

UKCS TECHNOLOGY NETWORK: Accelerating Deployment



August 2021



3 x TLB work groups set up in Q2 2021: Accelerate Deployment; Net Zero, Digitalisation

> Accelerate Deployment focusing on helping to promote the use of newly developed technologies in the basin

> > We took the NZTC/OGTC hopper of 50+ technologies as the starting point

> > > Reviewed TRL 7/8 and selected 7 for promotion through the TLF and TLB (criteria included: trial success, value potential, etc.)

> > > > Technology companies have prepared case studies for today, which will also be added to the TLB website



Provide opportunity for these companies to come forward through the TLB website e.g. 200 word case studies

> Promote through TLB forums, Scottish Enterprise, the Chamber, OGUK, etc.

- Conductor restraint
- UAV monitoring
- Digital Twin
- Valve safety
- Video/Audio/AR
- Stress concentration tomography
- CCUI for NII

Question for today – Do you see these technologies improving efficiency in your operations? If yes, why haven't they been deployed? If not, please share why.



Accelerating Deployment



Accelerating Deployment



Infinity Gauntlet Infinity



Offshore Methane Emissions Measurement Flylogix



Digital Worker Platform Kite



Laser Scanning Digital Twin GDi



Focused Stress Concentration Tomography Oceaneering & Speir Hunter

AquaShim

AquaTerra





Accelerating Deployment

CAISSON & CONDUCTOR MANAGEMENT SOLUTIONS





SOLVING A STABILISATION & INTEGRITY CHALLENGE



Developed in association with Net Zero Technology Centre, AquaShim® is a polyurethane-based alternative which is quick and simple to install and requires zero lifetime maintenance.

Providing low cost, long term stabilisation for caissons and conductors, AquaShim® halts deterioration and localised stresses, reducing vibration and noise, and extending asset lifecycle.

A typical 30" AquaShim® will deliver savings of 50% over a traditional 10 year inspection, maintenance and repair cycle.

Cost-effective, simple, reliable.

AquaTerra

Minimum 15-year lifespan Requires no specialist transport, heated containers or storage

Zero lifetime maintenance

Low temperature Installation

AquaShim

INSTALLATION PROCESS

- 1. Restraint Rigging
- 2. Cleaning and Inspection
- 3. Liner Installation (if required)
- 4. Centralising Chocks
- 5. Retainer Clamp
- 6. Urethane Compound Pour















PRODUCT ADVANTAGES

Evenly distributes environmental impact loads

Allows free vertical movement of tubular if combined with liner

Eliminates further fretting damage

Vastly reduces noise & vibration at well-head

Simple, rapid, low cost installation

containers or storage

Does not work loose over time





AquaTerra

POURED AQUASHIM®

Year-round installation	24hour cure time
Fast installation by qualified technicians	Zero material shrinkage ensures snug 360° fit
Requires no specialist transport, heated	Lower removeable clamp negates requirement for

р fill bags







PRE-CAST AQUASHIM®

Topside & Subsea
applicationE
gSubsea installation
using AquaCLAM®
or diversS
s

Engineered to suit any guide geometry

Significant lifecycle savings over alternative shim solutions





AquaTerra

ENGINEERING ASSESSMENT

Fully engineered, tested & proven for operation in harsh environments

Detailed assessments completed to client requirements Up to 50% reduction in localised stresses induced in the guide

Facilitates even distribution of loads into structure











FIELD TRIAL

Conductor Stabilisation

• X2 Aquashim® products installed on Brae Alpha in 2019

- Previous mechanical shims failed and replaced on several occasions
- Installed by 4 man team over a 7 day trip
- Due to weather delays, 2nd Aquashim was only partially poured, which has provided very useful trial data
- 6 month and 18-month visual inspection completed no issues found
- Additional analysis requested by client to review load distribution on guide structure. Analysis highlighted that the existing steel shim case shows higher localized stresses in the guide barrel and plates than the Aquashim®



AquaTerra







CASE STUDY

J-Tube Stabilisation

- First independent commercial project
- J-Tube stabilisation using AquaShim®
- Existing guide barrel corroded and unusable
- AquaShim incorporated into replacement guide design at concept design stage
- No accessible structural steelwork to attach a traditional friction clamp
- Unique "stabbing" design by Optimus Aberdeen Ltd held in neighbouring unused guides using Aquashim
- Complete solution installed with a 4 Man multi-discipline team over 10 days











2nd FIELD TRIAL

Conductor Stabilisation

- Potential 2nd Field trial on Claymore
- Currently being assessed, but potentially 2 conductor guides
- Existing stabilsation completely gone in one location
- Smart shim replacement at second location
- Currently reviewing commercial / technical proposal
- No survey required due to detailed scanning data availability
- Will be installed with a 4 Man multi-discipline team, over 7 day trip







Accelerating Deployment

Offshore Methane Emissions

Measurement

Flylogix



FLYLOGIX Offshore Methane Emissions Measurement



TRANSFORMING REMOTE OPERATIONS

We use centrally controlled unmanned aircraft to reduce the cost, risk and environmental impact of delivering aviation services.





HOW WE WORK

We have developed an efficient operating model built around UK offshore markets but scalable worldwide.

- Ground Control Station (GCS) fitted into a standard 20ft shipping container enabling rapid, unsupported deployment anywhere in the world
- Central monitoring of all operations through our Skyspace platform
- Local pilot and safety officer conduct operations

We have developed an airframe which is proven through routine operations in the harsh environment of the north sea.

- Dimensions: Wingspan 3.48m / Length 2.74m
- Mass: dry 27.0 kg with full fuel load 44.6 kg
- Fuel capacity : 22.0 litres
- Range: 350 miles
- Power: 17.5 BHP Petrol Fuelled
- Speed: Cruise speed 70 kts / Max speed 90 kts
- Communication range Unrestricted over Satellite CommunicationsDENTIAL



THE METHANE MEASUREMENT CHALLENGE

1. Measuring methane is a priority

- Industry / Operator led targets
- Regulators
- NGO's
- Investors / ESG issue
- 2. Quantifying methane offshore is difficult
 - Remote
 - High risk
 - Trend to de-manning
 - Hard to capture 'whole picture'

3. No obvious complete solution

- Manned aviation is costly
- Satellites lack granularity and struggle with cloud cover and over water
- On-asset cameras are costly and hard to capture everything
- Taking people with tech (multi-copter) is costly so hard to scale



REAL METHANE EMISSIONS MONITORING















DATA ACQUISITION

The long-range unmanned system transforms our ability to acquire methane concentration data offshore in a manner which is safe, efficient, cost-effective and un-intrusive.





- Mobilised direct from onshore no offshore equipment or personnel required
- 250m 550m stand-off from asset
- Cylindrical flight path descending from ~185m ASL to ~50mASL then back up average 40 mins
- > Secure client portal allows you to track your flight in real time from anywhere in the world.

THE RESULTS

Methane concentration data is transformed through a process of analytics and proprietary algorithms to determine an total emission rate in kg/hr.





- > Proven lower **detection threshold of 2.5kg/hr**.
- Spatial resolution: 0.3 data points/m
- > Average total data points collected: >90,000
- > Average data collection **time on asset: 40 minutes**

A PHASED ROLLOUT TO SUPPORT INDUSTRY

2021

Further flights in southern north sea, central north sea and west of Shetland scheduled

2022

Flylogix will be operating a hub in Shetland, Aberdeen and Norwich to support UKCS wide deployment

Currently scheduling measurement programs with operators commencing in Q1 2022

>Flylogix conducting first measurements in **other priority territories** worldwide.

2023

Routine measurement available worldwide.



What are your plans for methane measurement in 2022?

The Flylogix solution gives you **real measurement data** to support internal emissions management and reduction work and external reporting.

- Low-cost
- Non disruptive of production activities
- No personnel required offshore
- Fixed price inclusive of weather.

Chris Adams Business Development Director chris.adams@flylogix.com +44 7779 696833 www.flylogix.com





FLYLDGIX ALWAYS GOING FURTHER



Accelerating Deployment

Inspection & Digital Twin solutions

Global Design Innovation





SURVEY I DESIGN I FABRICATION I INSTALLATION

GD Presentation

Digital Twin & Remote Inspection

ENGINEERING. INNOVATION.



Technology Led End to End Engineering

Survey, Auto-Engineering, Fabrication & Construction

Asset Visualisation & Digital Twins

- GDi Vision Software
- Integration of multiple datasets

Disruptive Inspection Delivery Model

First in-kind inspection technology

GDi Vision - Data Capture & Visualisation



- 3D Point Cloud Data + 360° HD Photographic Images
- Data hosted in GDi Vision web-based unlimited user application
- Integration with WMS & Inspection Databases

Cost Savings – Removal of survey/site visits, engineering and inspection costs Speed - Ability for immediate design & fabrication Up Time – Reaction times for critical emergent issues reduced Technology – Foundation of GDi solutions





CASE STUDY – INSPECTION TO REPAIR













Semi-Automated Design Completed



Fabrication Tolerances Assured



Worksite Planning utilising Vision



Spool Installed Offshore





ENGINEERING. INNOVATION.

ENGAGING WITH GDi

- Vision
 - Reduce Costs & Manpower
 - Advanced Operational Functionality
- Inspection (Pioneering Technology)
 - Step Change in Quality
 - Reduce Costs & Manpower
- Engineering/Design/Fabrication & Construction
 - Reduce Cost and Time
 - Improve Quality





THANK YOU FOR YOUR TIME

Thank you for taking the time to allow us to present to you. We welcome any questions and feedback.

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Accelerating Deployment

Gauntlet Actuator

Infinity









COINFINITY OILFIELD SERVICES



ACTUATOR SAFETY

WORLDWIDE Patent Pending

Infinity Gauntlet - a certified, tested, patented "bullet-proof" safety cloak for degraded storedenergy actuators.

Made from layers of Kevlar[™] / Twaron[™] / Dyneema[™] para/meta-aramid woven fibres and stress-hardening closed cell foam armour.

> Stronger than steel, it protects personnel from an uncontained failure, prevents a possible MAH, and allows continued safe operation...

> > ...allowing you to respond appropriately and economically to industrywide safety alerts...

> > > ...and giving you the time you need to safely plan for replace/repair/decom.





INFINITY OILFIELD SERVICES

mfinity

GAUNTLET



WORLDWIDE Patent Pending











WHY GAUNTLET?

There have been numerous uncontained failures and HSE advisories for spring loaded actuators. Some types of actuators are more susceptible than others. The forces involved can be in the region of 15 tonnes or more.

The Infinity Gauntlet contains these forces and eliminates the damage this stored energy, unchecked, can cause to personnel, plant, and assets.

In use by Total, Shell, Repsol, Boskalis, Harbour, and others, it has become the SOP on many platforms in the North Sea.











LAYERED PROTECTION

- Para-aramid Kevlar[™]/ Twaron [™] /Dyneema [™] based
- "Stronger than Steel" by a factor of 10
- Stress hardening reactive foam layer stiffens at impact
- Minimal metallic components
- All Gauntlets are bespoke ensuring proper fit to your asset

CERTIFIED – TESTED - PROVEN

- FEA and FMEA analysed force retention (axial, radial)
- Tested at MOD certified munitions testing facilities
- Certified Lloyds Register product
- HSE reviewed (Piper implementation)

EASY TO USE

DESIGN

- Light weight and easy to install (under 2 hours)
- No requirement for pre-survey
- Can be hand-carried on chopper for immediate deployment
- Can be installed by core crew
- Bespoke design delivery typically two weeks or less

PERFORMANCE

- Does not degrade under normal operating conditions
- Does not corrode, does not melt, does not wear
- Effective from -196 °C to +500 °C
- Kevlar has been shown to resist salt-water submersion for over 1 year without any degradation in strength
- Material retains characteristics for decades
- External components easily replaced



Force = 1.859N



GAUNTLET BENEFITS

KEY BENEFITS vs Metal Clamps:

- No additional stress on actuator unlike heavy metal clamp
- No need for offshore survey or detailed analysis or measurement
- Inspection intervals can be extended to 1-2 years or beyond
- Respond quickly to deteriorating conditions and reduce risk of HSE Improvement Notice or imposed shutdown - Gauntlets can be installed quickly by core crew

Ultimately saving time and money in the race to create a safe environment around a degraded, potential MAH asset

ADDITIONAL BENEFITS:

- Reducing exposure of other workscopes carried out in the vicinity
- Reduces passing the (degraded actuator) "ticking time bomb" hazard during de-commissioning along the route to shore
- Kevlar is 100% re-cyclable = feeds into the Circular Economy
- Actuator can be safely decommissioned at Infinity

COINFINITY OILFIELD SERVICES



What's New? Development programme 2021-22

Partnering with Core Lab's **Owen Oil Tools**

Project 1 – Perforation Gun Production Safety

Utilising the known properties of Kevlar and other heat and blast resistant materials to create a safer working environment for Perf Gun production, assembly, and testing

- Kevlar screens for Gun Assembly Tables and test areas
- Deflection barriers

GAUNTLET DEVELOPMENT

- Protective body armour

Project 2 – Perf Gun Handling and Transport

2a) Design of onshore/offshore handling systems for movement of PCT explosives from point to point. Reduction in exposure of workers to possible incidents.

2b) Transport re-classification for PCT explosives for international shipping and airfreight. Cost and complexity reduction.



Accelerating Deployment

Digital Worker Platform

Kite





Delivering Live Visual Support





Using video live streaming is becoming the 'new norm' for supporting remote site activities such as site maintenance, inspections, monitoring and surveys.

KITE's combination of camera technologies, live streaming, augmented reality (AR) and machine learning (ML/AI) introduces a cost effective and efficient approach for supporting remote site activities.

Our Capture Share Analyse Respond (CSAR) approach demonstrates how companies can implement our technologies to create a successful digital transformation for remote site support.



DATA SOLUTIONS

KITE can be integrated with other systems. Our solution can be branded to customer requirements and tailored to specific needs.

BENEFITS

Faster image analysis.

Streamlined operations

Reduced Operational costs

Increased operational Efficiencies

EXAMPLE SCENARIOS

Provide workflow instructions to remote workers

Create tailored dashboards to include multiple live streams and maps showing user or camera locations

Store videos / images and create work site reports

Use AI and machine learning to speed up anomaly detection





WHY KITE ?

•

Faster remote visual inspection Accelerated time to resolution

Increased Resource utilisation Direct access to subject matter expertise Mentoring support to field workers Enhanced worker safety

Reduced travel demands



Reduced Operational Costs



Our integration services streamline your operations and contribute to a your digital transformation strategy

Call +44(0) 7989 391616 or email <u>info@kitedb.com</u> and find out how we can support your remote operations.

https://livestream.texo.co.uk



Accelerating Deployment

Focused Stress Concentration

Tomography

Oceaneering and Speir Hunter









Speir Hunter Limited

NET ZERO TECHNOLOGY CENTRE

FSCT PROJECT UPDATE

jmc/dt/cv Aug 24th 2021

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THE STORY SO FAR

Tested on-site in operational environments - Flotta, St Fergus, CATS

Applications

- 5m OD PV area of corrosion (repaired) located up to 65mm insulation thickness
- Pressure Piping
 - 2", 4", 6", 8", 10", 12" and 20" onsite and on samples
 - Any CUI (incl repaired) confirmed by insulation removal successfully related to detectable FSCT magnetic signal changes

Diameter [in]	Wall Thickness [in]	Insulation thickness [in]	Insulation type
2	0.17	0.98	Foamglass
4	0.17	0.98 / 1.5 / 1.97	Rockwool / Foamglass
6	0.22	0.98 / 1.97	Foamglass
8	0.31	1.97	Foamglass
10	0.27	2.75 / 3.14 / 3.54	Rockwool
16	0.27	1.97	Foamglass
20	0.18	1.97	Rockwool
197	N/A	1.97	Foamglass





DATA COLLECTION AND PRESENTATION – 1mm pits through insulation



Title page disclosure applies.

Speir Hunter Limited

DATA COLLECTION AND PRESENTATION – 1mm pits through insulation



Title page disclosure applies.

Speir Hunter Limited

FSCT – MINIMAL EQUIPMENT

Wireless mouse sized probe to a palmtop PC









CONTINUING WORK NEEDS

WHERE OPERATORS AND OWNERS CAN HELP

- Need as much data as possible from <u>live or decommissioned</u> plant to improve both hardware and software – all about training algorithms !
- Need to continue to test:
- Variety of diameters (3" to vessel / tank size)
- Variety of insulation thicknesses
- Variety of insulation types
- > Supports, parallel pipes etc
- Variety of temperature

- \rightarrow Determine pipe size and thickness limitations of the technology
- → Determine maximum insulation thickness for technology stand-off
- → Determine whether any insulation and jacket types affect results
- \rightarrow How close can we be to a support or another pipe ?
- → Higher temp pipes may increase magnetic signal strength

Bottom line

The technology 'sees' corrosion – but we need to 'train' it as to what is severe and what's ok



THANKS GO TOFOR THEIR CONTINUED SUPPORT













Technology Insights Microsite

Accelerating Deployment

🔊 Oil & Gas Authority



Technology Managers Network – OGA Technology Insights Microsite - Website Overview

Technology Insights Microsite

Go to the Oil & Gas Authority home page, select "Technology" and the OGA "Technology Survey & insights" from the drop down menu



Landing Page



 OGA analysis of the operator submissions and comparison with prior year's findings provides a UKCSwide overview of current operator practice

Net Zero



Facilities Management Category



Equipment Monitoring & Reliability

Operators focus around Equipment Monitoring and Reliability increasingly involves digital technology with examples including predictive condition monitoring using AI and Machine Learning for rotating machinery using streaming data. Digital technology applications also contributes to improving environmental performance with Predictive Emission Monitoring utilising data from process operations to predict flare efficiency. Operator attention on the environmental impact of plant and equipment performance also extends to use of drones to remotely measure flare efficiency by detecting unburnt hydrocarbon contributing to Methane emissions using sensor technology developed for NASA.

Number of technologies by operator



Existing Technologies:

- CoAbis Interface for Maximo to assist with managing/reporting on integrity workscopes (Repsol Sinopec Resources)
- PEMS (Predictive Emission Monitoring) + Streamlined reporting to improve accuracy of emissions reporting from combustion and Flaring (Chrysaor)

Emerging Technologies:

 FlyLogixs - unburnt hydrocarbons/methane monitoring using drone technology Drone/AUV flown remotely from Onshore to offshore installations, improving safety, reducing risk, reduces OPEX (Chrysaor)

Technology Sub-Categories

Facilities Management Category

Energy Portal

Disclaime

About us -The move to Regulatory Licensing & Exploration & Decommissioning -Technology 💌 Supply chain Data centre News & net zero IN framework consents 1 production publications Facilities Management Home / Technology / OGA Technology Survey & Insights / Technology Insights 2020 - Summary findings / Facilities Management Summary Count of technologies (Operators plans, total 884) Technology OGA Technology Stewardship OGA Technology Survey & Insights The Facilities Management category accommodates the greatest number of operator reported OGA Technology Survey & Insights technologies, accounting for over a quarter of the total number of solutions reported. When combined with Technology Insights 2020 – Summary findings Reservoir and Well Management, technology focussed on supporting operations activity accounts for 45% Technology Insights 2020 -Summary findings of the total technologies reported. Seismic and Exploration Technology Priorities for the Well drilling and ndustrv construction Facilities management (250) Subsea Systems Lifecycle Categories Installations and Topsides Seismic and exploration Reservoir & Well Seismic and Exploration Management Well drilling & construction 14% Facilities Management 9% Subsea systems Well Drilling & Construction Installations & Topsides 11% Existing and Emerging technologies Subsea systems Reservoir & Well management 17% Case Studies Well Plugging & 28% nstallations and topsides Facilities management Abandonment Facilities Decommissioning 6% Well P&A Reservoir & Management Facility integrity Eacilities decor Data and Digital Net Zero acilities Management Technology Priorities for the Industry Well Plugging & Abandonment Facilities Management submissions were analysed under four sub-categories: Technology Leadership Board Facilities Decommissioning Previous insights reports Technology Sub-Categories UKCS Technology Network **Functional Categories** 6.1 Equipment monitoring and reliability Useful links Data and Digital 6.2 Integrity monitoring and inspe 6.3 Facility integrity repairs Net Zero 6.4 Maintenance & Operations

🐞 Oil & Gas Authority

Integrity Monitoring and Inspections

With Integrity Monitoring and Inspections, operators are focused on Multiple new technologies for Non Intrusive inspection using Focussed Stress Corrosion Tomography, Neutron Backscatter, Passive TerraHertz, Pulsed X-Ray and Distributed Fibre Optic monitoring technologies for remote tank inspections.

Number of technologies by operator



Application Exemplars

Existing Technologies:

 NII Inspection Technologies, Advanced NDT tools using ultrasonics for topside vessel inspection reduces the need for manned intervention, improving safety and reliability(Repsol)

Emerging Technologies:

- Focussed Stress Concentration Tomography (FSCT) is a manually applied probe / probe array for detecting, positioning and classifying the severity of CUI, cracks or dents in real-time using highly sensitive magnetometers to detect the re-arrangement of magnetic domains caused by localised mechanical stress (Kellas Midstream)
- Neutron Backscatter inspection for CUI (Corrosion Under Insulation), rapid inspection method for measuring corrosion without disturbing the insulation coatings (CNR)
- CUI Camera Passive TerraHertz sensing technology for the purpose of detection corrosion under insulation (CUI) at a live gas processing site (Shell) Onshore

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Sub domain	Technologies	TRL	Operators	Case Stud
Equipment Monitoring and Reliability	Software Interface for Maximo to assist with Managing/Reporting on integrity workscopes	8-9	Repsol Sinopec	
neilauliity	Data management platform for plant and equipment Monitoring	8-9	Spirit	
	Software that connects to PI and uses AI to assist with condition monitoring faults diagnosis and plant optimisation	8-9	Spirit	
	PEMS (Predictive Emission Monitoring) + Streamlined reporting to improve accuracy of emissions reporting from combustion and Flaring	8-9	Chrysaor	
	Wireless Tablet reporting offshore for inspections services	8-9	Enquest	
	Integrity Management system – Pressure systems live source data for all integrity data	8-9	Enquest	
	Cloud scan – rapid surveying technique for automated offshore surveying	8-9	Enquest	
	Load stability system – extends operating envelope during marginal weather conditions, eliminates hazards associated with moving loads on platform deck	8-9	Chrysaor	
	Integrated Operations centre	6-7	Repsol Sinopec	
	Online CBM – Rotating Equipment CBM & predictive faults analysis	6-7	Repsol sinopec	
	Heat exchanger performance monitoring using	6-7	Chrysaor	/
\langle	UAV - unburnt hydrocarbons/methane monitoring using drone technology	6-7	Chrysaor/Repsol Sinopec	\triangleleft
	CFD to analyse downstream temperatures of choke valve	6-7	Chrysaor	
	Power Buoy – generate autonomous renewable energy and enables communication and data transfer via VSAT, to power subsea equipment and monitor exclusion zones	4-5	Premier	
Integrity Monitoring and	Hand held Tablets and scanning tools for use in fabrication workscopes offshore	8-9	Repsol Sinopec	
hispochori	Live and Online UT monitoring of erosion/corrosion hotspots	8.9	Repsol Sinopec	
	NII Inspection Technologies, Advanced NDT tools	8-9	Repsol Sinopec	
	Tablet, Wireless & Wearable technology	8-9	Repsol/Spirit/Ithaca Equinor	
	Remote Inspections – Drones, ROV's, Intelligent pigging	8-9	Taqa/Anasuria Op Co.	
	Software based Condition monitoring services - use AI to predict what, when and why equipment will fail	8-9	Taqa/CNOOC	
	TIMP – Technical Integrity Management portal, visualisation of technical safety barriers	8-9	Equinor	
	Data driven solutions from distributed fibre optic monitoring; Fibre Optics DAS, DTS, monitoring arrays	8-9	Apache	
	Syncro 4D-5D model allows better planning, communication and contract management for asset integrity	8-9	Shell	
	Web Based RBI application (XAMIN)	6-7	KNOC	
	CUI Camera - Passive TerraHertz sensing technology for the purpose of detection corrosion under insulation (CUI) at a live gas processing site	6-7	Shell	/
	Non-Intrusive Tank inspection tools	4-5	Ithaca	
\subset	GDi Automated Defect detection and reporting from laser imaging scans	1-3	KNOC	3

Tables

,UAV's such as FlyLogixs Drones for emissions monitoring

GDI Automated Defect Detection and reporting from laser Imaging scans, Also GDI **Digital twins**

Case Studies

OGA Technology Survey & Insights

Home / Technology / OGA Technology Survey & Insights



We ask operators and vendors to send us case studies of new technologies being used – use this link



Accelerating Deployment

Closing Remarks