UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

MEMORANDUM

To: Docket EPA-HQ-OAR-2015-0199

From: U.S. Environmental Protection Agency, Office of Air and Radiation

Date: August 2015

Subject: Allowance Allocation Proposed Rule Technical Support Document (TSD)

This memorandum provides information to support the EPA's approach to distribute CO_2 allowances in the proposed Clean Power Plan emission guidelines (EGs) mass-based federal plan.[1] As detailed in section V.D of the preamble to the proposed federal plan, the EPA would distribute an amount of CO_2 allowances in each state, for each year in each compliance period, equal to annual emission totals that are consistent with the statewide mass-based emissions goals promulgated in the EGs.[2] The EPA would base the distribution of allowances to affected electric generating units (EGUs) on each unit's share of state-level historical generation. The EPA would also create three set-asides of allowances: (1) an early action set-aside; (2) a set-aside for output-based allocation to affected EGUs that are natural gas combined cycle (NGCC); and (3) a set-aside for renewable energy projects. Excepting the allowances distributed from those set-asides, the EPA would distribute allowances in each state to affected EGUs using the historical-generation based approach.

This memorandum provides additional explanation for the historical-generation based allocation approach, the early action set-aside, and the set-aside for output-based allocation. A separate technical support document (TSD), titled "Renewable Energy Set-Aside Technical Support Document (TSD)," details the renewable energy (RE) set-aside.

The preamble to the proposed federal plan requests comment on allocating a portion of allowances to load-serving entities (LSEs) but does not propose to allocate to LSEs. States may also have an interest in an allocation to LSEs under a state mass-based plan; this memorandum provides additional information on allocating to LSEs.

The memorandum is organized as follows:

[1] 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.

[2] In this TSD, the term "state" generally encompasses the 50 states and the District of Columbia, U.S. territories, and any Indian Tribe, to the extent that the associated rulemaking is applicable to such jurisdictions.

This memorandum includes the following Appendices (attached Excel Workbooks):

- Appendix A: Calculated Historical-Generation Based Allocations and Underlying Data
- Appendix B: Clean Energy Investment Pool Early Action Set-Aside Size Calculation
- Appendix C: Output-based Allocation Set-Aside Size Calculation

1.0 HISTORICAL GENERATION-BASED ALLOCATIONS TO EGUS

Section V.D.1 of the preamble to the federal plan details the proposed approach to allocate allowances to affected EGUs based on historical generation data. This TSD provides additional information in support of the proposed approach. With the exception of allowances distributed from set-asides, the EPA would distribute all allowances in each state to affected EGUs based on each unit's share of state-level historical generation.

The EPA calculated proposed unit-level allocations using average annual net generation over the period 2010 through 2012 for all units that are identified as likely affected units in the 2012 adjusted baseline data from the EGs. The EPA included generation from, and calculated allocations to, all such units including units that may cease operations prior to the start of the program (i.e., prior to the first compliance period). For units that commenced operation in 2010 or 2011, the EPA excluded data from that year from the calculations. For units that were under construction and commenced operation during or after 2012, the EPA estimated 2012 net generation based on the unit's net summer capacity, assuming a 55 percent capacity factor for combined cycle gas units, a 60 percent capacity factor for steam units, and 8784 hours per year.[3] This wass the same approach taken to estimate 2012 generation for under-construction units in the Clean Power Plan EGs (see CO_2 Emission Performance Rate and Goal Computation TSD for the CPP Final Rule).

The units in the 2012 EGs baseline do not match one-for-one with the EGUs to which the EPA would allocate allowances. This is because the units in the 2012 EGs baseline are at the generator level while affected EGUs that would be subject to the federal plan are boiler-level. The EPA proposes to allocate allowances to affected EGUs at the boiler level.

The EPA first determined allocations at the generator level using 2010 through 2012 Energy Information Administration (EIA) net-generation data. Then, the EPA translated the resulting generator-level

[3] The EPA assumed 8,784 hours per year because 2012 was a leap year.

allocations to the boiler level by matching generators to boilers. The EPA matched generators to boilers using an approach similar to the matching approach that is discussed in the CO_2 Emission Performance Rate and Goal Computation Technical Support Document for the CPP Final Rule. For combined cycle units, the allocations were summed across all generators within a plant and then distributed to the units in the plant, based on the proportion of heat input from the EIA-923 Boiler file. For all other units: (1) if there was a one-to-one boiler-to-generator relationship, the allocation was matched directly with the boiler; (2) if multiple generators were associated with one boiler, then the allocations were summed across generators and matched to the boiler; (3) if multiple boilers were matched to multiple generators, then the generator-level allocations were summed and distributed to the boilers, based on the proportion of heat input from the EIA-923 Boiler file. If heat input data was unavailable, then the allocation was distributed to all boilers equally. The resulting boiler-level allocations are shown in Appendix A to this TSD, in the worksheet labelled "Proposed FP Allocations" – these are the proposed EGU allocations for the mass-based federal plan. The EPA rounded each EGU's allocations to the nearest ton.[4]

The 2010 through 2012 generator-level data that the EPA used to determine generator-level allocations before translating to boiler-level allocations, are provided in Appendix A, in the worksheet labelled "Underlying Generator-Level Data." The worksheet shows the calculated generator-level allocations, which are a step before translating to boiler-level allocations.

As detailed in section V.D.1 in the proposal, the EPA calculated allocations for all EGUs in the 2012 adjusted baseline from the EGs, regardless of whether any unit in that baseline may retire prior to the start of the first compliance period. The proposed allocations for all such EGUs (i.e., all EGUs in the 2012 adjusted baseline) are provided in Appendix A to this TSD in the worksheet labelled "Proposed FP Allocations" – these are the proposed allocations for the federal plan.

While proposing to allocate allowances to all EGUs in the 2012 adjusted baseline, the proposal also requests comment on the EPA's treatment of allocations to units included in the 2012 data set that cease operations before the start of the first compliance period. In section V.D.5 of the preamble to the proposed federal plan, the EPA proposes that if an affected EGU does not operate for 2 full consecutive calendar years, then starting with the next compliance period for which allowances have not yet been recorded, the allowances that would otherwise have been distributed to the unit would be allocated to the RE set-aside for the state in which the unit that ceased operations is located. As discussed in the preamble, the EPA proposes to record allowances by June 1, 2021 for the first compliance period (2022 through 2024). If the approach detailed in section V.D.5 is applied to a unit that ceases operations before the start of the program, then a unit that ceases operations by the end of 2018 (i.e., doesn't

[4] In this TSD all references to "tons" are "short tons," unless otherwise noted.

operate in calendar years 2019 or 2020) would not receive allocations. A unit that ceases operations in 2019 or 2020 would receive allocations for the first compliance period.[5]

Another approach for addressing units included in the 2012 data set that cease operations before the start of the first compliance period is to not allocate allowances to any unit that has an effective retirement date, or otherwise ceases operations, prior to January 1, 2021 (this date is before June 1, 2021, the proposed date by which the EPA would record allowances for the first compliance period). In this alternative approach, a unit submitting a retired unit exemption form with an effective retirement date of January 1, 2021 or earlier would not receive allocations for the proposed federal plan, and those allowances could instead be distributed to the RE set-aside, the output-based set-aside, or remaining affected EGUs in the state. In effect, this later cut-off date would reduce the amount of allowances being allocated to units that have no need of them for compliance purposes.

The proposal also requests comment on an alternative of continuing allocations to units that retire, instead of ceasing allocations to the retired units starting with the next compliance period for which allowances have not yet been recorded for the unit. Another approach would be to continue allocations to such units for a longer period, e.g., for two or three compliance periods or, for example, for ten years. The EPA urges such commenters to include suggested rationales for such an approach.

The EPA anticipates that it would know if a unit does not operate for two full consecutive calendar years, or on or after January 1, 2021, based on information that the unit owner or operator reports to EPA in accordance with 40 CFR part 75 (i.e., submission of a long term cold storage notification under 40 CFR 75.61 (a)(7) or quarterly emission data reports under 40 CFR 75.64 with zero operating time) and/or if a unit submits a retired unit exemption form. A retired unit exemption form is required for a unit to become exempt upon retirement from the Acid Rain Program (ARP), Clean Air Interstate Rule (CAIR), and Cross State Air Pollution Rule (CSAPR). The EPA anticipates expanding the use of the retired unit exemption form to include the proposed federal plan. In order to ensure that it has accurate information regarding units' operating status prior to the start of the compliance periods, the EPA is considering requiring a unit that retires before January 1, 2021 to submit by that date a retired unit exemption form.

Recognizing the distinction between units that permanently retire versus those that simply cease operating for an extended period of time, the proposal also requests comment on the treatment of allocations to units in long term cold storage. In the proposed approach, a unit in long term cold storage for two full consecutive calendar years would, starting with the next compliance period for which allowances had not yet been recorded, permanently cease receiving allocations.

The EPA proposes that the allowances for the proposed set-asides would be deducted from the total budget for a state prior to the historical generation-based allocation. Allowances remaining in under-

[5] Note that the issue of allocations of allowances to units that cease operations is distinct from the proposed compliance-exemption provisions for units that "permanently retire."

subscribed set-asides would be recycled back into the historical-generation allocation for distribution to the affected EGUs. Table 1 summarizes the set-asides that the EPA proposes to apply in each compliance period. Sections 2 and 3 in this TSD provide further information on the proposed Clean Energy Incentive Program (CEIP) early action set-aside and output-based allocation set-aside (OBA), respectively. Further information on the proposed renewable energy (RE) set-aside is provided in a separate TSD (see Renewable Energy Set-Aside TSD).

Table 1 – Allowance Set-Asides

Interim period			Final period
1st Compliance Period 2022-2024	2nd Compliance Period 2025-2027	3rd Compliance Period 2028-2029	2030-2031 and thereafter
CEIP + RE	OBA + RE	OBA + RE	OBA + RE

The sizes of the proposed CEIP and OBA set-asides are not based on fixed percentages and vary by state (the proposed RE set-aside is 5 percent in every state). Because the percentage of total allowances that the EPA would distribute to the set-asides varies by state, the percentage of allowances that the EPA would allocate to affected EGUs using the historical-generation approach also varies by state. On a nationwide basis, the EPA would allocate 90 percent of total allowances to affected EGUs for the first compliance period, based on the historical-generation approach, and 89 percent for each subsequent compliance period.[6]

2.0 CLEAN ENERGY INCENTIVE POOL EARLY ACTION SET-ASIDE

Section V.D.4 in the federal plan details the proposed approach to calculate the size of the Clean Energy Incentive Pool (CEIP) early action set-aside in each state. As discussed in that section, the EPA would determine the size of the early action set-aside in each state by distributing 300 million CO_2 allowances among all the states based on each state's relative share of the total reductions from the 2012 adjusted baseline mass emissions to the 2030 statewide mass goals. The EPA would set aside 100 million allowances from the total available in each year of the first three-year compliance period to make a total

[6] The EPA would handle the allocation of allowances in a state under a final federal plan only if the state did not submit an approvable state plan (or approvable state-determined allowance distribution methodology).

of 300 million allowances.[7] By setting the size of the proposed federal plan CEIP set-asides nationwide at 300 million allowances, the EPA would be allowing those states subject to a federal plan to be able to potentially access the full amount of their state's pro rata share of the 300 million-allowance federal CEIP "match." (The total size of the EPA match was set in the EGs.)

To calculate the set-asides in this proposed approach, the EPA compared each state's 2012 adjusted baseline CO_2 to its 2030 statewide mass goal. The EPA used the 2012 adjusted baseline CO_2 mass emissions from the state-level data in Appendix 3 of the CO_2 Emission Performance Rate and Goal Computation TSD for the CPP Final Rule. The EPA summed each state's adjusted baseline coal, NGCC, and oil/gas (OG) steam emissions from Appendix 3 to arrive at state total adjusted baseline CO_2 emissions. The resulting state total CO_2 emissions are shown in Appendix B to this TSD, in the workbook titled "CEIP Early-Action Set-Asides." The workbook also shows the calculation steps that the EPA took to determine the size of the proposed early action set-asides for each state.[8]

For all but four states, the 2030 mass goal is lower than the adjusted baseline. For the four states where the 2030 mass goal is higher than the adjusted baseline, the EPA calculated set-asides equal to 1 percent of the state's 2030 mass goal.[9] The EPA subtracted the sum of the set-asides for those four states (110,968 tons) from the total nationwide allowances available for each year of the set-aside (100 million tons), which results in 99,889,032 tons to be distributed among the remaining 46 states (for which the EPA established goals in the EGs) for each year of the set-aside.

The EPA then distributed the 99,889,032 tons among the 46 states in proportion to each state's relative share of the total reduction from the 2012 adjusted baseline to the 2030 statewide mass goals. The calculations and resulting set-asides are shown in the CEIP Early-Action Set-Asides workbook in Appendix B to this TSD. The proposed early action set-asides for each state are in Table 10 in section V.D.4 in the preamble to the proposed federal plan. The early action set-asides in Table 10 sum to 100 million tons per year nationwide from 2022 through 2024, which would result in a total of 300 million allowances if all of these set-asides were to be implemented.

3.0 OUTPUT-BASED ALLOCATION SET-ASIDE

As noted in section V.D.3 of the preamble to the proposed federal plan, the EPA is proposing a set-aside approach referred to as output-based allocation (OBA), which allocates a portion of allowances to existing NGCC units as a means of mitigating leakage.

[7] The EPA would implement the early action set-aside in a state under a final federal plan only if the state did not submit an approvable state plan (or approvable state-determined allowance distribution methodology).
[8] The EPA established the statewide mass goals in the Clean Power Plan EGs.
[9] These are Connecticut, Idaho, Lands of the Fort Mojave Tribe, and Maine.

Key parameters to be identified under the OBA approach include which affected EGUs receive the allocation, the timing of the set-aside's allocation procedure, the allocation rate(s), and the size of the set-aside. As described in the preamble and summarized here, the EPA proposes that existing NGCC units are eligible for the set-aside. The allocation rate is 1,030 lbs/MWh-net, which is the 111(b) standard for new NGCC units. Eligible units would receive allowances from the set-aside if their average capacity factor is above 50 percent. Beginning with the second compliance period, a portion of the total allowances within each mass-based federal plan state would be allocated to eligible units, based, in part, on their level of electricity generation in the previous compliance period. The amount of OBA set-aside allowances that an affected EGU would receive is based on its net generation above its 50 percent capacity factor in the preceding compliance period, multiplied by the allocation rate. The size of the set-aside is determined by assuming that it would incentivize all existing NGCC in the state to increase their utilization to a 60 percent capacity factor. That is, the size of the set aside in a state is calculated as the allocation rate, multiplied by 10 percent of the net generation (60 percent capacity factor minus 50 percent capacity factor) that may be achieved by all existing NGCC units in that state.

The following sections provide additional information in support of the proposed approach and identify other considerations.

The data that the EPA used to calculate the size of the proposed OBA set-aside in each state are in Appendix C, in the workbook titled "OBA Set-Asides." In that workbook, the tab labelled "State-level data" contains the baseline state-level NGCC net summer capacity data that the EPA used to calculate the size of the OBA set-aside for each state. This data is taken from Appendix 3 of the CO_2 Emission Performance Rate and Goal Computation TSD for the CPP Final Rule. In the OBA Set-Asides workbook, the calculations are shown in the tab labelled "OBA Set-Aside Calculation." As shown in this worksheet, the EPA calculated each state's OBA set-aside, in tons, as:

$$\text{Baseline NGCC capacity} \times 10\% \times 8{,}760 \text{ hours} \times 1{,}030 \text{ lb/MWh-net} \times 1/2{,}000$$

In the above equation:

- Baseline NGCC capacity is the adjusted 2012 baseline NGCC capacity,
- 10% is the difference between a capacity factor of 50% and capacity factor of 60%,
- 8,760 is the number of hours in a year,
- 1,030 lb/MWh-net is the 111(b) standard for new NGCC units, and
- 1/2000 is used to convert pounds (lbs) to tons

The EPA would place the amount of allowances that result from the above calculation from each year's allocation into that state's OBA set-aside.

Eligible Sources

As discussed in the preamble for the federal plan, existing NGCC units would be eligible for the OBA set-aside, because the difference in generation incentives between affected stationary combustion turbines

subject to a mass goal and otherwise similar new stationary combustion turbines that are subject to the 111(b) standards is likely one of the most salient deviations in production incentives to address. The EPA expects that the new emitting source of generation that would be constructed absent the OBA set-aside, and the source of leakage, would be new NGCC units. The EPA's modeling shows that new NGCCs are the most competitive new CO_2-emitting electricity-generating technology (U.S. EPA 2015).

The EPA proposes an approach under which each existing NGCC that is eligible for the set-aside receive OBA at the allocation rate only if its average capacity factor in the compliance period is above 50 percent on a net basis. The allocation rate only applies above a particular average capacity factor because it is intended to incentivize marginal generation and not generation that would have otherwise occurred absent the output-based allocation from the set-aside. Under this approach, eligible affected EGUs would receive no allowances from this set-aside for generation below this average capacity factor (although all affected EGUs will still receive allowances through the historic-generation-based approach detailed above).

Furthermore, this approach avoids incentivizing production at levels of generation below an average capacity factor of 50 percent from an eligible source, and therefore avoids giving an incentive to an inefficient or infrequently used EGU to operate if it is not otherwise economically efficient to do so.

Each eligible EGU would receive allowances at the allocation rate for all generation above an average capacity factor of 50 percent. That is, there is no "maximum" average capacity factor above which output-based allocations are not earned by an EGU eligible to receive them. This is to maintain the marginal incentive to generate from the affected EGU. The total number of allowances available in the set-aside is limited, however.

As described in the preamble and shown in the equation above, the total size of the set-aside is limited. As noted above, the size of the set-aside is the amount that would allow all existing NGCC EGUs in the state to increase their utilization to a 60 percent capacity factor and receive OBA allowances for that increase. The set-aside is thus sized based on multiplying the allocation rate by 10 percent of the capacity of eligible EGUs, where 10 percent is the difference between a capacity factor of 50 and 60 percent. The 50 percent value is based on the capacity factor above which all generation from an individual eligible EGU may receive allowances from the set aside. Limiting the size of the set-aside reduces the risk of incentivizing too much generation from eligible sources, which may lead to unintended consequences, as discussed below. The 60 percent capacity factor is used only to determine the size of the set–aside and eligible EGUs would still be able to earn additional OBA allowances for generation above a 60 percent capacity factor. That is, there is no capacity factor-based limit on the generation eligible to receive allowances from the set aside. This approach encourages competition between individual eligible EGUs and encourages those eligible EGUs to collectively operate at a high capacity factor.

Other Considerations for the Output-Based Allocation Set-Aside

OBA lowers the marginal production cost of eligible EGUs. Therefore, if these EGUs influence electricity prices, the reduction in their production costs will place downward pressure on the electricity price.

It is important that the OBA approach be designed to avoid unintended consequences. In particular, the design should avoid, to the extent possible, reduction in incentives to invest in new zero- or low-emitting generation as a result of the downward pressure the allocation approach may place on electricity prices. In part, this is why an RE set-aside is a useful complement to the OBA set-aside.

Furthermore, providing too strong a generation incentive to affected EGUs eligible for the set-aside could increase total electricity production costs. Specifically, if applied too strongly, OBA can go beyond the alignment of incentives across similar EGUs and lead to undesirable differences in incentives in the other direction. For example, if eligible affected EGUs receive too large a number of allowances for each MWh of generation, this set-aside could incentivize relatively higher-cost generation subject to a mass goal to crowd out relatively lower-cost generation from new EGUs instead of aligning their incentives to produce. This could raise the total cost of achieving overall emission levels with relatively little environmental benefit. Similarly, the size of the total set-aside is limited in order to avoid over-incentivizing production by eligible EGUs. The output-based allocation set-aside should be designed to address these economic concerns.

Studies suggest that the production incentives of existing EGUs subject to cost-of-service regulation to produce under a mass-based regulation may differ from existing EGUs that operate in a restructured market (see, e.g., Burtraw et al. 2001, Parry 2006, Fowlie, 2010). These studies suggest that existing sources in cost-of-service states may not have the same incentive to reduce their generation in the presence of a mass-emissions restriction compared to a similar situation in restructured markets.[10] The extent to which these incentives may differ between cost-of-service and restructured markets may also affect the nature or extent of how leakage could occur in the context of mass-based implementation to achieve state goals. The proposed OBA approach would apply for all states regardless of the market structure in that state. However, the agency invites comment in the preamble on whether an approach other than the particular OBA approach in this proposal could be used in a state-determined allocation approach to address leakage. Commenters on this approach may wish to consider whether the nature of economic regulation of electricity supply in their state or region suggest any adjustment to the design of this OBA approach that could address leakage more successfully with regard to market structure.

4.0 ALLOCATIONS TO LOAD-SERVING ENTITIES

[10] However, any difference in these production incentives between cost-of-service and restructured markets may depend, for example, on how state PUCs treat allocated allowance value in retail rate-making.

As described in section V.D.1 of the preamble to the proposed federal plan, the EPA requests comment on an alternative approach to allocation, which is allocating a portion of the allowances to load-serving entities (LSEs) rather than to affected EGUs. LSEs are the entities responsible for delivering power to retail consumers, and they include entities that are investor-owned, publicly owned, or owned by rural electric cooperatives, as well as other entities.

As described in the preamble, allocation to LSEs can help mitigate bill impacts on electricity consumers when applied in concert with certain additional design features. In particular, if LSEs commit and/or are required to pass through to ratepayers the value from selling the allocated allowances as condition of receiving an allocation of allowances, this approach can mitigate the impact of electricity bill increases on consumers that might otherwise result from application of the federal plan. This type of approach can also help to avoid or mitigate the potential for windfall profits for affected EGUs. Economic theory indicates that direct allocation to generators could result in profits to generators that, despite receiving allowances free of charge, include in the marginal cost of producing electricity some or all of the opportunity cost of having to surrender an allowance (which has an economic value) to cover the emissions associated with the marginal production of electricity.

Some existing mass-based greenhouse gas (GHG) emission programs allocate allowances to LSEs. For example, California's GHG emissions program allocates allowances for free to distribution utilities on behalf of electricity ratepayers, with the goal of protecting electricity ratepayers. California's regulations stipulate auction proceeds and allowance value obtained by an electrical distribution utility from these direct allocations "shall be used exclusively for the benefit of retail ratepayers of each electrical distribution utility……and may not be used for the benefit of entities or persons other than such ratepayers."[11] Each distribution utility that receives an allowance allocation must submit an annual report describing how they complied with this provision in their disposition of any auction proceeds and allowance value received for the prior calendar year.

The EPA could apply this approach to allocating allowances by conditioning the receipt of allowances by LSEs on the pass through to consumers of any allowance value, if necessary. In addition, most LSEs are regulated by state public utility commissions that would have authority to ensure that the value of allowances directly allocated to LSEs be passed through to ratepayers. Other LSEs that are publicly owned or are electric cooperatives have governing structures that could ensure that allowance value be passed through to ratepayers.

Allocation to LSEs, by reducing average electricity rate impacts, could reduce incentives for socially efficient demand response, including potential investment in energy efficiency (see, for example, Blonz et al. 2010). The magnitude of this effect, relative to alternative allocation options, may depend on certain design options and types of consumers (e.g., households, commercial and industrial consumers), and whether any allocation of allowance revenue to consumers is through or separate from the billing of

[11] Cal. Code Regs. tit. 17, § 95892(d)(3) (2015).

electricity.[12] As described in the preamble, the EPA requests comment on the form by which LSEs may distribute allowance value to rate-payers.

5.0 REFERENCES

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[12] Analyses that evaluate how households respond to changes in average and marginal electricity prices include, for example, Borenstein (2009), Ito (2014), and Fell et al. (2014).