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The potential impact of rate-based or mass-based rules on coal-producing states under the Clean Power Plan

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ABSTRACT

Simulations clearly show that the choice of rate- or mass-based standards potentially creates significant differences in incentives regarding investments in natural gas and renewable generation, and therefore the preservation of coal generation. The modeling suggests these incentives could have significant effects on coal generation outcomes, and by implication coal production in the future.

1. Introduction

Under the final Clean Power Plan (CPP) rules, among the first decisions states will have to make is whether to adopt CO_2 rate- or mass-based standards when adopting an implementation plan to control greenhouse gas (GHG) emissions from existing natural-gas- or coal-fired power plants. Under a rate-based plan, states adopt emissions standards defined as a limit on CO_2 emissions per unit of electricity produced at regulated generators within a state. Under a mass-based plan, CO_2 limits are defined as a finite total mass of emissions allowed across covered facilities within a state and covered generators must hold allowances to emit, where the total allowances available to firms sum to the state cap. The Environmental Protection Agency (EPA) has allowed states to choose either rulemaking standard and has defined CO_2 limits in each case in the final CPP rules for existing plants released on Aug. 3, 2015.[3]

The EPA has encouraged states to allow emissions trading to meet the limits of the CPP; however, states submitting to regulation under rate- or mass-based plans may only trade or cooperate with other states that choose to regulate under the same type of emissions standards. Historically, under Section 111(d) of the Clean Air Act, existing sources of emissions for other pollutants have been regulated using emissions rates. States regulating and trading emissions, however, have decades of experience regulating conventional pollutants under a mass-based standard, and previous CO_2 trading programs like the Regional Greenhouse Gas Initiative also define standards using mass-based limits.[4] The EPA claims that under their analysis, limits using rate or mass-based standards should lead to achieving an equivalent emissions goal. The choice of how to regulate, however, creates different incentives for states regarding compliance strategies, and EPA analysis indicates that mass-based standards may result in a lower total national cost of emission control. Other analyses differ, including one described here. Actual costs of pollution control will depend on how states choose to regulate, what standards states choose, and whether states themselves prefer regulating under

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[3] See the Clean Power Plan website maintained by the EPA at https://www.epa.gov/cleanpowerplan/clean-power-plan-existing-power-plants.

[4] The Regional Greenhouse Gas Initiative was the first mandatory market-based greenhouse gas emissions control program in the United States, and includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The program website can be found at www.rggi.org.

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standards they are more familiar with.

The incentives under each type of standard are quite different and the implications for regional economic impacts may also be quite different. A rate-based standard defines an intensity of emissions per megawatt-hour (MWh), and can dynamically adjust as changes in demand occur. For example, if demand increases, requiring greater generation, the actual emissions rate experienced will depend on how new generation is met. If the new load is met with low-emissions generation, the rate occurring could fall despite an increase in emissions. Under a rate-based standard, low-emissions generation may also allow other higher-emissions sources to continue operation through the creation of emission reduction credits. Under a mass-based standard, the emissions cap would be unaffected and this is not possible. This could have implications for coal production and the economic costs of the CPP regulation for coal producing states. This article investigates the potential implications of choosing rate-based or mass-based standards on coal producing states using a series of proprietary simulations based upon the National Energy Modeling System (NEMS) performed by the Rhodium Group.[5]

2. Background

Final Clean Power Plan rules for existing power plants were announced on Aug. 3, 2015. If upheld, these rules aim to reduce U.S. greenhouse gas emissions from the power sector by 32% from 2005 levels by 2030.[6] The final rule changed several areas of the 2014 proposal, though a review of all the changes is outside the scope of this article.[7] The 2014 rules streamlined the ability of states to engage in regional cooperative strategies to reduce the costs of implementing the new regulations, and the final rules attempt to encourage such actions. The changes also made the rules more consistent with other stationary source regulations under the Clean Air Act (CAA). For example, the original 2014 proposal potentially allowed states to decide the compliance entity accountable for ensuring regulations are met. In the proposal the responsible entity could have ranged from individual sources, to utilities and their fleet of sources, to state agencies overseeing all sources within a state's borders. The 2015 rule makes the individual emitter solely responsible, which is consistent with other CAA regulations. This also simplifies the rulemaking for emissions trading and other market-based strategies for compliance by allowing trade to more easily be defined between sources. The final rule also includes model trading rules to help facilitate and coordinate the development and organization of such trading efforts.

Importantly, to ensure consistency with other CAA regulations, which have historically been defined in terms of emission rates, but also with the fact that existing trading efforts in GHGs define mass-standards, targets for states were defined under both rate- and mass-based standards. Among the first decisions states will have to decide is whether to adopt CO_2 rate- or mass-based standards when formulating their state implementation plans (SIPs).[8] In the final rule, these are due by Sept. 6, 2016, unless an extension is requested, in which case states may have until 2018 to develop their respective plans, including multistate cooperative plans such as emission trading across state lines.[9] If states do not submit such a plan a Federal Implementation Plan (FIP) will be imposed within two years of non-compliance. Currently, a final FIP is not defined; however, two proposals currently exist – one a mass- and the other a rate-based plan.[10] Importantly, states adopting mass- or rate-based standards will only be allowed to create such trading plans with other states adopting regulation under a similar standard.

Under both mass- or rate-based rules, the EPA originally estimated that the choice of regulation would not fundamentally change emissions outcomes; however, their simulations did indicate that this choice could alter the total incremental cost of the rule, and costs faced by consumers. Modeling the 2015 rules assuming a nationalwide trading regime and single mass- or rate-based choice by all states, the EPA estimated the incremental cost of the CPP above a business as usual (no-CPP baseline) of between $5.1 billion under a mass-based approach to $8.4 billion under the rate-based approach. Despite these added costs, the EPA (2015) estimated that the average consumer's electricity bill would decrease by between 7% and 7.7%, respectively, by 2030 due to reduced power consumption and energy efficiency measures, while retail electricity rates were nearly unchanged from their business as usual projections.[11]

The emphasis on emissions trading in final 2015 CPP rules is consistent with several modeling results for rules under the 2014 proposal, which found that wider trading reduced significantly the potential cost of meeting the CO_2 standards of the CPP.[12] Reduced costs of implementation also reduce the impact of the rules on coal producing states like Wyoming as shown in Godby et al. (2015a,b) and Godby and Coupal (2016). Those results, using simulation results from Larsen et al. (2014) and the EIA (2015) to estimate state impacts as well as state revenue outcomes for the implementation of the 2014 CPP rules showed that wider trading could reduce such impacts from by 7–8% in the case of employment losses for Wyoming, the nation's largest coal-producing state.[13]

[5] Additional results from the simulations reported here can be found in Larsen et al. (2016a,b,c), and Larsen and Herndon (2016).

[6] These rules are currently under a stay by the U.S. Supreme Court pending the resolution of legal challenges to the rule. The stay was granted Feb. 9, 2016, and the notice of stay can be found at http://www.supremecourt.gov/orders/courtorders/020916zr3_hf5m.pdf.

[7] For a review of changes written shortly after the final rule was announced, see Ramseur and McCarthy (2015). Also, see Larsen et al. (2015) for a summary discussion.

[8] Under the mass-based standards, states will also have to decide whether to cover (i) only existing fossil-fuel generators while adopting a specific allowance distribution approach defined by the EPA in its model rules, or (ii) to cover both existing and new generation under a slightly higher cap defined by the EPA. This additional decision was necessitated by the fact that the rules for existing generators fall under the Clean Air Act's 111(d) portion of the rule, while new generators fall under separate 111(b) rules in the Clean Power Plan, which define emissions rates for new sources. Capping the emissions mass from existing power plants only could result in an incentive to build new fossil-fuel generators to avoid the rule's emission mass constraint, shifting generation to these new plants and thereby increasing total emissions beyond what the 111(d) rule intends. This is termed as "leakage" by the EPA. To avoid this incentive these additional considerations have been imposed on states opting for a mass-based plan to ensure that outcomes are broadly consistent with incentives and outcomes under a rate-based approach. For a deeper discussion and analysis of the potential impacts of leakage on CPP outcomes under a mass-based approach, see Larsen et al. (2016a).

[9] The U.S. Court of Appeals, D.C. Circuit will hear the appeal on Sept. 27, 2016. Since this is after the official deadline for states to submit initial implementation plans, the timetable of the rule will have to be delayed regardless of the appeal's outcome.

[10] A summary of the rule and its implications for state action can be found in Durkay (2016).

[11] Mass-based outcomes were modeled presuming only existing sources were covered, and that 5% of emissions allowances were set-aside to recognize and support the deployment of new renewable capacity. This is consistent with choice (i) in note 6.

[12] Larsen et al. (2014) consider the impact or regional versus national trading on 2014 CPP proposal outcomes using their version of the National Energy Modeling System (NEMS-RHG), while Hopkins (2015) describes the results of several simulations across a variety of models. EIA (2015) also estimated costs of the 2014 proposed rules, including under three trading scenarios.