

Microsoft Energy Core

Special Report Industry Board Meeting - Q2, 2022

Leveraging the Strengths of Two Modern Worlds: The 4th Industrial Revolution Meets the Great Energy Transition?



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20 **Participants**

- Board Members
- Attendees

Chapter 1: **Executive Summary**



Consider the enormity of this statement for a moment: more data has been generated over the past two years than in all previous recorded history. Astonishingly, in alignment with Moore's law, computer power has doubled every year since the 1970s. This means that operations in the energy industry are now faster, safer, and more transparent than ever before. These vast waves of technological advancements have also been a hugely positive disruptor to prosperity, productivity, job creation worldwide, in all sectors.

Looking ahead, the world must leverage all this technological expertise and experience to tackle the greatest environmental threat it has ever faced - and in turn, its greatest social and economic threat. Have no doubt that the global transition towards a cleaner and greener future will not succeed without leveraging technology, especially the digital tools that fall under the umbrella of the 4th Industrial Revolution. Each industrial transformation over nearly 250 years has sparked the creation of custommade solutions for major challenges - albeit on a monumental scale, the energy transition is our next challenge. Clearly, the energy transition is a deeply complex journey and in turn, it will inevitably take some time - but leveraging digitalization would add urgently needed speed to the clock.

PRESSURE IS ON

Emissions from the energy sector have climbed by 60% since the United Nations Framework Convention on Climate Change (UNFCCC) was signed in 1992, according to the International Energy Agency (IEA). While global carbon emissions declined by 5.8% in 2020 as the Covid-19 pandemic dulled global activity, energy-related carbon emissions are projected to significantly rise again in coming years.

Significant progress must be achieved ahead of the world's biggest annual climate gathering, COP27, in Egypt this November. This is especially true as a myriad of businesses in the energy value chain, as well as world leading energy firms, have set net zero targets, such as Saudi Aramco and ADNOC. The same

applies to Middle Eastern nations - Saudi Arabia, the UAE and Bahrain, so far that typically have petro dollars driving their economic engines.

Investors must also focus more solutions that enable the affordable scale up and storage of energy from existing renewable markets, such as solar, wind, hydro, carbon, capture, and storage (CCS), and clean hydrogen. The latter, for example, could achieve 20% of the global carbon abatement required by mid-century, the Hydrogen Council highlighted. Overall, more than 90% of the solutions leading up to 2050 involve renewable energy, flagged the Abu Dhabi-based International Renewable Energy Agency (IRENA).

The world is moving too slowly to hit climate goals by 2050, but the good news is that efforts are certainly on the right track. Investors spent a record-breaking \$755bn on deploying such technologies in 2021 - up by 27% year on-year. Source And a surge in partnerships, including cross-sector alliances, are making real, tangible progress. For one, Bee'ah — the Middle East's sustainability pioneer — is utilizing



Microsoft Azure to become the region's first fully digitally enabled company. Bee'ah has been able to innovate faster and has reduced total cost of ownership by 30% — all in record time.

MINDS OF THE FUTURE

Digitization, big data, cloud computing, analytics, and many other advancements will not only help make a successful energy transition a reality. Applications are also having a game-changing impact on jobs – ranging from job creation to job displacement, from heightened labor productivity to widening skills gaps. In many industries worldwide, the most in-demand occupations or specialties did not exist ten or even five years ago: just think of modern job titles like Chief Digital Officers, Social Media Managers, and Data Scientists. And the velocity of change will only guicken.

The Internet of Things (IoT), virtual reality, and machine learning are revolutionary tools that are also

reshaping global e-commerce and customers' experiences and demands, while FinTech and blockchain are fast gaining momentum worldwide. The same applies to other disruptive technologies, like drones, advanced commodities mapping, virtual reality, and so much more. All this feeds into the human capital, which is a pivotal link in the chain: a successful energy transition demands innovation and advanced skillsets.

As the energy transition accelerates, embracing innovation is a must for the industry. Those who remain flexible are most likely to float and succeed whilst those who linger on processes of the past will lose their relevance. In such a rapidly evolving employment landscape, the ability to anticipate and prepare is increasingly critical for businesses, governments, and individuals who collectively need to strengthen and protect three interlinking, nonnegotiable Ps: people, planet, and profit.

and challenges reflect the **Founding partners** opinions and brainstorming of the 30 high-level executives who dialed in Se ΜΛΛΝΛ accenture from ten countries on three continents - the Middle East, Europe, and Asia. The **Chatham House Rule applies,** Rockwell Automation Honeywell Schlumberger Sensia bar those featured. EMERSON

The Energy Core: A Global Facility and Initiative

Harnessing the power of AI, cloud technologies and the IoT, organizations can transform their businesses, increase productivity, drive innovation and run more efficient and sustainable operations.

Program anchors on 4 key pillars:

1 Empowering Digital Transformation

Building on AI and cloudbased technologies, **Microsoft Energy Core** supports organizations to develop AI solutions that improve operational efficiencies, enhance sustainability, increase energy innovation, and drive workforce transformation.

2 Coalitions for Responsible Innovation

Microsoft Energy Core is an open initiative that incorporates energy operators, leading industry partners and academics to lead responsible innovation across the energy value chain.

Closing the Skills Gap & Enhancing Employability

Energy Core showcases Microsoft's investments in Al skilling, complemented by contributions from leading universities, educational institutions, and industry partners to deliver AI readiness programs tailored for the energy sector.

Microsoft Energy Core has a mandate to create societal impact. Together with our partners, we are pursuing innovative solutions to solve the energy industry's most pressing issues on worker safety and environmental sustainability.

4 Sustainability &

Societal Impact

What is Microsoft

A global initiative and center dedicated

to digital transformation in the energy

sector. Building on AI and cloud-based

technologies, Microsoft Energy Core

supports organizations to develop AI

solutions that improve operational

efficiencies, enhance sustainability,

increase energy innovation, and drive

Dubai, Microsoft Energy Core has global

Source of

Special Report

This focuses on the exclusive

webinar on the 7th June 2022.

what is next for global trends

insights harvested from

Microsoft Energy Core's

Its pressing questions on

workforce transformation. Based in

scope.

Energy Core?

Microsoft Energy Core's Protocol of Engagement

- Microsoft Energy Core's industry board agrees to collaborate and exchange knowledge to accelerate innovation and digital transformation in the energy sector.
- Microsoft Energy Core's industry board members will attend quarterly meetings to establish an industry challenge to solve for using AI (see page 5). The identified challenge will move onto the ideation phase of the Center's integrated strategy where solutions will be brought to life through hackathons.
- Microsoft Energy Core Industry Board Members will be elevated as 'Featured Speakers' on a rotating basis for each quarterly board meeting.
- Microsoft Energy Core's industry board members will deploy at least one representative from their respective institutions to each hackathon to bolster the Center's posture and commitment to advancing digital transformation in the energy sector





- Microsoft Energy Core's industry board will commit to qualify at least one minimum viable product that emerges from each hackathon and assess its viability to be deployed in a working environment. If the pilot phase of a minimum viable product proves to be successful, Microsoft Energy Core's industry board will strive to support further incubation and establish a strategy towards scaled roll out.
- Each quarter, Microsoft Energy Core's industry board members will deploy one representative from their respective institutions into the AI Academy to conduct a lecture on the practical applications of AI and the digital skills necessary for the future of work in the energy sector.



Chapter 2: Artificial Intelligence

Pathways to COP27: How to accelerate the application of artificial intelligence (AI) across the energy sector?

Panel Session at the Microsoft Energy Core 2nd Anniversary Roundtable Workshop

- Daniel Jeavons, Vice President Computational Science & Digital Innovation Technology, Shell
- Widad Hadad, Vice President & General Manager, United Arab Emirates, Oman, Yemen & Lebanon
- Binu Mathew, Chief Technology Officer & General Manager, BHC3
- Darrell Willis, Corporate Vice President of Energy, Microsoft

Moderator: What are your opening thoughts on the question of the panel?

Daniel Jeavons: According to a joint report by the World Economic Forum and Accenture, as much as 20% of global greenhouse emissions could be reduced using digital technologies. Putting that in perspective, heavy industrial sectors account for 37% of emissions. The impact the digital can have is massive. Digital technologies are one of the key levers that we can pull to accelerate a reduction in global CO₂ emissions. And within that, for me, the biggest promise is that many of the other digital technologies are either about obtaining new data sources or new types of data or else visualizing data in a variety of different ways, whereas AI is at the core of enabling us to make intelligent decisions upon which we can act and make difference. The challenge is to scale and have the impact we're talking about. We need to be able to deploy AI at scale in almost every part of our business. In this aspect, we talk about three core areas. First, AI making us more effective and efficient in terms of our corporations. Secondly, AI is helping us to design the next generation of the energy system and accelerate the path to development. And third, operating the future energy system. The challenge is doing all of that at scale. We have to come together, and we have to find ways to share solutions and to create interoperable solutions which can transform the energy system more effectively.

Moderator: Given the presence of business leaders in Davos, did you identify that they are more alert to AI adoption?

Daniel Jeavons: There's been a realization among our business leaders about AI adoption, but there is no silver bullet to accelerate energy transition or to reduce global CO2 emissions. Of all the levers we can pull, digital technologies are one of the easier and quicker ones to drive impact. And so, I think there's a desire from different leaders to show meaningful progress towards net zero. In order to do that, they are looking for things that are going to drive near-term reductions in CO2 and greenhouse gas emissions and digital plays squarely into that role.

Moderator: Widad, how can the application of artificial intelligence be accelerated?

Widad Hadad: It is impossible to do what we need to do in this period, acknowledging being at the forefront, without

digitalization and without having AI backing the human side of the expertise. We must remember that A.I. cannot be thought of in a vacuum for AI to decipher. We need to look at the holistic components of the technology that are going to enable AI: where's data going to come from? Where's machine learning going to come from? What technology you need to implement further down the chain to obtain the expected results from AI? There has been hesitation in the past around cybersecurity. Deeper collaborations among different technology stakeholders can strengthen that trust and deploy certain technologies that took longer in the past to be accepted.

Moderator: Binu Mathew, we welcome your opening thoughts?

Binu Mathew: We are at the precipice of a massive transition in the entire energy industry. We have an enormous amount of data that is now available to us from sensor technology for a while, but it's only been in the last few years where we've been able to actually collect all of that data at scale, be able to move it over into infrastructure and actually start to do something with that data. I'd say the energy industry is actually far ahead in terms of sensor technology, in terms of actually collecting data. Now, building on the data together, aggregating it, doing an actual analysis on it, that's where I think the journey is only partially there.

Moderator: Darryl Willis, the debate has moved from energy transition to now being a question of energy security alongside energy transition. There is a concern that the energy transition might be a victim of this current window we're in. What is your observation from a global perspective?

Darrell Willis: There's an urgency around the decarbonization journey towards being net zero by 2050 as soon as possible. I don't see any sort of disruption in that journey. If anything, I see companies and countries leaning into it in a more aggressive way, more determined than ever to get there. One of my big questions is that in the absence of not having access, you will take anything you can get your hands on. It is still a billion people on the planet who do not have access to continuous electricity. It's going to take oil and gas, renewables and other sources of energy to get us where we need to get to by 2050.

Moderator: Widad, how do you see the momentum in the UAE towards low carbon?

Widad Hadad: I see the UAE as leading by example. They have

vocally communicated their goals. You can see on the ground plans, initiatives, ways to decarbonize to monitor emissions, to digitize a lot of the operations they have. You see a lot of renewable energy coming into play from existing installations and some new ones that are about to come. Very creative approach towards hitting that target, especially that COP 28 is coming as well here.

Moderator: Is this a case of catching up or are they moving ahead? What's your sense from that point of view?

Widad Hadad: It's both a case of catching up and moving ahead. They do have some catching up to do on decarbonization, but on renewables I think they are moving ahead compared to the rest of the region. They are being very aggressive in their catching up as well. Their decarbonization plans, the targets they're putting on their sites shows that it's a very aggressive approach to catch up.

Moderator: Daniel, I wanted to come back to you on your very key points in terms of scale and pace. Is having scale an advantage to implement AI, or is there another challenge?

Daniel Jeavons: If having AI at scale and pace was as simple as to plug in a card, it would all work beautifully. At Shell, we were able to put in place some common data foundations over the past 9 years. We chose some common components, and we chose to adopt a central strategy to drive AI through effectively digital surveillance centers to help with the adoption in the assets. We've got about 2.7 trillion rows of data aggregated into a central data lake, which we use to train our machine learning models across all our operating assets. The challenge is we chronically underestimated the effort it needs to embed this into processes that people operate every day. It's just something that you never fully anticipate, just how much work you need to do to rethink the business process as part of embedding a solution like AI, which so radically changes the way people work, and make sure that they buy into it. This is something new to people, so many are not aware of it. Many also have been burned by previous digital projects where they have seen the hype cycle. Also, we often need consistent inputs from experts at the sites to get the machine learning model trained effectively. Therefore, there has to be a tolerance for efforts and training of the models to get the solution to work, which isn't always there. Finally, we focus quite heavily on the end users in the assets, but the actual challenge was they don't have the time to really invest in this.

Moderator: Have energy economic cycles affected the implementation of AI?

Daniel Jeavons: The key thing is that in a lot of these core areas, asset management is consistent through the cycle and we see that quite often. There are two things that haven't changed and won't change in terms of critical business drivers. One is safety, which I don't think it's spoken about enough. The other is that emissions throughout that whole period have been front and center. This is where a lot of work we're doing here is continue to focus around that area because it's also resilient to the transition in the energy sector, because this is relevant to transforming energy and chemicals parks. It's also relevant to our upstream facilities, to our wind farms and our solar parks. All asset management is going to be albeit with subtle changes and slightly different technology.

Moderator: Binu, which areas present further room for AI implementation in the energy industry?

Binu Mathew: Asset management in general has a tremendous amount of potential in the short to medium term. Typically, companies are in somewhat cycle independent, looking to ensure increased safety, increased reliability. These are very big factors, especially as you go in to have more and more efficient operations. And they're really going from there on to improving the efficiency of the operations you have. It is a big deal if you can take 10, 20, 30% of the emissions out of what you have right now. I'm currently seeing more discipline around this. Also, the amount of data and precision required for proper sustainability analysis has much room for improvement. A lot of the ESG measurement and reporting that you have out there is very manual. This might suffice for corporate reporting, but for tasks such as analyzing scope one, two or three emissions, great precision becomes extremely important. From our experience, we are having clients whose data that are having is not giving them the results they expect, even in cases with obvious correlations which data does not reflect.

Moderator: Widad, your thoughts on this topic?

Widad Hadad: Safety is one area where the cost-cutting pressures from the industry haven't been felt. Investment in safety remain untouched. What's happening is we're seeing a sense of prioritization trying to find those pockets that are going to give us quick advancements towards KPIs.

Moderator: What are other challenges of AI adoption, from a perspective of employability and skills required?

Widad Hadad: Al adoption is going to be a transition rather than a switch. We need to produce more oil in order to build the infrastructure that is going to enable us to have a zero-emission world later on. The same applies to talent and expertise. We are not going to switch to machine learning immediately. There will be new rules and new types of jobs that are going to emerge that today probably we don't see.

Moderator: Thank you to all the speakers for their insights on this panel's topic. Darrell, we welcome your closing remarks on this panel.

Darrell Willis: First, it's important to remember that AI is an assistant to expertise rather than a replacement. Additionally, We are working within a very dangerous industry, we must never forget about it and talk about the safety aspects. Al is there to help us to see around corners and to mitigate accidents and damage. The second thing is that it's an energy transition rather than a pivot. Yesterday at the gas station, someone who was at the pump before me put \$5 worth of gas in their car. One gallon. I suspect they only put that volume in their cars because that's all they could afford for that person. This industry has the obligation to help create some relief given the current realities we are all facing today while bridging to the future. As we think about the future, one of the things that makes me proud of this industry is that in spite of the shocks we saw with the oil price in 2020 and the current shock in 2022, this industry has stayed steady and focused. They are delivering on the guarter, but they're not losing sight of the decade. And for that, Microsoft and myself are extremely grateful.



Chapter 2: Artificial Intelligence

Pathways to COP27: How to accelerate the application of artificial intelligence (AI) across the energy sector?

TOP TAKEAWAYS

• Digital technologies are one of the key levers that we can pull to accelerate a reduction in global CO₂ emissions. Al is at the core of enabling us to make intelligent decisions upon which we can act and make difference. The challenge is to scale it up and have the impact we're talking about regarding energy transition and net-zero targets. The energy industry can leverage on the massive volumes of data gathered over the last few years from the advanced deployment of sensor technology. Now, the challenge is building on the data together, aggregating it and doing an actual analysis on it.

- The challenge to scale AI adoption are the efforts that are required to embed it into processes that people operate every day. This requires rethinking the business process as part of embedding AI, which radically changes the way people work, and making sure they buy into it. Many also have been burned by previous digital projects where they have seen the hype cycle. Also, we often need consistent inputs from experts at the sites to get the machine learning model trained effectively.
- Business leaders have realized about the need to adopt AI for the energy transition and reaching net-zero targets, even though there is no silver bullet for that transition to happen.

"Many digital technologies are either about obtaining new types of data or visualizing data, whereas AI is at the core of enabling us to make more intelligent decisions."

Daniel Jeavons, Vice President Computational Science & Digital Innovation Technology, Shell

Al and other digital technologies are some of the easiest and quickest levers to drive impact from. Many governments and organizations have accelerated and made their efforts towards decarbonization more aggressive, although technological disruption remains limited.

Investments in asset management remain consistent through economic cycles. This presents potential for investments and developments for the short and medium terms. Companies are in somewhat cycle independent, looking to ensure increased safety, increased reliability and specially improving efficiency operations. Also, the amount of data and precision required for proper sustainability analysis has much room for improvement, particularly in the ESG sphere, which requires a high precision level for scope I, II or III emissions. Safety is another area where investment has remained untouched regardless of the economic cycle. Al has the potential to improve and mitigate different physical risks and damages within the industry.

"Al cannot be thought of in a vacuum. We need to look at the holistic components of the technology that are going to enable AI."

Widad Hadad, Vice President & General Manager, United Arab Emirates, Oman, Yemen & Lebanon The transition of the energy towards Al and machine learning must be seen as a transition rather than a pivot. There will be new rules and new types of jobs that are going to emerge that today probably we don't see. In this aspect, Al should be regarded from a human-machine collaborative approach, in which Al should serve as a support tool to experts within the energy industry.

INSIGHTS

AI MUST BE SCALED UP ACROSS BUSINESS AREAS TO REACH NET-ZERO TARGETS

According to a joint report by the World Economic Forum and Accenture, as much as 20% of global greenhouse emissions could be reduced using digital technologies. These could have a huge impact on heavy industrial sectors, which account for 37% of emissions. Al is at the core of enabling us to make intelligent decisions upon which we can act and make a difference. The challenge is to scale AI across all parts of our business in order to have that kind of impact. Moreover, A.I. cannot be thought of in a vacuum for AI to decipher. We need to look at the holistic components of the technology that are going to enable Al, such as where will data and machine learning come from, or which technology will be required to be implemented



further down the chain to obtain the desired outcomes. Currently, the energy industry is standing ahead of the curve in terms of sensor technology deployment, which has led the industry to capture massive volumes of data over the last few years. The industry has the opportunity to leverage their cutting-edge sensor technology to capture highly detailed data across operations. The challenge now is building on the data together, aggregating it and doing an actual analysis on it.

GREATER ACCELERATION, LIMITED DISRUPTION

There's been a realization among our business leaders about AI adoption, but there is no silver bullet to accelerate energy transition or to reduce global CO₂ emissions. Of all the levers we can pull, digital technologies are one of the easier and quicker ones to drive impact. In that aspect there's an urgency around the decarbonization journey towards being net zero by 2050 as soon as possible, although technological disruption remains limited. "We have had enormous amounts of data available from sensor technology for a while, but it's only been in the last few years that we started doing something with it."

Binu Mathew, Chief Technology Officer & General Manager, BHC3

CHALLENGES TO SCALE UP AI

The challenge for scaling up AI comes from embedding the technology into processes that people operate every day. Al is something new to many and can radically change the way we work. We must make sure people buy into Al. Many also have been burned by previous digital projects where they have seen the hype cycle. Also, we often need consistent inputs from experts at the sites to get the machine learning model trained effectively. The transition of the energy industry towards AI and machine learning shouldn't be seen as a pivot. There will be new rules and new types of jobs that are going to emerge that today probably we don't see. In that aspect, AI should be regarded from a human-machine

"In spite of the different shocks, we have seen during last few years, this industry has stayed steady and focused. They are delivering on the quarter, but without losing sight of the decade."

Darrell Willis, Corporate Vice President of Energy, Microsoft

collaborative approach, in which AI should serve as a support tool to experts within the energy industry.

INVESTMENTS IN ASSET MANAGEMENT REMAIN STABLE THROUGHOUT ECONOMIC CYCLES

Asset management is consistent through different economic cycles, and present potential for further investments and developments for the short and medium terms. Companies are in somewhat cycle independent when looking to ensure increased safety, increased reliability and specially improving efficiency operations. Also, the amount of data and precision required for proper sustainability analysis has much room for improvement, particularly in the ESG sphere, which requires a high precision level for scope I, II or III emissions. Safety is another area where investment has remained untouched regardless of the economic cycle. AI has the potential to improve and mitigate different physical risks and damages within the industry.



Chapter 3: Net Zero

Pathways to COP27: How can advanced analytics facilitate net zero energy systems?

Panel Session at the Microsoft Energy Core 2nd Anniversary Roundtable Workshop

- Ravi Srinivasan, Vice President, General Manager, Industrial Innovation for the Breakthrough Initiative (BTI) Business, Honeywell
- Sidharth Mishra, Vice President and Managing Partner, Wipro
- Uwa Airhiavbere, Director of Worldwide Oil and Gas Sector, Microsoft

Moderator: Ravi, your opening thoughts on how can advanced analytics facilitate net zero energy systems ahead of COP27?

Ravi Srinivasan: Taking a little step back, there are two ways to achieve net zero systems: Capex-oriented and operational oriented. Capex towards technological advancements such as carbon capture or blue, grey hydrogen. This will have a big stake in reducing carbon emissions and achieving net zero goals. The other part of reaching net zero systems comes from operational data such as operational and energy efficiencies that could drive the roadmap and help customers in their net zero journey. The common underlying feature of both Capex and Opex is data. Although there are billions of data coming into systems, there are a lot of estimations that happen when it comes to measuring carbon emissions in plants. Not everything is measured. There is a great opportunity to ensure that we measure all the right parameters at the plant level. For example, with methane fugitive emissions – which have had a huge impact on global warming – a lot of estimations happens. At Honeywell, we are developing sensors to measure the real-time emissions of methane. The data we get is on a real-time basis, not on a calculated basis. For instance, it comes in monthly or quarterly.

Moderator: Why are we not measuring some of the available data?

Ravi Srinivasan: We are not measuring some of the critical data because the technology is unavailable at this point, especially when talking about methane. For example, fugitive emissions are some of the biggest culprits in the industry. Currently, technology allows pure inspection of methane leaks. We cannot measure these leaks' impact in real-time. Once we can measure and obtain the data, analytics becomes very critical. We can structure and unstructure data while also contextualizing the data in the right format.

Moderator: This is increasing a liability in US regulatory oversight as they demand that methane leaks be controlled, measured, and corrected.

Ravi Srinivasan: Absolutely. There are a lot of good regulations coming into the picture. But we must assist these regulations by appropriately measuring and analyzing the data. As such, we would be able to support systems to fix the leaks in real-time. Currently, it takes weeks or months to fix any leaks. We

are trying to fix leaks instantly. This is a huge opportunity for our customers: it is profitable, drastically increases safety, and reduces the effects of global warming.

Moderator: Sidharth, let's welcome your opening thoughts on advanced analytics to facilitate net zero energy systems.

Sidharth Mishra: The starting point is the aggregation of data. At Wipro, we are working with our clients on three key features to achieve net zero pathways: baselining, system modeling, and change management.

From a baseline and compliance standpoint, we focus on the readiness of the market and current solutions that revolve around standards and reporting. The current challenge is the quality of the data. We are working with OEMs and providers of technology to solve some of the origination problems by using clouds and other technologies. We can aggregate the data, which can drive the transparency around operational data streams. In the enterprise landscape, reporting the aggregated data weekly, monthly, or quarterly is less complex than gathering operational data insights hourly or daily. That is the first problem statement we are attempting to tackle, in which Microsoft's capabilities and other technology providers can support. Once we have the baseline measurements, we must focus on the system modeling capabilities.

System models can be categorized in two types broadly. On one hand, coming from the technology of the licensed providers. On the other hand, system models which have been developed by organizations or more mature enterprises. How do we develop and deploy the system models on platforms where the data is available to identify more actionable pathways? The energy industry has a revenue opportunity to decarbonize its operations and help other sectors that might not have the same capabilities to drive some of these transformations. For example, look at the aluminum and cement sectors that face much steeper difficulties in decarbonizing and reaching net zero goals.

Moderator: It is worth noting that the world's first zeroemissions cement recently came out of the University of Cambridge. A big breakthrough.

Sidharth Mishra: There is a lot of innovation happening in developing sustainable materials. Yet, a lot needs to be done to decarbonize existing facilities using modeling to identify



specific triggers that can drive net-zero carbon pathways. How do we take some of these low-carbon initiatives out of the lab and embed them into the day-to-day operations? This is where things get complex. To drive change – reduction, replacement, abatement – we need to stop doing some things and start doing something else. Net zero initiatives must be embedded into operating procedures to improve people's mindset and learning.

Moderator: Not just at the pilot level but at scale. Uwa, I wanted to get your thoughts on moving from pledges to implementation, pilot to scale. What trade-offs are required to help navigate this transition?

Uwa Airhiavbere: A big trade-off to think about is IP. How much IP and exposure of your business models would you have to contribute? There is a lack of open standards. Today, the closest thing to open standards is Open Footprint – a group of peers and companies aiming to build an open system and emission standard. This would cut across not just oil and gas but also expand into other industries. Similar to OSDU, it will require a contribution of IP - exposure of systems and all of that. That will be a difficult and a big trade-off that will need to be made.

Moderator: Ravi, what would you identify as progress in the 4IR toolbox and advanced analytics to help reduce emissions? Where would you put some of the tangible wins?

Ravi Srinivasan: From Honeywell's perspective, the emissions are related to the performance of the assets on the plants – i.e., how effectively and efficiently they are working. Looking at the history, many companies such as Honeywell have been involved in projects with customers helping them with CO2 reductions. As mentioned, the emissions are a result of how the plant assets are performing. As we run the analytics and get the right data, which is auditable and traceable, we can create a closed-loop system. For example, we want to support our clients to create a

balance within industrial plants. We want to increase production to meet demand and identify opportunities within the plant to optimize and reduce energy emissions using our technologies. Through the closed-loop system and advanced analytics, we can help our customers meet the production but not increase emissions.

Moderator: What are some of the obstacles of knowledge and data sharing?

Sidharth Mishra: Standard are the single biggest difference when talking about sharing knowledge and data within an ecosystem, within an enterprise, or an extended enterprise. Open Footprint, for example, is trying to solve some of the issues around data standards and APIs. The organization aims to take some of the learnings of successful initiatives to drive some commonality across the industry. The type of labor, fair trade, emissions, logistics footprint, product quality, and packaging quality are, to some levels, ESG markers. Sharing will become more pervasive and accelerated if the value statements are focused on decarbonization and ESG-oriented.

Moderator: Ravi, let's talk about the essential component of cybersecurity.

Ravi Srinivasan: Cybersecurity is a challenge globally. It is a discipline in how we build the system and network within the energy plant. At Honeywell, we ensure that the architecture within the plant is secured. Whether it is sustainability-related data or not, we need to handle it in the same fashion. Cybersecurity has become a critical part. There are two parts to this. First, security is embedded into the products by default during the design stage. And secondly, adding additional security with a firewall. For example, having added layers of security, so data becomes intact. It becomes critical to have a plan and blueprint. Cybersecurity needs to be a part of the foundation as we move towards a cloud-enabled digital transformation.

Moderator: Uwa, let's welcome your closing thoughts with a focus on what energy companies can do to strengthen collaborative ecosystems to bring advanced analytics to new levels.

Uwa Airhiavbere: Energy operators are building advanced analytics to reduce emissions into their business models. Currently, some companies can deliver net zero oil. This is a huge benefit that they are delivering to customers. Some of them are looking ahead and announcing that they will be able to provide net-zero oil with precision by 2030 or 2040. Some companies are capturing carbon and then creating carbon offsets. These are some of the benefits of advanced analytics applied by energy companies.

Organizations like Open Footprint must be multiplied to bring advanced analytics in the energy industry to new levels. It is important to not forget the people-centric pieces to strengthen collaborative ecosystems. A lot of the time, it is easy to talk about the technical challenges and complexity and forget about the people. This is where the aspect of change management is needed. The way people operate machines, all the way down to how we live our lives daily, can help us achieve net zero targets.



Chapter 3: Net Zero

Pathways to COP27: How can advanced analytics facilitate net zero energy systems?

TOP TAKEAWAYS

• Energy operators are building advanced analytics to reduce emissions into their business models. Today, some companies can deliver net zero oil, which is a huge benefit for their customers in the long term. However, before exploring the advantages of advanced analytics to facilitate net zero energy systems, stakeholders must gather the correct data that will be analyzed. Currently, a key challenge for energy providers is collecting accurate data in real-time. Instead, they rely on estimations and calculations. Technology providers such as Microsoft are stepping in to bridge that gap. Once we can measure and obtain the data, analytics becomes very critical. We can structure and unstructure the data while contextualizing it in the proper format. With the right analyzed data, technology providers can, for example, develop closed-loop systems within power plants, significantly reducing carbon emissions.

• There are three critical features to achieving net-zero energy systems: baselining, system modeling, and change management. Firstly, organizations like Microsoft can support energy stakeholders to establish adequate baseline measurements. Secondly, organizations can then focus on system modeling capabilities to transition toward net zero energy systems. Finally, change management will be essential to drive the needed transformations. Stakeholders must establish an innovative solution to take some of these low-carbon initiatives out of the lab and embed them into the day"Once we can measure and obtain the data, analytics becomes very critical. We can structure and unstructure the data while also contextualizing the data in the right format to achieve net-zero energy systems."

Ravi Srinivasan, Vice President, General Manager, Industrial Innovation for the Breakthrough Initiative (BTI) Business, Honeywell

to-day operations. Net zero initiatives must be embedded into operating procedures to improve people's mindset and learning.

While we move toward decarbonizing economies globally, data and knowledge sharing become crucial. To capture the full potential of advanced analytics, organizations must share expertise, insights, and, more importantly, data that will enable clean energies to become a reality. A common standard is the biggest challenge when discussing the benefits of sharing data within an ecosystem. Open Footprint, for example, is trying to solve some of the issues around data standards and APIs. The organization aims to take some of the learnings of successful initiatives to drive some commonality across the energy industry. Value statements focused on decarbonization and ESG will allow sharing to become more pervasive. With increased data sharing, stakeholders in the sector need greater cybersecurity. This comes with a whole set of complexities and challenges. Cybersecurity needs to be a part of the foundation of systems as we move towards a cloud-enabled digital transformation.

Adopting 4IR technologies will require pragmatic trade-offs as we transition

"At Wipro, we are working with our clients on three key features to achieve net zero systems: baselining, system modeling, and change management."

Sidharth Mishra, Vice President and Managing Partner, Wipro

from current behaviors to a more climate-friendly society. Some difficult trade-offs will be unavoidable as we move from pledges to implementation, pilot to scale to achieve net zero energy systems. A significant trade-off to think about is IP. Each stakeholder in the energy system must be willing to expose their business models and contribute to developing open standards. Today, the closest platform to open standards is Open Footprint - a group of companies aiming to create a standard model for footprint-related data covering all types of emissions, consumptions such as water, land, energy, and base calculations to normalize and aggregate data.

 Strengthening collaborative ecosystems in the energy industry to bring advanced analytics to new levels is of utmost importance. Companies in the energy sector need to retain and attract talents to deploy these technologies most efficiently. Due to technical challenges and complexities, we tend to forget that people are, above all, at the core of collaborative ecosystems. The concept of change management, a systemic approach to transforming an organization's goals, will be crucial to strengthening collaborative ecosystems in the energy industry. A shift in mindset in the energy industry must occur to achieve net zero energy systems. From the way people operate machines all the way down to how we live our daily lives, we must gather our strengths and expertise to achieve the energy transition.



INSIGHTS ADVANCED ANALYTICS TO ACHIEVE NET ZERO

Countries worldwide declared ambitious net zero targets at COP26 in Glasgow last November. These countries will have to come to COP27 in Sharm el-Sheikh with tangible roadmaps to stand up to those net zero target destinations in a few months. Advanced analytics will be critical to facilitating pathways to net zero energy systems in the upcoming decades. With the development of 4IR technologies, the interpretation and communication of meaningful data patterns will play a more significant role in the fight against climate change. Advanced analytics will propel stakeholders to discover deeper insights, make predictions, and generate recommendations on decarbonizing their systems.

ACCURACY OF DATA IS CRITICAL

In the energy sector, operators are building advanced analytics into their business models. Before exploring the advantages of analytics to facilitate net zero energy systems, stakeholders aim to gather the correct data to enhance and optimize their systems. A key challenge for energy producers is collecting accurate data in real time. For example, fugitive methane emissions, which have detrimental environmental consequences, are tough to measure in real-time. Currently, most

"Organizations like Open Footprint must be multiplied to bring advanced analytics in the energy industry to new levels."

Uwa Airhiavbere, Director of Worldwide Oil and Gas Sector, Microsoft

energy producers can make estimations on a calculated basis, monthly or quarterly. Technology providers, such as Microsoft, are expected to step up to develop technologies that can gather and analyze real time data on an hourly or daily basis. This could enhance their systems and support customers in their energy transition journey. For example, with the right data and advanced analytics, technology providers can support clients in developing closed-loop systems within plants in the energy sector. This would allow the energy producers to increase production to meet demand while identifying opportunities within the plant to optimize and reduce energy emissions.

ACCELERATE AND ENABLE DEEPER KNOWLEDGE SHARING

While moving towards decarbonizing economies globally, data and knowledge sharing become crucial. To capture the full potential of advanced analytics, organizations must share expertise, insights, and, more importantly, data that will enable clean energies to become a reality. Agreeing on common standards is the biggest challenge when discussing the benefits of sharing data within an ecosystem. Today, the closest platform to open standards is Open Footprint. It is a group of companies aiming to create a standard model for footprint-related data covering all types of emissions, consumptions and base calculations to normalize and aggregate data. The organization aims to take some of the learnings of successful initiatives to drive some commonality across the energy industry.

ESTABLISHING COLLABORATIVE ECOSYSTEMS

Strengthening collaborative ecosystems in the energy industry to bring advanced analytics to new levels is of utmost importance. Companies in the energy sector need to retain and attract talents to deploy these technologies most efficiently. Due to technical challenges and complexities, we tend to forget that people are, above all, at the core of collaborative ecosystems. A shift in mindset in the energy industry must occur to achieve net-zero energy systems. From the way people operate machines all the way down to how we live our daily lives, we must gather our strengths and expertise to achieve the energy transition.



Chapter 4: Technology Adoption

Pathways to COP27: How can the oil and gas industry accelerate the adoption of 4IR innovative technologies?

Panel Session at the Microsoft Energy Core 2nd Anniversary Roundtable Workshop

- Ada Perniceni, RES CG Lead, Middle East, Accenture
- Babur Ozden, Vice President, Spark Cognition
- Uwa Airhiavbere, Director of Worldwide Oil & Gas Sector, Microsoft

Moderator: It is worth noting that the oil and gas industry was not invited to COP26. The industry possesses some of the greatest capabilities and resources to effect positive change and are certainly striving to do so. How can the oil and gas industry accelerate the adoption of 4IR innovative technologies?

Ada Perniceni: There is no solution to net zero and sustainability without the engagement of the oil and gas industry. Not only because the industry has a major responsibility in emitting carbon but also because key energy leaders are increasingly engaged in finding solutions for our planet. Working with some of the largest oil and gas producers in the Middle East, it is great to see that the sensitivity towards sustainability has grown in a remarkable way. It is great to see the announcements of the UAE and Saudi Arabia on their net zero ambitions.

Moderator: In this region, the national oil and gas companies have been slow to adopt digital technologies such as AI or the cloud at the pace that other sectors have – such as media and telecommunications. Is this a criticism, a reality, or evolving? What are your thoughts?

Ada Perniceni: The oil and gas companies are often considered slow movers in adopting technologies. I do not agree with that. Technology has been used extensively in the industry, is enabling additional functionalities, and unlocking new opportunities. This is changing the way the oil and gas companies think about their operations and business. The oil and gas industry has a lot of technology used in the industry itself. The industry, especially here in the Middle East, is extremely interested in adopting new technologies. However, there is a culture in the Middle East of being quite conservative when it comes to the adoption of new technologies. Stakeholders will always ask: this looks great, but where have you done it before? It is understandable because they deal with large operations and plants. HSE is one of the key concerns of the industry. They want to make sure that they are not risking people's lives working in the operations by adopting novel technologies. Having said that, there is a wide recognition that technology is going to enable a change in our way of working as we transition to net zero. We are working with energy players on their carbon intelligence to measure their emissions. Once we measure, we find ways to monitor, manage, and reduce their emissions over time.

Moderator: What are your thoughts on how the oil and gas industry can accelerate the adoption of 4IR innovative technologies?

Babur Ozden: The achievements of some of the largest companies in the energy industry on HSE over the last decade are remarkable. Companies have shown significant commitment towards HSE, and I believe the previous implementation of HSE standards can be used as a role model to implement sustainability roadmaps. The problem of sustainability is much larger and complex, but the achievements around HSE give me great hope that it can be replicated for sustainability when there is a priority, determination, and the budgets in place. If you start measuring the details of emissions, you'll see where you may some low hanging fruits to make an impact and eventually go after larger challenges. Interestingly, I focus on applying advanced analytical capabilities, machine learning, AI tools into the domain of HSE and recently, sustainability. Let me give you an example to understand the complexities of the challenge. For an offshore platform to be able to reduce emissions, they may need to let go of one of their energy-generating units and do it with less. The moment you start making fundamental changes to a system that has been operating for decades, the system itself collectively will have an emergent behavior. We have the tools and the know-hows, through AI, data, and subject matter expertise, to understand these new emergent behaviors. In other words, we can understand what it means to run a plant with two power-generating units rather than three, for example.

Moderator: To play devil's advocate, the large energy companies were brought in kicking and screaming to move towards sustainability. Beyond the annual reports, is the intention and commitment to sustainability sincere?

Babur Ozden: I would like to believe so. Recently, I have noticed many employees have sustainability in their titles. It just takes a quick LinkedIn search. Organizations are investing in people with expertise in sustainability. At the ground level, employees are tracking and reporting carbon emissions very carefully. There is a cultural shift in the mindsets at the organizational level. The reporting of emissions is being conducted in an organized and methodical manner to monitor people's safety who are facing the operational hazards on the field.



Moderator: Last year the word across the energy sector was hydrogen but this year it certainly is decarbonization. What are your thoughts on how 4IR offers real solutions to achieve decarbonization?

Uwa Airhiavbere: Energy operators are accelerating and adopting 4IR towards decarbonization. The IT and CTO become a bit more trustworthy working with startups and cloudscale providers to measure the cloud enablement in their organization. Coming out of the pandemic, organizations saw the value of using remote desktops and being able to keep their businesses running using the cloud. On a broader level, we see operations teams being incentivized to work on sustainability and digital transformation. We are witnessing leaders of upstream business or the VP of downstream looking for ideas on how to bring 4IR into their operations. Those are the pluses I have witnessed in the industry so far. One area in which I see room for improvement and a blocker of adoption is that the oil and gas industry is conservative and cautious. Executives still want to see proven examples. That slows things down.

Moderator: Regionally, what is the current state of financing 4IR in the industry to accelerate adoption?

Ada Perniceni: It is great to be in the Middle East with such high oil prices, but I am sure it is not as great in other parts of the world. Volatility in the oil price is exactly the issue and has impacted stakeholders who were planning to accelerate activities related to sustainability. This is especially the case when it comes to some capital projects, but it is not as true when we look at applying technology for sustainability. Nowadays, sustainability is at the top of the agenda of all CEOs. At the organizational level, leaders of energy companies have been able to cascade down their commitments to sustainability. From the C-level executives all the way down to the operators and the technicians on the field, sustainability is at the top of everyone's agenda. This means that investments related to sustainability never stopped and will only continue.

Moderator: What are your thoughts on the capital deployment for 4IR in the industry?

Babur Ozden: Cloudification is the first indication of a company's journey towards adopting 4IR technologies. A step into cloud indicates a number of earlier decisions made. Moving to cloud is not a hobby; you move to cloud to achieve specific goals. It is not an inexpensive step to take. Moving to cloud enables the most cost-effective way of creating a data infrastructure and platform for an enterprise. If I say cloud ten years ago, I would be kicked out of many offices. Today, everyone wants to consume and store data on the cloud. The second indication is the development of a data platform. Finally, in the last decade, the main challenge to advanced analytics has been to break the data silos. The attempts to build new tools and capabilities should not become silos. It will undermine any effort to apply machine learning at the scale of enterprise.

Moderator: Silo vs. innovative culture mentality – how can the oil and gas industry develop a more innovative culture to accelerate the energy transition?

Uwa Airhiavbere: I will close out this session with three comments: (1) the assessment of where we are in oil and gas, (2) behaviors that are driving adoption, and (3) codifying this adoption. The oil and gas industry does not get enough credit on its efforts in adopting 4IR technologies; we are way more advanced. It has accelerated since the pandemic where many levels of adoption have been implemented around cloud and various other ways. The behaviors that are driving the 4IR adoption are very interesting. Behaviors have changed since the pandemic and operation-focused executives are incentivized to drive sustainability and digital transformation. On a broader level, companies are setting net zero goals. My third observation from this conversation is how do you codify the 4IR adoption? From the beginning, companies can build AI within their systems. Another way companies can codify the adoption is through building refineries and offshore rigs but also building a digital twin. It's just a way of codifying that adoption from day one. Finally, moving from silos to data estate is a true signal of codification. It creates a fantastic foundation to build a company-wide tool for 4IR adoption.



Chapter 4: Technology Adoption

Pathways to COP27: How can the oil and gas industry accelerate the adoption of 4IR innovative technologies?

TOP TAKEAWAYS

• Oil and gas companies have adopted various 4IR innovative technologies. The technologies are constantly evolving and unlocking new opportunities in the industry. In the Middle East, national oil and gas companies are increasingly interested in adopting novel technologies. However, they have often been regarded as slow adopters of digital technologies such as AI or the cloud. Stakeholders in the region are generally conservative and cautious when it comes to implementing technologies that have not been used before. Today, there is a wide recognition that technology is going to enable the transition to net zero. The oil and gas industry must be at the table when talking about the energy transition and cannot not be left out when establishing pathways to sustainability.

 Cloudification is the first indication of a company's journey towards adopting 4IR technologies. It is not an inexpensive step to take but, today, it is the first step in implementing digital transformation for a more sustainable future. Moving to cloud enables the most cost-effective way of creating a data infrastructure and platform for an enterprise. Since the Covid-19 pandemic, oil and gas companies

"There is no solution to net zero and sustainability without the engagement of the oil and gas industry. Not only because the industry has a major responsibility in emitting carbon but also because key energy leaders are increasingly engaged in finding solutions for our planet."

Ada Perniceni, RES CG Lead - Middle East, Accenture

have accelerated their adoption of the cloud throughout their operations. In the last decade, the main challenge to advanced analytics has been to break the data silos. Cloudification is a critical solution to breaking those data silos which could lead to a more sustainable future.

Volatility in the oil price has been a major challenge to increasing the financing of 4IR technologies in the oil and gas industry. Achieving net zero requires \$125 trillion in climate investment by 2050. While that level of investment has not been achieved yet, it is ramping up. At the organizational level, leaders of energy companies have been able to cascade down their commitments to sustainability. From the C-level executives all the way down to the operators on the field, sustainability is at the top of everyone's agenda. The investments related to sustainability in the oil and gas industry have never stopped and will only ramp up in the upcoming years.

"The achievements of some of the largest companies in the energy industry on HSE over the last decade are remarkable. Companies have shown significant commitment towards HSE, and I believe the previous implementation of HSE standards can be used as a role model to implement sustainability roadmaps."

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 Individual behaviors on accelerating the adoption of 4IR technologies have changed since the pandemic. CEOs and operation-focused executives are increasingly incentivized to drive sustainability and digital transformation. On a broader level, companies are setting net zero goals and publishing their sustainability reports. Additionally, organizations are investing in people with the expertise in sustainability. At the ground level, employees are tracking and reporting carbon emissions very carefully. The behaviors that are driving the 4IR adoption in the oil and gas industry are very interesting. The shift in mindsets and culture towards sustainable goals is noteworthy.

• Oil and gas companies have developed know-hows on using 4IR technologies to accelerate the energy transition that should be shared and leveraged with all the stakeholders. We must give the industry more credit. The industry possesses some of the greatest capabilities and resources to effect positive change and are certainly striving to do so. Collaborative and innovative ecosystems attract the technologically savvy younger generation, who must have a seat at the table when discussing sustainability roadmaps. Oil and gas companies need to retain and attract talents to deploy these technologies most efficiently.



INSIGHTS OVERCOMING A CULTURE OF CAUTIOUSNESS

Oil and gas producers in the Middle East have been evolving remarkably in the past few years. One of the major leap changes has been the commitment to net-zero ambitions by countries such as the UAE and Saudi Arabia. Along with this trend is the drive towards adopting new technologies founded on the Fourth Industrial Revolution. The industry has been keen to advance their operations and overall business. Yet, observers note that stakeholders still cling to a culture of cautiousness when it comes to the adoption of novel technology. Traditionally, the oil and gas sector has been known to be slow adopters of technologies, but their concerns are understandable because they deal with large operations and plants. Safety is the main concern of oil and gas companies as they do not want to risk people's lives working on the field.

LEVERAGING AI, BIG DATA, AND **INDUSTRY EXPERTISE**

The oil and gas industry and the energy sector are way more advanced and have not been getting enough credit for their adoption of technology. Since the pandemic, the adoption has accelerated and cloudification can be a first indication to a company's journey towards adopting 4IR technologies. The progression among

oil and gas companies over the years can be traced back to how they have become more committed in the implementation of Health, Safety and Environment (HSE) compliance to taking bigger challenges surrounding sustainability. The reporting within oil and gas platforms has been rigorous and point to new directions in which the sector should be prepared to embrace new behaviors. These behaviors can be understood through a combination of AI, Big Data, and industry expertise.

RAMPING UP INVESTMENTS TOWARDS SUSTAINABILITY

Energy operations have been accelerating and adopting digital transformation towards decarbonization. Operationfocused executives are incentivized to drive the implementation of sustainability and digital transformation. The pace to which the industry is moving may not show massive and quick adoption but certainly, it is moving forward despite the volatility in the oil price in recent years. Sustainability is on top of the agenda of CEOs. At the organizational level, leaders

"The oil and gas industry does not get enough credit on its efforts in adopting 4IR technologies; we are way more advanced. It has accelerated since the pandemic where many levels of adoption have been implemented around cloud and various other ways."

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of energy companies have been able to cascade down their commitments to sustainability. The investments related to sustainability in the oil and gas industry have never stopped and will only ramp up in the upcoming years.

ADOPTING CLOUD TECHNOLOGIES

Another indication of the industry's advancements towards 4IR is the step into cloud, which ten years ago were completely ignored. These decisions are costly but enable the most cost-effective way of creating and extending a data infrastructure and platform. One of the main challenges today is how to move the advanced analytics forward. Building these new tools and capabilities, however, should not lead off takers to recreate old systems built around silos because that will undermine efforts in applying machine learning within enterprises. Another key observation is that companies which are building refineries and offshore rigs are now adopting new technologies such as digital twin. This reflects a solid foundation for 4IR adoption.



Chapter 5: Data Transparency

Pathways to COP27: Best actions to spur more open data platforms in existing and new partnerships?

Panel Session at the Microsoft Energy Core 2nd Anniversary Roundtable Workshop

- Sebastien Grau, Vice President Middle East, Africa and Turkey, Rockwell Automation
- Juan Jose Casado, Data & Analytics Director, Repsol
- Andreas Hartl, Senior Vice President Cloud, AVEVA
- David Rowan, Technology and Solutions Manager, Reservoir Engineering, Schlumberger
- Dave Wisenteiner, Managing Director of Azure Global Energy, Microsoft

Moderator: Sebastien, what are your opening thoughts on the critical question of this panel?

Sebastien Grau: Harmonization of all devices is the key goal today – all devices should communicate on the same protocol and have the same architecture, so that whatever the brand, they can correspond. All the governance now is around new transparent protocols that will become the standard in two or three years.

Moderator: How significant a hurdle is it in the MENAT region that data is a state secret?

Sebastien Grau: We know there are political sensitivities around data, so our products must be secure and safe. Customers' attitudes are evolving. Companies used to only manage data on their own premises that were not connected but they are okay now if the cloud is located in the country. Data that is not perceived to be sensitive by local end users could be stored outside the country - for instance, a maintenance platform that can manage wellhead services can be carried out by servers located in Canada. It's up to us to find these low hanging fruits in discussions with end users. We are developing a hybrid solution, on the premises and in the cloud when there is critical mass.

Moderator: How do you strengthen data collaboration to better support the energy transition?

Juan Jose Casado: What we really want to promote together is the creation of data spaces that are related to energy transition use cases - an ecosystem where companies can voluntarily share data in an environment of trust. That is key. Security is important so that companies feel they have sovereignty over their data. We need to think about how to create these data spaces with clear architecture and standards so that we have a B2B marketplace that helps improve CO2 emissions. The European government has developed a Data Act that seeks to facilitate the creation of data spaces. It tries to remove the barriers to data practices of companies, unlock the value of data and clarify the rules for sharing data. We have identified many use cases where the result will be much better if we are able to share data. For example, with mobility in electric vehicles and for improving the energy efficiency of our industries and energy assets. These are use cases that have a huge impact on CO2 emissions.

Moderator: Sebastien, what are your opening thoughts on the Moderator: What are the obstacles that need to be overcome?

David Weinsteiner: There are many opportunities we see internally at energy companies - things like data sharing, data privacy and data residency. Is Repsol going to share data with Saudi Aramco? Doubtful. Rather, it's across Repsol, across Aramco that they want to share data. We need to be able to share data meaningfully across the company itself and to leverage it as an industry as best as we can. The energy industry is ahead of manufacturing and retail in its efforts to create a unified data schema, with about 460 oil and gas companies coming together and executing. One challenge is data preparation - getting the data in shape for what you want to do with it. People build structures and data schemas definitions, but they don't figure out how to ingest that from companies like Rockwell and Schlumberger. There's an opportunity there for the industry to pull together.

Moderator: How is collaboration across multiple stakeholders progressing in the region?

Sebastien Grau: There are very big consortiums of companies with different industries - utilities, manufacturing, energy. I see common interest targets for all of these. The need for efficiency, sustainability goals and centralized decision-making will drive data sharing.

Moderator: Is a common mindset a challenge within these new consortiums?

David Rowan: In oil and gas, we have seen the transition to the cloud and the big reason for that is to enable data flows, to have silos broken down for planning. This trend could continue beyond upstream into downstream and into other energy sources and emissions for global sustainability. We still have a lot to do to bring in other data types and enable people to build multi-dimensional, objective functions that really show transparency in sustainability calculations because the world expects that.

Moderator: Who should be responsible for managing data collected in a collaboration?

David Rowan: Collaboration works well where there is a strong use case, two industries partnering together. In many of those cases, there is a government sponsor or a national body that



has oversight. In oil and gas, there are regulatory frameworks for sharing data even though there's a competitive interest in keeping codes that keep data proprietary. So, it is the use case of collaboration that will drive that. But we don't currently see any one body taking a global role in this.

Juan Jose: We need to create a federated data infrastructure, a decentralized network which can connect within a homogenous system. It needs to be secure and user-friendly system that brings together existing cloud providers, services and data applications. It's important as well to have small and medium sized enterprises collaborate in our value chain since they can really benefit from transparent markets. It's important that we balance the power in this new system, so that there is no one institution that is the manager. Otherwise, there will be no trust. We should launch pilots of this new data infrastructure, starting with cases where competitors are comfortable sharing data and later moving onto more sensitive cases.

Moderator: Does Microsoft have a role to play as a curator of collaborated data?

David Weinsteiner: Microsoft's role is providing a neutral place to enable the work that the operators want to do. There are a few things to consider. One is data sovereignty. There's a lot of data, particularly in the Middle East, where it can't leave the country. In many cases for national oil companies, it represents the vast majority of the sovereign wealth of that entire nation. Secondly, there is data integrity and ensuring it won't be monetized by a service provider. The other thing is for companies like Schlumberger to have the ability to open their applications to users on the cloud and be able to give them the power of unlimited compute. But those application providers don't want to risk having their work duplicated. Neutrality gives the application providers this confidence and gives operators the confidence that their data stays in the country. Microsoft can build the infrastructure to do that.

Moderator: How can we strengthen data collaboration?

Andreas Hartl: It depends on the use case. We can't be too generic about data and put everything in the same stream. It can work if you contain a data stream within a community. For example, we are working with clients in Brazil and in Australia who are collaborating in the mining industry. They were both working on the same assets, but their data streams were not connected. Now they have access to this specific data stream so that the other party is informed about the asset status and can take action when appropriate. These are contained use cases.

Moderator: How can the trust gap be plugged in IP protection?

Andreas Hartl: If you have a framework, standards and rules which all parties in the network agree to, and security is a key requirement here, this can work. Maybe not in every case. Some of our clients have a thousand partners in the supply chain. That becomes complicated because then you get the network multiplier effect and suddenly you have more than 20,000 connections within the network that you can't deal with.

David Rowan: I agree. It is the use cases which add value that will drive the data pipelines and connectivity. So, identify the industry challenge, identify some players to work with that. Technology providers like Microsoft are key players here. Once a few actors get locked in that partnership, it will drive an open standard for the exchanges and once you string enough of them together, you effectively build a standard for a supply chain which other people can come and join.

Moderator: Should we have a different standard for subsurface data collaboration?

Juan Jose: Definitely. In this matter we really need to be using case driven, otherwise the task is too difficult. Start as small as possible, build that small network that helps you learn and then grow it by inviting new players. It's much easier to define a standard between three or four players than between 40 or 50 at the same time.

Moderator: Is acquiring talent and experience a challenge? Andreas Hartl: It's very hard to get qualified talent specifically around data, and more so with a specialization in industry or energy. You need to invest in your local resources to develop new functions and we are hiring from outside as well. With subsurface data, maybe you need to create little islands of data streams and then get those islands connected - a direct link with a common framework that everybody agrees on.

Sebastien Grau: We have to go with what is feasible in a short time - business cases that add value. These are the MVPs most valuable projects - that are the low hanging fruit. We need to focus first on the most actionable, low capex, and fast implementation projects. That's why the cloud is important.

David Weinsteiner: It is often said that young people don't want to come and work in the oil and gas business and would prefer to work in the tech sector. The truth is, every single energy company is a technology business, and that's what we need to communicate to the world. If we post a job internally to work in the energy business, we get some great applicants but if we give it a sustainability slant, the number of applicants multiplies by up to 100. We need to help educate the world that these are the companies that will help the energy transition.



Chapter 5: Data Transparency

Pathways to COP27: Best actions to spur more open data platforms in existing and new partnerships?

TOP TAKEAWAYS

- The industry needs to promote the creation of so called 'data spaces' related to energy transition use cases -- an ecosystem where companies can voluntarily share data in an environment of trust. Security is important as well so that companies feel they have sovereignty over their data. These spaces must have a clear architecture and standards to facilitate the creation of a business-to-business marketplace for data that helps improve CO₂ emissions. The European government has developed a Data Act that aims to help create data spaces by removing the barriers to data practices of companies, unlocking the value of data and to clarify the rules for sharing data.
- As a provider of cloud services to the energy industry, Microsoft has a key role as a neutral facilitator of data exchanges between and within companies. Sovereignty of data is a key concern at national oil companies, especially in the Middle East where it represents the majority of a nation's wealth, and so isn't allowed to leave the country. As a neutral provider of cloud technology, Microsoft must give service providers the confidence that their applications wouldn't be replicated and sold in the marketplace. It must also build appropriate infrastructure to give oil companies the assurance that sovereign data stays within the country. Lastly, it must not sell this most valuable data.
- The industry needs to build a dispersed, secure, user-friendly network that brings

trust. That is the key word."

"All devices should communicate on the same protocol, should have the same architecture, so that whatever the brand, whatever the equipment, the tool that we are putting in place, they can communicate with each other."

Sebastien Grau, Vice President Middle East, Africa, & Turkey, Rockwell Automation

together existing cloud providers, services and data applications. It's also important to have small and medium sized enterprises participate in this chain. No one institution should be the manager of this system to ensure that there is sufficient trust between participants. Collaboration and data sharing should begin in areas where the industry agrees to share data and later move to sharing more sensitive data in core use cases. The network should start small and later expand as new players are invited. It's easier to define a standard between three or four players than between 40 or 50 players at the same time.

 The oil and gas industry is increasingly using the cloud to enable data flows and break down silos to facilitate better planning. Middle East companies are also becoming increasingly comfortable with hosting data on the cloud and accessing services from outside the country. They earlier managed data on their own premises that were not connected but are now comfortable hosting information on the cloud if it is located in the country. Talks for using the cloud has accelerated in the last two years and service providers are now developing

hybrid solutions -- on the premises and the cloud when there is critical mass.

 Collaboration works well where there is a strong use case, such as two industries partnering together. The industry should choose data projects that add value, have low capex, and can be implemented quickly, which is why the cloud is important. The large energy consortiums now operating in the Middle East, which include companies from different industries such as utilities, manufacturing, energy, will benefit from data sharing among themselves in the future. The board and the common interest of these consortium will drive exchanges due to the need for efficiency and the pressure to meet sustainability goals, helping them override cultural differences.

"We need to instill rules, commonalities, frameworks, and standards that all parties as a part of this network agree to."

Andreas Hartl, Senior Vice President -**Cloud**, **AVEVA**

Microsoft see opportunities in data sharing, data privacy and data residency mostly within energy companies as they aren't able to share data meaningfully internally. The oil and gas industry is ahead compared to its peers such as manufacturing or retail in its effort to create a unified data schema. About 460 oil and gas companies have come

together, are reaching agreements and executing. One area where there is still opportunity to work together is data preparation, which is getting information in shape and being prepared for what to do with it. The industry is building data schemas but doesn't prepare its data nor a plan for how it will be ingested from different companies such as Rockwell and Schlumberger.

• The industry finds it hard to get qualified talent for data, and more so with specialization in industry or energy. Companies need to invest in their local resources to develop new functions and to hire from outside as well to build muscle. Interest among young IT professionals to work in the oil and gas industry is limited because they see the technology industry as more attractive. But oil and gas companies are really technology businesses and people need to be educated of these companies' roles in meeting global sustainability goals. Interest among Microsoft professionals in working for the oil and gas industry multiplies a 100 times if the positions advertised are given a sustainability stance.

INSIGHTS

START SMALL, BUILD TRUST AND THEN **EXPAND THE NETWORK**

The oil and gas industry needs to build a dispersed, secure, user-friendly data network that brings together existing cloud providers, services and data applications. The network must have clear standards and architecture to facilitate the creation of a business-to-business marketplace for data, which will help improve CO₂ emissions.

Network architecture must be driven by energy transition use cases and must ensure that companies can voluntarily share data in an environment of trust. Security is important as well so that companies feel they have sovereignty over their data. It's also important to have small and medium sized enterprises participate in this chain so that they benefit from the



"In oil and gas we have seen the transition to the cloud. The big reason that people are going to the cloud is to enable data flows, to have silos broken down for their planning."

Schlumberger

data market. No one institution should be the manager of this system to ensure that there is sufficient trust among participants. The network should start small and later expand as new players are invited because it's easier to define a standard between three or four players than between 40 or 50 players at the same time. Collaboration and data sharing should begin in areas where the industry agrees to share data and later move to sharing more sensitive data in core use cases.. The industry should choose data projects that add value, have low capex, and can be implemented quickly, which is why the

cloud is important.

The European government has developed a Data Act that aims to help create data spaces by removing the barriers to data practices of companies, unlocking the value of data and to clarify the rules for sharing data. The oil and gas industry is increasingly

using the cloud to enable data flows and break down silos to facilitate better planning. Middle East companies are also becoming increasingly comfortable with

"It's not an understatement to say we're changing the direction of energy for the world together."

Dave Wisenteiner, Managing Director of Azure Global Energy, Microsoft

Juan Jose Casado, Data & Analytics Director, Repsol

"When we talk about the creation of open data spaces, what we are

voluntarily share data in an environment where, of course, we have

talking about is how we can create an ecosystem where companies can

David Rowan, Technology and Solutions Manager, Reservoir Engineering,

hosting data on the cloud and accessing services from outside the country.

As a provider of cloud services to the energy industry, Microsoft has a key role as a neutral facilitator of data exchanges between and within companies. Sovereignty of data is a key concern at national oil companies, especially in the Middle East where it represents the majority of a nation's wealth, and so isn't allowed to leave the country. As a neutral provider of cloud technology, Microsoft must give service providers the confidence that their applications wouldn't be replicated and sold in the marketplace. It must also build appropriate infrastructure to give oil companies the confidence that sovereign data stays within the country. Lastly, it must not sell this most valuable data.

The industry finds it hard to get gualified talent for data, especially those with specialization in industry or energy. Companies need to invest in their local resources to develop new functions and to hire from outside as well to build muscle. Interest among young IT professionals to work in the oil and gas industry is limited because they see the technology industry as more attractive. But oil and gas companies are really technology businesses and people need to be educated of these companies' roles in meeting global sustainability goals.

Microsoft Energy Core's Board Members

Energy Operators

Ahmed Hashmi, Chief Digital Officer and Technology Officer – Upstream, BP Chicovia Scott, GM Digital Innovation & Acceleration, Chevron Daniel Jeavons, Vice President Computational Science & Digital Innovation Technology, Shell Hamad Ahmad Al-Zaabi, Manager Innovation & Technology Group-KOC, Kuwait Petroleum Khaled Al Blooshi, Vice President, Digital Projects & Innovation, ADNOC Michael Deal, Chief Digital Officer, ExxonMobil Nabil Al Nuaim, Chief Digital Officer, Saudi Aramco Sergio Zazzera, Business Partner, Technical Computing for Geosciences and Subsurface Operations and ICT, Eni Torbjørn Folgerø, SVP & Chief Digital Officer, Equinor Valero Joaquin Marin Sastron, Chief Digital Officer, Repsol

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Microsoft

Ali Faramawy, Corporate Vice President, Digital Transformation & Partnerships Darryl Willis, Vice President, Energy Dave Wisenteiner, Managing Director of Energy, Microsoft Azure Vanessa Miler, Director, Energy Innovation & Impact

Energy Core Board Meeting (Q2, 2022) Participants

(*Alphabetical order)

Ada Perniceni, RES CG Lead - Middle East, Accenture Dr. Adel Ahmed, Dean, College of Computing and Mathematics, KFUPM Eng. Ahmed Ghassan, Assistant Deputy CEO for Planning and Projects, Egyptian General Petroleum Corporation Eng. Ahmed Osama, Assistant General Manager - Minister's Technical Office, Ministry of Petroleum & Mineral Resources of Egypt Eng. Alaa Hagar, Undersecretary for Minister's Technical Office, Ministry of Petroleum & Mineral Resources of Egypt Allan Rentcome, CEO, Sensia Andreas Hartl, Senior VP - Cloud, AVEVA Eng. Ayman Omara, Deputy CEO for Planning and Projects, Egyptian General Petroleum Corporation Babur Ozden, Vice President, Spark Cognition Binu Mathew, Chief Technology Officer & General Manager, BHC3 Brad Davis, Innovation & Commercialization Manager, Chevron Daniel Jeavons, General Manager, Data Science, Shell Darryl Willis, Corporate Vice President of Energy, Microsoft Eng. Dawlat Hashem, Assistant Chairman for Information Technology, Egyptian Natural Gas Holding Company Fouzia Boutobza, Industry Commercial Head, Energy & Manufacturing - MEA, Microsoft Khaled Al Blooshi, Vice President, Digital Projects & Innovation, ADNOC Dave Wisenteiner, Managing Director of Azure Global Energy, Microsoft David Rowan, Technology and Solutions Manager - Reservoir Engineering, Schlumberger Eng. Eman Wafy, Assistant Deputy CEO for Information Technology, Egyptian General Petroleum Corporation Frédéric Gimenez, Chief Digital Officer & Digital Factory Managing Director, Total Energies Juan Jose Casado, Data & Analytics Director, Repsol Michael Deal, Chief Digital Officer, ExxonMobil Eng. Mohamed Abdel Aziz, Chairman, Enppi Eng. Osama Salem, Digitalization Project Manager, Enppi Sidharth Mishra, Vice President & Managing Partner, Wipro Ravi Srinivasan, Vice President, General Manager, Industrial Innovation for the Breakthrough Initiative (BTI) business, Honeywell Sebastien Grau, VP Middle East, Africa, & Turkey, Rockwell Automation Dr. Steve Griffiths, Senior Vice President, Research and Development, Khalifa University Uwa Airhiavbere, Director of Worldwide Oil & Gas sector, Microsoft Widad Haddad, Vice President & General Manager - UAE, Oman, Yemen, Lebanon, Emerson

