Oil & Gas Authority

Technology Insights 2020

Summary

Technology Managers Network presentation

2nd March 2021

Today's presentation

Oil & Gas Authority

- Industry feedback – Operators' Technology Plans 2020
- Technology focus vs asset lifecycle
- Technology development vs deployment spend
- Examples: Exploration, Asset management, Well P&A
- Emerging areas: *Digital* and *Net zero*
- Next steps: OGA's *Technology Insights* released on-line
- Next steps: *Six technology priorities* for the OGA Stewardship

Technology focus by domain

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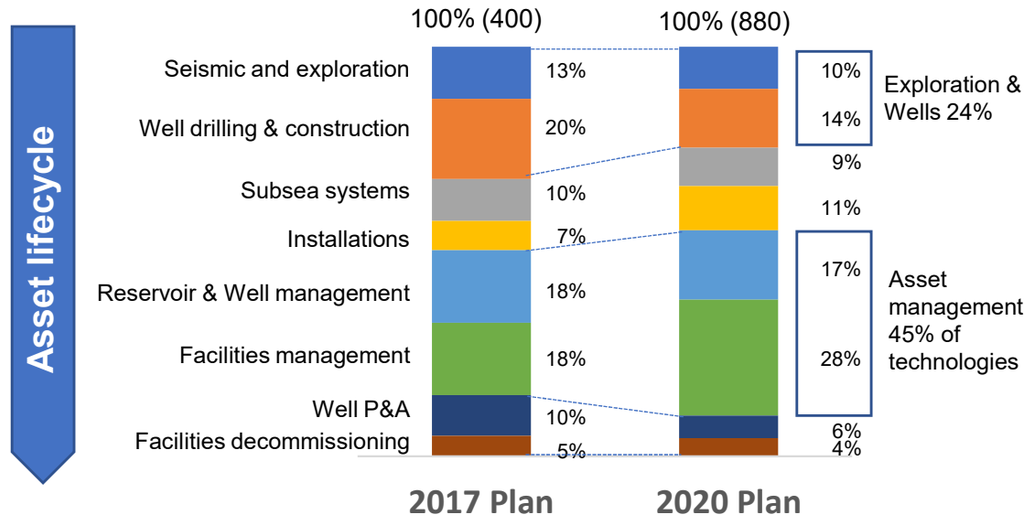
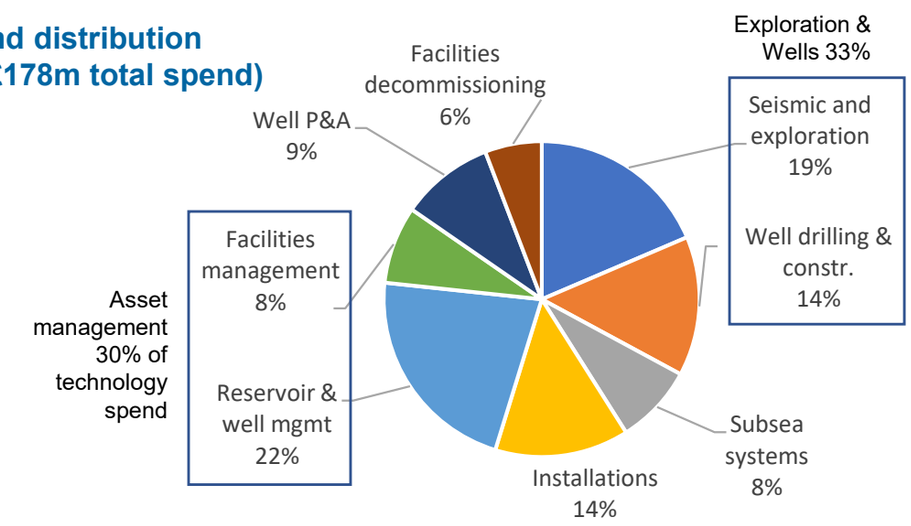
- Information on 880 individual technologies submitted through the plans of 70 operators in 2020
- Asset management accounted for the largest interest (45%)
  - Technologies for facilities management doubled since 2017
- Exploration and Wells delivery are also areas of strong operator focus (24% of total)
  - Despite 30% decrease in technology associated with well drilling and construction
- Judging by direct Operators' spend on technology Exploration & Wells activity take the lead (33%) with asset management second (30%)
- Decommissioning (both 'wells' and 'facilities') show a muted technology interest and low direct spend (circa 10% of totals)
  - Despite the large decommissioning scope coming later in the 2020's and in the 2030's
  - How will target decom cost savings be delivered without investment in maturing enabling technology?

N. of technologies in Operators Plans by technical domain



Technology spend distribution (2019 act., % of £178m total spend)



UKCS survey of Technology Plans

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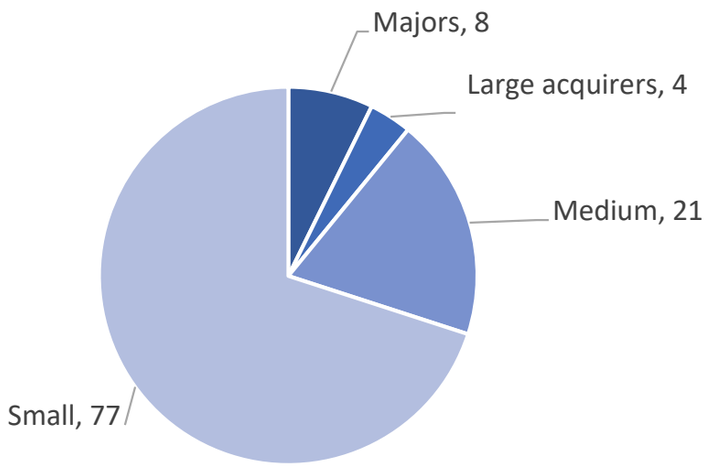
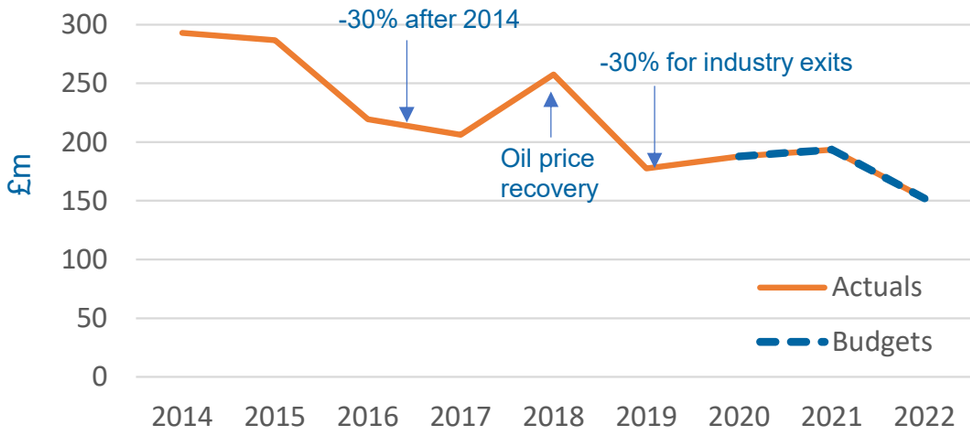
Survey of UKCS licence operators

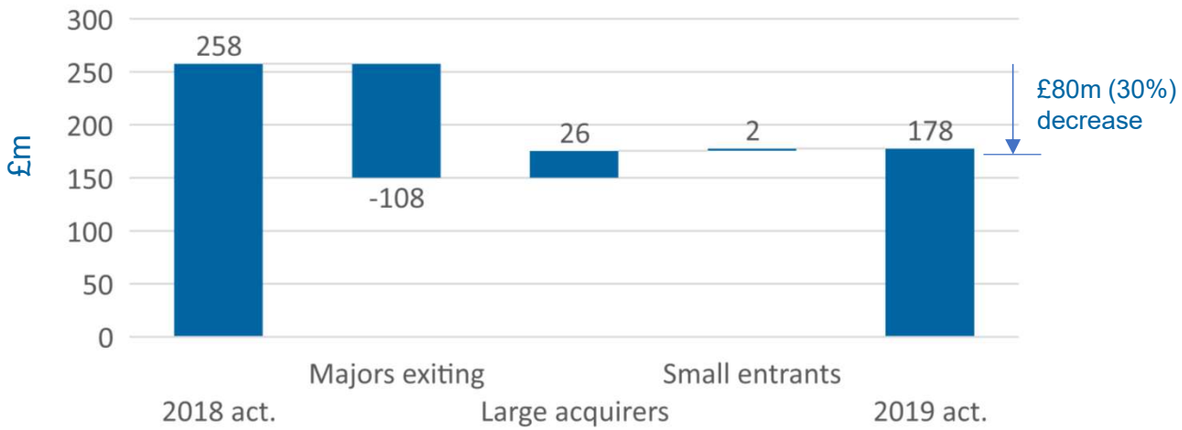


- Technology spend has declined steadily in the past 6 years
- Nearly 30% drop after the 2014 oil price crisis
- Exit of major operators in 2018/19 – spend decrease not completely offset by other companies
- Going forward, spend outlook is flat at 2019 levels
- Surveyed 112 UKCS operators, 5 years (2017-2020)

Reported technology spend (Total = R&D + field transfer)



2018-2019 impact of industry turnover on Total technology spend



Operators' technology spend

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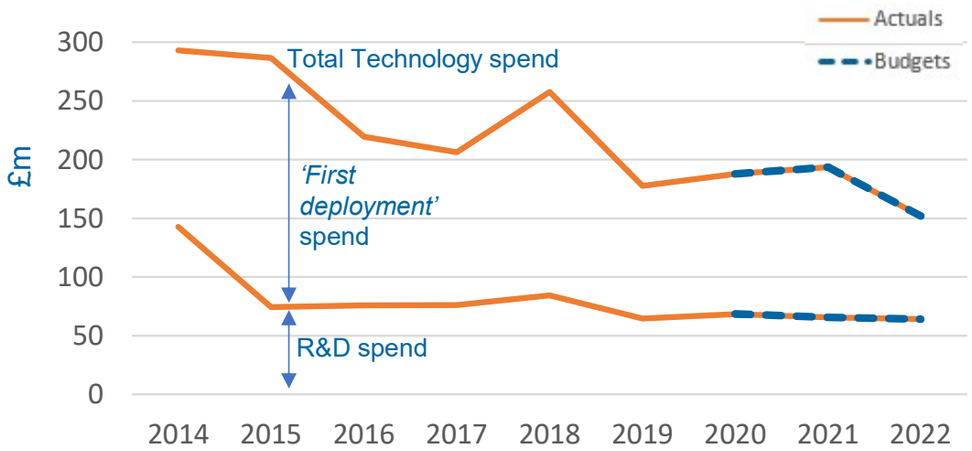
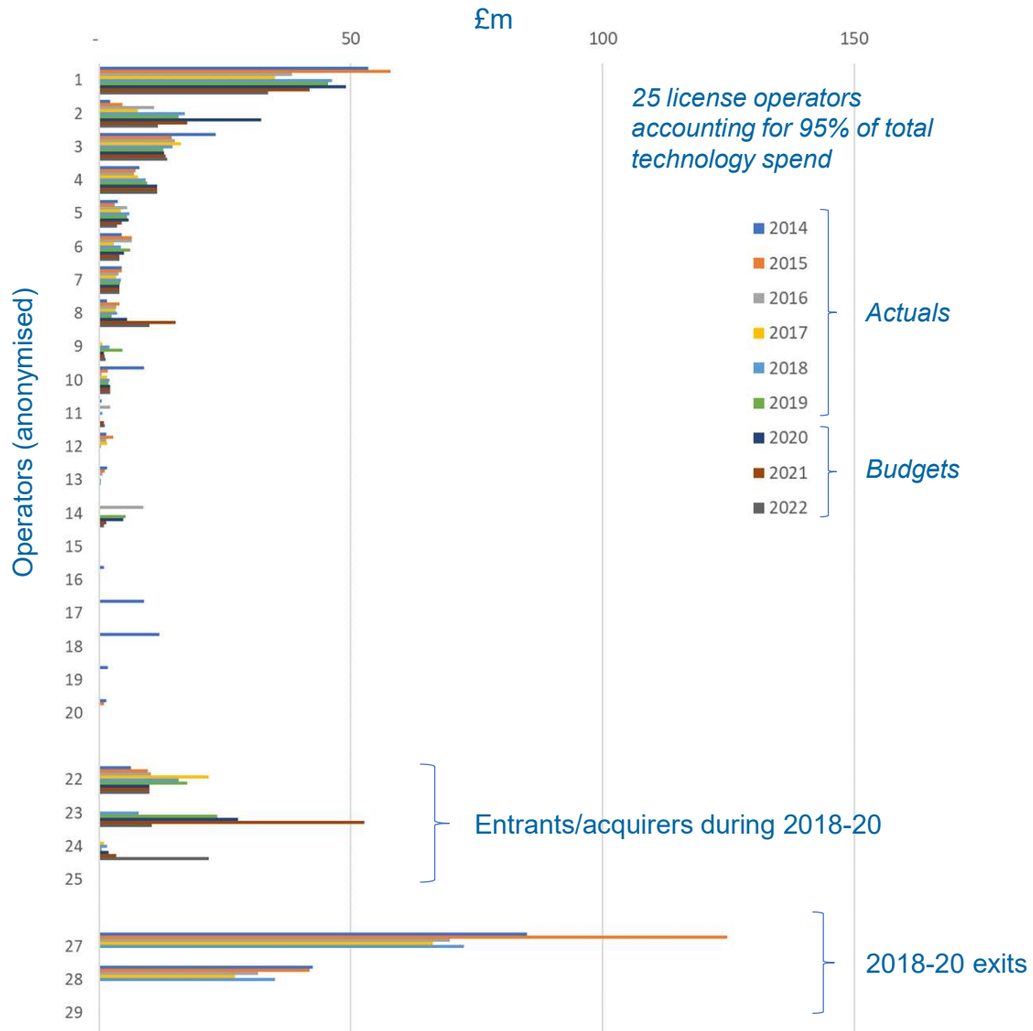
Reported technology spend



Total Technology spend = R&D spend + Field transfer

- About one third of the overall spend is for new technology development (R&D)
- The remainder is allocated to 'field transfer'
- Spend is concentrated with few operators (10 operators account for 90% of total technology spend)
- The negative impact on the spend of majors exiting the basin is significant

Total annual technology spend by operator (2014-2022)



Technology selection and provision

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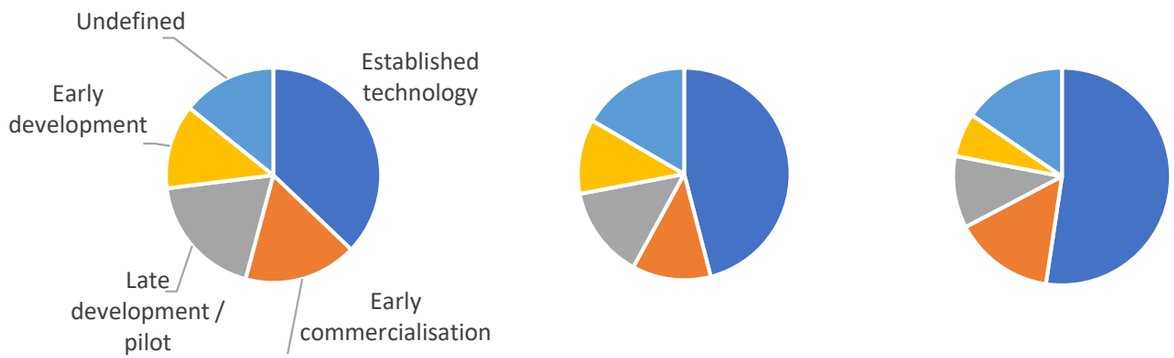
- As direct spend on technology development has declined…
- …increasing reliance on ready-to-use existing technology
  - trend mirrored within all individual technology categories
  - Exploration and Well Drilling rely on existing technology for 60 – 65% of operator needs
  - Subsea Systems and Well P&A are the only categories where <50% of solutions are existing technology
- … in parallel, growing reliance on Vendors solutions
  - Vendor investment in technology is not directly reflected in the spend profile
- Growing number of OGTC programmes is evident
- Significant collaboration through participation in JIPs and partnership with suppliers
- However, seldom reference to technology sharing from other industries
  - Could be useful in *asset integrity* and *digital*

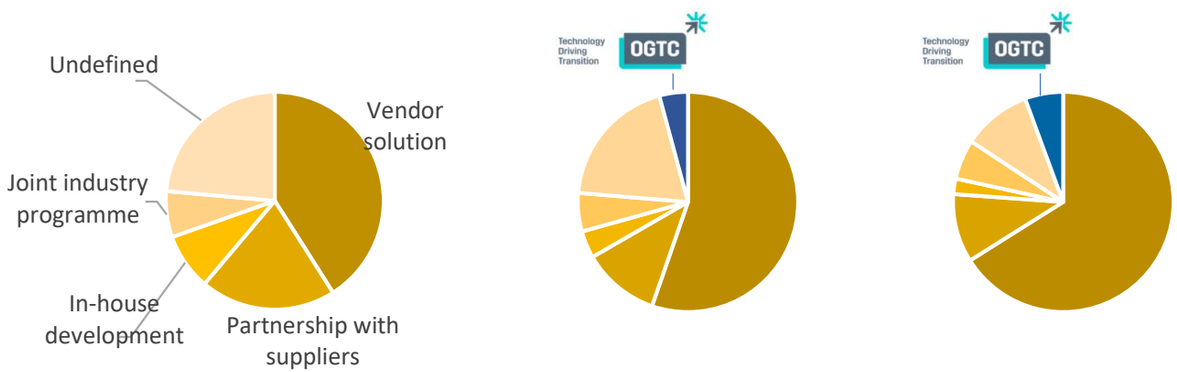
Maturity of technologies reported the Operators Plans

2017 Plans ▶ 2018 Plans ▶ 2020 Plans



Technology delivery plans

2017 Plans ▶ 2018 Plans ▶ 2020 Plans



Exploration & subsurface

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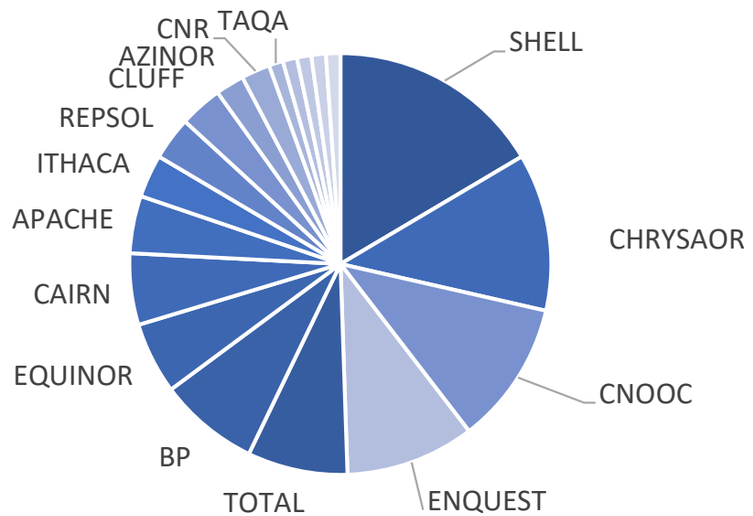
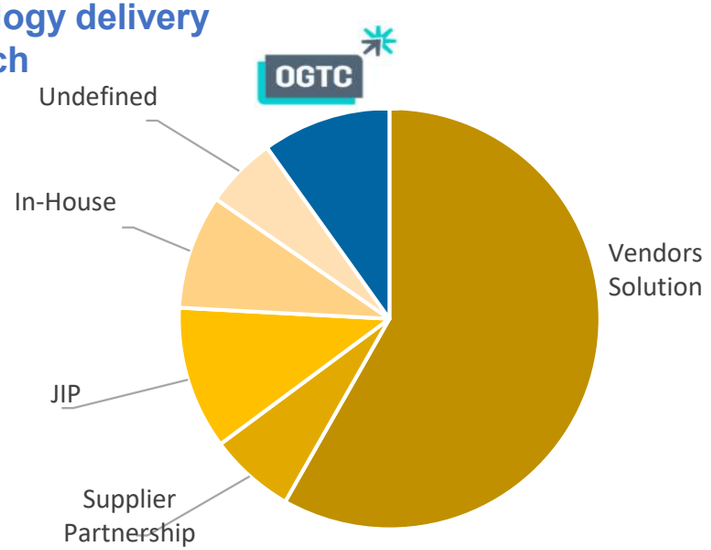
Number of technologies in the plans



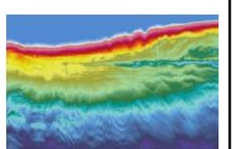
Technology delivery approach

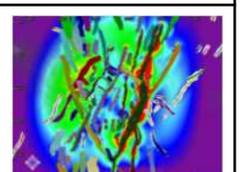


Key insights

- Broad cross-industry interest in exploration and subsurface technologies – seen as strategic across the asset lifecycle
- Many technologies provided by Suppliers, but still significant Operators R&D participation through OGTC and Academia
- Three main priorities
  - *Acquisition* – improving quality to illuminate difficult targets
  - *Processing* – extract full value from the data
  - *Subsurface modelling* – enabling decisions & cycle time efficiency

Key technologies

Acquisition	• Steerable streamers • Multi-source and multi-azimuth surveys • Use of OBNs on difficult targets and for 4D repeatability • VSP and 4D seismic acquisition using DAS • Forward-looking acoustic and deep-resistivity surveys 
Processing	• Broadband seismic processing • Reprocessing of 3D seismic • Advanced processing techniques e.g. FWI, AVO • 4D seismic processing • Digital solutions for workflow efficiency (inc *cloud*) 

Modelling	• Integrated inversion/subsurface modelling
	• Applications or AI / Machine learning, inc to:
	  • Fault mapping
	  • Missed-pay identification
	  • 4D seismic to locate remaining oil 

Reservoir & well management

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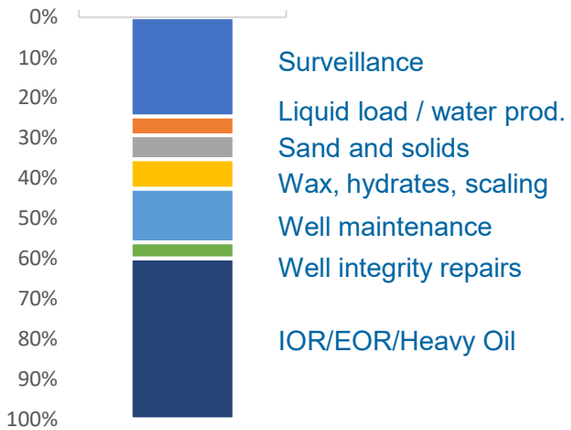
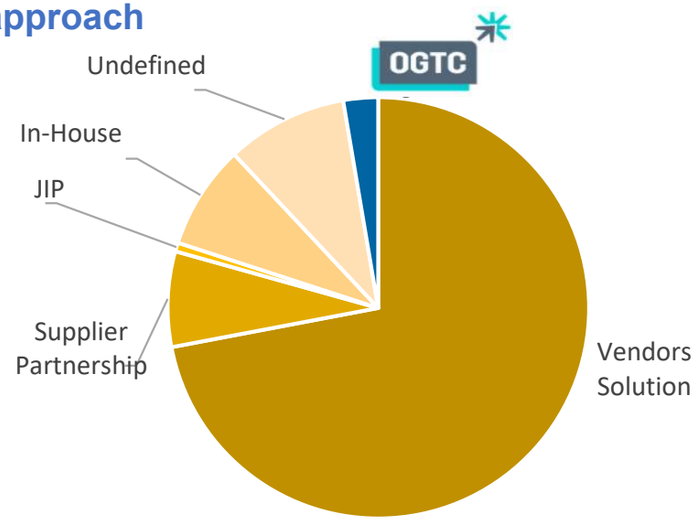
Technology sub-domains (technology count)



Technology delivery approach



Key technologies

Well Surveillance	• Single use fibre optic • Fibre DAS for VSP and 4D • Permanent monitoring • Laser interferometry non-intrusive flow measurement • Expansion of chemical tracer applications • Digital wells and dashboards for well monitoring

Production Optiisation	• Produced gas reinjection huff n' puff
	• Low pressure water injection/dump flood
	• Artificial lift
	  • Liquid assisted gas lift to deepen operating point
	  • ESP reliability, control and monitoring software
	  • Retrofit gas lit
	• Liquid loading
	  • Velocity strings
	  • Nanoparticle stabilisation of surfactants

Intervention	• Conductive slickline • Subsea well SISQ (diverless hydraulic interfaces) • Retrofit wireless DHSV • Wireline stimulation tools

EOR	• Polymer EOR evolution
	  • Polymer formulation improvement
	  • ESP performance on polymer breakthough
	  • process performance issues on flowback
	• Microbial / Enzyme EOR

Heavy Oil	• Downhole diluent completion • Artificial lift solutions • EOR Polymer formulation • Crude blend management

Facilities management

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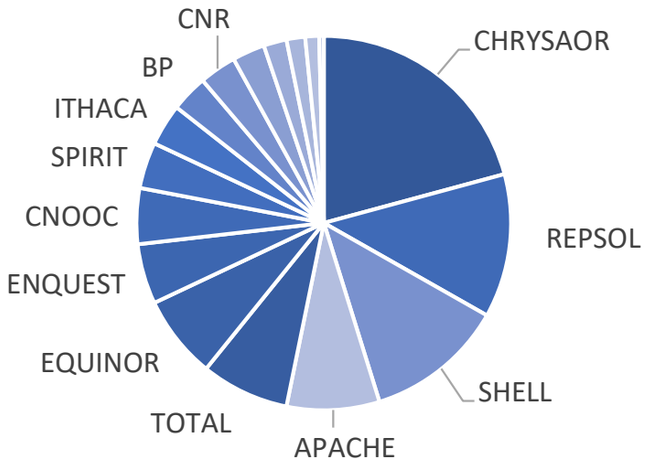
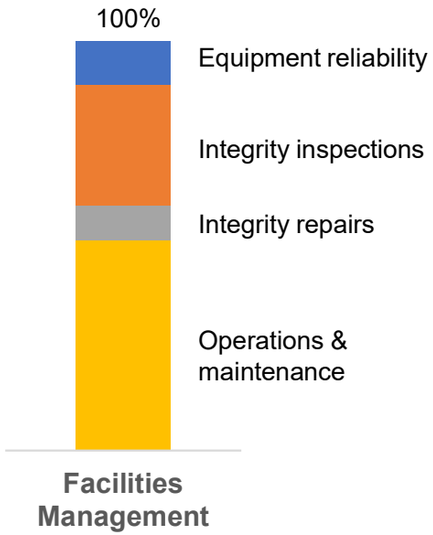
Number of technologies in the plans





- Largest theme by number of technologies in operators plans
- Widespread interest (over 20 operators) with activity proportional to asset portfolio sizes
- Focus areas with significant *digital* components:
  - *Asset integrity* – non-intrusive inspections, integrity repairs methods
  - *Operations & maintenance* – growing roll out of digital technologies and remote vehicles across surface operations
  - Equipment reliability -

Well Plug & Abandonment

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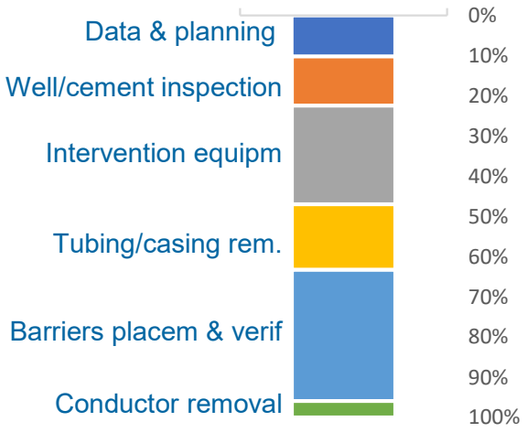
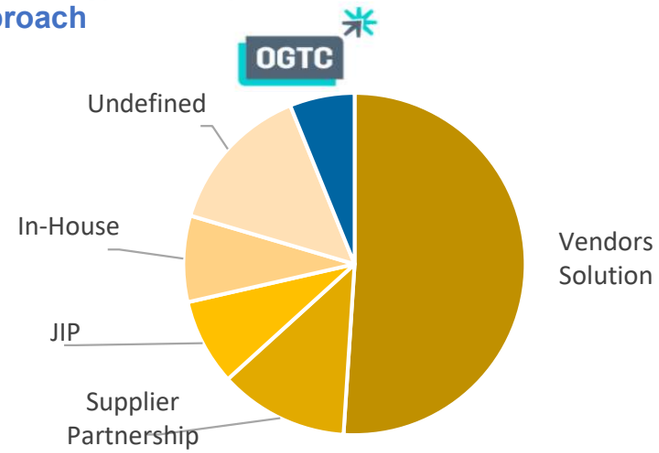
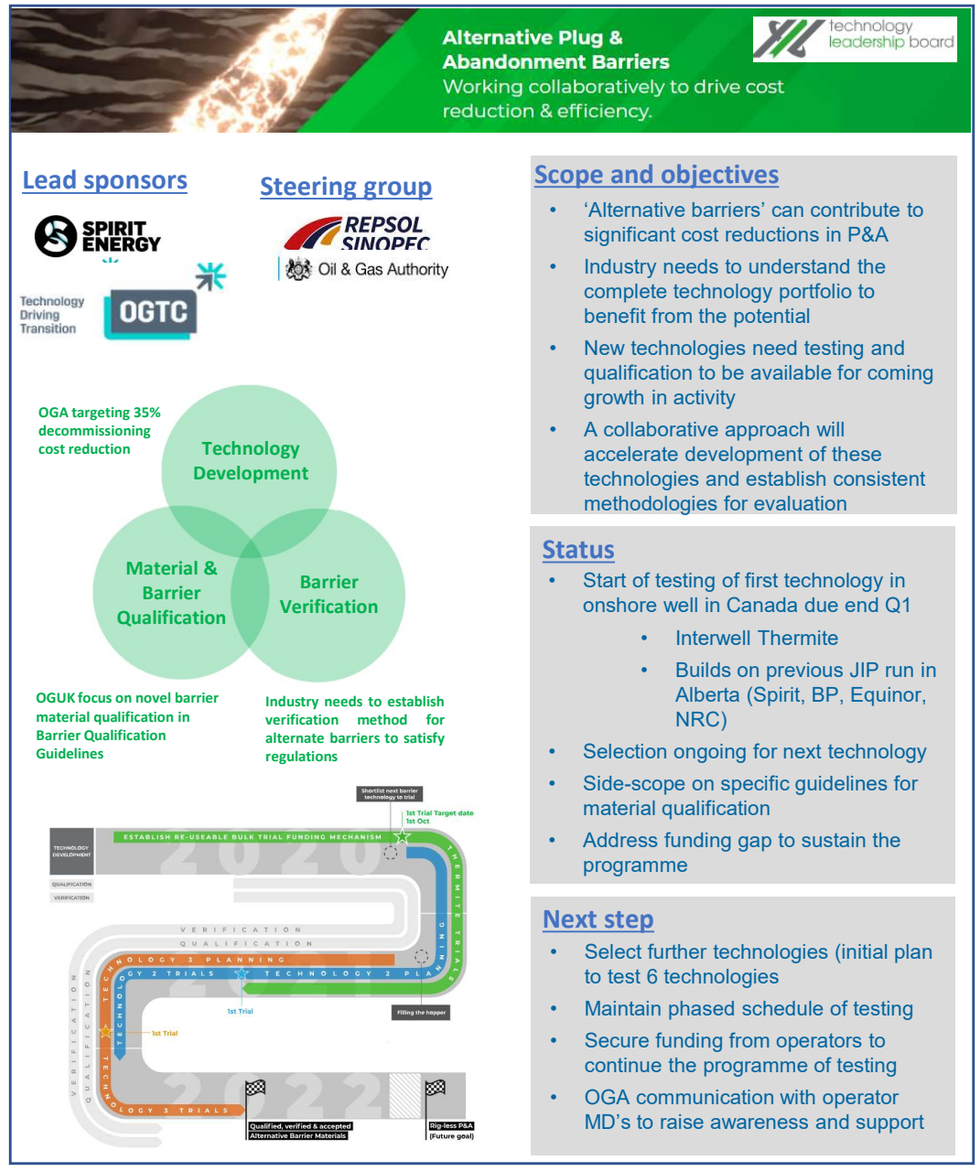
Technology sub-domains (technology count)



Technology delivery approach



- Focus predominantly on Barriers and intervention equipment
- High proportion of technology in development through collaboration and in-house indicative of low level of technology maturity
- Operator spend has declined and ranks among the lowest focus areas in terms of spend and number of technologies



Emerging: Digital and ‘Net zero’

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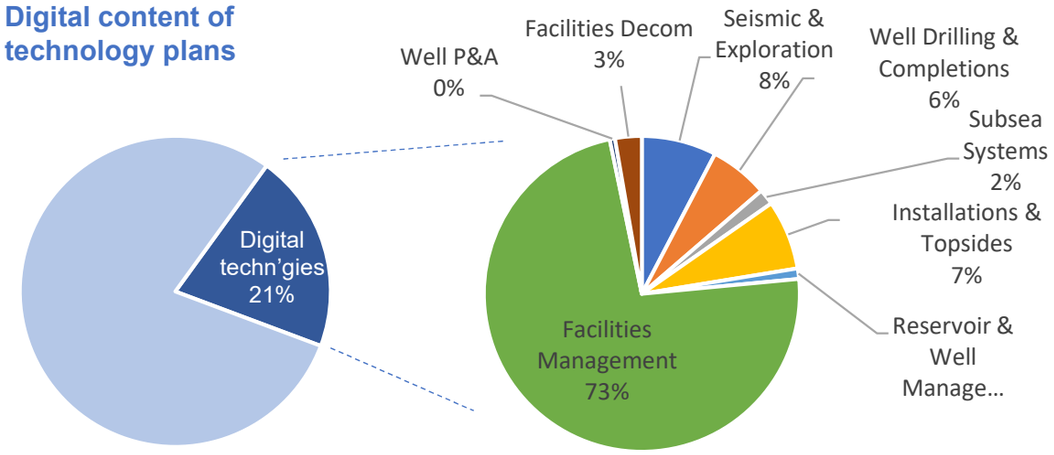
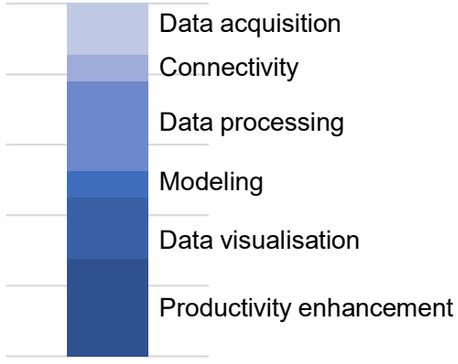
Digital technologies

Digital content of technology plans



Applications type

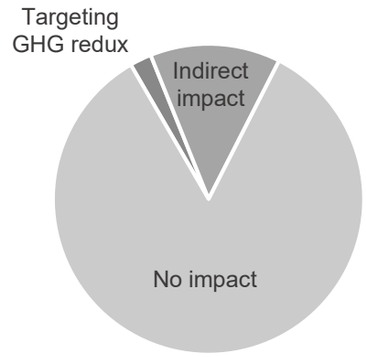


Digital trends

- Growth of digital applications reported in plans (from ~5% in 2016 to 21% of technologies in 2019)
- Focus on improving Asset management, followed by Seismic, Wells and Installations
- Data processing and visualisation with productivity enhancement tools are the most common applications

Technologies for ‘net zero’

Reported technologies w/ ‘net zero’ impact



Growing attention on ‘net zero’ themes in the 2020 technology plans, with efforts driven directly by Operators, with the support of the OGTC, and in partnership with Suppliers.

Reported technologies included:

Operational emission abatement

- Power efficiency (ring mains, umbilicals, avoiding spinning reserve, compressor retooling, NOX/SOX abatement)
- Local renewable power (subsea and NUIs)
- Flaring abatement (stand-by compressors, flare recover systems)

‘Scope 3’ emission reduction

- CO_2 capture (also offshore) and reinjection
- Hydrogen offshore generation
- Hydrogen uses (turbines and cells)

Case study: OPT’s PB3 Powerbuoy

OPT OCEAN POWER TECHNOLOGIES
PremierOil
Technology Driving Transition OGTC

- Uninterruptable Power Supply (UPS) which constantly recharges itself from waves
- Tested at Premier’s Huntington in 2019, further pilots at ENI in the Adriatic Sea, interest by other operators inc Total – Over 2.7 MWh generated
- To power surface and subsea payloads, can be integrated with solar power and storage

Next steps: OGA *Technology Insights* on-line

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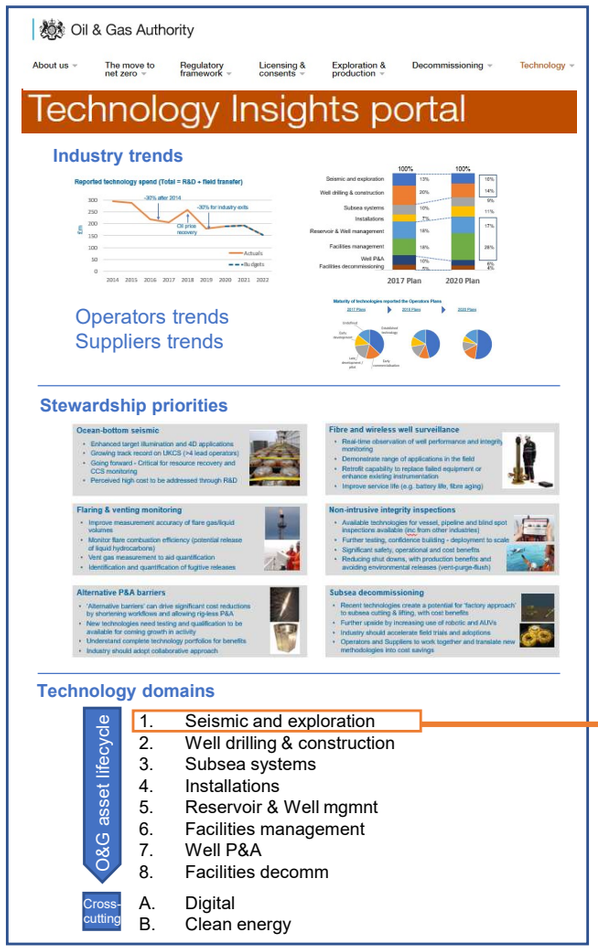
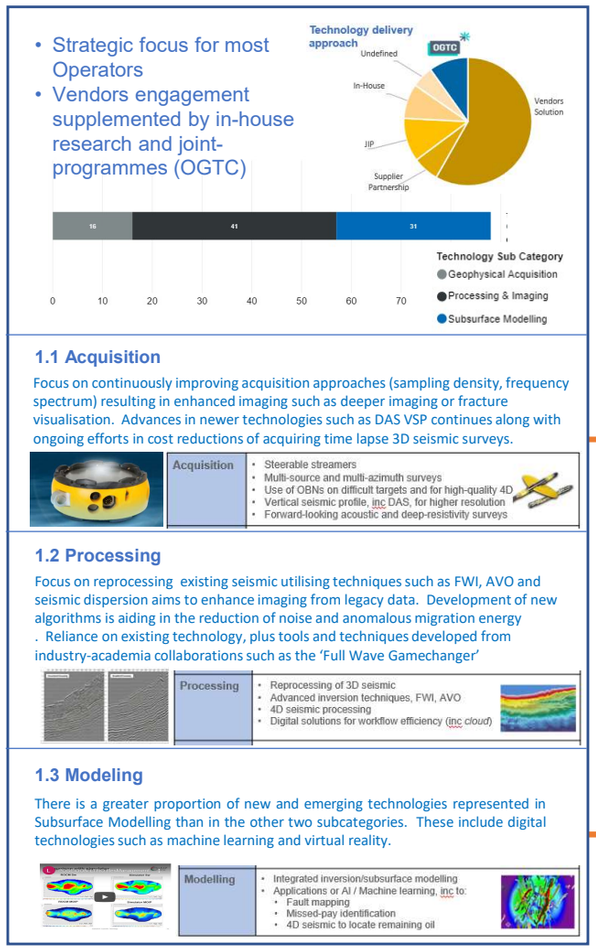
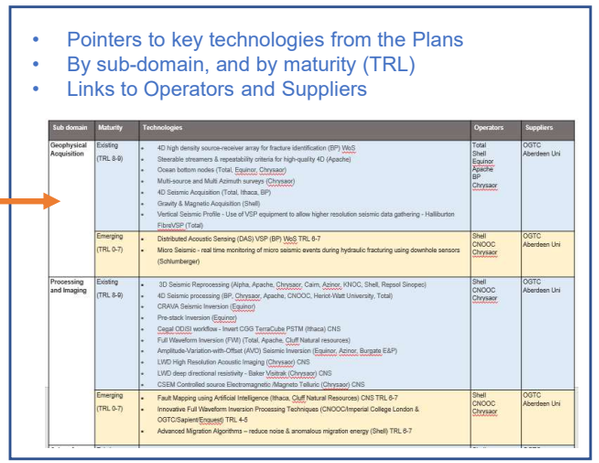
Technology Insights – Entry portal



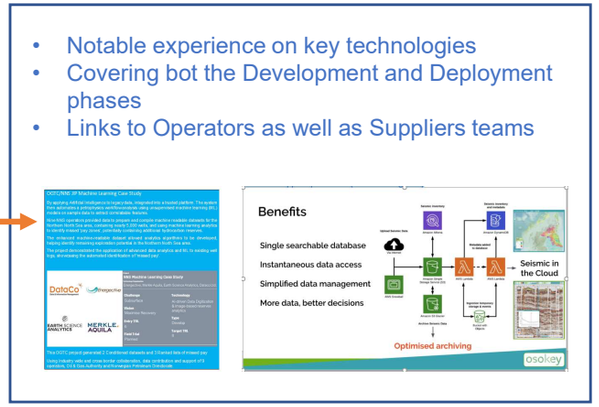
Example: Technical domain – 1. Exploration



Technology tables: links to contacts and information



Case studies: lessons learned, development & deployment



- **Based on operators technology plans, and supply chain information gathered by the OGA**
- **To communicate industry technology priorities and progress, supporting resource maturation and net zero**
- **To provide useful info and contacts for companies to deploy technologies**
- **To connect more companies into joint OGTC and other technology developments**

Next steps: OGA Stewardship *top-6 technologies*

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Ocean-bottom seismic

- Enhanced target illumination and 4D applications
- Growing track record on UKCS (>4 lead operators)
- Going forward - Critical for resource recovery and CCS monitoring
- Perceived high cost to be addressed through R&D

Fibre and wireless well surveillance

- Real-time observation of well performance and integrity monitoring
- Demonstrate range of applications in the field
- Retrofit capability to replace failed equipment or enhance existing instrumentation
- Improve service life (e.g. battery life, fibre aging)

Flaring & venting monitoring

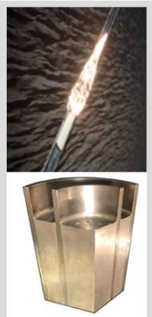
- Improve measurement accuracy of flare gas/liquid volumes
- Monitor flare combustion efficiency (potential release of liquid hydrocarbons)
- Vent gas measurement to aid quantification
- Identification and quantification of fugitive releases

Non-intrusive integrity inspections

- Available technologies for vessel, pipeline and blind spot inspections available (inc from other industries)
- Further testing, confidence building - deployment to scale
- Significant safety, operational and cost benefits
- Reducing shut downs, with production benefits and avoiding environmental releases (vent-purge-flush)

Alternative P&A barriers

- ‘Alternative barriers’ can drive significant cost reductions by shortening workflows and allowing rig-less P&A
- New technologies need testing and qualification to be available for coming growth in activity
- Understand complete technology portfolios for benefits
- Industry should adopt collaborative approach



Subsea decommissioning

- Recent technologies create a potential for ‘factory approach’ to subsea cutting & lifting, with cost benefits
- Further upside by increasing use of robotic and AUVs
- Industry should accelerate field trials and adoptions
- Operators and Suppliers to work together and translate new methodologies into cost savings