

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>.

Overview of the EPA’s Proposed Rule for Existing Power Plants and the Implications for CCS

On June 2, 2014, the US EPA released its “Carbon pollution emissions guidelines for existing stationary sources: electric utility generating units”. The following article is a summary of the key provisions, a sampling of the reactions on the rule to-date and a commentary by Howard Herzog on the implications for US CCS and Coal.

1. Summary of the key provisions

On June 2, 2014, the EPA released the Clean Power Plan proposal that outlines state-specific rate-based goals for CO₂ emission reductions from existing power plants that together would achieve a 30% reduction of national emissions by 2030 from 2005 levels. Coal currently provides 37% of the US’s energy and the EPA anticipates that by 2030 this will drop to 30% in favor for Natural Gas (NG), renewables and nuclear.

The 645-page proposal gives individual states their own reduction goals that were based on individual state’s current emissions and their capacity to achieve reductions in four areas that the EPA called “building blocks”. These are:

- 1: Improve coal power plant efficiency
- 2: Increase generation from less-carbon intensive NG when there is excess capacity
- 3: Increase renewables and nuclear
- 4: Increase end use energy efficiency



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As a result, there are widely different emission goals across the states. The EPA has not defined how states are to reduce their CO₂ emissions and has stressed that the proposal is “flexible” to allow each state to achieve these targets in their own way. States will also be able to convert their target emission rate (CO₂/MWh of net generation) to a mass-based standard (tons of CO₂ emitted/year), which will facilitate cap-and-trade programs. States have been given until June 2016 to hand in their mitigation plans, however if they decide to join and work together for a regional target, they will be allowed a year’s extension. The EPA has also given interim goals to be achieved in the 2020s before the final 2030 goal.

The EPA has not detailed what will happen if the states do not meet these targets, but it has said that if the goals are not met then the state could be liable for penalties under the Clean Air Act.

2. Sampling of reactions and comments on the rule

Since the EPA released its Clean Power Plan proposal, there has been a multitude of responses and analysis. Issues have been raised and we present a summary of the four main areas:

I. State Equity

The different treatment of states is currently a major talking point of the rule. Each state has been given a different rate-based CO₂ goal for the 2020s and 2030. The goals have been calculated by the EPA’s assessment on their potential for change. Some states which have already reduced their emissions significantly from the 2005 levels (for example ME, MA, MD and NY) have been given aggressive reduction targets, as the EPA believes that they can continue with this trend. Some states which have cut their 2005 emissions by much less, for example KY and WV have been given a much lower goal. The net result is that some states will need to make major reductions from their current levels, while others will need to make much more modest reductions. While the EPA claims all states will need to reduce from current levels, an analysis from Bloomberg New Energy Finance claims that up to 8 states (CA, MT, ND, NE, KS, MS, KT, RI) may actually be able to increase their CO₂ emissions

from current levels and still be in compliance with the new rules.

<http://www.businessweek.com/articles/2014-06-11/why-some-states-may-actually-get-to-increase-carbon-emissions-under-new-epa-rules>

II. Environmental

Some environmental groups don’t think that the proposal is going far enough. The EPA has chosen a baseline of 2005 (the same as for Obama’s Copenhagen Accord), which represents peak emissions for the US. Between 2005 and 2012, carbon pollution from electricity generation has already decreased 16%. This means that the US is already over half way to achieving their targets.

<http://www.nationaljournal.com/energy/what-angers-environmentalists-about-obama-s-global-warming-rule-20140602>.

There is also doubt if the US can meet the long-term Copenhagen Accord target of an 80% emission reduction in all sectors (not just electricity generation) by 2050. This proposal will only achieve one third of the intermediate goal of 42% cuts by 2030.

<http://www.washingtonpost.com/news/volokh-conspiracy/wp/2014/06/02/why-the-epas-new-power-plant-rules-are-a-diversion-from-serious-climate-policy/>

III. Legal Issues

There has been commentary as to whether the EPA has the jurisdiction under the Clean Air Act to carry out this proposed rule and if the EPA can use Section 111 (d) of the Clean Air Act to encourage end-use efficiency programs.

<http://blogs.law.harvard.edu/environmentallawprogram/files/2013/03/The-Role-of-Energy-Efficiency-in-the-111d-Rule.pdf>

The proposal will likely be challenged in the US state and national court systems. This could result in a delay of a couple of years as this proposal works its way through various legal barriers.

IV. Over-reliance on Natural Gas (NG)

In its last two electricity generation regulation proposals, the EPA has shown a preference to phase-out coal in favor

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of NG. There have been concerns about the US becoming over-reliant on NG. NG may not always be cheap and abundant and these regulations may lock the US into one energy source potentially causing problems in the future. <http://www.latimes.com/nation/nationnow/la-na-nn-epa-natural-gas-20140602-story.html>

There is also concern that NG production creates its own emissions that are not included in the emission calculation from the NG power plant. For example flaring at NG production sites and associated methane production can increase the overall emissions significantly. http://www.nytimes.com/2014/06/04/business/energy-environment/the-potential-downside-of-natural-gas.html?_r=0

3. How does the proposed EPA rule impact CCS? Commentary on the rule by Howard Herzog

The proposed EPA rule will have very little direct impact on CCS. The goals set by the proposed rule can be achieved by less expensive alternatives than CCS, such as substituting gas generation for coal generation. In the EPA's own words (page 244 of the proposed rule):

"For the reasons just described, based on the information available at this time, the EPA does not propose to find that CCS is a component of the best system of emission reduction for CO2 emissions from existing fossil fuel-fired EGUs. The EPA does solicit comment on all aspects of applying CCS to existing fossil fuel-fired EGUs (in either full or partial configurations), but does not expect to finalize CCS as a component of the BSER in this rulemaking. It should be noted, however, that in light of the fact that several existing fossil-fired EGUs are currently being retrofitted with CCS, the implementation of partial CCS may be a viable GHG mitigation option at some facilities, and as a result, emission reductions achieved through use of the technology could be used to help meet the emission performance level required under a state plan."

While the EPA states that theoretically CCS could be used to reduce emissions, the reality is the amount of contribution

from CCS will be very little at best. The bottom line is that the proposed rule will not create markets for CCS. The proposed rule will accelerate the shift away from coal and toward natural gas in electricity generation. This shift has the potential to impact CCS in both positive and negative ways. Since CCS has long been associated with coal in the US, this may lessen the incentive for investing in CCS RD&D. The reasoning would go that coal is becoming less important, so investing in "clean coal" technologies become less a priority. However, with growing greenhouse gas emissions coming from natural gas power plants, there may be increased interest in developing CCS for natural gas. If this brought in new RD&D funding for CCS, that would be a very positive development. Unfortunately, it would more likely just expand the scope of the CCS research portfolio while not bringing in any new resources.

While in the shorter-term it appears that the proposed rule will do little to create markets for CCS or to encourage investments in CCS RD&D, there is room for more optimism in the longer-term. One could argue that the proposed rule sends a signal that the United States is committed to enacting policies that reduce greenhouse gas emissions. The proposed rule can be viewed as a first step to even stronger emissions constraints in the future. As was detailed in the recent IPCC Working Group III report, CCS is a critical technology required to meet significant greenhouse gas reduction targets. If there was a general belief that more restrictive targets were on the way in the future, then this could lead to much greater investment in CCS RD&D today. However, at this point, this is only speculation. Only time will tell.

More information on the rule can be found at: <http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule>

We thank Howard Herzog and Victoria Clark for their contributions to this newsletter.

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Federal CCS Regulation News and Updates

April 10, 2014. Sen. Sheldon Whitehouse (D-RI) and Rep. Henry Waxman (D-CA), co-chairs of the Bicameral Task Force on Climate Change, hosted representatives from five major corporations that are committed to acting on climate change for a roundtable discussion. Each of the companies has signed onto the Business for Innovative Climate and Energy Policy (BICEP) Climate Declaration. The representatives discussed how their companies are working to reduce GHG emissions, taking advantage of energy efficiency opportunities and utilizing renewable energy technologies.

<http://democrats.energycommerce.house.gov/index.php?q=news/major-corporations-discuss-climate-change-with-bicameral-task-force>

April 28, 2014. Senator Jeanne Shaheen (D-NH) and Senator Rob Portman (R-OH) introduced SB 2262, the *Energy Savings and Industrial Competitiveness Act of 2014*. This bill has become a magnet for energy-related amendments, including the Keystone XL pipeline approval. Also thought to be an amendment to SB 2262 is the *Electricity Security and Affordability Act* SB 1905, which aims to block the EPA's proposed emissions rule for new coal-fired power plants.

<https://www.govtrack.us/congress/votes/113-2014/s131>

May 5, 2014. Senator Jay Rockefeller (D-WV) introduced two bills aimed at incentivizing CCS and funding federal research that could improve the CCS process. In addition to funding CCS research, Rockefeller's legislations would expand tax credits for companies that use CCS, fund loan guarantees for constructing CCS facilities and fund retrofits of existing commercial scale facilities utilizing CCS.

The *Carbon Capture and Sequestration Deployment Act of 2014* aims to facilitate the development and commercial deployment of CCS technologies.

The *Expanding Carbon Capture through Enhanced Oil Recovery Act of 2014* is an innovative approach to providing tax credits for CCS deployment. This bill would expand and reform the existing Section 45Q Tax Credit for Carbon Sequestration to advance capture technology through the greater use of CO₂-EOR in the US.

<http://www.rockefeller.senate.gov/public/index.cfm/press-releases?ID=9692ddcd-adbd-46a6-ad1c-808f31988c4d>

May 6, 2014. The Pennsylvania Coal Alliance has submitted comments to the EPA in response to the proposed emission standards for new coal-fired power plants, asserting that the standards would result in severe economic consequences.

<http://www.pennenergy.com/articles/pennenergy/2014/05/coal-alliance-files-comments-on-proposed-co2-emissions-standards.html>

EPA Issues Draft Class VI Well Permits

On March 31, the EPA awarded the first draft Class VI Underground Injection Control (UIC) permits for all four of FutureGen's CO₂ injection wells in Morgan County, Illinois.

On April 15, the EPA issued Archer Daniels Midland Company's Decatur CCS project a draft permit for its CCS #2 well. (Decatur's other well CCS #1 is already operating under a permit issued by the Illinois EPA).

Both companies have a 45-day period from the time of issue to comment on the draft permit. If no changes are made, then the EPA will issue the final Class VI UIC well permit without further notice and the companies can proceed with their wells.

Both companies have had public hearings for these draft permits. FutureGen's public hearing was held on May 7, and Decatur's was held on May 21. The EPA is currently reviewing the comments that were made at these public hearings.

FutureGen

EPA Cover Letter: <http://www.epa.gov/region5/water/uic/futuregen/pdfs/notice/cover.pdf>

FutureGen Fact Sheet: <http://www.epa.gov/region5/water/uic/futuregen/pdfs/notice/futuregen-fs.pdf>

Decatur

EPA Cover Letter: <http://www.epa.gov/Region5/water/uic/adm/pdfs/adm-ccs2-letter-draft-permit-20140415.pdf>

ADM Fact Sheet: <http://www.epa.gov/Region5/water/uic/adm/pdfs/adm-fact-sheet-201404.pdf>

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International Regulatory News

China. April 2, 2014. China has launched its sixth carbon trading market in the central Hubei province. The opening price was 21 Yuan (\$3.40) per ton. Hubei province will issue around 300 million permits for 2014, making it China's second biggest emissions market after Guangdong. China's seventh carbon market is scheduled to start later this year in the southwestern city of Chongqing.

http://usa.chinadaily.com.cn/epaper/2014-04/03/content_17405057.htm

Australia. April 25, 2014. Australia's Environmental Minister Greg Hunt unveiled the white paper on the Emissions Reduction Fund (ERF), the central component of the Coalition Direct Action climate change policy. The ERF is slated to begin on July 1 with a budget of \$300 million, growing to \$750 million over the next three years. The Coalition Direct Action policy aims to keep Australia's 5% emission reduction target but it removes the carbon price. Instead it will create a \$2.55 billion fund to pay businesses for emission reduction projects. The government is facing legislative hurdles introducing the scheme and the government's bid to repeal the carbon price has already been rejected by the Opposition in the Senate.

<http://www.abc.net.au/news/2014-04-24/government-releases-climate-change-policy-white-paper/5409262>

China. April 25, 2014. China's legislature has voted to adopt revisions to the country's environmental law and introduce tougher penalties for polluters. The new revisions call for improved environmental monitoring and there are specific articles aimed at tackling the country's air pollution.

<http://www.captureready.com/EN/Channels/News/showDetail.asp?objID=3756&isNew>

UK. April 25, 2014. The UK government announced that it has allocated £60 million (\$97 million) to encourage the development of CCS technology in emerging markets.

<http://www.bloomberg.com/news/2012-04-25/u-k-pledges-97-million-for-carbon-capture-in-emerging-markets.html>

EU. April 28, 2014. The European Investment Bank has raised more than €2 billion from the sales of 300 million emission allowances. This means that the NER300 programme has the funding to support its CO₂ capture projects and innovative

renewable energy demonstration projects.

<http://bellona.org/news/ccs/2014-04-european-investment-bank-raises-funding-ccs-projects>

Canada. April 29, 2014. Alberta's 2014 budget shows a continued commitment to invest in its two CCS projects. The Alberta Government, in 2014, is investing \$144 million in the Alberta Carbon Trunk Line and the Quest CCS Project. Over 15 years, the Alberta Government's investment will add up to almost \$1.3 billion.

<http://www.captureready.com/EN/Channels/News/showDetail.asp?objID=3760&isNew>

UK. May 21, 2014. The UK government is being urged to fast-track plans for the White Rose CCS project. After years of delay of the UK's £1 billion CCS competition, the Commons Energy Committee advised that the UK's CCS project plans must be fast-tracked and get the go-ahead before next year's general elections.

<http://www.bbc.com/news/uk-england-york-north-yorkshire-27499804>

UK and China. June 17, 2014. China and the UK have agreed to strengthen cooperation and increase collaboration on low carbon policies, technologies and financing. Chinese Premier Li Keqiang and UK Energy Secretary Ed Davey signed the 388-word pact which includes a continued CCS collaboration between the two countries as well as increased academic exchanges and support for UK companies working on CCS in China.

<http://www.clickgreen.org.uk/news/international-news/124827-uk-signs-climate-change-statement-with-china-during-premiers-visit.html>

State CCS Regulation News and Updates

Michigan

April 1, 2014. Michigan Lt. Governor Brian Calley signed into law a number of bills that provide incentives for CO₂-EOR projects. One of the signed bills was sponsored by state Representative Aric Nesbitt (R-Lawson) and defines that CO₂-EOR projects will be taxed at a 4% severance rate, rather than at the 6.6% for oil and 5% for natural gas projects.

http://www.mlive.com/news/kalamazoo/index.ssf/2014/04/lt_gov_brian_calley_signs_law.html

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CCS Project News

March 25, 2014. Mantra Energy Alternatives, a subsidiary of Mantra Venture Group, has signed a deal with NORAM Engineering and BC Research to commission an electrochemical carbon dioxide reduction pilot plant at a Lafarge cement plant in British Columbia, Canada.

<http://www.canadianmanufacturing.com/manufacturing/mantra-launches-pilot-plant-project-lafarge-b-c-plant-135916>

April 2, 2014. Kinder Morgan announced plans to build and operate a \$671 million CO₂ pipeline from Arizona to New Mexico. This is in addition to other significant investments to expand CO₂-EOR in the area.

<http://arizonageology.blogspot.com/2014/04/kinder-morgan-to-invest-1-billion-in-st.html>

April 2, 2014. Saskatchewan's Ministry of the Economy has awarded \$400,000 for CO₂ geological storage research to PTRC's Saskatchewan CO₂ Oilfield Use for Storage and EOR Research (SaskCO₂USER). SaskCO₂USER builds on 12 years of research conducted in the Weyburn-Midale CO₂ Monitoring and Storage Project.

<http://ptrc.ca/media-centre/news/item/?n=38>

April 9, 2014. SaskPower and Vattenfall have signed a Memorandum of Understanding (MoU) regarding CCS opportunities. Vattenfall approached SaskPower to make the deal which is not a financial agreement.

<http://www.newstalk650.com/story/saskpower-signs-carbon-capture-deal-european-company/308210>

April 10, 2014. The US DOE and Tampa Electric Company have announced the successful start-up of a pilot CCS at Polk Power Plant Unit-1 in Tampa, Florida. The project is approximately \$3 million under budget.

<http://www.pennenergy.com/articles/pennenergy/2014/04/clean-coal-carbon-capture-pilot-kicks-off-at-polk-igcc-plant-in-tampa.html>

April 15, 2014. Southern Company signed a memo of understanding (MoU) with Shenhua Group to cooperate on coal gasification, specifically including the Southern/KBR "TRIG" gasification technology.

http://www.downstreambusiness.com/item/Southern-Co-Inks-Coal-Gasification-Cooperation-Deal-Shenhua_132250?ch1=132591&ch2=related-items

April 15, 2014. Husky Energy has announced that CO₂ Solutions will install and operate a pilot capture unit of approximately 15 tonnes per day at Husky's Pikes Peak South, Saskatchewan, Canada. The project will be funded in part by the Government of Canada's ecoENERGY Innovation Initiative program.

<http://www.prnewswire.com/news-releases/co2-solutions-announces-carbon-capture-pilot-with-husky-energy-255292001.html>

April 17, 2014. The UK's White Rose CCS project at Drax Power Station could be awarded 300 million euros (US \$414.19 million) from the European NER300 programme. The White Rose project is the only CCS project left in the competition and could receive a maximum of 15 percent of all funds that are raised, amounting to around 300 million euros. So far the EU scheme has only been able to fund renewable energy projects as all the CCS candidate plants either pulled out or were deemed ineligible after member states were unable to promise financial backing.

<http://in.reuters.com/article/2014/04/17/britain-carboncapture-idINL6N0N92WC20140417>

April 17, 2014. Construction has reached midway on Shell's Quest CCS project. The facility should be ready to start operating in late 2015.

<http://www.edmontonjournal.com/Construction+hits+midway+point+Shell+Quest+carbon+capture+project/9750554/story.html>

April 29, 2014. Southern Company has delayed the startup of the Kemper County coal gasification power plant in Mississippi to May 2015. This is accompanied by a \$235 million increase to bring the total project cost to \$5.5 billion. Southern officials quoted the cause of the delays and cost increases are primarily due to piping issues.

<http://www.reuters.com/article/2014/04/29/utilities-southern-kemper-idUSL2N0NL2K220140429>

May 2, 2014. Shell has joined project leader, Scottish Carbon Capture and Storage, and its partners in the second phase of research into the feasibility of CO₂-EOR in the North Sea.

<http://www.clickgreen.org.uk/news/national-news/124562-shell-to-study-using-captured-co2-for-enhanced-oil-recovery-in-north-sea.html>

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IPCC Working Group III Summary for PolicyMakers: Summary of CCS

At the 12th Session of the IPCC Working Group III in Berlin, Germany (7-11 April 2014) the Summary for Policymakers was approved, line by line, by the member governments. This report concludes four years of collaboration of hundreds of worldwide authors to provide to the world's governments a comprehensive, objective and policy neutral assessment on the current scientific knowledge on mitigating climate change. The report focuses around scenarios reaching different atmospheric concentrations by 2100. The main target is 450 ppm CO₂eq by 2100 which is expected to keep the global temperature change below 2°C relative to pre-industrial levels. In order to achieve this goal, global GHG emissions in 2050 need to be lower than in 2010 and even lower in 2100.

CCS was mentioned in this report 35 times. Below is a brief summary of what the report says about CCS.

Most models could not achieve 450 ppm CO₂eq by 2100 without the widespread deployment of CCS. If the deployment of CCS and other zero and low carbon energy sources, is delayed or has limited availability, then the goal of 450 ppm will be unachievable. By 2050, zero and low carbon energy sources need to quadruple from their current levels, which highlight the necessity of large scale deployment of these technologies.

CCS deployment also reduces the long term cost of climate

mitigation. In scenarios which do not include CCS, the cost to achieve 450 ppm by 2100 is increased 138% (range from 29–297%), and to achieve 550 ppm the cost is increased 39% (range from 18–78%).

Mitigation scenarios reaching 450 ppm, 500 ppm and even 550 ppm CO₂eq in 2100 typically involve temporary overshoot of atmospheric concentrations. These overshoot scenarios typically rely on the widespread deployment of Biomass Energy with CCS (BECCS) and afforestation in the second half of the century. However the deployment of these Carbon Dioxide Removal technologies (CDR) has not been previously undertaken at the required large-scale and as a result they are associated with uncertainties and risks.

Decarbonizing (reducing the carbon intensity of) electricity generation is a key component to reach low-stabilization levels (430-530 ppm CO₂eq). In the majority of low-stabilization scenarios, the share of electricity production from CCS, renewable energy and nuclear, would increase from the current share of 30% to over 80% by 2050. Fossil fuel generation without CCS is almost completely phased out by 2100. Highly efficient natural gas combined-cycle power plants or combined heat and power plant without CCS are viewed only as a bridge technology, with deployment peaking and falling to below current levels by 2050 and declining further in the second half of the century.

More information can be found at: <http://mitigation2014.org>

CCS Project News Continued

May 2, 2014. The DOE has awarded Babcock & Wilcox Power a \$2.5 million award for Phase 2 development of iron-based coal direct chemical looping (CDCL) technology. Phase 2 of the project will test the CDCL process at a laboratory scale. CDCL is a process for CO₂ capture, where coal reacts with iron oxide based particles.

<http://www.utilityproducts.com/articles/elp-archives/2014/05/b-w-wins-doe-award-for-carbon-capture-research.html>

May 6, 2014. Vattenfall has cancelled its CCS research department in a cost cutting measure. They said that CCS technology has proven to be complex and expensive, especially in Europe where very low carbon prices have dramatically decreased profitability. The current status of Vattenfall's CCS pilot project Schwarze Pumpe is unknown. <http://www.powerengineeringint.com/articles/2014/05/vattenfall-ditches-research-into-ccs.html>

Images: Page 1: http://www.chromalox.com/case-studies/case-studies-detail.aspx?cs=287#.U4vX4BZ_chc

This newsletter was constructed using information from internet searches. The websites used have been cited.

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