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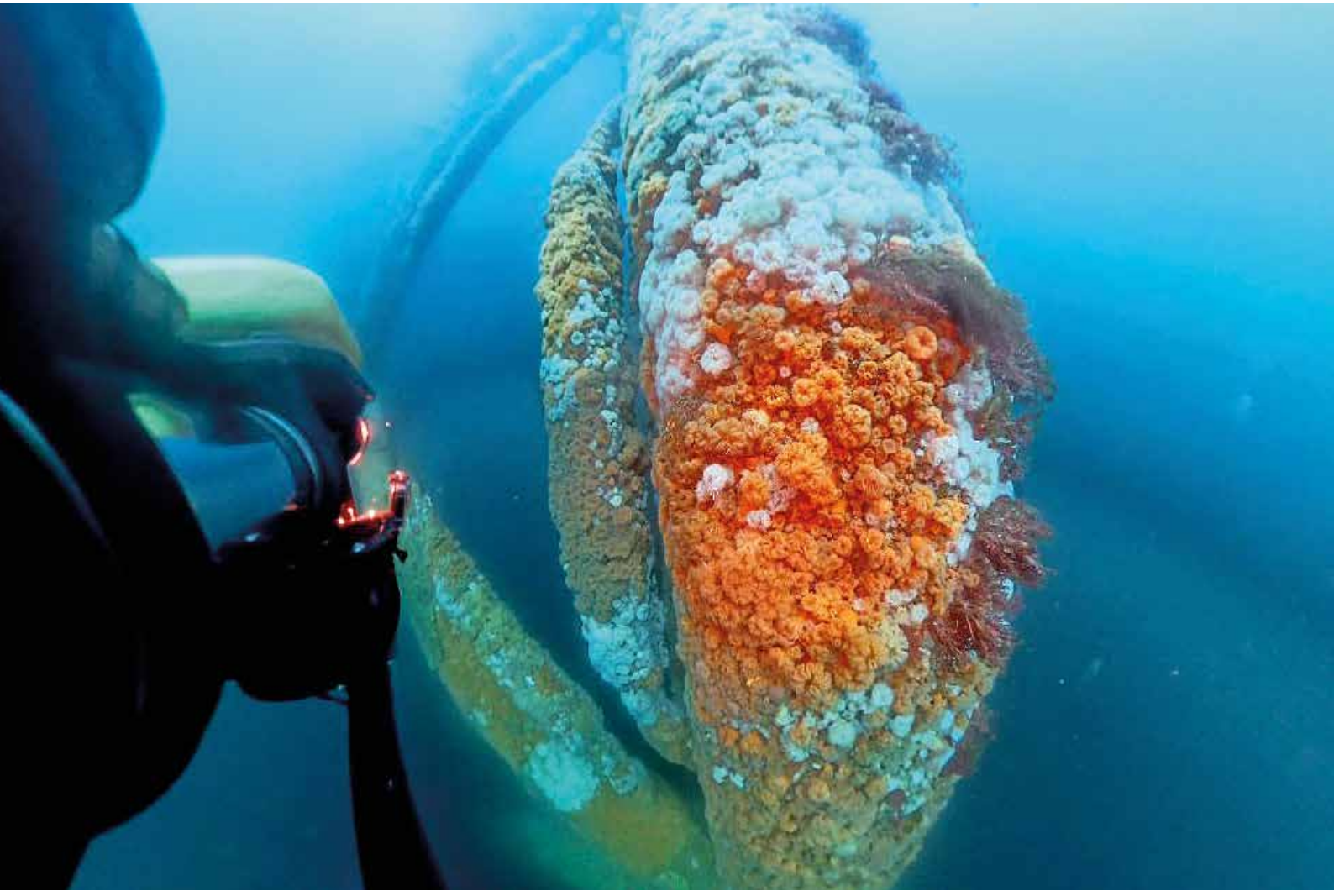
OFFSHORE EUROPE EVENT REPORT

July - October 2025



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Cover image: *A HPR camera mounted on a small ROV takes photos of a subsea object, which can later be developed into a 3D digital twin – see page 14*

North Sea petroleum politics and industry

The UK North Sea energy industry is not happy to have become a pawn in a political battle between the governing Labour, opposition Conservative, and populist Reform Parties. But it probably needs political support for survival

"We stand in the UK at a crossroads," said David Whitehouse, chief executive of UK industry association Offshore Energies UK, in an opening speech to the Offshore Europe event in Aberdeen on September 1.

"One way (leads) to a richer country, one to a poorer country. "

"We must choose to back home-grown energy." The energy transition should mean "re-industrialisation not de-industrialisation," he said.

Mr Whitehouse asked the audience to raise their hands if they know someone who has lost their job in the past few weeks or graduated and cannot find a job. At least half the audience members raised their hands.

"This needs to change," he said.

David Whitehouse, chief executive of UK industry association Offshore Energies UK

The UK's energy imports are at record highs, while the country is not investing as much as it could be in its own energy production, which means that value to the economy is being lost, he said.

Mr Whitehouse urged political leaders attending the event to "please, back home-grown energy in all its forms."

"The opportunity is huge," he said. "This sector offers a path to a positive future. Jobs, economic growth, emissions reduction, and energy security."

Louise Kingham, BP

"In the last few years, the challenge of how to get to net zero has been redefined," said Louise Kingham, head of UK, and senior vice president Europe with BP. "We cannot take energy security and affordability for granted."

In the North Sea, "production is declining. But there is an awful lot of life left in this basin."

"The world is in a stage of energy addition not subtraction," she said.

The North Sea has geology which is ideal for storing carbon. And there are very few places better suited for generating electrons from offshore wind, with strong and persistent winds.

This could be integrated with blue and green hydrogen production, and tidal power.

The entire North Sea could become a vast "low carbon energy plant backed by gas," she said.

It helps that "we have a hugely talented workforce, deep experience, and resilience. We also have infrastructure."

A further benefit is the size, proximity, and quality of the market (energy buyers).

On the "challenges" side of the ledger, there are time constraints. "We have less than 25 years to rebuild a low carbon emissions system. That really isn't much time given the scale we are talking about," she said.

Money is in short supply, with every project competing for investment.

Energy is also competing with every other sector for the best people with the right skills. An advantage the energy industry has here is that "no sector comes close to energy for job satisfaction," she said.

While graduates may be more tempted to work in industries like tech, finance, and health, they should recognise that none of these industries can function without energy, she said.

The policy framework needs to be internationally competitive, because boards and investors are looking for the best returns and considering many different countries.

There is a big human and economic impact if the industry does not "get the challenge right."

Louise Kingham, head of UK, and senior vice president Europe with BP

"Speeding up the pace of decision making and execution is really key," she said.

"We need to keep improving on safety using advantages of digital technology and AI."

There is also value to be gained from collaboration. "Companies are coming together and forming new ventures," she said.

"The North Sea and expertise that has been built up around it is a gift. We must make the most of it."

Michael Shanks, Labour

Michael Shanks MP

"We refuse to accept the status quo of the last decade seeing a third of energy jobs lost," said Michael Shanks MP, Parliamentary Under-Secretary of State for Energy with the governing labour party at the time of the conference.

"It cannot be a binary choice between one industry [petroleum] and another [wind]."

"Now is the time to build the North Sea energy future."

The government "will do everything it can" to support the North Sea. It will publish the government's response to a consultation shortly, including "clear next steps on licencing commitments," he said.

"This is one of the best places in the world for offshore wind, CO2 storage and hydrogen."

"We're making a huge commitment to carbon capture [including] $200 million for the Acorn project."

This government "will work with you to achieve our shared goal of a prosperous North Sea."

Kemi Badenoch, Conservatives

Kemi Badenoch, leader of the UK opposition Conservative party.

"We are sabotaging ourselves," said Kemi Badenoch, leader of the opposition Conservative party.

"UK energy production fell to a historic low last year. That is weakness by choice.

It does not have to be this way."

"OEUK says 7.5bn barrels can be found. 3.2bn more than the government admits."

"It requires business confidence. That confidence is being destroyed. About 1,000 jobs are lost every month and will continue to be lost without change."

"Oilfields are at risk of vanishing because of Labour's ideological approach. Towns could be wiped out by Labour's short-sightedness."

The UK oil and gas industry is subject to an Energy Profits Levy (EPL) or "Windfall Tax" introduced by the Conservative government in 2022, when gas prices were at record highs following the break-out of war in Ukraine.

Today, "there is no windfall left, and yet Labour is still taxing. Almost every other European country has dropped their levy, but Labour wants ours to run until 2030. If that happens, there won't be an industry left to tax."

"The EPL will cost the exchequer £12bn in lost revenue."

"Harbour Energy's decision to cut jobs was a direct result of the levy," she said. "The windfall tax punishes success and accelerates decline."

"The EU spent Euro 4.5bn on Russian gas imports in the first half of 2025, a billion more euros than they spent in the same period last year, despite sanctions. This is madness."

"I am proposing a new future for the North Sea," she said. "Conservatives are committed to our industry in the North Sea. We will scrap the Net Zero mandate. We will judge operators based on how much oil and gas they produce."

"North Sea Transition Authority will change [name] to North Sea Authority. North Sea is more than 'transitions'."

"Every extra barrel will underpin sterling."

For the Rosebank field, "Labour still refuse to commit to granting new licenses. Labour surrendered to the activists," she said.

"This 'lawfare' must end. Right now, we have more lawyers trying to stop oil and gas than rigs producing it. It has become paradise for activists. Conservatives will not be bullied by activists."

"A Conservative government will put the presumption in favour of new projects. Rigs don't need to be net zero, they need to provide energy."

"Labour [policy] is 'decline by design.' Ours is 'growth by choice.'"

If anyone doubts what a supporting government can achieve look at Norway. They are drilling in the same basins we are and reaping the rewards."

"Unless we act, 180 of our 280 fields will shut down in the next five years. That is not a managed transition. That is collapse."

"We are not anti-renewables if they cut people's bills. But all the evidence shows that Labour's obsession with building more wind and solar before the grid can handle it, and offering more and more subsidies, funded through more levies on bills, is going to drive bills up."

"Reform [at the time, the largest opposition party] want the state to get involved in our oil and gas fields, taking us back to the bad old days of the 1970s when the government controlled British industries, running them into the ground."

The future of the North Sea

A panel at Offshore Europe on the future of the North Sea looked at how it would best maintain its skills base and how UK policy needs to change, with speakers from Equinor, Shell, Wood, Scottish Renewables and members of parliament from opposite parties

Equinor already knows it will drill 250 exploration wells in Norway in the next 10 years, said Camilla Salthe, Senior Vice President - UK Upstream, Equinor. That is because it has confidence in the stability of the government's policy. But in the UK, there is much less confidence, she said.

Equinor has seen it is possible for people with oil and gas skills to transfer to the renewable energy sector, with many people formerly working on petroleum projects working on its Dogger Bank project, the UK's largest offshore wind "park".

Asked for her advice to new graduates, she

Offshore Europe panel on the future of the North Sea. From left to right: Simon Roddy, Shell; Steve Nicol, Wood; Camilla Salthe, Equinor; Clare Mack, Scottish Renewables; Melanie Onn MP; Andrew Bowie MP

said, "there could be a bright future here. I think we will manage, but it is a bit bumpy."

Andrew Bowie. MP

Over the period 2015-2022 the North Sea was "the most investable basin in the world," claimed Andrew Bowie, a member of UK parliament for the Conservative (opposition) party and shadow Secretary of State for Scotland.

The "Energy Profits Levy" or "windfall tax" introduced in 2022 "has done great damage". Decision makers in oil and gas companies in places like Houston, Abu Dhabi and Paris no longer have great confidence in the UK, he said. "We need to remove EPL, or there's no windfall left to tax."

Asked if his party's policy is to go "hell for leather after everything," he replied, "absolutely." This means incentivising investment in all kinds of energy, including nuclear, he said.

It would be useful if politicians could have rational pragmatic discussions. But the Labour government's Secretary of State for Energy and Net Zero Ed Miliband "does not want to engage in this," he said. "He wants to be the Secretary of State who winds down production of the North Sea."

The problem is not specifically the ban on new licenses, it is more that investors perceive the UK as discouraging business, he said.

Melanie Onn, MP

Melanie Onn, a member of UK parliament for the governing Labour party, says that certainty over UK policy does in fact exist, with plans in the election manifesto now being rolled out, even if that were not the direction the industry would like.

Ms Onn did not agree with an audience member who said that the government was undertaking a forced dismantling of the industry, saying that it would be happening anyway. "The sector has been losing people for over a decade."

Simon Roddy, Shell

"We are a long-term sector," said Simon Roddy, Senior Vice President - UK Upstream, Shell. "Long term consensus is extraordinarily important."

In government, "I think we need to continue to make our case," he said. "There's absolutely no doubt we will need more oil and gas than we can import."

Oil and gas companies need to be "nimble and competitive" to survive, and the regulatory regime needs to support that.

For the Acorn CO2 storage which Shell is involved with, there are many positive developments. "This is a very significant engineering project," he said. "It leverages the skills and capability of this sector."

People considering working in the sector should see that "North Sea is a world class asset for the country, and it needs the brightest and best."

Steve Nicol, Wood

"1,000 people could leave our industry every month while we import 40 per cent of our oil and gas needs," said Steve Nicol, Executive President, Operations, Wood.

However, Wood does see "significant jobs" coming in CO2 storage projects.

Strengths of the Scottish industry are its "fantastic safety record, world class supply chains," he said. "We've got the best engineers, planners, construction people."

Attracting graduates to work in the oil and gas industry is proving tough. It would be easier if industry could see more clearly what people it needs and when, and how they can transition to the renewables sector later, he suggested.

Claire Mack, Scottish Renewables

"The pace of energy transition is slowing," said Claire Mack, Chief Executive of business organisation Scottish Renewables.

The main reason is declining investment attractiveness, and the perceived risk of projects. "We are not managing that particularly well."

The dominant narrative about energy in the UK in political circles "is not really real."

The reality is that "providing cheap energy creates social and economic resilience." And also, the UK "needs an oil and gas sector at a certain scale.

The best way to accelerate the transition is to make energy more attractive to investors, she said, and also maintain availability of skilled people. The government is showing a "lack of common sense" in how it issues visas.

The vision for the North Sea

Stuart Payne, chief executive of the UK's North Sea regulator, and Bob Keiller, former CEO of Wood Group, shared ideas on the future of the UK North Sea energy industry, in a panel session at Offshore Europe

Bob Keiller, former CEO of oil and gas service company Wood Group, would like to see a "long and prosperous future for the North Sea," with a steady transition to low carbon energy, and a stable base of prosperous jobs.

But that will not happen if the current fall off in petroleum jobs is not balanced by an increase in opportunities elsewhere, he said.

He was speaking in a "fireside chat" session at the Offshore Energies UK event in Aberdeen in September, together with Stuart Payne, chief executive of North Sea Transition Authority, and moderated by Zoe Ogilvie, director of communications agency Big Partnership.

An issue of growing concern in Aberdeen is the way that North Sea oil and gas production is becoming politically polarised, with the governing party seemingly opposed to the industry and the opposition party promising strong support.

"Clouds to the left of me, jokers to the right," Mr Keiller said, quoting a line of the Gerry Rafferty and Joe Egan song, "Stuck in the middle with you."

Mr Keiller is sceptical about how well the industry is communicating with the UK government. "It does feel as though we are banging our head against a brick wall. It is not necessarily a way of changing peoples' opinion," he said.

The most important British decision makers may be members of the governing Labour party – that is the party members not the parliament members.

Party members would need to approve any change to the government's manifesto commitment not to grant new oil and gas licenses. The industry is not connecting with that audience.

Meanwhile the message the industry is giving to the British government may sound like, "if you give us tax relief we might invest," he said.

The government may hear a similar message from every British industry sector, looking for special treatment.

It could be better if the industry puts together a package which the government leadership can then take to its party members, such as a specific number of jobs which would be created if it makes specific improvements to the tax regime.

Oil and gas people may live in something of a bubble. "We get surprised when people don't like the industry."

The public seem not to care too much about how much gas the country is importing, which it could be producing domestically.

"If LNGs were coming across the channel on small inflatable boats it would be more interesting," he said, joking about the enormous political attention given to people attempting to come to the UK that way to avoid airport border controls.

Jobs

Although jobs are being lost in Aberdeen, the message may not be heard loudly by a government wrestling with a hundred other challenges. "We fail as a sector to cut through."

"A better message could be, if you want CO2 storage, that will be the oil and gas industry. The chocolate industry isn't going to deliver CO2 storage."

To meet the skills challenge, the industry should consider that it often seeks to attract graduates just by telling them what their role will be, not by telling them why their work will make a difference.

Stuart Payne, chief executive of UK North Sea energy regulator North Sea Transition Authority

It may do better at attracting graduates with a message of the benefits energy brings to society, such as powering systems which keep water clean and keep babies alive in hospitals. "Energy is the business of improving people's lives," he said.

When there is a snowstorm, news reports tell us how many people are without power, not how many people are without milk, he said.

In his past experience, talking that way led to four times more people applying for jobs, he said.

On the positive side, Mr Keiller said he has seen three industry downturns so far, and each time, "I've been fascinated by how resilient the supply chain is."

"The energy industry is one of the most exciting, satisfying, and important industries you can ever be involved in. It is all about improving people's lives," he concluded.

Stuart Payne, NSTA

It should be possible to discuss the future of the North Sea "as grown-ups," rather than in polarised political debates, said Stuart Payne, chief executive of UK North Sea energy regulator North Sea Transition Authority.

We already see two British carbon capture and storage projects putting £6bn into the UK economy, with "thousands of people" working on it. The contribution in terms of money and jobs is tracked carefully by NSTA, he said.

The UK government is holding consultations on the future of the North Sea, and how it should be taxed. "The two consultations are hugely important," he said. It shows that the decisions are being carefully considered. "They are not doing knee- jerk stuff."

Decommissioning is also a vast opportunity for Northeast Scotland. We already know large amounts will be spent on it (currently £44bn). The only guarantees in life are death, taxes, and decommissioning, he joked.

Big offshore supply companies no longer see being in Aberdeen as a necessity. "Our job is to make them want to be [in Aberdeen]."

One of the jobs of NSTA as a regulator is to find the path which delivers what people care most about. At the moment it is energy security and reliability, jobs, and "If we are talking about oil and gas for decades to come, it's got to be cleaner."

It would help if the petroleum and renewables industries could both make use of the same supply chains, he said.

Maintaining the UK North Sea supply chain

The UK offshore oil and gas industry would like to maintain or build its base of UK suppliers during the energy transition. A panel with Great British Energy, Subsea7, Ithaca and Everoze debated how to do it

Great British Energy is an investment body owned by the British state, with a stated mission to own, manage and operate "clean power" projects. It is financed by the oil and gas Energy Profits Levy or "windfall tax".

The body also works towards state objectives, such as maintaining a strong base of suppliers in the UK, paying UK taxes.

Juergen Maier, chair, Great British Energy (former CEO of Siemens UK) said he would like to see the emerging floating offshore wind industry sector "do a better job than the fixed wind [sector]" in working with engineers and supply chains in the UK.

In the longer term picture, it is clear that the future is clean power, he said. Decisions made today will govern whether or not clean power is supplied by British companies.

"The choice is how much [of the market] do we want to capture, and make sure Aberdeen remains the capital."

"GB Energy is going to build bridges and help anybody on their journey. Let' s continue to create projects the region and country deserve."

"The Acorn project could create 18,000 jobs. If we get carbon capture right, and floating wind, we can export the know-how and technology around the world, just like Aberdeen and North Sea has for oil and gas."

GB Energy had been established for 100 days at the time of the conference, and had 60 employees.

Its core focus areas will be floating offshore wind, long duration storage of hydrogen and carbon capture. "Those are areas where public intervention is necessary," he said.

"We [want to] have as much home-grown energy as possible which means we build as much as possible here," he said.

It will focus on supporting community and local power. "We believe we have to take communities with us more. We have to demonstrate why clean power is good, solar panels in schools and hospitals," he said.

GB Energy will also support the oil and gas

industry. "I am declaring myself publicly as for 'all energy'," Mr Maier said, to a round of applause from the room.

"There is no energy without standing on the shoulders of achievements that have been made in the North Sea."

"It baffles me why we have created such a divisive debate out of this."

"We need to both slow down decline and accelerate transition."

It is very important that the [energy] industry reduces job losses, or is able to offer anyone losing their oil and gas job a "bright and brilliant future" in clean energy, he said.

Ithaca Energy

With North Sea oil and gas operations, "I have a problem with the word decline," said Luciano Vasques, CEO, Ithaca Energy. "It is declining so people do not invest. It would probably not decline if people were investing."

"I believe in the end common sense will prevail."

Ithaca produces 120,000 bopd, all from the North Sea. It is a subsidiary of the Israeli-owned Delek Group. It gained its production assets through the acquisition of Siccar Point Energy for $1.5 billion in 2022.

The opening panel at Offshore Europe event. From left to right: Katy Heidenreich, OEUK; John Evans, Subsea7; Luciano Vasques, Ithaca Energy; Zoë Barnes, Everoze; Juergen Maier, GB Energy

The UK should support domestically produced oil and gas for carbon reasons, he said. UK North Sea average emissions are 24 kg CO2 equivalent per barrel. For Ithaca, the average is 17. For imported LNG, it is 79, he said.

Mr Vasques' previous role was in carbon capture and wind, and now he is working in oil and gas. This is an illustration of the interchangeability of skills, he said. "Let's talk about energy as a whole."

"[Jobs in] wind, carbon capture and oil and gas are perfectly interchangeable," he said. "The binary thing [renewables vs petroleum] is completely ludicrous."

John Evans, Subsea7

Subsea operator Subsea7 sees many business opportunities in renewables and CO2 storage, including putting pipelines and cables on the seabed, said CEO John Evans.

The company was founded in Aberdeen, but today its biggest market is in Brazil, and its Norway business is twice the size of its UK business, he said. "We have taken many suppliers with us from Aberdeen to the world."

So far it has proven difficult to make money in offshore wind, or more specifically, "the commercial case for moving to offshore wind has been pretty tricky," he said.

The important issue with the energy transition is getting the timing right, he said, so that new industry starts before the oil and gas industry goes too much into decline.

Re-purposing the UK regulator's data

The UK offshore energy regulator North Sea Transition Authority is keen to support people to re-purpose some of the data it has gathered from oil and gas operations, to use for CO2 storage, hydrogen storage and geothermal projects

The North Sea Transition Authority (NSTA), the UK's offshore energy regulator, has many years of petroleum data gathered in its "National Data Repository" which could be made available for use in CO2 storage, hydrogen and geothermal.

For example, with CO2 storage, the big challenge is ensuring that there will be no leakage of CO2 through older wells, said Alex Longden, chief data officer at NSTA.

Relevant well data information held by NSTA includes data about cementing and the construction (tubing) schematics.

He was speaking at a session "The role of data in delivering net zero" on Sept 2 at the Offshore Europe event.

Overall, its data is being used by regulators to shape policy, and by academics to model flowrates and understand risk, he said. There's a "whole ecosystem of insight and innovation."

"We are looking to have conversation with industry to ensure people can explore data better," he said.

There are many companies entering the subsurface industry for the first time, such as to work on CO2 storage projects. Unless they have a background in the oil and gas industry they may not know what data is available, he said.

The quality of some data sets are better than others. Typically, fields which have stayed with the same operate are probably better, added David Lecore, Head of Data Services and Compliance at North Sea Transition Authority.

Subsurface data

The National Data Repository holds 1.5 petabytes of subsurface data altogether, covering over 13,000 wells, seismic surveys, and reports. This includes 20 data types, from 6,000 data surveys. The data is structured, searchable and reusable.

Subsurface data could be used for future hydrogen storage projects, where data is needed about depth of wells, pressure and permeability of the subsurface, Mr Longden said.

It could be used for geothermal projects, which need data about the thermal gradient (how the temperature changes with depth), permeability of the subsurface (to allow flow of fluids to the well) and available infrastructure.

In both hydrogen storage and geothermal, the data can be used for opportunity mapping and screening.

The data can be used to de-risk new projects of all kinds and help them move faster.

NSTA also has monthly production data from all oil and gas fields in operation. When a well ceases production, NSTA gains access to daily production data.

Flaring data

NSTA also has a role of monitoring and regulating flaring from offshore platforms. This includes supporting emission reduction through planning, consents and operator benchmarking, and enforcing emission reductions.

It has analysed its data to observe a 51 per cent reduction in flaring since 2018, he said.

The goal is to end routine flaring by 2030. This would mean a reduction in CO2 emissions of 3m tonnes a year.

It is possible that NSTA flaring data could be integrated with other data types, such as satellite data about emissions. "We have been looking at it," he said.

The data can be accessed at **Data.nsauthority.co.uk.**

Energy industry confidence in transition is declining – DNV

Confidence in acceleration of the energy transition is declining in the energy industry around the world, a DNV survey found for its 2025 Energy Insight Report. Political risk is a growing barrier

DNV's 2025 Energy Insight Report looked at the "outlook, sentiment and priorities for the energy industry." The full report is available for free download on DNV's website.

The survey had 1160 respondents, of which 33 per cent worked in oil and gas, renewables 35 per cent, electrical power 17 per cent, other energy industry area 4 per cent, industrial energy consumer 11 per cent. It covered North America, Europe, Middle East, and Africa, with people at a seniority level ranging from technical staff to "c" level.

The most noticeable finding was how much uncertainty is growing in the industry, and shaking people's confidence, said Lucy Craig, director of growth and innovation for energy systems, DNV. The main driver for the uncertainty is "political risk."

In North America, 55 per cent of respondents selected political risk as one of the top three barriers to growth, up from 34 per cent in the previous survey.

Another major finding is that confidence in the energy transition is declining. 55 per cent of energy professionals believe the transition is accelerating, down from 72 per cent in 2024 and 79 per cent in 2023.

There are increasing concerns in energy companies that revenue and profit targets will not be hit, particularly in the renewables sector.

58 per cent of oil and gas companies expect to reach profit targets compared to 63 per cent last year; 50 per cent of renewables companies expect to reach revenue targets, down from 67 per cent last year. Only 43 per cent are optimistic about profits, down from 55 per cent last year.

So, the uncertainty in the industry is having a major impact, particularly on the renewables sector, Ms Craig said. The uncertainty is due to politics and geopolitical instability, not technology.

There is also a reduction in interest in large capital-intensive projects. In 2023, 66 per cent of respondents expected there would be more such projects in the year ahead, falling to 60 per cent in 2024 and 54 per cent in 2025.

There was a big regional difference here. In the Middle East and Africa, 75 per cent expected more large projects; in Europe it was 47 per cent (down from 58 per cent in 2024); in North America it was also 47 per cent (down from 56 per cent in 2024).

The biggest barrier to investment is policy uncertainty, she said.

There was 7 per cent increase in of oil and gas respondents saying their organisations will prioritise fossil fuels more than renewables, from 46 per cent in 2024 to 53 per cent in 2025.

There is still optimism over the longer term, with 69 per cent of all respondents positive about overall growth. Although this is a decline from 74 per cent in 2022.

In North America optimism about overall growth has dropped from 79 per cent in 2024 to 64 per cent now.

However, there is a surge in optimism in Middle East and Africa, with 84 per cent saying they are positive about overall growth, up from 69 per cent last year.

"They are benefiting from renewed focus on fossil fuels and massive investment in large renewables," Ms Craig said.

Energy systems

64 per cent believe a "whole energy systems" approach is impossible without a fully digitalised infrastructure.

59 per cent of respondents plan to boost spending on digitalisation. This has remained steady since 2022. So, there is no slowdown in investment in digitalisation.

60 per cent say they will be using AI driving applications in the coming year, up from 47 per cent one year ago.

In the power (electricity) sector, 76 per cent say the aging power grid is a significant barrier. 84 per cent say they cannot connect sources of renewable energy to areas of high demand. 96 per cent say there is a need for urgent investment in the power grid.

51 per cent of respondents believe a successful energy transition will ultimately be unfair to many nations, workers, and communities, such as through loss of employment, shifting investment to other sectors.

This could be improved by making clean energy technologies affordable and accessible, improving the flow of capital to developing and emerging markets, and looking at innovative models to fund energy projects in emerging and developing countries, Ms Craig said.

GenAI to do more for asset performance management

GenAI driven tools can help take Asset Performance Management (APM) further, such as by telling you the wider implication of any problem. But you need integrated data sources to do it. ABB explains

Until now, many Asset Performance Management (APM) tools were siloed and could only work with data provided by a specific piece of equipment, such as when it was maintained last and what its vibration and temperature sensors say.

But with Generative AI (genAI) tools, it is possible to get a broader picture of what is happening, such as how it relates to a wider business process and what recommended actions to take.

ABB, a global technology leader in automation and electrification, provides software to do this, using Large Language Models running on Microsoft Azure OpenAI Services. They have created several domain specific Copilots leveraging this technology.

It means reliability and maintenance engineers can take a broader view. They are not only looking at vibration and temperature data, for example, but can see the historical trends, assess when similar trends were previously detected, view maintenance history and evaluate several potential genAI recommendations for faster decision making.

This broader view can be achieved with a combination of AI and generative Large Language Modelling solutions. It uses vast data stores searching for patterns that are not easily apparent to the human eye. Then it cross-references information from multiple software platforms.

This can support operators to understand the implications of many adverse events. Such as, if it has happened before, how it relates to the pro-

cess, what upstream equipment problem could have caused it, and how this impacts operations and maintenance planning.

For example, if a reliability engineer observes liquid carryover to a compressor, the APM Copilot can help to find the origin of the problem upstream. In addition, it can provide a list of when similar patterns were observed in the past and what maintenance actions were taken.

Based on this information, the system can provide several recommendations for action to resolve the problem. Armed with this plan, integrated decision making between operations, maintenance, and planning and scheduling is made easy.

This also supports the work of APM Allocation, determining the right level of resources to put into optimising the performance of any asset.

To "seamless integration"

The long-term vision is that it will be possible for people to work seamlessly with data from different systems, says Gino Hernandez, Head of Global Digital Business for ABB's Energy Industries division.

Together with this, we will see a shift towards open, modular control systems, as part of large digital "ecosystems," he says.

The seamless integration will have multiple layers. First, people have their own layer within their own applications; then there are broader layers where people access data from other applications or equipment. And it should be possible to integrate with third party software.

Gino Hernandez, Head of Global Digital Business for ABB Energy Industries

No-one has all of their systems from one provider anymore, he says. This means ABB seeks to make it as easy as possible to integrate its software with applications and 'stacks' from other providers.

"Open standards in software development is critical," he says. "Software companies need to be able to work well with each other."

People benefits

Subject matter expertise lives within the tool. From a skills perspective, it enables a lower barrier of entry, and means a new trainee can be highly effective from day one, Mr Hernandez says.

It makes it easier to move staff around the company and develop projects faster.

We can get answers in seconds to questions which previously took someone hours, such as if they had to look up a specification, look up equipment history in SAP or dig out historical data sources, he says.

People can ask questions in natural language and get natural language responses.

That being said, there is still a need for domain experts, particularly in double checking genAI recommendations, and tuning the systems or configuring alarms, he says.

Technology

The generative AI engine is a software module within ABB's suite of Asset Performance Management tools. It is provided as part of ABB's standard offering.

ABB has developed Large Language Models tailored for specific industries, utilising standard services such as Azure OpenAI.

It can gain access to internal data sources, including operation data, engineering data and historical data.

It can also access information from suppliers, such as whether it is easy to obtain a replacement for a failing motor. It can pull relevant information from the internet, such as specification data for certain equipment.

Access to integrated data

"That generative AI engine is going to need access to a vast amount of data," Mr Hernandez says. Many customers are "on a journey of integrating."

Many customers started pilot projects and had to reassess them after finding that they did not have the data available or underestimated the effort needed to get the data, or that there are data quality challenges, he says.

It is useful if customers think about holding data in standard or 'common' data models, which multiple applications can work with, if they want to use generative AI, he said.

This should cover data from IT, OT, and ET (information, operations, and engineering technology).

Sometimes you find that you do not have systems to capture data in the fidelity that you need, so you need a new data historian or data warehouse.

You need high-fidelity data which is structured and tagged to get the best results. If your data quality is low level, you will probably need domain experts to either clean and label existing data or to train the LLM as you go.

Progress maps

ABB sits down with its customers to put together progress maps for their projects.

"We'll engage in a workshop with them and work through where they want to go and where they are at today."

The goals can be better achieved if split into steps or 'phases'. Each phase should provide a certain level of improvement and financial returns, to motivate and justify organizations to move onto the next phase.

Having the right foundation can be critical. "Customers want to move down this digital journey and look at generative AI and autonomous operations. A lot of people want to jump, but they do not have the foundation in place. They underestimate what the foundation needs to look like," he says.

"Customers that try to do everything at once, it can be challenging to even get started. That's where ABB comes in, helping to show what the path forward looks like" he says.

Using AI to better manage tanker loading

Diamond Key International (DKI) of Australia helped a number of road tanker terminals to run their operations more efficiently with the help of data structuring / integration services and AI

Road tanker terminal operators want to minimise queues but without building more facilities than is necessary. Also, they need to ensure that drivers and their vehicles meet regulatory standards and minimise technical problems which can cause delays.

Typical business goals for a road tanker terminal operator might be to achieve a minimum utilisation of 35 per cent, to have average 'gate time' under 35 minutes, average loading time of under 20 minutes, or a total cost of 3 cents per litre of fuel handled, said Martin Mioduszewski, digital program manager and IT Strategy and Operations Specialist with Diamond Key International Group (DKI). Operators may also want to reduce the administration workload.

He was speaking at a webinar organised by

oil and gas e-commerce standards organisation PIDX on August 21, "AI in Action: Case Studies on Standardizing Unstructured Supply Chain Data".

DKI is based in Melbourne, Australia, and provides services to help road tanker terminal operators do more with their data to achieve more efficient operations. It also provides automation and control systems and integrates systems together. It has systems installed in 600 road terminals in 28 countries.

Silo-ised data

A major challenge with improving efficiency is that data can be kept in silos, he said.

Engineering teams have process systems; maintenance staff are focussing on asset conditions and operating costs; operations teams are looking at utilisation and customer service. There are staff checking inventory, and accounting staff checking spending. "Each department has their own patch, their own metrics," he said.

There are many forms of data, including about pumps and pipelines, transactions, quality management, fuel additives, safety, and product security.

This silo-isation creates challenges with cybersecurity and compliance and makes it hard for the company to strategize. It is hard to integrate the data because the data systems behind the software tools often do not provide metadata or other context.

And the trend is for data volumes and complexity to grow, so the challenge of putting it together will also grow, he said.

To get data better integrated, a first step is to understand the data landscape, what data assets are available, what the gaps are, and how the data can be used, he said.

You need a robust data quality governance framework, so people feel data is good enough to trust. They do not try to work around it, or work with separate sets of data.

Once data is understood, robust and trusted, you have a basis for bringing multiple sources of data together into business intelligence tools, which can be used for planning, improving operational efficiency, and identifying risks, he said.

In future, it may be possible to gather data from text sources, including e-mail and job ticketing systems.

E-mails are often used for sending alerts, which is a form of data useful for analysis, he said.

Job ticketing systems can include large amounts of maintenance related data, including about time between breakdowns and remediation techniques.

"If we could use a LLM to learn from this it would be incredibly useful."

Reducing administration load

One terminal operator wanted to use integrated data to find a way to reduce administration workload, including verifying driver licenses and their vehicles, and the compatibility of the vehicle with the terminal.

For driver license and vehicle data, DKI developed an integration with data from the Australian regulatory service for road tankers, Safe Load Program (SLP).

SLP manages data about driving licenses, dangerous goods inspections data, and vehicle roadworthiness on a national level. Companies transporting fuel need to receive a SLP permit.

Before the integration with SLP, this terminal operator was doing a great deal of manual work inspecting driver documents. It was gathering data manually. The data could be error prone and quickly became unstructured.

The operator had been seeking to improve the process by requesting license data in advance of the tanker call at the terminal, and monitoring certificate expiry dates. But it still had no knowledge if a driver's license had been revoked.

With the direct integration to the SLP database, data could be synchronised automatically with records held by the operator, and there were no manual rekeying errors.

Any drivers with a revoked licence are immediately not able to access the terminals.

Operator staff just need a SLP ID number for drivers, and a vehicle identification number, and everything can be obtained automatically.

It is possible to use other SLP data, such as the maximum capacity of each compartment on the tanker and axle weight limits.

Reducing "interlock alarms"

This terminal operator was also seeing high levels of "interlock alarms," which occur when there is a disconnection in electrical earthing between the road tanker and the terminal.

The alarm will automatically stop loading, leading to delays.

By integrating 6 months of data about vehicles and alarms, DKI was able to identify that the worst ten vehicles triggered 23 per cent of the interlock alarms. "It means these ten tankers have a problem onboard," he said.

Queues and utilisation

In another example, DKI was able to help a terminal operator better manage queues and utilisation and make decisions about how many terminals it needed to build or operate.

This customer was considering decommissioning one of their terminals, but its internal analysis had predicted that it would need to build a new bay at another terminal, to avoid long queues.

DKI gathered 3-4 months of loading data. It eliminated data about the slowest 20 per cent of loading events, considering them to be anomalies. Then it built a simulation model, covering a 24-hour day, showing when tankers arrive, how long loading typically takes, and so how long they need to queue. This simulation proved to be 98 per cent accurate in matching actual operations.

The modelling identified two times of day where there is a peak in demand for loading days.

Decision makers could use this insight to understand that by finding ways to reduce the peaks in arrival time, they would avoid the need to build a new bay.

Now, the average utilisation is 36 per cent, and average queue is two tankers.

This is what we do with digital twins and with really good, structured data," Mr Mioduszewski said.

Reducing vapour recovery energy

Another example of DKI finding insights from integrating data was how it helped a terminal operator reduce energy consumption by vapour recovery units.

These units process the vapour inside the vehicle's tank, which is displaced when it is filled with liquid fuel.

The vapour recovery unit uses activated carbon beds to adsorb the hydrocarbon, as the vehicle is loaded.

After loading is finished, there is a "recovery phase" to remove hydrocarbon from the carbon beds.

The analysis showed that a special "economy mode" could be developed, working together with the VRU manufacturer, saving 24 per cent of running costs by leaving the system switched of for longer.

LLMs and supply chain data

Language models can convert unstructured supply chain data into structured data. The richer structured data can then be used, together with language models, to drive decisions. Wonderbotz of Houston explained

We are all familiar with structured supply chain data, such as with invoices. But unstructured supply chain data, such as in e-mail discussions, contains a great deal of insight which could be useful in decision making.

Analysis for decision making, or process automation, is generally based only on structured data. "Unstructured data" here can be defined as anything which is not easily tabular.

But the most useful information may be 'contextual' (for example, what was happening around the situation where something broke), and this contextual information may only be available in unstructured data.

If unstructured data can be made structured, it is much easier to analyse and use to support decision making, explained Bhavesh Joshi, SVP, Strategic Portfolio with Wonderbotz, based in Houston. This is something Large Language Models (LLMs) can do.

He was speaking at a webinar organised by oil and gas e-commerce standards organisation PIDX on August 21, "AI in Action: Case Studies on Standardizing Unstructured Supply Chain Data".

Examples of structured supply chain data are data relating to inventory (SKU numbers, product IDs, quantities on hand, reorder levels); procurement (supplier names, PO numbers, prices, delivery times); logistics (shipping schedules, delivery tracking numbers, freight costs).

Also, data relating to production (bill of materials, machine utilisation rates, production volumes); sales and orders (customer IDs, order dates, quantities, transaction values); warehouse (bin locations, pick times); planning (historical demand figures); and compliance and audits.

Bhavesh Joshi, SVP, Strategic Portfolio, Wonderbotz

Examples of unstructured supply chain data are data about product quality, supplier communications, customer feedback (chat logs, posts); logistics data (traffic cameras, driver notes, GPS), and various documents including contracts, field tickets, and delivery tickets.

There can also be imagery (visual inspection photos), market intelligence reports, and unstructured maintenance data, including notes, voice recordings, and repair logs.

One way to turn "unstructured" into "structured" is sentiment analysis tools which categorise e-mails and social media posts into the mood being expressed in them.

AI agents

Once more data is structured, there may be more scope for using "AI agents," defined here as a tool which works out how to achieve a specific goal, rather than just following instructions.

The AI agents themselves may use generative AI (genAI) and other types of software, such as "Robotic Process Automation" (RPA) tools which follow structured processes with multiple software components.

For example, where the generative AI tool may give you a written response to a question, a genAI together with RPA could determine what needs to be done and execute it in other software tools, he said.

You may also have an "orchestration" tool which decides which tasks need to be done and which AI agent should be used for them.

For example, consider the task of auditing proposed company processes to make sure they follow company policy.

You might use a genAI tool to answer questions about the proposed purchases, the context behind them, and provide a level of confidence in how much they comply with company policy. Then an RPA tool could cancel or approve the purchase or take out alternative steps.

The genAI tool can determine whether the proposed purchase aligns with the intent behind your company purchasing policy, not whether it follows the policy to the letter.

Where the genAI gives the proposed purchase a low level of confidence that it complies with company policy, you might pass the decision to a person to make a judgement.

The genAI tool can also extract information from invoices sent as pdf, to get structured data.

If the amount of the invoice is different to the purchase order, the RPA could file a dispute claim with the supplier. "Human intervention becomes less and less," he said.

"This is something we have already implemented at the customer, so we know it's working," he said. "This customer has seen millions of dollars of savings."

"You are able to have different source systems, different data points, different channels of data, and be able to use it all together to drive the outcome."

A genAI tool plus RPA could also automate many of the tasks of a warehouse manager, working with multiple unstructured documents, including bills of lading, packing slips, customer orders, and regulations.

It could automate the work of a logistics manager, perhaps identifying that a trucking company has vehicles unavailable due to a storm, then identifying alternative carriers with a similar price offering.

If there is a transport strike, the system can use various unstructured data sources to estimate what the delays might be.

The genAI could look up data from external sources, such as US tariff (HTS) data.

The genAI could allocate inventory in the warehouse to different customers.

It could generate responses to requests for quotes (RFQ) from buyers, creating an e-mail which a person can check. If the software is not able to generate the response, it can be handed to a staff member, and the software can send a follow-up if there is no reply after two days.

"You could have an agent that can orchestrate all these types of activities."

"Those are some of the ones we have been able to help our customers deploy.

It has been really helpful," he said.

Wonderbotz' service includes helping customers choose the right model, set it up, and set in the 'guardrails,' train and test it.

To access slides or video of the event, see **https://pidx.org/pidx-data-request-form/**

Groundup.ai – templates to build equipment health models faster

Groundup.ai of Singapore has templates of commonly used rotating equipment, which can be used to build equipment health models faster, to identify trends leading to failure modes

Digital tools have long been used to monitor equipment health and identify trends which may lead to failure.

But they normally take a long time to build, as much as 3 years for one piece of equipment. It involves painstaking work of looking through time series sensor data and trying to identify and explain patterns in it. For example, you might identify that a higher than usual level of vibration could mean something is loose or misaligned.

To make it faster, Groundup.ai of Singapore is developing a models library for rotating equipment. These can be quickly applied to many types of rotating equipment, as a starting point for an equipment health model.

It means that the model for specific equipment can be put together much faster, using the library model as a starting point.

Groundup has a particular focus on electric motors, which have many common elements, even though they can form a component of very varied types of machinery.

While there are unique factors to all motors, there is also much commonality among equipment from different manufacturers, or motors of different sizes, says Leon Lim, CEO and Founder of Groundup.ai.

A model developed for a small motor could be applied to a large motor with a few basic assumptions or "smart guesses", such as assuming vibration amplitude will be bigger for a bigger motor, he says.

Perhaps 50 per cent of the library model could be applied to any motor.

If Groundup is asked to build a health model for a pump from a manufacturer it has not seen before, "we have to be a bit cautious," he says. But "our guess it will most likely work the same."

Leon Lim, CEO and Founder of Groundup.ai

The system can be used for other equipment containing motors, such as blowers, chillers and any rotating machinery such as pumps. The Groundup model has been extended to eight hundred core machinery classes.

The system works particularly well with vibration sensor data, he says.

One maritime client is Atlantic Marine Group, which has deployed the full system on all machinery on one vessel, including turbomachinery and seawater pumps.

Groundup also has a project with the Singapore Navy, where its systems monitor a broad range of equipment.

The company also works in consumer, food, paper, and oil and gas industries. Systems have been deployed by Coca-Cola, Almarai (a Saudi dairy company), CBM Qatar (a facilities management company), and Napco National, a Saudi manufacturer of plastic and paper packaging solutions.

Groundup recently closed a "Series A" funding round with $4.25m.

Using AI

Once you have developed a health model for a specific asset, it can be used as a basis for AI tools which get a broader understanding of what is going on.

For example, by combining the health model data with documentation, or notes by people describing what they have learned about causes of problems, a large language model-based tool may be able to tell you the root cause of a problem and suggest a solution.

The Singapore Navy used AI tools together with the health models in this way to fine tune its alarms and reduce the number of false alarms from equipment, he says.

Whether operators of equipment need "alerting" depends on the criticality of the equipment, not just whether it is heading towards a failure mode.

Some pieces of non-critical equipment can be safely run to failure. In this case, the only necessary 'alert' is when the equipment has actually failed, he says.

"We helped them to use AI to train all these alerts. We put in parameters that matter and cut out those that don't matter. The biggest differentiator in being able to provide useful alerting is the quality of the models," he says.

Emerson - using local AI models in automation

Automation technology company Emerson is developing "local" (ie not cloud based) AI models to help manage industrial processes, including designing plant, plan control system upgrades, and develop decarbonisation strategy

The AI systems which are most useful in industrial facilities and control systems may be models running locally, not large language models (LLMs) in the cloud, says automation technology company Emerson.

Where an LLM is trained on all the text data in the internet, and works mainly by finding patterns in language, a "local model" can work with data using physics and engineering equations, and traditional AI.

These "local models" can be specifically built for the process they are looking after, and able to apply the relevant physics and engineering equations.

They can also use calculations based on first principles (direct equations), rather than just looking for patterns, as a LLM does.

Because they have been built and tested for a specific piece of equipment, their results should be more reliable than those from a broad large language model based system, Emerson says.

It also means that all the processing can be done on local machines, without using cloud systems.

"Generic large language models are insufficient for a live, mission-critical industrial plant that cannot afford unreliable or unsafe results," said Ram Krishnan, chief operating officer at Emerson.

One example is Emerson's AspenTech "Optiplant AI Equipment Layout" tool, which uses generative AI to generate multiple design options for greenfield and brownfield plants.

Engineers can then select the layout which they think is most suitable, taking into account performance, buffer zones, safety, proximity, and other factors.

Another local AI tool is "DeltaV Revamp", which works out how to evolve a legacy control and safety system to using the modern DeltaV communications protocol.

The AI "learns" from data gathered from thousands of modernisation projects, so it can plan the control system update with increased speed, and accuracy.

AspenTech's "Strategic Planning for Sustainability Pathways" local AI tool uses generative AI technology to help companies work out the right long term decarbonisation strategy, taking various options and possible pathways into account.

Emerson has its "Aspen Virtual Advisor" (AVA) built into its technologies. This provides users with operational guidance when they are working with its tools. AVA is programmed with deep knowledge of the relevant software tools.

Users can ask questions in natural language, to identify possible bottlenecks in processes, or find better ways to achieve specific goals.

Emerson has virtual advisors built into its Ovation 4.0 Automation Platform, which can be used to run "software-defined automation", and its Guardian Digital Platform for managing product support, subscriptions and licenses.

At the company's "Emerson Exchange" conference in May 20 2025 in San Antonio, Texas, it announced its new platform "Project Beyond" which can be used to deploy and manage its AI applications and models.

Managing cybersecurity on offshore unoccupied assets

Cybersecurity on offshore unoccupied assets can be extremely difficult, particularly if you are legally required to allow people to board them when in distress. The answer is a system with multiple layers. ABB experts explained

Operating offshore oil and gas assets unoccupied has long been possible to do technically, but has cybersecurity challenges.

You need to be able to maintain security in abnormal conditions, such as a fault state or shut down.

If it is not secure in the period between going into a fault state and the fault being fixed (such as with a person onsite), you give motivation to hackers to put the system into a fault state, explained Paul Gogarty, technical advisor for automation, telecoms, digital and cybersecurity with ABB, speaking at the Offshore Europe event in Aberdeen on September 3.

Another challenge is that any maintenance teams on the site may include people from supplier companies you don't know, and cannot easily check on.

And your ability to monitor what is happening remotely is limited to the sensors and cameras you have installed. A physical intruder may be able to avoid being in front of your cameras.

"Refuge Area" requirements in some countries, including UK, require you to be able to give access to strangers in emergency situations, such as if their boat is sinking. So, you are required by law to allow unauthorised people onboard.

Paul Gogarty, technical advisor for automation, telecoms, digital and cybersecurity with ABB

Sometimes, the first stage of a cyber attack is for an intruder to gain physical access and then install devices on the network which enable the attacker to get control remotely. "So, cybersecurity also has a blend of physical security," Mr Gogarty said.

Unoccupied energy industry assets have seen visits from people with an "urban explorer attitude", who enjoy going to places they are not supposed to go, he said.

Offshore installations have equipment which can be dangerous, such as electrical switch gear and rotating machinery, designed to be in an environment which only trained and authorised people can access. There was no plan for "urban explorers".

Solutions

To meet the "Safe Refuge" requirement, the 'physical' world can have a place where someone can go if they are in distress, seek shelter and raise an alarm, but with physical fences and padlocked cabinets to ensure they cannot access any of the equipment, Mr Gogarty said.

Meanwhile, the digital world can be heavily segmented and layered, said Luke Molyneaux, Cyber & Information Security Officer with ABB. So while you may be required to provide someone access to the physical world, the 'digital' world can deny all access to anyone not authorised.

An example of a security "layer" is a system which flags up if someone logs onto your Windows system at an unusual time or from an unusual place. Rather than either allow or deny someone complete access, it will allow you access because you have the login credentials, but give the real owner an opportunity to eject you from the system.

In the digital world, you can have what is known as a "Demilitarized zone", an area between the internal network and the outside world, preventing anything external which is untrusted from entering the internal network.

Luke Molyneaux, Cyber & Information Security Officer, ABB

If someone needs access to a critical system, there can be two factor authentication, or a need to get approval from the plant owner.

So, you can still ensure the most critical systems can only be accessed by authorised people, even if the whole system is in a fault state or you don't know exactly who is onboard.

"The digital security landscape is evolving faster than many people realise," Mr Molyneaux said. Every time there is a security 'event', tens of patches are developed to prevent it happening again. "You don't ever want to rely on one thing."

Physical security information management

The work of managing data relating to physical security has got so big it has its own name, Physical Security Information Management (PSIM).

This includes video images from cameras, and the work of tracking and reacting to any physical intruder.

One suggestion is that you have a public ad-

dress system as part of the security system, so if you see an intruder you can speak to them through speakers, "we have picked you up".

"That acts as a huge deterrent," Mr Gogarty said. "Most intruders will run at that point."

The PSIM also records information which can be passed on to authorities.

Petroleum vs renewables

There are some cybersecurity differences between offshore wind and oil and gas assets. Most oil and gas assets are normally occupied, and if not, they are "close to occupied", and are more likely to have vessels available, and can be accessed by helicopter.

Offshore wind installations typically don't have vessels in the area and can't be accessed by helicopter. So, it can take a lot longer for someone to fix any problem.

Moving forward

The biggest barrier to adopting stronger cybersecurity controls can be that people do not see what they need and what is going to be required, they only see the costs of systems, Mr Gogarty said.

Regulations can help here, if they mean higher costs to not implementing cybersecurity, even if nothing gets attacked.

The energy industry may be able to learn from industries which have much more internet-based IT infrastructure with millions of accesses a day, such as banking, he said.

Using 5G in energy operations

Cellular communications networks are best known for their use covering wide areas for public use. But they also offer benefits over wi-fi for a private network such as for an offshore oil and gas installation. Ericsson explained

Private 5G cellular communications networks offer many advantages over Wi-Fi, and so may be more suitable for use in an oil and gas facility, on or offshore, says 5G systems provider Ericsson.

They can offer higher bandwidth communications than wi-fi, and have fewer weak spots (with low coverage). They are also designed for moving receivers (carried by people or assets), and so hop easily from one transmission tower to another, unlike Wi-Fi, which may take longer to log on to a new router.

For installations with devices which communicate directly with a satellite, 5G offers advantages in that the latency (communication delay) is much lower, said Ammar Sabbagh, VP industry and partnerships with Ericsson, based in Dallas.

Ericsson's mobile network systems carry 50 per cent of 5G traffic globally, he said, speaking at an event at Offshore Europe in Aberdeen in September.

If your offshore installations is covered by 5G communications systems, you can use smartphone-like devices for many different uses, without the bandwidth constraints of working with wi-fi, he said.

5G tools can also locate and position workers real-time within a few metres without GPS.

Wi-Fi signals can sometimes drop, which can have repercussions for data transmission, even if it is only a fraction of a second. And a Wi-Fi network cannot guarantee a signal will be sent in the required time, he said. 5G networks do not have this problem.

It is useful to have your own 5G network even if your installation is already covered by a 5G network, he said, because the needs of energy companies are different to those of the public. Where the public want to see high download speeds and broad coverage, energy networks may want higher upload speed, coverage focussed on a specific area, and capability.

5G networks are also useful in the 'midstream' sector of energy industry (maritime shipping and pipelines). Pipeline operators want systems to gather and communicate data about leakage and vegetation. Maritime shipping companies want communications systems. Ships can communicate via the 5G network of an offshore installation they are visiting, even when 4km away.

In the 'downstream' sector, facilities such as refineries want to use their communications systems to communicate operations data, so it can be viewed by remote support personnel. They can use the data to help avoid equipment failures and shutdown, and unplanned maintenance.

The low latency of a 5G network is particularly useful if you are maintaining a 'digital twin' of a facility, and you want it to be instantly updated if there is a change to sensor data, he said.

Such digital twins can be used to monitor the location of workers, the condition of the asset, even the weather. "You can see the work environment in real time," he said.

5G networks can also be more reliable than older wired networks, and many wired networks are very old, he said.

Many customers are looking to bring in some kind of machine learning on their assets but have not yet connected them to any network. In this case, connecting the assets needs to be done first.

In future, 5G networks could support robotic operations, including "walking" robots with cameras, which can move around the installation and take photographs. These could replace people doing inspections with pen and paper, such as to monitor noise or the condition of handrails.

You could have a 5G drone fitted with a heat camera monitoring the facility for equipment generating more heat than it should be, an indication that something is going wrong.

The drone could be used to look at tanks from above, detect people, and search for fence defects. It could be used to carry gas detection and quantification cameras and other devices mounted on drones or fixed.

Once companies have a network, they often find more devices they want to add, such as CO2 cameras, Mr Sabbagh said.

Clients typically want systems to improve safety, production and operating efficiency, asset condition monitoring, and video surveillance, he says.

Building your network

Ericsson has an 'ecosystem' of partners providing 5G related services, including providing sensors which can send data by 5G, and providing gateway devices which connect networks to 5G, he said.

It has a service to test how well configured devices are to run on a 5G network, including whether they have the necessary cybersecurity, and if they achieve the bandwidth they promise. Only 60 per cent of devices typically pass this test, he says.

Ericsson helps customer employees to understand the increased value they can get from 5G devices. In one example, workers were provided with mobile devices but needed some persuasion that they were better than traditional "push to talk" handheld radios, he says. Push to talk only allows one person at a time to speak.

Work is already in place on the 6G network, which will be more for machine-to-machine communications he says.

How ABB manages internal training

ABB provides a broad range of training programs to its staff and customers under the name "ABB University." It covers technical developments and soft skills, and includes e-learning, webinars and classroom training

Automation company ABB provides a wide range of training program to engineers, programmers, maintenance and operations personnel, under the name "ABB University". It sees the service as a "learning ecosystem".

The training is available to company and customer staff, at levels from graduates to experts and senior engineers. It includes e-learning, webinars and classroom training.

The training can be provided at ABB training facilities, at customer plant sites, or online. ABB also runs "challenger days", when graduates employed by its customers visit to do "cross learning" from ABB.

It also has training collaborations with universities, including Imperial College London.

There are training assessment programs.

The training supports people to update their technical expertise relating to existing and new products, processes and technology advances.

Simon Wynne, head of energy industries for UK and Ireland, ABB.

Longer serving ABB staff still need to keep on top of developments with their own technologies and maintain knowledge of customer processes.

There is training for non-technical skills, including soft skills and teamwork. "Teamwork" today can mean working together with someone in Bangalore, so requiring different sorts of team skills, says Simon Wynne, head of energy industries for UK and Ireland, ABB.

AI

ABB University offers training relating to software skills and AI. There is "expert level" training on how AI can support specific expert work, and "broad" training about tools which "everyone has on their laptop," Mr Wynne says.

For experts, it is left more to the individual to define the particular tool they need to develop for their own product.

Introduction of AI can lead to changes in how systems are controlled, and the roles people do, Mr Wynne says. If the product is doing something new itself, there can be new responsibilities of the provider of it. Sometimes longstanding legal documents need to be reviewed.

AI is constantly evolving, says Emily Lockley from ABB University UK. "We are trying to be adaptive."

Recent graduates

ABB's training for recent graduates can be particularly important. 10 per cent of its workforce has been working for less than 3 years since graduating, Mr Wynne says.

Adaptability can be what is most important for a graduate. "If you are thinking of moving into energy then do it and talk to people. It matters to talk to people, no matter what badge you have."

It is important to give graduates routes to advance after entering the company, covering every product and service the company offers, Ms Lockley adds.

Emily Lockley from ABB University UK

Graduates may find themselves having to move to a different domain for job market reasons. In this case, they should see the development of new skills as developing "additional skills", rather than "restarting," she suggests.

The best career advice for a graduate could be to "maintain a healthy interest in industry, marketplace and technology. Be prepared for change," says Cameron Fyffe, UK Service Manager, ABB.

Making a subsea digital twin from camera images

With advanced subsea cameras together with image processing, it is possible to develop sophisticated "digital twin" 3D images of subsea equipment. This can help plan operations and understand problems. HPR explained more

Subsea equipment can often end up looking very different to what operators think it looks like, perhaps because it was installed many years ago by a different company, drawings have been lost, or items have moved on the seabed.

And while subsea photography and video can provide useful information, operators can get a better understanding, and be better able to understand dimensions, if they put video together using computer modelling to make a 3D digital twin.

HPR (High Performance Robotics) of Aberdeen provides subsea robots with high resolution cameras to take subsea video. These video images can be used to build 3D models, which can then be used to optimise operations and maintenance.

Its camera systems are typically 20kg and the largest is 30kg, said Jan Stander, managing director.

The company uses custom cameras on the subsea robots (ROVs), which can capture images in multiple directions simultaneously.

The company has a test tank in Edinburgh, Scotland, where it can try out its equipment. The tank can have water flows at 3 knots, and waves of 0.5m.

Using the video

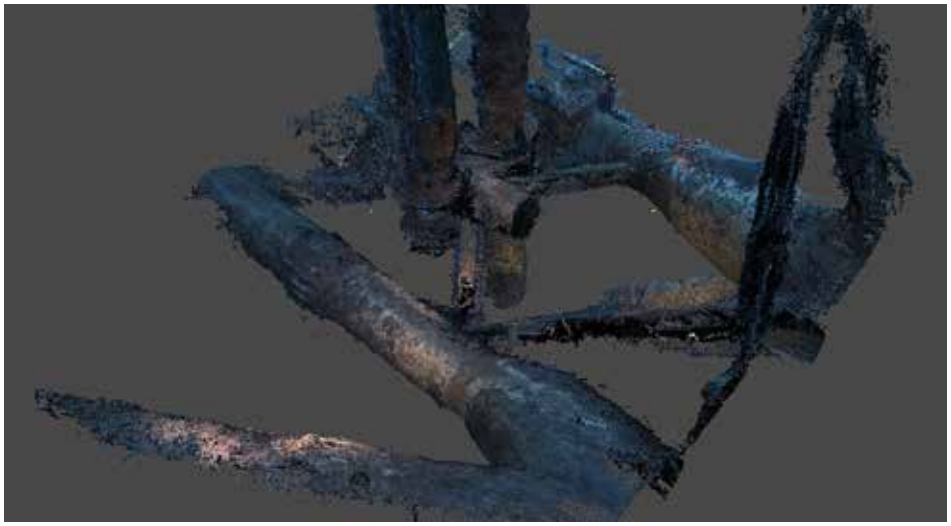
Computer analysis on the videos can provide measurements of the subsea equipment. You only need one point in the image of known dimensions to use as a reference, such as the diameter of a pipeline. Accuracy can be under 1mm over a 5m wide area.

The 3D model can be very useful in subsea operations. For example, if your project is to lift a subsea structure from the seabed with a heavy lift vessel, you will need to ensure the clamp fits all around it, because otherwise your charter of the heavy lift vessel is wasted. This can be checked using a 3D model made using multiple images.

3D models are also useful for comparing the current condition with a past condition,

such as to monitor growing damage to paintwork or coating, he said.

The 3D images can be viewed using an Oculus headset, so you can look in any direction. They can be layered onto a 'sensor digital twin."



A 3D digital twin of a subsurface object put together with imagery taken by a HPR camera on a ROV

Automated tools to manage machine identity

Many companies do not know exactly what devices they have on their network. This makes cybersecurity much harder, and means people can log onto the wrong device. Device Authority has automated tools to map them

As companies add more and more devices to their systems, sending data to their cloud servers, it gets harder and harder to keep track of them.

If people forget about devices, they are probably not managing their cybersecurity, which makes them much easier to hack.

And if people do not know exactly where the devices are, it makes it more likely they will log on to the wrong device, which could have dangerous implications.

Device Authority, based in Reading UK, with offices in Massachusetts and California, provides software which can locate all the devices on your network, monitor their health, manage and update them.

Examples of its customers in the energy sector are oil and gas operators in Texas with remote oilfields connected by satellite, wind turbine operators working with sensor data, and operators of smart electricity meters in homes.

The service is primarily geared to devices which have direct access to the operator's cloud systems, which is normally Microsoft Azure.

Companies have been installing more and more sensors on their assets, to do more analysis of their operations, and to reduce the need to physically visit the asset to monitor its health, says James Penney, CTO of Device Authority. It means keeping track of them gets harder and harder.

Systems are not constructed with an intrinsic ability to determine the difference between one device and another, or how far away a device is.

So a piece of equipment can be hacked from the other side of the world, without anyone wondering why data is being sent around the world.

Or you could be getting data from a wind turbine in the US thinking it is a wind turbine in the Netherlands.

Hacking through hardware

There is a well known story from 2017 of a casino in Las Vegas, where a hacker managed to access the network via an internet-enabled aquarium thermometer.

Casinos like to think of themselves as very good with security, and have large security budgets, so it was quite a shock, Mr Penney says

The thermometer was internet enabled because someone wanted to save on the cost of having a person checking the temperature manually several times a day.

Once hackers could access the thermometer, they could find a way to get to another device. "Before you know it you are in all kinds of systems," he said.

There was a similar story about a Target retail store in the US, when a hacker accessed a network via an internet enabled air conditioning system in 2014.

There is a great deal of variation in the in-built security of devices. As one extreme, if you buy a basic Raspberry Pi, it has no in-built security at all, and it all has to be configured manually, he said.

Any security system has to achieve a balance between usability and security, he says. We can achieve high security by switching all the devices off, but that does not make them very usable.

This balance is best achieved by cataloguing risks and being aware of them, he says.

An "image" of devices

The solution offered by Device Authority is a software tool called "Key Scaler", which builds an "image" or catalogue of all the devices on any network.

The software runs a full health check once a week, checking that the software the devices are running is the software that is expected, and everything is in the same location on the network.

There is a discovery tool which can scan networks and find all the assets, perhaps including some you do not know about.

If someone plugs in any new hardware, the changes are instantly seen.

Key Scaler can control the access which individual devices have to the private cloud or wider internet, ensuring that only authorised devices can communicate beyond the private cloud.

It can run either standalone or on the cloud. The cloud based version runs on Microsoft Azure. Microsoft Azure's IOT service is the most commonly used online service for handling device data, Mr Penney says.

So the cloud version of Key Scaler monitors devices which send data to the operator's Azure IOT account.

Device Authority won a Microsoft "Partner of

the Year" award in 2023, for "rising technology."

A root of trust

The most critical part of a machine identity management system can be the starting point, your process for adding a new device to the system.

If that is managed properly, it gives you a "root of trust", linking to the original identity.

This is analogous to the way we as individuals are given a birth certificate linking to hospital records of our births. It is then used as a basis for other documents such as a passport throughout our lifetimes to identify who we are, Mr Penney says.

The equivalent for devices on a network is the unique "key" number inside them, which is used to identify them on a network over their lifetimes.

It may be better not to use the same "credential" for the life of the device, but have them expire periodically and be replaced by another, just as we must renew our passports every 10 years, he says.

Having expiring credentials "minimises the attack surface for that credential if it gets compromised."

Managing identity by machine

Device identity should be handled differently to human identities, he says, since devices have a prescribed use. For example, a gateway will spend its life taking analogue signals from wind turbines, digitalising them and sending them to the cloud.

So it is possible for digital systems to set the limits on what they can access, and what can access the device. Managing devices manually would probably require more staff than there could ever be available, he says.

People, by comparison, do different activities during their lives, using different devices, in different job roles. So it is harder to manage their access digitally, and it involves manual work.

But people can also monitor their own access rights, something devices cannot do. For example, if there is a login to a Gmail account from an unusual computer, the account owner gets a warning email. "Devices don't have that context," he says.

New threats

New threats on systems are emerging almost daily, he says. AI processes can be used to create new attacks.

Companies should be as agile as possible, so they can respond better to new threats.

"Quantum computing is on the horizon. That will change everything [with cybersecurity]," he says. "If you don't have agility you'll never be able to respond to that."

For example, companies may want to try "security by obscurity", where you make it impossible for attackers to see what you are running, so they don't know how to subvert your processes.

"There's always something new. People should figure out what their plan is to respond to incoming threats they don't know about," he says.

Improving OSV performance with an "efficiency loop"

Opsealog of Marseilles, France, has developed an "efficiency loop" process to help operators of Offshore Supply Vessels (OSV) improve fuel consumption / emissions and utilisation. Here is how it works

Opsealog, a company based in Marseilles, France, has developed an "efficiency loop" process for working with operators of Offshore Supply Vessels (OSV).

It involves gathering data from ships, integrating, and cleaning it, analysing it with various algorithms and models, and generating improvement suggestions.

Then Opsealog holds a monthly meeting with the client to go through the suggestions and see how suggestions made in previous meetings have worked. 95 per cent of the efficiency loop solution is digital, the rest is based on expert recommendations.

The company calls its offering "efficiency as a service."

Two of Opsealog's focus areas are the reduction of fuel consumption / emissions and improving fleet utilisation – making the most of the vessel's cargo carrying capacity.

The ROI from using the service are, on average, over 250 per cent including savings on fuel costs and from fleet optimisation, says Arnaud Dianoux, Founder and Managing Director, Opsealog.

There is an emerging ecosystem of technology which can be used to help improve efficiency and utilisation, including devices to measure fuel consumption of each engine, and software to improve logistics management, he says.

Companies increasingly recognise that they need to measure if they are to improve.

Opsealog has gathered data for over one thousand vessels over the past 10 years. The more data it has, the better the algorithm gets. It has over two hundred fuel models.

Arnaud Dianoux, Founder and Managing Director, Opsealog

The operating cost of an offshore vessel including fuel can be USD Dollars 10m a year, so savings are well worthwhile.

The financial incentive to reduce emissions on OSVs is large in the European Union, where companies need to buy emissions credits under the EU Emissions Trading Scheme.

Companies want to have a 360-degree view about how effectively the vessel is being utilised and its operating costs minimised.

However, for vessels outside Europe, the main regulation putting costs on maritime emissions is IMO's Carbon Intensity Indicator (CII), and this does not apply to offshore vessels.

Mr Dianoux is a former captain, with 10 years sailing experience on offshore vessels. In this work, he recognised that there was plenty of scope to improve logistics efficiency and reduce fuel costs, leading to him setting up the company.

Opsealog's main customer base is Offshore Supply Vessels (OSVs) used by oil and gas and wind farm operators.