

North Sea Net-Zero UKCS

A report released by the Oil and Gas Technology Centre (OGTC) in conjunction with Wood Mackenzie, has laid out the Integrated Energy System Roadmap for the United Kingdom to develop a clean, integrated energy system by the 2050 net-zero deadline.

The United Kingdom is advantaged economically and geographically to take advantage of accelerating their net-zero ambitions faster than most other nations. To do so, the country intends to expand the offshore wind presence and decarbonise their oil and gas production outfits in the North Sea, predicated on the access to an estimated £430 billion in investments.

While the country remains highly dependent on fossil fuel power generation, the impetus to shift toward clean or low-carbon energy has driven the UK's commitment to achieve net-zero 2050 – the first major global economy to make such a declaration.

The roadmap highlights the five major areas that require the most immediate attention, and how to approach the necessary technological innovation; decarbonisation of oil and gas production, expansion of renewable technologies, developing a hydrogen ecosystem, Carbon Capture, Utilisation and Storage (CCUS), and digitalisation across the energy sector.

OGTC CEO, Colette Cohen OBE, believes there are significant challenges to overcome to achieve the 2050 net-zero goal, particular a drive toward greater technological innovation to combat carbon emissions at their source.

FUTURE OF UK OIL AND GAS

With the legislated directive of a net-zero society by 2050, the role the UK oil and gas industry plays within its own shores will be increasingly limited over the next three decades. Yet their role will remain crucial over the next three decades, as the intermittency concerns of renewables have not been overcome nor can homes be heated with hydrogen gas, yet.

Offshore oil and gas activities account directly for 3% of the UK's direct emissions, with 74% of these offshore emissions coming from combustion engines used to provide electrical power to rigs or drive their machinery. This leaves significant room to reduce emissions if renewables can generate the capacity to power rigs.

Beyond 2050 the demand for oil and gas will continue, as such, that necessitates the development of decarbonisation processes and technologies to mitigate the GHG emissions from this sector. Over the short-term, the retrofitting and re-use of oil and gas infrastructure for use by renewable power generation should be a priority.

OGTC-Wood Mackenzie's report indicates that £129 billion in CapEx would be required to fill these short-term goals, specifically; building out the electrification infrastructure of subsea cables and high-voltage substations, and to retrofit gas turbines to run on an ammonia-hydrogen blend. While over the medium-term, the vision would seek to incorporate subsea gas pipelines to channel hydrogen or carbon dioxide.

The mitigation of carbon emissions from oil and gas production may have the dual-benefit in utilising Enhanced Oil Recovery (EOR) technology to capture and store CO₂, ceasing the release at the source and providing an alternative income stream from the new UK Emissions Trading System. By merging

the oil and gas sector with CCUS technologies, and incorporating renewable and hydrogen energy to power production, the Oil and Gas Authority believes up to 30% of emissions could be reduced by 2050 while continuing to benefit the wider economy.

The OGTC report concluded that, “Developing low carbon technology industries could have an overall economic impact of £2.5 trillion on the UK economy. Over the next 30 years, the oil and gas industry will have the largest overall impact on the UK economy; however from 2035 onwards the hydrogen industry will have the largest impact on a yearly basis.”

RENEWABLES

The energy transition to ‘Net-Zero 2050’ is predicated on the uptake of renewables to provide power to UK homes and to integrate the production of oil and gas sector to be powered by renewables.

Capacity for renewables in the North Sea has been focused toward two areas; the offshore wind sector where the environment is exceptionally beneficial for wind power, and development of a hydrogen ecosystem that can replace the current demands for gas.

It is the belief of the UK government and energy industry drivers that these two sectors will be the foundations for achieving net-zero across the UKCS. Specifically, the offshore wind sector aims to increase the current capacity of 10GW fixed-bottom turbines to 40GW of installed capacity by 2030. Beyond 2030, the country will seek to expand to floating offshore wind and solar farms as the technology avails itself.

Concurrently the development of a hydrogen ecosystem is central to the country’s future energy demands. The plan to reach net-zero includes the introduction and integration of hydrogen technologies across the energy value chain. ‘Blue’ hydrogen and CCUS can meet the current targets for hydrogen production and carbon emissions removal, while the clean ‘green’ hydrogen technologies are rapidly developed.

The malleability of hydrogen makes it ideal for utilising current infrastructure (once retrofitted), capturing carbon at source and producing exceptionally clean energy if produced via renewable energy.

The report indicates that the wider economic benefit from offshore renewables, from now until 2050, could exceed £600 billion while creating an estimated 150,000 jobs in the process. The objective would be to build at least 75GW of offshore wind at a capex cost of £80 billion – this output would double the current offshore wind capacity. While the hydrogen sector could create 100,000 jobs and have an economic impact of £800 billion within the same period.

CHALLENGES

The greatest barriers to the 2050 net-zero objectives are the technological hurdles to digitalise, integrate systems and allow for reasonable storage of renewables. The focus is to embrace industry-wide digitalisation of oil and gas and renewables infrastructures in order to accelerate the efficiency of carbon-intensive systems.

By incorporating ‘Internet of Things’ (IOT) systems throughout oil and gas rigs, offshore turbines and onshore refineries the efficiencies gained would allow for six particular benefits; automation, asset

visualisation, resource mapping, reduced maintenance costs, efficiency optimisation, and management of production flow.

The investment into advancing these digital technological applications directly increases the production and processing efficiencies, lowering costs, consuming less energy and emitting less carbon as a result.

To achieve these stated goals and ambitions, the wider energy industry will require, “in excess of £430 billion will be required to achieve the Integrated Energy System Roadmap, with an estimated £270 billion being spent within the UK.” The majority of investments over the next 15 years will be spent on the offshore oil, gas and renewables sectors; while beyond 2035, there will be a significant increase in hydrogen and CCUS investments.

As one of the leading nations incorporating an integrated energy plan to achieve net-zero, the United Kingdom will be aptly positioned to assist and further the global ambitions to succeed in reducing carbon emissions. As the oil and gas sector enters into its twilight years, we may witness the North Sea energy hub shake its reputation as the darling of the European oil industry and rebrand as the standard-bearer for offshore renewables.