



Indonesian CCS Roundtable Summary

12 November 2009

Background

On the 12th November 2009, the IEA organized a Roundtable event on CCS in Jakarta, Indonesia. There were around thirty attendees at the roundtable event and associated panel session from different areas of government as well as from a number of research organizations and Industry.

The Roundtable was the fifth in the series of Roundtables on CCS that the IEA have been hosting in key emerging economies. The goal of these Roundtables is to collect detailed information about the technology, legal, financial, public awareness and international collaboration issues associated with CCS demonstration and commercialization in regions that are important to the development of CCS. The first roundtable was hosted in China in April 2009 followed by Poland in July 2009, Brazil in June 2009 and South Africa in October 2009.

Prior to the Roundtable, a study into the potential for Indonesia to implement CCS was undertaken by the Indonesian CCS Study Working Group. The Working Group comprises the Agency for Oil and Gas Research Development (LEMIGAS) of the Ministry of Energy and Mineral Resources of Indonesia, Indonesian National Committee – World Energy Council (KNI-WEC), PT PLN (Persero) – Indonesia State Electricity Corporation, Ministry of Environment of Indonesia, Royal Dutch Shell and UK Embassy. The study results were launched on 10 November 2009, followed by the IEA/APEC/LEMIGAS Joint Workshop ‘Carbon Capture and Storage in Indonesia’ on 11 November 2009, and the MEMR/IEA Roundtable on 12 November 2009.

This summary focuses on the discussions from the Roundtable but also includes some of the key points raised over the course of the IEA/APEC/LEMIGAS Joint Workshop. In particular some key messages have been taken from the final session of the Workshop which involved a panel session on *Implementing CCS – Globally and in Indonesia* which provided an industry perspective on CCS implementation in Indonesia.

Indonesian energy and CO₂ emissions profile

Indonesia has a key role to play in the global deployment of CCS given the extensive fossil fuel reserves in the region. In particular, Indonesia’s natural gas industry offers huge potential in the way of low-cost, early opportunity CCS. CCS technologies can capture the CO₂ for storage in EOR and EGR projects and in saline formations, providing a boost to local development as well as contributing to a sustainable energy future for the region. Commitment to the technology in Indonesia is clear with the Indonesian public and private sectors already investing in CCS research and development, as a method of exploring the potential for deployment of CCS.

The Government of Indonesia has been increasingly vocal with concerns about climate change and its impacts on the developing world. The Government has pledged to achieve a non-binding commitment to reduce carbon emissions by 26%-41% by 2020.

Technology demonstration and research

To commence the Roundtable, the representative from the Indonesian Department of Energy and Mineral Resources gave an overview of CCS in Indonesia. The overview covered a lot of the information from LEMIGAS Study on CCS.

Indonesia has a heavily fossil-fuels based economy, consuming coal, oil and gas produced domestically plus imported petroleum. This means Indonesia has significant potential for the deployment of CCS in the long-term. They also however have significant early opportunities to deploy CCS, particularly in the in the extensive natural gas industry.

Indonesia has extensive natural gas reserves, including the very large Natuna field which has 70% CO₂ content. Production of such fields results in significant releases of CO₂. They do however present a very low cost opportunity for CCS with a very pure stream of CO₂ and are inherently close to storage in gas reservoirs, aquifers and, in the case of South Sumatra, in EOR or ECBM projects.

The Indonesian Geology Agency already has a lot of experience in CCS related fields. They have already evaluated some potential storage sites, conducted seabed exploration, taken core and performed test injection into the core with help from the CSIRO in Australia. From their work they see that there is good potential for CO₂ storage in Indonesia and these results were presented at the CO2CRC CCS symposium in Brisbane. It was however identified that given Indonesia's location on the "ring of fire", volcano and earthquake zones need to be considered. That said, as long as site is selected carefully then there are suitable storage sites available that the Geology Agency would be able to recommend.

Interest in CCS in Indonesia crosses a number of government areas. The Ministry of Energy and Mineral Resources and the Agency of Geology actively contributed to the most recent study and the Environmental Ministry is also very actively finding out about CCS.

Indonesia's interest in CCS has built over recent years. As early as 2003, Indonesia was looking at the issue with a previous LEMIGAS study into CCS and incremental oil recovery in East Kalimantan and South Sumatra being produced between 2003 and 2005. Indonesia is also collaborating with a number of international partners to look at the issues including with:

- Sojitz-Japan (2006) – study on oil, gas, and coal
- Total (2007) – Signed at the UNFCCC
- Shell (2009)
- Founding member of the GCCSI (2009) – two government agencies
- Joint study with the UK Government (2009) – includes Ministry of Environment and Lemigas

Indonesia could also potentially access finances for CCS from the Indonesian Climate Change Trust Fund (ICCTF) which was recently announced to support the government's CO₂ emissions reduction goals.

There is however a number of issues associated with CCS development in Indonesia. Currently Indonesia does not have the legal and regulatory framework to enable the deployment of CCS. CCS also adds additional costs to any operations in industry, power generation, and oil and gas production. With no broad international incentives in place, funding CCS would be difficult. Indonesia also feels that although they have experience in oil and gas production, they do not have the technical capacity required to deploy CCS at scale. Public awareness about CCS in Indonesia is also very low which could cause problems with CCS deployment, especially with local communities.

Learning by doing is a key way of progressing CCS in Indonesia. This would primarily involve the development of a pilot project in the country. Indonesia would be interested in working with international governments and organisations to work on the deployment of CCS in Indonesia. The idea of using a pilot or demonstration project to push forward the CCS agenda including with public acceptance, regulatory development and capacity building was very well received by both industry and other government representatives at the roundtable. It was thought that this would be a good way of pushing the cause forward as it would make the government and other stakeholders act. If multinational companies were engaged this would also help create pressure from headquarters on their operations in Indonesia.

In summary, it is clear that there is big potential for CCS deployment in Indonesia, in particular in association with natural gas production, for example at the Natuna field, and in conjunction with EOR. To allow this potential to be realised, however, Indonesia see a local demonstration project with funding from international parties and the development of domestic CCS regulation as being crucial. There also needs to be improvement in international cooperation, including knowledge sharing and capacity building.

Financing

The cost of deploying CCS in Indonesia varies from the very low early opportunity projects in natural gas extraction and processing, up to more expensive projects in power and industry.

There are numerous natural gas operations with high CO₂ content and which are similar to Sleipner in the North Sea with CO₂ avoided costs in the region of \$15-20 per tonne. CCS from power and industry however is more challenging: Indonesia has a lot of small scattered coal plants rather than the large localised plants found elsewhere. This delocalisation of point sources takes away the benefits that can be gained through a pipeline network and the clustering of CO₂ sources.

Throughout the discussions the cost of CCS was identified by government, industry and other stakeholders as being the most significant barrier to deployment of CCS in Indonesia. It was urged however that the cost of CCS, and of all climate change mitigation options, need to be viewed in comparison with the cost of in-action. It was suggested in the Stern review in the UK that mitigating climate change could cost as much as 1-2% of GDP globally; whereas not mitigating climate change could cost as much as 5-6% of GDP. In this context, addressing climate change and CCS needs to be seen as a boost to development, not a barrier.

Indonesia's position towards CCS funding is similar to most developing countries. To start discussions, the representative from Indonesia's Ministry of Environment stated that CCS is too expensive for Indonesia and Indonesia should not be responsible for funding it themselves considering their low CO₂ emissions per capita. It was also made clear that Indonesia's first priority is enhancing and sustaining energy security and providing affordable energy to the population. Consequently, without international financial support, Indonesia would only be interested in CCS if it contributes to energy provision or security. Discussion did however lead to ways that CCS could be funded through other methods such as through the clean development mechanism (CDM), EOR, and other options.

Currently, CDM is the only mechanism available to use finances from developed countries to fund CO₂ emissions reductions in developing countries. However, it is still under discussion as to whether CCS should be part of the CDM process. While Indonesia has not yet taken a position on this, discussions made it clear that parts of the government are in favour, in particular the Ministry of Energy and Mineral Resources. It was suggested by a representative from the Indonesian Centre for Data Information that, in the ongoing UNFCCC negotiations, CCS was not a current priority for Indonesia. The representative from WEC in Indonesia has been very involved in the CCS CDM negotiations for a number of years and feels that CCS should be included as the issues being raised in objection are not new and have been dealt with for other technologies in the CDM. This suggests the objections to CCS are perhaps more political than they are technical.

Shell has interests in Indonesia and has been tracking very closely the CCS and CDM discussions. They see the mitigation of climate change to be particularly important to Indonesia because this region faces particularly significant impacts from climate change. Accordingly they see it as being very important that Indonesia plays a part in the UNFCCC negotiations, with the G20 and bilaterally, to ensure real action is taken globally. Shell also see the need for a commitment to funds transfer into developing countries and mechanisms like the CDM, in conjunction with binding targets in developed countries, as the primary means of achieving this.

For CCS to progress into the CDM, it will be very important that countries such as Indonesia take their role in the negotiations. If they wait for the outcomes to be resolved, there is a very real risk that they will forfeit their right to provide input on this critical issue.

To quickly develop CCS in Indonesia will mean sidestepping the CDM issue. Hence, one of the most logical options is EOR (and EGR). EOR is seen as a good early opportunity for Indonesia as it had the multiple benefits of contributing to CO₂ emissions reductions, improving energy security, and building experience in CCS operations. It also has the significant benefit of not relying on a price for CO₂ but rather relying only on the oil price.

LEMIGAS has looked into the prospects of EOR in Indonesia and is confident that CO₂-EOR could be successful in a number of locations in Indonesia. LEMIGAS also stressed that CO₂-EOR does lead to CO₂ reductions and so should be considered along with other methods for CO₂ re-use such as food processing. For CO₂-EOR to be considered as a CO₂ reduction technology, however, it would need to involve monitoring and verification of the stored CO₂ which isn't always the case in EOR operations operating today.

Even for a company to look into EOR, they would be expecting cost recovery, meaning that the government will essentially reimburse the company for the cost of setting up the project. If cost recovery was not possible, the Indonesian Climate Change Trust Fund could be another option to help fund it if it is able to be used for CCS and EOR.

Statoil and CO2CRC both have experience in CCS project development, Statoil at a commercial level and CO2CRC at a pilot level. They both therefore had additional suggestions on how CCS could be financed in Indonesia. Statoil is one of a number of oil companies active in Indonesia. Statoil has started exploration in the region and have been shortlisted for the Natuna field where they are looking at CCS as part of the development of the field. Statoil has extensive experience in CCS with active projects in Norway and one in Algeria. The Norwegian projects were driven by a CO₂ tax on the offshore oil and gas industry. The representative from Statoil suggested that a CO₂ tax similar to this could be a way of supporting CCS in Indonesia.

The CO2CRC Otway project was collaboratively funded by governments and industries including oil, gas and coal. This means that all the financial members share in the results and knowledge generated by the project but they also share in the financial risk. This could be a model that Indonesia could follow getting international companies in Indonesia to contribute and collaborate in a pilot project. Australia has also placed a voluntary levy on coal industry which will also build a fund for the demonstration of CCS. Again, Indonesia could look at something similar, placing a levy on the fossil fuel production on international companies in Indonesia.

Government and regulatory Issues

Although financial aspects of CCS are extremely important, having regulation in place for CCS operations will be required to give the confidence to investors to invest in Indonesia and to give the public confidence in the safety and security of the operations. This is particularly the case for larger scale commercial deployment. It is acknowledged by the Indonesian government that there is a need for need a long-term policy framework but there is also a need for financial incentives.

This was reiterated by Sasol who has an interest in Indonesia. Sasol currently produces 160,000bbl/day of oil in South Africa from coal to liquids (CTL) and is currently looking at how CCS could be used to address the CO₂ emissions associated with this process as it produces twice as much CO₂ as conventional oil refining. Sasol are in the process of looking for CTL opportunities in Indonesia and at how they could manage the associated CO₂. If the CO₂ is to be managed with CCS, Sasol see the need for a regulatory framework to provide certainty about their operations.

The two key areas of government involved in CCS deployment in Indonesia will be the Ministry of Environment who set standards for anything in Indonesia related to the environment and who setup best practice guidelines and, presumably BPMIGAS, the Upstream Oil and Gas Regulatory Authority, who control/approve gas flow in Indonesia and would licence CO₂ transport. It will however be the former; the Department of Environment, who will lead on regulatory development for CCS.

It was suggested that the next steps for Indonesia in regulatory development are to improve capacity building within the government and work on building public support. It was suggested that

a follow-up study could build on LEMIGAS work to produce a more detailed understanding of CCS in the Indonesian legal and regulatory system.

Although most of the people present at the meeting saw legal and regulatory development as being crucial, it was the opinion from the representative from the Centre for Data Information that Indonesia doesn't need a CCS regulatory framework yet but rather should be focusing on capacity building, joint research and possibly a pilot project.

Public awareness

The Ministry of Environment knows that CCS is an important technology for Indonesia and that the technology is now largely available. However, Indonesia needs to raise the awareness of the population about why CCS is important and how it can be deployed in Indonesia.

Indonesia recently held a general assembly meeting of stakeholders for National Council on Climate Change (NCCC) which was chaired by the Ministry of Environment. The meeting was attended by many ministers and the NCCC announced progress on climate change awareness in Indonesia including having 30 people trained by Al Gore to communicate climate change. Currently the public acceptance varies but nowhere is it as high as in the EU. To strengthen Indonesia's action on climate change, the general community will need to be more aware. The NCCC is now running an awareness raising campaign. With regard to CCS specifically, the awareness is even lower, and currently the NCCC campaign does not cover anything about CCS. It was suggested that perhaps it would be too difficult to communicate the technical details of CCS beyond the more populated and educated region of Java. However, one of the representatives from the CO2CRC who focuses on communication of CCS said that although communicating difficult science is hard, there are methods that have been shown to work. She also stressed the importance of communicating climate change and the link to CCS properly.

International Collaboration

International collaboration will be crucial if Indonesia is going to deploy CCS at the scale and rate required. International collaboration will enable Indonesia to learn from the experience gained elsewhere on CCS, both on a technical and non-technical level. It was suggested that Indonesia could benefit from more international collaboration on CCS from a variety of international organisations and that this could include expert visits to Indonesia or Indonesians delegations travelling elsewhere.

At an international level there is the IEA, GCCSI, CSLF and others working in this area. The IEA also has two implementing agreements that are looking at CCS, the IEA Greenhouse Gas R&D Programme (IEA GHG) and the IEA Clean Coal Centre (IEA CCC) and the CSLF has two working groups looking at the policy and the technical aspects of CCS. It is also one of the GCCSI's key mandates to improve knowledge sharing so they can be a very important partner in gathering information from existing projects around the world. Specific actions for Indonesia in this area could be joining the IEA GHG which would enable Indonesia to host CCS events such as Network meetings and the IEA GHG CCS Summer School, and also the IEA CCC which looks more at CO₂ capture from coal. There are also additional resources in the form of universities, companies, and other bodies that are interested in supporting the capacity development of developing countries. Each developing country however will

have a unique set of issues so any international collaboration with Indonesia needs to understand the Indonesian position.

A representative from Natural Resources Canada (NRCAN) attended the workshop and spoke about some of the benefits that have come from APEC and other capacity building efforts in the past. In 2007, APEC held a CCS capacity building workshop in Mexico. Mexico is a major CO₂ emitter. They did have some oil and gas reservoirs but as they are now depleting they are switching a lot of their energy supply from oil and gas to coal which means their CO₂ emissions are increasing. There was some interest in CCS from the Energy Ministry however there was very little dialogue between the key stakeholders within the government i.e. oil and gas, research, environment, power ministries. The Ministry of Energy approached APEC to explore options for capacity building. APEC then hosted a workshop that brought all the different stakeholders together. This started a dialogue. Since this workshop, Mexico have organised and held a workshop of their own in 2008 and are now looking at coal power plus CCS as well as CCS and EOR. They have engaged with the Weyburn EOR project in Canada and are participating in the North American CCS Network which is looking to develop international standards and common methodologies for site characterisation. In this example, the APEC workshop was a trigger for domestic action.

Next Steps

The IEA is exploring ways to expand its outreach and capacity building on CCS in Indonesia and will be in contact as ideas arise. If the Indonesian participants have other ideas or have an interest in working with the IEA, please contact Brendan Beck at brendan.beck@iea.org.