

23RD DECEMBER 5-9 2021 HOUSTON, USA

WORLD PETROLEUM CONGRESS

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AT THE SHOW

- Accelerating industry action on the SDGs
- Young Professionals put leadership on the spot
- Congress Program
- In the picture at the 23rd WPC
- No change in women's percentage of oil and gas workforce: Report
- We're in this together...
- Special thanks to 23rd WPC sponsors and partners

- Page 2
- Page 2
- Page 3
- Pages 8&9
- Page 9
- Page 10
- Pages 12&13



Saskatchewan Minister of Energy Bronwyn Eyre (left) and Alberta Minister of Energy, Sonya Savage (right) at the 23rd WPC

Photos: PHIL MCCARTEN/ CORPORATEEVENTIMAGES/ UPSTREAM

Canada keeps oil in focus

The Energy Ministers of Alberta and Saskatchewan tell the 23rd WPC in Houston that oil and gas innovation will continue to be their focus as Canada moves forward in the energy transition.

Page 4

Players reap benefits of unlocking digital power

Page 6

Industry warned over lack of investment

Page 11

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Expanding Our Vision

Total LNG production capacity to grow from 77 to 126 MTPA by 2027

QATARGAS

Accelerating industry action on the SDGs

IPIECA Chief of Staff **Ulrike Schopp** and Director of Sustainability and Social performance **Isabel Miranda** explain how the oil and gas industry can play an essential role in achieving the SDGs

Taking place at the heart of the energy world, Houston, and bringing together industry and government leaders from across the globe, the 23rd World Petroleum Congress has the potential to make a real difference to some of the most important challenges facing the world.

Walking through the Congress's Journey of Innovative Energy Solutions is a powerful reminder of just how important a role the oil and gas industry can play in helping to achieve the ambitions at the heart of the SDGs. Indeed, the oil and gas industry can contribute to all 17 SDGs by providing the affordable and reliable energy essential for economic growth, employment, education, eradication of poverty, and global health.

In 2017, IPIECA partnered with the United Nations Development Programme (UNDP) and the International Finance Corporation (IFC) to produce the *SDG Atlas* which presents the SDGs goal by goal, focusing on the contribution the industry can make to each goal, and importantly stressing the business case for incorporating the SDGs into industry activities.

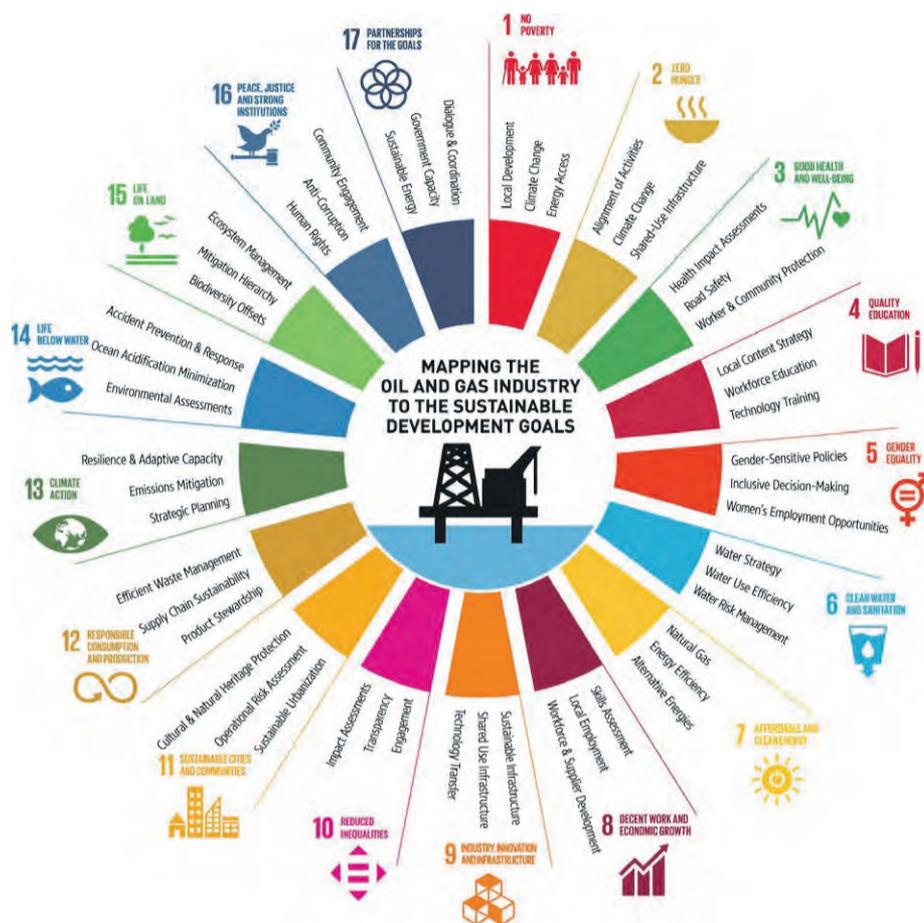
The 2030 deadline for the SDGs is fast approaching. In response to the urgent need for a coordinated and scaled up SDG action, we decided to

build on the Atlas, turning the theory into real life practice. In 2021, in partnership with WBCSD, we launched *Accelerating action: An SDG Roadmap for the oil and gas sector* (Roadmap).

The Roadmap presents 93 actions across eight impact opportunities and three systemic themes of climate, nature and people. It provides IPIECA, oil and gas companies and supply chain stakeholders with a shared vision on how to maximize the sector's contribution to the SDGs.

We're pleased to see that the Roadmap is already inspiring SDG action across the oil and gas industry. It is our hope that by providing a common direction on the SDGs, advice on where to focus collaborative efforts and a platform to form partnerships that the Roadmap will stimulate cooperation across the industry and beyond, allowing synergies to be adopted, accelerating the delivery of the SDGs.

When we launched the Roadmap,



we identified the World Petroleum Congress as a key event for its promotion. The congress, which brings together the global oil and gas community around a central theme of sustainability, can act as fulcrum to embed SDG action far and wide across the sector and provides a platform for businesses to explore potential partnerships and share knowledge in support of the SDGs.

Please download the Roadmap and join IPIECA and its members on a shared pathway to 2030 as we work to realize the transformational power of the SDGs.

For more information please visit: ipeica.org

Ulrike and Isabel will be participating in today's CEO panel on the *UN SDGs and the role of the oil and gas sector: providing access to energy for all* at 14:15.

Young Professionals put leadership on the spot

Yesterday, the 23rd World Petroleum Congress Young Professionals Program explored concepts behind industry leadership, the role of oil and gas in the energy transition, reflected on the challenges behind achieving sustainability, and discussed the state of talent attraction and retention.

During *Coffee with an Industry Leader*, Pedro Miras Salamanca (Incoming World Petroleum Council President), engaged in an open discussion with young professionals over his experiences within the industry, sharing advice on career and leadership.

During *Energy Talks: Understanding the Role of Oil & Gas in the Energy Transition*, Greg Hill (Chief Operating Officer & President, Hess Corporation) presented a reality check on the challenges behind the energy transition, discussed the need for energy, climate, and economic literacy

and expressed enthusiasm for how the industry is leading in ensuring the energy transition.

At the strategic review session speakers discussed the spectrum of metrics behind achieving sustainability, highlighting the challenges in understanding and communicating sustainability focused data.

At the *State of the Young Professionals* session, members of academia, industry, and the consulting world discussed results of the WPC Youth Survey and their implications for the challenges behind attracting, training, retaining, and developing talent.

During *Energy Lessons: Lessons in Achieving a Sustainable Future* members of the academic, strategy and innovation worlds discussed the road to a sustainable energy future.

Yesterday, the *Industry Odysseys* toured the Hess



and ExxonMobil booths and today will have tours focused on Hess, Deloitte and Baker Hughes.

Lastly, the *Afterwork* sessions were the perfect spot for casual dialogues regarding anything and everything in our industry.

Today will be filled with insightful sessions discussing

key challenges in our industry.

Coffee with an Industry Leader (11:00am to 12:00pm) will explore leadership in the innovation, startup, and sustainability sides of the industry.

Energy Talks: Women Leading the Energy Transition (12:45pm to 1:45pm) will have an inclusive dialogue learning

from impactful female leaders and sharing wisdom for all.

The final session of the 23rd WPC Young Professionals Program, *Strategic Review: Transformational Leadership for a Transitioning Industry*, will be focused on the business and societal challenges we face as we navigate the energy transition.



23RD WORLD PETROLEUM CONGRESS

CONGRESS PROGRAM

WEDNESDAY, DECEMBER 8, 2021

8:30 – 9:30AM CST	PL6: Building Partnerships SESSION TYPE: PLENARY SESSION GENERAL ASSEMBLY SPEAKERS: MELE KOLO KYARI , Group Managing Director, NNPC, Nigeria VICKI HOLLUB , President & CEO, Occidental, USA OLIVIER LE PEUCH , CEO, Schlumberger, USA	12:30 – 2:00PM CST	ER4: Low Carbon Solutions SESSION TYPE: CEO PANEL ROOM 320 MODERATOR: DR. IVÁN MARTÉN , Board Member, Tubacex, Spain PANELISTS: JOE BLOMMAERT , President, ExxonMobil Low Carbon Solutions, USA JOSHUA HAACKER , Chief Investment Officer, OGCI Climate Investments, USA TONY LEO , Executive Vice President & Chief Technology Officer, FuelCell Energy, USA S.S.V. RAMAKUMAR , Director R&D, Indian Oil, India
9:30 – 10:30AM CST	PL7: Energy Transition: Scenarios for the Future SESSION TYPE: PLENARY SESSION GENERAL ASSEMBLY SPEAKERS: MOHAMMAD SANUSI BARKINDO , Secretary General, OPEC JOSEPH MCMONIGLE , Secretary General, International Energy Forum (IEF), Saudi Arabia BJØRN OTTO SVERDRUP , Chair of the Executive Committee, OGCI	1:00 – 2:00PM CST	MSRT4: Regional Developments and Opportunities in Africa SESSION TYPE: MINISTERIAL ROUND TABLE GENERAL ASSEMBLY MODERATOR: DR. OMAR FAROUK-IBRAHIM , Secretary General, African Petroleum Producers Organization (APPO) PANELISTS: H.E. CHIEF TIMIPRE SYLVA , Minister of State for Petroleum Resources, Nigeria FITURI ELHAG IBRAHIM , Former CEO, Mabruk Oil Operations Former Total Libya LAWRENCE APAALSE , Chief Director, Ministry of Energy, Ghana H.E. TAKELE UMA , Minister of Mines and Petroleum, Ethiopia
10:45 – 11:45AM CST	A Targeted Approach to Improving Diversity in Energy SESSION TYPE: SPECIAL SESSION ROOM 320 PRESENTER: ULRIKE VON LONSKI , COO, WPC, UK MODERATOR: MELODY MEYER , President, Melody Meyer Energy; Director bp, AbbVie, and NOV, USA PANELISTS: VICKI HOLLUB , CEO, Occidental, USA DOUG PFERDEHIRT , CEO, TechnipFMC, USA SOPHIE ZURQUIYAH , CEO, CGG, USA	2:15 – 3:45PM CST	ER3: The UN SDGs and the Role of the Oil and Gas Sector: Providing Access to Energy for All SESSION TYPE: CEO PANEL ROOM 320 MODERATOR: ULRIKE SCHOPP , Chief of Staff, IPIECA PANELISTS: ISABEL MIRANDA , Director of Sustainability and Social Performance, IPIECA LEES RODIONOV , Global Director, Sustainability, Schlumberger, USA GERALDINE SLATTERY , President Petroleum, BHP DR. SCOTT TINKER , Director, Bureau of Economic Geology, The University of Texas at Austin, USA
10:45 – 11:45AM CST	USP03: Can Natural Gas, Including LNG, Deliver on the Promise of a Clean & Affordable Transition Fuel? SESSION TYPE: U.S. SESSION GENERAL ASSEMBLY MODERATOR: DR. RAUL CAMBA , Accenture, USA PANELISTS: CHARIF SOUKI , Executive Chairman of the Board, Tellurian, USA JIM TEAGUE , Director & Co-CEO, Enterprise Products Partners, L.P., USA	2:15 – 3:45PM CST	Block 1: F05 Improving Industry Performance SESSION TYPE: TECHNICAL FORUM ROOM 351 BCEF Block 4: F18 Transformation Energy of the Future SESSION TYPE: TECHNICAL FORUM ROOM 360 DEF Block 5: F23 Competencies and Skills for Innovative Energy Solutions SESSION TYPE: TECHNICAL FORUM ROOM 361 ABC
10:45 – 11:45AM CST	RT04: Delivering Large-Scale Downstream Projects SESSION TYPE: ROUND TABLE ROOM 360 ABC MODERATOR: POORNIMA SHARMA , Managing Director Process Technologies, Technip Energies, France PANELISTS: SHAKER ASIRI , Sr. Project Manager, Saudi Aramco, Saudi Arabia ETHAN PHILIPS , Partner, Oil and Gas, Bain, UK CARYN FULLER , Director, HKA	2:15 – 3:45PM CST	RT08: Impact of Digitalisation on the Gas Network SESSION TYPE: ROUND TABLE ROOM 361 DEF MODERATOR: JIM CLAUNCH , Expert Partner, Bain PANELISTS: FRANK CASSULO , Chief Digital Officer, Chevron Technical Center SYLVIE D'APOTE , Natural Gas Executive Director, IBP Brazilian Petroleum Gas and Biofuels Institute, Brazil DAVID SMETHURST , Chief Technology Officer Energy Sector (Global), Hitachi Vantara, Canada
10:45 – 11:45AM CST	RT02: Innovative Partnerships SESSION TYPE: ROUND TABLE ROOM 351 BCEF MODERATOR: PAUL GOYDAN , Managing Director and Senior Partner, BCG PANELISTS: KHALID ALDOSSARY , Executive Director, Innovation and Technology, TAQA, Saudi Arabia EIMEAR BONNER , Vice President & Chief Technology Officer, Chevron Technical Center, USA PETER NTEPHE BRIAN SKEELS , Senior Technical Advisor & Fellow, TechnipFMC, USA	2:15 – 3:45PM CST	PSG4: Raising Finance During the Energy Transformation SESSION TYPE: STRATEGIC SESSION ROOM 360 ABC MODERATOR: JOHN MARTIN , Chairman, Pharos Energy, UK PANELISTS: SCOTT DARLING , VP Finance, ExxonMobil Low Carbon Solutions, USA RANI PURANIK , Co-Owner & Global CFO, Worldwide Oilfield Machine, USA WALE TINUBU , Group CEO, OANDO, Nigeria DR. JOSE ARMANDO ZAMORA , President of the ANH, National Hydrocarbons Agency of Colombia, Colombia
10:45 – 11:45AM CST	MS04: Poland: Target Climate Neutrality: Is There a Future for Oil/Fossil Fuels? SESSION TYPE: MINISTERIAL SESSION ROOM 361 DEF SPEAKERS: PIOTR DZIADZIO , Undersecretary of State in Ministry of Climate & Environment, Poland	2:15 – 3:45PM CST	PSG5: Safety & Security Culture in the New Environment SESSION TYPE: STRATEGIC SESSION ROOM 310 MODERATOR: IMAN HILL , Executive Director, IOGP PANELISTS: AALI M. AL-ZAHRANI , Vice President Safety & Industrial Security, Saudi Aramco, Saudi Arabia JIM GUINN , Senior Managing Director, Global Cybersecurity Lead, Accenture, USA OLAV SKAR , Health, Safety, Security and Wells Director, IOGP MEX MARTINOT , Global Head of Growth Strategy Industrial Cyber & Digital Security, Siemens Energy
10:45 – 12:15PM CST	IE8: Driving Innovation: Key Challenges in R&D SESSION TYPE: CEO PANEL ROOM 310 MODERATOR: PROF. FRANK BEHRENDT , Chair, Energy Process Engineering and Conversion Techniques of Renewable Energies, TU Berlin, Germany PANELISTS: DR. ASHRAF AL TAHINI , Manager EXPEC Advanced Research Center & CEO of Saudi Aramco Upstream Technology Company (SAUTC), Saudi Aramco, Saudi Arabia PIERRE-FRANCK CHEVET , Chairman & CEO, IFP Energies Nouvelles, France CAROLINA DAUTRICHE , Technology Development VP, Schlumberger, USA MICHAEL DEAL , VP, Research, Technology & Digital Development, ExxonMobil Upstream, USA	2:45 – 3:45PM CST	USP04: Perception of the Energy Industry: Creating a Future Vision SESSION TYPE: U.S. SESSION GENERAL ASSEMBLY MODERATOR: MEGAN B. BLOOMGREN , Senior Vice President of Communications, American Petroleum Institute (API), USA PANELISTS: ROBERT BRYCE , Author of <i>A Question of Power: Electricity and the Wealth of Nations</i> , USA JONATHAN CHAVEZ , Co-Founder & Chief Analytics Officer at Social Sphere, USA ALEX EPSTEIN , Author of <i>The Moral Case for Fossil Fuels</i> , USA
12:00 – 1:00PM CST	MSRT3: Regional Developments and Opportunities in Latin America SESSION TYPE: MINISTERIAL ROUND TABLE GENERAL ASSEMBLY MODERATOR: SEBASTIAN BORGARELLO , VP Consulting, IHS Markit PANELISTS: HON. STUART YOUNG , Minister of Energy and Energy Industries, Trinidad & Tobago DR. JOSE ARMANDO ZAMORA , President of the ANH, National Hydrocarbons Agency of Colombia, Colombia H.E. EDUARDO GONZALEZ TORO , Minister of Energy and Mines, Peru	4:00 – 4:45PM CST	Dewhurst Award and Lecture SESSION TYPE: SPECIAL EVENT GENERAL ASSEMBLY AWARD PRESENTATION: TOR FJÆRAN , President, World Petroleum Council, Norway REX TILLERSON , Former Chairman & CEO of ExxonMobil Corporation & the 69th U.S. Secretary of State, USA AWARD RECIPIENT: DR. DANIEL YERGIN , Vice Chairman of IHS Markit, Pulitzer-Prize Winner, Leading Energy Expert, and Author of <i>The New Map: Energy, Climate, and the Clash of Nations</i> , USA
12:30 – 2:00PM CST	USL03: Houston: Leading the Energy Transition SESSION TYPE: U.S. INDUSTRY INSIGHTS LUNCHEON GEORGE BUSH GRAND BALLROOM SPEAKERS: SCOTT KIRBY , CEO, United Airlines, USA BOBBY TUDOR , Partner, Perella Weinderg Partners & Chairman, Tudor, Pickering, Holt & Co., USA DAVID BALDWIN , Co-President, SCF Partners, USA JULIANA GARAIZAR , Head of Houston Incubator & VP of Innovation, Greentown Labs, USA DAVID LEEBRON , President, Rice University, USA	4:45 – 5:30PM CST	Closing Ceremony SESSION TYPE: SPECIAL EVENT GENERAL ASSEMBLY SPEAKER: TOR FJÆRAN , President, World Petroleum Council, Norway MICHAEL HECKMAN , President & CEO, WPC Organizing Committee, USA HON. MAYOR SYLVESTER TURNER , Mayor of the City of Houston, Texas, USA HON. MAYOR JYOTI GONDEK , Mayor of the City of Calgary, Canada RACHEL MCCORMICK , Consul General of Canada, USA DENIS PAINCHAUD , President & CEO, 24th WPC
12:30 – 2:00PM CST	Block 1: F04 Impact of Digitalisation in the Upstream Sector SESSION TYPE: TECHNICAL FORUM ROOM 351 BCEF Block 2: F10 Growing Value in Midstream SESSION TYPE: TECHNICAL FORUM ROOM 360 ABC Block 3: F14 Technology Innovation in Mid- and Downstream Gas SESSION TYPE: TECHNICAL FORUM ROOM 361 DEF Block 4: F17 Regulatory and Policy Drivers SESSION TYPE: TECHNICAL FORUM ROOM 360 DEF Block 5: F22 Improving the Public Perception of the Oil and Gas Industry SESSION TYPE: TECHNICAL FORUM ROOM 361 ABC		

EMERGING TECHNOLOGIES

Oil and gas still key for Canada

Alberta and Saskatchewan Energy Ministers want innovation and carbon capture advances for energy transition

NAOMI KLINGE

Houston

THE Energy Ministers of Alberta and Saskatchewan said oil and gas innovation will continue to be their focus as Canada, which will host the 24th World Petroleum Congress in 2023, moves forward in the energy transition.

The ministers spoke on Tuesday, during the 23rd World Petroleum Congress in Houston, about emerging technologies, but said those technologies will come from within the oil and gas industry.

“We just have to be cautious about being told to diversify so much that we forget what we were good at in the first place,” said Saskatchewan Minister of Energy Bronwyn Eyre.

Eyre said Saskatchewan is hoping to increase oil production by 20% in the next decade, supporting the province's 30,000 industry workers, many of whom, she said, are anxious about the transition.

“I think we also have to be realistic that some of these buzzwords around clean tech are aspirational. They're possible, but they are also a source of great anxiety in the energy sector,” Eyre said.

Alberta Minister of Energy Sonya Savage likewise pointed to oil and gas innovation as key to the energy transition in her province, where emissions reduction — specifically the regulation of methane — has been a focus.

Savage said the region is on track to reduce methane emissions by 40% by 2025 and has already reduced overall emissions by 36% since 2000 levels.

She added that Alberta is set to reduce by another 13% to 25% in the short term.

“Every credible forecast for the global energy mix shows that oil and gas are going to continue to be used for decades. In fact, it's going to continue to dominate the energy mix,” Savage said.

“So if we want to be able to be part of that, we have to be low cost, low risk and low carbon, and we have to have innovations in the oil and gas sector to be able to continue to supply in a global mix.”

Savage has her eye on the Oil Sands Pathways alliance, a collaboration of six of Alberta's most emitting companies, to eliminate 68 megatonnes of emissions annually and reach net zero emissions by 2050.

US heavyweight ConocoPhillips



On track: Alberta Minister of Energy, Sonya Savage (left) and Saskatchewan Minister of Energy Bronwyn Eyre (right), at the 23rd WPC in Houston

Photos: PHIL MCCARTEN/CORPORATEEVENTIMAGES/UPSTREAM

became the **most recent company to join** the alliance in November.

The group was formed through industry interests, Savage said. It will need mass innovation to be successful, which she said that she intends to support.

The ministers said Canada's

federal government is working on a carbon tax credit, similar to the US's 45Q, which provides a tax credit for carbon capture projects.

Savage said Alberta has ideal geology for carbon capture and sequestration (CCS), and has enough storage capacity to

achieve net zero emissions in the region. “There's no path to net zero globally or in Canada, or Alberta, or anywhere, without carbon capture, utilisation and storage (CCUS),” Savage said.

Eyre stressed that incentives for CCUS also need to exist for

their utilisation in enhanced oil recovery (EOR) processes — Saskatchewan has one of the largest such projects — and not just for sequestration. She said EOR generates 82% fewer emissions than traditional extraction methods.

EXPLORATION



Exploration to remain centre stage

ExxonMobil, Petrobras and Chevron say exciting times lie ahead

Double that: ExxonMobil's Senior Vice-President for Exploration & New Ventures, watched by Petrobras Executive Director for Reservoirs Tiago Homen and Chevron Vice-President of Global Exploration Liz Schwarze
Photo: TODD BUCHANAN/CORPORATEEVENTIMAGES/UPSTREAM

GARETH CHETWYND

Houston

THE Guyana basin could hold double the 10 billion barrels of oil equivalent that ExxonMobil has already discovered in the Stabroek block, a World Petroleum Congress panel heard on Monday.

Participating in a strategic session on exploration hotspots, ExxonMobil's Senior Vice-President for Exploration & New Ventures Mike Cousins was asked just how big the discoveries on the prolific offshore block might be.

The supermajor's current assessment of oil and gas resources on Stabroek includes discoveries such as Liza, Payara and Yellowtail, but exploration and appraisal is still ongoing.

Cousins would not give an exact estimate of the scale of the Stabroek discoveries, but he did comment on the quality of the basin as a whole.

"We discovered over 10 billion oil equivalent barrels in six short years. This kind of result has been unprecedented for some time. In the whole Guyana basin, which goes down to Suriname, we would suggest that the industry will easily see double that amount," he said.

TotalEnergies and Apache are currently exploring and appraising discoveries on Suriname's Block 58, although an estimate of scale has not yet been given.

Cousins also confirmed that the Stabroek partners' current assessment of development plans for the asset point to 10 floating production systems.

His statement supports the view that this block alone will eventually support an oil production rate of more than 1 million barrels per day.

Cousins would not comment on future plans for the ExxonMobil-operated Canje and Kaitour blocks, located northeast of Stabroek, as talks with partners are continuing in relation to these areas.

Exploration wells drilled on the

two areas have not yet matched the successes seen on Stabroek, where a second floating production, storage and offloading unit is expected to start production in early 2022.

Also taking part on the exploration hot spots panel were Tiago Homen, Executive Director for Reservoirs with Petrobras and Liz Schwarze, Vice-President of Global Exploration with Chevron.

Homen said Brazil's state-controlled oil company will spud the first of 14 planned wells next year in Brazil's equatorial margin frontier play.

He said exploration investments in this region could reach \$2 billion by 2026.

Schwarze highlighted the East Mediterranean as a region to watch.

Chevron's position in the East Mediterranean was strengthened by the acquisition of US-based Noble Energy in 2020, and its assets include exploration blocks in the western desert region of Egypt.

"The seismic data [from Egypt] is just starting to come in, and we have 3D data to interpret and we'll see what there is to see," Schwarze said.

"These are really interesting areas that have not been accessible for a long time. This is a proven hydrocarbon province with favourable access to markets," she noted.

Cousins described ExxonMobil's own position in Cyprus as "really interesting" and "building on decades of knowledge in multiple basins".

"We will be spudding another well in Cyprus in a couple of weeks, which will tell us more about an initial discovery made a couple of years ago," he said.

The well is understood to be on Block 10, where the Glaucus-1 discovery is located.

ExxonMobil, in partnership with Qatar Energy, recently acquired new offshore exploration rights for Block 5 in Cyprus.

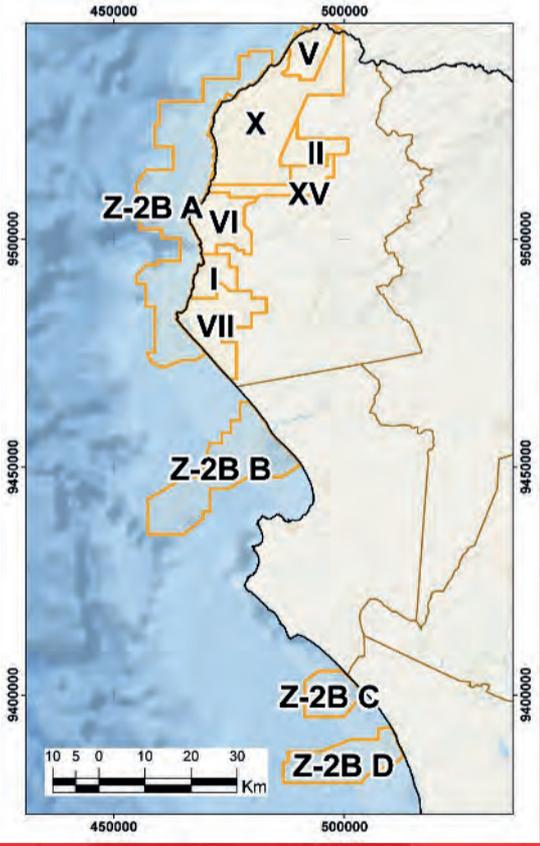


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4	SAPET	VII_VI	11/15/2023	32,434.11
5	CNPC	X	05/19/2024	46,952.34
6	SAVIA	Z-2B	01/14/2026	130,315.66
7	PETROMONT	XV	05/25/2028	9,498.90

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Shale still making strides

MARK PASSWATERS

NEW technologies could help unconventional oil and gas production become more efficient and cost-effective in the coming years, executives from Exxon-Mobil and Saudi Aramco told the 23rd World Petroleum Congress.

When asked what shale oil and gas producers need to succeed moving forward, Aramco Vice President of Southern Area Oil Operations Khaled Al-Buraik quipped: "Maybe we'll find another George Mitchell", harking back to the father of the unconventional revolution.

While shale oil and gas production has become popular in the US and has other nations hoping to emulate its success due to low costs and swift production times, the process still has efficiency concerns.

Only a small percentage of the available resources are actually tapped into by current unconventional methods.

David Scott, Vice President of ExxonMobil's Permian Business Unit, said the unconventional sector had made "huge strides" in efficiency in recent years, lowering costs and bringing wells on stream faster. Still, additional improvements are able to be made.

"I think... the future of unconventional is continuing our ability as an industry — and certainly ExxonMobil — to drive unconventional resources to be resilient and efficient," he said, during the Future of Unconventional Resources panel discussion.

"The industry has made huge strides in this space in recent years. We're continuing to use technology... to make unconventional resources more and more resilient and efficient."

Scott said technology was also being used by ExxonMobil in its efforts to reduce emissions from unconventional exploration and production.

He said the company is on track eliminate all routine flaring by 2022 and is taking an aggressive approach to eliminating other emissions.

"We're working to continue to develop technologies around monitoring, aerial surveillance and even in space using satellites to drive emissions (monitoring) across operations," he said.

"When I think about the future of unconventional, it's about continuing to raise the bar in responsible operations."

While US companies are focusing on improving technologies in the shale sector, other nations are hoping to use those advances to start unconventional production of their own.

Aramco's primary focus in shale is at its Jafurah gas field in Saudi Arabia's Eastern Province, which the company has estimated has 200 trillion cubic feet of recoverable production.

Al-Buraik said the field was the "crown jewel" of Aramco's unconventional programme and could produce as much as 2 billion cubic feet of natural gas per day by 2030.

TECHNOLOGY



Tech talk: Equinor Vice President of Subsurface Excellence & Digital, Aashild Hanne Larsen (far left), Siemens Energy Vice President of Sales Americas, Industrial, Patrice Laporte (second from left), Halliburton Executive Vice President, Global Business Lines, Eric Carre (second from right), and NIS Gazprom Neft, Serbia Chief Executive Kirill Tyurdenev (far right) at the CEO Panel: Digital Transformation
Photo: TODD BUCHANAN/CORPORATEEVENTIMAGES/UPSTREAM

Players reap benefits of unlocking digital power

CEO panel tells 23rd WPC that digitalisation of industry is increasing efficiencies and worker safety

JENNIFER PRESLEY

Houston

DIGITAL transformation experts discussed a variety of approaches to managing the technological and data transformation under way in the petroleum industry, during a CEO panel at the 23rd World Petroleum Congress in Houston on Monday.

"The digital transformation has been high on the agenda for the last few years and many companies, including Equinor, where I work, are seeing real benefits", said Aashild Hanne Larsen, Vice President of Subsurface Excellence & Digital for the Norwegian company, adding that to truly succeed with digital will require more than technology.

"Its real potential is unlocked when we're able to combine the tech with our data, our people and our capability to transform the way we work," she said.

For Halliburton, the digital

transformation is not viewed as a separate strategy, said Eric Carre, Executive Vice President, Global Business Lines.

"Digital permeates everything we do in the company. And we view it as a way to amplify and differentiate our business strategy," Carre said.

For four years the energy services company has, according to Carre, "invested hundreds of millions of dollars and have completed hundreds of projects" through application of the company's Halliburton 4.0 digital platform.

Carre identified automation and the reduction of human intervention in its work processes as one of the more impactful initiatives the company has worked on, with another being virtual remote operations and how they centralise and

change the way operational decisions are made. "For example, in Norway, we've taken an entire cementing operation that once took over 300 different actions by an offshore crew down to five clicks of a computer mouse by a team located onshore," he said.

The evolution of technology will continue in the digitalisation space, said Patrice Laporte, Vice President of Sales Americas, Industrial for Siemens Energy.

"Digitalisation is the solution and the technologies exist, but we are not fully using them," he said, explaining that there's an element missing that is needed.

"I think there is one thing that we don't have within the oil and gas industry and that is the culture of failing," Laporte said.

"Failing is difficult in our projects because you have so much money involved. We have a real

focus on reliability, and failing is not seen as something positive, but it is necessary."

Kirill Tyurdenev, Chief Executive for NIS Gazprom Neft, Serbia, said the digital transformation has enabled its people to proceed with projects more quickly, but there are still obstacles along the way.

"In tackling these obstacles we need to think about efficiency, about flexibility and taking different approaches and understanding that sometimes we have to fail and fail fast in order to move further," said Tyurdenev.

"But at the same time, we're working in an industry that requires a lot of capital investment, and we're working with hazardous elements and substances, so must always think about the safety of our employees and our clients."

INDUSTRY OUTLOOK

Lance in markets warning

ConocoPhillips Chief Executive tells 23rd WPC that three key factors are setting up 'volatile' but 'constructive' oil scene

NISHANT UGAL

Houston

CONOCOPHILLIPS Chief Executive Ryan Lance has warned of incredible volatility in the global oil markets amid uncertain demand and new coronavirus variants.

Lance told the 23rd World Petroleum Congress in Houston that three key factors are setting up an environment for the oil markets that is "going to be quite constructive", but also incredibly volatile.

"One is there's this sense of demand stagnation, because of the energy transition. So there's this big uncertainty around what the demand trajectory is going to look like for this business," he told a panel of speakers.

He cautioned that there's a fear in the market that demand is "going to stagnate and (could) start to go down pretty rapidly".

Lance warned of reduced capital investment in the oil sector in the coming years.

"We all know that uncertainty leads to reduced capital investment," he noted.

Investors in the industry are saying "no longer is growth, at the expense of returns, going to be allowed in this business," Lance said.

When it comes to this return on capital in the oil business, it's been a tough ride, Lance said.

"Our business over the last decade has produced dismal returns," he added.

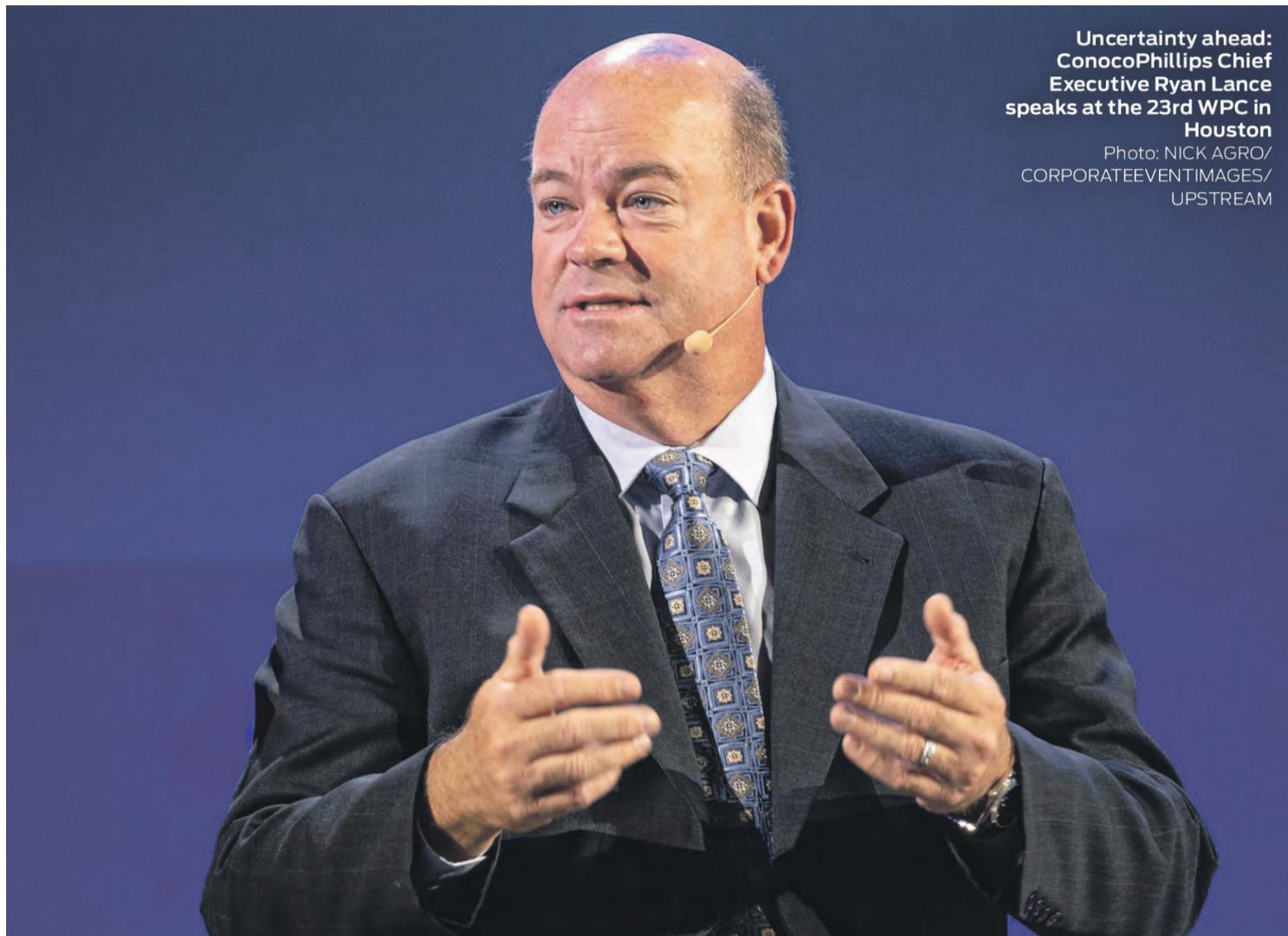
The Opec+ group no longer has enough spare capacity to be a swing producer, and that casts further doubts on future oil markets, he said.

Lance also warned of market uncertainties surrounding the Covid-19 variants.

"It's going to be things like, you know, a new Covid variant causing a 50% downdraught in the commodity price and a forward curve that starts to go down," he suggested.

However, Lance reckoned that the challenges ahead will "make it a pretty constructive environment, which is not going to bode well for the energy transition in terms of emissions and emission reductions".

"That's why we all have to do our business smarter, more sustainably, because as this demand starts to grow, it creates an environment [that] will take care of our market," he said. Despite the



Uncertainty ahead: ConocoPhillips Chief Executive Ryan Lance speaks at the 23rd WPC in Houston
Photo: NICK AGRO/ CORPORATEEVENTIMAGES/ UPSTREAM

challenges ahead for the oil markets, Lance referred to key mandates that lie ahead for companies like ConocoPhillips.

"We've got to meet the energy

transition demand, whatever that's going to look like over the next number of years," with the lowest cost per barrel, he said.

Companies also have to take

care of their emissions, Lance said. "The emissions that we create as a business, we have to have a sustainable path for those in a Paris-aligned climate

strategy framework," he said. Finally, Lance said investor returns need to be preserved in the industry, after they have been abysmally low in recent years.

In the picture at the



23rd WPC...



No change in women's percentage of oil and gas workforce: Report

There has been no change since 2017 in the percentage of women that make up the oil and gas workforce but World Petroleum Congress organisers say this still represents progress in the industry.

The 23rd World Petroleum Congress on Tuesday presented its second global report on gender diversity, called *Untapped Reserves 2.0 – Driving Gender Balance in Oil and Gas*, with a new focus on how the Covid-19 pandemic affected gender diversity in the workforce.

The first report in 2017 showed that 22% of the oil and gas industry was made up of women, lower than almost all other major industries – a number which had not changed by 2020.

As Covid-19 has impacted industries around the world, 107,000 workers were laid off between March and August 2020, according to a report from Deloitte.

"The fact that we've held that number and not gone backward is a positive," said World Petroleum Council Chief Operating Officer Ulrike von Lonski.

Organisers have seen positive changes since the 2017 report, including a large increase in programmes that promote gender balance which have been implemented by companies or that are planned to be introduced in 2021 or 2022.

The policies that have increased that most are those intended to attract women into the industry, which increased from 20% to 68%, and commitments from executives, which increased from 33% to 76%.

Commitments from executives, especially chief executive officers, are particularly important, as men are four times more likely to say they are supportive of gender balance if their chief executive makes it a priority, the report shows.

The report also has a Maturity Assessment Framework for companies to see how their actions on gender diversity rank from no significant action to best practices.

The report seems to be gaining traction, as this year's presentation had about twice as many people in the audience than the first report's presentation, according to incoming World Petroleum Council President Pedro Miras Salamanca.

He said there were also many more men in the audience this year than at the last Congress.

The next report will be presented in September 2023 during the 24th World Petroleum Congress in Calgary, Canada, with more updates on the state of the industry. Organisers are hoping to see even more people in the audience then.



From left: World Petroleum Council Chief Operating Officer Ulrike von Lonski; Boston Consulting Group Managing Director and Partner Andrea Ostby; Repsol Executive Managing Director of Client and Low-Carbon Generation, and Repsol Electricity & Gas Chair Maria Victoria Zingoni; National Hydrocarbons Agency of Colombia President Jose Armando Zamora; incoming World Petroleum Council President Pedro Miras Salamanca; and National Oil Corporation of Kenya Director Ogutu Okudo present the second global gender study at the 23rd World Petroleum Congress

Photo: NAOMI KLINGE/UPSTREAM

We're in this together...

Collaboration is the key to unlocking the energy transition, writes Iman Hill, Executive Director, International Association of Oil & Gas Producers

**Iman Hill,
Executive
Director,
International
Association of
Oil & Gas
Producers**

When the International Association of Oil and Gas Producers (IOGP) was set up almost half a century ago, the intent was to bring our industry together to develop and implement best practice to manage the very many challenges that face our industry.

Collaboration and transparent communication have been key principles guiding how our members have worked together during this time. Today, as we face perhaps the world's greatest existential crisis in recent history — climate change — our industry is more than ever committed to play its part.

This is why it has been particularly inspiring to see world leaders in government and business gather at the World Petroleum Congress to bolster action to reaching climate goals, and also to discuss how to bring about a least-disruptive transition. It's important to understand that energy transitions don't happen overnight.

Take for example, the transition from coal to natural gas, which began decades ago in some parts of the world but is yet to start in many coal-producing countries.

An eye-opening comment is made in Daniel Yergin's recent article *Why the Energy Transition is so Complicated* that the world today uses three times more coal today than it did in the 1960s. This is a real illustration of the fundamental challenges to pace and switching energy sources. I urge people to read this truly insightful article.

So, what do we need to do to move things faster? It goes without saying that the energy transition will be severely hindered without the involvement of the oil and gas industry's engineering capability, project management skills and investment power. In fact, one could argue that a successful transition cannot happen without our industry. So, it's fair to say that in order to reduce emissions — and in turn move to lower carbon — we need to go where the emissions are. And we are already seeing action with tangible and accelerated action to decarbonise through emissions reductions in operations and greater investment in renewable energy.

The IOGP is absolutely committed to supporting its members in addressing the challenges of getting to a low carbon world. This is why, as a result of a strategic review conducted recently, IOGP has established a new Energy Transition Directorate with the aim to accelerate decarbonisation through reducing flaring and venting, electrification, enhancing energy efficiency and supporting the scale-up of carbon capture, utilisation and storage. A further work stream on clean hydrogen will also start up in the new year.

At the same time, IOGP will also further strengthen efforts to advocate for the right policies required to support the industry's transition. A key one will be to articulate the role gas will play in accelerating the shift to lower carbon, by displacing coal in emerging economies, providing a reliable source of energy to supplement the intermittency of renewables, and eventually offering a low carbon energy source, when combined with CCUS and converted into blue hydrogen. IOGP will also be focusing its efforts on broader topics such as standardisation and digitalisation, and industry skills and competency management.

There's no doubt that there's a lot to do, if we want to get to a net zero existence smoothly and without sacrificing the stability of emerging economies, but thankfully the WPC has served to highlight the very real commitment of our industry. The IOGP would like to thank WPC for bringing together world and industry leaders in this most important conference to collectively work on our world's most pressing and urgent challenge.



INDUSTRY OUTLOOK



Industry warned over lack of investment

More funding needed to ease fears of continued price shocks and volatility, says report by IEF and IHS Markit

Upstream underinvestment: Daniel Yergin, Vice Chairman of IHS Markit speaking at the 23rd World Petroleum Congress in Houston
Photo: NICK AGRO/CORPORATEEVENTIMAGES/UPSTREAM

NISHANT UGAL

Houston

UNDERINVESTMENT in the oil and gas sector has extended for a second year in 2021, increasing the prospects of price shocks, scarcity and energy poverty, a report by the International Energy Forum (IEF) and IHS Markit has claimed.

Global upstream investment in the hydrocarbon sector remained depressed this year at \$341 billion, 23% below the pre-pandemic annual level of \$525 billion, despite rising global demand, the report said.

The report was jointly released by the two companies on Tuesday at the 23rd World Petroleum Congress in Houston.

Upstream capex had slumped by 30% last year, as the coronavirus pandemic led to sustained economic downturns in several world economies.

The report argued that global oil and gas demand has rebounded to near 2019 levels and is poised to keep increasing for several years, which warrants higher investment in the sector.

"Oil and gas investment will need to return to pre-Covid levels and stay there through 2030 to restore market balance," the report noted.

Joseph McMonigle, Secretary General of the IEF, said the "energy crisis in Europe and Asia this winter is a preview of what we can expect in the years ahead".

"Two years in a row of large and abrupt underinvestment in oil and gas development is a recipe for higher prices and volatility later this decade," he said.

McMonigle warned that "more frequent boom-bust cycles will harm consumers and producers recovering from Covid, set back UN climate and sustainable development goals, and threaten global security".

Daniel Yergin, Vice Chairman of IHS Markit said that as energy transition proceeds, "underinvesting in oil and gas before renewables and other low-carbon technologies that are ready to scale up to meet energy demand

could create recurrent energy crises of the kind we saw in Asia and Europe over the last few months".

Yergin cautioned of elevated commodity prices and adverse economic consequences if the low investments in the upstream sector continue over a longer time.

The report said that several factors are leading to lower investments in the upstream sector.

"These include record price volatility, changing government regulations, divergent long-term demand scenarios and non-standardised ESG criteria," it noted.

Pressure on governments and industry for a green recovery is further constraining the availability of capital, it added.

"As a result, investment decisions are becoming increasingly complex," the report argued.

The unprecedented level of uncertainty around investments

increases the risk profile of hydrocarbon investments and the cost of capital, thereby reshaping investment decisions, the report stated.

The two think tanks believe that the "next two years will be critical for sanctioning and allocating capital toward new projects to ensure adequate oil and gas supply comes online within the next five to six years".

Insufficient upstream investment could result in more price volatility and spur adverse economic consequences — such as wider energy poverty, more frequent scarcity and fuel switching to more polluting energy sources such as wood and coal, the report added.

Leading national companies in the Middle East have also been presenting a strong case for higher upstream investments.

Sultan Ahmed Al Jaber, Chief Executive of Abu Dhabi National Oil Company (Adnoc), said at the recent Adipe conference in Abu

Dhabi that massive investments in the global oil and gas sector are needed to keep pace with increasing energy demand.

Al Jaber said, "the oil and gas industry will have to invest over \$600 billion every year until 2030, just to keep up with expected [global] demand".

However, as a stark contrast, the International Energy Agency (IEA) earlier this year warned that no new oil and gas fields should be approved for development if the world is to meet its climate goals and limit global warming.

In its report, the IEA claimed that even if current climate pledges by global governments are achieved, the world will still fall short of bringing energy-related carbon dioxide emissions to net zero by 2050.

The IEA report also called for a halt to sales of new internal combustion engine passenger cars by 2035 and the phasing out of all unabated coal and oil power plants by 2040.



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Majors back gas for future

NISHANT UGAL

TOP executives from the world's leading energy players including TotalEnergies, Chevron and ExxonMobil have termed natural gas as a key transition fuel for the foreseeable future, with potential to replace coal in many developing economies.

Nigel Hearne, President for Chevron's Eurasia Pacific Exploration & Production business, told the 23rd World Petroleum Congress in Houston that "natural gas is and remains the cleanest of the fossil fuels and it will underpin transitions".

"It will provide greater energy security and achieve lower carbon targets," he said.

Hearne added that natural gas will also prove to be "feedstock for manufacturing new sources of hydrogen in association with carbon capture [and] storage".

He said that global natural gas demand is expected to increase by 38% between 2020 and 2050, underlining its critical role as part of the energy transition.

David Mendelson, Senior Vice President, Strategy & Business Development at TotalEnergies E&P business, echoed Herne's views and said that gas-based "electrification will play a key role in the future energy mix".

"We must do away as quickly as possible with the reliance on coal in power generation, which emits twice as much CO₂ as gas to generate the same amount of power," Mendelson noted.

Mendelson said the world needs to meet the growing demand for energy and at the same time, significantly reduce greenhouse gas emissions to reach carbon neutrality by 2050.

He said that in line with the company's energy transition plans, half of TotalEnergies' production growth between 2020 and 2030 will come from liquefied natural gas and the other half from electricity essentially from renewables.

The company plans to invest \$13 billion to \$15 billion per year through 2025 to meet its ambitious goals.

"Half of that investment will be focused on renewables and electricity and the other half focused on gas, mainly LNG," he said.

On the back of increased gas and renewables share, TotalEnergies expects to cut its scope 1 and 2 greenhouse gas net emissions by 40% by the year 2030.

Peter Clarke, Senior Vice President of ExxonMobil Upstream Oil & Gas Company, said that natural gas is already playing a very critical role in the energy transition.

Clarke said that in the US alone, the power sector has achieved substantial emissions reductions over the past seven years by switching generation from coal to gas.

"And there are there are many more locations around the world where meaningful reductions can be made," he added.

INDUSTRY INSIGHTS



Accelerating transformation: Accenture Chief Executive Julie Sweet (centre) speaks during the 23rd WPC Industry Insights Luncheon as Oil & Gas Climate Initiative Chairman Bob Dudley (right) and moderator Brian Sullivan, CNBC Worldwide Exchange Anchor & Senior Correspondent, listen

Photo: TODD BUCHANAN/CORPORATEEVENTIMAGES/UPSTREAM

Accelerating transition put in the spotlight

Industry leaders discuss how oil and gas sector needs to transform core business of innovation during energy switch

JENNIFER PRESLEY

Houston

THE oil and gas sector has to look outside the industry for solutions on how to accelerate its transformation into the best version of itself, attendees were told during Monday's US Industry Insights Luncheon at the 23rd World Petroleum Congress in Houston.

Accenture Chief Executive Julie Sweet and Oil & Gas Climate Initiative Chairman Bob Dudley discussed how the oil and gas industry is now wrestling with a way forward in a new era, after more than a century of meeting the energy demands of a growing global economy.

It is about "transforming the core business of innovation to make it more profitable, to make it lower carbon, and at the same time, transforming the business in the energy transition", Sweet said.

Throughout the transition,

however, there will still be a need for oil and gas for the foreseeable future.

"There will be oil in 2050, 2075, and further out. I know a lot of people want to transition away from it very quickly," said Dudley.

"But, when you think about an electric car, 20% of it comes from oil in the form of plastics. It will be around, just not maybe in the same volume."

He said the energy demand and the oil and gas industry will certainly be there, but "it will be the low-cost producers and the cleanest producers that will be the only ones allowed to survive".

As in nature, the industry's ability to survive hinges on its ability to adapt to environmental changes - through innovation and adoption of technologies.

Sweet said the need to innovate and the need to collaborate are

very different skills, noting that while the oil and gas industry is a tech industry, companies within the sector have collaborated with each other.

However, "the nature of the transformation that we have to do in terms of digital and using technology does require different leadership skills, it requires a different culture", she said.

"It's an important question about leadership. And when you change it, the first thing you have to do is know what you want from your leaders," she said.

"I think clarity on what is needed from leaders at this time is really important."

"As you think about the challenges that all of you are facing and in how you use technology to get better margins to make a lower carbon future for hydrocarbons, it requires working very

differently in that regard," she said.

"The leadership and the new ways of working are where I think there are a lot of lessons."

According to Dudley, the digital transformation that has swept through the oil and gas industry in the last year proves that the industry can change.

"It's not an industry that's known as the fastest in decision making and making quick steps, said Dudley.

"But, look what's happened with exploration. Its ability to take big data and visualise what's happened in the subsurface where nobody's ever been. Getting those changes into an organization is a cultural thing."

The Luncheon was moderated by CNBC Worldwide Exchange Anchor & Senior Correspondent Brian Sullivan.

INTERVIEW

Confidence: Halliburton Chief Executive Jeff Miller speaks at the 23rd WPC
 Photo: PHIL MCCARTEN/
 CORPORATEEVENTIMAGES/
 UPSTREAM



Halliburton confident for future of industry

In response to an Upstream survey of leading industry executives, Halliburton Chief Executive Jeff Miller shares his insights on topical issues shaping the sector

UPSTREAM: What impact will the energy transition have on the operations of oil and gas companies over the next five years and beyond?

MILLER: We see a steady demand for oil and gas long into the future while the transition to alternative energy sources takes place in parallel.

The energy industry, and especially our high-tech services, are critical to the creation of new, currently non-existent value chains of the sustainable energy future.

As we work toward a lower carbon energy future, our industry will continue to provide reliable, affordable energy to all.

UPSTREAM: Is natural gas becoming more attractive than oil for companies and, if so, what implications does that have for the business?

MILLER: Natural gas is a transition fuel. It burns cleaner than coal and oil and will help reduce carbon emissions. As our cus-



tomers prioritise gas projects, we are ready and prepared to support them with our innovative, low-emission technologies.

UPSTREAM: How can large-scale, multi-billion-dollar conventional oil and gas developments, including in deep waters, continue to compete for capital?

MILLER: We are confident that Halliburton technology will help make deep-water development more competitive over time.

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