MARSH

Executive Summary

ENERGY INDUSTRY CONFERENCE 2018
A SUMMARY OF KEY NEWS AND INSIGHTS FROM MARSH'S EIC CONFERENCE IN DUBAI

FOREWORD

Marsh's Energy Industry Conference 2018, which took place on March 6-8 in Dubai, UAE, began on a different note than our last conference two years ago. In 2016, one of the key talking points was the issues the oil industry faced as a result of the low oil price environment.

But this year looked to the future, with themes around innovation dominating speaker agendas and conversations among our 561 delegates who traveled from some 50 different countries. Renewable energy has been growing at a considerable rate, which was evidenced by speakers ranging from Latin America to Dubai itself. At the same time, the need for the energy industry to embrace digitalization and other forms of technological innovation has never been more important.

Industry changes have led to new risks arising, and the need to mitigate both these and existing risks should not be ignored. Cyber risk, for example, has evolved considerably, and as the industry relies increasingly on technology, this needs to be considered even more carefully. Meanwhile business interruption, the impact of natural catastrophes, environmental risks, and economic issues are all becoming more critical risks for energy companies to manage. Speaker Simon Johnson, CEO of Borr Drilling, summed this up well when he stated: "If we can't change the rules, we have to change the game." The game is changing and the players must change too if they are to keep pace.

Those who are veterans of our energy conference know that this conference, the seventh of its kind, started out as the National Oil Companies (NOC) Conference. This year we renamed it the Energy Industry Conference (EIC) to reflect the confluence between the hydrocarbon, power generation, and renewable energy sectors. We at Marsh believe it is increasingly important to address the whole value chain in the industry.

The result has been an event full of thought-provoking speakers, engaging workshops, and innovative ideas from across the industry, making this year's conference the best yet.

This publication provides a summary of the discussions and workshops that took place in Dubai.

We would like thank our sponsors, speakers, and all attendees for their participation in this year's event. We look forward to continuing this dialogue with you over the coming weeks and months.

Andrew George
Chairman, Energy & Power Practice, Marsh

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EMERGING RISKS AND NEW TECHNOLOGY

GROWTH OF RENEWABLE POWER: LEARNINGS FROM LATIN AMERICA

The use of renewable energy sources is growing significantly, as decreasing costs and better storage make hydro, wind, and solar more viable alternatives to fossil fuels, Tito Sanjurjo, Director of Operations of InterEnergy Holdings, said.

Growth of renewables has been considerable in recent years, but there is still plenty of room for further growth in Latin America, where Sanjurjo predicts that the share of renewable production will increase fourfold to 2030.

According to Sanjurjo, in some Latin American countries, the current energy mix has not been well diversified and is mostly dependent on imported fossil fuels and conventional large hydro projects, which have been subject to climatic vagaries following increasingly impactful El Nino events. But despite being "late to the game" for renewable energy sources, it is starting to catch up and is now experiencing notable growth.

Globally, the cost of new solar PV has reduced by 70%, wind by 25%, and batteries by 40% since 2010 and has helped renewables capture an increasing share in the energy mix.

"Renewable costs have come down significantly and now compete on a standalone basis with fossil fuels and this allows more and more generation to be put into the renewables area. And we are seeing that throughout the whole of Latin America," said Sanjurjo.

"The projections are that solar and wind will continue to reduce prices and continue to be more and more competitive each day."

The development of electricity storage technology, which is expected to foster an increase in the adoption of electrical vehicles, enable 24-hour off-grid solar home systems, and support 100% renewable mini-grids, will also play a key role in the development of renewables.

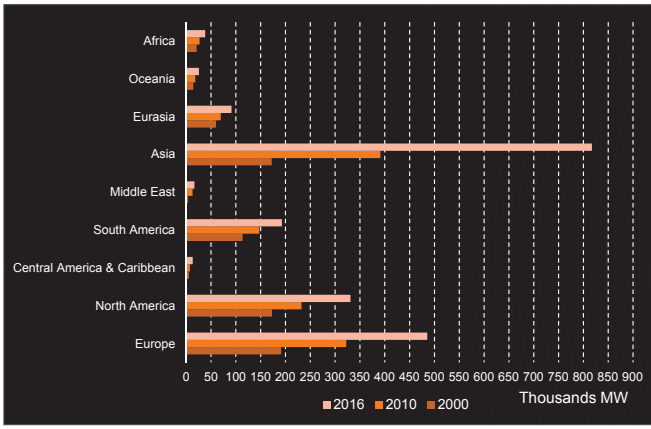
While the regulatory framework is subject to the considerations of each sovereign state in question, a long-term strategy supported by fiscal incentives would go a long way in supporting the development of the renewables market.

Sanjurjo concluded by predicting that the share of renewables in the energy mix will significantly increase and reductions in costs and favorable regulatory framework will accelerate this growth.

"Renewable costs have come down significantly and now compete on a standalone basis with fossil fuels."

Tito Sanjurjo, Director of Operations of InterEnergy Holdings

RENEWABLE GROWTH BY REGION



MW	2000	2010	2016	Growth
Europe	191,043	322,398	485,465	154.1%
North America	173,004	232,210	330,812	91.2%
Central America & Caribbean	5,607	7,611	13,273	136.7%
South America	113,665	147,308	192,912	69.7%
Middle East	3,930	12,858	16,591	322.2%
Asia	172,181	391,304	817,125	374.6%
Eurasia	60,205	69,763	91,316	51.7%
Oceania	14,431	18,406	25,650	77.7%
Africa	21,245	26,968	38,285	80.2%

FULFILLING THE GREATEST PROMISE – DUBAI'S CLEAN ENERGY VISION

Dubai is a major hub for both the energy industry and for innovation. HE Saeed Al Tayer, Managing Director & CEO, Dubai Electricity and Water Authority (DEWA) addressed the audience with the city's plans to become a clean energy leader and continue its path of recent growth.

Under Al Tayer's leadership, DEWA has become recognized as one of the most distinguished utilities worldwide. He addressed the plans for Dubai and the UAE to further grow and develop its renewable energy facilities. The recent work has been an integral part of the country's initiatives targeting growth and excellence.

"DEWA has aligned its vision with the objectives of the UAE Centennial 2071, the UAE Vision 2021, and Dubai Plan 2021 to secure a happy future and a better life for future generations," said Al Tayer.

"We are working to provide the finest government services and achieve the highest happiness rate," he said, adding that "the journey will be a continuous one."

One key part of this will be to revolutionize the city's use of energy and make it a hub for renewable energy sources.

"Our objective is to have 75% from clean energy by 2050 through the Dubai Clean Energy Strategy 2050," Al Tayer said. This will include the development of the largest single site solar park in the world, which is expected to produce carbon emissions by over 6.5 million tonnes per year. The park will have total investments of approximately AED50 billion and a total capacity of 5000MW by 2030.

Until now, renewable energy has been somewhat held back by the lack of ways to store the output. However, recent innovations in battery storage for energy sources such as solar has made this more viable, and furthering such innovations will be an integral part of Dubai's plans for the future.

Other key parts of the city's initiatives to become greener and more technologically advanced include:

- The application of smart grids and meters.
- Use of solar power on buildings.
- Charging stations for electric vehicles.
- Other digital services including the use of Artificial Intelligence (AI).

His Excellency concluded by reiterating that Dubai's increased move towards renewable energy will "enhance the quality of life and contribute to achieving a brighter future for Dubai. This will happen by developing the traditional energy industry, minimizing its environmental impact, developing renewable and alternative energy, and increasing [Dubai's] share in the global energy mix."

"DEWA has aligned its vision with the objectives of the UAE Centennial 2071, the UAE Vision 2021, and Dubai Plan 2021 to secure a happy future and a better life for future generations."

HE Saeed Al Tayer, Managing Director & CEO of DEWA

THE SHIFTING FOCUS OF THE ENERGY INDUSTRY

The global environment has changed considerably since Marsh held its last energy conference in Dubai in 2016. Flavio Piccolomini, President of International at Marsh and a keynote speaker at this year's conference, examined what this means for the energy industry.

Highlighting key unexpected changes over the past few years, including Donald Trump's election as US president, the UK's vote to exit from the EU, the recent policy changes in Saudi Arabia, among others, Piccolomini set the scene for what is not only a very different global geopolitical environment, but also a different energy sector.

At the conference in 2016, the key focus was on the recent fall in energy prices, with oil prices standing at around US$40 per barrel. "When oil prices fell, oil and gas companies had to take a step back and reassess the projects that they wanted to invest in and how to streamline the current operational portfolio," said Piccolomini.

"Even though the oil price has somehow recovered, experts predict that there will be decreasing investment in the development of new oil and gas facilities and the question is whether we are going to see the end of new mega projects."

But this year, with oil prices having shown recovery, the focus shifted to other developments. Renewable energy is developing as a viable addition to the energy generation matrix, thanks to recent developments in battery storage.

"We've been talking for years about the impact of new technologies on the energy sector and we are now seeing implementations that are making renewable energy solutions more viable, and we are seeing the implementation of technologies that increase efficiencies in traditional power plants," he said.

In addition, changes such as Saudi Aramco's plans around its initial public offering and several countries considering nuclear power options were hot topics as the event opened.

Piccolomini added: "While it may be true that the energy sector does not evolve as fast as some other industries, this is because of the huge investment in capital required, as well as the time required to build major infrastructure. There is a definite trend that can be seen that shows that the landscape in which we are operating will fundamentally change in the years to come."

For the insurance industry, the environment has also changed considerably. After a benign natural catastrophe environment over the previous few years, 2017 emerged as a significant loss year, particularly off the back of major Atlantic hurricanes.

"The three major hurricanes that hit the US and Caribbean last year caused unexpected damages which caused significant challenges for local communities, businesses, governments, and, of course, the global insurance industry," said Piccolomini.

He added that he expects to see the collaboration between risk professionals, the insurance industry, and energy industry to continue moving forward.

Referring to the energy industry as a "laboratory on how to manage risk," Piccolomini noted that "Risk is at the heart of the energy business. Not only because of the hydrocarbons that it handles, but also because of the size of the energy operations, the complexity, the interdependence between the various production units, and, of course, because of the huge values involved," he said.

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Flavio Piccolomini,
President of International at Marsh

GRAND TRANSITION, DIGITAL REVOLUTION, AND NEW ENERGY REALITIES

The energy industry is being shaped by a number of risk factors, including moves toward decentralization and digitalization, shifting demand and prices, and sustainability as a public policy issue, Christoph Frei, Secretary General of the World Energy Council, told the audience at the Energy Industry Conference.

And as the risks shift, so too do the opportunities. Frei began by comparing sustainability scenarios to different genres of music:

1. Modern Jazz: Market-driven approach to achieving individual access and affordability of energy through economic growth.
2. Unfinished symphony: Government-driven approach to achieving sustainability through international coordinated policy and practice.
3. Hard rock: A fragmented approach driven by the desire for energy security and independence in a world with low global cooperation.

The first two scenarios require considerable work and planning, but result in a joined-up approach, while the worst case scenario is that of "hard rock", due to a lack of collaboration globally.

Frei pointed out that there were several key risk areas regarding innovation in the energy industry, with one of the main ones being decarbonization.

"The challenge of decarbonization is massive," he said. "If you look back over the past 45 years, we have managed to decarbonize gross domestic product (GDP) by, on average, 1% per annum. If we want to achieve a change of two degrees Celsius, we must accelerate this from 1% to 6% per annum."

In addition, the energy industry faces challenges in innovation around electrification, digitalization, and decentralization. And, as 2017 highlighted, natural disasters are also a key concern.

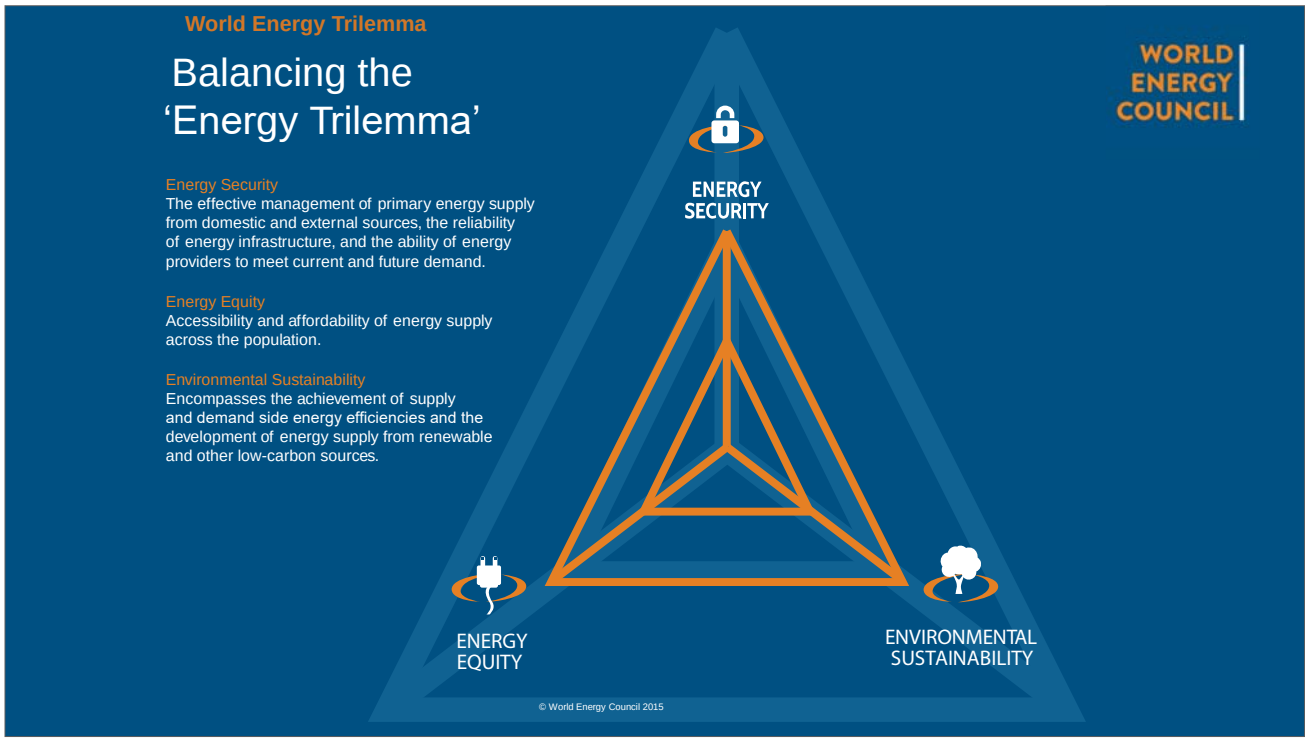
"As we all felt again last year, extreme weather events are, naturally, a huge issue for this industry," he said, referring to the disruption faced following the major hurricanes in the US in 2017.

Frei advised that "what it comes down to is, the best energy policies have a balance between security, affordability, accessibility, and sustainability."

He concluded by offering some advice to the industry for balancing the current "Energy Trilemma", which includes:

- **Energy Security:** The effective management of primary energy supply from domestic and external sources, the reliability of energy infrastructure, and the ability of energy providers to meet current and future demand.
- **Energy Equity:** Accessibility and affordability of energy supply across the population.
- **Environmental Sustainability:** Encompasses the achievement of supply and demand side energy efficiencies and the development of energy supply from renewable and other low-carbon energy sources.

"Energy realities are shifting faster than ever. Focus on innovation is critical. If you don't – someone else will," he concluded.



"Energy realities are shifting faster than ever. Focus on innovation is critical. If you don't – someone else will."

Christoph Frei, Secretary General & CEO of the World Energy Council

GLOBAL RISKS AND EMERGING TECHNOLOGY

In a risk environment that is undergoing momentous change, energy organizations will need to consider the way they mitigate against emerging risks and how to embrace new opportunities, John Drzik, President, Global Risk and Digital and Sastry Durvasula, Chief Digital Officer, of Marsh told the EIC audience.

Drzik outlined the top risks identified in the *Global Risks Report 2018*, which saw an increase in the number of technological risks.

Cyber risk emerged as a key concern in many regions, with a growth in companies naming this as a significant risk for two main reasons:

- The increasing range of motivation behind cyber-attacks goes beyond data to now include state sponsored attacks, extortion, financial gain, and intellectual property theft.
- The increasing dependence on technology and the use of emerging technology, which is widening the attack surface within companies.

When it came to emerging technology, there were three areas which were identified as being key areas for concern:

1. Internet of Things (IOT).

2. AI/robotics.

3. Blockchain.

According to Drzik, those organizations deploying these technologies can reap significant benefits – such as increased safety and productivity – but "risk management has to keep up with this innovation and I think there is increasing concern that there is a gap there," he said.

Durvasula discussed the uses and benefits that these new technologies could have for the energy industry, predicting that these will have applications for the sector in production, distribution, and consumption.

AI is becoming more advanced and widespread. "We fundamentally believe that AI is here to stay as a mainstream application," said Durvasula. Technologies such as the IOT could be employed to help with safety, for example, the use of smart belts on workers. Meanwhile visual intelligence, such as the use of drones, has become important to gathering data, and with enough periodic use, could evolve into actionable data to be used to predict future events.

According to Drzik, these technologies will bring changes in the way companies approach risk management as well as the way insurance companies operate. He said these technologies bring new opportunities for organizations and insurance companies to apply some of the technologies jointly for better risk management.

"The potential for this technology is there and can change the way we are monitoring risk, mitigating risk, measuring risk, and therefore changing the underlying insurance product," he said, pointing out that this could lead to more dynamic insurance products being developed.

To meet these emerging challenges, Drzik advised companies to "keep the images of the future in mind. The future may not unfold exactly as predicted now, but these forces coming from new data streams, new technologies, and emerging risks are there and will shape the world we live in. And it is going to be important to develop an overall approach that matches that emerging image of the future."

"The future may not unfold exactly as predicted now, but these forces coming from new data streams, new technologies, and emerging risks are there and will shape the world we live in."

John Drzik, President of Global Risk and Digital, Marsh

TOP FIVE RISKS MOST LIKELY TO INCREASE IN 2018, BY REGION

Rank	North America	Europe	South Asia, East Asia, the Pacific	Sub-Saharan Africa	MENA, Central Asia, Russia	Latin America
#1	Cyber – Theft	Cyber – Theft	Cyber – Theft	Cyber – Theft	Ecosystem destruction	"Fake news"
#2	Cyber – BI	Cyber – BI	Cyber – BI	"Fake news"	"Fake news"	Loss of privacy: Companies
#3	Anti-foreigner sentiment	Anti-foreigner sentiment	Ecosystem destruction	Ecosystem destruction	Cyber – BI	Cyber – Theft
#4	Trade protectionism	Trade protectionism	Loss of privacy: Governments	Youth unemployment	Water crises	Loss of privacy: Governments
#5	Populism	Personal identity theft	"Fake news"	Cyber – BI	Cyber – Theft	Populism

Economic Environmental Geopolitical Societal Technological

BI: business interruption.

2018 World Economic Forum Global Risks Report

TRANSITIONING FROM THE AGE OF THE MOLECULE TO THE AGE OF THE ELECTRON

Francois Austin, Senior Partner at Oliver Wyman, gave his insight into the nature and pace of global trends in energy demand and production, saying that he believes we are now at "the end of the beginning of the low carbon age."

Austin reviewed recent trends in energy investment, which showed that the balance of global capital into energy projects has shifted substantially over the last decade, with over 50% going into renewable rather than conventional energy projects since 2012. The proportion invested in renewables now exceeds 60% and is expected to continue to grow, perhaps at an even greater rate than it has up until now. Within the renewable fraction, solar and wind investment are now the most significant, having exceeded hydro since 2015.

But commercial power businesses will need to operate in a different paradigm to be successful in future. Many traditional energy generation firms have struggled in recent years, and the changing manner in which energy is generated will likely lead to a number of non-traditional organizations, such as technology companies, becoming much more significant in the energy sector, leveraging the infrastructure, client information, and client interfaces that they control.

The fact that some of the largest renewable energy sources exist outside the current dominant economies will also mean that the geographical spread of energy generation is likely to alter substantially.

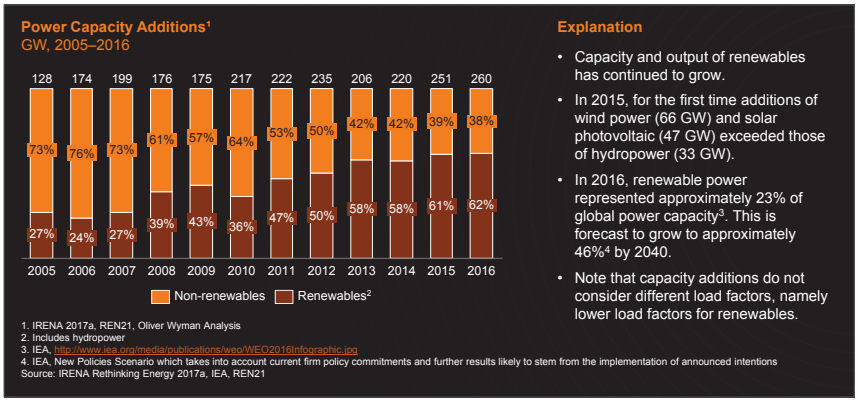
Austin pointed out that there have been several drivers of the current and future trends in energy production. These include factors such as:

- **Ecological and Political:** Driven by local and global environmental considerations.
- **Technological and Economic:** New and improved technologies creating and facilitating change.
- **Societal:** New attitudes creating changes in demand patterns and putting pressure on policy.

He reflected that the continued availability of capital to finance these trends in energy investment will be challenging as many governments withdraw subsidies in non-traditional energy generation. However, given that the pace of change in the energy balance in the past 10 years has exceeded most predictions, he does not believe that availability of capital is likely to be a significant limitation.

He closed by advising energy companies that "replicating the business models of the past will not work in the future." They will need to be nimble, responding to changes in patterns of generation and demand. They will also need to respond to provide a greater degree of choice in the generation, management, and consumption of the power which we all use.

ENERGY INVESTMENT SHIFT OVER PAST DECADE



"Replicating the business models of the past will not work in the future."

Francois Austin,
Senior Partner at Oliver Wyman

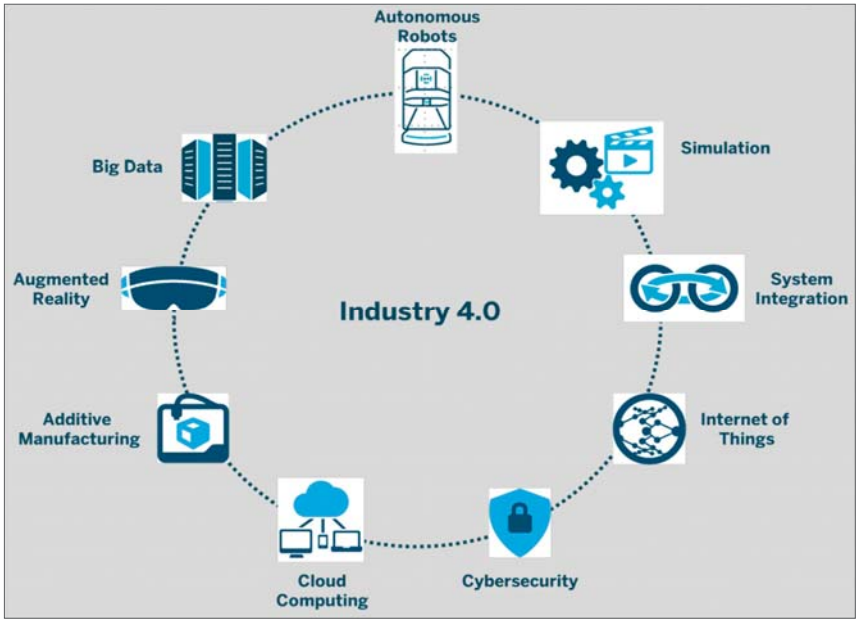
DIGITAL REFINING AND THE PATH TO NEW PRODUCTIVITY

Hussain Al-Qahtani, President of the Saudi Aramco Shell Refinery Company (SASREF, a joint venture between Saudi Aramco and Shell) spoke to the Marsh EIC audience about his own experience of the technological advancement journey, which has guided his refinery over the past 10 years.

Al-Qahtani stated that: "We stand on the brink of a technological revolution that will fundamentally alter not only the way we work, but also the way we live." Concentrating on the impact on the manufacturing sector, he predicted that there will be four areas where the Fourth Industrial Revolution will have the greatest impact:

- Advanced automation and robotics as a substitute for human labor.
- Rapid access to global digital platforms will improve the quality, speed, and price at which data, knowledge, products, and services are delivered.
- Sophisticated analytics that can "deep dive" into historical process data, and learn how to optimize the factors that can improve manufacturing yields and lower costs.
- Increased risk of cyber-attacks.

Through sharing the digital journey that SASREF has been undertaking since 2010, which was part of a larger transformative project known as "Tamkeen" (translating to "enabler" in Arabic), Al-Qahtani demonstrated that it was possible to revolutionize the performance of the refinery.



Through activities such as the integration of SAP to the manufacturing control system, adoption of cloud computing for performance and competence management, automation of field operator rounds and web-based asset integrity data management, SASREF was able to deliver zero injuries and process safety incidents, a leap from third-quartile to first-quartile plant reliability and achievement of the highest net income in a decade – a remarkable achievement in the era of "lower for longer."

Al-Qahtani rounded up his speech by offering his ingredients for success, which included effective change management and a high passion for value realization.

"It is imperative to apply the right mindset towards continuous improvement, ensuring that management is always prepared to open its door to new technology and innovation. As proven by time, technology always wins," he said.

"We stand on the brink of a technological revolution that will fundamentally alter not only the way we work, but also the way we live."

Hussain Al-Qahtani, President of the Saudi Aramco Shell Refinery Company

CYBER RISK: A CALL TO ARMS

Sir Iain Lobban KCMG CB, former Director of the UK's Government Communications Headquarters (GCHQ), sought to demystify cyber risk and called for boards and executive committees to take greater ownership of their organizations' cyber exposure.

"It is very appropriate to be speaking here in Dubai, in the UAE, in the Gulf, the hub of regional and global trade routes for centuries, perhaps millennia, the source of so much of the world's fuel, a marketplace for regional and international finance and commerce, and of course, in the internet age, a critical name on the global information highway," Lobban opened.

"But with that pivotal place in the region and in the world comes opportunity of risk and, indeed, threat."

Lobban, who was formerly the Director of the GCHQ, shared his perspectives on cyber risk across industries, drawing on his past experience.

"It is indeed an asymmetric threat; it is indeed a risk that is growing exponentially. But it does not need to be apocalyptic. Nor does it need to be super technical," said Lobban.

In terms of the cyber exposures organizations face, Lobban pointed out three prisms to data risk:

- **Confidentiality:** What if private and confidential information was stolen?
- **Integrity:** What if data was corrupted without the organization knowing?
- **Availability:** What if the access to the data was disrupted, denied, or even destroyed?

While the initial focus of cyber risk was around confidentiality of data, the risk has grown exponentially. Today, an attack could have a range of effects on an organization, including:

- Business disruption.
- Financial loss.
- Share price devastation.
- Destruction of personal reputations.
- Regulatory punishment.
- Class actions from employees against their employers.
- Fracture of personal privacy.
- Divorces or ruptures of partnerships between organizations.
- Kinetic consequences in chemical and power plants.
- A virtual pandemic.

Lobban highlighted some recent developments that have changed the risk landscape for cyber risk, with a hacker group called Shadow Brokers releasing cyber exploit tools that resulted in such widespread cyber-attacks as WannaCry and NotPetya.

"My main message around this is: You do not have to be a target in order to be a victim," he said, pointing out that more and more, those who are affected by cyber-attacks have not been specifically targeted as attacks become more wide reaching. And, while the audience was from the energy industry, he emphasized that attacks are not limited to specific sectors – one attack can span several.

For organizations, boards and executive committees should be taking a greater role in prioritizing and managing cyber risk.

"This subject belongs at the board and executive committee tables. It is not acceptable to delegate it elsewhere. It is not acceptable to be naïve or amateur. I expect to see diligence, priority, and curiosity in organizations. I want to see a dialogue of quality, active interest, and repeated attention," Lobban said.

He concluded by saying that executive committees should work with their brokers to manage their risks and look to provide risk transfer solutions.

"I believe that your insurance broker is your friend and a conversation around cyber security can be an excellent way into this discussion, particularly for members of the executive committee," he said.

"[Cyber risk] belongs at the board and executive committee tables. It is not acceptable to delegate it elsewhere."

Sir Iain Lobban,
former Director of the GCHQ (UK)

SECTION 1

THE FOURTH INDUSTRIAL REVOLUTION

Digital technology is set to change the energy industry profoundly. Unlike the previous industrial revolutions, this transformation will not replace human muscle with powerful machines; it will provide human decision making with support from intelligent machines.

Large firms are often slow to change and risk losing substantial value by not taking advantage of the new digital transformation. This workshop examined how firms can overcome this natural inertia. The Fourth Industrial Revolution has played a pivotal role in rebooting the risk agenda and panelists discussed the impact of this and how it is characterized by a range of new technologies.

In order to thrive, business leaders have to actively work to expand their thinking away from what has been traditionally done and include ideas and systems that may never have been considered.

The recent developments mean the insurance industry now needs to be asking a number of questions, including:

- How do we mitigate a risk and protect the consumer?
- How will a company assess a driver that has a self-driving car?
- How can insurance become more agile, efficient, and of significant value to the consumer?

As panelists pointed out, the world we live in demands efficiency, speed, and connectivity. This has led to every organization having a digital footprint, which has therefore increased the surface area of attack. Cyber security has been an issue since the 1990s, but the drivers of a cyber-attack have changed. The digital era we now exist in requires robust cyber security, but this should be created in tandem with IT infrastructure, not as an afterthought or halfway through the process.

This session pointed out that a major highlight in this revolution is the creation of blockchain. The role this will play in digitalization is going to challenge the fundamental assumptions of intermediaries and bring in to question their value.

Blockchain is a method of recording data – a digital ledger of transactions, agreements, contracts – anything that needs to be independently recorded and verified as having happened. The ledger isn't stored in one place; it is distributed across hundreds or even thousands of computers around the world.

The distributed nature of a blockchain database means that it's harder for hackers to attack it – they would have to get access to every copy of the database simultaneously to be successful. It also keeps data secure and private because the "hash" cannot be converted back into the original data – it's a one-way process. The journey and development of this concept and technology will be a true reflection of innovation, adaptation, and, if done properly, a victory in cyber security.

"The world is moving very quickly and we need to make sure what we do is sustainable, process orientated, and the right thing to do. There should be no price for doing the wrong thing. As we stand on the edge of this revolution – let's do the right thing," said Andrew George, Chairman of the Energy & Power Practice at Marsh.

ECONOMIC AND COMMERCIAL RISKS AND DEVELOPMENTS

GLOBAL MACRO ECONOMIC AND PETROCHEMICALS LANDSCAPE

Middle Eastern petrochemical players will need to step up in order to prevent losing global competitiveness, Mutlaq Al-Morished, CEO of Tasnee, warned the audience of the Marsh EIC.

Starting off with an overview of the global economy, he pointed out that GDP growth in major economies, including the US, is looking positive. The recent growth, he said, is "music to the petrochemical industry's ears," adding that "the petrochemical industry lives and dies by GDP."

The global outlook may look positive for the industry, but Al-Morished argued that there are significant challenges ahead, particularly for Gulf Cooperation Council (GCC) countries.

In the Middle East, regional petrochemicals players face increasing global competition. Between 2021 and 2030, ethylene demand growth will require 45 new crackers globally. To maintain current global share, GCC will need to build around nine new crackers.

He argued that "If GCC is not competitive, these crackers will be built elsewhere and the industry in the region will decline."

For Middle Eastern energy organizations, recent trends in the industry could result in:

- Reduction in cost advantage.
- Reduction in investment economics and the internal rate of return.
- The Middle East no longer being the prime investment destination.

The region faces increasing challenges when looking to maintain its position in the global energy market. In order to maintain growth, Al-Morished suggested the petrochemical industry in the Middle East needs to redefine business and growth models by considering the following:

- Change in corporate operating model with centralized functions and cohesive strategy.
- Pressure on margins due to increased feedstock costs and lower product prices.
- Optimization of existing assets to improve efficiencies, cost disciplines, and to better weather cyclical downturn.
- Diversification to broaden portfolio and lower cyclicality.
- International expansion given lack of domestic growth opportunities.

He concluded with a stark wake up call for companies. "Companies either grow or die. If you stay in your market and territories and there is no growth, the company is basically like a human; it gets old and will end up dying."

In the Middle East, regional petrochemicals players face increasing global competition.

IMPLICATIONS OF THE SHIFT TO A MULTIPOLAR WORLD

The world order has begun to undergo significant changes that could see a shift from a largely unipolar world dominated by the US to a more multipolar world made up of smaller alliances, Elisabeth Braw, a Senior Consultant in the Global Risks Analysis Practice at Control Risks, predicted.

Braw pointed out that following the Cold War, more and more countries began to adopt Western ideals such as liberal democracy and market economies, and enter into large alliances, such as NATO and the EU. This led to the creation of a seemingly unipolar world, with the US sitting at the head of the order. But, the US is currently in a transitionary period of balancing its dominance with other powers.

This level of dominance can be characterized as a presence of super power capabilities whose capabilities cannot be counterbalanced. While this shift is almost inevitable, the growing assertion of a new world order can be characterized as none other than transformative.

"Unipolarity is not a goal in itself and it is not a healthy situation because the club where everyone can be a member yields few benefits to every one of those members," she said. "Large groups without strong enforcement mechanisms are simply very difficult to manage."

As other regions and countries gain increasing dominance, we are now facing an inevitable shift from this largely unipolar world to a more multipolar one, Braw said. We have seen this with already existing unipolar environments now having multipolar entities existing within them.

Such a shift, she argued, is not necessarily a negative thing.

For example, an increasing number of smaller alliances have sprung up between NATO members in recent years as a means to gain needed support and make decisions more agilely than relying on the 29 country strong alliance to unanimously agree on an action.

"I predict we will see much more of these pragmatic groupings," she said. "That is not a threat to the world order. Instead, I would argue, it is a way of getting things done in perhaps a more time consuming, but ultimately more successful, way."

According to Braw, it is unlikely we will see regional blocs emerge such as those observed during the Cold War, and we won't see another major alliance resembling that of the European Union as this shift continues. The emerging environment could prove to be complex and lead to a much different operating environment for businesses, but, Braw concluded, this could be a positive change.

"Instead of chaos in a multipolar world, we will find more pragmatic ways for countries to work together, including countries that disagree on some issues," said Braw.

"And if I could venture a suggestion, it is that a multipolar world, for the very reason that it is more agile than the unipolar one, will present more business opportunities than we have seen in the mostly unipolar world."

"Instead of chaos in a multipolar world, we will find more pragmatic ways for countries to work together."

Elisabeth Braw, Control Risks

MANAGING NATURAL CATASTROPHES

With 2017 becoming one of the most impactful natural catastrophe years on record, the EIC hosted a workshop looking into how these events can affect the energy sector.

From hurricanes to flooding, earthquakes to landslides, 2017 saw several catastrophic natural disasters. This included two Category 5 hurricanes, Irma and Maria, and Category 4 hurricane Harvey, which impacted the Caribbean islands, the Florida peninsula, and the Texas coastline. Meanwhile, monsoon floods affected South Asia, and an earthquake measuring 7.1 on the Richter scale caused severe damage in parts of Mexico.

James Arcidiacono, Managing Director at Marsh, started off this workshop with a look at the impact of the fifth most active Atlantic hurricane season since 1851. According to the National Hurricane Center, Hurricane Harvey cost the US federal government around US$125 billion and affected more than 13 million people in Texas, Louisiana, Mississippi, and Tennessee, making landfall three separate times.

It was not the wind speed that caused the most destruction from Harvey, but the high intensity of rainfall that caused major flooding in the region. There was limited damage to offshore platforms and jack-up rigs; however, there was devastating flooding onshore, leaving one-third of Houston under water. Hurricane Irma, which hit the Florida peninsula as a Category 5 hurricane, followed a path up the less populated west side of the peninsula, but, like Harvey, caused severe flooding in the region.

Arcidiacono concluded by touching on the importance of the insurance industry in situations where consecutive natural catastrophes cause significant damage. With insured losses calculated at circa US$100 billion, it is important that post-loss responses are concise and actions are deployed immediately.

But it is not just the Atlantic Hurricane season that has been a cause for concern in the past year. Sharanappa Gurappa Gedigeri, CEO of Oman India Fertiliser Company, discussed Cyclone Gonu, which developed in the eastern Arabian Sea on June 1, 2007. The cyclone was estimated to have caused US$4.4 billion of damage across the regions of Oman, UAE, Iran, and Pakistan. This included an impact on the local energy sector. Gurappa Gedigeri discussed the impact of the storm on Omani energy plants that experienced the brunt of Cyclone Gonu, but were able to withstand the Cyclone with limited damage to the main plants due to advanced planning. Evacuation of the plant was executed with precision before the Cyclone hit the region and the emergency control room was set up to ensure the plants were safely shut down in time.

When considering what to do after an event, “drone imagery can be worth a thousand words,” said Dave Fox, CEO of Geospatial Insight, pointing out that the use of visual intelligence, such as drones, can help produce analysis after a natural catastrophe event. Geospatial, for example, has the ability to cover all natural catastrophe events straight after the event has taken place and allows organizations to see the exact locations where damage has occurred, aiding loss adjusting and helping organizations make informed business decisions about the process of recovery.

Natural catastrophes are becoming more frequent and more destructive each year, as millions of people are affected by widespread damage and destruction. With wind seasons becoming more unpredictable, good communication and concise response activities that take place immediately after an event are essential. Using previous case studies in the energy sector, organizations can analyze steps that need to be taken and ensure the clean-up process runs smoothly. In addition, the new era of visual intelligence enables them to make more in-depth business decisions. Organizations have a responsibility to understand their insurance policies and the perils covered, however, the insurance market must react to organizations’ needs, especially in the aftermath of a natural catastrophe occurrence.

DECOMMISSIONING: EMERGING ISSUES

With the number of late-life assets entering the decommissioning phase expected to increase in the coming years, companies are not always planning effectively for the costs involved. This workshop looked to lift the veil on the risks associated with assets reaching "end of life".

Decommissioning is relatively immature, typically suffering from significant cost overruns, with little understanding and quantification of risks. "It is an issue that impacts many sectors: downstream, upstream, mining, renewables, and power. It's also a global challenge across the North Sea, Gulf of Mexico, Australia, and Middle East," said Amy Barnes, Managing Director at Marsh.

The workshop examined the issues around decommissioning at each phase of the assets life, including the operational phase, late life, and post-life liabilities. The session focused on the UK Continental Shelf, which will see a significant amount of decommissioning over the next few years.

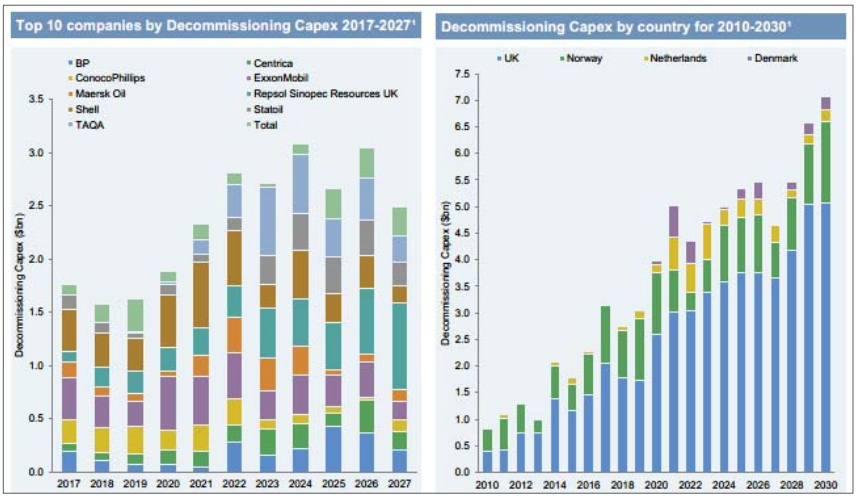
It is expected that 214 structures will be decommissioned by 2025, with costs of approximately US$17 billion.

"By any stretch, that is a large commitment to decommissioning," said Dennis Culligan, Managing Director at Longdown EIC. "Some of that is going to be oil price dependent, and if the oil price goes lower, we can expect higher decommissioning costs."

Meanwhile regulators are putting greater scrutiny on the funding around decommissioning, primarily due to:

- The amount of aging infrastructure in the industry.
- Operational adjustments to the lower oil price environment.
- Changing nature of the ownership of some of these assets from government to private equity.

INCREASES IN NORTH SEA DECOMMISSIONING



Source: Wood Mackenzie. 1Costs are nominal to 2017 and real (in 2017 terms) thereafter.

OPERATIONAL PHASE

Organizations need to start thinking longer term to consider the funding that will be needed once these assets reach the point that they are decommissioned.

Geoff Bauer, Principal at Mercer, suggested that one way to look at decommissioning funding was in a similar way to pensions, both being long-tail risks with uncertainties around timing and costs. But like pensions "advance funding can bring diversification benefits and can also be combined with insurance type solutions," he said.

LATE-LIFE ASSETS

Once the asset enters the phase where it is being decommissioned, the risks faced by operators become less tangible and more difficult to cover under insurance policies. In many cases, work will fall to contractors, but rather than increasing property risks as with construction projects, property values will be diminishing or non-existent.

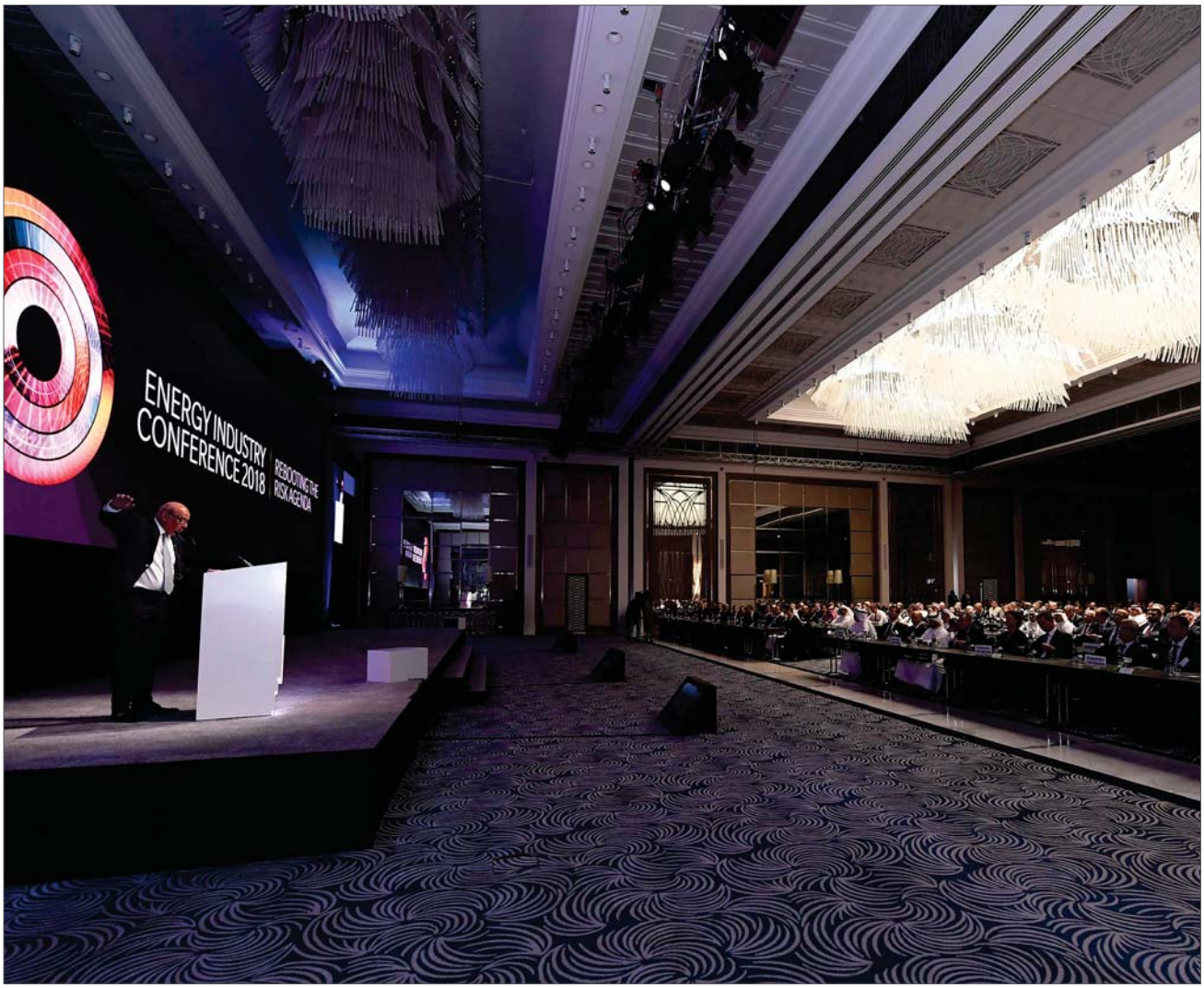
Exposures will generally come from legal liabilities, marine risks, and wreck and debris removal.

POST-LIFE LIABILITIES

"Once your decommissioning project has happened on time and on budget, fully covered, no losses, you then get into the post closure, and the regulation around this varies hugely globally," said Barnes.

Even once no or few assets are left in place following decommissioning, operators can still incur costs from damages in the form of liabilities. For example, if a well that was plugged during the decommissioning project were to leak, it could cause significant environmental liabilities, George Hutchings, Senior Vice President & Chief Operating Officer of Oil Insurance Limited, noted.

To complicate matters further, Culligan concluded liabilities can spring up long after the asset is decommissioned, and in many jurisdictions, do not appear to have an end date.



SECTION 2

MINIMIZING RISKS THROUGH PROCESS SAFETY CULTURE

The workshop looked into the challenges around process safety in the energy industry and how a Process Safety Culture can help minimize risks.

To outline the next level of process safety challenges in our industry, Marsh risk engineers Jasper Clark, Ryan McGovern, and Mariné Botha discussed how nurturing good process safety culture is the final frontier in loss prevention.

Process safety management (PSM) and its principles are rooted in some of the most significant historical losses in the process industries. PSM implementation has helped to prevent incidents throughout the process industries over the past 30 years; however, the size and complexity of the global refining, chemicals, gas, and power industries have also continued to increase, with losses continuing to occur.

The historical approach has centered on operational safety, which has proven successful in reducing injury rates.

However, an additional methodology is required to deliver the next level of safety performance and loss prevention – a cultural approach.

WHAT IS PROCESS SAFETY CULTURE AND WHY IS IT IMPORTANT?

Culture is a socially engineered pattern of basic assumptions or perceived norms, which is learned and nurtured by our local society/tribe/nationality. From a process safety perspective within an organization, this involves direction in the correct way to perceive, think, and feel – the alignment of mindsets and behaviors of all personnel to the vision of the organization with people contributing, not because they are told to do so, but because they want to do so. The goal is for this to influence all aspects of work and conscious decisions.

Ideally, an organization would look for early signs of an ineffective safety culture and monitor leading indicators to detect areas of concern.

However, process safety culture is difficult to measure in practice, given most aspects are subjective and there may be different subcultures within a single organization. But working to understand and measure this offers the following benefits:

- Affects accident causation and accident prevention.
- Leading indicator of process safety rather than lagging.
- Actively prompts people to think and talk openly about safety.
- Identifies strengths and improvement areas.
- Assesses facilitators and barriers for change.
- Reveals differences in perception across the organization.

WHAT DOES GOOD PROCESS SAFETY LOOK LIKE?

A It's in the "bloodstream"

People continually strive to avoid a "non-goal", valuing this as much as positive business outcomes.

- ✓ Poor conditions and practices are viewed by all to be **unacceptable** and are **openly challenged.**
- ✓ Events and incidents are seen as exceptional and unacceptable occurrences **that are avoidable.**
- ✓ Groupism trumps individualism, influence aligned to competence.

B Vibrancy of engagement

People contribute not because they are *told* to do so but because they *want* to do so.

- ✓ Improvements are widely recognized as **an outcome of the process** of improving culture.
- ✓ All employees involved in **proactively contributing** ideas for improvement.
- ✓ Acute awareness of what **world class performance** looks like.

C Errors are advertised

Errors are made as conspicuous as possible to undermine self-deception and concealment.

- ✓ Bad news is **treated as a resource** to be learned from.
- ✓ Anomalous events treated as outcomes rather than accidents, encouraging the search for **problem source.**
- ✓ Motivation system **transcends carrot-and-stick** approach.

- Determines readiness and supports selection of appropriate improvement initiatives.
- Detects early warning signs of deterioration, as difficult to revitalize a successful safety culture.

WHAT DOES "GOOD" PROCESS SAFETY CULTURE LOOK LIKE?

There are several cues which can gauge the health of process safety culture across an organization (see diagram on the previous page).

An organization with strong process safety culture understands that the full elimination of human error is not possible, but this can be minimized with strong controls of each human factor as a primary focus, followed by base features in design and other protection layers to compensate for any human errors which occur.

Continuous learning to sustain and nurture good culture is also important. This can be addressed through training programs and targeted recruitment; however, informal interactions, such as the shared behaviors of the organization, trust factors, leadership response in critical situations, and stories and legends may prove to have a more significant effect with a greater chance of invoking personal buy-in. Concluding the session, speakers highlighted areas that could be good indicators of process safety culture, including:

- Near miss, accident and incident reporting, investigation, and follow-up of action items.
- Response to risk improvement recommendations.
- Training (including refresher training).
- Control and quality of key operating documentation.
- Systems of work (management of change, permit to work, shift handover, bypass control).
- Housekeeping.
- Reporting of process safety indicators.

"Safety is a state of activity, not only the absence of accidents or incidents. Monitoring safety requires more than monitoring the signs of "illnesses", that is, incidents, deficiencies, errors. It is important to also know why the situation is so, and how the current safety management processes are contributing to the safety level."

Mariné Botha, Risk Engineer at Marsh

BREAKING THE CONTRACT MOLD IN DRILLING

The usual models around offshore drilling need to be rethought if it is to regain its competitiveness with alternative onshore models in the US, Simon Johnson, CEO of Borr Drilling posed to the Marsh EIC audience.

Johnson's company, a relatively new drilling contractor, has been seeking to change the traditional allocation of risk among drilling contractors and operators in the industry.

"The upstream market is dynamic and there is adversity in the business cycle, and by that I mean that when times are bad, contractors are forced to accept more risk at a time when they can least afford to accept it and to manage it," he said.

Currently, contractors are sandwiched between the operators and vendors in the value chain. Over the past 30 years, with a concentration in the number of oil companies and vendors, the contractor space has been increasingly squeezed, presenting multiple challenges for the space.

According to Johnson, this was compounded by the fact that there was a misalignment between the motives of the operator and the drilling contractor, as each one of them is looking to maximize their own interests at the well site. Since the downturn in oil prices, companies have had to relook at their supply chains and identify where these were too complex or inefficient.

This prompted Borr Drilling to start rethinking the commercial model. "If we can't change the rules, what we can do is change the game," he said, noting that Borr was developing a new model that is more efficient, cost effective, and makes better use of technology.

In order for the offshore industry to effectively compete with onshore shale gas in the US, Johnson suggests that drilling contractors need to integrate themselves better with shareholders and that there needs to be fewer parties present at the well site. This would require operators to take a step back to allow the service companies to work together more effectively, cohesively, and over long periods of time to minimize the disruption, particularly as the industry accelerates out of the recent downturn in the market. Drilling contractors would need to step up and take greater responsibility for the logistics and decision making at the well site.

In addition, technology is likely to play a greater role at these sites, with Johnson predicting we could soon see greater use of technology at the well site, which could one day be operated by automated machines run by the drilling contractors from an office location.

"We are in the early stages of working with our industrial partners to achieve some of this," he concluded.

"If we can't change the rules, what we can do is change the game."

Simon Johnson, Borr Drilling

THE HAZARDS HIDDEN WITHIN PROGRESS

Recent investments in Pakistan's energy sector may be growing the industry, but the new complexity means it is still exposed to considerable risks.

Despite progress in recent years, Pakistan's energy industry is facing a challenging environment, according to Tahir Jawaid, CEO of Hub Power Services.

In the past, Pakistan's energy industry suffered from several issues, including:

- A high cost of power generation as a result of an inappropriate fuel mix, which included a heavy reliance on oil.
- A large number of energy losses at each level of the value chain.
- Minimal growth in net power generation capacity and inadequate recoveries due to higher costs.

According to Jawaid, this resulted in issues such as power shortages, unaffordable power, debt, stalled economic growth, and exports being too expensive to be competitive. However, the China-Pakistan Economic Corridor, which includes an estimated US$50 billion bilateral investment package, is significantly growing Pakistan's energy sector, and is expected to continue to grow it further over the next few years.

But there is complexity in this growth and it exposes the industry to new risks, Jawaid argued. Challenges to be faced include issues associated with the extraction and use of lignite from the Thar mines, use of imported coal, the handling and storage of regasified liquid natural gas, the adoption of super critical steam generation technology, the use of new large nuclear generating units, servicing of debt associated with the investment, management of constraints on the high-voltage transmission system, and more.

There is also an increased risk profile due to the potential lack of skilled resources to adapt to the technology challenges, the transportation and storage of multiple fuels in a congested area at Port Qasim, electricity grid management issues with 660 MW and 1,000 MW generators, and the possibility of no demand for existing plants with unexpired power purchase agreements.

"They need to start telling the local markets how to look at risk with these big projects coming in," said Jawaid, adding that such factors as the reliance on manpower from other countries, along with a lack of experience in the market for dealing with new risks

that comes with plants moving from subcritical to super critical and needing to handle high temperatures and pressures.

What it comes down to, he said, is answering these questions: "If phenomenal growth comes in, are there people who are looking at how the risks that are coming from huge progress are going to be managed? Does it create any residual risk in the market?" as well as whether the recent changes will make Pakistan more competitive in the world market in the long run.

> "If phenomenal growth comes in, are there people who are looking at how the risks that are coming from huge progress are going to be managed?"
>
> Tahir Jawaid, CEO of Hub Power Services

SECTION 2

FRONTIER POWER TECHNOLOGY

As the technology employed in the power sector constantly evolves, so too does the importance of assessing the true risk exposures inherent to these advancements. This workshop discussed how optimal risk transfer and contractual arrangements can be developed to manage the machines operating on the frontier of possibility.

New technological advancements inherently come with associated risks. As developers seek to balance proven reliability with increased efficiency, careful consideration must be given to insurability and allocation of risk.

Philippe DuFour and Scot Peachey, Managing Directors at Marsh, led the workshop, examining what power companies should now be thinking about when looking at mitigating their risks and purchasing insurance. The session provided a summary of contractual and risk-sharing principles that should be considered when reviewing supply or engineering, procurement, and construction (EPC) contracts.

Gas turbines (GTs) have undergone rapid development. The first GT in 1949 generated 3.5 MW of electricity and these early units rarely ran for more than 10 consecutive hours. Today's modern GTs have an output of more than 400 MW, firing temperatures that exceed 1,600 degrees Celsius, and efficiencies that regularly exceed 60%. But with these new efficiencies come increasing risk.

New technology has also led to the development of independent power producer (IPP) plants. The success of any IPP depends upon the interrelation between stakeholders who establish the contractual foundations of the project, including the allocation of risk and agreement of a clearly defined insurance strategy. Contracting parties include, among others, project companies (which own the plant and raise the funds to build the plant), operators, power purchasers, lenders, contractors, and original equipment manufacturers (OEMs/suppliers), all of whom will be looking to retain or transfer risk under contract, while concurrently transferring as much as reasonably and economically possible to insurance.

Given this environment, this session looked at insurance solutions for new technologies, which will depend on:

- The availability of detailed technology information held on file.
- The relationship the individual carrier has with any given manufacturer.
- The wider confidence they hold in the research and development methodologies of that particular company.

Subject to the allocation of risk, deductible, and premium cost all gas turbines are insurable. What was evident from the presentation is that in order for Marsh to support clients and offer best-in-class advice, all power plants using advanced technologies require an in-depth study and knowledge of the contractual obligations in place.

IS GAS GOLD?

The EIC hosted two workshops on natural gas and LNG under the general theme "Is Gas Gold?" with the first session focusing on Unlocking Gas Demand and the second on Project Risk Management.

Natural gas is predicted to become the fuel of choice in the energy mix, with the demand for liquid natural gas (LNG) expected to grow at twice the rate of gas demand, at an average of 4% to 5% per year between 2015 and 2030, according to Paul Nicholson, Marsh's Global Head of LNG team.

The gas industry may enjoy a positive environment over the next few years, but companies will need to know how to unlock demand, Sandro Melis, Partner at Oliver Wyman said. Gas' share of hydrocarbons production is forecast to increase, from 40% in 2018 to an estimated 44% by 2035. But demand could be even greater in oil-intensive economies. To develop gas demand, the industry will need to take steps such as investing in downstream assets and rebuilding strong technical skills.

For Bangladesh, gas could be seen as "new age gold" for the country, A.N.M. Tariqur Rashid, Managing Director of Bangladesh's Summit LNG Terminal, speaking of the increasing demand in the country for LNG. Andy Hayward, operations manager at Excelerate Energy used Bangladesh as a case study for LNG demand and how floating storage regasification units (FSRUs) can help unlock the potential of LNG.

As these projects become more attractive, Keith Thomas, independent gas and LNG consultant, advised that companies should keep in mind the following questions:

- How can I set up a gas project to succeed?
- What do I need to know to be successful?
- What do I need to do to minimize the risk of failure?
- What do I do if the pieces of the project in terms of the value chain and infrastructure don't fit?
- How do I get from a project development to an operating plant?

Other key findings from these sessions included:

- Adel Ghaleb, Finance Manager at Yemen LNG, highlighted the national and strategic importance of natural gas production to Yemen as a country and elaborated on the security systems and controls in place around the project operations.
- Odiljon Karimov, Technical Director at Oltin GTL, discussed a project in Uzbekistan to further develop the use of synthetic liquid fuel and highlighted the importance of timely financing.
- Renad Younes, Partner at Ashurst, examined the contractual considerations within the LNG value chain. She emphasised the importance of careful contract drafting around take-or-pay obligations, liability for off-specification LNG, and force majeure.
- Sean Pearson, Assistant Vice President of Construction for Liberty Mutual Group, spoke about the risks of LNG and how organizations can approach insurance to mitigate these.

THE FUTURE OF NUCLEAR POWER

Nuclear power is set for growth as it represents one of the more carbon neutral forms of energy, but public opinion, regulation, and a move toward private funding will challenge the sector in years to come, one of the conference's workshops revealed.

Like many forms of renewables, nuclear is expected to gain attention as it has a lower carbon footprint. But unlike renewables, it also has the benefit of greater stability.

"At the point of generation, nuclear is carbon free. As a lifecycle it is not entirely carbon free because you have to make the equipment, you have to decommission, and you have to get the nuclear fuel to the site," said Mark Pollard, Managing Director at Marsh, who chaired the workshop.

"So there is a small carbon footprint from nuclear, but it is insignificant in comparison with fossil fuels such as oil, coal, and gas generation."

Pollard pointed out that there were two main risks facing the nuclear sector. The first centers on public opinion. Following high-profile disasters such as Chernobyl and Fukushima Daiichi, public opinion of the sector remains low, with high concerns around radiation risk following a large-scale disaster. "There are several cases where governments have shied away from engaging in nuclear power because of its unpopular nature with the public," said Pollard.

While disasters such as these are extremely devastating, Pollard highlights that these incidents are extremely low frequency and, as technology advances, the probability is decreasing further.

From an industry perspective, commercial risk is the biggest worry regarding nuclear power. When looking at a new plant, organizations are likely to ask themselves:

- Can this be built?
- Can we afford it?
- Will the revenue stream be at the level that we require in order to pay the debt back over a reasonable period?

Nuclear liability regimes are increasing the liability limits, which will also challenge the sector moving forward. The Vienna Convention on Civil Liability for Nuclear Damage of 1963 raised the limit to SDR* 300 million by a 1997 protocol in force from 2004, and the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 1960 will increase limits to EUR1.2 billion, when the 2004 Paris and Brussels protocols come into force. Both conventions also require a discovery period of 30 years for certain losses – which challenges insurance market capacity.

Decommissioning has also become an increasingly important commercial consideration in the life cycle of these plants. The cost of decommissioning per reactor is currently around US$1 billion. With the life cycle of a nuclear reactor standing at around 60 years with the possibility for extension, making decisions now for those that will be running the plant at the time of decommissioning can prove challenging.

The future investment in nuclear power will almost certainly be from private investors rather than governments, panelists at the workshop discussed. Concluding the workshop, panelists from nuclear insurers, including EMANI, Northcourt, and Nuclear Risk Insurers, discussed the capacity in the market and the challenges of insuring these assets from a liability perspective, particularly with the new limits coming into place from both conventions. However, general consensus among the panelists was that if there is a demand for new capacity in the nuclear market, it is likely that insurers will look to provide it.

The panel also discussed the thorny question of how procurement departments, which usually work with a number of alternative suppliers, can optimize the purchase of a complex product such as nuclear insurance from a very limited market, where discarding a supplier can mean not reaching the capacity required. The panel concluded by advising that organizations should consult with a competent insurance advisor from an early stage to develop a suitable strategy.

*SDR = special drawing rights.

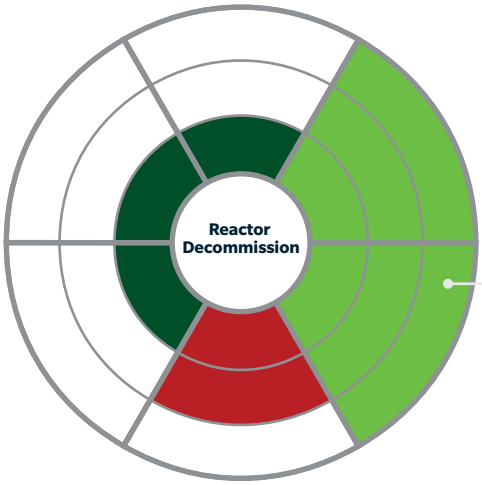
DECOMMISSIONING RISK AREAS

Program management

- Understanding areas of highest risk for delay, cost.
- Detailed planning for different phases.
- Execution.

Financial

- Detailed estimates with conservative assumptions.
- Buffers for cost overruns, mishaps.
- Impact of market shocks impacting decommissioning fund.



Waste handling, processing, storage and disposal

- Exposure minimization.
- Prevent spread of contamination.
- Plan for high radiation evolutions.
- Consider impact from scenarios with higher levels of Low Level Rad Waste disposal than anticipated.

Waste handling, safety, and workforce performance have greatest impact on timeline and cost of decommissioning.

Regulatory

- Understand requirements which may differ from operational types.
- Establish and maintain open communications.

Safety

- Continuing risk assessment.
- Cost does not compromise safety.

Workforce

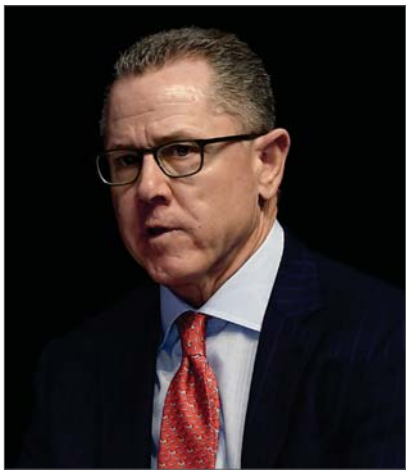
- Skills for operation different from those of decommissioning.
- Ensure continual training as process continues.
- Mechanism in place for feedback from workforce for best practice.
- Optimally scaled for different project phases.

"There is a small carbon footprint from nuclear, but it is insignificant in comparison with fossil fuels such as oil, coal, and gas generation."

Mark Pollard, Managing Director, Marsh

THE INSURANCE INDUSTRY

OVERCOMING CHALLENGES WITHIN THE ENERGY INSURANCE MARKET



The EIC hosted an insurer panel discussion, which focused on the effect of recent catastrophes, the influx of alternative capital into the market, and the challenges around providing cover for cyber risks.

Moderated by Dean Klisura, President of Global Placement and Specialties at Marsh, the panel featured leaders from across the insurance industry, discussing the current environment for energy organizations.

2017 was a year of transition for the insurance market, after major natural disasters in North America, such as hurricanes Harvey, Irma, and Maria, wildfires, and earthquakes, caused a significant amount of insured losses. However, while this represented a challenge for the market, it did not have a significant effect on pricing, panelists said.

Kamal Tabaja, Group Chief Operating Officer at Trust Re noted that 2017 was "one of the worst years that we have seen in the past 15 years in terms of the market loss," yet still had not contributed to a significant change in pricing. Insurance pricing has been reducing in recent years as capital levels in the market remain high. Some insurers are seeing prices for Specialties, such as energy, stabilizing.

"There is still a lot of interest in the insurance industry. With that backdrop, we are seeing overall stabilization in Specialty pricing in the market," said Michael Gosselin, Chief Underwriting Officer at Liberty Global Group.

Over the past few years, there has continued to be an influx of alternative capital into the market, which the insurance industry has seen as both a threat and an opportunity.

"If you look at the catastrophe losses that occurred in the US, the economic loss was around US$330 billion, of which US$130 billion was recovered by insurance. If we were going to add value to our clients, we should try and close that gap. And I think that alternative capital can help assist in that process and we should work alongside it," said Gordon Browne, Head of Energy at AIG.

"I think if we can embrace alternative capital as something that can be complimentary to traditional capacity, then that is something that we absolutely should be doing," added Adam Wakeley, Head of Energy Hub in Marsh Dubai.

Panelists also predicted we will continue to see mergers and acquisitions across the market following a number of large deals over the past few years. Meanwhile, cyber risk in the energy sector continues to remain a concern for companies and insurers alike.

"Cyber does present a unique challenge. If you look at a lot of what we do in the energy space, aggregation is very important," said Huw Jones, Global Head of Energy at XL Catlin. "I don't think we've had a potential peril like cyber before that goes across the portfolio regardless of the geography, and that, to us, is one of the biggest challenges."

USING CAPTIVES FOR ENERGY RISKS

The use of captives within the energy industry is widespread; it ranks within the top-10 industries in terms of captive utilization. This panel, hosted by Lorraine Stack, Managing Director of Marsh Captive Solutions Group, examined the current environment for captives.

Captives, a company's wholly owned insurance company, have a significant scale in the risk management world globally. There are currently more than 7,000 captives in more than 46 domiciles across the globe. A sense of the amount of business they account for is illustrated by the fact that the captives that Marsh manages currently write over US$46 billion of premium. In 2017, *Business Insurance* gave a total managed premium of circa US$85 billion globally. When you add in self-managed captives, captive premium easily hits US$100 billion.

To contrast that with commercial insurers, Forbes 2017 list of the largest global insurers has Ping An China with a premium, of US$106 billion, so captives are very much part of the insurance ecosystem. In spite of a continuing soft market the number of captives continues to grow, however, not everywhere and not always at the same speed.

Within Marsh's recent experience the captive count has increased marginally in the past year but the premium written within the 1,104 captives included in Marsh's Landscape Report of 2017 increased from US$44 billion to US$46 billion over the prior year, so captives are writing more business. Our 2017 survey also shows the following increases in non-traditional coverages written:

CLASS	ANNUAL INCREASE	FIVE-YEAR INCREASE
Multinational	30%	550%
Surety	37%	–
Cyber risk	10%	240%
US medical	16%	95%

Specifically with regard to the energy and power industries, energy and power are among the top-10 industries for captive utilisation and Marsh manages 80 captives in the sector with a surplus of nearly US$10 billion.

The most common coverages included in energy captives are property (including control of well in the energy space), liability, and cargo risks with the majority of captives purchasing some reinsurance. Captives are using their capital surplus in a number of ways such as to write non-traditional classes, such as cyber; to fund enterprise risk management/loss control projects and increasingly, although still only a small number, to fund wellness programs as part of employee benefit initiatives.

The panel was comprised of both energy companies (Balyan Suleiman of Petronas and Takashi Kubo of INPEX) and a captive regulator. Suleiman and Kubo discussed, from the client perspective, the rationale for captive domicile selection, how it creates value for the enterprise and the resources required to run a captive. Both clients saw significant value creation from their captives, giving them enhanced control and access to a broader range of (re)insurers. The rationale for captive domicile ranged from political to the rigor and experience of the regulator.

Steve Barnett, Director of Abu Dhabi Financial Centre Development, explained the driver for establishing a new captive domicile to provide a regional option for local companies. He went on to explain that Abu Dhabi reviewed the regulation from a range of mature and established domiciles, using the best fit from across the globe and then modifying to fit the territory.

The panel also went on to discuss the approach and rationale in assessing adding new lines of coverages to captives such as cyber and employee benefits.

Finally, the session addressed the issue of Base Erosion and Profit Shifting (BEPS), the concern that companies are using captives as part of an aggressive tax planning strategy, and shifting profit from a high tax domicile to a low tax domicile (the captive) by way of premiums charged. This increased scrutiny puts increased scrutiny on captives around premium calculations and demands that the captive demonstrates substance where the value adding activity is taking place (that is, in the captive domicile).

INSIGHT PAPERS PUBLISHED FOR THE EIC

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Marsh's 25th edition of the 100 largest losses in the energy industry explores the biggest property losses in the hydrocarbon industry from 1978-2017 to identify where risks lie and what can be done to manage them safely and effectively.

COULD ENERGY INDUSTRY DYNAMICS BE CREATING AN IMPENDING CYBER STORM?

Energy executives are becoming more concerned about the impact a cyber-attack could have on their organisations, but greater understanding, quantification, and mitigation strategies may be needed to tackle this growing risk.

REMOVING BIAS FROM DECISION MAKING IN THE ENERGY AND POWER INDUSTRY

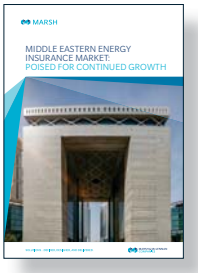
The transformation of risk management practices is set to accelerate over the next decade. One trend that has contributed to changes in risk management strategies over the past few years is debiasing.

RETHINKING BUSINESS INTERRUPTION RISKS IN AN OPTIMIZED OIL AND GAS INDUSTRY

Business interruption losses in the oil and gas industry are likely to increase over the next decade unless greater attention is given to how an event could affect supply chains that are more integrated, interdependent, and streamlined.

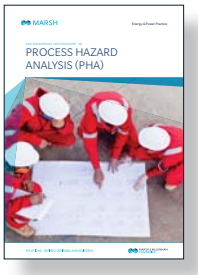
BENCHMARKING THE MIDDLE EASTERN ENERGY INDUSTRY

Despite a more challenging economic environment which has led to aggressive cost cutting in the industry, the Middle East has managed to maintain its position in the upper middle quartile overall.



MIDDLE EASTERN ENERGY INSURANCE MARKET: POISED FOR CONTINUED GROWTH

The recent significant growth of the Middle Eastern insurance market looks set to continue under current market conditions. This paper highlights increasing footprint of the risks written in the region and recognises it as an insurance hub of global significance.



RISK ENGINEERING PAPER: PROCESS HAZARD ANALYSIS

Major accidents on energy sites have the potential to result in hundreds of millions of dollars of physical damage, present a danger to employees and the local population, and can lead to significant business interruption. In this paper we look at process hazard analysis as a key tool for understanding major accident hazard.

BRINK ARTICLE – MANAGING THE FINANCIAL RISK OF INFRASTRUCTURE DECOMMISSIONING

After decades of development and production, many oil and gas fields around the world are approaching the end of their useful life. Developing financial strategies for decommissioning is essential for companies with ageing assets.

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