ESF MENA 2021

MIDDLE EAST ENERGY & SUSTAINABILITY FORUM

Decarbonising the Downstream Industry

25-27 October 2021 | Virtual

POST SHOW REPORT

HOSTED BY EURO PETROLEUM CONSULTANTS

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EPC
Euro Petroleum Consultants

INTRODUCTION

Following the success of the Energy & Sustainability Forum (ESF) in Europe earlier this year, Euro Petroleum Consultants (EPC) held the inaugural ESF MENA virtually from 25-27 October, the latest in their global series of conferences dedicated to downstream sustainability and decarbonisation. Over 200 delegates joined virtually across three days to hear keynote presentations, interactive panel discussions and the latest technologies supporting the development of a sustainable energy future in which the Middle East's downstream industry continues to play a leading role.

The conference focused on four key themes:

First was positioning and pathways for a low carbon transition which took place through a series of keynote presentations and panels focused on preparing the downstream industry for tomorrow, through market outlooks and future fuel predictions, as well as the most opportune decarbonisation pathways and implementation roadmaps for the region.

Second was decarbonisation technologies and asset diversification, which looked at how the region's refiners and producers can carbon base line their assets. Sponsors Wood, Saint-Gobain NorPro, Sulzer, and Lummus Technology presented the latest re-configuration, conversion, and catalysts technologies to support the evolution of the region's refiners and producers through increased flexibility and (product slate) diversification, including the production and development of new low-carbon and alternative fuels, as well as the delivery of energy and operational efficiency to minimise carbon footprint and operating costs.

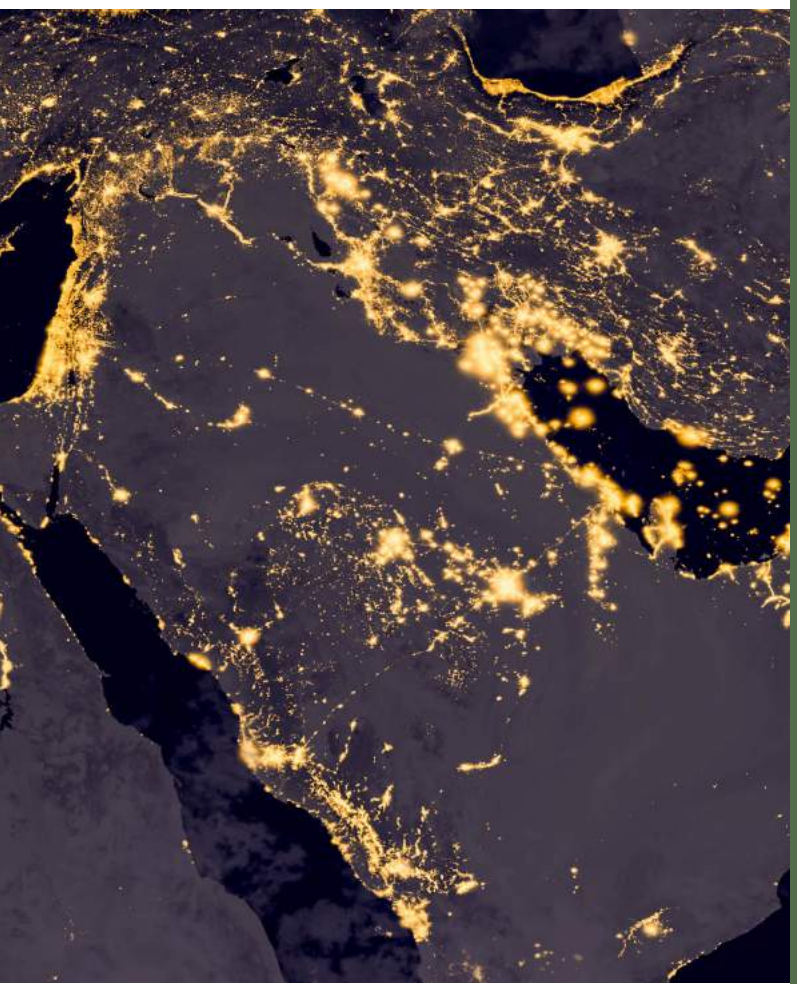
The forum's third session focused on the hydrogen hype and GCC advantage and welcomed a keynote presentation from NEOM's Executive Director Hydrogen & Green Fuels, Roland Kaeppner on the company's green hydrogen strategy, a building block of NEOM's vision and driver of Saudi Arabia's sustainability ambitions. Presentations from Dii Desert Energy, Axens, Honeywell UOP, Lummus Technology and Alfa Laval explored the latest zero emissions technologies, including CCS and hydrogen, essential to achieving deep decarbonisation targets.

The final session focused on circulatory which included a panel discussion on 'turning trash into treasure – commercialising circular economy strategies' and delegates heard from experts from Borouge, Tasnee, IHS Markit and Sabic on the value proposition and commercialisation status of plastics conversion technologies and the tangible steps needed for large scale implementation.

SPONSORS & EXHIBITORS:

PARTICPATING COMPANIES:

ESF MENA VIRTUAL IN NUMBERS



355 Registered Delegates

39 Speakers & Panellists

355 Messages Exchanged

75% Operators/ Producers

11 hours of content

737 Visits to Exhibition Stands

KEYNOTE SPEAKERS:

Andrew Inglis
Vice President of Energy and Fuels, EMEA

NEXANTECA

Winning Pathways and Policies to Define and Drive the Gulf's Transition

Ursula Thakkar
Vice President Low Carbon Development, Refining and Petrochemicals Orient

TOTALENERGIES

TotalEnergies Getting to Net Zero Together with Society

Francesco De Francesco
Managing Director

ENI ABU DHABI REFINING & TRADING SERVICES B.V.

Eni's Energy Evolution

Roland Kaeppner
Executive Director Hydrogen & Green Fuels
NEOM

A Journey Towards the 2nd Wave of Energy Transition

Dr. Fahad Al-Sherehy
Vice President Energy Efficiency & Carbon Management

SABIC

Enabling the Circular Carbon Economy (CCE) Through the Application of Game-Changing Technologies

PANELLISTS:

Bob Maughon
Executive Vice President, Sustainability, Technology and Innovation
SABIC

Tae-Yoon Kim
Senior Energy Analyst
INTERNATIONAL ENERGY AGENCY (IEA)

Alicia Eastman
Co-Founder & President
INTERCONTINENTAL ENERGY

Maitha Al Marashi
Vice President, Sustainability
BOROUGE

Leon de Bruyn
President & CEO
LUMMUS TECHNOLOGY

Bryan Glover
President & CEO
HONEYWELL UOP

Jean Sentenac
President & CEO
AXENS

Andy Gosse
President
SHELL CATALYSTS & TECHNOLOGIES

Doug Kelly
President Technology
KBR

Cornelius Matthes
CEO
DII DESERT

Salim Al Huthaili
CEO
OQ ALTERNATIVE ENERGY

Bashir Dabbousi,
Director - Technology Strategy & Planning
SAUDI ARAMCO

Frank Wouters
Director
EU-GCC CLEAN ENERGY TECHNOLOGY NETWORK

Dimitrios Dimitriou
Hydrogen Business Development Manager
ADNOC

Vatche Kourkejian
Partner & Head of Energy Practice
ROLAND BERGER STRATEGY CONSULTANTS

Saeed Al Ajrafi
VP Downstream
TASNEE

Richard Charlesworth
Executive Director Oil, Midstream, Downstream & Chemicals
IHS MARKIT

Mohannad Al-Haidri
Leader, CE MEAF
SABIC

Süleyman Özmen
Managing Director
3P18 INDEPENDENT CONSULTANTS LLC

Bilal Guliyev
General Manager of R&D and Innovation
SOCAR TURKEY

Daniel Carter
Global Director, Decarbonisation & New Energies
WOOD

John Murphy
Chief Executive Officer
THE CATALYST GROUP (TCG)

Halim Hamid Redhwi
Professor, Chemical Engineering Department & Deputy CEO, BD
King Fahd University of Petroleum & Minerals (KFUPM)

It was absolutely my pleasure to join the panel and it was a very positive experience. I really enjoyed hearing the comments from my colleagues in the industry. It was also good to hear the spirit of collaboration with operating companies in MENA to tackle the Sustainably challenges facing the industry. Thank you very much to you and the rest of the EPC team for arranging the virtual conference.

President, Technology, KBR

KEYNOTE PANEL
SUSTAINABILITY STATE OF PLAY IN THE MIDDLE EAST – FROM LAGGING TO LEADING

ESF MENA 2021

Our keynote panel at ESF MENA 2021 Virtual kicked off discussing the challenges and opportunities for the downstream industry as it recovers from a turbulent 18 months following the COVID-19 pandemic. Our Vice President Stefan Chapman was joined by Dr. Bob Maughon, EVP, Sustainability, Technology & Innovation, SABIC, Robin Mills, CEO, Qamar Energy and Tae-Yoon Kim, Senior Energy Analyst, IEA who discussed how the changing global energy dynamics and growing momentum for the energy transition is putting the Middle East region, traditionally heavily reliant on hydrocarbons, under increased pressure.

The pandemic has provided a preview into the economic and social strains that the region could face from reduced oil and gas revenues. Pressures on producers to reform and diversify the economy away from hydrocarbons is not new, but the pandemic has provided additional urgency.

There are two dimensions of diversification. First, the economic diversification and second, the energy diversification. On the economic diversification there has been some progress, the value of non-oil and gas export has been on the rise although it varies between countries. Looking at the energy diversification, progress has been extremely modest and the region's energy mix has barely changed in the past decade. The share of low carbon energy sources has remained among the lowest in the world. Many of the region's oil and gas producers do not yet have climate target ambitions, although the situation is fast changing as highlighted by the recent announcements from the UAE and Saudi Arabia.

There are many opportunities for the region to thrive in the era of the energy transition with its natural geology and abundance of low cost and low carbon resources. Carbon capture, and thus blue hydrogen presents a big opportunity. One item critical to the reduction of emissions intensity, from both up and downstream operations, is methane emissions. Although the region is seen to be improving its overall emissions intensity, the same cannot be said for its methane emissions. It is estimated almost 45% of methane emissions could be avoided at low cost. Tackling these emissions is one of the immediate opportunities for the region to decarbonise.

Looking at petrochemicals, it's clear that there are some near-term pressures on the industry. As well as addressing carbon neutrality, how can the industry bring forward solutions around the end of life for plastics? This is a challenge from both a Scope 3 standpoint but also from a societal standpoint. Currently standing at just 10-15%, the global implementation of addressing circular plastics is crucial and we are seeing this happening now, but still at a slow pace. Some regions, such as Western Europe and parts of Asia are more advanced. It was commented that as an industry we have not been ambitious enough when it comes to waste management infrastructure which is an extremely critical piece of the equation.

As one of the panellists said, "we must think of these materials as having an inherit energy value and they can be brought back and reused in the process". Integrated solutions must be developed around mechanical recycling and advanced chemical recycling, and integrated throughout the entire value chain. A petrochemical producer is only one part of the solution and collaboration is needed between brand owners, retailers, and converters to work in a coherent way, together. Furthermore, plastic demand is set to grow in the energy transition (with its use in solar panels, windmill blades and wiring cable applications etc), but we can only do this responsibly if we address the end of life of these materials. The future needs of a petrochemical producer will be based on a much more diversified range of feedstocks, whether its bio-based oils, plastic recycling feedstock or traditional feedstocks. At a regulatory level the issues are often looked at separately for example, banning plastics to address the end-of-life issue, but there are implications of using less efficient, heavier weight and more energy demanding materials which may lead to more carbon in the end.

The UAE, Saudi Arabia and Bahrain have all pledged to be net zero by 2050-2060. Globally, there is a fair amount of scepticism about these announcements given how hydrocarbon intensive and export reliant these economies are. In fact, it could be surprisingly easy for these economies to approach net zero. First in the power sector, it is already predominantly run-on gas. The UAE has started introducing nuclear power and has been successful along with Saudi Arabia in implementing solar power, home to some of the largest projects in the world with the lowest costs. The match between generation and demand is much better than you see in other parts of the world. A system based on solar power with batteries, nuclear power and to some degree of gas with CCS or gas turbines, burning hydrogen would provide a feasible net zero power system in the relatively near future. Once this is in place, industries can be electrified along with oil and gas operations and vehicles. After this, the harder to abate sectors can be addressed, with CCS and hydrogen offering solutions. This demonstrates how feasible it would be for the Middle East to reach its targets.

The recent announcements particularly that of Saudi Arabia's demonstrate the abundance of opportunities for the region. In every forecast there will still be demand for hydrocarbons after 2050, albeit heavily reduced and the Middle East as a major exporter are expected to continue to satisfy this demand as the lowest cost producers with the largest resources. The region has many opportunities to leverage its existing assets. For example, upstream can use low carbon hydrogen especially through natural gas with CCUS, which could provide opportunities to secure an additional revenue stream via export. The IEA estimate that hydrogen trade will grow substantially to $100-300m by 2050. Solar energy too will play an important role in the region's future energy mix and over the coming years we will expect to see a major growth in stored solar capacity. This means mid-day solar production in low demand periods such as the spring, will start exceeding demand. This will be an interesting challenge to see how the power will be stored and what will be done with the surplus solar power.

For refiners, there is a definite need to rethink the definition of the industry. From traditionally converting only crude oil to oil products, to converting crude oil, plastic waste, or biomass into highly valuable products. Energy efficiency and reliability are a critical piece of the energy transition equation for the downstream industry. It requires more investment in digital tools, manufacturing better integration at sites, improving reliability of operations, and upgrading technologies to ensure better production rates. The industry must deliver what it can with its current assets but it's not going to be enough to deliver carbon neutrality.

KEYNOTE TECHNOLOGY PANEL
THE PATH TO NET ZERO: TRANSFORMATIONAL TECHNOLOGIES AND ENABLING ENGINEERING

Held just ahead of COP26, which is perhaps the most passionate and purposeful conference on climate change yet, we reflect on the main take-aways from the technology CEO panel 'The Path to Net Zero: Transformational Technologies and Enabling Engineering' joined by Bryan Glover, President & CEO, Honeywell UOP, Doug Kelly, President Technology, KBR, Leon de Bruyn, President & CEO, Lummus Technology, Andy Gosse, President, Shell Catalysts & Technologies, Jean Sentenac, President & CEO, Axens and moderated by Stefan Chapman, Vice President, Euro Petroleum Consultants.

Our panellists agreed that climate change is real, and it is happening. It has the attention of the world, customers, shareholders, and society, but at the same time we must balance rising energy demand, population growth, and a strive for increased standards of living. Furthermore, it cannot be forgotten that many people are still living in energy poverty.

> *An excellent forum, providing a platform to learn the latest technologies and communicate with SME's. It is the place where collaboration starts!* **Bapco**

Given the world's demand for renewable energy, the Middle East looks set to continue their role as an energy exporter long-term due to the massive opportunities to create renewable energy and the world's demand for it.

Reflecting on the strategies currently seen across the Middle East, the conference heard they fall broadly into three categories – capture, avoid, and transition. First on the capture side, a significant one for the region where the natural geology really supports it. There are big opportunities and considerable efforts going into CO2 capture, particularly around blue hydrogen with the potential to sequester the CO2. This is going to be the cheapest, and quickest route to clean hydrogen. There is also interest and opportunities in post combustion capture, both brown and green field.

Looking at the avoid category, certainly in the Middle East with its rich solar resources, green hydrogen is a big topic, and a lot of companies are working to play in that space. Blue or green, we expect to see competition and a race between the two over the coming years.

Furthermore, within the avoid strategies, there is a lot of interest and traction in direct recycling of plastics through advanced mechanical and chemical recycling. Plastics are too valuable to throw away, it's a reflection of those hydrocarbons that go into the consumer products that are very valuable. Challenges and questions remain including how do we keep them in circulation, and how do we keep them away from just combustion for power production? Going forward we will expect to see increasing plastics recycling in the Middle East and potentially feedstocks coming from outside the region to supplement the cracking units.

Finally looking at transition, the region is showing interest and increasing activity to reduce scopes 1 and 2 emissions by moving up the value chain away from fuels and deeper into petrochemicals. Technologies in the region's refineries today allow us to go from crude to very high chemical outputs at relatively modest cost.

The Middle East is home to massive infrastructure that processes traditional feedstocks to traditional markets but what are seeing today is not just a mandate to change product specifications like we saw in the 2000's, but a change in feedstock which will have a greater impact on the region's processing facilities. Technology providers and operators must work together to understand these changes.

The region must make the most of its existing assets. The existing refining capacity is not going to be shut down as they are very valuable assets with very powerful reactor platforms. Those platforms can be deployed profitably and sustainably with different feedstocks and with different products.

The challenge will be to source feedstocks that comply with the expectations that we are putting on our systems. Circular feedstocks are not necessarily all available locally and so the complexity of solving the logistics and sourcing the circular or biomass feedstocks and bringing them together with the region's existing processing industry is substantial.

Discussing refinery transformation and a move towards petrochemicals, driven by the growing demand for polymers from the increasing aspirations of the growing world's population, the Middle East with its existing refining base is a fantastic place to apply Crude Oil to Chemicals (COTC). We are seeing refineries turning more and more into crude to polymer machines with a much deeper vertical integration across the whole energy value chain. Since the Chinese COTC grass route investments made only a few years ago, we have seen the bar move so much from up to 50% of output to today's levels of 75%+ of output, and at a CAPEX considerably below what went into those Chinese refineries. The technology exists to move those levels up and create flexibility between ethylene, propylene, and aromatics but the investment cycles need to pick up to realise the real transitions by 2030.

The panel concluded that through collaboration, and deploying the brilliant minds that the industry has, the region will overcome these challenges and be able to fully exploit the opportunities presented by the energy transition. Innovation is a must. The region and industry must keep innovating, and investing, faster than we have done historically.

PANEL: THE HYDROGEN HYPE AND GCC ADVANTAGE

Undoubtedly there is a lot of hype today around hydrogen but is it real and what opportunities does it present to the Middle East?.....we gathered the who's who of hydrogen in the region to discuss. Alicia Eastman, President, InterContinental Energy, Dr. Salim Al Huthaili, CEO, OQ Alternative Energy, Dr. Dimitrios Dimitriou, Hydrogen Business Development Manager, ADNOC, Dr. Bashir Dabbousi, Director of Technology Strategy & Planning, Saudi Aramco, Frank Wouters, SVP Energy Transition, Reliance Industries Limited & Director, EU GCC Clean Energy Technology Network and Cornelius Matthes, CEO, Dii Desert Energy, made up our panel, expertly moderated by Vatche Kourkejian, Partner, Roland Berger.

The panel started off by discussing some of the exciting net zero announcements that have come from the region and their huge importance as first steps. Earlier in the month, the UAE launched their plan to achieve net zero emissions by 2050 and just one day before the conference began, Saudi Arabia announced their net zero 2060 goal. Further announcements from Saudi Arabia followed throughout the week including the launch of the Middle East Green Initiative and Saudi Aramco and Sabic's aggressive targets for net zero by 2050. Hydrogen is viewed as the most compatible energy system which will allow the continued use of hydrocarbons whilst managing emissions and working within the circular carbon economy framework. Developing and accelerating the hydrogen economy can also enable low carbon/net zero transition in other countries that have limited access to renewables or storage. The panel heard the importance of these announcements as they give direction, show ambition, provide security for investors, offtakers and so on. With commitments formulated, vision and direction declared, how can the region's operators leverage the vast experience and capabilities to make hydrogen projects successful?

Looking back over the last 10 years, not even the greatest optimist could have predicted where we stand today with wind and solar. It was stated that the region has the potential to become a powerhouse of green electrons and molecules with the potential to transport a huge amount of energy to Europe through existing pipelines. The EU currently imports 80% of their primary energy and taking the EU Green Deal into consideration, Europe will have to import huge amount of green energy.

Germany, a highly industrialised country, was commented as achieving 51% renewable energy despite their fluctuating sources and was shared as a success story of what is possible in the GCC. On the other hand, the panel heard that consumers in Germany are paying up to 300 times more for green energy and therefore, we need a suite of different options to achieve net zero by 2050/2060. Demand for energy is growing and this has been putting huge strain on the production and supply of gas in the region. What has been shown, demonstrated, and evident is that renewables can replace power only to an extent since affordable storage solutions have not yet arrived. For example, NEOM on the best days will have 60% renewable power.

Hydrocarbons will continue to play a key role for many dependent sectors and so the focus needs to be on managing the emissions. Hydrocarbon producers have the capabilities and capacities to capture, transport and store CO2. Although CCUS has had a slow, bumpy road over the last 20-30 years, we need the world to unite and understand that it is one of the major enablers to achieve net zero.

PANEL: THE HYDROGEN HYPE AND GCC ADVANTAGE

Another critical point noted is the establishment of a standard agreement on the carbon content of the hydrogen molecule. As we look at a volume of projects and investments being made, we need a definition of the carbon intensity of blue hydrogen, as a reduced carbon product. Currently there is not enough activity in this area. More science is required but also political agreements to make this international traded molecule where all agree on the supply and pricing of the product. Whilst the long-term future may be green, until the costs come down it is not fair to ask consumers to pay eight or nine times the price. Everyone recognises the cost will come down in the next five to ten years, but we need to leverage the availability to produce low carbon hydrogen, especially in places like the GCC where the infrastructure to make blue hydrogen is in already in place.

The panel heard that the production of synthetic fuels from green hydrogen and carbon capture are about half the carbon footprint of biofuels and can lower a project's carbon intensity to meet all of the renewable energy objectives. The role of the energy producer should be to reduce emissions whilst providing affordable energy. There are two billion people today that still do not have access to stable energy. Urbanisation is ongoing, and energy demand is still increasing, ensuring the energy crisis will only get bigger if we don't fill that gap with the right projects.

Whilst the energy crisis in Europe is an eye opener, the capricious fossil fuel market can be viewed as an enabler of the hydrogen economy, rather than a showstopper. An example shared was the recent price changes of grey ammonia compared with models showing the significantly lower price of green. Obviously, this may change, but the sheer volatility of the fossil fuel market will help the transition. A developed hydrogen market could resemble the LNG market – big offtakers, matched one-to-one with producers but the distinction being that the hydrogen market will bring more supply and price certainty. The good news is that green hydrogen is set to become competitive with grey this decade and we can see more appetite and readiness from potential offtakers to really commit long term to hydrogen production, ensuring the cost will come down, however demand needs to be activated sooner rather than later.

Localisation, a key policy in the GCC, can be achieved through the establishment of the hydrogen economy. Socio-economic benefits from creating a domestic market in manufacturing, repurposing existing assets and attracting investment will drive huge job creation. Thanks to the recent government announcements, the region can convert these long-term targets into short-term goals, establishing partnerships, creating visibility and stability for investors across the entire value chain.

The panel concluded that the hydrogen hype is real, it is happening and an advantage for the region to leverage this unique opportunity, transform local economies and develop global partnerships. This is the decade of disruption and acceleration of the energy transition and hydrogen has a leading role to play.

PANEL: TURNING TRASH INTO TREASURE COMMERCIALISING CIRCULAR ECONOMY STRATEGIES

Our circular economy panel began focussing on the misconception of plastics as waste rather than as a resource. There are opportunities for the industry as it strives towards a truly circular economy to showcase the value of plastics. The biggest misconception we have today is that plastics harm the environment, but the reality is that plastics have enabled modern living in many ways such as pipes providing access to clean water, cable insulation to deliver electricity, packaging to reduce food waste and healthcare. Plastics play a crucial part in society and packaging made from plastics has up to four times less environmental impact compared to other alternatives. Educating the younger generations is key to changing the misconception of plastics. As a society we must be responsible for our actions and ensure that we are reducing plastic waste by reusing and recycling.

> *It was a very insightful experience with a lot of knowledge gains and knowing how the industry leaders are headed with future energy.*
> **KIPIC**

Implementing a truly circular economy requires true collaboration across the whole value chain. Regulations must be in place, and producers must be responsible as well as the consumers to reduce their waste. Circular economy should be seen as a concept of life and incorporated into all of societies values.

The issues of waste plastic can be separated into two parts. First, the industrial waste which is more controlled and integrated with downstream assets. Here the industry can maximise and capitalise on the waste from the petrochemical plant. Producers must design for recyclability and move away from the traditional products containing multiple materials designed to only serve one purpose and a way to do this is to use monolayers instead of multiple layers. Second, and the challenge that needs more focus and regulations is urban waste that comes out of the finished products used in cities. If this waste can be collected, then the products can be recycled within the many plants that are well equipped to do so. It is the duty of everyone in society to act responsibly. Materials should also be maintained to a certain level to ensure upcycling is possible rather than downcycling and more research is being done regarding product specifications but it is also down to the consumer to shift their mindset from the produce, use and dispose model to the produce, use, reuse and recycle model.

A question arose of what the industry can do to address the issue of waste in third world countries. An initiative co-founded by Borealis and Systemiq, with strategic partners Borouge, Nova Chemicals, Nestle and further value chain partners (Project STOP) was launched in an Indonesian fishing village to create the infrastructure to ensure that waste collection is available to each household with basic waste segregation tools. The project focusses on educating the local community, empowering the local leaders to maintain and run the programme, providing training, sorting facilities and creating jobs which also create a value for the waste material. Since launching, the project has expanded to two more cities in Indonesia and by the end of 2020, 100,000+ individuals had access to waste collection. Over 8,000tn of waste has been prevented from entering the environment and close to 200 people have been employed in this scheme. There are many examples of initiatives like this and the Alliance to End Plastic Waste is addressing the issue globally. Industry is realising they need to do their bit and the entire value chain must continue to work together.

PANEL: THE FUTURE "SMART, COLLABORATIVE, GREEN" REFINER

Decarbonisation is the need of the decade. For the companies that have committed to the energy transition, it is vital to have technology within their roadmaps to net zero. There are technologies available but as today no one has the entire monopoly of technology ready and available, collaboration is required across the whole 'technology supply chain'. The conference heard from our expert panel; Bilal Guliyev, General Manager of R&D and Innovation, SOCAR, Daniel Carter, Vice President, Decarbonisation & New Energies, Wood, Süleyman Özmen, Senior Consultant, 3P18 Independent Consultants, John Murphy, CEO, The Catalyst Group and Dr. Halim Hamid Redhwi, Vice President, Dhahran Techno-Valley Company (DTVC) & Professor Chemical Engineering Department, King Fahd University of Petroleum and Minerals (KFUPM).

R&D's role in developing clean energy and efficient commercially proven technology is critical. Companies must increase their innovative capabilities to enhance their competitiveness in the market. To accelerate the energy transition, R&D can be seen as the main driver, committed, and working to develop more sustainable replacements for refinery and petrochemicals feedstocks and products.

Does the downstream industry have access to the technologies to successfully implement the mandated energy transition goals for 2035/2050? Our panellists see within the decarbonisation of heavy industries that there is a whole range of solutions that can be employed. For example, operational and energy efficiency best practices can still have a significant impact on carbon footprint and start to make inroads into the decarbonisation challenge.

When it comes to the delivery of large-scale carbon reduction, operators need access to technology, at greater scale than what exists today. We've witnessed incentive schemes around the globe that help to develop technologies from bench scale to pilot but much of that is funded from private equity finance, and from individuals who have a personal interest in this space and want to support the green economy. Government incentive schemes are helping to kickstart technologies from lab to first deployment however we also see a number of technologies begin to stall when they get to the commercial operation, largely because the technology developers are small scale and don't have the large balance sheets to sustain it any further. Gaining the appropriate finance to build a first of a kind plant at scale needs a contractor or individual to underwrite performance guarantees and pricing to get access to funds. This provides a very significant challenge because of the difficulty for any contractor to guarantee a first of a kind plant in that way.

Delivering the technologies on "the bench" requires collaboration and speed. It can be risky and expensive to serve as a technology "first mover" but there is also the ability to benefit substantially and financially from position and practise. "Fast second" movers often yield the benefits from earlier experiences by avoiding the mistakes. The industry needs to take a holistic approach towards technology scale up whereby the risk is shared appropriately across the technology and solutions providers, and the end-user to ensure no stalling at the very early stages of developments, for example circularity and recycling which are very much at the forefront today.

We are witnessing many of the big oil companies investing heavily in university and R&D start up programmes or establishing venture capital programmes/subsidiaries. This requires ambition to be able to invest in the deployment of first of a kind technology, however, it gives operators the opportunity to be involved in technology development from an early stage which will expand their technology knowledge and potentially their product portfolio leading to differentiation in the future.

Another important point to note is the new metrics for defining success. In the past, the downstream industry often dealt with metrics such as return on capital employed or return on asset investments. Today's success is measured through metrics such as the life cycle analysis, carbon footprint, circularity of the carbon molecule, both in and out. This presents both challenges and opportunities. Development of catalytic chemical recycling, plastic waste to feedstock, usage of concentrated solar technologies for process heat are just some of the R&D activities taking place today. Sustainable alternatives must be cost competitive to replace fossil fuels. Without proper support from policy and financial mechanisms, scale up of innovations will struggle to compete with fossil-based products. The current and future expected carbon prices appear to have a powerful effect on R&D spending for the development and diffusion of decarbonisation technologies. Industry leaders should prioritise plans for clean energy transition in the most advanced and innovate way and continue to invest in research and innovation activities.

What are the main challenges facing the downstream industry in developing technologies to enhance the real vision of decarbonisation? First and foremost, policy. Many countries globally have policies focused domestically. As such, it is difficult for a technology developer to decide where to place all their efforts unless they plan to focus on one specific location. Policy also drives the role and future of that technology through funding. For example, carbon capture is already commercially available at scale with plans for plants to capture up to and above 1 million tonnes per annum of C02. However, there is still a lot of work to do to bring the cost of a carbon capture facility down to a level where it then becomes equitable to things like carbon pricing incentives and trading schemes so that rather than investing in carbon credits, the real inroad forward is investing in a solution to reduce the emissions.

Challenges are often defined by the environment in which they are faced. The importance of consistent, predictable, identifiable policy, either through guidance or mandates, can stabilise some of the assumptions that investors must make when it comes time to making a commitment towards a technology pursuit.

To conclude the panel, the experts were asked 'What technology areas still needs intensive R&D work to achieve their goals and objectives?' Some examples shared included;

- Recycling commercialised technology are here, but still need improvements in terms of capacity and intermediate product modification to be ready for usage at the existing steam crackers.
- Ethylene plants in petrochemicals are still a big energy consumer and delivering renewable heat resources to these crackers is also an area for development.
- Green hydrogen technology has a lot of room for improvement to be competitive.
- Utilisation of carbon dioxide to chemicals – many facilities do not have the storage solutions, so we need to simultaneously convert it to valuable chemicals.
- Additional R&D efforts are also needed in fuel cells, storage of renewable and power to x.

The panel concluded with the agreement that R&D is vital and possibility the unsung hero of the energy transition.

UPCOMING ESF EVENTS

Following the great success of the inaugural ESF held virtually in June 2021, Euro Petroleum Consultants is pleased to announce the **2nd Energy & Sustainability Forum 2022** will take place from **21-23 March at the Marriott Hotel Berlin, Germany.**

The transition is a pathway, not a moment in the story. As the transition accelerates and we look to 2022, so does the complexity, challenging the industry to invent new technologies, new supply chains, new value chains and new markets, all with collaboration at the heart.

With no one single solution to achieve net zero, the industry must form a coherent approach to take advantage of all opportunities including hydrogen, liquid fuels, circular economy, and clean and reliable energy. Meeting climate change neutrality is a science and technology challenge, and as a science and engineering-based industry, the downstream industry is well equipped to do that.

Following the success of the ESF European and Middle East forums in 2021, we are proud to announce the launch of ESF Russia & CIS, the latest in our series of regional conferences dedicated to downstream decarbonisation and sustainability. **ESF Russia & CIS 2022, taking place on 6-7 June in Sochi**, will be dedicated to Russia & CIS downstream sustainability and decarbonisation – undoubtedly the biggest issues facing the sector right now.

The climate change challenge debate is intensifying, encompassing all countries and industries worldwide, with a growing number announcing net zero goals and strategies to reduce emissions. The Russia & CIS downstream Oil & Gas downstream industry is positioning itself and identifying pathways for a low carbon transition, starting with a focus on efficiency in existing operations and reduction of emissions.

Following the great success of our European and MENA Energy & Sustainability Forums (ESF), we are excited to bring the only event dedicated to downstream decarbonization and sustainability to North America!
With one of the most ambitious decarbonization targets globally and one of the most difficult to implement, the US downstream sector is key to delivering the transition both domestically and globally.

Today success is no longer just measured on safe and profitable operations, but also the delivery of energy and operational efficiency whilst demonstrating a commitment to ESG and circularity.

As North American refiners and petrochemical producers position themselves for a low carbon transition, and with no silver bullet to achieve net zero, the industry must form a coherent approach to take advantage of all opportunities. The challenge to invent new technologies, new supply chains, new value chains and new markets has never been so complex.

Taking place in **Houston, TX from the 21st – 22nd June**, **ESF NA** will support the collaborations, discussions, and development of a sustainable energy future in which the oil and gas downstream industry continues to play a leading role.

Demands on the Middle East's refiners and producers are intensifying as the realisation and realities of net zero are hitting the region's sector.
Today success is no longer just measured on safe and profitable operations, but also the ability to demonstrate a commitment to sustainability goals and environmental stewardship with reduced carbon intensity, increased energy efficiency, whilst maximising in-country value and circularity.

Following the great success of the inaugural ESF MENA held virtually in October 2021, Euro Petroleum Consultants is pleased to announce the **2nd ESF MENA** will take place in October 2022 in the Middle East.

ESF Asia 2022

ASIA ENERGY & SUSTAINABILITY FORUM
Decarbonizing the Refining & Petrochemicals Industry
December 2022 | Seoul

ORGANISED BY EPC Euro Petroleum Consultants

As the net zero momentum gathers pace, Asia's oil and gas industry is fast recognising the impacts and importance of climate change, as well as feeling the increasing pressure from investors, stakeholders, and customers to decarbonise their assets, operations, and products.

Whilst climate change has the attention of the world, customers, shareholders, and society, at the same time, Asia more so than any region of the world must balance its rising energy demand, population growth, and strive for increased standards of living. Furthermore, it cannot be forgotten that many people in the region are still living in energy poverty.

It's becoming increasingly apparent to the downstream oil and gas industry globally that climate change does not discriminate between borders and as such decarbonisation must be the forefront of all business and government agendas.

Asian refiners and petrochemical producers, with their own unique set of challenges presented by the transition, must act now to embrace the opportunities available to reduce both scope 1 and 2 emissions to carbon case line assets and move up the value chain away from fuels and deeper into petrochemicals, as well as find solutions to reduce Scope 3 emissions and the decarbonisation of its products and supply chains.

Against this backdrop, we are excited to announce **ESF Asia**, taking place December 2022 in Seoul, South Korea, the latest in our series of conferences dedicated to downstream decarbonisation and sustainability.

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