IEAGHG Information Paper: 2015-IP29; Emissions Performance Standards – For or Against

Both the USA and Canada have recently regulated emissions from fossil fuel fired power plants using Emission Performance Stands. The EU has decided against such action and is instead relying on the EU ETS to provide a market stimulus for emissions reduction on power plants. This paper summarises the different approaches.

The Canadian Government introduced the regulation: Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations (SOR/2012-167)[1]. The new performance standard for coal-fired electricity generating units will come into force on July 1, 2015.

The Regulations will set a stringent performance standard for new coal-fired electricity generation units and those that have reached the end of their useful life.

In the regulations a new coal unit is defined as: A unit that starts producing electricity commercially on or after July 1st, 2015. And an End-of-life Coal Unit is defined as, a unit that is 50 years of age[2].

The level of the performance standard is set at 420 tonnes of carbon dioxide per gigawatt hour (CO_2/GWh).

The stated aim of this approach is that it will implement a permanent shift to lower- or non-emitting types of generation, such as high-efficiency natural gas, renewable energy, or fossil fuel-fired power with carbon capture and storage (CCS).

The imposition of the regulation is designed to reduce emissions from coal-fired electricity (11 percent of Canada's total GHG emissions) and form a key part of meeting Canada's 2020 target of reducing greenhouse gas emissions to 17 percent below 2005 levels. They also note the additional benefit of improving air quality which will have a direct impact on the health of Canadians.

Specific provisions are made in these regulations for Carbon Capture and Storage. New and end-of-life coal units incorporate technology for CCS can apply to receive a temporary exemption from the performance standard until December 31, 2024. Units will have to provide documented evidence that they are meeting yearly regulated construction milestones, which are:

- Complete Front End Engineering and Design Study by January 1, 2020;
- Purchase all major pieces of capture element of the CCS system by January 1, 2021;
- Take all necessary steps to obtain regulatory approvals for the capture element of the CCS system by January 1, 2022;
- Have contracts in place concerning the transportation and storage of CO2 by January 1, 2022; and
- Begin commissioning stage of CCS system including the capture, transport and storage of CO2 by January 1, 2024

If a generator installs a CCS system on an existing unit prior to its end-of-useful-life then they may be deferred from meeting the performance standard on an end-of-useful-life unit for 2 years.

It should be noted that these are national regulations but each state in Canada has a degree of independence to negotiate the application of these national regulations. For instance the SaskPower

[1] http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=209
[2] http://www.ec.gc.ca/cc/default.asp?lang=En&n=C94FABDA-1

Boundary Dam 3 project was constructed before these regulations came into force. It captures 90% of the CO_2 emissions from that plan well in excess of the current regulatory requirements. The recent report published jointly by IEAGHG and SaskPower on the project discusses the new national Regulations and Saskatchewan's options at some length[3], but is not considered further here.

In The USA**, the Clean Power Act** was announced in August 2015 but becomes effective from December 2015. It treats existing a new build plants separately.

Carbon Pollution Emission Guidelines for <u>Existing</u> Stationary Sources: Electric Utility Generating Units[4]

The plan aims to reduce CO_2 emissions from electrical power generation by 32 percent within fifteen years relative to 2005 levels. The plan is focused on reducing emissions from coal-burning power plants.

The plan requires individual states to meet specific standards with respect to reduction of carbon emissions, depending on their energy consumption. States are free to reduce emissions by any means they want, and must submit emissions reductions plans by 2018. If a state has not submitted a plan by then, the USEPA[5] will impose its own on that state.

States are to implement their plans by focusing on three building blocks: increasing the generation efficiency of existing coal plants, substituting lower carbon dioxide emitting gas generation for coal powered generation, and substituting generation from new zero carbon dioxide emitting renewable sources for coal powered generation. States may use regionally available low carbon generation sources when substituting for in-state coal generation and coordinate with other states to develop multi-state plans.

As part of the plan the USEPA is establishing interim and final carbon dioxide (CO2) emission performance rates for two subcategories of fossil fuel-fired electric generating units (EGUs): Fossil fuel-fired electric generating units (generally, coal- fired power plants) and natural gas-fired combined cycle generating units.

It is giving the States a range of choices on how to implement and meet the standards[6]. It is establishing interim and final state wide goals in three forms:

- A rate-based state goal measured in pounds per megawatt hour (lb/MWh);
- A mass-based state goal measured in total short tons[7] of CO_2;
- A mass-based goal with a new source complement measured in short tons of CO_2.

States then develop and implement customized plans that ensure that the power plants in their states – either individually, together or in combination with other measures –to achieve the interim CO_2 emissions performance rates over the period of 2022 to 2029 and the final CO_2 emission performance rates, rate-based goals or mass-based goals by 2030.

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[3] IEAGHG Report 2015/06, Integrated CCS Project at SaskPower's Boundary Dam Power Plant, September 2015

[4] http://www2.epa.gov/cleanpowerplan/carbon-pollution-standards-new-modified-and-reconstructed-power-plants

[5] The United States Environmental Protection Agency (USEPA) responsible for implementing the Clean Power Act in the USA.

[6] http://www2.epa.gov/sites/production/files/2015-08/documents/fs-cpp-state-goals.pdf

[7] The short ton is a unit of weight equal to 2,000 pounds (907.18474 kg) that is most commonly used in the United States where it is known simply as the ton. A tonne is 1,000 kilograms or 2,204.62262 pounds.

The states are being encouraged at emissions trading, as an option.

Greenhouse Gas Emissions from <u>New, Modified, and Reconstructed</u> Stationary Sources: Electric Utility Generating Units[8]

In this action USEPA is establishing separate standards for two types of fossil-fuel fired sources:

- stationary combustion turbines, generally firing natural gas; and
- electric utility steam generating units, generally firing coal

These final standards reflect the degree of emission limitation achievable through the application of the best system of emission reduction (BSER) that USEPA has determined has been adequately demonstrated for each type of unit.

Note: this action is now in force unlike the earlier one for existing power plants. The Emission Performance Standards[9] set under this action are given in the table below.

The standards reflect the degree of emission limitation achievable through the application of the best system of emission reduction (BSER) that The USEPA has determined has been adequately demonstrated for each type of unit.

Process and BSER	**Emission Standard**	
	lb CO_2/MWh-gross	**Tonnes/GWh**
Natural Gas Combined Cycle (New and reconstructed, base load)	1,000	454
New coal fired power plant. Supercritical coal fired power plant with partial (20%) capture	1,400	635
Modified coal fired power plants	No standard	No standard
Reconstructed coal fired power plants - use most efficient generating technology	1,800 (heat input >2,000 MMBtu/h) 2,000 (heat input ,2,000 MMBtu/h)	820 910

Note: The USEPA state that CCS has been demonstrated to be technically feasible and is in use or under construction in various industrial sectors, including the power sector. Partial CCS designed to meet the final emission standard will continue to promote implementation and the further development of CCS technologies.

For the definitions of new, modified and reconstructed, refer to reference 8.

In the European Union, in 2011, the European Commission investigated the potential impact of emissions performance standards (EPS) for newly built power plants and the interaction with the EU Emissions Trading Scheme (ETS). A report was commissioned that assessed the impact on new power plant build and the EU Emissions Trading Scheme (ETS) of a CO_2 emission performance standard (EPS)

[8] http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22837.pdf
[9] http://www3.epa.gov/airquality/cpp/fs-cps-overview.pdf

set to prevent new coal or lignite-fired power stations from coming online unless they are fitted with Carbon Capture and Storage (CCS)[10].

The report found that even under conservative assumptions on the development of the European carbon market the implementation of an EPS post 2020 would have very little impact. The main reason for this is that with the EU ETS in place, virtually no new coal or lignite units without CCS would be built in the future beyond those projects already under development.

The report suggested that in Western Europe a simple cost analysis showed that by 2020 there is no economic rationale for building coal plants over Combined Cycle Gas Turbines (CCGTs). This was even considered to be the case without a carbon price. In Eastern Europe which historically has had lower coal and lignite prices than Western Europe, building coal fired power stations plants was only considered viable under €5/t carbon price. With coal subsidies being phased out across Europe, increasing public opposition to new coal-fired stations in some regions, and the very strong likelihood of carbon prices being in excess of €20/t by 2020, they concluded that one would expect very few new coal-fired stations to be built at all after 2020.

The analysis also showed that implementing an EPS in 2015 would not produce any material benefits in terms of reducing greenhouse gas emissions or deploying CCS technology and would lead to slightly higher abatement costs and higher imported gas dependency for the EU.

The need for an Emission Performance Standard was raised again during the review of the CCS Directive this year. Despite pressure for an EPS to complement the ETS from environmental NGO's like, Greenpeace, WWF and Bellona, the conclusion was:

With the 2030 climate and energy policy framework, including the target of reducing greenhouse gas emissions by at least 40% by 2030 compared to 1990 levels, supported by the October 2014 European Council, the Commission does not consider it necessary or practicable to establish a mandatory requirement for EPS for new power plants. The ongoing reform of the EU ETS, with the proposed introduction of a market stability reserve and the increased ambition of the EU ETS beyond 2020 with the target of reducing emissions by 43% by 2030 compared to 2005, is expected to substantially boost the investment climate for low-carbon technologies over time.

In contrast to the EU, **The United Kingdom,** an EU member state, does have an emissions performance standard[11]. The UK EPS applies to all new fossil fuel electricity generation plants that are above 50MWe and receive development consent after 18 February 2014 -the date at which the EPS came into force. The EPS has been set at a level equivalent to emissions of 450gCO_2/kWh if the plant is operating at 'baseload'. This is around half the level of emissions of unabated coal generation and is fixed until end 2044.

The Emissions Performance Standard Regulations 2015 form part of the implementing legislation for the UK Government's Energy Market Reform programme[12] which is intended to incentivise investment in secure and low-carbon electricity generation, while improving affordability for consumers.

[10] http://ec.europa.eu/clima/policies/lowcarbon/ccs/docs/impacts_en.pdf
[11] http://www.legislation.gov.uk/uksi/2015/933/pdfs/uksiem_20150933_en.pdf
[12] https://www.gov.uk/government/publications/2010-to-2015-government-policy-uk-energy-security/2010-to-2015-government-policy-uk-energy-security

The UK EPS will not impact gas fired plant but will impact impact new coal plant, and reinforces the requirement that CCS is demonstrated on at least 300MW (net) of the proposed generating capacity. The link to the UK CCS competition, although these plant in the completion are exempted from the EPS.

Also interestingly and in stark contrast to the EU's stance the **European Investment Bank (EIB**)[13] have recently adopted an emissions performance standard for energy projects, which aims to screen out those energy projects that could undermine the EU's climate change policies, including its target to slash emissions 80 per cent by 2050. The 550g limit will effectively block investment by the Bank in coal plants that do not feature some forms of emission reduction technologies. However, it will still allow for coal plants to get funding if they co-generate power with biomass, use combined heat and power technology to maximise efficiency, or deploy carbon capture and storage (CCS) technology. A tighter standard of 450gCO_2/KWh, which could have eliminated lending to all coal and lignite plants that do not feature CCS technology was also discussed but not approved by the EIB Board.

There are two more examples of banks setting performance standards.

- HSBC, which does not lend to coal projects with carbon emissions above 550 gCO_2/kWh (or 850 gCO_2/kWh in developing countries). However, this applies only to projects above 500 MW capacity.
- The ANZ Bank has recently changed its lending policy for loans to the coal industry. The bank will not lend to existing coal-fired power plants, while lending to new coal-fired power plants will be limited to plants that generate carbon dioxide emissions below 800 kilograms per megawatt.

Summary

Both Canada the USA and the UK are using Emission Performance Standards to reduce CO_2 emissions from new coal fired power plant. In all cases natural gas combined cycle power plants can be built without CCS as they meet the performance standards without abatement. All sets of regulations include CCS as an option on new coal fired power plants. For new coal fired power plant CCS will be required to meet the standards, although this may only be partial capture - only 20% in the USA case.

The USA is putting forward plans for EPS on exiting power plants, requiring States to set their own standards. This is meeting some opposition in the USA.

The European Union has considered Emission Performance Standards for new coal fired plant but considers they are unnecessary as it has set up the European Trading Scheme which should provide the market stimulus for power plant emissions reduction when it is reformed.

Several international lenders are now also introducing Emission Performance Standards although these are not as strict as the country standards.

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[13] The EIB is Europe's Bank and funds infrastructure project in EU member states and enlargement countries like Serbia, Turkey etc.,