Securing the UK's Energy and Climate Future: Energy Bill 2015

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The North Sea offshore oil and gas industry requires re-invention through lower cost utilisation and identification of new sources of revenue. UK climate policy requires a substantial decrease of carbon emissions while reducing the associated costs and regulatory burden on industry, taxpayers and consumers. These joint objectives can be secured by providing the Oil and Gas Authority with the power to require fossil fuel companies to sequester carbon dioxide equivalent to a small but rising fraction of the fossil carbon they extract or import into the UK.

The licensing of carbon dioxide storage is one of the functions of the Oil and Gas Authority (OGA) specified in the current Energy Bill, yet gives the Bill gives no indication on how this function is to be reconciled with its primary objective of promoting the exploitation of oil and gas reserves nor with existing obligations to greenhouse gas reductions under the Climate Change Act. This note proposes a simple enabling amendment that could provide: a guaranteed source of revenue for the UK oil and gas industry even if international oil prices remain low; promotion of enhanced oil recovery and the nascent carbon capture and storage (CCS) industry at no additional cost to the UK taxpayer; and protection of fossil fuel energy supplies and fossil-fuel-related assets in the light of evolving climate change objectives.

Stopping the process of human-induced climate change will require net global carbon dioxide (CO_2) emissions to be reduced to zero. By the time global warming reaches two degrees, every tonne of fossil carbon extracted for energy production will need to be compensated for by the permanent disposal of 3.7 tonnes of CO_2 (the amount generated when that tonne of carbon is burned) if warming is to be limited to that level. This is uncontested science. Although promising alternatives exist, the only currently proven technology for disposal of immense CO_2 tonnages is long-term geological storage. To stabilise global temperatures, the only alternative to CO_2 disposal is a global ban on all fossil fuel extraction and use. Such is the range of productive uses of fossil carbon that, even if it were enforceable, such a ban would be economically catastrophic. The International Energy Agency predicts that fossil fuels will continue to provide 75 % of global energy in 2030. UK Government predicts [1] that existing policies will not meet the UK's 4th carbon budget to 2027 because of our continued dependence on fossil energy.

CCS will be needed to stabilise climate at an affordable cost. Energy modelling studies consistently find that meeting a goal of limiting global warming to two degrees without large-scale use of CCS would be two to three times more expensive than meeting this goal if large-scale CCS is developed

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and deployed when needed [2, 3]. The reason CCS has not automatically developed under existing market-led UK or EU climate policies is due to the lack of a durable long-term business model. This proposal provides a simple, easy to understand, and cheap to administer, model for that purpose.

Current national and international climate change policies are failing to promote the progressive deployment of CCS. This is largely because they focus on the wrong target: rates of greenhouse gas emissions in 2030 or 2050, while the climate system primarily responds to the total (cumulative) amount of carbon dioxide emissions over the entire industrial epoch. CCS, although essential to any affordable scenario for limiting cumulative emissions, is relatively expensive as a means of reducing emission rates in the shorter term. As a result, conventional mitigation policies typically envisage relatively little deployment of CCS for the next 20 years or so, followed by very rapid (and hence risky and expensive) deployment in the 2040s. Such a precipitate deployment of CCS would potentially be accompanied by significant stranding of otherwise economically valuable fossil fuel-based assets.

Additional measures are required to ensure that CCS is deployed progressively in order to spread the cost over time, minimise risk to future taxpayers, encourage technological innovation and minimise systemic risks of stranded assets. The simplest mechanism that involves minimal additional regulation and no additional taxation is an upstream sequestration mandate: a requirement on producers and importers of fossil fuels to sequester, or pay for the sequestration of, a small but rising fraction of the carbon content of the fossil fuels they extract or import into the United Kingdom.

The proposed mechanism is as follows: to introduce a Certificate system to identify any person extracting, or importing, oil or gas for sale or use as fuel or feedstock or reagent within the economic jurisdiction of the UK. The Certificate carries an obligation to demonstrate permanent storage of a percentage of the fossil carbon content of that oil or gas in the form of carbon dioxide that would otherwise, under normal business practice, have been vented into the atmosphere. The percentage will be set by the OGA in consultation with independent scientific advice, and increase over time to be commensurate with the UK's long-term climate goals. Permanent storage may be provisionally defined as an expected storage lifetime of 10,000 years.

The regulatory burden of such a certificate system is both simple and light. All of the information required is in existence, and much of it already gathered by Government. The only novel element here is a simple combination of information to produce a liability. The discharge of that liability is equally simply measured with currently collected data. These duties sit very well with the envisaged mission of the OGA. The UK offshore petroleum industries hold much of the required data, have developed the expertise to engineer the required storage, and have hundreds of thousands of skilled workers able to develop and operate the necessary carbon storage facilities. An additional benefit is the possibility to create, for the first time in the UK, a guaranteed supply of carbon dioxide. This can develop a new market for CO_2-Enhanced Oil Recovery in the North Sea. CO_2-EOR is recognized by the industry PILOT task force as the technologically most effective way to Maximise Economic Recovery [4].

Benefits

1) The costs of CCS deployment are spread across the entire fossil-fuel-using economy rather than, as now, being concentrated in the electricity sector and largely born by the taxpayer. This correctly reflects the long-term role of CCS in protecting the value fossil-fuel-related assets.

2) A true market in carbon storage would develop without the need for additional subsidy. Industry will discover their own least cost solutions – using CO_2 for Enhanced Oil Recovery, (providing additional revenue that could render otherwise uneconomic fields productive even under low international oil prices), CCS in aquifers, or sequestration of carbon by mineralisation.

3) This approach automatically assigns a value to CO_2 and its storage. An Obligation to store CO_2 creates payments by commercial extractors and importers to mitigate the impact of emissions from the products they sell. These could defray the £3 billion OPEX costs for each of Peterhead-Goldeneye and Drax-5/42 CCS competition projects which will otherwise be funded by UK Treasury under the Levy Control Framework.

Pathway and costs

An illustrative pathway of enactment would be to create Certificates from 2018, and mandate storage of 0.25% from 400 $MtCO_2$ in 2020 (1 $MtCO_2$, the capacity of Peterhead-Goldeneye, at a cost to fossil fuel extractors and importers of 25p/tCO_2, or 0.06p/litre of petrol, assuming a conservative sequestration cost of £100/tCO_2 sequestered), rising to 10% storage in 2030, with the objective of 100% storage by the time global human-induced warming reaches 2^{o}C.

The proposed Energy Bill amendments:

To introduce into Clause 4 of the Bill an additional matter to which the OGA must have regard:

> Progressive and timely deployment of carbon capture and storage
> The need for carbon capture and storage to be deployed at a rate commensurate with meeting climate change objectives while minimising the risk of stranding of fossil fuel assets and costs to future consumers and taxpayers.

To introduce a new chapter 4 of the Bill stating how this matter will be discharged through the introduction of a carbon certificate system.

> Chapter 4: Ensuring progressive deployment of carbon storage
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> 31) OGA will create a unified carbon licence, which will be required to extract, or import, fossil carbon into the UK. This licence will report to OGA the tonnage of carbon in fuel, reagent, or feedstock, and its ownership. The OGA will grant equivalent Certificates, of zero face value, to owners for each tonne of carbon reported.
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> 32) Certificate holders have a duty to ensure a progressively increasing fraction of the annual carbon licensed is directly and verifiably stored or sequestered within the European Economic Area (EEA) in the form of carbon dioxide that would otherwise, under normal business practice, have been vented to the atmosphere.
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> 33) The sequestered fraction will be set and published annually by OGA, with an outlook 10 years ahead. This fraction will be informed by independent scientific advice consistent with long-term climate goals.

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QUESTIONS and REFERENCES

1) Has industry demonstrated a capability for Carbon Capture and Storage? It has. There are 14 large projects worldwide storing carbon into the deep subsurface, and another 8 in construction [5]

2) Could this conflict with the EU-ETS? It would not. A tonne of CO_2 stored under this scheme would have its EU Emission Certificate transferred from the EU scheme and cancelled by the UK. The UK certificate is not transferred back into the EU. This was adopted by EU Parliament 2013 [6].

3) Is there sufficient storage capacity? There is. The UK has about 80,000 Million tonnes of CO_2 storage , shown by SCCS and by ETI [7]. This is adequate to securely store hundreds of years of UK emissions, or many decades of EU emissions. Commercially proven storage of 30Mt by Shell and 200Mt by National Grid is now proven for the UK CCS Competition. 1,500 Mt additional storage will be confirmed in May 2016 [8].

4) Is sufficient CO_2 available at an affordable cost? Distributed over the entire fossil fuel economy, costs of progressive deployment of CCS are both manageable and the most affordable route to net zero carbon emissoins. The cost of CO2 transport and storage is small, typically £10/tonne CO_2 in 2030 [9]. To obtain pure CO_2, 1.5 Mt/yr industry sources are already available [10]. Low cost capture from Tees industries offers 4Mt/yr from 2022, rising to 15Mt/yr [11] (current UK policy ignores these sources). Power plant CO_2 from Peterhead and Drax will provide 2 x 1Mt CO2 from 2020, future CCS projects like Caledonia Clean Energy can add 3.8 Mt/yr CO_2 from 2021. An overall marginal cost of £100/tCO_2 sequestered in the 2020s represents a very conservative estimate.

5) Are companies ready? Most transnational hydrocarbon companies have already successfully undertaken their CO_2 storage pilot(s). These companies [13] have already priced CO_2 into their internal planning at $40-$60 per tonne. This imposition of carbon storage is expected: but when.

6) Is there a legal precedent? There is. This proposal does not levy a tax, so there is no border charge. Certificates are to ensure an environmental clean-up obligation. The UK has uniquely established conceptually similar Packaging Recovery Notes, implementing the EU Packaging Directive [12].

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