Department of Energy & Climate Change

# Next Steps in CCS: Policy Scoping Document – Summary of Responses

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# Context

1. The Government published 'Next Steps in CCS: Policy Scoping Document'[1] in August 2014. The document set out the Government's commitment to the goal of making CCS cost competitive with other forms of low carbon technology in the 2020s, and the framework for supporting CCS deployment in the UK.

2. 'Next Steps in CCS' sought views and evidence from the CCS sector on a possible next phase of CCS deployment. In total 36 responses were received (see Annex A for the list of organisations who responded). Government would like to thank all those who submitted a response.

3. Government invited views on the policies and proposals put forward in the Policy Scoping Document. A list of questions is attached at Annex B. This document provides a summary of the key themes and issues raised in the responses overall, under the broad headings used in 'Next Steps in CCS'. It also highlights recent steps taken by the Government to progress the development CCS in the UK.

[1] https://www.gov.uk/government/publications/ccs-policy-scoping-document

# Summary of Responses

## Financing CCS Projects

4. In ‘Next Steps in CCS’ Government acknowledged the challenges faced by industry in raising finance to develop CCS power projects.

5. Stakeholders saw a need for action to provide greater clarity on future CCS deployment, potentially through a CCS target and funding under the post 2020-21 Levy Control Framework. Some suggested that additional grant support or early allocation of the CfD before costs are fixed may be necessary to enable developers to make the necessary pre-capital investment in CCS projects and to enable positive Final Investment Decisions (FID). Without this Government action, respondents felt that developers would not be willing to invest in project development at their own risk to a point where FID can be taken.

6. The majority of responses agreed with the proposition in ‘Next Steps in CCS’ that a CfD for CCS projects is an appropriate financial mechanism to support investment in CCS power. However, stakeholders expressed a concern that the current generic CfD terms would not be investible for CCS and some variations would be required. Ideas put forward included:

    - Modifying the terms to reflect risk sharing arrangements that are different from the generic renewables CfD;
    - Putting in place arrangements to adjust the “Strike Price” to reflect early stage CCS operational risks and uncertainty around capital costs at the point of FID;
    - Lengthening the term of the CfD (i.e. beyond fifteen years); and
    - Enabling adjustments in the Strike Price to take account of changing fuel prices over time.

7. Responses also highlighted storage liability as a risk that in the view of respondents may need to be addressed through Government action. Some respondents expressed concern that the market (e.g. insurance sector) would not provide products, at least in the early stages of CCS deployment, to address storage liability risks. In addition, stakeholders highlighted the importance of increasing overall investment flows into CCS projects, suggesting that the Green Investment Bank, UK Guarantee Scheme, European Investment Bank, Export Credit Agency and UK Trade & Investment all had important roles to play in making and / or facilitating this additional investment.

## Transport and Storage Infrastructure

8. Stakeholders thought that the Government had put in place a robust domestic regulatory framework, particularly for storage. Responses received generally supported the finding of the CCS Cost Reduction Task Force that the use of existing transport and storage infrastructure could be key to achieving cost reductions in early post-Competition CCS

projects. Nevertheless, respondents highlighted the importance of third parties being able to discuss proposals for infrastructure sharing with Competition developers, as provided for under the Storage of Carbon Dioxide (Access to Infrastructure) Regulations.

9. Stakeholders broadly agreed that a shared transport and storage infrastructure will help incentivise both power and industrial CCS. However, some argued that the lack of available expertise in the transport and storage of $CO_2$ limited development. Stakeholders suggested Government could help overcome this barrier by incentivising companies to undertake the exploration and development of storage and transportation infrastructure.

10. Stakeholders highlighted the European CCS Directive as a strong foundation for the regulation of geological storage of $CO_2$ in Europe and indicated that sufficient regulation was in place to enable CCS construction. Consequently, stakeholders were keen that any subsequent revisions to the European CCS Directive were tightly focused as substantial revisions could introduce risk and dis-incentivise early projects.

## Enhanced Oil Recovery (EOR)

11. On the issue of CCS and Enhanced Oil Recovery (EOR) there was no overall consensus, although the majority of stakeholders felt that Government should do more to encourage $CO_2$-EOR. Stakeholders outlined that $CO_2$-EOR could make a positive contribution to economic growth and help maximise the oil and gas reserves in the North Sea. However, stakeholders thought that in order to achieve this, Government needed to put in place measures to enable a coordinated $CO_2$-EOR approach alongside the development of CCS. It may also require additional pipeline infrastructure investment given the location of oil fields. It was recognised that CCS alone would not be enough to bring forward $CO_2$-EOR in the UK, and wider issues such as the price of oil would be important in determining whether $CO_2$-EOR was an attractive proposition for the industry.

12. Stakeholders supported the findings of the Wood Review[2] which indicated the potential for $CO_2$ -EOR in the UK. Stakeholders supported the establishment of the new Oil and Gas Authority, which will have a role in facilitating future EOR developments and considered that this new body could lead on co-ordination. Stakeholders argued that $CO_2$ for EOR could contribute positively to the business case for investment in CCS infrastructure and could help create an environment for private sector investment in CCS. They felt a clear signal on the timetable for CCS deployment from Government would provide greater clarity to North Sea oil producers about when a source of $CO_2$ will become available for Enhanced Oil Recovery purposes.

## Industrial CCS

13. Responses highlighted the importance of Industrial CCS (ICCS) as the only currently viable technology to enable energy intensive industries to decarbonise. Some responses saw value in a Government ICCS strategy which would encompass the development of ICCS clusters ensuring that, where appropriate, ICCS could link in with the transport and storage infrastructure provided through the Government's Commercialisation Programme.

14. Respondents were clear that an incentive/financing mechanism would need to be developed if ICCS is to make progress in the UK. Stakeholders highlighted the

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/330927/Wood_Review_Government_Response_Final.pdf

importance of the forthcoming Teesside ICCS feasibility study in developing ICCS in the UK.

15. Stakeholders felt that early deployment of ICCS could help de-risk transport and storage infrastructure and stimulate investment across CCS (i.e. in power and industry capture projects as well as transport and storage infrastructure).

16. Responses also called for further investment in ICCS research and development, particularly for demonstration projects and industries (e.g. cement) where the capture process is technically challenging.

## Bio-CCS / BECCS

17. Respondents agreed that the development of Bio-CCS (combining bioenergy with CCS (BECCS)) remained at an early stage but argued there was a case to seek to allow negative emissions from BECCS to be recognised under the EU Emissions Trading Scheme (EU ETS) as the EU ETS does not currently incentivise CCS with biomass.

## Carbon Capture and Utilisation

18. Recognising that Carbon Capture and Utilisation (CCU) technology is very much in its infancy, responses reflected the view that funding for research and development was needed to assess whether CCU could cost effectively support long term $CO_2$ emission reductions.

## CCS Supply Chain

19. Respondents saw a positive role for Government in supporting and stimulating a UK-based supply chain. Responses urged Government to prioritise skills development both in the CCS sector and energy industry more widely, on the grounds that without Government action there could be a shortage of construction capacity and CCS specific services which could subsequently delay the deployment of CCS in the UK.

20. Both projects in the CCS Commercialisation Programme have announced the award of subcontracts under their respective FEED Contracts. White Rose and Peterhead have awarded around 20 subcontracts, each worth over £100,000.

## Knowledge Transfer

21. Respondents were asked whether arrangements for knowledge transfer similar to those under the Commercialisation Programme's Front End Engineering and Design (FEED)[3] contracts should be made for any future CCS projects supported by Government (including any projects in receipt of operating support only).

22. The majority of responses acknowledged knowledge transfer as a key philosophy underpinning the Commercialisation Programme. Responses proposed that knowledge could be disseminated through existing CCS community networks e.g. using the CCS Association and UK CCS Research Centre.

23. In addition to using existing networks responses highlighted the importance of the FEED process in providing information to the wider CCS community, e.g. the dissemination of the knowledge transfer documents from the FEED process for the Peterhead and White

[3] https://www.gov.uk/uk-carbon-capture-and-storage-government-funding-and-support

Rose projects was considered important to helping reduce the cost of follow-on CCS projects.

## Research Development and Innovation

24. Stakeholders generally supported Government's approach to research and development, agreeing that continued investment in CCS research, development and innovation was a key way to achieve cost reductions in future CCS projects by creating better, cheaper components and processes.

25. Stakeholders welcomed the Government and Research Councils' £125m commitment to a CCS R&D programme between 2011 and 2015. Notwithstanding that this programme supports research across all aspects of the CCS chain and includes industrial CCS, some respondents saw scope for further targeting of funding on particular technologies within CCS. Some respondents saw value in reviewing future R&D funding requirements once learning from CCS projects in operation had been achieved and disseminated.

# Policy Action in Support of the CCS Commercialisation Outcome

26. In the 2012 CCS Roadmap[4], the Government set out its approach of working in partnership with industry towards the goal of enabling CCS to compete on cost with other low carbon technologies by the 2020s. Action in support of this goal included the CCS Commercialisation Competition, Electricity Market Reform, work to create an enabling environment for CCS through appropriate regulation, and support for CCS Research & Development, international knowledge transfer and collaboration.

27. The Government continues to take forward work in these areas and this update highlights steps taken since publication of 'Next Steps in CCS: Policy Scoping Document' to support the commercial deployment of CCS in the UK.

28. The CCS Competition remains central to Government's efforts to commercialise CCS technology. Both White Rose and Peterhead are progressing through their Front End Engineering and Design (FEED) work, and the Government will shortly publish an update on our gov.uk website[5] on the process and timetable for publishing the Key Knowledge Deliverables from FEED. In December 2014 draft Project Contracts, governing use of the proposed capital grant, and draft Contracts for Difference governing operating support for the projects were shared with White Rose and Peterhead. Contract negotiations will continue throughout 2015 with developers expected to take Final Investment Decisions in late 2015 with the government taking FID shortly after.

29. Alongside the Competition, Government remains committed to putting in place a framework for further deployment of CCS in the 2020s and beyond. This work seeks to provide increasing clarity for potential investors considering future CCS projects, subject to future Ministerial decisions on the Levy Control Framework (LCF). To this end, we are advancing work on the design principles of a post-Competition CCS CfD and arrangements for the potential competitive award of CfDs to future CCS projects. Following receipt of responses to 'Next Steps in CCS', Government shared with industry stakeholders a concept note on the purpose of this work, and the scope and timetable for the first stage to late spring 2015[6]. We followed this up with a December 2014 workshop with industry, consumer and expert stakeholders to agree this scope. Using the output of this discussion, DECC is now working to build the evidence base to support future work on options for an appropriate CCS CfD allocation mechanism and contract terms. This will include further engagement with industry in early spring 2015 on the specific challenges facing post-Competition CCS power projects.

30. In Europe, the UK secured a commitment to funding future CCS projects through the NER400 innovation fund in the October European Council conclusions. The importance of CCS to the European Union meeting its long term low carbon objectives was

[4] https://www.gov.uk/government/publications/the-ccs-roadmap

[5] https://www.gov.uk/uk-carbon-capture-and-storage-government-funding-and-support

[6] https://www.gov.uk/government/publications/ccs-policy-scoping-document

reaffirmed in the Commission's Communication on the Energy Union Package[7] and the March European Council Conclusions which referenced CCS's place in a new energy and climate-related technology and innovation strategy[8].

31. Ensuring a strong market-led framework for the development of transport and storage infrastructure remains a priority. To this end, in November, the Government published its 'Third Party Access Guidelines' providing guidance to accompany the UK $CO_2$ Infrastructure Regulations governing third party access to pipeline and storage sites. At the same time we wrote to the CCS Association setting out the interaction between the CCS Competition process, which is governed by the standard public procurement rules, standard practice in commercial negotiations and the roles envisaged for developers and Government in the Regulations. This letter[9] clarifies that under the terms of the Competition the White Rose and Peterhead project developers are free to engage in discussions with potential third parties interested in accessing $CO_2$ pipelines and storage sites.

32. In addition to transport and storage infrastructure, Government is keen to build on current work underway to determine how best to successfully deploy industrial CCS (ICCS) in the UK. We are already taking action to support ICCS through £1 million funding for the Tees Valley City Deal which will examine the feasibility of establishing Teesside as a centre of excellence for future clean industrial development by creating Europe's first ICCS equipped industrial zone.

33. CCS research and development remains a priority. Last year several funding calls were announced to encourage research into CCS technology:

- November 2014: Government announced Innovate UK's Cleaner, More Efficient Conventional Fuels Competition[10] which opened on 2 March 2015 with up to £4m for collaborative R&D and up to £1m for feasibility studies to improve efficiency, reduce cost and minimise the environmental impact of extracting and using fossil fuels. This fund will be made available to CCS projects.
- November 2014: Government announced Phase 4 of DECC's Energy Entrepreneurs Fund (EEF) Competition with £5m allocated for projects in 2015-16, of which up to £2.5m has been prioritised for CCS projects.
- December 2014: Government announced £2.5m of funding to support industry in identifying and appraising the next set of potential North Sea $CO_2$ storage sites. This funding is being awarded by the Energy Technologies Institute (ETI). Projects supported under this and the EEF Competition will be scheduled to complete by March 2016.

34. A collaborative cross-Government project with the Energy Research Partnership (ERP)[11] will examine the opportunities for better linking CCS projects and $CO_2$-EOR. The outcome of this work, to be published in summer 2015, will clarify whether there is scope and justification for further work to develop policy. Separately, HM Treasury are taking

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[7] http://ec.europa.eu/priorities/energy-union/docs/energyunion_en.pdf

[8] http://www.consilium.europa.eu/en/press/press-releases/2015/03/conclusions-energy-european-council-march-2015/

[9] https://www.gov.uk/government/groups/ccs-development-forum

[10] https://interact.innovateuk.org/competition-display-page/-/asset_publisher/RqEt2AKmEBhi/content/cleaner-more-efficient-conventional-fuels-collaborative-r-d

[11] http://erpuk.org/project/co2-eor/

forward a review of the 'Oil and Gas Fiscal Regime'[12] which has involved a call for evidence (published in July), the publication of a 'roadmap'[13], which included a commitment for further discussions and consultations by HM Treasury.

[12] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/336699/oil_and_gas_fiscal_review_call_for_evidence.pdf

[13] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/382785/PU1721_Driving_investment_-_a_plan_to_reform_the_oil_and_gas_fiscal_regime.pdf

# Annex A: Stakeholders who responded to the Consultation

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|---|---|
| Progressive Energy | Sandbag |
| Confederation of UK Coal Producers (CoalPro) | Scottish Government |
| EDF Energy | TeesValley Unlimited and NEPIC |
| C Gen | UK Advanced Power Generation Technology Forum (APGTF) |
| Summit Power | CoalImp |
| RWE Generation | SSE |
| Shell | Mineral Products Association |
| Sargas AS | Doosan Babcock |
| Loose Anti Opencast Network (LAON) | Low Carbon Gas |
| CO2 Deep Store | Ecofin Foundation |
| SEPA | Carbon Capture and Storage Association (CCSA) |
| Sahaviriya Steel Industries UK | 2Coenergy |
| The Crown Estate | National Grid Carbon |
| Lecturers at Imperial College | EEF, The Manufacturers' Organisation |
| ReSus Technology | UK Centre for Carbon Dioxide Utilisation (CDUK) |
| Lecturer Cardiff University | Tata Steel |
| CO2 Chem Network | UKCCS Research Centre |
| ZEP | CBI |

# Annex B Next Steps in CCS Policy Scoping Document Catalogue of Questions

| | |
|---|---|
| **Ch 4: Financial Incentives and Electricity Market Reform** | |
| Q1. | To what extent would developers be prepared to invest in FEED costs ahead of allocation of a CfD, and if they are not able to do so what measures could be adopted so that the developers have sufficient certainty of their costs and a Strike Price to form the basis of an investment decision? |
| | |
| Q2. | How best should the industry-led CCS Commercial Development Group work to support project developers in engaging with finance markets? |
| | |
| Q3. | To what extent should Government reflect long-term risks of full chain CCS projects in the design of a CCS CfD? In particular, we will want to explore the extent to which similar risks also arise in other sectors and the changes that may be needed in CfD design to put CCS on an equivalent basis to other low carbon technologies. |
| | |
| **Ch 5: Financing CCS projects** | |
| Q4. | Are the existing products offered by the Green Investment Bank (GIB), Infrastructure UK (IUK) and the European Investment Bank (EIB) sufficient to support CCS projects in raising necessary finance from non-public sources? If not, please explain why, with supporting evidence, and what kind of additional financing or products would be needed? |
| | |
| **Ch 6: Transport and Storage Infrastructure** | |
| Q5. | To what extent is it a priority from an industry perspective for regulation to cover technical aspects of shared CCS infrastructure, such as operating parameters including pipeline pressures for wider networks, or specifications for the $CO_2$ to be transported? |
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| Q6. | What further steps may be necessary to stimulate private investment in infrastructure deployment |
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| Q7. | What are your views on the current arrangements for permitting the operation of storage sites? Are these proving to be a barrier to investment, and if so how might these barriers be overcome? |
| | |
| Q8. | Are there elements in the way the CCS Directive has been implemented in the UK that ought to be revisited? What should the UK be asking for during the Directive review process? |
| | |
| **Ch 7: Part and Full Chain projects** | |
| Q9. | The Government does not consider it currently has a role, beyond existing third party regulations, in establishing the terms and conditions of any agreements between part-chain projects and full-chain / $CO_2$ infrastructure providers. What steps do you think industry should take to further develop the commercial models for any such agreements? |
| | |
| **Ch 8: Enhanced Oil Recovery (EOR)** | |
| Q10. | On issues of incentives for $CO_2$-EOR, respondents are encouraged to input to the HM Treasury call for evidence on the Review of the Oil and Gas Fiscal Regime, which closes on 3 October 2014. |
| | |
| Q11. | How should industry collaborate to best match the needs of $CO_2$ supply and demand for any future $CO_2$-EOR industry and how should this be managed? |
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| Q12. | How should the industry collaborate to take forward any additional transportation infrastructure requirements of any future $CO_2$-EOR industry? |
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| **Ch 9: Industrial CCS** | |
| Q13. | What changes to the CfD design would developers need in order to bring forward projects involving industrial emitters installing CCS on their onsite power generation? Respondents should note that the Government intends to publish further guidance on Private Network Generation in early Autumn 2014. |
| | |
| Q14. | Which of the barriers to industrial CCS are the most important and how should they be overcome? |
| | |
| Q15. | What is the best next step for each sector? For example, should first generation technologies be brought forward in all sectors, or would it be better to consider bespoke actions per sector? |
| | |
| Q16. | How should any Government activity best support R&D and innovation for ICCS? |
| | |
| **Ch 10: Bio-CCS / BECCS** | |
| Q17. | We would welcome views as to what issues the UK Government may want to urge the European Commission to consider regarding BECCS before they propose the detailed architecture of EU climate and energy policy for the period post-2020, including revisions to the EU ETS Directive for phase IV of the EU ETS (2021-2030). |
| | |
| **Ch 11: CCU** | |
| Q18. | The Government and its R&D partners will continue to monitor the progress of CCU technologies, as part of its wider efforts on CCS. Do you wish to offer any evidence of such progress? |
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| **Ch 12: Supply Chain** | |
| Q19. | Is any further action needed to support supply chain companies wishing to supply good and services to CCS projects in the UK, or abroad? |

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| Q20. | Do you agree that currently there does not appear to be significant supply chain barriers to the commercial deployment of CCS up to 2030? If your answer is no, please set out why, with supporting evidence. |
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| **Ch 13: Knowledge Transfer (KT)** | |
| Q21. | Should similar arrangements as those under the Commercialisation Programme, be made for the provision of KT from any future CCS projects? If so, what kind of aspects of KT does industry find most useful? |
| | |
| Q22. | How can KT from projects under the Commercialisation Programme and any future projects be most usefully disseminated, e.g. via report, workshops, seminars etc.? |
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| **Ch 14: Research, Development (R&D) and Innovation** | |
| Q23. | For any future funding calls, should R&D funding be targeted at specific aspects of the CCS chain, or level of technology maturity? |
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