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Department of Energy and Climate Change

Carbon capture and storage: lessons from the competition for the first UK demonstration

Summary

Carbon capture and storage is a priority infrastructure investment

What is carbon capture and storage?

Carbon capture and storage is a three-part process that involves capturing the carbon dioxide produced from burning fossil fuels, transporting it to a storage site, and permanently storing it under pressure, usually underground. The individual elements of the technology exist but have not yet been linked and operated together at a commercial scale power plant. The technology has the potential to reduce carbon dioxide emissions from burning fossil fuel by around 90 per cent.

1 Carbon capture and storage is one of the forty priority areas for UK infrastructure investment identified within the Government's National Infrastructure Plan for meeting the infrastructure needs of the UK economy. The Government's vision is that it can reduce carbon emissions from the energy sector and tackle climate change through supporting:

- the commercial deployment of carbon capture and storage;
- new nuclear power stations;
- increased deployment of renewable energy sources; and
- improved energy efficiency.

2 The coalition Government has continued its predecessors' commitment to the energy market driving the most efficient investment strategy for power generation. The aim is for the market to incentivise investment in low carbon energy generation to meet the challenges arising from the Government's objectives to deliver a secure, low carbon and affordable energy system. For the short to medium term the Government recognises it needs market mechanisms to continue to support emerging low carbon technologies, including carbon capture and storage. The Government expects to continue to provide direct support for industry projects to develop the technology.

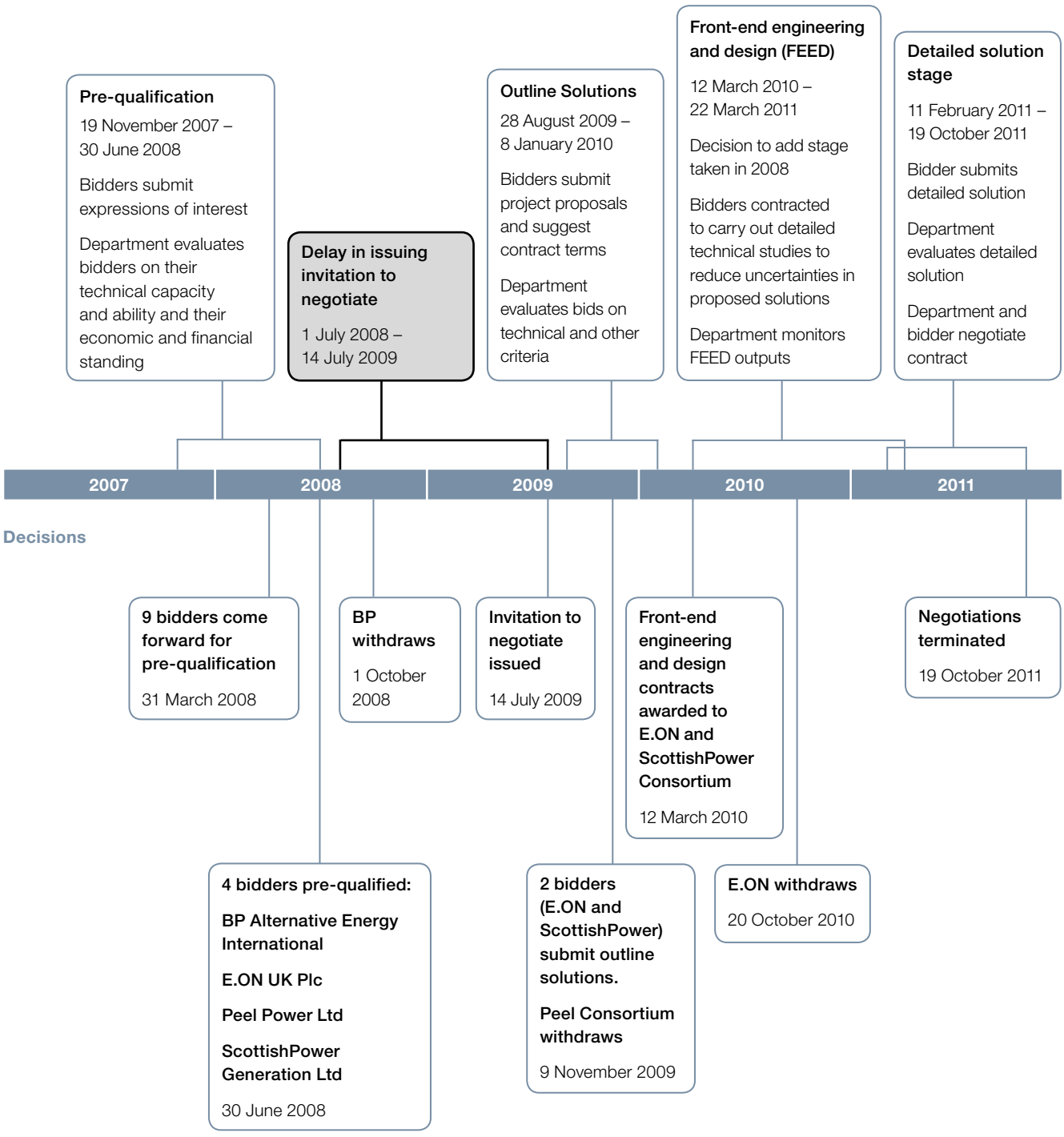
3 This study examines the Government's first carbon capture and storage demonstration competition, as an example of the Department of Energy and Climate Change's work to stimulate private sector investment and innovation in the UK's energy infrastructure. In our report we consider the background to the procurement and the challenges the Department of Energy and Climate Change (the Department) faced and how they were addressed. Our aim is to identify the lessons to be learned to help the Department secure value for money from its programmes in the future.

The carbon capture and storage procurement process

4 In November 2007, the then Department for Business, Enterprise and Regulatory Reform (the Department's predecessor) launched a competition for industry to run a project to design, construct and operate the UK's first commercial-scale carbon capture and storage demonstration project at a coal-fired power station, by 2014, with government funding. The coalition Government has continued the last Government's commitment to fund up to four carbon capture and storage demonstration projects and in the Spending Review in 2010 announced that it had made available up to £1 billion in capital investment for the first carbon capture and storage demonstration project.

5 On 19 October 2011, the Department withdrew from negotiations with the last remaining bidder in the competition – a consortium made up of ScottishPower, National Grid and Shell – as the Department considered it could not agree a deal that would represent value for money (**Figure 1**). The Department decided that the project could not be funded within its agreed £1 billion capital limit. It also could not agree with ScottishPower how to offset the additional cost of the new carbon price floor (a minimum charge for emitting carbon dioxide) to secure the availability of Longannet power station for the duration of the demonstration project. Furthermore, there was no prospect of agreeing contract terms that would be mutually acceptable to all members of the consortium and the Department. Because of the strategic importance of advancing carbon capture and storage technology, the Department confirmed that the £1 billion agreed for the demonstration project would be available to pursue other carbon capture and storage projects as part of a new process, the details of which it is currently developing.

Figure 1
Key events during the competition



Source: National Audit Office

Key findings

6 The Department and its predecessor's costs in running the competition were relatively small compared to the overall scale of the investment required to develop carbon capture and storage and the potential importance of the technology to delivering an affordable, secure and low carbon energy system. Over the four years of the competition, the Department and its predecessor spent £64 million, including £40 million on engineering and design studies.

7 Procuring a demonstration plant was a challenging, high-risk undertaking. The Department's predecessor, the Department for Business, Enterprise and Regulatory Reform wanted industry to take up a commercial contract, for a large and potentially costly developmental project, with considerable uncertainty over its design and costs. The competition took place against an evolving background of economic, policy and regulatory uncertainty. The Department was progressing the competition at the same time that it was developing UK policy and energy market reforms to incentivise decarbonisation of energy generation. It was also contributing to developments in EU energy policy to facilitate and regulate carbon capture and storage. The Department's predecessor was inexperienced at dealing with a project of this scale. After launching the competition the Department's predecessor responded to concerns about its commercial capacity and skills, by recruiting an experienced Senior Responsible Officer, increasing the capacity of the team and improving its commercial strategy. The project team transferred to the Department of Energy and Climate Change when it was established in 2008.

8 The Department's predecessor pursued the carbon capture and storage demonstration project without reviewing alternative options for working towards the Government's policy objectives. The competition was launched based on the strategic importance of carbon capture and storage but without a detailed business case or options appraisal, and without clarity over how a single demonstration project would contribute to policy objectives. The Department's predecessor did not formally review alternatives, such as holding a design competition or supporting a number of smaller scale projects developing individual aspects of the technology. Therefore, the Department and its predecessor could not clearly compare the project's progress against alternatives of stopping or pursuing other options. The Department subsequently developed plans for supporting up to three more projects to make a wider programme to meet its objectives. The Department's new programme will supersede these plans.

9 The project involved government financing for capital investment to deliver a demonstration project contract. The Department and its predecessor did not engage sufficiently early with the commercial risks involved and their consequences on cost. Before launch, the Department for Business, Enterprise and Regulatory Reform did not articulate the commercial risks in the project or develop a commercial strategy to manage them. The Department gave limited weight to commercial viability when it assessed bidders' outline solutions. It paid for engineering and design studies to reduce the risk to capital costs and developed its understanding of the commercial proposition. The Department decided to continue the competition as a single-tender negotiation in October 2010, when there remained significant uncertainty about whether an agreement on the commercial terms

could be reached. In February 2011, the remaining consortium formally stated its position that any deal would require the Government to accept material risks resulting from a change of law and from demonstration risks. The Department entered into detailed negotiations on cost and risk allocation from March 2011, which were ultimately unsuccessful.

10 The Department established finance for the capital costs of the project three years after its predecessor launched the competition and did not reach agreement with the Treasury on the funding for operating costs. The affordability of the project was a critical factor in the Department deciding to end negotiations. Lack of clarity over government finance for the project delayed the early stages of the competition and added to the commercial risks for bidders. In October 2010, the coalition Government identified a £1 billion capital budget for the project. At this time, the Department estimated that the ScottishPower consortium's bid required capital of £1.9 billion. This preliminary figure was based on data provided by the ScottishPower consortium before its engineering and design work had been completed and included an adjustment for optimism bias, in line with standard Treasury guidance. The Government's goal was to see if engineering and design work could reduce costs to within the budget available. Agreement on government funding for operational costs was deferred until after further work on reforms to the energy market. Despite subsequent negotiations and efforts to reduce project cost uncertainty, the Department stopped the competition because it was not affordable.

11 The Department for Business, Enterprise and Regulatory Reform's procurement approach provided structure but restricted negotiations to the project specifications that were set at the outset. Following advice, the Department's predecessor decided that the negotiated procedure form of competitive public procurement would provide flexibility and allow bidders to be innovative, in their designs and solutions. However, narrow project specifications, including post-combustion carbon capture at a coal-fired power station of 300 megawatts, limited the number of bidders and their options, and made negotiations inflexible.

12 External reviews of the project were undertaken frequently and advised of significant risks. The Department took decisions to continue, without fully considering the opportunity cost of continuing and alternative courses of action. The Government's decisions in April 2009 to proceed, and, in March 2010, to award engineering and design contracts, were not informed by detailed consideration of the probability of reaching acceptable contract terms or a full and objective assessment, of the value of alternative courses of action to pursuing the existing competition, including the opportunity costs should the competition fail. In awarding the engineering and design contracts in March 2010, the Department took bidders' willingness to contribute a quarter of the costs of the work as assurance on their commitment to the project. In July 2010, a Major Projects Review noted that the project was feasible but that significant issues existed. In March 2011 and June 2011, the Major Projects Review Group raised strong doubts that an acceptable outcome could be achieved from the negotiations. From May 2011, the Department identified detailed criteria for assessing the value for money of the project and challenged the process through its new approvals committee. This led to the final decision to end the competition in October 2011.

13 Although the competition did not result in a contract, it has increased the Department's experience of the associated technical, regulatory and commercial challenges, and its knowledge of the costs of carbon capture and storage. Industry stakeholders have welcomed the two engineering and design studies completed as they may help to reduce the costs of future engineering and design work. The procurement process and the bidders' proposed solutions also supported the Department's policy and regulatory work and will inform its new programme. The Department has carried out an internal review of the original competition, disseminated the findings widely within the Department and shared the key lessons that it has identified with industry.

Lessons for securing value for money

14 The carbon capture and storage demonstration project was an example of a strategically important project, for which the development costs are small scale compared to the potential benefits from the project. In such cases, it is critically important for the project to be initiated well so the chances of success are maximised. It is also important for progress to be managed well, with appropriate regard to likely value for money, likelihood of successful delivery and the opportunity costs if progress is not as intended. We therefore make the following recommendations:

a **The Department for Business, Enterprise and Regulatory Reform launched the demonstration competition without considering alternatives or having a clear plan stating how the project would meet government policy objectives.** The Department's new support programme is intended to contribute to meeting the Government's vision for a secure, low carbon and affordable energy system. It is part of the Government's wider plans for meeting Carbon Budgets and the National Infrastructure Plan aim to support a competitive economy. The Department should clearly articulate how its programme and the individual projects will contribute to meeting the Government's objectives. It should set related milestones and metrics so that it can monitor progress and consider consequences for meeting the energy vision and infrastructure plan. The Department should clarify with the Treasury and Cabinet Office the nature of its accountability to the new Cabinet Committee for infrastructure so that roles are not blurred.

b **Regulatory uncertainty contributed to the Department's inability to reach a commercial contract.** The Department intends to address in its proposed roadmap for carbon capture and storage how it will work to address the barriers to commercial deployment of the technology. To move to a commercially viable, privately financed and consumer funded model for carbon capture and storage the Department will need to work closely with industry and other government departments to identify all the key risks and systematically address them.

c **The Department defined narrow project specifications. These limited the number of bidders applying to the competition, the technical project options they could submit, and the flexibility of the negotiations.** In its future programme, the Department should set procurement specifications and associated evaluative criteria that meet its policy objectives but allow sufficient flexibility for innovation.

d **The demonstration project was to test the integration of the technology at commercial scale and would have involved many technical challenges. The Department engaged with the project costs but not the commercial costs until a later stage in negotiations with the final bidder.** For its new programme, the Department needs to understand fully its commercial proposition to industry, fully investigate the costs and the technical, price and regulatory risks in individual projects and compare their value. The Department should address how it will monitor the return industry is likely to make and how government risks can be minimised. To do this, the Department will need appropriate commercial skills in place from the outset of its new programme.

e **The first demonstration project was affected by lack of clarity over its affordability.** The capital budget of £1 billion remains committed in principle for the new carbon capture and storage programme and the Government has proposed new market mechanisms to support low carbon technology. Before starting a new programme, the Department and the Treasury should be clear on the capital investment available in total and across the length of the programme. It should also set out how industry will be incentivised and establish any affordability constraint.

f **The competition process showed early indications of risks to value for money materialising, which neither went away nor were resolved. As long as there remained a chance of the project succeeding, its potential strategic benefits outweighed its costs, and so the Department considered continuing represented value for money without full reference to opportunity cost.** At a late stage in the competition, the Department developed criteria to challenge itself on whether the contract was likely to deliver value for money for the taxpayer. For its new programme, the Department should identify value-for-money criteria to be used from the outset. It should set programme governance arrangements to assess routinely whether the programme is on course to deliver value for money. And at project level it should allow for formal breakpoints with triggers for further reviews as necessary to test the value for money of proceeding further.