

# Accelerating Global Decarbonization Trend and Middle Eastern Challenges

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## Introduction

Decarbonization and carbon neutrality initiatives are accelerating globally. In 2020, Japan and the United States followed the European Union in announcing plans to reach net-zero greenhouse gas emissions or carbon neutrality by 2050. China vowed to realize carbon neutrality by 2060. More than 120 economies have already offered to achieve carbon neutrality by around 2050. On the other hand, however, the world now depends on fossil fuels such as oil, natural gas and coal for more than 80% of primary energy supply. Fossil fuels backed by abundant supply and excellent price competitiveness support the global economy and civic life. A pathway from the present to carbon neutrality would represent a thorough energy transition accompanied by revolutionary changes.

At a time when fossil fuels account for most of global energy supply, the Middle East is the center of fossil fuel supply including oil and natural gas/liquefied natural gas (LNG). As of 2020, the Middle East commanded 31% of global oil production, 34% of oil exports and 26% of LNG exports, being one of the world's leading energy producers and exporters. For oil and gas producing countries in the Middle East, oil and natural gas/LNG revenue plays the most important role in stabilizing their economies, governments and societies. If the world enhances decarbonization initiatives to reduce traditional fossil fuel consumption, it may exert huge impacts on the stability and survival of Middle Eastern countries over a long term.

Based on the above awareness, I would like to summarize the global decarbonization trend, its impacts on fossil fuel markets and the Middle East's relevant initiatives and challenges.

## 1. Global Decarbonization Trend and Oil/Natural Gas Markets

Any country has prescriptions indispensable for achieving carbon neutrality. First, any country must cap and reduce energy consumption by improving energy efficiency as much as possible and promote renewable, nuclear and other non-fossil energy consumption. Second, any country must promote electrification (raising electricity's share of final energy consumption) as much as possible and achieve net-zero emissions in the power sector. However, the two prescriptions are insufficient for net-zero GHG emissions. The massive introduction of new fuels such as CO<sub>2</sub>-free hydrogen and ammonia and negative emission technologies like direct air capture to collect CO<sub>2</sub> from the

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atmosphere would be indispensable. Technological progress, market penetration, cost cuts and social acceptance regarding these technological options are plagued with high uncertainties, leading pathways to carbon neutrality to range widely, with multiple scenarios developed.

However, various scenarios for achieving carbon neutrality commonly include the high likelihood of oil, natural gas and coal demand peaking out. In an analysis released in May 2021, the International Energy Agency described that if the world realizes net-zero GHG emissions in 2050, oil and natural gas production would decline by 75% and 55%, respectively, from 2020 to 2050, with global oil and natural gas demand plunging. The IEA analysis represented one of various future scenarios. Even if the world goes in the direction of carbon neutrality, future oil and natural gas demand is very uncertain.

If global oil and gas demand goes in a downward direction, however, it may exert huge impacts on oil and gas revenue that is indispensable for economic and social management in the Middle East. This is because oil and gas revenue may substantially decline due to lower production and export volume and a market shrinkage that may drive down prices. If decarbonization is promoted over a long term to cut oil and gas consumption, oil and gas resources in the Middle East may become stranded assets. The world going in the direction of carbon neutrality could pose grave risks or threats to the Middle East.

## **2. Middle Eastern Initiatives and Challenges Responding to Global Decarbonization**

The global decarbonization trend basically exerts downside pressure on oil and natural gas production in the Middle East. However, we must note that the competitiveness of Middle Eastern oil and natural gas production featuring the world's lowest cost can play a key role in the shrinking market. If the entire market shrinks, the Middle East may take advantage of its high cost-competitiveness to increase its share of the market. Nevertheless, it must be reiterated that oil and gas production and exports in the Middle East would decline in volume. The production volume fall would be combined with price drops to substantially lower oil and gas revenue for the Middle East, forcing the region to make some responses.

In response to oil and natural gas revenue falls and stranded oil and gas assets, oil and gas producing countries in the Middle East may have to phase out their dependence on oil and gas revenue. There are various approaches to the phaseout. Among approaches that directly respond to the global decarbonization trend and attract attention from the Middle East and energy stakeholders in the world is the decarbonization of the region's oil and gas resources for CO<sub>2</sub>-free hydrogen and ammonia exports. Since Saudi Arabia hosted a summit of Group of 20 major countries in 2020, the Kingdom became a center in the Middle East to advocate the concept of a carbon circular economy seeking to decarbonize and utilize fossil fuels. The concept envisages that Middle Eastern countries would produce hydrogen from their oil and gas resources and subject subsequent CO<sub>2</sub> emissions to CCS (carbon capture and storage) or CCUS (carbon capture, utilization and storage) technologies, resulting in CO<sub>2</sub>-free hydrogen (blue hydrogen) that would be exported to energy consuming

countries to help them achieve carbon neutrality. International supply chains to produce hydrogen as the ultimate clean energy fuel from fossil fuels, treat subsequent CO<sub>2</sub> emissions with CCS or CCUS technologies and utilize such hydrogen in energy consuming countries would be developed, including Middle Eastern oil and gas producing countries as the supply source. Technological, economic and social challenges exist before the realization of the concept and must be overcome. Particularly, ultralow temperature facilities and infrastructure would be required to produce and transport liquefied hydrogen. In response, Saudi Arabia and Japan have cooperated in demonstrating an initiative to use existing supply chains for CO<sub>2</sub>-free ammonia to lower overall hydrogen supply chain development costs. They are promoting the strategic initiative to begin with ammonia for the effective utilization of oil and gas resources in the Middle East in response to global decarbonization.

As a matter of course, technological challenges exist in regard to relatively low cost CO<sub>2</sub>-free ammonia, including the development of supply chains and relevant infrastructure to further reduce costs and accommodate massive supply. More difficult challenges must be overcome for CO<sub>2</sub>-free hydrogen. Numerous challenges would have to be overcome to pave the way for the Middle East to contribute to global decarbonization and effectively use their domestic resources over a long term. To this end, the Middle East would have to cooperate with Japan and other Asian countries that would become major consumers of CO<sub>2</sub>-free hydrogen and ammonia.

Even if the Middle East successfully realizes massive CO<sub>2</sub>-free hydrogen and ammonia exports through its own efforts and international cooperation, various other challenges may have to be considered during the process. First, many resource-rich countries would tackle CO<sub>2</sub>-free hydrogen and ammonia export initiatives in consideration of growing interests in the clean energy fuels, leading to international competition. Second, global certification would have to be secured for CO<sub>2</sub>-free hydrogen and ammonia. Another fundamental challenge is that rent from CO<sub>2</sub>-free hydrogen and ammonia exports would be lower than from traditional oil or natural gas production. Regarding rent levels, it must be remembered that oil prices under the current production management of the Organization of the Petroleum Exporting Countries and other oil producing countries are higher than those in a completely competitive market. Furthermore, CO<sub>2</sub>-free hydrogen and ammonia supply chain costs, including CCS/CCUS and transportation costs, would be higher than oil supply chain costs. The successful utilization of CO<sub>2</sub>-free hydrogen and ammonia is expected to contribute to preventing oil and gas resources from becoming stranded assets, but rent revenue from CO<sub>2</sub>-free hydrogen and ammonia would be lower than from oil. If so, a big challenge would remain for economic and social management in oil and gas producing countries in the Middle East.

In this sense, oil and gas producing countries in the Middle East would have to not only decarbonize fossil fuels but also diversify and advance their economies structurally. Such structural reform efforts would have to be enhanced in the future. In this area, their cooperation with Japan and other major countries would be indispensable.

### 3. Conclusion: Challenges for Stabilizing the Middle East

Oil and gas producing countries in the Middle East face a mountain of challenges in addition to those regarding the globally accelerating decarbonization trend. Over the short term, they must keep crude oil prices at levels required to secure financial resources for advancing their economies for the future. To this end, they will have to continue difficult oil production adjustment in the fast-changing international oil market.

Factors that complicate the international oil situation include the destabilization of the Middle East. At present, we must watch how the U.S. Biden administration would handle its Iran policy and how the Biden administration's diplomacy giving priority to values including human rights and democracy would influence the stability of the Middle East. As the United States gradually reduces its engagement in and influence on the Middle East over a medium to long term, we would have to pay attention to how China and Russia would enhance their respective engagement in the Middle East. Particularly, we should watch how China would increase its presence in and influence on the Middle East amid the intensifying U.S.-China confrontation and how such change would impact the stabilization of the Middle East.

The stability of the Middle East will remain one of keys to that of the international energy situation. Middle Eastern countries' stabilization efforts are indispensable for the stability of the Middle East. At the same time, their relations with major countries surrounding the region and the geopolitical situation exert great influence on the regional stability. As the global decarbonization trend complicates the Middle Eastern situation, the region must make further efforts for its stabilization and prosperity. Middle Eastern countries' future efforts will grow even more important along with international initiatives to support their efforts.

#### Writer's Profile

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Dr. Koyama joined IEEJ in 1986. He got his PhD in 2001 from University of Dundee, Scotland. He has held many senior positions in IEEJ, including Head of the World Oil & Energy Group, Senior Research Fellow, Energy Strategy Unit. He has served as a committee member of energy policy related councils and advisory committees of Japanese government in many occasion. His specialized field of research is: energy security issues and geopolitics of energy; and analysis for global energy market and policy development with emphasis on the Asia-Pacific region. He has authored numerous publications in the area of energy economics.