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POLICY BRIEF

EXPLORING CARBON MARKET INSTRUMENTS FOR THE KINGDOM OF SAUDI ARABIA (KSA)

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EXECUTIVE SUMMARY

As more and more countries prepare net-zero pledges under the Paris Agreement, the Kingdom of Saudi Arabia (KSA) has a specific concept: the Circular Carbon Economy (CCE), targeting carbon circularity by building a competitive advantage on clean hydrogen and carbon capture utilisation and storage (CCUS) technologies. The concept is nationally endorsed and the next steps now need to be elaborated. How best should technological and financial efforts be designed? This policy brief analyses the different elements of a potential carbon market for KSA, considering the country's economic and competitive strengths, its plans to diversify its economy, and calls for a long-term low-carbon strategy for the country.

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1. INTRODUCTION

In the past few years, nations and corporations are joining the carbon neutrality pledge[1], with a substantial increase in carbon neutral commitments being announced in the past months, where more than 60 countries are aiming to reduce carbon emissions to net-zero by 2050 (or by 2060), corresponding to approximately half of global emissions.[2] Some may still be doubtful about certain roadmaps and timelines but the dynamic that the Paris Agreement has set in motion is undeniable. The carbon neutrality era is here to stay.

KSA, the largest economy in the Middle East and member of the G20, is heavily dependent on a limited resource base: oil and gas, where the export of energy products constitutes over 90% of all Saudi exports.[3]

Carbon neutrality related policies, such as those of the European Green Deal, are changing oil and gas producers' markets. Low-cost oil producers, such as KSA, are better positioned to deal with declining global oil prices, but not indefinitely. In the medium-term, they might even increase their market shares, as high-cost producers will be pushed out of the market. However, even low-cost oil producers will feel the impact of declining prices. Already, at the current oil price of USD 40/barrel, KSA's budget deficit is at 12% of GDP. This suggests that economic diversification away from oil is a must.[4]

KSA, like other economies, is now facing the challenge of how to diversify its economy and export markets away from reliance on oil and gas while encouraging emerging low-carbon energy technologies and markets.

KSA invests significant research and development (R&D) sums on carbon capture, storage, and use in enhanced oil recovery and in materials, hoping to achieve breakthroughs in technology-driven solutions to climate change. If commercially scalable, these technologies could decouple the growth of demand for fossil fuels from the growth of emissions. KSA's Saudi Arabian Basic Industry Corporation (SABIC) has become the third-largest petrochemical company in the world and is aggressively pursuing research and development, and the commercialisation of new material technologies derived from recycled plastics, as well as those that can be produced from carbon dioxide by carbon capture and use.[5]

KSA is committed to developing and implementing the Kingdom's concept of Circular Carbon Economy. The concept is built on the concept of the circular economy, where operating systems are transformed from their existing linear structures to more circular systems. KSA's Circular Carbon Economy specifically targets the circularity of carbon (in the form of CO2 or other greenhouse gases), guided by four principles: reduce, reuse, recycle and remove (the so-called '4Rs'):

- Reduce: Reduction of carbon based greenhouse gases emitted into the atmosphere;
- Reuse: Reusing the carbon based greenhouse gases without changing its chemistry;
- Recycle: Recycling the carbon based greenhouse gases or products containing greenhouse gases into similar or different products with different chemical characteristics;
- Remove: Removal of carbon based greenhouse gases from the system, partially or fully.

The concept has been nationally endorsed, but precise policies still need to be elaborated.

1 Carbon neutrality refers to achieving net-zero carbon dioxide emissions. This can be done by balancing emissions of carbon dioxide with its removal

2 Which countries have a net zero carbon goal? (climatechangenews.com)

3 Saidi M. Ouassaf, King Faisal University - The Economic Diversification in Saudi Arabia Under the Strategic Vision 2030 (abacademies.org)

4 Leonard, Pisani-Ferry, Shapiro, Tagliapietra and Wolff - The geopolitics of the European Green Deal (bruegel.org)

5 Grzegorz Peszko, Dominique van der Mensbrugghe, Alexander Golub, John Ward, Dimitri Zenghelis, Cor Marijs, Anne Schopp, John A. Rogers, and Amelia Midgley, World Bank Diversification and Cooperation in a Decarbonizing World (worldbank.org)

2. THE KINGDOM'S ECONOMY

An oil price boom from 2003 to 2013 boosted prosperity in KSA, which became the world's 19th-largest economy. GDP doubled, household income rose by 75%, and 1.7 million jobs were created. The government invested in education, health, and infrastructure and built-up reserves amounting to almost 100% of GDP in 2014. Nevertheless, KSA will struggle to continue to grow based solely on oil revenue and public spending in the face of a changing global energy market and a demographic transition that will lead to a bulge in the number of working-age Saudis by 2030.[6]

This is where diversification plays an important role. KSA is undergoing an economic diversification under the strategic Vision 2030[7] to avoid market vulnerability due to its high dependence on oil exports. By 2030, SMEs are projected to account for 35% of KSA's GDP (currently 20%), the private sector will contribute 65% of GDP (currently 40%), and the Vision aims to increase foreign direct investment from 3.8% to the international level of 5.7% of GDP. An important economic goal is raising the share of non-oil exports in non-oil GDP from 16% to 50% and increasing the non-oil government revenues from USD 45 Billion to USD 267 Billion.[8]

3. SCALING UP LOW-CARBON INVESTMENT

An increasing number of major economies are developing a net-zero climate strategy based on seven blocks: low carbon electricity, energy efficiency, clean mobility, industrial decarbonisation, infrastructure, bioeconomy, and residual emissions. Each country weighs the importance of these in different ways when developing national plans and linking them with national policies. For example, Japan has identified in its recent Green Growth Strategy[9] 14 technologies to be pursued in the sectors of energy, transport, manufacturing and buildings. Under its new Industrial Strategy, [10]the EU has initiated a process to identify key value chains. Industrial alliances, for example, on batteries, hydrogen, renewable energy (offshore wind), low-carbon industry, raw materials are emerging.

In this context, two options are more likely to work for KSA: 1) to make competitive green hydrogen[11] for export as a complement to oil and gas, and 2) to produce blue hydrogen.[12] In KSA, there are ongoing high-level discussions about dedicated policies in the form of a long-term roadmap, with clean hydrogen (green and blue hydrogen) at its core. In early 2021, Energy Minister HRH Abdulaziz bin Salman stated[13] that Saudi Arabia aims to convert half of its power sector to gas and the other half to renewables by 2030 - though green hydrogen ambitions within the Kingdom are challenged by low levels of renewables capacity installed to date, i.e., 0.4 GW in a 75 GW power system (with another 10 GW under construction).[14]

Also, on March 11, 2021, HRH Abdulaziz bin Salman, Minister of Energy of Saudi Arabia and German Economic Affairs Minister Peter Altmaier signed a Memorandum of Understanding (MoU)[15] establishing cooperation on clean hydrogen. The MoU formalises the commitment of both countries' governments and industries to cooperate closely on the production, processing, use and transport of clean hydrogen and underlines

6 Gassan Al-Kibsi, Jonathan Woetzel, Tom Isherwood, Jawad Khan, Jan Mischke, Hassan Nourai, McKinsey MGI Saudi Arabia_Executive summary_December 2015.pdf (mckinsey.com)
7 Saudi Vision 2030 – consulted on 18/04/2021
8 Saidi M. Ouassaf, King Faisal University - The Economic Diversification in Saudi Arabia Under the Strategic Vision 2030 (abacademies.org)
9 Overview of Japan's Green Growth Strategy Through Achieving Carbon Neutrality in 2050, January 2021 1225_001a.pdf (meti.go.jp)
10 European industrial strategy | European Commission (europa.eu)
11 Green hydrogen is produced when renewable power is used in the electrolysis process.
12 Blue hydrogen uses carbon capture and storage for the greenhouse gases produced in the creation of grey hydrogen. Grey Hydrogen is hydrogen produced using fossil fuels such as natural gas
13 Bloomberg/ Matthew Martin, Salma El Wardany, and Abeer Abu Omar Saudi Arabia Aims to Become Next Germany of Renewable Energy - Bloomberg – consulted on 06/04/2021
14 EnergyPost/ Jan Frederik Braun, PhD Saudi Arabia's clean hydrogen plans for converting ambitions into action - Energy Post – consulted on 06/04/2021
15 BMWi/ Andreas Martens BMWi - Federal Ministry for Economic Affairs and Energy - Minister Altmaier signs Memorandum of Understanding on German-Saudi hydrogen cooperation – consulted on 06/04/2021

KSA's ambition in becoming a global powerhouse producer in this field.

KSA, as a low-intensity hydrocarbon producer with 6 trillion cubic meters of proven natural gas resources (the eighth largest in the world), about 25Gt of CO2 storage capacity in multiple storage formations, and very high direct normal irradiance and wind speeds, has the resources, infrastructure, and skills for producing cost-competitive clean hydrogen. This argument is exemplified by KSA's decade-long experience in industrial-scale hydrogen and chemicals production – Saudi Aramco's CO2 capture plant in Hawiyah, which injects compressed CO2 into flooded oil reservoirs as a mechanism for CO2 storage while simultaneously enhancing oil recovery, has a sequestering capacity of 800.000 tCO2 per year. The futuristic project NEOM Helios, the world's largest renewable hydrogen-to-ammonia facility, a joint venture between Air Products, ACWA Power, and NEOM is an ongoing project scheduled to go onstream in 2025. The facility will take advantage of the very high direct irradiance and wind speeds along the Red Sea. Equipped with 4GW of renewables, with solar powering the plant during the day and wind during the night, the electrolysers at Helios will run at a high load factor with an output of ammonia estimated at 1.2 Mt/year.[16] The world's biggest oil exporter has set its sights on also becoming the largest supplier of clean hydrogen. In September 2020, the country already shipped the world's first cargo of blue hydrogen, which was converted into ammonia, to Japan.

The potential is clear but challenges remain. A key hurdle for the Circular Carbon Economy's concept is the lack of competitive, scalable CCUS technologies. When it comes to innovation, a vast majority of the proposed technologies have not had the chance to be demonstrated at a commercial scale, which should now be a priority for the country. To do so, more efforts and resources should be allocated towards achieving scalability in a shorter time frame than currently envisaged.

Establishing a domestic system of carbon offsets from both nature-based and technological removals is a potential instrument that could generate financial revenues for CCUS development. If KSA's domestic offset market goes forward, special effort must be put into developing transparent and robust Monitoring, Reporting and Verification protocols, and a registry system. Demand for such carbon offsets could come from emitting sectors of the economy, thereby combining the polluter-pays-principle with revenues to finance technological development. International sources of sustainable finance could also be drawn upon, as renewable hydrogen and CCUS are activities considered sustainable under the EU Taxonomy, subject to stringent technical criteria. International finance is moving fast towards ESG (Environment, Social and Governance) and net-zero commitments aligned with the Paris Agreement. The opportunity of using the emerging framework to accelerate economic diversification can reinforce KSA's leadership role.

4. CONCLUSIONS

Low carbon technologies (for reducing, reusing, and capturing carbon emissions) will play a key role as well as carbon pricing as part of the policy package. Clean, known, and affordable technologies (renewables and storage) should become KSA's technological pillar. There is a nascent local industry, ready to finance and develop projects together with hydrogen add-on projects, and ready for ESG disclosure – which is starting to be mandated in KSA. CCUS is key and is eligible under sustainable finance frameworks, but still needs scale and a carbon pricing mechanism to become competitive. If KSA strengthens both pillars, diversification and carbon pricing, the technological evolution could be accelerated.

Diversification of the economy has a considerable benefit in avoiding potential stranded assets: not being so dependent on oil and gas exports but rather relying on clean hydrogen - prioritising the one produced with renewables (green hydrogen) – taking advantage of its competitive position (natural resources and financial capabilities) to lead

16 EnergyPost/ Jan Frederik Braun, PhD Saudi Arabia's clean hydrogen plans for converting ambitions into action - Energy Post – consulted on 06/04/2021

the hydrogen market on a trend that shall take green hydrogen to become competitive in 2030.[17] Also, more drive and resources should be allocated towards achieving CCUS scalability to complement the clean hydrogen mix with a more competitive blue hydrogen. KSA has the full potential to lead the clean hydrogen race, setting standards and definitions.

Sustainable finance from international funding sources is also an option for KSA, as green hydrogen and CCUS are activities considered sustainable under the EU Taxonomy, which is not unimportant given the strong trading links with the European market. For this to happen, KSA must be leading from the front in terms of ESG financial disclosures, as financial markets and civil society expect stricter integration of sustainability from all players.

KSA's government and the private sector have critical roles in shaping the economy´s transformation. Public authorities should lead and steer the way forward for green and blue hydrogen, setting out future regulations that guide investment decisions, and reassures the private sector through a predictable regulatory framework underpinning KSA's clean hydrogen ambitions. A long-term strategy setting priorities for more investment in renewables and for boosting the demonstration of CCUS technologies at scale is crucial for KSA's carbon neutrality success.

17 Green hydrogen costs between 3.50 EUR (USD 4.15) and 5.00 EUR per kilogram, according to the IEA (International Energy Agency). That compares with around 1.5 EUR for the conventional, dirtier process that produces grey hydrogen. The cost of producing blue hydrogen lies in between these two levels.

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