UK oil and gas policy in a 1.5ºC world

Feb 2022

Dan Welsby
Research Fellow, UCL Institute for Sustainable Resources

James Price
Senior Research Fellow, UCL Energy Institute

Steve Pye
Associate Professor, UCL Energy Institute

Policy Brief

THE BARTLETT
ENERGY INSTITUTE

The future of fossils fuels in a 1.5°C world

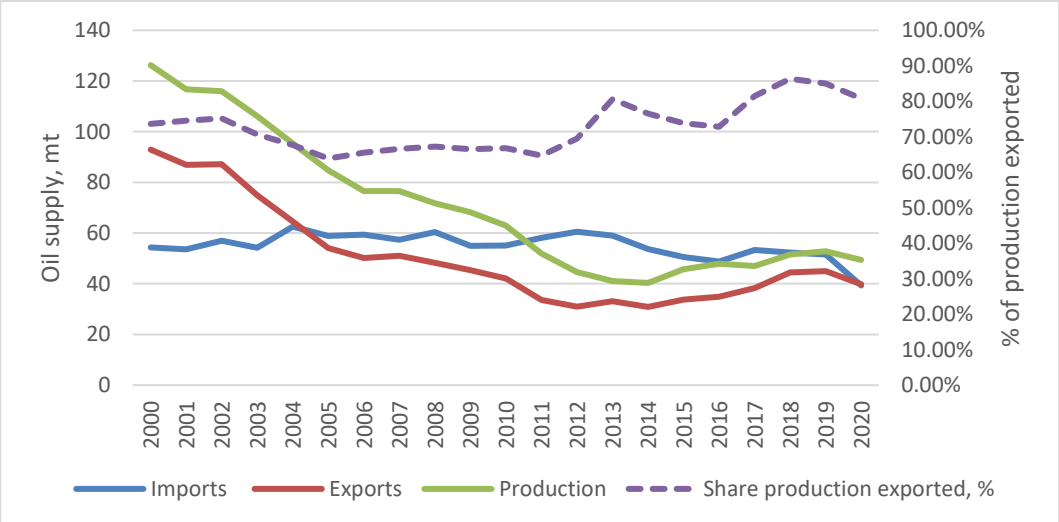
There is now a significant body of research that indicates substantial reductions in fossil fuel use are required to limit global heating to 1.5°C and achieve global net zero emissions in the second half of the century, in line with the Paris Agreement. The International Energy Agency's (IEA) Net Zero report[1], the United Nations Environment Program's (UNEP) Production Gap Report[2] and new research from UCL[3] (hereafter Welsby et al), all indicate that limiting global heating to 1.5°C requires fossil fuel production to decline, now. The rate of this decline depends on various assumptions such as how quickly carbon capture and carbon dioxide removal technologies can be scaled up and the future demand for energy by different economic sectors (e.g. road transport). However, all evidence points to the same conclusion: that global fossil fuel production needs to have already peaked and be entering decline.

This need to rapidly reduce extraction paints a bleak picture for the future of global fossil fuel production, with UCL's research, published in Nature, indicating that almost 60% of oil and gas reserves and 90% of coal reserves must remain in the ground by 2050 to provide a 50:50 chance of limiting heating to 1.5°C above pre-industrial levels. The analysis also found that the developed economies lead the way with decarbonisation efforts, and in particular with the required reductions in fossil fuel production. For example, Europe and Canada see rapid oil production decline of ~ 6% per year, whilst the US sees rapid reductions in gas (from 2020) and oil (from 2025) production of 8% and 4% per year, respectively. Huge proportions of these regions' coal reserves also remain in the ground with the US (97%), Australia (95%) and Europe (90%) providing a critical leadership role. These findings align with those presented in the IEA's Net Zero report which concluded that globally there should be "no new oil and gas fields approved for development" going forward.

This briefing paper aims to translate the insights developed by Welsby et al into the UK context and elucidate its implications for the country's oil and gas sector.

UK oil and gas production – historical production from the UK continental shelf

The UK Continental Shelf (UKCS) is a mature hydrocarbon producing province, with a large number of currently producing fields in the decline life cycle phase. As seen in Figure 1, oil and gas production has been declining at an average annual rate of ~ 5% since 2000.



[1] IEA, 2021. https://iea.blob.core.windows.net/assets/beceb956-0dcf-4d73-89fe-1310e3046d68/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf
[2] UNEP, 2021. https://productiongap.org/wp-content/uploads/2021/10/PGR2021_web_rev.pdf
[3] Welsby et. al, 2021. https://www.nature.com/articles/s41586-021-03821-8

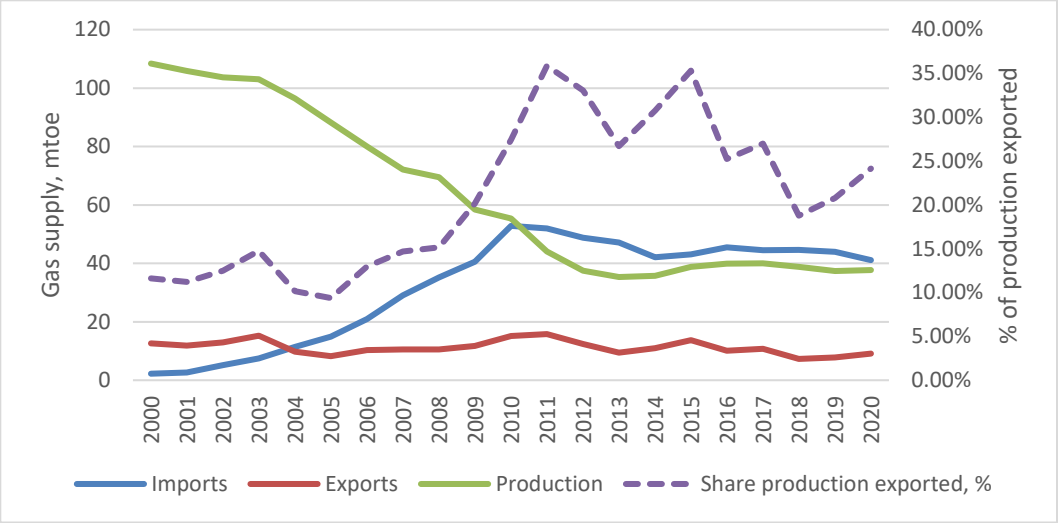


Figure 1: UK oil (a (Digest of UK Energy Statistics[4])) and gas (b (Digest of UK Energy Statistics[5])) production, exports and imports between 2000 and 2020

Additionally, whereas revenues from oil and gas production peaked in 2008-9 at ~ £12.4 billion (or ~ 0.6-0.7% of total GDP), by 2019-2020 this had reduced to £863 million (or ~ 0.04% of GDP), with total government revenues even turning negative in 2015-2016 and 2016-2017 when the oil price dropped below $50/barrel[6,7].

The future of UK fossil fuel production in a 1.5°C world

Welsby et al found that to be aligned with a 50% chance of limiting climate change to 1.5°C, UK oil and gas extraction must decline at rates of 6% and 7% on average per year, respectively. Based on these average annual decline rates, cumulative oil and gas production in the UK between 2018 and 2050 is ~ 5.6 Gboe and ~ 3.5 Gboe, respectively. This means that from the total UKCS resource base estimated by Welsby et al, approximately 10 Gboe and 6 Gboe of oil and gas, respectively, would need to remain in the ground.

As stressed in Welsby et al, it is likely that these production decline rates are underestimates of what is necessary for the UK play its part in stopping global heating. This is for two key reasons. Firstly, a 50% chance of achieving the headline target of the Paris Agreement is an underwhelming probability for success. Secondly, UCL's modelling includes large amounts of speculative negative emissions technologies (NETs) which enable a slower decline in fossil fuel production across the world by drawing down carbon from the atmosphere after it has been emitted and storing it underground.

Globally, the central scenario in Welsby et al requires an ambitious 1.1 $GtCO_2$ per year to be captured and stored in 2030 which increases to 4.4 $GtCO_2$ by 2050 (i.e. an increase of 7% per year from 2030-2050). This compares to 1.9 $GtCO_2$ captured and stored per year in 2050 in the IEA's net zero emissions (NZE) scenario and a range of 3.5-16 $GtCO_2$ based on the scenarios from Intergovernmental Panel on Climate Change that the IEA assessed. For the UK, UCL's modelling indicates a need for 38 $MtCO_2$ to be captured in 2030 rising to 57 $MtCO_2$ in 2050, while the Committee on Climate Change expects only 5 $MtCO_2$ in 2030 which then increases to 58 $MtCO_2$ by 2050. It is currently highly uncertain whether these largely unproven NETs can be deployed at scale at all, and particularly as early as 2030, which introduces a significant risk of society being unable to prevent global heating exceeding safe thresholds.

The IEA stated in their NZE scenario that no new oil and gas fields are required in a world that limits global temperatures to 1.5°C. In comparison to the IEA NZE, Welsby et al had a combination of higher levels of energy

[4] DUKES, 2021. https://www.gov.uk/government/statistical-data-sets/crude-oil-and-petroleum-production-imports-and-exports
[5] DUKES, 2021. https://www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes
[6] National Statistics, 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/902799/Table_11.11_July_2020_.pdf
[7] ONS, 2021. https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/abmi/bb

service demands (e.g. demands for mobility, heat, industrial products) and a higher reliance on NETs, and therefore higher cumulative production from fossil fuels. Cumulative (2020-2050) global oil and gas production was 17% and 13% higher in the research from UCL than in the IEA NZE, showing the importance of material and energy efficiency gains and behavioural changes in reducing energy demands, if global net zero emissions are to be achieved. In terms of production pathways for oil and gas, a direct comparison for the UK between the IEA NZE and Welsby et. al is not possible. However, based on annual average decline rates, the two analyses are closely aligned as shown in Table 1. It should also be noted here that in 2021, UK Oil and Gas Authority estimates of average annual (2020-2050) decline rates varied between 5-6% and 6-9% for oil and gas, respectively[8,9,10].

Table 1: Average annual derived decline rates for oil and gas production (2020-2050)

Study	Average annual decline rate for oil, %	Average annual decline rate for gas, %
Welsby et. al (UK specific)	6	7
IEA NZE (European level)	8	8

UK policy implications

In 2019 the UK became the first major economy to enshrine in law the goal of net zero greenhouse gas emissions by 2050 and in doing so renewed the country's aim to be seen as a global climate leader. Given that in 2021 the UK is responsible for the 9th highest cumulative CO_2 emissions since 1850 of any country, this net zero target started to align its domestic climate policy with the Paris Agreement's core tenets of equity and common but differentiated responsibilities. At the same time, it is current UK Government policy to pursue a strategy that maximises economic recovery (MER) from the UKCS. The Government's intention is then to balance the tension between these two policy objectives by introducing a "climate compatibility checkpoint" which must be passed as part of the licensing of future oil and gas projects in the region. This would allegedly ensure new developments are in line with the UK's climate targets.

However, Welsby et al clearly set out the stark reality that, given a 1.5°C temperature target places a ceiling on cumulative CO_2 emissions, extraction from new fossil fuel projects can only go ahead if other potential reserves remain unextracted. Yet the additive, rather than substitutive, nature of global fossil fuel markets means that there is a risk that any new UK production would simply add to existing extraction activities elsewhere in the world, leading to additional emissions. The overall context of the required decline in global oil and gas production from today raises a fundamental question: if new oil and gas fields are bought online, therefore adding to the global supply 'pot', where will this production be offset to ensure the decline trajectories suggested by the IEA, UNEP, and Welsby et. al are realised.

Therefore, we argue that to truly align new fossil fuel production in the UK with global climate targets, the climate compatibility checkpoint would need to explicitly identify which projects elsewhere in the world would not produce or that the decline rates shown in Table 1 are being significantly exceeded. This places a high burden of proof that would have to be met prior to giving new UK projects the green light. Furthermore, it also puts the viability of new developments such as the Cambo oilfield, 125km West of Shetland, under significant doubt.

Considering this requirement, the alignment of the IEA NZE findings with those of Welsby et al and the likely underestimate of the necessary production decline rates discussed previously, we argue that the development of new UK oil and gas fields are not compatible with limiting warming in line with the Paris Agreement. The UK's aspirations to be a global leader on climate simply strength this conclusion. Therefore, we recommend a moratorium be placed on all new oil and gas fields and the Government focus its efforts on supporting the transition to a low carbon economy, both domestically and internationally. The Beyond Oil and Gas Alliance (BOGA) announced at

[8] OGA, 2021. https://www.ogauthority.co.uk/data-centre/data-downloads-and-publications/production-projections
[9] OGA, 2021. https://www.ogauthority.co.uk/media/7185/oga-medium-term-projections-mar-2021.pdf
[10] OGA, 2021. https://www.ogauthority.co.uk/media/7136/oga-production-plus-beis-and-ccc-demand-projections-february-2021.xlsx

COP26 provides a useful framework that the UK could join to demonstrate such a commitment, and which is already supported by a broad coalition of countries.

We do note that for certain regions of the UK (especially areas in close proximity to the North Sea fields), oil and gas revenues are an important source of local employment and revenue generation. Any transition would therefore need to take into account the potential for job losses and the required support mechanisms need to be in place to minimise the impact of these to the greatest possible extent. Additionally, there is significant scope for employment from offshore renewable generation hubs to offset the employment losses from the wind down of fossil fuel production.