Joint IEA-IEF-OPEC Report

On the

12th Symposium on Energy Outlooks

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Key Points

1. As energy transitions proceed, they have become more disjointed and disorderly over time putting net zero targets and UN shared goals at risk of being deferred or missed. The onus is on governments to change the enabling frameworks which allow decarbonization to take place and demonstrate they are acting in the public interest.

2. Long-term scenarios from IEA, OPEC, and others differ across multiple variables including climate goals, technology adoption, GDP growth, and resource supply. Assumptions on how soon the energy system will decarbonize are most significant.

3. Energy demand and GDP remain closely correlated. Decoupling the two will be a significant challenge but is key to a low carbon future.

4. The difference between the highest and lowest long-term oil and gas demand scenario grows each year and is larger than the current market size today. This highlights the growing range of uncertainty over short and long-term projections.

5. The Business as Usual (BAU) scenario in outlooks makes risk more transparent and enables effective outlook comparisons.

6. The cost of the transition is critically dependent on the policy design that prioritizes improving efficiency, deploying technologies, and transforming energy infrastructure. Such policy includes continued investments in both clean technologies and the upstream sector.

7. While renewables grow fastest across all scenarios with the divergence based on speed of adoption, the challenges lie in infrastructure connectivity and resilience that requires improved land-use permitting processes, construction licensing, and network access.

8. The phase out of coal could reduce energy flexibility and will need to find suitable replacements by renewables, natural gas, nuclear, storage and other energy technologies such as bio-methane and hydrogen to bridge short and long-term energy security, affordable access, and climate needs.

9. For net-zero scenarios to be viable, trade of minerals and hydrogen will have to exceed that of fossil fuels today. It will be critical that these minerals are developed with the highest Environmental Social Governance (ESG) standards on open and transparent world markets.

10. Decarbonization is unlikely to be possible without nuclear energy. Greater capacity can be added through smaller modular reactors (SMRs) that have a smaller project outlay, are more financially feasible, and fit many specialized markets and applications. More ambition should be placed on nuclear energy also given its potential wider scope of use beyond baseload electricity including producing hydrogen, fresh water, and heating to towns and cities.

Introduction and Opening Statements

This summary reflects the main outcomes of the Twelfth session of the IEA-IEF-OPEC Symposium on Energy Outlooks that the International Energy Forum (IEF) convenes yearly, in collaboration with the International Energy Agency (IEA), and the Organization of the Petroleum Exporting Countries (OPEC). The symposium was held in a hybrid format (virtually and in-person) on 16 February 2022 at the IEF Headquarters in Riyadh and convened close to 150 participants including ministers and other high-level industry and government representatives who gathered alongside leading experts to provide a range of insights.

Opening remarks by Joseph McMonigle, Secretary General, IEF, touched on the recent market dynamics including a powerful rebound in demand, shortfall in energy investment, rising prices, and elevated levels of uncertainty. While there are a multitude of net-zero strategies in place, the pathways to achieve these vary and remain uncertain. Over time, the divergence between the high demand and low demand scenarios in the long-term has grown, increasing long-term demand uncertainty. Mr. McMonigle stressed the importance of balancing fossil fuel demand with climate goals through scaling clean technologies.

HE Fatih Birol, Executive Director, IEA welcomed participants and provided views on increasing energy demand and supply fundamentals, solutions to climate change, and the need for clean and orderly energy transitions.

Dr. Ayed Al-Qahtani, Director of Research, OPEC discussed the greater need for collaboration and transparency, the impacts of COVID-19 on the energy market, and growing energy demand. Both speakers emphasized three key points:

1. Collaboration between governments is crucial to achieving energy market stability in an uncertain environment.
2. Addressing pent-up demand will require vigilance in the post-pandemic risk environment.
3. Government policy will play a key role in enabling and accelerating clean energy transitions through technologies such as Carbon Capture, Use & Storage (CCUS) and Hydrogen.

Dr. Qahtani additionally emphasized that increased upstream investment is essential to meet future oil demand that will grow in the medium- to long-term.

HE Francesco La Camera, Director-General, International Renewable Energy Agency (IRENA); Numar Alfonso Blanco Bonilla, Executive Secretary, OLADE; Rafael Mariano Grossi, Director General, IAEA; and Mohamed Hamel, Secretary General, Gas Exporting Countries Forum (GECF) were invited as special guests.

Mr. La Camera emphasized the crucial role energy efficiency, renewables, electrification, green hydrogen will play in global decarbonization, and the need to meet net-zero goals by 2050. Numar Alfonso Blanco Bonilla outlined OLADE's commitment to open and transparent access to the energy sector through the Joint Organization Data Initiative (JODI). Mr. Bonilla also outlined the path for energy transitions for Latin America and the Caribbean but emphasized that each country will have their own unique challenges and opportunities. Given regional dynamics, net-zero aspirations in Latin America, however, require more policy action, additional investment, and a flow of capital.

Rafael Grossi, Director General, IAEA stressed the importance of greater investment-led recovery which is crucial to achieving world's climate and economic goals. Part of this investment will need to be in nuclear energy, which is proven, scalable, and available. Nuclear energy will be essential in addressing the climate crisis for both mitigation and adaptation, creating economic growth, and energize sustainable growth in a new energy era. Mohamed Hamel, Secretary General of GECF, cited the stability of natural gas and its resilience during the destabilization caused by the pandemic. He added that international trade in natural gas is continuing and being driven by global interconnected markets and its role as a cleaner fossil fuel. The availability of natural gas will also be crucial in alleviating energy poverty and energy access issues.

Opening remarks reaffirmed commitments to international energy market security and the need for stable transitions especially considering the emergence of a new risk environment due to COVID-19 pandemic and the impacts of climate change. Speakers also drew attention to the multilateral efforts of the global community in managing the energy crisis and the continued need for data transparency and informed policy decisions which will allow evolving energy systems to rebalance and enable a sustainable recovery.

Session Introductions

Joseph McMonigle moderated presentations by partner organizations that were represented by Dr. Ayed Al-Qahtani, Director, Research Division, OPEC; Dr. Abderrezak Benyoucef, Head Energy Studies Department, OPEC; Keisuke Sadamori, Director of the Office for Energy Markets and Security, IEA; Richard Newell, President and CEO, Resources for the Future, RFF; and John Staub of the US Energy Information Administration (EIA). The objective of the session was to present and compare the outlooks prepared by the IEA, OPEC, and EIA and to exchange points of view on their determinants, how they relate to other outlooks, and wider implications for sustainable and inclusive growth.

Session II Medium-term Perspectives focused on energy security and the recent market volatility due to a confluence of economic, geopolitical, and societal factors. Questions on changing market fundamentals, diverse energy and climate policy trajectories, the impact of new policies on market volatility, and policy levers to enable just and orderly transitions were explored. Amrita Sen, Director and Co-Founder and Director of Research, Energy Aspects, moderated and participated in a session with Robert McNally, President, Rapidan Energy; Ken Koyama, Managing Director, the Institute of Energy Economics, Japan (IEEJ); Irina Gayda, Director, Energy Centre Skolkovo Business School; and Laszlo Varro, Vice President Global Business Environment, Shell.

Session III focused on a long-term energy future that goes beyond just renewables and electrification. With global demand increasing, regulatory obstacles to permitting new projects, and supply/demand balances tightening, more needs to be done to satisfy global demand, reduce emissions, increase energy access, and overcome energy poverty while increasing economic growth. Incorporating clean technologies and diversifying fuel sources will be paramount to this end. Fahad Alajlan, President, King Abdullah Petroleum Studies, and Research Center (KAPSARC) moderated the discussion with Harry Kamian, Senior Bureau Official, Bureau of Energy Resources, US Department of State; Nobuyuki Kikuchi, Director, Resource Security Division, Economic Affairs Bureau, Ministry of Japan; Julien Perez, VP Strategy & Policy, Oil and Gas Climate Initiative (OGCI); Andrea Stegher, Vice President, International Gas Union; Cosmin Ghita, Chief Executive Officer, SN Nuclearelectrica Romania; and Luay Al Shurafa, President and Managing Director, GM Africa, and Middle East; and keynote speaker Sama Bilbao y Leon, Director General, World Nuclear Association.

The Joint Symposium on Energy Outlooks is one of three joint high-level expert meetings that the IEA, IEF and OPEC undertake under the trilateral work program of the producer-consumer dialogue to enhance the understanding of energy market and policy developments. The trilateral work

program was agreed upon by the three organizations under the Cancún Declaration, which was endorsed by energy ministers at the 12th IEF Ministerial Meeting, held in Cancún, Mexico, in March 2010, as referenced in Attachment Two of the Cancún Declaration. In addition to the Joint IEA-IEF-OPEC Symposia on Energy Outlooks, the trilateral collaboration involves workshops on Physical and Financial Energy Market Interactions and Gas and Coal Market Outlooks.

Substantial progress was made over the course of the previous eleven IEA-IEF-OPEC Symposia on Energy Outlooks to enhance collective understanding of flagship publications through in-depth dialogue and advancing the comparability of IEA's and OPEC's outlooks. The IEF also successfully facilitates collaboration between IEA and OPEC experts in a series of technical meetings.

Key highlights from the three sessions discussions and main findings from both organizations' outlooks are presented in the next sections. The agenda and full livestream and presentations can be accessed on IEF's website at www.ief.org.

Ministerial Roundtable

Hosted by HRH Prince Abdulaziz bin Salman, Minister of Energy of Saudi Arabia, a high-profile group of Ministers and special guests provided opening statements at the Twelfth session of the IEA-IEF-OPEC Symposium on Energy Outlooks at International Energy Forum (IEF). The Ministers included:

- HE Virgil-Daniel Popescu, Minister of Energy, Romania
- HE Bruno Jean-Richard Itoua, Minister of Hydrocarbons, Congo
- HE Diego Mesa, Minister of Mines and Energy, Colombia
- Mr. Amos Hochstein, Senior Advisor for Energy Security, US Department of State
- Special guest Lord John Browne of Madingley, Chairman, Beyond NetZero, and former CEO of BP

Topics reiterated the importance of an affordable and fair energy transition that establishes a diverse energy mix for the future along with security of supply. Countries such as Romania and Colombia are moving towards decarbonization by increasing renewable capacity, exploring hydrogen production, and increasing energy access. Yet, maintaining security of supply is also important and must be balanced along with the energy transition. The balance can only be achieved through collective and holistic dialogue between producer consumer countries amid rising geopolitical risk and oil prices. At the same time, there is continued need for sustainable investment in the fossil fuel sector to ensure supply security while also working towards decarbonization. Governments must enable the private sector to make the required investments to keep the energy system functioning as energy security cannot be taken for granted.

The discussion focused on greater infrastructure investment, the potential of government and private funding to unlock technology deployment to reach net-zero goals, and the importance of dialogue and collaboration when resolving energy challenges from both a producer and consumer perspective. Also highlighted was the need for enhancing supply chain networks and implementing more diversified routes to reduce dependence on sole suppliers. Diversifying fuel sources and incorporating nuclear energy into the mix is also a crucial step towards self-sufficiency. While energy transitions are proceeding rapidly, they have become more disjointed and disorderly over time and put net zero targets and UN shared goals at risk.

While changing sentiments among consumers and poor investor returns are partly responsible for the historical decline in fossil fuel investment, the world still relies on hydrocarbons which comprises

80 percent of our energy needs. To effectively fight climate change, oil companies must take bolder steps in separating low carbon and net-zero activity from their fossil fuel business rather than reallocating capital back and forth. Prioritizing both functions will allow for an orderly energy transition enabled by:

1. Innovative technologies such as Carbon Capture Use and Storage (CCUS) and more innovative investments and technologies.
2. Diversifying the global energy mix by complementing renewable energy with reliable sources of baseload and peak load power.
3. Taking a whole economy approach solution to decarbonization that prioritizes industrial decarbonization, energy efficiency, and circular economy concepts,
4. A rigorous approach to data and measurement of GHG emissions.

Consumers now demand higher emissions standards from companies, and corporate leaders taking greater responsibility in response to legal and regulatory changes to meet rising standards. Investors are also becoming more nuanced in their approach to demanding change. Governments, meanwhile, have shown commitment to net-zero targets even if in aggregate those targets do not go far enough – a price on carbon must be considered for a more effective move towards energy transitions. The onus is now on governments to change the enabling frameworks which allow decarbonization to take place and to demonstrate they are acting in the public interest. Operations and policies need to reflect that.

Discussions explored dwindling public support for transitions amid high energy prices. Stronger price signals and effective intervention by governments is required to prevent sudden price surges. Still, the energy transition will require complex system changes that will take time. This includes the implementation of “Fourth Industrial Revolution” technologies such as Artificial Intelligence, Internet of Things, and other learned systems. Gauging consumer sentiment is becoming more important in how these forecasts are being developed. In the past, the consumer had little control in how energy was being used. but now such technologies make this possible. While these systems hold promise, they also add another layer of uncertainty to an already uncertain situation.

Another development will be the rise of new baseload capacity where nuclear energy can offer something that renewables sources cannot offer due to limitations in energy storage. New developments in nuclear technology include the production of small modular reactors (SMRs) and research in nuclear fusion, but more talent is needed in this area to make greater progress and permitting remains a challenge.

Session I: IEA OPEC Energy Outlooks Compared & Placed in Wider Context Key Findings of the IEF-RFF Comparative Outlook Analysis

OPEC

In the short-term, OPEC forecasts economic growth projections at 4.2 percent in 2022 after 5.6 percent growth in 2021 acknowledging uncertainties due to COVID-19. World oil demand is forecast to increase by 5.7 mb/d in 2021 and 4.2 mb/d in 2022 with non-OECD seeing the greatest growth at 2.3 mb/d. From a supply perspective non-OPEC liquids production is forecast to increase by 0.6 mb/d in 2021 and 3.0 mb/d in 2022. US total liquids supply is expected to increase by 0.15 mb/d in 2021 and 1.03 mb/d in 2022. Excessive stock surplus negatively impacted the oil market leading to a deep cut in global upstream investment.

From a medium and long-term perspective, global energy demand is set to increase by 28 percent from 2020 to 2045. Oil will maintain the largest share in the energy mix in the period to 2045 and the entire growth in demand will come from non-OECD countries. Renewables and natural gas will continue to play a significant role in the evolving energy mix. Renewables continue to expand adding almost 30 mboe/d in the long-term while natural gas will provide the second largest addition increasing by almost 22 mboe/d. Oil, meanwhile, grows strongly in the short and medium-term while coal demand declines. Oil demand will slow significantly after the medium-term period, demand is projected to reach around 108 mb/d in the long-term and is expected to increase by 17.6 mb/d between 2020 and 2045. By sector, most of the demand growth will be seen in road transport, aviation, and petrochemicals.

Non-OPEC supply will peak in the late 2020s in line with US tight oil production growth and then slowly decline. In the long-term, non-OPEC supply grows by 2.5 mb/d from 2020-2045. OPEC liquids, meanwhile, will rebound and grow from the late 2020s increasing their share in global supplies from 33 percent to 39 percent.

In summary, oil remains the primary fuel in the long-term even as the energy mix evolves. Renewables continue to grow but face economic, technological, and infrastructure challenges. It will be important to balance climate goals with economic recovery for an equitable transition that also eradicates energy poverty. Greater investment must ensure ample oil supplies are available to avoid market volatility. The evolution of energy policies related to emissions reductions will become more important going forward but divergent demand trajectories mean significant uncertainties remain.

IEA

The IEA outlined that new net-zero policies, technology cost reductions, and the pandemic have pulled the projected emissions curve down especially after COP26 in Glasgow where many new pledges were made. According to the announced pledges scenario (APS) oil demand remains stable and plateaus while natural gas decreases. Solar PV and wind capacity increase into 2030 and overtake both natural gas and coal by the end of the decade. The announced pledges after Glasgow only close 30 percent of the gap between the STEPS (Stated Policy Scenario) and the net-zero by 2050 scenario (NZE) in 2030. For net-zero to be viable, trade of minerals and hydrogen will have to be larger than trade in fossil fuels today.

The IEA also maintains that the world is not investing enough to meet its future energy needs. While oil and gas investment are geared to a world of stagnant or falling demand, transition-related spending is not rising fast enough. Clean energy transitions can cushion consumers from the shock of price spikes or oil and gas if households can get help to manage the upfront costs of energy efficiency improvements and electrification. The 2050 NZE scenario would expose consumers to less severe price shocks.

EIA

While the EIA does not advocate policy, it does provide long-term forecasts on the market. In EIA's most recent international energy outlook to 2050, the EIA used an integrated economic model that captures the long-term relationships among energy supply and demand trends across the regional markets. The reference case focuses on the existing climate laws and what can be quantified. This serves as a base to assess certain legislative changes going forward and helps estimate the impact of alternative assumptions. In EIA's long-term forecast, oil consumption reaches 125 mb/d by 2050, but reaches as high as 151 mb/d in the high economic growth case. Forecasts are also dependent on whether a country acts on its climate pledges. Country statements on climate policy are not as clear, so the incorporation of such statements is deciphered by a country's previous history in achieving their policy statements through metrics such as financial ability, economic incentives, and existing energy contracts. The challenge going forward will be to try and model policy goals with inconsistent past performance, model the impact of emerging technologies such as hydrogen, and new policy mechanisms, and incorporate non-economic considerations such as elections and new political parties.

RFF

The IEF-RFF Outlooks Comparison Report that compares short-, medium-, and long-term demand and supply scenarios between the IEA, OPEC, and EIA. This year's report also took a more detailed

look at various long-term energy demand scenarios produced by IRENA, GECF, and private sector stakeholders. Oil demand is set to remain strong unless prices go up or further inroads are made into electric vehicles. The IEA and OPEC forecasts are more aligned than they used to be in terms of North American supply, and both see similar growth into 2026. Long-term scenarios from IEA, OPEC, and others differ across various dimensions including climate goals, technology adoption, GDP growth, and resource supply, but the most notable one is the assumption on how soon the energy system will decarbonize. Key points are as follows:

Liquids

- The difference between the highest and lowest demand liquids demand scenarios is larger than current oil demand of about 100 mb/d.
- The fossil fuel share declines from 80 percent in 2020 to 68-70 percent under the IEA STEPS and OPEC Reference case scenarios and to about 30-60 percent with higher levels of climate action in the IEA NZE Scenario and APS.
- The long-term baseline scenario represented by the IEA STEPS and OPEC Reference case see demand plateau at similar levels of 108-109 mb/d. IEA's APS sees liquids demand still above 80 mb/d in 2050.

Natural Gas

- Long-term natural gas scenarios also differ wildly, reflecting a range of uncertainty that includes greater growth and a more modest decline than oil.
- The range includes a 45 percent increase from 2020 to 2050 relative to a 55 percent decline in gas demand under the IEA NZE scenario.
- The IEA STEPS scenario forecasts about a 25 percent growth compared to a five percent decline in the IEA APS with the OPEC Reference Case in between.

Renewables

- Renewables grow fastest across all scenarios with the divergence based on speed of adoption.

- Most scenarios project growth by a factor of 2.5-3.5 times by 2050. The IRENA 1.5C scenario is at the high level which sees a six-fold increase in renewables by 2050.

Nuclear

- Nuclear also sees growth across all scenarios that show less divergence.
- The fuel goes from a slight increase between scenarios to about a two time increase in growth under the most ambitious scenarios.
- The IEA STEPS and the IEA APS sees a 40 to 65 percent increase in nuclear energy demand with the OPEC Reference Case in between.

The absence of a Current Policies Scenario or a Business as Usual (BAU) case from current outlooks is misleading and obfuscates risks. Traditionally, the BAU case is used as a baseline to compare scenarios that incorporate new policies. Given greater momentum for global climate action, the BAU is allegedly no longer needed. IRENA clarified that its outlook is not a forecast but a determination on where the world needs to be in terms of liquids demand to get to below the 1.5C degree mark.

Session II: Medium Term Perspective – Energy Security and Market Stability: A More Volatile New Normal?

Market consensus in previous years was on supply shocks such as in the US shale caused five years ago. Today, the consensus lies in reduced oil demand growth in the medium-term – a view that sees oil demand decoupling from GDP growth this decade and remains without evidence. The energy system is exposed to three interrelated crises: one driven by consumption, the second driven by security and geopolitics, and the third driven by sustainability and climate concerns. The recovery from COVID-19 saw an unprecedented energy consumption wave particularly due to changes in consumer behaviour seeking services to manufactured products.

As a result, global SUV sales set another record in 2021 setting back efforts to reduce emissions while policies and political will to encourage consumers to shift to fuel efficient vehicles are weak. There has been no improvement in fuel efficiency in cars bought by Americans since 2014. While higher oil prices compel consumers to buy more fuel-efficient cars, the appetite for efficiency falls as oil prices fall and efficiency gains cause a rebound in energy demand. The market is assuming that supply and demand will remain relatively balanced (~0.5 mb/d vs. ~0.7mb/d), but forecasts show an imbalance of at least ~0.5 mb/d vs. ~1.4 mb/d based on a 3 to 3.5 percent global GDP growth

according to Rapidan Energy. Therefore, it is important for BAU cases to be included into forecasts to provide a baseline and a more comprehensive picture of the risks prevalent in this new energy dynamic.

Different regions have different approaches towards decarbonization. The western narrative of the energy transition leading to peak demand and lower investment does not apply to non-OECD countries. While renewables are a benefactor of the transition and the pandemic encouraged governments to implement policies which were politically impossible before, energy demand in non-OECD countries will continue to grow. In China, for example, coal demand growth was still at 100 percent. Energy demand will continue to grow in emerging markets and even with very aggressive global EV sales, it is difficult to get below 100 mb/d. For perspective, fossil fuels comprised 80 percent of total energy demand in 2020 as it did in 1980. While the world has shifted more towards natural gas within the fossil fuel sphere, the overall share of fossil fuel consumption has not decreased dramatically over the last 4 decades. The downstream sector is also impacted partly due to China limiting refining capacity as part of its net energy reduction targets by 2025. China is also no longer exporting as much products as it used to. In combination with high oil and gas prices, it is becoming more expensive to run refineries while demand will be higher for these products in future. Chronic under-investment has the potential to cause a mid-term supply crunch in the oil and gas market.

Securing the necessary investment is the key to market stability and energy security along with sufficient supply which also includes supply diversification and supply flexibility. At least $520 billion is required each year just to hold production flat at 100 mb/d compared to the current investment of $370 billion according to Energy Aspects. The lack of appetite of banks and financial institutions to invest in fossil fuels due to changing sentiment will continue to lead to higher prices. While the current decline in oil and gas investment is in line with energy IEA NZE transition goals, the key question is whether this decrease in oil and gas production will be replaced with a sufficient scale up of clean energy investment. Renewables have benefitted as a result, but the real challenge lies in land-use, permitting processes, construction licensing, and grid access. The other challenge is the loss of energy flexibility due to substitution among fossil, nuclear and renewable sources. The phasing out of coal will reduce flexibility that will need to be replaced by gas, nuclear, renewables and storage in the short-term and hydrogen in the longer-term. Current geopolitical trends also impact the energy system. These include the Ukraine crisis, global energy market shifts to Asia, US-China relations, and interactions among key producers and consumers.

As a result, energy security risks are growing in significance. Given these risks, existing exporters may become exporters of decarbonized fossil fuels such as hydrogen and ammonia. Russia is one such exporter that is retaining focusing on oil, coal, and natural gas but with similar plans for blue ammonia, hydrogen, in concert with investments in Carbon Capture Use and Storage (CCUS). From an electricity standpoint, as power demand grows, electricity supply becomes far more important in which renewable intermittency, system reform, and cyber-security become critical issues. The geography of energy security is changing as electrification depends on critical minerals imports from new resource rich regions. In the end, the cost of the transition is critically dependent on the policy design that prioritizes improving efficiency, deploying clean technologies, and transforming infrastructure.

Session III: Long Term Perspectives – Transitions Pathfinder: Beyond Renewables and Electrification

Acknowledging that fossil fuels will continue to provide energy security, climate concerns and net-zero pledges have created the momentum towards the use of alternative fuels. Here, nuclear energy offers an opportunity to build a cleaner and more equitable world and already provides 10 percent of the global low-carbon electricity. More nuclear capacity is required through large units and smaller modular reactors (SMRs). SMR's have a smaller project outlay, are more financially feasible, and fit many specialized markets and applications.

Nuclear energy will comprise 25 percent of the world electricity by 2050 for a broad range of applications beyond electricity according to the World Nuclear Association. Because nuclear energy is the only source that can produce low carbon electricity and low-carbon heat, it can be used to decarbonize hard-to-abate sectors more effectively than other sources. Other applications include producing hydrogen through thermochemical water-splitting, district heating of towns and cities, producing fresh water to mitigate water shortages, and hydrogen/electricity for low-carbon transportation. Nuclear energy can also operate independently of geopolitical pressures, under a variety of weather conditions, and contains a small footprint in terms of land-use, fuel use, and materials use along with low life-cycle impacts. Further inroads into nuclear energy will be dependent on greater investment.

Here, the role of governments will be particularly important especially as it pertains to instilling a sense of confidence in long-term energy plans to give clarity and transparency to incentivize industry and the investment community. The industry itself will also need to take a proactive approach in terms of public engagement through programs dedicated to public opinion and local communities.

More ambition should be placed in the role of nuclear energy given its potential wider scope of use and this should be reflected in future forecasts. Romania, more specifically, is looking to expand its nuclear program as nuclear energy comprises about 20 percent of energy consumption and creates close to 11,000 jobs. Future investments into the sector totaling 8-9 billion euros will expand the nuclear sector until 2030 along with taking a lead role in developing SMRs.

In addition to nuclear energy, the role of natural gas cannot be understated. As a secure energy supply for an inclusive, sustainable future, natural gas is the link that forges together security of supply and security of demand with the promise of a more sustainable future. The security of natural gas will especially be important as the population increases by 2 billion people by 2050. Natural gas can bridge short-, medium-, and long-term energy security access and climate needs as traditional oil and gas companies move towards more holistic “energy company” approaches and consider various technologies. Natural gas also shows promise from both a trade and technology perspective. Last year, LNG trade surpassed pipeline trade and advances in renewable natural gas in the form of biogas and biomethane also highlight the potential that the gas sector offers. Other uses for LNG are in the maritime and heavy-duty transport sectors that have been historically difficult to decarbonize. To realize this potential requires an investment infrastructure that is flexible, affordable, and secure to ensure availability and acceptability.

The automotive industry is also making massive strides towards decarbonization. GM, for example, aims to eliminate tail pipe emissions from new light duty vehicles by 2030 and become carbon-neutral by 2040 in all operations. The commitment to renewables started two decades ago the company plans that 100 percent of electricity will come from renewable energy by 2035. To put plans into action, the company made a $35 billion investment and will put it towards creating 30 all new electric vehicles by 2025, 13 of which will be introduced in the Middle East.

In the end, the role of the private sector will be crucial as it is best positioned to develop and deploy the necessary new technologies. At the same time, the role of critical minerals and their growing role in a low-carbon world will also be important going forward. As demand grows exponentially, it will be vital to ensure critical minerals are developed with the highest governance and environmental standards.

Conclusions

The heads of IEA, IEF and OPEC reflected on this year's dialogue that focused on the most crucial points including the impacts of net-zero policies, supply/demand shocks, elevated uncertainty and energy market volatility, the accelerated pace of energy transitions, and challenges and opportunities to energy investment and trade. All organizations recognize that there is a need to reconcile demands for secure and affordable energy on stable markets in the short-term with clear government policies that will accelerate energy transitions in an orderly, just, and predictable investment environment. High oil and natural gas prices can stifle the post-COVID global economic recovery. While market volatility comes with the change that transitions bring, continued dialogue and cooperation on the IEF platform should enable producers and consumers to work towards energy security market stability and shared UN goals. Moreover, a realistic, orderly, and well-managed transition depends on clear and readily comparable supply and demand outlooks based on well aligned historical baselines. The IEA, IEF and OPEC reaffirmed their commitment to further strengthen the dialogue to deepen understanding of energy market and policy dynamics. The IEA, IEF and OPEC thanked all the participants in the 12th session of the IEA-IEF-OPEC Symposium on Energy Outlooks.