Comments Addressing

The Role of Carbon Capture and Sequestration in the Environmental Protection Agency's Proposed Standards of Performance for Greenhouse Gas Emissions From New Stationary Sources: Electric Utility Generating Units

Submitted to:
The Environmental Protection Agency Science Advisory Board

by
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January 21, 2014

My statement addresses two topics regarding the Environmental Protection Agency (EPA) assessment of carbon capture and sequestration (CCS) as Best System of Emissions Reduction (BSER). These are limitations in the (1) applicability of engineering studies conducted for the Department of Energy (DOE) National Energy Technologies Laboratory (NETL) to justify the mandate of CCS for the proposed CO_2 New Source Performance Standards (NSPS), and (2) commercial experience with CCS at the generating capacity, fuel variety, and process integration necessary for broad coal-fired utility application.

As discussed by the Science Advisory Board (SAB) on December 5, EPA cites three NETL-sponsored analyses to justify both the feasibility and cost of CCS, and the near absence of new coal-fired plants to be built in the next three decades.[1] These reports have not been adequately peer-reviewed. These analyses, which employ conventional cost-estimating methodology, may be appropriate for use by an owner to evaluate technology options; however these studies are not adequate to justify what effectively is a national energy strategy.

As noted by EPA staff in the SAB December 5 meetings, the three reports are inextricably linked to a fourth "baseline" report published in 2007.[2] Results in this first report appear to be predicated on data from about the 2004-2006 timeframe. Further, the cost data appears – based on report language – to be mostly derived from

[1] 1. *Cost and Performance for Fossil Energy Plants Volume 1: Bituminous Coal and Natural Gas to Electricity, Rev. 2*, DOE/NETL-2010/1397. Revision 2, November 2010; Revision 2a, September 2013. 2. *Updated Costs (June 2011 Basis) for Selected Bituminous Baseline Cases,* DOE/NETL-341/082312 (Aug 2012). 3. *Cost and Performance of PC and IGCC Plants for a Range of Carbon Dioxide Capture*, DOE NETL-2011/1498 Revision 1, September 19, 2013; Original May 2011.

[2] *Costs and Performance Baseline for Fossil Energy Plants*, DOE/NETL-2007/1281, Vol. 1: Bituminous Coal and Natural Gas to Electricity Final Report (original issue Date, May 2007), Rev. 1, August 2007.

a proprietary database. A single database may not be adequate to characterize the cost fluctuations witnessed in the first decade of this century, when capital prices rapidly changed for power generating equipment. The error margin for CCS cost estimates is even greater, as to date there are no large commercial designs from which to derive experience. CCS components may evolve in size and configuration.

A fifth DOE-sponsored report demonstrates how cost estimates vary when using a second, independent source of cost. The DOE National Renewable Energy Laboratory (NREL) sponsored a study to determine capital cost for coal-fired and natural gas/combined cycle generating equipment.[3] The different results derived for NREL compared to NETL suggests more than one source of cost data are desired.

A second shortcoming is the lack of relevant experience. The CCS facilities referenced by EPA are inadequate to qualify CCS as BSER for dedicated power generation. The carbon capture processes applied at small industrial units are not relevant: these are small in scale; operate intermittently, and do not sequester or store the CO_2 captured. A limited number of CCS pilot plants operate but these too are relatively small. The Great Plains Synfuel Project employs most key gasification steps, but operates dedicated to production of commercial materials and generates power as a byproduct. Experience with this unit is valuable but does not completely reflect that required for wholesale power generation.

Designating an evolving technology such as CCS as BSER – without relevant commercial experience – is unprecedented. For example, when the EPA revised NSPS for sulfur dioxide (SO_2) in 1979 to an emission rate that mandated scrubbers and thus eliminated the compliance options of low sulfur coal or coal cleaning, there were 10,000 MW of scrubbers in U.S. operating.[4]

A similar level of experience is required to designate CCS as BSER. The attached figure depicts a timeline for key pilot, demonstration, and early commercial tests that could determine CCS feasibility in the U.S. The timeline shows there are only four units greater than 200 MW that are either operating or under construction from which to demonstrate CCS feasibility. Significant CCS experience on large units does not accrue until about 2017-2018 - implying commercial design data will not be available around 2019-2020; even these results will be limited in scale and scope. The timeline shows more projects planned but financing not complete (e.g. open symbols). In summary, the timeline shows by 2020 only a limited number of demonstrations will be available from which to derive design rules.

EPA's designation of CCS at BSER is flawed for these two reasons.

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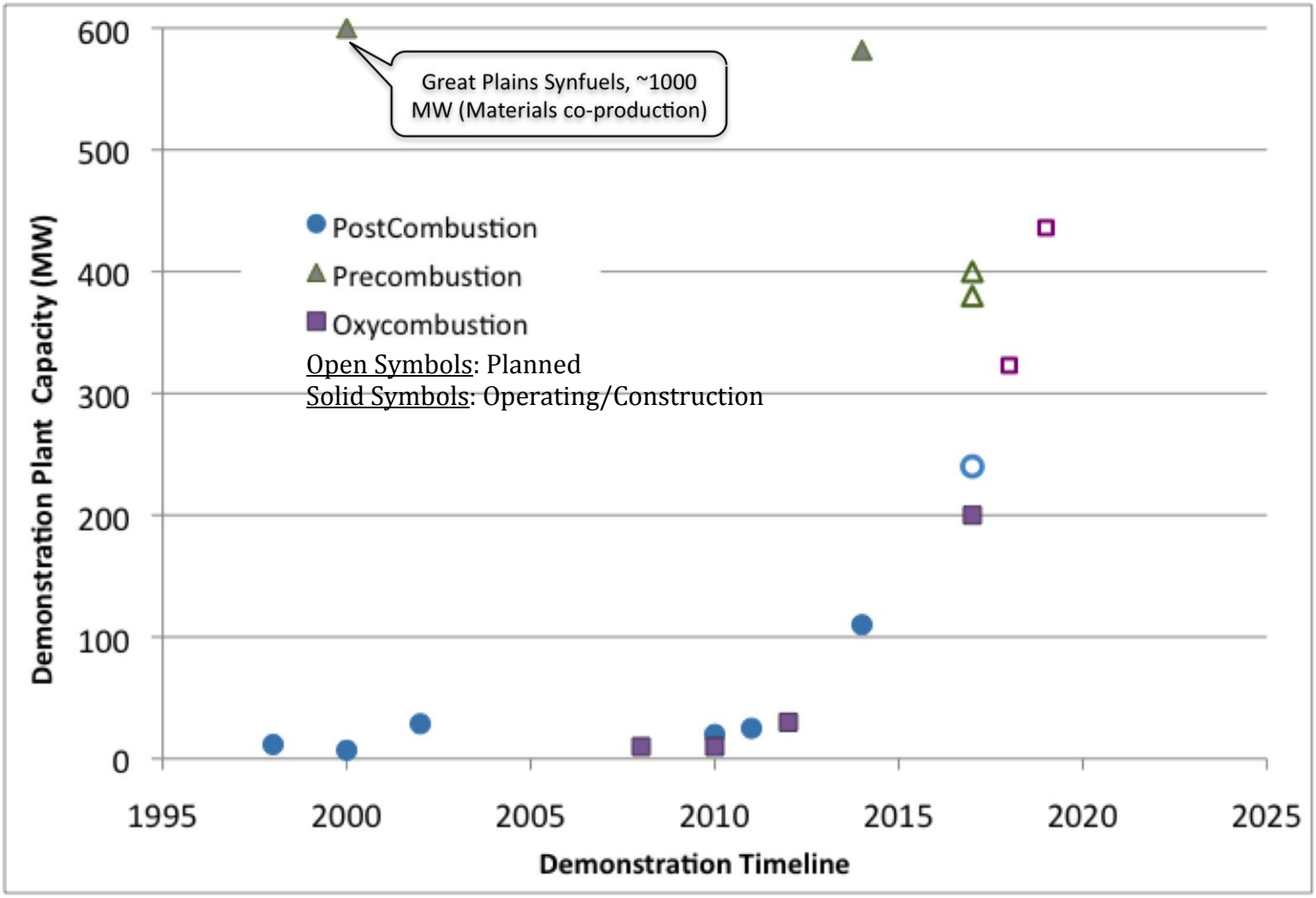
[3] *Cost and Performance Data for Power Generation Technologies*, Issued February 2012, prepared for the National Renewable Energy Laboratory.

[4] Shattuck, D. et al., *A History of Flue Gas Desulfurization (FGD) – The Early Years*. United Engineers 2007 Technical Paper.



CCS Pilot Plant And Demonstration Timeline (Source: *Factors Affecting the Commercial Feasibility of Carbon Capture and Sequestration Technologies for Coal-Fired Power Plants*, Testimony of J. Edward Cichanowicz before the Subcommittee on Energy and Power, Committee on Energy and Commerce, United States House of Representatives).