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SCCS Response to Maximising Economic Recovery of Offshore UK Petroleum: Draft Strategy for Consultation

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1 Introduction

Scottish Carbon Capture and Storage (SCCS) welcomes the opportunity to provide a response to the consultation on the draft strategy for maximising economic recovery of petroleum from the United Kingdom continental shelf. This document first provides some context on petroleum production and decommissioning as it relates to CO_2-Enhanced Oil Recovery and Carbon Capture and Storage, and then discusses the recommendations we would make for inclusion in the draft strategy.

SCCS is the largest carbon capture and storage (CCS) research group in the UK, a partnership of the British Geological Survey, Heriot-Watt University, the University of Aberdeen, the University of Strathclyde and the University of Edinburgh. SCCS is able to act as the conduit between industry, government and academia. We provide a single point of coordination for all aspects of CCS research ranging from capture engineering and geoscience, to social perceptions and environmental impact, through to law and economics.

2 Context

There is an inescapable synergy between maximising economic recovery, decommissioning production infrastructure and carbon capture and storage (CCS). There are multiple types of enhanced oil recovery (EOR) which can be applied to particular subsurface oil fields. However, for the UK sector of the North Sea CO_2-EOR is the technology with the greatest potential. CO_2-EOR involves the injection of liquid CO_2 into the mature oil reservoir where, at the subsurface conditions of high temperature and high pressure, it acts as a solvent making the oil less viscous, such that additional quantities can be produced from the oil field. CO_2-EOR can be an effective closed cycle system, with CO_2 separated from the produced oil and returned to the reservoir for reuse and ultimately for permanent secure storage. SCCS (2015) has shown that the small additional carbon budget necessary for the engineering of offshore CO_2-EOR, has no adverse consequence on the embedded carbon reduction budget of onshore electricity generation with CCS to supply millions tonnes of CO_2.

Analysis in an Element Energy report undertaken for Scottish Enterprise identifies additional recoverable oil, through CO_2-EOR from 19 UKCS oil fields, of the order of 2.5 billion barrels of oil (Element Energy 2012). PILOT, a partnership between the UK Oil and Gas industry and the UK Government, published the findings of its EOR Work Group in 2014, concluding that miscible CO_2 technology ranked the highest in terms of total recovery from the UKCS; the top 15 fields most technically suitable for CO_2-EOR could produce a risked additional 0.6 billion boe (McCormack 2014). Similar, or larger, opportunities exist in the Norwegian sector.

Use of CO_2 to increase oil recovery from mature fields is already financing CCS deployment in the US and Canada, and securing domestic oil production and additional tax revenues. MER in the UKCS could similarly have three benefits : provision of new oil production tax revenue; defending Treasury against imminent offshore decommissioning costs, at a difficult time of tax and oil price for the offshore industry; contributing a large amount to the UK's CO_2 storage obligation, whilst also reducing the embedded carbon assigned for the UK's oil production..

The development of CO_2 injection in offshore oilfields has been slower than anticipated. However, in the North Sea important demonstrations of the technology include:

- CO_2 has been injected from offshore platforms at Sleipner, Snøhvit and Brae at rates of 1MtCO_2 per year
- EOR has been trialled in 19 projects (Awan et al 2008), including full-field gas injection operations such as Oseberg
- Two injections of miscible methane gas at full commercial scale were successful in large UK deepwater oilfields at Ula and Magnus (Brodie et al 2012).
- The operating miscible methane injection at Åsgard, offshore Norway is comparable in size, technical success, and financial return to a full CO2-EOR operation (Cavanagh and Ringrose 2014).

At the recent, December 2015, COP21 meeting the deal adopted includes a commitment to a target of net-zero emissions by 2050. This will require large volume CO_2 injection to offset fossil fuel extraction emissions. Research by SCCS shows that a beneficial balance of carbon storage through CO_2-EOR can be achieved through appropriate injection strategies. Using this incentive can store more carbon, faster, at less cost, than any other method for the UK (SCCS 2015). Other EOR techniques do not enable concurrent carbon storage.

The Norwegian government has recognised the importance of CO_2 storage in the North Sea as evidenced by the recent announcement that Statoil will conduct new feasibility studies on carbon storage on the Norwegian continental shelf (Reuters 2016). The results from the storage studies will form the basis for a decision by the Norwegian government on further progress for full-scale CCS in Norway, which intends to realise at least one full-scale CCS demonstration project, supplied from industrial CO_2 sources, and operating by 2020.

There is certainly a balance to be maintained between driving good outcomes for the UK tax payer and ensuring that UKCS stays "open for business" but this should also join up with other DECC and UK government objectives, including meeting the UK's carbon reduction targets. The European Union Joint Research Centre study (Tzimas 2005) concluded that 'CO_2-EOR could help Europe simultaneously reduce the emissions of CO_2, improve the security of energy supply by enhancing the recovery of European oil resources, and encourage the development, demonstration and deployment of advanced cleaner and more efficient fossil fuel energy conversion technologies by making available proven CO_2 storage sites.'

Decommissioning strategies and CO_2-EOR are tightly linked to the development of CCS. Economic costs of the implementation of CCS can be greatly reduced by the reuse of existing infrastructure such as subsea pipelines, associated gas handling equipment, platforms and boreholes (production wells can be converted to CO_2 injection wells) and can further be economically enabled by additional oil production through CO_2-EOR. "A wait-and-see approach to CO_2-EOR in the UKCS could however lead to missed opportunities for the UKCS, as most of the UK's relevant oilfields are predicted to be decommissioned by the 2030's." (Element Energy 2012). Re-entry costs into offshore CO_2 storage sites in depleted fields, by reuse of decommissioned infrastructure for CO_2 transport, injection and storage can be dramatically reduced by using technologies and processes that will enable this reuse. Two clear examples are firstly the mothballing (rather than removal) of onshore and offshore pipelines, which could be re-used for CO_2 transport ,. Secondly the more novel approach to abandon suitable boreholes so that they can be re-located, and re-used for CO_2 injection. This would involve measures such as : retention of wellhead integrity and flanges suitable fro re-connection, and only temporary plugging of boreholes. At present, abandoned boreholes are typically filled with concrete, cut off below the seabed, and rendered un-locateable and irretrievable. We regard useful offshore infrastructure as including compression facilities and pipelines onshore and offshore, and borehole arrays and wellheads. In addition, the permitting of abandonment to enable re-use, and the development of UK CO_2-EOR should be identified priorities of the OGA.

3 MER UK Draft Strategy – Recommendations

3.1 Development – Supporting Obligations 10 and 11

This section correctly identifies the need to future proof the planning, commission and construction of infrastructure in order to maximise petroleum recovery, but should also include reference to the need to consider CO_2-EOR and CO_2 storage requirements. The Paris COP21 agreements, in the context of global carbon budget fundamentals, make it inevitable that CO_2 storage will feature large from some point in the next 30 years, it is simply a question of when. The UK will be negligent now, if it allows short-term cost-saving by companies and Treasury during decommissioning to neutralise assets which will increase re-entry and re-development costs by hundreds of millions of pounds, in 10 or 20 years time. It is likely that arguments of "additional cost" will be deployed by companies operating decommissioning infrastructure, there always are. However it is the responsibility of Government to see through such short term market failure, and to choose which infrastructure assets to steward for the long-term benefit.

3.2 Technology – Supporting Obligations 15 and 16

SCCS strongly supports Supporting Obligation 15, in particular where these technologies potentially relate to CO_2-EOR and the development of CO_2 storage opportunities. There are other 'potential long-term benefits to the UK of the development and deployment of such technologies' as CO_2-EOR and CCS in addition to those of 'driving good outcomes for the UK tax payer and ensuring that UKCS stays "open for business"'. There are other UK targets that DECC and UK government must address to achieve long-term benefits to the UK, such as meeting carbon reduction targets via the development of CO_2 storage, especially in the context of the recent COP21 agreement. CO_2-EOR simultaneously enables MER and storage of carbon dioxide; the development and promotion of UK CO_2-EOR should be an identified priority of the OGA.

3.3 Decommissioning - Supporting Obligations 17-19

The MER UK Draft Strategy correctly identifies in Supporting Obligation 17 that potential continued use options should be explored, such as the transport and storage of CO_2 before commencing the decommissioning of any infrastructure. However, CCS is described as "not directly relevant to the recovery of petroleum". In some cases carbon storage may be directly linked to MER for the case where CO_2-EOR is an option, and this should be reflected in the wording of Supporting Obligation 17. The argument that CCS is not connected to MER is untrue – as demonstrated by the continuing takeup of CO_2-EOR in north America, and certain States of Europe where CO_2 is available. The blockage to MER by CO_2-EOR is availability of CO_2 the price of oil, and the cost of entry into offshore engineering. All of these will change into the future, not least the subsea technology as demonstrated at Åsgard.

The Context section of this document highlighted the importance of retaining infrastructure for reuse in the development of CO_2-EOR and CO_2 storage. SCCS concurs with Supporting Obligations 18 and 19. However, to ensure that valuable infrastructure is not removed prior to the development of CO_2 storage opportunities we suggest that Supporting Obligation 18 should include reference to these opportunities for reuse.

For example:

'Relevant persons must decommission infrastructure located in relevant UK waters in the most cost effective way that does not prejudice the maximising of the recovery of economically recoverable petroleum from a region nor the development of CO_2 storage sites.'

In several cases, it is likely that the imperative for decommissioning will not coincide in time with the emergence of a demand for CO_2 storage. In such strategically selected cases, the OGA and UK government should consider taking effective ownership of, and holding such oil field sites as are technically suited to CO_2-EOR and/or CO_2 storage locations until such time as these technologies will be implemented. We suggest that decommissioning costs can be paid by the present asset owners into escrow accounts, to be held in trust for government to fund the ultimate decommissioning of those assets.

3.4 MER UK Strategy and the Sector Strategies

The MER UK Strategy is set within the context of the Wood Review, which has additionally called for the development of a suite of six "Sector Strategies" intended to cover the following areas:

- Exploration (including access to data)
- Asset Stewardship (including Production Efficiency and Improved Oil Recovery)
- Regional Development (starting with the Southern North Sea)
- Infrastructure
- Technology (including Enhanced Oil Recovery and Carbon Capture and Storage)
- Decommissioning

As discussed above in the Context section of this document, the Sector Strategies of Technology and Decommissioning are inextricably linked and the OGA should consider how to ensure joined up thinking within these Sector Strategies, as laid out above for Supporting Obligations 15-19. Even now, after many months of work inspired by the Wood Review, it seems that current oil and gas interests dominate over strategic visioning of different uses for the North Sea subsurface, which could find a longer and more sustainable business future.

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