE Conference: Ireland, Sept. 2019
  Unlocking the potential of ocean energy around the globe

Current Deployment and Potential

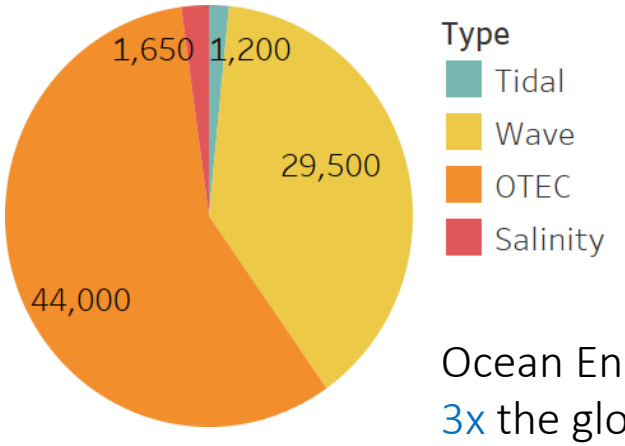
Current Deployment (MW)



Total: 535.1 MW

Total: 13.55 MW

Resource Potential : 82 900 (TWh)

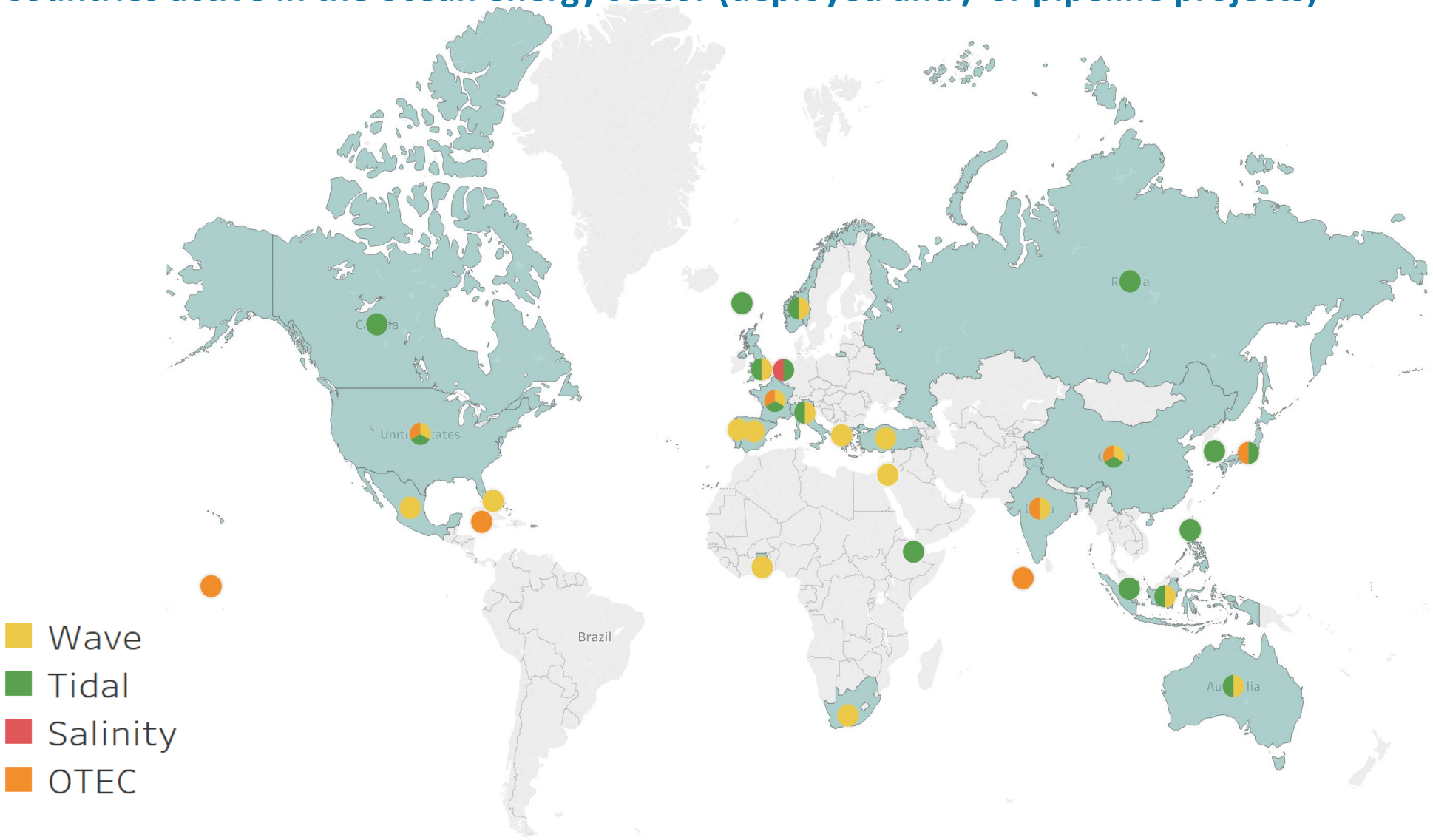


Ocean Energy could cover up to 3x the global electricity demand.

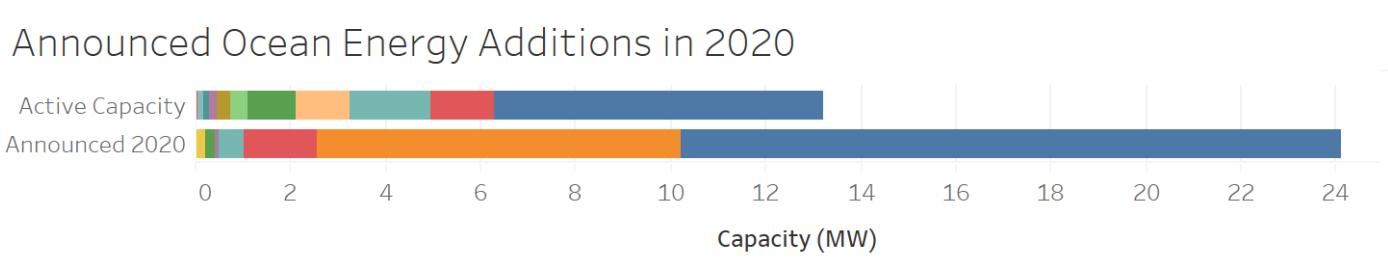
Global Electricity Demand was 25 814 TWh in 2019.
Source: Ember 2020

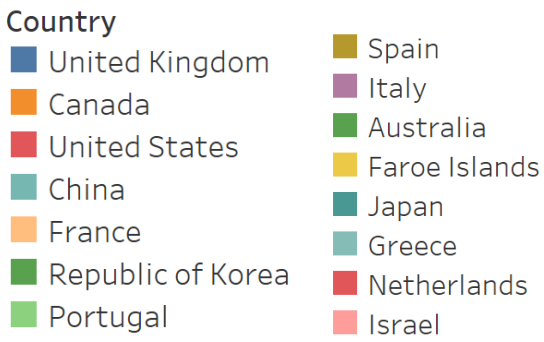
Global Ocean Energy Deployment Activity

Countries active in the ocean energy sector (deployed and / or pipeline projects)

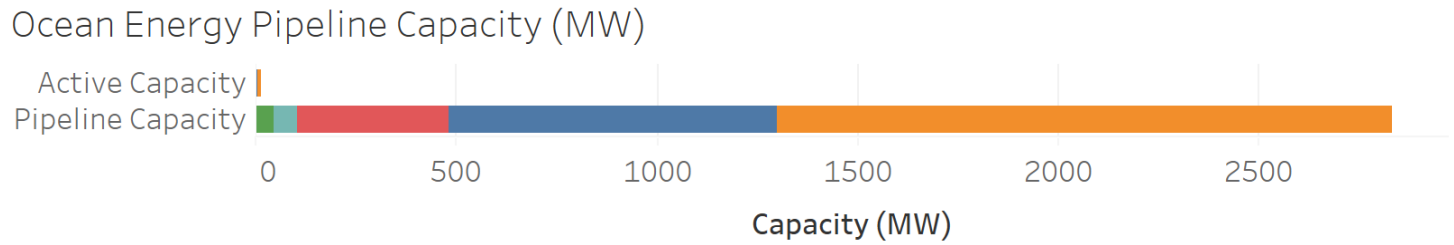


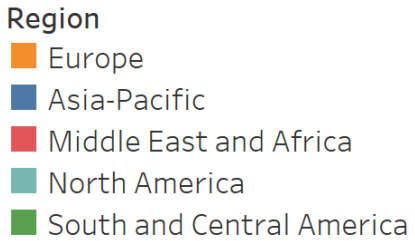
Future Deployment: Forecast





24 MW new deployments in 2020





Pipeline capacity almost 3 GW

IRENA estimates 10 GW of installed capacity by 2030

Best Practice Overseas Example: China

Actors:

Guangzhou Institute of Energy Conversion (GIEC)

- Floating wave energy platform for remote island grids (successfully tested with over 200kWh output)
- Offshore aquaculture cage with integrate wave energy converters (deployed)

National Ocean Technology Center (NOTC)

- Floating test platform
- OTEC resource assessment programme

Funding / Revenue Support

National Energy Administration (NEA) and National Development and Reform Commission (NDRC)

- Approved temporary feed-in tariff for tidal current
- Includes ocean energy in their catalogue for the guidance of green industries

Special Funding Programme for Marine Renewable Energy (SFPMRE)

- Has provided over USD 196m million dollars for offshore renewables since 2010

National Key Research and Development Programme (NKRDP)

- Currently funds 3 ocean energy projects

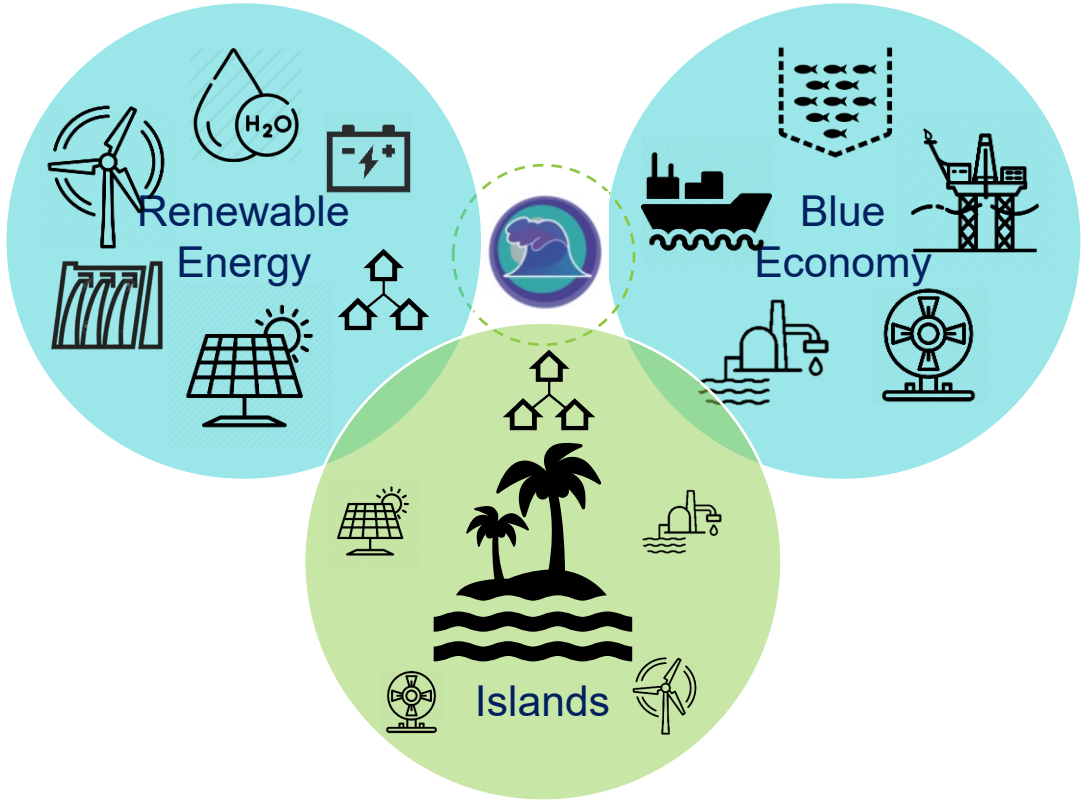
Active and Announced Projects:

Technology	Project Name	Status	Capacity	Year
Tidal Range	Jiangxia Tidal Power Generation Plant	Active	4.1 MW	1980, 1985, 2007
Tidal Stream	LHD Tidal Current Project Phase 1	Active	1 MW	2016
Tidal Stream	LHD Tidal Current Project Phase 2	Active	0.7 MW	2018
Tidal Stream	LHD Tidal Current Project Phase 3	Announced	1.7 MW	
Tidal Stream	Zhoushan Tidal Current Energy Demonstration Project	Under Construction	0.3 MW	2020
Wave, with aquaculture cage	Guangzhou Institute of Energy Conversion (GIEC)	Announced	0.2 MW	
OTEC	Hainan OTEC Power Plant	Announced	10 MW	

Small Island Developing States (SIDS)

Coupling with other Renewable Energy Sources

Create hybrid energy systems with other offshore energy sources to complement each other, create hybrid energy sources and/or benefit from synergies



Coupling with other Offshore Sectors

Positions ocean energy as a source to power other sectors

Apply both on Islands

Benefit from the ideal preconditions on islands as market entry

Key Messages

Global View

- Interest in ocean energy is global
- Europe has established as a front runner
- Taking up speed: 25 MW new deployments in 2020. Pipeline capacity ~3 GW (half planned in Europe)
- Islands have immense potential
- Tidal is in a higher technology readiness level than wave, as can be witnessed in the convergence of technology that can be observed for tidal
- Potential to provide 400’000 jobs in Europe by 2050 (OEE, 2020)

Next Steps

- Reduce LCOE
- Need for a mix of financial support and innovative funding schemes
- Encourage innovative business models: actions towards a blue economy and sector coupling
- Include OE in country energy roadmap and establish clear policies that can help in the achievement of national targets

Thank you for your attention!

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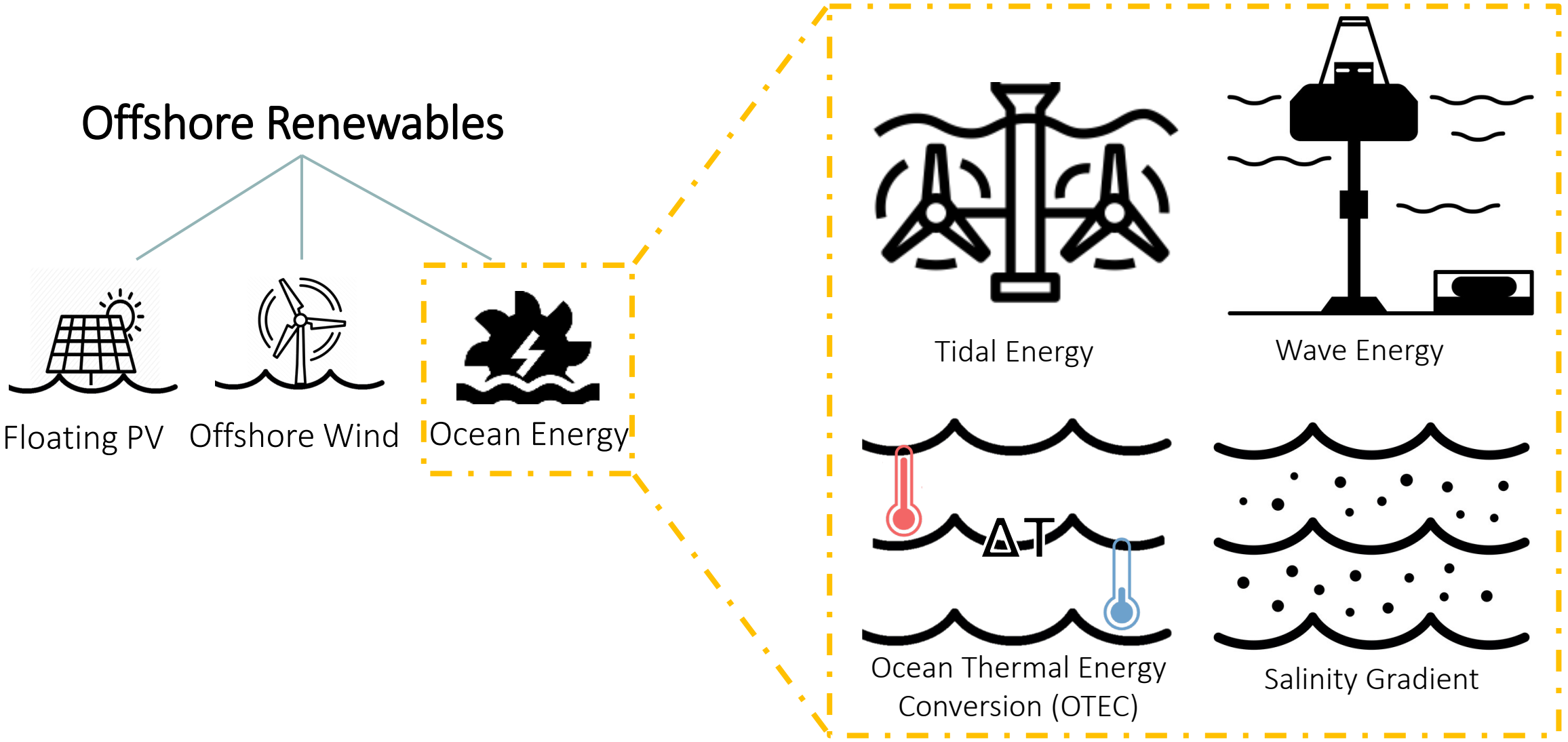
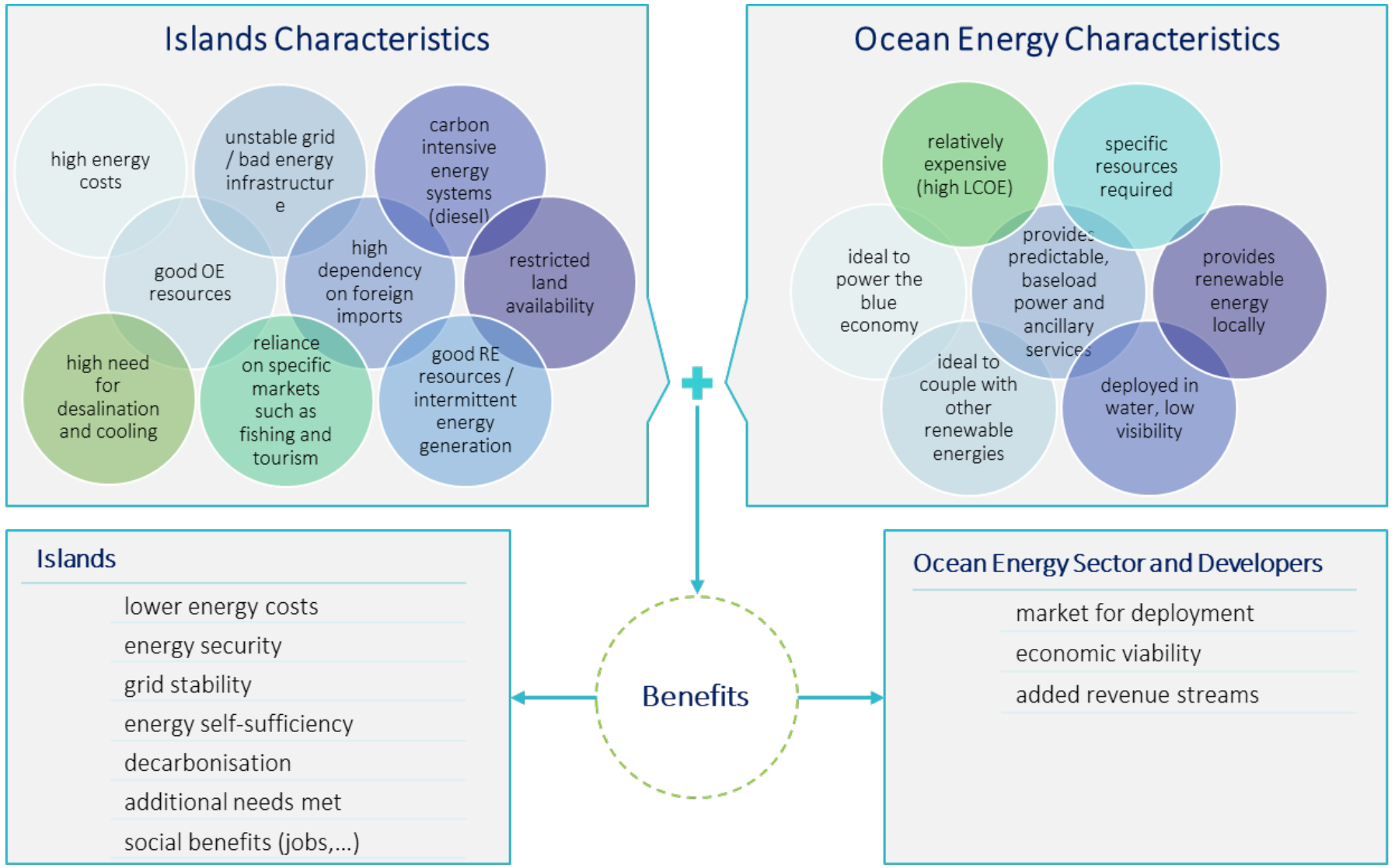
Back up

Ocean Energy

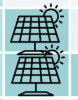


Small Island Developing States (SIDS)

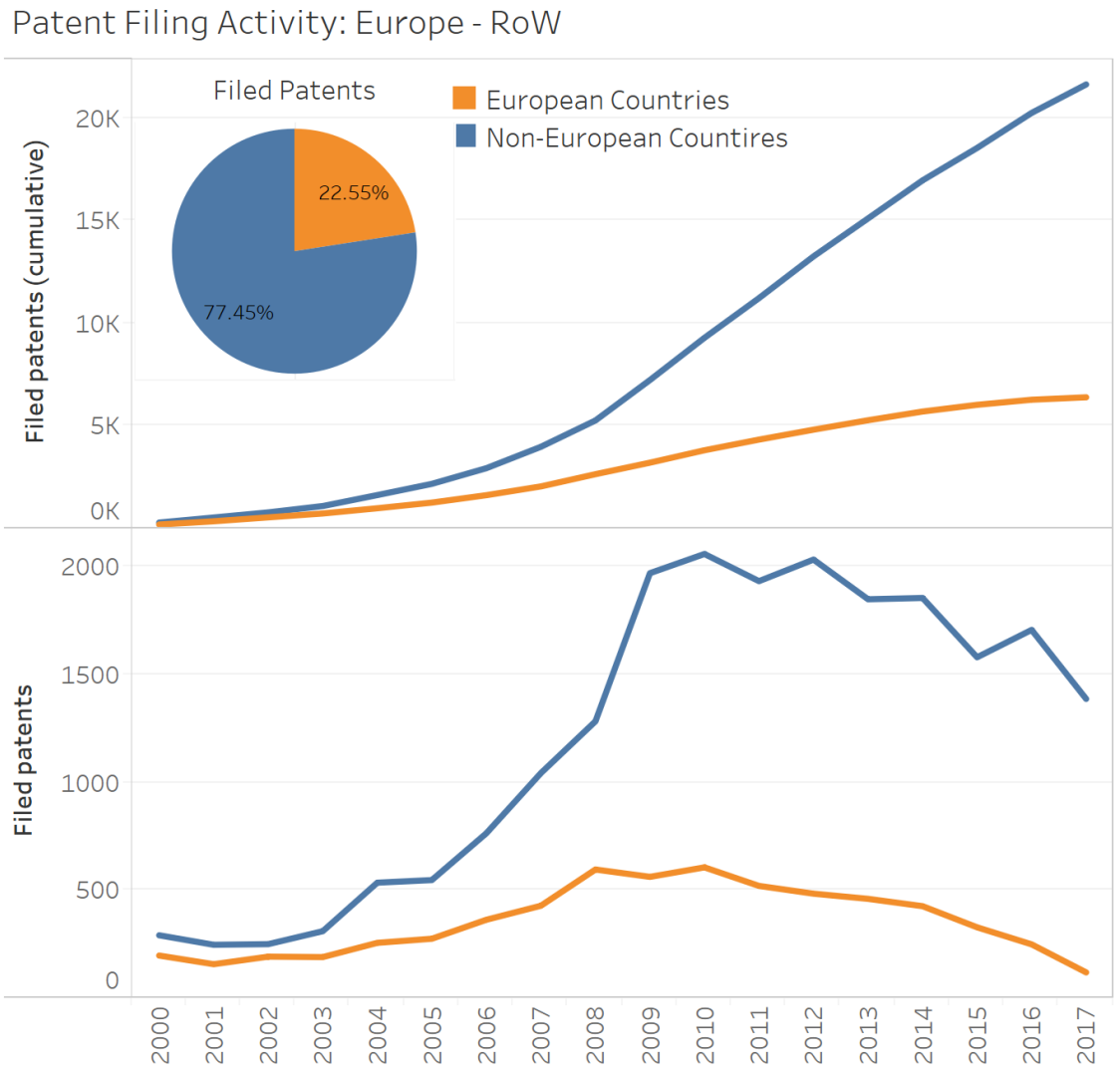


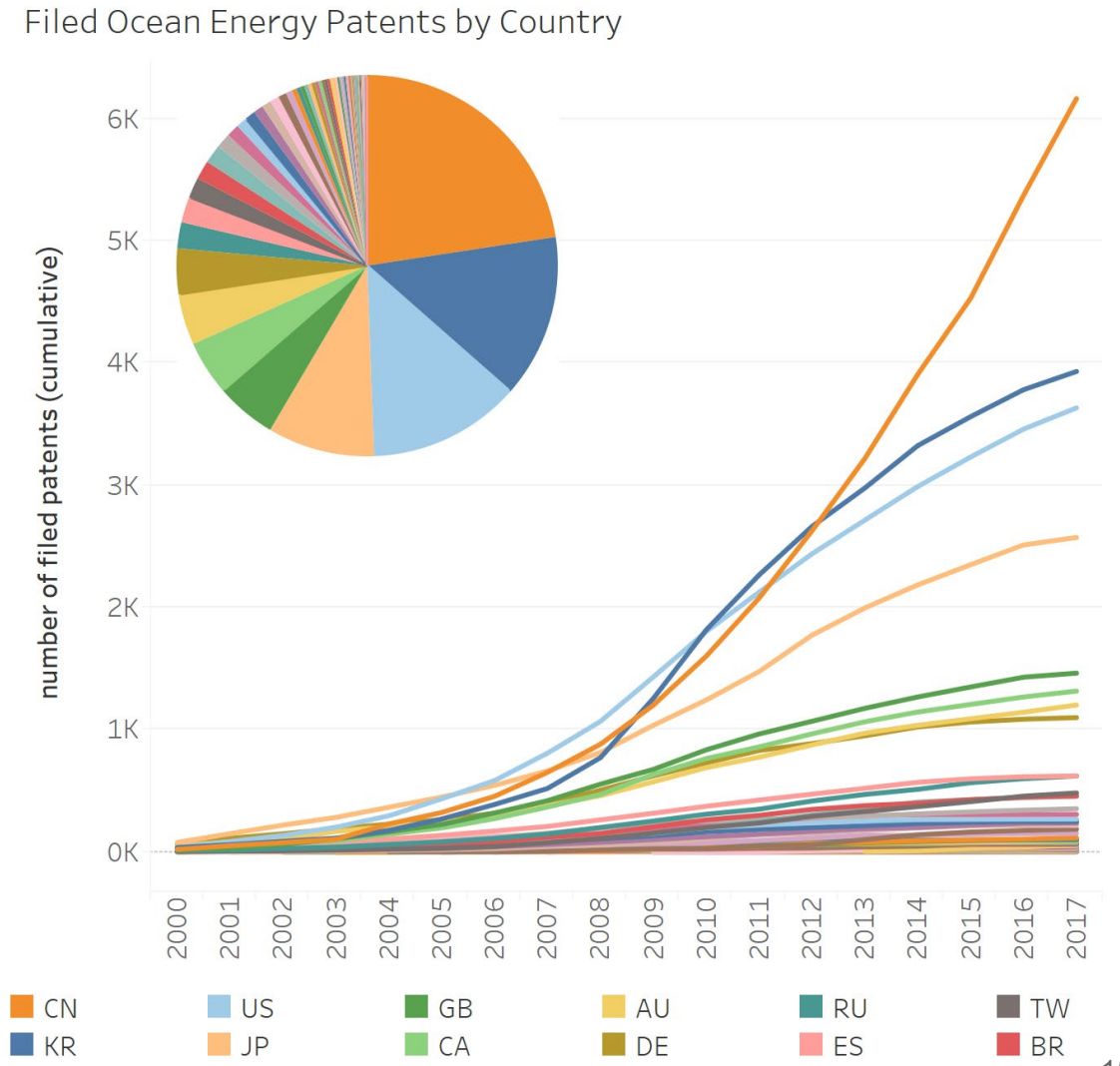
Innovative Business Models Around the Globe

System Coupling of Renewable Energy Technologies

	Solar	Wind	Floating Wind	Pumped Hydro	Storage	Microgrid	Hydrogen	Examples	Country	Status
Tidal								BIG HIT / Surf'n'Turf Orkney	Scotland	In operation
Tidal								Bluemull Sound Shetland	Scotland	In operation
Tidal								San Antonio	Philippines	R&D
Tidal								PHARES Ushant Island	France	Planning
Tidal								KIOST	South Korea	R&D
Tidal								KIOST	South Korea	R&D
Tidal								Dent Island	Canada	Test Completed
Wave								King Island	Australia	Planning
Wave								Garden Island	Australia	Planning
Wave								KIOST	South Korea	R&D
Wave								Canary Islands	Spain	R&D
Salinity								REDstack	Netherlands	Planning

Global Ocean Energy Innovative Activity

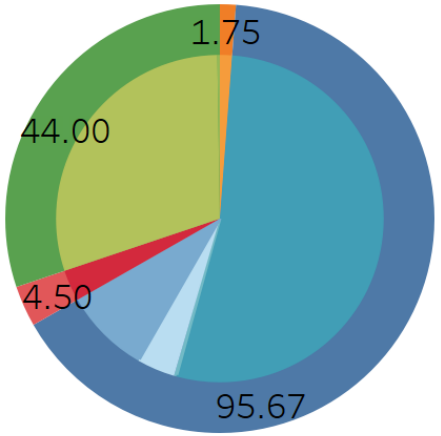




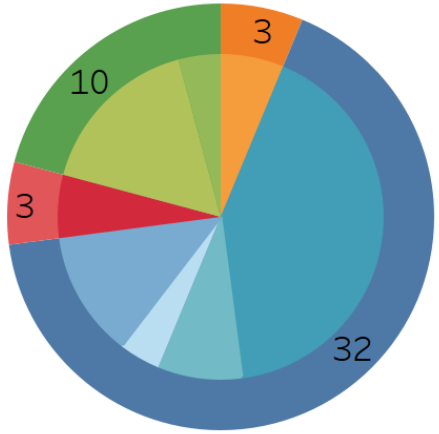
Technology Status

Wave: many technologies

Pipeline Capacity (MW)



Pipeline Projects

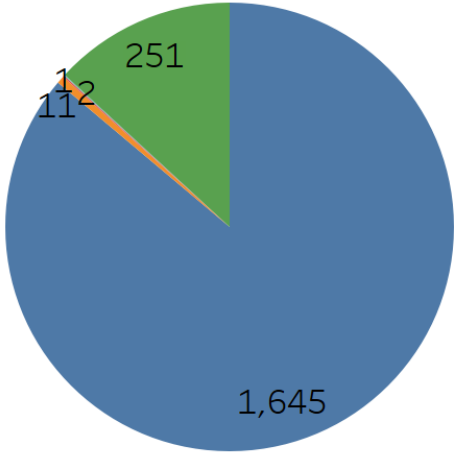


Main device types
- Oscillating Water Column
- Oscillating Body
- Overtopping Device
- Other

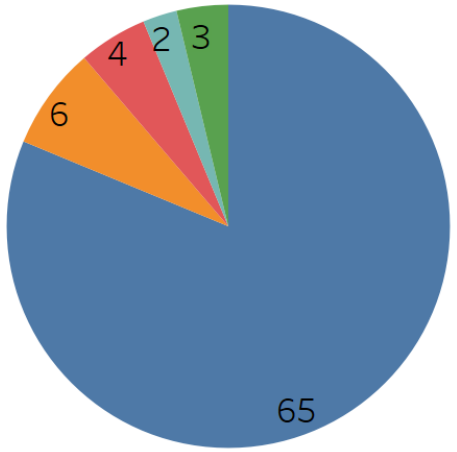
Device Type
- Oscillating Water Col..
- Point Absorber
- Oscillating Water Su..
- Submerged Pressure ..
- Attenuator
- Overtopping
- Rotating Mass
- Other

Tidal: convergence

Pipeline Capacity (MW)



Pipeline Projects



Device Type
- Horizontal Axis Turbine
- Tidal Kite
- Archimedes Screw
- Vertical Axis Turbine
- Other

Key Takeaways - Ocean Energy Event, Ireland

- Cost scale effects- standardisation
- Ocean energy added value to energy systems
- Sector coupling
- Islands vast potential and market opportunities
- Jobs success cases
- Tracking TRLS, provide updated market figures
- Innovative ideas on funding schemes