Is Hydrocarbon the Enemy or Ally to Climate Change Countermeasures?

～Unexpected Innovative Value of Fossil Fuels～

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Introduction

For the first time this year, International Petroleum Week in London featured a plenary session on climate change. As a speaker, I expected to be challenged on whether we needed to act immediately, if not on the need to act. But the C suite attendees were not on that page at all. Instead they discussed how they were going to reduce the emissions for which they were responsible – both from their own operations and from consumption of their products. The question therefore whether there is unexpected value in hydrocarbons to be unlocked by innovative technologies is highly topical. Is there enough potential value that companies can rely on modest evolution of their current business models, or must they drive on to more radical change?

The Context

To address this question, we must consider how quickly emissions must be reduced. Building on the original agreement at COP 21 in Paris to limit global temperature rise to 'well below 2 degrees', a report from the Intergovernmental Panel on Climate Change* warned of the dramatic risks inherent in the two degree goal amid mounting evidence of well nigh unmanageable impacts like wildfires, floods and other extreme events. The world took note. Policy is increasingly driving towards a 1.5 degrees goal, which requires 'net zero' GHG emissions by 2050, that is, a small residual level of emissions accompanied by emission removal measures. It is significant that the International Energy Agency has for the first time now published a scenario based on limiting global temperature rise to 1.5 degrees Celsius (World Energy Outlook for 2020**).

The UN Conference on Climate Change scheduled for November 2021 was originally centred on getting governments to ratchet up their commitments to deliver 'well below 2 degrees' but is now increasingly focused on the 1.5 degrees agenda. In line with this, some 24 national governments have announced commitments to 'net zero' before or by 2050 (or 2060, in the case of China); with the USA expected to join them. Non-state actors (states, regions and global corporates) have joined them.

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The Implications for Future Demand for Hydrocarbons

Notwithstanding all this, some remain optimistic about the continued role of high emitting hydrocarbons because of how challenging it will be to phase them out. I would invite them to consider the case of coal, whose future is bleak. According to the IEA's World Energy Outlook 2020, the pandemic has catalysed a structural fall in global coal demand: falls in forecast demand in developed countries the USA and Europe outweigh growth in Asia. In the USA, some 100 GW of coal plants is forecast to retire by 2025 and there is not a single proposal for new build. This is notwithstanding President Trump's commitment to support the industry. Admittedly the fall has driven as much about coal to gas switching as replacement by renewable power generation. But lest the gas developers seize on this, they might want to note President Elect Biden's commitment to a zero carbon power generation system by 2035.

Consider investor attitudes. Global financing for coal projects has been excluded by many IFI's and large investors. Oil and gas projects now face the same fate: the UK announced at the recent Climate Action Summit*** that they would be ineligible from UK export financing support. Thirty asset managers, who collectively oversee $9trn, have committed to net zero across their portfolios by 2050 and some investors have announced that they will no longer invest in fossil fuels. Denmark has announced the cancellation of remaining licensing rounds for exploration of oil and gas in its offshore waters.

This will be beginning to affect the financeability of projects, and in turn, might prompt price increases - adding to the challenge (already considerable in the power sector) of competing with renewables on cost.

Fossil fuels therefore face a toxic mix of an increasingly hostile policy framework, and greater challenges in securing financing - unless of course they can be produced so as not to emit GHG's. The most obvious way to do this is through carbon capture, use and storage technologies (CCUS) which would be relevant in some of the current markets for hydrocarbons, notably the power generation and industrial sectors.

The Potential of CCUS for Emissions Removal

i) The Power Sector

CCUS has been a proven technology at lab and pilot demonstration scale for at least a decade and exciting new technologies continue to emerge. But they have struggled to secure the financial support to get deployed at scale. With some isolated exceptions, and despite significant investment by OEM's, the hydrocarbon industry has been slow to commit support. Some campaigners have opposed it (often not for sound scientific reasons) and - whether influenced by such campaigns or for other reasons - governments have moved slowly or not at all. Only a tiny fraction of the funding given to renewables has been available to move CCUS from lab or pilot demonstrations to deployment; nor have other polices such as carbon pricing or regulation been harnessed to do so.

Although efforts have been stepped up significantly in a few jurisdictions over recent years, the development of business models along the whole value chain (capture, transport and storage or usage) remains rudimentary. Importantly, CCUS is expensive as cost reductions from learning by doing and economies of scale have yet to be realised. The costs of renewables by contrast have fallen dramatically. They are for instance already viable subsidy free, and cost competitive with thermal power generation, in many regions of the world. It is difficult to see how CCUS can penetrate that market, given the cost it adds to either new or retrofitted thermal plant. Any market for CCUS abated coal and gas power plants therefore depends on whether governments are prepared to subsidise them.

The exceptions might be plants operating with bioenergy coupled with carbon capture and storage (BECCS), or thermal plants with CCUS where the captured CO_2 has a value elsewhere. There are difficulties with either proposition. There is much competition for biomass (for heating and transport particularly), concern over how sustainably it is produced, and competition for land use for food production. Markets for CO_2 streams have to be developed which are compatible with the net zero agenda – and scalable.

ii) Industry and Hydrogen Production

There is probably be more prospect of continued use of hydrocarbons with CCUS beyond the power sector, such as where there are not alternative technologies sources or energy cannot be sourced from renewables. But the challenge again is scale and competing with some of those industries which are themselves researching possible alternatives with lower emissions. Added value will of course be derived from hydrogen production through steam reformation for uses such as transport or heating. Here, the competition will be with electrification and with the production of green hydrogen (electrolysed from water using renewable power).

Hydrocarbons in the Transport Sector and Elsewhere

The role of hydrocarbons in the transport sector is likely to be confined to the indirect one of producing hydrogen. How large a market might this become? In the UK, the government has recently been advised by the independent Committee on Climate Change**** to confine the use of hydrogen for transport to freight, and public transport such as buses or trains – usually alongside electrification as part of the solution, in part because of the constraints on hydrogen production and distribution before the ban on new internal combustion engine cars (ICE's) with effect from 2030. Sales off electric cars have reached record levels in the last few months, even as conventional sales have fallen: the technology appeals and they are cheap to run. According to a recent report by BNP Paribas*****, the cost of electric mobility (based on a renewables powered grid) will within 25 years become up to seven times cheaper than ICE's on a full lifecycle basis. To compete, oil prices would have to fall to uneconomic levels - below $20 bbl . So the market for hydrogen in cars may go the way of CCUS for coal or gas power, that is, be pre-empted by another technology which is

cheaper and readier earlier.

Innovative technologies could enable hydrogen to contribute to the decarbonisation of heating in buildings depending on the scale of trials over the next decade – and their success in showing how to overcome considerable challenges over safety and storage.

These examples are far from the whole story for the potential value of hydrocarbons to be unlocked by innovative technologies, but lack of space precludes that discussion in areas such as fertilisers and plastics. Suffice to say that innovative technologies will be needed even to maintain some of those traditional markets to match the future emphasis on sustainability, eg in terms of reusable or recyclable products.

Conclusion

The hydrocarbons sector has driven the world's prosperity for centuries but climate change means that the capital stock which it has accreted over the centuries must now be replaced. Innovative technologies which could enable hydrocarbons to continue to be valued in a low carbon world are already evident. But they will be limited in extent by several factors. First, leaders of the hydrocarbons sector are all too conscious that it must regain trust in the sustainability of its operations. It must put its house in order as regards operational emissions and fugitive methane. Second, it must rapidly accelerate efforts to deploy innovative technologies in a world where the process of replacement of hydrocarbons has already begun. In certain sectors even abated hydrocarbon technologies will struggle for market share, such as power generation where it is difficult to see how CCUS can compete effectively with renewables (unless added value can be secured at scale from by products such as hydrogen). Third, while other uses such as packaging, chemicals and fertilisers offer continued promise, developing those markets successfully must be conditional on whether doing so meets sustainability criteria.

The sector certainly has the ingenuity, technical expertise and motivation to develop innovative products beyond its traditional markets. The question is whether it will be given enough time, and have the financial firepower, to succeed in a world where erosion of the market for its products has already begun.

Writer's Profile

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Ms. MacNaughton chairs The Climate Group and the International Advisory Board of the New Energy Coalition, and is a Non Executive Director of En+ Group plc. She sits or has sat on several other boards in the academic, public and corporate sectors, and the Advisory Boards of the Grantham Institute, the Joint Institute for Strategic Energy Analysis, and Engie UK plc. She is one time Vice Chair of the UN High Level Panel on the CDM, former Chair of the Governing Board of the IEA, and a former Director General of Energy in the UK Government.