policy brief

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Regulating Greenhouse Gases Sector by Sector under the Clean Air Act: How Well Does the Electric-Generating Unit Experience Translate to Petroleum Refineries?

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The U.S. Environmental Protection Agency (EPA) commenced the process of developing sector-specific regulations for greenhouse gases (GHGs) under § 111 of the Clean Air Act in 2013. President Obama has directed the EPA to finalize regulations for new electric-generating units (EGUs) under § 111(b) in a timely manner and to propose and finalize regulations for existing units under § 111(d) by June 2016.[1] On June 2, 2014, the EPA proposed its GHG standards for existing power plants.[2]

The EPA may now begin to regulate other categories of stationary sources of GHG emissions. Although EPA Administrator Gina McCarthy has indicated that she has no immediate plans to regulate greenhouse gases from the petroleum refining sector,[3] the EPA entered into a settlement agreement with a group of states and nongovernmental organizations (NGOs) in 2010 that suggested a final rulemaking for existing refineries would be completed by late 2012.[4] Despite Administrator McCarthy's statements, many stakeholders have suggested that this settlement indicates that the refining industry may be the next sector to be regulated.

If the EPA were to regulate greenhouse gases from petroleum refineries, it would likely consider how much of the precedent set in the EGU regulation is relevant to refineries. It may be possible to use some elements of the EGU rulemaking as a model for refineries. For example, if finalized as proposed, the EPA's rule for existing power plants would set a precedent for establishing state-specific targets on the basis of a particular configuration of sources and mitigation opportunities within states but allow states considerable flexibility in how they meet their aggregate target.[5]

1. The White House Office of the Press Secretary, Presidential Memorandum—Power Sector Carbon Pollution Standards, June 25, 2013.
2. U.S. Environmental Protection Agency (EPA), Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, June 2, 2014 to be codified at 40 C.F.R. 60.
3. Ben Geman, "EPA Chief Won't Commit to Refinery Carbon-Emissions Rule," *National Journal,* March 6, 2014.
4. Settlement Agreement for Petroleum Refineries (Dec. 23, 2010).
5. U.S. EPA, 2014 *supra* note 1 at 374.

However, differences between the power and petroleum refining industries—including the nature of the production processes, product mix, emission abatement options, and the markets in which power plants and refineries operate—may be substantial enough to warrant a re-examination of the key regulatory decisions rather than reliance on the power plant rule as a template.

This policy brief, completed as part of a Bass Connections in Energy project at Duke University, identifies key differences between electric-generating units and refineries that may affect a GHG rulemaking under the Clean Air Act. Many of these differences and their possible significance for rulemaking are highlighted below.

Differences in the Characteristics of the Petroleum Refinery Industry and the Electric Power Industry

Eight differences in the characteristics of the petroleum refinery industry and the electric power industry could affect GHG rulemaking under the Clean Air Act.

Electric-generating units produce a single product with a small number of distinct technologies, so establishing a rate-based performance standard (pounds of emissions per megawatt of electricity generated) as currently proposed by the EPA for existing electric-generating units is straightforward.[6] However, the refining industry has multiple outputs and a wide range of production processes. A tradable standard defined in terms of refinery outputs could distort production decisions in a cost-raising way. Moreover, the variation in process complexity is more significant for refineries than for electric-generating units, making concerns about equity and distributional impacts potentially more significant for the former. Although a dominant input—crude oil—could be used to establish an input-based performance standard, variation in its quality is also tied to emissions, again raising questions about both distortions and distributional impacts.

In addition to final products, some refineries produce intermediate products that are shipped to other refineries for additional processing, further complicating development of standards. The production of a given final product may occur in stages at two distinct refineries, whereas production of electricity always occurs instantaneously at one facility. Therefore, standards for refineries may need to be distinguished on the basis of both inputs *and* outputs (or processes), because emissions at one refining stage differ from those at other stages.

The electricity produced by electric-generating units is almost entirely consumed domestically, and effectively faces no real international competition, but refined petroleum products are internationally traded. The price of refinery inputs (crude oil) and products (gasoline, among others) are set in global markets. Therefore, U.S. producers may have exceedingly limited ability to pass the cost of regulation to consumers. Many refined products are substitutable, potentially shifting production (and emissions) to other countries not subject to regulation, a phenomenon known as "leakage." On the other hand, different states within the United States have different requirements for products such as gasoline. Therefore, foreign competitors may have to adjust their product for various U.S. markets.

Because elements of pricing and reliability are regulated at the federal and state level, many electric generators do not face a market in the same way that refineries do. Some generators sell into competitive wholesale markets, but others are part of a vertically integrated market with regulated investment and rates of return. Refineries are subject to no comparable price regulation, further hampering their ability to pass along costs in the form of consumer prices.

Electric-generating units are physically connected to one another through the transmission and distribution grid; refineries are not connected through such a system. The connectivity of the former argues for a "systems-based"

6. *Id.*

approach to selection of a best system of emissions reduction on which EPA is required to base a performance standard under the Clean Air Act.[7] Such an approach may be legally more challenging to argue for in the context of the refining sector because operation of one refinery does not as heavily influence operation of another.

Similarly, electric-generating units are physically connected to their end users through the grid, whereas refineries are more loosely connected to users of fuel (i.e., automobile drivers). Therefore, refinery operators have less ability than EGU operators to influence amounts of energy use and resulting emissions. End-use (offsite) energy efficiency measures—one method of emissions reduction considered in the rulemaking process for electric-generating units—would be less feasible for refineries than for electric-generating units.[8]

Power plants are distributed across all 50 states, but refineries are clustered in particular regions near petroleum sources or shipping infrastructure. The uneven distribution of refineries among states could regionally concentrate the costs of regulation, depending on whether they are borne locally, passed along to downstream consumers, or absorbed by capital owners. Some states would not be regulated at all, and some states with only one refinery would, by themselves, not have flexibility to meet the EPA's performance standard. States where refineries are concentrated, such as Texas, Louisiana, and California, would be much more affected by the regulation than other states.

The distribution of refineries may also influence the feasibility and design of trading schemes or other flexible mechanisms. States with a single refinery or a small group of refineries would likely need to cooperate with other states to take advantage of interstate trading. This situation could allow a few states to dictate the arrangements for that trading.

A power plant typically has only one CO_2-emitting "smoke stack" per generating unit, whereas a single refinery may have dozens of emissions points. The complexity of the refinery production process—and the myriad ways that refineries combine different processes to make their products—may affect opportunities for emissions abatement. The relative simplicity of electric-generating units suggests that they could better accommodate some abatement solutions such as carbon capture and sequestration (an end-of-pipe technology).[9]

Onsite emissions from the electric power industry are an order of magnitude higher than emissions from the petroleum refining industry. The electricity sector is responsible for 31% of U.S. GHG emissions; petroleum refining contributes 2.6%.[10] The difference between the two sectors' contribution to total U.S. emissions could affect the timing of a refinery rule, because other sectors, such as oil and gas production, have emissions similar in magnitude to those of refineries.

Conclusion

The EPA may regulate petroleum refineries under § 111 of the Clean Air Act. If so some of the policies for regulating carbon emissions from electric-generating units might be translatable to a GHG performance standard for refineries. Some considerations, such as the potential need to differentiate among sources with different abatement opportunities and the argument for states' flexibility to include trading as a compliance option, would likely apply to both the electric power and the petroleum refining industries. However, rulemaking for refineries would be far more complex than for electric-generating units because of refineries' unique configurations, multistage production

7. In its power sector proposal, the EPA includes end-use energy efficiency, re-dispatch, and displaced emissions from investment in non-emitting generation as components of the best system of emissions reduction.
8. U.S. EPA, *supra* note 5 at 153.
9. The EPA has proposed partial CCS as the best system of emission reduction for *new* power plants under section 111(d), but is not proposing carbon capture and sequestration as the best system of emission reduction for existing power plants under section 111(d).
10. The United States emitted 6,526 million metric tons in 2012; refineries contributed 173.3 million metric tons CO2e, and electricity production, 2,022 million metric tons of CO2. U.S. Department of Energy, "Manufacturing Energy and Carbon Footprint, Sector: Petroleum Refining," Dec 2010; U.S. EPA, "National Greenhouse Gas Emissions Data," April 2014.

processing, and multiple inputs and outputs. Although surmountable, these challenges would make a simple transfer of EGU compliance principles to the refining sector impossible.[11]

11. For a discussion of the potential components of a refinery rulemaking, see Allison Donnelly, Kristie Beaudoin, Sarah K. Adair, Brian Murray, Billy Pizer, and Tim Profeta, "Regulating Greenhouse Gas Emissions under Section 111(D) of the Clean Air Act: Implications for Petroleum Refineries," NI WP 14-05, Nicholas Institute for Environmental Policy Solutions, Duke University, 2014.