



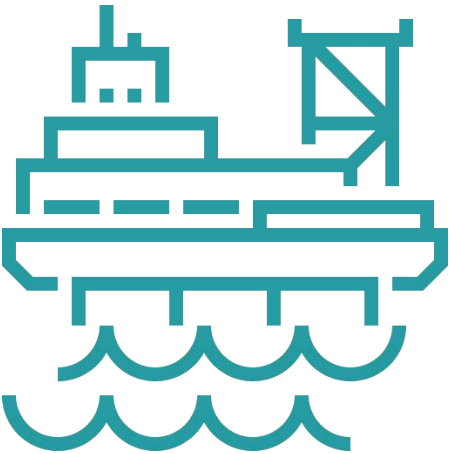
**The
Oil & Gas
Technology
Centre**

Your Innovation Partner

Future Offshore Technology & Innovation Strategy in the North Sea



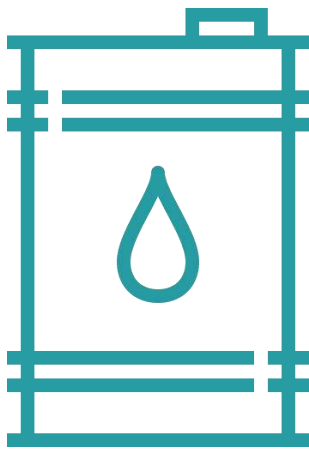
In context



Production

1999 Peak Production
5 mmboe/day

2016 Production:
1.65 mmboe/day



Resources

44bn barrels since 1970
£330 billion in corporation tax

10-20 billion barrels
potential remaining



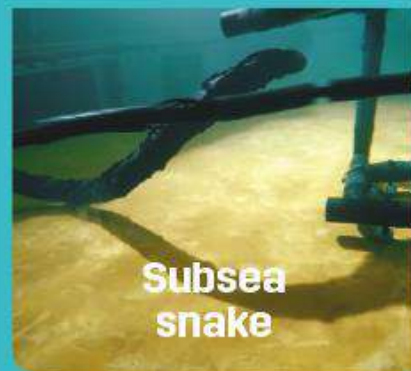
Jobs

300,000 jobs in UK
from oil & gas
(~ population of 4th,
5th & 6th Scottish
cities combined)

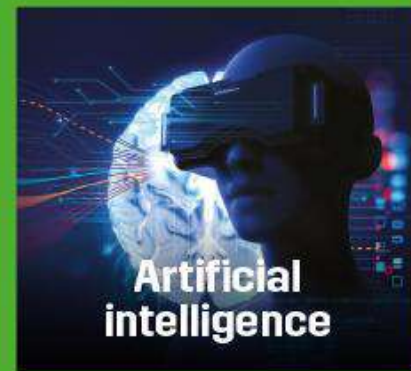
Every 1bn barrels produced generates £50bn of value for the economy

Enabling MER UK

Fix today



Maximise recovery



Asset Integrity

Eliminating the impact of asset integrity on uptime



Well Construction

Reducing drilling costs by 50%



Small Pools

Developing up to 3.4 billion barrels of oil and gas discoveries



Decommissioning

Driving down the cost of decommissioning



Digital Transformation

Transforming performance and unlocking hidden data

Inspiring, accelerating and funding technology innovation

21st Century Oil and Gas



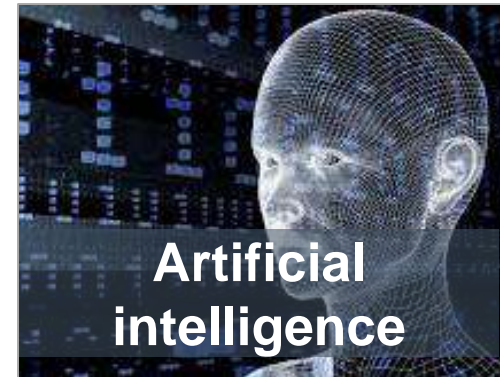
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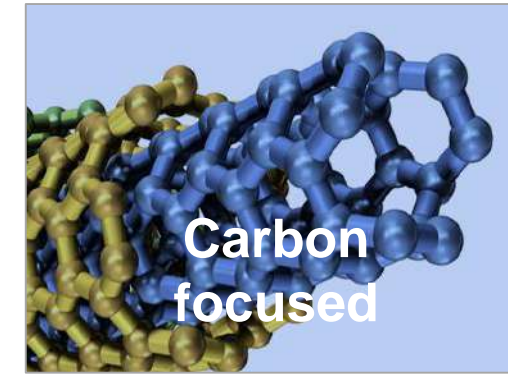
Fix today



Enable MER UK



Transform tomorrow



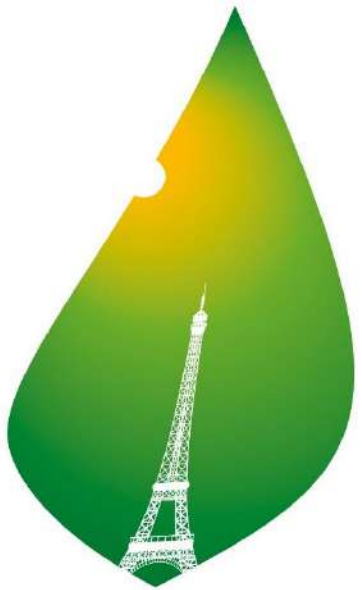
Technology will transform the oil and gas industry for the future

Low carbon future



The Oil & Gas Technology Centre
Your Innovation Partner

COP21



COP21 • CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

Came into force in
November 2016

Driving change



60% of global power generation by 2040



\$23 trillion energy efficiency investment



Oil demand increases by 11% by 2040



150 million vehicles by 2040



Gas fastest growing fuel up 33% by 2040

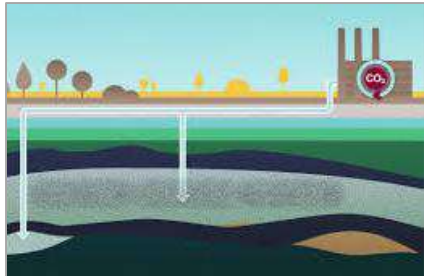


Composites market worth \$105 billion by 2021

Low carbon oil and gas



Hydrogen produced; carbon left behind



Essential role for carbon capture and storage



Gas replacing coal for power generation



Gas replacing petrol for transportation




Gas to wire delivering power direct to grid

IEA World Energy Statistics 2016

Creating value



Unlock the
potential of the
UK North Sea



Anchor the supply
chain in the North
East of Scotland



Create a culture
of innovation that
attracts academia
and industry

£180m City Region Deal public funding

Our Centre

Solution Centres

- Well construction
- Asset integrity
- Small pools
- Decommissioning
- Digital



Centres of Excellence

- World class R&D
- Partner universities
- Leverage capabilities
- Develop new skills
- Test, simulate, develop

Technology Accelerator

- Enable innovation
- Support SMEs
- Connect investors
- Co-fund and mentor
- Provide expertise



Innovation Hub

- Inspiring environment
- Learn and experience
- Ideas from other sectors
- Tech Talk programme
- Facilitated workshops

Become the 'Go To' Technology Centre in the UK and internationally

Small Pools

Key aspirations:

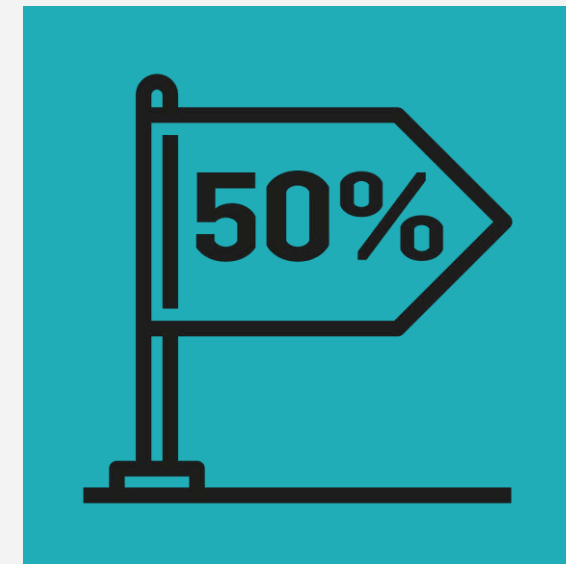
Rapid Tiebacks



50% Cost Reduction by 2025



50% Under Development by 2030



No Stranded Assets



Key Work Themes:

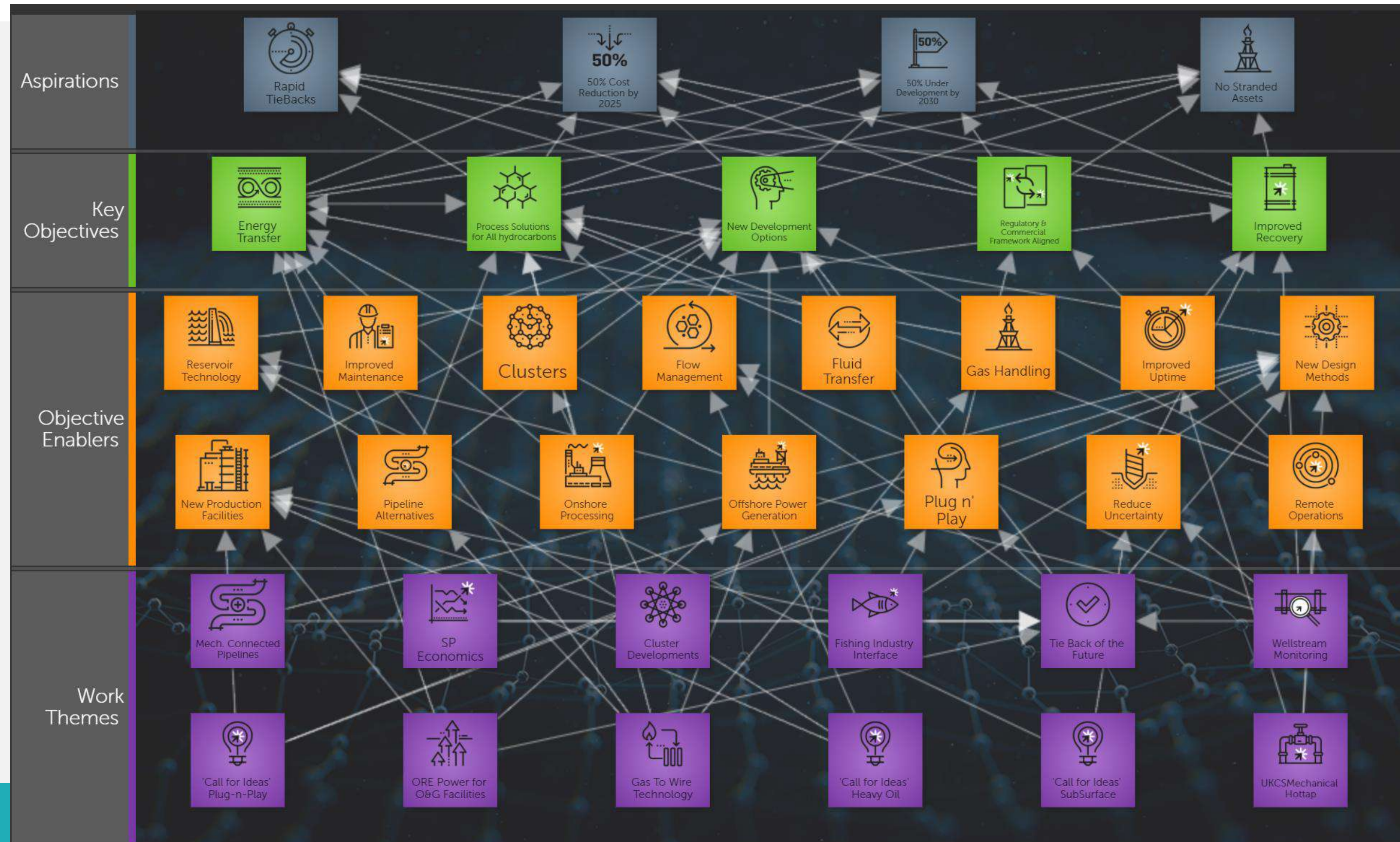
- > TieBack of the Future: ½ the COST in ½ the TIME
- > Facility of the Future: Compact / Unmanned / Automated
- > Decarbonising the UKCS
- > Call for Ideas: Plug n Play / Heavy Oil / Reservoir Delineation
- > Cluster Developments

Incremental Technology:

- > Subsea Retrofit Flow Meters
- > Renewable Power Generation
- > Mechanical Hot taps



Small Pools Solution Centre



Project Overview

EC-OG – Subsea Power Hub

Technology company



Companies involved



Total funding

£1 million

What is it?

A small scale turbine extracting energy from seabed currents to power remote subsea equipment

Why it's needed?

- Eliminates the need to provide topside power to temporary marginal pool assets
- Eliminates the need for a power umbilical to a platform

How does it work?

- Converts, stores and delivers autonomous electric power
- Harnesses the power of ocean currents

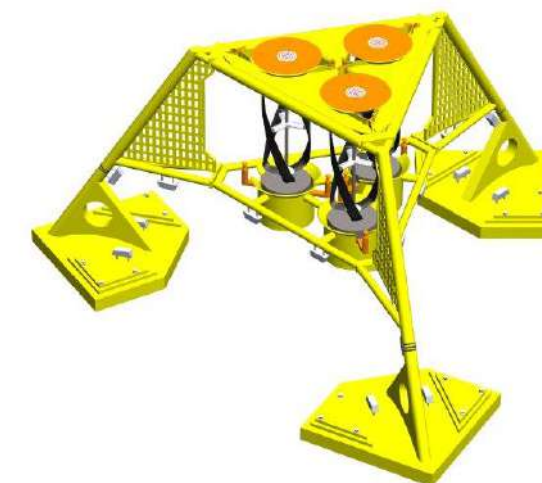
Key milestones

- June - Oct 2017 – Phase 1A Project Engineering
- Sept – Dec 2017 – Phase 1B Project Engineering

Benefits

- NE Region based company - Scotland focus
- Reduces costs and removes capital expenditure associated with electric cables
- Re-deployable between fields and is road transportable

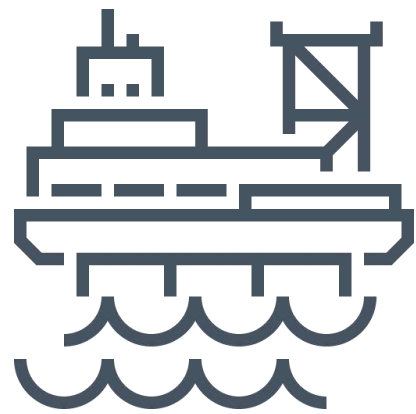
Design



Subsea Power Hub

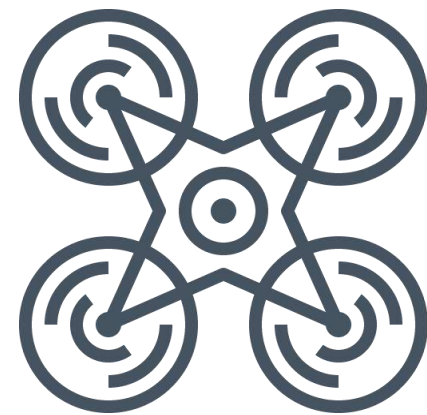
Perfect alignment with umbilical-less system

Asset integrity



£4 trillion

Corrosion costs the global economy £4 trillion pa and **£28 billion** pa in the UK



14 projects

Focused on solutions to vessel inspection and corrosion under insulation



8 field trials

With major operators ongoing during 2017 shutdown period



Call for Ideas

Use of robotics in vessel inspection attracted **29 submissions**

Eliminate the impact of asset integrity on uptime

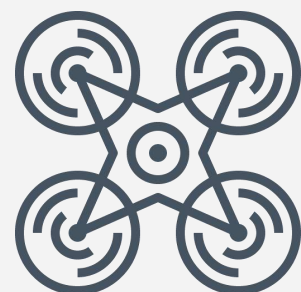
Asset Integrity Focus Areas

Current Activities:



6 field trials approved

- 3 x NII Vessel Inspection
- 1 x CUI Monitoring
- 1 x CUI Detection
- 1 x Coating System



2 projects underway

- inspection of composite repair wraps
- next generation of UAVs



1 field trial underway

- 6 month trial of EMAT technology for corrosion monitoring

3 Calls for Action:

1. The use of Robotics for Vessel & Tank Integrity
2. Coating and Insulation Systems for the elimination of CUI
3. Conditioning Monitoring of Subsea Infrastructure

Investigate:

The use of Robotics in an Offshore Environment

Digital Worker – Change the way we work

Additive Manufacturing – as an alternative repair solution

Project Overview

Fail Force Actuator Safety Gauntlet

The
Oil & Gas
Technology
Centre

Your Innovation Partner

Technology company



Companies involved



Total funding

£XX million

What is it?

Flexible containment device based on Kevlar protection and strapping to encapsulate the actuator and make it safe.

Why it's needed?

- Failure of a spring return pipeline emergency shut down valve
- Estimated cost of replacing all actuators in the UKCS £1.4bn
- Eliminates the risk to personnel and infrastructure of a failure

How does it work?

Prevents the internal spring being catastrophically released via the end or side of the spring housing, resulting in uncontained and uncontrolled releases of energy, presenting a high risk to personnel and equipment.

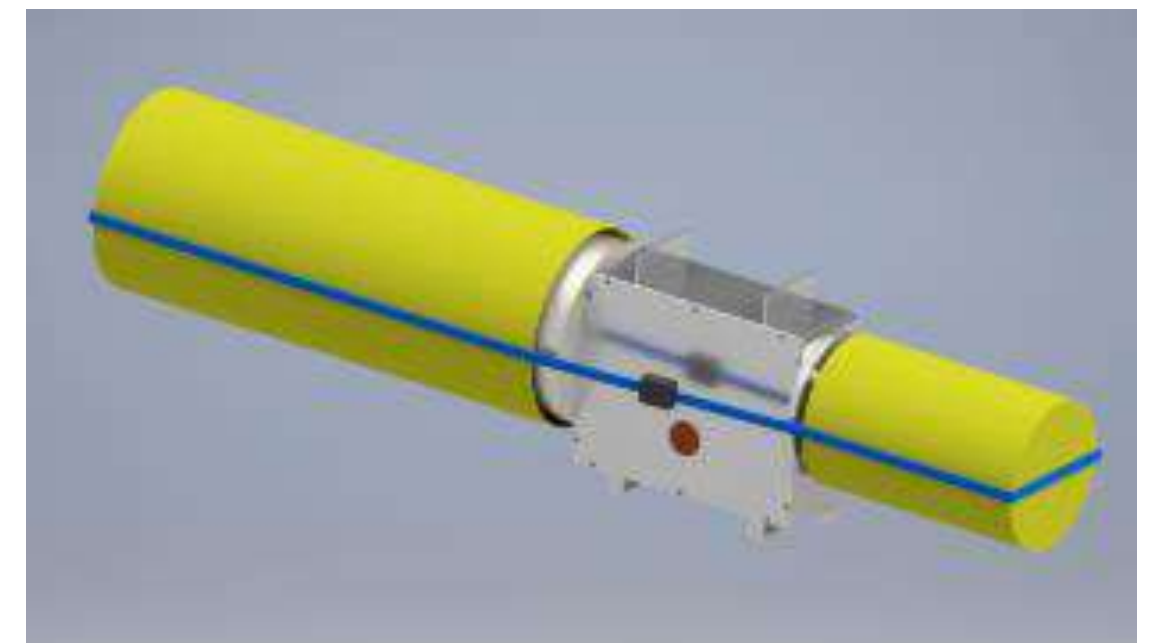
Key milestones

- November 2017 – Detailed Design Complete
- December 2017 – Prototype Build Complete
- April 2018 – Project Complete

Benefits

- Estimated UCKS cost saving of £329 million
- Certified by Lloyd's Register
- Maersk Oil UK Ltd technical consultant
- Easily stored, meaning no lead time
- Installation by platform personnel

Design



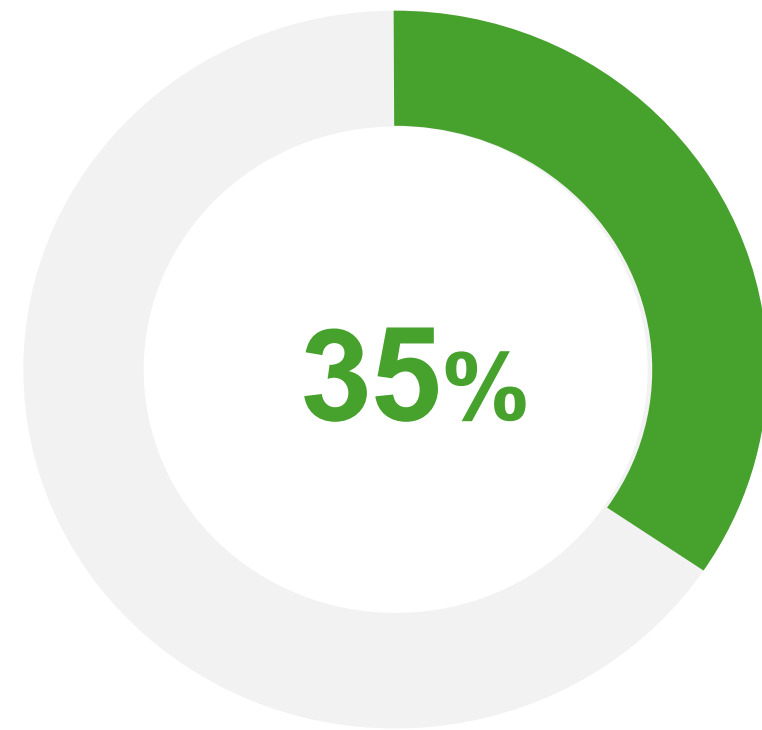
Fail Force Actuator Safety Gauntlet

Estimated UKCS cost saving of £329 million

Well Construction Solution Centre

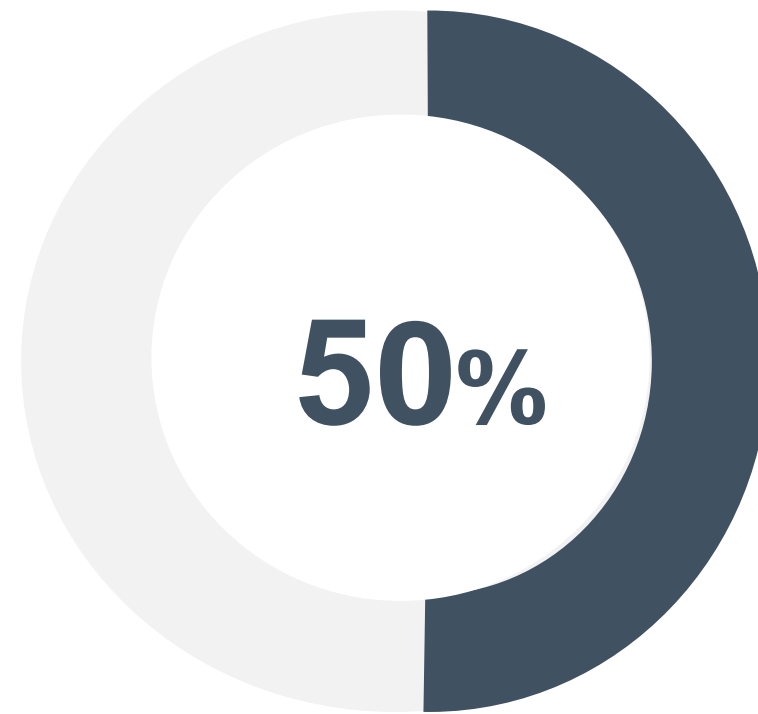


Key themes in first three years:



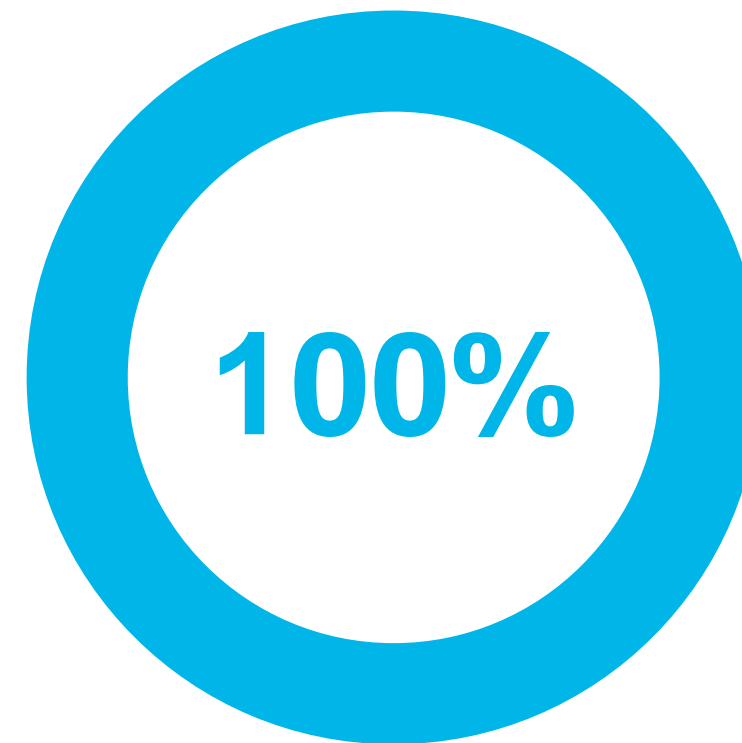
35% Abandonment Cost Reduction

Rigless P&A
Alternative barriers



50% Well Construction Cost Reduction

Drilling optimisation
Standardisation of equipment
Transform well design



100% Well Reliability for Design Life

Enhancing lifecycle integrity



Flawless Delivery

Rig automation
Augmented decision making

Transforming well activity to unlock the potential of the North Sea

Project Overview

Thermite Plug

Technology company



Companies involved

centrica

Total funding

£1 million

What is it?

A thermite plug to seal and abandon wells.

Why it's needed

- Barrier placement and verification is a major challenge
- Plug and abandonment needs a new philosophy

How does it work?

.creates a high temperature chemical reaction in the wellbore, leading to a molten metallic plug that melts the adjacent casing strings and on solidification fuses to the rock creating a barrier.

Key milestones

- August 2017 – Build collaborative industry group
- December 2018 – Cross industry verification
- October 2017 – Field Trial with Centrica
- March 2018 - Field Trial with ENI

Benefits

- Collaborative approach
- Large number of operators
- High potential contributor to reducing P&A costs by 35%
- Technique could unlock significant value

Design



Thermite Plug

High potential contributor to reducing P&A costs by 35%

Project Overview

Acoustic Data Transmission

Technology company

RAPTOROIL



Companies involved



Total funding

£1.2 million

What is it?

A system providing high speed wireless acoustic data transmission through a pipe.

Why it's needed

- Increases drilling efficiency
- Provides high quality data to enable better decision making

How does it work?

.Increases target data rates to 300bit/sec, which exceeds performance improvement of 10x, using a downhole tool (non drilling)

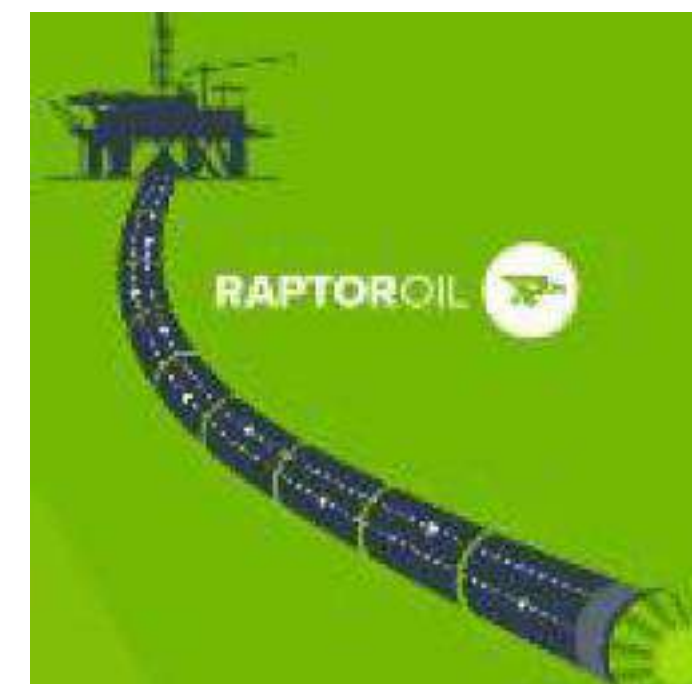
Key milestones

- November 2017 – Update algorithms & tool and test
- April 2018 – Analyse results
- April 2018 – Build downhole tool system
- July 2018 – Design drilling system
- October 2018 – Analyse performance

Benefits

- Increased data bandwidth could enable other technologies
- Low risk field trial
- Strong industry interest
- Local organisation – retention of local focus for technology development

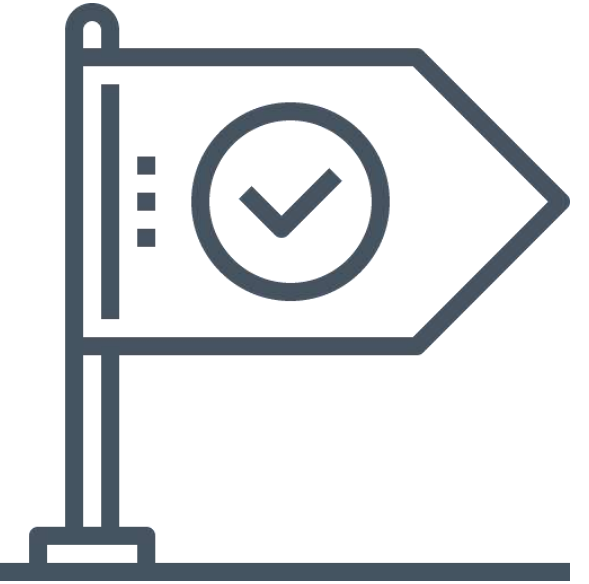
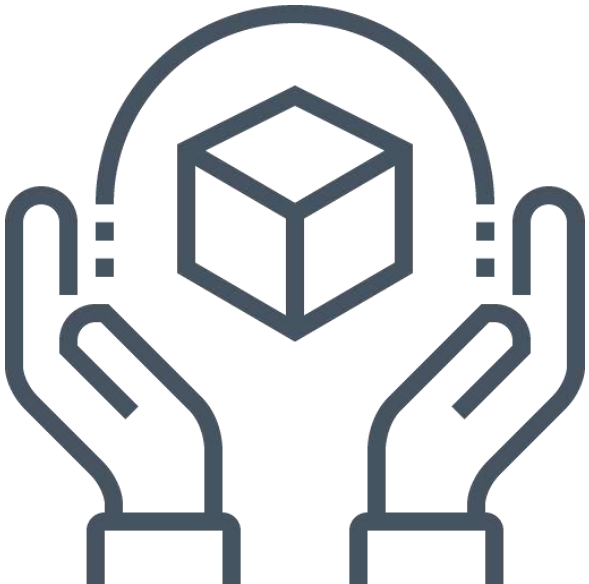
Design



Acoustic data transmission through pipe

Exceeds 10x performance improvement rate

Decommissioning



Decom, Asset and Liability Cost reduction

Decom Scope & Asset Decisions

Knowledge

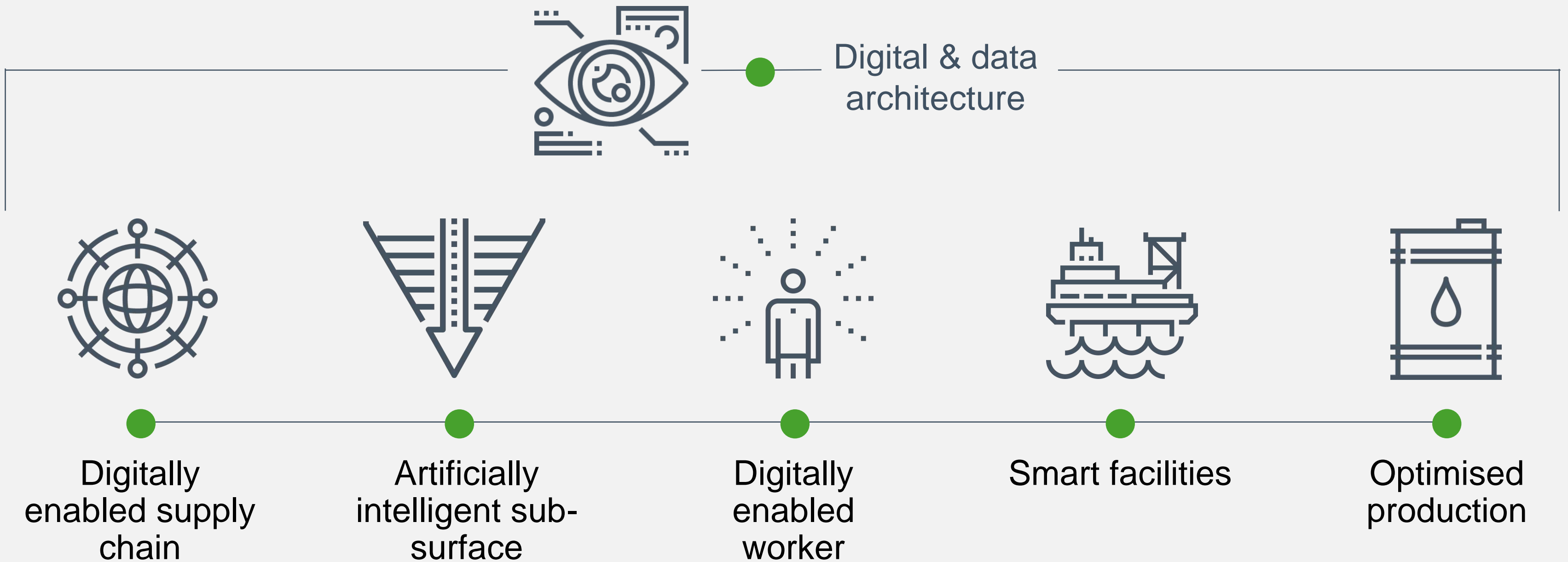
Extending Life

Decommissioning Initial Focus Area

Knowledge Exchange	Environmental	Alternative Power	Innovative Lifting Solutions
<ul style="list-style-type: none"> • Best practice • Standardisation • Learning from each other • Culture Change • Competency 	<ul style="list-style-type: none"> • Re-use of equipment and materials • Reduce impacts • Marine science 	<ul style="list-style-type: none"> • Facilities running costs • Wave • Solar • Lower cost options 	<ul style="list-style-type: none"> • Dropped object protection • Integrity / HSE of lifted items • Alternative solutions for structures removal and transportation

Long Term Liability	Pre-Removal Activities	Subsea Infrastructure
<ul style="list-style-type: none"> • Monitoring • Inspection • Data acquisition • Sensors • UAV / ROV 	<ul style="list-style-type: none"> • Topsides preparation • NORM / LSA management • Optimising PoB / Post CoP OPEX 	<ul style="list-style-type: none"> • Burial techniques • Mattress removal • Residual liability • Underwater cutting

Digital Transformation

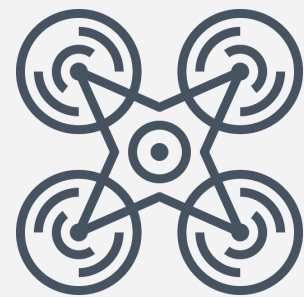


Using digital technology to drive operating performance

Digital Current Focus Areas

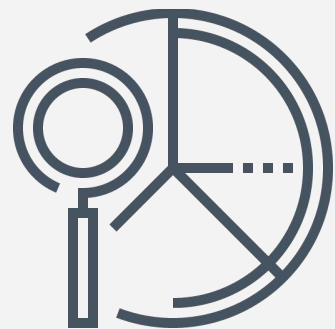


Current Activities:



Landscaping

- TLB evaluating Industry needs
- 2 key projects identified
- Progressing scoping



Accessing Capability

- Understanding University & Industry offering
- Understanding NS Gaps
- Understanding other industry parallels

Current Work:

1. Marine Logistics project
2. Exploration – machine learning project
3. 10 proposals underway

Near Future and Investigate:

- Digital Worker – Optimise and automate the way we work
- Smart Facilities - Leverage IIoT to enhance operations and management
 - Remote operations, Digital Twins, 6D Models, Condition based monitoring
- Data driven and augmented decision making
- Production optimisation

Accelerating innovation



Funding

Funding with **no equity** or pay back required



Mentoring

Advice from experienced mentors



Facilities

Access to facilities and tailored training



Relationships

Support to develop industry relationships

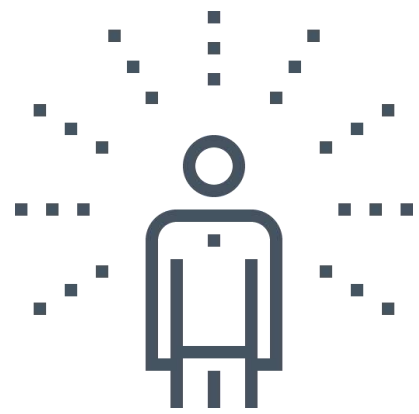


Programmes

Start-ups
Market entries
Ventures

Support 100 start-ups and SMEs in 10 years

Our programmes



Start-ups TechX Pioneers

Mentoring and support for entrepreneurs to develop business, validate products, acquire customers and attract funding

2 programmes each year
10 companies per programme



Market entry TechX Associates

SME with a unique and near market ready product, preferably from a different industry, needing operational testing, benefit validation and scaling

Applications anytime
Ongoing programme



New ventures TechX Ventures

Filling technology and supply chain gaps with new companies and products formed through creativity, innovation and determination.

Deep Science Ventures collaboration
6-9 months programme

Accelerating the future today

Strong delivery



The story so far...



£12M+

of investment approved with 70% funding leverage



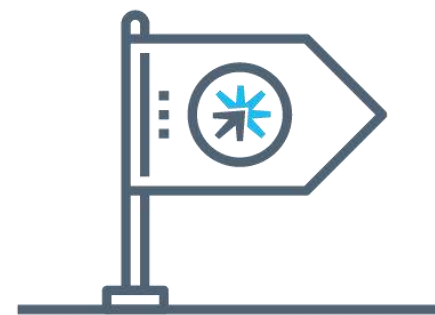
40

members from major operators to SME technology providers



21

live projects to accelerate the adoption of innovative solutions



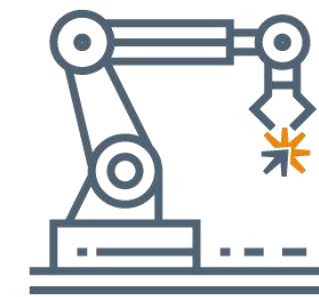
8

field trials ongoing to be completed in October 2017



300+

technologies and projects reviewed for offshore trial or investment



100+

ideas generated through our 'Call for Ideas' process



Positive engagement with the industry



theOGTC.com