Comments Addressing

The Role of Carbon Capture and Sequestration in
the Environmental Protection Agency 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

William Rogers
Manager: Environmental Strategies/Emissions Quality
DTE Energy

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The purpose of my statement is to assure the Science Advisory Board (SAB) is aware of the extent carbon dioxide (CO_2) reduction is required by the proposed New Source Performance Standards (NSPS), and the technology differences between flue gas scrubbing for sulfur dioxide (SO_2) and carbon capture and sequestration (CCS) for CO_2.

Emissions of CO_2 are typically measured in terms of the mass of CO_2, generated in tons, per megawatt-hour of power produced.

The CO_2 emission rate depends on power plant design, coal composition, and how the plant is operated. A recent analysis shows the emission rates of relatively new plants that have become operational in the last 10 years is mostly between 1,750 and 2,100 lbs of CO_2 per megawatt-hour, when averaging a year of hourly data. I have submitted a chart from this study in my written version of this statement that shows CO_2 emission rates for a variety of relatively new coal-fired units.

You may hear of CO_2 emission rates from coal-fired power plants below these values, perhaps to as low a 1700 lbs per megawatt-hour, but in most cases these data represent shorter periods of operation that do not always reflect the range of conditions required for long term power supply.

The proposed EPA NSPS CO_2 emission rates of 1,100 lbs/MWh will require at least a 40% reduction from the emissions levels of even the newest and most efficient

plants. This extent of CO_2 reduction is well beyond anything that can be achieved by improvements in the efficiency with which the coal is utilized, or by changing coals.

It has been suggested that the evolution of CCS is no different than scrubbers for SO_2 in the late 1970s. This analogy grossly oversimplifies evolving CCS technology. My company has installed four state-of-art scrubbers to remove SO_2 at our Monroe Power Plant – and we consider ourselves experts in understanding this technology. There is a vast difference between SO_2 scrubbers and CCS in many ways – but most notably in the amount of material removed and stored, the complexity of the process, and the parasitic power demand.

Let's start with the amount of material removed. Over a year, a typical 780 MW unit – like those we have at Monroe – will produce an amount of CO_2 that when compressed for sequestration would fill up the Pontiac Silverdome two and a half times.[1] <u>That's each year.</u> In contrast, material generated from our SO_2 scrubber at Monroe is a fraction of that amount – about 75,000 tons of nearly dry solid per year. Assuming none of this material is used beneficially for construction supplement, the Silverdome would store the FGD byproduct from more than a decade of operation. The Monroe scrubber byproduct is an easy-to-stack and safely store solid, which can be used for building materials such as wallboard.

In contrast, the CO_2 captured must be transported off-site, perhaps for long distances, and maintained at high pressure to inject underground. You have already heard comments about the complexities and uncertainties of transporting CO_2 over long distances, and storing captured CO_2 underground, or using it for enhanced oil recovery.

Equally important is process complexity – a typical postcombustion process to capture CO_2 from a pulverized coal powerplant will feature over 100 separate process steps that must be managed and controlled. In contrast, a conventional scrubber requires a small fraction of that.

A final difference is the auxiliary power that is parasitic to the power production process. A state-of-art FGD system will consume typically not more than 2% of gross plant output. In contrast, a state-of-art postcombustion CCS process will consume up to about 25% of the gross plant output. For a Monroe unit, that's about 195 MW. To put that in perspective, Units 1-4 at our St. Clair Station each provide about 150 MW to the electric grid. So in concept not even a single St. Clair unit would be able to provide the auxiliary power for CCS on a single Monroe unit.

In summary, scrubbers and carbon capture and sequestration are not like processes, but - to use a common analogy - are as different as day and night.

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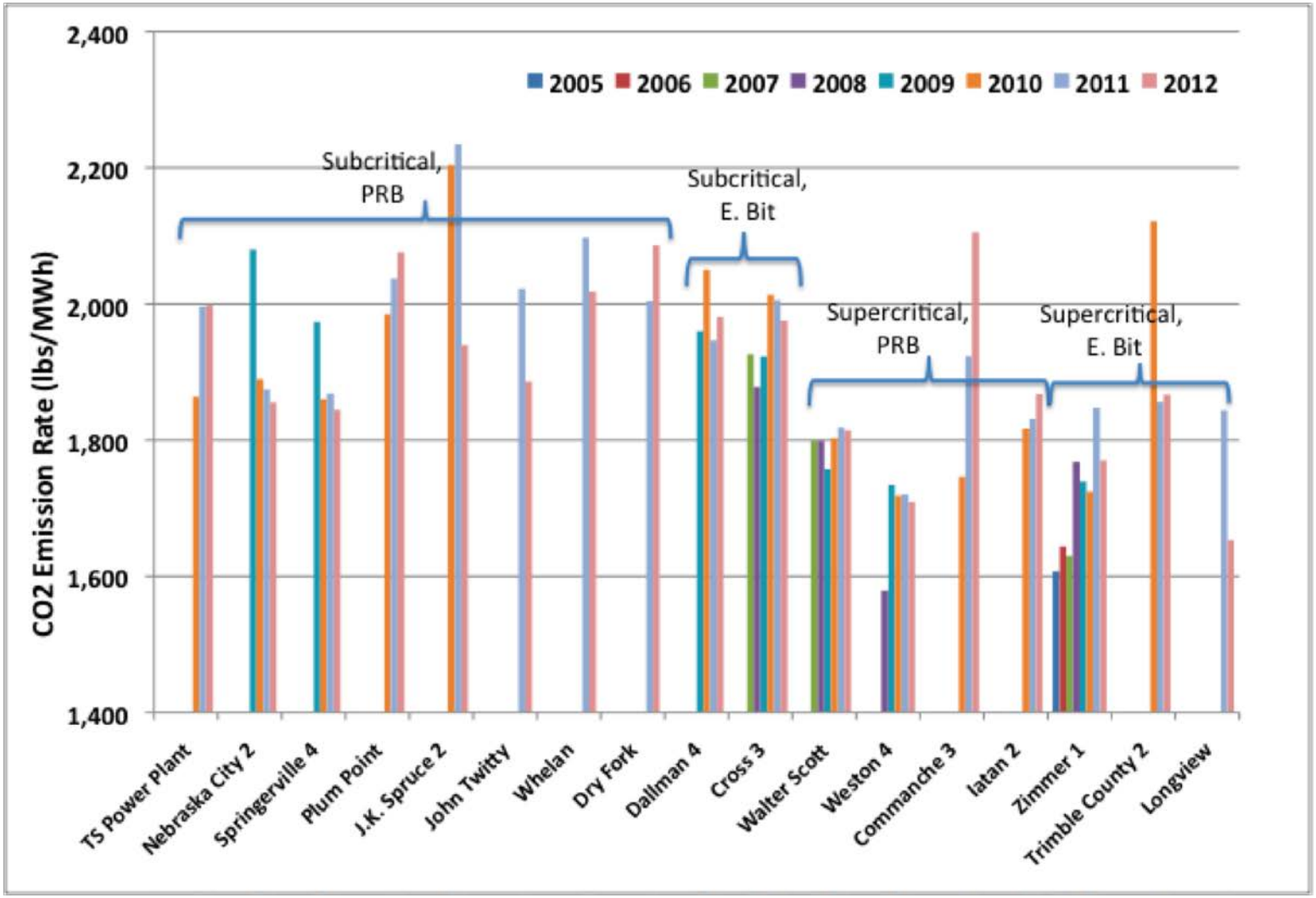
[1] Basis: Capacity 780 MW; heat rate 10,000 Btu/kWh; capacity factor 75%; CO_2 content 212 lbs/MBtu; supercritical CO_2 density 700 kg/m^3; Pontiac Silverdome volume of 2,462,045 m^3.



Annual Averages of CO_2 Emission Rate (lbs/MWh) From Bituminous or Subbituminous Coal-fired Units
(Source: *Use of CO_2 Emission Rate Data to Derive Achievable NSPS for Coal-fired Electric Generating Units*, Supporting Material for July 31, 2013 Discussion between ACCCE and Office of Management and Budget.)