

CCS REGULATION

NEWSLETTER

Welcome to the CCS Regulation Newsletter. This is produced by the **MIT Carbon Capture and Sequestration Technologies Program**. It is a quarterly report designed to keep the reader up-to-date with the current regulatory news and issues surrounding Carbon Capture and Storage (CCS).

For more information about the program, please see <http://sequestration.mit.edu>

Report on the Role of CCS in the IEA's ETP 2012 Publication

The International Energy Agency (IEA) released its Energy Technology Perspectives (ETP) 2012 on June 11, 2012. This publication is the 4th edition and is one of the main publications of the IEA.

At the center of the analysis is the two degree Celsius scenario (2DS) by 2050. The 2DS focuses on the energy technology choices which would ensure an 80% chance of limiting long term global temperature change to 2°C. In the 2DS, there is a dramatic shift in global energy sources and demands. It will be a sustainable energy system which is a smarter, more complex, unified and integrated energy system.

Currently there is slow progress towards this target with almost all technology areas not on track to meet the 2DS target and significant effort is required to reach this goal. Currently the



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only technology which is on schedule, is renewable energy. The ETP 2012 also looked at a four degree scenario (4DS) which reflects the climate change demonstrating the current pledges by countries to cut emissions and boost energy efficiency. And finally there is the six degree scenario (6DS) which is the predicted temperature change which will occur with the current state of affairs. ETP 2012 finally looks to 2075 and the possibility of a zero-carbon future; although it is seen as being possible, it will be challenging even if the 2DS targets are met.

ETP 2012 presents scenarios and strategies up to 2050, with the aim of guiding decision makers on energy trends and what needs to be done to build a clean, secure and competitive energy future. In order to achieve the 2DS goal, a multi-faceted approach using all available technology needs to be used. Below we look at the role of CCS in ETP 2012.

- **The importance of CCS in achieving the 2DS**

CCS is very important in achieving the 2DS and it is estimated to meet 20% of the total CO₂ reduction goal. If you removed CCS from the 2DS, the emissions target cannot be met. There is currently no available technology which can reduce CO₂ emissions from industry. And if you removed it from the power sector it would result in a 30% increase in nuclear and gas power. This

change in power source would cost more than CCS.

- **The current progress of CCS**

Due to the global economic situation in the last 2 years, since the last ETP publication in 2010, CCS has not made the progress that it was thought it was going to have made. As a result the rate of deployment in ETP 2012 has been decreased. However the IEA still believes the potential of CCS is very large and vital in achieving the 2DS.

- **The global application of CCS**

In order to achieve the 2DS goals, CCS has to grow rapidly around the world. By 2020 there is estimated to be 16 GW of power generation fitted with CCS and 196 MT of CO₂ captured in industrial applications. Initially the majority of the emission capture is to occur in OECD countries but by 2050 the bulk of these emissions are to be captured in China, India and non-OECD countries. There is a split in the predicted deployment of CCS worldwide. In the Americas and China power sources have the greatest CCS capacity while in the rest of the world it is industry which has the largest emissions. In 2050, 63% of coal-fired electricity generation (630 GW) is to be equipped with CCS, 18% of gas (280 GW) and 9% of biomass (50 GW).

- **The cost competitiveness of CCS**

By 2030 CCS is expected to be cost competitive in the model given the existence of a carbon tax.

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- The role of gas-fired power stations

Around 2020 to 2030, as CCS is implemented worldwide, the CO₂ emissions from coal-fired power plants will fall below that of gas-fired power plants. At this time it will be necessary to have CCS on gas-fired power plants.

- The role of retrofitting

Retrofitting plays a role in meeting the 2DS. It is estimated that there are currently 500 GW of power globally which might be applicable for retrofitting. In the 2DS by 2050 there needs to be 100 GW of power plants retrofitted. It is important for governments and the power industry to think now about how to design and plan to retrofit plants in the future to decrease the number of plants which are retired early.

- The role of industrial applications

The ETP 2012 looked closely into the role of CCS in industrial applications. CCS plays an important role, which is sometimes overlooked. In contrast to power generation, there are a lot of industrial processes that produce highly concentrated CO₂ vent streams, for example gas processing and ethanol production. Capture from these high purity sources is relatively straightforward with lower costs and it is where we see CCS applied today. In industries where there are dilute exhaust streams, e.g. blast furnaces and cement kilns, the same CO₂ separation technologies which are applied in power generation are needed and as a result they have a higher cost. High purity CO₂ streams

are therefore more favorable and it is estimated that by 2050, 1/3 of all CO₂ captured for CCS will be from high purity industrial sources of CO₂. However industry type varies around the world. In the 2DS, between 2015 and 2020, 72% of CO₂ capture from industrial applications comes from non-OECD countries.

- The role of biomass

Obtaining energy from using biomass in industrial and power applications and then capturing the CO₂ can result in negative emissions. However, there is a challenge to make sure that the biomass is grown and harvested sustainably as this significantly impacts the level of emission reductions that can be achieved.

- The role of transportation and storage

There is the need for global development of CO₂ transportation and storage. It is estimated that there is a huge sequestration potential worldwide, but it needs to be better defined. There are huge volumes of CO₂ that need to be stored in the next few decades. Between 2015 and 2030, 13 GT of CO₂ is estimated to need sequestering and through 2050, 123 GT of CO₂. There is therefore a rapid need to develop transportation and storage sites. There is a good understanding of the costs of transport of CO₂ through the EOR industry, and it is estimated that there will be ample storage worldwide. However, these need to be better defined worldwide.

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- The investment needed for CCS in the 2DS

A total investment of \$3.6 trillion is needed for CCS. Although this is a significant amount, it is relatively small compared to the total cost of the 2DS. It is estimated that the current pledges will result in the 4DS and to obtain the 2DS, an additional \$36-40 trillion investment is needed.

- The estimated price of CO₂

The cost of CO₂ in the 2DS is estimated to be between \$150-160/ton.

- Where we are today in meeting the 2DS

By 2020, in the 2DS, the IEA sees that there should be 15-16 GW of power with CCS capturing 196 MT/Yr CO₂. This is a big jump from our current status. Currently worldwide there are only 4 large industrial projects capturing 5-6 MT/Yr. At the current rate we need to have 65 large scale industrial projects in the pipeline.

- ETP 2012 recommendations for near term government actions

Governments need to assess and act on the role of CCS in the future. They need to increase their efforts to demonstrate CCS at a commercial scale. They need to develop long term incentives, with legal and regulatory framework for the demonstration and deployment of CCS. Government and industry must also develop information on transport and storage infrastructure along with capacity and associated costs, so that CCS projects may be successful. Government and industry must assist RD&D. Finally all

parties must inform the public about policies and projects information to allow for transparency and a two-way flow of information.

The Energy Technology Perspectives 2012 is a comprehensive publication and it is available online and for purchase. The data behind the publication is available for everyone to see. However if you purchase the publication you are able to use and explore the data which went into producing ETP 2012. For more information; please visit www.iea.org/etp.



Anthropogenic Test site begins CO₂ Injection

August 22, 2012. The Southern States Energy Board and SECARB Partners announced that CO₂ injection is underway at the Anthropogenic Test site in Southwest Alabama.

This is the world's first fully integrated project involving:

- CO₂ capture from a 25 MW slipstream from Alabama Power's Plant Barry
- CO₂ transported for 12km via a dedicated Denbury pipeline
- Geologic storage within the saline Paluxy Formation at the Citronelle oilfield.

http://www.secarbon.org/?page_id=8

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Federal CCS Regulation News and Updates

June 5, 2012. Cost evaluations for the proposed EPA regulations on coal fired power plants came under U.S. House panel scrutiny.

<http://www.globalccsinstitute.com/institute/news/cost-evaluations-new-regs-come-under-house-panel-scrutiny>

June 8, 2012. The U.S. House has voted to approve funding for clean-coal technology funding in a new Water and Energy Appropriations Bill. The Bill provides funding for the DOE. The measure also restores funding levels that President Obama had

proposed to cut from the fossil energy program for coal research. The Bill now moves onto the Senate.

<http://bdtonline.com/local/x318746251/U-S-House-votes-to-restore-clean-coal-technology-funding>

June 28, 2012. The U.S. House Appropriations Committee approved the 2013 fiscal year Interior and Environment Appropriations Bill which approves funding for the EPA among others. The Bill gives the EPA \$7 billion, a decrease of \$1.4 billion (or 17%) from 2012. This will significantly impact funding for climate change work.

<http://appropriations.house.gov/news/documentsingle.aspx?DocumentID=301337>

New DOE CCUS Best Practices Manual

June 7, 2012. The DOE has released the latest “Carbon Capture Utilization and Storage (CCUS) Best Practices Manual.” This manual features top strategies for Carbon Storage wells and covers the planning, permitting, design, drilling, implementation, and decommissioning of CO₂ storage wells. The new manual provides an overview of the well-management activities typically associated with CCUS projects, beginning with pre-injection planning and continuing through post-injection operations. It provides a roadmap and resource for lessons learned about well-management issues and what project planners and operators can expect as a project unfolds.

The manual discusses the types of experts needed for a successful CCUS project team—from technical scientists and engineers to non-technical legal counsel, economists, and communicators. It also informs the general public about the rigorous approach that project developers undertake to ensure human and environmental safety as they design, drill, maintain, and close these wells.

News: <http://www.carboncapturejournal.com/displaynews.php?NewsID=955>

Manual: http://www.fe.doe.gov/news/techlines/2012/12025-NETL_Issues_Best_Practices_Manual.html



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International Regulatory News

IEA

June 11, 2012. The IEA has called for doubling of clean energy spending by 2020. It is estimated that \$23.9 trillion is required by 2020 to keep the global temperature rise to within 2 degrees Celsius. The IEA also noted that CCS was one of the technologies which had the largest potential and was making the least progress.

<http://in.reuters.com/article/2012/06/11/iea-technology-idINDEE85A08W20120611>

Canada

June 8, 2012. Ottawa and Saskatchewan are negotiating an agreement on GHG regulations for coal-fired electricity generation.

<http://www.edmontonjournal.com/news/Ottawa+Saskatchewan+negotiate+greenhouse+agreement+coal+fired/6752253/story.html>

Germany

June 27, 2012. Germany's parliamentary mediation committee has approved a compromise, which would allow CCS in Germany on a test basis.

<http://www.reuters.com/article/2012/06/27/us-germany-energy-co-idUSBRE85Q1JL20120627>

Australia

August 13, 2012. The Peter Cook Center for Carbon Capture and

Storage Research has opened in Melbourne, Australia. CO2CRC will direct research in the new center.

http://www.pennenergy.com/index/power/display/9634928261/articles/electric-light-power/generation/coal/2012/August/Carbon_capture_research_center_opens_in_Australia.html

EU-EUA

August 10, 2012. The European Investment Bank announced that 20.5 million EU CO₂ Allowances (EUA) were sold in July. This is a total of €162.8 million. 21.5 million EUAs were sold in June 2012.

June 27, 2012. Major companies including Shell, Statoil and Bunge Limited have requested the removal of 1.4 million EUAs which they say is flooding the market and decreasing the incentive to invest in low carbon technology.

<http://www.captureready.com/EN/Channels/News/showDetail.asp?objID=2770>

EU-ETS

Jul 20, 2012. The EU Commission plans to withhold carbon allowances to support the struggling Emissions Trading Scheme (ETS).

<http://www.reuters.com/article/2012/07/20/us-eu-ets-idUSBRE86J0Q820120720>

EU-NER 300

July 16, 2012. The EU earmarked €1.3 to €1.5 billion for CCS projects under the European Union's NER 300 funding program. It released the projects by rank of which the top 2-3

would receive funding: Don Valley (UK), Belchatow (Poland) and Green Hydrogen (Netherlands).

However on August 5, 2012, the money to be awarded has been decreased by £800 million. The award money was linked to the carbon credits which have decreased in the last 2 years.

<http://www.guardian.co.uk/environment/2012/aug/05/value-carbon-capture-fund-declines>

EU-Budget

June 29, 2012. As the Danish hand over the EU Presidency to Cyprus, they have negotiated an EU budget for 2014-2020 that is "seriously open" to investments in climate friendly technologies at the regional level, with the proposed amount around €1 trillion.

<http://www.euractiv.com/regional-policy/danish-presidency-hands-cyprus-s-news-513622>

Australia

August 29, 2012. The Australian government has announced that it will abandon the proposed floor price of its emissions trading scheme as part of a deal to link the scheme with the EU. The \$15 a tonne of CO₂ will not come into effect in 2015 as previously planned.

Australian emitters will also be able to buy up to 50% of their liabilities from international markets.

<http://www.captureready.com/EN/Channels/News/showDetail.asp?objID=2794&isNew=>

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State CCS Regulation News and Updates

New York

June 28, 2012. New York environmental regulators have adopted CO₂ limits for new and expanded power plants that are slightly stricter than proposed federal limits. This makes it nearly impossible to build a new coal unit in the state.

<http://www.reuters.com/article/2012/06/28/us-utilities-newyork-carbon-coal-idUSBRE85R1GF20120628>

Wyoming

May 1, 2012. Wyoming's Governor Matt Mead opened a discussion about a proposed statewide network of CO₂ pipeline corridors within federal land. As a result of pre-approved corridors, permitting time would be shortened, allowing for EOR. Under current plans, pipeline corridors on Federal land are determined separately by the nine individual Wyoming BLM offices.

<http://governor.wy.gov/media/pressReleases/Pages/GovernorLookstoSupportCO2.aspx>

Illinois

August 10, 2012. Governor Quinn vetoed the Public Utilities Act Amendment, SB 3766. This Bill was meant to help build and sustain Leucadia's proposed coal gasification plant in Chicago. SB 3766 would have required Ameren and Nicor to sign a 30-year contract to buy natural gas from the Taylorville gasification plant. There was strong public opposition as Ameren and Nicor customers believed they could have paid significantly higher rates to fund the \$3 billion in costs to build and operate the plant.

<http://www.ilga.gov/legislation/BillStatus.asp?DocNum=3766&GAID=11&DocTypeID=SB&SessionID=84&GA=97>

California

May 16, 2012. The California City of Oroville's City Council has approved the development of a climate control plan to comply with California legislation to reduce greenhouse gas emissions. The goal of Sustainable Community Planning Grants is to develop plans for sustainable communities and climate protection by reducing greenhouse gas emissions in compliance with Assembly Bill 32 and Senate Bill 375.

<http://donnastorage.net/donna-tx-storage/oroville-city-council-approves-plan-to-reduce-greenhouse-gas-emissions/>

Washington DC

July 19, 2012. A ruling from the U.S. Court of Appeals has rejected several legal challenges to the EPA's 2009 regulation of greenhouse gases. In 2010 Sen. Murkowski (R) sponsored a bid to block the EPA from moving forward with greenhouse gas regulations.

http://www.enn.com/environmental_policy/article/44686?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+EnvironmentalNewsNetwork+%28Environmental+News+Network%29

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International CCS Project News

Belchatow, Poland

May 25, 2012. PGE has suspended its 600 million-euro (\$747 million) investment in the carbon capture facility. PGE requires confirmed state support before they can continue with the 858 MW retrofit project.

July 16, 2012. Belchatow received second place in the NER 300 EU funding award. It will receive a portion of the €1.3-1.5 billion EU fund.

<http://www.businessweek.com/news/2012-05-30/pge-says-belchatow-carbon-capture-project-needs-state-support>

Don Valley, UK

June 13, 2012. BOC has taken a 15% stake in 2Co Energy's Don Valley Power Project.

July 16, 2012. The Don Valley Project was awarded the first place in receiving money from the NER 300 EU grant. It will receive a portion of the reduced €1.3-1.5 billion.

<http://www.carboncapturejournal.com/displaynews.php?NewsID=957>

Hunterston, UK

June 26, 2012. Ayrshire Power has withdrawn its planning application for a CCS facility at Hunterston Power Station in Northern England, blaming the economy and funding uncertainty.

<http://www.bbc.co.uk/news/uk-scotland-scotland-business-18602532>

Scotland, UK

June 29, 2012. 4.5 tons of CO₂ were injected over 30 days into the seabed of the North Sea which then leaked into the sea to simulate a gas leak. This experiment investigates the safety of CCS and the effect of a leak on the marine ecosystem.

<http://www.guardian.co.uk/environment/2012/jun/29/ccs-leak-experiment>

Mongstad, Norway

July 2, 2012. Alstom has continued to the next step of

the CO₂ capture technology qualification program for the full scale CCS plant at Technology Centre Mongstad.

<http://www.captureready.com/EN/Channels/News/showDetail.asp?objID=2721>

Quest, Canada

July 11, 2012. The Energy Resources Conservation Board of Alberta has conditionally approved the \$1.35 billion Quest Project. The project is operated by Shell and is located at the Scotford upgrader, Alberta. The project has a proposed capture of 1.2 MT/Yr.

<http://ca.finance.yahoo.com/news/shell-canadas-oilsands-carbon-capture-162027187.html>

Peterhead, UK

July 20, 2012. Shell and SSE have won the UK's first license for offshore storage of CO₂. This is for the proposed Peterhead CCS project.

July 16, 2012. The Peterhead project was placed far down the list on the NER 300 grant money. It is unlikely it will receive any of the reduced €1.3-1.5 billion unless other projects are cancelled.

<http://carbon.energy-business-review.com/news/shell-and-ses-offshore-carbon-storage-project-wins-uks-first-licence-200712>

Ordos, China

August 6, 2012. China's first CCS project, the Ordos coal gasification in Inner Mongolia, has successfully captured and stored 40,000 tons of CO₂.

http://www.china.org.cn/environment/2012-08/06/content_26150055.htm

Kingsnorth, UK

August 12, 2012. E.ON has confirmed the closure of Kingsnorth power station by March 2013 after reaching its allocated running hours. E.ON has also withdrawn its plans to retrofit the plant with CCS.

<http://www.eon-uk.com/generation/kingsnorth.aspx>

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U.S. CCS Project News

HECA, California, USA

June 1, 2012. MHI has been awarded to perform the FEED services and design order for Hydrogen Energy California (HECA) Project.

<http://www.japancorp.net/press-release/25287/mhi-performing-front-end-engineering-and-design-order-for-ccs-capable-igcc-power-generation-and-fertilizer-production-project>

Miller Power Station, Alabama, USA

June 27, 2012. Southern Company's Alabama Power announced that ADA will be testing its new carbon capture technology at a 1 MW slip stream from the Miller Power Station in Alabama. The new technology will be a regenerable solid-sorbent-based capture.

<http://www.businesswire.com/news/home/20120627005215/en/ADA-ES-Announces-Clean-Coal-Technology-Project>

Indiana Gasification, USA

June 28, 2012. Indiana Gasification has received an air permit for the proposed coal gasification plant. The captured CO₂ will be sold for EOR projects.

<http://www.prnewswire.com/news-releases/indiana-gasification-wins-air-permit-for-clean-coal-facility-says-plant-a-big-win-for-environment-and-indianas-energy-future-160683585.html>

Taylorville, Illinois, USA

July 10, 2012. The Illinois EPA will reconsider its air pollution permit for Tenaska's Taylorville Energy Center project awarded in April 2012. This is so it is more in alignment with the U.S. EPA's proposed New Source Performance Standards for GHG Emissions for new power plants. Tenaska's current permit does not require the plant to capture and sequester any CO₂ emissions. The proposed EPA regulations would limit CO₂ emissions to 827 lbs/MWh (gross).

<http://www.power-eng.com/articles/2012/07/illinois-epa-to-reconsider-permit-for-taylorville-energy-center.html>

DOE Project Funding

July 26, 2012. The DOE announced awards to projects advancing innovative clean coal technology. The DOE's \$7 million investment will be leveraged with recipient cost-share to support approximately \$9.4 million in total projects. It will support the development and deployment of Carbon Capture, Utilization, and Storage (CCUS) by focusing on further improving the efficiency and reducing the costs associated with carbon capture.

<http://energy.gov/articles/energy-department-announces-awards-projects-advancing-innovative-clean-coal-technology>

Images:

Page 1: Laying pipeline: <http://www.pnnl.gov/science/highlights/highlight.asp?id=537>

Page 4: CO₂ Phase III injection well: <http://www.sseb.org/secarb.php>

Page 5: Oil derrick: <http://www.escapefromamerica.com/2009/12/the-best-energy-investments-in-the-world/>

This newsletter was constructed using information from internet searches.

The websites used have been cited.

Holly Javedan compiled this report.

For more information, questions and comments please email javedan@mit.edu.

Thank you.