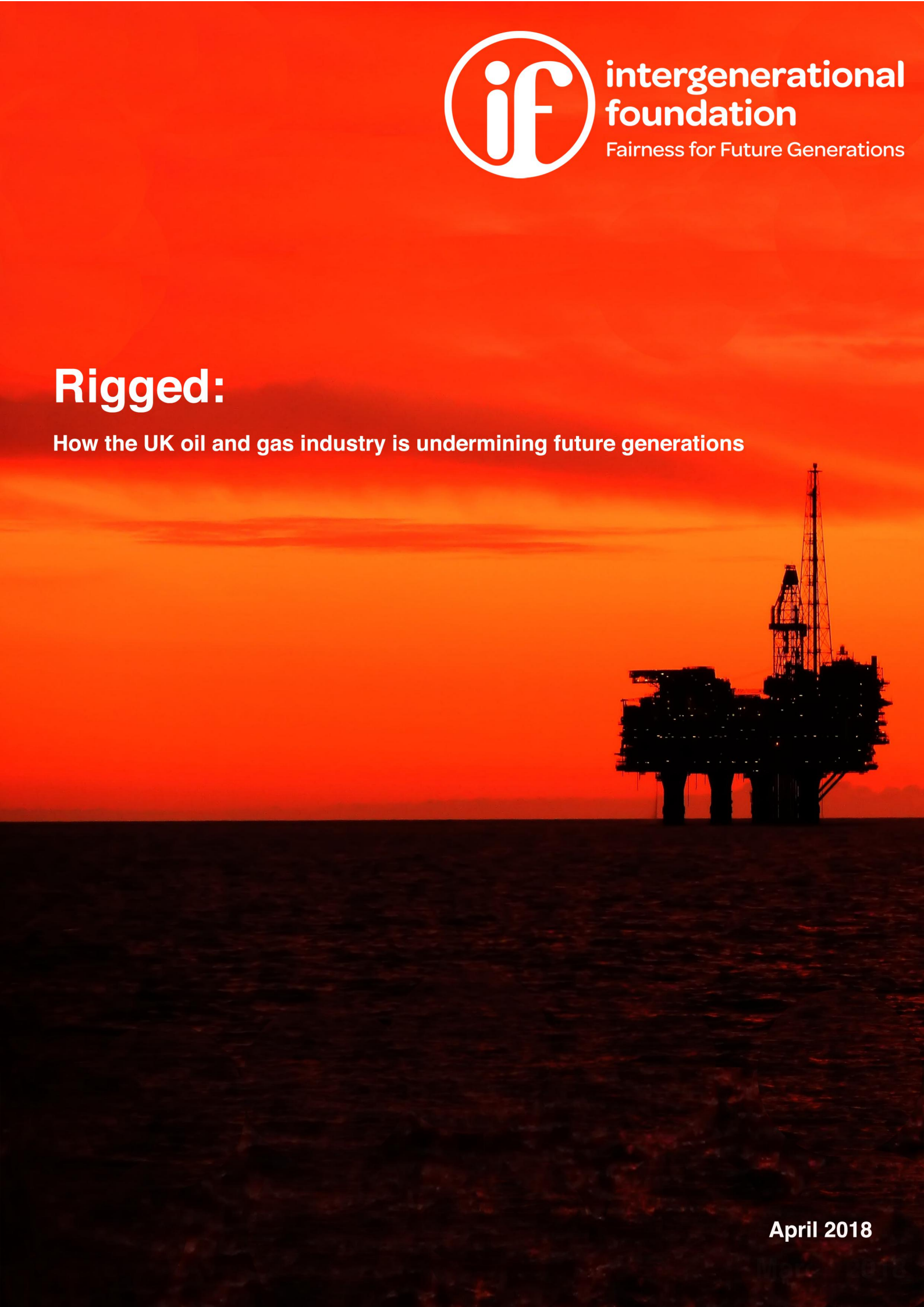
intergenerational foundation
Fairness for Future Generations

Rigged:

How the UK oil and gas industry is undermining future generations



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The Intergenerational Foundation (www.if.org.uk) is an independent, non-party-political charity that exists to protect the rights of younger and future generations in British policy-making. While increasing longevity is to be welcomed, our changing national demographic and expectations of entitlement are placing increasingly heavy burdens on younger and future generations. From housing, health and education to employment, taxation, pensions, voting, spending and environmental degradation, younger generations are under increasing pressure to maintain the intergenerational compact while losing out disproportionately to older, wealthier cohorts. IF questions this status quo, calling instead for sustainable long-term policies that are fair to all – the old, the young and those to come.

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Andrew Simms and David Boyle of The New Weather Institute, a co-operative think tank forecasting change and designing a rapid transition to a fair, ecological economy were commissioned by the Intergenerational Foundation to produce this report. http://www.newweather.org/.

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Foreword

This paper explains how each child in the UK could be handed a toxic bill of up to £3,000 if the government allows North Sea oil and gas companies to escape their decommissioning obligations. The bill for the expensive legacy of decommissioning 3,000 pipelines covering 8,000 kilometres, 5,000 wells, 250 fixed installations and 250 subsea production systems, could exceed £80 billion, more than double current, preferred government estimates.

Rather than setting aside monies to pay for decommissioning, the North Sea oil and gas industry and the government are together handing a tax burden on to a younger generation who did not benefit from the oil extracted but will be expected to pick up the bill for previous generations' profligacy. It is extraordinary that there is no proper mechanism in place to protect our children from having to pay the clean-up costs for oil and gas they didn't use, while the companies involved can potentially escape responsibility by off-loading their North Sea holdings onto smaller contractors and retain just one quarter of the costs of decommissioning while benefiting from generous tax breaks.

The government is allowing these companies to break the principles of the Energy Act 2004, whereby builders and operators are "responsible for ensuring that the installation is decommissioned at the end of its useful life, and should be responsible for meeting the costs of decommissioning." The next generation is expected to prop up an uneconomic industry that may shirk responsibility for clearing up its own mess.

It is ironic that the Government is planning to part-fund the clean-up costs with further extraction of waning North Sea oil and gas resources and this will simply create a larger burden for future generations to pay in cash, in health bills relating to air pollution, and in carbon-emission costs.

We need a new intergenerational decommissioning deal and policy framework: a "sunset, sunrise" contract which sees the managed closure of systems which have run out of economic usefulness and environmental space, and which allow for the growth and substitution of a renewable energy framework to provide better health, more jobs, a safer environment and long-term economic prospects for young people and future generations. We should be moving towards a greener renewable future for energy. Instead, current government policy is about subsidising the extraction of more carbon.

Angus Hanton, IF Co-founder

Summary

In June 2017, the Oil and Gas Authority (OGA), the regulator created for the industry mostly centred on the UK's continental shelf oil and gas fields, published an estimate for what it will cost to decommission the sector in its twilight years. It was presented as a range, with the most likely amount given as a little short of £60 billion (£59.7bn at 2016 prices) to decommission all the existing and proposed infrastructure, over a non-specified period. This would remove over 250 fixed installations, a similar number of subsea production systems, over 3,000 pipelines and about 5,000 wells.[1] There is strong pressure to delay decommissioning as its high costs are likely to undermine profitability.

This cost figure was the highest estimate yet, and a wake-up call for an intergenerational burden being passed to young people in the UK. Unlike other oil and gas producing countries such as Norway, UK governments have not prudently managed and saved the proceeds from the industry in a sovereign wealth fund. Norway's fund recently surpassed $1 trillion, worth nearly $200k for every Norwegian citizen. [2] By contrast, in 2016, the UK industry became a net drain on public resources. A mild recovery was quickly followed in the 2017 budget with lower revenue forecast, and with more tax breaks announced. In the future, the oil and gas sector looks set to be a burden to a younger generation who received no direct benefit from it. There are also reasons to believe that even the OGA's new high estimate of decommissioning costs is an underestimate. But this, too, is just a small part of the UK oil and gas sector's intergenerational burden whose full costs go largely unaccounted. The policy framework put in place to manage the industry's decline seems designed, perversely, to maximise the intergenerational burden, with an indulgent tax regime, and a focus on maximising the extraction and use of fossil fuels that carry critically high health and environmental costs which disproportionately hit younger people.

This report finds that the OGA's estimate for the cost of decommissioning is flawed in ways which point towards the real costs being higher. Its estimate appears even to contradict its own research on the actual performance of the industry in the field. In particular:

- This is their so-called 'P50 target', which means that there is a 50:50 chance of the costs being higher than that.[3]
- It assumes that additional cost savings of 35% should be "easily attainable", when in fact its own review of UK oil and gas projects between 2011 and 2016 found an average

overspend of 35% against estimates. This figure, too, appears to be a global average overspend for mega-projects in the power sector, seriously questioning the OGA's confidence. Other sources cite actual decommissioning cost overruns compared to estimates of between 30 and 100%.[4]

- North Sea decommissioning is considered a more difficult task than in fields like the Gulf of Mexico, where decommissioning is more advanced, and has had to happen faster than expected, partly due to extreme weather events. The OGA's exercise is treated as immune to any "events", assuming none will happen. Against the riskiest, and dominant type of project cost estimate – so called "Class 5" – which carries the least information and about which the least is known, the OGA makes a "judgement" to include only half the recommended contingency.

Regardless of these flaws, the OGA's cost estimates are still equal to between four and eight decades' worth of current tax income from the sector, or between two and four decades if, as expected, the public meets half the cost. And, there is no policy to govern what happens if one of the companies responsible for decommissioning, and which jointly owns pipelines or terminals, goes bankrupt or refuses for some other reason to play their part.[5] The problem, for those who care about young and future generation, is that the burden will fall disproportionately on young people under 18 who did not benefit from the oil itself. Also that the transfer of tax resources now to pay the costs of decommissioning sets the UK apart from other nations. Nor does this approach stick to the principles of the Energy Act 2004, whereby the builders and operators of installations are "responsible for ensuring that the installation is decommissioned at the end of its useful life, and should be responsible for meeting the costs of decommissioning."[6]

There is a central contradiction that decommissioning is necessary, partly because of depleted reserves and partly because of the Paris climate agreement which the UK ratified – yet UK policy deems decommissioning must be paid for by the continued exploitation of the oilfields. In a broader intergenerational perspective, UK oil production should mirror reductions in consumption. Young people are particularly vulnerable to the air pollution that results significantly from the burning of fossil fuels.

- The UK's annual health bill related to air pollution (mostly derived from the burning of oil and gas fuel products) is estimated at £20 billion, or more than two decades worth of current tax income from the oil and gas sector.

- The carbon cost of a single year's worth of production from the main, Scottish North Sea fields in 2016–17 comes in somewhere between $8.3 billion and $49.3 billion, depending on which estimate for the costs of carbon is used, (the range for the UK as a whole would be between $10.1bn and $60.1bn (see below)).

Maximising North Sea extraction, in part to pay the costs of decommissioning – running faster to stand still – simply creates a larger burden for future generations, and especially given the health and environmental costs of oil and gas. There is also an opportunity cost to public subsidy towards oil and gas. It creates a bias of five to one in the support public finances gives to fossil fuels compared to renewables. Because of these contradictions, this report argues that the UK oil and gas industry is undermining young and future generations. Its impact goes largely unaccounted because it is hard to judge precisely by how much. It survives through the indulgence of a protective policy duvet, plus both direct and indirect. public and environmental subsidies. If properly accounted for, with full responsibility for its product – the bills for decommissioning, health and environment – the industry would probably be bankrupt. The next generation is expected to prop up an uneconomic industry in order to clear up its own mess.

A new intergenerational deal and policy framework is needed: a "sunset, sunrise" contract which sees the managed closure of systems which have run out of economic usefulness and environmental space, and which allow for the growth and substitution of a renewable energy framework to provide better health, more jobs, a safer environment and long-term economic prospects for young people and future generations. If government is not inclined to take action to rectify this intergenerational injustice, then at the very least lessons should be learnt for the future.

1. Overview – how the oil and gas sector is rigging the future against the young

What would you choose to pass on to your children from your home? Small heirlooms with sentimental value or perhaps monetary worth, jewellery, photo-albums, or a cherished book or picture? It is less likely that you would give as an intergenerational gift a garage full of old, redundant and toxic machinery, things of no use that were going to be difficult and very expensive to dispose of. But that is what one generation of the United Kingdom is set to do to the next.

After a brief, national flirtation with North Sea oil and gas, an industry now in long-term decline, an expensive legacy of decommissioning is being passed on to the next generation. In the face of the geologically inevitable, state subsidies are nevertheless being given to prop up, and to further develop the waning sector. These actions present a double hit, economic and environmental, on the next generation.

First, the economic. The push to carry on exploiting the sector is linked to the problem of decommissioning because the UK government is relying on resources from continued exploitation to pay for the clean-up process – and there are huge costs involved: over 250 fixed installations, a similar number of subsea production systems, over 3,000 pipelines and about 5,000 wells, await decommissioning safely.

As we explain later in this report (see Section 2), the Brent field alone involves plugging the wells, removing the top of the platforms and capping the legs, moving debris from drill-holes, and shifting steel the equivalent of ten US Navy aircraft carriers or two Dubai skyscrapers.[7] A crude estimate suggests that the whole weight of metal and ballast in the UK oil and gas fields may be equivalent to almost 320 aircraft carriers, a staggering prospect for decommissioning.[8]

The problem is also immediate. According to Oil & Gas UK and Decom North Sea, by 2025 – just seven years hence – over 200 oil and gas platforms, around 2,500 wells and nearly 8000km of pipeline across the North Sea are to be decommissioned, the majority of which are on the UK Continental Shelf with costs to the UK sector estimated by the industry to be £17 billion.[9]

The environmental issues are even more worrying, pointing to a process that is already complicated in theory, becoming even more difficult once practical realities are confronted. For example, in January 2018 three oil rigs due to be towed away for decommissioning were impounded in the Cromarty Firth off Inverness on orders of the Scottish Environmental Protection Agency over fears about their "destination and disposal". The Maritime and Coastguard Agency said that the safe decommissioning of offshore industry structures was a "significant international concern".[10]

But, from a national interest point of view, the economic prospects for the industry already look disastrous. In 2016, for the first time, the industry was a net drain on the public purse, taking more in subsidy and support than it gave in tax revenue. Even if the most recent forecasts of a return to making a modest positive contribution prove reliable and consistent, the amount spent on decommissioning the industry's redundant hardware (which is substantially tax deductible) will be greater than what it actually pays in taxes, and for decades to come.

Yet, the direction of the tax regime for oil and gas has become progressively more generous and kind to the industry. The November 2017 Budget introduced a further tax break for the sector allowing "transferable tax histories", these function as a form of tax relief against the costs of decommissioning.[11]

Prospects for the North Sea oilfields in part explain the eagerness of oil majors like Shell to dispose of their assets. Early in 2017, Shell announced a multi-billion sale of assets in which it would retain a set liability of just around one quarter of the costs of decommissioning.[12]

At the same time, there is a push by the sector to delay spending on decommissioning because of the immediate threat to profitability, and in the hope that technological advances may reduce decommissioning costs.

When measured against the combined costs of decommissioning, climate change and the health impacts of its product, the sector may never have been profitable in a meaningful sense for society as a whole, but decommissioning costs make it a huge intergenerational burden.

2. The North Sea oil and gas industry

"We are working with the industry to ensure that we extract every drop of oil and gas, that it is economic to extract, that we enable decommissioning, and enable end-of-life fields to be operated in the most effective way."

Philip Hammond, Chancellor of the Exchequer, House of Commons, July 2017

Those who lived through the 1970s, and the energy crisis, may remember the advent of North Sea oil and gas as the great hope to save the nation from economic decline. It contributed to the UK economy for over 40 years, providing jobs and technological innovation – though arguably the contribution to the Exchequer was wasted on reducing the overall deficit, rather than invested in a structured programme of industrial development, or in a sovereign wealth fund as other countries have created.

Either way, the North Sea has paid the equivalent of about £330 billion in total in taxes to the UK Exchequer (2017 prices), according to the Chancellor.[13] This has given rise to hopes within the industry that recent projects and investments will maintain short-term increases in production.[14]

Yet nothing can hide the fact that the sector is in long-term decline. Production peaked as long ago as 1999. Jump ahead a decade and in 2010–11, tax receipts were just under £11 billion, but falling. By 2015–16, the UK government made a loss on North Sea oil and gas (effectively subsidies exceeded the revenues) for the first time since it started keeping figures, going £24 million into the red.[15] Yet, rather than signal a dramatic shift in energy policy, UK policy-makers saw this as a reason for more public money to go towards support for the declining sector.

There is still some opportunity to exploit this resource. There are estimates of between 10 and 20 billion barrels of oil equivalent, which could theoretically be pumped out – if climate change allows – and there may be more.[16] However, a conservative estimate of keeping a 50:50 chance of meeting the 2°C Paris climate target, suggests that, globally, 52% of known gas and 35% of know oil reserves need to be left in the ground.[17] And, even this analysis relies heavily on the rapid, large-scale uptake of highly speculative so-called negative emissions technologies to capture carbon.[18] At the same time,

there are huge costs – economic and environmental – involved in decommissioning existing infrastructure which will also increase if this extraction is extended.

In January 2018, Shell announced its first new, staffed installation in the region for nearly 30 years.[19] As the years go by, other new drilling projects will come on-stream that will also need to be decommissioned. These have not been included in the official estimates for the cost of decommissioning – which is just one way in which they probably under-estimate the final costs.

Meanwhile, the oil and gas industry is trying – quite logically, perhaps – to speed up production while it delays the expense of decommissioning. The main way it has been doing this is for the bigger players to offload their North Sea holdings onto smaller contractors. To do so, they normally will have to agree to pay those parts of the decommissioning which relate to their own profits there. The government is working to facilitate this on the grounds that – since one part of Whitehall may care too little about the priority of other parts – it might keep production moving a little longer. It might prevent a "premature cessation of production".[20]

This process also makes other elements more expensive and more uncertain. The drilling industry is pretty mature – it knows what it is doing – but the decommissioning industry is not. It is in its early years. Nevertheless, things are accelerating. Ten years ago, around four decommissioning programmes per year were being approved. More recently, the Department for Business, Energy and Industrial Strategy (BEIS) approved 19 decommissioning programmes in 2015 and 10 in 2016, with activity expected to rise to a peak fairly soon, in around 2024/25.[21]

And, the decommissioning process is becoming clearer, partly thanks to Shell's decision to end production on the Brent field. This involves plugging the wells, removing the top of the platforms and capping the legs, moving debris from drill-holes, taking up more than 100 km of subsea pipelines, including 295,000 tonnes of steel, 568,000 tonnes of concrete, 238,000 tonnes of sand ballast and 16,000 tonnes of rocks.[22] It should all be done in Brent by 2026.

One of the side-effects is that 800,000 tonnes of carbon dioxide is going to be emitted in burned fuel and recycling, plus from ships and lorries used to move the stuff and to plug the wells, in addition, of course, to the carbon from the usual production cycle.[23]

The problem for the new owners of the production fields is that a fluctuating oil price – and especially if it is going down – undermines their ability to plan decommissioning in such a way that they can pay for it out of current profits. It makes it harder to borrow the money they need to invest.

The purpose of tax relief on decommissioning, which the government has recently increased, is to try to iron out some of these peaks and troughs. That is why we now turn to the tax regime and the costs of decommissioning which both the industry and the government are attempting to reduce.

3. Costs, tax breaks and who pays

"The sector is no longer the cash cow chancellors have come to expect over the past several decades."

Simon Evans, *Carbon Brief* policy editor, on the North Sea oil and gas sector.

The UK government taxes oil and gas production in three ways:

- Ring-fenced Corporation Tax at 30% (with capital allowances of 100% on production costs for the first year, and you can carry forward losses for up to ten years afterwards).
- Supplementary Charge at 10% (with capital allowances of 62.5% of investment).
- Petroleum Revenue Tax (albeit zero since 2015), which is a deductible expense against the previous two.

When oil companies spend money on decommissioning, the tax loss can be set against what they already paid in these taxes, and then what they paid in previous years. Repayments of money paid in Petroleum Revenue Tax (when it wasn't zero) was paid with interest, but then set against the others.

If there is still a tax loss, the company can offset taxes paid on other oilfields.

Normally, this ability to set against previous taxes paid doesn't apply to new owners of fields, so they have to estimate costs as part of the agreement to buy – or the sellers have to agree to carry the costs of decommissioning when the time comes. Until 2017, North Sea companies could not trade their tax histories, but the government announced in its November 2017 budget that – with details still to be worked out – they will be able to pass on to new owners some of their tax history including tax breaks, making facilities more attractive to buy.

The tax position of decommissioning is complicated because the oil companies get between 40 and 75% of their decommissioning costs set against taxes they paid during the production years. When oil prices go down, this means that the Treasury is paying out more than they are receiving, about £396m more in 2016 according to one independent analysis.[24] A projection by the Office of Budget Responsibility (OBR) is that the Treasury will actually be getting about £4.5 billion over five years over and above what they are paying out.[25] The volatility and unpredictability of oil prices is such that this

represents a flip from a similar sized loss to the Treasury projected just one year previously. Since then, however, coinciding with the November 2017 budget, the OBR downgraded its estimate of revenues from the sector by £0.4 billion per year, falling from £1.1 billion in 2017–18 to £700 million, and further down to £500m and £400m in subsequent years, amounting to a £2 billion loss of expected revenue.

Whatever way you do the figures, the top five oil and gas company recipients of government money– BP, Shell, ExxonMobil, Talisman Sinopec and Hess – were paid a total of £1.1 billion in 2014 and 2015.[26]

Costs of decommissioning

To calculate some of these figures, the Oil and Gas Authority (OGA) has produced the latest and most authoritative estimate of the costs of decommissioning. Included in the exercise were the Treasury, other parts of Whitehall, commercial operators and their trade association. It could be argued that both the Treasury and operators have vested interests in keeping the cost estimate low. They came up with a range of estimates from £44.5 billion to £82.7 billion. This gave them a best-guess price within the range of £59.7 billion, the highest estimate so far and it is their so-called "P50 target", which means that there is a 50:50 chance of the costs being higher than that.[27]

This figure then got the treatment, set out under the Decommissioning Strategy, that there would be a target saving of 35% – apparently an arbitrary figure. The official cost estimate that includes this target saving is therefore £39 billion, in 2016 prices.

The estimate assumes there are no changes to working practices, and that contractors will always be available. It assumes also no new technology and no "events", which would appear to be at odds, at least, with current trends in extreme weather. With North Sea decommissioning in its early stages beset with unknowns, one geographical area of precedent is the Gulf of Mexico where, in fact, fields have been compelled to close following damage from extreme weather.[28]

Also, compared to the Gulf of Mexico, decommissioning in the North Sea is considered to be a far more complex and difficult challenge – for example, the North Sea is a harsher environment with necessarily more stringent safety and environmental standards.[29] The OGA's cost estimate for the

largest, loosest category of estimates is generous in another respect. These so-called Class 5 estimates (for the riskiest projects) "are generally prepared based on very limited information".[30] Yet they account for 68% of the whole exercise. The OGA comment that there is "a very wide range of uncertainty within these estimates."[31] Yet they go on to say, without further explanation, that "a judgment was made to add in only half the recommended contingency percentage for a Class 5 cost estimate" resulting in 27% contingency being added across the principal estimate.

These estimates rely heavily on information provided by operators, and operators have often proved "not adept" at estimating costs according to international industry consultants the Boston Consulting Group. And, in arriving at its estimates, the OGA recognises the likelihood of operators exhibiting some "optimism bias". But studies of actual decommissioning projects reveal this bias to be substantial, with cost overruns compared to estimates of 30–100%.[32]

In justification of the 35% target, the OGA comment that "Many other industries have found a 35% reduction in cost to be easily attainable", drawing the conclusion therefore that "oil and gas decommissioning should be no different."[33]

Yet both the OGA and other observers provide reasons to suggest otherwise. The irony of the 35% cost-saving target for decommissioning is that the OGA itself published earlier research revealing that North Sea oil and gas projects run, on average, 35% over budget.[34] It is possible, of course, that this might somehow inform the OGA's belief that a 35% cost saving is possible. But it turns out that a 35% overspend, coupled with a two year delay on delivery, is a *global average* for mega-projects specifically in the power and utilities sector.[35] Consequently, it seems more likely that "optimism bias" is extremely large in cost estimation, and rather than there being an opportunity for savings of 35%, consistent real world experience suggests that estimates for future decommissioning may need to be revised upwards by 35%. This would push the realistic costs of North Sea commissioning, based on the OGA's assessment, back toward the top of its cost range at over £80 billion.

The uncertainty of the exercise carries strong echoes of the loose official attempts to quantify the costs of nuclear decommissioning. From the outset of that energy sector, the question of decommissioning was, quite literally, an afterthought according to the Nuclear Decommissioning Authority (NDA). Taking account of "numerous uncertainties" and producing figures largely because they are politically obliged to rather than, perhaps, because they thought the exercise reliable, the

NDA produced a cost range spread over 120 years "likely to be somewhere between £90 billion and £220 billion". This issue is scrutinised in a separate Intergenerational Foundation report.[36]

By comparison, a clear scheme for the decommissioning of offshore renewable energy installations was written into law under the Energy Act 2004, whereby the builders and operators of installations are "responsible for ensuring that the installation is decommissioned at the end of its useful life, and should be responsible for meeting the costs of decommissioning."[37]

The problem is, as the OGA recognises, that there is now intense pressure to delay decommissioning, because the costs threaten to undermine profits. That isn't the only reason either. The oil companies are hoping that, the longer they wait, the more developed will be the techniques and the technology available to cut costs. There are already investigations into whether you can melt the steel rather than remove it, and cap the wells with it, or cut metal remotely through robotics.

There are also forces moving in the other direction: the uncertainties in the oil price, and the policy response to the Paris agreement on climate. Even if the price of oil increases, it looks certain that oil companies will stop production in about 140 offshore fields in the North Sea over the next five years. Only about 38 new fields are likely to launch there in the same period.[38]

Because of the way they have constructed their approach, the UK government finds itself caught between their need to stick to their climate targets and what, for them, appears to be a more urgent demand: to make sure the oil fields continue to be exploited. Their 2016 Autumn Statement set out a long-term plan for the North Sea with the title "Driving Investment". It was this that reduced the Supplementary Charge to 10%, and cut the Petroleum Revenue Tax from 50% to zero.[39] They have also funded two seismic surveys of the oilfields at a cost of £40m.

There are also hidden subsidies for decommissioning which, we have to assume, are not being included. A 2016 package of public support for the city of Aberdeen, totalling £250 million, included funds to expand Aberdeen harbour. This is intended to help the city position itself for work, as it estimates 326 oil and gas fields will become uneconomic and need closing by 2030.[40] But the same infrastructure will be used to maximise the extraction of remaining fossil fuels. This means more public subsidies go to the sector, both to the oil companies themselves and the surrounding infrastructure. The city is also not blind to the fact that offshore wind will be a long-term growth sector

off the east coast. It seems reasonable that they should capitalise on the investment into decommissioning, but this is also an extra hidden subsidy for the process of decommissioning too.[41]

Other jurisdictions

This same division is present in any jurisdiction. There is bound to be some pulling in different directions between the need to reduce costs or maximise revenue on the one hand, and to meet climate obligations on the other. But in other countries, these different objectives have often been properly resolved in policy-making. The way that tax authorities take decommissioning into account varies in other jurisdictions.

There is one symbolic way popular with some operators but criticised by environmentalists as a cost saving short-cut: the US option to use old oil platforms, in certain circumstances, to as artificial reefs – as long as they are at least five miles apart. The decommissioning process in the USA is regulated by the BSEE (Bureau of Safety and Environmental Enforcement), and known there as the "Idle Iron" policy. Idle Iron needs to be plugged within three years of drilling stopping there.[42]

Regardless, there may not be the same opportunities for artificial reefs in UK waters, because the waters have different risks, ecologies and regulatory frameworks. But comparisons with other authorities can yield dividends, and suggest in particular that there may be better ways of organising tax deductions for decommissioning.

There seem to be broadly three ways in which this can be done:

1. Provide a tax deduction when cash is actually spent on decommissioning (UK, Australia, Denmark, Norway, Zambia. (Mining:) Australia, Canada, Chile, Peru, USA).
2. Provide a tax deduction when decommissioning is accounted for by the company making provision for decommissioning in the future (Netherlands).
3. Provide a tax deduction when decommissioning is pre-funded, in return for contributions to a decommissioning fund (Ghana, India, Mozambique, South Africa, Zambia, Canada (mining).

The advantage of doing it the UK way is that you are then dealing with actual costs, which reduces the obvious risk of underestimating. The difficulty is that it puts provision for decommissioning apparently inexorably into the future. It may also shift some of the risk to the government, as it has in the current situation.[43] The problem with the UK approach is that it leaves the profits of the drilling

companies unaffected during the years of plenty and, when it comes to decommissioning, threatens to roll back the tax they paid during those years. It still leaves taypayers responsible for picking up the bill for any underestimates.

4. The intergenerational burden

"We don't need an army of actuaries to tell us that the catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix."

Mark Carney, Governor of the Bank of England, September 2015

The Paris agreement has led to a peculiar limbo for the oil and gas industries. On the one hand, nothing has changed and the drilling goes ahead regardless. On the other hand, with the investment available drying up and different jurisdictions beginning to impose stricter limitations on fossil fuels, there is a risk to them that they will own the so-called "stranded assets" – the oil and gas reserves that companies list as part of their valuation, but which in reality may be worthless, because they may never be drilled.

The Paris agreement sets a limit of carbon emissions consistent with only a rise in temperatures of 2°C, and to strive towards the tougher target of 1.5°C. In spite of on-going debate about the size of the remaining carbon budget, global carbon emission trajectories still show no signs of coming anywhere near those limits. [44]

One widely cited paper in the journal *Nature* concluded that "globally, a third of oil reserves, half of gas reserves and over 80% of current coal reserves should remain unused from 2010 to 2050 in order to meet the target of 2 C."[45] But even this assessment relies significantly on so-called speculative – in other words unproven and not currently available – "negative emissions technologies". This makes the estimate conservative and, of course, inappropriate for the more stringent 1.5°C target.[46]

If every UK government department was to take Paris seriously, then decommissioning in the North Sea would have to happen faster and therefore at a greater expense – and at greater cost to taxpayers.

It is not clear how much faster, because this depends on a number of unknowns – not least of which will be the oil price and the development of decommissioning technology which could have cut their costs if they had been able to delay. This same uncertainty also makes it difficult for oil companies to

offset their costs against current production, though big players also have the opportunity to set it against tax they had paid in recent years.

The scenario depends entirely on whether oil prices go up or down in the years to come. They have recovered in recent months, otherwise decommissioning would also have been going ahead sooner, especially in the North Sea where costs are higher and so the drilling becomes uneconomic faster.

If the world implements the Paris agreement – an outcome which is progressing albeit half-heartedly – then the highest cost oil is likely to be left in the ground, given that finance will be increasingly difficult to borrow for oil or gas projects. That would leave the North Sea stranded, because costs are higher there. Yet, there will almost certainly be more drilling before the world shifts more wholeheartedly into tackling climate change, and that will probably include the North Sea.[47]

This mismatch between the objectives of the Paris agreement and the demand for oil and gas to continue is exacerbated by the way that UK policy is itself so divided, on the one hand paying lip service to the Paris process but, on the other, putting incentives in place to extend production in the North Sea to pay for the clean-up.

That is the central contradiction of decommissioning. It is necessary to decommission because of the Paris agreement and related international measures – which the UK ratified in 2016 – yet UK policy deems that it must be paid for by the continued exploitation of the oilfields.

Other impacts of the UK approach to decommissioning

There are also broader burdens that the oil and gas industry places on the UK population which deepen some of these contradictions.

But environmental questions go even closer to the heart of the industry's long-term intergenerational burden, and the short-term choices on exploiting remaining reserves. Even if some smaller fossil fuel deposits remain to be found, to avoid dangerous climate change, we can afford to burn less than a fifth of all current known deposits, making investment in further exploration and production pointless. The production process alone for North Sea oil and gas produces 3% of total UK carbon dioxide equivalent, greenhouse-gas emissions – over 13.2 million tonnes of carbon dioxide in 2015, a 5% increase on the previous year.[48]

That is little compared to the carbon dioxide that results from the burning of the product, the oil and gas itself. For every tonne of fossil fuel energy burned, about 3 tonnes of carbon dioxide are released into the atmosphere.[49]

North Sea oil and gas must bear some responsibility for the environmental and health costs of its products – and the government likewise has a responsibility inasmuch as it supports the industry in favour of cleaner alternatives.

In 2016–17, Scottish North Sea oil and gas production (82% or total UK oil and gas production) was 74.7 million tonnes (oil equivalent or "mtoe").[50] If all that was burned, around 224 million tonnes of carbon dioxide would enter the atmosphere. Estimates of the costs of the damage caused by carbon dioxide emissions – the so-called "social cost of carbon" – vary enormously.[51] In the USA, for example, previous policy has been guided by an official estimate of damage costing $37 per tonne, but scientists at Stanford University recently attributed a cost of $220 per tonne. That would give a cost for a single year's production of $8.3 billion to $49.3 billion. Scottish government estimates would therefore put total UK production at 91.1 mtoe, for 2016–17, with a comparable carbon cost range of between $10.1bn and $60.1bn. This is notional, of course, because not all oil products are burned, and highly sensitive to assumptions, but it illustrates the huge scale of uncounted health, economic and environmental subsidy that results from the absence of full cost accounting in relation to oil and gas production.

Apart from this extraordinarily reckless gamble with the climate of younger and, in perpetuity, future generations, there is also the impact of fossil fuels on the health of the next generation. The costs of air pollution related premature deaths in the UK, for example, represents more than two decades worth of current tax income from the oil and gas sector, with the UK having the third highest costs in Europe.[52]

Drawing on earlier work on fossil fuel subsidies done by the International Monetary Fund, recent research by the Health and Environment Alliance (HEAL) related the scale of such subsidies to the costs of the health burden from air pollution due to the burning of fossil fuels.[53] Air pollution is linked with one out of every eight deaths in the UK.

It is worth dwelling on this point to underline the gravity of government policy towards the oil and gas industry – and the effect on young and future generations. UNICEF states that "children are uniquely

vulnerable to air pollution – due both to their physiology as well as to the type and degree of their exposure." As well as the 600,000 children under five years old estimated globally to die from exposure to air pollution, many more are left with life-limiting and life-long chronic health conditions.[54] Living near busy roads is suspected of causing 15–30% of new cases of asthma in children.[55] For child health, the Royal College of Physicians points to "clear evidence that early exposure to air pollution can damage the lungs, and increase the risk of lung infections that may be fatal. It is known to have an effect on heart health in adult life." The Royal College also says that research is pointing "towards effects on growth, intelligence, asthma, and development of the brain and co-ordination".[56]

London alone sees an estimated 9,400 premature deaths annually as a result of poor air quality.[57] And in the UK as a whole, 40,000 deaths are attributable to outdoor air pollution, with health costs exceeding £20 billion.[58] It was the third highest cost among European countries, behind only Germany and Poland. The oil and gas industry claims to make useful financial and social contributions to the UK economy – but this health cost is equal to more than two decades worth of current tax income from the oil and gas sector.

The burden on young people

Not only does the burning of fossil fuels represent a disproportionate threat to younger and future generations, but also that it puts a heavy bill for decommissioning largely onto young people, who did not benefit from the years of production. Estimates appear to be rising for the cost of decommissioning. It is widely accepted that UK taxpayers will be expected to foot about half the bill – about the same that the new Trident fleet is supposed to cost.[59]

Table: Costs falling on under 18s alive today

OGA estimate cost range	Cost per person under 18 if bearing half the full cost
£39bn (35% saving)	£1,405
£44.5bn (low estimate)	£1,602
£59.7bn (principal estimate)	£2,150
£82.7bn (high estimate)	£2,979

A number of things complicate the attribution of costs intergenerationally. The exact timing of decommissioning is unknown and its complexity and emerging problems make it likely that time frames will slip. But decommissioning is likely to occur over the prime of the working lives of those under 18 today, a generation who did not directly benefit from the industry's heyday. Conversely, the generation that did will be moving into retirement and drawing down pensions.

To put the official figure for decommissioning in perspective, as a bill to the next generation, if young people under 18 alive today in the UK (13.9 million according to latest figures, 21.1% of the population[60]) bear half the £59.7 billion cost of decommissioning, that will be a burden of £2,150 each, paid off during their working lives. Their parents, by contrast, faced no such deficit, but rather benefited from the revenues. If oil revenues stay low and decommissioning is speeded up, the burden will be higher. Or, alternatively, if the current mandate for maximum extraction continues with new production facilities, and regardless of climate and health impacts, the costs of these and the consequent decommissioning will grow for young people.

To that burden, we also have to add the climate change burden of the previous generation and its impact in the future on the generation now under 18 in the UK. This is hard to quantify but nonetheless real, and of an order of magnitude much higher than the direct costs of decommissioning. But, as we saw above, the full cost of carbon for a single year's worth of production in the main Scottish North Sea areas was $8.3 billion to $49.3 billion, and for the UK as a whole $10.1bn to $60.1bn.

In the absence of full official disclosure, UK sector-wide fossil fuel subsidies are estimated to be in the region of $6.5bn.[61] In the UK more than four out of 10 premature deaths linked to air pollution could be avoided through the ending of fossil fuel subsidies, coupled with environmentally progressive reform on oil, coal and gas.[62] Work by Prof Mark Z. Jacobson and colleagues at Stanford University, has modelled a rapid shift to 100% renewable energy by 2050 for all the US States, and radical green energy shifts for 139 countries.[63] In addition to the obvious climate benefits, he estimates that rapid, global decarbonisation and the substitution of clean renewable energy between 2017 and 2050 has potential for dramatic human health consequences, preventing 90.3 million premature deaths over the 33 year period.[64]

Yet, currently the governments of the G20 countries as a whole are providing around four times more public finance to fossil fuel production than they are to renewable energy, in the UK the ratio has bee

over five to one.[65] There are fears of a collapse in investment in wind farms, solar and biomass over the next three years in the UK. And, as the government subsidises fossil fuel extraction, a similar amount of investment was disappearing from renewable energy projects during 2016, according to calculations by the Green Alliance.[66]

5. Regulatory contradictions

"Why, sometimes I've believed as many as six impossible things before breakfast…"

The Red Queen in Lewis Carroll's *Alice Through the Looking Glass*

The OGA was one of the core recommendations of the Wood Maximising Recovery Review.[67] As a result, the Maximising Economic Recovery (MER) strategy came into force in 2016, linking maximising revenue from the North Sea to the issue of decommissioning.

As we have seen, the central problem about the government's decommissioning strategy is that it is attempting to pay for it by continuing to exploit the North Sea oil and gas fields. This is not just a weakness, as we have seen: it conflicts with the UK government's policy in other departments and UK obligations to stick to emissions limits under the Paris agreement. If it is necessary under that accord to leave the oil and gas in the ground, then decommissioning on the basis of maximising the exploitation of remaining oil and gas reserves will break our legal obligations. It will also conflict with policies pursued by other government departments.

This implies the following weaknesses in the UK regulatory regime:

1. Decommissioning is an ambitious and toxic task, and it requires major investment. Yet, because the government is assuming that the money will come from oil and gas exploitation, then it is likely that provisions made in future national accounts are going to be inadequate. No survey has been carried out, that we are aware of, about provisions made in individual company accounts.

2. This leads to a truly conflicted policy: if the UK decommissioning model is successful, it will lead to an increased likelihood of default in UK treaty obligations.

3. In the same way, if the decommissioning model is unsuccessful, it will leave the UK government with three unpalatable options: either paying for it themselves when they have made inadequate provision, or extracting the resources from the oil companies which profited from the North Sea on a scale which could bankrupt some of the smaller players. Or watering down decommissioning standards.

There are other concerns. There is no policy to govern what happens if one of the companies responsible for decommissioning, and which jointly owns pipelines or terminals, goes bankrupt or refuses for some other reason to play their part.[68]

There are distinctions to be made, for example, with the US regulatory regime in the Gulf of Mexico, where decommissioning has been taking place. There operators have been allowed to run a "rigs to reefs" programme, which allows them to leave large parts of platforms under the sea to become habitats for marine life. This is controversial and not allowed by the international agreements that cover the oceans around the UK, though operators have been looking for ways that they can be exempt from the rules, which Shell appears likely to do with the Brent platforms. Shell is said to be applying to leave behind three concrete structures, each one the size of the Empire State Building. Other players are counting on permission to do something similar.

The weakness of the regime is that governments face huge costs if they don't agree to loosen the rules around decommissioning in this way. They are not, therefore, honest brokers that we should allow to manage these agreements.

Missed opportunities

Without major technological breakthroughs, the costs of decommissioning are relatively fixed and typically exceed the estimates. They may not yet be fully knowable but there is no obvious way of reducing them, except by allowing standards to be slackened or by encouraging the development of technology to do it more effectively.

It is reasonable for the UK government to make sure these costs are paid, at least partly, by those who profited from the sale of the oil and gas. It is not reasonable for them to encourage the oil extractors so much that they continue to undermine the future for young people in this country – by adding to the mounting liabilities which still have to be decommissioned, and by increasing the temperature of the earth to unsustainable and dangerous levels.

Yet the UK government is still delaying the fateful day when decommissioning must begin in earnest and keeps paying out more subsidies for North Sea fossil fuel extraction. In the UK, production subsidies have already benefited major fossil fuel companies operating in the country, mostly foreign-owned. And, in 2015, the UK was revealed as the only country in the G7 to increase fossil fuel

subsidies.[69] George Osborne's measures in the 2015 Budget alone amount to a package worth £1.7 billion by 2020 spent by taxpayers on subsidising North Sea production in order to extend the ambit and cut the costs of decommissioning.[70]

A Treasury statement said that this would build on "unprecedented support already provided to the oil and gas sector through £2.3bn packages in the last three years".[71] As a result of these concessions, as we have seen, rebates to the Big Five alone amounted to £1.1 billion over 2014 and 2015, and that is before the real work of decommissioning has begun to reach scale.

6. Principles for a new framework

"A true conservationist is a man who knows that the world is not given by his fathers, but borrowed from his children."

John James Audubon, American ornithologist

To deliver a new intergenerational deal that respects young people alive today, and the prospects of coming generations, a very different policy framework is needed. An expensive, toxic burden, and an energy market rigged against their interests, should not be the gift of this generation to the next.

We need a new "sunset, sunrise" contract with energy. The first half of that would see the responsible, managed winding-down of a fossil fuel sector that has run out of economic usefulness and environmental space, in a way that does not worsen its impact. Simultaneously, we need to encourage the growth and substitution of a renewable energy framework to provide better health, more jobs, a safer environment and long-term economic prospects for young people and future generations.

- Bearing in mind the flaws in the OGA's approach, and potential conflicts of interest of some of those involved in the exercise, a more realistic estimate of the true costs of decommissioning should be produced by the UK Statistics Authority (as both the industry and the Treasury potentially have vested interests in the estimates being low.)

- Any link between decommissioning and the continued maximised extraction of oil and gas needs to be broken. New ways of funding both decommissioning and renewables expansion are need. For example, there could be a "clean air" bond issue backed by UK government that will go into both decommissioning and renewables.

- Even as the price of oil varies, oil companies still make huge, and in effect "windfall" profits. The great bulk of responsibility for decommissioning, and the health and environmental impact of its product, should be shouldered by the industry that profited from it.

- The oil and gas industry should fund a dedicated decommissioning authority that would take responsibility for the implementation of efficient, economic decommissioning operations conducted to a timetable and on a scale compatible with the UK's climate obligations, and under the auspices of the Oil and Gas Authority (OGA).

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