

# A strategic approach to decarbonization for GCC hydrocarbon exporters



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*The global trend to decarbonize economies is set to have a direct impact on the oil-exporting countries of the Gulf. The latter can however mitigate and potentially profit from this trend if they decisively act and invest in carbon capture use and sequestration (CCUS) technology, thus securing and projecting a long-term future for hydrocarbons as a valuable and sustainable economic resource.*

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## Strategic options for hydrocarbon reserves

The peak in global oil demand may not be tomorrow, and the decline past the peak may not be precipitous, but oil exporting countries with large untapped reserves should worry equally about the future value of oil or gas that they have in the ground. Oil exporters always needed to think strategically, but in the past the main concern was about the time when oil might run out, and production decline or cease. This led some of the major oil exporters, notably the ones that are members of the GCC, to deliberately slow down the pace of exploitation of their reserves. This attitude was in contrast to private oil companies, as well as national oil companies and a majority of other oil producers, that always aimed at maximizing short-term production and revenue.

The need for strategic thinking has not disappeared, but the concern is today for the possible loss of economic value of remaining reserves, which, according to one theory, runs the risk of never being extract-ed from below ground. At first sight, this might encourage the holders of such reserves to shift strategy and aim at driving higher-cost competitors out of the market, but this approach has proven to be extremely costly, leading to excessively depressed oil prices. The alternative is defending the value of hydrocarbons in a decarbonizing world, attempting to slow down the pace of substitution with moderate prices, but more importantly also aiming at the decarbonization of hydrocarbons' production and use.

## Alternatives to decarbonization

Decarbonizing hydrocarbon production and use entails the systematic, if progressive, elimination of emissions from oil and gas:

- Scope 1 emissions, connected to the extraction of hydrocarbons and their transformation into final products
- Scope 2 emissions, connected to the generation of electricity used in the hydrocarbons industry
- Scope 3 emissions, related to the final use of the products derived from hydrocarbons.

With respect to scope 1 emissions, it is a well-recognized fact that not all oil and gas streams are the same, depending on conditions for extraction, or leakage of gases into the atmosphere. The GCC oil and gas producers are in a favorable position in international comparison, because of the prolific nature of their fields, and the vast investments made to contain gas flaring or venting. Further decarbonization is possible through the capture and utilization or sequestration (CCUS) of the CO<sub>2</sub> generated in the extraction, transportation and refining processes.

Electricity generation (scope 2) in the GCC countries is today almost entirely based on oil or gas. The opportunity to develop renewable or nuclear sources has been discussed for years, and ambitious plans announced, but implementation is lagging. The UAE is leading, but even there more could be done. It is unrealistic to think that oil and gas in power generation will be phased out anytime soon, but CCUS could be systematically implemented especially in newer plants to progressively reduce emissions.

Scope 3 emissions are the most important size-wise, but also the most difficult to tackle. Oil producing countries can follow three strategies to be able to eliminate scope 3 emissions:

- **First strategy:** Turning hydrocarbons into intermediate products that are not destined to be burned as fuel, by integrating downstream into the value chains, towards an increasingly diversified and sophisticated array of advanced intermediary or final consumer products.
- **Second strategy:** Using hydrocarbons locally in energy-intensive transformations coupled with CO<sub>2</sub> CCUS.
- **Third strategy:** Turning hydrocarbons into non-carbon, clean-burning fuels – which basically means hydrogen and its non-carbon composites, while also engaging in systematic CCUS.



## Assessment of strategies for scope 3 emissions

### First strategy

- Successfully pursued for years with the development of the petrochemical industry and the progressive integration downstream into higher value-added products. This is sometimes treated as an inferior or insufficient solution, primarily by observers who are not fully aware of the bewildering array and the advanced technological content of products from the petrochemical industry. The demand for crude oil may well peak, but that for petrochemical products will certainly continue to grow both quantity and quality-wise. What is needed is the systematic implementation of carbon capture so as to break the association between petrochemicals and high carbon emissions.

### Second strategy

- The second strategy is well present in the experience of GCC countries, but little attention has been paid to presenting the products as low-carbon. This lack of attention risks damaging the future of the industries involved, such as steel or aluminum, in the face of likely recourse of some importing countries to compensatory measures to limit so-called carbon leakage. The EU is likely to impose a Carbon Border Mechanism to make sure that carbon-intensive imports cannot undermine European products that would be subjected to higher carbon prices. In the case of aluminum smelting, which requires large inputs of electricity, competition from Norway, whose electricity generation is almost completely clean because originating from hydropower, could be a significant problem. It is important to note that the only large carbon capture project in the region is that of Al Reyadah, which captures CO<sub>2</sub> from a factory of Emirates Steel.

### Third strategy

- More speculative. Hydrogen is increasingly being recognized as the fuel of the future in the Far East, Europe and the United States. But most of the talk and attention is concentrated on so-called "green" hydrogen, derived from electrolyzing water with electricity from renewables (in some versions, also nuclear). A scenario of predominant reliance on green hydrogen would in essence aim at solving the problem of discrepancy between the time profile of availability of supply from non-dispatchable renewables (wind and solar) and the time profile of demand. Green hydrogen, in other words, is essentially a tool for storing electricity from non-dispatchable sources. It would be coherent with a scenario of increasing penetration of electricity in all final uses, including mobility. It is far from ideal for hydrocarbon exporting countries.



## The rationale for blue hydrogen paired with CCUS

The alternative is “blue” hydrogen, produced from hydrocarbons subjected to steam re-forming, with capture and use or sequestration of the CO<sub>2</sub> which is the inevitable by-product of the process. Today, blue hydrogen is much less expensive and potentially much more abundant than the green variety, opening the door to the progressive transformation of gas networks into hydrogen distribution tools, and substituting for liquid fuels in mobility uses or power generation, either through clean burning in turbines, or through fuel cells. The birth of a full-fledged hydrogen economy necessitates both blue and green hydrogen, letting technology and production costs decide which of the two should prevail.

In this latter perspective, the opportunity for the hydrocarbon exporting countries is to progressively become producers and exporters of blue hydrogen (possibly also green, in a more distant future). This again entails emphasis on CCUS, as otherwise the production of hydrogen would add to emissions rather than subtract from them. As light hydrocarbon molecules contain more hydrogen than heavier ones, it is mostly the gaseous fractions that would be used to produce hydrogen. But these are the same molecules that are also cracked to produce petrochemicals, therefore, a choice may become necessary at some point between producing hydrogen or petrochemicals. Also, hydrogen is needed to crack the heavier molecules and improve the production of lighter cuts in the refining process. Hence the perspective of becoming hydrogen exporters impinges upon the composition of available hydrocarbon streams and may be relevant only for countries that have excess availability of natural gas.

What emerges clearly in this discussion is that a strategy for defending the long-term value of hydrocarbons must in any case be based on major efforts towards carbon capture, utilization or sequestration. This is a widely recognized conclusion, and CCUS has attracted growing attention in the GCC countries over the years. In 2017, Suhail Al Mazrouei, the UAE Minister of Energy and Industry, at the 7th ministerial meeting of the Carbon Sequestration Leadership Forum (CSLF) in Abu Dhabi stated that CCUS projects across the world should scale up 100 times to meet the challenge of decarbonization: so far there is no signal that any dramatic upscaling is in the making at all. To the contrary, the lack of initiative and commitment to large-scale pilot projects undermines the very credibility of the technologies involved in CCUS.

The major GCC oil exporters certainly are amongst the parties that have the strongest interest in demonstrating that CCUS is a valid and real alternative for decarbonization. It is impossible to project a long-term future for hydrocarbons as valuable economic resources otherwise. International oil and gas companies are finding it difficult to justify investment in CCUS on a commercial basis, except for those situations in which CO<sub>2</sub> is produced jointly with oil and gas and its capture and re-injection in the field is a prerequisite for the production of the hydrocarbons. As private companies are responsible for delivering value to their shareholders, it is understandable that they take the attitude of waiting for governments to adopt regulations that will justify investment in CCUS before taking the plunge. But governments of fossil fuel exporting countries (including major exporters of coal) have a strategic interest in demonstrating the viability of CCUS, and should take the plunge even if projects cannot today be proven to be commercially viable.

## ***The Way Forward***

The strategic defence of hydrocarbons' economic value certainly requires massive investment: in CCUS projects, in clean power generation from renewables and nuclear, in the industrial transformation of hydrocarbons into non-fuel products, in other energy-intensive industries, and finally in the production and export of hydrogen and some of its non-carbon composites. This requires the mobilization of private as well as public, and national as well as international, investment. Such mobilization is possible if a credible narrative is proposed. After all, there are huge vested interests in the preservation of the hydrocarbon industry globally, not just in the major oil and gas exporting countries. The potential is there, but its realization requires credible leadership and coherence to acquire legitimacy in the global drive towards decarbonization.

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