This redline strikeout revision of the Work Group's January 7 Memorandum reflects the requested changes and comments provided by Chartered SAB members during the January 21, 2014 conference call.

MEMORANDUM

SUBJECT: Revised Recommendations on the Adequacy of the Science Supporting the Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (2060AQ-91) listed in the Spring 2013 Regulatory Agenda

DATE: January ~~7~~24, 2014

FROM: James R. Mihelcic, Chair, SAB Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science

TO: Members of the Chartered SAB and SAB Liaisons

The Chartered SAB ~~will complete~~completed its discussion of whether to review the adequacy of the science supporting planned regulatory actions announced in the Spring 2013 Regulatory Agenda at a public teleconference planned for January 21, 2014. This teleconference was scheduled after the SAB received additional information on one planned agency action, the Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (2060AQ-91), at a public meeting on December 4-5, 2013. Based on the information provided by EPA staff and the deliberations among SAB members, the chartered SAB asked the SAB Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science to gather some additional information and re-evaluate based on this additional information, its recommendations regarding this planned action. This memorandum supplements the memorandum provided to the Chartered SAB on November 12, 2013 and updates the Work Group recommendations on that action.

Summary of the process used by the SAB Work Group for the New Source Performance Standards for Electricity Generating Units

The Work Group presented its recommendations in the November 12, 2013 memorandum to the Chartered SAB at the December 4-5, 2013 meeting. In addition to those recommendations, the Chartered SAB received agency briefings on the New Source Performance Standards for Electricity Generating Units (2060 AQ91) proposed rule and other EPA climate change initiatives, and discussed the Work Group's recommendations. The meeting materials and a summary of that discussion are available on the SAB website. Based on new information provided at the December 4-5, 2013 meeting, the Chartered SAB requested the Work Group to conduct an additional fact finding call with EPA staff and re-evaluate the recommendation for this proposed rule to reflect the Chartered SAB discussions and the results of the fact finding call. Additional information was provided to the Work Group through several public comments and by the EPA.

The fact finding call was held on December 17, 2013. A summary of that teleconference is presented in Attachment A.

This redline strikeout revision of the Work Group's January 7 Memorandum reflects the requested changes and comments provided by Chartered SAB members during the January 21, 2014 conference call.

Work Group Recommendations Regarding Planned EPA Action 2060 AQ91

The SAB Work Group recommends that the SAB not review the science supporting the Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (2060-AQ91). This recommendation is based on the (1) information provided on the Clean Air Act statutory requirements for feasible technology, the (2) status of carbon sequestration under the Underground Injection Control Program, and (3) additional information on the EPA peer review process. The work group finds that a review by the SAB would not provide additional benefit to the proposed rule.

This proposed rule was signed by Administrator McCarthy on September 20, 2013 and released to the public during the Work Group's deliberations. In a fact finding teleconference on December 17, 2013, EPA stated that the science and technical bases of this action do not rely on new science, are based on the Best System of Emission Reduction (BSER), and the action is technology based. The Work Group initially considered that this action involved precedential and novel issues that rely on new technologies for carbon capture and storage (CCS). However, as discussed below, EPA has made a ~~policy~~legal decision that this action only applies to carbon emissions and the capture of carbon emissions, and thus does not directly address carbon sequestration. This legal decision resulted in the Work Group having to consider a narrower focus of the underlying science related to an important issue that did not include carbon sequestration. During the December 17, 2013 fact finding teleconference, EPA Staff explained that the agency's consideration of feasibility and commercially availability of CCS provisions would be technically binding only on coal-fired EGUs and were based on three examples of implementing partial CCS. They stated that the agency's considerations meet the statutory requirements to determine if technologies will be available for the regulated community at the time of construction[1] . They provided several examples of facilities with similar engineering and technological processes used in electricity generating units (EGUs) employing carbon capture and reiterated that the demonstration of these facilities provides reasonable assurance for the future availability of the technology (See Attachment C in the Work Group's November 12, 2013 Memorandum,). The EPA also noted that this proposed rule does not address carbon sequestration and relies on the permitting and reporting requirements for carbon dioxide sequestration required in the Office of Water's Underground Injection Control Program for Carbon Dioxide Geologic Sequestration.

At the December 17, 2013 fact finding teleconference, EPA provided some additional information on the basis and peer review process used by the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) for the studies[2] used in developing the proposed rule. The EPA staff explained that existing and planned EGUs that use various energy sources and technology were used as the basis for the BSER assumptions for new natural gas and coal fuel sources for new EGUs. The EPA staff noted that these EGUs may be under construction or in advanced stages of development and not fully operational. After the Work Group requested additional information on the peer review process

[1] Senate Report on Clean Air Act 1970 as cited in Portland Cement Association vs. Ruckelshaus.

[2] Volume 1 of the series – "Cost and Performance Baseline for Fossil Energy Power Plants, Volume 1: Bituminous Coal and Natural Gas to Electricity" (and subsequent updates) – available at http:/www.netl.doe.gov/energy-analyses/baseline_studies.html
August 2011 report "Cost and Performance of PC and IGCC Plants for a Range of Carbon Dioxide Capture" which modified the CO2 capture rates for select cases presented in the "Cost and Performance Baseline for Fossil Energy Plants" did not undergo peer review. That report can be found here: http://www.netl.doe.gov/energy-analyses/refshelf/PubDetails.aspx?Action=View&PubId=396

supporting the proposed rule, EPA staff explained that the NETL studies were all peer reviewed under DOE peer review protocols and that EPA did not actually conduct additional peer review(s). However, EPA provided further information to the Work Group from NETL in addition to that cited in the November memorandum. A summary of merit reviews and a comment response document on the *2006 Cost and Performance Comparison of Fossil Energy Power Plants* for DOE documents was provided (See Attachment A). EPA staff noted that the different levels of review of these DOE documents met the requirements to support the analyses as defined by the EPA Peer Review Handbook [3]. They also stated that peer review of economic data typically occurs only if new modeling procedures are employed.

The Work Group finds that while the scientific and technical basis for carbon storage provisions is new and emerging science, the agency is using the best available science and has conducted peer review on the DOE documents at a level required by agency guidance. The Work Group notes that the proposed rule estimates a limited number of newly constructed coal-fired power plants in the future and is also subject to a required review in eight years from promulgation. The Work Group encourages the agency to consider decreasing the initial review period and to carefully monitor the post rule reality compared to its estimated construction of coal-fired power plants and carbon sequestration demand to ensure that the technologies are feasible and available to newly constructed electricity generating units to meet the new standards. The specific technical and scientific matters that can be examined as part of that review the agency could include (1) feasibility and risk associated with carbon capture and storage as a BSER for coal-fired plants, (2) underlying scientific assumptions around carbon pollution emissions technological controls, (3) ~~estimating~~projections for construction of coal-~~fire~~fired power plants, and (4) the level of carbon dioxide emission set by the standard.

Attachment B provides information provided by EPA and the revised recommendation for 2060 AQ91.

Work Group Recommendations Regarding Improvements to the Process for Identifying EPA Planned Actions for SAB Consideration

The Work Group acknowledges that the EPA provided additional clarifying information for consideration upon request and thanks the agency for providing this information. However, the Work Group emphasizes that the SAB needs the agency to provide more complete and timely information earlier in the process so that the Board can make recommendations and decisions regarding the science supporting planned actions. The Work Group finds that the preliminary information provided by the Agency for this action (See Attachment B of this Memorandum) did not fully meet the requirements or the spirit of the framework adopted by EPA (See Work Group November 12, 2013 Memorandum Attachment A) to facilitate the SAB review of planned regulatory actions. The omission of critical information, especially regarding peer review of information used as the basis of parts of the planned action, created delays in reviewing the adequacy of the scientific and technical information that support planned actions. To improve the process for future review of the semi-annual regulatory agenda, the SAB Work Group continues to strongly recommend that EPA enhance descriptions of future planned actions by providing specific information on the peer review associated with the science basis for actions and more description of the scientific and technological bases for the actions. EPA should provide such information in the initial descriptions provided to the work group.

[3] U.S. Environmental Protection Agency Peer Review Handbook, 3rd Edition EPA/100/B-06/002.

This redline strikeout revision of the Work Group's January 7 Memorandum reflects the requested changes and comments provided by Chartered SAB members during the January 21, 2014 conference call.

In summary, effective SAB evaluation of planned actions requires the agency to characterize these elements in the initial descriptions of planned actions:

- All relevant key information associated with the planned action;
- The science supporting the regulatory action. If there is new science to be used, provide a description of what is being developed. If the agency is relying on existing science, provide a short description.
- The nature of planned or completed peer review. To the extent possible, provide information about the type of peer review, the charge questions provided to the reviewers, how relevant peer review comments were integrated into the planned action, and information about the qualifications of the reviewer(s).

This SAB Work Group made these recommendations in March 2013 and in November 2013. We request that the chartered SAB highlight to the Administrator the need for the agency to provide more complete information to support future SAB decisions about the adequacy of the science supporting actions in future regulatory agendas.

Attachments

Attachment A Summary of the December 17, 2013 fact-finding teleconference, questions sent to National Program Offices at the SAB's request and the agency

Attachment B: Descriptions of the Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (2060AQ-91) with updated SAB Work Group Recommendation

Attachment A
Summary of Science Advisory Board Fact-Finding Meeting on
New Source Performance Standards
for Electricity Generating Units (2060 AQ91)

December 17, 2013

Introduction

The SAB Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science presented its recommendations in a November 12, 2013 Memorandum to the Chartered SAB at a public meeting on December 4-5, 2013. In addition to the Work Group's recommendations the Chartered SAB received information on the New Source Performance Standards for Electric Utility Generating Units (2060 AQ91) proposed rule, other EPA climate change initiatives, and discussed the Work Groups recommendations. The Chartered SAB requested the Work Group to conduct an additional fact finding call with EPA staff and revise the recommendation for this proposed rule to reflect the Chartered SAB discussions and the results of the fact finding call peer review requirements, feasibility and commercialization of sequestration technology, and analyses supporting the proposed rule's emissions standard coal fired EGUs.

Dr. James Mihelcic, Chair of the Work Group, led members and EPA staff through a discussion of the propose rule and the Work Group's questions on December 17, 2013. Participants in the discussion are listed in Attachment 1.

Summary of Teleconference

The Work Group provided a set of questions requesting additional information on the planned activity after the Chartered SAB meeting on December 4-5, 2013. The questions are listed below with a summary of the agency's responses.

Mr. Kevin Culligan provided opening remarks and an overview of the proposed rule. Mr. Culligan described the Clean Air Act's unique statutory guidance on setting performance standards based on the determination of the Best System of Emission Reduction (BSER) and for determining the technical feasibility and commercial availability of those systems. He also noted that the conference report[1] and legislative history for the Clean Air Act make it clear that the BSER technology does not need to be in actual routine use but can projected based on existing technology... When setting a standard, this BSER determination is a policy judgment based on an evaluation of the available technologies and sector trends.

There are a range of carbon capture projects in operation today. These include smaller-scale projects at coal-fired power plants that are connected to the grid and are selling the captured CO_2 for commercial use. They also include larger-scale projects that are gasifying coal or petroleum coke and capturing CO_2 using the same technologies that would be utilized at a new IGCC plant There are also several full-scale utility projects in various stages of development - including two that are more than 75percent complete.

[1] Senate Report on Clean Air Act 1970, as cited in Portland Cement Association vs. Ruckelshaus

Questions from the Work Group for OAR

Peer Review Questions:

Question: What are the EPA peer review requirements for studies of the feasibility and commercialization of sequestration technology that support the Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (2060-AQ91)?

Response: In addition to the comment Mr. Culligan provided, EPA staff noted that carbon dioxide (CO_2) sequestration regulations were developed under separate rules. The agency views the technical documents used in support of this proposed rule as economic in nature and focused on the cost of CCS, not on the technical feasibility. The agency used previously peer-reviewed reports to conduct this analysis and determined that additional peer review was not required as described in the EPA Peer Review Handbook[2]. Agency staff noted that technology, cost, and performance information from research conducted by the Department of Energy's Nation Energy Technology Laboratories (NETL) was used in developing the proposed rule. The process NETL used to develop the cost and performance analyses involved a multi-step process that included convening of expert panels to review the research agendas, working with experts in the specific sectors (i.e., electricity generating units) to develop specific reports, and subsequent peer review of the product reports. CCS was also addressed in comments to the *2006 Cost and Performance Comparison of Fossil Energy Power Plant* (see below)

Question: Please provide information that documents the required peer reviews, including the charge, peer reviewers' report, names of peer reviewers, and how the peer reviewers' concerns were addressed.

Response: EPA noted that NETL conducted reviews of the cost and performance analyses. EPA staff provided information on the merit review and comments received on analyses conducted by NETL These documents were provided as examples of NETL's level of review on analyses EPA used in developing the New Source Performance Standards (2060 AQ91).

NETL conducted a merit review on Project B2A that compared performance and cost on a consistent basis of currently available technologies and considered shifts in the power industry since the previous study was published in 1998. (See page 22 of the NETL Systems Analysis Merit Review, August 2005) The cost and performance analyses included state-of-the-art natural gas combined cycle (NGCC) and coal-fired power plants and capture of approximately 90 percent CO_2 from each of the generation technologies.
A summary of the NETL review is available on the SAB website. NETL states that "[t]he merit reviews provide a means of guiding future activities to ensure intended objectives are met. Projects are reviewed by a team of technical experts from industry, academia, outside research laboratories including the national laboratories, and the relevant NETL personnel."

EPA also provided the comments and partial NETL responses from a review of the *2006 Cost and Performance Comparison of Fossil Energy Power Plant*s. The review was conducted in September 2006 by a 13 member panel of reviewers. The blinded reviewers comments and NETL response are available on the SAB website at: Insert link

[2] **U.S. Environmental Protection Agency Peer Review Handbook,** 3rd Edition EPA/100/B-06/002

Feasibility of Carbon Sequestration Questions:

In addition to Mr. Culligan's description of the factors that the Clean Air Act requires for consideration, EPA staff identified several coal-fired plants that utilize carbon capture and sequestration technologies at different levels of capture. The agency cites these plants as demonstration the technology will be available for new plants built in the future. The agency, based on the industry trend analysis[3], estimates that there will only be a "handful of plants" that would consider coal as a fuel source, further supporting the agency's determination that the technology is feasible and adequately demonstrated and the standard is achievable.

Questions: What is the basis for EPA's understanding of the feasibility and commercialization of carbon sequestration technology? What EPA programs currently regulate carbon sequestration? What is the status of those current regulations? What are EPA's assumptions about future carbon sequestration technology, activities and regulations that give it confidence that carbon sequestration is an appropriate part of this rulemaking?

Response: EPA staff provided a PowerPoint presentation (see Attachment 2) that provides information on geologic sequestration in the context of the proposed carbon pollution standards for new power plants, provides an overview of geologic sequestration technology, and describes EPA's geologic sequestration regulations. Under the proposed rule, captured CO_2 must be sent to a facility that meets the existing regulatory requirements for monitoring and reporting geologic sequestration (Subpart RR of the Greenhouse Gas Reporting Program). The presentation provides background on the Greenhouse Gas Reporting Program requirements. The presentation also describes the permitting requirements under the Underground Injection Control Program, including traditional enhanced oil recovery (Class II wells) and large-scale geologic sequestration (Class VI wells). A rule under the Resource Recovery Act will clarify how EPA waste regulations apply to CO_2 streams that are injected into Class VI wells. EPA staff also noted that the EPA developed a peer reviewed Vulnerability Evaluation Framework to help evaluate site specific vulnerabilities at geologic sequestration projects.

Analyses for new coal-fired plants standard

Question: What analyses support the proposed rule's emissions standard of 1,100 lb CO_2/MW hr for coal fired EGUs?

Response: The agency considered a range of technologies and fuel sources to develop the proposed emissions standards for coal fired EGUs. Both cost and performance were taken into account. The agency considered carbon capture technologies ranging from 0-90% capture and proposed a standard based on a reasonable and achievable level of carbon emission reduction. The agency also compared coal-fired plants to other fuel sources to better understand the policy

[3] "Trends in Structure of Electric Power Sector Limiting Amount of New Coal", Technical Support Document available in the docket for the proposed rule at: regulations.gov (Docket ID EPA-HQ-OAR-2013-0495).

implications for proposing the standard at 1,100 lb CO_2/MWh. Agency staff using information from the Energy Information Administration (EIA) and NETL, estimated costs for systems using other fuel sources (e.g., coal without CCS, natural gas, and nuclear) to range between $80/MWh to $130/MWh. These costs were considered in proposing the standard at 1,100 lb CO_2/MWh.

Attachment 1
Participants in the Science Advisory Board Fact-Finding Meeting on EPA Planned Actions in the Spring 2013 Regulatory Agenda

December 17, 2013

Members of Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science

Dr. James R. Mihelcic, Chair
Dr. Taylor Eighmy
Dr. R. William Field
Dr. H. Christopher Frey
Dr. Madhu Khanna
Dr. Peter S. Thorne

SAB Staff Office

Mr. Thomas Carpenter, Designated Federal Officer

EPA Office of Air and Radiation Staff

Mr. Kevin Culligan, Associate Director, Sector Policies and Program Division, Office of Air Quality Planning and Standards

Dr. Mark De Figueiredo, Team Leader, Greenhouse Gas Reporting Program, Office of Atmospheric Programs

Dr. Nick Hutson, Senior Technical Advisor, Energy Strategies Group, Sector Policies and Program Division, Office of Air Quality Planning and Standards

Ms. Anhar Karimjee, Chief, Greenhouse Gas Reporting Program, Office of Atmospheric Programs

Mr. Carl Mazza, Senior Advisor, OAR

Mr Peter Tsirigotis Director, Sector Policies and Program Division, Office of Air Quality Planning and Standards

Geologic Sequestration

December 17, 2013

1

Proposed Carbon Pollution Standards for New Power Plants

- Under the proposed carbon pollution standards for new power plants, captured CO_2 must be sent to a facility that meets the existing regulatory requirements for monitoring and reporting geologic sequestration (Subpart RR of the GHGRP)
- Proposal relies upon the existing requirements and does not set any new requirements related to sequestration
  - EPA already has a regulatory framework in place for monitoring and permitting CO_2 injection and geologic sequestration
  - Only requiring any new fossil fuel-fired power plant owners to meet the proposed emission limit

2

Overview of Geologic Sequestration (GS)

- Industry, researchers, government agencies, and other stakeholders have been evaluating CCS technologies since the 1990s
- Existing project and regulatory experience, research, and analogs indicate that GS is a viable long-term CO_2 storage option
  - About 50 million metric tons of CO_2 are transported each year in the US through 3,600 miles of pipelines
  - Industry has 40+ years experience conducting EOR
  - Geologic storage potential is widespread across the US (over 2,300 billion metric tons of CO_2)
- Four existing commercial CCS facilities in other countries and a number of studies have demonstrated geologic sequestration of CO_2

"With appropriate site selection…, a monitoring program…, a regulatory system, and the appropriate use of remediation methods…, the local health, safety and environmental risks of geological storage would be comparable to risks of current activities…"

-IPCC Special Report on Carbon Capture and Storage (2005)

3

Regulatory Background

- EPA has spent over 10 years analyzing geologic sequestration issues and engaging with stakeholders to evaluate regulatory or other barriers to CCS deployment and ensure continued protection of human health and the environment
- EPA has closely coordinated development of GS regulations across applicable statutes
  - Safe Drinking Water Act
    - Underground Injection Control (UIC) Program: Standards and requirements for permitting wells used to inject CO_2 underground
  - Clean Air Act
    - Greenhouse Gas Reporting Program: Monitoring and reporting for geologic sequestration
  - Resource Conservation and Recovery Act
    - Proposed rule clarifying how EPA's waste regulations apply to captured CO_2 streams that are geologically sequestered via injection wells designated for that purpose under the Safe Drinking Water Act

4

Underground Injection Control Program

- Safe Drinking Water Act (SDWA) authorized the establishment of the Underground Injection Control (UIC) Program to ensure protection of underground sources of drinking water (USDWs)
  - 30+ years of experience on regulating underground injection in an informed, scientific and transparent manner
- SDWA provides permitting framework for CO2 injection
  - Class II wells: Traditional enhanced oil recovery (EOR) projects
  - Class VI wells: Large-scale geologic sequestration projects

5

Underground Injection Control - Class VI Overview

Considerations for GS

- Large Volumes
- Buoyancy
- Viscosity (Mobility)
- Corrosivity

New well class established: Class VI

UIC Program Elements

- Site Characterization
- Area of Review (AoR)
- Well Construction
- Well Operation
- Site Monitoring
- Post-Injection Site Care
- Public Participation
- Financial Responsibility
- Site Closure

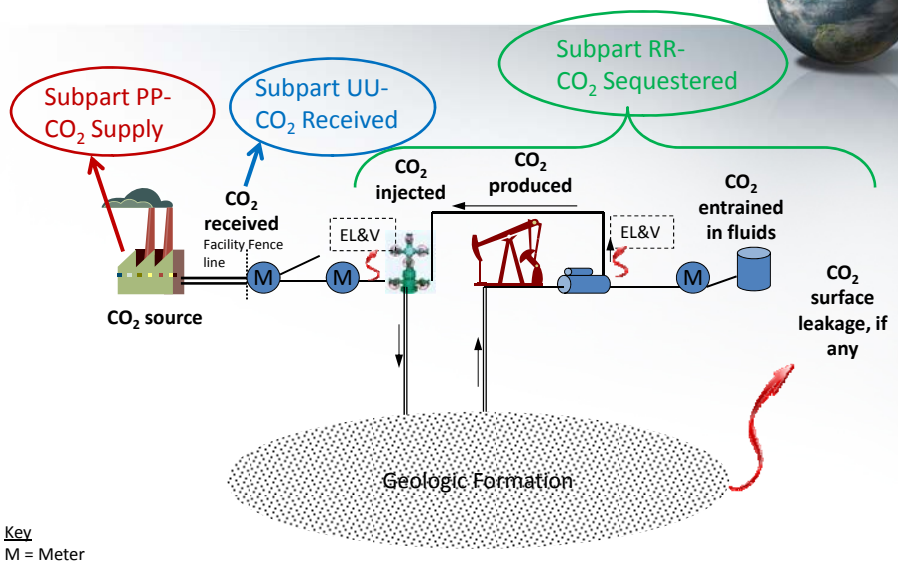
6

Greenhouse Gas Reporting Program (GHGRP)

- Launched in response to FY 2008 Consolidated Appropriations Act
  - Statutory authority: Clean Air Act, Section 114
- Annual reporting of GHGs by 41 source categories
  - 33 types of direct emitters
  - 6 types of suppliers of fuel and industrial GHGs
  - Facilities that inject CO_2 underground for geologic sequestration, enhanced oil recovery, or any other purpose
- Most source categories began collecting data in 2010, with first annual reports submitted to EPA in September 2011
  - An additional 12 source categories began collecting data in 2011, with first annual reports submitted to EPA in September 2012
- Direct reporting to EPA electronically
- EPA verification of GHG data

7

GHGRP Subparts Related to CCS



Key
M = Meter
EL&V = Equipment Leaks and Vented Emissions

8

Geologic Sequestration in the GHGRP (Subpart RR)

- Subpart RR provides a mechanism for facilities to monitor and report to EPA the quantity of CO_2 sequestered on an annual basis
- Complementary to and builds on Underground Injection Control requirements
- EPA developed a Vulnerability Evaluation Framework (VEF) for Geologic Sequestration that supported the proposed rule

9

Geologic Sequestration in the GHGRP (Subpart RR)

- All facilities subject to Subpart RR must develop and implement an EPA-approved monitoring, reporting and verification (MRV) plan
  - Delineation of the monitoring areas
  - Identification of potential surface leakage pathways for CO_2
  - Strategy for detecting and quantifying surface leakage of CO_2
  - Strategy for establishing the expected baseline for monitoring CO_2 surface leakage
  - Site-specific variables
- Once the facility has an approved MRV plan, the following are required to be reported annually:
  - CO_2 received and the source of the received CO2, if known
  - Mass balance equation inputs (CO_2 injected, CO_2 produced, CO_2 emitted by surface leakage, CO_2 emitted from equipment leaks and vented CO_2 emissions)
  - An annual monitoring report, which includes a narrative history of monitoring efforts, non-material changes to MRV Plan, narrative history of monitoring anomalies, and description of surface leakage of CO_2, if any

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Attachment B

Descriptions of the Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (2060AQ-91) with updated SAB Work Group Recommendation

Description of Potential EPA Tier 1 or Tier 2 Action (EPA provided in August 2013)

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

RIN Number: 2060-AQ91

EPA Office originating action: OAR

Brief description of action and statement of need for the action:

Power plants are the largest concentrated source of emissions in the United States, together accounting for roughly one-third of all domestic greenhouse gas emissions. President Obama's Climate Action Plan, and the June 25, 2013 presidential memorandum on power sector carbon pollution standards, direct EPA to take several actions to reduce greenhouse gas emissions from power plants. One of these is to propose, and then finalize, carbon pollution standards for new power plants. In this action, EPA plans to establish new source performance standards (NSPS) for new electric utility generating units (EGUs) under the authority of section 111 of the Clean Air Act.

Timetable:

EPA intends to issue new proposed carbon pollution standards by September 20, 2013, and final standards within one year of publication of the proposal.

Does the action rely on science that meets the EPA *Peer Review Handbook* definition of "an influential scientific or technical work product" that "has a major impact, involves precedential, novel, and/or controversial issues, or the Agency has a legal and/or statutory obligation to conduct a peer review?"

This action does not rely on new science. This action will rely on the identification of existing, proven technologies to set achievable emission standards that, by statute, offer the "best system of emission reduction" (BSER).

Scientific questions to be addressed and approach:

This is a technology based rule (as described above).

Plans for scientific analyses and peer review:

See description above.

Recommendation from the SAB Work Group on EPA Planned Actions for SAB Consideration of the Underlying Science (Revised January 2014)

Name of planned action: Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (AQ91)

Please respond to the following questions based on the short description EPA provided for the planned action.

	Yes	No
Is the action planned or under review by the SAB? If not, has EPA identified other high-level external peer review (i.e., by the NAS, CASAC, or FIFRA SAP)?		**X**
Is the action primarily administrative (i.e., involve reporting or record keeping)?		**X**
Has EPA characterized the action as one that has "an influential scientific or technical work product" that "has a major impact, involves precedential, novel, and/or controversial issues, or the Agency has a legal and/or statutory obligation to conduct a peer review?"		**X**
Is the action an extension of an existing initiative?		**X**

Please indicate whether the action merits a high, medium or low level of interest regarding the following historical SAB science- and problem-driven criteria, based on the short description EPA provided for the planned action.

	High	Medium	Low
Involves scientific approaches that are new to the agency	**X**		
Addresses areas of substantial uncertainties	**X**		
Involves major environmental risks	**X**		
Relates to emerging environmental issues	**X**		
Exhibits a long-term outlook		**X**	

Please provide a recommendation regarding whether the SAB should consider this action for review and comment on the adequacy of the supporting science and provide a brief rationale.

The SAB Work Group recommends that the SAB not review The Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units (2060-AQ91). This recommendation is based on the (1) information provided on the statutory requirements on feasible technology, (2) the status of carbon sequestration under the Underground Injection Control Program, and (3) additional information on the EPA peer review process provided to the Work Group. The Work Group finds that a review by the SAB would not provide additional benefit to the proposed rule.

This action involves development of new performance standards for greenhouse gas emissions (CO_2) from new Electric Utility Generation Units (EGUs) under new source performance rules.

The Work Group review of this action[1] considered all items in the table in the previous page including: (1) , whether there was an adequate scientific and technological basis for the proposed provisions to achieve emissions reductions in coal-fueled EGUs and (2), whether the peer review of the scientific and technical information supporting the action was adequate.

The Agency's expectation is that most new power plants will utilize natural gas combined cycle technology to implement this proposal. The EPA considered industry trends, available technology, and best systems of emission reduction to develop the proposal. The Agency concludes that the proposed standard will not be technology forcing for such plants.

In a fact-finding call held on September 26, 2013, the EPA Staff explained that should new EGUs not utilize natural gas and opt for coal as a fuel source, these new coal plants will need to implement new carbon capture and storage (CCS) technologies to meet the standards. The EPA is identifying partial CCS as a viable technology for new efficient coal units that would meet the criteria of the best system of emission reduction (BSER) for implementation of the proposed standards. In setting BSERs, the EPA considers the standard and whether: the system is technically feasible; the costs are reasonable; the amount of emissions achieved by the technology meets the standard; and does the proposal promote the implementation and further development of a technology.

EPA Staff explained that the CCS provisions are based on three examples of implementing partial CCS and the strong demonstration these facilities make for the feasibility of this technology (See Attachment C of the November 12, 2013 Memorandum to the Chartered SAB). EPA Staff explained that the feasibility and commercially available considerations for CCS provisions would only be binding to coal-fired EGUs and meet the statutory ~~elements~~requirementsin the Clean Air Act to determine if the technologies will be available for the regulated community at the time of construction[2]. They provided several examples of facilities with similar engineering and technology processes to electricity generating units using CCS and stated that the demonstration of these facilities provides a reasonable assurance for the availability of the technology. EPA also noted during two December meetings (December 4-5 and 17) that this proposed rule does not address carbon sequestration and relies on the established permitting and reporting requirements for carbon dioxide sequestration required in the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration. The Work Group finds that while the scientific and technical basis for carbon storage provisions is new and emerging science, the agency is using the best available science and has conducted peer review of DOE documents at a level required by agency guidance. The Work Group notes that the proposed rule estimates a limited number of newly constructed coal-fired power plants and is also subject to a required review in eight years from promulgation. The Work Group encourages the agency to consider decreasing the initial review period and to carefully monitor the post rule reality compared to its estimated construction of coal-fire power plants and carbon sequestration demand to ensure that the technologies are feasible and available to newly constructed electricity generating units to meet the new standards. The specific technical and scientific matters that can be examined as part of that review could include (1) feasibility and risk associated with carbon capture and storage as a BSER for coal-fired plants, (2) underlying scientific assumptions around

[1] Administrator McCarthy signed the proposed Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generation Units on September 20, 2013.
[2] Senate Report on Clean Air Act 1970, as cited in Portland Cement Association vs. Ruckelshaus

carbon pollution emissions technological controls, (3) ~~estimating future~~accuracy of projections of construction of coal-fired power plants, and (4) the level of carbon dioxide set by the standard.

The EPA Staff cited Department of Energy National Energy Technology Laboratory (NETL) studies as well as existing EGUs under construction and in advanced stages of development as the basis for the BSER assumptions for new natural gas and coal fuel sources for new EGUs. EPA staff explained that the NETL studies are all peer reviewed and EPA did not conduct additional peer review(s).

The SAB Staff requested additional information on the technological basis and peer review for the action from OAR and NETL for a September 26 teleconference with the Work Group. OAR Staff notes that the EPA relied on information NETL released in a series of reports on the '*Cost and Performance Baselines for Fossil Energy Plants*." The studies were conducted to establish estimates for the cost and performance of combustion and gasification based power plants as well as options for co-generating synthetic natural gas and fuels, all with and without carbon dioxide capture and storage. Volume 1 of these studies explains that …"[t]he initial results of this analysis were subjected to a significant peer review by industry experts, academia and government research and regulatory agencies." [3]

NETL Staff responded that "reviewers were sent the report and given several weeks for review and the regulatory agency that provided the review was the EPA." NETL noted that this peer review process was specifically tailored for this report and NETL does not have a publically-available description of the review. NETL staff also notes that all the information presented for coal-fueled sources was not peer reviewed.[4]

In the December 17, 2013 fact-finding teleconference, the work group learned that EPA did not provide the peer review of the NETL study; rather the peer review was managed by DOE. For the December 17, 2013 fact-finding teleconference, EPA provided additional information from NETL on the review process. A summary of merit reviews and a comment response document on the *2006 Cost and Performance Comparison of Fossil Energy Power Plants* for DOE documents was provided (Attachment A). EPA staff noted that the different levels of review of these DOE documents met the requirements to support the analyses as defined by the EPA Peer Review Handbook [5]. They also stated that peer review of economic data typically occurs only if new modeling procedures were employed.

[3] Volume 1 of the series – "Cost and Performance Baseline for Fossil Energy Power Plants, Volume 1: Bituminous Coal and Natural Gas to Electricity" (and subsequent updates) – available at http://www.netl.doe.gov/energy-analyses/baseline_studies.html

[4] August 2011 report "Cost and Performance of PC and IGCC Plants for a Range of Carbon Dioxide Capture" which modified the CO_2 capture rates for select cases presented in the "Cost and Performance Baseline for Fossil Energy Plants" did not undergo peer review. That report can be found here: http://www.netl.doe.gov/energy-analyses/refshelf/PubDetails.aspx?Action=View&PubId=396

[5] **U.S. Environmental Protection Agency Peer Review Handbook,** 3rd Edition EPA/100/B-06/002