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The Status, Potential and Research Progress of CO_2 Storage Worldwide

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Energy demand continues to grow and is expected to have increased by 35% by 2035, and CO_2 emissions continue to increase with a current pathway to 650ppm by 2050. Carbon dioxide capture and storage (CCS) is considered to be an important carbon dioxide mitigation technology. The IEA CCS Technology Roadmap 2009 based on the 'blue map' scenario predicts that to reach CO_2 reduction targets 100 commercial CCS projects is desired by 20201, compared to the G8 target of 20 CCS projects by 2020. A recent analysis of current storage projects and future projections shows the G8 target is possible if adequate resourcing is provided and if CO_2-EOR projects are included; however the IEA Roadmap CCS target may be unattainable2. With sufficient funding, 50 projects are achievable by 2025 and 100 projects by 2028 inclusive of CO_2-EOR projects, the latter requiring 6 billion Euros of total investment. Project lead times are long, which could be up to 15 years for deep saline formation storage projects, and without sufficient funding the gap between targets and the current number of projects will widen.

However, there has been progress. 74 CCS projects have been identified by the Global CCS Institute with 14 large scale integrated projects in the operate and execute phase expressing a total storage capacity of 33 Mtpa: 3 more projects in the execute phase since 2009, and 10 more have announced they will be ready for a final investment decision in the next 12 months hence ready to move to the execute phase3. Explanations of project suspension or cancellation have been predominated by non-technical issues; however there are technical challenges remaining; including injectivity and uncertainty in capacity, particularly for deep saline formations; all of which are being considered by the CCS research community. Other considerations that are currently being assessed are subsurface resource interaction, which includes potential interactions of CO_2 storage with hydrocarbon production, potable groundwater and geothermal energy, as well as potential use of pore space for the disposal of waste or natural gas storage.

We present the recent results of research studies of the IEA Greenhouse Gas R & D Programme in key geological storage areas identified to advance the knowledge base for the development of CO_2 Storage projects, in relation to progress in CCS research. These studies include consideration of potential effects of impurities in the CO_2 stream, potential impacts on groundwater resources, monitoring techniques and, quantification techniques for ETS requirements; in addition to potential capacity and pressure management through brine abstraction. These studies highlight that though technical questions remain, such will be significantly reduced with continued experience, project operation and further understanding. Increase in large scale integrated CCS projects is imperative to fully comprehend the potential of CCS to meet carbon dioxide emissions reduction targets.

1IEA. 2009. Technology Roadmap: Carbon Capture and Storage.
2IEAGHG. 2011. Global Storage Resource Gap Analysis for Policy Makers, 2011/10, September, 2011.
3GCCSI. 2011. Global Status of CCS: 2011.