IEAGHG Information Paper: 2015-IP19; CO_2MultiStore: Optimising CO_2 storage around the UK - London launch

Tuesday, 15th September 2015 14:30 – 16:30, Committee Room 2A, House of Lords

The CO_2MultiStore project is a research endeavour sponsored by the Scottish Carbon Capture and Storage Centre, the Scottish Government, the Crown Estate, Shell, Scottish Enterprise and Vattenfall. The distinguished former Shell director and crossbencher, Lord Oxburgh, chaired a meeting in the House of Lords to launch the publication of two complementary studies[1,2]. Lord Oxburgh opened the meeting by stressing the necessity for CCS and the drive to facilitate offshore, shelf areas for CO_2 storage. With multiple industry co-ordination storage assets could be opened up over a wide area, but collaboration between industry, government and regulators will be essential. A planning and co-ordination role, currently under the remit of Crown Estate, needs to be extended across all offshore responsibilities.

Maxine Akhurst, from the British Geological Survey, outlined the two key objectives of the project: the secure containment of CO_2 in two or more sites within a single formation; and to determine how multiple sites can operate using a practical and feasible approach that combines academic research and industry expertise. The study area focussed on the Captain Sandstone a formation that extends across a wide area beneath the outer Moray Firth. This formation occurs at a depth of 2,400m in the area of interest. It is the formation which contains the reservoir for the Goldeneye Gas Condensate Filed which is the planned storage site for the Peterhead CCS project. Two different models, the Scottish Study Captain Model and the Shell Captain Fairway Model, were applied, one to each injection site. The re-use of existing industry derived data, including production metrics, were used to validate the models. The change in the pressure regime induced by simultaneous injection was then predicted from these models over a 30 year period. Evidence from this study clearly shows that both sites can be operated without adverse effects on the other location. Pressure monitoring in the storage formation, and in overlying formations, is essential to provide the key data to manage increases during injection. Additional monitoring by other storage sites may be required to ensure that they do not adversely affect existing storage or hydrocarbon extraction operations. It is clear from this work that oil industry data, and expertise, increases certainty and confidence in assessments.

The predicted outcome of injection at both sites was presented by Chris McDermott, from the University of Edinburgh. The modelled scenario assumed injection began five years after initial injection at the other site. Both sites injected 6 M tonnes for 30 years. A dynamic model was used to check how the pressure increase disseminating from each site. The model also showed how formations above, in the overburden, and below reacted to the pressure change. The impact of thermal stress, pressure stress induced by an increase in fluid pressure, and physical stress changed as CO_2 was injected. This study has provided a formative background showing that 360 M tonnes could be stored across an area equivalent to one sixth of the Captain Sandstone formation.

[1] Optimising CO_2 storage in geological formations ; a case study offshore Scotland, CO_2MultiStore project September 2015. www.sccs.org.uk

[2] Assessing interactions between multiple geological CO_2 storage sites: generic learning from the CO_2MultiStore project, 15th September 2015, WP SCCS 2015-03

Stuart Haszeldine, from the University of Edinburgh, summarised the main conclusions that can be drawn from the study. The amount of CO_2 that can be securely stored, and the associated risks, have been identified. The study has shown that commercial storage can be de-risked and a lease application could be prepared and submitted to Crown Estate. Hydrocarbon industry experience, knowledge and software can be adapted to any UK site. Stuart also concluded that following this study potential CO_2 storage sites can be characterised and prepared for storage within six years.

The CO_2MultiStore project has engaged external industry and technical experts in risk assessment workshops. The experts reviewed the injection scenario at the two sites. The experts assessed the probability of different risks occurring and the severity of their impacts. A list of potential risks was then compiled, ranked and used to guide modelling work to investigate the interactions between the two injection sites. The outputs from the geological modelling of the Captain Sandstone, the dynamic simulation of CO_2 injection and geomechanical modelling were then further reassessed for risk. The predictive models were then updated with additional data and further investigation. Mitigation actions that could be implemented in a full-scale storage operation to reduce risks were discussed and reported. None of the risks that relate to the interaction between the two injection sites were considered to be 'show stoppers'. The generic lessons that can be drawn from the CO_2MultiStore project are explained and sumamrised in one of the publications[2]. The report also presents a series of questions on key topics related to different facets of modelling and concludes on the design of a plan for monitoring multi-user storage operations.

The concept of a CO_2 multistore reservoir is an essential step towards regional storage and therefore large-scale retention of CO_2. These reports clearly show that multiple injection could be achieved within defined limits and assessed risks.

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