

SEA CHANGE

CLIMATE EMERGENCY, JOBS AND
MANAGING THE PHASE-OUT OF UK
OIL AND GAS EXTRACTION



May 2019

Endorsed by

COMMON WEAL



global witness



GreenerJobsAlliance

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Construction workers on the foreshore of the Solway Firth near Workington, Cumbria.
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KEY FINDINGS

This report shows that a well-managed energy transformation based on Just Transition principles can meet UK climate commitments while protecting livelihoods and economic well-being, provided that the right policies are adopted, and that the affected workers, trade unions and communities are able to effectively guide these policies.

Global commitments on climate change, enshrined in the 2015 Paris Agreement on climate change, require the rapid transformation of energy systems, replacing fossil fuels with energy from renewable sources.

Both the UK and devolved Scottish Governments have introduced pioneering Climate Change Acts and are phasing out or have already phased out coal power. In contrast, carbon dioxide emissions from burning of oil and gas have fallen just 3% since 1990. Both governments' policy on oil and gas is to enable the greatest possible volume to be extracted. This report finds that policy position incompatible with the UK's and Scotland's climate commitments.

The UK offshore oil industry is a significant employer, with about 30,000 direct workers and over 70,000 more in the domestic supply chain.¹ However, as the industry increases automation and tries to cut costs, it has made many job cuts and put pressure on working conditions. Unfortunately, failures of energy transition policy have meant the development of the renewable energy sector over the last 20 years has not translated into significant UK job creation, as a high proportion of manufacturing jobs in the renewables industry have been lost to overseas competitors. Furthermore, the growing offshore wind power sector is characterised by a lack of trade union recognition and challenging working conditions.

This report examines the future of UK offshore oil and gas extraction in relation to climate change and employment. It finds that:

- **The UK's 5.7 billion barrels of oil and gas in already-operating oil and gas fields will exceed the UK's share in relation to Paris climate goals - whereas industry and government aim to extract 20 billion barrels;**
- **Recent subsidies for oil and gas extraction will add twice as much carbon to the atmosphere as the phase-out of coal power saves;**
- **Given the right policies, job creation in clean energy industries will exceed affected oil and gas jobs more than threefold.**

In light of these findings, the UK and Scottish Governments face a choice between two pathways that stay within the Paris climate limits:

1. **Deferred collapse:** continue to pursue maximum extraction by subsidising companies and encouraging them to shed workers, until worsening climate impacts force rapid action to cut emissions globally; the UK oil industry collapses, pushing many workers out of work in a short space of time. Or:
2. **Managed transition:** stop approving and licensing new oil and gas projects, begin a phase-out of extraction and a Just Transition for workers and communities, negotiated with trade unions and local leaders, and in line with climate change goals, while building quality jobs in a clean energy economy.

Given the tightness of remaining carbon budgets, each new license, permit or tax break for oil and gas pushes the UK further towards the deferred collapse path. This report however recommends the second course; it shows that energy transformation can meet UK climate commitments while protecting livelihoods and economic well-being, if the right policies are adopted.

Local manufacturing and workforce participation therefore need to guide new approaches to economic development, industrial policy and ownership, together with stronger trade union rights for workers affected by energy transitions, including union recognition and sectoral bargaining to ensure acceptable norms on pay and working conditions.

The report recommends that the UK and Scottish Governments:

- **Stop issuing licenses and permits for new oil and gas exploration and development, and revoke undeveloped licenses;**
- **Rapidly phase out all subsidies for oil and gas extraction, including tax breaks, and redirect them to fund a Just Transition;**
- **Enable rapid building of the clean energy industry through fiscal and policy support to at least the extent they have provided to the oil industry, including inward investment in affected regions and communities;**
- **Open formal consultations with trade unions to develop and implement a Just Transition strategy for oil-dependent regions and communities.**

SUMMARY

CLIMATE LIMITS: UK OIL AND GAS VS THE PARIS GOALS

Using data sources from the energy industry and the Intergovernmental Panel on Climate Change (IPCC), research by Oil Change International (OCI) has found that carbon dioxide emissions from the oil, gas and coal in *already-operating fields and mines* globally will push the world far beyond 1.5°C of warming and will exhaust a 2°C carbon budget, as shown in Figure ES-1.

These *developed reserves* exist where infrastructure has already been built, capital invested and workers employed for long-term operating jobs. Because of the problem of “carbon lock-in”, the more fossil fuel reserves that are developed, the harder it will be to achieve the Paris goals.

Any new oil or gas field developed in the UK or elsewhere will add to the left-hand column in Figure ES-1. Barring a dramatic change in the prospects of carbon sequestration technologies, this can only lead to two possibilities: either the newly developed reserves are fully extracted and burned, helping push the world further beyond climate limits, or some portion gets left in the ground, stranding the capital

already invested and forcing a deferred collapse of fossil fuel extraction at the expense of workers and communities.

The alternative to such socially damaging and costly outcomes is a structured and planned transition, phasing out oil and gas extraction while replacing it with clean energy to power our economy. And while this process must occur worldwide, the first steps should be taken in countries that have the greatest resources to enable the transition. As well as in the UK, climate justice advocates are actively calling for an end to new oil and gas development as part of a managed transition in Norway, Canada and the United States; in all three cases, the calls have entered the political debate. In the words of the Lofoten Declaration, signed by over 500 civil society organisations, “It is the urgent responsibility and moral obligation of wealthy fossil fuel producers to lead in putting an end to fossil fuel development and to manage the decline of existing production.”³

However, the policy of the UK and Scottish Governments is to maximise extraction of oil and gas, by continuing to support exploration and new oil extraction infrastructure.

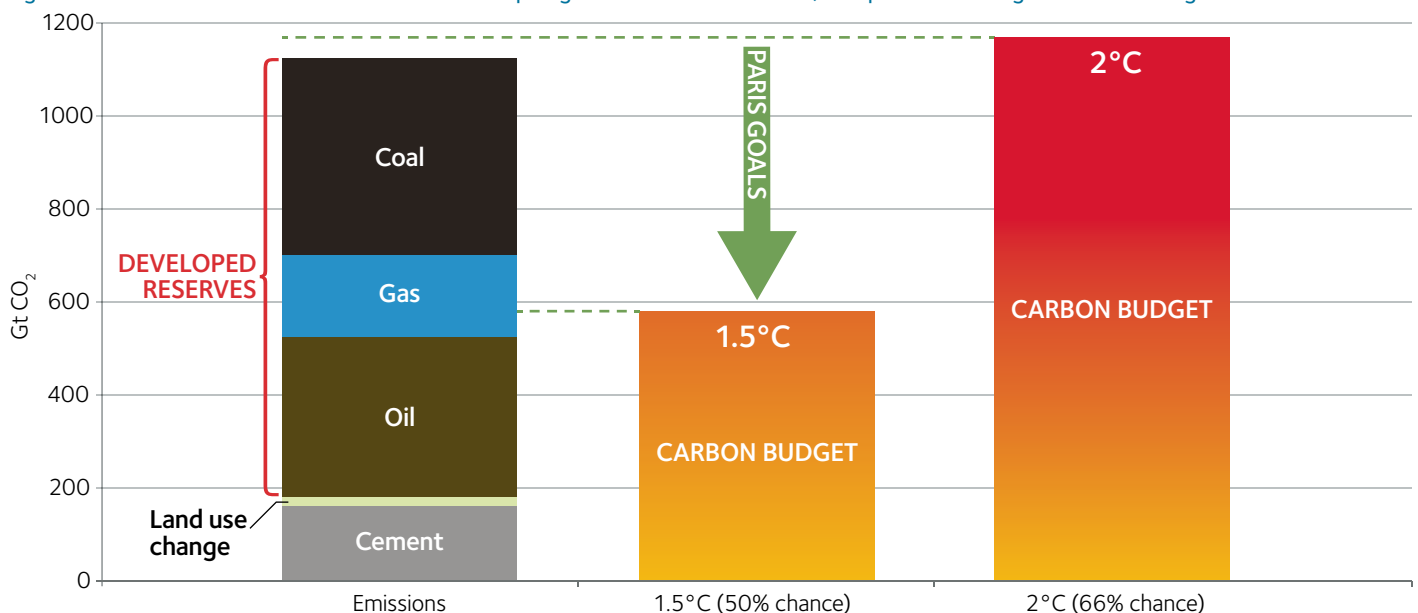
Extraction is currently growing, with major new projects coming on stream (such as BP’s Clair Ridge) and new discoveries (such as Total’s Glendronach field). In 2019, the UK Government plans to complete the UK’s 31st licensing round and launch a 32nd licensing round, to encourage yet more exploration.

Key finding: The UK’s 5.7 billion barrels of oil and gas in already-operating fields will exceed the UK’s share in relation to the Paris climate goals – whereas industry and government aim to extract 20 billion barrels.

This report finds that:

- **Opening new fields would nearly quadruple the emissions from UK oil and gas.** These new fields are additional to the UK’s developed reserves in Figure ES-1 below. These emissions are shown over time in figure ES-2 overleaf.
- **If all countries took the same approach as the UK – of phasing out coal power while maximising oil and gas extraction – resulting warming would significantly exceed 2°C, moving dangerously beyond the Paris goals** (see Figure ES-3). This is because the additional oil and gas emissions far exceed the savings from coal.

Figure ES-1: Carbon dioxide emissions from developed global fossil fuel reserves, compared to Paris goals carbon budgets



Sources: Rystad UCube, International Energy Agency (IEA), World Energy Council, Intergovernmental Panel on Climate Change (IPCC), OCI analysis²

KEY RECOMMENDATIONS

Based on these findings, we recommend that:

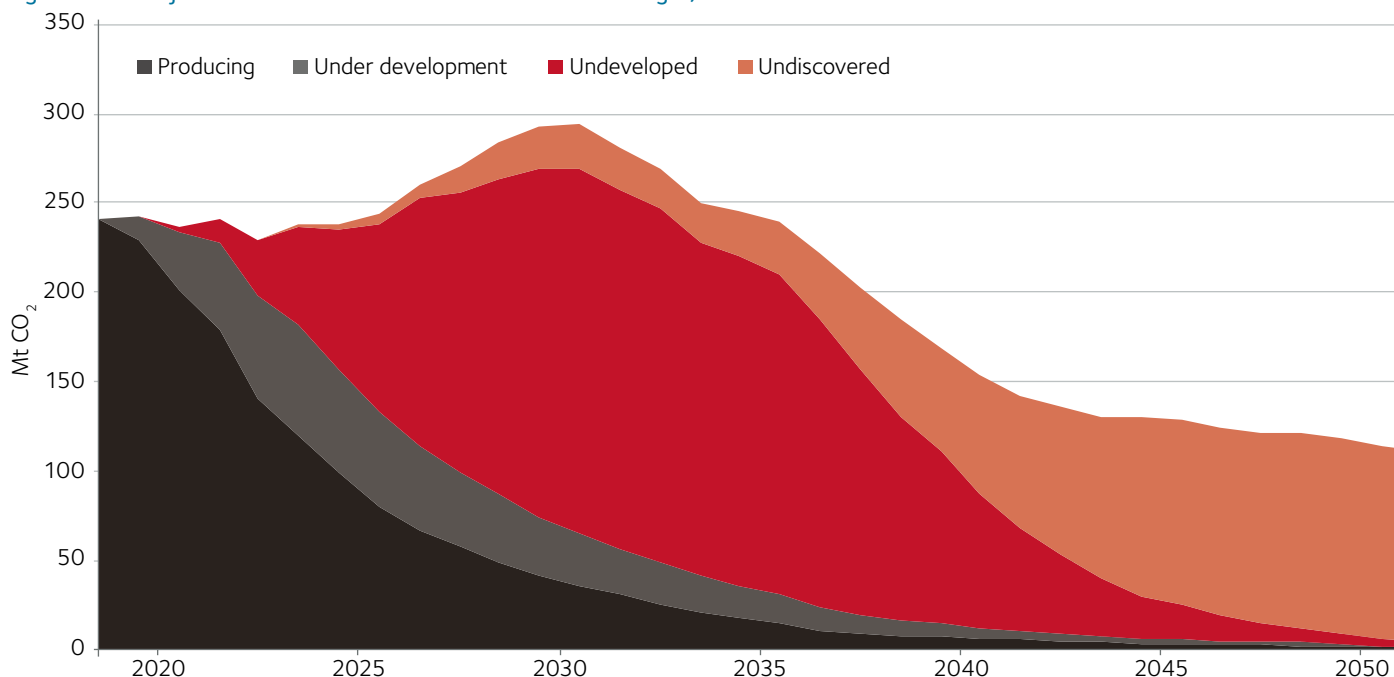
- The UK should cancel the current and any future oil and gas licensing rounds, and stop issuing permits for new fossil fuel exploration and development;
- The UK should revoke undeveloped licenses and review whether existing

facilities should be phased out early through a Just Transition, in order to contribute to the achievement of the Paris goals.

While this report focuses on the impacts of offshore UK oil and gas extraction, these conclusions apply equally to the

UK Government's efforts to encourage onshore extraction in England through hydraulic fracturing (fracking). The Scottish Government has declared an indefinite moratorium on fracking; the Welsh Government has stated it will not issue any licenses for fracking.

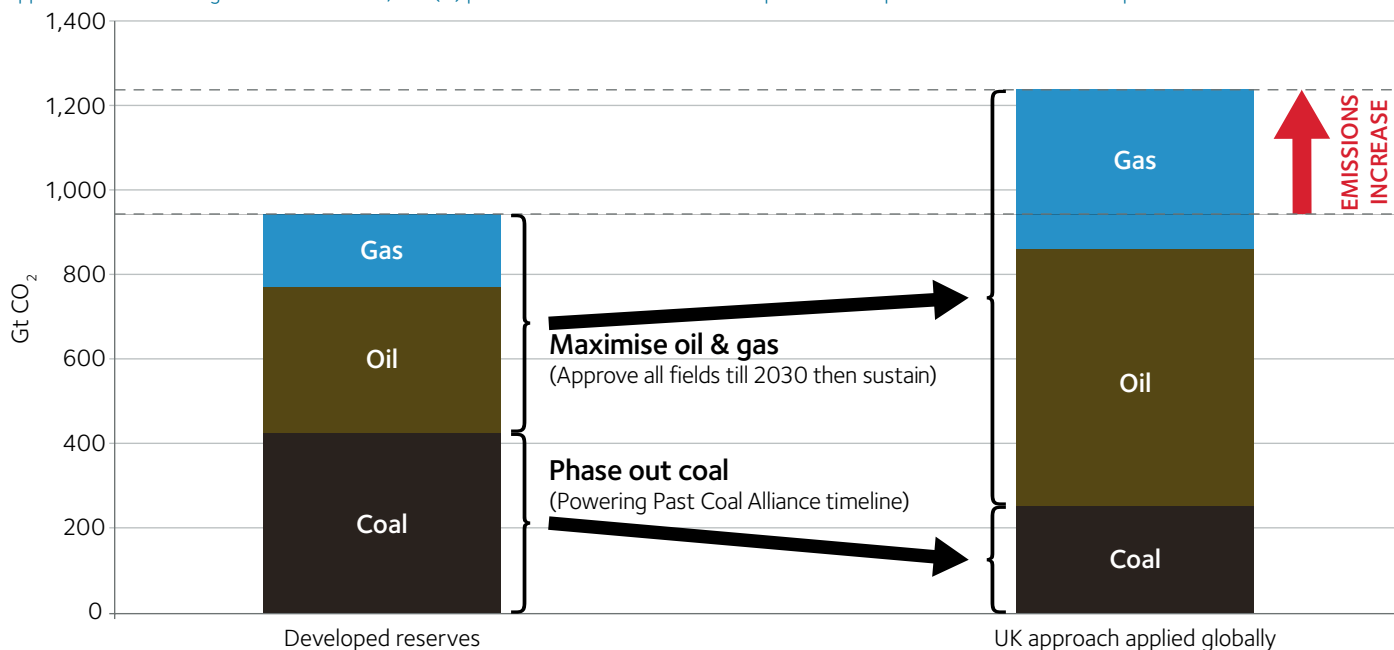
Figure ES-2: Projected carbon dioxide emissions from UK oil and gas, 2018-50



Sources: Rystad UCube, IPCC, OCI analysis

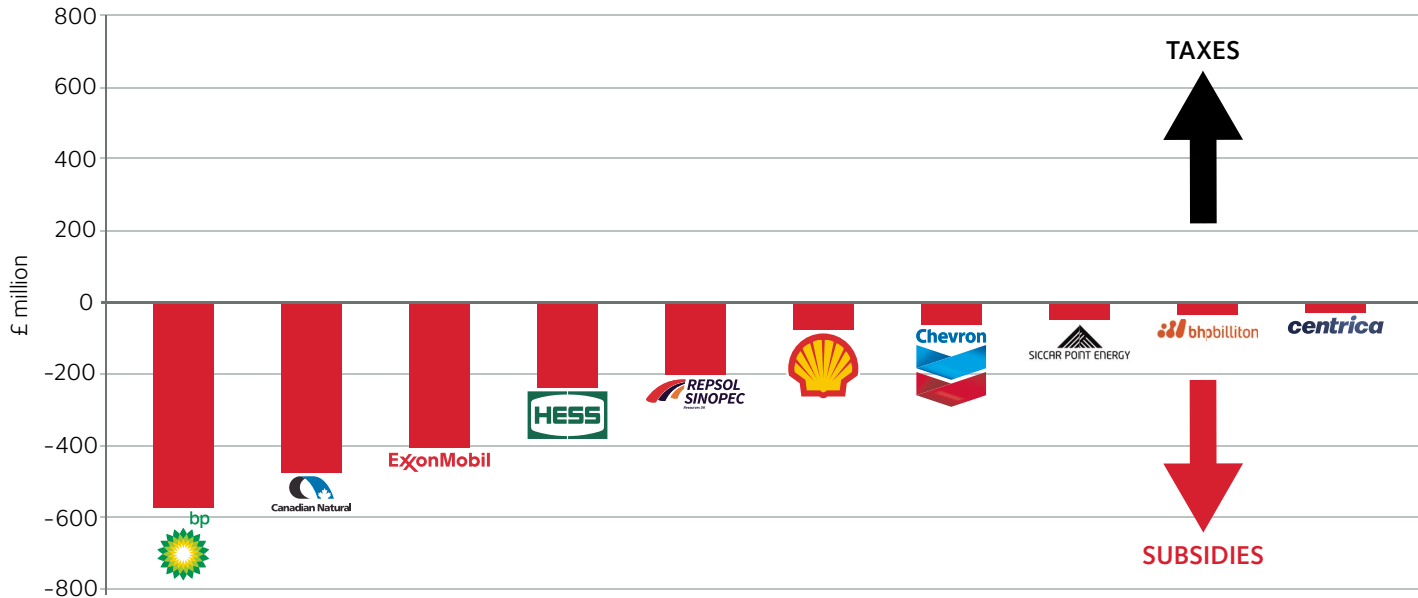
Figure ES-3: If all countries took the same approach as the UK: The impact on cumulative global carbon dioxide emissions from fossil fuels if all countries phase out coal while maximising oil and gas extraction

Specifically, if countries: (i) phase out coal power using the timeline of the Powering Past Coal Alliance; (ii) phase out non-power uses of coal by 2050; (iii) approve all new oil and gas fields until 2030; and (iv) provide additional subsidies to keep those fields profitable whenever the oil price falls



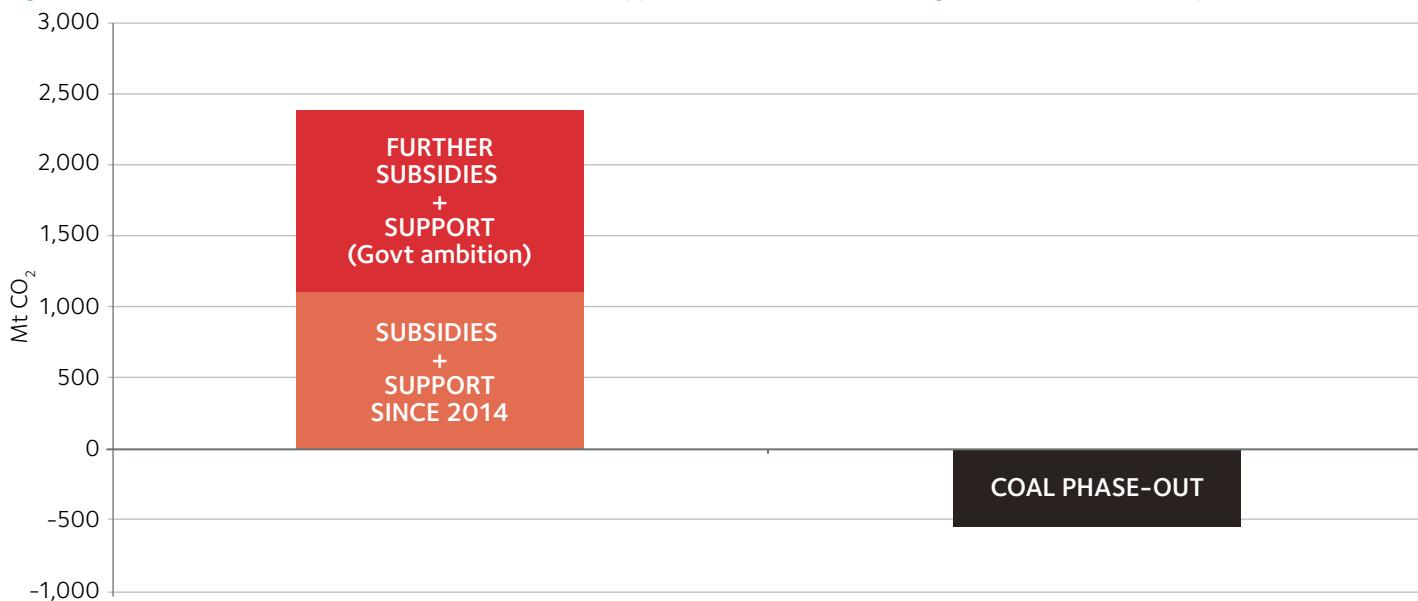
Sources: Rystad UCube, IEA, World Energy Council, IPCC, OCI analysis⁴

6 Figure ES-4: The top ten takers: Total net payments to government by selected oil and gas companies, calendar years 2015-17



Source: UK Extractive Industries Transparency Initiative (EITI) Multi Stakeholder Group⁷

Figure ES-5: Effect on 2016-2050 carbon emissions of UK support and subsidies for oil and gas extraction, vs UK coal phase-out



Sources: Rystad UCube, Oil and Gas Authority (OGA), Department for Business, Energy & Industrial Strategy (BEIS), IPCC⁹

SUBSIDIES FOR OIL AND GAS EXTRACTION

In pursuit of its policy of maximising oil and gas extraction, the UK Government has given generous tax giveaways to oil and gas companies. In the tax years 2015-16 and 2016-17, the Treasury gave more money to oil companies than it took from them in taxes.^a Figure ES-4 shows the top ten beneficiary companies, all of which received net handouts during 2015 to 2017. This is not because they made losses: at least five

of the ten were profitable during the period. Both BP and ExxonMobil made more than £1 billion of profits from UK extraction during that period.⁶

Key finding: Recent subsidies to oil and gas extraction will add twice as much carbon to the atmosphere as the phase-out of coal power saves.

The UK Government estimates that the oil and gas subsidies and support that it has

introduced since 2014 will increase future extraction by more than 30%.⁸ The carbon dioxide emissions from that additional oil and gas are already twice what will be saved over that period by the UK phase-out of coal power (see Figure ES-5). Through additional measures to achieve its “Vision 2035”, the government hopes to double the impact of those recent subsidies.

a In 2017-18, tax revenues went back into the black (to £1.2 billion) although still a long way short of the £6.1 billion collected in 2010, when oil prices and extraction rates were at roughly the same level.⁵

This report identifies and evaluates three major types of subsidy for UK oil and gas extraction:

- 1) **Tax allowances:** tax breaks on high-cost and marginal fields, available from 2009 to 2015, now replaced by tax breaks on investment on all fields.
- 2) **Reduced tax rates:** the UK has some of the lowest oil tax rates in the world, pushed even lower in the 2015 and 2016 Budgets. For example, Petroleum Revenue Tax is now charged at zero percent.
- 3) **Decommissioning tax breaks:** the taxpayer will pay almost half of the cost

of decommissioning offshore oil installations at the end of their life.

In addition:

- Since 2013, the government has signed legal guarantees to prevent any future elected government from changing the tax rules, an extraordinary surrender of sovereignty.
- It allows companies to sell their tax histories to other companies, so that those new companies can also claim public funding for decommissioning.

Table ES-1 shows estimates of the costs and impacts of these subsidies.

KEY RECOMMENDATIONS

Based on these findings, we recommend that:

- **The UK should remove all subsidies from oil and gas extraction, including tax breaks, and redirect them to fund a Just Transition.**
- **Decommissioning Relief Deeds should be cancelled; companies should pay decommissioning costs, and their decommissioning plans should provide for a Just Transition for workers.**

Table ES-1: Summary of three types of UK subsidy for oil and gas extraction

Type	Measure	Cost to taxpayer	Effect on extraction/emissions		Fits subsidy definition?
Tax allowances	Field Allowances (2009-15)	£1.1 bn granted in 2013-14, used over 5 years	Designed to enable extraction of fields that would be otherwise unviable	Supported 100 additional fields	Tax allowances almost universally considered to be a form of subsidy (except by UK govt)
	Investment Allowance (2015-)	£1.3 bn over 5 years (combined with 2015 tax cuts)	Designed to incentivise investment, causing carbon lock-in	+ 700 MtCO ₂ = 10 years of UK coal emissions	
Reduced tax rates	25 years of tax cuts, to unusually low levels	Govt revenue since 1990 is £255 bn lower than if it had the same effective tax rate as Norway	Declining extraction has been reversed through subsidies	New fields opened since the major subsidies of 1993 have added 13.3 bn boe to date ⇒ +3.6 GtCO ₂ , more than UK coal emissions over that period	Govt forgoes revenue, enabling higher profits than otherwise due (WTO, IMF definitions); UK fails to secure the public's fair share of income from the nation's resources; oil companies average 20% profit over last 10 years, cf 12% for other UK industries.
	Major tax cuts in 2015 and 2016 Budgets	£2.3 bn over 5 years (including Investment Allowance)		2015 tax cuts + investment allowance: 15% increase in 2019 extraction ⇒ +16 MtCO ₂ /yr	
Decommissioning funding	Decommissioning tax reliefs	Taxpayer pays almost half of a bill estimated at £60 bn, but could be much higher	Attracts more companies to extract, frees up their capital for expansion	Not known	A grant, liability or foregone tax (WTO), not available to other industries (IMF)
	Decommissioning Relief Deeds	Principal cost is in removing future governments' freedom to change tax rules. Already by 2019, Treasury has committed £357m to covering one company's default.	Unlocking capital for expansion (up to £40 bn)	Could enable extraction of an additional 1.7 bn barrels of oil equivalent ⇒ +650 MtCO ₂	These mechanisms don't directly change flow of funds, but underpin the tax reliefs, and are not available to other UK industries or in other countries
	Transferable Tax Histories	Unknown, though clearly the mechanism allows companies to claim reliefs that they could not otherwise	Designed to increase investment and extraction	Not known	

Sources: See chapter 4

JOB CREATION IN THE TRANSITION TO A CLEAN ECONOMY

To respond to the challenges presented by climate change while avoiding a deferred collapse of the UK's oil industry, a structured and planned transition is needed which covers both phasing out extraction and replacing the oil and gas with clean energy to power our domestic economy. Renewable energy is now cheaper in the UK than gas power. Several UK and global studies have shown that a rapid transition to 100% renewable energy is both technically feasible and affordable. The barriers are political.

The history (and present) of UK oil and gas extraction shows what can be achieved when a government sees a strategic interest in enabling an industry. From the first discovery of oil in 1969, the UK was an oil exporter within just twelve years, and by 1985 was the world's fifth largest producer of oil.¹⁰ It was government policy that enabled this rapid expansion, and government policy (through subsidies and industrial interventions) that sustained extraction long after it would have otherwise declined.

Clearly, it is an ambitious project to transform the UK energy system within a couple of decades, just as the rapid development of the North Sea was an ambitious project. However government intervention enabled the oil industry to develop, and it will be government intervention that similarly enables renewables.

This report models the impact on the oil and gas workforce of ending the development of new fields. Taking into account jobs created through decommissioning and forecast retirement in the existing workforce, we estimate that 40,000 existing oil workers (direct and supply chain) may need to be in a different job by 2030.

To examine the scale of jobs that can be created in compatible clean energy industries and the level of policy ambition necessary, this report models the numbers of new jobs that would be created in offshore wind, marine renewables and energy efficiency retrofits, sectors that have strong overlaps with existing oil and gas skills.

Key Finding: Given the right policies, job creation in clean energy industries will exceed affected oil and gas jobs more than threefold.

On the Current Trajectory (minimal support for renewable energy), the growth of jobs in wind energy alone exceeds the number of oil workers affected by the transition, but will not result in enough power to meet UK demand, nor in enough jobs to credibly support large-scale re-employment of existing oil industry workers. This demonstrates that ambitious government action is needed to push ahead the transition.

In an Existing Ambitions scenario (currently proposed ambitious targets from industry

and policymakers), at least three times as many new jobs will be created in wind power, marine renewables and energy efficiency retrofits as the number of oil and gas jobs affected in a managed phase-out of oil and gas extraction.

In this report we advocate the full transition from fossil fuels to renewable energy before 2050, in line with climate goals. In a Fully Renewable scenario, we find that over four times as many new jobs will be created in just these sectors as the number of current oil and gas workers affected.

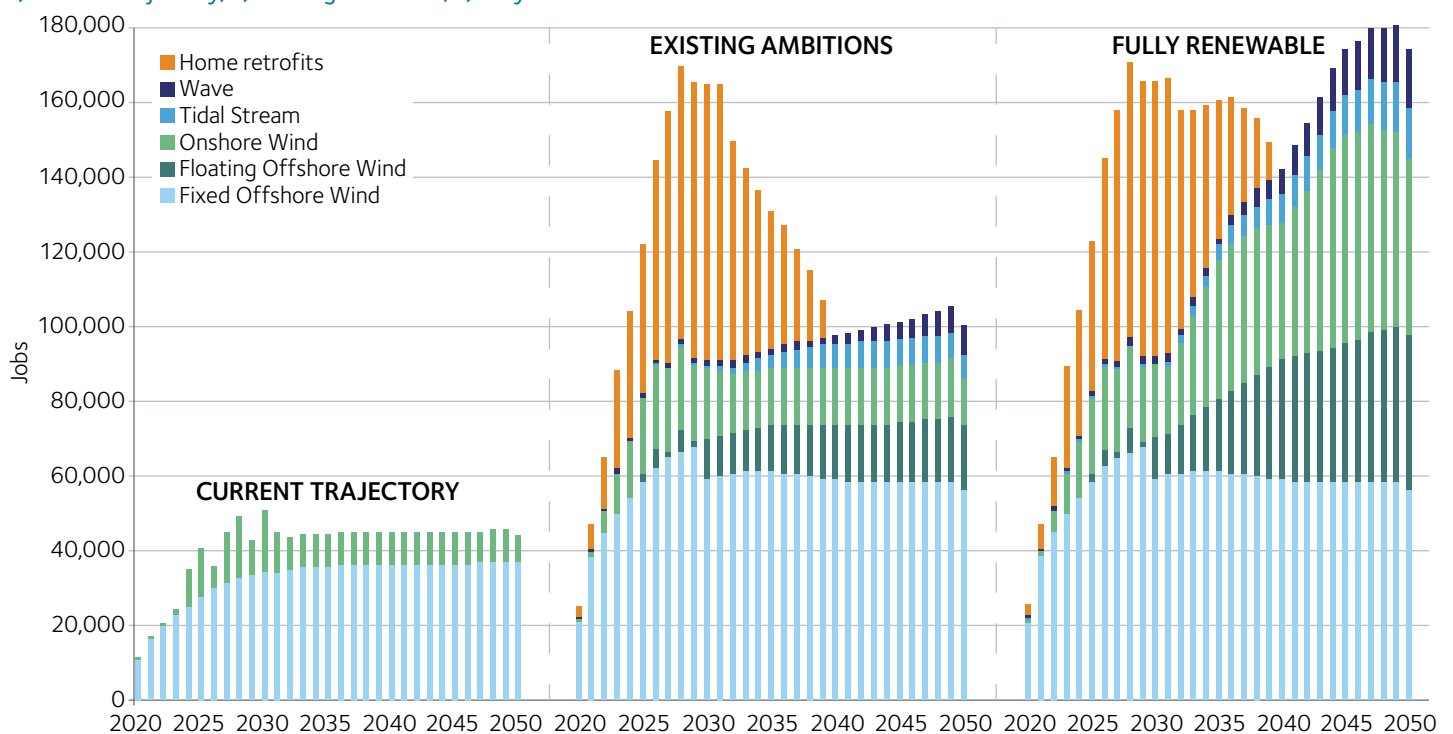
KEY RECOMMENDATIONS

Based on these findings, we recommend that:

- **The UK and Scottish Governments should initiate a concerted policy and fiscal effort to rapidly build the clean energy industry to at least the extent they have supported the oil industry, with the aims of meeting UK energy needs and creating decent employment. This should include investment and public sector participation in the clean economy, for example through national investment banks, ownership of renewable infrastructure and support for local supply chains.**
- **The governments should support major scaling-up of education, retraining and re-skilling to help workers succeed in new industries.**

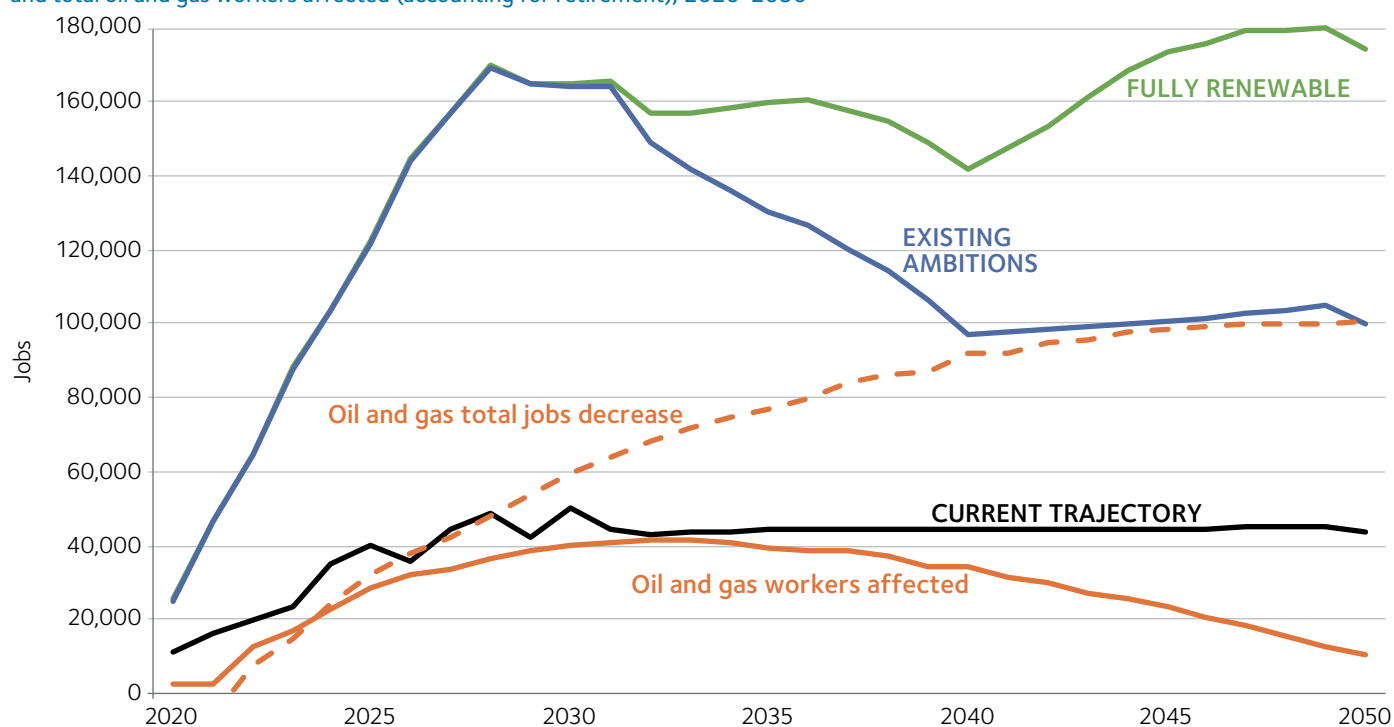
Figure ES-6: Estimates of cumulative potential new jobs in case-study industries –

a) Current Trajectory, b) Existing Ambitions, c) Fully Renewable.



Sources: Modelling by Platform and Transition Economics. See Appendix 3

Figure ES-7: Potential new clean energy jobs in three scenarios, compared to total oil and gas jobs lost (without new fields), and total oil and gas workers affected (accounting for retirement), 2020-2050



Sources: Modelling by Platform and Transition Economics. See Appendix 3

DELIVERING A JUST TRANSITION FOR THE WORKFORCE

While developing renewable energy and clean infrastructure can create significantly more jobs than those affected in a phase-out of oil and gas extraction, it does not follow automatically that new jobs will be created in locations where they are needed, that they will match the skills of existing workers, or that these new jobs will equate to decent, unionised work. Government policy therefore plays a pivotal role. Past energy transitions in the UK have failed in these respects, with manufacturing jobs going overseas, increased labour market inequality and rising poverty. The present transition to a low-carbon economy has similarly seen a large portion of manufacturing jobs in the renewables industry go overseas. New approaches to economic development, industrial policy and ownership which emphasise local democracy and workforce participation are therefore necessary. Regional strategies will be required to respond to the particular challenges faced by industry centres like Aberdeen and Aberdeenshire.

A Just Transition Plan for industrial conversion to renewable energy sources while protecting workers' livelihoods is urgently needed.

Drawing on published literature and trade union statements, this report brings together a set of safeguards necessary to protect existing oil and gas workers' rights and livelihoods that a Just Transition strategy should aim to deliver. The safeguards include:

- Accountability to worker representatives and affected communities;
- Long-term investment into industry cluster locations such as Aberdeen;
- Where jobs are lost, creation of new jobs with equivalent terms and conditions and permanent contracts;
- Support for workers' education, re-location and retraining, along with wage and pension protection;
- Trade union rights for workers affected by energy transitions, including union recognition and sectoral bargaining.

Creating good quality new jobs requires public sector participation, support and investment. Evidence from other countries (from Taiwan to Denmark to Canada) suggests that significant degrees of public ownership of energy infrastructure and support for innovation, infrastructure and supply chains can be decisive in enabling a rapid transition that serves the public good.

KEY RECOMMENDATIONS

We recommend that:

- **The UK and Scottish Governments should develop and implement robust Just Transition Plans, guided by climate limits, for the workforce and communities dependent on the oil industry. These should be accountable to trade unions and local stakeholders and guarantee safeguards to protect workers' livelihoods.**
- **Governments should provide regionally specific policy development, planning and targeted long-term investment to manage transition for the wider community in oil industry centres.**
- **The UK and Scottish Governments should ensure that offshore renewable energy projects are designed so as to maximise the transferability of oil and gas workers (for example, in terms of common standards), and provide terms and conditions equivalent to those of existing oil and gas jobs.**

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ABBREVIATIONS

°C	degrees Celsius
bbl	barrel
bcf	billion cubic feet
BECCS	bioenergy with carbon capture and storage
BEIS	Department for Business, Energy and Industrial Strategy
bn	billion
boe	barrels of oil equivalent
CCC	Committee on Climate Change
CCS	carbon capture and storage
CO ₂	carbon dioxide
CRINE	Cost Reduction Initiative for the New Era
EITI	Extractive Industries Transparency Initiative
EJ	exajoules
FT	Financial Times
G7	Group of 7 nations
G20	Group of 20 nations
GDP	gross domestic product
Gt	gigatonnes
GVA	gross value added
GW	gigawatts
HMRC	Her Majesty's Revenue and Customs
HMT	Her Majesty's Treasury
HSE	Health and Safety Executive
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
ILO	International Labour Organisation
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ITUC	International Trade Union Confederation
kbd	thousand barrels per day
kcm	thousand cubic metres
m	million
mbd	million barrels per day
mboed	million barrels of oil equivalent per day
Mt	megatonnes
MWh	megawatt-hours
OBR	Office for Budget Responsibility
OCI	Oil Change International
OECD	Organisation for Economic Cooperation and Development
OGA	Oil and Gas Authority
OGUK	Oil and Gas UK
ONS	Office for National Statistics
OPEC	Organisation of the Petroleum Exporting Countries
OREC	Offshore Renewable Energy Catapult
OSO	Offshore Supplies Office
PRT	Petroleum Revenue Tax
RMT	National Union of Rail, Maritime and Transport Workers
SC	Supplementary Charge
SEPA	Scottish Environmental Protection Agency
SR15	Special Report on Warming of 1.5°C
STUC	Scottish Trades Union Congress
TTH	Transferrable Tax History
TUC	Trades Union Congress
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organisation

1. INTRODUCTION

CLIMATE EMERGENCY

The burning of oil, gas and coal is driving a breakdown of the earth's climate. To date, the world has warmed by about 1°C since pre-industrial times and is already experiencing profound impacts.¹¹ In the UK, the Met Office has estimated that the record-breaking temperatures of summer 2018 were made about 30 times more likely by human-caused climate change than they would be in a natural climate.¹² As this report goes to press, the Scottish and Welsh Governments and the UK Parliament have declared a Climate Emergency.

The 2015 Paris Agreement, now in force and ratified by the UK among more than 170 nations, aims to hold the global average temperature increase to well below 2°C above pre-industrial levels and pursue efforts to limit it to 1.5°C.¹³ The importance of the 1.5°C target was re-emphasised in October 2018 in a *Special Report* by the Intergovernmental Panel on Climate Change (IPCC), which found that limiting warming to 1.5°C (compared with 2°C) would significantly reduce impacts on the most vulnerable people and reduce risks of wider system impacts.¹⁴

In the absence of strong action to reduce greenhouse gas emissions, these impacts will get significantly worse. The IPCC reports that if climate change is unchecked:¹⁵

- Crop yields will be severely reduced, potentially causing hunger on a mass scale, with a one-in-five chance that yields of wheat, maize, rice and soya will decrease by more than 50% by 2100 and a further one-in-five chance that they will decrease by between 25% and 50%;
- Cities will increasingly be hit by storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity and sea level rise;
- A large proportion of the earth's species faces increased risk of extinction, as many cannot adapt or migrate as fast as the climate changes.

Disruption to agriculture and storm damage to cities are affecting millions of jobs. For example, Typhoon Hagupit/Ruby in 2014 adversely affected 800,000 workers in the

Philippines.¹⁶ A 2011 report by the Joseph Rowntree Foundation found that climate change impacts would have a major impact on jobs in the UK's coastal areas, including in fishing, agriculture and tourism.¹⁷

While there are large uncertainties in how climate change will affect employment, several studies have found that it will have a major negative impact on the global economy. Estimates since the Stern Review of 2006 have commonly put the impact at several percent of global gross domestic product (GDP) by the late twenty-first century; a 2015 study of historic correlations between temperature and economic activity suggested that unmitigated climate change could cause as much as a 20% reduction in 2100 economic output.¹⁸ As the International Trade Union Confederation puts it, "There are no jobs on a dead planet."¹⁹

UK OFFSHORE OIL AND GAS

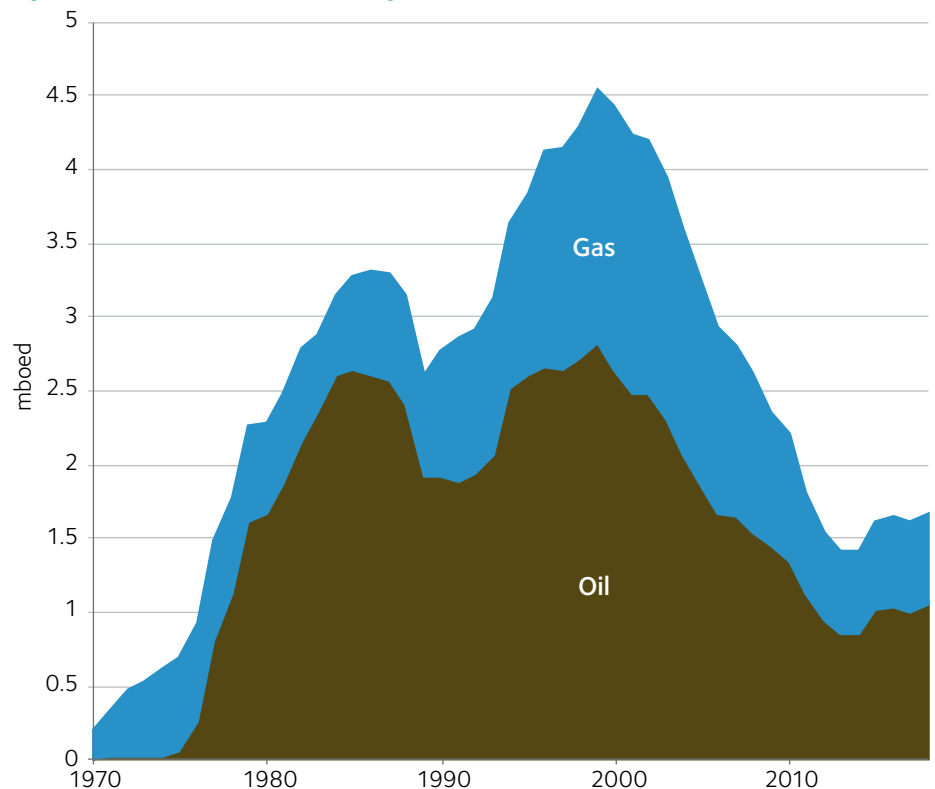
This report examines the implications of UK offshore oil and gas extraction for the climate and of an energy transition for the UK oil and gas workforce.

The UK is the second largest producer of oil and gas in Europe after Norway. Oil and gas were first discovered in the North Sea in the 1960s and many of the largest fields were developed in the 1970s. Extraction has peaked twice – in the mid-1980s and early-2000s – and today is growing again.²⁰ Most extraction is still in the North Sea, although about a fifth comes from the North Atlantic, West of Shetland.

In November 2018, extraction began at BP's Clair Ridge project, where the company aims to extract over 640 million barrels of oil over the next thirty years.²² The project, located in the north Atlantic about fifty miles west of Shetland, constitutes the sixth largest capital investment in the history of the UK oil industry (in real terms).²³

Today there are over 50 companies with stakes in extracting UK offshore oil. Smaller companies have taken up many of the newer small fields and have bought out some of the declining old fields; however, Shell, BP, Total and Chevron still operate fields accounting for around 40% of extraction.²⁴

Figure 1: Historic UK offshore oil and gas extraction



Source: Rystad UCube²¹

Jurisdiction over offshore oil and gas lies at the UK level, not devolved to Scotland. The Department for Business, Energy and Industrial Strategy (BEIS) is responsible for licensing and most regulation; HM Treasury is responsible for taxes and most subsidies. The Scottish Government plays a supportive role, in skills, training, some infrastructure and local investment.

Oil and gas extraction remains a significant employer, with about 100,000 direct and supply chain employees combined (excluding UK workers serving oil and gas extraction overseas). Estimates of the number of workers directly employed in the extraction of oil and gas vary between 29,700 to 36,100.²⁵ A further 71,300 work in the UK oil industry's supply chain,²⁶ providing services ranging from administration to specialised construction, from machinery to IT.

These jobs are highly geographically concentrated in Scotland, especially in its northeast, though estimates of the concentration vary. According to the Office for National Statistics, 87% of the jobs in oil and gas extraction and support activities are located in Scotland, with a further 5.9% in London and 3% in the East of England;²⁷ while Oil and Gas UK attributes 38% of direct, supply chain and induced jobs to Scotland.

WORKING CONDITIONS

The National Careers Service estimates that offshore oil and gas workers' salaries are in the range of £12,000–£50,000 a year; however, key specialist and management roles can earn well in excess of this range. Salary depends on location, experience and level of risk involved in the job. Oil roustabouts (unskilled or low-skilled labourers) may earn around £18,000 a year, while newly qualified technicians and engineers may start at £35,000 a year. Due to the working conditions and amount of time spent away from home, employee turnover rates are relatively high.³⁶

It is a dangerous industry. In 1988, the *Piper Alpha* explosion took the lives of 167 people. Crashes of helicopters traveling to oil platforms have caused 33 deaths since 2009, as well as many non-fatal incidents.³⁷

BOX 1: JOB LOSSES IN THE OIL INDUSTRY

As oil and gas firms ramp up efforts to automate extraction and attempt to cut costs during low oil price periods, they have cut significant numbers of jobs in recent years. Communities in North East Scotland have already felt the impacts of the long-term decline in oil drilling. Oil companies like ConocoPhillips and BP have repeatedly cut workforces, resulting in highly qualified and experienced people being made redundant.²⁸ Increased automation looks set to reduce offshore human labour further, including Total's planned introduction of autonomous robots to inspect rigs.²⁹ Risk management company DNV GL predicts that oil and gas companies may implement fully autonomous (crewless) drilling by 2025.³⁰

Recent years have seen particularly significant job losses linked to measures to cut costs in the context of a low oil price. According to Oil & Gas UK, the number of workers employed per barrel of

oil extracted fell by 30% between 2014 and 2017.³¹ The National Union of Rail, Maritime and Transport Workers (RMT) has estimated that there has been an average 20% fall in staffing levels on UK Continental Shelf installations, with the remaining offshore staff working an average of 300 hours more per year for the same pay as in 2014.³²

Jobs already lost include offshore workers, with the core offshore workforce reducing by 18% between 2012 and 2016,³³ but also those employed in the oil supply chain and in other anchor/volume sectors in and around Aberdeen that relied on oil activity, such as retail, hospitality, transport and property.³⁴ The decline is expected to continue: a 2018 regional skills strategy published by Skills Development Scotland expects 5,700 fewer jobs in energy (predominantly oil and gas) by 2027 in Aberdeen City and Aberdeenshire.³⁵

Following recent years of cost-cutting by the oil industry, a number of key workplace protections and conditions have been eroded:

- A shift pattern of 3-weeks-on/3-weeks-off has become the norm, replacing previous patterns 2-on/2-off or 2-on/3-off, with adverse consequences for health of the workforce.³⁸
- An increasing proportion of offshore workers is employed by subcontractors,³⁹ resulting in zero-hours and fixed-term contracts and lack of access to company pension provision and union representation.⁴⁰
- Existing worker pensions are also at risk: oil and gas companies have overwhelmingly channelled funds into dividends and stock buybacks as opposed to supporting their pension funds – both when the firms have had highly profitable years and when they have experienced losses.⁴¹
- At present UK employment law only applies within 12 miles of the shoreline so it is legal for crews working beyond that limit to be paid less than the National

Minimum Wage. The government – notwithstanding promises by ministers to protect those working in UK waters – has failed to insist on payment of the minimum wage. As a result, the RMT union reported that contractors decommissioning a BP rig, and others decommissioning a Canadian Natural Resources platform, were being paid about £2.70/hour – just over one third of the minimum wage.⁴²

Despite these issues, the workforce still currently benefits from higher levels of trade union recognition and better working conditions than, for instance, workers employed to install and maintain offshore wind farms.⁴³ The working conditions and safety standards of the UK oil industry were established through decades of trade union organising and many struggles, in particular after the *Piper Alpha* disaster.⁴⁴



Royal National Lifeboat Institution rescue team with boats in Carlisle city centre after Storm Desmond caused severe flooding.

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STRUCTURE OF THIS REPORT

It is in this context that this report focuses on offshore oil and gas extraction in the UK in relation to climate change and employment.

Chapter 2 examines climate limits and carbon budgets at a global level and why fossil fuel extraction matters in relation to these. Chapter 3 applies these findings to UK oil and gas extraction, reviews the government policy of maximising extraction and assesses what the impact on climate would be if all countries adopted similar policies. Chapter

4 looks at the fossil fuel subsidies that lie at the heart of the maximisation policy, enabling growth that would otherwise be uneconomic.

Chapter 5 explores how much clean energy will be needed to enable the UK to run without fossil fuels and the policies needed to make it happen. Chapter 6 models the future of oil and gas extraction jobs in light of climate limits, estimating the numbers of workers over time that could be affected by the transition, and models the potential for

the growth of new jobs in clean industries. Chapter 7 explores a range of policies that could ensure a Just Transition for oil and gas workers and the creation of decent jobs in renewable-powered industries.

Each chapter makes recommendations to the UK and Scottish Governments and Parliaments. Chapter 8 compiles these recommendations, outlining how to put the UK and Scotland on the path to being the climate leaders they should be.

BOX 2: FRACKING: A NEW FRONTIER OF FOSSIL FUELS

The UK Government hopes to open up a new frontier of previously inaccessible onshore oil and gas using hydraulic fracturing, commonly known as fracking. This is a new source of carbon the atmosphere can ill afford.

Since former Prime Minister David Cameron announced in 2014 that “we’re going all-out for shale”,⁴⁵ the UK Government has introduced a series of measures to support the industry, including tax breaks, changes to the planning system and removing home owners’ rights to say no to fracking underneath their homes.⁴⁶ Faced with major public opposition, only one site (in Lancashire) has been fracked so far, and that is currently suspended after causing a series of earthquakes.

On the other hand, the Scottish Government has adopted a more cautious approach, partly in response to the climate impacts of the industry, introducing a moratorium on all onshore unconventional oil and gas extraction in 2015, which remains in place indefinitely.

The focus of this report is on another UK carbon threat – the undeveloped reserves of the North Sea and North Atlantic. It also examines what the UK and Scottish Governments’ policy of maximising extraction of *offshore* oil and gas means in the context of the Paris Agreement. However, it is worth highlighting that climate constraints to offshore production apply equally onshore. None of the UK’s shale gas and oil resource – whether under license or not – has been proven as commercially viable. This means that the UK’s unconventional oil and gas resources are additional to the reserves that this report considers.

2. CLIMATE LIMITS: WHY OIL AND GAS EXTRACTION MATTERS

In this chapter, we review global fossil fuel extraction in relation to climate limits and identify the central choices for energy transition pathways.

ENOUGH ALREADY: GLOBAL OIL, GAS AND COAL

Climate science has established that the total cumulative carbon dioxide emissions over time determine how much global warming will occur.⁴⁷ To keep warming within any particular limit – all else being equal – there is a maximum cumulative amount of carbon dioxide that may be emitted: this is the carbon budget.

The Paris Agreement requires governments to pursue efforts to limit global temperature rise to 1.5°C above pre-industrial levels and in any case to hold it well below 2°C.⁴⁸ In this and the subsequent chapter, we use the

carbon budgets aligned with these goals, as calculated by the Intergovernmental Panel on Climate Change (IPCC).

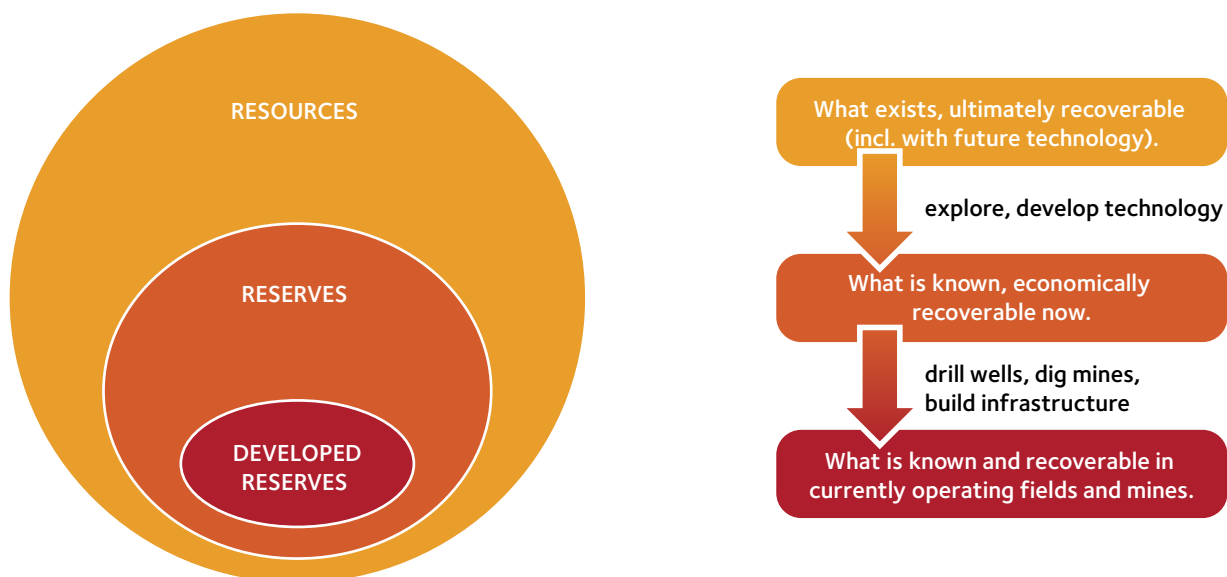
Other researchers have found that the world's stock of fossil fuel reserves significantly exceeds the carbon budget aligned with 2°C.⁴⁹ The logical implications of this “terrifying mathematics” were popularised by Carbon Tracker Initiative in 2011 and in a 2012 *Rolling Stone* article by US writer Bill McKibben. Indeed in 2016, UK Minister of State for Business Nick Hurd acknowledged that 70% to 75% of known fossil fuels would have to be left unused in order to limit global temperature rise to below 2°C.^{b, 50}

“Reserves” are defined as fossil fuel sources that are known (ie they have been found through exploration) and economically

extractable with current technology. Beyond that is an even larger quantity of fossil fuel “resources”, which includes undiscovered and unconventional sources, such as oil and gas that could be extracted by fracking in the UK. An obvious first step to addressing this vast surfeit of reserves is to stop adding to them by ending new exploration and refraining from opening new frontiers.

In a September 2016 report, *The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production*, Oil Change International assessed what the Paris goals would mean for fossil fuel extraction globally.⁵¹ It built on the earlier studies of fossil fuel reserves compared to carbon budgets, but focused specifically on the subset of oil, gas and coal reserves in fields and mines that are already in operation or under construction (see Figure 2).^c

Figure 2: What are developed reserves?



Source: OCI

^b This is based on a 50% probability of keeping warming below 2°C.

^c To be more precise, with conventional oil and gas we are referring to “projects” that have their own final investment decision, which in the case of a large field may be one phase of a multi-phase development. Thus for example, in the Clair field, two projects are now operating – Clair and Clair Ridge – while a third, Clair South, is expected to start extraction only in 2024, and so is currently treated as undeveloped.

16 The report focused on these “developed reserves” because they represent the oil, gas and coal that companies have already invested in extracting over the coming decades: the wells have been (or are being) drilled, the pits dug and the related infrastructure built. As a result, due to the problem of “carbon lock-in”,⁵² it will be more politically and economically difficult to leave these reserves unextracted compared to reserves that have not yet been developed.

The Sky's Limit estimated developed reserves of oil and gas using the UCube database and model of Rystad Energy, a consultancy based in Norway.^d It estimated developed reserves of coal using data published by the International Energy Agency and World Energy Council. It calculated the carbon dioxide emissions resulting from these, using IPCC emissions factors, and compared them with carbon budgets established in the IPCC's Fifth Assessment Report.

This report uses the same approach as *The Sky's Limit*, but updates the carbon budgets to those published in the IPCC's 2018 *Special Report* on 1.5°C of warming.^e

These updated findings are shown in Figure 3.^f

The results show that:

- **The oil, gas and coal in existing fields and mines (together with optimistic estimates of future emissions from land use change and cement manufacture) would push the world far beyond 1.5°C and would exhaust a 2°C carbon budget.**
- **Even if global coal use were phased out overnight, the developed reserves of oil and gas would push the world above 1.5°C of warming.**

These findings indicate that there is no room for new fossil fuel development: when you are in a hole, you should stop digging. We recommend that governments worldwide should cease issuing licenses, leases and permits for new fossil fuel projects in order to stop pushing the developed reserves bar in Figure 3 even higher. Stopping new projects alone will not be enough to achieve the Paris goals: governments should also revoke undeveloped licenses and phase out a significant number of existing projects ahead of schedule.⁵⁴ All new energy investments must be in renewable energy and related technologies such as electrification, storage and grids.

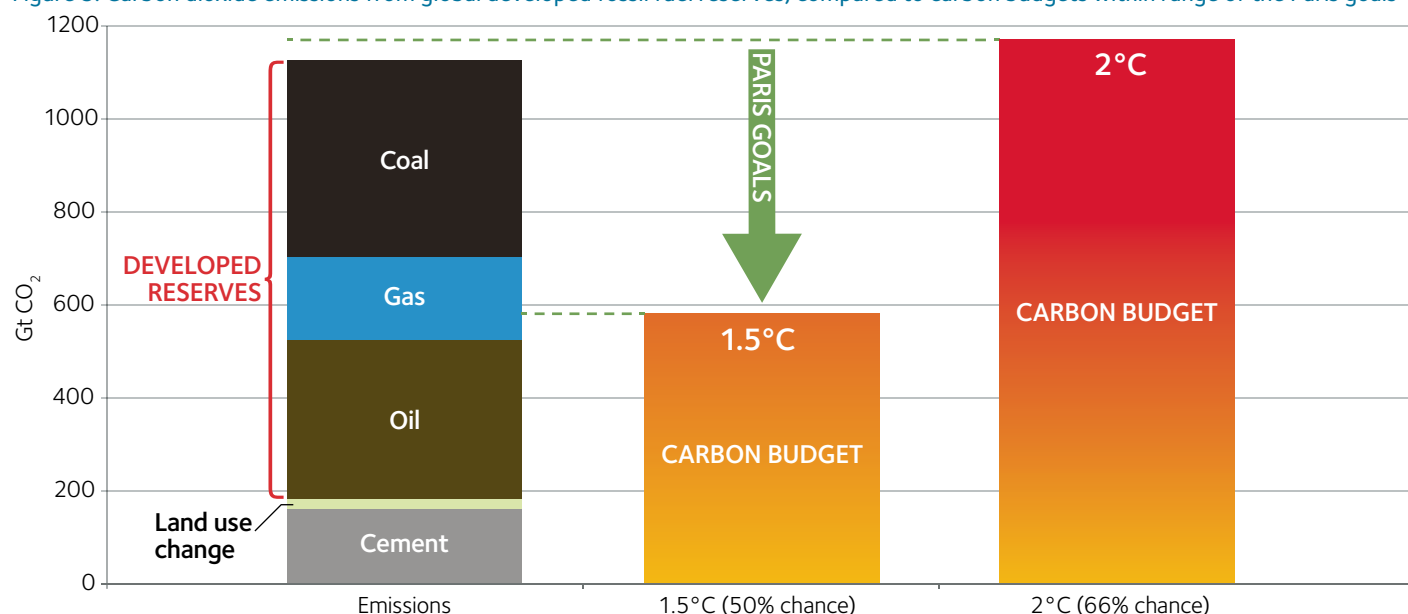
How do these findings relate to the earlier research on the total amount of (developed and undeveloped) reserves? Using the same sources as above, we estimate total reserves to be nearly three times the size of developed reserves, hence a majority of total reserves must remain unburned, as the earlier studies found.⁵⁵ Whereas a policy conclusion from the earlier work on all reserves is that there is no room for new exploration, the conclusion from the finding on developed reserves is that there is no room for new development either.

MANAGED PHASE-OUT

Any new oil or gas field developed in the UK or elsewhere will add to the left-hand column in Figure 3, going even further beyond climate limits. Unless one relies on carbon capture and storage technologies becoming available at large scale (see Box 3), the Paris goals could then only be achieved if some portion of the developed reserves gets left in the ground, stranding the capital already invested and forcing a rapid collapse of fossil fuel extraction.

There are therefore only two possibilities consistent with the Paris goals:

Figure 3: Carbon dioxide emissions from global developed fossil fuel reserves, compared to carbon budgets within range of the Paris goals



Sources: Rystad Energy, IEA, World Energy Council, IPCC, OCI analysis⁵³

d The UCube is a bottom-up model and database of the past, present and future production and economics of all of the world's oil and gas fields and projects (more than 65,000 in total). Rystad collects and verifies data from company and government reports, or where not available, conducts research and uses its own modeling estimates. The UCube is updated monthly.

e Since scientific knowledge is finite, and the earth system immensely complex, much climate knowledge is couched in terms of probability. For historical reasons, IPCC findings tend to be given for probabilities of >50% and >66%.

f We use the budgets for a 50% probability of keeping warming below 1.5°C to reflect the fact that it is a goal to pursue efforts towards (50% probability means that outcomes are as likely to be higher as lower) but a 66% probability of keeping below 2°C, as the Paris goals see this as a danger threshold to be avoided (and 66% is the highest probability the IPCC publishes).

- **Deferred collapse:** Governments allow further fossil fuel development to continue, but eventually manage to limit emissions to within carbon budgets. The resulting collapse in demand then leads to a sudden and chaotic shutdown of fossil fuel extraction, stranding assets, damaging economies and pushing many workers in fossil fuel and related industries out of work in a short space of time.⁹

Or:

- **Managed transition:** Governments stop approving and licensing new fossil fuel projects, while carefully managing the phase-out of fossil fuel extraction over time and planning for a Just Transition for workers and communities.

The costs of a sudden shutdown are illustrated by the UK's de-industrialisation in the 1980s. In its report *A Green and Fair Future*, the Trades Union Congress (TUC) writes:⁵⁶

Unfortunately, significant periods of economic restructuring in the past have often happened in a chaotic fashion, leaving ordinary workers, their families and communities to bear the brunt of the transition to new ways of producing wealth. Indeed, many individuals and communities in the UK are still paying the price for the rapid shift away from industrial production over the last 30 years. Such injustice cannot become a feature of environmental transition. Not only would this be morally wrong and socially damaging but it would undermine the credibility of the transition itself and could slow or even halt this vital and urgent shift.

On the other hand, there is a growing body of international experience of managing a transition justly. While nowhere has undergone a perfect transition, there are many successes to replicate and cases to learn from. These lessons are reviewed in Chapter 7.

Clearly, a managed transition is the better path. By stopping new fossil fuel development and managing a Just Transition towards an economy powered by clean energy, we can achieve the brightest future. An eloquent argument for a planned transition was made during the Climate Change Bill debate in 2008 by Greg Clark, then Shadow Energy and Climate Secretary:⁵⁷

In any case, what is affordable? Is it clinging to a high-carbon economy and everything that that implies for our energy security, price volatility and the costs of doing business, or is it switching to secure, stable and efficient energy systems that put British business, particularly British process industries, which have long been world-beating, into the forefront of world innovation?

Now that Clark is Business Secretary, his Department seems not to be heeding his earlier observation, as we shall see.

BOX 3: CARBON CAPTURE AND STORAGE: LIMITED AND UNCERTAIN

Since the 1990s, the fossil fuel industry has argued that carbon dioxide emissions can be eliminated while continuing to burn fossil fuels, by using the technology of carbon capture and storage (CCS). However, as most of the few CCS pilot projects to date have proved costlier and less effective than hoped,^h many analysts now consider that wind and solar power, which are proven technologies, are likely to remain cheaper than CCS, even as CCS technology improves. Advocates and investors have pulled back from the technology in recent years, including the UK and US Governments and some European utilities.⁵⁸ In the words of Francesco Starace, Chief Executive of the Italian utility Enel and chair of trade association Eurelectric, "I think CCS has not been successful. It doesn't work, let's call it what it is – it is simply too expensive, too cumbersome, the technology didn't fly."⁵⁹

Going one step further, many climate models over the last ten years have assumed that CCS can be combined with bioenergy to suck large amounts of excess carbon dioxide back out of the atmosphere later in the century. This approach suits the models' cost-optimising logic, but as the recent IPCC report warns, "Deployed

at scale, [carbon dioxide removal] is unproven and reliance on such technology is a major risk in the ability to limit warming to 1.5°C."^{60, i} Furthermore, it would require converting land to grow bioenergy instead of food, risking large-scale food shortages: for example, offsetting a third of today's fossil fuel emissions would require land equivalent to up to half of the world's total crop-growing area.⁶² Given the challenges and uncertainties, the European Academies Science Advisory Council recommends that models that depend on large-scale use of "negative emissions" technologies should not be considered a useful guide to policy.⁶³

If CCS can ultimately be deployed reliably, affordably and without harm, it might provide a welcome means of further lowering emissions and/or offsetting hard-to-eliminate emissions, such as in heavy industry. However, it would not be prudent to *rely* on an uncertain technology, because if it does not work out, climate change will be locked in. It is far safer to reduce emissions in the first place! Therefore, throughout this report we apply the precautionary assumption that CCS will not be available at a significant scale.

g In the UK case, it would also make it hard to ensure decommissioning benefited UK workers, as decommissioning would need to occur faster than UK industrial capacity would allow.

h For example, the world's first industrial-scale CCS project, the Sleipner project in Norway, started in 1996 and was assumed to be safe until it was discovered to have fractures in its caprock in 2013. The Boundary Dam project in Canada, the first to install CCS at a power station, was exceptionally expensive to build and has struggled to operate as planned, suffered considerable cost overruns, and been forced to pay out for missing contracted obligations.

i Bioenergy grown on the wrong soils, or replacing existing biomass, or using the wrong inputs, can emit more carbon dioxide than it absorbs. If it competes with agricultural land, it could undermine food security. Carbon dioxide injected in the wrong geological structure may not be safe over the long term. Thus to deliver effective large-scale "negative emissions" would require extensive international monitoring and regulation over subsequent centuries in order to ensure emissions were actually negative and not reversed, together with internationally agreed incentives, funding and penalties.⁶¹

j Furthermore, even if these technologies can be delivered at large scale, their potential to capture or remove carbon dioxide is much smaller than the total emissions from fossil fuels. The most optimistic scenario by the International Energy Agency – a strong advocate of CCS – projects 8.4 Gt CO₂ captured by CCS in 2050. The IPCC sees the maximum potential for bioenergy with CCS as 5 Gt CO₂ in 2050. For comparison, carbon dioxide emissions from fossil fuels and industry were 36 Gt in 2017.⁶⁴

INTERNATIONAL JUSTICE: WEALTHY COUNTRIES MUST LEAD

Continuing the logic above, one possible scenario would be for the UK to continue developing new oil and gas fields, leaving other countries to go through faster transitions to offset new UK extraction and stay within global climate limits.

To illustrate the consequences of such a scenario, compare the UK with Algeria, which produces nearly twice as much oil and gas as the UK.⁶⁵ Media reports suggest around 3% of the Algerian workforce is employed in the oil and gas sector: about 350,000 workers (official data are not available).⁶⁶ However, in Algeria oil and gas account for 34% of government revenue⁶⁷ and hence also provide the salaries of that proportion of the public sector employees, a further 1.7 million workers, or 14% of the country's total workforce.⁶⁸ The 100,000 workers in UK oil and gas and its supply chain (see page 13) amount to 0.3% of the total workforce and oil provides just 0.16% of government revenue.⁶⁹ Whatever the UK's or Scotland's challenges in enabling a Just Transition, they are considerably smaller than those of Algeria.

Furthermore, not only are Algeria's transition challenges greater than the UK's, but it has just a fraction of the UK's economic resources to address them. Algeria has a per-capita GDP of US \$4,000, compared

to the UK's \$40,000.⁷⁰ Broadening this analysis, Figure 4 illustrates the challenges of transition in various oil-extracting countries. It plots oil's share of countries' public revenue against their per-capita GDP.

Clearly, it would violate principles of international justice and solidarity to allow the UK to go on extracting for longer in the expectation that countries like Algeria would phase out their extraction more quickly.

That is not to say that poorer countries should not transition: the remaining carbon budgets are now so small that all countries must do so; for example, there are active campaigns for a Just Transition away from fossil fuels in many African countries including Nigeria.⁷² In some cases, oil and gas extraction should be stopped immediately where it fundamentally violates people's rights by destroying their land, water, food and political or cultural freedoms. However, the considerations above require that wealthy countries like the UK must move faster than the global average, not slower.

In an analysis on how Scotland can meet its climate commitments, the Tyndall Centre for Climate Change Research recommended a phase-out of oil and gas extraction for similar reasons.⁷³

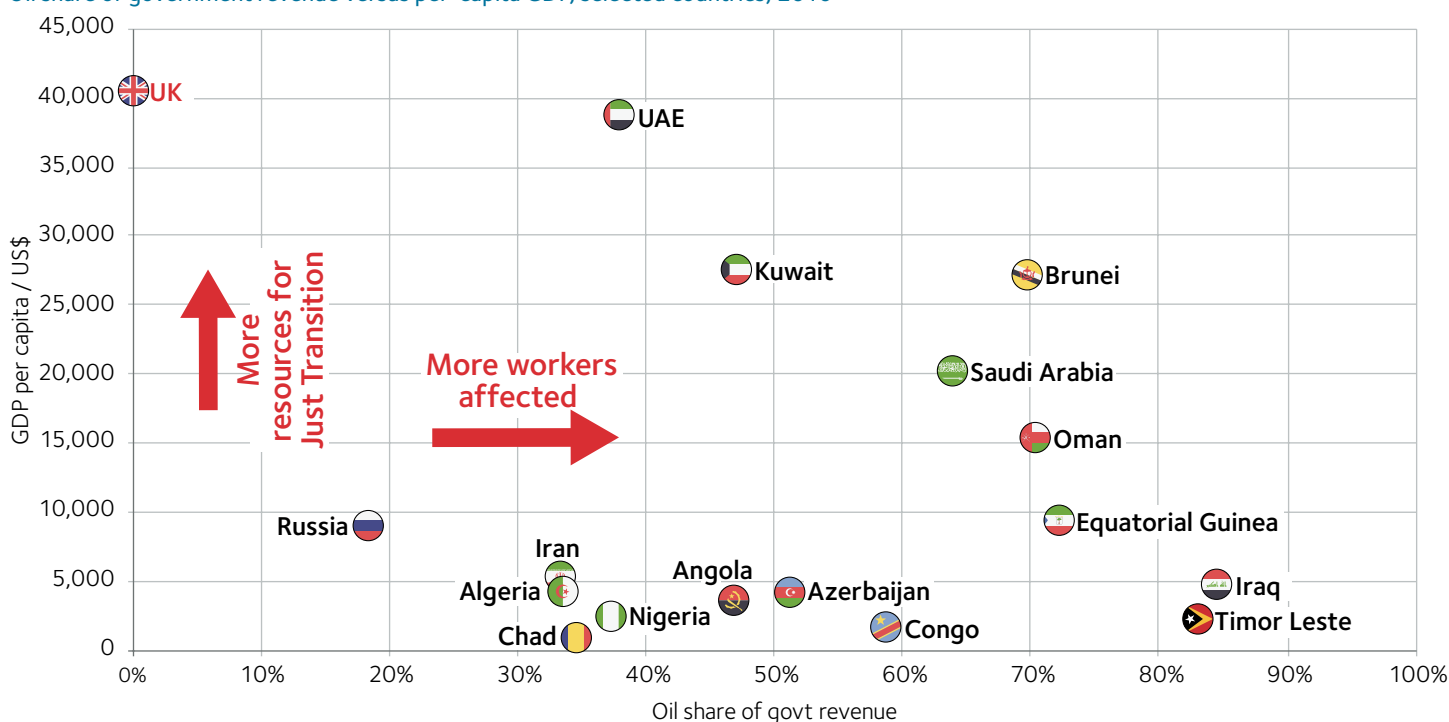
The Paris Agreement's steer on equity requires wealthy and industrialised

nations to lead the way on early and deep mitigation. Given that for 2°C between 70 and 80% of known fossil fuel reserves cannot be exploited (higher still for 1.5°C) and that Scotland is a wealthy industrial nation with excellent prospects for renewable energy, the Scottish Government needs urgently to enact policies to rapidly cease hydrocarbon production from its oil and gas sector.

To consider the relative pace of transition in different countries, a forthcoming paper by Oil Change International and the Stockholm Environment Institute proposes five key ethical principles by which we might aim to fairly manage the transition from fossil fuels worldwide:⁷⁴

- 1) **Curb total fossil fuel extraction at a pace consistent with climate limits**, as defined by the Paris goals;
- 2) **Ensure a Just Transition** for fossil fuel-dependent workers and their communities;
- 3) **Respect human rights** by prioritising for closure any extraction activities that violate rights, especially of poor, marginalized, ethnic minority and Indigenous communities;
- 4) **Transition fastest where it is least socially disruptive**, particularly in wealthier, less extraction-dependent countries;
- 5) **Share transition costs fairly**, providing poorer countries with support for an effective and Just Transition.

Figure 4: Relative challenges of Just Transition away from oil extraction:
Oil share of government revenue versus per-capita GDP, selected countries, 2016



Sources: OBR, IMF, UNDP⁷¹

DEPLETING OIL AND GAS FIELDS

The oil industry commonly argues that it must continue to develop new fields in order to replace declining extraction from existing fields. If no new fields are developed, there will be a flattening in global extraction for a few years while existing expansion is completed, followed by a decline at between 4% and 7% per year.

Some have argued⁷⁶ that this pace of decline is faster than an energy transition can occur; therefore, there is still a need for new oil and gas to offset the decline. This claim is commonly based on an assumption that the fastest possible transition is that described in the International Energy Agency's (IEA's) "Sustainable Development Scenario", which proposes a 1% per year decline in oil consumption and an increase in gas consumption up to 2040.⁷⁷ However, (contrary to the IEA's claims) this scenario is not aligned with the Paris goals.⁷⁸ If carbon dioxide emissions are to fall instead at a rate in line with the Paris goals, that implies a decline in oil and gas consumption roughly in line with the natural decline of extraction from existing fields:

The recent IPCC *Special Report* presents four illustrative pathways to achieving the 1.5°C target, with varying degrees of reliance on "negative emissions" technologies. In Figure 5, the green line shows the pathway with no reliance on unproven technologies, a precautionary approach (see Box 3). The red line shows a projection of global oil and gas extraction if companies continue to build new infrastructure and open up new fields. The blue line shows extraction associated with already-developed fields, corresponding to the left-hand column in Figure 3 – this is only just above the 1.5°C pathway from the *Special Report*.

The full set of scenarios used in the *Special Report* is published online. Looking at the scenarios that result in 1.5°C of warming, and that do not assume future use of negative emissions at a level higher than the IPCC's assessment of what can be practically achieved, oil and gas consumption must fall rapidly. In the median of those scenarios, we find that:

- **Oil and gas consumption consistent with 1.5°C of warming must fall by an average of 4.4% per year between 2020 and 2040. This is roughly in line with the natural decline of extraction from existing fields.⁸⁰**

We shall examine in Chapter 5 how the UK can meet its energy needs in line with this pace of decarbonisation.

FOSSIL FUEL EXTRACTION AND CLIMATE CHANGE

To many people, it is a matter of common sense that opening up new oil and gas fields and building new high-carbon infrastructure is inconsistent with acting to limit climate change. Fossil fuel companies extract safe underground carbon, then transport, process and sell that carbon to factories, power stations, homes and vehicles, where it is burned to create dangerous atmospheric carbon dioxide.¹

In contrast, the government considers climate change and energy more narrowly, only in relation to the combustion of fossil fuels, not their extraction. For example, when asked in parliament what assessments the government had made of the compatibility of maximising oil and gas extraction with the Paris goals and with IPCC recommendations, Clean Growth Minister Claire Perry did not answer the question, but instead asserted,

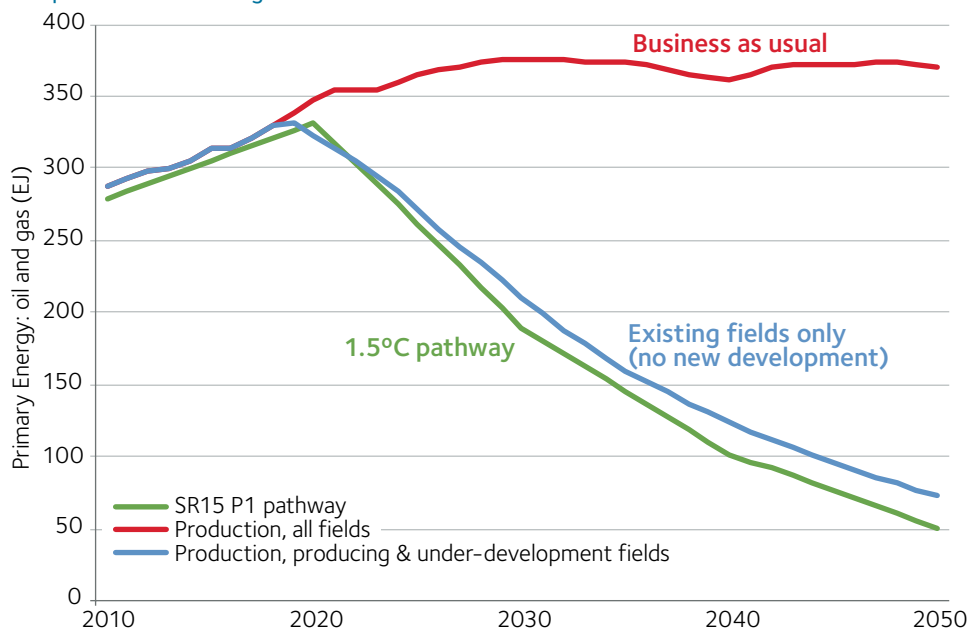
Oil and gas will continue to play an important role as part of the energy mix for decades to come. We are committed to reducing carbon emissions from 1990 levels by 80% by 2050 and any emission from use of oil or gas will be included in our binding carbon budgets [emphasis added].⁸¹

In other policy arenas, restrictions on the supply of harmful substances – such as ozone-depleting chemicals and asbestos – have been widely employed as part of comprehensive strategies to reduce their damaging effects. Climate policy, in contrast, has traditionally focused only on measures to slow the consumption of fossil fuels while leaving their extraction to be regulated by the market.⁸²

This is beginning to change. The World Bank announced in 2017 that it will phase out finance for oil and gas extraction, recognizing such finance as inconsistent with climate goals.⁸³ A growing number of governments, including Costa Rica, France, New Zealand and Belize, have implemented full or partial bans on new oil and gas licensing.⁸⁴ Similar measures are currently under consideration in Spain and Ireland.⁸⁵ In Scotland, the Energy Minister cited climate change as a key factor in the decision to implement an indefinite moratorium on fracking and other forms of unconventional onshore oil and gas extraction.⁸⁶

There is a growing academic literature arguing that restricting fossil fuel extraction is a vital and effective part of climate policy. In Appendix 1, we apply some of the findings of this literature to the specific circumstances of the UK. The graphic overleaf summarises the discussion in the appendix, illustrating the key economic and political dimensions through which new fossil fuel extraction undermines the achievement of climate goals.

Figure 5: Global oil and gas extraction with and without new development, compared to demand aligned with 1.5°C



Sources: IPCC SR15, Rystad UCube⁷⁹

k As oil and gas fields are depleted, falling reservoir pressures lead to a decrease in extraction rates. The global average decline rate varies according to economic conditions: generally in the range of 4 to 7% for conventional fields. Robert Perkins, "Analysis: Decline rates, spending crunch fuels fresh oil industry concerns," *Platts*, 29 July 2016
Wood Mackenzie, "Non-OPEC decline rates remain stable until 2020," 26 September 2017, <https://www.woodmac.com/news/feature/non-opec-decline-rates-remain-stable-until-2020/>⁷⁵

l This is with the exception of the small quantity that goes into long-lived non-combustion uses, such as building materials and some plastics.



Issue Spotlight

FOSSIL FUELS AND CLIMATE CHANGE: WHY EXTRACTION MATTERS

1 OIL AND GAS COMPETE WITH CLEAN ENERGY



While the costs of wind and solar power have fallen dramatically in recent years, their further growth is slowed by competition from fossil fuels, whose prices are within a similar range. Increased extraction pushes down oil and gas prices, strengthening their competitiveness against clean energy.

2 GOVERNMENT POLICY HELPS OIL AND GAS COMPETE



Much of government oil and gas policy has been geared to making UK oil and gas extraction cheaper, including both major subsidies (Chapter 4) and support programmes to help industry reduce costs (page 39). Each cost reduction makes oil and gas more competitive relative to renewable energy.

3 OIL AND GAS SUCK INVESTMENT FROM CLEAN ENERGY



Investments in clean energy are falling well short of what would be needed to achieve the Paris goals. One reason for this is that too much energy investment is instead going into oil and gas.

4 NEW FOSSIL INFRASTRUCTURE “LOCKS IN” CARBON EMISSIONS

Once fossil infrastructure is built, it becomes harder to reduce carbon dioxide emissions, because the infrastructure creates economic incentives to keep operating, competitive advantages over alternatives, and political and legal barriers to policies that would make it redundant.

5 TODAY’S DECISIONS SHAPE THE LONG-TERM ENERGY FUTURE

New UK oil and gas extraction licenses last about 30 years and are generally extendable; new infrastructure can enable additional nearby fields to be opened, over an even longer timeframe. New developments will thus lock in carbon well beyond the time when carbon dioxide emissions need to be deeply cut (halved globally in 12 years and cut to zero within 30 years).

6 MORE EXTRACTION INCREASES EMISSIONS IN OTHER COUNTRIES

If the UK reduces its oil and gas consumption while maximising extraction, the effect will be to increase consumption in other countries. The most efficient way to reduce carbon dioxide emissions worldwide is to tackle consumption and extraction in parallel.



3. UK OIL AND GAS VS THE PARIS GOALS

In Chapter 2, we saw that global developed reserves of oil, gas and coal exceed the carbon budgets aligned with the Paris goals. In this chapter, we examine what this means for offshore UK oil and gas extraction.

ACTION ON CLIMATE CHANGE IN THE UK

With the Climate Change Act in 2008, the UK became the first country to set legally binding limits to greenhouse gas emissions. Following a request from the government, the Committee on Climate Change, has recently recommended that the long-term target under the Act should be for UK emissions to reach net zero by 2050 and Scotland's by 2045, in order to be consistent with the Paris goals. And this may not be ambitious enough, when taking climate equity into account. The Committee admits that, "Considering both the UK's relative wealth and large historical emissions ... [it] would need to reach net-zero [greenhouse gas] emissions considerably before 2050."⁸⁷

The UK's original target, set seven years before the Paris Agreement in 2008, was an 80% reduction in greenhouse gas emissions by 2050 compared to 1990.^m Even compared to that pre-Paris 80% target, the CCC reports that the UK is set to fall well behind on these reductions beyond 2023.⁸⁹ In Scotland, the Government's Climate Change Bill proposes to update its targets to a 90% reduction by 2050. Civil society argues that alignment with the Paris Agreement requires at least 80% reductions by 2030 and net-zero by 2045.⁹⁰

While the UK reduced its carbon dioxide emissions by 38% from 1990 to 2017, and Scotland hit its 42% emission reduction target four years early in 2016, almost all of the reductions have been from the closure of coal power and coal-powered heavy industry, as shown in Figure 6.

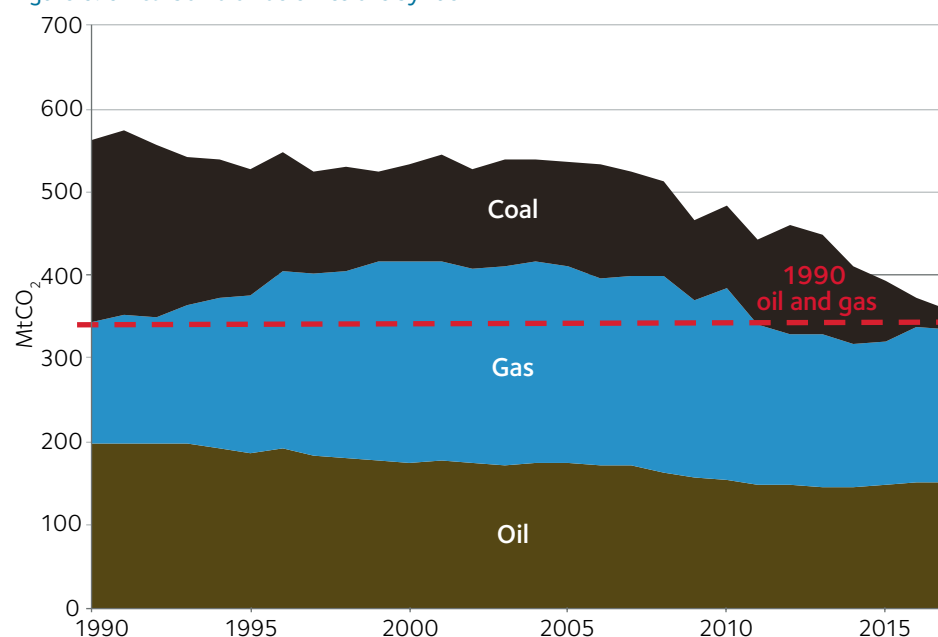
Greenhouse gas emissions are conventionally measured at the point where they enter the atmosphere, for example a chimney of a factory or the exhaust pipe of a car – and it is to this quantity that the historic data and future targets above relate. This chapter explores the climate impact of *extraction* of offshore UK oil and gas.

UK OIL AND GAS DEVELOPMENT VS PARIS GOALS

The UK and Scottish Governments' primary objective for offshore oil and gas is to enable as much as possible to be extracted. Although dubbed "maximising economic recovery", this policy does not refer to maximising economic benefits (such as revenues or jobs), but rather maximising the volume extracted.ⁿ As Chancellor Philip Hammond has put it, "We are working with the industry to ensure that we extract every drop of oil and gas that it is economic to extract".⁹³ The UK Government is also encouraging onshore extraction in England through fracking, against widespread public opposition (see Box 2, page 14).

We saw in the previous chapter that already-developed reserves of oil, gas and coal exceed what can be extracted and burned while achieving the Paris goals. How does the UK feature in this? Using the Rystad UCube model and IPCC emissions factors again, we now project the carbon dioxide emissions from oil and gas in existing and future UK offshore fields.

Figure 6: UK carbon dioxide emissions by fuel



Source: Department for Business, Energy & Industrial Strategy⁹¹

^m The 80% target was based on an assumption that climate impacts would remain at an acceptable level if global temperature rise is limited "to, or close to, 2°C", while the probability of crossing "the extreme danger threshold of 4°C" is reduced to a very low level. Since then, climate science has indicated that a 2°C warming poses more serious risks than previously thought, such that 2°C may now be seen as the "extreme danger threshold".⁸⁸

ⁿ The term "economic recovery" means extraction of oil and gas that can be extracted profitably (whereas resources that cost more to extract than they can be sold for would be labelled "uneconomic").⁹²

Table 1: UK offshore oil and gas reserves in developed fields and projected in undeveloped and undiscovered fields

	Producing fields	Under development	Total developed	Undeveloped fields	Undiscovered fields	Total undeveloped + undiscovered
Oil (bn bbl)	3.1	0.6	3.7	5.1	4.7	9.9
Gas (bn boe)	1.6	0.4	2.0	2.3	2.1	4.4
Emissions (Mt CO ₂)	1,860	420	2,280	2,980	2,740	5,720

Sources: Rystad UCube; IPCC emissions factors

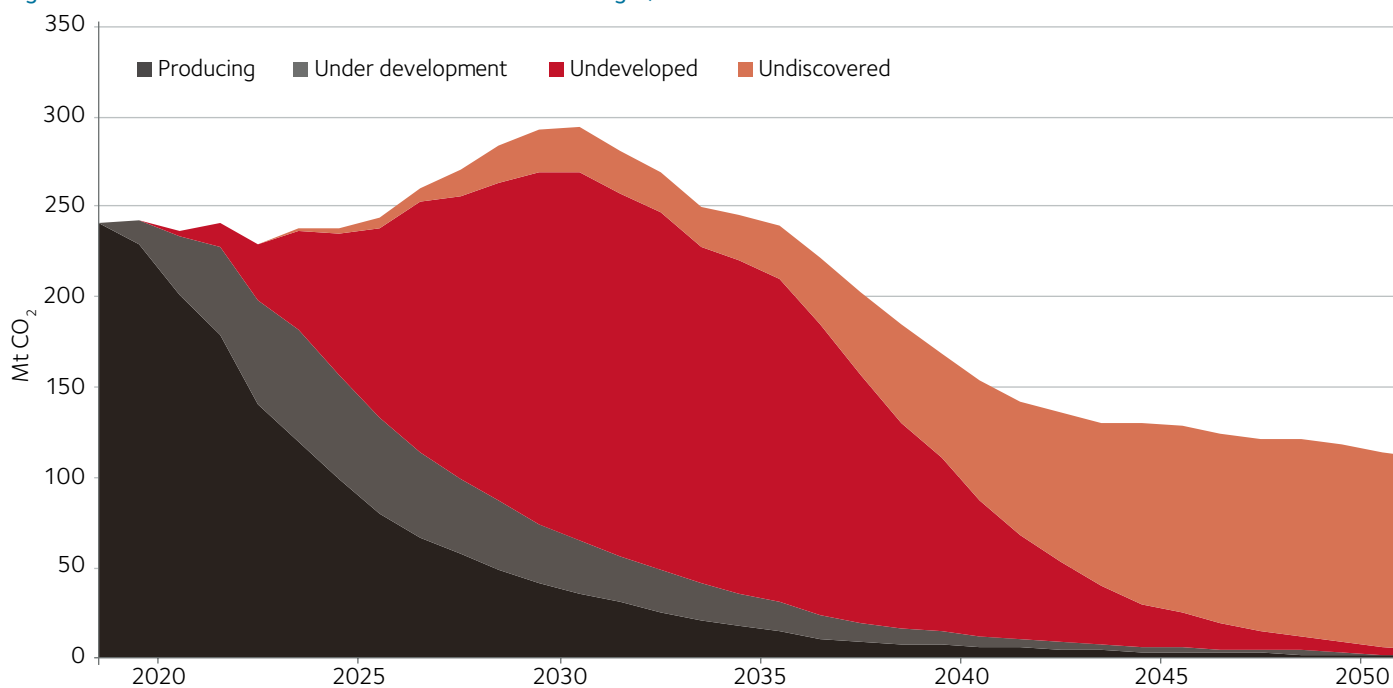
As Table 1 shows, we find that:

- Whereas existing fields contain about 5.7 billion barrels of oil and gas reserves, Rystad's total offshore projection including undeveloped and undiscovered fields is 20 billion barrels.⁹⁵

In other words, the UK will add nearly three times as much to the developed reserves (left-hand) column in Figure 3 as it already has in that column (and any onshore extraction from fracking will be additional to this). These additions will either help push

the world further into climate breakdown or lead to a deferred collapse in oil and gas extraction.

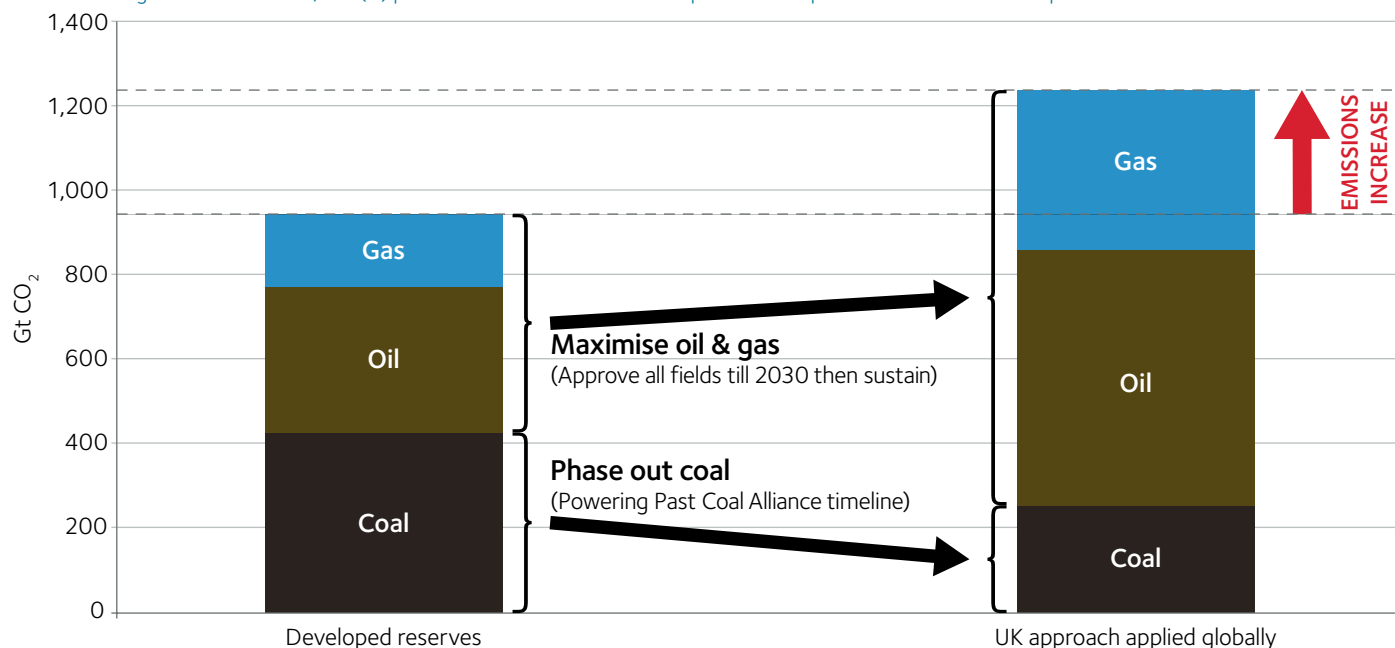
Figure 7: Carbon dioxide emissions from UK offshore oil and gas, 2018–50



Source: Rystad UCube⁹⁴

Figure ES-3: If all countries took the same approach as the UK: The impact on cumulative global carbon dioxide emissions from fossil fuels if all countries phase out coal while maximising oil and gas extraction.

Specifically, if countries: (i) phase out coal power using the timeline of the Powering Past Coal Alliance; (ii) phase out non-power uses of coal by 2050; (iii) approve all new oil and gas fields until 2030; and (iv) provide additional subsidies to keep those fields profitable whenever the oil price falls



Sources: Rystad UCube, IEA, World Energy Council, IPCC, OCI analysis¹⁰⁰

OIL AND GAS VERSUS COAL

After coal power declined dramatically in the 1990s and again in the 2010s, the UK government has set a target of 2025 for closing its remaining coal power stations. Scotland's last coal power plant, Longannet, closed in 2016.

The UK is now playing a leading role in encouraging other countries to phase out coal power through the Powering Past Coal Alliance.⁹⁶ Thirty national governments have joined the Alliance, committing to phase out their use of coal to generate power by 2030 for OECD countries and by 2050 for non-OECD countries.

At the same time as phasing out coal, the UK aims to maximise offshore oil and gas extraction and to open up new frontiers of fossil fuel resource through support for shale gas fracking. What if all countries did the same?

We saw in the previous chapter that developed reserves of fossil fuels would push the world beyond the temperature limits of the Paris goals. In Figure 8, we compare global developed reserves with the carbon dioxide emissions that would occur if all countries followed the UK in phasing out coal power but maximising extraction of oil and gas. But this time we assume that all countries will:

- Phase out coal power generation on the timeline of the Powering Past Coal Alliance;
- Phase out non-power use of coal worldwide by 2050;⁹⁷
- Develop all commercially viable oil and gas fields until 2030 and then continue their operation until the end of their economic life;⁹⁸
- Offer the oil industry more subsidies whenever the price falls in order to maintain its economic position as if there had been no price fall.⁹⁹

We see that:

- **Phasing out coal helps move towards achieving the Paris goals by leaving about 40% of the coal in existing mines unextracted and unburned. However, that progress is more than offset by maximising extraction of oil and gas.**
- **Even continuing new field developments until 2030 nearly doubles the committed carbon dioxide emissions from oil and gas, pushing warming above 2°C. If more projects were developed beyond that point, the warming would be even worse.**

In short, if all countries did the same as the UK, the Paris goals would be missed by a considerable margin.

⁹⁹ The fourth assumption above is arguably an understatement of the effect of UK policy. It includes adaptation of the fiscal regime in response to low prices, as Chancellor George Osborne did in 2015 and 2016. The effect of this is to counteract the effect of climate policies that reduce end-of-pipe emissions (by maintaining viability of extraction against falling demand and hence prices). What it does not include is the long-term goal of maximising recovery beyond that. To illustrate the effect of maximising ultimate recovery, the UK has an average recovery factor of 43% (the share of the geological oil and gas that ultimately gets extracted), compared to a worldwide range of between 20% and 40%. If all countries adopted policies that increased their recovery factor to the UK level, the climate impact of developed reserves would be correspondingly larger.⁹⁹

Lobby group Oil & Gas UK (OGUK) argues in its *Energy Transition Outlook* that maximising oil and gas extraction is “consistent with potential pathways for the transition to a low-carbon economy”.¹⁰¹ Its argument is entirely based on OGUK’s own views about what pace of technological development in clean energy is feasible. It believes that – at most – renewable energy and electrification could reduce oil and gas demand by only 30% by 2035 (from current levels), leaving a residual demand for more oil and gas than the UK is likely to be extracting by then.

The report misunderstands climate change and the energy transition in three important ways:

First, and most importantly, the future it describes is not consistent with the Paris goals^p of holding warming to well below 2°C and pursuing efforts to limit warming to 1.5°C. For example, IPCC scenarios that keep warming to 1.5°C (excluding scenarios that rely on unproven “negative emissions” technologies to a greater extent than the IPCC considers realistic) suggest a global

reduction in oil and gas consumption of about 60% by 2040.¹⁰² According to the principle of common but differentiated responsibilities enshrined in the Paris Agreement,¹⁰³ wealthy countries like the UK with high historic carbon emissions should cut emissions much faster than the global average. The Committee on Climate Change recommends the UK reach net zero greenhouse gas emissions by 2050 and Scotland by 2045. As noted above, if the UK were to contribute its fair share of global emissions reduction, the net zero target would be “considerably before 2050”.¹⁰⁴

Second, by focusing only on technological potential, the report ignores the role of policy in determining the extent to which dangerous climate change is avoided. Indeed, the report calls for larger, more concerted government support for oil and gas extraction.^q Such policy would make it much harder to limit dangerous climate change, as we saw in Chapter 2.

Third, even setting aside climate change, the report fails as a forecast of the limits of technological change. Aside from the

general dangers of downplaying the potential for unanticipated, non-linear technological and policy change,¹⁰⁵ some of OGUK’s analysis is ungrounded. The report claims that the only potential for oil and gas demand reduction is in the power generation and transport sectors; it believes that nothing can be done to reduce industrial or residential demand. For example, it believes gas use in domestic heating will not be reduced at all, because insulation and conversion will be difficult, costly and unpopular with consumers – yet such a proposal is already on the political agenda.¹⁰⁶

In short, while OGUK describes a possible future, it does not plausibly describe the limits of how rapidly change can occur, or of what can be done to address climate change, not least because it is not consistent with the goals to which 170 countries (including the UK) have committed.

RECOMMENDATIONS

The UK and Scottish Governments must align policies on fossil fuel extraction with their commitment to global climate goals. This means cancelling the current and any future licensing rounds, stopping issuing permits for new oil and gas exploration and development and revoking undeveloped licenses. Furthermore, the governments should review whether existing facilities should be phased out early as part of a Just Transition that protects the rights and livelihoods of workers and communities that currently depend on the industry.

The UK Government should:

- Cancel the 31st offshore oil and gas licensing round and any future planned onshore or offshore rounds;

- Revoke all existing oil and gas licenses on which no work has yet been carried out and negotiate the cancellation of all other licenses which have not yet been developed;
- Conduct a review of how fast existing oil and gas extraction facilities need to be phased down in order to limit warming to 1.5°C, bearing in mind the UK’s greater capacity to finance a Just Transition relative to other countries, and taking a precautionary approach to unproven “negative emissions” technologies;
- Publish a plan for a managed phase-out of UK fossil fuel extraction and Just Transition in line with the Paris goals.

The UK Parliament should:

- Pass legislation banning future licensing of all offshore fossil fuel exploration and development, and onshore exploration and development in England;

- Amend the Petroleum Act 1998 and the Infrastructure Act 2015 to remove the duty to “maximise economic recovery” and replace it with a duty to align fossil fuel extraction with the UK’s fair share of delivering the Paris goals.

The Scottish Government should:

- Revise its Energy Strategy and align policies on fossil fuel extraction with its fair share of delivering the Paris goals.

The devolved Assemblies and Parliament should:

- Pass legislation banning future licensing of all onshore fossil fuel exploration and development.

p The report states once (p.18) that it is “consistent with the Paris Agreement”, but does not say what it means by this, nor provide any justification. For example, it does not mention governments’ pledges (Nationally Determined Contributions), nor the Paris Agreement goals (well below 2°C and pursuing efforts for 1.5°C).

q It makes the remarkable claim (p.16) that “policy arguably remains overly focused on small marginal improvements rather than addressing the key strategic choices”, in contrast with the findings of Chapter 4 of this report.

4. SUBSIDIES FOR UK OIL AND GAS EXTRACTION

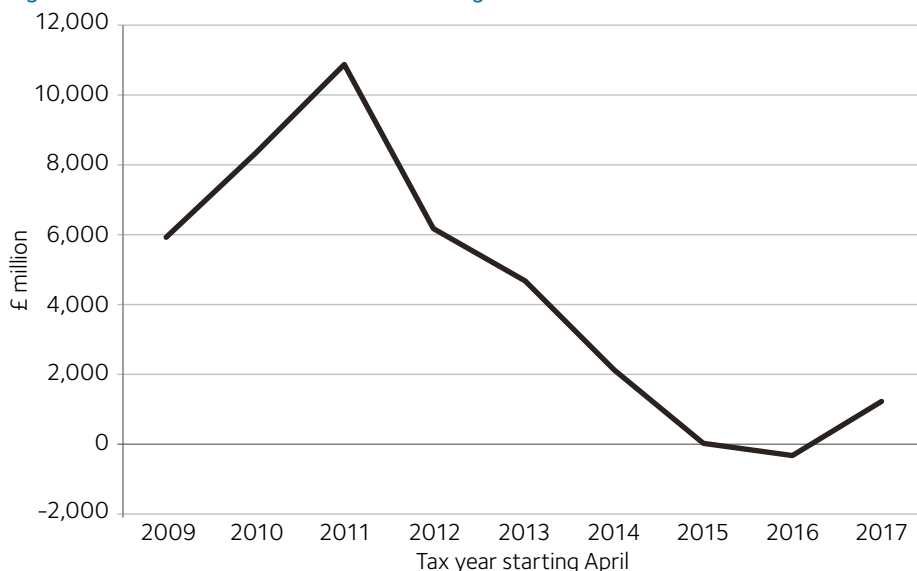
As noted in Chapter 3, UK government policy is to maximise extraction of offshore oil and gas, a policy that is inconsistent with the Paris goals. To this end, the government provides a range of subsidies to oil companies, mainly in the form of tax breaks. This chapter will review these subsidies.

HANDOUTS EXCEED TAXES

In the tax years 2015-16 and 2016-17, the Treasury gave more money to oil companies than it took from them in taxes, as shown in Figure 9. The oil industry's collective tax bill was negative by £2 million in 2015-16 and by £350 million in 2016-17. In 2017-18, higher oil prices pushed tax revenues back into the black, to £1.2 billion, although still a long way short of the £6.1 billion that would have been collected without recent tax cuts, according to estimates by the *Financial Times*. The *FT* notes that out of the roughly £50 (US\$70) price of each barrel, the government now gets just £2, down from £10 per barrel in 2010 when the oil price was last around this level.¹⁰⁷

The companies that have gained the most from negative tax bills over the last three years are shown in Figure 10.

Figure 9: Annual tax revenues from UK oil and gas extraction

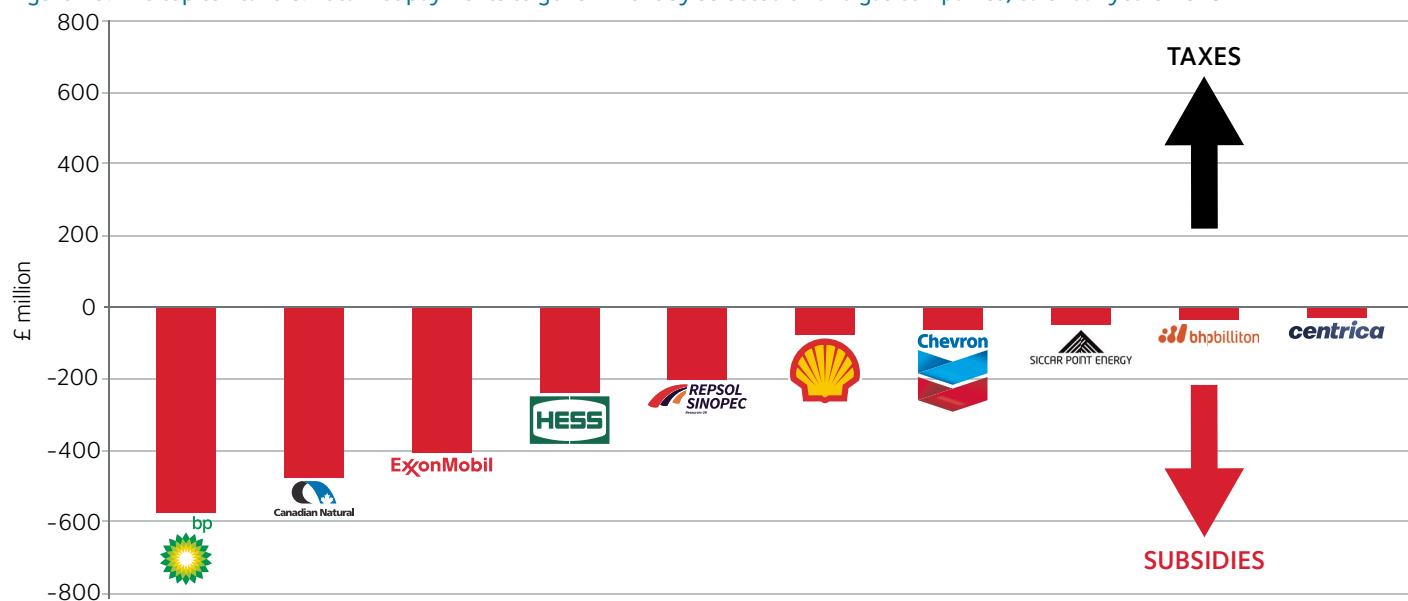


Source: HM Revenue & Customs¹⁰⁸

Perhaps negative taxes (net rebates) might be more understandable if the companies made losses in those years. But in spite of the low oil price, they did not make losses; at least five of the ten had profitable UK operations during the period. Both BP and ExxonMobil made more than £1 bn of profits from UK extraction during that period.¹¹⁰

The negative taxes in 2014 to 2016 were not just a blip. As we shall see, this period of negative taxes is only a foretaste for the much larger negative economic impact of UK oil and gas in the future, due to the decommissioning liabilities the government has accepted on behalf of the taxpayer.

Figure 10: The top ten takers: Total net payments to government by selected oil and gas companies, calendar years 2015-17



Source: UKEIT¹⁰⁹

THE CONTEXT: PERVERSE SUBSIDIES

The former prime minister David Cameron called subsidies to fossil fuels “economically and environmentally perverse” since they “distort free markets and rip off taxpayers”.¹¹¹ But as we shall see, his government’s subsidies to oil and gas extraction – like those of his predecessors and successor – were designed to enable extraction that would otherwise have not occurred, helping lock in the high-carbon economy. Following large new subsidies in the 2015 and 2016 Budgets, UK extraction is now growing again (see Figure 1, page 12). This growth is inconsistent with the Paris goals, which require global carbon dioxide emissions to be reduced by 45% by 2030, according to the Intergovernmental Panel on Climate Change.¹¹²

There are two types of subsidies: those that reduce prices for consumers and those that reduce costs or increase profits for producers (companies). The second type often take the form of tax breaks (though they may also include grants and other expenditure). Most internationally-agreed definitions of subsidies include both types.¹¹³ Three of the most important definitions are:

- **World Trade Organisation (WTO):** “a financial contribution by a government... [including] a direct transfer of funds, ... potential direct transfers of funds or liabilities, ... [or] government revenue that is otherwise due is foregone or not collected (eg fiscal incentives such as tax credits).”¹¹⁴
- **International Monetary Fund (IMF):** “Consumer subsidies arise when the price paid by consumers is below a benchmark price... Producer subsidies exist when producers receive either direct or indirect support that increases profitability above what it otherwise would be... [including] receiving preferential tax treatment.”¹¹⁵
- **International Energy Agency (IEA) (energy subsidies definition):** “any government action that concerns primarily the energy sector that lowers the cost of energy production, raises the price received by energy producers or lowers the price paid by consumers.”¹¹⁶

The UK government has denied that it provides fossil fuel subsidies, by defining them narrowly as “government action that

lowers the pre-tax price to consumers to below international market levels”, a definition that excludes subsidies to producers.^r

Meanwhile, the UK has not cooperated with G20 initiatives to improve subsidy transparency. After G20 nations committed to phase out “inefficient fossil fuel subsidies” at their Pittsburgh summit in September 2009, the UK was one of seven members that claimed to have “no inefficient fossil fuel subsidies”.¹¹⁸ The G20 provided for countries to peer review each other; the UK declined to be peer reviewed.¹¹⁹

A comparative survey of G7 countries led by the Overseas Development Institute found that the UK’s transparency was “extremely poor”, that it had failed to publish specific reports on fiscal support to fossil fuels and that it had not participated in a G20 peer review process.¹²⁰

THE TAXES LEVIED ON UK OIL AND GAS EXTRACTION

Like all companies doing business in the UK, oil companies are charged Corporation Tax on their profits, as their share of meeting the financial needs of the country. The reason a special tax system is needed for oil and gas extraction is to capture the state’s share of the value from depletion of its non-renewable resources.¹²¹

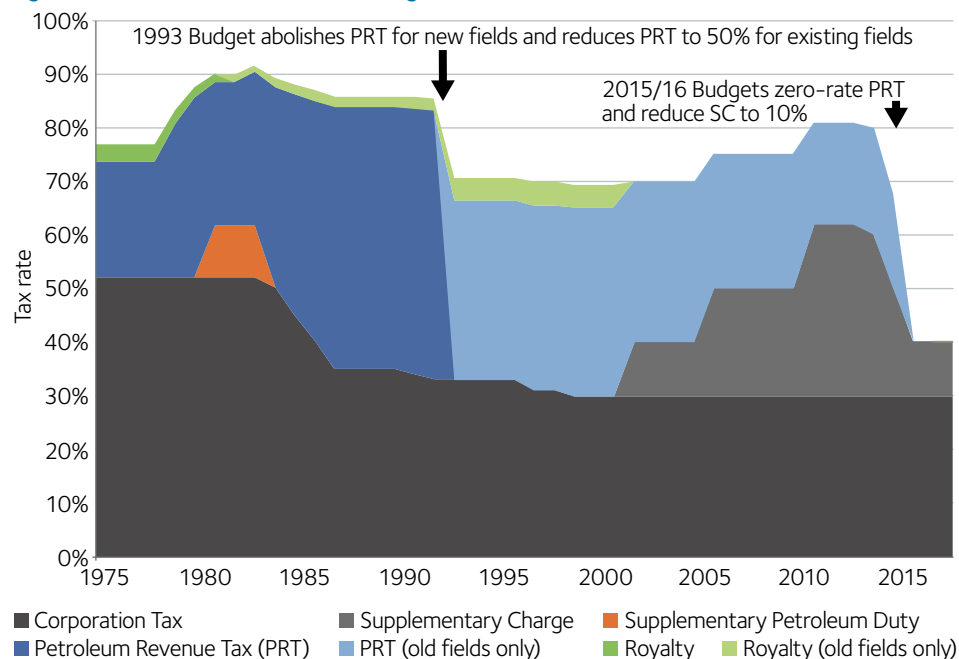
The UK’s underground and subsea oil and gas resources, like those the world over are owned by the state (the one exception is the United States). In some countries, the state takes the full value of the extracted oil and gas, paying companies an agreed fee for their work in extracting it. In others, the value is shared between state and companies according to a formula. In the UK, it works the other way around: companies get to keep what they extract but must return some of the value to the government through the tax system.

Several different taxes and levies have been charged over the years in the UK to obtain this public share. Corporation tax for offshore oil is charged at a higher rate of 30% of profits (compared to the usual 19%)¹²² but is subject to some more favourable rules than normal corporation tax.^s A Supplementary Charge claims a further 10%, making a total tax rate of 40%. This is very low compared to other similar countries: oil consultancy CERA estimates that the average government take globally is 72%.¹²³ Petroleum Revenue Tax (PRT) is now charged at 0%.¹²⁴ The other taxes – Royalty, Supplementary Petroleum Duty and Gas Levy – have been abolished.

So, in summary, there are now three taxes:

- Corporation Tax: 30%
- Supplementary Charge: 10%
- Petroleum Revenue Tax: 0%

Figure 11: Taxes on UK offshore oil and gas extraction, 1975–2018



Source: HM Treasury, Oil Change International¹³⁰

^r In fact, even with the UK’s narrow focus on consumption subsidies, research by the Overseas Development Institute, Oil Change International and partners challenges the government claim: A recent report estimates that the UK provides about US\$9.5 billion a year of subsidies to consumption of fossil fuels in homes, vehicles and power stations (generally lowering prices to consumers). Shelagh Whitley et al, “G7 fossil fuel subsidy scorecard: Tracking the phase-out of fiscal support and public finance for oil, gas and coal”, ODI, NRDC, IISD & OCI, June 2018, p.16, <https://www.odi.org/sites/odi.org.uk/files/resource-documents/12222.pdf>¹¹⁷

^s such as 100% capital allowances, and increasing carried-forward losses by 10% a year (“uplift”) for a period of up to ten years.

28 To most taxpayers, the idea of a tax charged at zero percent will seem strange. The 2016 Budget zero-rated PRT rather than simply abolishing it so that companies can still claim rebates on PRT, particularly for decommissioning expenses.¹²⁵ PRT payments can now never be positive. In the tax year 2017–18, payments of PRT were negative by more than half a billion pounds, and the government forecasts that they will stay at around that level.¹²⁶

Lobby group Oil & Gas UK claims that the total 40% tax rate paid on oil extraction is “double that paid by other UK industries”,¹²⁷ a claim repeated by the present government.¹²⁸ But this is not comparing like with like. In the case of oil, the taxation system is designed not only as a levy on profits, as it is for any other industry, but also to secure the public’s share of the resources’ value.^t

The tax rates’ variations over time and their combined effect are shown in Figure 11. The biggest changes to the system were in the 1993, 2015 and 2016 Budgets, under Chancellors Norman Lamont and George Osborne. As a result, the total tax rate fell from 83% in 1992 to 40% from 2016. This was the context for the net negative tax take from oil and gas extraction in the tax years 2015–16 and 2016–17.

This chapter will examine some aspects of the tax system that constitute subsidies, and their impact on both the Exchequer and the climate.

THE CLIMATE IMPACT OF UK SUBSIDIES AND SUPPORT

Following Sir Ian Wood’s 2014 recommendations on how to maximise extraction of UK offshore oil and gas (see page 39), the government both added new subsidies in the 2015 and 2016 Budgets and created the Oil and Gas Authority (OGA) to further support the industry. As we saw in the previous chapters, continuing to license new offshore acreage and permit new fields to be developed is already inconsistent with the Paris goals. The subsidies and other support push projected future extraction even higher.

The OGA projects that the cumulative extraction from 2016 to 2050 will be more than 30% higher than it would have been without the 2015 and 2016 subsidies and other post-Wood changes.¹³¹ The associated carbon dioxide emissions are shown in Figure 12.¹³²

We see that:

- **The carbon dioxide emissions from that additional oil and gas are already twice as much as what will be saved**

over that period by the UK phase-out of coal power.

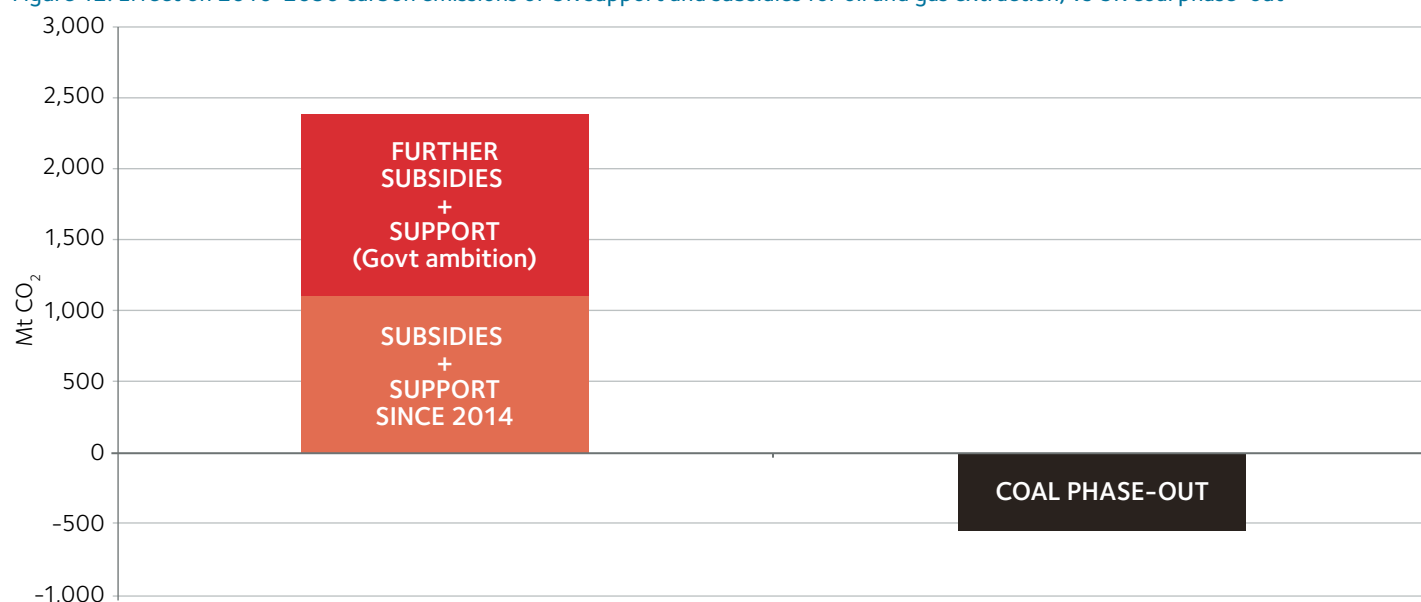
- **Through additional measures to achieve its “Vision 2035”, the OGA hopes to increase projected oil and gas extraction by as much again as the measures already enacted.**

The International Institute for Sustainable Development (IISD) has analysed the impact of different types of extraction subsidies, which increase carbon dioxide emissions in three ways. These are:¹³⁴

- **Creating “zombie energy”** – extraction from fields that would be unviable without government support;
- **Skewing energy markets** – pushing down prices, and reinforcing fossil fuels against competition from clean energy;
- **Locking in fossil fuel dependency** by enabling investment in long-lived fossil infrastructure, which incentivises continued extraction.

IISD finds that because of the lock-in effects, the greatest climate impact arises from subsidies that enable new investment and hence the resulting emissions over the lifetime of the resulting projects. Furthermore, the greatest impact per pound of subsidy occurs where the subsidy is targeted earliest in the supply chain (especially at new investments), because of the “time value of money”.¹³⁵

Figure 12: Effect on 2016–2050 carbon emissions of UK support and subsidies for oil and gas extraction, vs UK coal phase-out



Sources: OGA, BEIS, IPCC¹³³

^t Oil & Gas UK has consistently pushed the message that the UK offshore oil industry is marginal and struggling, and through repetition has succeeded in getting many policymakers and commentators to hold that view. We show below that the picture is false; indeed in 2016, OGUK admitted that it had been “crying wolf”. For example, in the run-up to the 2003 Budget, a year after the first oil tax increase in two decades, OGUK (then called UKOOA) warned that “The cost of the Budget changes last year was in investor confidence. The full impact will be on future production, investment and jobs will be felt two or three years down the line.” Yet that very year, a poll of oil company managers found the UK the most attractive destination worldwide for new investments. After the tax rise in 2011, OGUK said, “This change in the tax regime will decrease investment, increase imports and drive UK jobs to other areas of the world”. In reality, investment increased from £5.5 bn in 2010 to £11.8 bn in 2012, employment increased and the decline in extraction slowed.¹²⁹

The next sections of this report review three major UK subsidies to oil and gas extraction: tax breaks for high-cost fields and investments, reduced tax rates and public payment of decommissioning costs. For each, it considers the measure against the above definitions of subsidies and assesses both its cost to the public and its climate impact, in light of our finding that UK extraction already exceeds what would fit the Paris goals.

In respect of cost, we do not attempt to quantify a total inventory of UK fossil fuel subsidies, as that work has been done by the Overseas Development Institute and others.¹³⁶ We consider a wider range of potential subsidies, whose costs are not neatly additive. In respect of climate impact, we apply a qualitative assessment of each measure, drawing on the framework proposed by IISD, but we do not attempt to model the dynamic effects in the wider global energy economy. Whereas in other countries, Stockholm Environment Institute has quantified this effect by modelling,¹³⁷ we do not see this as necessary in the UK, whose government is unusually explicit about its deliberate use of fiscal measures to increase extraction. For that reason, we review the government's and industry's own estimates of the resulting extraction that is enabled rather than generating our own.

SUBSIDY #1: TAX ALLOWANCES

Description: The UK has been extracting oil and gas offshore for more than 50 years. The most accessible oil and gas has been taken, and the government has provided subsidies to enable extraction from the costlier and more marginal remaining fields. The first of these came in 2009: a Field Allowance, reducing the amount of profits subject to Supplementary Charge (SC), for small, high-pressure or high-temperature fields, or ultra-heavy oil or deepwater gas fields. In 2012, this was extended to deep fields with sizeable reserves and large shallow-water gas fields.¹³⁸ The allowances system was so broad that a 2014 Treasury review noted that 86% of all new field approvals over the previous four years had received an allowance.¹³⁹

In 2015, the focus moved away from marginal fields to encouraging investment in all fields. Field allowances were replaced by a new Investment Allowance, which reduced taxable profits subject to SC by 62.5% of capital expenditure.¹⁴⁰

Is it a subsidy? Most international organisations (in contrast to the UK) would routinely consider tax breaks to be subsidies, and they are explicitly named in the World Trade Organisation (WTO) and International Monetary Fund definitions. The WTO notes that often governments "provide subsidies through tax concessions. Indeed, when a government provides a tax exemption, credit, deferral or other forms of preferential

tax treatment to an individual or group, its budget is affected in much the same way as if it had spent some of its own money."¹⁴¹

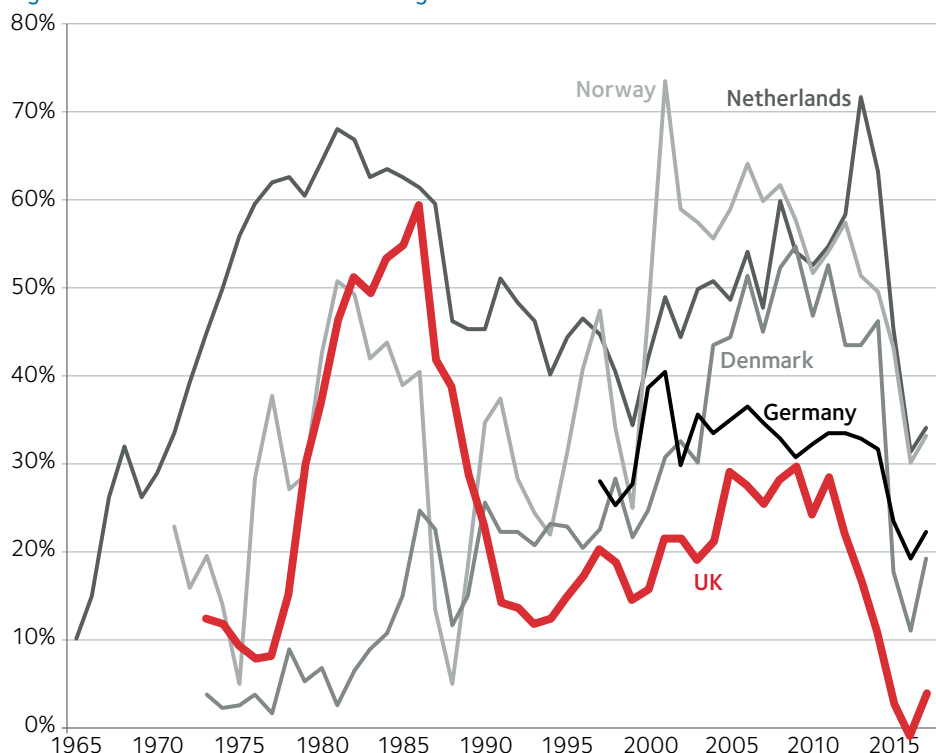
Cost: The UK granted 110 Field Allowances in the period April 2009 to September 2015, corresponding to a maximum available benefit of £6.8 billion.¹⁴² However, the only publicly available data confirming the amount actually taken up is for £1.1 billion of tax reductions from allowances granted in 2013-14 (to be applied over five years).¹⁴³ The Investment Allowance was introduced in the 2015 Budget alongside reductions of SC and PRT and was costed as part of the same package with those reductions (below).

Climate impact: The Field Allowances were designed to enable development of fields that would be otherwise unviable, so explicitly to increase UK extraction, creating "zombie energy". The Investment Allowance is designed to incentivise investment, so will have a long-term lock-in effect.

The quantitative impact of the Investment Allowance on extraction was again assessed as part of the package with other 2015 Budget measures (below). A study from the University of Aberdeen estimates that the Investment Allowance specifically will enable extraction of 700 m barrels of oil equivalent that would not otherwise be extracted, mostly in the 2020s.¹⁴⁴ Assuming oil accounts for 60% of this amount, the associated emissions would be 270 Mt CO₂, equivalent to ten years of the UK's 2017 coal emissions.¹⁴⁵

Workers on an oil drilling platform in the North Sea. ©A Room With Views / Alamy Stock Photo





Source: Juan Carlos Boué¹⁴⁹

SUBSIDY #2: REDUCED TAX RATES

Description: The UK has reduced tax rates for all fields to very low levels, including in the 2015 and 2016 Budgets, as described above.

Is it a subsidy? Significant tax cuts would potentially fit the WTO definition of “government revenue that is otherwise due is foregone”. This is more contested, because it depends on what is judged to be “otherwise due”. Charging Petroleum Revenue Tax at 0% would seem to be a clear case of revenue forgone; an argument can also be made for counting the reduction of the rate of SC from 32% to 10%, and some of the earlier tax reductions, as these taxes are designed to obtain the public’s share of value of publicly-owned resources. They also “lower the cost of energy production” (IEA definition) and “increases profitability above what it otherwise would be” (IMF).

Because there is no established “correct” rate of tax, oil taxes are generally judged by comparison to other countries, or by the profit rate they enable companies to achieve compared to what is considered reasonable.¹⁴⁶ On both counts, the UK has been disproportionately generous to oil companies.

The UK has consistently treated oil companies more favourably, tax-wise, than have other oil extracting countries. In the Treasury’s words, the UK has “one of the most competitive oil and gas fiscal regimes in the world”.¹⁴⁷ The Oil and Gas Authority adds that “UK was already fiscally competitive” before the most recent tax cuts.^{u, 148}

The most important comparison is with countries where the costs and industry conditions are similar. Oil researcher Juan Carlos Boué has compared the UK’s *effective tax rate* – the total tax revenue as a share

of gross revenues from extraction^v – with that of the other four North Sea oil extracting countries: Norway, the Netherlands, Denmark and Germany. The results are shown in Figure 13.

Boué calculates that the UK effective tax rate since 1990 has averaged 18%, compared to 31% for Germany, 33% for Denmark, 46% for Norway and 48% for the Netherlands. Whereas in 2017 the UK Government received just US \$1.86 from each barrel of oil, its North Sea neighbours received respectively \$10.35, \$8.45, \$13.53 and \$10.78.¹⁵⁰

We can also look at what is “otherwise due” in terms of whether companies achieve a fair or a disproportionate rate of profits. Building on work by Boué and Philip Wright,¹⁵¹ Figure 15 shows that oil companies make profits at a much greater rate than firms in other sectors: the profitability (net rate of return) of UK offshore oil companies, on average over the last ten years, has been a very high 20%, compared to 12% for companies in other UK sectors (excluding finance). Oil profits reached 45% during the period of high oil prices: “spectacular returns”, in the words of one investment analyst.¹⁵² While they dropped below other sectors after 2014, they had overtaken again by mid-2018, and are now at 18%.

Cost: The closest comparable country is Norway (the other three are much smaller and costlier¹⁵⁴). Over the period 1990 to 2017, the UK government collected £181 bn in revenues (in 2019 pounds); if the effective tax rate had been the same as Norway’s, this would have been about 2.5 times as high, at £437 bn.¹⁵⁵ In other words, low UK taxes compared to Norway’s have given oil companies nearly £255 bn at the expense of the taxpayer.

^u The OGA reproduces modelling by consultants Wood Mackenzie, showing that a standard small, high-cost field would generate extremely high internal rates of return of 35% in the post-Budget UK, compared to about 10% in Indonesia, and between 20 and 25% in Norway, Denmark, Australia, US Gulf of Mexico and Angola. These high profits are at the cost of the taxpayer: the same analysis shows the UK getting only between one-fifth and two-thirds of the revenues those other countries would receive in the same circumstances.

^v The effective tax rate is a simple empirical measure that cuts through the complexities of allowances, incentives, accounting conventions and other tax rules. It does not take account of costs, but it shows how great the disparity in costs would have to be to justify the disparity in taxes. Since these countries are all North Sea producers, it can be assumed that costs are similar; in fact, the three smaller producers in the southern North Sea may have higher costs than the UK due to economies of scale.

As for the specific cost of recent measures, the 2015 and 2016 tax cuts combined with the Investment Allowance (page 29) would together cost the taxpayer £2.3 bn over their first five years.¹⁵⁶

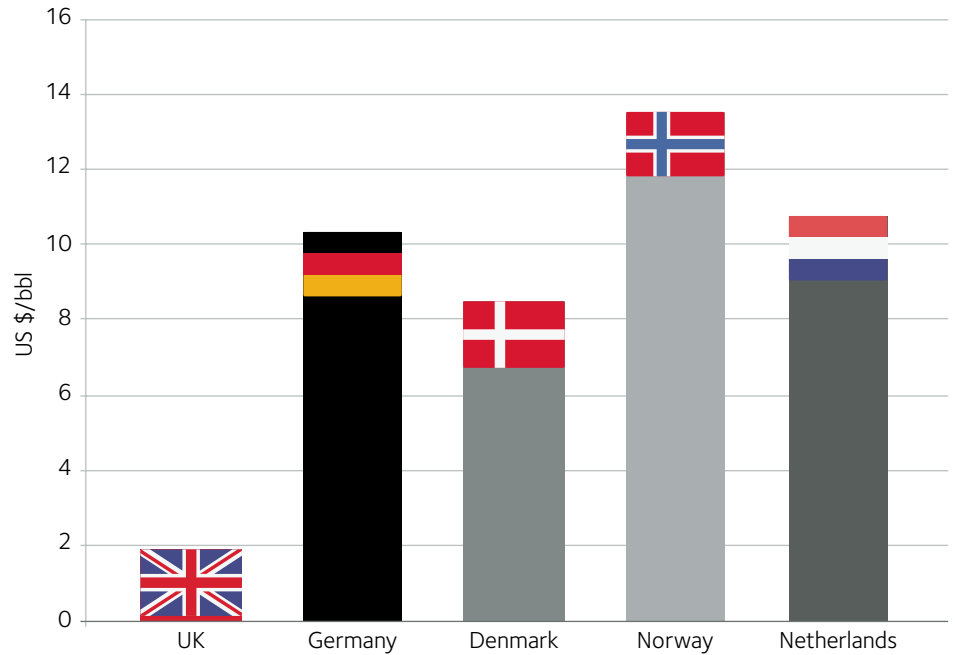
Climate impact: Low tax rates influence extraction in two ways:

- 1) **Zombie energy effect:** Extraction is enabled that would be otherwise unviable under a normal tax regime – serving the government objective of maximising extraction.
- 2) **Competitive effect:** The government aims to attract investment from other parts of the world through low taxes, enabling ultra-high profit levels. However, this generates profits that are also higher than other industries (as we have seen), so will also attract investment capital away from non-carbon sectors (including clean energy). Furthermore, as the UK oil industry implicitly acknowledges, it creates a race to the bottom where other countries retaliate by lowering their taxes, pushing the UK to go even lower.¹⁵⁷

As we have seen, tax cuts in the 1993 and 2015–16 Budgets reversed declining rates of extraction in the UK. It is reasonable to assume that without those Budgetary measures, the decline would have continued: thus much of the second hump in extraction during the 1990s and 2000s can perhaps be attributed to subsidies. Additional fields opened since 1993 have already produced 8.6 bn barrels of oil and 28.1 bn cubic feet of gas;¹⁵⁸ emissions from this oil and gas amount to 3.6 Gt CO₂ – more than the UK's total emissions from coal burning over the same period (2.9 Gt).¹⁵⁹ Some of these new fields would have been opened without the 1993 subsidies,¹⁶⁰ but it is fair to assume a large proportion of this additional extraction may have been enabled by those subsidies.

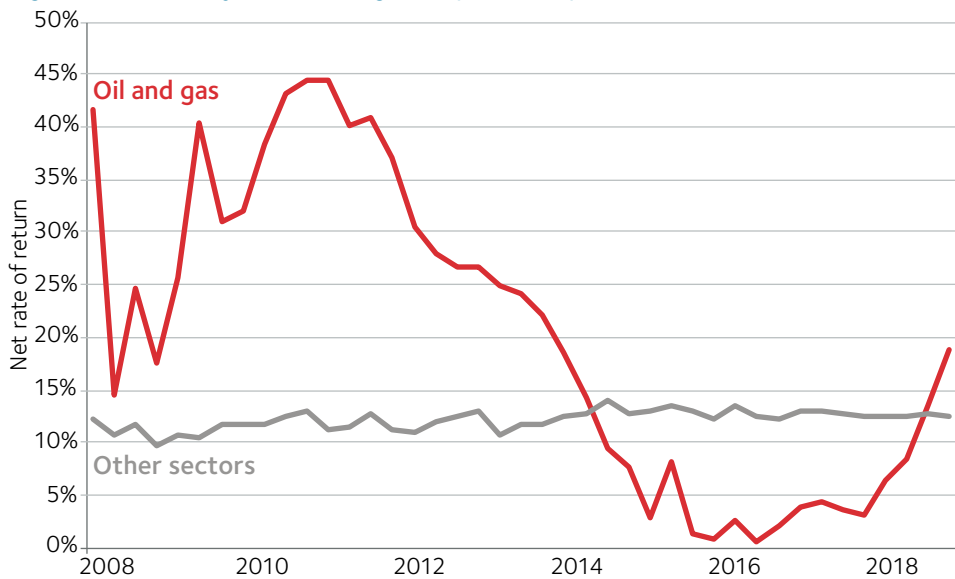
More specifically, the Office for Budget Responsibility projects that the 2015 tax cuts would increase 2019 oil extraction by 23 m barrels and gas extraction by 104 m cubic feet.¹⁶¹ Burning this extra oil and gas will release 16 m tonnes of carbon dioxide per year,¹⁶² equivalent to nearly two thirds of the UK's total carbon emissions from coal in 2017.¹⁶³ The government did not estimate the impact of the 2016 measures on extraction.

Figure 14: Government revenue per barrel, North Sea countries, 2017



Source: Juan Carlos Boué

Figure 15: Profitability of UK oil and gas companies compared to other non-financial sectors



Source: Office for National Statistics¹⁵³

SUBSIDY #3: DECOMMISSIONING

Description: As UK oil and gas extraction ends, the vast infrastructure of hundreds of platforms and pipelines will need to be dismantled and environmental pollution cleaned up. Almost half of the costs of decommissioning are set to be covered by the taxpayer.¹⁶⁴ This is because oil companies are allowed to carry back their pre-tax “losses” incurred during decommissioning and set them off against their historic profits, triggering a rebate of previous tax (with interest).

Is it a subsidy? Whether considered as a direct transfer of funds, a public liability or a rebate of revenue that was otherwise due, decommissioning payments would seem to fit the WTO definition of subsidies. It is also significant that oil companies are treated preferentially (IMF definition).

In most industries, closure and post-closure costs are considered part of ordinary costs, just as capital equipment and labour are, with only limited and generally short-term provisions to offset against very recent tax.¹⁶⁵ Indeed, expectations of fairness would suggest that whoever has built something (and profited from it) should be responsible for taking it away and cleaning up their mess: the “polluter pays” principle.

The tax treatment of oil decommissioning is in strong contrast with the treatment of other businesses. In the Treasury’s words, “the flexibility to relieve losses available at the end of a field’s life is far more generous than is available in other industries, as the losses can be carried back considerably further”.¹⁶⁶ In other sectors, companies can normally carry back losses for tax relief purposes only one year,¹⁶⁷ or three years where a business closes entirely.¹⁶⁸ Remediation work on factory sites that contaminate surrounding land, for example, is done under the normal business tax regime, and tax relief can be claimed only if the owners played no part in the original contamination.¹⁶⁹ When it comes to oil, decommissioning losses on Corporation Tax and Supplementary Charge can be carried back to 2002, and on Petroleum Revenue Tax indefinitely.

Cost: A key danger to the taxpayer is that while tax breaks for decommissioning have been guaranteed, the total future cost of decommissioning is highly uncertain, with rising estimates over time shown in Figure 16.

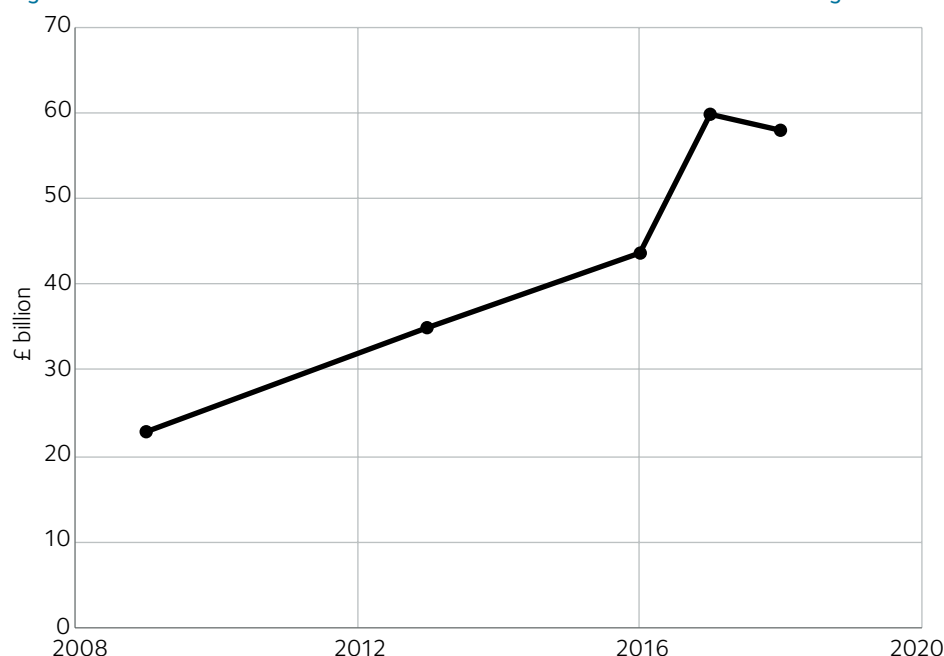
The Oil and Gas Authority’s central estimate of the total cost of decommissioning is £58 billion, an estimate that has more than doubled over the last ten years. Oil & Gas UK (on behalf of the oil companies) warns that the numbers in Figure 16 – based on companies’ cost estimates – are subject to great uncertainty and could be as high as £83 bn.¹⁷¹ A report commissioned by the GMB union, whose members work in shipyards and ports which are able to undertake decommissioning work, estimated a baseline figure of £75 bn, but potentially up to £100 bn.¹⁷² Both organisations note that cost overruns are more likely than underspends, and that the total estimate is likely to grow as new installations are built.

Whatever the final figure turns out to be, the taxpayer’s share constitutes an open-ended bill of tens of billions of pounds. Indeed, the parliamentary Public Accounts Committee notes that while HM Revenue & Customs has estimated that the public share of the central cost estimate to be £24 bn, it has not estimated what the public share would be if the total cost is higher.¹⁷³

The large public share of the costs creates an incentive for the UK Government to lighten its regulation of decommissioning in order to reduce its own costs. In February 2019, leaked documents obtained by *Unearthed* and *The Times* revealed that the government supports proposals by Shell to leave portions of its Brent Field platforms in place, rather than dismantling them, including storage tanks containing oil and chemicals, and with the risk of causing maritime accidents. The German government has objected to the plans.^{174, w}

Climate Impact: The government has argued that generous tax relief on decommissioning both attracts companies to invest in UK extraction and frees up their funds to invest in exploration and extraction.¹⁷⁵ In respect of the first claim, it is unlikely that a company developing a new field is strongly influenced by the promise of decommissioning relief twenty years into the future, because over that timeframe the effect will be very heavily discounted; the principal impact is likely to be on late-stage continued investment in existing fields. It is not possible to quantify the second claim, because an oil company may invest the freed-up capital in any country where it sees opportunities, not necessarily the UK.

Figure 16: Government estimates of the total cost of offshore oil decommissioning



Sources: HMRC, OGA¹⁷⁰

w Ironically, it was Shell’s attempts in 1995 to dump at sea a storage facility from the same field – the Brent Spar – that first drew public attention to the decommissioning issue, and led to the rules that installations should generally be taken away and dismantled onshore.

BOX 5: OFFSHORING JOBS IN DECOMMISSIONING

In spite of the taxpayer covering nearly half of the cost of decommissioning, much of the work is set to go overseas, and so not even bringing jobs to UK and Scottish workers, even though the capacity to do the work often exists here, as a detailed 2016 report for the GMB union showed.¹⁷⁶

For fixed installations, decommissioning has both an offshore component (plugging wells, cutting and lifting “topsides”, removing substructures, cleaning and removing pipelines etc) and an onshore component (dismantling the topsides and substructure, and recycling the materials). For the offshore component, workers are protected by Minimum Wage legislation only for installations less than 12 miles offshore, and there have been cases of companies paying less than the minimum wage beyond that,

often using exploited foreign labour. For example, the RMT union reports that some workers involved in decommissioning BP’s Miller platform were paid just £2.70 per hour (compared to the Minimum Wage of £7.50 for workers older than 25).¹⁷⁷

In its Decommissioning Action Plan, Highlands and Islands Enterprise warns that “Foreign facilities and consortia supported/funded by national Governments are currently [the] lower cost option”, and that where foreign contractors and vessels are used, they will tend to take the structures to foreign ports and yards for dismantling. The experience of decommissioning so far has been mixed, with some structures coming to UK yards – albeit often run by overseas firms – and others going elsewhere: Norway (including Miller), the Netherlands or further afield.¹⁷⁸

When it comes to mobile drilling rigs and floating production vessels, the problem is even worse. They are often towed to ship-breaking yards in Asia for cheaper dismantling, where working conditions are often unsafe. In 2016, Maersk’s former floating production vessel, the *North Sea Producer*, was sold to US company GMS for scrapping, and later found dumped on a beach in Bangladesh; the Bangladeshi Environment Ministry halted the scrapping when the vessel was found to contain dangerous levels of radioactive materials. Maersk later apologised. In 2018, when Diamond Drilling sold three of its retired North Sea rigs to GMS, protests by the RMT led the Scottish Environmental Protection Agency (SEPA) to intervene. SEPA ordered the rigs to be held in the Cromarty Firth while it investigates the safety of scrapping plans.¹⁷⁹

While the overall treatment of decommissioning is unusual, two obscure-sounding specific measures in recent years go even further in offering special treatment to the oil industry: Decommissioning Relief Deeds and Transferable Tax History.

Decommissioning Relief Deeds

Description: In 2013, the government took the remarkable step of giving companies a legal guarantee that future elected governments could not change the tax rules on decommissioning. The new Decommissioning Relief Deeds specified that if a future elected government were to change the tax rules – conventionally always seen as a sovereign matter – it would have to compensate the companies from the public purse.

Could the deeds be cancelled? The government designed them to be “virtually impossible” to revoke, seeking to tie its own hands – and those of its successors – as much as possible (a “slightly strange” objective on which to have sought legal advice, according to a senior Treasury civil servant involved in the process).¹⁸⁰ While in the UK legal system Parliament is sovereign, so new legislation could in principle annul the Deeds, even that might not reverse their effect, as companies might then take legal action against the government in the courts,¹⁸¹ under the European Convention on Human Rights,¹⁸² or in secretive tribunals under investment treaties such as the Energy Charter Treaty.¹⁸³

Is it a subsidy? The special treatment of oil and gas in a manner not available to other industries is grounds for considering this a subsidy, as well as its uniqueness internationally. Chancellor George Osborne commented, “Never before has any government entered into legally binding contracts with individual companies to guarantee the tax relief they can expect decades into the future. No other place in the world provides such a guarantee.”¹⁸⁴ On the other hand, as it does not immediately or directly change flows of funds, it might better be seen as a legal underpinning of the decommissioning subsidy, rather than a new subsidy in its own right.

Cost: The government claims the deeds are cost-neutral, in that they simply fix the existing status quo; in reality, their principal cost lies in their removing future governments’ freedom to change tax rules.

As well as ordinary relief on decommissioning expenditure, the deeds also provide for government to provide additional relief where a company defaults on its decommissioning obligations. Already by 2019, the Treasury has committed £357m in relation to covering one company’s default.¹⁸⁵ The company has not been named.

While the government has placed a model deed online (a template), the actual deeds themselves are not published. Given the vast and open-ended cost to the taxpayer, it is striking that concerned citizens or parliamentarians cannot review the agreed

relief rates; nor can they know which companies are involved, for example in order to judge the reliability of their cost estimates or their risk of default.

Climate impact: Oil & Gas UK has estimated that Decommissioning Relief Deeds could unlock £40 bn of capital over time and enable extraction of an additional 1.7 bn barrels of oil equivalent.¹⁸⁶ Assuming that 60% of this is oil, the associated emissions would be 650 Mt CO₂. As of March 2018, the government had signed 92 deeds, unlocking an estimated £5.7 bn of capital.¹⁸⁷

Transferable Tax Histories

Description: In 2019, the government set another global precedent for generous tax treatment of oil companies.¹⁸⁸ The new Transferable Tax History (TTH) mechanism means that when a company sells UK assets to another company, it is selling not just the physical infrastructure and the rights to extract oil and gas, but also the history of its tax payments. In this way, the buyer can claim rebates on tax previously paid by the seller.

The main impacts of the change are that a seller company (often a large multinational seeking to reorganise its portfolio) will likely be able to sell its UK assets at a higher price (because they are also now selling their tax history and thereby a reduction in the future decommissioning costs for the buyer).¹⁸⁹ In a briefing published by Global Witness, former oil company financial executive Tom Mitro pointed out that seller companies would “extract” some of the tax reduction value.¹⁹⁰

34 Is it a subsidy? Like the Decommissioning Relief Deeds, TTH constitutes special treatment for the oil industry, but is an administrative measure to underpin a subsidy, rather than a direct change to flows of funds.

Cost: The cost to the public is difficult to assess, though clearly the mechanism allows companies to claim reliefs that they could not otherwise. Government projects a modest increase in revenues over the next six years due to increased extraction.¹⁹¹ However, expert testimony commissioned by Global Witness points out that this choice of timeframe ignores the later period in which the greatest costs will potentially occur, due to more of the eventual decommissioning costs being shifted onto the public purse; the government did not assess this.¹⁹²

Climate impact: The government's justification for TTH is to increase investment and extraction (by an unquantified amount), by encouraging sale of assets to companies who may be better able to develop and operate them, extending the productive life of fields.¹⁹³ Given their complex role in influencing asset sales, it is not possible to quantify this impact.

SUMMARY OF THREE TYPES OF UK SUBSIDY

The above discussion is summarised in Table 2. In short:

- **Field Allowances and Investment Allowances** are very much targeted at new investments, and unlock the largest amount of new extraction per pound of subsidy (in the hundreds of millions or low billions per year).

- Tax reductions and abnormally low tax rates both attract investment and enable otherwise-unviable extraction ("zombie energy"); they have historically cost the Exchequer hundreds of billions of pounds, with a large impact on extraction, notably reversing declines in extraction rates.
- Public contributions to decommissioning costs are the least "efficient" subsidies in that they enable the smallest amount of new extraction per pound of subsidy, but are set to be a very large cost of tens of billions in the coming decades.

Table 2: Summary of three types of UK subsidy to oil and gas extraction

Type	Measure	Cost to taxpayer	Effect on extraction/emissions		Fits subsidy definition?
Tax allowances	Field Allowances (2009-15)	£1 bn granted in 2013-14, used over 5 years	Designed to enable extraction of fields that would be otherwise unviable	Supported 100 additional fields	Tax allowances almost universally considered to be a form of subsidy (except by UK govt)
	Investment Allowance (2015-)	£1.3 bn over 5 years (combined with 2015 tax cuts)	Designed to incentivise investment, causing carbon lock-in	+ 700 MtCO ₂ = 10 years of UK coal emissions	
Reduced tax rates	25 years of tax cuts, to unusually low levels	Govt revenue since 1990 is £255 bn lower than if it had the same effective tax rate as Norway	Declining extraction has been reversed through subsidies	New fields opened since the major subsidies of 1993 have added 13.3 bn boe to date ⇒ +3.6 GtCO ₂ , more than UK coal emissions over that period	Govt forgoes revenue, enabling higher profits than otherwise due (WTO, IMF definitions); UK fails to secure the public's fair share of income from the nation's resources; oil companies average 20% profit over last 10 years, cf 12% for other UK industries.
	Major tax cuts in 2015 and 2016 Budgets	£2.3 bn over 5 years (including Investment Allowance)		2015 tax cuts + investment allowance: 15% increase in 2019 extraction ⇒ +16 MtCO ₂ /yr	
Decommissioning funding	Decommissioning tax reliefs	Taxpayer pays almost half of a bill estimated at £60 bn, but could be much higher	Attracts more companies to extract, frees up their capital for expansion	Not known	A grant, liability or foregone tax (WTO), not available to other industries (IMF)
	Decommissioning Relief Deeds	Principal cost is in removing future governments' freedom to change tax rules. Already by 2019, Treasury has committed £357m to covering one company's default.	Unlocking capital for expansion (up to £40 bn)	Could enable extraction of an additional 1.7 bn barrels of oil equivalent ⇒ +650 MtCO ₂	These mechanisms don't directly change flow of funds, but underpin the tax reliefs, and are not available to other UK industries or in other countries
	Transferable Tax Histories	Unknown, though clearly the mechanism allows companies to claim reliefs that they could not otherwise	Designed to increase investment and extraction	Not known	

Sources: see detail above

BOX 6: CORPORATE CAPTURE OF UK OIL TAX POLICY

This chapter has described the extreme and one-sided nature of the UK's oil and gas tax policies. One reason for these may be the manner in which policy is made: in close coordination with the oil companies and their tax advisers, and with almost no consultation with other stakeholders. The attitude of policymakers was summed up in 2002, when – explaining the choice not to reintroduce Petroleum Revenue Tax (PRT) – Financial Secretary Ruth Kelly said, “As far as I know, no one in the industry has called for the reintroduction of PRT.”¹⁹⁴

Recent policy processes have almost exclusively been developed in coordination with the oil industry. Prior to issuing Decommissioning Relief Deeds, the Treasury organised working groups covering commercial aspects, reference amounts (which help set the level of insurance provided) and legal design. The meetings were held at the offices of Oil & Gas UK or the corporate law firm CMS Cameron McKenna; attendees identified included “industry” and “industry lawyers” (though an appendix listing the participants by name was left out when the conclusions were published).¹⁹⁵

In 2017, to prepare the decision on transferable tax histories, the Treasury convened an “expert group” made up entirely of oil companies and their associations and tax advisers. The group discussed the proposals in detail, including how the cover afforded by Decommissioning Relief Deeds could be transferred along with tax

histories, and how commercial aspects of transactions could be kept confidential.¹⁹⁶

In addition to such focused working groups, the Oil & Gas Authority aims to serve as a conduit for industry views on taxation and subsidies. The Treasury convenes an Oil and Gas Industry Direct Tax Forum, which has met quarterly since 2006. And there are more meetings of which no records are published, such as the Oil and Gas Fiscal Forum where ministers, as well as Treasury officials, meet with oil company representatives; and private meetings. An analysis by InfluenceMap of the period January 2013 to September 2016 recorded 110 such meetings.¹⁹⁷

Perhaps tellingly, in February 2014, when the UK Cabinet met in Scotland for the first time since 1921, the meeting was held at the Shell offices in Aberdeen. Former oil services executive Ian Wood addressed the Cabinet at that meeting, on his review of how to maximise oil and gas extraction.¹⁹⁸

Juan Carlos Boué comments that whereas taxation without representation is a byword for tyranny, oil companies in the UK have achieved the opposite: their views are amply represented in policymaking, but they are subject to minimal taxation.¹⁹⁹

SUBSIDISING COMPANIES, NOT JOBS

Protecting jobs is often the reason given for tax breaks for offshore oil extraction. In his 2015 Budget, George Osborne presented his new subsidies “for hundreds of thousands whose jobs depend on the North Sea”.²⁰⁰ But they did not prevent job losses: over the following two years, the UK oil and gas workforce continued to fall by nearly a fifth, costing another 28,000 people their jobs in UK direct extraction or the domestic supply chain, combined with a knock-on effect on local economies, especially in North East Scotland.²⁰¹ The workforce also fell by a fifth in the three years following the large tax cuts of 1993.^{x, 202}

The most that subsidy advocates can claim is that tax cuts reduced the number of job losses by enabling additional extraction. However, any such effect is more than offset by the thrust of both oil company practice and government policy. Just one week after the 2015 Budget, Shell cut 250 UK jobs, stating, “Reforms to the fiscal regime announced in the Budget are a step in the right direction, but the industry must redouble its efforts to tackle costs and improve profitability.”²⁰³

The job losses between 1993 and 1996 – in spite of Norman Lamont’s tax cuts – came during the most active period of the government’s Cost Reduction Initiative in the New Era (CRINE), which aimed to help companies cut costs (see page 39). Similarly, when this initiative was extended into the PILOT Taskforce, job numbers fell by 12% between 1998 and 2002 – a period in which the oil price doubled and taxes remained stable.²⁰⁴ In other words, subsidies and cost-cutting (job losses) are seen as part and parcel of maximising company profitability.

Subsidies have thus greatly benefited companies, but not the workers in whose name they were advocated. How can this imbalance be addressed, given the urgency of climate limits and the need to phase out extraction?

The United Nations Tax Committee recommends that policy on decommissioning extractive operations should address the “often profound economic consequences for local communities” as well as the environmental and infrastructural aspects.²⁰⁵ On this basis, companies should be expected to invest in helping enable a smooth economic transition, as an aspect of decommissioning.

Neither the UK Government nor the oil companies have included in their decommissioning plans any strategy to take the economy of North East Scotland (and other areas reliant on oil and gas extraction) into the post-fossil-fuel era. Decommissioning is envisaged as a purely physical and technical job: namely, the removal of offshore installations.²⁰⁶

This social aspect of “decommissioning”, namely a Just Transition, is a worthy use of public funds. This chapter has shown that there is no shortage of funds; rather there is a need for their redirection from propping up companies to funding a Just Transition for workers. In subsequent chapters we turn to the potential for a Just Transition and how to deliver it.

RECOMMENDATIONS

The UK should remove all subsidies for oil and gas extraction, including tax breaks, and redirect them toward funding a Just Transition. Furthermore, Decommissioning Relief Deeds should be cancelled. Companies should pay decommissioning costs, with decommissioning plans required to ensure a Just Transition for workers.

x Conversely, the (smaller) increases of the Supplementary Charge did not lead to a collapse in employment, contrary to grave warnings by Oil & Gas UK: the 2002 introduction of Supplementary Charge (SC) was followed by a modest decline in workforce, but employment remained stable after SC was raised to 20% in 2006, and increased after it was raised again in 2011.



Oil drilling rigs in the Cromarty Firth, Northeast Scotland. ©Elliottsday / Pixabay

The UK Government should:

- In the next Budget, terminate all subsidies for oil and gas extraction (according to the internationally-agreed WTO definition of subsidies), including tax breaks;
- Redirect at least the same amount of funding to stimulate rapid development of renewable energy sources at a pace which will ensure sufficient energy supply;
- In the next Budget, introduce a new fiscal approach to the decommissioning of oil and gas infrastructure, which ensures that companies pay the costs;
- Participate genuinely and constructively in the G20 peer review process for fossil fuel subsidies;
- Require that companies include Just Transition for their workers and affected communities in their decommissioning plans, and prioritise the use of UK facilities and workforce for physical decommissioning activities.

The UK Parliament should:

- Repeal provisions for Transferable Tax History from the 2019 Finance Act;
- Pass legislation to cancel the Decommissioning Relief Deeds in order to restore the state's sovereignty over taxation policy;
- Pass legislation amending tax rules such that any rebates on previous tax payments are no more favourable to oil companies than those available to other industry sectors, and requiring companies' decommissioning plans to include detailed provision for a Just Transition of their workers;

- Conduct a review of the historic and present favourability of the UK oil and gas taxation regime compared to other countries, and of the historic and present profitability of UK oil and gas extraction compared to other economic sectors;
- Order a public inquiry into the process by which the Decommissioning Relief Deeds were issued, the compromise of UK sovereignty and the resulting damage to public finances.

5. INVESTING IN THE CLEAN ECONOMY

The previous chapters have shown why, in the context of the climate crisis, the UK and Scotland need to phase out oil and gas extraction. In this and subsequent chapters, we turn to the question of how to do this, starting by exploring what clean energy will be required and potential policies to unlock it.

MEETING UK ENERGY NEEDS

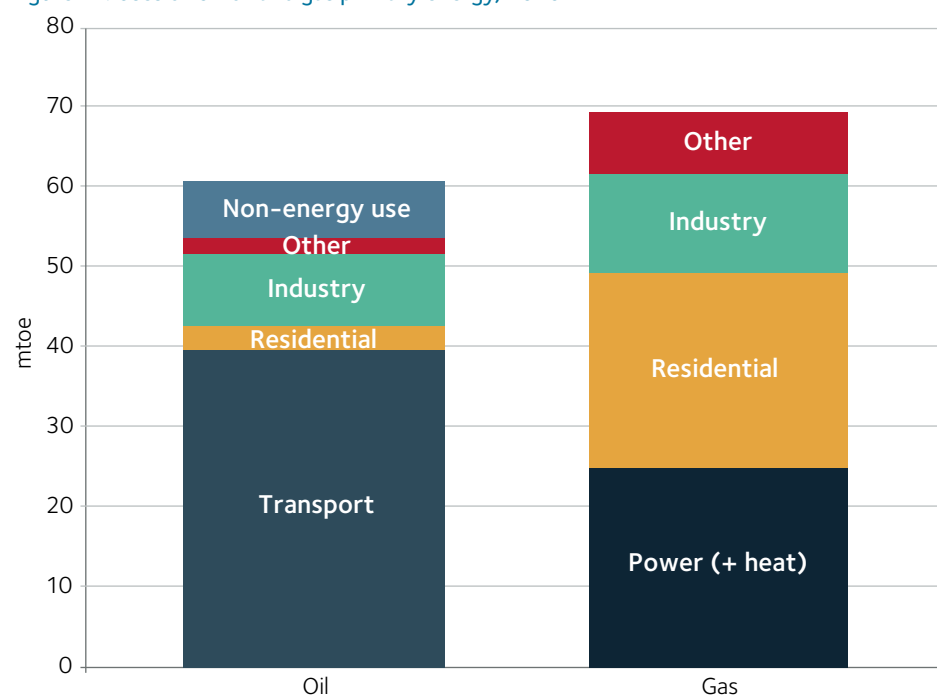
In Chapters 2 and 3, we found that development of new oil and gas fields is not consistent with the Paris goals. We recommend a managed phase-out of extraction from existing fields. This must be matched by a reduction in UK consumption of oil and gas, both to prevent greater dependence on imports,^y and also for the UK to do its part in reducing end-of-pipe emissions. As we saw in Chapter 3, almost all of the UK's present carbon dioxide emissions are from oil and gas, so reducing emissions means reducing use of oil and gas. In other words, the full UK energy system – from well to wheel – must go through a transition to clean energy.

UK use of oil and gas

Oil and gas currently account for 82% of the UK's energy consumption.²⁰⁸ Figure 17 shows how UK oil and gas are used, with transport, power generation and residential uses together accounting for around 70%. These three sectors should therefore be a key focus of decarbonisation efforts, for example by:

- Expanding, improving and incentivising use of public transport networks;
- Enabling electric vehicle take-up, while bringing forward the ban on sales of new

Figure 17: Uses of UK oil and gas primary energy, 2016



Source: IEA²¹⁰

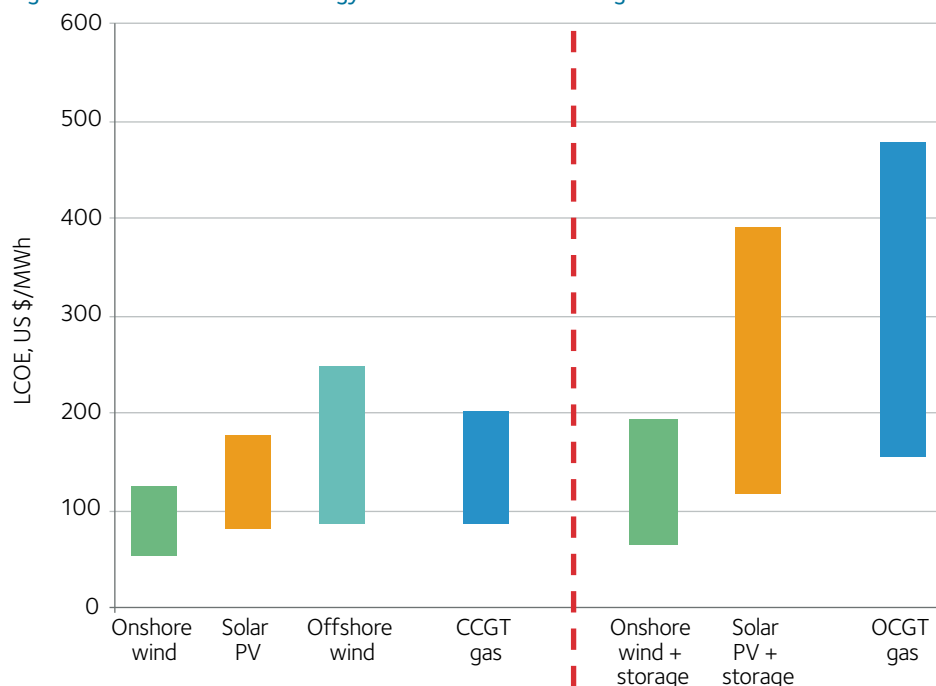
petrol cars from 2040 (UK) and 2032 (Scotland) to the 2020s;²⁰⁹

- Expanding wind and solar power generation to replace gas (as well as the remaining coal), combined with investment in energy storage, demand management and other grid technologies;
- Insulating homes to reduce their heating fuel requirements.

Clean energy is cheaper than oil and gas

The costs of clean energy technologies have fallen dramatically in recent years, to the extent that it is now cheaper in the UK to generate a unit of electricity using wind or solar than using gas (Figure 18). Similarly, while electric cars cost more to purchase than petrol or diesel, their fuel and maintenance costs are considerably lower; combining these on a *total cost of ownership* basis, electric cars are already cheaper in the UK.²¹¹ And with battery costs falling fast, Bloomberg New Energy Finance projects that purchase prices will reach cost parity by 2025, combined with much lower running costs.²¹² Not only is a rapid energy transition necessary, it is both possible and affordable.

^y The UK is a net importer of oil and gas, though it extracts more than it imports of both fuels.²⁰⁷



Source: Bloomberg New Energy Finance²¹³

In fact, as a result of falling costs, the right policies can ensure a transition to clean energy is a net economic benefit to consumers, taxpayers and workers. The greatest potential costs are in relation to fossil fuel companies who own high-carbon infrastructure such as oil platforms, pipelines or power stations; however presently these costs are being transferred to workers, taxpayers and energy users. But given that such companies unwisely invested in this infrastructure despite worsening climate change, and profited in the meantime, their future losses cannot justify a delay in the transition, nor are they worthy of a government bail-out.

The pace of transition – achievable with strong policy effort

We noted in Chapter 2 that as oil and gas fields are depleted, falling reservoir pressures lead to a decrease in extraction rates. Ceasing to develop new fields in the UK would lead to a 70% reduction in UK oil extraction by 2030 and an 80% reduction in gas extraction, compared to 2018 levels.²¹⁴ Replacing this domestic extraction without simply switching to imports requires concerted efforts, starting now, both to expand renewable energy and to reduce inefficient use of energy. These efforts will enable the UK economy to be largely decarbonised by the 2030s.

Both the government²¹⁵ and Oil & Gas UK (Box 4, page 25) have argued that continued

oil and gas extraction will be needed to meet energy demand. We have seen however that in IPCC scenarios leading to 1.5°C, global oil and gas consumption fall by 4.4% per year (page 19). In wealthy countries like the UK, the reduction in oil and gas consumption should be faster than this, according to the Paris Agreement principle of Common but Differentiated Responsibilities and Respective Capabilities. Conversely, a claim that more oil and gas than this is needed can only be based on an assumption that the Paris goals will not be met.

Advocates of the status quo also make an implied claim that a faster transition is not possible.²¹⁶ However, a growing body of literature disproves the claim that a fast transition is not possible. Three studies have shown how replacing oil and gas at the pace described in this report is technically achievable and affordable in the UK, using only technology that is already available:

- The Zero Carbon Britain project of the Centre for Alternative Technology has shown how the UK could achieve 100% renewable energy by 2030, by a combination of reducing energy demand through efficient technologies (“power down”) and replacing fossil fuels with renewable energy sources (“power up”).²¹⁷
- Mark Jacobson and colleagues at Stanford University have developed detailed roadmaps for how 139 countries (including the UK) could achieve 80% renewable energy by 2030 and 100%

by 2050, based on wind, wave and solar energies.²¹⁸

- A study by Vivid Economics, commissioned by WWF, has demonstrated a pathway to net-zero greenhouse gas emissions in the UK by 2045, including zero emissions from power, surface transport and buildings;²¹⁹ a companion report examines Scotland’s contribution.²²⁰

Others have shown how very high levels of renewable energy penetration can be achieved worldwide, for example:

- A detailed study by the University of Technology Sydney examines 100% renewable energy scenarios consistent with 1.5°C and 2°C of warming. In the OECD Europe region, renewables provide 74% of electricity by 2030 in the 1.5°C scenario, while oil use in transport falls to 16% of its 2015 level.²²¹
- Consultancy Ecofys (now Navigant) has published a technically feasible and socially/politically optimised scenario for the global energy system consistent with 1.5°C, even while demand for energy services such as transport and heating grows. In this scenario, by 2040 global oil use falls to less than 5% of its 2020 level and gas use to 28% of its 2020 level.²²²
- A scientific paper by Arnulf Grubler and colleagues, published in the journal *Nature Energy*, used least-cost integrated assessment models to plot a way to limit warming to 1.5°C and without relying on carbon capture and storage, by deploying social and technological innovations to maximise efficiency and reduce energy demand; it became one of the four illustrative pathways featured in the IPCC’s 2018 *Special Report on 1.5°C*.²²³ In this scenario, oil use falls 87% by 2050, and gas use 74%.²²⁴

We conclude from these studies that:

- **There is no technical or economic barrier to rapidly reducing oil and gas dependence. The barriers are political: a lack of courage by governments and obstruction by powerful vested interests in the fossil fuel industry.**²²⁵

Indeed, while oil companies claim that energy transitions necessarily take many decades,²²⁶ Benjamin Sovacool of Aarhus University has examined ten historical energy transitions at the national level, in both end-use and supply technologies, that took place within 10 to 20 years.²²⁷ What made many of these rapid transitions

^z Levelised cost of energy is a measure to allow cost comparison between energy sources with different capital intensities. It represents the average revenue per unit of electricity that would be needed to recover the costs of building and operating a generating plant over its lifetime.

possible was a concerted and coordinated effort by government in facilitating the transition. This was done through subsidies, establishing pilot programs, retraining workers and regulation. A clear example is France's strategic decision after the 1974 oil crisis to shift to nuclear energy, which grew from 8% of the electricity supply in 1974 to 70% by 1986.²²⁸ It is government action that determines speed.

What we have proposed here is certainly ambitious, but with sufficient government support is achievable.

HOW THE UK GOVERNMENT CREATED THE NORTH SEA OIL INDUSTRY

If there is any doubt about what can be achieved when a government sees a strategic interest in enabling an industry, one need look no further than the UK's development of oil and gas. From the first discovery of oil in 1969, the UK became an oil exporter within just twelve years, in 1981. By 1985, the UK was the world's fifth largest producer of oil, ahead of all OPEC nations except Saudi Arabia.²²⁹

In launching the first licensing round in 1964, the government's foremost objective was "to encourage the most rapid and thorough exploration and economic exploitation of petroleum resources".²³⁰ To this end, regulatory hurdles were swept out of the way, regardless of cost. For example, in 1965 the UK was so anxious to begin exploration that it hastily settled the question of how to divide the North Sea, in a manner generally recognised to have been highly favourable to Norway.²³¹

In that first round, the government granted rights to 394 blocks, covering about 40,000 square miles. A second round in 1965 added a further 127 blocks.²³² By the fourth round in 1971/72, the UK had licensed up to two thirds of the area considered to be prospective.²³² Companies were selected for licenses at the Minister's discretion, rather than by bidding offers of government revenue in an auction (as was common in the international oil industry). The government's reason was that it wanted companies to spend all their money on exploration rather

than on preparing bid packages, and worried that an auction process would slow down development.²³³

To entice companies and enable rapid development, the government offered highly attractive terms. In 1973 the Commons Public Accounts Committee warned that the fiscal terms were excessively generous, while newspapers talked of the "Great North Sea Giveaway".^{bb, 234} The American oil tycoon T Boone Pickens observed,

I couldn't help thinking about the great possibilities across the Atlantic, especially when I learned that 50,000-acre tracts were being given free to oil companies willing to explore them. To oilmen used to paying millions just for the privilege of drilling, that was a real incentive.²³⁵

After most of the supply work went to American rather than British firms in the early years, bodies were set up to expand the supply chain (the Offshore Supplies Office, OSO), train the workforce (the Offshore Petroleum Industry Training Board) and stimulate local investment (the North East Scotland Development Agency). The director of the OSO described the oil-related sector of the economy as on a "war footing". In the 1970s, when energy shortages led to industrial customers being supplied electricity only three days a week, the OSO listed factories supplying the oil sector, who would be the only ones to receive seven-day power.²³⁶

HOW THE UK GOVERNMENT SUSTAINS THE OIL INDUSTRY

Just as it was government policy that enabled the rapid growth of oil and gas extraction, it would be government policy too that would sustain it, long after it would otherwise have declined. After extraction first peaked in 1986, the UK Government provided a range of subsidies to stem and then reverse the decline.^{cc} However, government intervention during this period went far beyond economic incentives. From this point, UK Governments (of all stripes) would take a hands-on role in enabling the oil industry.

In 1992, the government "embarked on a joint programme of industrial reorganisation in the [UK Continental Shelf] that in its

scale is unique in modern British history," as Glasgow University's Charles Woolfson and colleagues put it.²³⁸ The Cost Reduction Initiative in the New Era (CRINE) sought to replace inter-company competition with collaboration among companies and throughout the supply chain, facilitated by the government. Through planning and coordination, the aim was to cut the industry's costs by 30% by enabling standardisation and economies of scale in the supply chain.²³⁹

In 1998, the government's role expanded, with the formation of the PILOT initiative.^{dd} As well as continuing the work of CRINE in coordinating the supply chain, PILOT enabled:^{ee 240}

- **Technology:** It established an Industry Technology Facilitator to identify technological needs, commission and coordinate research and oversee rollout of new technologies;
- **Skills:** It created an oil and gas academy to provide specialist training; it encouraged alignment of university courses with oil industry needs, and promoted oil careers to students;
- **Finance:** The Nova Fund provided private equity finance for innovative technologies in the oil and gas supply chain;
- **Infrastructure:** It facilitated negotiations to give companies' access to existing pipelines;
- **Stewardship:** It proactively reviewed the potential of each producing asset and worked with operators to maximise their long-term output;
- **Access:** It provided a channel for oil companies to communicate more directly with government to request regulatory and fiscal changes.

Building on these 20 years of very active industrial policy, in 2014 the government commissioned former oil services executive Ian Wood to review how to go further. The principal outcome was the foundation of a new body, the Oil & Gas Authority (OGA), to "regulate, influence and promote the UK oil and gas industry".²⁴¹ While having the normal functions of a regulator, including responsibility for issuing licenses, the OGA integrates the oil companies more closely into the body that regulates them. OGA and

aa As of April 2019, the UK is approaching completion of its 31st offshore Licensing Round. It plans to launch a 32nd round in mid-2019.

bb Following that controversy, Petroleum Revenue Tax was introduced, albeit at a lower rate than the industry had expected (45%, although later raised to 75%), and with significant allowances, including that companies would not have to pay the tax until they achieved an assured rate of profit.

cc From 1986, all exploration and development expenditure became offsettable for tax purposes against profits anywhere in the UK offshore, effectively making exploration and development almost free of charge, as the taxpayer would pay 83% of the costs. After Petroleum Revenue Tax was abolished for new fields developed after 1993, the government would receive *nothing* for depletion of the nation's resources in those fields beyond normal Corporation Tax, until the introduction of the Supplementary Charge in 2002 (see Chapter 4). Today, some oil executives call for a return to that no-tax situation.²³⁷

dd PILOT was initially called the Oil and Gas Industry Taskforce.

ee As well as these primary activities, PILOT set up organisations to address brownfields, communications, cooperation with Norway, decommissioning, economics, exports, new business, regulation and licensing, stimulating exploration, undeveloped discoveries, small company mentoring, safety and sustainable development.



Whitelee Wind Farm near Eaglesham, East Renfrewshire. ©Rachelalienergy / Pixabay

the oil companies' lobby group Oil & Gas UK jointly developed Vision 2035, aiming to boost UK 2035 extraction by 50% compared to baseline projections.²⁴²

The National Audit Office drily notes that "the OGA encourages operators to act in their own interest";²⁴³ however, both sides now have the option of the courts to enforce maximisation of extraction. Whereas the objective of maximising extraction has been established in statute since the Petroleum Act 1998,²⁴⁴ today the government and OGA are legally bound to deliver the objective of maximum extraction, and to follow their written strategy – including optimising exploration, development, stewardship and technology.²⁴⁵

On establishing a new Ministerial group on oil and gas in January 2016, then Energy Secretary Amber Rudd said:

The UK Government stands 100 per cent behind our oil and gas industry and the thousands of workers and families it supports. It's a fantastic industry which benefits Scotland and the whole of the

UK, but clearly the low oil price brings real challenges, and we're determined to do everything we can to take advantage of the UK's broad shoulders and help build a bridge to the future for UK oil and gas.²⁴⁶

In contrast to the government's fundamental support for oil and gas, an EY report in 2016 observed that its "non-committal, if not antagonistic, approach to energy policy continues to go against the grain of almost universal global support for renewables."²⁴⁷ Renewable projects often struggled to obtain planning permission and sudden changes to the fiscal regime "with little or no consultation with relevant businesses and industries" deterred investments²⁴⁸ – unlike the promises of "stability" and "certainty" for the oil industry.

In 2015, the government closed the Renewables Obligation to onshore wind one year earlier than had previously been announced, removed the Climate Change Levy (CCL) exemption for renewables, reduced Feed-In-Tariffs for small scale renewable generation, cancelled the Zero Carbon Homes policy due to come into force in 2016. Rudd explained in November 2015,

"We need to work towards a market where success is driven by your ability to compete in a market. Not by your ability to lobby Government."²⁴⁹ After UK investment in clean energy had consistently grown for a decade, it fell from US \$26 bn in 2015 to \$10 bn in 2017.²⁵⁰

CREATING THE CLIMATE JOBS: THE ROLE OF PUBLIC INVESTMENT AND OWNERSHIP

What could be achieved if the UK and Scottish Governments gave the scale of strategic support to building a clean energy industry, that they have given to the oil industry? We do not aim to set out a blueprint, but in the remainder of this chapter, we suggest some mechanisms that could help enable transition at the scale of ambition required through a leading role for the public sector, drawing in part on lessons of what has worked elsewhere. Achieving the best public good in the transition with the necessary speed will require significant state investment, planning, intervention and a hands-on industrial strategy.

Industrial strategy and national investment banks

Investment in clean energy systems in the UK and Scotland is currently far too low.²⁵¹ In part, this is because private investors are drawn to other, more profitable sectors (including publicly-supported fossil fuels). Targeted investment is needed. One way to enable such investment is through national investment banks for the UK and for Scotland.²⁵²

Where has this worked before? Denmark's wind power success story showcases the potential for public sector financing to kick-start a massive shift to renewables. As studies by Andrew Cumbers and others demonstrate, with a mandated 30% state investment in each windfarm between 1980 and 1990, the Danish government was able to give the industry the boost it needed to set up.²⁵³ Public bank KfW has underpinned Germany's energy decarbonisation efforts, with 15 bn Euro in co-financing renewable energy projects in 2015 and 2016 alone.²⁵⁴ More recently, in 2016 Canada has earmarked CAD 21.9 bn over 11 years for green infrastructure and clean energy, including through the Canadian Infrastructure Bank.²⁵⁵

Public ownership of Offshore Wind and Marine Renewables

Another option for ensuring sufficient investment is through public ownership. This is where national, regional or municipal government or other parts of the public sector have ownership of part of the relevant enterprises. Public ownership of renewables will make the roll-out of clean technology cheaper (due to lower borrowing rates) and faster (instalments driven by climate targets rather than maximising profit) and will facilitate reshoring jobs to the UK.²⁵⁶ Publicly-owned renewables companies can emphasise local employment and champion local manufacturing by using their procurement powers and role in shaping industrial practices to improve economic activity and labour standards. They can also help ensure compliance with Just Transition mandates across the energy system (Chapter 7).

Public ownership of energy systems has already been proposed as part of a solution to the current high levels of fuel poverty, high energy prices and dissatisfaction with the behaviours of the big energy suppliers. The Scottish Government has proposed plans to

create a publicly-owned energy company, but with little attention to decarbonisation and to the delivery of energy efficiency measures. Initial proposals are restricted to the retail end of the energy system, and place generation and transmission in a distant third phase of development. The Just Transition Partnership (page 53) argues that this would be a missed opportunity, as "The best option for competing commercially and driving energy transition involves generation and transmission as well as supply."²⁵⁷

Where has this worked before? Danish and German publicly-owned energy companies have successfully grown to become major international offshore wind investors. The largest offshore wind company in the world is publicly-owned Orsted from Denmark. Publicly-owned companies from other countries (such as Orsted, Vattenfall in Sweden and Munich's city energy company) already own over 50% of the UK's offshore wind installations.²⁵⁸ Denmark's policy of mandating windfarms to be part-owned by local co-operatives or residents' groups has ensured wide public support for building windfarms.²⁵⁹

Taiwan's publicly owned energy utility Taipower has underpinned Taiwan's rapid shift to offshore wind power with bold infrastructural investments, such as the region's biggest port for offshore wind operations at Taichung.²⁶⁰

Public support for innovation and early deployment of new technologies

The UK could benefit from leading the development of new clean energy technologies such as tidal stream and floating offshore wind turbine installations. Early adopters will benefit from export opportunities in the years and decades to come and benefit from a boost to manufacturing.

Through public control of intellectual property rights, the UK can help ensure that corporations cannot use intellectual property rights law to slow down innovation in order to capture profit.²⁶¹

Where has this worked before? Research by Kyle Smith at the University of Edinburgh shows how Denmark's early state support for windfarm manufacturers in the 1970s and 1980s gave Denmark's wind industry "first mover advantage" globally, including

over the UK.²⁶² The Offshore Renewable Energy Catapult points out that the UK could maximise first mover advantage – and therefore jobs – in tidal stream energy by adopting an approach similar to Denmark's early wind policy.²⁶³

Investing in ports

Investment in European port infrastructure is needed to host the growing wind industry,²⁶⁴ but UK ports have struggled to win contracts for offshore wind turbine deployment. In order to be able to compete for and win big wind turbine deployment contracts, ports may need upgrading before commercial commitment. By providing upfront infrastructure investment, the UK public sector could maximise the economic benefits of marine energy supply chains.

Where has this worked before? According to a report by BVG Associates for the Department for Business (BEIS), "Most UK ports are operated privately and make investment decisions on purely commercial factors. In contrast many Continental ports are in public ownership and their investment decisions can consider the wider local economic benefits of a project, as well as the direct port revenue. ... Speculative investment of public funds in Germany and Netherlands has enabled the establishment of facilities suitable for offshore wind."²⁶⁵

Local supply chain support

The UK can ensure it reaps maximum benefit from supply chain opportunities through a variety of policies: from hire-local and buy-local requirements to access subsidies, to other policy mechanisms to ensure jobs are located in areas most at need.

Where has this worked before? Taiwan assesses bids for new installations on local content proposed, while letting investing companies choose which local suppliers to work with. The Taiwan government mandated "fully localised" wind turbine towers for projects for construction in 2021, leading to commitments from Vestas,²⁶⁶ Swancore²⁶⁷ and others, and dozens of contracts for local manufacturers.

France has a different approach: companies bidding to install renewable energy generation have to demonstrate manufacturers' commitment to invest in and operate local factories,²⁶⁸ and investment in economically deprived regions is favoured.

42 This industrial planning led to commitments to build assembly facilities for nacelles (housing for electrical components) in Saint Nazaire and Le Havre, and blade plants at Cherbourg and Le Havre. One of these is already operational²⁶⁹ and others are expected to go ahead as construction on related windfarms begins.

Support for re-tooling supply chains

Many existing workplaces that participate in the oil industry can re-tool and thrive in clean industry sectors.

Some parts of the offshore oil supply chains are already perfectly equipped to take on supply contracts for offshore renewables: for instance, many specialised scaffolding companies already offer their services both to oil and gas and wind turbine installations.²⁷⁰ Others will find making the jump harder. In the west of Denmark, specialised construction companies that were used to fulfilling bespoke contracts for the oil industry have not been as successful in adapting to the standardised approach needed in for offshore wind contracts.²⁷¹

Research by Arup for Scottish Enterprise has indicated which potential clean sectors are most suitable as targets for diversification for the supply chain of the industry. Offshore wind²⁷² and decommissioning are straightforward matches for some of the capabilities and skills of the oil industry. For others, there are potential matches with geothermal and district heating infrastructure, with investment in water industry infrastructure and with the various elements of the new energy system which has to be created, eg storage, hydrogen, wave and tidal and nuclear decommissioning.²⁷³

Transition policy will need to consider how to match supply chain companies with opportunities and which sub-sectors will require extra investment to re-tool.

Where has this worked before? Research by Scottish Enterprise highlights a number of examples of successful diversification by oil and gas supply chain companies into offshore wind, for instance:

- Sembmarine Ltd went from building offshore oil rigs to offshore wind substations;
- Tekmar used its lifting and mechanical services expertise in the oil and gas sector to start work on subsea cables;
- Global Energy Group diversified from providing facilities services to oil industry to providing foundations for wind turbines.²⁷⁴

Another success story is the Spanish state-owned shipyard company Navantia. Navantia has been successful in moving from defence contracts to building infrastructure for the offshore wind industry – such as the Andalusia II offshore substation, constructed entirely in its Puerto Real shipyard and destined for deployment in the UK.²⁷⁵

Energy efficiency retrofits

There is widespread recognition that we require a transformation of the UK's housing stock to reduce energy consumption and greenhouse gas emissions. Making every UK home energy efficient could cut domestic heat demand by approximately one quarter. Making homes warmer, more liveable and energy efficient is a way to tackle climate change, tackle energy poverty and boost quality of life. A nationwide building upgrade programme was outlined by the Energy Bill Revolution, backed by GMB, Unite and The Cooperative group.²⁷⁶ A similar programme was outlined at the Labour Party's 2018 conference and in the expert briefing note published alongside.²⁷⁷ Such a programme would require a huge number of skilled energy assessors, engineers, electricians, technicians, trainers and ancillary workers, with jobs spread evenly across the country through the lifetime of the programme.

Where has this worked before? The UK's residential heating gas grid is the result of a similar programme. Following the discovery of oil and gas fields in the North Sea, the then publicly owned British Gas Corporation ran a 10-year conversion programme to switch the UK's entire heating network from coal-derived "town gas" to natural gas. Teams of installers inspected and where possible retrofitted every gas appliance in every home and (particularly later on in the 1970s) offered to switch homes from room heaters to central heating installation.²⁷⁸

RECOMMENDATIONS

The UK and Scottish Governments should initiate a concerted policy and fiscal effort to rapidly build the clean energy industry to at least the extent they have supported the oil industry, with the aim of meeting UK energy needs and creating decent employment. This should include enabling public sector participation, for example through national investment banks, ownership of renewable infrastructure and support for local supply chains. The governments should support major scaling-up of education and re-skilling to help workers succeed in new industries.

The UK, Scottish and local governments should:

- Set up public financing mechanisms – including national and regional investment banks – at sufficient scale to invest in industries crucial for the transition;
- Set up public energy companies – and enable existing ones – to develop renewable energy and energy efficiency projects;
- Support oil and gas supply chain companies to diversify to compatible sectors (offshore renewables, heating, water treatment among others);
- Upgrade ports to enable supply chains for large scale offshore renewables and decommissioning to develop;
- Initiate national energy efficiency retrofit programmes;
- Carry out a review of the energy system to identify which parts should be considered for public ownership as the best means of driving forward a just energy transition;
- Carry out a detailed assessment of the overlap and any gaps in skills required for clean energy sectors to allocate finance and support for re-skilling where most needed.

The Scottish Government should:

- Make driving forward a Just Transition a central purpose of the proposed publicly-owned energy company.

The Scottish Parliament should:

- Amend the Scottish National Investment Bank Bill to:
 - Ensure that the Bank includes funding for a Just Transition in its core objectives;
 - Ensure the Bank cannot lend to projects which support the development of fossil fuel extraction.

6. JOB CREATION IN THE TRANSITION TO A CLEAN ECONOMY

The previous chapter proposed a vision for a clean energy economy and outlined how investment and policy might enable it. This chapter examines the impact of transition on oil and gas jobs and the potential for new jobs in clean energy sectors and energy efficiency retrofits.

OIL AND GAS JOBS IMPACTED BY PHASE-OUT

In Chapters 2 and 3, we found that alignment with the Paris climate goals requires a managed phase-out of UK oil and gas extraction, and in particular an end to development of any new fields not already in operation or under construction.

This section analyses how many new jobs will need to be created in order to match the numbers of jobs potentially affected in the offshore industry as oil and gas extraction winds down. Where possible,

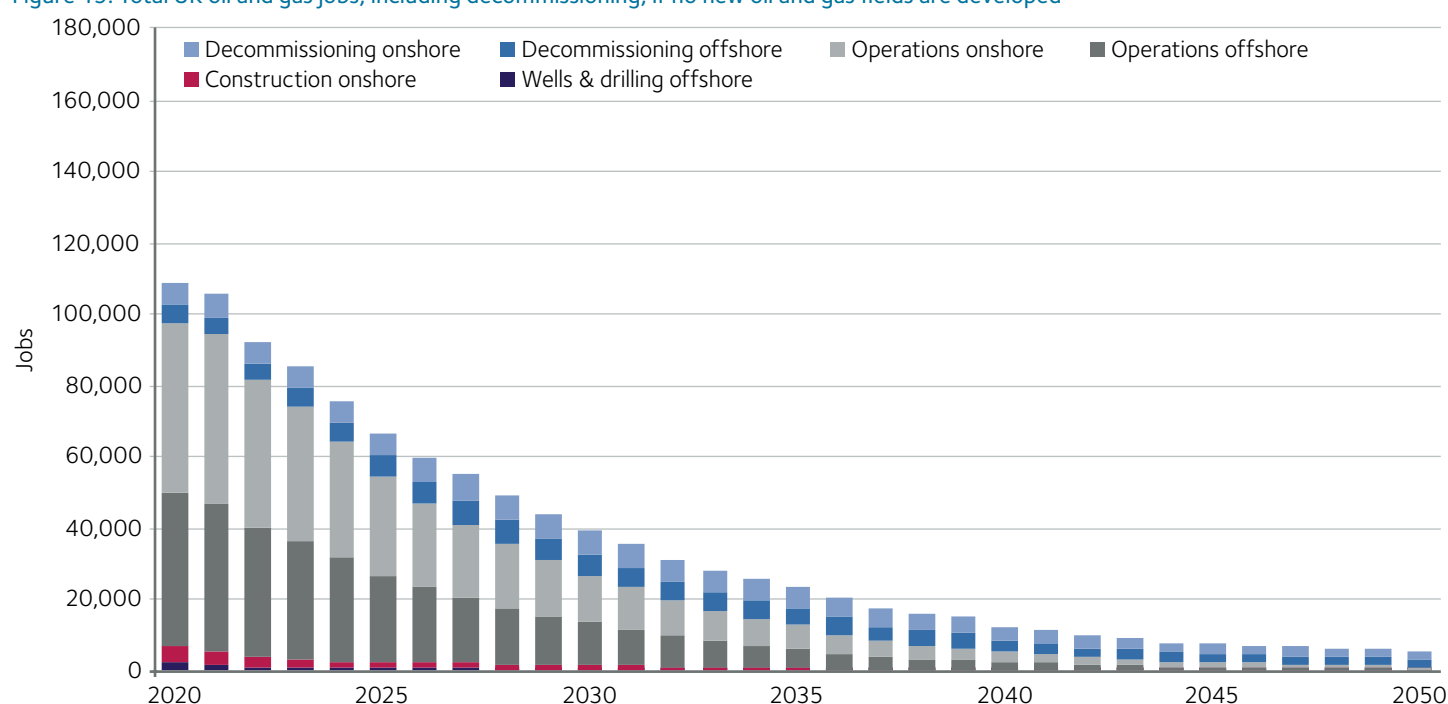
we have used Oil & Gas UK employment statistics on UK direct and domestic supply chain employment, as representing the higher end of the available estimates of job numbers. They are modelled into the future by correlation with future extraction volumes and expenditure projections for developed fields, from Rystad Energy's UCube database and model. The overall trajectory of jobs in oil and gas extraction, including direct employment and supply chain, is shown in Figure 19 below.

As shown in Figure 19, decommissioning is a potential growth area for oil and gas jobs. In the UK offshore there are over 250 fixed installations, over 250 subsea extraction systems, over 3,000 pipelines and approximately 3,650 wells, all of which must be decommissioned.²⁸⁰ Decommissioning relies on many of the same workers and skills that were required for oil and gas exploration

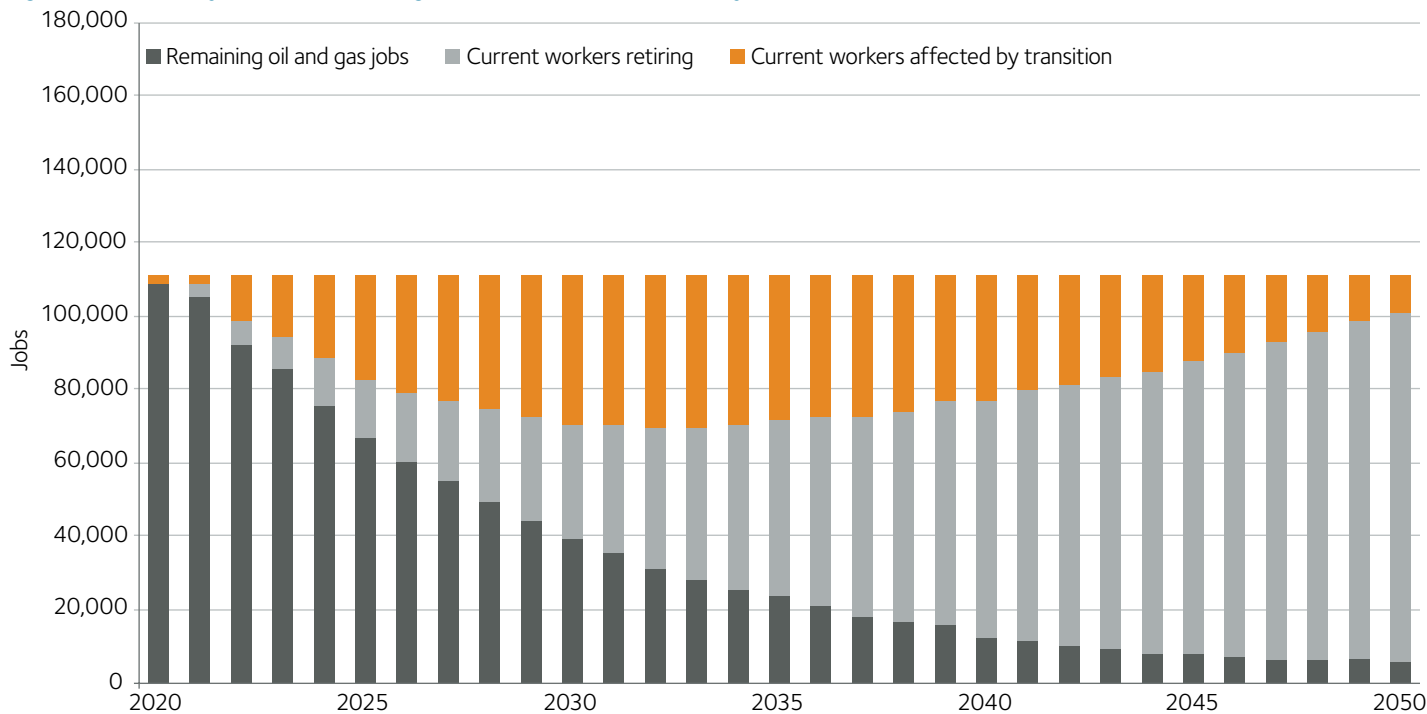
and extraction – from well plugging and abandonment, to cleaning and flushing of facilities and pipelines, offshore removals and onshore disposal.²⁸¹ Our forecast projects 12,000 decommissioning jobs in 2030 and 7,000 in 2040, given the right policies to locate these jobs in the UK.²⁸²

There is an ageing trend in the oil and gas workforce: offshore workers under 30 years of age make up just 19% of the total offshore workforce. According to Oil & Gas UK, the average age of offshore workers is 42.²⁸³ Naturally, new jobs will also be required for young people entering the job market, but in the sections that follow we distinguish between overall decrease in job numbers in a managed transition, and the specific requirement for replacement jobs, where the latter takes into account retirement.

Figure 19: Total UK oil and gas jobs, including decommissioning, if no new oil and gas fields are developed



Sources: Rystad UCube, Oil & Gas UK, EY, ONS, Platform analysis²⁷⁹



Sources: Rystad UCube, Oil & Gas UK, EY, ONS, Platform analysis. See Appendix 2 for methodology.

Figure 20 shows the numbers of existing oil and gas workers who may need to be offered an alternative job if the UK stops opening new oil and gas fields, and how the decrease in jobs during a managed transition is partially displaced by retirement.^{ff} This is likely to be a significant over-estimate, as many of the supply chain jobs will remain, with their employers shifting their customer base to sectors other than oil.

BOX 7: EMPLOYMENT IN OIL INDUSTRY CENTRES

Towns where oil industry jobs are concentrated face a particularly difficult challenge in the managing the transition of these jobs. Oil & Gas UK estimates that 39% of all jobs generated by the oil industry (including induced employment, ie that which results from the demand for goods and services created by the industry) are located in Scotland. According to the more detailed ONS dataset (which likely errs on the side of overestimating the concentration),²⁸⁴ 85% of all oil and gas extraction jobs are located in Aberdeen City and Aberdeenshire, and 96% in the top 10 counties together.

Offshore oil workers commonly alternate between three weeks at home and three weeks on shift at an oil platform.²⁸⁶ Many of them live in industry centres when off-shift, while others return to homes elsewhere in the country. Oil & Gas UK estimates that almost 50% of the offshore workforce reside in what are considered traditional oil and gas hubs: 28% in Aberdeen and Aberdeenshire, 15% in northeast England (Tyne and Teesside) and 5% live in Norfolk.²⁸⁷

This makes the economic effects of the decline of the oil industry a particularly acute problem for Aberdeen City and Aberdeenshire, where direct oil and gas jobs account for 11% and 5% of total jobs respectively, according to ONS data.²⁸⁸ Furthermore, the oil industry supports a significant share of local authority revenues through business rates and council tax, and underpins the wider economy. Aberdeen has consistently stayed in the UK's top 10 cities by average wage, dropping from second in 2014²⁸⁹ to ninth in 2018,²⁹⁰ while property prices have been rising faster than anywhere else in the UK, including London, since 2005.²⁹¹

The UK's painful history of forced coal mine closures in the 1980s is a stark warning of the dangers of rapid industry decline where no adequate transition measures and little support is put in place.

In Chapter 7, we shall explore how the regional dimension of transition can be addressed.

^{ff} Note that the actual number of workers likely to seek support in reemployment is likely to be less than this estimate due to regular flows of workers in and out of the industry.

Table 3: Top 10 counties by oil industry employment

County or borough name	0610: Extraction of crude petroleum	0620: Extraction of natural gas	0910: Support activities for petroleum and natural gas extraction	Total jobs
Aberdeen City	8,000	10	13,000	21,010
Aberdeenshire	700	0	5,000	5,700
Norfolk	700	5	225	930
Westminster	500	5	250	750
Hounslow	400	0	10	410
Hillingdon	400	0	0	400
Stockton-on-Tees	200	5	0	205
Nottinghamshire	20	20	150	190
City of Edinburgh	150	10	10	170
East Riding of Yorkshire	0	100	50	150

Source: ONS²⁸⁵

Table 4: Three scenarios – wind and marine renewable energy targets

Scenario:	Current Trajectory		Existing Ambitions		Fully Renewable	
	2030	2050	2030	2050	2030	2050
Offshore wind capacity (fixed)	32 GW	55 GW	45 GW	73 GW	45 GW	70 GW
Offshore wind capacity (floating)	0	0	0	20 GW	0	48 GW
Onshore wind capacity	18 GW	18 GW	23 GW	23 GW	23 GW	48 GW
Tidal stream and wave capacity	0	0	1 GW	12 GW	1 GW	23 GW

FORECAST OF POTENTIAL NEW CLEAN INDUSTRY JOBS

We now turn to the potential of expanded clean energy to create new jobs.

While sustainable reindustrialisation means creating jobs across a range of sectors (transport, agriculture, infrastructure and more), here we have chosen to model only three. Firstly wind power (offshore and onshore) and secondly marine renewables (wave and tidal) are the sectors offering the clearest compatibility for skills and resources existing in the offshore oil industry. Thirdly, energy efficiency retrofitting also provides some skills overlap (in construction and engineering). As noted in Chapter 5, power generation and residential heating are two of the three biggest uses of oil and gas (the third is transport, which is not modelled here). Trade union Unite's manufacturing strategy suggests these as appropriate expanding sectors for the oil and gas workforce to transition into as extraction declines.²⁹²

One of the biggest energy workers' unions, UNISON, advocates the use of hydrogen power as an important element of the phase-out of high-carbon energy and a Just Transition.²⁹³ As with green transport, we have not considered hydrogen jobs in this report, because of a limited skills overlap (it is more relevant to the gas distribution and installation workforce).²⁹⁴

We now model job numbers in these sectors for three scenarios to 2050 (with capacity targets shown above in Table 4):

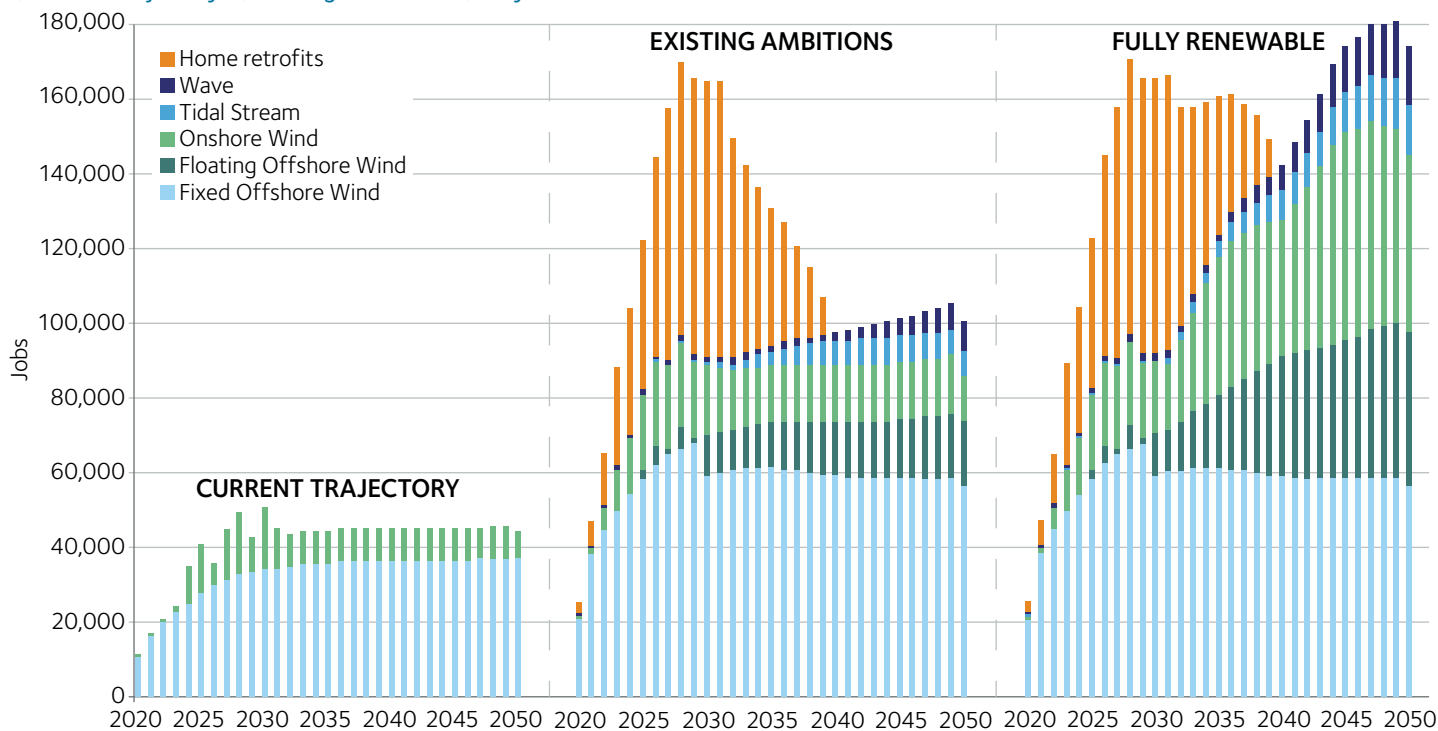
- **Current Trajectory scenario: little to no support for renewable energy.** Onshore and fixed offshore wind installations proceed at current rates; marine renewables installations do not go ahead due to lack of policy support; no additional jobs in home energy efficiency retrofits.
- **Existing Ambitions scenario: appropriate support to reach industry's stated ambition targets.** Onshore and fixed offshore wind installations proceed at rates currently considered ambitious by

industry; marine renewables and floating offshore wind proceed as modelled by Offshore Renewable Energy Catapult; the UK's homes are all retrofitted for energy efficiency over the next 20 years.

- **Fully Renewable scenario: renewable energy sufficient to replace phased out oil and gas by 2050.** All renewable energy sources expanded as proposed in Mark Jacobson et al. model (see Chapter 5) of an energy system reliant on 100% wind, wave and solar by 2050; a UK-wide energy efficiency programme retrofits every home in 20 years.

In this report, we advocate the full transition from fossil fuels to renewable energy before 2050, in line with climate goals. While there have been several proposals for how to do this (outlined in Chapter 5), our modelling here is based on Jacobson et al.'s scenario.

The resulting job creation is shown in Figure 21.



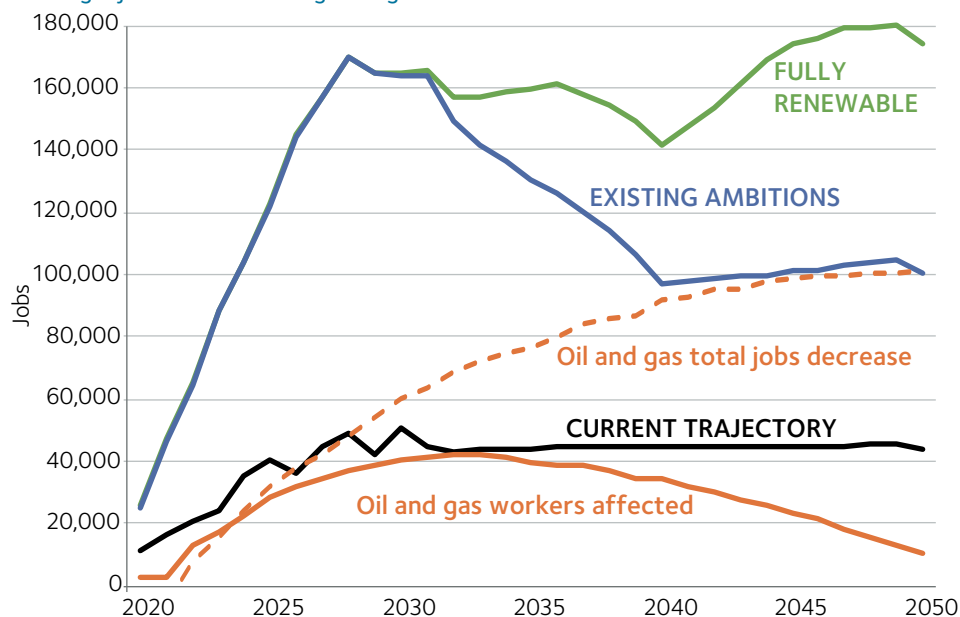
Sources: Modelling by Platform and Transition Economics. See Appendix 3 for methodology

We now compare this clean jobs potential both with the number of workers directly affected by a managed phase-out of oil and gas extraction (workers who no longer have jobs), and with the total decrease in oil jobs (including retirees). The three scenarios for new jobs are shown alongside oil and gas jobs needs in Figure 22.

Based on our estimates:

- In the Current Trajectory scenario, more new jobs are created in wind energy than the number of oil and gas workers affected by the transition, but new jobs do not replace the total decrease in oil and gas jobs (including retirees).
- In the Existing Ambitions scenario, new jobs exceed the number of workers affected by the transition by a factor of more than three. New jobs plateau at a level just above the overall decrease in oil and gas jobs.
- In the Fully Renewable scenario, new jobs exceed the number of workers affected by the transition by a factor of more than four, and exceed the overall jobs decrease by a factor of more than 1.5.

Figure 22: New jobs created in case-study clean industries vs. oil and gas jobs decrease during managed transition



Sources: Modelling by Platform and Transition Economics. See Appendix 3

Our estimates illustrate that the current policy landscape for renewable energy will not result in sufficient job creation to ensure a Just Transition for workers and communities dependent on oil and gas extraction; Nor will it meet the UK's energy needs as fossil fuel extraction declines.

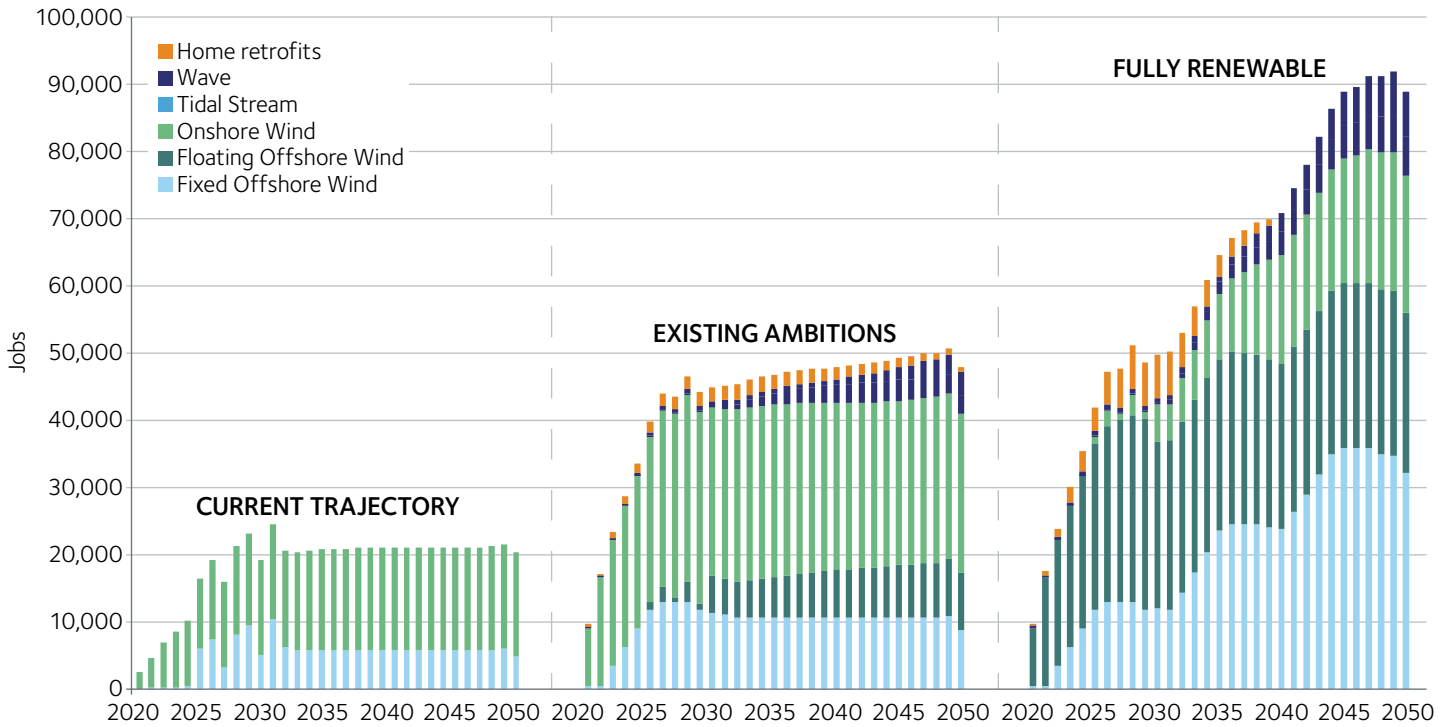
Meeting existing policy and industry ambitions can create 100,000 jobs long-term in just our case-study sectors. This is enough to replace the overall decrease in oil

and gas jobs during managed transition, or over thrice the number of jobs needed for current oil and gas workers affected by the energy transition (after deducting those who will retire during the period).

Achieving a fully renewable energy mix for the UK in line with a phase-out of fossil fuel extraction and use by 2050 as recommended elsewhere in this report would create up to a further 70,000 jobs in the 2040s.

Figure 23: Scotland's estimated share of new jobs in wind energy, marine renewables and energy efficiency retrofits in 3 scenarios

a) Current Trajectory, b) Existing Ambitions, c) Fully Renewable.



Sources: Modelling by Platform and Transition Economics. See Appendix 3

FUTURE JOBS IN SCOTLAND

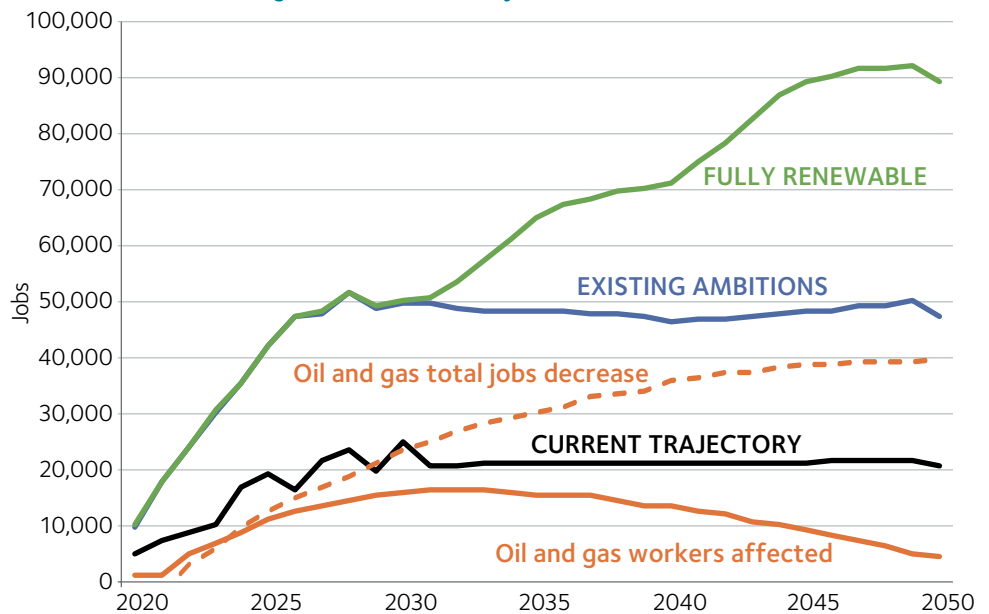
How well will employment generated by our case-study sectors replace oil and gas jobs located in Scotland?

There are fewer publicly accessible industry statistics on Scottish oil and gas employment (both Oil & Gas UK and EY only give regional proportions for their aggregate statistics and ONS data considers only a narrower part of the supply chain). This makes modelling challenging, but if 39% of oil and gas jobs are located in Scotland (the proportion of combined direct, indirect, export and "induced" jobs), these amount to approximately 42,000 currently, dropping down in our scenario to 19,000 by 2030 and to 3,000 by 2050.

What proportion of jobs in offshore wind, marine renewable energy and energy efficiency retrofits could be located in Scotland? Our findings are shown in Figure 23.

Again, we compare this potential with the affected jobs in oil and gas, as shown in Figure 24.

Figure 24: How Scotland's estimated new jobs in wind energy, marine renewables and energy efficiency retrofits compare to the oil and gas extraction industry jobs decrease, and to the number of current oil and gas workers affected by the transition



Sources: Modelling by Platform and Transition Economics. See Appendix 3

We see that:

- In the Current Trajectory scenario, new jobs in the case-study clean energy sectors do not replace the decrease in oil and gas jobs in Scotland;
- In the Existing Ambitions scenario, the case-study sectors create around 1.3 times as many new Scottish jobs as the overall decrease in oil and gas jobs;
- In the Fully Renewable scenario, the increase in Scottish jobs is even greater.

48 SKILLS OVERLAPS BETWEEN OIL AND GAS WORKFORCE AND NEW JOBS

While we have demonstrated that job numbers in just two key clean industries replace the number of oil and gas jobs affected by the transition, it is important to consider how compatible these new jobs will be to the skills profile of the existing oil and gas workforce. To analyse skills gaps and enable comprehensive planning for the transition, more detailed data would be needed on specific employment sub-sectors.

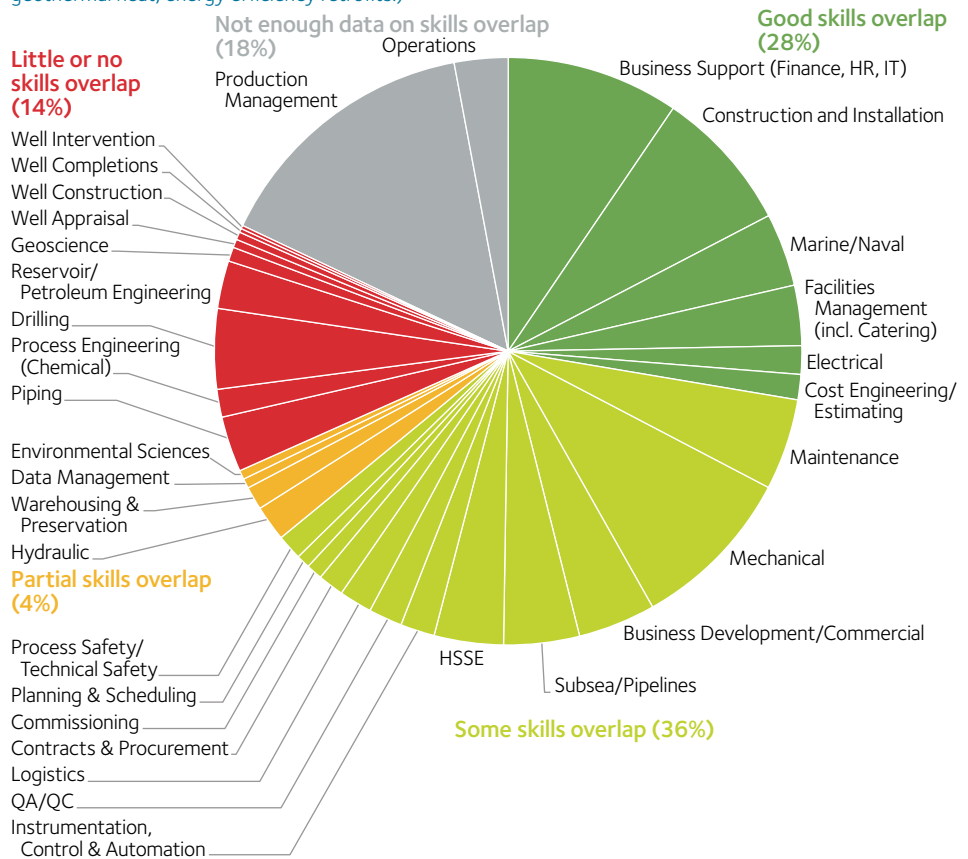
Figure 25 provides an initial sketch, as a starting point for considering these questions. Some common oil industry professions are applicable to a very broad range of other sectors: for example, business support (finance, HR and IT), business development, facilities management, contracts and procurement and data management. Other professions have direct applications in renewable energy installations: scaffolders and marine personnel already work interchangeably on oil and gas and wind installations in many cases. Subsea / pipeline personnel will have expertise applicable to subsea cable installations essential in offshore wind. A number of specialist construction supply companies are using their skills in offshore wind installations. Some other professions may not be readily adaptable to new sectors; these may be where the greatest efforts are needed in supporting workers' transition.

While these and many other skillsets required in the oil industry map well onto other industries, several challenges remain. The requirements, mindsets and processes of clean industries may be different and require adaptation and additional training. For instance, construction and engineering firms and personnel involved in the oil industry are commonly required to take on bespoke projects, while the offshore wind sector demands mass-produced parts and installations as part of its drive to lower costs. The oil and gas supply chain companies on the west coast of Denmark largely failed to make the adjustment to standardised installations and so missed out on offshore wind sector contracts.²⁹⁶

It is clear that specialised support will be needed to help some oil and gas workers and some oil and gas supply chain companies succeed in new industries. Energy Skills Scotland already works with employers and education institutions to offer appropriate training to broaden energy sector expertise, and the Scottish Government has set up a

Figure 25: Preliminary assessment of skills transferability: UK oil and gas industry to offshore renewables

(Note that other industries will match other parts of the skills profile, eg water treatment and management, geothermal heat, energy efficiency retrofits.)



£12 million Transition Training Fund to help energy sector workers gain skills.²⁹⁷ But for a wholesale transition away from oil and gas, this support will need to be scaled up massively (see Chapter 5). In order to design such a programme of support, more detailed data will be needed on the skills profile of the oil and gas sector, as well as on the requirements of clean sectors.

In this chapter, we have shown the considerable potential for employment in wind power, offshore renewables and home retrofits. However, if poorly managed, a transition to clean energy may lead to limited job creation in the UK.

Much of the jobs potential in clean energy lies in the supply chain, so the employment benefit depends heavily on domestic provision of the work. A recent study by the Scottish Trades Union Congress has found that much of the offshore wind development to date has been carried out by overseas companies, from across Europe and beyond, often at lower workplace standards than would be available for workers in Scotland.²⁹⁸

Furthermore, there are often needless barriers to workers moving from oil and

gas to offshore renewables. For example, the Global Wind Organisation, which sets international standards for the construction of wind power facilities, has been criticised by unions for creating a new set of safety training standards that are inconsistent with those in the oil and gas industry – such that highly qualified oil and gas workers may not be eligible to work in offshore wind. Meanwhile, pay and conditions in renewables are often unattractive, compared to the agreements negotiated in the oil and gas industry.²⁹⁹

To enable rapid growth of the renewables industry, and to enable oil and gas workers to benefit from the transition, governments will need to ensure a large proportion of the jobs go to workers who need them and who already have the skills needed. In Chapter 5, we recommended policies including buy-local requirements, investment in the supply chain and public ownership. Furthermore, the UK and Scottish Governments should remove barriers to transferability of the workforce, including in the design of new renewables developments and in using their influence in global bodies. The next chapter will propose ways to ensure the creation of decent jobs, with comparable terms and conditions.

CASE STUDY: BIFAB

BiFab, a Scottish company that “delivers major fabrication works from facilities in Scotland for the oil and gas, renewable and infrastructure industries,” is a clear example of a local company well positioned to enable its employees to shift from work in the carbon-intensive economy to renewables without sacrifice of wages and conditions, ie a Just Transition.

However, the company has struggled to benefit from the growth in renewable energy in Scotland, reaching a crisis point in November 2017 when it faced going into administration following a dispute with a contractor. Hundreds of workers marched on Holyrood to fight for the future of 1,400 jobs at yards in Fife and the Isle of Lewis, in the biggest ‘orange jacket’ demonstration seen in Scotland for many years.

Despite a £15m emergency loan and intervention to resolve the dispute from the Scottish Government, BiFab continues to face multiple hurdles in securing contracts. Until recently, all of its facilities have been mothballed and its 250-person permanent workforce laid off (plus some 1,100 workers employed indirectly).

While BiFab’s Arnish yard on the Isle of Lewis won a contract in March 2019 to manufacture supports for the Moray East 100-turbine offshore wind farm, securing 82 jobs and re-opening the yard, neither the Burntisland nor Leven yards in Fife won any work from either of the Moray East or Kincardine major offshore renewables projects.

In a joint statement GMB Scotland Secretary Gary Smith and Unite Scotland Secretary Pat Rafferty said:

Ten years ago, we were promised a ‘Saudi Arabia of Renewables’ but today we need political intervention to help level the playing field in Scottish offshore renewables manufacturing. The truth is that state-funded European energy and engineering firms, backed by Far East finance and Middle East sovereign wealth funds, are carving up thousands of jobs and billions of pounds from our renewables sector, and firms like BiFab are left fighting for scraps off our own table. That one hundred per cent of the manufacturing of the turbine jackets for Moray East and five platforms for Kincardine will be done in yards outside of Scotland is an absolute scandal.³⁰⁰

In this chapter, we have seen the potential for job growth during the transition to clean energy. However, the recent experience of BiFab demonstrates that energy transition is not necessarily a pathway to jobs: it depends how that transition is managed. In this case, the Scottish Government’s reactive interventions have not been sufficient to overcome the barriers, which result from wider UK industrial and energy policies that drive manufacturing (and profit) abroad. Indeed, this case shows that proactive industrial planning is necessary. In the next chapter, we explore some of the policies that may help ensure workers and communities benefit from the transition.

Battle for BiFab march, Edinburgh. ©petecannell2012 / Flickr Creative Commons



7. DELIVERING A JUST TRANSITION FOR THE WORKFORCE

In Chapter 6, we saw that with the right policies, new jobs in clean energy will substantially outnumber the jobs affected in a managed phase-out of oil and gas extraction. In this chapter, we examine what some of those policies might be. We focus on policies that protect the rights of affected workers, ensure decent jobs and enable a Just Transition in oil-dependent regions.

The cost and uncertainty created by the need for an energy transition should not be borne by the workers in affected industries. It is also important that the climate transition must not be used as a means for employers to undermine organised labour. “Green jobs” in themselves are not a panacea: planning for the transition needs to face the risks to workers head-on.

Furthermore, with unions being among the world’s most important progressive political forces, a Just Transition serves pragmatism as well as justice: without addressing the real concerns of workers and communities, the transition may simply not be politically possible. In Germany, the trade union movement has strongly opposed and sometimes effectively blocked the closure of the most polluting workplaces – coal power plants and mines – because these workplaces are strongly unionised (over 80% union members) and their 20,000 workers are well-protected. By contrast, jobs in renewable energy in Germany, while much more numerous (over 330,000), are not unionised.³⁰¹ Meanwhile, vested interests have too easily maligned climate action as an unjust assault on workers’ livelihoods; in the United States, for example, the efforts to implement climate policies were branded “a war on coal”.

This report aims to build common cause between advocates for climate justice and labour rights.

SAFEGUARDS AND POLICIES FOR A JUST TRANSITION FOR THE OIL AND GAS WORKFORCE

A Just Transition strategy for the oil and gas workforce will naturally need to be developed with input and leadership from workers and affected communities and guided by climate limits. Drawing on principles set out in existing research, trade union publications³⁰² and guidance from individual trade union officials, this chapter aims to contribute to that discussion by suggesting a set of safeguards and policies for protecting oil and gas workers’ rights and livelihoods. To illustrate how these safeguards could be applied in practice, we explore a number of solutions that have been successful elsewhere.

The concept of Just Transition originated within the trade union movement from those seeking to protect workers’ rights to work in response to necessary changes to protect the environment and people’s health. It is now seen as a vital aspect of addressing climate change and is incorporated into the Paris Agreement.³⁰³

The International Trade Union Confederation (ITUC) describes Just Transition as “a tool for a fast and fair shift to a low carbon and climate resilient society”. Following its inclusion within the UN framework the International Labour Organisation (ILO) published guidelines as the outcome of its tripartite (employer–union–government) considerations of the topic. The Trades Union Congress (TUC) passed a resolution in 2017 which called for “the establishment of a Just Transition strategy and practical steps needed to achieve this as integral to industrial strategy”. The TUC describes the five key principles of a Just Transition as:³⁰⁴

- **Consultation:** Consultation between representatives from trade unions, business, government and voluntary organisations, on the shift to a green,

low-carbon economy, from the workplace to national government.

- **Green and decent jobs:** Investing in the technologies and infrastructure to meet the sustainability challenges for a low-carbon, resource-efficient future while creating quality jobs.
- **Green skills:** Government-led investments in education/training and skills programmes, from the workplace to national levels, to equip students and the workforce with the skills for a low-carbon, resource-efficient economy. Promoting individual worker rights to training to ensure access for all workers.
- **Respect for labour & human rights:** Democratic decision-making and respect for human and labour rights are essential in order to ensure the fair representation of workers’ and communities’ interests. Strengthening worker information, consultation and participation rights to matters concerning sustainable development.
- **Social protection:** Strong and efficient social protection systems in the transition to a low-carbon economy.

In Autumn 2018 four major UK energy unions – Unite, Unison, GMB and Prospect – met and agreed what Just Transition means to them:³⁰⁵ a balanced low-carbon energy mix, investment in skills and infrastructure, protecting and creating high-quality jobs and employment and no community left behind.

Many communities in the UK have experienced large-scale industrial transformation as painful and imposed on them. It is important to not impose pathways upon communities but allow leadership from within. A study of coal industrial region transitions by researchers at Australian National University suggests that key to this is “providing a local and inclusive participation framework combined with top-down quality control as an alternative to previously more centralized policy and governance approaches.”³⁰⁶

An accountable transition

Based on existing literature and trade union policies, we suggest the following safeguards to make sure the transition is accountable:

- **Trade unions at the heart:** Trade unions and elected worker representatives should be actively involved in shaping and negotiating any employment transition. Decisions should not be limited to investors and national government.³⁰⁷
- **Accountable industrial governance:** New industries' governance structures are more accountable to workers, including via codetermination (trade unions and elected representatives on companies' boards).³⁰⁸
- **Local accountability:** Transition measures for communities where the oil and gas workforce is concentrated, like Aberdeen, Aberdeenshire and Yarmouth, should be locally accountable and ensure long-term investments to put their economies on a sustainable footing.³⁰⁹

Policies that could fulfil these safeguards:

Government can **negotiate the overall process of transitioning away from oil and gas extraction with trade unions and affected communities**, as well as specific phase-out timetables and field plans. For example, Germany's industrial transition of the Ruhr Valley, going from 390,000 coal jobs in the 1960s to 39,000 in the 2000s, has been praised for "a bottom-up approach, and the critical role of codetermination with equal voices for workers and employers at the table".³¹⁰

Accountability could be achieved in part through codetermination: worker representation on company boards, as legislated in Germany³¹¹ and recently proposed by Prime Minister Theresa May in the UK.³¹² Legislating to ensure **worker representation on boards of both private and public companies** involved in the transition would significantly increase their accountability to their workers, as shown by the German example. Ensuring a **significant role for the public sector** will also help guarantee accountability, as there is greater scope for worker representation in the governance of publicly controlled companies.

Regional plans and programmes must be designed with **accountability to and leadership from local governments and a range of local stakeholders**, within a timescale set by government and determined by the need to urgently meet emissions reduction targets. There are a range of US-based examples of Just Transition programmes driven from the ground up, such

as the Navajo community-led Black Mesa Just Transition Initiative that has a vision to develop solar installations at scale in place of an existing major coal mine, but also works with local communities to improve food security and support existing Navajo wool producers in the area.³¹³

Decent jobs

In the previous chapter, we showed that potential new clean jobs substantially outweigh oil and gas jobs; however, the issue is not just about numbers of jobs, but also their quality.

According to the ILO, "The job-creating potential of environmental sustainability is not a given: the right policies are needed to promote green industries while ensuring decent work within them."³¹⁴ Without strong policy guidance and grassroots pressure, shifts from fossil fuels to renewable energy can lead to more precarious jobs and painful jolts to communities, especially in a context where subcontracting regimes, regional inequalities and tax regimes exacerbate these. "Green jobs" in themselves are not a panacea: planning for the transition needs to face the risks to workers head-on.

The offshore wind industry has been hesitant to support unionisation of workers,³¹⁵ with trade union members in the sector worried that raising issues threatens their job security.³¹⁶ The dispersed nature of much employment makes membership drives challenging. Worker crews brought in to build one of the UK's largest offshore windfarm projects were being paid less than £5 an hour – under minimum wage – due to a legal loophole that allows offshore installations to bypass UK labour legislation.³¹⁷

Green Jobs must be decent jobs. In ILO's definition, decent work "is productive and delivers a fair income; provides security in the workplace and social protection for workers and their families; offers prospects for personal development and encourages social integration; gives people the freedom to express their concerns, to organize and to participate in decisions that affect their lives; and guarantees equal opportunities and equal treatment for all".³¹⁸

We suggest the following safeguards to ensure decent jobs:

- **Job security:** Energy workers whose jobs are disappearing are offered equivalent jobs on at least equivalent terms and conditions and permanent contracts.
- **Workers do not bear the costs of transition:** Worker support to include free

access to and paid time off for education, fully paid-for relocation or retraining where necessary, wages protected for five or more years where a matching salary cannot be secured (funded by industry and/or government); protecting existing members' pensions and guaranteeing pensions for affected workers who do not already have them.

- **Trade union rights for workers affected by energy transitions,** including union recognition in workplaces and sectoral bargaining and agreements.

Policies that could fulfil these safeguards:

At the national, regional and local level, **the public sector will need to take an active role in developing clean sectors** including renewable energy, energy efficiency retrofitting, smart water management and others (see Chapter 5). Outcomes will be strengthened by giving public sector bodies involved a statutory duty to deliver a Just Transition and to offer oil and gas workers opportunities for new employment.

A Just Transition Framework created by government, with trade union participation, should lead to an industry-wide agreement with employers regarding redeployment, job matching and upskilling. It will be reasonable in most cases to expect the industry to contribute alongside the public training system to retraining and upskilling, as and when it is required for the smooth transition of individuals or groups of workers to changed or new employment. Social protections should be negotiated as part of this package; these include unemployment benefits, income guarantees, early retirement packages and relocation packages.

Ensuring existing workers' access to new jobs is a challenge. One pathway to this could be public sector specialised skills agencies (such as Skills Development Scotland) that **match individual workers with new appropriate work**, providing tailored support packages to make the transition smooth. **As well as individual training support, the skills agencies would catalyse training programmes** where they are needed, working with public and private companies in sectors such as the renewable sector and energy efficiency. In Latrobe Valley, Australia, a newly established skills agency matches workers from a closing coal power plant with employment elsewhere in the energy sector.³¹⁹ In Portugal, a national skills agency established in 2007 maintains dialogue with employers and trade unions to anticipate training needs.³²⁰ In Belgium, construction workers' trade unions and employers have

52 collaborated to produce recommendations on skills development programmes needed to enable workers to take up energy efficiency retrofit jobs, and the government is funding the resulting programmes.³²¹

Currently, stable employment and better conditions in renewable energy industries are in manufacturing (eg Siemens' manufacturing plant in Hull provides over 700 stable jobs),³²² so helping establish UK supply chains for renewable energy industries will be crucial to creating decent jobs. Government could legislate **local content requirements** (stipulating a minimum share of the supply chain be local) as a condition for a supportive environment for offshore and marine renewables, drawing on examples such as Taiwan's stringent local content requirements for new offshore windfarms and France's preference for investment into economically deprived regions from windfarm manufacturers (see Chapter 5).

UK labour rights **protection regulations should be extended to apply beyond their current 12 nautical miles limit** to cover

all workers employed offshore, as has been done in Norway. Protections such as the National Minimum Wage and the Equality Act 2010 should apply to vessels operating in UK waters.³²³

Where relocation is necessary, it should be fully paid for by industry / government and shaped by individual workers affected. Where replacement work is not available locally and workers choose not to transfer, they should be supported in finding alternative work within their community. Wages should be protected where a new job cannot begin before an old job ends, or where the starting salary in a new position is lower than that in high-carbon industry, funded by government and/or industry.

Some jobs will be created in and around industry centres, though they are likely to be more evenly distributed around Scotland's coastline than oil and gas jobs. Other workers among the affected workforce will prefer to take up a comparable job on equivalent conditions elsewhere. Oil & Gas UK data show that just over half of the offshore workers

who live in the UK reside in places outside the traditional oil and gas hubs (Aberdeen and Aberdeenshire, Norfolk and Tyne and Wear).³²⁴ There is currently no published statistical data on employee preferences between these options. Such data, alongside input from trade unions, individual workers and local democratic institutions, will need to form an integral part of Just Transition strategies and policies.

Employers within the energy sector and other clean industries should pro-actively **recognise and encourage union membership** amongst all direct employees; use procurement mechanisms to **ensure decent employment in the supply chain** (as has been done at Hinkley C nuclear power station)³²⁵; and participate in **sectoral bargaining** on employment conditions (as is established practice in Italy,³²⁶ Germany and Norway)³²⁷. Government needs to identify levers to ensure employers do this.

Engineer on boat at offshore windfarm, Lincolnshire. ©Cultura Creative (RF) / Alamy Stock Photo



It's time for a Just Transition in Scotland, moving to a modern low-carbon economy in ways which protect workers' livelihoods, create a new industrial base and deliver a fairer Scotland. The need for action is urgent in order to avert the environmental and economic costs of climate change and to rebalance the economy to one which provides enough decent jobs making things in clean ways.

*Just Transition Partnership Joint Statement
on Just Transition, December 2016³²⁸*

Scotland's Just Transition Partnership was formed by Friends of the Earth Scotland and the Scottish Trades Union Congress (STUC) in October 2016, in response to the loss of jobs due to the fall in oil price, combined with the signing of the Paris Agreement. The Partnership also includes Unite Scotland, UNISON Scotland, UCU Scotland, CWU Scotland, PCS Scotland and WWF Scotland. Since then it has been working to embed the argument for a Just Transition in the debate about climate change in Scotland and developing concrete proposals for how this should be implemented.

For the Partnership, a Just Transition means moving to a modern low-carbon economy in a way which protects workers' livelihoods, creates a new industrial base and delivers a fairer Scotland. It is calling for climate change obligations to be used as the basis of a new industrial policy in order to enable Scotland to reap the full economic benefits of the move to a low-carbon economy. Such intervention is necessary, it argues, because despite a significant shift to electricity generation from renewables over the previous 20 years, projected jobs growth has not been realised. Rather, under the UK and Scotland's present model of energy policy and economic development, manufacturing jobs have grown in other countries where turbines are made and operating profits accrued to multinational energy companies which dominate the electricity markets.

The Partnership believes that a Just Transition must be guided by the following:

- Employee, unions and community participation in the preparation of plans for the transition;
- Employment levels must be maintained and livelihoods protected;
- Affected communities and regions will be supported through the transition;
- Training and re-training will be funded;
- Measures to tackle disadvantage in the labour market will be included;
- Options for public and community ownership or partial stakes in flagship projects and enterprises will be pursued.³²⁹

Shortly after its formation, the Just Transition Partnership called for a Just Transition Commission to advise government. The Scottish Government established a Just Transition Commission in January 2019 and tasked it with a two-year remit to advise on the implementation of Just Transition principles, and provide practical, affordable recommendations for action to:³³⁰

- Maximise the economic and social opportunities that the move to a carbon-neutral economy by 2050 offers;
- Build on Scotland's existing strengths and assets;
- Understand and mitigate risks that could arise in relation to regional cohesion, equalities, poverty (including fuel poverty) and a sustainable and inclusive labour market.

Welcoming the appointment of Professor Jim Skea as its Chair in September 2018, Dave Moxham of the STUC, who has also been appointed to the Commission, said:³³¹

Scotland's trade unions are clear that tackling climate change is a moral imperative and Scotland must play its part in reducing emissions. However, meeting targets must ensure a just transition for the workforce and communities which currently extract or depend on the use of fossil fuels. The Chair will have an important role in developing a Commission which must involve workers and trade unions in the development of a proper industrial strategy, reducing emissions while creating new, good quality jobs and benefiting communities across Scotland.

Supported by some Members of the Scottish Parliament, the Just Transition Partnership is now calling for the Just Transition principles and the Commission to be enshrined in the new Climate Change Bill as well as in the remits of the proposed Scottish National Investment Bank and publicly-owned energy company.

54 OIL-DEPENDENT REGIONS NEED REGIONAL JUST TRANSITION STRATEGIES

The oil industry's centres, especially Aberdeen and Aberdeenshire, face a particular challenge in a rapid managed transition of oil and gas industries.

According to statistics collected by Aberdeen City Council's Economic Advisory Board, the Gross Value Added (GVA) of the energy sector in the North East of Scotland was £7.6 bn in 2016, which was down from £17 bn in 2013. GVA per worker in 2016 in the energy sector in Aberdeen was £229,807 – more than twice the GVA per worker in the Life Sciences sector and more than four times the GVA per worker in the Creative Industries.³³²

As outlined above, the transition will affect not only numbers of available jobs but the whole economy, including property prices and local authority income through business rates.

Spurred by the short-term downturn in oil prices and the city's medium-term dependency on the oil industry, local and Scottish authorities and business development associations like Opportunity North East have already conducted some planning and investment into diversification. Aberdeen City Council is considering its economic strategy on the basis of a projected decline of oil extraction rates to 350,000 boe/day by around 2050.³³³ But this is far from enough to meet the Paris climate targets, as outlined in Chapters 2 and 3: our modelling of the 'no new development' scenario sees extraction rates fall further to 17,000 boe/day by 2050.

In order to diversify away from the oil industry, Aberdeen City Council has produced detailed economic assessments and already invested in infrastructural improvements and hubs for biotechnology and cultural industries.

The success of these measures is evident in employment statistics. Aberdeen and Aberdeenshire's overall employment rate dipped to 70% and 78% respectively in 2016 following the 2014 drop in oil prices. After this, the oil industry continued slashing jobs – while Aberdeen's employment rate went back up to 76% and 81% respectively.³³⁴

However, the challenge to diversify remains huge. This is in part due to industrial clustering and the fact that the oil industry spends, and generates, comparatively high amounts of money per worker. High property

prices, service costs and business rates can make it hard for other industries to start up or to match the oil industry's contribution. Aberdeen's economy is second highest in UK after London for GVA per job filled. In the words of the Aberdeen Economic Policy Panel Report:

If the Aberdeen economy is to diversify successfully in the long-term, in a way that supports productivity improvements and economic growth, then it will be critical that new activity in the clean sectors and/or other sectors is focused on high value-added activity. This is particularly vital to diversify away from a sector like oil and gas, which is very high value added and underpins the high productivity of the economy.³³⁵

To meet the need for investment in oil- and gas-dependent regions, the UK and Scottish Governments could develop targeted **community development investment programmes** backed by national funds in each region most impacted by the phase-out of oil and gas drilling (in this case, Aberdeen and Aberdeenshire, Norfolk, Tyne and Wear, Shetland). Designing such programmes could draw on the experience of North Rhine-Westphalia in Germany, where the federal government committed funds to establishing research centres and better transport infrastructure to attract technology-intensive industries into a region previously dependent on coal.³³⁶ Investment programme budget should be locked in over the long term. This happened for example in Limburg, Netherlands, where EU structural investment funds were allocated for a period of 25 years to help transition away from coal.³³⁷

A regional transition strategy needs to consider how to develop Aberdeen and Aberdeenshire's economy in the context of a rapid managed phase-out of oil and gas extraction. Based on existing research into Aberdeen's economy and past experiences of transitions, the strategy may involve the following elements:

- **Use existing strengths: re-tool the supply chain:** According to an assessment carried out by Arup for Scottish Enterprise,³³⁸ Scottish oil and gas supply chain companies are already well prepared to take on some parts of new sectors including Heat networks, Geothermal heat, Water treatment (municipal and industrial) and Smart water management.
- **Build regional innovation hubs:** Aberdeen has already successfully established itself as a new hub for biotechnology. A city council and ONE-

backed £40 m Bio-Therapeutic Hub for Innovation is planned for opening in 2020,³³⁹ as part of an effort to grow the sector in Aberdeen to £8 bn annual turnover in 2025. Other low-carbon industries could form the basis of more innovation hubs.

- **Improve logistics and connectedness:** Aberdeen City Council has already planned rail improvements, as well as making Aberdeen Scotland's "first gigabit city".³⁴⁰ Elsewhere, ultra-fast internet networks have helped remote cities like Chattanooga, Tennessee, attract investment and new workplaces.³⁴¹ However the climate (and social) impacts of proposed new infrastructure also have to be evaluated (eg, road improvements – A96 dualling in Aberdeen – and rail improvements such as the HS2 project).
- **Support skills:** The experiences of past coal industry hubs in Germany show that support for education and research centres can play a crucial part in kick-starting new industry. New universities in Bochum, Dortmund and Dusseldorf in the 1960s and a series of other cities in the 1970s helped these cities offer an attractive home for tech and service industries.³⁴² Unlike the Ruhr valley of the 1960s, Aberdeen is already home to concentrated high-tech industry, but the point of supporting skills and expertise development still stands. In the words of the Aberdeen Economic Policy Panel: "Any further barriers to innovation in the regional economy should be identified and addressed for businesses across all sectors, considering such issues as availability of key skills and finance, the spread of knowledge and technology within the local economy, how businesses learn from global best practice in leading international businesses and maximising the opportunities for knowledge transfer."³⁴³
- **Reinvest locally and support businesses to do the same:** Based on studying diversification efforts in 10 case studies across the US, the Appalachian Regional Commission identifies the local reinvestment of wealth as key to diversifying local economies. Among the means to achieve this, the Commission suggests "connecting local demand for goods and services with local suppliers to increase the amount of money recycled within the community".³⁴⁴ In the UK, the Centre for Local Economic Strategies has been developing approaches that local government can use to encourage wealth circulation locally, including through commissioning and procurement.³⁴⁵

To finance its diversification strategy so far, Aberdeen City Council has issued index-linked bonds on debt capital markets, raising £370 million.³⁴⁶ While it is outside the scope of this report to develop or comprehensively cost such a regional transition strategy, it is clear that a far larger community investment programme will be needed, with participation from UK and/or Scottish Government.

RECOMMENDATIONS

The UK and Scottish Governments should develop and implement robust Just Transition Plans, guided by climate limits, for the workforce and communities dependent on the oil industry. These should be accountable to trade unions and local stakeholders and guarantee safeguards to protect workers' rights and livelihoods. Plans and policies should be regionally specific and should include targeted, long-term investment to manage transition for the wider community in oil industry centres.

The UK and Scottish Governments should:

- Use licencing, permitting, or financing conditions to ensure designs of new offshore renewable installations contain no barriers to transferability of oil and gas workers, and advocate for harmonisation of international renewables standards (for example, the Global Wind Organisation) with those in oil and gas.
- Prepare Just Transition Plans for oil and gas with the participation of trade unions and representatives of affected communities, including the following safeguards:
 - ① Accountability to worker representatives and affected communities;
 - ② Where jobs are lost, new ones created with equivalent terms and conditions and permanent contracts;
 - ③ Support for the transitioning workforce, including free access to and paid time off for education, fully paid-for voluntary relocation or retraining where necessary, pension protection, and wage protection for 5 years where matching salaries cannot be secured.
 - ④ Trade union rights for workers affected by energy transitions, including union recognition in workplaces and sectoral bargaining;

- Create regional policies and long-term investment programmes for oil industry centres, particularly Aberdeen and Aberdeenshire.

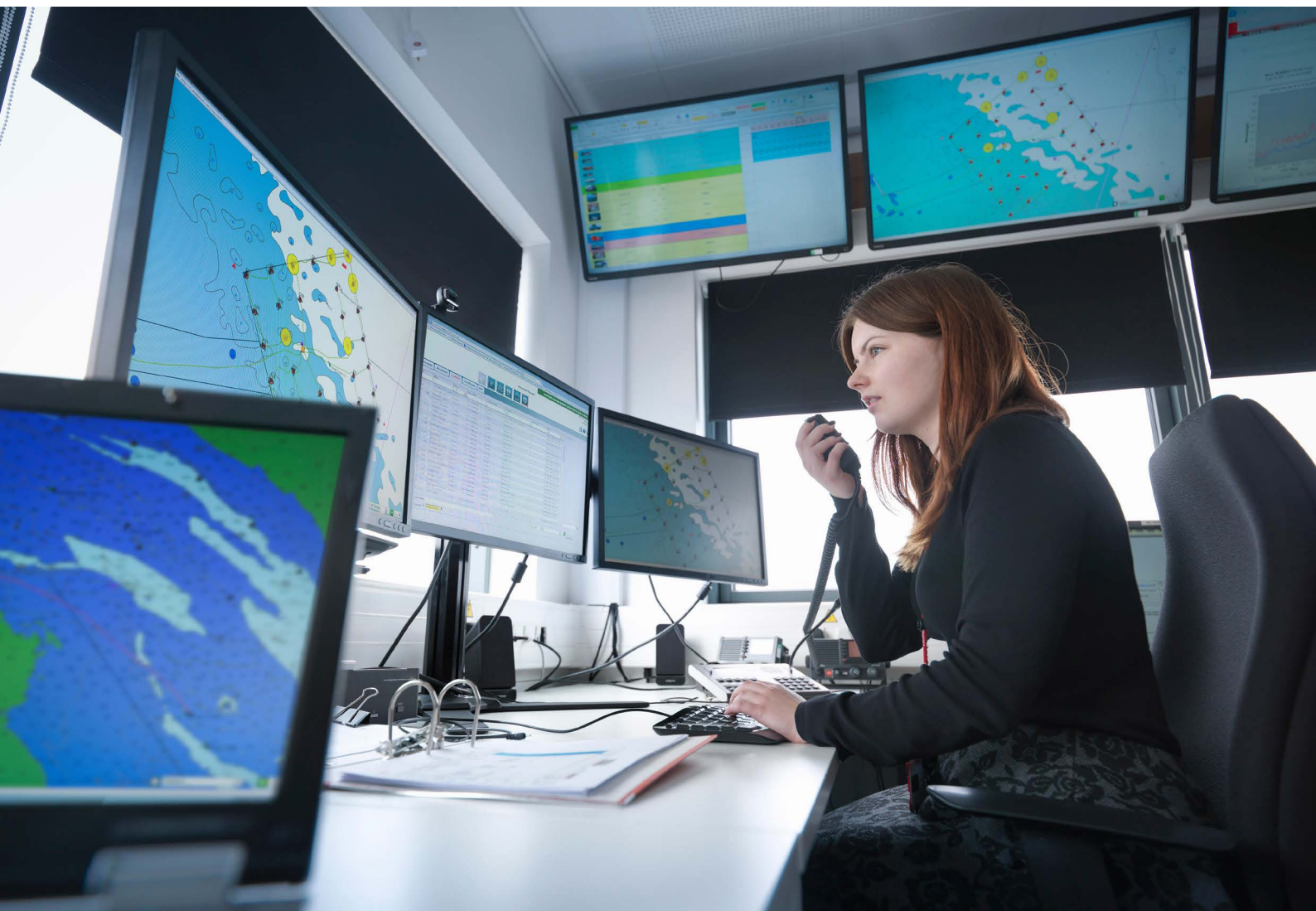
The UK Parliament should:

- Legislate to require companies to pay at least minimum wage to all workers on the whole UK Continental Shelf, whether in oil production, decommissioning or renewables.

The Scottish Parliament should:

- Amend the Climate Change Bill to:
 - ① Put the Just Transition Commission on a statutory basis, for the duration of the emissions reduction targets laid out in the Bill;
 - ② Include a commitment that a Just Transition approach will be applied to achieving climate targets;
 - ③ Include reporting requirements on Just Transition in the Climate Change Plan, ie on how proposals and policies will affect employment in different sectors, what measures will be put in place to support the transition of the workforce and related communities, the scale and sources of investment; and annually by Ministers on progress towards these.

Operator in offshore windfarm control room, Lincolnshire. ©Cultura Creative (RF) / Alamy Stock Photo



8. RECOMMENDATIONS

In this chapter, we collate the detailed recommendations from the previous chapters.

ALIGN OIL AND GAS POLICY WITH THE PARIS GOALS

The UK and Scottish Governments must align policies on fossil fuel extraction with their commitment to global climate goals. This means cancelling the current and any future licensing rounds, stopping issuing permits for new fossil fuel exploration and development and revoking undeveloped licenses. Furthermore, the governments should review whether existing facilities should be phased out early as part of a Just Transition that protects the rights and livelihoods of workers and communities that currently depend on the industry.

THE UK GOVERNMENT SHOULD:

- Cancel the 31st offshore oil and gas licensing round and any future planned onshore or offshore rounds;
- Revoke all existing oil and gas licenses on which no work has yet been carried out, and negotiate the cancellation of all other licenses which have not yet been developed;
- Conduct a review of how fast existing oil and gas extraction facilities need to be phased down in order to limit warming to 1.5°C, bearing in mind the UK's greater capacity to finance a Just Transition relative to other countries, and taking a precautionary approach to unproven "negative emissions" technologies;
- Publish a plan for a managed phase-out of UK fossil fuel extraction and Just Transition in line with the Paris goals.

THE UK PARLIAMENT SHOULD:

- Pass legislation banning future licensing of all offshore fossil fuel exploration and development, and onshore exploration and development in England;
- Amend the Petroleum Act 1998 and the Infrastructure Act 2015 to remove the duty to "maximise economic recovery" and replace it with a duty to align fossil fuel extraction with the UK's fair share of delivering the Paris goals.

THE SCOTTISH GOVERNMENT SHOULD:

- Revise its Energy Strategy and align policies on fossil fuel extraction with its fair share of delivering the Paris goals.

THE DEVOLVED ASSEMBLIES AND PARLIAMENT SHOULD:

- Pass legislation banning future licensing of all onshore fossil fuel exploration and development.

END SUBSIDIES FOR OIL AND GAS EXTRACTION

The UK should remove all subsidies for oil and gas extraction, including tax breaks, and redirect them toward funding a Just Transition. Furthermore, Decommissioning Relief Deeds should be cancelled. Companies should pay decommissioning costs, with decommissioning plans required to ensure a Just Transition for workers.

THE UK GOVERNMENT SHOULD:

- In the next Budget, terminate all subsidies for oil and gas extraction (according to the internationally-agreed WTO definition of subsidies), including tax breaks;
- Redirect at least the same amount of funding to stimulate rapid development of renewable energy sources at a pace which will ensure sufficient energy supply;
- In the next Budget, introduce a new fiscal approach to the decommissioning of oil and gas infrastructure, which ensures that companies pay the costs;
- Participate genuinely and constructively in the G20 peer review process for fossil fuel subsidies;
- Require that companies include Just Transition for their workers and affected communities in their decommissioning plans, and prioritise the use of UK facilities and workforce for physical decommissioning activities.

THE UK PARLIAMENT SHOULD:

- Repeal provisions for transferable tax history from the 2019 Finance Act;
- Pass legislation to cancel the Decommissioning Relief Deeds in order to restore the state's sovereignty over taxation policy;
- Pass legislation amending tax rules such that any rebates on previous tax payments are no more favourable to oil companies than those available to other industry sectors, and requiring companies' decommissioning plans to include detailed provision for a Just Transition of their workers;
- Conduct a review of the historic and present favourability of the UK oil and gas taxation regime compared to other countries, and of the historic and present profitability of UK oil and gas extraction compared to other economic sectors;
- Order a public inquiry into the process by which the Decommissioning Relief Deeds were issued, the compromise of UK sovereignty and the resulting damage to public finances.

INVEST IN THE CLEAN ECONOMY

The UK and Scottish Governments should initiate a concerted policy and fiscal effort to rapidly build the clean energy industry to at least the extent they have supported the oil industry, with the aim of meeting UK energy needs and creating decent employment. This should include enabling public sector participation, for example through national investment banks, ownership of renewable infrastructure and support for local supply chains. The governments should support major scaling-up of education and re-skilling to support workers who need to move into changed roles or into new industries.

THE UK, SCOTTISH AND LOCAL GOVERNMENTS SHOULD:

- Set up public financing mechanisms – including national and regional investment banks – at sufficient scale to invest in industries crucial for the transition;
- Set up public energy companies – and enable existing ones – to develop renewable energy and energy efficiency projects;
- Support oil and gas supply chain companies to diversify to compatible sectors (offshore renewables, heating, water treatment among others);
- Upgrade ports to enable supply chains for large-scale offshore renewables and decommissioning to develop;
- Initiate national energy efficiency retrofit programmes;
- Carry out a review of the energy system to identify which parts should be considered for public ownership as the best means of driving forward a just energy transition;
- Carry out a detailed assessment of the overlap and any gaps in skills required for clean energy sectors to allocate finance and support for re-skilling where needed.

THE SCOTTISH GOVERNMENT SHOULD:

- Make driving forward a Just Transition a central purpose of the proposed publicly-owned energy company.

THE SCOTTISH PARLIAMENT SHOULD:

- Amend the Scottish National Investment Bank Bill to:
 - Ensure that the Bank includes funding for a Just Transition in its core objectives;
 - Ensure the Bank cannot lend to projects which support the development of fossil fuel extraction.

ENABLE A JUST TRANSITION FOR WORKERS AND COMMUNITIES

The UK and Scottish Governments should develop and implement robust Just Transition Plans, guided by climate limits, for the workforce and communities dependent on the oil industry. These should be accountable to trade unions and local stakeholders and guarantee safeguards to protect workers' rights and livelihoods. Plans and policies should be regionally specific and should include targeted, long-term investment to manage transition for the wider community in oil industry centres.

THE UK AND SCOTTISH GOVERNMENTS SHOULD:

- Use licencing, permitting, or financing conditions to ensure designs of new offshore renewable installations contain no barriers to transferability of oil and gas workers, and advocate for harmonisation of international renewables standards (for example, the Global Wind Organisation) with those in oil and gas.
- Prepare Just Transition Plans for oil and gas with the participation of trade unions and representatives of affected communities, including the following safeguards:
 - Accountability to worker representatives and affected communities;
 - Where jobs are lost, new ones created with equivalent terms and conditions and permanent contracts;
 - Support for the transitioning workforce, including free access to and paid time off for education, fully paid-for voluntary relocation or retraining where necessary, pension protection, and wage protection for five years where matching salaries cannot be secured.
 - Trade union rights for workers affected by energy transitions, including union recognition in workplaces and sectoral bargaining;
- Create regional policies and long-term investment programmes for oil industry centres, particularly Aberdeen and Aberdeenshire.

THE UK PARLIAMENT SHOULD:

- Legislate to require companies to pay at least minimum wage to all workers on the whole UK Continental Shelf, whether in oil production, decommissioning or renewables.

THE SCOTTISH PARLIAMENT SHOULD:

- Amend the Climate Change Bill to:
 - Put the Just Transition Commission on a statutory basis, for the duration of the emissions reduction targets laid out in the Bill;
 - Include a commitment that a Just Transition approach will be applied to achieving climate targets;
 - Include reporting requirements on Just Transition in the Climate Change Plan, ie on how proposals and policies will affect employment in different sectors, what measures will be put in place to support the transition of the workforce and related communities, the scale and sources of investment; and annually by Ministers on progress towards these.

APPENDIX 1: FOSSIL FUEL EXTRACTION AND CLIMATE CHANGE

Over the last three decades, climate policy has focused almost exclusively on limiting the combustion rather than the extraction of fossil fuels. However, a growing body of literature finds that extraction of fossil fuels also has direct and indirect impacts on emissions. This appendix applies some of the lessons from that literature to the UK, to indicate how UK and Scottish policy of maximising oil and gas extraction undermines efforts to reduce emissions.

OIL AND GAS COMPETE WITH CLEAN ENERGY

The potential of energy production from renewable sources very significantly exceeds current rates of deployment. As noted in Chapter 5, several studies have demonstrated the potential of renewable energy to provide the majority – and potentially all – of the UK's and the world's energy needs, within a few decades.

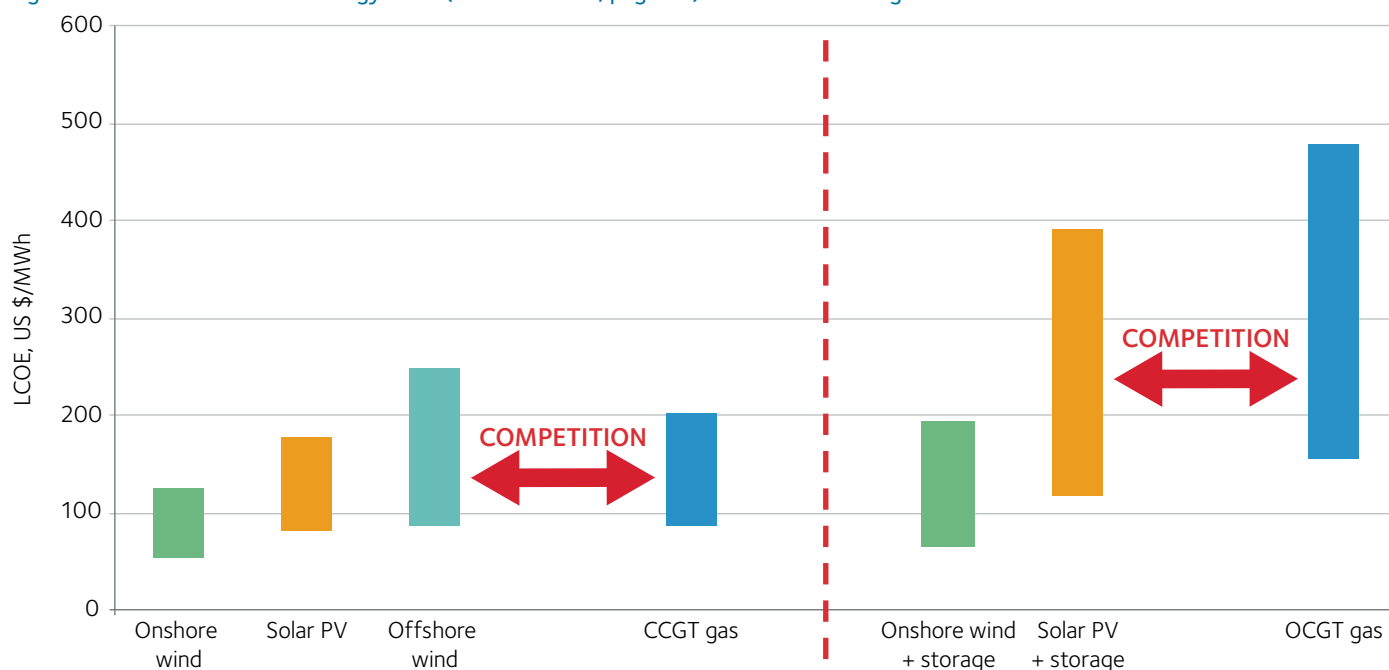
Given that renewable energy generation is clean, affordable and job-creating (as well as necessary to address climate change), why is it not a larger part of the energy mix today? A major reason is that its growth is slowed by competition from fossil fuels. In the United States, several studies have modelled the competition between different fuels, finding that greater supplies of gas tend to increase (or at least not decrease) total greenhouse gas emissions, because the additional gas displaces renewable energy as well as coal.³⁴⁷

In the UK, power from renewable energy commonly costs roughly the same as from gas, as shown in Figure A1-1. The more gas is extracted in the UK, the lower its market price, and the harder it will be for renewables to compete.

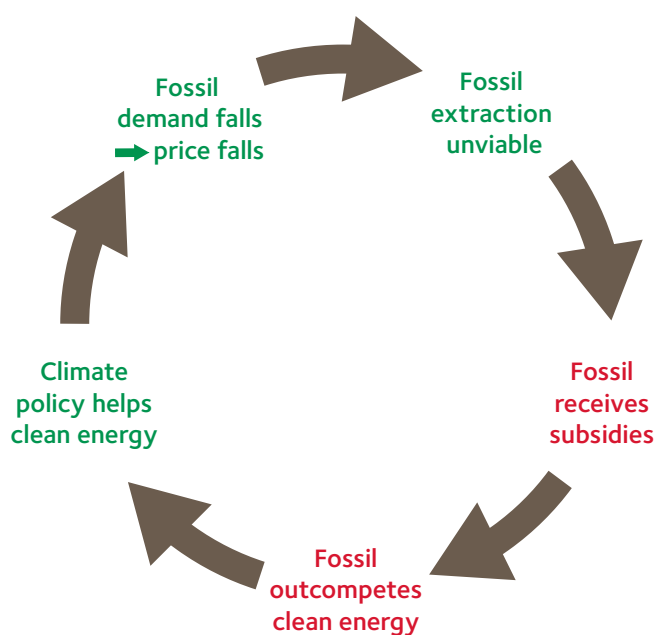
When it comes to oil, the same broad effects occur, albeit mediated through the global market. In particular, maximising global supplies of oil will disincentivise consumers from switching from petrol or diesel cars to electric, companies from electrifying lorry fleets, or entrepreneurs from investing in new zero-carbon technologies.

Oil and gas have the advantage of incumbency: they are familiar, the infrastructure has been built, and user technologies and companies are geared to these fuels. Thus free competition between fuels will lead only to a very slow transition, even if renewable energy is somewhat cheaper. To illustrate, studies with optimistic projections of renewable cost reductions (beyond those already achieved) do not generally lead to achieving the Paris goals without policy interventions.³⁴⁹ To create space for clean energy growth, the supply of fossil fuels needs to be restricted.

Figure A1-1: Levelised cost of energy in UK (see footnote z, page 38): wind and solar vs gas



Source: Bloomberg New Energy Finance³⁴⁸



Source: Oil Change International

GOVERNMENT POLICY TIPS THE SCALES IN FAVOUR OF OIL AND GAS

Conventional climate policy – as practiced by the UK Government – focuses only on emissions at the end of the pipe (such as through fuel efficiency or switching to alternative fuels). It assumes markets will then translate this to reduced supply through the price mechanism: reduced demand will push down the oil price, making some (higher-cost) extraction unviable.

However, government subsidies for extraction negate this very mechanism by protecting the viability of costly extraction. After the oil price fell dramatically in 2014 and 2015, Chancellor George Osborne provided large oil and gas extraction subsidies in his 2015 and 2016 Budgets.

Much of government oil and gas policy has been geared to making UK oil and gas extraction cheaper: from the CRINE and the PILOT initiatives in the 1990s to the Vision 2035 strategy today (page 39). Each cost reduction further entrenches the competitive position of oil and gas relative to renewable energy.

ONCE INFRASTRUCTURE IS BUILT, CARBON EMISSIONS ARE “LOCKED IN”

Once fossil fuel infrastructure is built, it “locks in” carbon dioxide emissions over the lifetime of the infrastructure, which can be several decades. The term “carbon lock-in” was coined by Gregory Unruh in 2000.³⁵⁰

This means that it is harder to reduce flows of fossil fuels through the infrastructure, and hence to prevent the associated emissions (through climate policies). There have been several recent studies of the carbon locked-in by the world’s capital stock (built infrastructure) of power stations and buildings.³⁵¹ However, the lock-in effect occurs also with extraction, as some initial studies have examined.³⁵² This report addresses the carbon locked-in by extraction infrastructure.

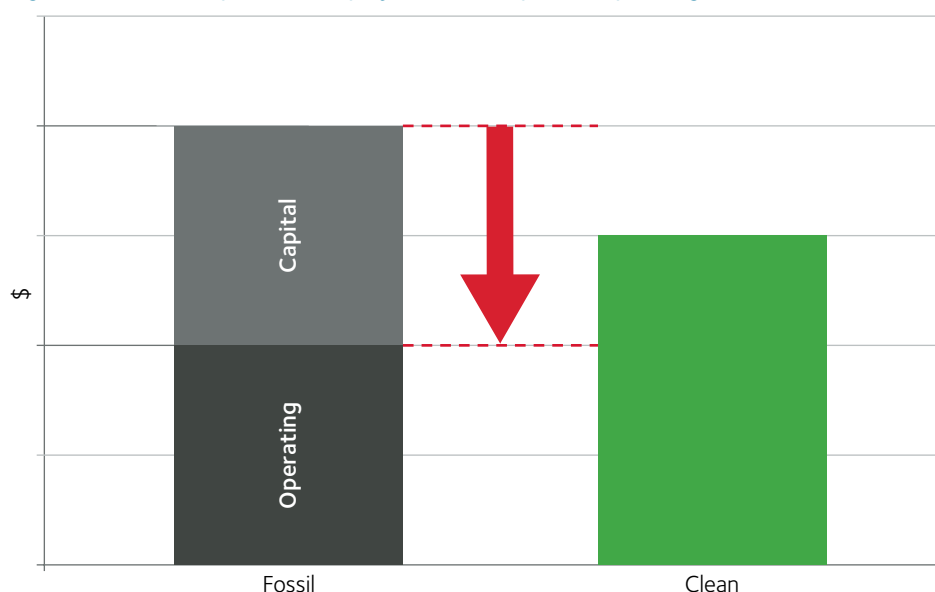
The best-known aspect of lock-in relates to the economic effect of infrastructure.

After capital has been invested, operators are incentivised to continue operating even if they make a loss on their capital, as long as they can sell their products for more than the marginal cost of operation. In other words, as long as each unit generates more revenue than it costs to produce, it will at least contribute to reducing overall losses, even if the spent capital is written off. This effect makes it harder for alternative energy sources to compete once fossil infrastructure is built.

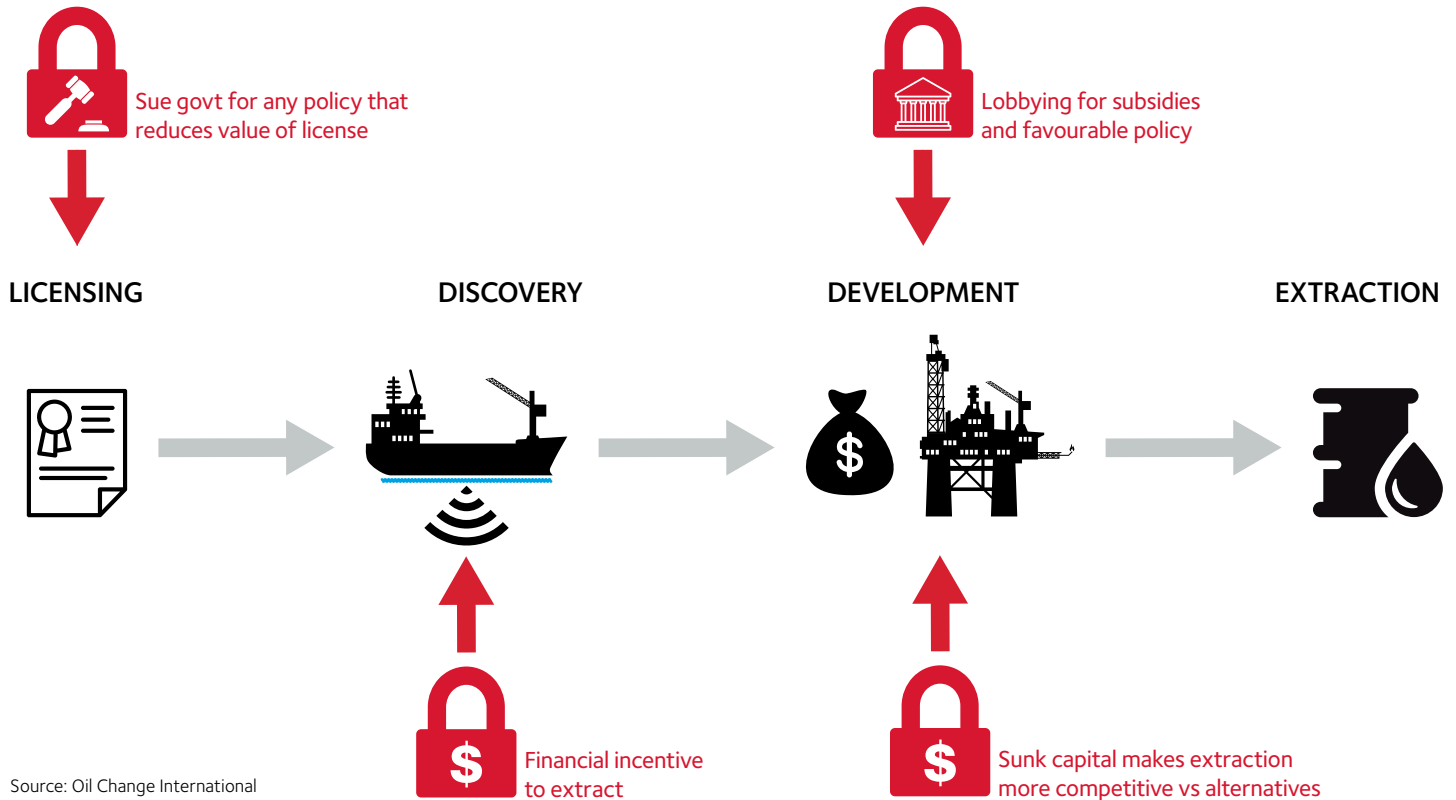
To illustrate the economic lock-in effect, we can look at the elements of levelized cost of energy for UK power plants published by the Department for Business (BEIS). Onshore wind in 2020 is projected to cost an average £63/MWh in total, slightly cheaper than the £66/MWh for combined-cycle gas turbines. However, £9/MWh of the gas cost consists of construction and other fixed costs: once these are sunk, the gas plant becomes more competitive relative to wind, with variable costs of just £57/MWh.³⁵³

The same applies to extraction. Take the Glendronach gas field, discovered to the west of Shetland in September 2018, one of the largest discoveries in a decade. According to estimates by Rystad Energy, projected marginal operating costs at Glendronach are just over 55% of total physical costs over the life of the field. Taking into account also the cost of capital, operator Total would need a relatively high gas price to sanction the project: about US\$ 220 per thousand cubic metres (kcm). But once infrastructure is built and capital sunk, the project can extract gas at an operating

Figure A1-3: Once capital is sunk, projects can compete on operating costs alone



Source: Oil Change International



cost of just \$25/kcm during plateau extraction (rising to about \$60 in the later stages of the project).³⁵⁴

More recently, researchers have begun to examine political, institutional and social dimensions of lock-in.³⁵⁵ For example, when companies have invested capital, they have an incentive to protect their investments, including by lobbying government for more favourable treatment. This report has mentioned the influence of oil companies over the fiscal regime (page 35).

A further dimension of lock-in is a legal one: it is difficult for government to close down a project – or even to change the fiscal regime (see Chapter 4) – once a license and/or development consent has been granted. Each time the government grants a new license or consent, it increases the legal barriers to ultimately aligning extraction with climate limits, and/or its potential future liability, should it act more concertedly on climate.

TODAY'S DECISIONS SHAPE THE LONG-TERM ENERGY FUTURE

It is important to remember that decisions now will shape extraction far into the future:

- From the award of a new license, it is commonly 10 or more years before extraction starts: first, the area is explored; once a commercial discovery

is made, it is appraised in order to understand it better and judge how to develop it; then a final investment decision approves the construction of infrastructure such as pipelines and platforms.

- Extraction commonly continues for fifteen or twenty years (though it can be shorter for small fields tied into existing infrastructure, or much longer for large fields).

The standard durations for UK licenses are 26 or 30 years,³⁵⁶ but they are almost always extendable if more time is needed to extract more, or in many cases for additional exploration. For example, BP's Clair field was discovered in 1977 under licenses issued in 1972; extraction of the Clair Ridge project (the second phase of development of the field) started in 2018 and is expected to continue until 2049.³⁵⁷ Furthermore, once infrastructure is built, companies have a strong incentive to maximise use of the infrastructure through opening new fields nearby,³⁵⁸ enabling more expansion.

All this means that a decision to award a license or begin exploration today could be shaping the UK's energy system into the second half of the century, well beyond the date where carbon dioxide emissions need to reach net zero.

OIL AND GAS SUCK INVESTMENT AWAY FROM CLEAN ENERGY

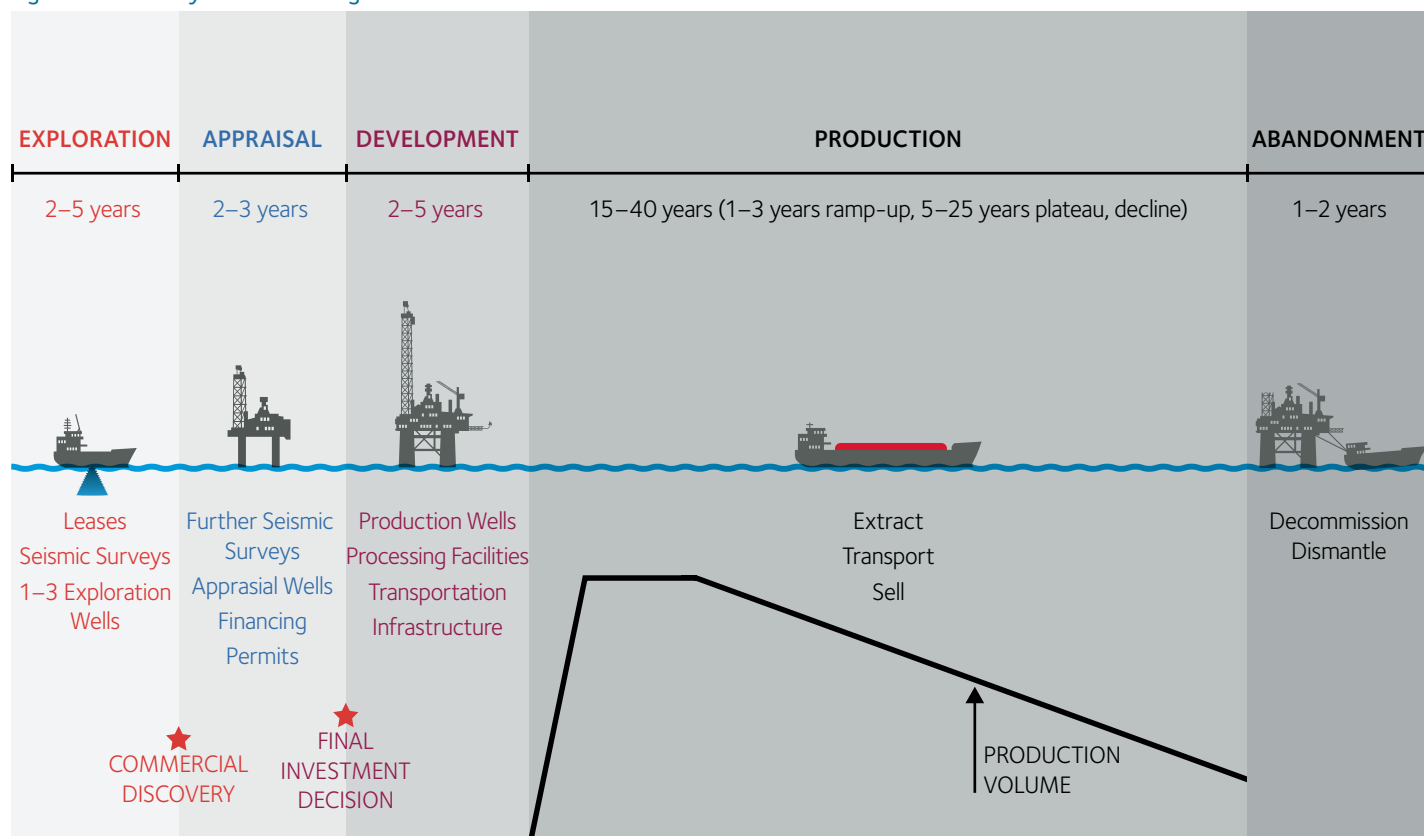
Article 2.1 (c) of the Paris Agreement calls for global financial flows to be aligned with low-emission pathways. That is not currently being achieved. Worldwide, the International Renewable Energy Agency warns that even to achieve a 66% probability (2-in-3) of keeping warming below 2°C, renewable energy deployment needs to increase six- or seven-fold from its current rates.³⁵⁹

Unfortunately, the UK is moving in the wrong direction.

According to Bloomberg New Energy Finance, clean energy investment in the UK fell from US \$26 bn in 2015 to \$10 bn in 2017 and 2018. And in 2017, planning applications were submitted for just 0.9 GW of renewable generation compared to 1.2 GW in 2016 and 2.5 GW in 2015.³⁶⁰ Looking forward, the picture may get a lot worse. Based on an assessment of planned projects in the infrastructure pipeline, the Green Alliance estimates there will be a 95% reduction in investment between 2017 and 2020.³⁶¹

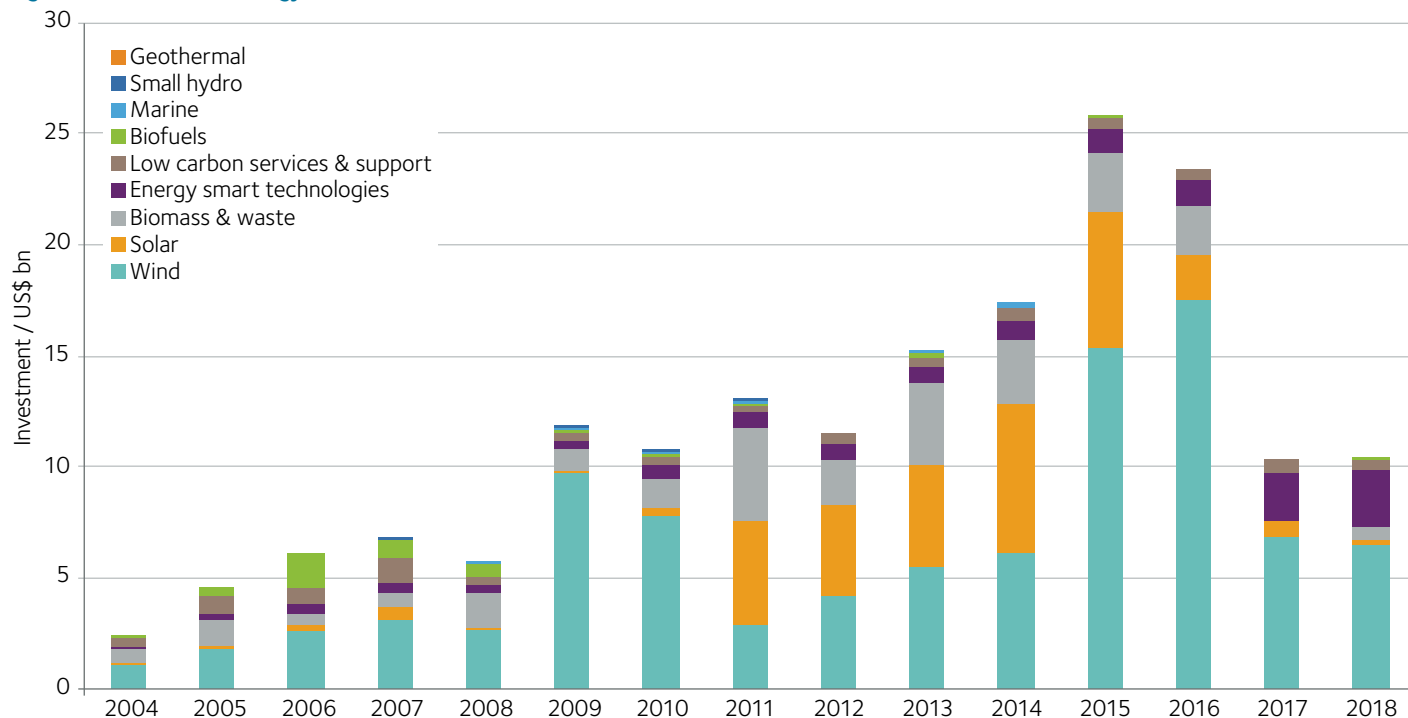
The most important reason for the dramatic fall in UK renewables investment is a series of sudden, damaging policy changes in 2015, including early removal of onshore wind from the Renewables Obligation, charging the

Figure A1-5: Lifecycle of an oil or gas field



Source: Oil Change International

Figure A1-6: UK clean energy investment



Source: Bloomberg New Energy Finance³⁶²

62 Climate Change Levy on renewables (they were previously exempt), cutting Feed-In-Tariffs for small scale renewable generation and cancelling the Zero Carbon Homes policy.³⁶³

However, another reason is the opportunity cost. There is no shortage of available capital to invest in expanding renewables; the problem is that it is being invested elsewhere. Policies that make oil and gas investment more attractive conversely make renewable energy investment relatively less attractive. According to Rystad Energy, capital investment in offshore UK oil and gas was US \$11.4 bn in 2018³⁶⁴ (not counting downstream fossil fuel investments).

A multi-model study led by David McCollum of the International Institute for Applied Systems Analysis (IIASA) found that while annual global investments in renewable energy and energy efficiency over 2015 to 2050 each need to be US \$350 bn higher than their current trajectory in order to keep warming to 2°C, and \$550 bn higher to keep it to 1.5°C, investments in fossil fuel extraction and conversion need to be respectively \$400 bn or \$550 bn lower.³⁶⁵

Commenting on the study, Professor Sam Fankhauser, director of the Grantham Institute and a former member of the Committee on Climate Change, said, “We need some extra investment, too, but the main thing is redirecting existing energy investment from fossil fuels to renewables.”³⁶⁶

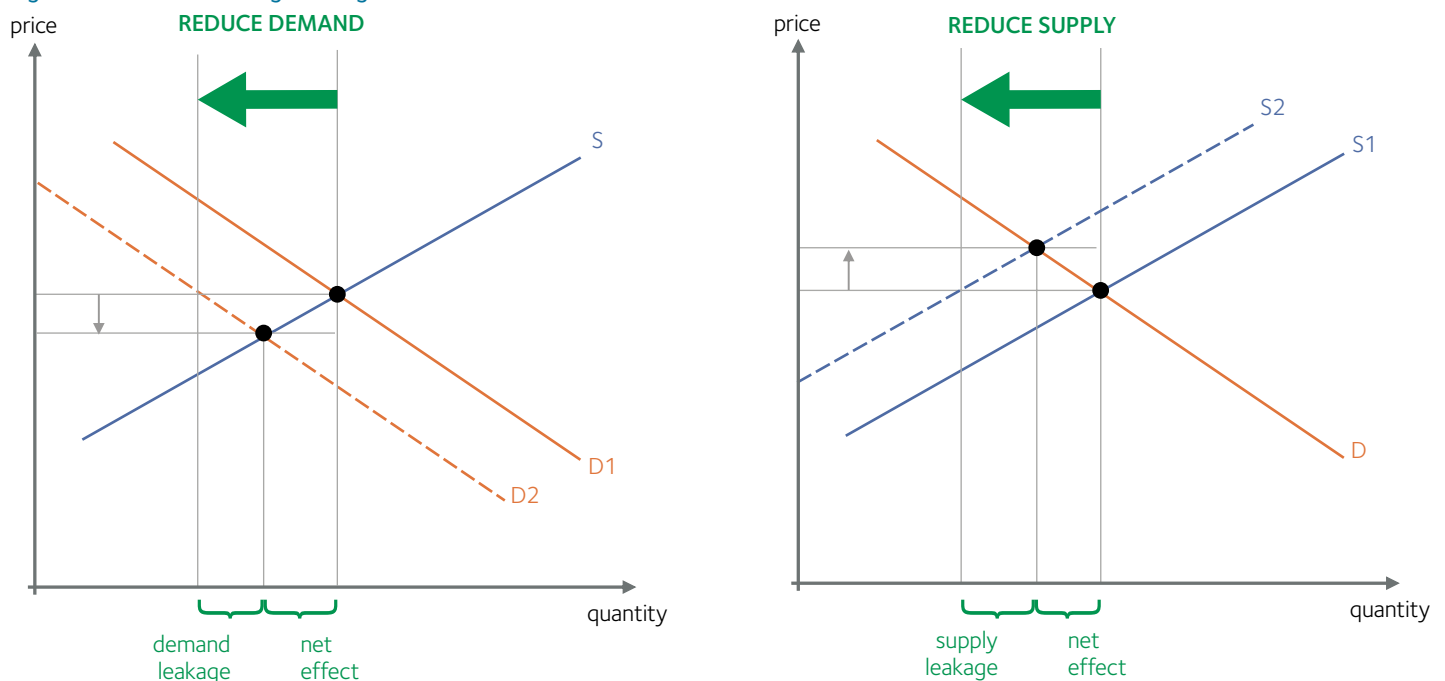
MAXIMISING OIL AND GAS EXTRACTION ENCOURAGES OTHER COUNTRIES TO DO LESS TO CUT EMISSIONS

Some argue that if the UK (for instance) stopped extracting oil and gas, another country would extract the same amount instead. This is not true, as the “leakage” effect is only partial: only some of the reduced extraction is compensated by increases elsewhere. But a corresponding effect also occurs with conventional climate policy approaches: reduced UK consumption will be partially offset by increased consumption elsewhere (someone else consumes the oil and gas instead). Stockholm Environment Institute has shown that the relative carbon leakage from policies to restrict fossil fuel supply and demand depends on the price elasticities of supply and demand.³⁶⁷

In fact, unless the UK addresses oil and gas extraction as well as consumption, it will lose effectiveness due to demand leakage, essentially by helping other countries shirk their emissions obligations. If the UK reduces its demand for oil and gas while maximising oil and gas supply, the effect will be to push down prices. This in turn will encourage consumers outside the UK to increase their oil and gas consumption: some of the UK efforts will be offset in other countries. To minimise leakage, the best approach is to simultaneously tackle fossil fuel demand and supply.

Taran Fæhn has assessed the most efficient and effective routes for Norway to reduce carbon dioxide emissions globally, taking into account leakage. She found that emissions could be reduced by restricting oil and gas extraction at less than half the cost of doing so by restricting territorial emissions. She recommended that in order to achieve maximum climate benefit at lowest cost to the Norwegian economy, the majority of climate mitigation should take place on the supply side.³⁶⁸

Figure A1-7: Carbon leakage through market effects



Source: Oil Change International

APPENDIX 2: METHODOLOGY: OIL AND GAS JOBS AFFECTED BY MANAGED PHASE-OUT

This appendix explains the methodology and assumptions we use in modelling how a managed phase-out of oil and gas extraction will affect jobs.

OVERALL JOBS TRAJECTORY

Starting job numbers for 2017 are based on latest Oil and Gas UK figures. Starting domestic supply chain employment for 2017 is inferred from Oil and Gas UK figures for indirect employment (125,100)³⁶⁹ and Oil & Gas UK's (OGUK's) estimate of the proportion of domestic revenues (57%).³⁷⁰

We distinguish workers in drilling, well services and construction from the rest of the workforce, as these disciplines are likely to need to transition faster in a scenario where no new projects are developed. Detailed statistics on employment in these roles are not available. However, based on recent partial estimates by OGUK and older estimates by EY,³⁷¹ we assume the current workforce includes 5,500 drillers and well specialists, and 8,300 construction workers.

In our model, we assume drilling and well services job numbers decline in proportion to the projected capital expenditure (capex) on wells, construction job numbers in proportion to projected capex on facilities. We use capex projections for already-developed fields from the Rystad UCube.³⁷²

For the remaining disciplines, we assume continued productivity at current levels (ie maintaining the ratio of extraction (in boe) per worker employed), and use Rystad's projections of future extraction from already-developed fields.

DECOMMISSIONING

We assume that the initial jobs-to-expenditure ratio for decommissioning will be the same as for the rest of the offshore industry. The jobs-to-expenditure ratio in

the overall offshore oil and gas industry is calculated using jobs data from Oil & Gas UK's *Workforce 2018* report and expenditure data from the Oil & Gas Authority.³⁷³ This is a conservative assumption, given that there is less need for new materials.

The total cost of decommissioning to 2050 is taken to be £58 billion, in line with the Oil and Gas Authority's current estimate for this cost.³⁷⁴ We plot a trend in expenditure that reflects a rapid increase from 2023 (by which time production in our scenario is dropping significantly), then a plateauing in activity until the late 2030s and then a gradual drop as the final fields and pipelines are wrapped up.

Increases in decommissioning productivity in future years mean that the jobs-to-expenditure ratio will fall, especially as greater economies of scale emerge. The industry and government have agreed a target of 35% reduction in costs by 2035.³⁷⁵ We therefore assume that the jobs-to-expenditure ratio in decommissioning falls in line with this, plateauing after 2035. Without precise data available on how many workers engaged in decommissioning spend time offshore, we assume the same proportion as the rest of the industry.

RETIREMENTS

Our estimates of annual retirements in the oil and gas workforce are based on the age profile and overall workforce numbers provided by Oil and Gas UK for 2017 – the most recent published data at the time of writing. We apply retirements in our model from 2020, which should result in marginally underestimating their number annually, considering the overall aging trend in the workforce.

The baseline number of offshore workers in 2017 is based on Oil & Gas UK data as

above, and age profile of offshore workers on Oil and Gas UK data.³⁷⁶ Projections for offshore workers' retirement are based on a combination of the number of offshore workers who turn 65 in each year and the proportion who choose to leave the industry early. This latter is modelled on the attrition in offshore oil workers after the age of 46 and averaged out over six years, representing early retirement rates varying from 1.7% of 48-year-olds to over 18.9% at the age of 64 to over 30% at the age of 68. These retirement figures do not assume any additional early retirement, beyond the existing age profile for the industry sourced from Oil & Gas UK, but they do assume a compulsory retirement age of 65 after 2023.

The baseline number of *onshore* workers is based on Oil and Gas UK data as above. We take a similar approach to modelling retirement for onshore workers as for offshore – except that there is no available age profile for workers in the oil and gas sector who don't travel offshore. We therefore base our projections on onshore workers no longer working in the industry on retirement at the age of 65 and attrition modelled from the general adult population age profile.³⁷⁷ This is a conservative estimate, as we assume no early retirement for onshore oil workers.

For comparison, EY's oil industry workforce report projected 13.5% of the oil industry's direct, indirect and induced workforce would retire over the five years between 2014 and 2019.³⁷⁸ In our modelling, 12.9% of the onshore workforce and 17.2% of the offshore workforce are expected to retire after five years. We believe this to be a more accurate estimate of retirements, as EY's was based on national average retirement age rather than the specific age profile of the offshore workforce.

APPENDIX 3: METHODOLOGY: POTENTIAL CLEAN ENERGY JOBS

This appendix explains the methodology and assumptions we use in modelling the jobs potential of clean energy in our three case-study sectors.

WIND ENERGY

The Offshore Wind Valuation report conducted on behalf of a consortium of industry and research groups estimated the UK's total, practical offshore wind energy resource at 531 GW, at around six times the UK's peak electricity use. This figure includes 116 GW of capacity in fixed offshore wind, where technology is already widely available and economically attractive.³⁷⁹

How much of this capacity is it possible to utilise in the coming decades? A common target currently used by industry sources is to provide 30 GW by 2030,³⁸⁰ with projects currently operational, in construction and in planning totalling 32 GW.³⁸¹ A more ambitious target of 50 GW appears in, for example, the Labour Party's policies.³⁸²

Existing models for a fully renewable energy system have suggested potential higher targets for a longer-term horizon. The Centre for Alternative Technology's *Zero Carbon Britain* (2013) report proposes a target of 140 GW of offshore wind capacity.³⁸³ Mark Jacobson et al. estimate that the UK's end-use electrical power demand in an entirely wind-, wave- and solar-powered scenario is 140 GW, out of which, they suggest, 36% would be met by offshore wind, requiring 121 GW installed capacity.³⁸⁴ (Neither CAT nor Jacobson et al. disaggregate fixed and floating offshore wind.)

In our model:

- The Current Trajectory scenario sees 32 GW fixed offshore wind installations by 2030 (ie all currently planned projects are completed), steadily increasing after this, but no floating offshore wind installations as the industry fails to develop for lack of support.

- The Existing Ambitions scenario sees 45 GW fixed offshore wind installations by 2030, continuing installations after this to reach 73 GW by 2050. Floating offshore wind installations deliver 20 GW capacity between 2030 and 2050, as proposed by Offshore Renewable Energy Catapult (OREC).
- The Fully Renewable scenario sees the same rate of deployment of fixed offshore wind as the Existing Ambitions scenario, but a greater deployment of floating offshore wind, with over 48 GW installed by 2050, to meet Jacobson et al.'s target of 121 GW overall.

Fixed offshore wind energy

Modelling conducted by Cambridge Econometrics on behalf of Aura and Hull University in 2017 estimated that if the fixed UK offshore wind industry is to grow to provide 20 GW electricity by 2030, its workforce will grow from the current 10,000 direct and 7,500 indirect (supply chain) employees to 21,000 direct and 18,000 indirect employees in 2032.³⁸⁵ To estimate employment in our scenarios, we scale up Aura's modelling figures up to 2028 with slightly conservative multipliers to account for economies of scale (1.35 for 32 GW by 2030 and 2.4 for 45 GW by 2030) and extrapolate the modelling into the future.

The ratio of installation and construction jobs to MW capacity installed is assumed to be somewhat lower for the Current Trajectory scenario (plateauing around 19 versus 22), to account for less significant supply chain capture in the UK.

As the industry and technology develop, efficiency on capex is assumed to improve by 9% with every doubling of capacity, in line with Aura's assumption.³⁸⁶

A large proportion of these jobs are in construction or installation. However, the need to repower wind infrastructure helps

create a self-sustaining industry. Offshore wind turbines require re-commissioning after 15 to 25 years of operational life. After 2030, therefore, installation rates for new offshore capacity slow down as workers will instead be required to re-power existing installations.

Floating offshore wind energy

The UK also has a significant opportunity to develop world-leading floating offshore wind technology. The Offshore Valuation Group report estimates the UK's potential resources that can be tapped using floating installations at nearly four times the "fixed" offshore wind resources, but as the technology is less developed, it is not included in the estimates above. An OREC report commissioned by the Crown Estate Scotland shows that the number of jobs supported by the floating wind industry can ramp up quickly to reach 11,000 by 2031 and 17,000 by 2050, comprising 9,300 direct and 7,700 indirect jobs.³⁸⁷ This corresponds to 20 GW capacity installed by 2050. For the Fully Renewable scenario, to estimate the jobs created if the industry expands faster to meet the Jacobson et al. target, we scale up OREC's model using similar assumptions on efficiency improvement as for fixed offshore wind, leading to 42,500 jobs in 2050.

Onshore wind energy

The UK already has 13 GW onshore wind energy capacity installed,³⁸⁸ most of it (over 7 GW) in Scotland,³⁸⁹ with installations significantly slowing down after the UK Government excluded onshore wind energy from Contracts for Difference auctions and introduced further planning hurdles to the industry.³⁹⁰ Jacobson et al.'s model for fully Wind Water and Solar power system proposes using the UK's full onshore wind capacity of 48 GW.³⁹¹

Modelling by BVG Associates on behalf of wind energy industry companies projects that approving an extra 5 GW of new

onshore wind installations would result in 8,700 new long-term jobs in maintenance and operations and up to 18,000 jobs in the peak years of construction.³⁹² We use these figures in our Current Trajectory scenario.

For the Existing Ambitions scenario, BVG figures are scaled up to build 10 GW new onshore wind installations (twice BVG's proposed programme) and for the Fully Renewable scenario, 35 GW. In the Existing Ambitions scenario (using conservative multipliers to account for economies of scale) this results in 15,300 new long-term jobs by the late 2020s, and in the Fully Renewable scenario, 36,000 new long-term jobs. BVG's modelling and therefore our calculations include a proportion (under 15%) of jobs related to new transmission infrastructure necessary for onshore wind installations.

TIDAL STREAM AND WAVE

Significant public investment in pilot tidal stream and wave energy industry projects between 2004 and 2014 enabled 22 tidal device developers and 23 wave energy developers to be active in the UK by 2018. According to estimates by OREC, the tidal and wave energy sectors could support almost 4,000 jobs by 2030 and 22,600 by 2040, focused in Scotland, Wales and the South West.³⁹³

OREC's report notes that growth of the industry is expected through absorbing workers from "existing UK industries where there is strong absorptive capacity, especially offshore wind, oil and gas, steel and maritime."³⁹⁴ The Catapult's report models for the UK's ability to capture the benefit of first-mover advantage and export these technologies abroad. This more than doubles the jobs created. For our purposes, for consistency's sake, we only model for jobs related to UK installations.

We assume that marine renewables installations have to be decommissioned on the same timeline as offshore wind installations, ie after 15–20 years. Efficiency improvements due to technological advances and learning are assumed to proceed similarly to offshore wind industry, with a 9% increase in efficiency for every doubling of installed capacity.

- In our Current Trajectory scenario, tidal stream and wave energy installations do not create new jobs as the industry does not develop due to lack of support.
- For the Existing Ambitions scenario, extrapolating from OREC modelling data, we project job numbers stabilising around 8,000 jobs between 2040 and 2050 in tidal stream energy, and reaching 8,000 by 2050 in wave energy, corresponding to 7 GW and 5 GW capacity installed respectively.
- For the Fully Renewable scenario, Jacobson et al.'s model for fully Wind Water and Solar powered system proposes 12 GW wave and 11.4 GW tidal stream capacity. Using OREC modelling, proposing a five year earlier start for wave energy and a faster scale-up of installations, reaching these targets by 2050 produces around 15,000 and 16,000 jobs in tidal and wave energy respectively. With regards to wave energy technology, the rate of expansion implied appears challenging as the technology is yet to be developed.

MASS ENERGY EFFICIENCY RETROFIT PROGRAMME

The energy transition offers the opportunity for – and indeed, requires – one-off, large-scale investment projects to upgrade existing infrastructure (homes, transport, communication networks) to the level of energy efficiency required to meet climate commitments. Upgrading each sector of infrastructure on the scale required will create large numbers of jobs for a multi-decade programme, and it is outside the scope of this report to consider each one. Here we provide estimates for numbers of jobs created just through a mass home retrofit programme, as a case study that requires workers with construction or engineering skills all across the UK.

Estimates of person-years required to retrofit the UK's 24 million homes range from 820,000 (according to the Labour Party) to 890,000 – 1,665,000 (Energy Bill Revolution) to 910,000 (Cambridge Econometrics). (Person hours worked out as a sum of projected numbers of full-time-equivalent jobs in each scenario over 12 years of a mass retrofit programme.)³⁹⁵ Assuming a slightly conservative 800,000 person-years spread over a 20-year period with a gradual start, yields up to 73,000 jobs in the peak years of the programme. This estimate appears in the Existing Ambitions and Fully Renewable scenarios.

JOBS IN SCOTLAND

According to Crown Estate data on **fixed offshore wind**, the existing, under construction and planned offshore windfarms in Scotland account for only 5 GW of the UK's overall 32 GW capacity.³⁹⁶ However, the Offshore Valuation Group estimated Scotland's economically viable resource for fixed offshore wind installations at 46 GW out of the UK's 115 GW.³⁹⁷ In our estimation, if fixed offshore wind installations to 2050 proceed in line with construction already planned and then in proportion to the resources estimated by Offshore Valuation Group, installations in Scotland will form 42% of the UK's offshore wind capacity. If Scottish oil industry supply chain firms successfully make the jump to supplying offshore wind installations, the proportion of overall employment generated will be greater.

In **floating offshore wind**, Scotland is likely to account for a greater proportion of installations and jobs, as its floating offshore wind resource is estimated to be greater than that of other UK regions, the only two existing UK floating offshore wind farms are located in Scotland, and the Scottish Government has pledged active support to developing the industry.³⁹⁸ In the graph below we estimate Scotland's proportion of floating offshore wind jobs at 50% of UK total.

In **onshore wind**, Scotland takes the lion's share of both capacity installed and jobs created, with 60% of new jobs (and approximately 70% of long-term new jobs) in onshore wind according to BVG.³⁹⁹ Our modelling follows the proportions suggested by BVG.

Tidal and wave energy jobs are estimated at 42.5%, in line with the proportion of tidal and marine energy contracts currently taken up by Scottish supply chain companies (Scottish companies account for 346 out of 815 contracts to date, according to the Marine Energy Supply Chain Gateway (MESCG), a database of suppliers supporting the UK's marine energy industry).⁴⁰⁰

Home energy efficiency retrofit jobs are estimated according to Scotland's share of UK households number (8.9%).⁴⁰¹

Unless otherwise indicated, all URLs accessed on 3 April 2019.

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 - Talisman Sinopec became Repsol Sinopec when Repsol purchased the stake owned by Talisman in 2015;
 - Siccar Point bought OMV (UK) in November 2016.
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