Replacing the Clean Power Plan with an "Inside the Fence Line" Alternative Would Do More Harm than Doing Nothing

The U.S. Environmental Protection Agency (EPA) has proposed to repeal the Clean Power Plan which was designed to curb carbon dioxide emissions from power plants but would also reduce emissions of other pollutants that can adversely affect public health (EPA 2017). It is expected that the EPA will replace the Clean Power Plan with a narrower "inside the fence line" approach focused on improving the thermal efficiency of coal-fired power plants (S&P Global 2017). Under this approach, the option to replace high-polluting power plants with wind and solar, switch them to natural gas, or moderate their impact with energy demand reduction strategies will effectively be off the table.

The "inside the fence line" approach to regulating carbon dioxide emissions favored by the current EPA represents a serious weakening of the Clean Air Act standard that calls for implementing the "Best System of Emission Reduction". The 2015 EPA Clean Power Plan took a flexible approach to reducing carbon dioxide emissions and would have generated air quality and health benefits that far outweigh the cost of the standards. An "inside the fence line" alternative would produce little to no climate and clean air benefits, and would harm human health.

In 2015 our team analyzed several options for power plant carbon standards and compared them to a reference case with no new carbon standards. The analysis included a flexible approach like the Clean Power Plan and a narrow "inside the fence line" approach. We published our results in the independent scientific journal *Nature Climate Change* (Driscoll et al. 2015). In light of recent reports that EPA may adopt the narrower alternative, the results have new relevance.

The "inside the fence line" option that we analyzed using results from the Integrated Planning Model (IPM, an electric demand model incorporating dispatch to the least expensive producers) resulted in only a 2% decrease in carbon dioxide (CO_2) emissions as well as a 3% decrease in nitrogen oxide (NO_x) emissions, but a 3% *increase* in sulfur dioxide (SO_2) emissions in 2020 compared to the no-new-policy reference case (see *Power plant improvements* results in Figure 1). The estimated increase in SO_2 emissions is attributable to emissions rebound which occurs when facilities with high emissions are made more efficient and therefore operate more frequently and for longer periods, emitting even more pollution.

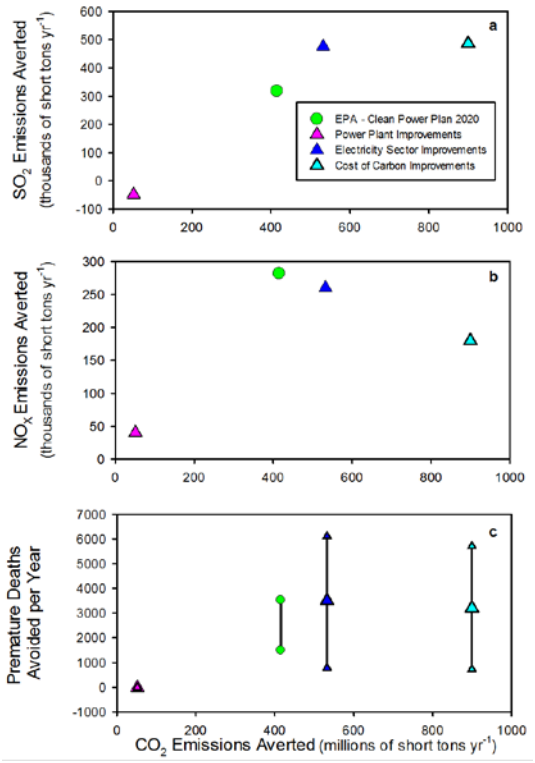

Figure 1: Comparison of SO_2 and NO_x emissions averted, and premature deaths avoided per tonne of CO_2 averted for different power plant carbon standards relative to a no-new-policy reference case in 2020. (a) SO_2 averted; (b) NO_x averted; and (c) premature deaths avoided per tonne of CO_2 averted. The green circles represent the EPA Clean Power Plan. The pink triangles for "Power plant improvements" represent an "inside the fence line" approach. The dark blue triangles for "Electricity sector improvements" represent a flexible approach similar to the Clean Power Plan. The light blue triangles for "Cost of carbon improvements" reflect a carbon tax approach to power plant regulation. Smaller symbols in (c) indicate uncertainty bounds and larger symbols indicate central estimates where available. Adapted from Driscoll et al. 2015; EPA 2015.

We also used EPA's own Community Multi-Scale Air Quality Model (CMAQ) to map the air quality effects of the estimated emission changes. We found that the "inside the fence line" option would result in an *increase* in fine particulate matter ($PM_{2.5}$) and ozone (O_3) – the primary constituents of smog and soot – and lead to an increase in premature deaths in seventeen states compared to the no-new-policy reference case (Figures 2 and 3).

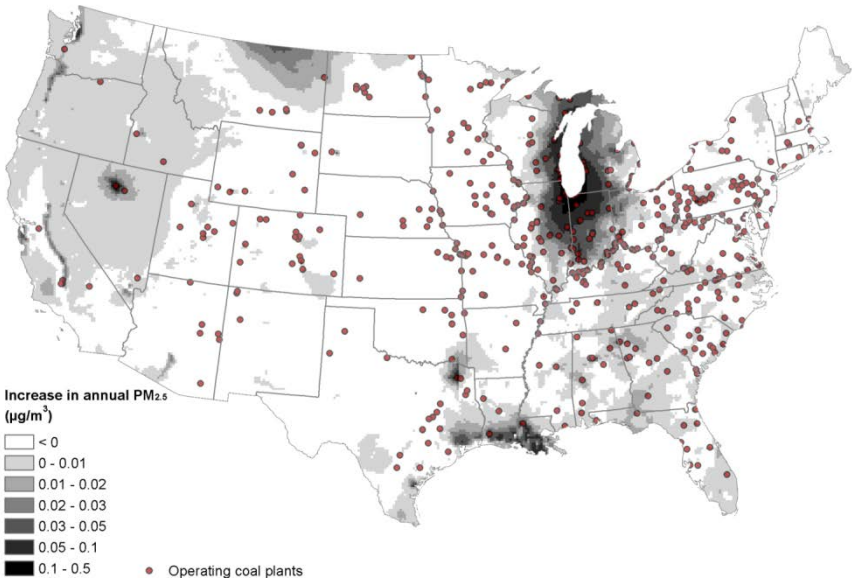

Figure 2: Increase in fine particulate pollution in 2020 with an "inside the fence line" power plant carbon standard compared to a no-new-policy reference case in which there are no carbon standards. Positive values represent areas that are expected to experience higher air pollution with the "inside the fence line" approach. Based on Driscoll et al. 2015.

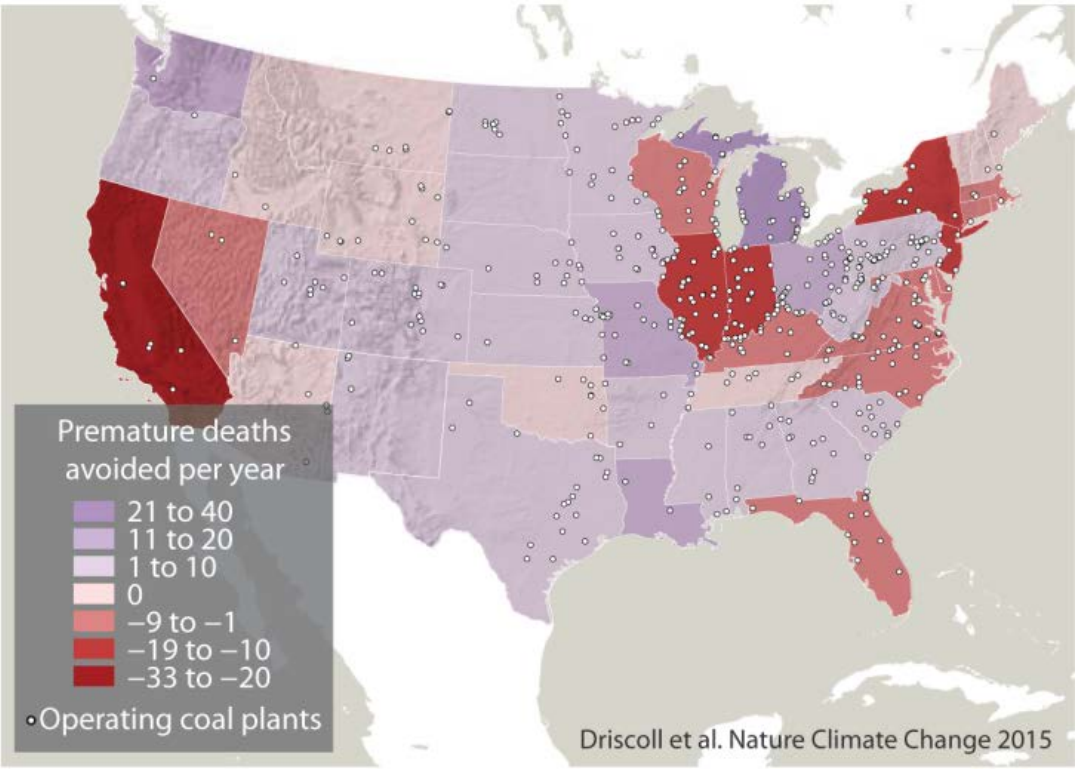

Figure 3: Change in premature deaths avoided in 2020 with an "inside the fence line" power plant carbon standard compared to a no-new-policy reference case with no carbon standards. The states with negative values in pink and red are expected to experience more premature deaths than if no policy action were taken. From Driscoll et al. 2015.

By contrast, our analysis showed that power plant carbon standards that employ a flexible approach similar to the Clean Power Plan could achieve an estimated 24% reduction in CO_2 emissions, 27% reduction in SO_2 emissions, and 22% decrease in NO_x emissions in 2020 compared to the no-new-policy reference case (see *Electricity sector improvements* in Figure 1). These emission reductions would result in air quality improvements in all lower forty-eight states and bring substantial health benefits. As a result of these anticipated air quality improvements, forty-one million people in forty-one large U.S. cities would experience cleaner air under a power plant carbon standard like the Clean Power Plan (based on Driscoll et al. 2015). Further, we estimated that 3,500 premature deaths, 1,000 hospitalizations, and 220 heart attacks associated with air pollution could be prevented *each year* in the U.S. with this flexible approach (central estimates from Driscoll et al. 2015).

In a follow-on analysis, we calculated that the economic value of carbon standards like the Clean Power Plan far outweighs the costs on an annual basis with net benefits of $33 billion per year (Buonocore et al. 2016). These peer-reviewed results underscore the importance of conducting regulatory impact analyses that accurately reflect scientific understanding about the health

effects of air pollution, including the existence of health effects below the current regulatory standards for air quality, known as the National Ambient Air Quality Standards (NAAQS).

In addition to the public health and economic benefits, we determined that the anticipated air quality improvements from a flexible clean power standard would mitigate productivity losses for some tree species by up to 8% and for some types of crops by as much as 16% in 2020 compared to the no-new-policy reference case (Capps et al. 2016). Depending on market value fluctuations of these crops over the next few years these air quality benefits could produce gains of tens of millions of dollars for farmers—with large gains in areas such as the Ohio River Valley where power plants currently contribute to elevated ground-level ozone at concentrations that can damage crops (Capps et al. 2016).

Collectively, our analyses show that the policy design of power plant carbon standards has a marked impact on the climate, air quality, health, economic, and ecosystem outcomes for local communities and states. Rolling back the Clean Power Plan would forfeit significant clean air gains. An "inside the fence line" replacement would not only cause thousands of extra deaths and cost billions every year compared to the Clean Power Plan; it would do more harm than doing nothing at all.

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