



DP ENERGY

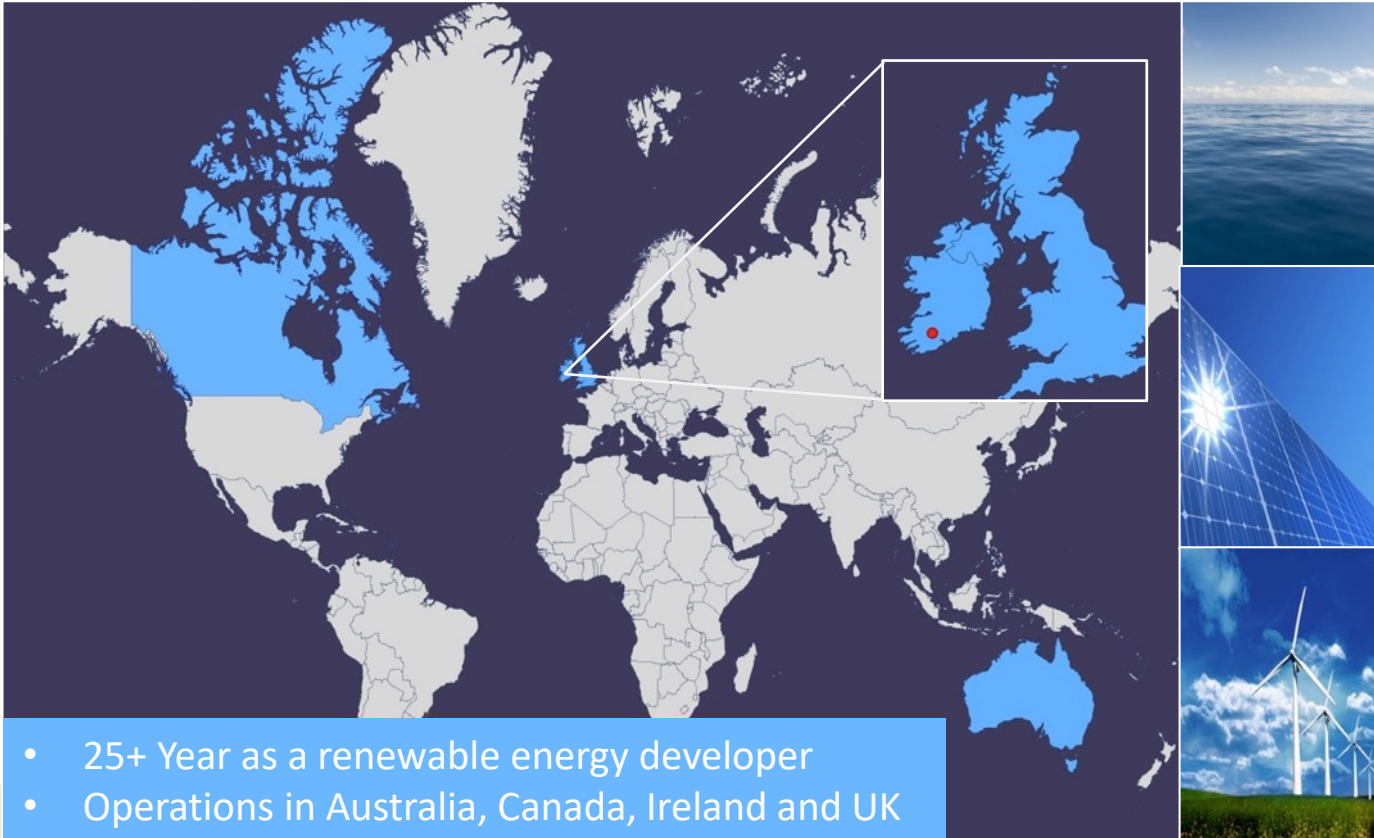
OFFSHORE WIND & WAVE ENERGY – OPPORTUNITIES FOR SYNERGY

IRENA Workshop
16th October 2019

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DP Energy is a renewable energy company operating worldwide to develop projects which are both sustainable and environmentally benign. Our current portfolio of development projects include onshore wind, tidal, solar PV, storage and floating wind technologies.



The image features a world map with a white outline of continents. A white box highlights the United Kingdom, and a red dot is placed on the map of the UK. To the right of the map are three vertical panels: the top panel shows a blue ocean under a blue sky with white clouds; the middle panel shows a close-up of solar panels with a bright sun flare; the bottom panel shows several white wind turbines in a green field under a blue sky with white clouds.

- 25+ Year as a renewable energy developer
- Operations in Australia, Canada, Ireland and UK

- Continued market growth: Since 2013, ~ 21% increase (renewable energy world)
- Potential for ~ 5000 TWh per year (world ocean review)
- Higher, more consistent wind speeds offshore → higher power output
- Equipment continues to grow in size, larger output per turbine

Challenges:

- Improved foundations for deeper water (floating)
- Cost reductions in foundations
- Robustness due to marine environment and storms
- Installation methodologies
- Installation cost reductions

- Continued market growth: Since 2013, ~ 21% increase growth (renewable energy world)
- Large resources available world-wide; potential for ~ 1140 TWh per year of sustainable energy (world ocean review)
- Predictable energy

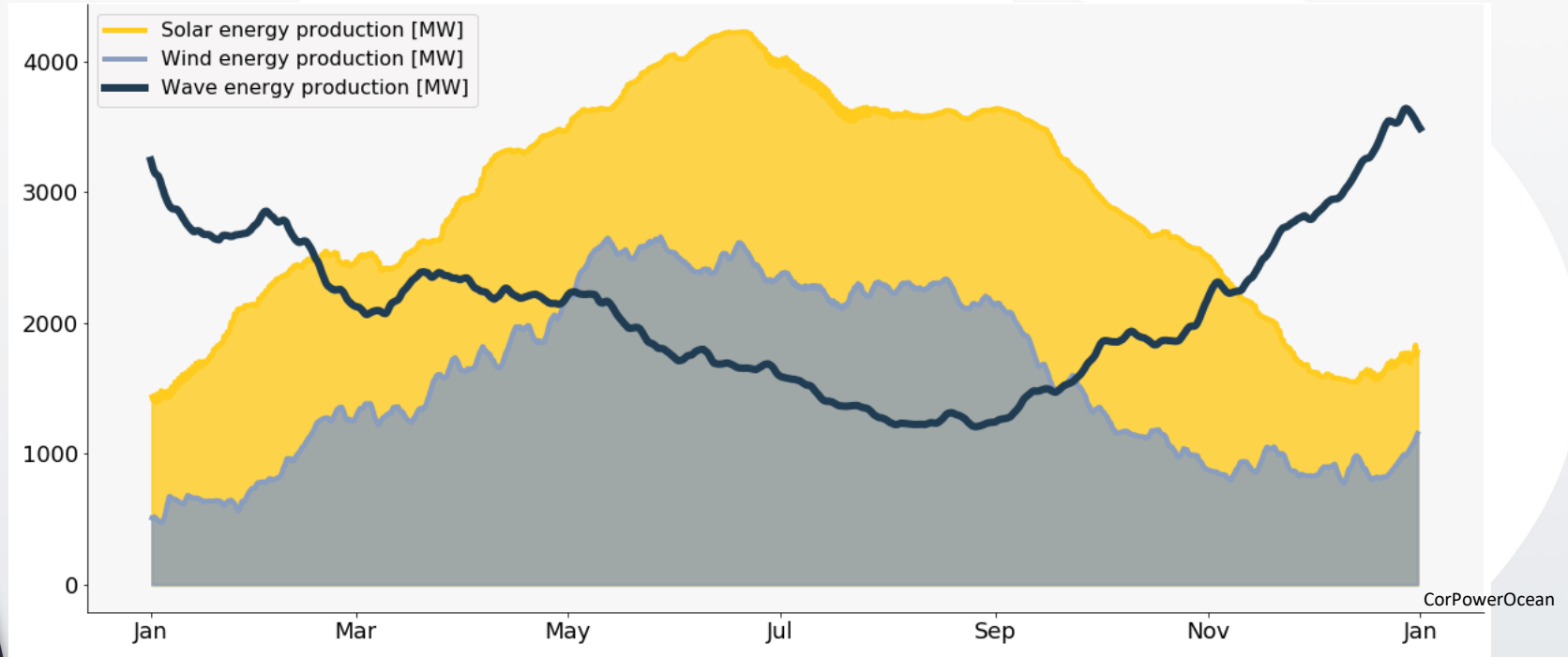
Challenges:

- Concept development continues; multiple Power Take Off devices
- Weight reduction of systems
- Mooring systems
- Power connection

Wave Energy in California

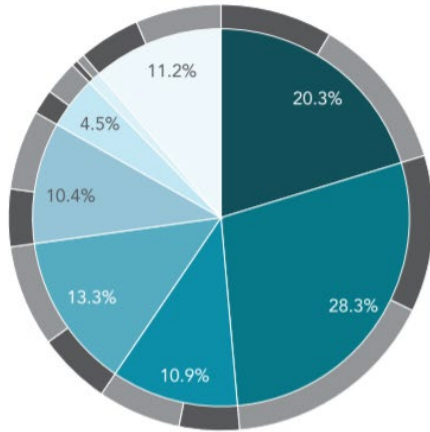
Annual Production Profile, California 2019

Seasonal profile is complementary to solar and wind. Better than base-load from balancing perspective

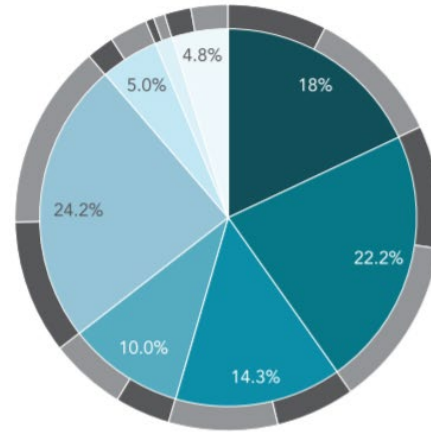


Wind (6.5 GW) and solar (13.5GW) production: Actual time series of the period
Wave production (6.0 GW): Estimate based on measured wave data and CorPower power matrix
6 GW wave energy devices evenly distributed over four sites along the coast of California

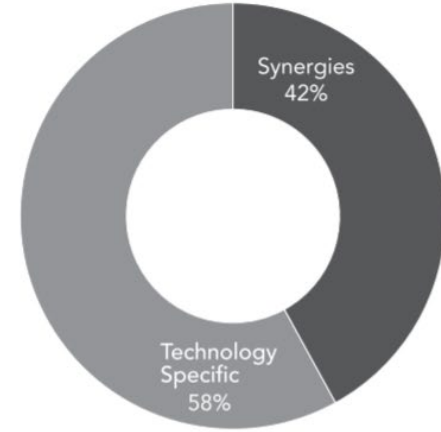
Synergies of Wave and Offshore Wind



Wave & Tidal



Offshore Wind



- O&M
- Power Take Off
- Electrical Infrastructure
- Support Structure
- Logistic & Installation
- Project Development Permit
- Other CAPEX
- Other VAR

- Use of the same cable/grid infrastructure
- Better utilisation of the Marine Space
- Common/shared port & depot facilities
- Consenting process commonality

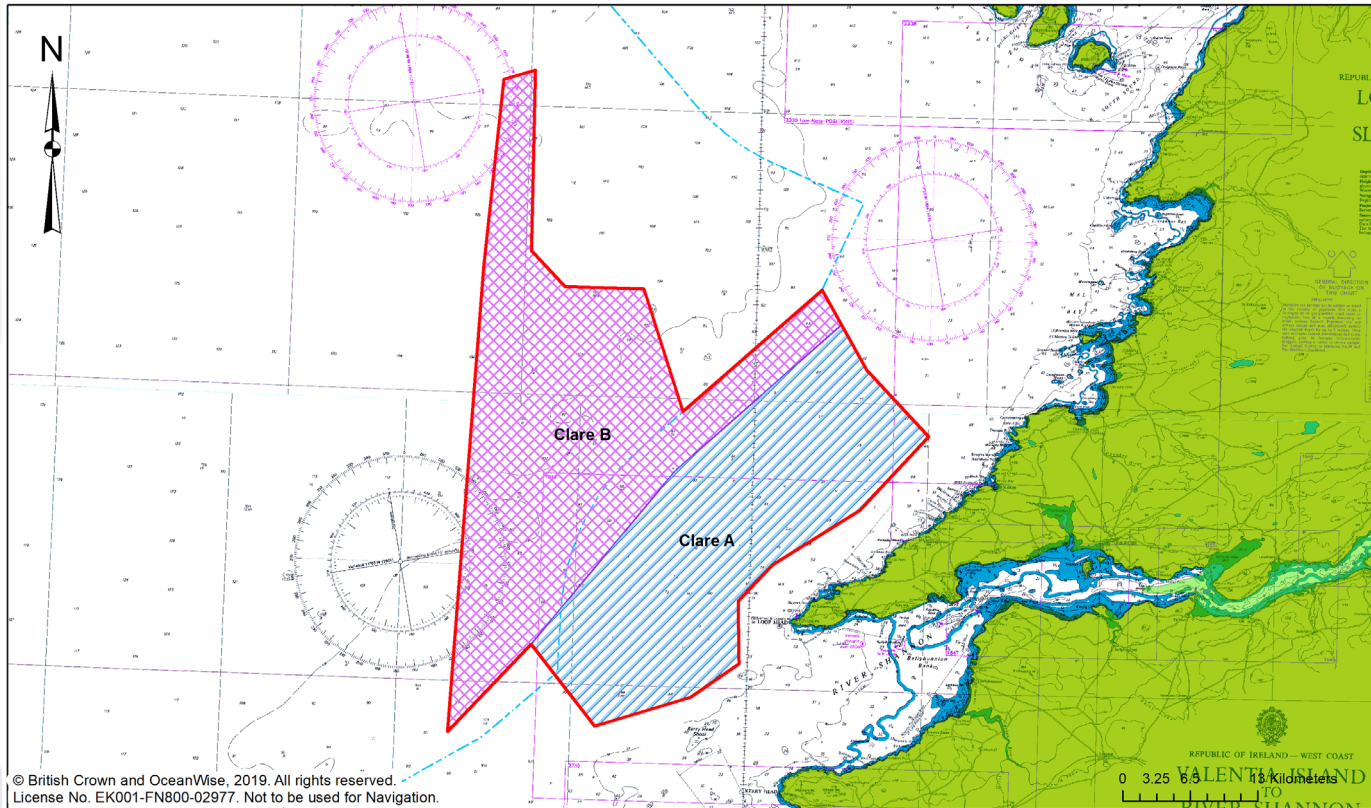
Hybrid Platforms

- Increase capacity factor of overall installation
- Increased predictability of power output

Co-located Farms (Independent or combined arrays)

- Studies shown that devices in water near wind device can dampen impact of waves on wind installation, 'Shadow effect', by reducing mean wave height

Colocation Example



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OFFSHORE WIND IRELAND - CLARE AREA MAP 1 Clare MEP AoS A and B

- Legend**
- ▬ Clare MEP Site Boundary
 - Development**
 - ▨ Area suitable for Wave-Energy Development
 - ▩ Area suitable for Offshore Wind and Wave-Energy Development
 - - - Irish Waters_within12nm

| Ver | Date | Drawn by | Checked | Approved |
|---|------------|--------------|---------|----------|
| V1 | 15/10/2019 | AM | CMG | |
| Filename: Clare_LandfallsCableRoutes | | | | Size A3 |
| Scale: 1:450,000 | | Printed @ A3 | | |
| Coordinate System: IRENET95 Irish Transverse Mercator | | | | |
| Projection: Transverse Mercator | | | | |



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- Impact of one device on the other
- Longer development times of wave devices versus mature status of offshore wind
- Insurance costs – lack of experience in co-located projects. (Accident and damage risks)
- Site selection compromise – finding the optimum site for both resources may be difficult. Important to consider the complementarity of the wave and offshore wind resource
- Regulatory regimes and revenue support stream



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