



**SIMEC ATLANTIS  
ENERGY**

# MEYGEN UPDATE

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# PHASED DEVELOPMENT PROGRAMME

## PHASE 1A – PROOF OF CONCEPT

- World's first multi-MW tidal turbine array
- 4 x 1.5MW turbines
- 6 MW ROC accredited array
- Entered operating phase 2018
- Over 22 GWh electricity generated to date



MeyGen 1A  
turbine operating

## PHASE 1B – ENABLING PROJECT

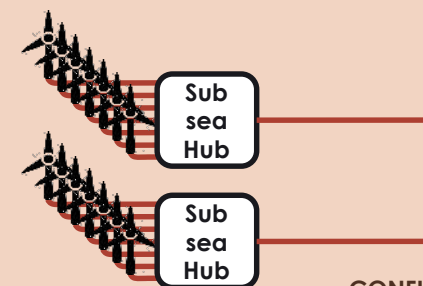
- Demonstration of larger turbine rotors for improved yield
- Installation of subsea hub to connect multiple turbines through
- Innovations lead to step change reduction in LCOE
- All leases, consents and grid connection secured



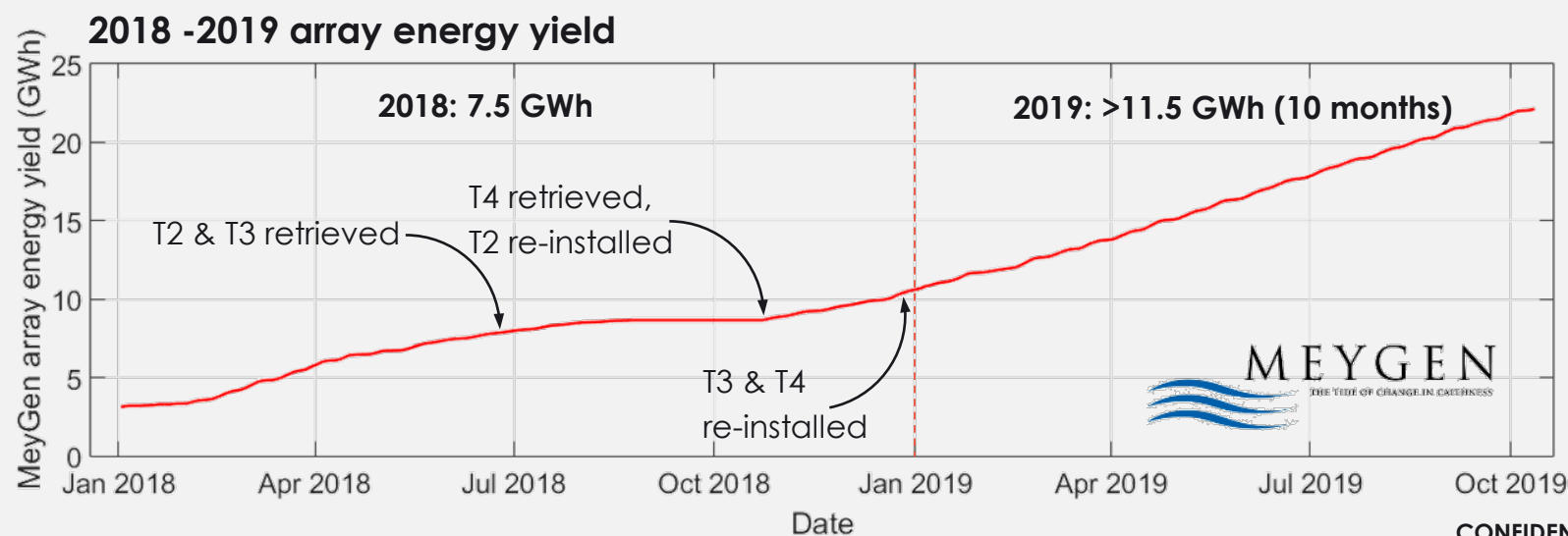
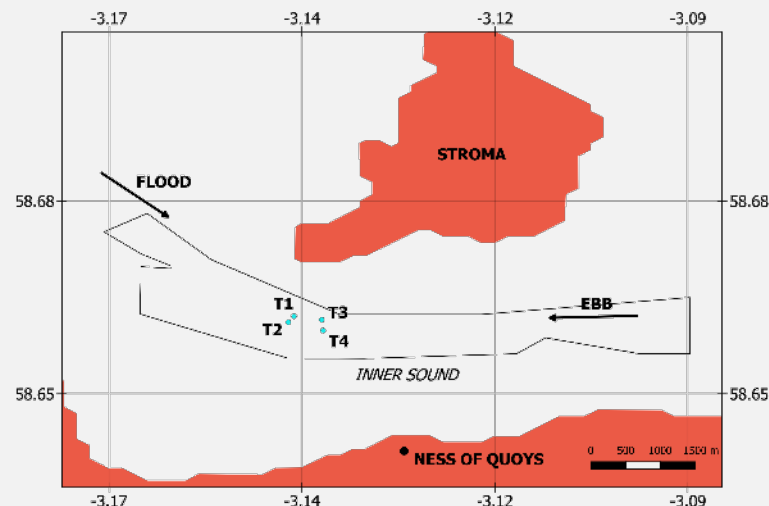
Subsea hub

## PHASE 1C – COMMERCIAL ARRAY

- Offshore seabed lease and environmental consent secured
- Onshore land lease and planning permission granted
- Grid connection agreement in place

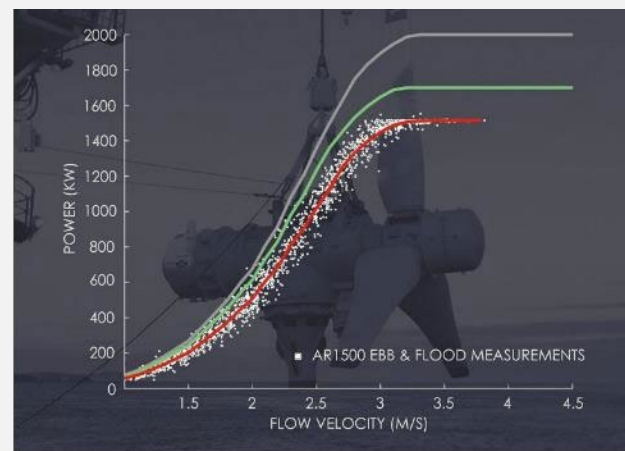


# MEYGEN PHASE 1A





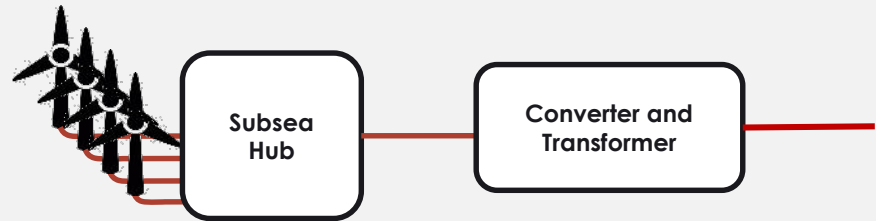
# MEYGEN PHASE 1B – AR2000



	AR1500	AR2000
Rated power	1.5 MW	2.0 MW
Rotor diameter	18 m	20 – 24 m
Hub height	14 m	> 15 m

**Increase in energy yield per turbine of >30% from AR1500 to AR2000 with 20 m rotor dia.**

# MEYGEN PHASE 1B – SUBSEA HUB



- Connects multiple turbines subsea
- Reduces number of export cables
- At MeyGen, reduces bore hole drilling operations
- Reduces number of converters, which also reduces onshore footprint

# MEYGEN PHASE 1B – RESEARCH

## FLOW MEASUREMENT



- Collaboration with Bangor University to deploy forward looking ADCP on new AR2000 turbine
- Measurements to characterise onset flow to turbines, facilitating easier and cheaper power curve testing (IEC 62600-200)

## MARINE MAMMALS

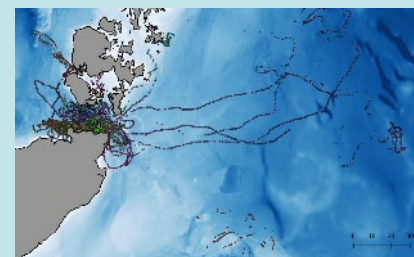
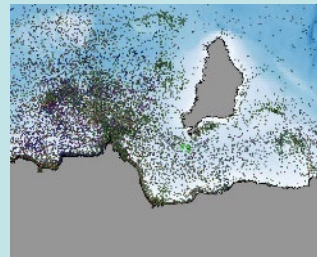


University of  
St Andrews



Sea Mammal  
Research  
Unit

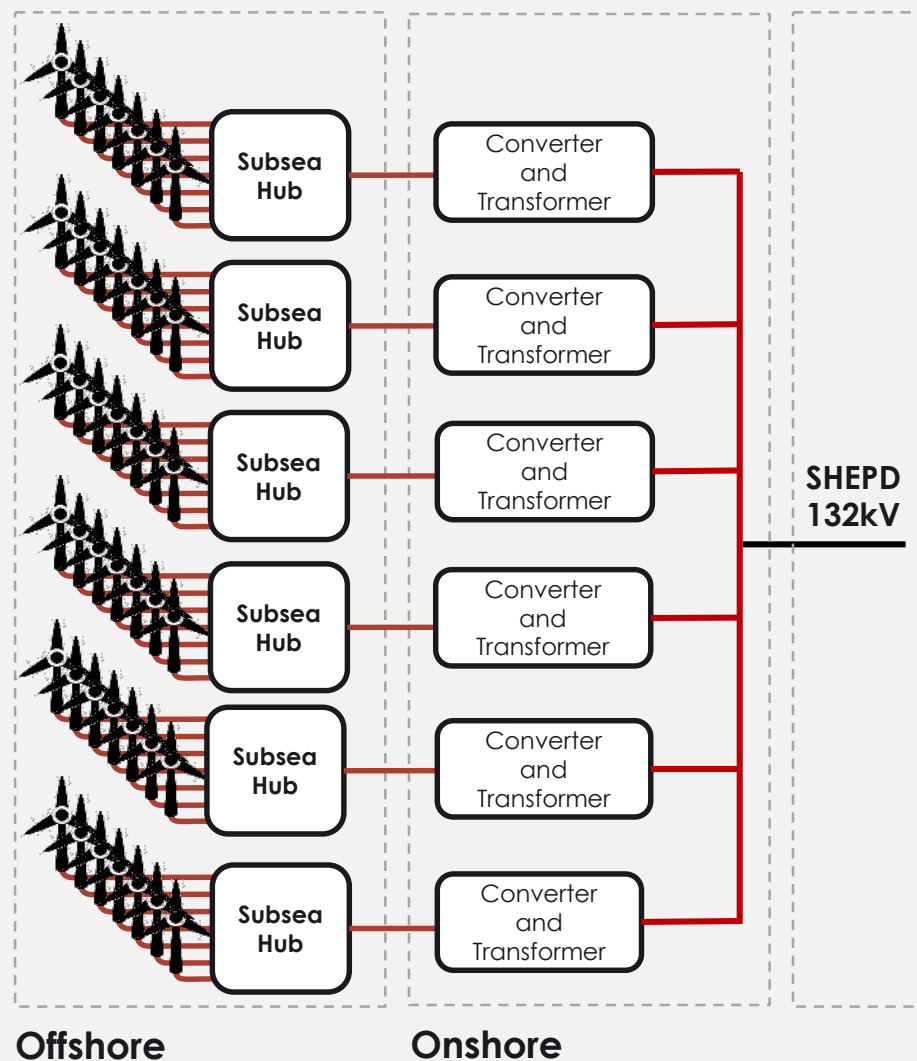
- Collaboration with University of St Andrews and the Sea Mammal Research Unit (SMRU)
- Harbour seal tagging to track movements around MeyGen Phase 1A turbines
- Initial results indicate harbour seals spend 0.001% of their time in MeyGen consented area



# MEYGEN PHASE 1C

Subject to final optimisation:

- 80 MW array
- Monopile turbine support structures
- 7 turbines connected to each subsea hub
- 25 year operating life
- Turbine size and rating TBC



# COST REDUCTION & LEARNING

## MONOPILE FOUNDATIONS

- Reduction in steel of 90% vs. gravity based foundations
- Provide greater flexibility to micro-site turbines in high energy regions



## WET MATE CONNECTORS

- Proven to halve installation time offshore
- 65% lower installation cost vs. dry mate connectors



## OFFSHORE EXPERIENCE

- 2 vessels on deck in winter weather conditions - proven
- Reduces vessel cost significantly by minimising total transit time



## MASS MANUFACTURING

- Dedicated manufacturing facilities
- Cost reduction through economies of volume



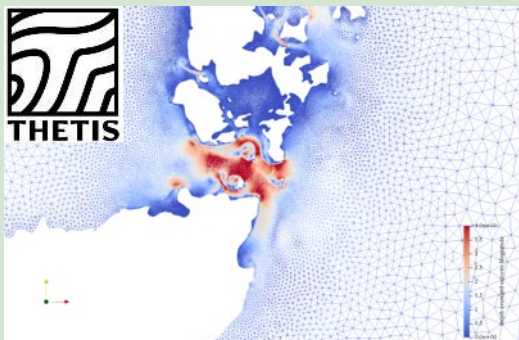


# MEYGEN PHASE 1C – RESEARCH

## RESOURCE CHARACTERISATION & ARRAY OPTIMISATION

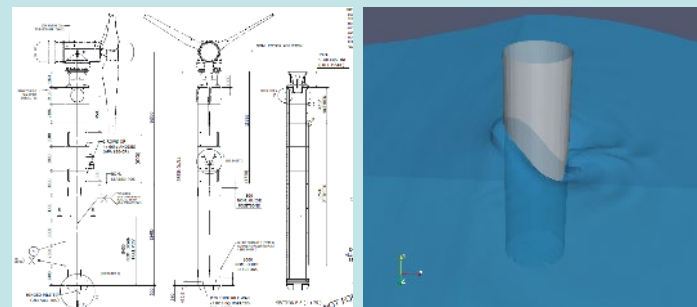
- Collaboration with Imperial College London and University of Edinburgh
- Array optimisation of UK sites using Thetis unstructured grid coastal ocean model
- Drone footage to characterise tidal stream energy resource over wide spatial coverage

**Imperial College  
London**



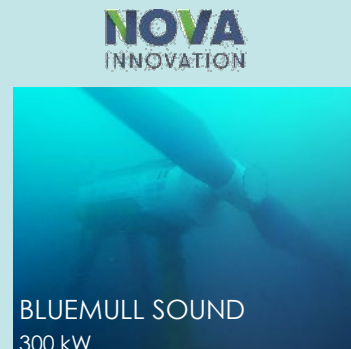
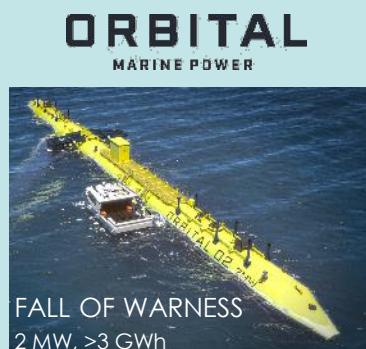
## FLUID-STRUCTURE INTERACTION

- Collaboration with Plymouth University on the Collaborative Computational Project on Wave Structure Interaction (CCP-WSI)
- Design of monopile structures for MeyGen Phase 1C
- Interaction between flow and export cables



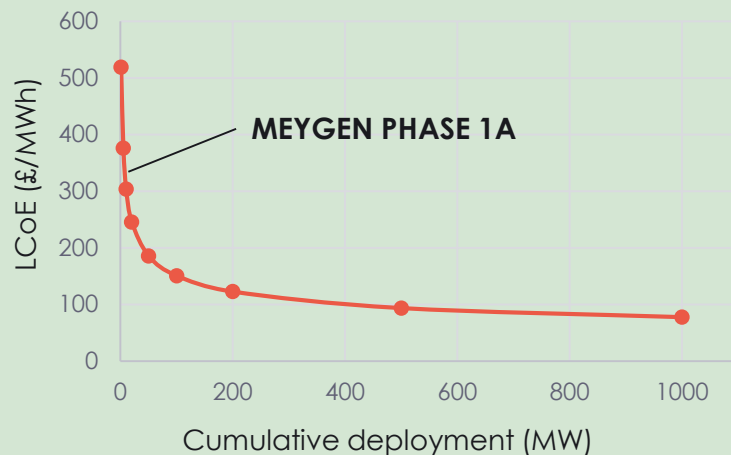
# PROGRESS

## EXISTING PROJECTS:



**TOTAL ENERGY YIELD BEFORE 2017: >14 GWh, TOTAL ENERGY YIELD BETWEEN 2017-2019: >25 GWh**

## FUTURE PROJECTIONS:



**CATAPULT**  
Offshore Renewable Energy

**TIDAL STREAM AND  
WAVE ENERGY COST  
REDUCTION AND  
INDUSTRIAL BENEFIT**

- Projection based on aggregated data – kW to MW scale devices, vertical/horizontal axis turbines
- Assumes 100 MW of installed deployment/year from 2021/22
- Estimated shortfall in clean energy of 100 TWh/year by 2030 (Based on ref scenario in BEIS Energy & Emissions Projections vs. 5th carbon budget)
- UK practical resource estimate: 15 GW

# SUMMARY

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## **MeyGen 1A (Proof of concept)**

- Energy yield >22 GWh
- Significant learning and technology innovation – e.g. wet mate connectors reduce install costs by 65%

## **MeyGen 1B (Enabling project)**

- AR2000 – 30% increase in energy yield/turbine vs. AR1500
- Subsea hub – reduces balance of plant (export cables, converters) and bore hole drilling to reduce LCoE

## **MeyGen 1C (Commercial array)**

- Monopiles cut cost by reducing steel usage by 90%
- Economies of volume

## **Research focus**

- Marine mammal behaviour around tidal stream turbine arrays
- Reduction in LCoE – array optimisation, monopiles, export cables, field measurements





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# Thank you

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