The IEA CCS Technology Roadmap: One Year On

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Abstract

In October 2009, the International Energy Agency’s CCS Technology Roadmap was launched at the Carbon Sequestration Leadership forum (CSLF) Ministerial Meeting in London. The Roadmap builds on the IEA BLUE Map scenario that leads to the stabilisation of CO\textsubscript{2} emissions at 450ppm by 2050. Achieving this scenario will require an energy technology revolution involving a portfolio of solutions: greater energy efficiency, increased renewable energy technologies and nuclear power, and the near decarbonisation of fossil fuel-based power generation via carbon capture and storage (CCS). In this scenario CCS contributes almost 20\% to the total emissions reductions required in 2050. Recommendations are made in the IEA CCS Roadmap on what is required to achieve this level of deployment not only technically, but also from a financial and regulatory point of view as well as in terms of public engagement and international collaboration, including the sharing of knowledge. This paper looks at progress made against these recommendations in the 12 months since the release of the roadmap.

- Analysis undertaken by the IEA consistently identifies a significant role for CCS in mitigating global CO\textsubscript{2} emissions. IEA analysis suggests that there will be a need to capture and store 10 Gt CO\textsubscript{2} per year in 2050, from 3400 projects globally to achieve the BLUE Map emissions reduction targets.
- Significant progress is being made to launch large-scale demonstration facilities across the globe, with some 80 large-scale integrated demonstration projects identified. As of April 2010, public funding commitments were in the range of USD 26.6 billion to USD 36.1 billion.
- While 5500km of CO\textsubscript{2} pipelines already exist and further infrastructure development is planned, it is however clear that to enable large-scale deployment of CCS, more joint planning of CO\textsubscript{2} transportation infrastructure is required globally.
- The status and availability of data on CO\textsubscript{2} storage varies significantly around the world and is potentially a major constraint to rapid, widespread CCS deployment. In regions with the potential to store large volumes of CO\textsubscript{2}, a concerted effort will be required to characterise the basins in sufficient detail.
- Much progress has been achieved in the legal and regulatory area. The first movers in establishing legal frameworks have generally been OECD countries. It is now important that the large emerging economies start developing their legal and regulatory frameworks.
- Public awareness and acceptance is a key element in making CCS possible. Public concerns are legitimate and require a close dialogue and sharing of information with the local population. While companies developing transport and storage will need to lead on the engagement processes, governments and politicians have a vital role to play.
- Several initiatives are in place for international dialogue and collaboration on the development and deployment of CCS.
- While much progress has been made, many challenges still remain if CCS is to deliver at the scale required. The challenges are well-known and require concerted action by industry, governments, international organisations and civil society. Continued political leadership remains absolutely essential.

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1. Introduction

In October 2009, the IEA’s CCS Technology Roadmap (hereinafter referred to as the Roadmap) was launched at the CSLF Ministerial Meeting in London. The Roadmap builds on analysis presented in the IEA Energy Technology Perspectives (ETP) 2008 BLUE Map scenario, a cost optimized scenario for stabilizing CO2 emissions at 450ppm by 2050. Achieving this scenario will require an energy technology revolution involving a portfolio of solutions: greater energy efficiency, substantially increased renewable energy technologies and nuclear power, and the near decarbonisation of fossil fuel-based power generation using carbon capture and storage. CCS contributes significantly to the least-cost route of reducing and stabilising CO2 emissions in the atmosphere, representing 19% of total emissions reductions in 2050. Deploying CCS can bring significant economic benefits. One sensitivity variant of the IEA BLUE Map scenario demonstrates that without CCS in the technology mix the cost of CO2 stabilization at 450ppm could increase by 78%.

The last few years have seen increasing interest shown in CCS technologies, which has been reflected at the highest political levels. At the Gleneagles Summit in 2005, the G8 Leaders committed to ‘work to accelerate the deployment and commercialisation of Carbon Capture and Storage technology’. Over the past five years, the G8 has been an important, high-level, political forum that has served to push the technology forward; through their recommendations the G8 Leaders have raised its profile and demonstrated the potential of the technology to mitigate unwanted climate change. In 2008, the G8 Leaders recommended that 20 large-scale CCS demonstration projects should be launched by 2010 with a view to beginning broad deployment of CCS by 2020. Since 2008, significant progress has been made to address these high-level recommendations. CCS has advanced towards commercialisation, notably through the commissioning of CCS pilot plants, continued learning from plants already in operation and the development of legal and regulatory frameworks. Several governments have committed to provide funding support for demonstration projects. International collaboration and public outreach activities have increased substantially. The mapping of suitable storage sites is underway in various countries and guidelines for CCS-ready plant have been developed.

The IEA, CSLF and the Global CCS Institute are jointly engaged in following up and tracking progress towards the G8 recommendations. It is crucial that a global, high-level political forum continues to discuss and to push the development of carbon capture and storage.

2. The IEA CCS roadmap recommendations

After its publication in October 2009, the Roadmap quickly became a widely referenced document summarizing the status of CCS development globally and identifying actions needed to allow CCS to develop. The key findings of the Roadmap were as follows:

- Carbon capture and storage (CCS) is an important part of the lowest-cost greenhouse gas (GHG) mitigation portfolio. IEA analysis suggests that without CCS, overall costs to reduce emissions to 2005 levels by 2050 increase by 70%. This roadmap includes an ambitious CCS growth path in order to achieve this GHG mitigation potential, envisioning 100 projects globally by 2020 and over 3 000 projects by 2050.

- This roadmap’s level of project development requires an additional investment of over USD 2.5-3 trillion from 2010 to 2050, which is about 6% of the overall investment needed to achieve a 50% reduction in GHG emissions by 2050. OECD governments will need to increase funding for CCS demonstration projects to an average annual level of USD 3.5 to 4 billion (bn) from 2010 to 2020. In addition,
mechanisms need to be established to incentivise commercialisation beyond 2020 in the form of mandates, GHG reduction incentives, tax rebates or other financing mechanisms.

- Although the developed world must lead the CCS effort in the next decade, CCS technology must also spread rapidly to the developing world. This growth will require expanded international collaboration and financing for CCS demonstration in developing countries at an average annual level of USD 1.5 to 2.5 bn from 2010 to 2020. To provide this funding, CCS needs to be approved in the Clean Development Mechanism or an alternative financing mechanism.

- CCS is more than a strategy for “clean coal.” CCS technology must also be adopted by biomass and gas power plants; in the fuel transformation and gas processing sectors; and in emissions-intensive industrial sectors like cement, iron and steel, chemicals, and pulp and paper.

- CO₂ capture technology is commercially available today, but the associated costs need to be lowered and the technology still needs to be demonstrated at commercial scale. Additional research and development is also needed, particularly to address different CO₂ streams from industrial sources and to test biomass and hydrogen production with CCS.

- CO₂ transport via pipeline has been proven; the challenge for the future of transport technology is to develop long-term strategies for CO₂ source clusters and CO₂ pipeline networks that optimise source-to-sink transmission of CO₂. To address this challenge, governments need to initiate regional planning exercises and develop incentives for the creation of CO₂ transport hub.

- There is an urgent need to advance the state of global knowledge of CO₂ storage prospectivity. While depleted oil and gas fields are well mapped and offer promising low cost opportunities, deep saline formations are the most viable option for the long-term. However, only a few regions have adequately mapped the CO₂ storage potential of these formations. There is also a need for common international methods for CO₂ storage site selection, monitoring and verification, and risk assessment.

- While some regions have made important progress in developing dedicated legal and regulatory frameworks for CCS, most countries still have issues to address before significant progress can be achieved. There is a need to develop near-term regulatory approaches to facilitate CCS demonstration efforts, while working at the same time to develop comprehensive approaches for the large-scale commercial deployment of CCS.

- Local communities have legitimate concerns about CCS that must be addressed. Governments need to take the lead on developing community-tailored CCS public engagement strategies, starting with providing resources for this critical activity and then ensuring early provision of information about the costs and benefits of planned CCS projects compared to other GHG mitigation options.

- Due to the short timeframe and investments required, this roadmap’s vision will only be possible via expanded international collaboration. In particular, new efforts to provide developing country CCS capacity building and knowledge/technology transfer are needed. Industry sectors with a global reach should also expand their CCS collaborative efforts.

3. Current developments against milestones
One year after the publication of the roadmap, it is interesting to look at what kind of progress has been achieved towards these key recommendations.

3.1. Are we still aiming at over 3000 projects by 2050?
The premise of the roadmap was based on the BLUE Map scenario of the IEA’s 2008 ETP, a scenario that targets the stabilisation of CO2 emissions at 450ppm by 2050.

The BLUE Map scenario has been updated in ETP2010. According to ETP2010, Baseline (or business-as-usual) CO2 emissions would rise to some 57 Gt globally per year by 2050, doubling from today’s global annual emissions of 29 Gt. This increase, slightly lower than projected two years ago, is due inter alia to the current economic downturn and its impact on the economic growth and energy consumption during the next four decades. To achieve stabilisation of the concentration of CO2 in the atmosphere at 450ppm by 2050, global emissions would need to be reduced to 14 Gt per annum. This figure has not changed since the analysis undertaken for ETP 2008, and still represents a significant challenge.

ETP 2010’s BLUE Map scenario calculates the least-cost way of reaching the needed reductions. The projected role for CCS in the scenario has not changed since 2008; it continues to occupy an important role in achieving global CO2 emission reductions, meeting 19% of the total reduction requirements. This represents some 9 Gt of emissions captured in 2050, and cumulatively some 120 Gt of CO2 captured globally over the next four decades. This figure gives an indication of the storage volumes that need to be found, explored and licensed.

Analysis undertaken by the IEA consistently identifies a significant role for CCS in mitigating global CO2 emissions. To capture 9 Gt CO2 in 2050 would still require somewhere around the 3400 projects estimated in the roadmap. Against this background, it is also absolutely clear that the short-to-mid term challenges remain. Some 100 projects globally are still required by 2020 if we are to set CCS technologies on the right pathway to delivery.

3.2. Are we seeing enough early investment in CCS across countries and sectors?

Significant progress is being made to launch large-scale demonstration facilities across the globe. To ensure success, firm commitments from both industry and government are needed. Industry must be ready to invest in the facilities and to share knowledge and lessons learned from early stage projects, and governments must be willing to share the first-mover risks with industry. A study commissioned by the Global CCS Institute in the spring of 2010 identified 80 large-scale integrated demonstration projects at various stages of development around the world, many of them having been initiated only during the past two years. In parallel, over the past two years, many governments have made significant commitments to the launch of between 19 and 43 large-scale projects by 2020. This is very promising, as government support is vital to help projects under development overcome the final hurdles.

The large-scale CCS demonstration projects under development are located primarily in developed countries in Europe, the United States, Australia, Canada and Korea. It is encouraging to note that seven of the projects are in developing countries – four in China, two in the Middle East and one (in operation) in Algeria. As the larger developing economies have turned to coal to fuel their growth, and will in all likelihood continue to do so in the decades to come, CCS will be a key technology for these economies to embrace in the future. Four demonstration projects are under development in China, three in the power sector, where they plan to demonstrate CCS with integrated gasification combined cycle technology, and one on a coal-to-liquids plant.

Overall around two-thirds of the projects identified are in the power generation sector. Other industrial projects include those associated with the separation of CO2 from natural gas. There are unfortunately a very limited number of projects related to the cement, aluminium and iron and steel industries. Clearly more projects need to be developed in these sectors, as CCS is often the only solution for them to achieve deep cuts in CO2 emissions. According to the roadmap, in 2050 up to 45% of global CO2 captured will come from sources other than power generation. Demonstration and deployment of CCS in industrial sectors is therefore critical. The UN Industrial Development Organisation is currently coordinating a major analysis of industrial CCS opportunities, which will result in a global Industrial CCS Roadmap by end of 2010.

Nine large-scale projects are currently in operation, while the rest are in various stages of development and planning. Five of the nine operational projects are considered CCS projects, with the other four being Enhanced Oil Recovery (EOR) projects that do not have complete monitoring systems to assess the viability of the long-term

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1 Global CCS Institute, *The Status of CCS Projects, Interim Report 2010*, 2010
2 In Salah (Algeria), Sleipner and Snohvit (Norway), Rangely (USA) and Weyburn-Midale (Canada/USA).
storage of the CO₂. Another project, the Gorgon project in Australia, is now under construction. A number of other projects have progressed through various phases of the project development cycle and are moving towards being ‘investment ready’, notably in Canada, in the US and in the European Union. EOR is emerging as an important factor in driving progress on a number of potential ‘early mover’ projects.

Significant progress has been made in relation to government commitments. Over the past two years, a number of governments (notably Australia, Canada, the European Union, Japan, Norway, the Republic of Korea and the United States), have committed substantial funding and are actively facilitating the deployment of large-scale CCS demonstration projects. As of April 2010, public funding commitments were in the range of USD 26.6 billion to USD 36.1 billion. Moreover, governments have announced a commitment to launch 19 to 43 large-scale integrated projects before 2020. In many jurisdictions, a significant portion of economic stimulus spending has focused on developing, demonstrating and deploying clean energy technologies, such as CCS. These commitments, however, are generally contingent on industry taking a full and active role.

### Table 1. Funding and project announcements from governments and international organisations

| Country                  | Funding committed to date (billion USD) | Number of projects committed by 2020 |
|--------------------------|----------------------------------------|--------------------------------------|
| Australia                | 2 to 6                                  | 3 to 5                               |
| Canada                   | 3.5                                    | up to 6                              |
| European Commission⁴     | 4 to 6                                  | 6 to 12                              |
| Japan                    | 0.1                                    | 1 to 2                               |
| Norway                   | 1                                      | 1 to 2                               |
| Korea, Republic of       | 1                                      | 1 to 2                               |
| United Kingdom           | 11 to 14.5                             | 4ª                                   |
| United States            | 4                                      | 5 to 10                              |
| **TOTAL**                | **26.6 to 36.1**                       | **19 to 43**                         |

Notes:

a. This includes the 300 million permits that are set aside under the EU-ETS for demonstration of CCS and of innovative renewable energy, and EUR 1 billion from the EC energy recovery package.

b. UK funding includes operational support for 10 to 15 years of CCS operations. Note that UK funds may be used in conjunction with EC funds where one or more of the UK projects are co-funded from EC funds.

c. Within the ‘TOTAL’ range, the lower number considers 2 of these 4 projects are counted within the EC figure; in the larger number, they are all considered additional to EC projects.

Great effort will be needed to meet deployment levels required in the future. As mentioned above, the volumes of CO₂ to be captured will require some 100 large-scale projects to be operational by 2020, 850 by 2030 and 3400 by 2050. And, while CCS development will begin in the industrialised countries, it is expected to shift rapidly to developing countries after 2020. The dashed white line in Figure 1 indicates separation of OECD and non-OECD regions. The amount of CO₂ captured in non-OECD countries accounts for 50% in 2020, rising to 65% by 2050.

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³ Global CCS Institute, *The Status of CCS Projects, Interim Report 2010*, 2010

⁴ Based on information available in the public domain as of 28 April 2010. Source: IEA/CSLF report to G8 Muskoka Summit, June 2010.
There is general agreement that CCS is needed especially in the large emerging economies such as Brazil, China, India, Indonesia and South Africa. In these countries, progress has been mixed, with limited CCS activity in many of them to date, due mostly to lack of clear incentives and financial support. China, however, has made notable progress. In addition to extensive R&D activity, China has demonstrated CO₂ capture on two coal-fired power plants and has begun construction on the first phase of the GreenGen project, a three-phase project to demonstrate CCS on a commercial-scale Integrated Gasification Combined Cycle (IGCC) plant. The potential of deploying CCS has been studied in Indonesia; CCS projects are also being planned in Brazil, in addition to their active R&D programme.

Discussions are underway on post-2012 climate change arrangements. Governments must maintain their efforts to ensure that CCS is not excluded from the incentive mechanisms under the post-Kyoto arrangements. Without access to such mechanisms, it is unlikely that the deployment of CCS will expand at the pace required in developing countries. Effective incorporation of CCS in the Kyoto Protocol’s Clean Development Mechanisms (CDM) would represent an important first step.

3.3. Transport infrastructure development lacking

There are approximately 5500 kilometres of existing CO₂ pipelines in the United States, which have been operating for over three decades. The government of Canada and the Province of Alberta announced that they would provide approximately CAD 500 million for the first phase of a pipeline project (the Enhance project) to link oil sands and petro-chemical operations with EOR opportunities in Alberta. In the United Kingdom, Yorkshire Forward is co-ordinating the development of plans for a CO₂ pipeline hub system in the northeast of England. Other pipeline networks are planned in the European Union: in Rotterdam and Le Havre, and in Australia: the Collie Hub (Western Australia) and Carbon Net (Victoria). However, to enable large-scale deployment of CCS, more joint planning of CO₂ transportation infrastructure is required globally.

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www.co2sense.org.uk
3.4. Have we enough knowledge of storage capacities?

The most recent IEA analysis, from ETP2010, indicates that some 120 Gt of CO₂ must be captured and stored globally over the next four decades, an indication of the storage volumes that need to be found, characterised, licensed and safely operated.

The status and availability of data on CO₂ storage vary significantly around the world and this is potentially a major constraint to rapid, widespread CCS deployment. In regions with the potential to store large volumes of CO₂, a concerted effort will be required to characterise the basins in sufficient detail for pipeline planning. This work should have a long-term perspective that takes into account expansion from demonstration to commercialisation.

Several countries, including Australia, Canada, Japan, Mexico and the United States, as well as the European Union, have started to map storage potential and create storage capacity databases in order to align CO₂ sources and storage sites. Through the North Sea Basin Task Force, for example, Germany, the Netherlands, Norway and the United Kingdom are working together to evaluate their sub-seabed storage potential and undertake source-sink analysis.

Canada, Mexico and the United States are collaborating to produce a North American Carbon Storage Atlas of major CO₂ sources, potential storage reservoirs and storage estimates in all three countries, based on compatible mapping and data sharing methodologies. The atlas will be used to develop a comprehensive understanding of the potential for carbon capture and safe storage in North America.

Various other background analyses are also being undertaken. For example, the Global CCS Institute and the IEA’s Greenhouse Gas R&D Programme Implementing Agreement (GHG IA) are undertaking a global storage resource gap analysis. This analysis, which will be available by the end of 2010, will alert policy makers to the scale, cost and timing of storage resource assessment tasks.

The GHG IA, through its international research networks is following the development and status of monitoring, modelling and risk assessment tools for CCS projects. There is a large range of monitoring techniques that can be applied to CCS projects, and these are being tested at existing pilot/commercial injection projects around the world. The GHG IA has developed a monitoring selection tool to demonstrate the range of monitoring techniques available and their status. The GHG IA’s modelling network is providing a framework for the benchmarking of predictive models, whilst the risk assessment activity is assessing the relative merits of different risk assessment approaches for CCS. All these activities aim to assist the development of guidelines that can feed into best practice guidance for CCS regulations.

3.5. Progress with legal and regulatory frameworks

Progress has been achieved in the legal and regulatory area. In the European Union, the Directive on the Geological Storage of CO₂ and the EU Emissions Trading Scheme Directive provides a framework for legislation and regulation of CCS within the region, which must be transposed into individual Member State law by 2011. To guide this process of transposition, the EU has recently consulted stakeholders on four Guidance Documents, each covering an aspect of the Directive in more detail. In Australia, comprehensive CCS legislation has been put in place at the federal level to cover offshore storage and, in a number of states, to cover CCS onshore. In the United States, a number of states have implemented CCS legislation in parallel with ongoing work at the federal level by the Environmental Protection Agency. In addition to these early movers, a number of other countries have begun the process of reviewing and amending legislation, including Canada, Japan and Norway.

The first movers in establishing legal frameworks have generally been OECD countries. It is now important that the large emerging economies start developing their legal and regulatory frameworks. To support this process, both the IEA and the Global CCS Institute have work programmes focused on CCS legislation and regulation.

3.6. How is public engagement and acceptance developing?

Public awareness of CCS technologies is low. That climate change is a pressing issue must not be allowed to drift. The message that action needs to be taken now to mitigate rising levels of CO₂ and the important role that CCS has to play in achieving this successfully, must be effectively communicated. Public awareness and acceptance is a key element in making CCS possible. For transport and storage, this principally emanates from a perspective of
general acceptance of new infrastructure (i.e., NIMBY or NUMBY syndrome), or from concerns over the safety of storage sites and their long-term liability. Concerns are, of course, legitimate, and require a close dialogue and sharing of information with the local population. While companies developing transport and storage will need to lead in the engagement processes, governments and politicians have a vital role to play in explaining the benefits and disbenefits of CO₂ storage.

Work is being undertaken by several organisations globally to analyse the issue of public acceptance. The Global CCS Institute has developed a comprehensive approach to advancing both project-level and regional public engagement strategies. The Institute’s approach is based on advancing social research, practical project support and improving regional communications. The CSLF has developed a communications plan that will focus its outreach efforts on the global aspects of CCS as an important CO₂ mitigation technology. The purpose of the plan is to build public confidence in the viability of using fossil fuel resources to meet increasing future energy needs while reducing CO₂ emissions through CCS. The roadmap has also served to increase understanding of the role of CCS and the challenges it still faces in research, development, demonstration and deployment. The GHG IA operates a social research network, aimed at analysing the various aspects of public acceptance, engagement and communication.

There are also significant initiatives at the regional level. The European Union’s Zero Emissions Platform (EU ZEP) has been active in this arena over many years. It has built up a very informative website (http://www.zeromissionsplatform.eu/) and has been important in building capacity within Europe. The EU ZEP has published a number of influential documents aimed at enhancing understanding of CCS technology and its benefits. The IEAGHG Weyburn-Midale CO₂ Monitoring and Storage Project has developed, in partnership with the Canadian CCS Network and Natural Resources Canada, a comprehensive national website (www.CCS101.ca) as a tool for communication with and outreach to the public on CCS.

In January 2010, the National Energy Technology Laboratories (US Department of Energy) issued its Best Practices for: Public Outreach and Education for Carbon Storage Projects. These guidelines were developed from the experiences of the seven US Carbon Regional Sequestration Partnerships.

### 3.7. What international collaborative actions have taken place?

The CSLF published its Capacity Building Program in October 2009, with the purpose of assisting all CSLF members to develop the information, tools, skills, expertise and institutions to implement CCS demonstration projects and to move rapidly towards commercial operation. Programme initiatives include disseminating practical information; building capacity in emerging economies; assisting government and regulatory agencies; and building academic and research institutions for CCS. CSLF members and the Global CCS Institute have provided both funding and in-kind resources to carry out these activities. In addition, the CSLF commissioned the Asian Development Bank to prepare a financial roadmap for developing countries. The CSLF welcomed engagement from developing countries at its 3rd Ministerial Meeting (London, October 2009), with ministers from China and South Africa in attendance.

In 2009, the IEA hosted a series of CCS Roundtables in Brazil, China, Poland, South Africa and Indonesia to expand its co-operation with emerging and developing economies on this topic. The goal of the Roundtables was to collect up-to-date information on the technology, legal, financial, public awareness and international collaboration issues associated with CCS in regions that are important to its development. The Roundtables included key CCS stakeholders representing government, industry, environmental non-governmental organisations and academia to discuss the current status and future development of CCS in these regions.

In September 2008, as a direct result of the G8 declaration to launch 20 demonstration projects by 2010, the Australian government announced the formation of the Global CCS Institute and committed USD 90 million in annual funding for the first four years for its operation. The central objective of the Institute is to accelerate the commercial deployment of CCS projects.

The Global CCS Institute has also partnered with and is providing resources to a number of organisations and initiatives in CCS capacity building. To date, these organisations include the Asian Development Bank, the World

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6 Available at: www.bigskyco2.org/files/pdfs/BPM_PublicOutreach.pdf.
Bank and the CSLF Capacity Building Programme. Knowledge sharing has been identified as essential to a CCS demonstration programme for accelerating technology development and driving down costs. Dissemination of know-how and learning from the first wave of demonstration projects should greatly reduce the challenges facing the next generation of CCS projects.

The European Commission has initiated a Project Network for sharing knowledge arising from European CCS demonstration projects. Canada is developing a knowledge-sharing framework and is collaborating with the United States under the Clean Energy Dialogue. The Asia-Pacific Partnership on Clean Development and Climate has also established two knowledge-sharing networks. The Global CCS Institute is commissioning a knowledge-sharing programme to communicate lessons learned from demonstration projects. In co-operation with the IEA and the CSLF, this programme will develop knowledge-sharing principles and protocols. To accelerate global deployment of CCS, the programme will also link the emerging national and regional networks in the European Union, the United States, Australia and Canada.

While the G8 process has provided a forum for high-level political dialogue on low-carbon energy policies, including CCS, the future of this forum as an energy discussion platform is uncertain. However, the first ever Clean Energy Ministerial (CEM) meeting was held on 19-20 July 2010 in Washington DC, bringing together energy ministers and high-level ministry officials from 25 countries plus the European Commission, to discuss low-carbon energy technology and policy. At the meeting, the CEM established a “Carbon Capture, Use and Storage (CCUS) Action Group”, which intends to provide a forum for ministerial level engagement to advance on issues of strategic CCS direction, financing, storage, regulation and knowledge sharing.

4. Conclusions and issues still to tackle

It is evident from these early results that progress is being made. However, many challenges still remain if CCS is to deliver at the scale required. The challenges are well-known; they require concerted action by industry, governments, international organisations and civil society.

Continued political leadership is absolutely essential at both national and international levels to achieve the levels of CCS deployment required to stabilise CO₂ concentrations in the atmosphere at 450ppm by 2050. Heightened urgency on the part of all stakeholders is needed to realise the number of large-scale projects that constitute the critical first steps in the deployment of CCS. The next decade, from 2010 to 2020, will be a crucial watershed period for the future of CCS. Absolutely critical to its success is the need to reach a broadly supported international agreement on a global response to climate change, to build capacity that will enable the delivery of CCS at the scale, time and magnitude necessary, to construct a number of large-scale demonstration facilities and to ensure an active sharing of knowledge on the experience gained.

References

IEA CCS Technology Roadmap, IEA 2009

Energy Technology Perspectives 2008, IEA 2008

Energy Technology Perspectives 2010, IEA 2010

IEA/CSLF report to the Muskoka G8 Summit: Carbon Capture and Storage – Progress and Next Steps. Prepared in cooperation with the Global CCS Institute. IEA 2010
The Status of CCS Projects, Interim Report 2010, Global CCS Institute 2010.
http://www.globalccsinstitute.com/downloads/general/2010/The-Status-of-CCS-Projects-Interim-Report-2010.pdf