



Oil & Gas
Authority

Subsea technologies for MER UK

SUT, IMCA and the Hydrographic Society in Scotland

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Head of Technology

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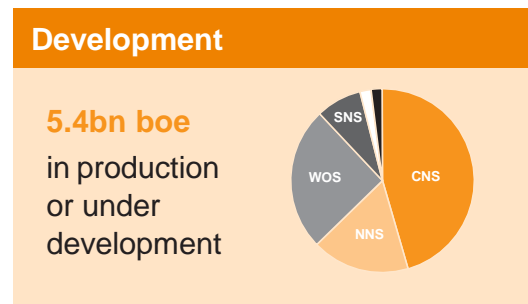
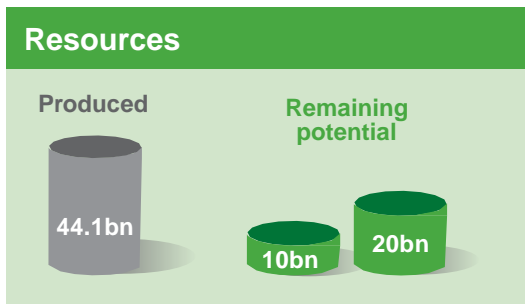
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UKCS context

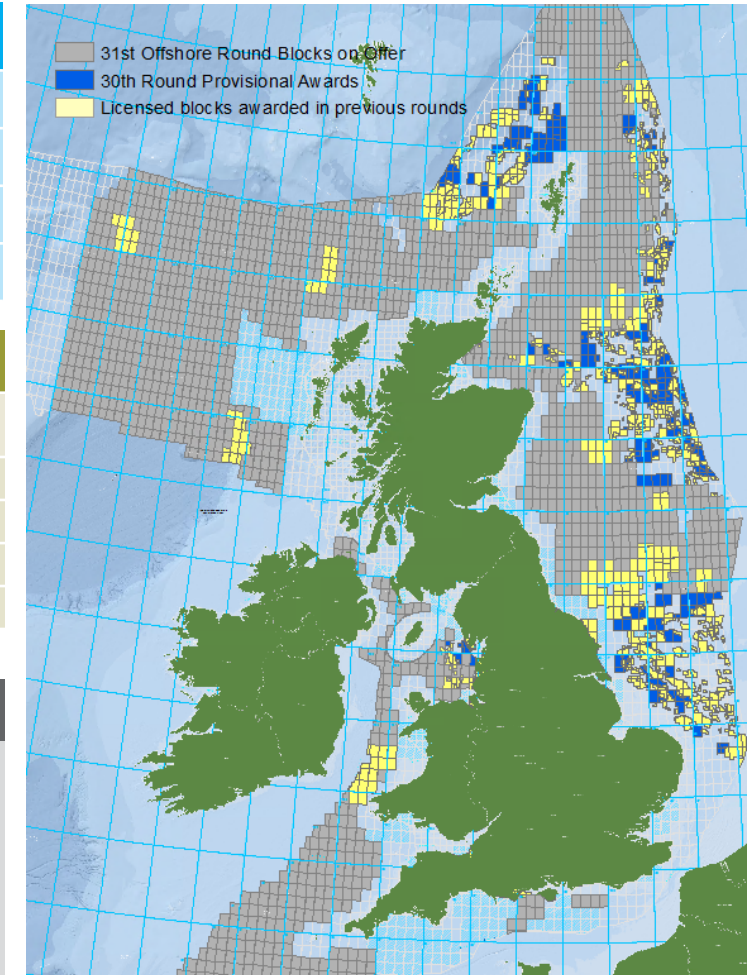
Infrastructure		
10,000+ wells	250 fixed installations	389 producing fields
250+ subsea systems		3,000+ pipelines

Production (boepd)	
2014	1.42 million
2015	1.57 million
2016	1.63 million
2017	1.63 million

Production efficiency	
2014	65%
2015	71%
2016	73%
2017	74%



Exploration success rates		
	Technical Success Rate %	Technical finding cost \$/boe
2014	69	9
2015	53	5
2016	45	5
2017	47	2



Source – OGA. Produced data as at end 2017, remaining potential as at end 2016.

Source – OGA as at end 2017

Source – OGA

Costs
Unit Operating Cost down by 1/3
Average fallen from £19 per boe in 2014 to £12/boe in 2017
Unit Development Cost down

Supply chain
£27bn turnover
c.40% through exports and supporting
c.80% of UK oil and gas jobs

Jobs
> 280,000 jobs in the UK
Delivered through or supported by upstream oil and gas activity

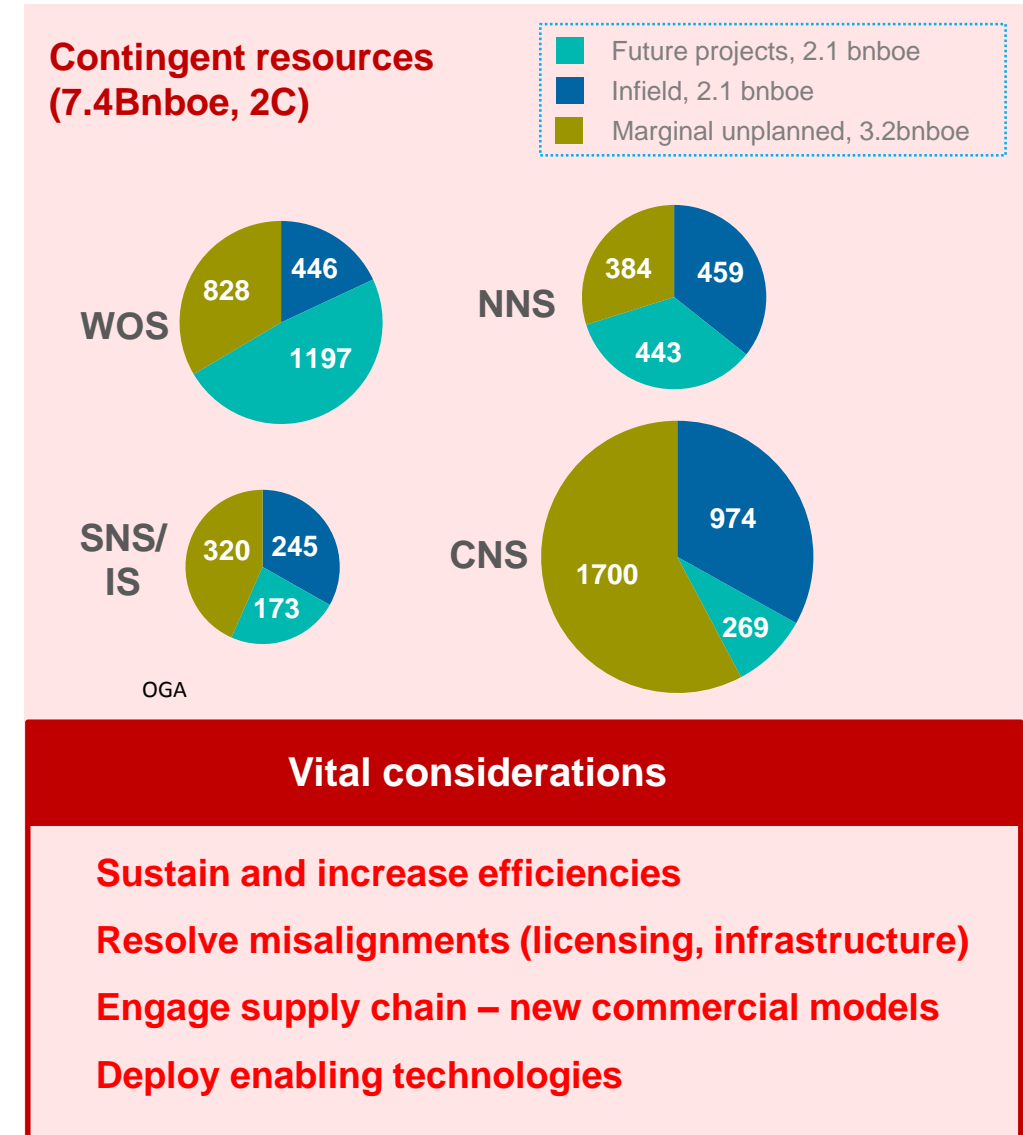
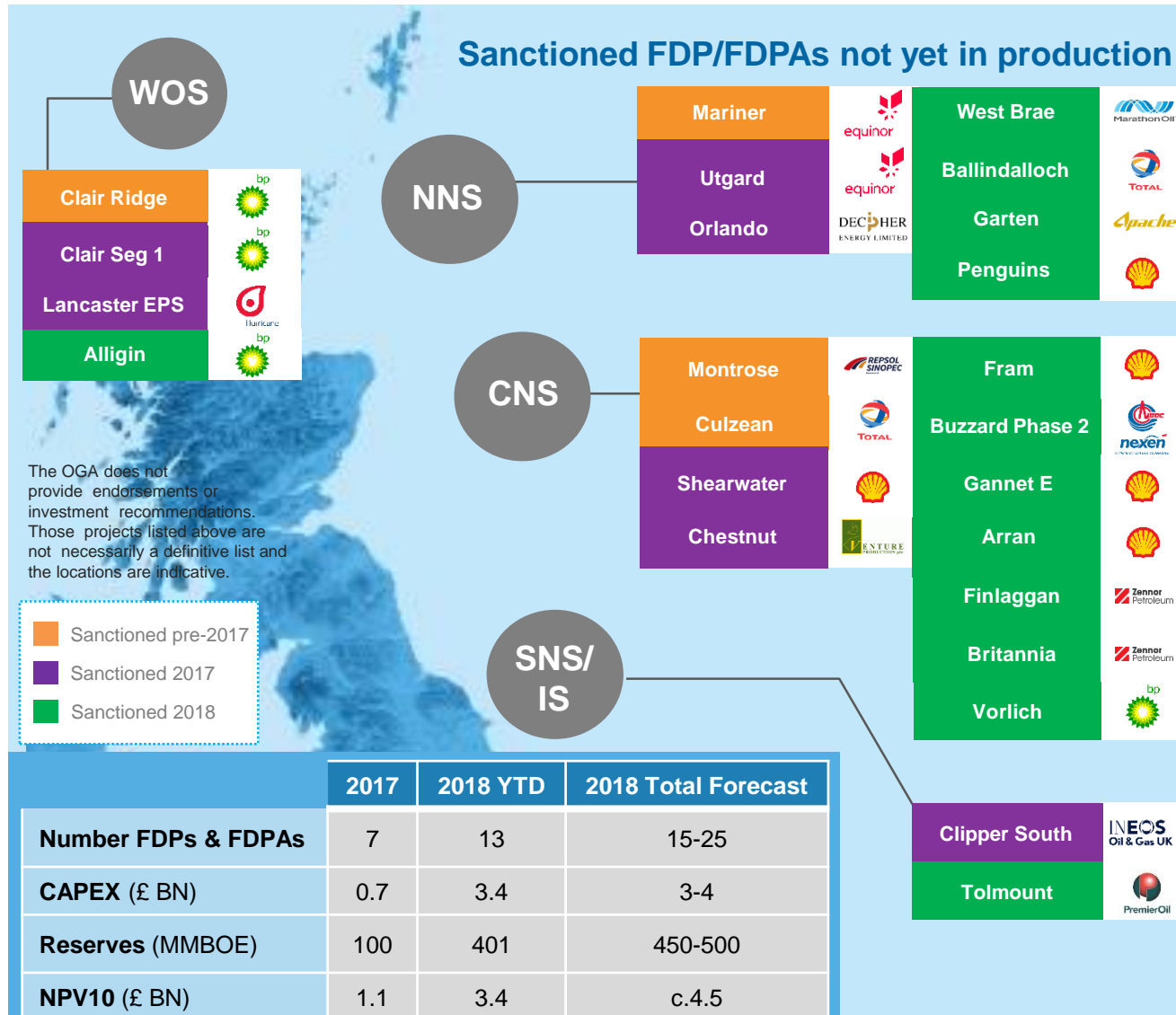
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Oil & Gas UK and EY

Oil & Gas UK – 2017 data

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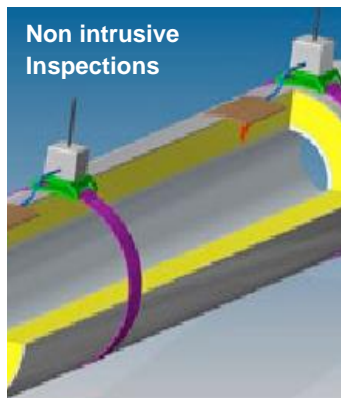
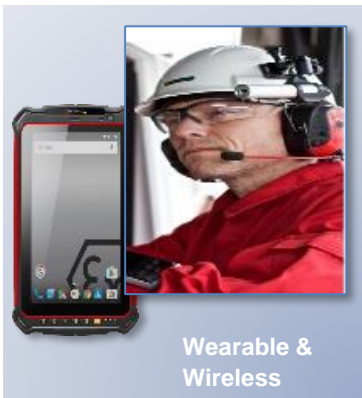
Project activity



Improved project outlook with 7.4Bnboe of further contingent resources

Technology

Existing assets



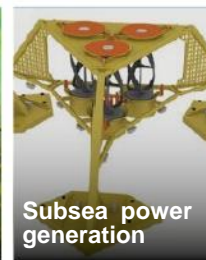
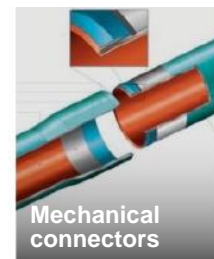
New developments

Tie back of the future

System simplification

Plug-n-play

Re-usable

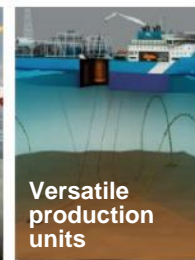
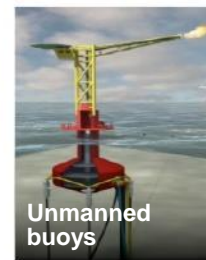
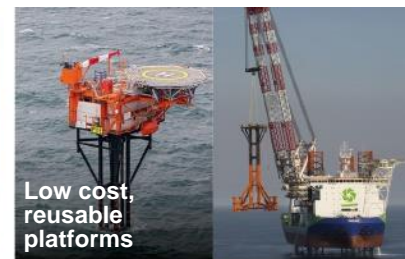


Standalone facilities

Low Capex

Low Opex

Re-deployable



OGA expectations

Operators submit Technology Plans

Well-identified asset needs

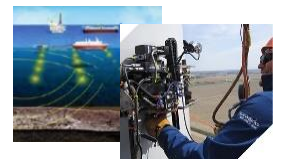
Demonstrate use of appropriate technologies

OGA Technology Insights – Industry learnings

Work with the Industry



Technology gaps (top 20)
Agreed with MER UK TFs



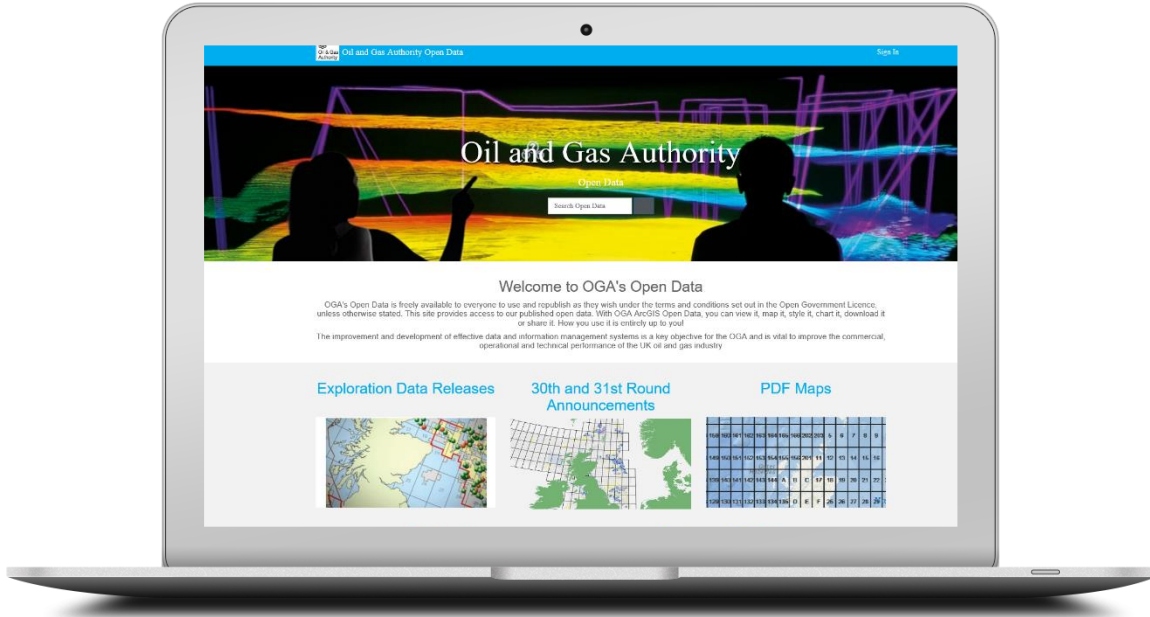
Collaboration with OGTC

Joint plans and initiative
to close technology gaps



£180m Government funding

**Launch
Q1 2019**



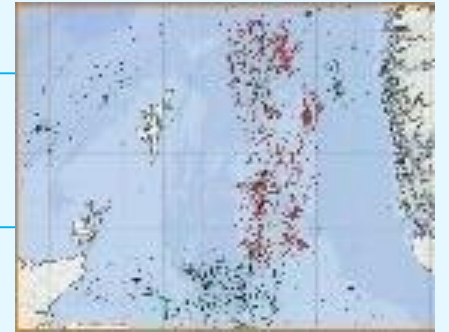
National Data Repository A first for the UK

OGA led, backed by industry

New regulations for reporting, retention and disclosure

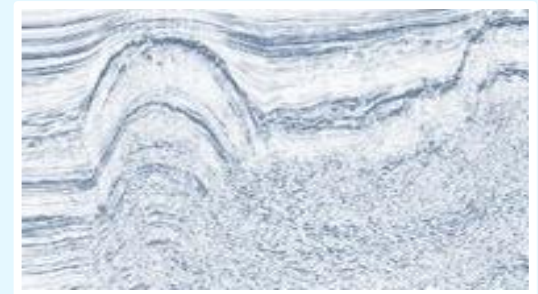
Open data model to fully exploit value

Collaboration Technology AI & machine learning



Improved knowledge
Data cleansed

Frontier basins research with academia



53M

Spatial server requests

700%

growth in server requests since OGA established

55k+

users



View it



Map it



Chart it



Download it



Share it

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Subsea technologies for UKCS



Oil & Gas Authority

1 Metering and flow assurance

2 Cost efficient tie-backs

3 More capable subsea systems

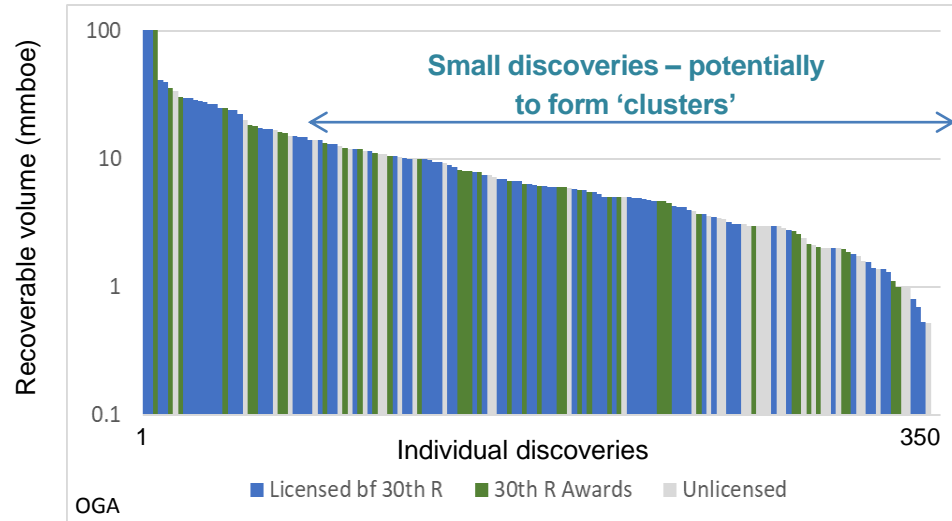
4 Inspection & maintenance

5 Energy integration & transition

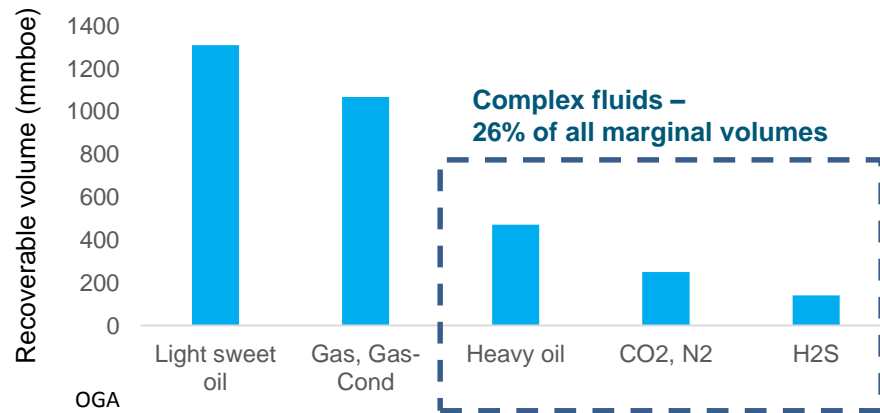
6 Surveys

Metering and flow assurance

UKCS 350 marginal discoveries – 3.2bnboe opportunity



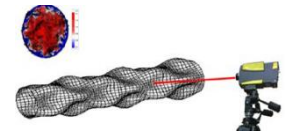
UKCS marginal discoveries – Fluids



Multi-phase (subsea) flow meters



- MPFM for continuous and accurate well flow rate
- Critical for multi-field cluster developments
- Non-intrusive options



- Technology investment

- New TUV NEL centre in East Kilbride



- Heavy oil: 3-in-1 flowmeter with flowrate, density and viscosity

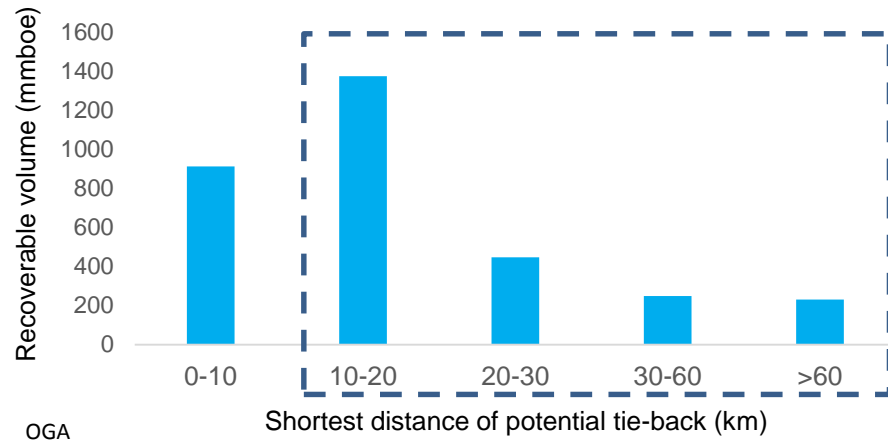


- Data analytics for improved accuracy and self calibration

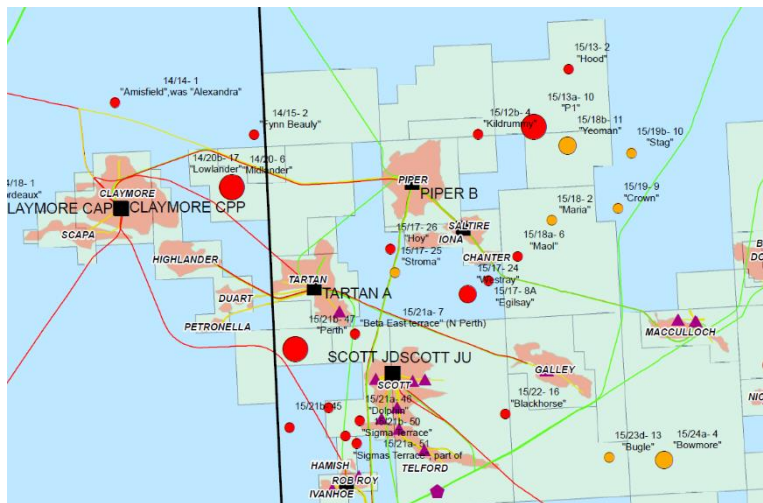
- Data analytics for large data volumes

Cost efficient tie-backs

Potential tie-back distances (marginal fields)



Discoveries and infrastructure (eg. Scott-Piper-Claymore area)



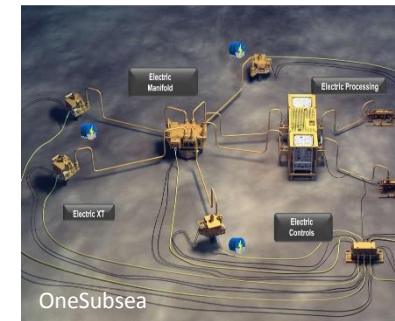
- Oil discovery
- Condensate discovery

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Tie-back of the future



- Low-cost pipelines (e.g. spoolable, using composites, mechanical connectors)
- Subsea storage of chemicals and hydraulics



- All-electric subsea systems -- simpler trees and controls
- Fewer parts / greater reliability
- Reducing / eliminating umbilicals

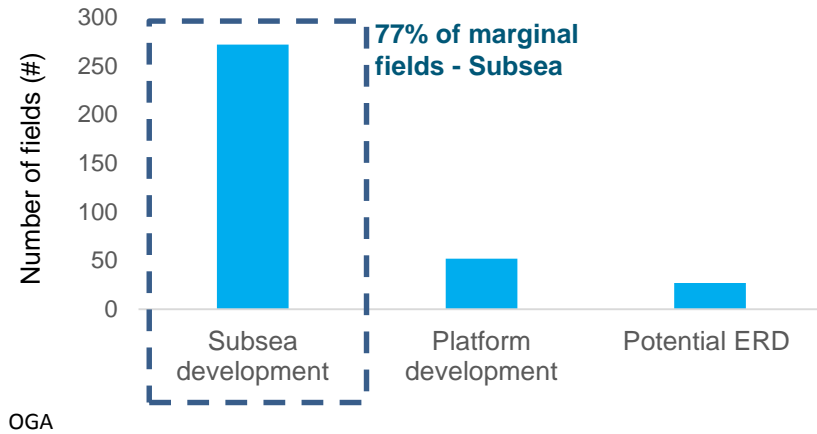
- Subsea power generation
- Real-time monitoring from shore
- Moving towards autonomous systems



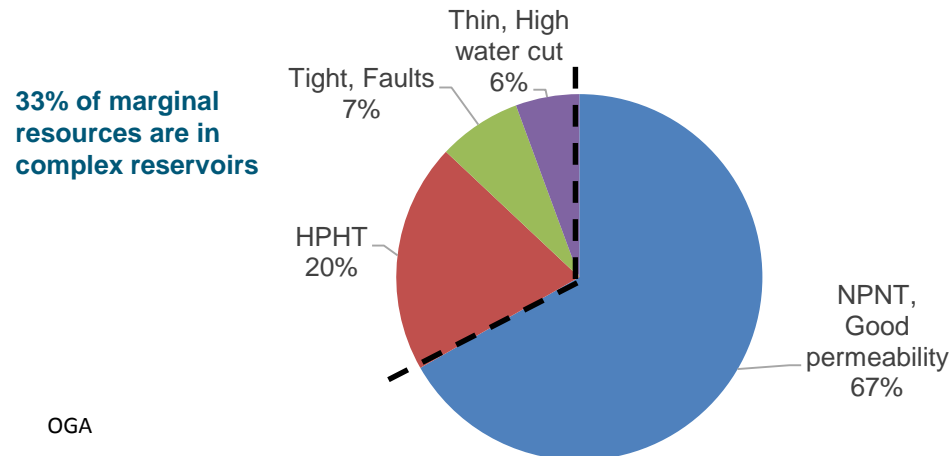
>70% of tie backs over medium to long distances – tieback efficiency will be key

More capable subsea systems

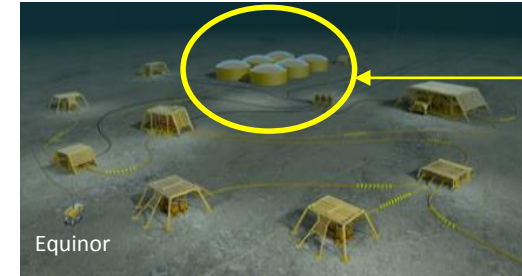
UKCS marginal field developments (350 discoveries)



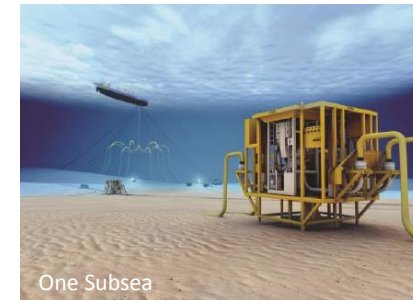
UKCS marginal field complexity



Advanced subsea systems



- Subsea storage
- Modular bladder tanks, extended capabilities



- Subsea compression for remote field
- Combined with separation, processing, water handling
- Reduce topsides burden and allow access to export infrastructure

- Subsea HPHT – to meet field requirements (P, T) and lower cost of development



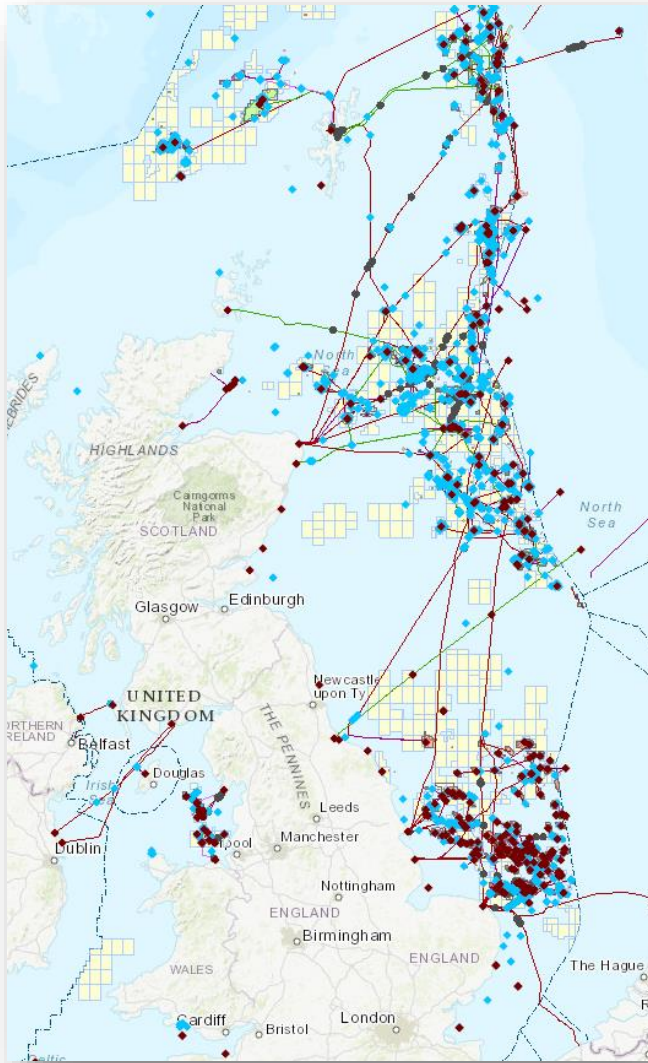
- Challenge: manufacture/install systems at lower cost
- Exploit data for more flexibility, self-diagnostic, and self-healing – lower Opex

Subsea inspection and maintenance



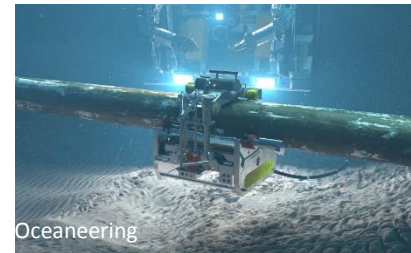
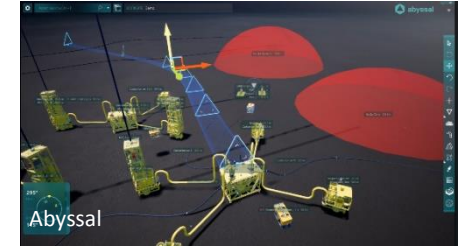
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UKCS extensive infrastructure



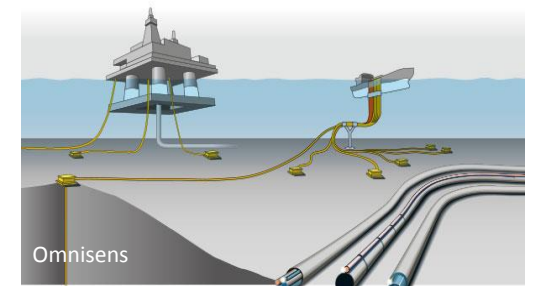
Digitally-enabled asset management

- Digital certification (“from cradle to grave”)
- Enhanced planning with ROV simulations and 3D visualisation
- Digital collaboration to track real time operations worldwide



- Non-intrusive inspections
- Subsea Digital Radiography mounted on ROV and/or AUV

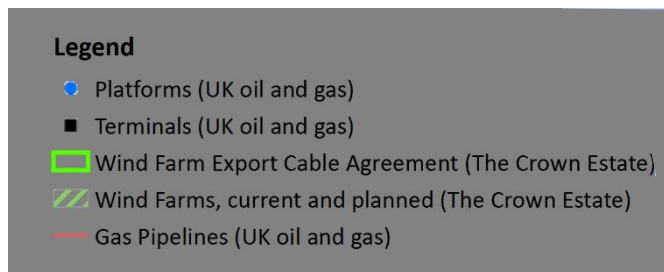
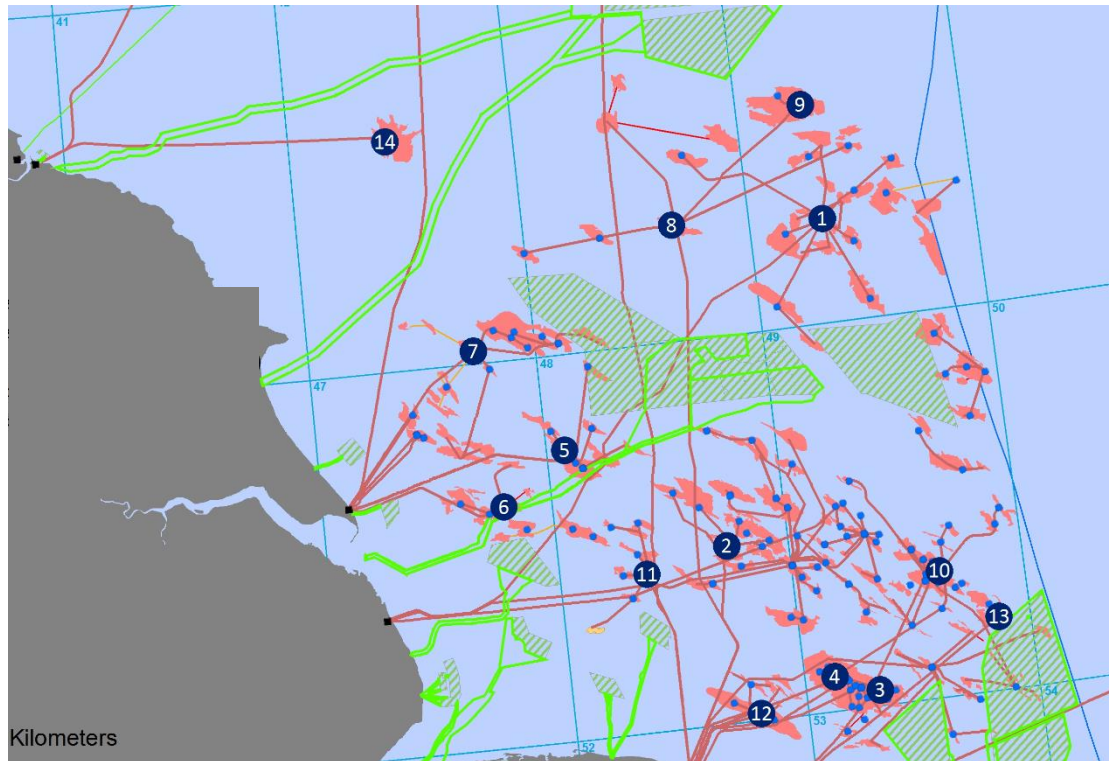
- Monitoring of pipelines, risers, umbilicals using fibre-optic
- Real-time data, data analytics and predictive
- Self-diagnostic and self-healing systems (eg flow assurance)



Digital technologies can transform how we manage assets

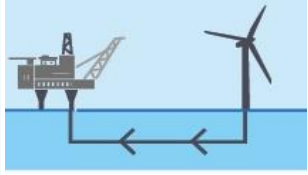

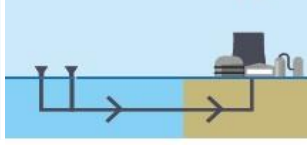
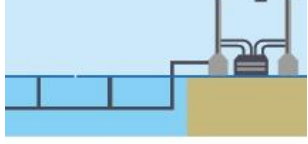

Energy integration

Southern North Sea energy industry footprint



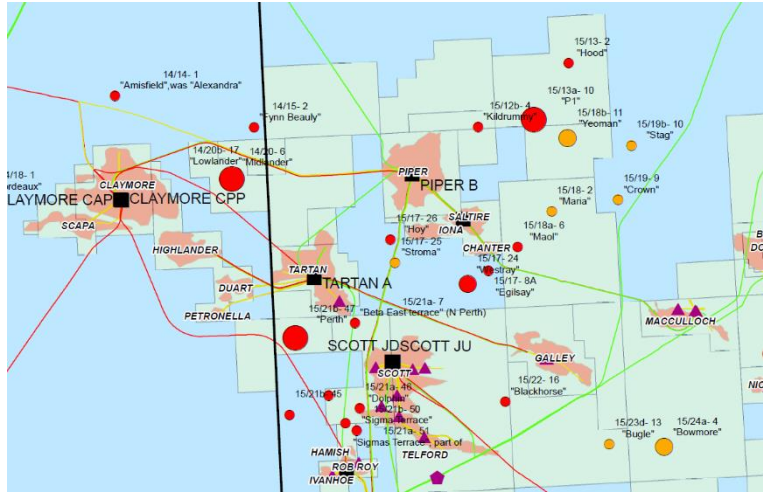
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Potential integrated concepts

Activity	Schematic	Potential Applications
Platform Electrification		<ul style="list-style-type: none"> SNS: power existing gas hubs from nearby windfarms WoS: use floating offshore wind to create ring main
Gas-to-Wire		<ul style="list-style-type: none"> SNS and EIS: convert late-life infrastructure into offshore power generation
Power-to-Gas (H₂)		<ul style="list-style-type: none"> SNS and EIS: use redundant infrastructure
CO₂ transport and storage		<ul style="list-style-type: none"> SNS and EIS: use redundant infrastructure
North Sea Wind Power Hub		<ul style="list-style-type: none"> Integrate UK offshore power and gas (including hydrogen) activities

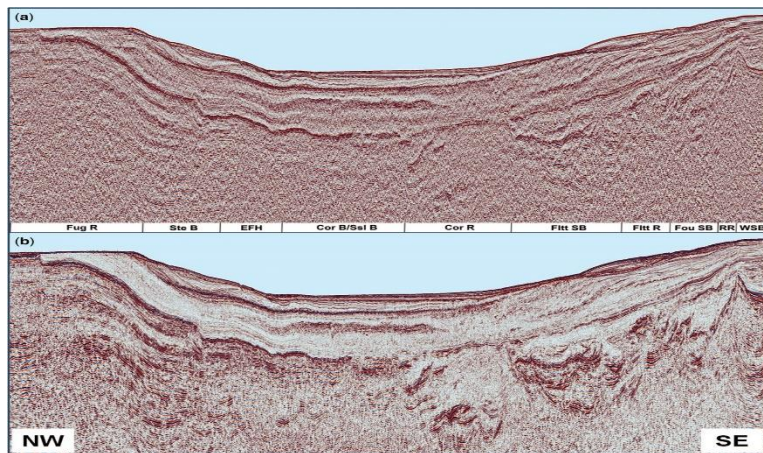
OGA, TNO

Mature areas – infrastructure density



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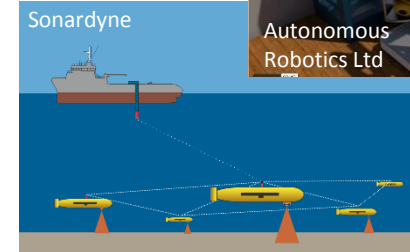
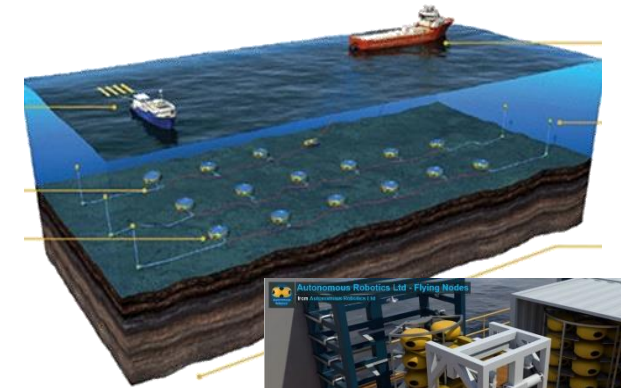
Frontier areas – difficult targets (eg. sub-basalt)



Woodburn et al. 2014

Geophysical and other surveys

- Ocean bottom nodes
- Full-azimuth – high resolution (eg. sub-basalt, sub-salt)
- Near infrastructure placement
- 4D seismic for improved recovery
- More autonomous and affordable nodes, using robotics and digital
- Sea-bed seismic sources (more environmentally friendly)



- Multi-discipline surveys using autonomous vehicles
 - Oil & gas
 - Engineering
 - Environmental

THANK YOU