Review of benefit-cost analysis for the EPA's proposed revisions to the 2015 Steam Electric Effluent Limitations Guidelines

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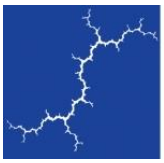

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EXECUTIVE SUMMARY

This report assesses the Benefit-Cost Analysis (BCA) performed by the U.S. Environmental Protection Agency (EPA) to support the proposed revisions to the 2015 *Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Categories* (the ELG rule), which updated Clean Water Act effluent limitation guidelines (ELGs) for the steam electric power industry (codified at 40 CFR Part 423).

When the original ELG rule was proposed in 2013 (and later finalized in 2015), it was the first update to the steam electric ELGs in more than 30 years. The ELG rule protected water quality by limiting the release of Total Suspended Solids (TSS) broadly. The rule also specifically limited various toxic pollutants, including arsenic, mercury, selenium, and nitrate/nitrite. The rule did this by limiting discharges from flue gas desulfurization (FGD) wastewater, bottom ash (BA) transport water, flue gas mercury control wastewater, gasification wastewater, combustion residuals leachate, and non-chemical metal cleaning wastes based upon the then-identified best available control technology (BAT).

The EPA now proposes to modify the technology basis for the FGD and BA wastewater streams. The EPA supports its proposed modifications to the technology basis of the rule by claiming that, due to recent advances in pollution control and treatment technologies, new pollution control systems are available to the industry that can achieve similar standards as established in the 2015 rule at a more economic cost. However, the EPA is not proposing a new advanced technology; rather the agency proposes to allow plants to use a different version of the technology required in the 2015 rule, configured in a cheaper and less effective manner (substituting a low residence time biological reduction, or LRTR, for a high hydraulic residence time biological reduction, or HRTR). The proposed modifications, if adopted, will relax technology standards on FGD and BA transport wastewater streams.

Under the proposed modifications, the EPA has evaluated four regulatory options (see Table 1) that will allow compliance for FGD wastewater and BA transport water with a new technology baseline. Option 1 is the least stringent and Option 4 is the most stringent. The agency calculated the difference between the baseline and each regulatory option to determine the net incremental effect of each proposed modification. The EPA proposes Option 2 as its preferred option based on its findings that Option 2 provides the highest level of incremental environmental benefits at the lowest cost, relative to the baseline. However, this conclusion is based almost entirely on the EPA's use of a misleading baseline and incomplete accounting of the potential cost and benefits of the proposed modifications to the ELG rule.

Table 1: Technology basis for BAT/PSES regulatory options

Waste stream	Subcategory	Technology Basis for BAT/PSES Regulatory Options				
		2015 Rule (Baseline)	Option 1	Option 2	Option 3	Option 4
FGD Wastewater	All units not falling into a subcategory listed below	Chemical Precipitation + HRTR Biological Treatment	Chemical Precipitation	Chemical Precipitation + LRTR Biological Treatment	Chemical Precipitation + LRTR Biological Treatment	Membrane Filtration
	High FGD Flow Facilities[1]			Chemical Precipitation	Chemical Precipitation	Chemical Precipitation
	Low Utilization Boilers[2]			Chemical Precipitation	Chemical Precipitation + LRTR Biological Treatment	Membrane Filtration
	Boilers retiring by 2028		Surface Impoundment			
FGD Wastewater Voluntary Incentives Program (Direct Dischargers Only)		Chemical Precipitation + Evaporation	Membrane Filtration	Membrane Filtration	Membrane Filtration	NA
Bottom Ash Transport Water	All units not falling into a subcategory listed below	Dry Handling / Closed loop	Dry Handling or High Recycle Rate	Dry Handling or High Recycle Rate	Dry Handling or High Recycle Rate	Dry Handling or High Recycle Rate
	Low Utilization Boilers[2]			Surface Impoundment + BMP Plant		
	Boilers retiring by 2028		Surface Impoundment			

Source: Benefit and Cost Analysis for Proposed Revisions to the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, November 2019.

The EPA's analysis for the proposed modifications fails to comply with EPA guidelines for best economic practices. The BCA relies on a faulty baseline which obscures the full cost and benefits of the proposed modifications. The baseline does not reflect the current status quo or the future in the absence of the proposed modifications. Instead, it reflects an alternative compliance scenario that exempts all plants retiring by 2028 from the requirements to use the BAT, and it excludes the impact of this exemption from the BCA. The EPA BCA should evaluate the impact of the proposed modifications using both an updated existing-rule baseline (what future compliance looks like in the absence of the proposed modifications when applied to the current population of steam electric generators), and a status quo baseline. Both BCAs should transparently break out the impacts of each proposed change and part of the ELG rule.

In addition to the faulty baseline, the EPA fails to monetize and quantify the impact of several proposed modifications—specifically changes in the incidence of cardiovascular disease (CDV) and impacts on

endangered and threatened (T&E) species. The agency claims that the impacts of the proposed modifications are too small to include. The EPA also excludes monetization of the impacts from NO_x and SO_2 changes, claiming that the agency did not have sufficient modeling support at the time to conduct the full analysis. All these flaws need to be corrected in the final version of the proposed modifications.

Aside from the technical flaws above, the proposed modifications have substantive problems: the proposed modifications will increase pollutant levels and environmental cost across all categories of pollutants except bromide. With the proposed modification to the Voluntary Incentives Program's (VIP) program, the EPA pits bromide-reduction benefits against all other pollutants. In essence, the EPA proposes trading a reduction in bromide pollution for an increase in all other pollutant levels. Additionally, the EPA proposes subcategories for high FGD flow units, low utilization boilers, and boilers retiring by 2028 that would allow these plants to comply using a less stringent technology basis. The result of the subcategories and the relaxed BAT (which allows plants to comply with FGD requirements using LRTR instead of HRTR—with the compliance deadline deferred by two years—and to comply with BA transport requirements using a high recycle rate system instead of a closed-loop system) is a decrease in the environmental benefits for all pollutants except bromide.

The EPA uses the BCA methodology and the inappropriate baseline to obscure the full environmental impacts associated with the relaxed environmental standards in its recommended compliance option, Option 2. If the EPA were to perform a BCA in conformance with its own guidelines, it likely would have found that the selected technological basis for the proposed rule modification under Option 2 fails to perform as well as Option 4. Option 4, with the removal of the subcategories, should be the recommended compliance option.

Purpose of the report

The purpose of this report is to (1) evaluate the proposed changes to the 2015 ELG rule; (2) review the four options the EPA lays out for compliance (focusing on Options 2 and 4); (3) review the EPA's BCA; (4) critique the EPA's analysis and results; (5) provide recommendations on how the EPA should structure its BCA and which compliance option it should recommend.

Findings

Our primary findings are as follows:

1. The EPA's selection of Option 2 is based on a skewed analysis that omits important benefits. Option 4, with the removal of the subcategories for high FGD flow plants, low-utilization boilers, and boilers retiring by 2028, as well as maintenance of zero-discharge requirements for bottom ash transport water, will provide the highest environmental benefits and should be the EPA's preferred option.

2. The EPA's proposed changes to the technology basis for ELG compliance for FGD and BA wastewater streams allow less stringent and delayed compliance options relative to the 2015 rule. These changes will increase environmental damages, resulting in significant

losses of benefits that would have resulted from full and timely implementation of the 2015 rule.

3. The EPA's claim that the proposed changes will increase benefits and lower costs is misleading and stems entirely from the agency's assumptions about the VIP's estimated reduction in bromide pollution at nine plants. With the exception of the reductions that EPA assumes will be created by the VIP program, the proposed update will increase environmental damage from all plants.

4. In calculating the cost and benefits of the proposed modifications, the EPA relies on an inappropriate baseline that removes all plants retiring by 2028 and therefore does not account for all proposed modifications to the ELG rule.

5. The BCA does not adequately and transparently break out the impact of each modification and proposed change in keeping with good BCA practices.

6. The EPA systematically neglects to monetize, and therefore does not account for, specific reduced environmental benefits relating to incidences of cardiovascular disease, endangered species protection, and NO_x and SO_x emission levels that will result from the proposed modifications to the ELG rule.

Recommendations

1. The EPA should update the BCA analysis structure to include the following:

    - Evaluation of the changes in the costs and benefits that will result from the proposed modifications to the ELG rule relative to the costs and benefits of ELG compliance in the absence of the proposed modifications ("existing-rule baseline")

    - Evaluation of the total costs and benefits that will result from the proposed modifications to the ELG rule relative to a baseline of current conditions (a status-quo baseline)

    - A transparent and clear break-out of the costs and benefits for each program and component of the proposed modifications to the ELG rule relative to the existing-rule and status-quo baselines

2. The EPA should calculate and transparently present the following:

    - The impacts of the VIP program on bromide pollutant levels separately from the impacts of the other proposed modifications on the levels of each pollutant evaluated in the original ELG rule

    - The impact that the CCR amendment will have on ELG compliance, if adopted

    - The impact of each subcategory (high FGD flow, low-utilization boilers, and boilers retiring by 2028)

    - The impacts of deferring compliance with FGD requirements by two years

3. The EPA should calculate and include the following in an updated BCA:
    - The costs and benefits of allowing plants retiring between 2023 and 2028 to continue to use surface impoundments
    - The cost and benefits associated with announced operational changes between October 2018 and July 2019
    - The change in benefits for impacts that were monetized in the 2015 BCA but were not monetized in the BCA for the proposed modifications to the rule due to agency claims that the impacts were too small:
        - changes in incidence of cardiovascular disease in adults from lead exposure via fish consumption
        - changes in benefits from protection of threatened and endangered species
    - Monetized changes in NO_x, SO_2 and $PM_{2.5}$ benefits that were omitted based on the purported unavailability of modeling resources to the EPA.
4. The EPA should select regulatory Option 4, with the removal of the proposed subcategorizations and the proposed changes to bottom ash transport requirements, as the preferred regulatory compliance option and not Option 2.
5. However, if Option 2 remains the preferred regulatory option, the EPA should first update the following components of the rule:
    - Do not exempt plants retiring between 2023 and 2028 from compliance.
    - Do not allow high FGD flow and low utilization boilers to comply using less stringent chemical precipitation technology.

1. BACKGROUND ON THE PROPOSED MODIFICATIONS TO THE 2015 ELG RULE

1.1. The 2015 rule strengthened the technology-based ELG standards for steam electric power plants

In November 2015, the EPA released the final rule for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (ELG rule).[1] The EPA established the 2015 rule to protect "public health and the environment from toxic metals and other harmful pollutants, including nutrients" through a strengthening of the technology based effluent limitations guidelines and standards for steam electric power generation industry.[2] The rule was expected to reduce the discharge of toxic metals, nutrients, and other pollutants by 1.4 billion pounds and reduce water withdrawals by 57 billion gallons, with an estimated social cost of $480 million (2013 dollars) and monetized benefits in the range of $451–$566 million (2013 dollars) at a 3 percent discount rate.[3]

The 2015 rule applies to both new and existing sources of wastewater discharges from steam electric power generators. The effluents covered are fly ash transport water, bottom ash (BA) transport water, flue gas mercury control, flue gas desulfurization (FGD), and gasification wastewater, combustion residual leachate, and non-chemical metal cleaning wastes.[4] The rule operates by limiting the discharge of Total Suspended Solids (TSS) broadly, as well as various toxic pollutants specifically. These pollutants include mercury, arsenic, selenium, and nitrate/nitrite.

The benefits resulting from the 2015 rule are broken into several categories:

- Human health benefits from surface water quality improvements—reduced IQ loss in children and infants, reduced need for specialized education, reduced incidence of cardiovascular disease and cancer, and other reduced adverse health effects
- Ecological conditions and recreational use changes benefits from surface water quality improvements—improved aquatic and wildlife habitat, improved species protection,

[1] The guidelines were promulgated under the Clean Water Act (CWA), which authorizes the EPA to establish nationally applicable technology-based effluent limitation guidelines and new performance standards for wastewater discharges from categories of point sources that occur directly into the waters in the United States.

[2] The need for the rule has been in part driven by implementation of air pollution control technologies which created new wastewater streams at steam electric plants. Federal Register/Vol. 80, No. 212/Tuesday, November 3, 2015/Proposed Rule, page 67840.

[3] Federal Register/Vol. 80, No. 212/Tuesday, November 3, 2015/Proposed Rule, page 67841.

[4] Federal Register/Vol. 80, No. 212/Tuesday, November 3, 2015/Proposed Rule, pages 67849-50.

benefits to water-based recreation, increased aesthetics, enhanced non-use values, and reduced sediment contamination

- Market and productivity benefits—reduced impoundment releases, reduced dredging costs, increased beneficial use of ash, reduced water treatment cost, improved commercial fisheries value, benefits to tourism, increase property values
- Air-related benefits—reduced emissions of NO_x, SO_2 and CO_2
- Reduced water withdrawal benefits—reduced ground and surface water withdrawals

The EPA analyzed many regulatory options as part of the 2015 rule and used a cost-effectiveness analysis to select the preferred compliance option. The rule required steam electric facilities to comply with the effluent limitations "as soon as possible" after November 1, 2018 (which was later amended to November 1, 2020 as part of the 2017 postponement rule)[5] and no later than December 31, 2023.[6]

1.2. The EPA's proposed modifications will relax technology standards on FGD wastewater and BA transport water streams

In November 2019, the EPA proposed revisions to the 2015 rule. The proposed revisions contain new numeric effluent limitations and pretreatment standards that apply to the discharges of FGD wastewater and BA transport water; the modifications do not affect the other wastewater streams covered in the 2015 rule. The EPA expects that the modifications will reduce industry compliance costs by approximately $136.3 million annually while still reducing the pollutant discharges over the 2015 rule (between $14.8–68.5 million in benefits) at a 3 percent discount rate.[7] The agency is clear that it hopes that lower compliance costs will slow the pace of coal plant retirements.[8] However, the modifications will increase discharges of nearly all pollutants regulated under the rule with the exception of bromide. The assumed decrease in bromide pollution is attributed to the EPA's assumption that 18 plants will participate in the VIP program and choose to comply with a delayed (2028) but more stringent (membrane technology) technology solution.

The EPA proposed four key modifications to the ELG rule

The proposed modifications alter the original 2015 rule in several notable ways, as summarized below.

1. Technology Basis: The EPA proposes a new technology basis for meeting the effluent limitation guidelines, which include the following: (1) replacing the original high residence time biological reduction (HRTR) for FGD wastewater with less costly and less

[5] Federal Register/Vol. 82, No. 179/Monday, September 18, 2017/Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, page 43498.

[6] Federal Register/Vol. 80, No. 212/Tuesday, November 3, 2015/Proposed Rule, page 67882.

[7] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64622.

[8] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64640.

effective low hydraulic residence time biological reduction (LRTR); (2) replacing the closed loop systems for BA transport water with non-closed loop, high recycle rate systems; and (3) allowing certain subcategories of boilers to continue using surface impoundments or chemical precipitation (CP).[9] The EPA claims that these modifications are reasonable given that there are now newer lower cost pollution-control technologies that were not available were when the original 2015 rule was proposed.[10] The full technology basis for the proposed modification is listed below in Table 2.

2. Subcategories: The EPA has proposed new subcategories for high FGD flow facilities, low utilization boilers (both FGD and BA), and boilers retiring by 2028 (both FGD and BA). Effluent limitations[11] apply to steam-electric generators based on which subcategory the facility falls under and/or whether it chooses to participate in the VIP. Some of the limitations are higher than the corresponding limits in the 2015 rule and in some cases the limitations are lower (see Table 3) (see Section 5.2 for a full discussion of the proposed subcategories).

3. Voluntary Incentives Program (VIP): The EPA is proposing to amend the VIP, which provides facilities the option of adopting additional process changes and controls for more stringent limitations on mercury, arsenic, selenium, nitrate/nitrite, bromide, and total dissolved solids in FGD wastewater in exchange for a longer compliance deadline.[12] The VIP program under the original rule had a December 31, 2023 compliance deadline; however compliance costs were so high that the EPA did not include the program in its BCA, and no plants participated.[13] The proposed revisions extend the VIP compliance timeframe five years to December 31, 2028[14] and replace the thermal evaporation system technology basis with membrane technology,[15] which the EPA finds achieves a similar level of pollutant removal for a lower cost.[16]

4. Compliance Deadline: The EPA is proposing to push back the compliance window by two years from the compliance date established in the 2017 amendment. Under the proposal, compliance begins November 1, 2020 (instead of November 1, 2018) and will go no later than December 31, 2025 for FGD. The EPA makes an exception for high flow

[9] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64630.

[10] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64626-7.

[11] Effluent limitations are set based on daily maximum limitations, monthly average limitations, and long-term averages. The daily maximum limitation is the "highest allowable daily discharge" and the maximum for monthly average limitation is the ''highest allowable average of 'daily discharges' over a calendar month.

[12] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64636.

[13] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64636.

[14] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64637.

[15] To support its choice of Option 2 over Option 4, the EPA puts forward two unsubstantiated claims to cast doubt on the viability of the technology, claiming that that the technology is not fully market tested, implying it can't actually be rolled out at scale by 2023, and that that brine disposal could be a challenge, however, the brine can be disposed of using processes that don't require the use of fly ash. Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64632.

[16] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64634.

and low utilization boilers, which still need to comply by December 31, 2023.[17] The latest compliance date for BA transport water remains December 21, 2023.[18] The compliance date under the VIP program is December 31, 2028.

Table 2: Technology basis for BAT/PSES regulatory options

Waste stream	Subcategory	Technology Basis for BAT/PSES Regulatory Options				
		2015 Rule (Baseline)	Option 1	Option 2	Option 3	Option 4
FGD Wastewater	All units not falling into a subcategory listed below	Chemical Precipitation + HRTR Biological Treatment	Chemical Precipitation	Chemical Precipitation + LRTR Biological Treatment	Chemical Precipitation + LRTR Biological Treatment	Membrane Filtration
	High FGD Flow Facilities[1]			Chemical Precipitation	Chemical Precipitation	Chemical Precipitation
	Low Utilization Boilers[2]			Chemical Precipitation	Chemical Precipitation + LRTR Biological Treatment	Membrane Filtration
	Boilers retiring by 2028		Surface Impoundment			
FGD Wastewater Voluntary Incentives Program (Direct Dischargers Only)		Chemical Precipitation + Evaporation	Membrane Filtration	Membrane Filtration	Membrane Filtration	NA
Bottom Ash Transport Water	All units not falling into a subcategory listed below	Dry Handling / Closed loop	Dry Handling or High Recycle Rate	Dry Handling or High Recycle Rate	Dry Handling or High Recycle Rate	Dry Handling or High Recycle Rate
	Low Utilization Boilers[2]			Surface Impoundment + BMP Plant		
	Boilers retiring by 2028		Surface Impoundment			

Source: Benefit and Cost Analysis for Proposed Revisions to the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, November 2019.

[17] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64673-4.

[18] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64674.

Table 3: Pollution limitations under the original rule and the proposed modifications

Subcategory	Pollutant	2015 Rule			Proposed Modifications		
		Long-term average	Daily max limitation	Monthly average limitation	Long-term average	Daily max limitation	Monthly average limitation
Requirements for all facilities not in the VIP or subcategories specified below (BAT & PSES)	Arsenic (µg/L)	6.0	11.0	8.0	5.1	18.0	9.0
	Mercury (ng/L)	159.0	788.0	356.0	13.5	85.0	31.0
	Nitrate/ nitrite as N (mg/L)	1.3	17.0	4.4	2.6	4.6	3.2
	Selenium (µg/L)	7.5	23.0	12.0	16.6	76.0	31.0
Low utilization subcategory—AND—High flow subcategory (BAT & PSES)	Arsenic (µg/L)	Same as above			6.0	11.0	8.0
	Mercury (ng/L)				159.0	788.0	356.0
VIP for FGD Wastewater (BAT only)	Arsenic	4.0	4.0	NA	5.0	5.0	NA
	Mercury (ng/L)	17.8	39.0	24.0	5.1	21.0	9.0
	Nitrate/ nitrite as N (mg/L)	Not included in 2015 Rule			0.4	1.1	0.6
	Selenium (µg/L)	5.0	5.0	NA	5.0	21.0	11.0
	Bromide (mg/L)	Not included in 2015 Rule			0.2	0.6	0.3
	TDS (mg/L)	14.9	50.0	24.0	88.0	351.0	156.0

Source: Federal Register/Vol. 84, No. 226/Tuesday, November 22, 2019/Proposed Rule, 64663.
Federal Register/Vol. 80, No. 212/ Tuesday, November 3, 2015/Rules and Regulations, 67870.

The EPA evaluated four regulatory compliance options

Under the original 2015 ELG rule, the Best Available Technology Economically Available (BAT) for FGD wastewater compliance was Chemical Precipitation + HRTR Biological Treatment technology, and the BAT for BA transport water compliance was Dry Handing / Closed Loop technology. Under the proposed modifications, the EPA has evaluated four regulatory options (see Table 2) that will allow compliance for FGD wastewater and BA transport water with a new technology baseline. The agency calculated the difference between the baseline and each regulatory option to determine the net incremental effect of each proposed modification.

For FGD wastewater compliance, Option 1 is the least stringent, Option 4 is the most stringent, and Options 2 and 3 fall incrementally in between. Option 1 requires Chemical Precipitation technology at all plants. Option 2 is slightly more stringent and requires the addition of LRTR Biological treatment at all facilities not included in the high FGD flow or low utilization subcategories. Option 3 is similar to Option

2 but applies the LRTR technology to low utilization boilers as well. Options 4 requires that membrane filtration be installed at all units between December 31, 2023 and December 31, 2028, except those boilers sub-categorized as high FGD flow, which are only required to use chemical precipitation technology. Options 1–3 all offer the VIP as an alternative option for compliance using Membrane Filtration technology, with the compliance deadline deferred until December 31, 2028.

For BA transport water compliance, Options 1, 3, and 4 all require Dry Handling or High Recycling Rate technology for all units. Option 2 allows low utilization boilers to comply using surface impoundments and Best Management Practice plans. Options 1–4 all allow boilers retiring by 2028 to comply with both the FGD wastewater and BA transport water requirements using surface impoundments.

The EPA proposes Option 2 as its preferred option based on its findings that Option 2 provides the highest level of incremental environmental benefits at the lowest cost, relative to the baseline. However, as we will discuss in the next section, this conclusion is based almost entirely on the EPA's use of a misleading baseline and incomplete accounting of the potential cost and benefits of the proposed modifications to the ELG rule.

2. THE EPA'S CHOICE OF BASELINE FOR ITS BCA FAILS TO COMPLY WITH EPA GUIDELINES AND BEST ECONOMIC PRACTICE AND AS A RESULT OBSCURES THE TRUE COSTS AND BENEFITS OF THE PROPOSED MODIFICATIONS TO THE ELG RULE

The EPA analyzes regulatory compliance for Options 1 through 4 (described in section 1.2 above) and presents the change in compliance cost and pollutant loading levels that will result from the proposed modifications to the ELG rule. However, the EPA's BCA analysis structure allows the agency to obscure the true costs and benefits of the proposed modifications. This makes the EPA's less costly and less effective preferred compliance option (Option 2) look most favorable. In this section we outline the ways in which the EPA's choice of baseline results in a BCA is both inadequate and misleading.

2.1. EPA's guidelines offer several valid baselines to use for the BCA…but the EPA's selected baseline for this BCA is not one of them

In developing its BCA and evaluating the impacts of the proposed modifications, there are several potential baselines and one future scenario that the EPA should be considering. In keeping with the

EPA's *Guidelines for Preparing Economic* Analyses, two of the baselines reflect "no change" baselines, and one reflects a "reality in the absence of the regulation" baseline.[19]

1. 2015 status-quo: This describes the original conditions of ELG pollution control technologies and pollutant levels at power plants covered by the ELG rule, prior to the implementation of the 2015 rule.

2. Current status-quo: This describes the current conditions of ELG pollution control technologies and pollutant levels at power plants covered by the existing ELG rule as we actually see them today. This is an appropriate baseline to evaluate the total impact that is expected from the proposed modifications to the ELG rule.

3. Actual existing-rule future: This describes the future state of ELG pollution control technologies and pollutant levels at power plants covered by the existing ELG rule that was expected to result from implementation of the existing (2015) ELG rule. This, updated to reflect external change to the industry, is an appropriate baseline to evaluate the delta between the original rule and the proposed modifications to the rule.

    - The delta in costs and benefits between 1 and 3 is the expected impact of the original ELG rule.

    - The delta in costs and benefits between 2 and 3 (updated for changes that occurred or are expected to occur, independent of the ELG rule) represents the impact that implementation of the original rule has had up until now.

4. Proposed-modifications future: This describes the expected future of ELG pollution control technologies and pollutant levels at power plants covered by the proposed modifications to the ELG rule that will result from implementation of the proposed modifications to the ELG rule.

    - The delta in costs and benefits between 2 and 4 represents the total expected impact of the proposed modifications to the rule.

    - The delta in cost and benefits between 3 and 4 represents the difference between the original ELG rule and the proposed modifications.

Unfortunately, the EPA did not use any of the "no change" or "reality in the absence of the regulation" baselines or future outcomes described above to evaluate the impact of the proposed modifications in the BCA. Instead, the EPA incorporated substantial modifications to the existing rule baseline and came up with its own scenario against which to compare the proposed modifications. We will discuss the specific shortcomings of the EPA's faulty "baseline" next.

[19] Guidelines for Preparing Economic Analyses, Chapter 4: Baseline. December 2010. Accessed at https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-05.pdf.

2.2. The EPA's "existing-rule" baseline for evaluating changes expected from the proposed modifications relative to the original rule is flawed

The EPA updated the "existing-rule" baseline to reflect changes to the steam electric industry profile, as well as changes in the regulations that occurred (or are now expected to occur) to power plants covered by the ELG rule. These updates isolate changes in external or market factors from modifications attributed to the BCA rule. However, the agency also incorporated proposed modifications to the compliance deadline into its baseline, thus burying a substantial modification in the baseline rather than properly accounting for the proposed changes and transparently presenting the results in the BCA for the public.

We review this and the EPA's other proposed updates and modifications to the baseline in detail below and evaluate which are reasonable and which are inappropriate.

The EPA updated the dataset of plants covered by the ELG rule

To evaluate the impact of the proposed modifications to the ELG rule, the EPA updated the dataset of steam electric power plants covered by the ELG rule. These updates incorporated (1) changes to the steam electric industry profile, (2) amendments and revisions to the Coal Combustion Residual Rule (CCR) rule, and (3) removal of the Clean Power Plan (CPP).

Updates to the steam-electric generator profile

The EPA updated the steam electric unit data set to incorporate newly commissioned coal units since 2009, coal retirements since August 2014 (the latest retirement data accounted for in the original 2015 rule), fuel conversions away from coal, wastewater treatment updates, and updates to the capacity utilization and operational changes of currently operating coal units.

Most updates are reasonable. However, the EPA's decision to create a new subcategory for all plants schedule to retire by 2028, and therefore remove all plants retiring between 2023 and 2028 from the baseline, is completely inappropriate. The EPA did not clearly outline how many of the 160 retiring generating units (as shown in Table 4 below) were scheduled to retire between 2023 and 2028,[20] and would therefore have been included in the BCA for the original 2015 rule, and which retirements are schedule to occur prior to 2023, and therefore would have also been excluded from compliance under the original rule as well.

[20] The EPA included a table of all plants scheduled to retire by 2028; however, the agency oddly did not include the expected retirement date of each plant in the table. ERG Memo: Changes to Industry Profile for Coal-Fired Generating Units for the Steam Electric Effluent Guidelines Proposed Rule – DCN SE07207. July 31, 2019.

Table 4: Industry profile updates verified between August 2014 and October 2018 by type of change in operation

Change in Operation	# Generating Units	# Power Plants
Commissioning of New Coal-Fired Generating Unit	18	16
Retirement of Coal-Fired Generating Unit	160	78
Fuel Conversion to Non-Coal Fuel Type	43	26
Installation of Wet FGD System	16	8
Modification or Upgrade of FGD Wastewater Treatment System	533	18
Installation of or Conversion to Dry Handling, Closed-Loop Recycle, or High Recycle Rate Bottom Ash System	138	61

Source: Changes to Industry Profile for Steam Electric Generating Units for the Steam Electric Effluent Guidelines Final Rule, p.3.

The EPA only accounted for changes verified by October 2018 in the proposed rule. However, the agency performed subsequent analysis to evaluate the impact of changes announced between October 2018 and July 2019 (summarized in Table 5). The EPA found that at 18 of the 25 plants with recent operational changes, the changes would result in at least one coal-unit being removed from the compliance cost or pollutant loading analysis. At the remaining six plants,[21] no changes in cost or pollutant loading is expected based on a change in operation.[22] Table 6 shows the total impact of including these plants in the industry profile. The EPA does not clearly indicate whether these numbers represent positive or negative changes; however as the plants and pollutant levels are being removed from the analysis, the impact will likely be to lower the estimated compliance costs and pollutant levels from the EPA's faulty baseline. Once again, none of these changes are incorporated into any analysis on the proposed modifications.

Table 5: Additional profile updates since October 2018 by type of change in operation

Change in Operation	# Generating Units	# Power Plants
Retirement of Coal-Fired Generating Unit	39	21
Continued Operation of Coal-Fired Generating Unit Previously Announced to Retire	2	1
Fuel Conversion to Non-Coal Fuel Type	6	2
Modification or Upgrade of FGD Wastewater Treatment System	2	1

Source: Changes to Industry Profile for Coal-Fired Generating Units for the Steam Electric Effluent Guidelines Proposed Rule, p.10.

[21] It is unclear why the EPA's numbers don't add up; that is 18 plants with units that will be removed from the population plus 6 plants not removed from the population equals 24 not 25 total plants.

[22] Changes to Industry Profile for Coal-Fired Generating Units for the Steam Electric Effluent Guidelines Proposed Rule, ERG Memo. July 31, 2019, p. 10.

Table 6: Estimated impact of operation changes announced since October 2018 on industry compliance costs and pollutant loading for Option 2

Evaluate Wastestream	Count of Plants	Percent of Option 2 Results	
		Compliance Costs	Change in Pollutant Loading
FGD Wastewater	12	15.3%	26.0%
Bottom Ash Transport Water	11	5.76%	5.17%

Source: Changes to Industry Profile for Coal-Fired Generating Units for the Steam Electric Effluent Guidelines Proposed Rule, p.11

Amendments and revisions to the CCR Rule

The EPA is currently proposing revisions to multiple aspects of the CCR rule.[23] However, because these amendments have not been finalized, the EPA opted to use the same methodology in evaluating the impact of the CCR rule on the proposed modifications to the ELG rule as it did back in 2015 (when the EPA performed a sensitivity analysis regarding the amendments to the CCR rule).[24] The EPA found that:

- 18 plants will convert to mechanical drag or remote mechanical drag bottom ash handling systems because of the CCR rule and as a result would not incur bottom ash transport water compliance costs attributable to the ELGs.[25]
- 8 plants would modify their FGD wastewater treatment because of the CCR rule and as a result their costs to comply with the ELGs would be reduced.

If the amendments are finalized, all CCR unlined surface impoundments will have to comply with a cease receipt of waste deadline of July 2020 (with extensions available for certain categories of facilities). It is reasonable that the EPA would not incorporate pending amendments into the baseline. However, the EPA should qualitatively discuss, and evaluate separately the impact (and associated costs and benefits) should the amendments be adopted. Specifically, the EPA should clearly identify which plants will be impacted, and how that will change the costs and benefits currently attributed to the ELG proposed modifications.

Repeal of the CPP and issuance of the Affordable Clean Energy (ACE) Rule

The 2015 rule incorporated compliance costs associated with the CPP, and therefore included CPP-driven unit retirements in the baseline. In the proposed rule, the EPA updated the baseline to account for the repeal of the CPP[26] by removing all future CPP-driven retirements or compliance investments. The ACE rule, which replaced the CPP, sets no binding standards or requirements for power plants

[23] The ELG and CCR rules impact a similar and overlapping set of units. Therefore, it is important to isolate which costs and benefits are attributed to compliance with the CCR rule, and which are attributed to the ELG rule.

[24] See the *Supplemental Technical Development Document (TDD)* for details on how the EPA accounted for the CCR rule effects as part of the baseline for this analysis (U.S. EPA, 2019a).

[25] Supplemental TDD, p. 3-12.

[26] Supplemental TDD, November 2019, Page 1-3.

emissions.[27] Therefore, the rule is not likely to have any impact on coal plant operations and retirement decisions or ELG compliance costs or benefits.

The EPA inappropriately incorporated modifications to the ELG rule into its existing-rule baseline

As shown in Table 4, the EPA updated its existing-rule baseline data set to reflect recent and scheduled plant retirements. Under the original rule, the EPA removed all units scheduled to retire before the compliance deadline of 2023 from the 2015 status-quo baseline.[28] These plants would retire before they were impacted by the rule; therefore it was a reasonable baseline decision. All plants retiring between 2023 and 2028 had to comply through relatively stringent BAT, and all the costs and benefits of compliance for these plants were included in the BCA.

The EPA now proposes to remove all units scheduled to retire by 2028, the last date through which plants can comply if they choose to participate in the VIP program, from the existing-rule baseline. This would remove the costs and pollutant levels associated with all plants retiring between 2023 and 2028 from the baseline, and not account for the difference between these plants complying using surface impoundments compared to the BAT in the BCA.

As a result, the EPA's selected "baseline" (what we have been calling the EPA's existing-rule baseline) does NOT reflect the costs and benefits that would result from ELG compliance in the absence of the proposed modifications. What the EPA calls its "baseline" is actually an alternative compliance scenario that allows all plants retiring between 2023 and 2028 to comply with the rule by continuing to discharge untreated wastewater from surface impoundments. By removing the costs and pollutant levels associated with these plants from both the existing-rule baseline and the new compliance scenario, the EPA fails to account for the full costs and benefits of the proposed modifications in the BCA.

3. THE EPA SHOULD EVALUATE THE IMPACTS OF THE PROPOSED MODIFICATIONS RELATIVE TO BOTH AN EXISTING-RULE AND STATUS-QUO BASELINE

In this section, we outline how the EPA needs to structure the BCA to accurately evaluate the proposed modifications to the ELG rule relative to both an updated and valid "existing rule" baseline, and relative to a status-quo baseline. Additionally, the EPA should transparently break out the costs and benefits of

[27] The ACE rule establishes emission *guidelines* for states to develop plans to address greenhouse gas emissions from existing coal-fired power plants.

[28] Changes to Industry Profile for Steam Electric Generating Units for the Steam Electric Effluent Guidelines Final Rule, p.2.

each program and component of the proposed modification relative to both the existing-rule baseline and the status-quo baseline.

3.1. The EPA should be using an existing-rule baseline that reflects the cost and benefits that will result from ELG compliance in the absence of the proposed modifications

There is nothing fundamentally wrong with the EPA conducting a BCA based on differential analysis. However, if the EPA is going to provide a differential analysis, the agency needs to select a baseline that is accurate and does not obscure and hide any impacts of the proposed rule modifications. For this differential analysis, the agency's baseline should reflect the costs and benefits associated with the pollution control technologies and pollutant levels that will result from ELG compliance with the 2015 rule (as modified by the 2017 postponement rule) in the absence of any of the proposed modifications. The difference in cost and benefits between this accurate existing-rule baseline and the proposed-modification future represents the impact of the proposed modifications to the ELG rule.

Additionally, this baseline should incorporate the updates to the steam electric power industry announced between October 2018 and July 2019 as discussed in Section 2.2. Specifically, six of the Power Plants with updated retirement dates are now scheduled to retire in the time period between December 31, 2023 and December 31, 2028. Therefore, the change in pollutant discharges should be incorporated into the BCA (not removed from the baseline as the EPA currently does). The remainder of the announced retirements will occur prior to December 31, 2023, and therefore the plants should be removed from an updated and corrected existing-rule baseline. Given the large number of unit retirements announced in the 10-month period between October 2018 and July 2019, it is important for the EPA to evaluate the significant impact these changes will have on compliance costs and pollutant levels associated with the proposed modifications.

3.2. The EPA should evaluate total costs and benefits relative to a baseline of current conditions

Even if we update the baseline and perform the BCA relative to a corrected existing-rule baseline, the differential analysis still only tells us the difference between the proposed modifications and the existing rule—not the total impact of the rule when applied to all relevant power plants with the proposed modifications. The EPA should also calculate and present the total costs and benefits of the proposed modifications to the ELG rule relative to a status-quo baseline of current conditions. This will allow the public to understand the total impacts of the ELG rule with the proposed modifications relative to current conditions, not just the impacts relative to a strategically selected baseline.

3.3. The EPA should transparently break-out the impacts of each individual element of the proposed modification to the rule

A robust BCA clearly and transparently breaks out the impacts of individual program components. This allows the public to easily see how individual components of the proposal impact water quality, human health, and other environmental indicators (and therefore the costs and benefits of compliance) without having to dig through thousands of pages of documentation. This is especially important when some proposed modifications improve indicators (costs or benefits), while others reduce indicators. In the case of the ELG rule modifications, the EPA has proposed to alter parts of the program, without presenting a clear breakdown of the components of the rule change. The EPA claims that the proposed modifications will drive both a decrease in costs and increase in environmental benefits. However, the lack of transparency in the presentation of the BCA makes it incredibly challenging to understand key drivers and assumptions, and to evaluate the reasonableness of the proposal and the assumptions.

4. THE EPA SHOULD CORRECT AND UPDATE THE BCA TO INCLUDE CATEGORIES OF BENEFITS THAT WERE OMITTED FROM, OR UNDERESTIMATED IN, THE BCA ANALYSIS

In Section 2 we explored the flaws in the EPA's proposed baseline for analysis. In this section, we explore several other significant flaws with the BCA that the EPA uses to support its recommendation for compliance Option 2. Specifically, we discuss the EPA's failure to monetize all categories of cost and benefits, and the EPA use of a new standard to calculate the social cost of carbon.

4.1. The EPA fails to monetize and quantify all costs and benefits

The EPA excluded specific modifications, claiming the impacts are too small to quantify

The EPA failed to quantify and monetize the reduced benefits for several environmental indicators in the BCA for proposed revisions to the ELG rule. Specifically, the EPA claimed the following impacts from the proposed modifications were too small to calculate:[29]

- Changes in incidence of cardiovascular disease (CDV) in adults from lead exposure via fish consumption: Under the original rule, CDV impacts were evaluated based on an analysis framework that calculated blood lead levels, linked the blood levels to CDV mortality, and then quantified the value of statistical life. The EPA claims it did not

[29] BCA 2019, Appendix A. The EPA also didn't monetize changes in the ability to market coal combustion byproducts such as beneficial use of fly ash; however this has a minimal impact on the benefits side of the equation.

quantify or monetize the change in benefits under the proposed modifications because the change in lead exposure was very small.[30]

- Change in benefits from protection of threatened and endangered (T&E) species: Under the original rule, impacts on T&E were quantified based on a meta-analysis of willingness-to-pay to protect T&E specifies. The EPA only discussed the changes qualitatively under the proposed modifications to the rule.[31]

These impacts will change based on the proposed modifications. However, it is unclear how much because the EPA only assessed the impact of the proposed modifications on these indicators qualitatively for the proposed rulemaking. Cumulatively, ignoring monetization of multiple reduced benefit streams skews the results away from Option 4 (which, with the removal of the subcategorization, is the preferred option) towards Option 2. Additionally, the EPA's claims that the change in benefits is too small to calculate is likely due in part to agency's use of a faulty baseline: If the cost and pollutant levels associated with all plants retiring between 2023 and 2028 is accounted for in the BCA, the impacts on CDV and T&E will likely be significantly larger. The EPA must calculate the impacts of the proposed modifications on all indicators that were quantified and monetized in the original rule in the BCA.

The EPA continues to exclude specific benefits (that the agency excluded from the original 2015 analysis as well)

The EPA failed to monetize several categories of impacts under the original 2015 rule. With its proposed modifications to the rule, the EPA once again has failed to monetize these categories of impacts, omitting them from the BCA analysis. Categories of impacts that the EPA has failed to monetize include: (1) adverse health effects from changes in exposure to pollutants vis fish consumption and drinking water; (2) changes in sediment contamination from changes in deposition of toxic pollutants to sediment; (3) changes in various categories of market and productivity benefits; and (4) changes in surface water withdrawals from changes in vulnerability to drought and impingement and entrainment mortality.[32]

In the category of human health impacts, the following are specific impacts that the EPA acknowledges are not included and monetized:[33]

- Low birth weight and neonatal mortality from in-utero exposure to lead, decreased postnatal growth in children ages one to 16, delayed puberty, immunological effects, decreased hearing and motor function

[30] BCA 2019, Appendix A.

[31] BCA 2019, Appendix A.

[32] BCA 2019, Table 2-3, page 2-17 through 2-18.

[33] BCA 2019, page 2-7.

- Effects to adults from lead exposure (e.g CDV, decreased kidney function, reproductive effective, immunological effects, cancer and nervous system disorders
- Effects to adults from exposure to mercury, including vision defects, hand-eye coordination, hearing loss, tremors, cerebellar changes
- Other cancer and non-cancer effects from exposure to other steam electric pollutants

The EPA acknowledges that, because of these (and other) omissions, the totally monetary value of the change in impacts included in the analysis only represents a subset of potential benefits (or forgone benefits) expected to result from the regulatory option.[34] While it's clear that the EPA is underestimating the environmental impacts of ELG pollution, it is unclear exactly how large an impact the excluded categories would have on the BCA. It is concerning that the EPA has failed to monetize so many impacts without providing adequate justification for its decisions.

The EPA excluded NO_x and SO_2 changes because it did not have sufficient modeling support

In deviation from the 2015 rule, the EPA quantified but did not monetize the national average benefit per ton estimates for $PM_{2.5}$, SO_2, and NO_x.[35] According to the EPA, mapping these emissions changes to air quality changes required air quality modeling. However, the EPA claimed it could not conduct the necessary modeling in time, as the agency's modeling capacity was fully allocated to supporting other regulatory and policy efforts. Although it is possible that this will be included in the final rule, lack of inclusion of the benefits associated with reductions in emissions of these air pollutants would skew the overall results of the benefit-cost analysis. More specifically, the NO_x and SO_2 emissions for Option 4 are significantly less than those for Option 2.[36] Lack of inclusion of the air quality changes underestimates the total benefits associated with Option 4 and overestimates the benefits associated with Option 2.

4.2. The EPA uses a new standard to calculate the social cost of carbon

The EPA has shifted how it accounts for the social cost of carbon in its regulations. In keeping with this trend, the current analysis uses the domestic social cost of carbon rather than the global social cost of carbon (which the EPA originally used in 2015). The domestic social cost of carbon evaluates and monetizes the impacts and damages of CO_2 emissions felt within the United States, whereas the global social cost of carbon evaluates the impacts and damages felt globally from the CO_2 emissions. Globally, some regions are significantly more vulnerable to the impacts of climate change than the United States; therefore the domestic cost will be significantly lower than the global cost. This shift impacts both the baseline and the rule modification; however, the CO_2 emissions for Option 4 are significantly less than

[34] BCA 2019, page 2-7.

[35] Federal Register/Vol. 84, No. 226/Tuesday, November 22, 2019/Proposed Rule, 64658.

[36] Federal Register/Vol. 84, No. 226/Tuesday, November 22, 2019/Proposed Rule, 64659, Table XII.

the CO_2 emissions for Option 2.[37] Therefore, undervaluing the social cost of carbon would underestimate the benefits associated with Option 4 in comparison to Option 2.

5. THE EPA SHOULD AMEND ITS PROPOSED MODIFICATIONS TO THE ELG RULE TO MITIGATE UNNECESSARY ENVIRONMENTAL DAMAGE FROM INCREASED POLLUTANT LEVELS

In this section we outline our major substantive concerns with the EPA's proposed modifications to the ELG rule (which are introduced in Section 1.2). Our concerns here are separate from the baseline and BCA methodological critiques we discussed above. However, they are enabled and compounded by the EPA's use of a flawed BCA with a faulty baseline.

We find that the proposed modifications actually increase pollutant levels and environmental cost across all categories of pollutants except bromide by: (1) reducing the technology basis for compliance and extending the compliance deadline for FGD flows; (2) introducing sub-categories that allow compliance using a lower technology standard; and (3) using the VIP program to pit bromide reduction benefits against all other pollutant reduction benefits.

5.1. The EPA's proposal to use a less stringent technology basis for both FGD and BA transport water, and to delay compliance for FGD wastewater streams, will result in unnecessary environmental damage

The EPA's proposed changes to the technology basis for ELG compliance for FGD and BA wastewater streams allows less stringent and delayed compliance options relative to the 2015 rule. These changes will increase environmental damages, resulting in significant losses of benefits that would have resulted from full and timely implementation of the 2015 rule. Specifically, for FGD wastewater the EPA proposes substituting LRTR biological treatment for HRTR biological treatment, claiming that the LRTR is less costly and requires fewer process and facility and footprint modifications than the HRTR.[38] For BA transport water, the EPA proposes substituting high-recycle rate system for a closed-loop system. While the EPA claims the proposed technologies will achieve a similar level of pollution control benefits, the reality is "similar" means lower. Specifically, the EPA is proposing to allow higher daily maximum limits

[37] Federal Register/Vol. 84, No. 226/Tuesday, November 22, 2019/Proposed Rule, 64659, Table XII.

[38] "LRTR is a biological treatment system that targets removal of selenium and nitrate/nitrite using fixed film bioreactors in smaller, more compact reaction vessels than those used in the biological treatment system evaluated in the 2015 rule (referred to in this proposal as HRTR—high residence time biological reduction). The LRTR system is designed to operate with a shorter residence time (on the order of 1 to 4 hours, as compared to a residence time of 10–16 hours for HRTR), while still achieving significant removal of selenium and nitrate/nitrite." Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64627.

for selenium and arsenic under the proposed modifications to the ELG rule than under the original rule.[39] Total pollutant levels for all pollutants except bromide are expected to increase under the proposed modification.

The EPA is also proposing to delay compliance for FGD wastewater streams until 2025. This will allow units to put their wastewater in surface impoundments for an extra two years relative to the original rule. The EPA should absolutely not be proposing a relaxation of the BAT or an extension in the compliance deadline: The decrease in environmental benefits that accompanies these proposed changes is significant when evaluated against a valid baseline. Instead, the EPA should be recommending Option 4, compliance using membrane filtration technology, with the removal of the subcategories outlined below.

5.2. The EPA proposal to allow sub-categories of plants to comply using less stringent technology standards will result in unnecessary environmental damage

The EPA has also proposed three subcategories, which include exempting plants retiring by 2028 from compliance and allowing high FGD flow and low utilization plants to comply with less stringent technologies. The EPA is not transparent about the environmental impacts (negative benefits) that each proposed subcategorization will have, and we recommend that the EPA remove these subcategories from the proposal. Each of these is explained below.

Facilities with high FGD flows

The EPA proposes the high flow subcategory based on the statutory factor of cost.[40] The subcategory is designed specifically for the Cumberland Fossil Plant owned by the Tennessee Valley Authority, which requested a variance under the original rule, and will allow the plant to comply using the less stringent chemical precipitation technology.[41] This exemption is completely inappropriate and prioritizes cost over all environmental impacts to people in the region. The EPA is not transparent about the environmental costs of allowing the Cumberland Plant, which accounts for approximately one-sixth to one-seventh of all industry FGD wastewater, to comply using a significantly less stringent technology for the remainder of its operating life.

[39] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64632.

[40] Federal Register/Vol. 84 No. 226/Friday, November 22, 2019/Proposed Rule, page 64638.

[41] The plant's wastewater flow volumes are an order of magnitude higher than other units due to the system design, which prevents recycling of water. This would make the cost of a biological system very high. Federal Register/Vol. 84 No. 226/Friday, November 22, 2019/Proposed Rule, page 64638.

Boilers with low-utilization

The EPA proposes the low-utilization subcategory based on the statutory factors of cost and non-water quality environmental impacts (including energy requirements).[42] The subcategory is designed to allow low utilization coal-fired boilers that are operating as cycling or peaking boilers to comply using the less stringent chemical precipitation technology. The EPA makes the unsubstantiated claim that continued operation of these plants is "useful, if not necessary, for ensuring electricity reliability in the near term."[43]

It is expensive and inefficient to operate coal plants as anything other than baseload units due to the long start-up and shut-down times, and high associated costs (which are passed on to the ratepayers). This proposed subcategory will allow utilities to continue to operate these plants, rather than evaluating the myriad of lower-cost alternatives that exist to supply the energy and peaking capacity that the EPA claims is "necessary for reliability." The EPA does not acknowledge that, in addition to the negative environmental impacts, this proposed modification will incur cost to ratepayers by allowing uneconomic coal plants to continue to operate instead of retiring.[44]

Boilers retiring by 2028

The EPA proposes the subcategory for boilers retiring by 2028 based on the statutory factors of cost, the age of the equipment and facilities involved, non-water quality environmental impacts (including energy requirements), and other factors as the Administrator deems appropriate.[45] This subcategory is designed to allow units retiring by 2028 to comply by putting their wastewater into so-called surface impoundments, despite the EPA openly admitting that "surface impoundment[s] are not as effective at controlling pollutants like dissolved metals and nutrients as achievable technologies like chemical precipitation and LRTR."[46] This modification essentially grants these plants exemptions to manage their untreated wastewater in giant surface pits.[47]

As discussed in Section 2.2, the EPA does not account for the change in environmental benefits and costs that will result from this proposed subcategorization. Instead, the EPA excludes all plants retiring

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[42] Federal Register/Vol. 84 No. 226/Friday, November 22, 2019/Proposed Rule, page 64638.

[43] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64639.

[44] Market rules allow utilities to regularly self-commit coal plants, even when it is uneconomic to do so. The SPP market monitor published a study on the topic of self-commitment in December 2019, concluding that self-commitment practices increase system cost and depress market energy prices, available at https://spp.org/documents/61118/spp%20mmu%20self-commit%20whitepaper.pdf. Sierra Club also published a report exploring this practice around the country, available at https://www.sierraclub.org/sites/www.sierraclub.org/files/Other%20Peoples%20Money%20Non-Economic%20Dispatch%20Paper%20Oct%202019.pdf.

[45] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64639.

[46] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64639.

[47] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64634.

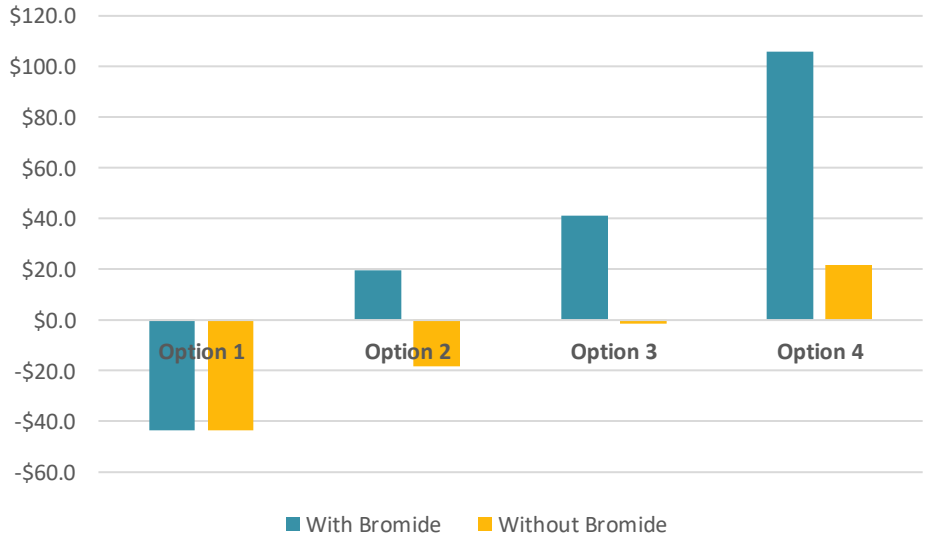
by 2028 from the baseline, and therefore from the BCA. The EPA is not transparent about the number of plants retiring between 2023 (the compliance deadline under the original rule) and 2028. Nor is it transparent about the environmental impacts of these plants continuing to place their wastewater into unlined pits rather than treating wastewater using the BAT (or alternatively retiring because compliance is uneconomic relative to resource alternatives). It is totally inappropriate that the EPA is not only proposing such a low stringency compliance option but is also hiding the impacts of the proposed modification in the baseline so that the negative environmental impacts do not show up in the differential BCA (relative to the original rule).

5.3. The EPA's proposed modifications to the VIP program pits bromide reduction benefits against all other environmental impacts and hides the damage that will result from the increase in all other pollutant levels

The EPA's claim that the proposed changes will increase benefits and lower costs is misleading and stems entirely from the VIP program's estimated reduction in bromide pollution at nine plants. Without the VIP program, the proposed update will increase environmental damage across all non-bromide pollutants (mercury, arsenic, selenium, nitrate/nitrite, bromide, and total dissolved solids).

One significant problem with the proposed modifications is that they allow the agency to present the compliance options as though the public has to make a choice between reducing bromide or reducing all other ELG regulated pollutants. A reduction in bromide and bladder cancer is unarguably a good thing. However, it should not be used to justify an increase in all other pollutants. As shown in Figure 1, under the EPA's proposed Option 2, the changes decrease the net environmental benefits absent the bromide benefits from the VIP program. However, under Option 4, even without the bromide reduction benefits, the proposed modifications will offer net environmental benefits.

Figure 1: Annualized benefits relative to EPA's 2015 baseline, with and without the VIP program (mid-range)



Source: Benefit and Cost Analysis for Proposed Revisions to the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, November 2019. Tables 4-7 and 13-1.

Per the EPA, there is significant uncertainty in the bromide impacts from the membrane technologies, and the benefits come from a small number of facilities that would be participating in the VIP program.[48] Under the original rule, compliance with the VIP program was too expensive, and no plants opted in. Although it is reasonable to attribute the benefits from bromide reduction to the proposed modification, the number of benefits attributed to the current VIP program skews the benefits heavily. This is particularly concerning given the uncertainty in whether the benefits will materialize.

Additionally, the EPA has acknowledged that bromide reduction benefits from VIP program participation stems from only a small number of plants, [49] but drives the benefits results. The EPA states, "approximately 90 percent of these benefits derive from a small number of steam electric facilities (6 facilities under Option 2, 7 facilities under Option 3, and 17 facilities under Option 4)." [50] However, the EPA projects that 18 plants will opt in to the VIP program under Option 2. This means that two-thirds of the plants do not actually deliver high bromide reduction benefits (likely because they have significantly smaller wastewater streams or lower bromide levels to begin with) but are still able to defer compliance by five years. Under Option 2, the EPA is essentially trading off the benefits of using a more stringent membrane technology against a delayed compliance deadline for all other pollutants. However, Option 4 (with the removal of the subcategorizations) would not require a trade-off between reduced bromide levels and all other pollutants and should be the recommended compliance option.

6. CONCLUSION

Based on our review of the EPA's proposed modifications to the ELG rule and the accompanying documentation—including the BCA, Supplemental TDD, Regulatory Impact Assessment—we find that Option 4 with a modification to remove the proposed subcategories for high FGD flow plants, low-utilization boilers and boilers retiring by 2028 is the only regulatory compliance option that offers an acceptable change in the level of environmental benefits from ELG compliance relative to the original rule. The EPA's recommendation to adopt Option 2 is based on incomplete and flawed analysis. Furthermore, the agency attempted to obscure these flaws by designing a BCA analysis structure that is opaque and omits accounting of specific proposed modifications.

[48] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64656.

[49] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64656.

[50] Federal Register/Vol. 84, No. 226/Friday, November 22, 2019/Proposed Rule, page 64656.

Below, we summarize our complete findings. We then outline recommendations for the EPA to modify and improve the transparency of its analysis and design a new regulatory compliance option.

6.1. Findings

Our primary findings are as follows:

1. The EPA's selection of Option 2 is based on skewed analysis that omits important benefits. Option 4—with the removal of the subcategories for high FGD flow plants, low-utilization boilers, and boilers retiring by 2028, as well as maintaining current zero-discharge requirements for bottom ash transport water —will provide the highest environmental benefits and should be the EPA's preferred option.

2. The EPA's proposed changes to the technology basis for ELG compliance for FGD and BA wastewater streams allows less stringent and delayed compliance options relative to the 2015 rule. These changes will increase environmental damages, resulting in significant losses of benefits that would have resulted from full and timely implementation of the 2015 rule.

3. The EPA's claim that the proposed changes will increase benefits and lower costs is misleading and stems entirely from the Voluntary Incentives Program's (VIP) estimated reduction in bromide pollution at nine plants. Without the VIP program, the proposed update will increase environmental damage from all plants.

4. In calculating the cost and benefits of the proposed modifications, the EPA relies on an inappropriate baseline that removes all plants retiring by 2028 and therefore does not account for all proposed modifications to the ELG rule.

5. The BCA does not adequately and transparently break out the impact of each modification and proposed change in keeping with good BCA practices.

6. The EPA systematically neglects to quantify or monetize impacts, and therefore does not account for specific reduced environmental benefits that will result from the proposed modifications to the ELG rule.

6.2. Recommendations

1. The EPA should update the BCA analysis structure to include the following:

    - A baseline that presents the costs and benefits that will result from ELG compliance in the absence of the proposed modifications

    - Evaluation of the changes in the costs and benefits of the proposed modifications to the ELG rule relative the updated baseline

    - Evaluation of the total costs and benefits that will result from the proposed modifications to the ELG rule relative to a baseline of current conditions

- A transparent and clear break-out of the costs and benefits for each program and component of the proposed modifications to the ELG rule relative to the updated existing rule baseline and the current conditions baseline

2. The EPA should calculate and transparently present the following:
    - The impacts of the VIP program on bromide pollutant levels separately from the impacts of the other proposed modifications on the levels of each pollutant evaluated in the original ELG rule
    - The impact that the CCR amendment will have on ELG compliance, if adopted
    - The impact of each subcategory (high FGD flow, low-utilization boilers, and boilers retiring by 2028)
    - The impacts of deferring compliance with FGD requirements by two years
3. The EPA should calculate and include the following in an updated BCA:
    - The costs and benefits of the surface impoundment technology for the plants retiring between 2023 and 2028
    - The cost and benefits associated with announced operational changes between October 2018 and July 2019
    - The change in benefits for all the impacts that were monetized in the original BCA but were not monetized in the BCA for the proposed modifications to the rule due to agency claims that the impacts were too small
    - Monetized changes in NO_x, SO_2 and $PM_{2.5}$ benefits that were omitted based on the purported unavailability of modeling resources to the EPA.
4. The EPA should select regulatory Option 4, with the removal of the proposed subcategorizations and the proposed changes to bottom ash transport water requirements, and not Option 2 as the preferred regulatory compliance option.
5. However, if Option 2 remains the preferred regulatory option, the EPA should first update the following components of the rule:
    - Amend the VIP rule to only allow plants that will provide significant bromide reduction benefits to participate.
    - Do not exempt plants retiring between 2023 and 2028 from compliance.
    - Do not allow high FGD flow and low utilization boilers to comply using less stringent chemical precipitation technology.