Comments on US EPA White Paper, "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Combustion Turbine Electric Generating Units"

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Submitted by
Michael Ash,[*] James K. Boyce,[*] Bridget Diana,[*] and Manuel Pastor[†]

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We appreciate the opportunity to comment on EPA's draft white paper, "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions From Combustion Turbine Electric Generating Units." The white paper review of technical approaches to reduce GHG emissions from combustion turbine EGU will likely contribute to the specification of control technologies in future regulation in accordance with the enabling legislation of the CAA. Our comments specifically address the importance of including consideration of co-pollutants in the technical assessment and associated policy assessment of control technologies primarily focused on GHG reduction.

OMB guidance on regulation requires consideration of ancillary costs and benefits. The potential reduction in co-pollutants should be considered as an ancillary benefit of GHG reduction and should be treated as such in establishing the terms of regulation, such as the designation of a Best Available Control Technology. The consideration of local co-pollutants is essential to achieve efficient and equitable regulation, including environmental justice for low-income communities and communities of color.

The draft white paper reflects an unfortunate siloing of EPA's expertise in the regulation of GHGs and in the regulation of other pollutants, for example, criteria pollutants and hazardous air pollutants. In broad terms, we urge EPA to integrate its assessment of GHG and co-pollutants. We offer the following comments and recommendations.

1. *Consider local co-pollutants in GHG regulation of electric generation*

Policies to regulate and reduce GHG emissions from EGU have important implications for local environments and for environmental justice due to the release of hazardous local co-pollutants as well as GHGs during combustion-based electricity generation. A technical assessment that integrates GHG reduction and co-pollutant reduction will provide a more useful yardstick for environmental policy instruments than consideration of GHG reduction alone. Any regulation for GHG reduction, either economic incentives or technical requirements, must be carefully structured because the adoption and siting of new technologies will bear on the exposure of local populations to co-pollutants. It is sometimes assumed that reductions in GHGs necessarily translate into reductions in co-pollutants, that decarbonization will not significantly exacerbate pollution exposure disparities in relative terms, and that GHG reductions are unlikely to result in higher pollution burdens in absolute terms in some communities, in particular, in communities that already bear disproportionate cumulative impacts. Theoretical reasoning and empirical evidence contradict these assumptions.[1]

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[1] Appendix A illustrates the enormous variation in co-pollutant risk among EGU with high GHG intensity. For insight into the foregone potential for environmental improvement when policies fail to integrate GHG and co-pollutant reduction, see: Cushing, L., Blaustein-Rejto, D., Wander, M., Pastor, M., Sadd, J., Zhu, A., & Morello-Frosch, R. (2018) Carbon trading, co-pollutants, and environmental equity: Evidence from California's cap-and-trade program (2011–2015), *PLoS Medicine*, 15(7); and Pastor, M., Ash, M., Cushing, L., Morello-Frosch, R., Muna, E., & Sadd, J. (2022) Up in the Air: Revisiting Equity Dimensions of California's Cap-and-Trade System, Equity Research Institute,

[*] Department of Economics and Political Economy Research Institute, University of Massachusetts Amherst
[†] Department of Sociology and Equity Research Institute, University of Southern California
Corresponding author: Michael Ash, mash@umass.edu.

Technologies for reducing greenhouse gas emissions may affect the linkage between GHG emissions and the emission of co-pollutants in specific processes, in particular life cycles, or in the electrical generation system as a whole. For an example at the process level, Carbon Capture, Use, and Sequestration (CCUS) technologies could remove GHG from an emission stream while the release of co-pollutants continues.

A strength of the white paper is its consideration of the full lifecycle and the energy needs ("parasitic load") of control technologies in relation to GHG. Consideration of the full lifecycle and energy needs should apply to co-pollutant assessment as well.

2. *Improve data collection and analysis*

Data collection should support integrated analysis of co-pollutant releases related to combustion turbine EGUs and their local impact. Facility reporting requirements should be expanded to include regular reporting by all combustion turbine EGUs of GHGs, criteria air pollutants, hazardous air pollutants, and other relevant combustion byproducts in ways that support comparability across EGU and other industrial facilities. EPA's Toxics Release Inventory (TRI), which mandates reporting on the release of toxics by industrial facilities in the United States, currently limits reporting from the electric sector "to facilities that combust coal and/or oil for the purpose of generating power for distribution in commerce." Combustion EGUs should not be exempt from any reporting on the basis of fuel.

Transparent and comprehensive integrative tools should provide assessment and communication of risk from existing and new sources. For example, EPA's Risk Screening Environmental Indicators (RSEI) augments TRI to provide an integrated risk-screening that combines quantity, fate and dispersion, toxicity, and population exposure to characterize the aggregate human health risk from toxic releases from industrial facilities, and these methods should be applied to combustion turbine EGU.

Integrated assessment can also identify cumulative risk from multiple facilities, both EGUs and other industrial facilities. Often located near industrial-residential margins, combustion-turbine EGUs may account for only a share of the total chronic human health risk from all industrial facilities affecting nearby communities. Because EGUs often are located in areas with substantial impacts from other facilities, an integrative model such as RSEI can help identify cumulative impacts on communities of concern by capturing overlapping plumes, which should bear on the selection of technologies for reducing greenhouse gas emissions from combustion turbine electric generating units.

EPA's eGRID collates Energy Information Administration and Environmental Protection Agency data to characterize electrical generation and the release of GHG and of some co-pollutants. Expansion of the list of reported co-pollutants, inclusion of products of chemical decay, fate and dispersion modeling, and greater temporal specificity about fuel use, abatement technology, generation, and emissions would make eGRID more useful for assessing technologies for reducing greenhouse gas emissions from combustion turbine electric generating units.

We urge EPA to include consideration of co-pollutants in the technical assessment and associated policy assessment of control technologies primarily focused on GHG reduction and to mandate data collection, reporting, and analysis to facilitate public assessment and communication. Thank you for your consideration.

University of Southern California. For an analysis of the economic and environmental effects of clean air and environmental justice mandates in decarbonization policies for the electricity sector, see Diana, B., Ash, M. and Boyce, J.K. (2021) Green for All: Integrating Air Quality and Environmental Justice into the Clean Energy Transition, Political Economy Research Institute, University of Massachusetts Amherst.

Appendix A: Variation in Co-Pollutant Risk among Gas-Fired EGUs

The concern that GHG-reduction technologies and policies should take co-pollutants into account depends in part on the variation across facilities in the impact of co-pollutants per unit of GHG. If all EGUs had identical profiles in terms of co-pollutants, then the adoption of an equivalent GHG-reducing technology would be neutral across facilities. To illustrate the actual variation, Table 1 focuses on a set of facilities that are all high in terms of the carbon intensity of energy production (CO2-e per MWh). As GHG-intensive facilities, any of these facilities would be an effective site of intervention for GHG reduction. But the profile of co-pollutant damage intensity, determined by the combustion process and the size and composition of the surrounding population, varies enormously. Within this list, Co-Pollutant Damage Intensity varies by two orders of magnitude from $800 co-pollutant damage per 1,000 mt CO2-e at the Coyote Springs EGU to nearly $100,000 co-pollutant damage per 1,000 mt CO2-e in Queens, NY. The variation across facilities in co-pollutant impact on EJ communities is also enormous, with nearby populations ranging from 0% to nearly 40% Black, 6% to more than 60% Hispanic, and 18% to nearly 50% low-income. The variation implies that the selection and deployment of GHG reduction technology will have large, highly variable, and differential effects on population well being via changes in co-pollutant exposure. Co-pollutants and the co-benefits of co-pollutant reduction should inform decisions regarding GHG reduction technologies and policies.

Table 1. Co-Pollutant Risk from the Ten Gas-Fired EGUs with the Highest Carbon Intensity

		Co-Pollutant Damage Intensity	Demographics within 5-km of Facility		
	Facility (Capacity, County, State)	($/1000 mt CO2)	Black (%)	Hispanic (%)	Low Income (%)
1	Cedar Bayou 4 (536 MW, Chambers, TX)	3,268	14.6	41.0	32.0
2	AES Alamitos (2,055 MW, Los Angeles, CA)	22,014	4.4	17.4	17.9
3	Intercession City (1,197 MW, Osceola, FL)	10,638	6.6	34.9	48.1
4	Madison Generating Station (692 MW, Butler, OH)	19,497	2.6	6.2	25.8
5	Coyote Springs (266 MW, Morrow, OR)	784	0.0	61.5	47.3
6	CFB Power Plant (310 MW, Calhoun, TX)	5,047	5.4	28.8	38.8
7	Fremont Energy Center (740 MW, Sandusky, OH)	9,501	7.7	13.4	41.8
8	Riverside (1,122 MW, Tulsa, OK)	24,980	3.5	7.5	18.6
9	Astoria Generating Station (1,345 MW, Queens, NY)	95,949	23.3	36.3	39.2
10	Handley Generating Station (1,433 MW, Tarrant, TX)	8,573	38.7	26.4	46.0

Notes: The table reports local population demographics and co-pollutant damage intensity, which is the monetized damage to human health, physical capital, and agriculture from the quantity of co-pollutants emitted with each 1,000 mt CO2-e released by the EGU as estimated with the APEEP model. The table includes the ten gas EGU with the highest carbon intensity (kg CO2-e per MWh, with the highest carbon-intensity EGU first and with all ten facilities exceeding 650 kg CO2-e per MWh) and is limited to EGUs with at least 200 MW capacity and 500,000 MWh annual production. The nameplate capacity in MW and county and state are reported for each EGU. The low-income population is defined by the percent of the population living below twice the Federal Poverty Line.

Sources: US EPA eGRID 2018 for facility data including capacity and GHG and co-pollutant (NOx, SO2, PM2.5) release quantities. Air Pollution Emission Experiments and Policy (APEEP) analysis model for co-pollutant marginal damage based on the source county of emissions.[2] US Census Bureau American Community Survey (ACS) 2018 5-year block-group data for demographics of the 5-km radius around each facility.

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[2] Muller, N. and Mendelsohn, R. (2007) Measuring the damages of air pollution in the United States. Journal of Environmental Economics and Management 54 1–14.