

Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units

Presentation to the Science Advisory Board

December 4, 2013

Overview

- ▶ Building Off Existing Science and Regulatory Structures
- ▶ EPA Considerations When Developing a New Source Performance Standard (NSPS)
- ▶ Topics Raised by Science Advisory Board (SAB) Workgroup
- ▶ Topic 1: Setting separate standards for coal-fired and gas-fired units
- ▶ Topics 2 - 4: Inter-related Focus on Scientific Underpinnings of the “Best System of Emission Reductions” (BSER) Determination
 - ▶ Availability/Feasibility of Carbon Capture and Storage (CCS) Technologies
 - ▶ Cost of CCS Technologies
- ▶ Long Term Coordination with SAB

Building Off Existing Science and Regulatory Structures

- ▶ Proposed Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units (proposed NSPS under CAA Section 111(b))
 - ▶ Economic projections suggest NSPS will not significantly impact new build decisions
 - Most economic option for new fossil fuel-fired generation is natural gas combined cycle (NGCC)
 - ▶ Carbon capture requirements (< 50%) are significantly less than most of the full-scale demonstration projects under development
 - ▶ Does not set new sequestration requirements
 - New sources would be required to meet existing monitoring and reporting requirements for stored CO₂
 - ▶ Proposed separate standards for gas-fired turbines and coal-fired units
 - Consistent with EPA approach since 1970s

EPA Considerations When Developing an NSPS

- ▶ In making decisions for an NSPS (Section 111 of the Clean Air Act) EPA considers:
 - ▶ Economics
 - ▶ Science
 - ▶ Law
 - ▶ Policy (including how all factors are weighted)
- ▶ Specific factors considered when determining BSER:
 - ▶ Technical feasibility of control options
 - ▶ Reasonableness of costs
 - ▶ Size of emission reductions
 - ▶ Whether the system promotes the implementation and further development of technology

Topics Raised by SAB

- ▶ SAB Work Group recommended that the SAB review science supporting the proposed Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units
- ▶ Work Group raised 4 key areas to examine
 1. Scientific basis to develop separate standards for gas-fired and coal-fired units
 2. CCS as BSER for coal-fired plants
 3. Underlying scientific assumptions about carbon pollution emission technology controls
 4. Adequacy of peer review of the Department of Energy's National Energy Technology Laboratory (NETL) studies used in developing the rule

Topic 1: Setting separate standards for coal-fired and gas-fired units

- ▶ SAB Work Group suggests it should discuss the scientific basis to develop separate standards for gas-fired and coal-fired units
- ▶ Not a unique approach
 - ▶ EPA has set separate standards for these of sources since it began regulating combustion turbines in the late 1970s
- ▶ Main technical issues are found in determining which technologies do and do not qualify as the BSER

Topics 2 - 4: Inter-related Focus on Scientific Underpinnings of BSER Determination

- ▶ SAB Work Group topics 2 – 4 focus on scientific underpinnings of BSER determination and can be viewed collectively
 - ▶ EPA's proposed determination for coal-fired power plants that partial CCS is BSER and that other technologies are not
- ▶ Scientific or technical components of this BSER determination:
 - ▶ Availability/feasibility of CCS technologies to meet the proposed 1,100 lb CO₂/MWh standard
 - ▶ Cost of technologies at that level

Availability/feasibility of CCS

- ▶ EPA considered information from a variety of sources, including:
 - ▶ Demonstrated projects (both industrial and power sector)
 - ▶ Projects that are under construction or in advanced stages of development
- ▶ EPA focused on two basic technology options/basis for determination:
 - ▶ Integrated gasification combined cycle (IGCC) with pre-combustion CCS
 - Multiple existing projects show technology has been demonstrated to work at commercial scale and under commercial conditions
 - For example Dakota Gasification Facility has been operational for more than 10 years capturing CO₂ and transporting via CO₂ pipeline for use in enhanced oil recovery (EOR) operations and demonstration of long term storage
 - ▶ Conventional boiler technology with post-combustion CCS
 - Applicable technologies have been used in industrial facilities for many years
 - Successful slip-stream demonstration projects at AEP's Plant Mountaineer and Southern Company's Plant Barry
 - Boundary Dam project has almost completed construction and is designed to capture 90% of the CO₂ in the flue gas stream
 - NRG W.A. Parish Project is in advanced stages of development

Cost of CCS

- ▶ Cost of CCS technologies when meeting the proposed 1,100 lb CO₂/MWh standard
 - ▶ Based cost estimates on two reports issued by DOE
 - 1st Report
 - Describes cost and performance of full (i.e., 90%) CCS systems
 - Peer reviewed
 - 2nd Report
 - Builds upon work done in original peer reviewed report
 - » Uses identical methodology and consistent set of assumptions with 1st Report
 - » Describes cost and performance for a range of partial CCS options
 - Key assumptions related to partial capture are technology configurations
 - » PC units must capture 90% of CO₂ from a slip stream of total flue gas
 - » IGCC units control the level of CO₂ capture by controlling the amount of syngas “shift” (i.e., converting CO to CO₂ via the water-gas shift reaction)
 - » Each of these configurations has been demonstrated in practice:
 - AEP’s Mountaineer and Southern’s Barry are conventional PC units that utilized partial capture from a slip stream.
 - Dakota Gasification uses water-gas-shift to target the amount of CO₂ for capture from the syngas stream
 - Other projects (WA Parish, Kemper IGCC) will utilize these configurations to capture a portion of their produced CO₂

Geologic Sequestration

- ▶ Treatment of geologic sequestration
 - ▶ EPA is not setting any new requirements related to sequestration and thus has not done a new analysis related to such requirements
 - ▶ EPA already has a regulatory framework in place for monitoring and permitting CO₂ injection and geologic sequestration
 - ▶ Proposal relies upon the existing requirements and does not set any new requirements related to sequestration
 - Only requiring any new fossil fuel-fired power plant owners to meet the proposed emission limit
 - ▶ Captured CO₂ must be sent to a facility that meets the existing regulatory requirements for monitoring and reporting geologic sequestration
 - ▶ Existing project and regulatory experience, research and analogs indicate that geologic sequestration is a viable long-term CO₂ storage option
 - Recognized internationally by organizations such as the Intergovernmental Panel on Climate Change
 - Four existing commercial facilities in other countries and a number of studies have demonstrated the science and viability of geologic sequestration

Long Term Coordination with SAB

- ▶ EPA recognizes there is a range of longer term issues associated with CCS
- ▶ EPA is interested in continuing to engage with SAB on these longer term issues
 - ▶ As we all learn more from ongoing sequestration projects
 - ▶ As technology developers and users pursue non-geologic sequestration approaches (e.g., algae production for bio-fuels and building materials)