COMMENTS OF THE ELECTRIC POWER RESEARCH INSTITUTE ON

ENVIRONMENTAL PROTECTION AGENCY

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[EPA–HQ–OAR–2015–0199; FRL 9930–67–OAR]

Federal Plan Requirements for Greenhouse Gas Emissions from Electric Utility Generating Units Constructed on or Before January 8, 2014; Model Trading Rules; Amendments to Framework Regulations

January 11, 2016

The Electric Power Research Institute, Inc. (EPRI) respectfully submits the enclosed comments[1] on the U.S. Environmental Protection Agency's (EPA's) proposed rule titled Federal Plan Requirements for Greenhouse Gas Emissions from Electric Utility Generating Units Constructed on or Before January 8, 2014; Model Trading Rules; Amendments to Framework Regulations. EPRI thanks the EPA for the opportunity to comment on this proposed rule.

EPRI is a nonprofit corporation organized under the laws of the District of Columbia Nonprofit Corporation Act and recognized as a tax exempt organization under Section 501(c)(3) of the U.S. Internal Revenue Code of 1986, as amended, and acts in furtherance of its public benefit mission. EPRI was established in 1972 and has principal offices and laboratories located in Palo Alto, Calif.; Charlotte, N.C.; Knoxville, Tenn.; and Lenox, Mass. EPRI conducts research and development relating to the generation, delivery, and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, health, safety, and the environment. EPRI also provides technology, policy, and economic analyses to inform long-range research and development planning, as well as supports research in emerging technologies.

Specifically related to this proposed rule, EPRI has been involved in global climate change-related research for more than 20 years, with economic and integrated assessment analyses and expertise related to emission projections, mitigation technologies, and climate economics. Technology assessment and technology innovation have been central to EPRI's activities since its inception. EPRI work spans nearly every area of electricity generation, delivery and use; management; and environmental responsibility. In assembling these comments, EPRI draws upon decades of experience and expertise in wide ranging

[1] This document is EPRI Report 3002007325.

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research efforts associated with heat rate improvements, natural gas generation, and nuclear and renewable technologies as well as energy utilization across the electric sector.

EPRI’s comments on the proposed rule reflect this background in that they are technical rather than legal in nature, and they are based upon EPRI’s experience over the last 40 years in technology innovation, planning, and analysis for the electric industry. EPRI’s high level comments focus principally on following key areas:

- Inclusion of Energy Efficiency
- Evaluation, Measurement, and Verification (EM&V) for Energy Efficiency
- Credit for Nuclear Life-extension
- Reliability
- Choice of Rate vs. Mass Final Plans
- Allowance Allocation
- Allowance Banking
- Output-based Set-asides (OBS) for NGCCs in the Mass Model Rule

In addition, a more detailed section on the OBS provision also is included. All comments contained in this letter reflect only EPRI’s opinion and expertise and do not necessarily reflect the opinions of those supporting and working with EPRI to conduct collaborative research and development.

EPRI hopes its comments and technical feedback on the proposed Federal rule will be valuable to EPA.

Sincerely,

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Inclusion of Energy Efficiency

In the Federal Plan, EPA proposed to limit the issuances of Emission Rate Credits (ERCs) to designated categories of affected Existing Generation Units (EGUs) and to renewable resources and nuclear generation. This would exclude energy efficiency from being eligible to generate ERCs in a rate-based Federal Plan [FED, p64989-90], in contrast to the Clean Power Plan Final Rule, which explicitly includes energy efficiency as a source of ERCs. The EPA requests comments on whether to limit the scope of the Federal Plan in this manner [FED, p64990]. As energy efficiency is a potentially low-cost zero-emission resource, and as long as there is quantifiable verification of energy efficiency impacts, EPRI suggests that EPA include it as a potential mitigation option – i.e. ERC source – under a rate-based Federal Plan.

Evaluation, Measurement, and Verification for Energy Efficiency

The EPA requested comment on a broad range of issues relating to energy efficiency evaluation, measurement, and verification (EM&V) [FED, p65007] under a rate-based Federal Plan. In general, EPRI agrees with the methods for EM&V that are within the EM&V Guidance document, and suggests these be appended to the rate-based Federal Plan if energy efficiency is included as an ERC source. These methods follow accepted practices and will ensure quantifiable verification of energy efficiency impacts. EPRI emphasizes the need to ensure that energy efficiency ERCs generated in different states are equivalent. If national consistency is not required, varying levels of rigor across jurisdictions may undermine the validity and tradability of energy efficiency sources of ERCs.

Credit for Nuclear Life-extension

The EPA requested comment on what other sources of low- or zero-emitting electricity should be included in a possible rate-based Federal Plan [FED, p64990], in addition to new renewables, new nuclear units, and nuclear uprates. In addition to energy efficiency (per discussion above), EPRI suggests that EPA consider explicitly allowing generation from existing nuclear units that have undergone a life extension on or after 2013 to count as a source of ERCs. This is consistent with EPA’s treatment of nuclear unit uprates, and new nuclear units, as a life extension essentially is a new source of zero-CO_2 generation. If the unit were instead to retire, it would be mostly likely replaced at least partially with new unaffected natural gas generation. For example the Carlsbad Energy Center, 600 MW of new natural gas generation, is being proposed as a (partial) replacement to the recently-closed San Onofre nuclear units. Providing an incentive to maintain nuclear output beyond current licensed lifetimes is consistent with the goals of the Clean Power Plan.

Currently nuclear energy provides nearly 20% of the electricity generated in the United States, and about 60% of U.S. carbon free generation. There are currently 99 units in operation and five units under construction. While the nuclear plants were initially licensed for 40 years, 81 plants have received license extensions allowing them to operate out to 60 years.

At this time, a real possibility exists to extend the license for nuclear plants out to 80 years. The U.S. Nuclear Regulatory Commission announced that it is preparing to receive the first submittal of an application for Subsequent License Renewal (to 80 years). One utility (Dominion) recently announced its intent to evaluate seeking the second license extension.

Subsequent license renewal could provide a significant source of non-carbon emitting generation. For example in 2050 an additional 800 TWh of carbon free generation could be available if 80% of the current fleet were to extend licenses out to 80 years instead of retiring from operation after 60 years.

The decision to seek license extension and to operate a nuclear plant for a longer period of time is a deliberate one and is weighed against other generation options. The rate-based Federal Plan, as proposed, does not create any credits or incentive for a company to make this decision in favor of the nuclear license extension.

If retired nuclear generation is replaced by natural gas, significant CO_2 emission increases could be experienced. Addressing this potential increase will impact the ability of some states to meet the 2030 goals and will pose a significant challenge in the period 2030 to 2050.

Reliability

The EPA asserted that no reliability safety valve is needed for a rate-based Federal Plan, since “inflexible requirements are not imposed on specific plants” [FED, p64982]. EPRI cautions that this may not be true for states with new nuclear units. If there is an extended outage for one of the new units, strict compliance with the Clean Power Plan will leave states in a double bind of (1) not having the output from the nuclear units and (2) not having the ERCs the new units were creating available to support compliance of the existing fossil fleet. Compliance will require either acquiring ERCs from other states (assuming there are other states choosing rate pathways and are thus able to supply ERCs), or cutting back existing fossil generation to a level that can be supported by the supply of non-nuclear ERCs. The existing Reliability Safety Valve, even if permitted by the EPA, does not apply here, as it only covers short outages of 90 days or fewer. The three year compliance periods will enable states to defer immediate action, but that will require a greater response later in the compliance period to maintain a constant average adjusted emissions rate. EPRI suggests that EPA acknowledge this possible supply risk and provide states with a mechanism to defer compliance during extraordinary supply disruptions. Additionally, there might be other unforeseen reliability challenges that warrant this same mechanism.

Choice of Rate vs. Mass Final Plans

The EPA stated its intent to finalize a single approach for the Federal Plan; either rate-based or mass-based, but not both [FED, p64970]. The EPA requested comments on which approach is preferred for the Federal Plan. EPRI sees potential advantages and challenges for states to both rate and mass-based plans, and no clear universal choice. However, EPRI does suggest that EPA consider the status and robustness of existing and pending state-created trading markets when finalizing a Federal Plan. This will help ensure that the states subjected to the plan will be able to participate in ERC/allowance trading in an active market. If most states chose a mass pathway, subjecting a state to a rate-based Federal Plan (or vice-versa) would limit the opportunities for cost management through trading. A state facing a thin market may also have reliability impacts if unforeseen circumstances force the state to the market to assure compliance. Uncertainty on the depth and liquidity of future rate vs. mass-based compliance markets argues for EPA to keep both options open.

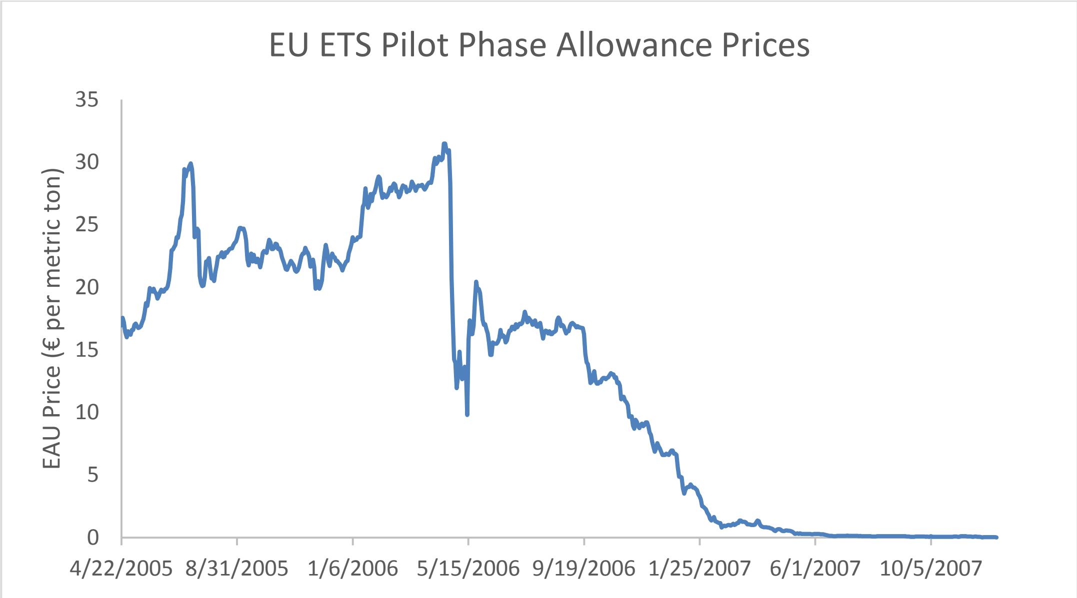
Allowance Allocation

The EPA proposed allocating most of the CO_2 allowances in the mass-based Federal Plan to affected EGUs based on historical generation, minus set-asides for the Clean Energy Incentive Program and output-based subsidies, where applicable [FED, p65016]. EPRI sees two circumstances in which allowance allocation alternatives may impact economic efficiency (policy cost) and market liquidity. First, EPA is currently proposing that allowances be allocated to affected generators based on historical output, and that if affected units retire their allocations cease after as little as two years [FED, p65026]. This creates an incentive for those units to keep operating beyond the point where simple economics would have them retire, potentially operating at low levels of output for additional years to continue receiving allowances. This would be economically inefficient. EPRI suggests EPA remove this restriction on allowance allocations to retired units to limit this perverse incentive.

Second, EPA is also seeking comment on allocating allowances to other sources, such as load serving entities [FED, p65018]. From an economic theory perspective, this should not affect compliance costs or allowance prices. However, the practice may be different. Distributing allowances to entities that do not have a direct need to use them for compliance may delay entry into the market as these entities decide the disposition of their allocations, leaving the market short. EPA can mitigate this effect by requiring such non-principal entities to commit/sell their allocations to the market on a timely basis or have the allocations retracted and redistributed to affected generators or other participants.

Allowance Banking

The EPA is seeking comment on the proposal to allow for unlimited allowance or ERC banking between present and future compliance periods [FED p65014, p65010 respectively]. EPRI supports EPA’s proposals for both allowances and ERCs. Prohibiting the use of allowances or ERCs in future compliance periods renders them perishable. This creates an inefficient incentive to use them or lose them, similar to what was seen at the end of the European Union’s Pilot Phase Emission Trading Scheme (figure below), where Phase I allowances had no value in subsequent periods. The allowance price went to zero, removing incentives to mitigate emissions. Allowing credits/allowances to be banked obviates this inefficient market incentive and reduces price volatility.



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Output-based Set-asides for NGCCs in the Mass Model Rule

The EPA requested comment on the proposed requirement for state plans to create an output-based allowance allocation set-aside program (OBS) for existing NGCC units in states choosing the Existing Mass (Mass Model Rule) compliance pathway. EPA asked for comments on all aspects of the proposed approach to calculate output-based set-asides. [FED, p65022].

EPRI suggests that the EPA can greatly simplify the mass-based Federal Plan by dropping the requirement to have an OBS program for existing NGCCs, at no significant increase in total CO_2 emissions. The proposed OBS program for existing NGCC units offers no environmental benefit unless it facilitates participating units to operate at power prices below their incremental dispatch costs. In practice, challenges such as risk, uncertainty, and time delays for receiving the required subsidies will likely limit participation.

Even if the program were redesigned to make it more attractive to participants, economic analysis suggests it will have little impact due to limited opportunities to increase NGCC output in an environment already strongly incentivizing NGCC use, and the effect of capital costs on new NGCC units' competitiveness as a compliance mechanism. EPRI's simulations confirm this finding. While preliminary, EPRI's results suggest only a 1.8% reduction in CO_2 as a consequence of the OBS. As these ideal-circumstances do not consider the practical barriers to participation from uncertainty and risk mentioned above, this reduction is best interpreted as an upper bound.

More detailed discussion of the basis for this suggestion to drop the NGCC OBS requirement is contained in the Appendix. EPRI makes no comment on the Model Rule's OBS for renewable energy, or the Clean Energy Incentive Program (CEIP) mechanism.

Appendix: Supporting Comments on Output-based Set-asides for NGCCs in the Mass Model Rule

The mass-based Federal Plan sets a cap on emissions for existing steam and NGCC units, while new NGCC units are regulated under Section 111(b). The intent of the OBS requirement is to limit leakage around the cap from displacing existing NGCC generation with new NGCC generation. The EPA expects the OBS to accomplish this by providing an incentive for increased generation from existing NGCC units. Note that the proposed OBS program for existing NGCC units offers nothing additional unless the subsidized units are operating at power prices below their incremental dispatch costs.

The OBS program establishes a pool of allowances, set aside from each state's total allocation (i.e., the mass cap). The set-aside pool varies by state, ranging up to 20% of the total allocation, based on a formula set by the EPA. Under this program, existing NGCC units can claim 1,030 lb. of allowances per MWh, for each MWh generated over their respective 50% capacity factors (CFs), but do not receive the set-aside until the next compliance period, when their total eligible output in the current period is known. The subsidy could be large, for example if the allowance price is $20/ton when the set-aside is distributed, this would result in an ex-post subsidy of more than $10/MWh. If nothing else changed, this would allow an NGCC unit to operate profitably at lower power prices than otherwise, and produce greater output.[2]

However, the set-aside subsidy applies to other existing NGCC units as well, and their bid prices will also be correspondingly lower, assuming they meet the 50% CF requirement. If one of these subsidized units sets the price, then the incentive for increased output collapses, as the subsidy is offset by an equivalent fall in the wholesale price. In this scenario, the net increase in output from existing NGCC units may be small. If power prices are being set by renewables, where incremental cost is zero or negative (due to incentives such as the PTC), then once again the result is little incremental output. The best opportunities for increased output from the NGCCs due to the OBS are when the dispatch cost of coal (including CO_2 emission charges) is less than the dispatch cost of NGCCs without the OBS, but inclusion of the OBS reverses the economics. Only then does the dispatch change and the NGCCs displace coal. The effectiveness of the OBS in creating additional output depends on how much of the time these particular circumstances occur.

There are practical challenges as well. The time differential between when NGCC units operate versus when they receive the set-asides introduces uncertainty and risk. The uncertainty in future allowance prices means NGCC operators may not have a confident estimate of the next period's allowance price. If the price ends up below their planned value, they lose money on some of their output (when they were operating at a loss in anticipation of greater-sized subsidy). The uncertainty and risk will be greatest at the beginning of the compliance period, when set-aside deliveries are (up to) three years away, though less when the compliance period nears its end. Operators may well use the current allowance prices as a proxy for the future price (if they assume an efficient market with banking), but they will have to sell the expected set-asides earned short in the forward market to avoid incurring further financial risk. [3] If the

[2] If the allowance price in the current period was also $20/ton, an NGCC with an 830 lb/MWh emission rate would have to include an $8.30 adder to its dispatch price (market price at which it can profitably dispatch).

[3] Note that if there are active forward markets for next time period allowances, this uncertainty can be managed, but that requires the NGCC to sell its expected set-asides short as it earns them). Frequent trading engenders transaction costs which will diminish the value of the set-asides.

operator does not cover in forward market the lag in subsidy payments creates a financing cost, as operators must cover the current period losses before recovery of the loss in the following compliance period.

Another source of uncertainty is the great disparity in the economics between NGCC units that expect to have high capacity factors, versus those closer to the 50% CF threshold for eligibility. Units will not know their capacity factors in advance, as future output depends on the day-to-day, hour-to-hour interplay of market prices vis-à-vis their dispatch prices, all influenced by natural gas prices, coal prices, load, renewable output, and plant outages, and all uncertain. Unless an NGCC unit is confident it will be above the 50% CF threshold for its output over the next three years, there is an added risk to pursuing the subsidy. If a low-CF NGCC unit bids aggressively in anticipation of the set-aside subsidy next period – in other words, racks up current period losses to increase its output – the effort to get to the 50% threshold is uncompensated. That loss would only be recovered on output beyond the 50% level and will be hard to make up. Per the $10/MWh subsidy example above, if the unit was losing an average of $6/MWh to get to the 50% point, it will only recover at a rate of $4/MWh once it gets the $10 subsidy. It may then have to operate at a much higher CF to break even, and then the incremental benefits would be small. Few existing NGCC units are likely to choose to accept this proposition.

NGCC units with expected CFs above 50% do not face this downside risk. All of their output above the threshold earns future set-asides, whether or not they choose to bid below their dispatch price to earn still additional set-asides.

There is also potential risk if the program is oversubscribed. EPA sets the size of the set-aside pool to approximately equal to a 10% increment to the state average CF for NGCCs. If the incremental eligible output were to exceed that total, the set-asides would have to be pro-rated, reducing the payout below the 1,030 lb/MWh value. For the reasons outlined above, this seems unlikely.

Lastly, it should be noted that the OBS for NGCC units compete at the margin with the OBS for renewable energy. A successful NGCC OBS will exert the same economic pressure on renewables that it exerts on new NGCC units, by reducing the distribution of wholesale power prices and thus the profitability of new capacity. For these reasons the effectiveness of the OBS will be limited, with little additional output from the affected fossil fleet.

Even if it could be redesigned to make it more attractive to participants, an OBS for NGCCs is unlikely to achieve much benefit in reduced output/emissions from new NGCC units. This is due to the basic comparative economics of new versus existing NGCC units. Essentially, they do not compete with each other, so incenting increased output from existing NGCC units does not directly reduce the need for new NGCC units. Incremental supply from new NGCC units carries fixed costs to build the unit, while for existing NGCC units, incremental costs are solely the extra fuel and O&M, and the CO_2 emission charges. Existing units will likely be less efficient than new units, but the translation to fuel cost differences is modest. The real challenge is that new NGCC units must recover incremental capital costs to build the unit. For a new NGCC unit operating at a 60% capacity factor, the fixed cost averages $23/MWh. While new units avoid the CO_2 emissions costs facing existing units, it would take a CO_2

price of approximately \$50 per short ton to offset the fixed cost burden for a new unit.[4] \$50 per ton is higher than anything EPRI has seen in EPA's simulation results, and EPRI's own simulation results. The bottom line is that new NGCC units are an expensive alternative for cutting emissions of affected NGCC units, and the incentives to bypass the Clean Power Plan through this mechanism are weak.

This conclusion is borne out by EPRI's own simulation results assessing the implications of the Clean Power Plan pathways for seven different states using its US-REGEN 48 state electric sector model. Since release of the Proposed Rule in 2014 and the Final Rule in 2015, EPRI has been working with its members and other stakeholders via national and state-level analyses to help understand the cost and other implications of EPA's suggested rate and mass compliance pathways. This includes simulation of the Mass-based Model Rule, with output-based set-asides for renewable energy and NGCC units per the proposed Model Rule.[5] While these analyses have focused on high-level comparisons of pathways, and not on direct analysis of output-based set aside provisions, EPRI believes these simulations faithfully and fully model the NGCC output-based set-aside as currently proposed, though they assume an ideal implementation with optimal decision making and no uncertainty. These ideal-circumstance results show only a 1.8% reduction in CO_2 as a consequence of the OBS.[6] As this excludes any accounting for the practical barriers to participation from uncertainty and risk, as discussed above, this value is best interpreted as an upper bound. Given our findings, EPRI suggests that EPA reconsider requiring output-based set-asides for the existing mass Model Rule. EPRI stands ready to discuss its methodological approach with EPA to support this conclusion.

[4] Assume new NGCC cost is \$1,200/kW and an annual capital charge rate of 10%, the annual capital costs are \$120,000/MW. If the unit has a 60% capacity factor, the average cost is \$23/MWh [\$120,000/(0.6*8760) = \$22.83/MWh]. A 7 MMBtu/MWh exiting unit emits 0.406 CO_2 tons/MWh. In that case the breakeven CO_2 price = 22.83/0.406 = \$56.2/ton. Adjusting for fuel savings from the new unit brings the breakeven to \$52.50. The breakeven is lower for less efficient existing units: \$37 for an 8 MMBtu/MWh unit, \$25 for a 9 MMBtu unit, though such low efficiency units would likely have capacity factors below 50% and not be candidates for OBS.

[5] At the time of writing, EPRI has not yet simulated the CEIP as part of these analyses.

[6] From an illustrative simulation of CPP compliance with RGGI states and CA selecting NSC Mass path, GA, SC, and TN selecting a Subcategory Rate path, and the rest of the states selecting Existing Mass path with OBS, AEO2015heur (low) gas prices. Assumes Existing Mass states trade allowances, and the Rate states trade ERCs, but the NSC trading blocs do not trade. Result is for 2030, when the impact of the OBS is most notable. The impact on cumulative emissions to 2050 is less than 0.5%.

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