ETIP Ocean & EERA Ocean Energy JP Webinar:

DEMONSTRATION OF WAVE ENERGY DEVICES AND PTO

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Wave Energy Scotland

11 June 2020

Contents

- WES Background
- WES Programmes
- Wave Energy Converters
- Power Take Off Programme

WES Background

WES Background

Developing cost competitive wave technology

Project collaboration across Europe and globally

A subsidiary of HIE Highlands and Islands Enterprise Iomairt na Gàidhealtachd's nan Eilean

£ Research, development & innovation programme funded by the Scottish Government

5 Programmes

230 Organisations

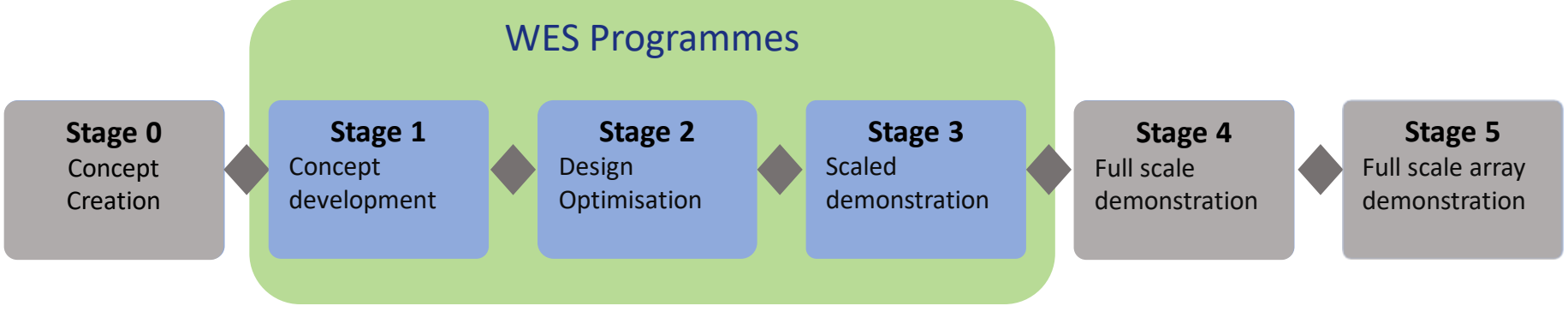
96 Projects

13 Countries

£39.6 million committed expenditure

WES Programmes

WES Stage Gate Process



Metric Topic Areas

Controllability

Acceptability

Reliability

Maintainability

Installability

Energy Capture

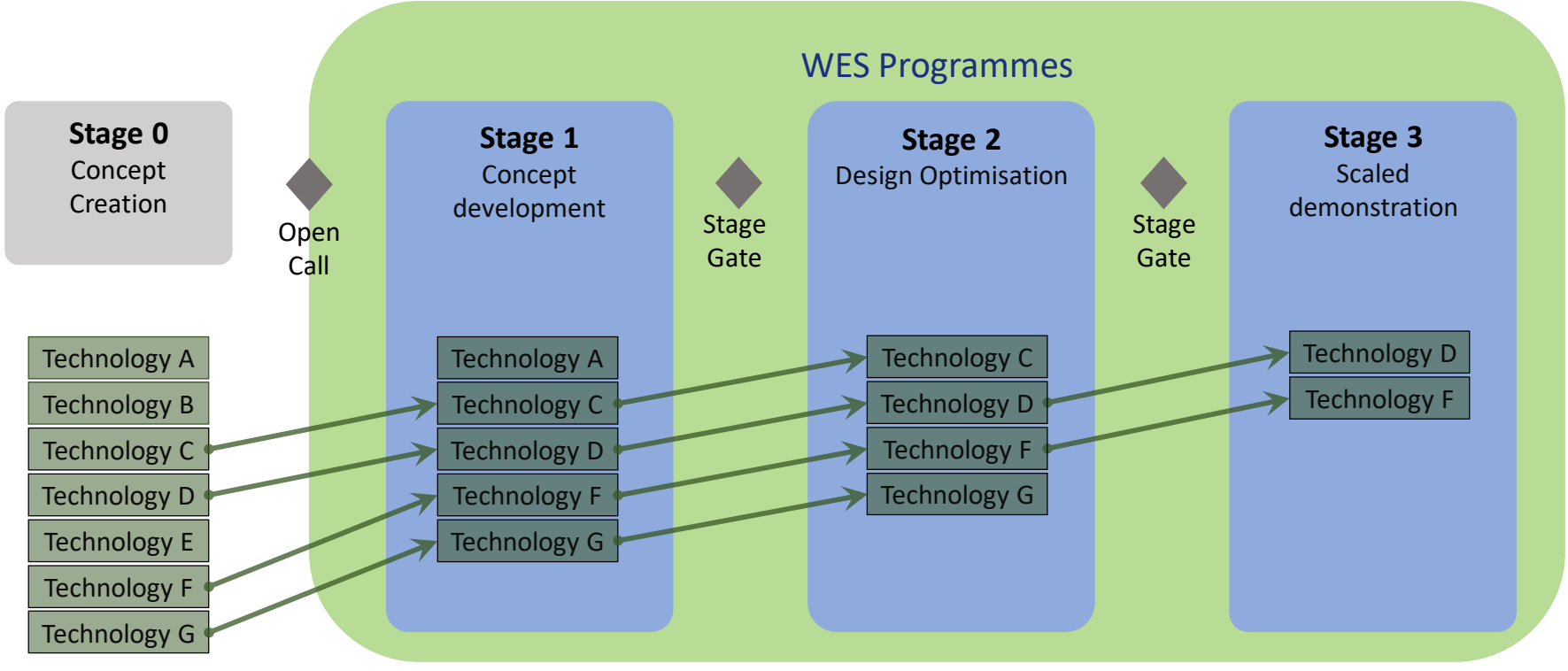
Manufacturability

Energy Conversion

Survivability

Affordability

WES Programmes



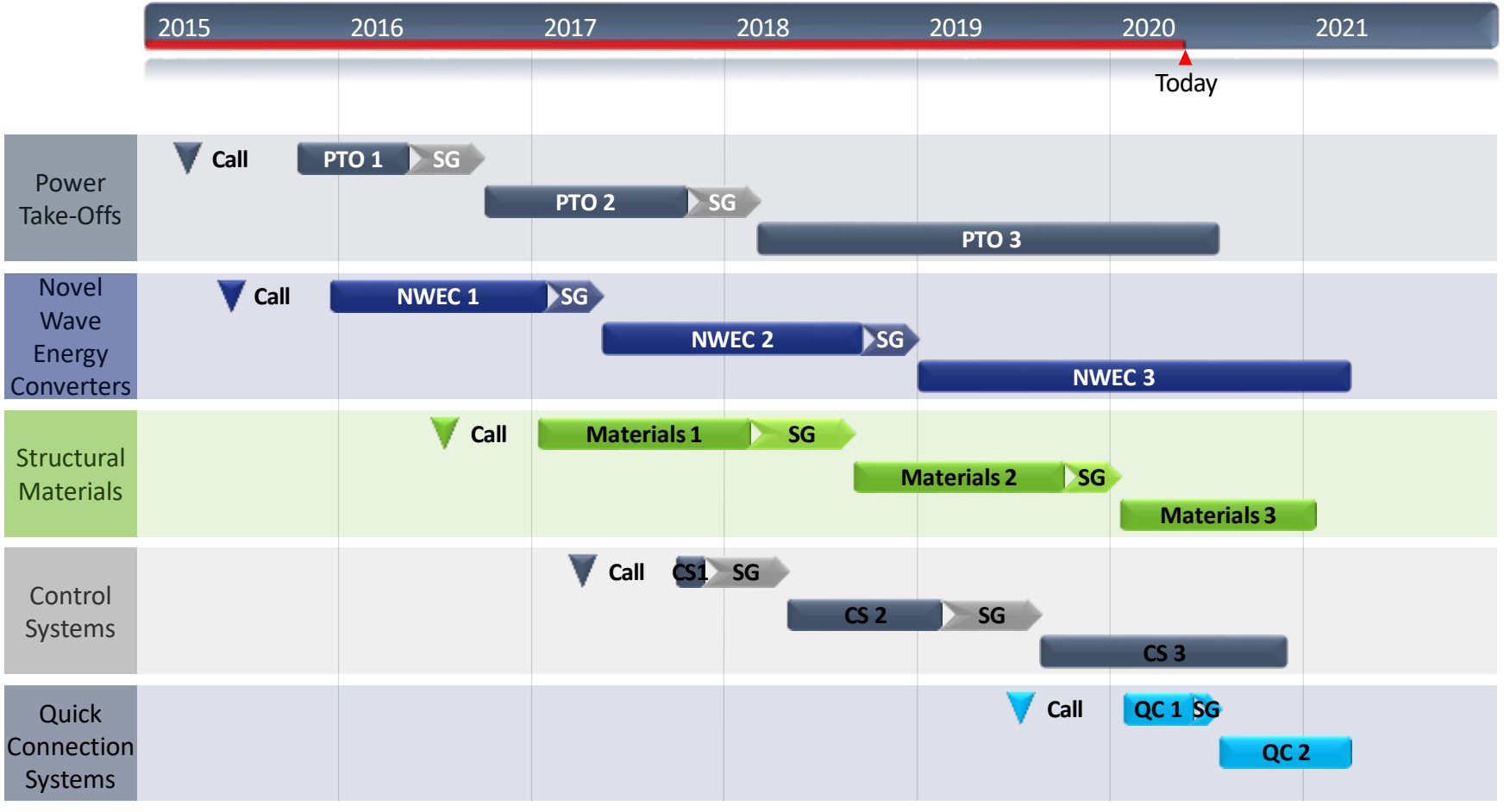
WES Programmes

- Power Take-Offs
- Novel Wave Energy Converters
- Structural Materials
- Control Systems
- Quick Connection Systems

WES Programmes

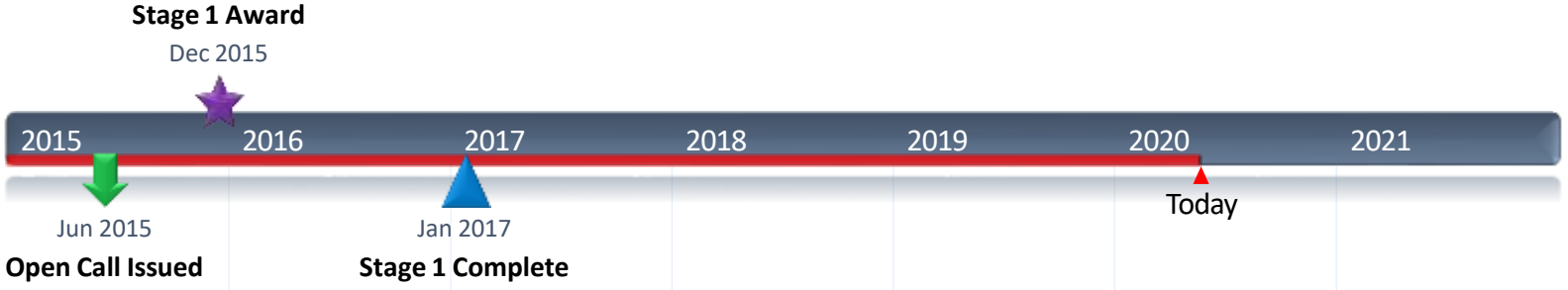
Power Take-Offs	
Novel Wave Energy Converters	
Structural Materials	
Control Systems	
Quick Connection Systems	

WES Programmes



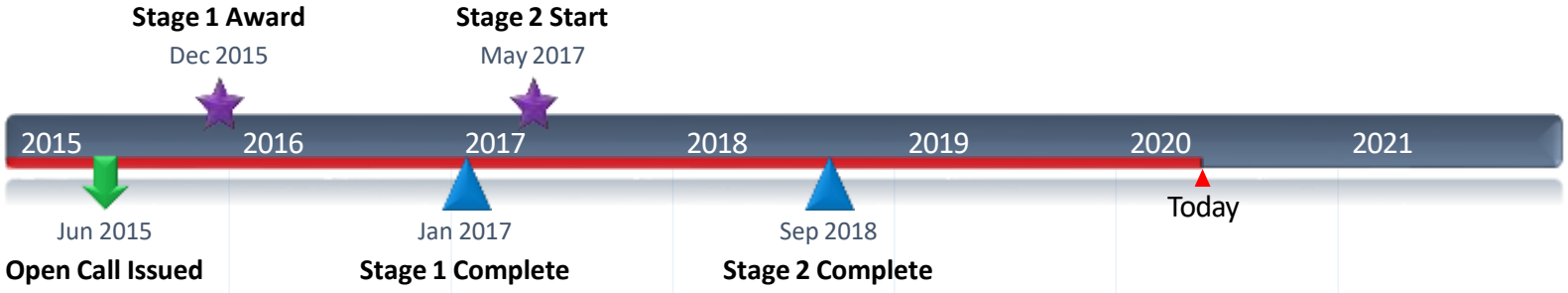
Wave Energy Converters Programme

WECs Phase 1



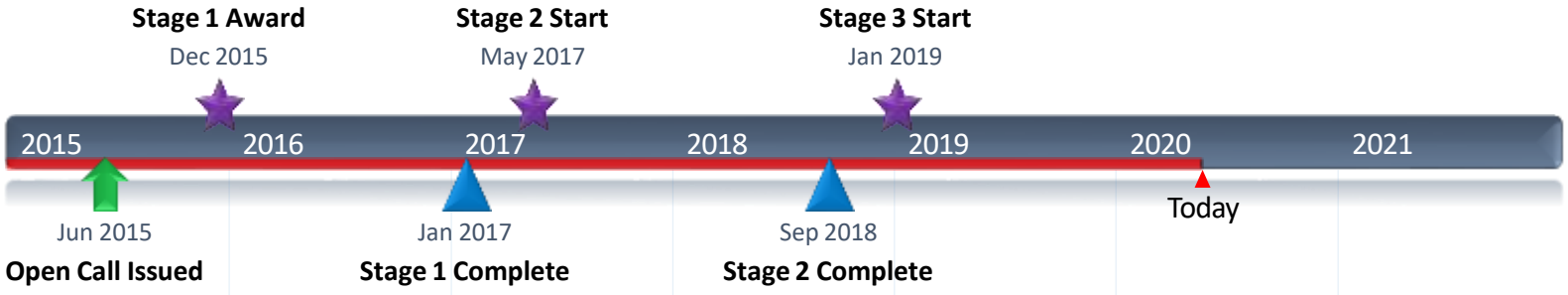
4CE	Stage 1
ALB	Stage 1
AWS	Stage 1
CHK	Stage 1
JOU	Stage 1
MOE	Stage 1
QUO	Stage 1
ZYB	Stage 1

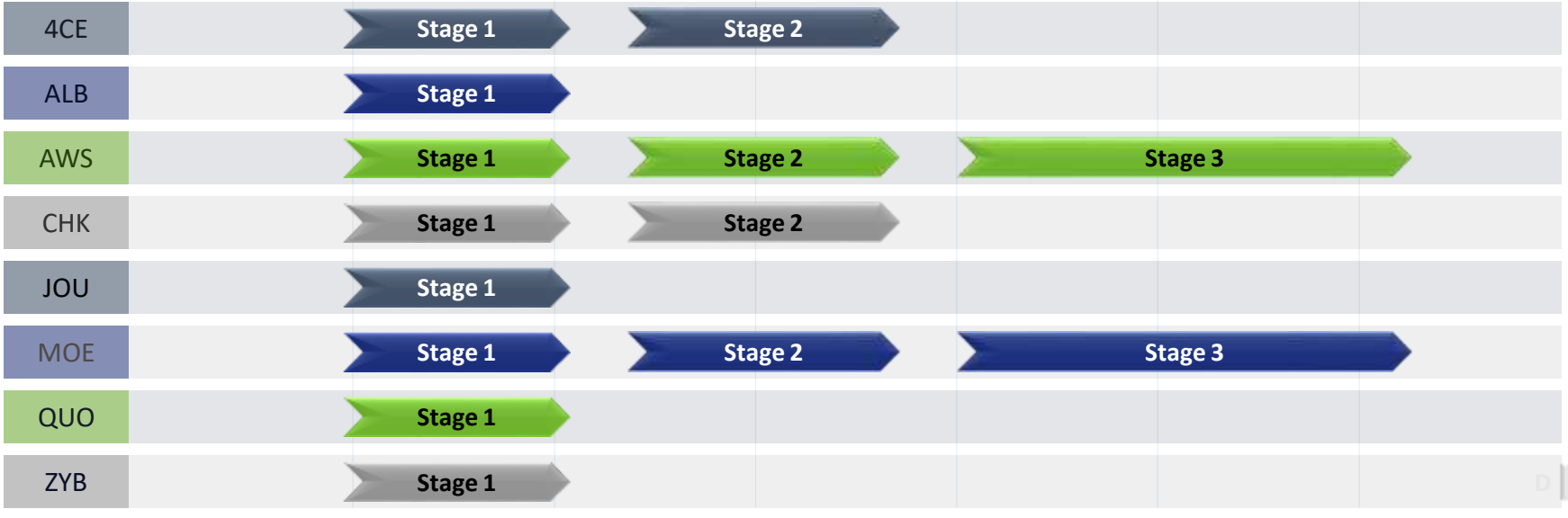
WECs Phase 2



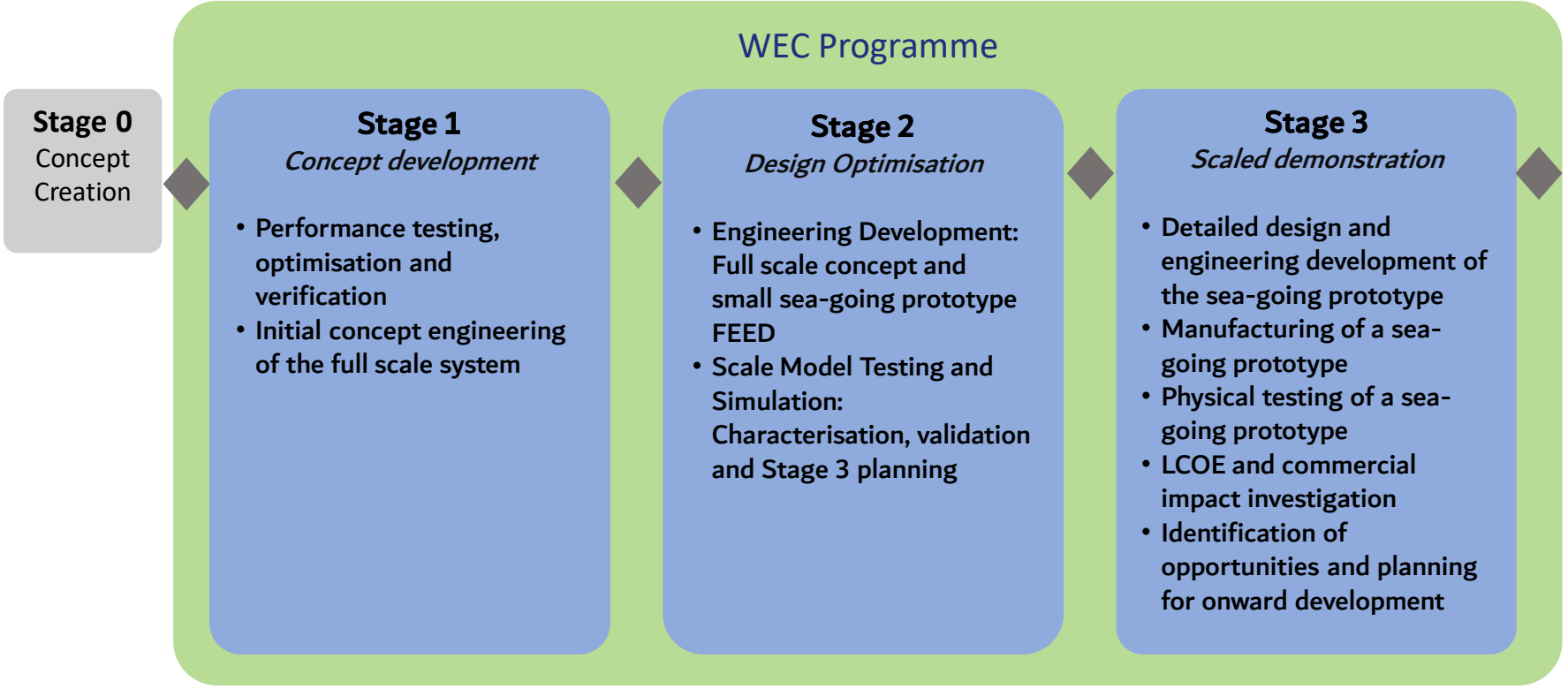
4CE	Stage 1	Stage 2
ALB	Stage 1	
AWS	Stage 1	Stage 2
CHK	Stage 1	Stage 2
JOU	Stage 1	
MOE	Stage 1	Stage 2
QUO	Stage 1	
ZYB	Stage 1	

WECs Phase 3


Stage 1 Award
Dec 2015
Stage 2 Start
May 2017
Stage 3 Start
Jan 2019
2015
2016
2017
2018
2019
2020
2021
Today
Jun 2015
Open Call Issued
Jan 2017
Stage 1 Complete
Sep 2018
Stage 2 Complete


4CE
Stage 1
Stage 2
ALB
Stage 1
AWS
Stage 1
Stage 2
Stage 3
CHK
Stage 1
Stage 2
JOU
Stage 1
MOE
Stage 1
Stage 2
Stage 3
QUO
Stage 1
ZYB
Stage 1

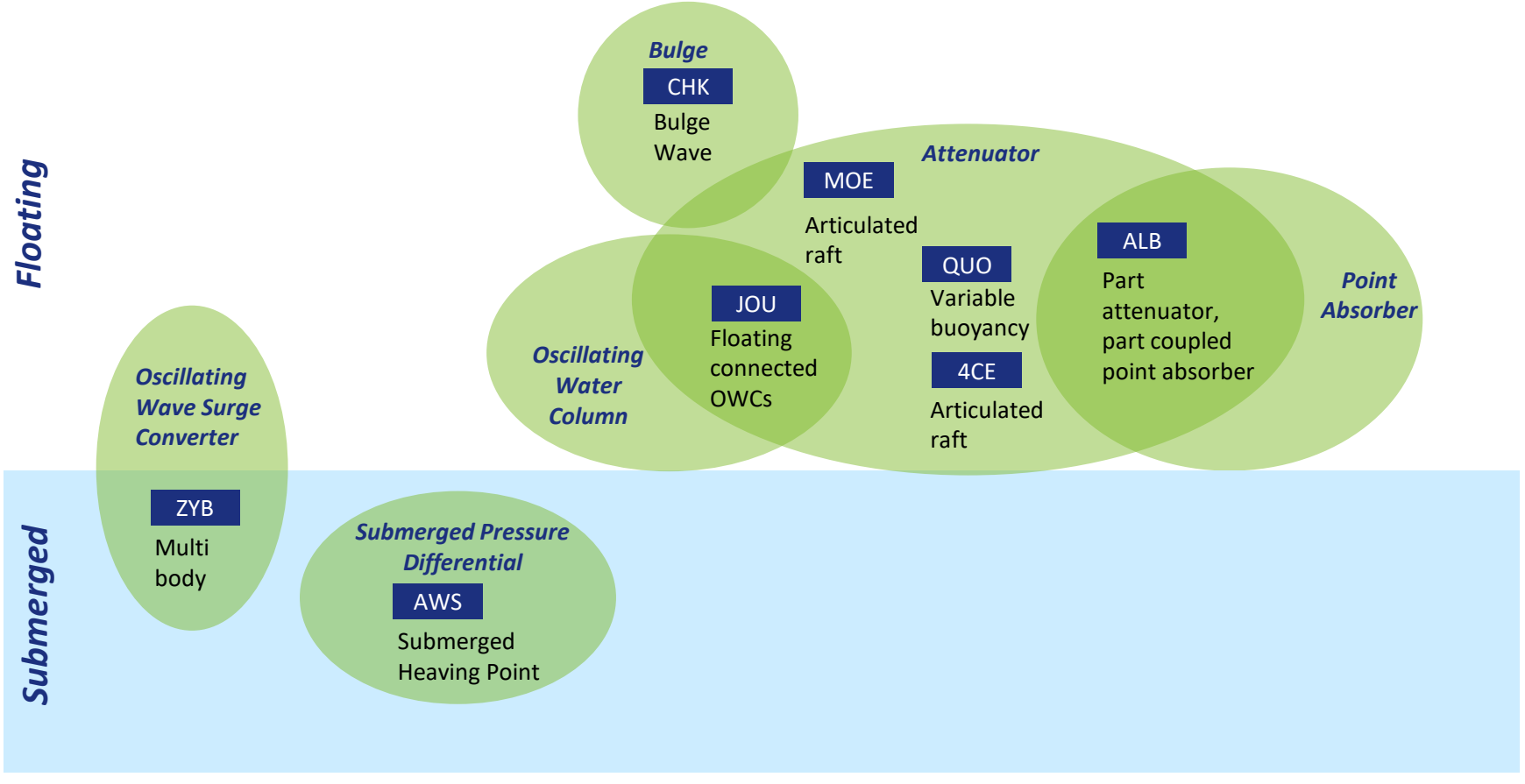
Wave Energy Converter Programme



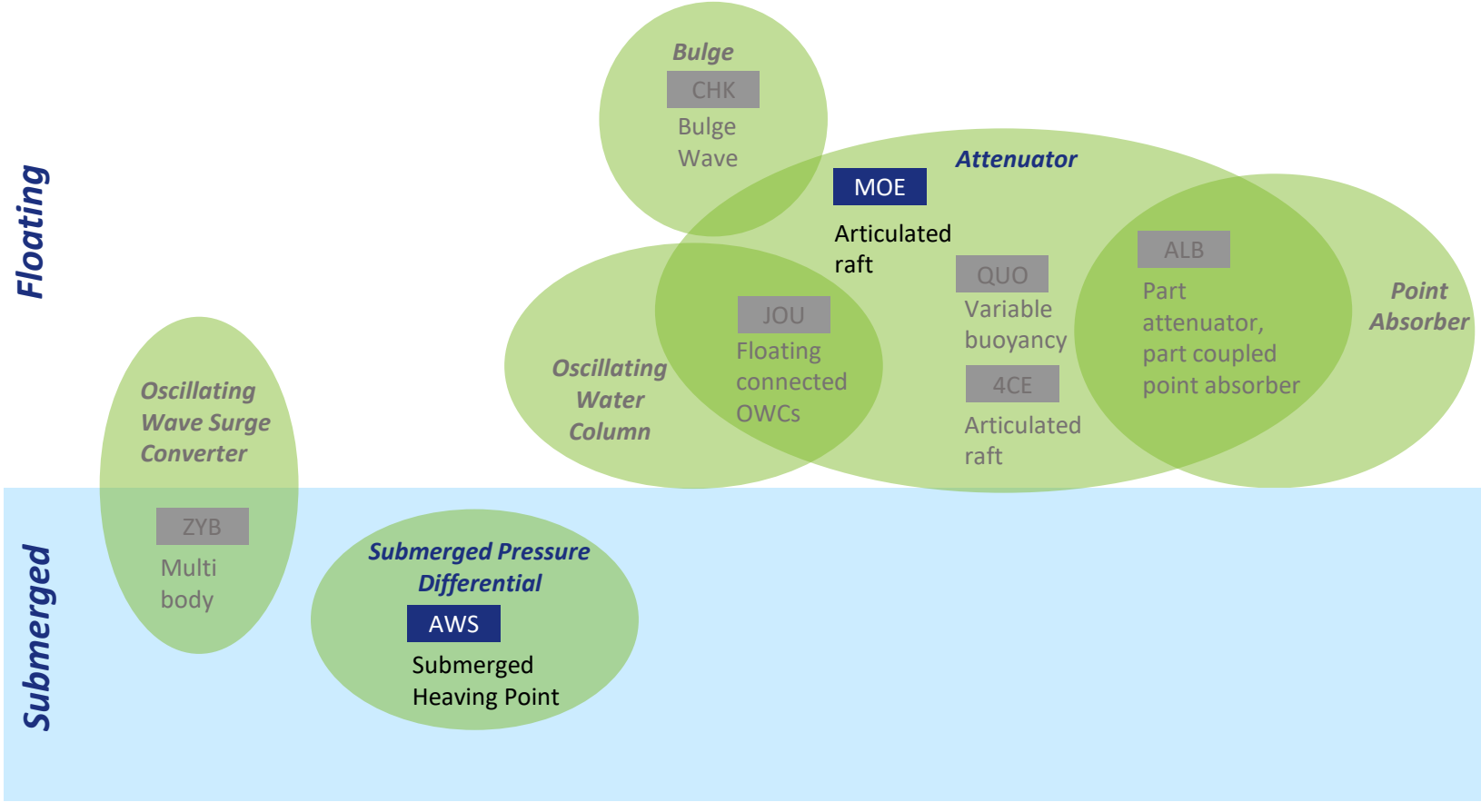
Selection Criteria

- Technology Development
- Future Commercial Offering
- Scope of Work for Stage
- Project Management

WEC Stage 1


Floating
Submerged
Bulge
CHK
Bulge Wave
Attenuator
MOE
Articulated raft
QUO
Variable buoyancy
4CE
Articulated raft
Point Absorber
ALB
Part attenuator, part coupled point absorber
Oscillating Water Column
JOU
Floating connected OWCs
Oscillating Wave Surge Converter
ZYB
Multi body
Submerged Pressure Differential
AWS
Submerged Heaving Point

WEC Stage 3


Floating
Submerged
Bulge
CHK
Bulge
Wave
Attenuator
MOE
Articulated
raft
QUO
Variable
buoyancy
4CE
Articulated
raft
ALB
Part
attenuator,
part coupled
point absorber
Point
Absorber
Oscillating
Water
Column
JOU
Floating
connected
OWCs
Oscillating
Wave Surge
Converter
ZYB
Multi
body
Submerged Pressure
Differential
AWS
Submerged
Heaving Point

WEC Programme

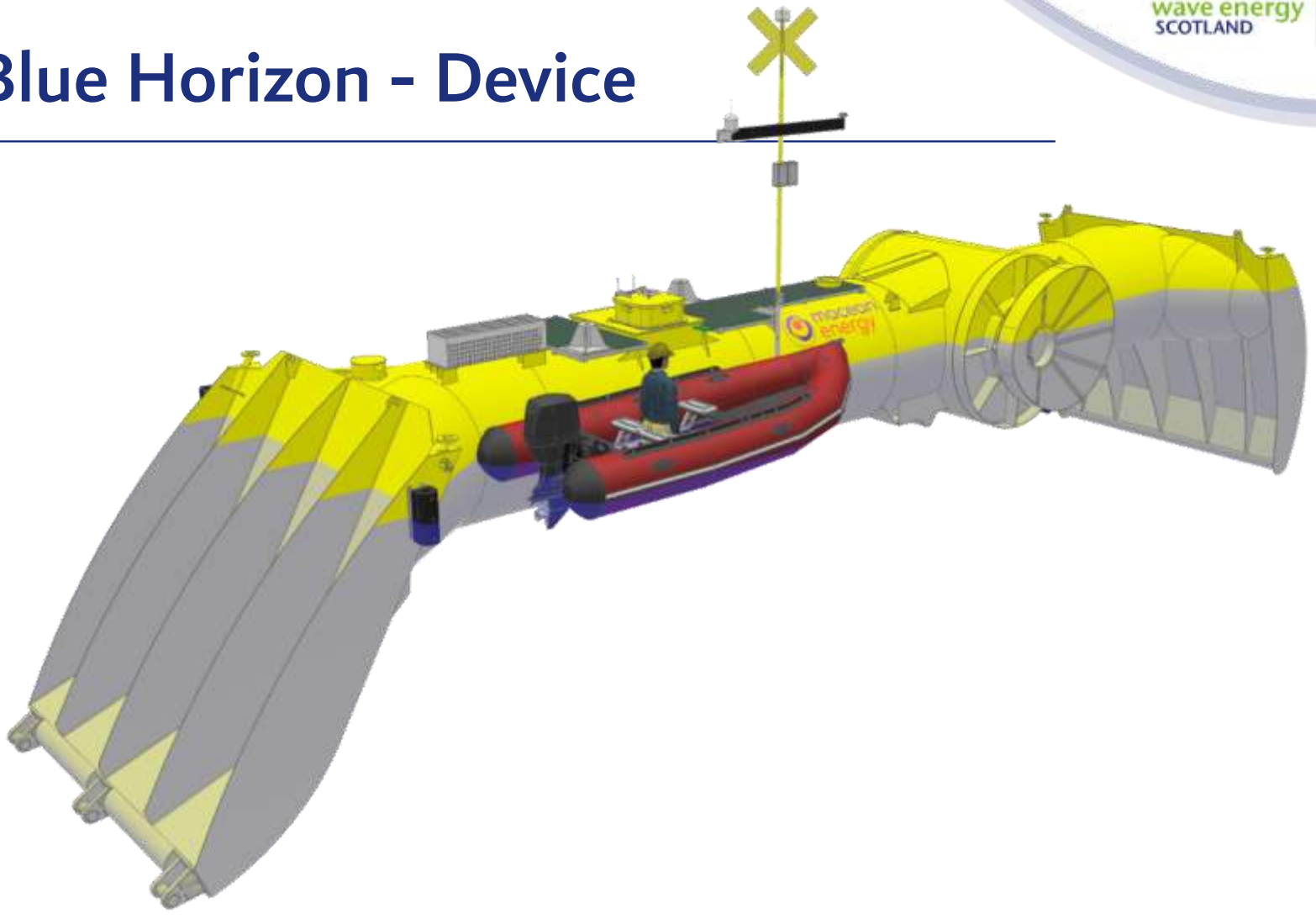
mocean energy

AWS ocean energy

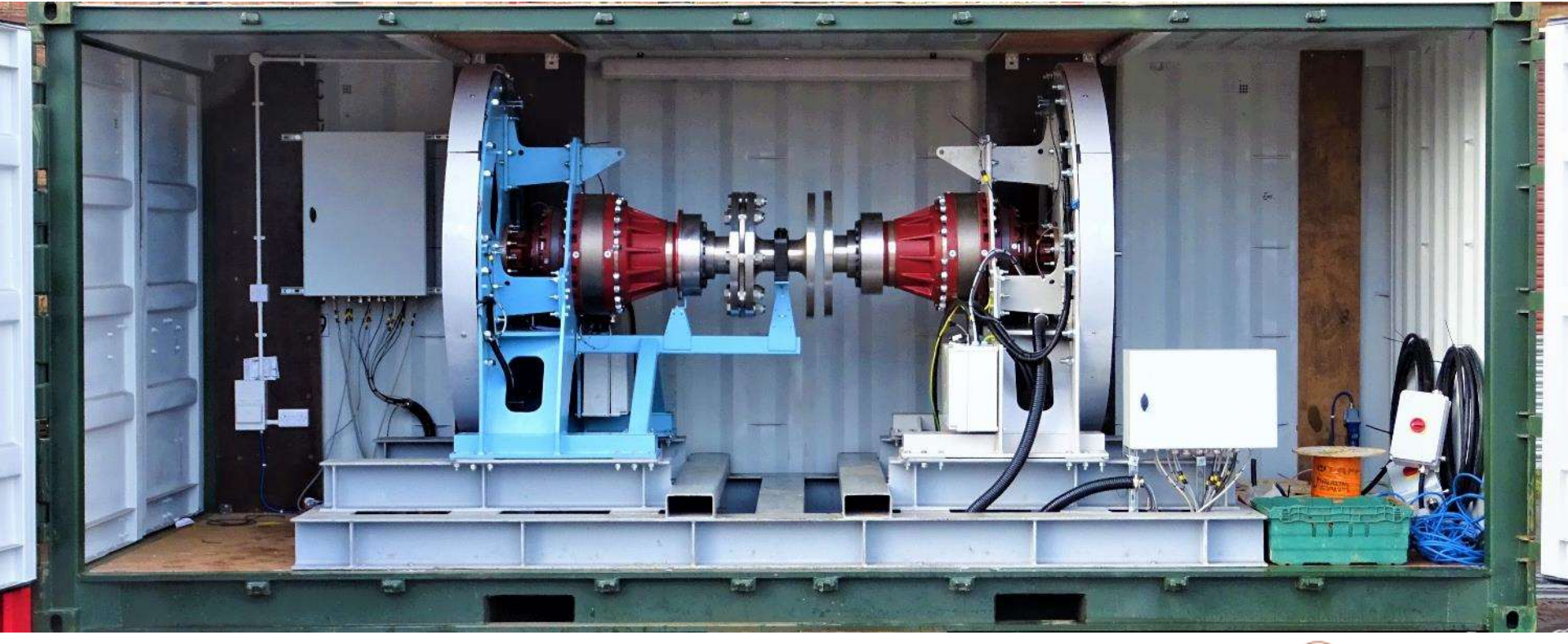
Blue Horizon - Tank Testing

mocean energy

Blue Horizon - Device

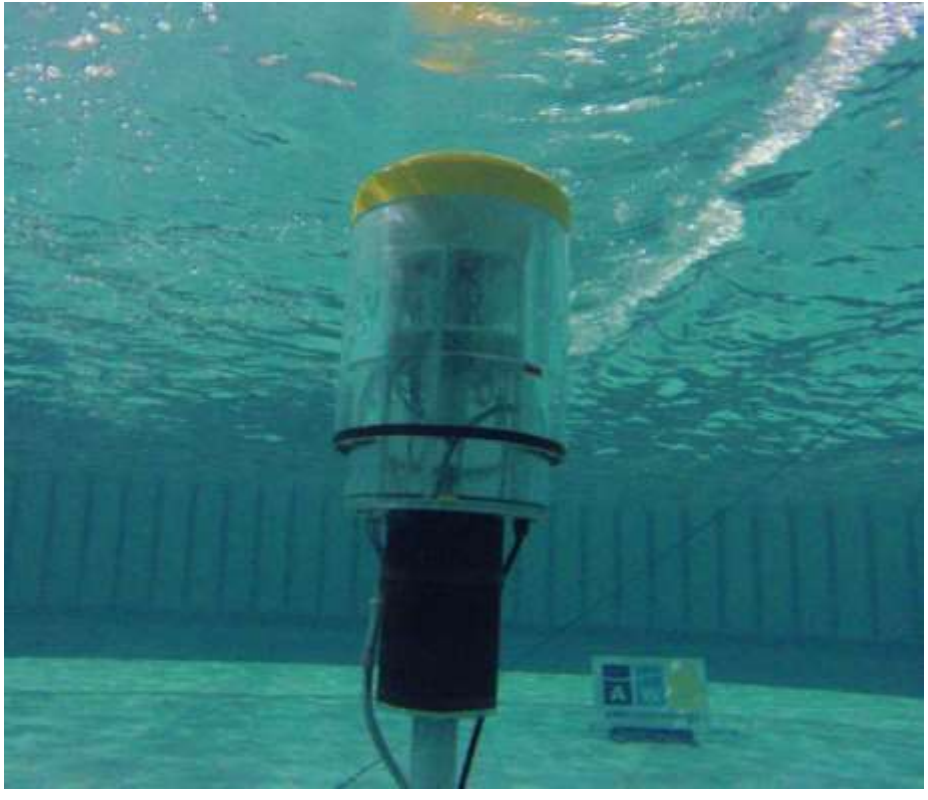


Blue Horizon - Back to Back Testing



Blue Horizon - Fabrication

Archimedes Waveswing - Tank Testing



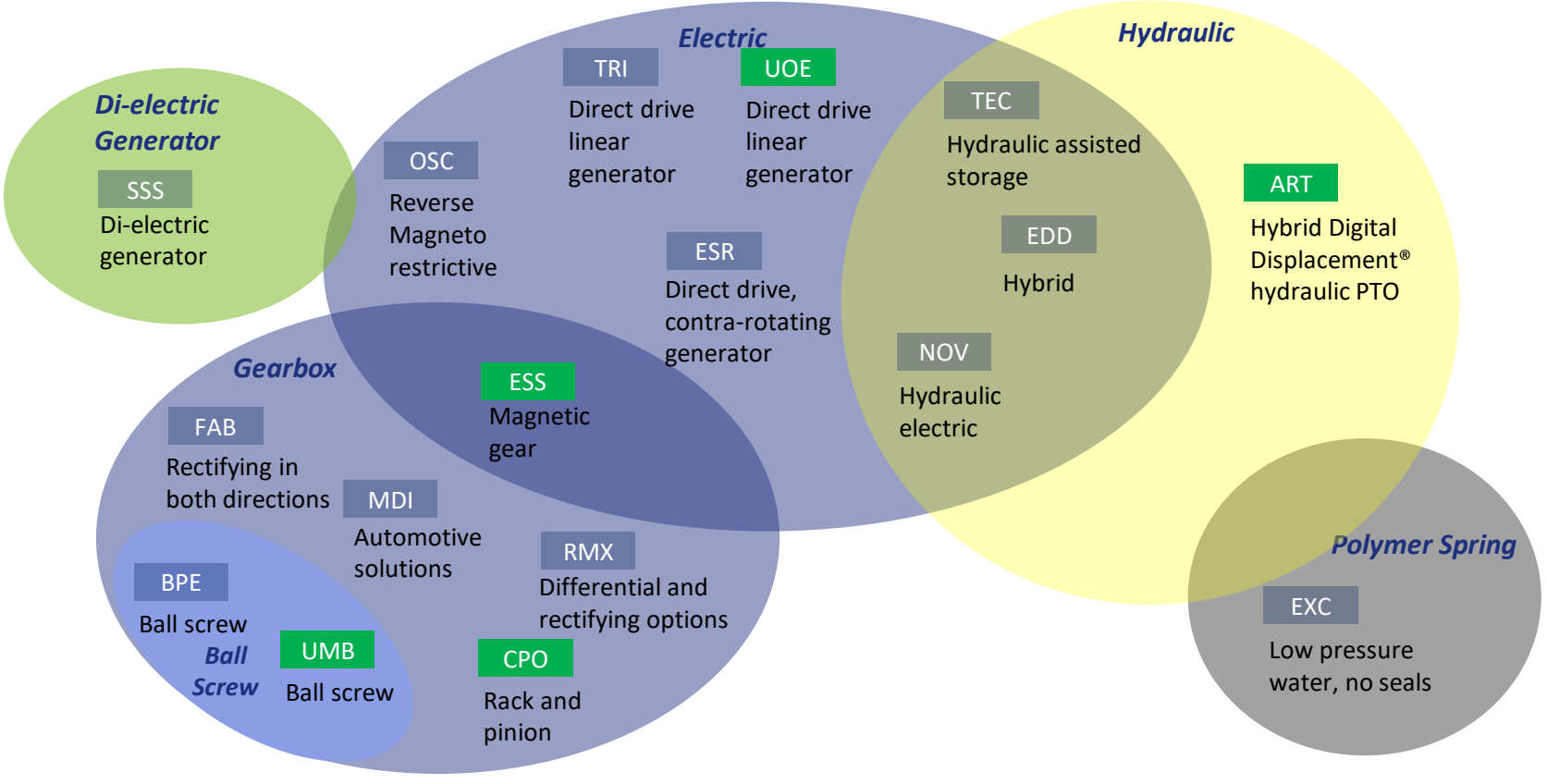
Archimedes Waveswing - Device

Archimedes Waveswing - Fabrication

CorPower PTO Testing

Power Take-Off Programme

WES PTO Programme



Power Take-Off Programme

Project

HiDrive Cascade Drive

CORPOWER OCEAN

Project

Neptune Linear Generator

School of Engineering | Institute for Energy Systems

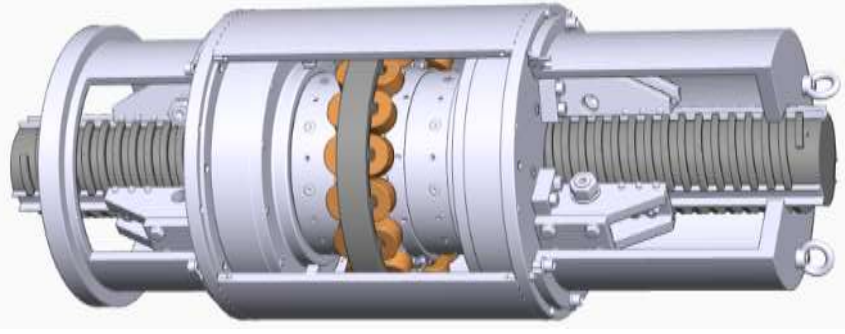
Power Take-Off Programme

Project

Quantor (Advanced Hydraulics)

Project

Power Electronic Controlled Magnet Gear (PECMAG)



PTO Project Example

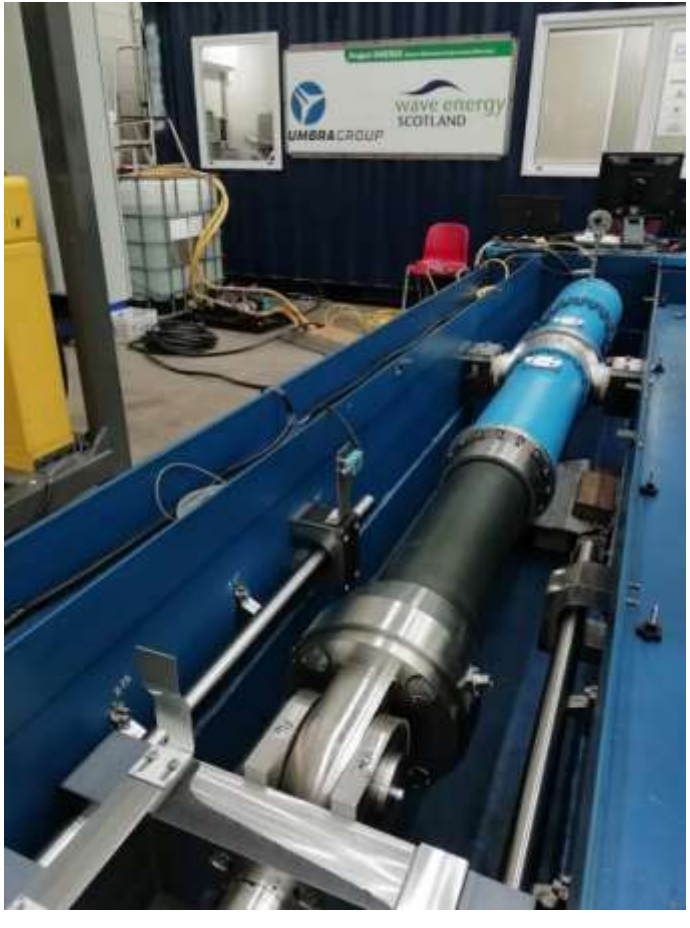
Reciprocating linear drive recirculating ball screw technology

PTO Project Example

EMERGE (Electro-**ME**chanical **R**eciprocating **GE**nerator**) project**

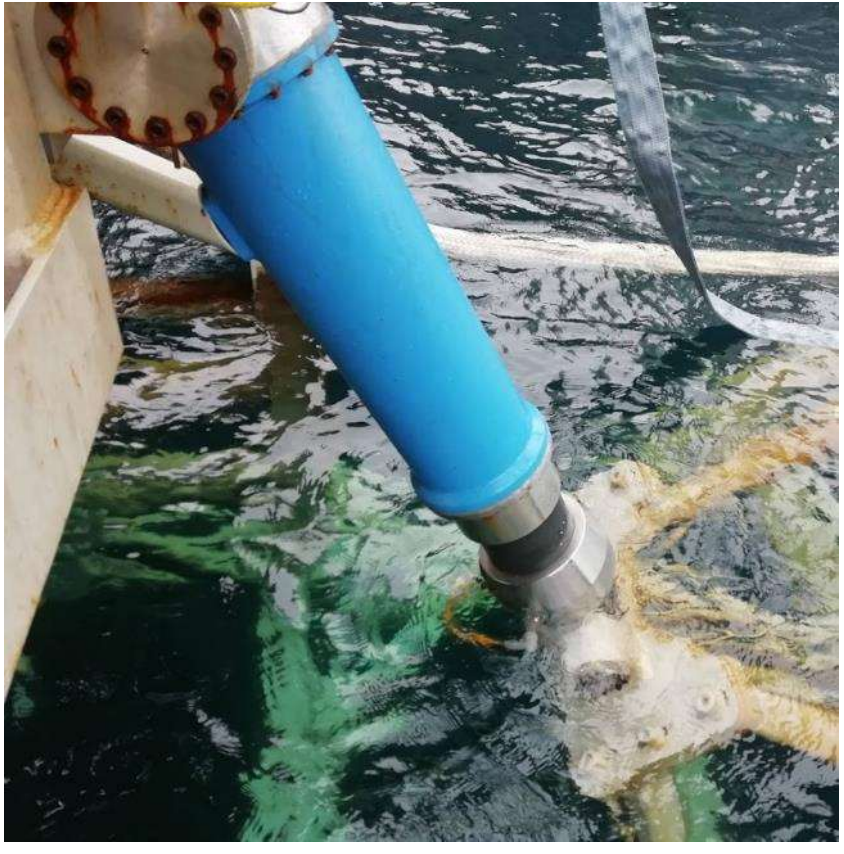
PTO Testing in Wave Tank

PTO Laboratory Testing

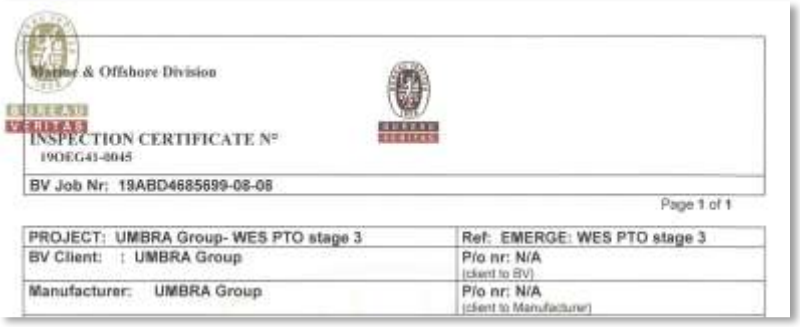


PTO Testing in Orkney

PTO Testing in Orkney



PTO Project Example



Marine & Offshore Division

INSPECTION CERTIFICATE N°
19OEG41-8045

BV Job Nr: 19ABD4685699-08-08

Page 1 of 1

PROJECT: UMBRA Group- WES PTO stage 3	Ref: EMERGE: WES PTO stage 3
BV Client: : UMBRA Group	P/o nr: N/A (client to BV)
Manufacturer: UMBRA Group	P/o nr: N/A (client to Manufacturer)

BUREAU VERITAS MARINE & OFFSHORE SAS

ENDORSEMENT OF POWER TAKE-OFF QUALIFICATION TESTS

Knowledge Library

Wave Energy Scotland is managing the most extensive technology programme of its kind in the wave energy sector. The Knowledge Library provides access to key information and documents generated through this world leading commercial and academic research & development.

Access world leading R&D in wave energy technology

- → Discover the projects supported through the Wave Energy Scotland Programme
- → Find Potential collaborators in your own or other fields
- → Search project reports on work completed through Wave Energy Scotland Programme
- → Find information on previous wave energy technology development in Scotland