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KE KIA'ĀINA O KA MOKU'ĀINA 'O HAWAI'I

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In reply, please refer to:
File:

26-134E CAB

April 17, 2026

U.S. Environmental Protection Agency
EPA Docket Center (EPA-DC)
Regulations.gov

Dear EPA Desk Officer:

Subject: Docket ID No. EPA–R09–OAR–2025–0152; Comments on EPA Proposed Partial Approval and Partial Disapproval of Hawaii's Regional Haze State Implementation Plan (SIP) for the Second Planning Period

The Hawaiʻi State Department of Health (Hawaiʻi DOH) appreciates the opportunity to comment on the Environmental Protection Agency's (EPA's) proposed partial approval and partial disapproval of Hawaii's Regional Haze SIP for the second planning period (91 Federal Register 7204, February 17, 2026). EPA's decision has Regional Haze implications far beyond Hawaiʻi, including ramifications on other states' second planning period (2018-2028) Regional Haze SIPs. Hawaii's Regional Haze SIP for the second planning period was submitted initially in 2022, revised, and resubmitted in 2024.

Hawaiʻi DOH is concerned that EPA's proposed action on Hawaii's Regional Haze SIP is not consistent with the purpose of Clean Air Act Section 169A which was enacted to protect visibility in national parks and wilderness areas. In addition, the decision directly conflicts with EPA's previous guidance for developing Regional Haze SIPs. Therefore, we respectfully request EPA to reconsider its proposed action to partially disapprove Hawaii's Regional Haze SIP. Please refer to the enclosed comments for further details.

If you have any questions regarding this matter, please contact Ms. Marianne Rossio of the Hawaiʻi DOH, Clean Air Branch by email at cab.general@doh.hawaii.gov or by phone at (808) 586-4200.

Sincerely,

KENNETH S. FINK, MD, MGA, MPH
Director of Health

Enclosure

Hawai‘i Department of Health Comments on Docket ID No. EPA-R09-OAR-2025-0152 April 17, 2026 Letter to EPA Docket Center (EPA-DC)

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I. INTRODUCTION

Congress enacted Section 169A of the Clean Air Act (CAA) to decrease haze and protect visibility in national parks and wilderness areas. Hawai‘i is home to two such national parks where protection of visibility is absolutely imperative. Haleakala National Park on the Island of Maui is a dormant volcano located 10,023 feet above sea level. Haleakala means “house of the sun” in Hawaiian and may be the best spot on earth to watch the sunrise. Mark Twain once described the sunrise at Haleakala as “the most sublime spectacle I have ever witnessed.” Hawai‘i Volcanoes National Park located on the Island of Hawai‘i is home to one of the most active volcanoes on earth. The park is a truly unique landscape where visitors can peer into the boiling caldera of Halemaumau Crater, a persistently active pit within Kilauea’s summit. Both parks are home to unique wildlife, both flora and fauna, many of which are found nowhere else on earth.

In furtherance of Congress’s goal of protecting visibility in these parks, Hawai‘i DOH developed the Regional Haze SIP. The Department is now concerned with the proposed partial disapproval of Hawaii’s long-term strategy under 40 CFR § 51.308(f)(2). The Department understands that EPA’s primary reason for proposing to partially disapprove the SIP is that Hawai‘i has not provided necessary assurances required by CAA §110(a)(2)E) that unconsented enforceable closures without just compensation could violate the Takings Clause of the US Constitution and similar provisions of State law. EPA recognizes that these closures were not unconsented at the time the State submitted the SIP.

Hawai‘i DOH is concerned that EPA’s characterization of “unconsented” closures is misplaced when the retirements were based on value decisions made by the sources in considering the costs of pollution controls. In all cases, the sources themselves proposed unit retirements. Further, some of the pollution controls required by the SIP do not even involve unit shutdowns and were also disapproved without explanation. Here, EPA acts arbitrarily by proposing to disapprove all the emissions controls. At least one source has the option of emissions controls in lieu of unit shutdown built directly into the terms of the Title V permit. Additionally, Hawai‘i DOH is concerned that EPA’s proposed disapproval rests on misreadings of CAA §110(a)(2)(E), the Takings Clause, and the relationship between the two.

I.0 Overview: The Hawai‘i DOH worked in consultation with EPA, Federal Land Managers (FLMs), and industry for over 6 years (July 2018 to August 2024) to prepare Hawaii’s Regional Haze SIP for the second planning period. Developing a Regional Haze SIP is a complicated, highly technical process during which states rely on the best information available at the time. *See* Attachment A for a history of events. During that time, the CAA, Regional Haze Rule (RHR), and all available EPA guidance documents were followed to develop long-term strategies for protecting visibility in Hawaii’s Class I areas (Haleakala National Park on Maui and Hawai‘i Volcanoes National Park on the Big Island/Hawai‘i). Now, more than 7 years after starting the SIP development process, EPA, under a new administration, is proposing to disapprove Hawaii’s long-term strategy based on its meeting with Hawaiian Electric and EPA’s new policy on unit shutdowns which is inconsistent with the statutes, regulations, and EPA’s own previous guidance to determine reasonable progress. *See* Attachment B for EPA’s updated guidance after SIPs have already been submitted for approval.

I.1 Clean Air Act: As part of establishing long-term strategies for meeting the national goal of preventing and remedying any impairment of visibility in mandatory Class I areas, the EPA required State agencies to create visibility related progress goals for their jurisdictions. In creating these progress goals, certain aspects of potentially affected businesses must be considered when establishing said goals. The EPA and State environmental agencies consider four factors when establishing reasonable progress goals. These factors are commonly known as the "four factor analysis" required under Section 169A of the CAA, under 42 U.S.C. Title 42, Subchapter I, Part C, Section 7491 Visibility Protection for Federal Class I areas, section (g) Definitions. These factors are:

1) Costs of compliance;
2) Time necessary for compliance;
3) Energy and non-air environmental impacts of compliance; and
4) Remaining useful life of any existing source subject to such requirements.

Additionally, the same four factors are also required by the RHR under 40 CFR Chapter I Subchapter C, Part 51, Subpart P. The rule mirrors the statute requiring States to establish reasonable progress goals while considering the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected source. Under the CAA, the role of the FLMs is to identify the classes or categories of sources and the types of air pollutants which may reasonably be anticipated to cause or contribute significantly to the impairment of visibility in their respective Class I areas. The CAA further provides guidelines and requires each applicable State agency to create an implementation plan if said State contains a Class I area.

The CAA establishes a framework of cooperative federalism under which states retain primary responsibility and are the principal decision-makers for developing SIPs to achieve national air quality and visibility goals. In developing SIPs, states are required to explain how the state will meet federal air quality requirements.[1] During this process, states are tasked with selecting emissions limitations and other control measures and providing for the enforcement of such measures.[2] Here, Hawai'i DOH proposed the Regional Haze SIP under CAA §110(a) and §169A(b) to evaluate sources within their jurisdictions and develop implementation plans to achieve reasonable progress toward natural visibility conditions in mandatory Class I Federal areas.

EPA's role is to review SIP submissions for compliance with statutory and regulatory requirements, but the Act preserves substantial state discretion in determining the specific control strategies used to meet those requirements, including the application of the four statutory factors identified in CAA §169A(g)(1). In reviewing SIPs, EPA "is confined to the ministerial function of reviewing SIPs for consistency with the Act's requirements-if a SIP meets the statutory criteria of the [Act], then EPA must approve it."[3]

[1] *See Heal Utah v. EPA*, 77 F.4th 1275, 1280 (10th Cir. 2023).
[2] *Id*. at page. 15.
[3] *State of Texas v. EPA*, 132 F.4th 808, 819 (5th Cir. 2025).
[4] Basic Information about Visibility – EPA https://www.epa.gov/visibility/basic-information-about-visibility.

Hawai‘i developed its Regional Haze SIP consistent with this framework, relying on EPA regulations and guidance available during the planning process and incorporating enforceable commitments negotiated with affected sources. Reinterpreting that guidance after SIP submission undermines the cooperative federalism structure of the CAA and the ability of states to rely on EPA guidance when developing SIPs.

Under the mandates of the CAA and the RHR, and working with the FLMs, the Hawai‘i DOH has been given the responsibility of analyzing and determining the progress needed to attain national visibility goals in its mandatory Class I areas while also considering the above-mentioned four-factor analysis.

I.2 Source Screening: In developing the SIP, Hawai‘i DOH selected the sources with the greatest potential to impact visibility in the national parks. Pursuant to 40 Code of Federal Regulations (CFR) §51.308 (f)(2)(i) of the RHR, Hawai‘i DOH provided documentation on its rational for the selection of emission sources requiring an analysis of control measures. For the selection process, direct pollutants and precursor pollutants that could impair visibility included sulfur dioxide (SO_2), nitrogen oxides (NO_X), fine and coarse particulate matter (PM), volatile organic compounds (VOCs), and ammonia (NH_3) (*See* 2019 EPA Regional Haze Guidance, page 11).

Hawai‘i focused on SO_2, NO_X, and PM emissions as these are the dominant pollutants from combustion sources with the highest potential to affect visibility[4] including those pollutants from units grandfathered from the prevention of significant deterioration (PSD[5]) regulations with no controls or emission limits. Many of these steam units are inefficient and Hawaiian Electric recognizes that major repairs and maintenance are expected. It is explained in the Hawaiian Electric Integrated Grid Plan Report May 2023[6] on page 260, that such maintenance would result in “significant increases in operation and maintenance expenses.” Note that primary emissions from the Kahului Power Plant consist of PM, SO_2, and NO_x. In 2024, the facility reportedly emitted 2,032 tons of SO_2, 586 tons of NO_x, 77 tons of PM, 0.7 tons of VOC and 6.2 tons of NH_3. Despite the significant emissions from this non-PSD source, Kahului Power Plant has neither pollution controls nor emission limits. Furthermore, the power plant is located only approximately 16.5 miles from the border of Haleakala National Park, one of Hawaii’s two Class I areas. Visibility monitoring findings showed primarily sulfates and nitrates with lower levels of elemental carbon for both of Hawaii’s Class I areas. A portion of the SO_2 levels in the area are likely attributable to releases from the Kilauea Volcano. However, the nitrates and elemental carbon measured at the Interagency Monitoring of Protected Visual Environments (IMPROVE[7]) sites are markers of particulate species from anthropogenic sources. Showing that the site is impacted by anthropogenic pollution.

[4] Basic Information about Visibility – EPA https://www.epa.gov/visibility/basic-information-about-visibility.
[5] Prevention of Significant Deterioration Basic Information – EPA https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information.
[6] Hawaiian Electric Integrated Grid Plan Report May 2023 at Dkt. C.02 260.
[7] CSN and IMPROVE Protocol Network Assessment – EPA https://www.epa.gov/amtic/csn-and-improve-protocol-network-assessment.

The Hawai'i DOH initially used an emissions divided by distance (Q/d) screening method conducted by the Western Regional Air Partnership (WRAP) in coordination with the Ramboll US Corporation to determine which sources required a four-factor analysis. The Q/d screening provided an assessment of SO_2, NO_x, and PM less than 10 microns in diameter (PM_{10}). Based on Q/d, the following facilities were selected for four-factor analysis:

Q/d Screening (see note a)	
Facility	**Island**
Kalaeloa Partners, L.P. Cogeneration Plant	O'ahu
Kahe Generating Station	O'ahu
Kanoelehua-Hill Generating Station	Hawai'i
Kahului Generating Station	Maui
Maalaea Generating Station	Maui
Puna Generating Station	Hawai'i
Waiau Generating Station	O'ahu

a. The "Q/d" surrogate for screening is the annual emissions in tons per year ($Q_{SO2} + Q_{NOX} + Q_{PM}$) divided by the distance in kilometers (d in km) between the source and the nearest class I area.

To address limitations with the Q/d metric, such as the absence of transport, dispersion, and photochemical processes, WRAP/Ramboll conducted a weighted emissions potential/area of influence (WEP/AOI) analysis for the Hawai'i DOH to determine the potential of sources to contribute to visibility impairment at the national parks for the most impaired days. The WEP/AOI analysis provided an individual Q/d assessment for SO_2 and NO_x and also accounted for meteorological data such as wind patterns, and the specific light extinction contribution of the particle species (nitrates and sulfates).

Based on WEP/AOI rankings, sources selected with Q/d on O'ahu which did not rank high in their potential to affect visibility in the national parks were excluded from requiring a four-factor analysis. The WEP/AOI analysis; however, determined that electric plants on Maui and the Big Island and the Mauna Loa Macadamia Nut Corporation plant on the Big Island had the greatest potential to affect visibility in the national parks. Therefore, the list of sources requiring a four-factor analysis was narrowed down to the following plants:

WEP/AOI Screening			
Facility	**Island**	**Nearest Class I Area**	**Distance from Park Border (miles)**
Kanoelehua-Hill Generating Station	Hawai'i	Hawai'i Volcanoes National Park	15.9
Puna Generating Station	Hawai'i	Hawai'i Volcanoes National Park	14.3
Kahului Generating Station	Maui	Haleakala National Park	16.5
Maalaea Generating Station	Maui	Haleakala National Park	15.9
Mauna Loa Macadamia Nut Corporation Plant	Hawai'i	Hawai'i Volcanoes National Park	16.2

I.3 Cost Threshold: The cost threshold significantly impacted both the emissions controls proposed by Hawai‘i DOH and the source’s decision to propose the shutdowns. Hawai‘i DOH notes that EPA does not appear to take issue with the SIP’s cost threshold analysis. Originally, the threshold for cost-effectiveness was generally around $5,000 per ton of pollutant removed, expressed in 2009 dollars, during the first planning period of the Regional Haze plan produced by the EPA. To maintain equivalence with sector-specific inflation, this value was escalated using the Chemical Engineering Plant Cost Index (CEPCI). The CEPCI increased by around 16% from 2009 to 2019, updating the threshold to approximately $5,800 per ton. This cost threshold serves as a benchmark, since EPA guidance makes clear that cost metrics act as non-binding guidelines, and that states retain discretion to identify control measures as cost-effective even when cost-effectiveness exceeds these thresholds.

Ultimately, the Hawai‘i DOH followed EPA's recommendation to escalate costs to 2021 dollars and to incorporate the then-current prime interest rate in its four-factor analysis. The CEPCI rose from 521.9 in 2009 to 708 in 2021, a 136% increase, yielding a revised threshold of approximately $6,800 per ton. (The 2022 CEPCI was not yet available at the time of evaluation.) This is the figure used in the 2024 revision of the Regional Haze SIP, and the one that EPA references in the proposed rule.

I.4 Long-Term Strategy Overview: In accordance with 40 CFR §51.308 (f)(2) of the RHR, Hawai‘i DOH performed four-factor analyses, using the original cost threshold, to determine the long-term strategy for regional haze based on screening results from the WEP/AOI analysis. On May 27, 2021, the Hawai‘i DOH notified Hawaiian Electric (*See* Attachment C) of regional haze control measures selected. Hawai‘i DOH determined that reasonable control measures included fuel switches, emissions controls, and monitoring. The measures selected by Hawai‘i DOH did not include unit shutdowns. Instead, the unit shutdowns were the product of negotiations, which resulted in the shutdowns being proposed by Hawaiian Electric. The notification letters reflected Hawai‘i DOH’s request that Hawaiian Electric submit applications for permit modifications to incorporate the following regional haze controls:

- Kanoelehua-Hill Power Plant Boilers Hill 5 and Hill 6 – Fuel switch to ultra-low sulfur diesel on and after December 31, 2024, combustion controls including low-NO_x burners, flue gas recirculation (FGR), and overfire air (OA) or the applicable combination of these controls on and after December 31, 2027, selective catalytic reduction (SCR) on and after December 31, 2027, and continuous emissions monitoring system (CEMS) to monitor NO_x.

- Puna Power Plant Boiler – Fuel switch to ultra-low sulfur diesel on and after December 31, 2024.

- Kahului Power Plant Boilers K1 through K4 – Fuel switch to ultra-low sulfur diesel on and after December 31, 2024, combustion controls including low-NO_x burners, FGR, and OA or the applicable combination of these controls on and after December 31, 2027, SCR on and after December 31, 2027, and a CEMS to track emissions from the air pollution control devices.

- Maalaea Generating Station Units M1, M2, and M3 – Fuel Injection Timing Retard (FITR) on and after December 31, 2026.

- Maalaea Generating Station Unit M7 - SCR with ammonia slip monitoring system and CEMS to monitor NO_x.

Initially, Hawai'i DOH requested a four-factor analysis for the Mauna Loa plant on the Island of Hawai'i based on the screening results. However, a control measure analysis is no longer required for this facility because, according to the Mauna Loa Macadamia Nut Corporation Plant's maintenance manager, the power plant for the facility is currently shut down, there are no plans to restart the power plant, and electricity is now provided to the Mauna Loa plant by a solar farm at their facility and the electric utility. Additionally, their permit was amended on January 16, 2024, to incorporate an enforcement commitment to shut down the main boiler by December 31, 2026.[8]

After considering the pollution controls proposed by Hawai'i DOH, Hawaiian Electric proposed federally enforceable air permit conditions to shut down the Kahului and Kanoelehua-Hill Generating Station boilers by December 31, 2027, as documented in Hawai'i DOH's November 9, 2021, letter (*See* Attachment D). Hawaiian Electric made this proposal with the understanding that the enforceable shutdowns exclude these boilers from a four-factor analysis (*See* Attachment E). This value decision implicitly concedes that the four-factor analysis results in similar emissions controls to those proposed by Hawai'i DOH. Currently boilers at the Kahului and Kanoelehua-Hill plants are units grandfathered from PSD regulations that burn residual fuel oil No. 6 operating with no pollution controls or emission limits.

I.4.1 Long-Term Strategy – Regional Haze SIP 2022 Submittal: Although discussions with Hawaiian Electric were ongoing, on August 12, 2022, Hawai'i DOH submitted Hawaii's Regional Haze SIP in order to meet EPA's August 15, 2022, deadline and avoid EPA's Finding of Failure to Submit. This SIP plan included Title V permit amendments for the Kanoelehua-Hill, Kahului, and Puna Power Plants which incorporated the following regional haze control measures:

Hawai'i Island Sources:

- Kanoelehua-Hill Power Plant – Permanent shut down of Boilers Hill 5 and Hill 6 by December 31, 2027. The shutdown date was based on a compliance time of five years to implement controls selected in the four-factor analysis.

- Puna Power Plant – Fuel switch from fuel oil No. 6 to ultra-low sulfur diesel for the plant's boiler by four years from issuance of the permit amendment. The permit amendment was issued on August 10, 2022, during the first submittal of the Regional Haze SIP on August 12, 2022.

[8] Hawaii's Regional Haze Progress Report for Second Planning Period State Implementation Plan January 2025 at page 22. https://health.hawaii.gov/cab/files/2025/01/2025-RHPR-Final.pdf

Maui Island Sources:

- Kahului Power Plant – Permanent shut down of Boilers K-1, K-2, K-3, and K-4 by December 31, 2027. The shutdown date was based on a compliance time of five years to implement controls selected in the four-factor analysis.

- Maalaea Power Plant – Preliminary evaluation found that fuel injection timing retard (FITR) for Diesel Engine Generators M1, M2, and M3 and selective catalytic reduction (SCR) for Diesel Engine Generator M7 by 2028 are required. After further review, more controls for units from this facility were being considered. Therefore, controls for the Maalaea Generating Station were addressed in the Regional Haze SIP revision later submitted in 2024.

Even after the Regional Haze SIP was submitted with the terms above, Hawai‘i DOH consistently worked with Hawaiian Electric to consider their concerns and afforded Hawaiian Electric every opportunity to engage in discussions. In a letter dated December 2, 2022, Hawaiian Electric requested Hawai‘i DOH extend the shutdown of the Kahului Generating Station (Kahului) and Kanoelehua-Hill Generating Station (Hill) boilers from the current deadline of December 31, 2027, to December 31, 2028, (*See* Attachment F). The request was based on Hawaiian Electric's consultant's (AECOM) direct correspondence with EPA's Office of Air Quality Planning and Standards (OAQPS) indicating that a unit may be excluded from a four-factor analysis based on a closure date as late as the end of 2028. Although AECOM's correspondence with OAQPS took place over one year prior to the SIP submittal to EPA, Hawai‘i DOH was not made aware of the information until receiving comments on the SIP on July 22, 2022.

Based on the same rationale for extending the closure dates to the end of 2028, Hawaiian Electric submitted permit applications on January 6, 2023, for significant modification to extend boiler shutdown dates for the Kahului and Kanoelehua-Hill Generating Stations.

Recognizing the "ongoing challenges of maintaining older units…" in a letter dated January 20, 2023, Hawaiian Electric proposed shutdown dates for diesel engine generators M10 - M13 for the Maalaea Generating Station (*See* Attachment G). EPA's 2019 guidance allows the state to justify not selecting for analysis of control measures if there is an enforceable requirement for a source to cease operation by a date outside the second regional haze planning period (2018-2028). The remaining useful life factor is closely related to the cost of compliance factor, with calculated cost of compliance generally increasing with a shorter remaining useful life based on decreasing amortization period.

After being informed of the increase in cost threshold from $5,800/ton to $6,800/ton, Hawaiian Electric sent Hawai‘i DOH a letter on March 6, 2023. The letter proposed a shutdown of M7 and revised shutdown dates for M10 to M13 at Maalaea Generating Station. The letter also requested that the M7 shutdown be conditional and Hawaiian Electric have the flexibility to install SCR by December 31, 2028, in lieu of the shutdown. *See* Attachment H.

On November 6, 2024, after additional consultation with Hawaiian Electric regarding the cost of controls, Hawai‘i DOH drafted the technical support document for amending the permit to incorporate regional haze control measures for the Maalaea Generating Station.

I.4.2 Long-Term Strategy – Regional Haze SIP 2024 Re-submittal: On August 2, 2024, Hawai‘i DOH submitted Revision 1 of Hawaii’s Regional Haze SIP to EPA for approval. The plan included issued permit amendments that incorporate the following regional haze control measures:

- Kanoelehua-Hill Power Plant Boilers Hill 5 and Hill 6 – Shut down boilers by the end of 2028.
- Puna Power Plant Boiler – Fuel switch to ultra-low sulfur diesel in August of 2026.
- Kahului Power Plant Boilers K-1 through K-4 – Shut down boilers by the end of 2028.
- Maalaea Generating Station Units M1 and M3 – FITR by the end of 2027.
- Maalaea Generating Station Units M7 and M10-M13 – SCR or permanently shut down by:
    - 2037 for M7
    - 2030 for M10 and/or M11;
    - 2032 for M10 or M11 if one of the units shuts down by the end of 2030 or installs SCR; and
    - 2037 for M12 and M13.

On October 7, 2024, after the Regional Haze SIP was submitted to EPA for approval and after extensive consultation with Hawaiian Electric, Hawaiian Electric proposed the following contingency measures for the Kahului and Kanoelehua-Hill Generating Stations (*See* Attachment I):

- Kahului, Maui

  Kahului Units K-1 through K-4 may operate on fuel oil No. 6 temporarily during periods of generation need until December 31, 2030, with an annual fuel use limit for K-3. All boilers shall be permanently shut down by December 31, 2030.

- Kanoelehua-Hill, Hawai‘i Island

  Kanoelehua-Hill Unit Hill 6 may operate on fuel oil No. 6 temporarily during periods of generation need until December 31, 2030, with an annual fuel use limit. The Hill 6 boiler shall permanently shut down by December 31, 2031.

In response to Hawaiian Electric's proposed contingency measures for the Kahului and Kanoelehua-Hill Generating Stations, Hawai‘i DOH sent Hawaiian Electric a letter titled" Response to Request for Extending Boiler Shutdown Dates Specified in Air Permits for Hawaii's Regional Haze State Implementation Plan" (*See* Attachment J), dated November 18, 2024. In the letter, Hawai‘i DOH explains that, after discussions with EPA Region 9, it was determined that performing the actions required to comply with Hawaiian Electric's proposal would delay Hawai‘i DOH's SIP submittal to a point at which EPA would issue Hawai‘i with a "Finding of Failure to Submit" which can lead to legal actions, sanctions, and loss of federal funding. It was concluded that Hawai‘i DOH would be unable to grant Hawaiian Electric's requests, but that Hawai‘i DOH may consider Hawaiian Electric's proposal as part of the third regional haze planning period (2028-2038) Regional Haze SIP.

The EPA experienced a change in leadership in January of 2025 and EPA changed their interpretation of the RHR and the statutes. Hawaiian Electric's position then abruptly changed as a result of EPA's new positions on the RHR. On June 10, 2025, Hawaiian Electric sent a letter requesting a meeting with Hawai‘i DOH to discuss potential revisions to the Regional Haze SIP, citing EPA's approval of other state's SIPs and information on EPA's new policy in their SIP approvals that includes revised presumptions concerning reasonable progress and the state's four-factor analysis. Hawaiian Electric also noted macro-level economic trends that increased the costs associated with previously assessed control technologies and replacement generation development as another reason to discuss revisions. *See* Attachment K.

Hawaiian Electric began to request that Hawai‘i DOH consider the basis of EPA's recent approvals in other states. *See* Attachment L. At a meeting on June 27, 2025, Hawaiian Electric requested that Hawai‘i DOH prepare a supplemental SIP to re-evaluate control costs.

This initiated additional communications from Hawaiian Electric raising grid reliability concerns, EPA policy changes, project delays and cancellations, minimal visibility impacts, and new air modeling data and calling for Hawai‘i DOH to submit a supplemental SIP. *See* Attachment M. Also included in Attachment M are the slides that were presented to CAB during the meeting, explaining and summarizing the points reiterated in the email.

On August 25, 2025, during a meeting between Hawaiian Electric and the Regional Administrator for EPA Region 9, Hawaiian Electric presented arguments as to why the Hawai‘i Regional Haze SIP requires a supplement to address new grid reliability concerns. The Hawai‘i DOH, the

relevant air regulatory agency of Hawaiian Electric facilities, was neither present nor invited to the meeting. In slides that Hawaiian Electric presented during the aforementioned meeting (*See* Attachment N), they highlighted a few key points including recent changes in EPA policy as reflected in SIP disapprovals, post submittal economic changes, project delays and failures, and questions regarding the necessity of controls and retirements to attain reasonable progress in the regional haze second planning period. Additionally, the slides mention a Hawaiian Electric meeting with EPA Headquarters on July 10 including Aaron Szabo, the Assistant Administrator of the EPA, and Abigale Tardif, the Principal Deputy Assistant Administrator, who suggested Hawaiian Electric meet with EPA Region 9.

On August 29, 2025, Hawaiian Electric sent a follow-up letter via email to Mr. Josh F.W. Cook, the Regional Administrator for EPA Region 9 (*See* Attachment O), detailing the additional information promised by Hawaiian Electric at the conclusion of their August 25, 2025, meeting. The additional information provided in the letter is in support of Hawaiian Electric's concerns over how "[Hawaiian Electric] was forced under the SIP to accept enforceable retirement deadlines for units [Hawaiian Electric] plans to retire, due [to] the high costs of controls and fuel switches," and that "[Hawaiian Electric's] primary concern is that the proposed dates of these unit retirements may not allow enough time to successfully procure and place in service replacement projects needed to maintain grid reliability and integrity."

II. EPA's DECISION TO DISAPPROVE HAWAII'S LONG-TERM STRATEGY CONFLICTS WITH PREVIOUS GUIDANCE TO IMPLEMENT CAA §169A

II.0 EPA Proposal: EPA has proposed partial approval and partial disapproval of Hawaii's Regional Haze SIP for the second implementation period under the Regional Haze Rule (40 CFR §51.308). EPA proposes to approve several technical and reporting elements of the SIP, including the visibility metrics and technical analyses required under 40 CFR §51.308(f)(1), such as baseline visibility conditions, current visibility conditions, natural visibility estimates, progress assessments, and calculation of the Uniform Rate of Progress. EPA also proposes to approve Hawaii's progress reporting elements under 40 CFR §51.308(f)(5) and (g), including documentation of measures implemented during the first planning period, emission reductions achieved, updated emissions inventories, and visibility trend analyses. In addition, EPA proposes to approve the SIP's monitoring strategy under 40 CFR §51.308(f)(6), including continued use of the IMPROVE monitoring network and participation in the Western Regional Air Partnership, and EPA states that it identified no deficiency with respect to the reasonably attributable visibility impairment provisions under 40 CFR §51.308(f)(4).

EPA proposes to disapprove the SIP's long-term strategy under 40 CFR §51.308(f)(2), stating that the strategy relies on shutdowns of certain electric generating units that are no longer supported by the utility. EPA states that these shutdowns were initially agreed to but that the utility later withdrew

consent due to changes in renewable project timelines and concerns regarding grid reliability. EPA raises legal concerns regarding whether approval of such measures could implicate the Takings Clause and states that Hawai‘i did not provide the necessary assurances required under CAA §110(a)(2)(E)(i) that implementation of the SIP would not violate federal or state law. Because the Reasonable Progress Goals (RPGs) under 40 CFR §51.308(f)(3) depend on the long-term strategy, EPA proposes to disapprove the RPGs as well. EPA also proposes to disapprove the Federal Land Manager consultation element under 40 CFR §51.308(i) because the consultation was based on a SIP that EPA is now proposing to consider legally deficient. If finalized, the proposed disapproval would trigger a two-year deadline for EPA to promulgate a Federal Implementation Plan (FIP) unless Hawai‘i submits and EPA approves a revised SIP addressing the identified deficiencies.

Hawaii’s Regional Haze SIP for the second planning period relied on enforceable measures including retirement deadlines and control strategies to ensure visibility progress at Haleakala and Hawai‘i Volcanoes National Parks. Hawai‘i DOH also emphasizes that unit retirement deadlines are an alternative to installing pollution controls found feasible in four-factor analyses, which allows units to be shut down in the second planning period to be excluded from the four-factor analysis or the “remaining useful life” consideration be shortened to render control costs economically infeasible. EPA’s proposed partial disapproval of Hawaii’s Regional Haze SIP raises key issues that are addressed in Sections II.1 through II.7 below.

II.1 Lack of Documentation for Grid Reliability Concerns: While the Hawai‘i DOH understands and agrees with the importance of ensuring reliable operations and an adequate supply of energy to the State, the Hawai‘i DOH must express its concerns with EPA’s proposal to disapprove Hawaii’s long-term strategy. The Hawai‘i DOH is basing its concerns on the lack of technical documentation and authority justification provided directly by the EPA to support its decision. This is inconsistent with the tenets of cooperative federalism. Hawai‘i DOH was made aware of a meeting between Hawaiian Electric and Josh Cook, the Regional Administrator for EPA Region 9, on August 25, 2025, to discuss Hawaiian Electric’s grid reliability concerns raised by the State of Hawaii’s Regional Haze State Implementation Plan for the second planning period under the RHR. Despite Hawai‘i DOH’s direct involvement in the subject of the meeting, DOH was nonetheless excluded. During the meeting, Hawaiian Electric voiced its desire to have the closures imposed by the SIP submittal be reconsidered and addressed by EPA requiring the Hawai‘i DOH to submit a supplemental SIP or to partially or fully disapprove the SIP currently being reviewed by the EPA. *See* Attachment O.

The combination of the Hawai‘i DOH’s exclusion from and the timing of the above-mentioned meeting, the EPA action coinciding with Hawaiian Electric’s recently voiced concerns, and the lack of EPA documentation on the matter, it is Hawai‘i DOH’s concern that EPA’s decision to partially disapprove Hawaii’s SIP was either disproportionately or entirely influenced by Hawaiian Electric’s discussion with Region 9’s Regional Administrator. Hawai‘i DOH also notes that Hawaiian Electric’s statements on grid reliability are inconsistent with statements made in the final Integrated Grid Plan (IGP) prepared by Hawaiian Electric and approved by the Hawai‘i State Public Utilities Commission (PUC).

Courts have been critical of EPA's attempts to demonstrate expertise in the realm of grid reliability. "EPA's reliance on an outside expert demonstrates, EPA has no expertise on grid reliability… Therefore, the deference owed to EPA's assertions about grid reliability are diminished and the agency must support its arguments more thoroughly than in those areas in which it has considerable expertise and knowledge."[9] Hawai'i DOH does not question the competency of the EPA or any theoretical third-party experts they may utilize. However, Hawai'i DOH is concerned by the lack of any technical discussion and documentation on one of the issues that the partial disapproval appears to be based upon.

Hawai'i DOH echoes Colorado's concerns that EPA may lack authority to base SIP approvals based entirely or partially on grid reliability. In the January 2025 Executive Order, *Unleashing American Energy*, President Trump declared in Section 2.d, among other policies, that it is in the national interest to "[ensure] that all regulatory requirements related to energy are grounded in clearly applicable law."[10] Without clear reference to considerations of grid reliability in the Regional Haze provisions of the Clean Air Act, Hawai'i DOH must question EPA's authority to specifically enforce rules on the basis of grid reliability. In conjunction with the technical questions and the authority questions over grid reliability, Hawai'i DOH voices its concerns about the overall lack of documentation for both the technical and authority aspects of grid reliability cited in EPA's proposed partial disapproval for Hawaii's SIP.

II.2 Unconsented Closures: Hawai'i DOH understands that EPA's primary basis for proposing to partially disapprove Hawaii's SIP is Hawaii's failure to provide necessary assurances that the unconsented closures in the long-term strategy would not violate federal and possibly state law. Hawai'i DOH maintains that the unit closures were not unconsented closures.

In a letter sent by Hawai'i DOH on November 9, 2021, it is clear that Hawaiian Electric proposed the shutdown of the boilers at both the Kahului and Kanoelehua-Hill Generating Stations during a meeting on October 7, 2021, to exclude these units from a four-factor analysis, and the emissions controls resulting from the analysis. Based on the initial four-factor analyses, air pollution controls were initially selected for Kahului Boilers K-1 through K-4, and Kanoelehua-Hill Boilers Hill 5 and Hill 6. In order to meet the requirements for excluding a source from requiring a four-factor analysis, Hawaiian Electric made the value decision to commit to enforceable shutdowns of these boilers before the end of the second planning period (2018 to 2028). This reasoning and cost analysis is documented in the technical support documents for permit amendments to incorporate regional haze control measures dated June 9, 2022, for the Kahului Generating Station and May 6, 2022, for the Kanoelehua Hill Generating Station.

For Maalaea Generating Station, Hawaiian Electric worked with Hawai'i DOH to establish a shutdown schedule to reduce remaining useful life as SCR was economically feasible for diesel engine generators M7, M10, M11, M12, and M13 assuming a 20-year remaining useful life for installing SCR. The 20-year

[9] State of Texas v. EPA, 829 F. 3d 405, 432 (5th Cir. 2016).
[10] Executive Order No. 14154, 90 FR 8353, Document No. 2025-01956, January 20, 2025.

remaining useful life is a default value from EPA's Air Pollution Control Cost Manual for retrofitting diesel engine generators with SCR. Options were given for installing control technologies or having the units permanently shut down by the set dates to reduce the remaining useful life. This reasoning and cost analysis is documented in the technical support document for the draft permit amendment for the Maalaea Generating Station dated November 6, 2023.

In both cases, Hawaiian Electric cooperated with Hawai'i DOH to agree on terms and confirm dates for compliance with the RHR through shutdown or installing the required air control technology. Future communications discussed the timeline of these compliance dates, but Hawaiian Electric did not disclose or document any changes in consent to the shutdowns in future communications prior to the SIP submittal.

II.3 Voluntary Closures are Not Takings: Hawai'i utilities voluntarily committed to retire fossil-fueled units to avoid more costly air pollution controls that would have been found feasible otherwise, given their nature of allowing the units to operate longer and allow greater operational flexibility and reliability. The selected boilers for the Kahului and Kanoelehua-Hill Generating Station were chosen in part for retirement to exclude these units from a four-factor analysis, and the pollution controls accompanying this analysis. Selected diesel engine generators for the Maalaea Generating station were chosen for retirement in part based upon their shorter remaining useful life. The generator shutdowns were made federally enforceable only to the extent that pollution controls were not retrofitted onto these units. The commitments for Maalaea made by the utilities were incorporated into the SIP only as an alternative to employing pollution reduction measures, and the utilities have the option of complying with either requirement. EPA now characterizes all these commitments as "unconsented closures" and raises Federal Takings Clause concerns. When utilities propose retirement dates to avoid the cost of pollution controls, these dates are voluntary decisions by utilities, not forced closures. Characterizing these retirements as "unconsented" negates the years of negotiations that the Clean Air Branch of the Hawai'i Department of Health and other state air quality regulating agencies spent with companies agreeing to the terms of the SIPs.

II.4 Grid Reliability: The CAA's statutory requirement to assess "energy and non-air environmental impacts" was never meant to require state air regulators to perform a full electric grid reliability study. This factor, codified by Congress in Section 169A(g)(1) of the CAA, is meant to help evaluate emission control options by looking at local effects such as energy efficiency changes, fuel usage, water needs, and waste production.

To the extent that the factor requires state air regulators to consider "energy impacts", EPA's Regional Haze guidance explains that the review "generally involves assessing the impacts of a control measure on the energy consumed by a source" (2019 EPA Regional Haze Guidance, page 33). This interpretation is consistent with the analysis that a state air quality agency could realistically provide. Both the guidance and longstanding SIP practice focus on impacts to individual emission sources, not the reliability of the broader electrical grid. In addition, grid reliability is not a visibility or air-quality metric, nor is it an area in which the Clean Air Branch of the Hawai'i Department of Health has any

specialized expertise. Oversight of grid reliability falls under a separate regulatory body, the PUC.

In 2018, the PUC opened the "Integrated Grid Planning" (IGP) Docket (No. 2018-0165) to replace earlier grid planning efforts.[11] Hawaiian Electric prepared the Integrated Grid Plan to "determine the grid's needs and to plan how to meet them[.]"[12] Hawaiian Electric presented the Final IGP as a pathway towards "a clean energy future where customers have more choices, more reliable power and more stable rates. See Dkt. C.02 at 1. The PUC accepted the Final IGP on March 4, 2024. (attach D&O).

The shutdowns were incorporated into the grid reliability analysis in the Final IGP as shown in the table below. Hawaiian Electric represented "Hill 5 and 6 and Kahului 1-4 boilers are slated for retirement in their designated years…" See Dkt. C.02 at 257. Hawaiian Electric noted that emissions reductions were required for the units and indicated that the units may not be available to generate power. "Maalaea generating unit 7 will be required to install emission reduction technology by the end of 2027." *Id*. "Puna Steam will switch to a cleaner fuel and likely be placed in standby status for the same reasons. Standby status for Puna Steam will improve the resilience of the Hawai'i Island system." *Id*.

Table 12-1. Planned Removal-from-Service Assumptions for O'ahu, Hawai'i Island and Maui

Year	O'ahu	Hawai'i Island	Maui
2024	Waiau 3–4 removed from service		
2025		Puna Steam on standby	
2027	Waiau 5–6 removed from service	Hill 5–6 removed from service	Kahului 1–4, Mā'alaea 10–13 removed from service
2029	Waiau 7–8 removed from service		
2030			Mā'alaea 1–3, 4–9 removed from service
2033	Kahe 1–2 removed from service		
2037	Kahe 3–4 removed from service		
2046	Kahe 5–6 removed from service		

Note. From Hawaiian Electric's Integrated Grid Planning Report May 2023 at Dkt. C.02 256.

Hawaiian Electric suggested that these plant retirements could actually *improve* grid reliability. "Reducing dependence on fossil fuel-based generators will improve reliability given that our fossil fuel-based generators are currently more than 60 years old…" See Dkt. C.02 at 160. Hawaiian Electric noted that keeping these units in operation result in high costs and maintenance problems. "Maalaea generators 10-13 have limited life remaining because the engine manufacturer has declared the engines obsolete and notified Hawaiian Electric that spare parts may no longer be available in the future. Because these are unique engines, aftermarket parts supply is not reliable." Dkt. C.02 at 257.

[11] https://puc.hawaii.gov/energy/integrated-grid-planning-docket-for-hawaiian-electric-2018-0165/
[12] Id.

At the same time, Hawaiian Electric touted the benefits of renewable energy for grid reliability. Using a loss of load expectation metric to show the sensitivity of grid reliability to small changes in renewable capacity, Hawaiian Electric generated the figure below for Hawai‘i Island:

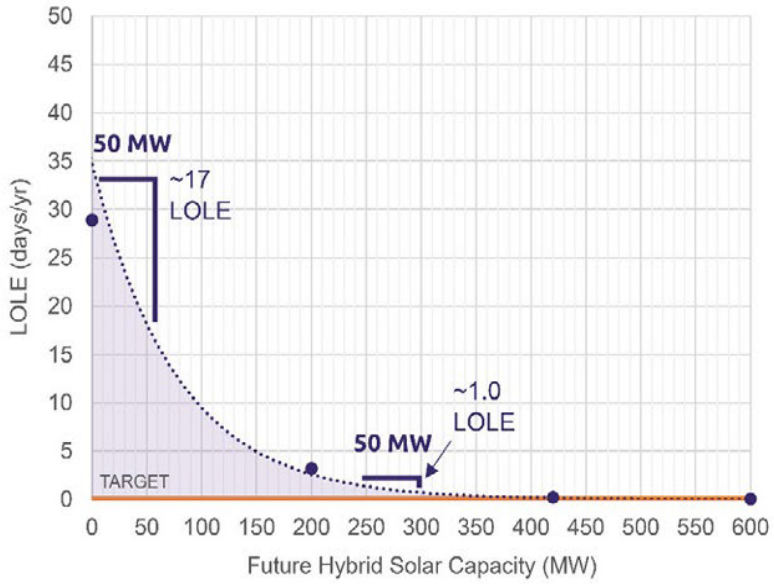

Figure 12-18. Hawai‘i Island: relationship between change in loss of load and change in future hybrid solar capacity (High Load, 2035)

Note. From Hawaiian Electric's Integrated Grid Planning Report May 2023 at Dkt. C.02 274.

Hawaiian Electric indicated “small changes in hybrid solar capacity can significantly change the reliability of the system[.] *See* Dkt. C.02 at 273. Hawai‘i DOH notes that Hawaiian Electric’s current position is inconsistent with previous statements representing that the planned shutdowns are part of the grid reliability analysis and that transitioning to clean energy would improve grid reliability.

II.5 EPA Ignores Four-Factor Analyses: EPA’s previous guidance, and longstanding policy for preparing second planning period Regional Haze SIPs, has required the application of the four statutory factors to determine the emission reduction measures necessary to make reasonable progress and develop the long-term strategy. Hawai‘i DOH employed the four-factor analysis for the relevant facilities on the Islands of Hawai‘i and Maui to demonstrate the necessity for selecting control measures based on the screening results. EPA’s proposed action to disapprove Hawaii’s long-term strategy is flawed because it ignores the four-factor analyses demonstrating that the following regional haze control measures are necessary to make reasonable progress:

- Kanoelehua-Hill Power Plant Boilers Hill 5 and Hill 6: The four-factor analysis determined that a fuel switch and add-on controls are required to make reasonable progress as a long-term strategy for boilers at the Kanoelehua-Hill Power Plant. If the units are not shut down by the end of 2028, as proposed by Hawaiian Electric to exclude the four-factor analysis, then a fuel switch and add-on controls are required for the boilers in accordance with the four-factor analysis. For approving Hawaii’s Regional Haze SIP, Hawai‘i DOH can amend the permit for the Kanoelehua-Hill Power Plant to incorporate regional haze control measures as a SIP supplement.

- Puna Power Plant Boiler: The four-factor analysis for the Puna Power plant determined that a fuel switch to ultra-low sulfur diesel is required for the boiler at this facility. The long-term strategy, which excludes unit shutdown, is an approvable regional haze control measure specified in the issued permit for the Puna Power Plant to make reasonable progress.

- Kahului Power Plant Boilers K1-K4: The four-factor analysis determined that a fuel switch and add-on controls are required to make reasonable progress as a long-term strategy for boilers at the Kahului Generating Station. If units are not shut down by the end of 2028 as proposed by Hawaiian Electric to exclude the four-factor analysis, then a fuel switch and add-on controls are required for the boilers in accordance with the four-factor analysis. For approving Hawaii's Regional Haze SIP, Hawai'i DOH can amend the permit for the Kahului Power Plant to incorporate regional haze control measures as a SIP supplement.

- Maalaea Generating Station Units M1 and M3: The four-factor analysis for the Maalaea Generating Station determined that FITR is required for Diesel Engine Generators M1 and M3 to make reasonable progress as a long-term strategy. The long-term strategy, which excludes unit shutdowns, is an approvable regional haze control measure specified in the issued permit for Maalaea Generating Station to make reasonable progress.

- Maalaea Generating Station Units M7, M10, M11, M12, & M13: The four-factor analysis for Maalaea Generating Station determined that SCR is required for Diesel Engine Generators M7, M10, M11, M12, and M13 to make reasonable progress. Unit shutdowns proposed by Hawaiian Electric reduce the remaining useful life rendering controls economically infeasible. The long-term strategy to make reasonable progress for these units to either shutdown or retrofit with SCR is an approvable regional haze control measure specified in the issued permit for Maalaea Generating Station.

II.6 EPA Incorrectly Claims There Is No Way to Screen Out Volcanic Emissions: In Hawaii's 2025 Regional Haze Progress Report, Hawai'i DOH demonstrated a method for screening out high sulfate light extinction due to impacts from volcanic eruptions using 2019 sulfate extinction values as a substitute for determining the haze index. Because no eruptions occurred in 2019, sulfate light extinction values from that year represented background conditions without influence from volcanic eruptions.[13]

Sulfate extinction was adjusted using ratios of 2005 SO_2/2019 SO_2 and 2028 SO_2/2019 SO_2 for sources that contribute most to visibility impairment at each national park. Volcanic SO_2 emissions in 2019 (17,301 tons per year), which were significantly lower than emissions during eruptive periods, were also incorporated into the adjusted light extinction calculations.

[13] Hawaii Regional Haze Progress Report for Second Planning Period State Implementation Plan, January 2025, Appendix L. at: https://health.hawaii.gov/cab/files/2025/01/FinalAppendix-L.pdf

The 2005 emissions inventory was used to represent baseline period source contributions because it was the most complete dataset available from when regional haze planning began. For projected 2028 conditions, the emissions estimates from Appendix V of the Regional Haze SIP, Revision 1, which reflect regional haze control measures, were used to derive the 2019 SO_2/2028 SO_2 adjustment ratios applied to the reasonable progress goals.

A second method to screen out volcanic emissions also exists, by removing the sulfate light extinction component from the deciview equation entirely. Note that nitrate and elemental carbon related light extinction is a marker of anthropogenic emissions and serve as a reliable indicator of visibility impacts from fuel combustion sources alone. Volcanic emissions do not contribute significant nitrates, making this approach an effective way to isolate human-caused haze from natural volcanic influences.

III. EPA CANNOT LAWFULLY DISAPPROVE HAWAII'S LONG-TERM STRATEGY ON TAKINGS GROUNDS

III.0 Overview: EPA proposes to find that Hawai'i has not provided necessary assurances that it is not prohibited by the Takings Clause of the U.S. Constitution, and possibly comparable provisions of Hawai'i law, from carrying out its long-term strategy. This proposal is misguided for several reasons, in addition to those noted elsewhere in these comments: it misinterprets CAA § 110(a)(2)(E)(i); it misinterprets the Takings Clause; and it holds the Department to an unreasonable burden of proof.

III.1 Scope of CAA Section 110(a)(2)(E)(i): The takings clauses of the federal and Hawai'i Constitutions are not "provisions of law" for which States have to provide necessary assurances. The canon that "a word is known by the company it keeps" indicates that EPA should not be concerned with provisions of law (like takings provisions) that are unrelated to "personnel, funding, and authority" of States to carry out implementation plans. A taking presumes that the government was authorized to perform the action and that the action was correct in all respects. *See Lingle v. Chevron USA*, 544 U.S. 528, 543 (2005). Constitutional provisions are not necessarily encompassed by the phrase "provisions of law," (*See, e.g.*, 12 U.S.C. § 4642(b)), and it does not make sense for Congress to have given EPA, an agency with no particular expertise on matters of constitutional interpretation (and certainly not takings), power to review a State's laws for constitutionality. EPA's proposal does not befit a regime of cooperative federalism.

III.2 Interpretation of CAA Section 110(a)(2)(E)(i): EPA wrongly states that "is not *prohibited* by any provision of Federal or State law from carrying out such implementation plan" is best read as "cannot risk *violating* federal or state law in the course of implementation." Equating *violations* and *prohibitions* of takings is misguided. A taking that is remediable by money compensation in a reasonable, certain, and adequate inverse-condemnation proceeding (like the one provided in Hawai'i courts) cannot give rise to a prohibition on closure enforcement. That is so regardless whether the Takings Clause is "violated," as the Supreme Court stated repeatedly in *Knick v. Township of Scott*, 588 U.S. 180, 185, 201, 202, 205 (2019). Under Hawai'i's Constitution, a taking without contemporaneous compensation is not even a "violation," due to the availability of a procedure to recover just compensation.

See DW Aina Le'a Dev't v. State Land Use Comm'n, 477 P.3d 836, 843 (Haw. 2020). Thus, any hypothetical taking could not prohibit Hawai'i from carrying out the implementation plan. That is all the assurance EPA needs to approve the plan.

III.3 Source Closures are Not Physical Invasions: An enforceable source closure cannot be a "physical" taking. No property (real or personal) is seized, and neither state officers nor authorized third parties enter onto private property to effect closures. Hawai'i law does not recognize the operation of a power plant as a property right, nor is that particular use a critical "stick" in the bundle of rights that comprises real property. A mandatory source closure is merely a use restriction, which cannot work a physical taking under *Cedar Point*, *Horne*, or any of the other authorities on which EPA's proposal relies.

III.4 Hawai'i Need not Show that its Plan Cannot Result in a Regulatory Taking: EPA proposes to find that the mere possibility of a regulatory taking suffices to disapprove Hawai'i's long-term strategy. That flips the burden from the landowner claimant to the defendant government and exceeds whatever discretion EPA has to find that a State hasn't given necessary assurances. "[T]he constitutionality of statutes ought not be decided except in an actual factual setting," and "[a]dherence to this rule is particularly important in cases raising allegations of an unconstitutional taking of private property." *Hodel v. Virginia Surface Mining & Reclamation Ass'n*, 452 U.S. 264, 294–95 (1981). This is an informal rulemaking in which no one (Hawai'i included) has the authority to subpoena evidence uniquely within Hawaiian Electric's possession that could be highly relevant to whether a regulatory taking occurred. Defining the "parcel as a whole," for instance, requires application of "a multifactor standard" that is property- and owner-specific. *Murr v. Wisconsin*, 582 U.S. 383, 402 (2017). As for the *Penn Central* factors, where (as here) "a business [is] engaged in a highly regulated industry, the [property owner's] reasonable investment-backed expectations are an especially important consideration in the takings calculus." *Rith Energy v. United States*, 270 F.3d 1347, 1351 (Fed. Cir. 2001). Because Hawaiian Electric's expectations would have to be not only objectively reasonable, but also subjectively held at the time a property was acquired, *See Appolo Fuels v. United States*, 381 F.3d 1338, 1349 n.5 (Fed. Cir. 2004), this determination "may require a factual hearing," *id.* at 1350. There is no possibility of such a hearing in this setting; indeed, for EPA to hold one would not comport with Hawai'i's sovereign immunity. *See Fed. Maritime Comm'n v. S.C. State Ports Auth.*, 535 U.S. 743 (2002). By asking Hawai'i to assure now that no taking will occur, EPA essentially assumes the role of a court adjudicating a hypothetical takings claim against the State, but without giving the State the due process protections a court would have to afford.

III.5 Hawai'i's Long-Term Strategy will Not Result in Regulatory Takings: No taking will occur as a result of this implementation plan, for several reasons.

First, the character of the government action weighs strongly against a taking. This is an industry highly regulated at both the federal and state levels, and closure decisions are part of the course. The appropriateness and necessity of the closure to achieve the Clean Air Act's visibility goal cannot be collaterally attacked in a takings suit, and this is not a context in which a taking has ever been found. EPA's speculation about possible shifts in future takings jurisprudence is not enough reason to disapprove Hawai'i's plan.

Second, Hawaiian Electric's reasonable, investment-backed expectations necessarily have been shaped by the longstanding regulatory regime under which Congress set, among other things, a national visibility goal that States were to achieve or be subject to federal regulations to that end. Prudent owners of fossil fuel-fired generation units have recognized that "[t]he likelihood of regulatory restraint is especially high with regard to possible adverse environmental effects, … which have long been regarded as proper subjects for the exercise of the state's police power." *Rith Energy*, 270 F.3d at 1351. Regardless whether Hawaiian Electric changed its stance recently, the fact that these closures were by consent reflects a lack of subjective (and objective) expectations that these units would continue to operate past their closure dates. EPA does not cite any reasonable, investment-backed expectations of Hawaiian Electric in long term, as-is operation of these units.

Hawaiian Electric recognizes that transitioning to clean energy is good for business and the environment. "Our work to modernize and decarbonize the grid has never been more urgent as the effects of climate change escalate and existing electrical facilities and infrastructure age." *See* Dkt. C.02 at 1. This is especially true given the age of these units "[e]xisting fossil fuel-based generators on Hawai'i Island, Maui, and O'ahu are 55 to 75 years old. These facilities were never designed to keep up with today's dynamic grid, which far outpace the needs of decades past and continue to grow." *Id.* at 6. Hawaiian Electric also understands the disadvantages of fossil fuels. "Getting off imported fossil fuels removes Hawai'i from the volatility of world energy markets and gives future generations a tremendous advantage. It can also create a clean energy research and development industry for our state." *Id*. at 9. As to the volatility of imported fuel: "[f]ossil fuel pricing is inherently volatile and is impacted by unpredictable global events and conditions." *Id*. at 31. Recently, as a result of the ongoing conflict in Iran, *See* Attachment P, Hawaiian Electric forecasted that typical residential bills may rise between 20% and 30% over the next several months. Hawaiian Electric indicated they "recognize that Hawai'i already faces a high cost of living and that any increase in energy costs places an additional burden on our families and businesses." *Id*. Because of these issues and others, Hawaiian Electric recognizes the urgency of transitioning to clean energy. As to bringing renewables online and deactivating fossil fuel-based generators, Hawaiian Electric indicates "[s]imply put: there's no time to waste." *See* Dkt. C.02 at 6.

Third, Hawaiian Electric's "parcels as a whole" consist of not only the entire facilities of which certain units will close (while others continue operating), but also the company's adjacent or contiguous properties used for related purposes. *See, e.g.*, *Murr*, 582 U.S. at 403–04 (combining contiguous lots for regulatory-takings analysis). The parcel as a whole may even include Hawaiian Electric's broader suite of holdings within the State. The scattered closures prompted by the long-term strategy "burden … the use of only a small fraction of the property that is subjected to regulation." *Keystone Bituminous Coal Ass'n v. DeBenedictis*, 480 U.S. 470, 499 n.27 (1987). And whatever the scope of the relevant parcel for takings analysis, the economic impact of a forced closure could not be a "total" regulatory taking because other valuable uses of the property will remain.

Under the controls selected by the 2024 Regional Haze SIP submittal, only three power plants were affected by shutdown requirements.[14] *See* Dkt. B.03 at pdf 97. These units will continue to provide value to Hawaiian Electric.

- Kanoelehua-Hill Power Plant: If the SIP were approved, Hill 5 and Hill 6 boilers would shut down. Id. However, the plant would still run four diesel engine generators and one combustion turbine generator. Id. at pdf 103-104. Thus, the plant itself continues to generate power.

- Maalaea Power Plant: If the SIP were approved, Generators M7 and M10-13 *could* be shutdown as an alternative to installing SCR on those units. *Id* at pdf 112. Even if Hawaiian Electric exercised the *option* to shut down, the plant would continue to run numerous generators. *See Id*. at pdf 106-107.

- Kahului Power Plant: If the SIP were approved, this is the only plant that would shut down all existing equipment. *See Id*. at pdf 105. However, Hawaiian Electric intends to convert two boilers into synchronous condensers. *See* Dkt. C.02 at D-97. The properties are owned by Hawaiian Electric and continue to remain valuable to the company. Each of these properties hold land values in the millions of dollars, which are independent of the structure values on the land, i.e. the plants themselves. *See* Attachments Q, R, and S. Each property is also zoned as industrial and could feasibly be used for any purpose consistent with the zoning and other land use requirements. *Id*. Therefore, in the unlikely event Hawaiian Electric decided to transfer the properties, they would hold value independent of the shutdown requirements.

IV. HAWAIʻI DOH POSITION

The parks relevant to this Regional Haze SIP are truly unique national treasures. These parks are both environmentally and culturally significant places that deserve to be enjoyed in their natural air quality and visibility conditions. The Clean Air Act establishes a framework of cooperative federalism in which states are responsible for evaluating sources within their jurisdictions and developing State Implementation Plans that achieve national visibility goals. Consistent with CAA §§110 and 169A, Hawaiʻi undertook an extensive, multi-year effort to develop its Regional Haze SIP in consultation with EPA, Federal Land Managers, industry, and other stakeholders. The State relied on the Clean Air Act, the Regional Haze Rule, and EPA's own guidance available at the time to conduct source screening, perform four-factor analyses, and develop a long-term strategy for achieving reasonable progress toward natural visibility conditions.

As discussed throughout these comments, EPA's proposed partial disapproval raises concerns that extend beyond Hawaii's SIP. The proposal reflects a reinterpretation of prior EPA guidance after states have already completed the extensive work required to develop second planning period Regional Haze SIPs. Such shifts in interpretation risk undermining the cooperative federalism structure of the Clean Air Act, creating regulatory uncertainty for states and stakeholders who relied on existing EPA guidance when developing their plans.

[14] As noted previously, control measures are no longer necessary for the Mauna Loa plant

States must be able to rely on EPA's regulations and guidance when undertaking the complex technical and policy work required to prepare Regional Haze SIPs. Hawai'i developed its plan in good faith using the best available information and through negotiations with regulated entities that resulted in enforceable commitments incorporated into the SIP. Characterizing these negotiated commitments as "unconsented closures" or requiring analyses beyond those contemplated in EPA guidance risks undermining years of collaboration between states, regulated sources, and federal partners.

For these reasons, and for the reasons detailed throughout these comments, the Hawai'i Department of Health respectfully requests that EPA reconsider its proposed partial disapproval of Hawai'i's Regional Haze SIP and evaluate the State's long-term strategy consistent with the cooperative federalism framework established by the Clean Air Act and reaffirmed in EPA's own Regional Haze guidance.

Attachment A:
History of Events

History of Events

The following is a summary of events that took place during consultation with the Environmental Protection Agency (EPA), Federal Land Managers (FLM's) and regulated community during the preparation of Hawaii's Second Planning Period Regional Haze State Implementation Plan (RH-SIP) posted at: https://health.hawaii.gov/cab/regional-haze/:

1) The Department of Health Clean Air Branch (CAB) had check-in meetings with the FLMs from July 19, 2018 to July 13, 2023 prior to submitting the RH-SIP to EPA for approval. Please see pages 3 to 5 of Appendix P for the RH-SIP.

2) CAB had monthly check-in meetings with EPA Region 9 from May 9, 2019 to February 15, 2023 prior to submitting the RH-SIP to EPA for approval. Please see pages 26 to 35 of Appendix P for the RH-SIP.

3) CAB had consultation meetings with industry from November 12, 2019 to March 1, 2023 prior to submitting the RH-SIP to EPA for approval. Please see pages 36 to 39, pages 562 to 563, and pages 564 to 565 of Appendix P for the RH-SIP for consultation with Hawaiian Electric, Kalaeloa Partners, L.P., and Mauna Loa Macadamia Nut Corporation, respectively.

4) 2019 - An initial Q/d screening analysis (page 60 of the RH-SIP main document) selected the following plants for four-factor analysis to evaluate regional haze control measures:

   - Kalaeloa Partners, L.P. Cogeneration Plant
   - Hawaiian Electric Kahe Generating Station
   - Hawaii Electric Light Kanoelehua-Hill Generating Station,
   - Maui Electric Kahului Generating Station
   - Maui Electric Maalaea Generating Station
   - Hawaii Electric Light Puna Generating Station
   - Hawaiian Electric Waiau Generating Station

   A four-factor analysis was requested for these facilities on September 11, 2019 (RH-SIP Appendix B). The four-factor analysis is a Clean Air Act (CAA) requirement to evaluate 1) cost of compliance, 2) time necessary to achieve compliance, 3) the energy and non-air quality environmental impact of compliance, and 4) the remaining useful life of any existing source subject to such requirements.

5) 2019 - 2020 – A more sophisticated weighted emissions potential/area of influence (WEP/AOI) screening analysis (page 71 of RH-SIP main document) found the following plants had the greatest potential to affect visibility in Hawaii's National Parks:

   - Hawaiian Electric Light Kanoelehua-Hill Generating Station,
   - Hawaii Electric Light Puna Generating Station
   - Maui Electric Kahului Generating Station
   - Maui Electric Maalaea Generating Station

- Mauna Loa Macadamia Nut Corporation Plant

Kalaeloa Partners L.P., Kahe, and Waiau Power Plants on the island of Oahu, initially screened did not rank high in their potential to impair visibility using more sophisticated screening. Therefore, these plants were excluded from requiring a four-factor analysis. A four-factor analysis for the Mauna Loa plant on the island of Hawaii; however, was requested based on the screening results. A four-factor analysis for the Mauna Loa plant is no longer required because the Maintenance Manager indicated that their power plant is currently shut down, there are no plans to restart the power plant, and electricity is now provided by a solar farm at their facility and the electric utility. Please see page 22 of Hawaii's Regional Haze Progress Report for the Second Period State Implementation Plan dated January 7, 2025 at:https://health.hawaii.gov/cab/files/2025/01/2025-RHPR-Final.pdf

6) 2019 to 2021 – CAB reviewed and corrected multiple revisions to four-factor-analyses deemed incomplete for establishing reasonable progress goals.

7) May 27, 2021 – CAB notified Hawaiian Electric (page 43 of Appendix P for the RH-SIP) of regional haze control measures selected based on four-factor analyses and requested Hawaiian Electric to provide applications for permit modifications to incorporate the following controls:

- Hawaiian Electric Light Kanoelehua-Hill Power Plant Boilers Hill 5 and Hill 6 – Fuel switch to ultra-low sulfur diesel on and after December 31, 2024, combustion controls that include low-NO_X burners, flue gas recirculation (FGR), and overfire air (OA) or the applicable combination of these controls on and after December 31, 2027, selective catalytic reduction (SCR) on and after December 31, 2027, and continuous emissions monitoring system (CEMS) to monitor nitrogen oxide (NO_X) emissions.
- Hawaiian Electric Light Puna Power Plant Boiler – Fuel switch to ultra-low sulfur diesel on and after December 31, 2024.
- Maui Electric Kahului Power Plant Boilers K1 through K4 – Fuel switch to ultralow sulfur on and after December 31, 2024, combustion controls that include low-NO_X burners, FGR, and OA or the applicable combination of these controls on and after December 31, 2027, SCR on and after December 31, 2027, and a continuous emissions monitoring system to track emissions from the air pollution control devices.
- Maui Electric Maalaea Generating Station Units M1, M2, and M3 – Fuel Injection Timing Retard (FITR) on and after December 31, 2026.
- Maui Electric Maalaea Generating Station Unit M7 - SCR with ammonia slip monitoring system and CEMS to monitor NO_X.

8) June 16, 2021 – Hawaiian Electric provided additional cost information for their four-factor analyses and stated they will not submit permit applications to incorporate control measures until the SIP is approved by EPA.

However, EPA Region 9 said at monthly check-in meetings that air permits to incorporate regional haze controls must be issued as part of the SIP before EPA can approve the plan.

9) October 7, 2021 – Hawaiian Electric agreed to federally enforceable air permit conditions to shut down the Kahului and Kanoelehua-Hill Generating Station boilers by December 31, 2027, as documented in CAB's November 9, 2021 letter (page 93 of Appendix P).
EPA guidance allows an enforceable commitment to retire a source "by 2028" as an option to performing a four-factor analysis. EPA Region 9 indicated at check-in meetings that "by 2028" means by December 31, 2027.

10) November 2021 – CAB response letter confirms Hawaiian Electric's choice to shut down boilers at the Kahului and Kanoelehua-Hill Generating Stations by December 31, 2027, instead of implementing controls as EPA guidance allows a unit to be excluded from the four-factor analysis if there is a federally enforceable limit to shut down the unit by 2028. The December 31, 2027, deadline was based on a compliance time of up to five years to implement controls for the boilers as indicated in the four-factor analyses. If Hawaiian Electric selected controls, the boilers could operate beyond 2028.

11) March 2022 – CAB initiates the 60-day FLM consultation period in accordance with 40 Code of Federal Regulations (CFR) §51.308(i)(2) and receives comments from the FLMs in May of 2022.

12) June 2022 – Permit modifications, technical support documents (TSDs), the RH-SIP, and associated appendices were drafted pursuant to the RHR and Hawaii Administrative Rules (HAR) §11-60.1-10. Federal Land Manager (FLM) comments were also addressed regarding regional haze control measures for the Kahului, Kanoelehua-Hill, and Puna Generating Stations. The four-factor analysis for Maalaea Generating Station was still incomplete at the time.

13) June 24, 2022, to July 24, 2022 – CAB provided a 30-day public comment period for the RH-SIP and associated permits in accordance with 40 CFR §51.102 and HAR Chapter 11-60.1.

14) July 1, 2022, to July 30, 2022 – CAB provided a 30-day public comment period for the permit amendments to incorporate regional haze control measures in accordance with Hawaii Revised Statutes (HRS) Chapter 342B and Hawaii Administrative Rules (HAR) Chapter 11-60.1.

15) July 30, 2022 (page 23 of Appendix X for the RH-SIP) – Hawaiian Electric provided comments on the RH-SIP which included information that they confirmed with EPA that a shutdown date as late as December 31, 2028 is acceptable to exclude a source from four-factor analysis. The confirmation was in an email from EPA's Office of Air Quality and Standards (OAQPS) to Hawaiian Electric's consultant. The confirmation was received by the consultant on June 1, 2021. Yet Hawaiian Electric waited until July 22, 2022, towards the end of the public comment period for the RH-SIP, to request an extension of the compliance date for shutting down the boilers (page 493 of Appendix X for the RH-SIP).

16) August 18, 2022 - CAB, in its response to comments on the RH-SIP, could not consider the Hawaiian Electric's request to extend the compliance date for retiring boilers because it would involve additional review, another public comment period, and prevent the state from meeting the August 15, 2022 deadline for submitting Hawaii's RH-SIP to EPA (page 493 of Appendix X for the RH-SIP).

17) August 12, 2022, CAB submitted the initial RH-SIP to prevent a failure to submit finding from EPA. The deadline for failure to submit findings was August 15, 2022. EPA found Hawaii's SIP to be complete on August 16, 2022.

    It was indicated in the submittal that potential control measures for the Maalaea Generating Station and extension of the compliance dates would be addressed in an RH-SIP revision.

18) January 6, 2023 – Hawaiian Electric submitted applications for significant permit modifications to extend the shutdown dates for boilers at the Kahului and Kanoelehua-Hill Generating Stations.

19) January 20, 2023 – Hawaiian Electric provided updated cost estimates for the four-factor analysis to evaluate regional haze control measures for the Maalaea Generation Station.

20) March 2023 – Hawaiian Electric provided additional cost estimates for the Maalaea Generating Station four-factor analysis.

21) May 2023 – Hawaiian Electric provided updated SCR cost estimates for the Maalaea Generating Station four-factor analysis.

22) June 7, 2023 – CAB notified the National Park Service to initiate the 60-day FLM consultation period in accordance with 40 CFR §51.308(i)(2) and receives comments from the FLMs in July 2023.

23) November 2023 – CAB completed a draft of the Maalaea Generating Station permit modification and TSD. Draft permit amendments for the Kahului and Kanoelehua-Hill Generating Stations were also completed pursuant to permit applications received for extending the boiler shutdown dates.

24) November 27, 2023, to December 26, 2023 – CAB provided a 30-day public comment period for Revision 1 of the RH-SIP and associated permits in accordance with 40 CFR §51.102 and HAR Chapter 11-60.1.

25) November 27, 2023, to December 26, 2023 – CAB provided a 30-day public comment period for permit amendments to incorporate regional haze control measures in accordance with HRS Chapter 342B and HAR Chapter 11-60.1.

26) March 11, 2024 – CAB provided notification that a public hearing would be held on April 19, 2024, for Revision 1 of the RH-SIP in accordance with HRS §342B-13(c).

27) April 19, 2024 – CAB held a public hearing on Revision 1 of the RH-SIP in person and virtually at 9:00 a.m. Hawaii Standard Time.

28) May 29, 2024 – Meeting with Hawaiian Electric disclosed Hawaiian Electric's investigation of potential extension of boiler shutdown dates related to regional haze and the potential to bring in mobile combustion turbine/nonroad generators for contingency/emergency use, including to avoid outage.

29) August 2, 2024 – CAB submitted Revision 1 of Hawaii's RH-SIP to EPA for approval. The plan includes issued permit amendments that incorporate the following regional haze control measures (executive summary of main document):

- Kanoelehua-Hill Power Plant Boilers Hill 5 and Hill 6 – Shut down boilers by the end of 2028.
- HL Puna Power Plant Boiler – Fuel switch to ultra-low sulfur diesel in August of 2026.
- ME Kahului Power Plant Boilers K1 through K4 – Shut down boilers by the end of 2028.
- ME Maalaea Generating Station Units M1 and M3 – FITR by the end of 2027.
- ME Maalaea Generating Station Units M7 and M10-M13 – SCR or permanently shut down by:

  2037 for M7
  2030 for M10 and/or M11;
  2032 for M10 or M11 if one of the units shuts down by the end of 2030 or installs SCR; and
  2037 for M12 and M13

30) October 7, 2024 - Hawaiian Electric requested CAB to extend the December 31, 2028 shutdown dates specified for boilers at the Kahului and Kanoelehua-Hill Generating Stations to accommodate delays in renewable project timelines.

31) November 12, 2024 - CAB responded to HE's October 7 letter indicating their request could not be granted due to the amount of time it would take to revise the SIP. CAB offered to consider HE's request during the third regional haze planning period.

32) June 10, 2025 – HE submitted letter informing CAB of EPA's revised policy for approving second planning period RH-SIPs and requested a meeting with CAB to discuss issues. The meeting was requested to discuss issues prior to a meeting HE scheduled with EPA Headquarters in Washington D.C. HE indicated that they planned to meet with EPA in early July.

33) June 27, 2025 – CAB met with HE to discuss issues that included RH-SIP approvals from other states finding controls too costly to implement. At the meeting HE

requested CAB prepare a supplemental SIP to re-evaluate control costs and request EPA to seek an extension of the court-ordered deadline for acting on Hawaii's RH-SIP.

The Sierra Club, along with other environmental groups, sued the EPA over its failure to act on RH-SIPs submitted by states. The court-ordered deadline to act on Hawaii's RH-SIP was September 30, 2025.

34) July 3, 2025 – HE requested that CAB submit a supplemental SIP (S-SIP) to EPA to address changes in circumstances that may affect the company's flexibility to respond to energy shortages and which are anticipated to increase control costs. According to their letter, this would allow EPA to request the necessary extension of the court-ordered deadline for its review of Hawaii's RH-SIP. It was also indicated in the letter that the court-ordered deadline was extended from September 30, 2025 to December 19, 2025 to finalize EPA's review of Hawaii's RH-SIP.

35) July 30, 2025 – HE informed CAB of EPA's partial disapproval of a portion of Colorado's RH-SIP that specified retirement of 13 sources between 2023 and 2032 to meet reasonable progress during the second regional haze planning period.

36) August 7, 2025 – A Western States Air Resources Council (WESTAR) Planning Committee meeting indicated:

- Colorado disagreed with EPA's reasoning and legal basis for partially disapproving their RH-SIP.
- It was unusual to see this type of legal reasoning in a SIP disapproval.
- Colorado is preparing formal comments and working with its attorney general.
- Other states and organizations are encouraged to coordinate supportive comments.
- Colorado invited others to coordinate comments to avoid conflicting messages and ensure solidarity.

Attachment B:
EPA Regional Haze Guidance

February 19, 2026

MEMORANDUM

SUBJECT: Update to Guidance on Regional Haze State Implementation Plans for the Second Implementation Period

FROM: Aaron Szabo
Assistant Administrator

TO: Regional Administrators, Regions 1 – 10

The purpose of this memorandum is to distribute an update to the regional haze guidance document titled "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period" issued on August 20, 2019 ("2019 Guidance"). This update addresses analyzing energy and non-air quality environmental impacts in determining reasonable progress. The U.S. Environmental Protection Agency (EPA) prepared this non-binding guidance document update to assist states with the preparation of any remaining second planning period regional haze state implementation plans (SIPs) that are due to the EPA, as well as any future revisions to those SIPs. This guidance update addresses a near-term issue while the EPA simultaneously moves forward with the previously announced effort to revise the Regional Haze Rule (RHR).[1]

Since development of the 2019 Guidance, the EPA has seen significant increases in electricity demand and strain on the reliability of the United States' electrical grid. Consequently, the EPA does not support states encouraging or forcing an electric generating facility to close in order to comply with the Clean Air Act's (CAA) regional haze requirements.

The 2019 Guidance included recommendations on how states should evaluate and consider the four CAA statutory factors[2] when determining the emission reduction measures that are necessary to make reasonable progress toward Congress's visibility goal. With respect to the third statutory factor, "energy and non-air environmental impacts of compliance," the 2019 Guidance provides that the inquiry "generally involves assessing the impacts of a control measure on the energy consumed by a source," and "recommend[s] that states focus their analysis on direct energy consumption at the source."[3] However, the 2019 Guidance does not address considering impacts on the electrical grid and grid reliability. This has led to confusion with respect to how grid reliability should be considered as part of the reasonable progress analysis.

[1] *See* Advance Notice of Proposed Rulemaking, "Visibility Protection: Regional Haze State Plan Requirements Rule Revision," 90 FR 47677 (Oct. 2, 2025).
[2] *See* CAA section 169A(g)(1), 42 U.S.C. § 7491(g)(1).
[3] 2019 Guidance at 33.

This guidance update clarifies that the EPA encourages states to consider potential impacts on grid reliability when determining the emission reduction measures that are necessary to make reasonable progress. Specifically, the EPA encourages states to consider these impacts when analyzing energy and non-air quality environmental impacts *(i.e.*, the third statutory factor).[4] Of special emphasis, states should consider the grid reliability impacts of any future electric generating unit closure that would become federally enforceable if approved into the SIP.

The EPA notes that the Supreme Court has held unlawful the use of generation shifting as a form of emissions control in other contexts.[5] Therefore, when considering grid reliability, states should focus their analyses on whether an emission control measure or facility closure might create reliability concerns.

This memorandum does not change or substitute for provisions or requirements of the CAA or RHR or create any new requirements. Rather, this memorandum clarifies and provides further information on existing statutory and regulatory requirements. The EPA evaluates and acts on SIP submissions on a case-by-case basis, reviewing each submission against the applicable requirements. The EPA's approval or disapproval of a SIP submission is subject to judicial review in the appropriate U.S. Circuit Court of Appeals pursuant to CAA section 307(b)(1). This memorandum does not constitute or prejudge EPA action on any SIP submission but rather clarifies the Agency's interpretation of the applicable statutory and regulatory requirements against which submissions will be evaluated in subsequent, separate actions.

Please share this memorandum with your staff, as well as colleagues at state, local, and tribal air agencies. If you have questions about this document, please contact Scott Mathias, Director of the Office of State Air Partnerships, at 919-541-5310 or Mathias.Scott@epa.gov for further information.

[4] *See* 2019 Guidance at Steps 4.e and 5.c.
[5] *See West Virginia v. EPA*, 597 U.S. 697 (2022).

Attachment C:
Communications with Hawaiian Electric
on May 27, 2021

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File:
21-250E CAB
File No. 0235

May 27, 2021

Mr. Everett Lacro
Director, Generation – Hawaii Island
Hawaii Electric Light Company, Inc.
P.O. Box 1027
Hilo, Hawaii 96721-1027

Dear Mr. Lacro:

SUBJECT: Significant Permit Modification to Incorporate Regional Haze Controls
Covered Source Permit (CSP) No. 0235-01-C
Hawaii Electric Light Company, Inc. (Hawaii Electric Light)
Puna Generating Station
One (1) 20 MW Combustion Turbine with a 600 KW Black Start Diesel Engine Generator, and One (1) 15.5 MW Boiler with a Multi-Cyclone Dust Collector
Located At: Keaau, Hawaii
UTM Coordinates: 286.6 km East, 2172.3 km North, Zone 5, Old Hawaiian

The Department of Health, Clean Air Branch (CAB), is working on Hawaii's Regional Haze State Implementation Plan for the second planning period (2018–2028) and has determined that a significant permit modification is required to incorporate regional haze control measures for the subject facility. The CAB appreciates the meeting with Hawaiian Electric on March 25, 2021 to discuss the implementation dates for the control measures selected. Requests from Hawaiian Electric's letter dated March 30, 2021 were shared with the U.S. Environmental Protection Agency (EPA) regarding the proposed schedule for implementing the controls.

Based on a regional haze four-factor analysis for the Puna Generating Station and after further discussions with EPA, Region 9 regarding the control implementation dates and monitoring requirements, CAB has determined that the following control measure is required for the Puna boiler to fulfill the requirements of EPA's Regional Haze Rule:

- A fuel switch to ultra-low sulfur diesel on and after December 31, 2024 for reducing sulfur dioxide, nitrogen oxide, and particulate matter less than ten (10) microns in diameter (PM_{10}).

The Clean Air Branch requests that you complete an application for significant modification to CSP No. 0235-01-C by **June 28, 2021**, to incorporate the aforementioned regional haze control measure for the Puna Generating Station.

Permit application Forms S-1, S-6, C-1, and C-2 and instructions for use in applying for a significant permit modification are available at: http://health.hawaii.gov/cab/permit-application-forms/.

If there are any questions regarding this matter, please contact Mr. Kai Erickson of my staff at [redacted].

Sincerely,

MARIANNE ROSSIO, P.E.
Manager, Clean Air Branch

MM/CKE:rkb

c: Karin Kimura, Director, Hawaiian Electric
Marisa Melzer, Hawaiian Electric

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File:
21-251E CAB
File No. 0234

May 27, 2021

Mr. Everett Lacro
Director, Generation – Hawaii Island
Hawaii Electric Light Company, Inc.
P.O. Box 1027
Hilo, Hawaii 96721-1027

Dear Mr. Lacro:

SUBJECT: Significant Permit Modification to Incorporate Regional Haze Controls
Covered Source Permit (CSP) No. 0234-01-C
Hawaii Electric Light Company, Inc. (Hawaii Electric Light)
Kanoelehua-Hill Generating Station
Two (2) Boilers, One (1) Combustion Turbine, and Four (4) Diesel Engines
Located At: 54 Halekauila Street, Hilo, Hawaii

The Department of Health, Clean Air Branch (CAB), is working on Hawaii's Regional Haze State Implementation Plan for the second planning period (2018–2028) and has determined that a significant permit modification is required to incorporate regional haze control measures for the subject facility. The CAB appreciates the meeting with Hawaiian Electric on March 25, 2021 to discuss the implementation dates for the control measures selected. Requests from Hawaiian Electric's letter dated March 30, 2021 were shared with the Environmental Protection Agency (EPA) regarding the proposed schedule for implementing the controls.

Based on a regional haze four-factor analysis for the Kanoelehua-Hill Generating Station and after further discussions with EPA, Region 9 regarding the control implementation dates and monitoring requirements, CAB has determined that the following control measures are required for Boilers Hill 5 and Hill 6 to fulfill the requirements of EPA's Regional Haze Rule:

- A fuel switch to ultra-low sulfur diesel on and after December 31, 2024 for reducing sulfur dioxide (SO_2), nitrogen oxide (NO_x), and particulate matter less than ten (10) microns in diameter (PM_{10}).
- Combustion controls that include low-NO_x burners (LNB), flue gas recirculation (FGR), and overfire air (OFA), or the applicable combination of these NO_x controls to be installed, operated, and maintained at all times on and after December 31, 2027.
- Selective Catalytic Reduction (SCR) with an ammonia (NH_3) slip monitoring system, to be installed, operated, and maintained at all times on and after December 31, 2027 for reducing NO_x.
- Installation, operation, and maintenance of a continuous emission monitoring system (CEMS) to verify compliance with the NO_x emission limit based on emission reductions from combustion controls and SCR.

The Clean Air Branch requests that you complete an application for significant modification to CSP No. 0234-01-C by **June 28, 2021**, to incorporate the aforementioned regional haze control measures for the Kanoelehua-Hill Generating Station.

Permit application Forms S-1, S-6, C-1, and C-2 and instructions for use in applying for a significant permit modification are available at: http://health.hawaii.gov/cab/permit-application-forms/.

If there are any questions regarding this matter, please contact Mr. Kai Erickson of my staff at [redacted].

Sincerely,

MARIANNE ROSSIO, P.E.
Manager, Clean Air Branch

MM/CKE:rkb

c: Karin Kimura, Director, Hawaiian Electric
Marisa Melzer, Hawaiian Electric

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:
File:
21-252E CAB
File No. 0067

May 27, 2021

Mr. John Mauri
Director, Generation – Maui County
Maui Electric Company, Ltd.
P.O. Box 398
Kahului, Hawaii 96733

Dear Mr. Mauri:

SUBJECT: Significant Permit Modification to Incorporate Regional Haze Controls
Covered Source Permit (CSP) No. 0067-01-C
Maui Electric Company, Limited (Maui Electric)
Maalaea Generating Station
Four (4) 20 MW (Nominal) Combustion Turbine Generators (Units M14, M16, M17, and M19) and Sixteen (16) Diesel Engine Generators (Units M1 through M13, X1, X2, and SG1)
Located At: Maalaea Generating Station, Maalaea, Maui

The Department of Health, Clean Air Branch (CAB), is working on Hawaii's Regional Haze State Implementation Plan (RH-SIP) for the second planning period (2018–2028) and has determined that a significant permit modification is required to incorporate regional haze control measures for the subject facility. The CAB appreciates the meeting with Hawaiian Electric on March 25, 2021 to discuss the implementation dates for the control measures selected. Requests from Hawaiian Electric's letter dated March 30, 2021, were shared with the Environmental Protection Agency (EPA) regarding the proposed schedule for implementing the controls.

Based on a regional haze four-factor analysis for the Maalaea Generating Station and after further discussions with EPA, Region 9, regarding the control implementation dates and monitoring requirements, CAB has determined that the following control measures are required for Diesel Engine Generators M1, M2, M3, and M7 to fulfill the requirements of EPA's Regional Haze Rule as described below:

Units M1, M2, & M3

- Manufacturer's specified fuel injection timing retard (FITR) shall be utilized on Units M1, M2, and M3 on and after December 31, 2026 to reduce nitrogen oxide (NO_x) emissions. Please provide the degrees of FITR utilized on each unit and resulting NO_x reductions in the significant permit modification application, or if not possible, provide explanation as to why, and the date that information will be provided.

- Installation, operation, and maintenance of a continuous emission monitoring system (CEMS) on each unit shall be utilized to verify compliance with the NO_x emission limit based on the emission reductions from FITR.

Unit M7

- Selective catalytic reduction (SCR) with an ammonia (NH_3) slip monitoring system, shall be installed, operated, and maintained at all times on Unit M7 on and after December 31, 2026 to reduce and monitor NO_x emissions.

- Installation, operation, and maintenance of a CEMS on Unit M7 shall be utilized to verify compliance with the NO_x emission limit based on the emission reductions from SCR.

The Clean Air Branch requests that you complete an application for significant modification to CSP No. 0067-01-C by **June 28, 2021**, to incorporate the aforementioned regional haze control measures for the Maalaea Generating Station.

Permit application Forms S-1, S-6, C-1, and C-2 and instructions for use in applying for a significant permit modification are available at: http://health.hawaii.gov/cab/permit-application-forms/.

If there are any questions regarding this matter, please contact Mr. Scott Takamoto of my staff at [redacted].

Sincerely,

MARIANNE ROSSIO, P.E.
Manager, Clean Air Branch

MM/ST:rkb

c: Karin Kimura, Director, Hawaiian Electric
Marisa Melzer, Hawaiian Electric

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File:
21-254E CAB
File No. 0232

May 27, 2021

Mr. John Mauri
Director, Generation – Maui County
Maui Electric Company, Ltd.
P.O. Box 398
Kahului, Hawaii 96733

Dear Mr. Mauri:

SUBJECT: Significant Permit Modification to Incorporate Regional Haze Controls
Covered Source Permit (CSP) No. 0232-01-C
Maui Electric Company, Ltd. (MECO)
Kahului Generating Station
Four (4) Boilers
Located At: 200 Hobron Avenue, Kahului, Maui

The Department of Health, Clean Air Branch (CAB) is working on Hawaii's Regional Haze State Implementation Plan for the second planning period (2018–2028) and has determined that a significant permit modification is required to incorporate regional haze control measures for the subject facility. The CAB appreciates the meeting with Hawaiian Electric on March 25, 2021 to discuss the implementation dates for the control measures selected. Requests from Hawaiian Electric's letter dated March 30, 2021 were shared with the Environmental Protection Agency (EPA) regarding the proposed schedule for implementing the controls.

Based on a regional haze four-factor analysis for the Kahului Generating Station and after further discussions with EPA, Region 9 regarding the control implementation dates and monitoring requirements, CAB has determined that the following control measures are required for Boilers K-1, K-2, K-3, and K-4 to fulfill the requirements of EPA's Regional Haze Rule:

- A fuel switch to ultra-low sulfur diesel on and after December 31, 2024 for reducing sulfur dioxide (SO_2), nitrogen oxide (NO_x), and particulate matter less than ten (10) microns in diameter (PM_{10}).
- Combustion controls that include low-NO_x burners (LNB), flue gas recirculation (FGR), and overfire air (OFA), or the applicable combination of these NO_x controls to be installed, operated, and maintained at all times on and after December 31, 2027.
- Selective Catalytic Reduction (SCR) with an ammonia (NH_3) slip monitoring system, to be installed, operated, and maintained at all times on and after December 31, 2027 for reducing NO_x.
- Installation, operation, and maintenance of a continuous emission monitoring system (CEMS) to verify compliance with the NO_x emission limit based on emission reductions from combustion controls and SCR.

The Clean Air Branch requests that you complete an application for significant modification to CSP No. 0232-01-C by **June 28, 2021**, to incorporate the aforementioned regional haze control measures for the Kahului Generating Station.

Permit application Forms S-1, S-6, C-1, and C-2 and instructions for use in applying for a significant permit modification are available at: http://health.hawaii.gov/cab/permit-application-forms/.

If there are any questions regarding this matter, please contact Mr. Kai Erickson of my staff at [redacted].

Sincerely,

MARIANNE ROSSIO, P.E.
Manager, Clean Air Branch

MM/DH:rkb

c: Karin Kimura, Director, Hawaiian Electric
Marisa Melzer, Hawaiian Electric

Attachment D:
DOH-CAB Response Letter
on November 9, 2021

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH429

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File:
21-491E CAB
File Nos. 0067, 0232,
0234, & 0235

November 9, 2021

Ms. Karin Kimura
Director
Environmental Division
Hawaiian Electric
P.O. Box 27501
Honolulu, Hawaii 96840-0001

Dear Ms. Kimura:

SUBJECT: Response to Regional Haze Rule Request
Hawaii Electric Light Company, Inc.
Maui Electric Company, Ltd.

The Department of Health, Clean Air Branch (CAB) acknowledges receipt of your letters dated March 30, 2021 and June 16, 2021, regarding Hawaiian Electric's Regional Haze Rule request. The letters were sent in response to the proposed schedule for implementing regional haze controls, including CAB's May 27, 2021 letters requesting permit applications for incorporating these controls to reduce sulfur dioxide (SO_2), nitrogen oxide (NO_X), and particulate matter less than ten microns in diameter (PM_{10}) at electric plants on Hawaii and Maui Islands.

Regional haze controls included fuel switches to ultra-low sulfur diesel (ULSD), NO_X combustion controls[1], and selective catalytic reduction (SCR). The controls were selected for units at the Kahului, Kanoelehua-Hill, Maalaea, and Puna Generating Stations pursuant to a regional haze four-factor analysis for these facilities.

In your letters, new information was provided by Hawaiian Electric and consultant (AECOM) that was not presented in Hawaiian Electric's four-factor analyses previously submitted to CAB for evaluation. This included the need to install secondary tank containment liners and fuel atomization systems to accomplish boiler fuel switches, documentation to support Hawaiian Electric's claim that 7% is its nominal interest rate, new remaining useful life assumptions, and a revised construction cost multiplier for SCR of 1.2.

During our October 7, 2021 meeting, both CAB and Hawaiian Electric were in agreement with permanently retiring the boilers at both the Kahului and Kanoelehua-Hill Generating Stations by December 31, 2027. To make reasonable progress, the regional haze program for the second planning period offers flexibility in selecting an enforceable commitment to source retirement by 2028 as an option to performing regional haze four-factor analyses and selection of cost-effective control measure(s). Hawaiian Electric has agreed to a federally enforceable air permit condition requiring the shutdown of these units by December 31, 2027.

[1] NO_X Combustion controls selected include low NO_X burners (LNBs), flue gas recirculation (FGR), and over fire air (OFA) for boilers at the Kahului and Kanoelehua-Hill Generating Stations and fuel injection timing retard (FITR) for diesel engine generators at the Maalaea Generating Station.

We have completed our review of the new information for selecting regional haze controls and compliance dates. Please refer to the enclosed attachment for CAB's response to Hawaiian Electric's Regional Haze Rule request and other concerns raised in the correspondence. Controls selected for units that do not have an enforceable shut down limit are based on a $5,800/ton cost per ton of pollutant removed threshold established by CAB for the four-factor analysis. The cost threshold is used as a floor to determine what controls are considered economically feasible. The tables below provide a summary of the regional haze control measures and associated compliance dates selected for sources on the islands of Hawaii and Maui based on CAB's review of the new information provided by Hawaiian Electric and AECOM.

Control Measures Selected for Hawaii Island Sources		
Power Plant	Controls Selected	Compliance Date
Kanoelehua-Hill	Permanent Shut Down of Boilers Hill 5 and Hill 6	December 31, 2027
Puna	Fuel Switch to ULSD for Puna Boiler	4 years from permit issuance

Control Measures Selected for Maui Island Sources		
Power Plant	Controls Selected	Compliance Date
Kahului	Permanent Shut Down of Boilers K1, K2, K3, and K4	December 31, 2027
Maalaea	FITR for Diesel Engine Generators M1, M2, and M3	December 31, 2027
	SCR for Diesel Engine Generator M7	December 31, 2027

If there are any questions regarding this matter, please contact Mr. Dale Hamamoto or Mr. Mike Madsen of my staff at [redacted]

Sincerely,

MARIANNE ROSSIO, P.E.
Manager, Clean Air Branch

DH/MM:rkb

Attachment

c: Robert Isler, Hawaiian Electric
Stanton Oshiro, Hawaiian Electric
Marisa Melzer, Hawaiian Electric

Attachment E:
EPA 2019 RHR SIP Guidance for Second Planning Period

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

August 20, 2019

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Guidance on Regional Haze State Implementation Plans for the Second Implementation Period

FROM: Peter Tsirigotis
Director

TO: Regional Air Division Directors, Regions 1 – 10

The purpose of this memorandum is to distribute a guidance document titled, "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period." The U.S. Environmental Protection Agency (EPA) prepared this non-binding guidance document to assist states with the preparation of regional haze state implementation plans (SIPs) that are due to EPA by July 31, 2021. The document fulfills EPA's commitment in the agency's September 11, 2018, Regional Haze Reform Roadmap to issue regional haze SIP development guidance and replaces the 2016 draft regional haze guidance document.

The guidance document is posted on EPA's visibility website at: *https://www.epa.gov/visibility/visibility-guidance-documents.*

Please share this memorandum with your staff, as well as colleagues at state, local, and tribal air agencies. If you have questions concerning this document, please contact Liz Etchells at (919) 541-0253 or *etchells.elizabeth@epa.gov* for further information.

Attachment

Note: EPA issued this guidance on August 20, 2019 to assist states as they develop plans to address visibility impairment for the second implementation period under EPA's Regional Haze Rule. In July 2021, EPA issued a memorandum also addressing Regional Haze State Implementation Plans for the second implementation period.

The July 2021 memorandum is available here: https://www.epa.gov/visibility/clarifications-regarding-regional-haze-state-implementation-plans-second-implementation.

Guidance on Regional Haze State Implementation Plans for the Second Implementation Period

EPA-457/B-19-003
August 2019

Guidance on Regional Haze State Implementation Plans for the Second Implementation Period

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Policy Division
Research Triangle Park, North Carolina

Table of Contents

I. Introduction

A. Purpose of this guidance

The purpose of this guidance document is to help states[1] develop approvable regional haze state implementation plans (SIPs) to protect visibility in mandatory Class I Federal areas.[2] This guidance document in particular applies to the SIPs that are due to be submitted to the Environmental Protection Agency (EPA) by July 31, 2021, for the second implementation period ending in 2028.[3] The required content of these SIPs is specified in 40 CFR 51.308(f), which was revised in 2017.[4] This document supports key principles of program implementation, including supporting states in developing SIPs for complying with the Clean Air Act's (CAA) visibility requirements; reducing state planning burdens; and leveraging emission reductions achieved through CAA and other programs that further improve visibility in protected areas. EPA released a draft guidance for public comment in 2016; this 2019 final guidance document replaces the 2016 draft document.

The key principles referenced above, which were highlighted in the September 11, 2018 Regional Haze Reform Roadmap Memorandum,[5] articulate EPA's policy foundation for this document and the implementation of the regional haze program. Importantly, this guidance is intended to provide information about EPA's understanding of the discretion and flexibilities states have within the statutory and regulatory requirements to develop regional haze SIPs, even where states' approaches differ from those provided in this document. States retain the discretion to develop regional haze SIP revisions that differ from the recommendations in this guidance; however, states must ensure the regional haze SIPs are consistent with applicable requirements of the CAA and EPA regulations, and are the product of reasoned decision-making.

This document provides recommendations for use by states in developing SIP submissions, and for EPA Regional offices in acting on them. This document does not substitute for provisions or requirements of the CAA, nor is it a rule itself. As a legal matter, this document does not impose binding, enforceable requirements on any party. Therefore, this guidance is not judicially reviewable. Non-mandatory language such as "guidance," "recommend," and "may" in this document is intended to describe EPA's non-binding recommendations, while mandatory terminology such as "must," "required," and "may not" is intended to describe legal requirements under the CAA or EPA regulations.

Reasoned decision-making is a core component of the regional haze program, and thus of states' regional haze SIP submissions. EPA will evaluate a state's SIP revision to determine whether the

[1] This guidance applies to plans to protect visibility in mandatory Class I Federal areas, none of which are located on tribal land. However, under the CAA and EPA regulations, a tribe may, but is not required to, apply for "treatment in the same manner as a state" for purposes of developing a tribal implementation plan (TIP), including a regional haze TIP. Many provisions of the Regional Haze Rule would apply to a regional haze TIP in the same way they apply to a SIP from a state without a mandatory Class I Federal area.

[2] For brevity, mandatory Class I Federal areas will be referred to as "Class I areas" in the remainder of this document.

[3] This guidance document does not address any SIP revisions that may be submitted to or reviewed by EPA during the second implementation period that concern only the requirements of the first implementation period. Such SIP revisions are subject to either 40 CFR 51.308(d) and (e) or 51.309, which are outside the scope of this guidance.

[4] Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017.

[5] *Available at https://www.epa.gov/visibility/epa-releases-regional-haze-reform-roadmap.*

state has reasonably conducted the required analyses and engaged with the requisite considerations in a manner that is consistent with the statutory visibility goal.[6] To this end, this guidance uses "should" where EPA recommends an approach because it is consistent with the overarching principle that states must engage in reasoned decision-making.

EPA encourages states to discuss SIP development approaches with their EPA Regional office early in their process so that EPA can support states in the development of approvable SIPs. For background purposes, a brief overview of the regional haze program and recent revisions to the Regional Haze Rule are provided below.

B. Brief overview of the regional haze program

A detailed history and explanation of the regional haze program is provided in the preamble to the 2017 rule revisions, found at 82 FR 3078 (January 10, 2017). A brief overview is included here to provide context to the second implementation period SIP development information contained in this document. Appendix A contains descriptions of CAA provisions, EPA rulemakings, and EPA guidance documents related to visibility protection, and may also be informative.

"Regional haze" is defined at 40 CFR 51.301 as "visibility impairment that is caused by the emission of air pollutants from numerous anthropogenic sources located over a wide geographic area. Such sources include, but are not limited to, major and minor stationary sources, mobile sources, and area sources." This visibility impairment is a result of anthropogenic emissions of particles and gases in the atmosphere that scatter and absorb (i.e., extinguish) light, thus acting to reduce overall visibility. The primary cause of regional haze is light extinction by particulate matter (PM).[7] Section 51.308 of the Regional Haze Rule requires states to submit a series of SIPs to protect visibility in Class I areas.

In January 2017, EPA issued a final rule updating the regional haze program, including revising portions of the visibility protection rule promulgated in 1980 and the Regional Haze Rule promulgated in 1999.[8] The revised rule governs states' obligations and EPA's review of periodic SIPs developed for the second and subsequent implementation periods, among other requirements. As noted in the Regional Haze Reform Roadmap Memorandum, in January 2018 the EPA Administrator announced in a letter to several petitioners that EPA intends to

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[6] *See, e.g.*, *North Dakota v. EPA*, 730 F.3d 750, 761 (8th Cir. 2013) (citing *Alaska Department of Environmental Conservation v. EPA*, 540 U.S. 461 (2004) (rejecting argument that EPA is required to approve determination under Clean Air Act § 169A that is "based upon an analysis that is neither reasoned nor moored to CAA's provisions"); *Arizona ex. rel. Darwin v. EPA*, 815 F.3d 519, 531 (9th Cir. 2016) ("EPA has substantive authority to assure that a state's proposals comply with the Act, not simply the ministerial authority to assure that the state has made *some* determination").

[7] For purposes of the Regional Haze Rule, light extinction is estimated from measurements of PM and its chemical components (sulfate, nitrate, organic mass by carbon (OMC), light absorbing carbon, fine soil, sea salt, and coarse material), assumptions about relative humidity at the monitoring site, and the use of a commonly accepted algorithm. These estimates of light extinction are logarithmically transformed to deciviews. The PM measurements used in the regional haze program are collected by the IMPROVE (Interagency Monitoring for PROtected Visual Environments) monitoring network.

[8] Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017; Final Rulemaking: Visibility Protection for Federal Class I Areas, 45 FR 80084 (December 2, 1980); Final Rule: Regional Haze Regulations, 64 FR 35714 (July 1, 1999).

commence a notice-and-comment rulemaking to revisit certain aspects of the January 2017 Regional Haze Rule. The Regional Haze Reform Roadmap Memorandum indicated that such a rulemaking would impact future regional haze implementation periods.

Importantly, when EPA refers to the requirements for the second and subsequent implementation period SIPs, the Agency is referring to the requirements of 40 CFR 51.308(f). A summary of key changes to the Rule in 2017, including changes to 40 CFR section 51.308(f), is provided below.

- *Extension of the 2018 due date for SIPs*. EPA extended the due date for the second implementation period regional haze SIPs, from July 31, 2018, to July 31, 2021. The second implementation period still ends in 2028.
- *Relationship between the long-term strategy (LTS) and the reasonable progress goals (RPGs).* EPA clarified (1) the relationship between the LTS and RPGs in state plans[9] and (2) the LTS obligation of all states.[10]
- *Progress tracking.* EPA revised the way in which some days during each year are to be selected as the 20 percent most impaired days and then used for purposes of tracking progress towards natural visibility conditions. This change focuses attention on days when anthropogenic emissions impair visibility instead of days when wildfires and natural dust storms are the greatest contributors to reduced visibility.
- *Possible adjustment of the uniform rate of progress (URP) for the impacts of anthropogenic sources outside the U.S. (i.e., international sources) and certain types of wildland prescribed fire.* EPA added a provision that allows EPA to approve adjustments to the URP to reflect the impacts of these causes of visibility impairment if an adjustment has been developed through scientifically valid data and methods. These adjustments would be developed and applied separately, although they would both be accomplished by adding an estimate of the impact of the relevant source type or types to the value of the natural visibility condition for the 20 percent most anthropogenically impaired days, for the purposes of calculating the URP. The wildland prescribed fires that are eligible under the Regional Haze Rule to be included in this adjustment are those conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied.[11]
- *Progress reports*. EPA revised the due dates for progress reports and removed the requirement for progress reports to be submitted in the form of SIP revisions for the second and subsequent implementation periods.

[9] This clarification of the existing requirements was accomplished primarily by a reordering of the subsections of 40 CFR 51.308(f) compared to the ordering of similar topics in the subsections of 40 CFR 51.308(d), and by a discussion in the preamble to final rule. *See* 82 FR 3090.

[10] In particular, EPA clarified that all states, including states with no Class I areas, are required to develop an LTS based on analysis of emission control measures and may be required to provide a robust demonstration that there are no additional emission control measures that are necessary for reasonable progress. *See* 40 CFR 51.308(f)(3) and 82 FR 3099.

[11] 40 CFR 51.308(f)(1)(vi)(B).

- *Reasonably attributable visibility impairment* (*RAVI)*. EPA updated, simplified, and extended to all states the provisions for RAVI. At the same time, EPA revoked many of the existing FIPs implementing the 1980 RAVI requirements.[12]
- *Federal land manager (FLM) consultation*. EPA made changes to FLM consultation requirements.
- *Monitoring strategy*. EPA removed the requirement for progress reports submitted for the second and later implementation periods to re-address the monitoring strategy for regional haze. The requirement for periodic SIP revisions to re-address the monitoring strategy was retained.

For convenient reference, Appendix B of this guidance document includes the sections of the Regional Haze Rule that are relevant to the preparation of the SIPs due by July 31, 2021.

II. Regional haze SIP development steps

A. Overview and framework for regional haze SIP development

The CAA and the Regional Haze Rule provide a process for states to follow to determine what is necessary to make reasonable progress in Class I areas. As a general matter, this process involves a state evaluating what emission control measures for its own sources, groups of sources, and/or source sectors[13] are necessary in light of the four statutory factors, five additional considerations specified in the Regional Haze Rule,[14] and possibly other considerations (e.g., visibility benefits of potential control measures, etc.). States have discretion to balance these factors and considerations in determining what control measures are necessary to make reasonable progress. The preamble to the 1999 Regional Haze Rule stated: "The flexibility for State discretion is, of course, exactly what the regional haze rule provides." 64 FR 35760. This guidance is intended to help states exercise their discretion in SIP development for the second implementation period. Importantly, there is no specified outcome or amount of emission reduction or visibility improvement that is directed as the reasonable amount of progress for any Class I area.

Table 1 lists the key process steps that EPA anticipates that states will typically follow when developing a regional haze SIP for the second implementation period. The applicable sections of the Regional Haze Rule are also listed for reference. Table 1 also provides an outline for the remainder of this document which is organized by steps in the SIP development process.

[12] On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address portions of the Regional Haze Rule as revised in 2017, including but not limited to the RAVI provisions and provisions related to Federal Land Manager consultation. *See https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions.* This letter also announced plans to develop regional haze SIP development guidance.
[13] Hereinafter, "sources, groups of sources, and/or source sectors" is referred to as "source(s)."
[14] 40 CFR 51.308(f)(2)(iv)(A)-(E).

Table 1. Key steps in developing a regional haze SIP for the second implementation period

Step 1 Applies only to a state with a Class I area.	*Ambient data analysis* Identify the 20 percent most anthropogenically impaired days and the 20 percent clearest days and determine baseline, current, and natural visibility conditions for each Class I area within the state. 40 CFR 51.308(f)(1) The separate 2018 EPA guidance document addresses this step.[15]
Step 2 Applies to all states.	*Determination of Affected Class I Areas in Other States* Determine which Class I area(s) in other states may be affected by the state's own emissions. *See* 40 CFR 51.308(f)(2) Section II.B.2 of this document addresses this step.
Step 3 Applies to all states.	*Selection of sources for analysis* Select the emission sources for which an analysis of emission control measures will be completed in the second implementation period and explain the bases for these selections. For the purpose of this source selection step, a state may consider estimated visibility impacts (or surrogate metrics for visibility impacts), the four statutory factors, the five required factors listed in section 51.308(f)(2)(iv), and other factors that are reasonable to consider. *See* 40 CFR 51.308(f)(2) Section II.B.3 of this guidance document addresses this step.
Step 4 Applies to all states.	*Characterization of factors for emission control measures* Identify potential emission control measures for the selected sources, develop data on the four statutory factors and on visibility benefits if they will be considered. *See* 40 CFR 51.308(f)(2) Section II.B.4 of this guidance document addresses this step.
Step 5 Applies to all states.	*Decisions on what control measures are necessary to make reasonable progress* Consider the four statutory factors, the five required factors listed in section 51.308(f)(2)(iv) (if not already considered when selecting sources), and, optionally, visibility benefits, and decide on emission controls for incorporation into the LTS. Consider measures adopted by other contributing states, including all measures that have been agreed upon through interstate consultation. 40 CFR 51.308(f)(2) Section II.B.5 of this guidance document addresses this step.
Step 6	*Regional scale modeling of the LTS to set the RPGs for 2028*

[15] Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018. *https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf*

Applies only to a state with a Class I area.	Determine the visibility conditions in 2028 that will result from implementation of the LTS and other enforceable measures to set the RPGs for 2028. Typically, a state will do this through regional scale modeling, although the Regional Haze Rule does not explicitly require regional scale modeling. 40 CFR 51.308(f)(3) Section II.B.6 of this guidance document addresses this step.
Step 7A Applies only to a state with a Class I area.	*Progress, degradation, and URP glidepath checks* • Demonstrate that there will be an improvement on the 20 percent most anthropogenically impaired days in 2028 at the in-state Class I area, compared to 2000-2004 conditions. 40 CFR 51.308(f)(3). • Demonstrate that there will be no degradation on the 20 percent clearest days in 2028 at the in-state Class I area, compared to 2000-2004 conditions. 40 CFR 51.308(f)(3). • Determine the URP that would achieve natural conditions at the in-state Class I area in 2064. The URP may be adjusted for international anthropogenic impacts and certain wildland prescribed fires subject to EPA approval as part of EPA's action on the SIP submission. 40 CFR 51.308(f)(1). • Compare the 2028 RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath for the in-state Class I area. If the RPG is above the URP glidepath, demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS. If the RPG is above the URP glidepath, also provide the number of years needed to reach natural conditions. 40 CFR 51.308(f)(3)(ii)(A). Section II.B.7 of this guidance document addresses this step.
Step 7B Applies to a state only with respect to an out-of-state Class I area to which sources in the state may reasonably be anticipated to contribute to visibility impairment.	*URP glidepath check* If the RPG for the 20 percent most anthropogenically impaired days for the affected Class I area in another state is above the URP glidepath, the state preparing the SIP must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state whose emissions may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS. 40 CFR 51.308(f)(3)(ii)(B) Section II.B.7 of this guidance document addresses this step.
Step 8 Applies to all states.	*Additional requirements for SIPs* Provide additional information necessary to ensure that other requirements of the Regional Haze Rule are met. 40 CFR 51.308(f)(4), (5), and (6) Section II.B.8 of this guidance document addresses this step.

B. Guidance on each SIP development step

1. Step 1: Ambient data analysis

This SIP development step is addressed in a detailed, separate 2018 guidance document that provides recommendations for selecting the 20 percent most anthropogenically impaired days and the 20 percent clearest days at Class I areas.[16] Section 51.308(f)(1) of the Regional Haze Rule requires each state with a Class I area to calculate the baseline, current, and natural visibility conditions as well as to determine the visibility progress to date and the uniform rate of progress (URP). Below is a short summary of EPA's recommendations for using the IMPROVE network ambient data to identify the 20 percent most anthropogenically impaired days and the 20 percent clearest days.

The 20 percent most anthropogenically impaired days are those days with the highest anthropogenic visibility impairment, in deciviews (dv), defined as:

$$\Delta\, dv_{\text{anthropogenic visibility impairment}} = dv_{\text{total}} - dv_{\text{natural}}$$

where dv_{total} is the overall deciview value for a day and $dv_{natural}$ is the natural portion of the deciview value for a day. There are several steps required to calculate the $dv_{natural}$ value, including the assignment of the daily extinction values into three categories: 1) episodic natural, 2) routine natural, and 3) anthropogenic. The episodic natural extinction is typically associated with extreme episodic events like wildfire smoke and dust storms that are identified by a site-specific threshold of carbon (organic carbon + elemental carbon) and dust (fine soil + coarse matter) based on observed IMPROVE 95th percentile values from 2000-2014. The non-episodic extinction values for each day are then allocated to the routine natural and anthropogenic categories based on the ratio of the NC-II estimates[17] and non-episodic annual average for each chemical species. Any remaining extinction after determining the episodic and routine natural extinction is assigned to the anthropogenic category. Days selected as the 20 percent most anthropogenically impaired have the highest anthropogenic extinction relative to the natural extinction. The natural visibility conditions are calculated by the average of the 2000-2014 annual averages of $dv_{natural}$ from the 20 percent most anthropogenically impaired days.

The uniform rate of progress is calculated according to the following equation:

$$URP = [(2000\text{-}2004\ \text{visibility})_{\textit{20\% most impaired}} - (\text{natural visibility})_{\textit{20\% most impaired}}]/60$$

2000-2004 represents the baseline period of the URP and 2064 represents the endpoint where the deciview value of the URP is assumed for the purpose of analysis to reach natural visibility conditions.

The procedure for identifying the 20 percent clearest days is unchanged from the first implementation period meaning the 20 percent clearest days continue to be those days with the

[16] Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018. *https://www.epa.gov/sites/production/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf.*

[17] Copeland, S., Pitchford, M. & Ames, R., 2008. Regional Haze Rule Natural Level Estimates Using the Revised IMPROVE Aerosol Reconstructed Light Extinction Algorithm, s.l.: *http://vista.cira.colostate.edu/improve/Publications/GrayLit/032_NaturalCondIIpaper/Copeland_etal_NaturalConditionsII_Description.pdf.*

lowest daily extinction and dv_{total} values, not the days with the lowest anthropogenic impairment. Therefore, it is unnecessary to assign extinction on the clearest days to anthropogenic and natural fractions.

2. Step 2: Determination of affected Class I areas in other states

Section 51.308(f)(2) of the Regional Haze Rule requires each state to develop an LTS that includes the control measures necessary to make reasonable progress at each Class I area outside the state "that may be affected by emissions from the state."[18] This section addresses how a state determines which Class I areas in other states may be affected by its own emissions, so it knows which out-of-state Class I areas need to be considered in the development of its LTS. This linkage to specific Class I areas affects LTS development because baseline visibility impacts from individual sources and visibility benefits from possible emission control measures are specific to a Class I area. Also, section 51.308(f)(3) of the Regional Haze Rule provides that if a state contains sources whose emissions are reasonably anticipated to contribute to visibility impairment in a Class I area in another state for which the RPG is above the URP glidepath, the state must provide a "robust demonstration" that there are no additional emission reduction measures that would be reasonable to include in its own LTS.[19]

As an initial matter, a state has the flexibility to use any reasonable method for quantifying the impacts of its own emissions on out-of-state Class I areas, and it may use any reasonable assessment for this determination. Additionally, since determinations of affected Class I areas were previously made for the first regional haze implementation period, states may consider retaining the same linkages and assumptions from those SIPs, but if states do so then they should consider whether the assumptions about source-receptor relationships have changed since those assessments.

States that are reassessing their linkages for the second implementation period may make this determination based on the state's recent emissions or anticipated emissions in 2028, which is the end of the second implementation period. Because visibility impairment is defined such that only anthropogenic emissions are considered to contribute to visibility impairment, all types of anthropogenic sources are to be included in this determination. States may also make this determination based on total statewide emissions.

A variety of technical, quantitative approaches exist to assess which out-of-state Class I areas may be affected by aggregate emissions from a given state. The most common approach in the first implementation period was to use a photochemical transport model to track the contribution due to emissions from whole states to specific Class I areas. This approach may also be used in the second implementation period, or a state may use another reasonable approach (e.g., back trajectory-based approaches).

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[18] Section 51.308(f)(2) of the Regional Haze Rule also requires each state to develop an LTS that includes the control measures necessary to make reasonable progress at each of its own Class I areas. The qualification regarding "may be affected" applies only to out-of-state Class I areas; the state preparing a SIP revision must develop an LTS that includes measures necessary to make reasonable progress at each of its own Class I areas regardless of the impact from its own sources' emissions on those areas.

[19] *See* Section II.B.7.c of this document for additional information regarding the requirement for a robust demonstration.

A state with a Class I area may advise another state that it considers its Class I area to be affected by emissions from the other state. However, each state is responsible for its determination of what Class I areas may be affected by its emissions, regardless of impacts that a neighboring state might or might not have identified.[20] This is also a suitable subject for interstate consultation. The Regional Haze Rule requires that states describe actions taken to resolve any disagreements and document interstate consultations.[21]

3. Step 3: Selection of sources for analysis

This section addresses how a state selects emission sources for analysis of emission control measures.[22] In the subsequent analysis of control measures, the state will determine what emission control measures are necessary to make reasonable progress at the state's own Class I areas and Class I areas in other states. The selection of a source for analysis at this step does not necessarily mean that an additional emission control measure will ultimately be required for that source.[23]

A key flexibility of the regional haze program is that a state is not required to evaluate all sources of emissions in each implementation period. Instead, a state may reasonably select a set of sources for an analysis of control measures. The guidance that an analysis of control measures is not required for every source in each implementation period is based on CAA section 169A(b)(2), which requires each SIP to contain emission limits, schedules of compliance, and other measures as may be necessary to make reasonable progress, but (in marked contrast to the statutory provision for BART[24]) does not provide direction regarding the particular sources or source categories to which such emission limits, etc., must apply. Selecting a set of sources for analysis of control measures in each implementation period is also consistent with the Regional Haze Rule, which sets up an iterative planning process and anticipates that a state may not need to analyze control measures for all its sources in a given SIP revision. Specifically, section 51.308(f)(2)(i) of the Regional Haze Rule requires a SIP to include a description of the criteria the state has used to determine the sources or groups of sources it evaluated for potential controls. Accordingly, it is reasonable and permissible for a state to distribute its own analytical work, and the compliance expenditures of source owners, over time by addressing some sources in the second implementation period and other sources in later periods. For the sources that are not selected for an analysis of control measures for purposes of the second implementation

[20] If the state preparing a SIP revision has no Class I areas of its own and it has demonstrated that there are no out-of-state Class I areas that may be affected by its sources' emissions, we encourage the state to discuss this conclusion with their EPA Regional office.
[21] 40 CFR 51.308(f)(2)(ii)(C).
[22] In this document, the term "analysis of control measures" refers to an analysis of what emission control measures for a particular source are necessary in order to make reasonable progress. The analysis of control measures must include consideration of the four statutory factors. It must also include consideration of the five additional factors listed in 40 CFR 51.308(f)(2)(iv) unless these five factors have already been considered in the selection of the sources for which the state will complete an analysis of control measures. It may include the consideration of visibility benefits.
[23] Section II.B.5 of this document addresses the determination of what measures are necessary for reasonable progress.
[24] CAA section 169A(b)(2)(A).

period, it may be appropriate for a state to consider whether measures for such sources are necessary to make reasonable progress in later implementation periods.

The Regional Haze Rule does not explicitly list factors that a state must or may not consider when selecting the sources for which it will determine what control measures are necessary to make reasonable progress. A state opting to select a set of its sources to analyze must reasonably choose factors and apply them in a reasonable way given the statutory requirement to make reasonable progress towards natural visibility. Factors could include but are not limited to baseline source emissions, baseline source visibility impacts (or a surrogate metric for the impacts[25]), the in-place emission control measures and by implication the emission reductions that are possible to achieve at the source through additional measures, the four statutory factors (to the extent they have been characterized at this point in SIP development), potential visibility benefits (also to the extent they have been characterized at this point in SIP development), and the five additional required factors listed in 40 CFR 51.308(f)(2)(iv).

A state that brings no sources forward for analysis of control measures must explain how doing so is consistent with the CAA's requirements that SIPs make reasonable progress towards the national goal of preventing future and remedying existing anthropogenic visibility impairment, and that reasonable progress must be determined by considering the four statutory factors. For example, such an explanation could include a discussion of the types and origins of visibility impairing pollutants impacting the state's Class I areas and/or out-of-state Class I areas to which the state is linked, an assessment of anthropogenic emissions of visibility impairing pollutants in the state broken down by source type and location, and a reasoned assessment based in empirical data and analysis of why further reductions of visibility impairing pollutants are not reasonable (*see* Sections II.B.3.d and II.B.3.f of this document for further detail).

An initial assessment of projected visibility impairment in 2028, considering growth and on-the-books controls, can be a useful piece of information for states to consider as they decide how to select sources for control measure evaluation. Such modeling is optional, but EPA understands that many RPOs and/or states plan to do such modeling to help states understand visibility impairment at Class I areas. Both the emissions inputs and modeling results can provide states with an understanding of the major contributors to visibility impairment.[26]

Overall, this section provides guidance on the types of information that may be useful for selecting a set of sources and the flexibilities a state has when considering this information. This section begins in Section II.B.3.a of this document with a discussion of how a state determines which pollutants (i.e., which forms of particulate matter and its precursors) it will consider in selecting sources for analysis of control measures. Section II.B.3.b of this document then addresses the technical question of how a state can estimate visibility impacts from individual

[25] Instead of quantifying and considering visibility impacts for the purpose of selecting sources to analyze, a state may also develop and consider a reasonable surrogate metric for such impacts (e.g., the emissions/distance relationship, etc.). Surrogate metric here refers to a quantitative metric that is correlated to some degree with visibility impacts as they would be estimated via air quality modeling. For example, a simple surrogate metric is emissions in tons/year divided by distance to an affected Class I area in kilometers, also known as Q/d. A more complicated surrogate metric could also, for example, incorporate information from wind trajectories and daily light extinction budgets. *See S*ection II.B.3.b of this document.

[26] Such modeling can also provide states with an early indication of whether their SIP might need to include a robust demonstration that no further additional emission reduction measures are reasonable to include in its LTS. *See* Section II.B.7.c of this document.

sources or source sectors. Section II.B.3.c of this document contains guidance on how a state can use estimates of visibility impacts to select sources that will be evaluated to determine emission control measures necessary to make reasonable progress at the Class I areas affected by the state. Visibility impacts are not the only factor that can be considered in selecting sources for evaluation; Sections II.B.3.d through II.B.3.f of this document discuss other factors a state may wish to consider. Section II.B.3.g addresses some considerations that apply only to wildland fire. Section II.B.3.h of this document summarizes the Rule's requirements to document the basis of the source selection step.

a) Determining which pollutants to consider

The direct and precursor pollutants that can impair visibility include sulfur dioxide (SO_2), nitrogen oxides (NOx), fine and coarse particulate matter (PM), volatile organic compounds (VOC), and ammonia. When selecting sources for analysis of control measures, a state may focus on the PM species that dominate visibility impairment at the Class I areas affected by emissions from the state and then select only sources with emissions of those dominant pollutants and their precursors. Also, it may be reasonable for a state to not consider measures for control of the remaining pollutants from sources that have been selected on the basis of their emissions of the dominant pollutants.

IMPROVE data and a 2018 EPA technical guidance document on tracking visibility progress[27] can be used directly to develop light extinction budgets (i.e., pie charts showing the light extinction contribution from each ambient PM species) for single days and average budgets for the 20 percent most anthropogenically impaired days. These budgets reveal the relative importance of each PM species to total light extinction. As such, they may be used by a state to focus its SIP development work on the pollutants that matter most.

However, we recommend that the fact that a PM species accounts for only a small percentage of *total* light extinction not be used, by itself, to eliminate the species from subsequent analysis, because a large portion of the total light extinction may be due to natural source impacts, even on the 20 percent most anthropogenically impaired days. In that scenario, the percentage contribution to total light extinction by an individual PM species may give a false sense of the role of that PM species relative to anthropogenic light extinction. For example, organic mass by carbon (OMC) light extinction might be dominant in the IMPROVE data for a western Class I area on the average of the 20 percent most anthropogenically impaired days, even though days heavily affected by fires will tend not to be included in the 20 percent most anthropogenically impaired days. This may cause sulfate to account for only a small percentage of total light extinction. However, it could be clear that most of the OMC is natural and that sulfate dominates *anthropogenic* light extinction. In this situation, we recommend that a state consider SO_2 sources and SO_2 control measures.

To systematically address situations such as this, it is possible to use the recommended data analysis approach in the 2018 technical guidance document on tracking visibility progress cited above to develop an extinction budget specifically for anthropogenic impairment at a Class I area for each day, and to then calculate an average anthropogenic extinction budget for the 20 percent most anthropogenically impaired days. Source attribution modeling using a photochemical grid

[27] Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program, U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018.

model with good performance for all PM species may also be used to develop extinction budgets for anthropogenic light extinction. Using photochemical models and emissions projections, it may be possible to construct light extinction budgets that have a 2028 perspective, and then use those prospective budgets to determine the most important contributors to anthropogenic light extinction. Typically, the state with a Class I area takes the lead on developing the total and/or anthropogenic versions of the light extinction budgets for the Class I area (if a multistate organization or a federal agency has not already provided this information), but the implications of the light extinction budgets apply to all states with sources that contribute to impairment at the area.

In the first implementation period, many states eliminated VOC and ammonia emissions from consideration based on the expectation that anthropogenic VOC emissions make only a small contribution to visibility impairment and that formation of nitrate and sulfate PM is most effectively reduced by reducing emissions of NOx and SO_2 rather than by anthropogenic emissions of ammonia. EPA believes that, in general, this would also be a reasonable approach for the second implementation period. EPA recommends that states that eliminated NOx, SO_2, or PM emissions from full consideration in the first implementation period consider this determination again in the second implementation period.

The remainder of this section applies to sources of PM species that have not been eliminated from further consideration.

b) Estimating baseline visibility impacts for source selection

This section offers recommendations on developing and applying air quality model-based visibility impact estimates. Section II.B.3.c of this document offers recommendations on applying these visibility impact estimates in the source-selection step. Modeling guidance for setting RPGs is available in other EPA guidance documents,[28] as well as in Section II.B.6. of this document. The recommendations in this section are primarily directed at estimating source impacts on visibility using an air quality model. They focus mainly on analysis, modeling, and identification of sources for subsequent evaluation of potential control measures.

Modeling-based estimates of visibility impacts versus surrogates for visibility impacts

While most of the discussion in this section presumes the use of an air quality model to obtain estimates of source or source category visibility impacts, the Regional Haze Rule does not require states to develop estimates of individual source or source category visibility impacts, or to use an air quality model to do so. Reasonable surrogate metrics of visibility impact may be used instead. Many, but not all, of the concepts and recommendations here and in Section II.B.3.c of this document can also be applied when selecting sources based on surrogate metrics.

States may find some or all of the following techniques useful for examining source impacts for the second implementation period.

[28] Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, July 2017 (*https://www.epa.gov/air-emissions-inventories/air-emissions-inventory-guidance-implementation-ozone-and-particulate*); Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 (*https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf*).

1) Emissions divided by distance (Q/d)
2) Trajectory analyses
3) Residence time analyses
4) Photochemical modeling (zero-out and/or source apportionment)

The above techniques are listed in order from the least complicated (Q/d) to the most complicated and resource intensive (photochemical modeling). Each technique has advantages and disadvantages. In general, the simple techniques are easy to implement, but do not provide detailed information. The more sophisticated techniques provide detailed information on PM and PM species impacts, but they are more resource intensive. States may use other reasonable techniques.

Emissions divided by distance (Q/d). A state may use a source's annual emissions in tons divided by distance in kilometers between the source and the nearest Class I area (often referred to as Q/d) as a surrogate for source visibility impacts, along with a reasonably selected threshold for this metric. This metric is a less reliable indicator of actual visibility impact because it does not consider transport direction/pathway, dispersion and photochemical processes, or the particular days that have the most anthropogenic impairment due to all sources. Therefore, it is recommended that use of this technique be limited to source selection for the purpose of developing a list of sources for which a state may conduct a four-factor analysis.

In the most simple implementation of Q/d, metrics and thresholds[29] can be defined on the basis of the sum of emissions of all visibility-impairing pollutants. However, since primary PM and PM precursors may have very different visibility impacts per ton of emissions, it may be best to evaluate Q/d metrics on an individual pollutant basis. Additionally, since the magnitude of Q/d may vary considerably when total emissions are considered versus emissions of individual primary PM and precursor pollutants, appropriate pollutant-specific Q/d thresholds for primary PM and each precursor may need to be considered as part of the analysis. Metrics may also be defined based on only the pollutants that have not been previously eliminated as insignificant contributors.

Section II.B.3.h of this document discusses how a state should document the technical basis of its source selection approach including the basis for any visibility impact thresholds used.

Trajectory analyses. Additional information can be provided through trajectory analyses which examine the wind direction on individual days. Directionality of upwind sources and source categories can be established by examining sources that tend to emit pollutants upwind of Class I areas on individual days. Back trajectories start at the Class I area and go backwards in time to examine the path that emissions took to get to the Class I areas. Back trajectory analyses are typically run for 72 hours or more, using multiple starting heights and multiple start times throughout the day of interest.

[29] The magnitude of previously used Q/d thresholds were closely tied to the specific modeling tools and metrics used in the first implementation period. Therefore, states' previously selected Q/d thresholds may or may not be appropriate to use when selecting sources for analysis of reasonable progress measures in the second implementation period. Thresholds should be evaluated and justified based on the facts and circumstances of the available technical information for the second implementation period.

Residence time analyses. A more sophisticated trajectory-based analysis technique combines emissions, ambient PM data, and trajectory information. This approach selects sources for analysis using an approach that gives each point source a score that takes into account the source's emissions, the daily values of light extinction at a Class I area, the distance between the source and a Class I area, and the relative frequency with which wind trajectories indicate that each source is upwind of the IMPROVE monitoring site.[30] Large sources of pollutants contributing more to light extinction that are near the Class I area and frequently upwind of the Class I area will get higher scores. This type of approach does not quantify daily visibility impacts, but a state can focus on certain days, for example the 20 percent most anthropogenically impaired days, by generating trajectories only for those days. The score will not be in units of light extinction or deciviews. States using this approach would select the sources that are above a chosen score threshold. If the details of this approach are reasonably chosen, a state may use this type of approach for selecting sources in the second implementation period.

Photochemical modeling. In addition to these non-modeling techniques, states can also use a photochemical model to quantify source or source sector visibility impacts. In 2017, EPA finalized revisions to 40 CFR Part 51 Appendix W, Guideline on Air Quality Models.[31] As part of that action, EPA stated that photochemical grid models should be the generally preferred approach for estimating source impacts on secondary PM concentrations. The existing SIP Modeling Guidance[32] provides recommendations on model setup, including selecting air quality models, meteorological modeling, episode selection, the size of the modeling domain, the grid size and number of vertical layers, and evaluating model performance. EPA Regional offices are available to provide an informal review of a modeling protocol before a state or multijurisdictional organization begins the modeling.

The SIP Modeling Guidance focuses on the process for calculating RPGs using a photochemical grid model. The SIP Modeling Guidance does not specifically discuss using photochemical modeling outputs for estimating daily light extinction impacts for a single source or source sector. However, the approach on which the SIP Modeling Guidance is based can also be applied to a specific source or set of sources. The first step in doing this is to estimate the impact of the source or set of sources on daily concentrations of PM species.

The simplest approach to quantifying daily PM species impacts with a photochemical grid model is to perform brute force "zero-out" model runs, which involves at least two model runs: one "baseline" run with all emissions and one run with emissions of the source(s) of interest removed

[30] *See* section 5.6 of *Final Report - Technical Support Document for VISTAS Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans*, Environ International Corp., March 11, 2009. VISTAS narrowed its focus to sulfate impacts prior to this step of its analysis, and consequently considered only the sulfate contribution to light extinction along with SO_2 emissions.

[31] Final Rule: Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter, 82 FR 5182, January 17, 2017.

[32] Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 (*https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf*).

from the baseline simulation.[33] The difference between these simulations provides an estimate of the PM species impact of the emissions from the source(s).

An alternative approach to quantifying daily PM species impacts is photochemical source apportionment. Some photochemical models have been developed with a photochemical source apportionment capability, which tracks emissions from specific sources or groups of sources and/or source regions through chemical transformation, transport, and deposition processes to estimate the apportionment of predicted $PM_{2.5}$ species concentrations.[34] Source apportionment can "tag" and track emissions sources by any combination of region and sector, or by individual source. For example, PM species impacts can be tracked from any particular source category in the U.S., or from individual states or counties. Individual point sources can also be tracked.

Selection of days to consider

Some possible methods of selecting sources to analyze for control measures are based on information about daily visibility impacts which can vary from day to day. For example, this is the case if wind trajectories or photochemical modeling is used. Because the impact of emissions from a source can vary daily, the determination of whether a source will be selected for analysis of emission control measures may involve a decision about which day or days' impacts to use in making the determination.

The Regional Haze Rule requires that the 20 percent most anthropogenically impaired days be used for purposes of setting reasonable progress goals. The 20 percent most anthropogenically impaired days are also used for tracking progress (along with the 20 percent clearest days). Considering source sector impacts averaged across the 20 percent most anthropogenically impaired days when selecting sources will focus attention on the sectors that have the greatest consistent impacts on visibility on days that now have the most impairment.[35]

If a state selects sources for analysis of control measures using annual emissions or annual emissions divided by the distance to a Class I area (i.e., Q/d), it is not necessary for the state to select a particular set of days to focus on at this step in SIP development.

Alternative metrics may be more appropriate when examining visibility impacts from individual sources. Depending on wind direction and other meteorological factors, emissions from a single source may not always or frequently impact a particular Class I area. But there may be individual day visibility impacts that may be important to consider. This is particularly important for modeled demonstrations that provide a single year of meteorological regimes at a given Class I area which may not capture days over the broader multi-year period where a source may be

[33] Cohan, D. S., Hakami, A., Hu, Y. T., and Russell, A. G., (2005), Nonlinear response of ozone to emissions: Source apportionment and sensitivity analysis, Environ. Sci. Technol., 39, 6739–6748.

[34] Kwok, R. H. F., Napelenok, S. L., & Baker, K. R., (2013), Implementation and evaluation of $PM_{2.5}$ source contribution analysis in a photochemical model. Atmospheric Environment, 80, 398-407. Kwok, R., K. Baker, S. Napelenok, and G. Tonnesen. Photochemical grid model implementation and application of VOC, NOx, and O_3 source apportionment. Geoscientific Model Development. Copernicus Publications, Katlenburg-Lindau, Germany, 8:99-114, (2015); User's Guide Comprehensive Air Quality Model with Extensions Version 6.50, *www.camx.com*. Ramboll Environment and Health, Novato CA, 2018.

[35] If these emissions from these sources are reduced as a result of measures in the LTS for the second implementation period, other types of days may become the 20 percent most anthropogenically impaired, which may lead to the selection of other sources in later implementation periods.

contributing to visibility impairment. Therefore, for individual sources, the maximum daily visibility impact on all days may be a more meaningful metric. However, a state may also consider the values of visibility impacts on other days. Sections II.B.3.c and II.B.3.d of this document further discuss how a visibility impact metric can be developed based on the days selected by the state.

Delta deciviews versus light extinction in inverse megameters

The Regional Haze Rule requires that baseline period visibility conditions, current visibility conditions, natural conditions, and the URP be expressed in deciviews, calculated based on total light extinction. Deciview units were also typically used in BART and reasonable progress analyses in the first implementation period. For the purposes of selecting sources for analysis of control measures in the second implementation period, a state has the flexibility to express visibility impacts in units of light extinction (inverse megameters, Mm^{-1}) or in deciviews. The two approaches will rank sources by visibility impact in the same order, but the deciview approach involves additional computational complexities that can make public understanding more difficult. Therefore, EPA recommends that states use light extinction units, rather than deciviews, for quantifying baseline visibility impacts.

States that decide to use a deciview approach to quantifying source-specific visibility impacts may want to consider the following and are encouraged to discuss an appropriate approach with their EPA Regional office. Quantifying baseline source impacts in units of deciviews involves the "delta deciview" approach.[36] A state should not evaluate the visibility impact of a source by only using a delta deciview value for which the current visibility condition, or the projected 2028 condition, is the "background" in the delta deciview calculation. The "background" value should be the light extinction due to natural sources only. EPA recommends the use of the natural conditions values included in the December 2018 Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program as the background value.[37] The values provided in the December 2018 guidance document are for the 20 percent most impaired days and are in deciview units but can be converted to light extinction units. Additionally, the logic of expressing delta deciview impacts relative to natural visibility conditions was articulated in the preamble to the final rule that established the BART Guidelines.[38]

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[36] Under the delta deciview approach, the daily visibility impact of a source should be the difference between the daily visibility that would exist if the source were the only anthropogenic source, added to the natural background, and the daily visibility that would exist due to the natural background alone.

[37] EPA spoke to using natural visibility as background values during the first implementation period, and the Eighth Circuit upheld this approach in *North Dakota v. EPA*, 730 F.3d 750, 764-766 (8th Cir. 2013).

[38] The preamble stated, "Using existing conditions as the baseline for single source visibility impact determinations would create the following paradox: the dirtier the existing air, the less likely it would be that any control is required. This is true because of the nonlinear nature of visibility impairment. In other words, as a Class I area becomes more polluted, any individual source's contribution to changes in impairment becomes geometrically less. Therefore, the more polluted the Class I area would become, the less control would seem to be needed from an individual source. We agree that this kind of calculation would essentially raise the 'cause or contribute' applicability threshold to a level that would never allow enough emission control to significantly improve visibility. Such a reading would render the visibility provisions meaningless, as EPA and the States would be prevented from assuring 'reasonable progress' and fulfilling the statutorily-defined goals of the visibility program. Conversely, measuring improvement against clean conditions would ensure reasonable progress toward those clean conditions." 70 FR 39124, July 6, 2005.

Selection of emissions information when estimating visibility impacts (or surrogates) for source selection purposes

All of the techniques described above require estimates of source emissions. Generally, we recommend that states use estimates of 2028 emissions (resolved by day and hour, as appropriate) to estimate visibility impacts (or related surrogates) when selecting sources, rather than values of recent year emissions. By doing so, sources that are projected on a reasonable basis to cease or greatly reduce their operations or to install much more effective emissions controls by 2028 may be removed from further consideration early in the SIP development process, which can reduce analytical costs. Generally, the estimate of a source's 2028 emissions is based at least in part on information on the source's operation and emissions in a representative historical period. However, there may be circumstances under which it is reasonable to project that 2028 operations will differ significantly from historical emissions. Enforceable requirements are one reasonable basis for projecting a change in operating parameters and thus emissions; energy efficiency, renewable energy, or other such programs where there is a documented commitment to participate and a verifiable basis for quantifying any change in future emissions due to operational changes may be another. A state considering using assumptions about future operating parameters that are significantly different than historical operating parameters should consult with its EPA Regional office.

If a state uses a value for emissions in an earlier year, we recommend the state consider whether emissions have appreciably changed (or will change) between the earlier year, the current period, and the projected future year (2028). It is especially important to consider whether source emissions have increased or are likely to increase in the future compared to earlier emissions values.

Use of actual emissions versus allowable emissions

Generally, we recommend that a reasonably projected actual level of source operation in 2028 be used to estimate 2028 actual emissions for purposes of selecting sources for control measure analysis. Source operation during a historical period can inform this projection, but temporary factors that suppressed or bolstered the level of operation in the historical period should be considered, along with factors that indicate a likely increase or decrease in operation. *See* the SIP Emissions Inventory Guidance for more details.[39] Questions about projecting 2028 emissions may be directed to EPA Regional offices.

Choice of emission inventory year for source selection purposes

Whether a state is selecting sources based on forecasts of 2028 actual emissions or on actual source emissions in a historical period, the state should be aware of the relevant requirement of section 51.308(f)(2)(iii) of the Regional Haze Rule.

Section 51.308(f)(2)(iii) of the Regional Haze Rule requires a state to document, among other things, the emissions information on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress, and requires that this

[39] Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. May 2017. Available at: *https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf*

emissions information must include, but need not be limited to, information on emissions in a year at least as recent as the most recent year for which the state has submitted emission inventory information to EPA as part of the triennial National Emissions Inventory process (referred to here as the "most recent NEI submission year").[40] The requirements of section 51.308(f)(2)(iii) of the Regional Haze Rule can be met if a state uses information from the most recent NEI submission year from the start of its SIP development if its SIP development schedule allows. The state would not be required to use the same information as it has submitted to the NEI, and instead may use more recently updated or corrected emissions information for that year or a more recent year. However, in some cases, a state may have begun its modeling and source selection using emissions information for an earlier year.

While it may not be reasonable for a state to revise its work to entirely rely on emissions information from the most recent NEI submission year at the source selection step, the state should consider updating its source selection work in whole or in part to incorporate this more recent information if it is reasonable to do so.

Another reasonable option for a state to satisfy the requirement in section 51.308(f)(2)(iii) of the Regional Haze Rule, when it is not possible to fully incorporate the more recent information in all the source selection analysis steps, may be to verify in a reasonable manner, for some or all of the state's sources, that there are no important differences between the older and new emissions information that can be expected to affect the selection of sources. In most cases, the state should focus on source sectors that may have experienced increased emissions in the most recent NEI or new sources that did not exist in the previous inventory.

For example, if a state has used 2014 information to select sources (directly, or as the starting point for a 2028 projection) and if for that state the most recent NEI submission year is 2017, the state could compare the 2014 and 2017 emissions for some sources. If 2017 emissions from a source the state has not selected are lower than its 2014 emissions, the state could reasonably conclude that using the 2017 information would not have resulted in the source being selected if the analysis had been based only on 2017 emissions information. If 2017 emissions are higher than 2014 emissions, further consideration of that source may be appropriate.

In addition, another way the state could use information from the most recent NEI submission year is to use such information in the subsequent analysis of control options, to the extent it is reasonable to do so. *See* section II.B.4 of this document.

[40] However, if a state has made a submission for a new inventory year in the period 12 months prior to submission of the SIP, the State may use the inventory year of its prior submission. This 12-month period serves as a grace period, so that a state does not have to incorporate the newest emissions information into its SIP revision late in the process of its adoption at the state level. As explained in Section II.B.6 of this document, there is no Regional Haze Rule requirement as what emission inventory year is used as the starting point to project the 2028 RPGs. Also, in preliminary modeling to project 2028 visibility levels with already adopted emission controls or to attribute current or 2028 visibility impairment to sources or groups of sources for purposes of general understanding of the regional haze situation, neither of which is a requirement of the rule, a state may use any inventory year as the starting point. Note that, as discussed in Section II.B.6 of this document, there is no Regional Haze Rule requirement for which year emissions inventory is used as the starting point for modeling to project 2028 visibility levels, to attribute current or 2028 visibility impairment to sources, or to project the 2028 RPGs.

c) Using estimates of visibility impacts to select sources

A state choosing to consider visibility impacts may consider any of a number of possible visibility impact metrics. A state may define a reasonable value of its chosen metric to serve as a threshold, such that only sources with impacts above this threshold are selected for analysis of control measures. As already stated, EPA recommends that visibility metrics and thresholds be put in terms of inverse megameters of light extinction.

Selecting a threshold level for visibility impacts for selecting sources

The appropriate threshold for selecting sources may reasonably differ across states and Class I areas due to varying circumstances. In setting a threshold, a state may consider the number of emissions sources affecting the Class I areas at issue, the magnitude of the individual sources' impacts, and the amount of anthropogenic visibility impairment at the Class I area.[41] Various visibility metrics may be appropriate to use, but metric thresholds should be developed in consideration of the magnitude of an individual metric at an individual Class I area. For example, if modeling a full year, the maximum modeled day visibility impact may be several orders of magnitude larger than the impact averaged across the 20 percent most impaired days. There may be other approaches and factors that would be appropriate for states to use when setting and explaining such a threshold. If quantifiable, the amount of anthropogenic visibility impairment from a source can be compared to the total anthropogenic impairment at a Class I area. For example, a threshold of "X" Mm^{-1} may be reasonable if current visibility impairment is mostly due to relatively few sources with impacts above "X" Mm^{-1}, but may not be reasonable if current visibility impairment is due to a large number of sources each with impacts below "X" Mm^{-1}. A similar concept applies if source-specific visibility impacts are expressed as percentages of total light extinction.

Whatever threshold is used, the state must justify why the use of that threshold is a reasonable approach, *i.e.*, why it captures a reasonable set of sources of emissions to assess for determining what measures are necessary to make reasonable progress.[42] For example, it may be difficult to show reasonableness of a threshold set so high that an uncontrolled or lightly controlled source that is one of the largest contributors to anthropogenic light extinction at a Class I area is excluded.

Visibility impacts at multiple affected Class I areas

EPA recommends that a state preparing a SIP submission repeat the source selection step from the perspective of each Class I area in the state and each Class I area in another state that may be affected by emissions from the state. For example, for the first Class I area to be considered, we recommend that the impacts from sources in the state preparing a SIP submission be compared to the threshold to select the sources that will be subject to analysis of control measures. This

[41] The BART Guidelines recommended that states choose a deciview value of up to 0.5 for visibility impacts as the threshold for subject-to-BART determinations, and provide justification for the choice of threshold. Most states used 0.5 dv. However, the magnitude of the previously recommended subject-to-BART threshold was closely tied to the specific modeling tools and metrics recommended in the BART Guidelines, as well as to the purpose and structure of the BART provisions. Therefore, states' previously selected subject-to-BART thresholds are not necessarily appropriate thresholds to use when selecting sources for analysis of reasonable progress measures in the second implementation period.

[42] Section 51.308(f)(2)(i) of the Regional Haze Rule.

process would then be repeated for other Class I areas. In this analysis, it does not matter in which state a Class I area is located. A source within the state preparing the SIP submission that is identified for analysis of control measures because of its potential visibility impacts on any one of the Class I areas, whether in that state or another state, would then be brought forward for analysis of control measures. If impacts at different areas are estimated using different approaches or if different thresholds are used for different Class I areas, this must be explained in the presentation of the results, including the state's rationale for using different approaches or thresholds.

d) Option to consider the four statutory factors when selecting sources

EPA expects that, typically, states are more likely to select sources based on visibility impacts and not consider the four reasonable progress factors (i.e., cost of compliance, remaining useful life, time necessary for compliance, and energy and non-air quality environmental impacts) until after a source is selected. However, in some cases, a state may already have information on one or more of the four reasonable progress factors at the time of source selection. If so, the state may consider that information at the source-selection stage. In particular circumstances, that information may indicate that it is reasonable to exclude the source for evaluation of emission control measures because it is clear at this step that no additional control measures would be adopted for the source. The source-selection step is intended to add flexibility and discretion to the state planning process – ultimately, the state decides which sources to consider for reasonable progress.

EPA anticipates the two most common factors that states may decide to use at the source-selection step are remaining useful life and cost of compliance. The following paragraphs provide specific guidance about how a state could consider already-available information on these two reasonable progress factors at the source selection step if a state so chooses. Should a state be interested in using information on the remaining factors, EPA recommends the state discuss with their EPA Regional office. A state opting to not bring a source or sources forward for further analysis based on preliminary information regarding the statutory factors should explain its basis for concluding that no additional control measures would be reasonable to require.

Remaining useful life – If a source is expected to close by December 31, 2028, under an enforceable requirement, a state may consider that to be sufficient reason to not select the source at the source selection step. Given the combination of the time required for EPA to review and act on the SIP[43] and the reasonable time required for the source to come into compliance once EPA has approved the emission limit, the remaining time period in which additional controls, if required, could provide a visibility benefit prior to shutdown of the source would be very limited. The year 2028 is not a bright line for these considerations, so a state may be able to justify not selecting a source for analysis of control measures because there is an enforceable requirement for the source to cease operation by a date after 2028. The remaining useful life factor is closely related to the cost of compliance factor, with the calculated cost of compliance generally increasing with a shorter remaining useful life based on the decreasing amortization period. Therefore, it may be more challenging for a state to reasonably use a shorter remaining useful

[43] As explained in Section II.B.5.e of this document, it is acceptable for a state to conceptually "start the clock" on the reasonable time for compliance with a new measure included in a SIP at the date of EPA approval of the SIP emission limit anticipated under the statutory deadlines.

life as the basis for not selecting sources the further away the enforceable shutdown date gets from 2028.

Cost of compliance – States choosing to consider the cost of compliance at the source selection step should do so on the basis of complete cost data; that is, estimated values of capital costs, annual operating and maintenance costs, annualized costs, and cost per ton of emission reductions that have been prepared according to EPA's Control Cost Manual. Such cost estimates could be either generic or source-specific; if generic estimates are used, EPA recommends that states use EPA's Control Cost Manual generic cost estimates. Generally, we expect that states will not have complete cost data for the full range of potentially applicable control measures at the source-selection step; that is, that states will not yet have fully developed the information outlined above. If complete cost data is available, states should consult with their EPA Regional office regarding its consideration at the source-selection step.

e) Option to consider the five additional factors when selecting sources

Section 51.308(f)(2)(iv) of the Regional Haze Rule requires that when developing its LTS, a state must consider five additional factors. However, the rule does not specify that these factors be considered at any particular step of developing the LTS. As part of meeting the requirement to consider these five additional factors, a state may take one or more of them into consideration when it selects sources. If a state decides not to consider these factors during source selection, the subsequent analysis of control options will provide another opportunity for states to meet the rule requirement to consider the five factors. These five factors are described in more detail below.

Section 51.308(f)(2)(iv)(A) of the Regional Haze Rule -Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment

This factor is inherently considered in the process of source selection if visibility impacts are used to select sources, since those visibility impacts depend on emission reductions from ongoing air pollution control programs. This factor is also considered if a state does not select certain sources based on those sources already having effective emissions controls in place. *See*, also, the discussion of the fifth of these factors, below.

Section 51.308(f)(2)(iv)(B) of the Regional Haze Rule -Measures to mitigate the impacts of construction activities

If the state has selected construction activities as a source category for an analysis of control measures, it will consider this factor in that analysis. That analysis and the decision about what measures are necessary for reasonable progress are the subjects of Sections II.B.4 and II.B.5 of this document.

If the state does not select construction activities as a source category for an analysis of control measures, the SIP must nevertheless indicate how the state has considered measures to mitigate the impacts of construction activities. For example, if the IMPROVE-based light extinction budget or the modeling-based extinction budget indicates a small impact for all coarse PM, or if modeling indicates a small impact from construction dust, the state can show it has considered this factor by explicitly concluding that measures to mitigate dust due to construction activities would have only small visibility benefits. If a state has existing measures in place to mitigate the

impacts of construction activities, a state could present that information in the SIP to address this requirement.

Section 51.308(f)(2)(iv)(C) of the Regional Haze Rule -Source retirement and replacement schedules

This factor can be considered in selecting sources for control measure analysis, for example by not selecting sources that have an enforceable commitment to be retired or replaced by 2028.

Section 51.308(f)(2)(iv)(D) of the Regional Haze Rule -Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs

The fire-related recommendations in Section II.B.3.g of this document explain ways in which a state can consider this factor.

Section 51.308(f)(2)(iv)(E) of the Regional Haze Rule -The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy

A projection of the anticipated net effect on visibility progress that will occur during the second implementation period due to projected changes in emissions from sources within the state can be a useful consideration in determining which in-state sources to select. That is, the amount of net visibility progress during the second period that will result from in-state emission reductions due to ongoing air pollution control programs, including source measures the state has adopted to meet CAA requirements other than for visibility protection, and any measures that the state has already adopted or will adopt into its LTS for the second implementation period, can be a consideration when determining which sources to include in the analysis of controls measures in the second implementation period. As an early, optional step in developing its SIP, a state may project 2028 visibility conditions assuming only already adopted controls. National-scale modeling runs conducted by EPA may be useful in this process.

The fact that visibility conditions in 2028 will be on or below the URP glidepath is not a sufficient basis by itself for a state to select no sources for analysis of control measures; however, the state may consider this information when selecting sources. *See* the final rule preamble discussion of this subject at 82 FR 3078 at 3093 and 3099-3100, January 10, 2017. Rather, that fact would serve to demonstrate that, after a state has gone through its source selection and control measure analysis, it has no "robust demonstration" obligation per 40 CFR 51.308(f)(3)(ii)(A) and/or (B).

f) Sources that already have effective emission control technology in place

It may be reasonable for a state not to select an effectively controlled source. A source may already have effective controls in place as a result of a previous regional haze SIP or to meet another CAA requirement. In general, if post-combustion controls were selected and installed fairly recently (*see* illustrative examples below) to meet a CAA requirement, there will be only a low likelihood of a significant technological advancement that could provide further reasonable emission reductions having been made in the intervening period. If a source owner has recently made a significant expenditure that has resulted in significant reductions of visibility impairing pollutants at an emissions unit, it may be reasonable for the state to assume that additional

controls for that unit are unlikely to be reasonable for the upcoming implementation period. A state that does not select a source or sources for the following or any similar reasons should explain why the decision is consistent with the requirement to make reasonable progress, i.e., why it is reasonable to assume for the purposes of efficiency and prioritization that a full four-factor analysis would likely result in the conclusion that no further controls are necessary. This consideration forms the basis of the following examples, which are intended to illustrate (in a non-exhaustive fashion) scenarios in which EPA believes it may be reasonable for a state not to select a particular source for further analysis:

- New, reconstructed, or modified emision units subject to and complying with New Source Performance Standards (NSPS) that were promulgated or reviewed since July 31, 2013,[44] and that regulate emissions of visibility-impairing pollutants, on a pollutant-specific basis.[45] The statutory considerations for setting NSPS are similar to the four statutory factors for reasonable progress, and it is unlikely that new control measures will be available, or that previously known control measures can be made significantly more effective, beyond those relied on in up-to-date NSPS.
- New, reconstructed, or modified emission units that went through Best Available Control Technology (BACT) review under the Prevention of Significant Deterioration (PSD) program or Lowest Achievable Emission Rate (LAER) review under the nonattainment new source review program for major sources and received a construction permit on or after July 31, 2013,[46] on a pollutant-specific basis. The statutory considerations for selection of BACT and LAER are also similar to, if not more stringent than, the four statutory factors for reasonable progress.
- For the purpose of SO_2 control measures, an EGU that has add-on flue gas desulfurization (FGD) and that meets the applicable alternative SO_2 emission limit of the 2012 Mercury Air Toxics Standards (MATS) rule[47] for power plants. The two limits in the rule (0.2 lb/MMBtu for coal-fired EGUs or 0.3 lb/MMBtu for EGUs fired with oil-derived solid fuel) are low enough that it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these limits would conclude that even more stringent control of SO_2 is necessary to make reasonable progress.[48]

[44] The CAA requires EPA to review, and if necessary, revise NSPS every 8 years. Therefore, NSPS promulgated or reviewed since July 31, 2013, will be up-to-date as of the due date for the second implementation period regional haze SIPs.

[45] Unless otherwise indicated, "on a pollutant-specific basis" here and elsewhere in this section means that the consideration is relevant only for the pollutant that was the target of the control installed on or after the indicated date. If the source emits other pollutants that impair visibility, the source would still be brought forward for analysis of control measures for those other pollutants. For example, an EGU may participate in a trading program for SO_2 and NOx, while being subject to a requirement to install new controls for PM emissions under an up-to-date NSPS. It may be reasonable to not select that source for analysis of additional control measures for PM, but to select it for analysis of additional SO_2 and NOx controls.

[46] BACT and LAER determinations are informed by, among other things, applicable NSPS, which the CAA requires to be reviewed on 8-year cycles. Therefore, a BACT or LAER determination within 8 years of SIP submission for the second implementation period should be consistent with up-to-date, effective, and reasonable control measures.

[47] 77 FR 9309, February 16, 2012. The MATS rule has been revised since 2012, but those revisions have not affected the alternative SO_2 emissions limits.

[48] EGUs without FGD are not included in this category because an analysis of control measures for an EGU that has elected to meet the standard of 0.2 or 0.3 lb/MMBtu through use of a particular type of coal rather than a scrubber

- For the purpose of PM control measures, a unit that is subject to and complying with[49] any CAA section 112 National Emission Standard for Hazardous Air Pollutants (NESHAP) or CAA section 129 solid waste combustion rule, promulgated or reviewed since July 31, 2013, that uses total or filterable PM as a surrogate for metals or has specific emission limits for metals. The NESHAPs are reviewed every 8 years and their emission limits for PM and metals reflects at least the maximum achievable control technology for major sources and the generally available control technology for area sources. It is unlikely that an analysis of control measures for a source meeting one of these NESHAPs would conclude that even more stringent control of PM is necessary to make reasonable progress.
- For the purpose of SO_2 and PM control measures, fuel combustion units[50] that combust only pipeline natural gas per enforceable requirements.[51] Add-on SO_2 controls or more stringent limits on the sulfur content of the natural gas would very likely not be determined to be necessary to make reasonable progress.
- For the purposes of SO_2 and PM control measures, fuel combustion units that are restricted to using only distillate fuel with a sulfur content of no more than 0.0015 percent, per enforceable requirements. This is the sulfur limit for ultra-low sulfur diesel fuel for mobile sources and is also the lowest limit adopted or advocated by any state for stationary sources using distillate fuel.
- For the purposes of SO_2 and NO_X control measures, a combustion source (e.g., an EGU or industrial boiler or process heater) that, during the first implementation period,[52] installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), on a pollutant-specific basis.[53]

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could result in a determination that a scrubber is necessary to make reasonable progress. The alternative MATS SO_2 limit is not available to EGUs without FGD.

[49] States should consult with their EPA Regional offices to address situations in which a NESHAP has been promulgated at the time of SIP development and has a compliance date for existing sources at some point during the second implementation period.

[50] Stationary fuel combustion units are units that combust solid, liquid, or gaseous fuel, generally for the purposes of producing electricity, generating steam, or providing useful heat or energy for industrial, commercial, or institutional use, or reducing the volume of waste by removing combustible matter. Stationary fuel combustion sources include, but are not limited to, boilers, simple and combined-cycle combustion turbines, engines, incinerators, and process heaters.

[51] This does not include units that physically can and are permitted to also use liquid fuel, for example for startup or during a gas supply interruption. However, such a source can be excluded if it is required to use only liquid fuels that meet the sulfur limits in the next two category descriptions.

[52] For purposes of this consideration, the first regional haze implementation period started when SIPs were due on December 17, 2007.

[53] While a 90 percent control effectiveness is used in this example, we expect that any FGD system installed to meet CAA requirements since 2007 would have an effectiveness of 95 percent or higher. This does not apply to a source that has recently achieved a higher level of control efficiency without the installation of a control system, for example if it has merely increased the flow rate of a reagent. In such a situation, the four factors should be fully considered. The outcome may still be that the current level of control is the measure that is necessary to make reasonable progress.

- BART-eligible units that installed and began operating controls to meet BART emission limits for the first implementation period, on a pollutant-specific basis.[54] Although the Regional Haze Rule anticipates the re-assessment of BART-eligible sources under the reasonable progress Rule provisions,[55] if a source installed and is currently operating controls to meet BART emission limits, it may be unlikely that there will be further available reasonable controls for such sources. However, states may not categorically exclude all BART-eligible sources, or all sources that installed BART controls, as candidates for selection for analysis of control measures.

g) Special considerations for wildland fires

Consistent with the regional haze program's focus on reducing anthropogenic impacts, the rule provides for considerations for wildland fires and wildland prescribed fires as part of the SIP planning process.

Wildland wildfires

The Regional Haze Rule defines wildland wildfires to be natural events.[56] Accordingly, emissions from wildland wildfires are considered to be natural emissions that contribute to natural reductions in visibility, but these emissions do not contribute to "visibility impairment." Thus, the Regional Haze Rule does not obligate states to select, or even to consider selecting, wildland wildfires for analysis of control measures.

Wildland prescribed fire

Consistent with the December 2018 Executive Order on Promoting Active Management of America's Forests, Rangelands, and other Federal Lands to Improve Conditions and Reduce Wildfire Risk, EPA supports the promotion of healthy and resilient forests, rangelands, and other Federal lands by actively managing them through partnerships with states, tribes, communities, non-profit organizations, and the private sector. This active forest management includes the use of prescribed fires. For the purpose of the regional haze program, EPA considers prescribed fires to be anthropogenic sources of visibility-impairing pollutants.[57] Section 51.308(f)(2)(iv)(D) of the Regional Haze Rule requires that as they develop their LTSs, all states must consider basic smoke management practices[58] for prescribed fire used for agricultural and wildland vegetation

[54] This consideration may be relevant for sources that installed and began operating controls that satisfied the BART requirement on or after December 17, 2007, but is not applicable to BART-eligible units that were determined to be not subject to BART, BART-subject units for which the BART requirement was met in whole or in part by emission reductions at other units as part of a better-than-BART alternative or trading program, units that were not subject to BART that contributed emission reductions for a better-than-BART alternative or trading program, and sources for which existing controls were determined to be BART. A state might, however, have a different, reasonable basis for not selecting such sources for control measure analysis.

[55] 40 CFR 51.308(e)(5) states that "After a State has met the requirements for BART or implemented an emissions trading program or other alternative measure that achieves more reasonable progress than … BART, BART-eligible sources will be subject to the requirements of paragraphs (d) and (f) of this section."

[56] 40 CFR 51.301.

[57] *See* 40 CFR 51.301; 82 FR at 3105-09.

[58] Basic smoke management practices are types of actions that the manager of a prescribed fire can take to reduce the amount of smoke generated by a prescribed fire and/or to reduce public exposure to the smoke that is generated. These practices are described in more detail in a publication issued by federal agencies that use prescribed fire as part of their land management programs. *See* USDA Forest Service and Natural Resources Conservation Service,

management purposes and smoke management programs.[59] However, EPA notes there are many ways to consider such practices and programs and the rule does not require states to incorporate them into their regional haze SIPs (82 FR 3108).

There are many ways that a state can give consideration to basic smoke management practices and smoke management programs. In particular, a state does not need to shoehorn prescribed fire, basic smoke management practices, and smoke management programs into a formal source selection analysis or a formal analysis of control measures. Relatedly, the 2017 Regional Haze Rule revisions allow states to propose an adjustment to the endpoint of the URP glidepath to account for wildland prescribed fire impacts (Section 51.308(f)(1)(vi) of the Regional Haze Rule). States with substantial wildland prescribed fire may consider the option to propose adjusting the endpoint of the URP glidepath to account for prescribed fire impacts. Consistent with section 51.308(f)(1)(vi) of the Regional Haze Rule, the URP adjustment may be an important tool used to accommodate use of wildland prescribed fire when such fires are conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species, and during which appropriate basic smoke management practices are applied.

The following are possible paths that a state can take. EPA is not offering a recommended path, as the situations among the states and Class I areas are too varied for a general recommendation. A state may consult with the EPA Regional office about its particular situation. As states consider whether to adopt new measures that might affect the ability of land managers to use prescribed fire, they may consider both the effectiveness of their smoke management programs in protecting visibility and the benefits of wildland prescribed fire for ecosystem health and public safety. Consultation with the FLMs and state forestry agencies may be useful during this consideration.

A path that may be appropriate when there is no contribution, or only little contribution, from prescribed fires. If in-state prescribed fires do not contribute significantly to visibility impairment on the 20 percent most anthropogenically impaired days at any of the Class I areas to which the state's sources contribute, the state may meet the fire-relevant requirements of the Regional Haze Rule simply by stating and supporting this conclusion. This can be done, for example, by observing that there is very little in-state prescribed fire activity and/or observing that light extinction at the Class I area(s) in question due to elemental and organic carbon has been at levels that are not consistent with a significant impact from biomass burning generally or from prescribed fire specifically. Emission inventory values for prescribed fire emissions may also be cited and compared to other sources in the state and/or neighboring states. In this situation, the state will have implicitly considered basic smoke management practices and smoke management programs even though it has not selected prescribed fire for analysis of control measures.

Basic Smoke Management Practices Tech Note, October 2011.
http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046311.pdf.

[59] The term "smoke management program" is used within the fire management community to refer to a multi-participant program that seeks to influence or regulate both whether and when prescribed fires are conducted and, typically, the smoke management practices employed during a prescribed fire.

Paths that may be appropriate when there is significant contribution from prescribed fire. If in-state prescribed fires contribute significantly to visibility impairment[60] at one or more Class I areas, the state may show it has considered basic smoke management practices and smoke management programs in any reasonable way, which might or might not involve an analysis of control measures. The state can show that it has reasonably considered basic smoke management practices by explaining that basic smoke management practices are required by state law or are promoted as voluntary measures, or by showing that the large majority of prescribed fire managers already employ these practices. Section 51.308(f)(2)(iv)(D) of the Regional Haze Rule does not require or recommend a state incorporate its existing requirements into the SIP as enforceable measures.

To show reasonable consideration of smoke management programs, a state that has an existing smoke management program (or that is adopting a smoke management program) can describe the program and note that it has benefits for visibility, while considering how the use of prescribed fire on wildland can benefit ecosystem health and public health from the air quality impacts of wildfires. A state that does not have an existing smoke management program (and that chooses not to adopt one) can show that it has reasonably considered smoke management programs by explaining why it is not adopting a smoke management program. EPA recommends that states consult with the FLMs, state forestry agencies, and other wildland managers/owners when considering smoke management programs.

h) Documentation of the source selection process and result

Consistent with section 51.308(f)(2)(iii) of the Regional Haze Rule, which requires a state to document the technical basis, including modeling, monitoring, cost, engineering, and emissions information, on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress in each Class I area it affects, a state must document the basis of its source selection step. Additionally, section 51.308(f)(2)(i) of the Regional Haze Rule requires a SIP to include a description of the criteria the state has used to determine the sources or groups of sources it evaluated for potential controls. EPA recommends that this documentation and description provide both a summary of the state's source selection approach and a detailed description of how the state used technical information to select a reasonable set of sources for an analysis of control measures for the second implementation period. The state could include qualitative and quantitative information such as: the basis for the visibility impact thresholds the state used (if applicable), additional factors the state considered during its selection process, and any other relevant information. While there is no requirement for states to select a certain number of sources or percentage of visibility impairing pollutants emitted for four-factor analysis in any given implementation period. It may be helpful, however, for states to

[60] Source apportionment or sensitivity modeling may be a useful way to determine whether prescribed fire is a significant contributor to visibility impairment. The EPA's Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program (EPA-454/R-18-010, December 2018) describes EPA's recommended methods on two technical aspects of regional haze SIP development: 1) the visibility tracking metrics and 2) estimating international anthropogenic impacts and optional adjustment to the URP glidepath. The method to adjust the URP glidepath for international anthropogenic impacts can also be used to propose adjustments to the glidepath for prescribed fire impacts. EPA will provide modeling results that may be useful to states interested in making such URP glidepath endpoint adjustments. Additionally, to the extent that credible projections of international anthropogenic emissions and/or prescribed fire burning activity are available, whether increases or decreases, it may be appropriate to calculate glidepath adjustments based on future year emissions estimates. States are encouraged to consult with their EPA Regional Office during the development of any proposed approach.

provide an assessment of the portion of sources and/or emissions selected in order to demonstrate that the source selection process employed has achieved a reasonable result.

The above section provided information regarding the source selection step, a step typically undertaken by states during regional haze SIP development. Some of the above concepts will also be discussed as part of the control analysis step (step 4), which is discussed in the next section.

4. Step 4: Characterization of factors for emission control measures

The characterization of relevant factors for emission control measures for a source or group of sources is a necessary step before those factors can be taken into consideration when determining what measures are necessary to make reasonable progress. States will typically characterize most of the relevant factors only after selecting sources for further analysis, because one function of the source selection step is to reduce the number of sources for which the full set of relevant factors will be characterized. This section will discuss the four statutory factors and other considerations relevant to this part of the analysis.

Section 169A(g)(1) of the CAA lists four factors that must be taken into consideration in determining reasonable progress and states are required to consider those four factors (i.e., cost of compliance, time necessary for compliance, energy and non-air environmental impacts, and remaining useful life of the source) in the control analysis step. The visibility benefit of an emission reduction measure is not listed as a required factor, but neither the CAA nor the Regional Haze Rule prohibits a state from considering visibility benefits when it determines what emission control measures are required for a source to make reasonable progress at a Class I area. Therefore, a state may consider the visibility benefits of potential control measures when determining what is necessary to make reasonable progress.[61] A state may also consider one or more of the five additional factors listed in section 51.308(f)(2)(iv) of the Regional Haze Rule. All these factors are addressed in this section.

The Regional Haze Rule has very few specific requirements for how factors are to be characterized. States have flexibility to decide how to characterize the factors, but a state's approaches must be reasonable. Additionally, Section 51.308(f)(2)(iii) of the Regional Haze Rule requires that the SIP must document how the state has done its analysis. Technically sound facts regarding costs, visibility benefits, and other factors will help states make well-reasoned decisions in step 5 that are also technically sound. Before it can characterize the relevant factors for potential emission control measures for the selected sources, a state must determine which emission controls measures it will consider. Accordingly, that is the first topic addressed in this section.

a) Determining which emission control measures to consider

The first step in characterizing control measures for a source is the identification of technically feasible control measures for those pollutants that contribute to visibility impairment.

[61] The introduction to Section II.B.4.g of this document provides more discussion on the consideration of the visibility benefits of emission control measures in the determination of what measures are necessary to make reasonable progress.

Identification of these measures does not create a presumption that one of them will be determined to be necessary to make reasonable progress.

A state must reasonably pick and justify the measures that it will consider, recognizing that there is no statutory or regulatory requirement to consider all technically feasible measures or any particular measures. A range of technically feasible measures available to reduce emissions would be one way to justify a reasonable set.

Once a set of potential control measures have been identified for a selected source, the state must characterize (i.e., collect data on and apply) the four statutory factors that will be considered in selecting the measure(s) for that source that are necessary to make reasonable progress. A state planning to consider visibility benefits will also need to characterize those benefits.

Control measures versus emissions limitations

The analysis of control measures focuses on possible physical or operational changes at the source that may reduce emissions of visibility impairing pollutants. Once such a change or set of such changes has been determined to be necessary to make reasonable progress based on the four statutory factors and other factors, the state will need to address what emission limitation or limitations are appropriate to ensure that the physical or operational change or changes are implemented by the source. That topic is addressed in Section II.B.5.e of this document.

Baseline control scenario for the analysis

Typically, a state will not consider the total air pollution control costs being incurred by a source or the overall visibility conditions that would result after applying a control measure to a source but would rather consider the incremental cost and the change in visibility associated with the measure relative to a baseline control scenario. The projected 2028 (or the current) scenario can be a reasonable and convenient choice for use as the baseline control scenario for measuring the incremental effects of potential reasonable progress control measures on emissions, costs, visibility, and other factors. A state may choose a different emission control scenario as the analytical baseline scenario. Generally, the estimate of a source's 2028 emissions is based at least in part on information on the source's operation and emissions during a representative historical period. However, there may be circumstances under which it is reasonable to project that 2028 operations will differ significantly from historical emissions. Enforceable requirements are one reasonable basis for projecting a change in operating parameters and thus emissions; energy efficiency, renewable energy, or other such programs where there is a documented commitment to participate and a verifiable basis for quantifying any change in future emissions due to operational changes may be another. A state considering using assumptions about future operating parameters that are significantly different than historical operating parameters should consult with its EPA Regional office.

Examples of types of emission control measures states may consider

States have the flexibility to reasonably determine which control measures to evaluate, and the following is a list of example types of control measures that states may consider:

- Emission reductions through improved work practices.
- Retrofits for sources with no existing controls.
- Upgrades or replacements for existing, less effective controls.

- Year-round operation of existing controls.
- Fuel mix with inherently lower SO_2, NO_x, and/or PM emissions. States may also determine that it is unreasonable to consider some fuel-use changes because they would be too fundamental to the operation and design of a source.
- Operating restrictions on hours, fuel input, or product output to reduce emissions.
- Energy efficiency and renewable energy measures that could be applied elsewhere in a state to reduce emissions from EGUs.[62]
- Basic smoke management practices and smoke management programs for agricultural or wildland prescribed fires.

The state must consider the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress in the Class I area

This requirement of section 51.308(f)(2)(ii)(B) of the Regional Haze Rule applies to all states affecting a given Class I area. To give adequate consideration to this factor, a state must (1) consult with other contributing states to learn what measures they have identified as being necessary to make reasonable progress and then (2) consider those measures for any similar in-state sources that it has already selected for analysis of control measures. This provision of the rule does not require the state to select additional sources for analysis of control measures if its source selection process is otherwise reasonable; however, a state should explain why its source selection process arrived at a different result.

A state that has determined that certain measures for its sources are or are not necessary to make reasonable progress will have developed technical analyses on costs and other factors that may be informative to other states. Such analyses could be shared and discussed during interstate consultation.

b) Selection of emissions information for characterizing emissions-related factors

After a state has identified potential control measures for further evaluation, the state will generally need to use emissions information to estimate the emission reductions from the potential control measures. This information on emission reductions feeds into the estimation of visibility benefits and into calculations of cost effectiveness. EPA's recommendations in this area are similar to the recommendations in Section II.B.3.b of this document regarding how emissions information is selected and used as part of using baseline visibility impacts in the process of selecting sources. As described in Section II.B.3.b of this document, a state should be sure to address in its analysis of control measures the relevant requirement of section 51.308(f)(2)(iii) of the Regional Haze Rule at either the source-selection step or the analysis of control measures step.

[62] EPA understands that some states may be interested in exploring such measures for their second implementation period SIPs, which is generally appropriate. We suggest such states discuss the measures and programs and their incorporation into the SIP with their EPA Regional office. Additionally, the following resources may be helpful: Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans - *https://www.epa.gov/sites/production/files/2016-05/documents/eeremanual_0.pdf;* EPA's website with energy efficiency and renewable energy resources - *https://www.epa.gov/energy-efficiency-and-renewable-energy-sips-and-tips*; AVoided Emissions and geneRation Tool (AVERT) - *https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert*.

c) Characterizing the cost of compliance (statutory factor 1)

After a state has identified the potential control measures for evaluation and the emissions information to be used in that evaluation, a state begins collecting information to characterize the statutory factors. This subsection covers the first statutory factor – the cost of compliance – and provides EPA's recommendations for determining the costs of the identified control measures.

For purposes of the second implementation period, EPA recommends that states follow the source type-relevant recommendations in the EPA Air Pollution Control Cost Manual[63] that are stated in the manual as applying to cost estimates in a permitting context.[64] Cost calculation spreadsheets consistent with the Control Cost Manual recommendations are available for several types of emission control systems. Also, the final revised chapter 2 of section 1 of the Control Cost Manual provides useful conceptual background and recommendations for the analytical approach to cost estimation, including the use of the "overnight method" for accounting for capital investments.

EPA recommends that states follow the recommendations in the Control Cost Manual to facilitate apples-to-apples comparisons of different controls options for the same source, and comparisons across different sources. This type of consistency is helpful to support informed public comment and reasoned decision-making. Also, state-level review of source-prepared cost estimates and EPA review of SIPs will be more efficient if sources and states follow the recommendations in the Control Cost Manual. A state that is following the recommendations in the Control Cost Manual can rely on a simple reference to the manual as documentation of approach and its rationale for that approach. We recommend that a state that deviates from these principles and factors explain how its alternative approach is appropriate.

In some instances, the installation of a new control may involve the removal or discontinuation of existing emission controls. Such situations present special issues and states should consult with their Regional offices. For example, it may be appropriate to account for the salvage value of dismantled equipment. We recommend against including sunk capital costs the cost of compliance for any scenario.

EPA recommends that a state express the costs of compliance in terms of a cost/ton of emissions reduction metric, and that the emission reduction used as the denominator for the cost/ton metric be the annual tons of reduction from implementation of the additional measure. The state must document the cost analyses within the SIP. States with questions on cost analysis may want to consult with their EPA Regional offices.

Use of generic cost estimates for particular types of control equipment

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[63] EPA is engaged in a long-term process to update portions of the Control Cost Manual. A project plan describing the scope and schedule for this update effort is available at *https://www3.epa.gov/ttn/ecas/docs/cost_manual_timeline_2016-08-04.pdf*. As draft or final updated chapters are available, we recommend that states follow the recommendations in those future updates rather than in the 6th Edition. Final revised chapters and cost calculation spreadsheets are posted at *https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution*. Draft revised chapters are announced in the *Federal Register* when available for public comment and can be obtained from EPA Docket No. EPA-HQ-OAR-2015-0341 at *https://www.regulationgs.gov*.

[64] Recommendations presented in the Control Cost Manual as applying to EPA rulemakings and other national analyses are not relevant to SIP development.

For a streamlined approach or when site-specific cost estimates are not available, states may quantify control costs for particular types of control equipment by using generic cost estimates or estimation algorithms. The Control Cost Manual is EPA's recommended source of generic cost estimates and algorithms.

The Control Strategy Tool, or CoST, is a software tool that states can use as a source of cost estimates primarily for non-EGUs. CoST replaces AirControlNet, which EPA previously used to estimate the costs of some national rules affecting non-EGUs. CoST is best applied for estimates of average or typical control costs rather than costs for a particular source. Even so, the cost estimates for individual control measures, which are found in the control measure documentation for CoST, may be useful to identify relevant ranges or generate preliminary estimates. The cost equations and control measure database documentation reports for CoST at *https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-analysis-modelstools-air-pollution#control strategy tool* are useful references.

Use of source-specific cost estimates

We recommend that states exercise caution before accepting or rejecting controls based on generic cost estimates if adequately documented source-specific estimates are available or can be prepared. When considering source-specific estimates, states may place greater weight on vendor quotes that represent an offer to enter a contract at that price than on estimates without an offer to enter a contract. When using source-specific cost estimates, such estimates should provide sufficient detail to allow for a complete review of the estimate. We recommend that a state that intends to be following the Control Cost Manual recommendations assess whether the vendor or expert's treatment of costs is consistent with the principles in the Control Cost Manual (e.g., contingency adjustments, cost escalation, etc.). Adjustments or exclusions may achieve this consistency if it is not already present. If a cost quote or opinion prepared for one source is adopted or adapted to another source, EPA recommends the state explain in its SIP submittal how the source for which the original cost estimate was made is relevant to estimating the cost of compliance for the source in question.

As part of meeting the requirement of the Regional Haze Rule for the state to document the cost and engineering information on which the State is relying to determine the emission reduction measures that are necessary to make reasonable progress (40 CFR 51.308(f)(2)(iii)), every source-specific cost estimate used to support an analysis of control measures must be documented in the SIP. If information about a source has been asserted to be confidential, we recommend the state consult with its EPA Regional office regarding whether such confidentiality is appropriate and allowed under the CAA and if so how it can be reconciled with the need for adequate documentation of the basis for the SIP.

d) Characterizing the time necessary for compliance (statutory factor 2)

Characterizing the second statutory factor – the time necessary for compliance – involves estimating the time needed for a source to comply with a potential control measure. Prior experiences with the planning and installation of new emission controls of the same or similar type at similar sources may be helpful when estimating how much time a particular source will reasonably need for compliance. However, we recommend that states consider source-specific factors, if available and appropriate. Section II.B.5.e of this document discusses setting compliance deadlines, once the time needed for compliance is determined.

A state should justify the time needed to install a control measure as being reasonable. Unlike for BART, there is no requirement in the Regional Haze Rule that emission control measures that have been determined to be necessary to make reasonable progress must be installed as expeditiously as practicable or within 5 years of EPA's approval of the SIP revision.

e) Characterizing energy and non-air environmental impacts (statutory factor 3)

Characterizing information about the third statutory factor – the energy and non-air environmental impacts – generally involves assessing the impacts of a control measure on the energy consumed by a source. Non-air environmental impacts can include the generation of wastes for disposal and impacts on other environmental media, such as nearby water bodies.

Energy impacts

The Control Cost Manual provides advice on estimating energy requirements or savings for some situations. States may consider energy impacts in terms of kilowatt-hours or mass of fuels used. We recommend that states focus their analysis on direct energy consumption at the source rather than indirect energy inputs needed to produce raw materials for the construction of control equipment. Prior experience with energy impacts of the same or similar emission control measure at similar sources can also be informative.

Non-air environmental impacts

When there are significant potential non-air environmental impacts, characterizing those impacts will usually be very source- and place-specific. Other EPA guidance intended for use in environmental impact assessments under the National Environmental Policy Act may be informative, but not obligatory to follow, in this task.[65]

f) Characterizing remaining useful life of the source (statutory factor 4)

Characterizing the final statutory factor – remaining useful life of the source – involves collecting information on how long the source will remain in operation and the lifetime of potential control measures. Depending on the type of source, there may be different considerations, as discussed in the following subsection.

Remaining useful life for stationary sources

Generally, states can consider this factor by considering the useful life of the control system rather than the source. Typically, the remaining useful life of the source itself will be longer than the useful life of the emission control system under consideration unless there is an enforceable requirement for the source to cease operation sooner. The presumption is that after the end of the useful life of the emission control system, it will be replaced by a like system. Thus, annualized compliance costs are typically based on the useful life of the control equipment rather than the life of the source, unless the source is under an enforceable requirement to cease operation.

[65] A collection of EPA policies and guidance related to the National Environmental Policy Act is available at *https://www.epa.gov/nepa/national-environmental-policy-act-policies-and-guidance. See*, for example, Considering Ecological Processes in Environmental Impact Assessments, July 1999.

If a control measure involves only operational changes, there typically will be only small capital costs, if any, and the useful life of the source or control equipment will not materially affect the annualized cost of the measure.

In the situation of an enforceable requirement for the source to cease operation before the end of the useful life of the controls under consideration, a state may use the enforceable shutdown date as the end of the remaining useful life. To the extent such a requirement is being relied upon for a reasonable progress determination, the measure would need to be included in the SIP and/or be federally enforceable. See 40 CFR 51.308(f)(2). The length of the useful life is the number of years prior to the shutdown date during which the new emission control would be operating, taking into account the date that a possible new emission limit under consideration for the LTS would become enforceable if it were adopted into the SIP and the time normally needed for EPA to review and approve such emission limit. In the situation where an enforceable shutdown date does not exist, the remaining useful life of a control under consideration should be full period of useful life of that control as recommended by EPA's Control Cost Manual. *See* Section II.B.5.e of this document.

The Control Cost Manual provides guidance on typical values for the useful life of various emission control systems used at stationary sources. EPA recommends that states use these values.

Remaining useful life for reciprocating internal combustion engines

Some mobile and stationary reciprocating internal combustion engines are retired and replaced, or substantially rebuilt, on fairly short intervals in the normal course of business (or personal) use. For engines, states may rely on a reasonable estimate of when the engine will be replaced or rebuilt even if there is no enforceable requirement to replace or rebuild the engine (or to cease operation).

When considering whether new or enhanced add-on emission controls for a particular engine or a category of engines are necessary for reasonable progress, the state may take into account how the anticipated replacement or rebuild schedule will affect how long the add-on controls would reduce emissions from the engine(s). The add-on emission control equipment might be reusable on the new or rebuilt engine. However, an anticipated engine replacement or rebuild might instead preclude continued use of the new add-on emission control system, for example if the new engine would be purchased with comparable or superior emission controls already in place.

g) Characterizing visibility benefits

A state choosing to consider visibility benefits along with the four statutory factors will need to estimate the visibility benefits of possible control measures for sources that are selected for analysis of control measures. Like visibility impacts, visibility benefits will vary from day to day due to variations in emissions and meteorology. This section discusses how a state can quantify daily visibility benefits and form a single-valued metric to summarize those daily benefits.

While visibility impacts and/or potential benefits may be considered in the source selection step in order to prioritize the examination of certain sources for further analysis of emission control measures, visibility benefits may again be considered in that control analysis to inform the determination of whether it is reasonable to require a certain measure. While the recommendations in Section II.B.3.b of this document are primarily directed at estimating daily

baseline impacts on visibility and summary metrics for those impacts for the purpose of source selection, those recommendations are also relevant to the estimation of daily visibility benefits from emission control measures and metrics for those benefits.

EPA recommends that visibility benefits of a control measure be expressed in units of light extinction (inverse megameters, Mm^{-1}), for the reasons explained in Section II.B.3.b of this document. EPA also recommends that, if a state is going to consider a metric defined as the cost per unit of visibility benefit, it use light extinction units in the denominator for quantifying visibility benefits. When visibility benefits are expressed in units of light extinction, the visibility benefit can be calculated from modeling results in multiple ways.

The modeled visibility benefit can be calculated by making two air quality modeling runs, with and without the measure assumed to be in place. However, if a source's impacts on ambient PM species under a particular emissions scenario have been determined through source apportionment/attribution, it will generally be appropriate to estimate the reductions in ambient PM species due to pollutant-specific emission reductions from the source by assuming a proportionality between source emissions of the relevant species precursor and the ambient PM species concentration. The PM species concentrations with and without the measure can then be used to estimate the light extinction benefit of the measure.

A large set of values for daily visibility benefits can be summarized by one or more metrics. A state may use the average of the daily visibility benefits on the 20 percent most anthropogenically impaired days as its visibility benefit metric. However, as noted in Section II.B.3.b of this document, alternative metrics may be more appropriate when examining visibility impacts from individual sources. Modeled demonstrations that provide a single year of meteorological regimes at a given Class I area may not capture days over the broader multi-year period where a source may be contributing to visibility impairment. Therefore, for individual sources, the maximum daily visibility impact on all days may be a more meaningful metric. A state may instead, or also, consider the maximum daily visibility benefit within the most impaired days or the values of visibility benefits on other days.

The discussion in Section II.B.3.b of this document regarding the use of a natural background light extinction value when expressing baseline source impacts in delta deciview units applies as well when expressing visibility benefits in delta deciview units. In particular, a state should not use the difference in projected 2028 visibility with and without the control measure (e.g., the effect on the 2028 RPG) as its only characterization of the visibility benefit of the measure.[66]

[66] In the first implementation period and in comments submitted in the rulemaking for the 2017 revisions to the Regional Haze Rule, some stakeholders stated that, when considering visibility benefits as one of the five statutory factors for BART or when considering visibility along with the four statutory factors for reasonable progress, it is appropriate to consider only the amount by which a potential measure or combination of measures would change the projected overall ambient deciview index value as of the end of the implementation period, i.e., the incremental effect on the RPGs. The Rule requires RPGs to represent the expected actual overall visibility conditions at the end of the implementation period. The RPGs are values that will be compared in a progress report to actual visibility conditions. In contrast, estimates of the visibility benefits of emission control measures have a different purpose, which is to help guide decisions on the control of individual sources. In this context, relying solely on a quantification of visibility benefits relative to "dirty background" (i.e., conditions with greater impairment than natural background visibility conditions) obscures the full potential benefits of control measures and makes it less likely that a measure would appear reasonable from a visibility benefit perspective. EPA has used a natural

In some instances, the installation of a new control may involve the removal or discontinuation of existing emission controls. Such situations present special issues about how to quantify emission reductions and visibility benefits. We recommend that states consult with their EPA Regional offices for advice on such special situations.

h) Reliance on previous analysis and previously approved approaches

To satisfy the requirement for documentation in section 51.308(f)(2)(iii) of the Regional Haze Rule, a state that is referencing and relying on a previous analysis could explain why it concludes that the previous analysis does not require an update. It may be appropriate for a state to rely on a previous BART analysis or reasonable progress analysis for the characterization of a factor, for example information developed in the first implementation period on the availability, cost, and effectiveness of controls for a particular source, if the previous analysis was sound and no significant new information is available. Nonetheless, a state must reasonably consider all new public comments about the previous factual information that are substantive and relevant.

5. Step 5: Decisions on what control measures are necessary to make reasonable progress

This section addresses how, once it has characterized relevant factors, a state makes decisions on what emission control measures for a source or group of sources are necessary to make reasonable progress for the second implementation period. As noted earlier, the regional haze program is an iterative program that provides states with flexibility to develop a cohesive strategy that demonstrates reasonable progress over time. This section makes recommendations consistent with this overarching principle. In rare instances, a state may be able to demonstrate, based on careful consideration of the relevant factors for its selected sources, that no additional measures are necessary to make reasonable progress in the second implementation period.

Importantly, this section assumes that the state will consider visibility benefits as part of the analysis. Section 51.308(f)(2)(i) of the Regional Haze Rule requires consideration of the four factors listed in CAA section 169A(g)(1) and does not mention visibility benefits.[67] However, neither the CAA nor the Rule suggest that only the listed factors may be considered. Because the

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background light extinction value when expressing baseline source impacts in delta deciview units in the North Dakota (77 FR 20894, April 6, 2012), Montana (77 FR 57864, September 18, 2012), Arizona (79 FR 52420, September 3, 2014), and Texas (81 FR 296, January 5, 2016) FIPs and partial disapprovals of North Dakota (77 FR 20894, April 6, 2012) and Texas (81 FR 296, January 5, 2016) SIPs that relied on modeling employing high-deciview ambient background conditions. This approach has been upheld by the Eighth Circuit. *North Dakota v. EPA*. 730 F.3d 750, 764-766 (8th Cir. 2013) ("Although the State was free to employ its own visibility model and to consider visibility improvement in its reasonable progress determinations, it was not free to do so in a manner that was inconsistent with the CAA. Because the goal of § 169A is to attain natural visibility conditions in mandatory Class I Federal areas, *see* 42 U.S.C. § 7491(a)(1), and EPA has demonstrated that the visibility model used by the State would serve instead to maintain current degraded conditions, we cannot say that EPA acted in a manner that was arbitrary, capricious, or an abuse of discretion by disapproving the State's reasonable progress determination based upon its cumulative source visibility modeling.")

[67] Section 51.308(f)(2)(iv) of the Regional Haze Rule also requires consideration of five listed additional factors in developing the LTS. While the fifth of these additional factors is the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the LTS, this is not the same as considering the visibility improvements that would result from implementation of a specific, additional measure under consideration in the context of the control analysis.

goal of the regional haze program is to improve visibility, it is reasonable for a state to consider whether and by how much an emission control measure would help achieve that goal. Likewise, it is reasonable that such information on visibility benefits be considered in light of other factors that may weigh for or against the control at issue. Such a balancing of outcomes is consistent with CAA section 169A(b)(2), which states that SIPs must contain elements as may be necessary to make reasonable progress towards meeting the national visibility goal. Thus, EPA interprets the CAA and the Regional Haze Rule to allow a state reasonable discretion to consider the anticipated visibility benefits of an emission control measure along with the other factors when determining whether a measure is necessary to make reasonable progress.

A state that chooses not to consider visibility benefits would decide on the basis of the four statutory factors whether it considers a particular measure to be necessary for reasonable progress. The state would not use the magnitude of the visibility benefit to justify rejecting the measure.[68]

Section II.B.5. of this document discusses the factors that EPA expects typically may influence the determination of whether an emission control measure is necessary to make reasonable progress (i.e., the cost of compliance and the visibility benefits). Sections II.B.5.b-d of this document discuss the remaining three statutory factors. Section II.B.5.e of this document discusses how a state establishes emission limits that correspond to the measures that have been determined to be necessary to make reasonable progress.

a) Considering the cost of compliance and visibility benefits

We anticipate that the outcome of the decision-making process by a state regarding a control measure may most often depend on how the state assesses the balance between the cost of compliance and the visibility benefits, with the other three statutory factors either being subsumed into the cost of compliance or not being major considerations.[69] Because we anticipate that the balance between the cost of compliance and the visibility benefits will be an important consideration in a state's decisions, the discussion in this section focuses on providing guidance on weighing the costs of compliance and visibility benefits. The other three statutory factors are discussed in Sections II.B.5.b (time necessary for compliance), Section II.B.5.c (energy and non-air quality environmental impacts), and Section II.B.5.d (remaining useful life) of this document.

[68] It is not inconsistent for a state choosing this approach to have considered baseline visibility impacts when selecting sources for analysis of control measures, even though it has decided to not consider visibility benefits along with the four factors in determining what controls are necessary to make reasonable progress. Section II.B.3 of this document, which addresses the step in which the state would select the sources for which it will determine what measures are necessary to make reasonable progress, is applicable to all states.

[69] States will typically consider the remaining useful life of a source by annualizing the costs of compliance. States will typically consider the time necessary for compliance by setting a compliance deadline that provides a reasonable amount of time for the source to implement the measure. We anticipate that only in unusual situations will energy or non-air environmental impacts that cannot be incorporated into the costs of compliance be such significant considerations that they strongly influence the decision about the control measure under consideration. We emphasize that this is not a recommendation that a state give particular or extra weight to the cost factor and visibility benefits, but rather a prediction on our part of how states will view the factors. For a state that is not considering visibility benefits, we similarly anticipate that the outcome of the state's decision-making process will most often depend on the costs of compliance, with the other three statutory factors either being subsumed into the cost of compliance or not being major considerations.

A state should generally make control decisions that are reasonably consistent among and across sources within the state. Absent a thorough explanation, inconsistent control determinations are "the hallmark of arbitrary action." *NPCA v. EPA*, 788 F.3d 1134, 1145 (9th Cir. 2015). When two sources are of a similar type and size and a certain common new emission control measure would have similar costs and visibility benefits when applied to each, consistency may be achieved by applying the measure to both if it is applied to either. Consistency is also an issue if two sources have the prospect of similar costs and visibility benefits for dissimilar measures that could be applied to each. Even if the costs and visibility benefits are different, consistency is an issue if the ratio of the two is similar for two sources.

Metrics for compliance costs and visibility benefits

The technical analyses described in Section II.B.4 of this document will typically produce estimated values of capital costs, annual operating and maintenance costs, annualized costs, and cost per ton of emission reductions, as well as multiple values for daily visibility benefits. As discussed in that section, a state may simplify this information by using summary metrics for the cost and visibility benefit factors. The summary metrics for cost and visibility benefits can be combined in a ratio to form a metric for cost per unit of visibility benefit.

If multiple Class I areas would experience visibility benefits from a control measure, we recommend that the state consider all of those benefits. Consideration of a supplemental metric equal to the sum of the selected visibility metric across the affected Class I areas (in addition to a metric expressing visibility benefits at individual Class I areas) is one possible approach.

Use of decision thresholds

A state may find it useful to develop thresholds for single metrics to organize and guide its decision-making. As the Ninth Circuit explained in *NPCA v. EPA*, 788 F.3d at 1142, the Regional Haze Rule does not prevent states from implementing "bright line" rules, such as thresholds, when considering costs and visibility benefits. However, the state must explain the basis for any thresholds or other rules (*see* 40 CFR 51.308(f)(2)). If a state applies a threshold for any particular metric to remove control measures from further consideration before all other relevant factors are considered, it should explain why its selected threshold is appropriate for that purpose, i.e., why its application is consistent with the requirement to make reasonable progress.

Visibility benefits – If a state uses a visibility benefit threshold to evaluate control measures, it must explain how its approach is consistent with the requirement to consider the statutory factors in making reasonable progress determinations. Additionally, EPA has previously explained that, because regional haze results from a multitude of sources over a broad geographic area, a measure may be necessary for reasonable progress even if that measure in isolation does not result in perceptible visibility improvement.[70]

[70] *See* Response to Comment Document, Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017 at 268-69 (explaining that a measure may be necessary for reasonable progress even if it does not result in a perceptible visibility improvement because progress will require addressing many relatively small contributions to impairment); *see*, also, 77 FR 57864, 57883 (September 18, 2012) (citing 70 FR 39104, 39129 (July 6, 2005)) (perceptibility of visibility impairment is not dispositive in BART context "because regional haze is produced by a multitude of sources and activities which are located across a broad geographic area").

Cost/ton – If a state applies a threshold for cost/ton to evaluate control measures, we recommend that the SIP explain why the selected threshold is appropriate for that purpose and consistent with the requirement to make reasonable progress. As explained below, a cost/ton metric and comparisons to the cost/ton values for measures that have been previously implemented may or may not be useful in determining the reasonableness of compliance costs.

EPA does not believe it is reasonable to solely use a threshold for the capital cost or annualized cost to determine that a measure is not necessary to make reasonable progress. Large capital costs considered in isolation may not provide complete information about the potential reasonableness of a measure; additionally, decisions to exclude control measures from consideration should also take into account relevant information for other factors.

Cost/inverse megameter – If a state uses a cost per unit of visibility benefit metric to evaluate control measures, EPA recommends the use of a cost/inverse megameter metric rather than a cost/deciview metric because the application of the deciview scale on a source- or measure-specific basis is complicated by the logarithmic nature of the deciview scale. When only one Class I area is affected by a measure under consideration, a state may calculate and consider the cost/inverse megameter metric for that one area. If multiple Class I areas would experience visibility benefits from a measure, a state may calculate and consider a metric defined as the annualized compliance cost divided by the sum of the light extinction benefit across these Class I areas. A state may use reasonable thresholds for these metrics as a way of considering the balance between compliance costs and visibility benefits.

Consideration of past decisions regarding reasonable progress and other CAA requirements

A state may consider in its analysis of control measures how it, other states, and EPA made reasonable progress decisions during the first implementation period and may consider final decisions already made in the second implementation period, if any. Consultation among states during the development of their SIPs will give states an early understanding of how other states are contemplating making their own decisions.

Past reasonable progress determinations may or may not have involved the balancing of compliance costs and visibility benefits as many states relied on BART decisions to also satisfy reasonable progress. As the program transitions away from the first implementation period, under which states had both BART and reasonable progress obligations, and proceeds into the second implementation period, under which states only have reasonable progress obligations, SIPs need to include a reasonable progress analysis that meets the requirements of the CAA and the implementing regulations. If a state is considering visibility benefits and is comparing its decisions with those of other states, comparisons between similar analysis approaches are likely to be the most helpful (i.e., comparisons amongst states that also considered visibility).

When comparing past decisions and current situations needing a decision, states may want to consider how both context and the use of different analytical methods and/or metrics may have influenced the quantification of factors on which past decisions were based. In addition, the cost impact and visibility benefits for a measure reported and considered by another state may have been relative to a particular analytical baseline scenario, and that this may affect the comparison between the cases. For example, a cost/ton value for SCR presented in a document prepared by one state may have been relative to uncontrolled NOx emissions, while a source in another state may already have some NOx controls in place.

When the cost/ton of a possible measure is within the range of the cost/ton values that have been incurred multiple times by sources of similar type to meet regional haze requirements or any other CAA requirement, this weighs in favor of concluding that the cost of compliance is not an obstacle to the measure being considered necessary to make reasonable progress. The state would then proceed to weigh the cost of compliance and the visibility benefits.[71] Where the cost/ton of a possible measure exceeds the historical range of cost/ton values, we recommend that the state not automatically conclude that the cost of compliance by itself makes the measure not necessary to make reasonable progress. Rather, the state may need to conduct further source-specific investigation before a conclusion can be reached. In comparing a cost/ton value associated with a past regulatory action and a cost/ton value developed more recently, we recommend a state consider whether the past value reflects the principles in the Control Cost Manual, and how the comparison is affected by changes in equipment and construction prices and operation and maintenance prices in the period between the dates on which the two values were developed.

Separate consideration of sources in a group of sources

It can be efficient for a state to consider a group of similar sources when determining what measures are necessary to make reasonable progress. However, if it is feasible to establish and enforce different requirements for specific sources or subgroups of sources, and if relevant factors can be quantified for specific sources or subgroups of sources, making a separate decision for each source or subgroup will help states make well-reasoned decisions. For source sectors in which sources are smaller and more numerous or for which specific information to characterize the relevant factors for each source is not available, it may not be possible to give separate consideration to the specifics of each source. The only practical choice may be to subject all the sources to a common requirement or to exclude them as a group. In such situations, we recommend that states conduct an aggregate assessment.

At a single source, we recommend that states separately assess units that can be controlled with separate equipment.

Multiple control alternatives

States may consider the incremental differences in cost and visibility benefits between the alternative control measures for a single source and may use an incremental version of the cost/ton and cost/inverse megameters metrics when doing so.

[71] As already stated, we anticipate that the outcome of the decision-making process by a state regarding a control measure may most often depend on how the state assesses the balance between the cost of compliance and the visibility benefits, with the other three statutory factors either being subsumed into the cost of compliance or not being major considerations. A state that is not considering visibility benefits would not weigh visibility benefits and the cost of compliance. If the measure is not rejected as unreasonable based on the cost of compliance alone, it would be determined to be necessary for reasonable progress unless one or more of the other three factors makes it unreasonable.

Visitation

We do not recommend the use of weighting of visitation, high or low, in protecting visibility in Class I areas. In addition, we believe that a state should not give less weight to protecting visibility in a given Class I area during times of the year with lower visitation.[72]

b) Time necessary for compliance

While the CAA and the Regional Haze Rule require states to consider the time necessary for compliance when selecting emission control measures that are necessary to make reasonable progress, the time necessary for compliance factor enters the decision-making process in a different way than the other three statutory factors. While high compliance costs, adverse energy or non-air quality impacts, or a short remaining useful life may weigh in the direction of not including a particular control measure in the LTS, the time necessary for compliance does not present the same type of barrier. This is because the time perspective of the regional haze program is long and extends well beyond the time required to install and "shake down" any emission control system. It would be inconsistent with the regulation for a state to have selected a source for reasonable progress analysis and found that a control is reasonable from a cost, energy and non-air quality environmental impacts, remaining useful life, and visibility benefit perspective, but not require that control simply because the time frame for implementing it falls outside the regulatorily established implementation period. In considering the time necessary for compliance, if the State concludes that a control measure cannot reasonably be installed and become operational until after the end of the implementation period, the State must not consider this fact in determining whether the measure is necessary to make reasonable progress (40 CFR 51.308(f)(2)(i)).[73]

We recommend that states consider the time necessary for compliance as part of their determination of what compliance deadlines for selected control measures are reasonable, rather than as part of their determination whether to adopt the control measures in the first instance. In other words, the other three factors determine *how much* progress is reasonable, while the time necessary for compliance factor determines *when* that progress can be reasonably achieved. *See* Section II.B.5.e of this document for further discussion of setting compliance deadlines.

c) Energy impacts and non-air quality environmental impacts

EPA recommends that states consider energy impacts by accounting for any increase or decrease in energy use at the source as part of the costs of compliance. Upstream energy impacts, like the energy used to produce construction materials, are already reflected in the price of those materials.

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[72] The 2005 BART rule preamble includes statements regarding visitation that do not apply to the reasonable progress analysis. Specifically, the 2005 BART rule preamble stated, "Other ways that visibility improvement may be assessed to inform the control decisions would be to examine distributions of the daily impacts, determine if the time of year is important (e.g. high impacts are occurring during tourist season), consideration of the cost-effectiveness of visibility improvements (i.e. the cost per change in deciview), using the measures of deciview improvement identified by the State, or simply compare the worst case days for the pre- and post-control runs." This statement no longer represents EPA's position on the subject of visitation.

[73] We anticipate this situation to arise only when a SIP is not submitted on time, or when a SIP is disapproved and a new plan is developed by the state or EPA closer to the end of the implementation period.

We expect that in most cases it will not be appropriate for states to take into account energy purchases by EGUs during outages for installation of pollution controls. EGUs typically can plan for pollution control installation during scheduled unit outages, when the unit would have been down anyway for other maintenance. Compliance deadlines can be set with consideration of such planned outages.

EPA recommends that states consider relevant non-air quality environmental impacts, such as water usage or waste disposal of spent catalyst or reagent, by accounting for them as part of the costs of compliance. The fact that a control measure would create liquid and solid waste that must be disposed of does not necessarily argue against that measure being determined to be necessary to make reasonable progress, particularly if the control measure has been applied to similar facilities elsewhere and the solid or liquid waste that will be generated is similar in character and quantity to that generated at those other facilities. On the other hand, in location-specific cases, the installation of a control measure may lead to adverse non-air quality environmental impacts. In these cases, states may consider such impacts separately from the costs of compliance when determining whether the measure is necessary to make reasonable progress.

States may also consider any beneficial non-air quality environmental impacts.

The CAA does not require states to consider air deposition impacts, including effects on water, soils, and vegetation, when determining reasonable progress.

d) Remaining useful life

Section II.B.4.f of this document discusses how a state determines the remaining useful life of a source and the useful life of new emission control systems. In most cases, EPA recommends that states consider remaining useful life by using it to calculate emission reductions, annualized compliance costs, and cost/ton values.[74]

We recommend that states interested in using the remaining useful life factor in another way contact the EPA Regional office.

e) Establishing emission limitations, compliance schedules, and other measures necessary to make reasonable progress

Section 51.308(f)(2) of the Regional Haze Rule requires SIPs to include the "enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress as determined pursuant to [51.308](f)(2)(i) through (iv)."[75] This provision requires SIPs to include enforceable emission limitations and/or other measures to address regional haze, deadlines for their implementation, and provisions to make the measures practicably enforceable including averaging times, monitoring requirements, and record keeping

[74] Note, as stated in Section II.B.3.d of this document, if a source is certain to close by December 31, 2028 (or soon thereafter), under an enforceable requirement, a state can reasonably consider that to be sufficient reason to remove the source from further analysis and reasonable progress consideration.

[75] If a source is not selected for analysis of control measures, the LTS is not required to include emission limits for the source. In this situation, the state is not determining that any particular controls on the source are necessary or not necessary for reasonable progress. Rather, it is deferring a determination on that source until a later implementation period.

and reporting requirements. There is a considerable body of applicable EPA rules, EPA guidance, and EPA-approved state practices on the topic of practicably enforceable emission limits.[76] The regional haze program is implemented through SIPs, and the second implementation period SIPs must include the emission limits and other measures necessary to assure reasonable progress in order to comply with the applicable statutory and regulatory requirements.[77]

If a state determines that an in-place emission control at a source is a measure that is necessary to make reasonable progress and there is not already an enforceable emission limit corresponding to that control in the SIP, the state is required to adopt emission limits based on those controls as part of its LTS in the SIP via the regional haze second implementation period plan submission. The LTS can be said to include those controls only if the SIP includes emission limits or other measures (with associated averaging periods and other compliance program elements) that effectively require the use of the controls. If the current SIP includes emission limits and other measures that would not ensure the continued use of that technology with good operating practices, then the limits and compliance program elements in the LTS must be revised via the regional haze second implementation period plan submission. Inclusion in the SIP makes the emission limits permanent (meaning they cannot be subsequently revised without an EPA-approved SIP revision) and federally enforceable.

A source that has been selected for analysis of emission control measures may have recent actual emissions below its permitted levels, for example due to the voluntary use of a cleaner fuel with a favorable current price, and the state may have reasonably projected that this situation will continue through 2028 based on the best available information. Depending on the facts of the particular case, a state might reasonably conclude based on appropriate considerations that requiring the source to continue using the cleaner fuel (or indirectly requiring this via an emission limit that would be impractical to attain when using the prior higher emission fuel) is not a measure that is necessary to make reasonable progress. Such a conclusion could be based on the likelihood that the future cost of the cleaner fuel may become unreasonably expensive, and support for this conclusion should be appropriately documented. However, in this situation, the state should consider: determining whether there is any additional measure when operating on the cleaner fuel that is necessary to make reasonable progress; conducting a control measure analysis for the higher-emitting fuel; and adopting an emission limit applicable when the higher-emitting fuel is used, if the existing emission limit when using that fuel is not as stringent as would be necessary to make reasonable progress. Alternatively, the state could require the use of the cleaner fuel (or adopt an emission limit that reflects the use of the cleaner fuel) and plan to submit a SIP revision to change this requirement if market conditions change such that a sufficiently higher price for the cleaner fuel is expected to prevail for an extended period.

It is also possible that a source may be operating an emission control device but could remain in compliance with applicable emission limits if it stopped operation of the device. The state may reasonably consider based on appropriate factors whether continued operation of that device is necessary to make reasonable progress, such that the regional haze SIP submission for the

[76] *See* 57 FR 13497, 13567 (April 16, 1992) (explaining principles, including enforceability and accountability, to which SIPs and implementing instruments must adhere to help assure that planned emission reductions will be achieved); and 77 FR 74355, 74365 (December 14, 2012) (State's SIP must contain monitoring, recordkeeping, and reporting components necessary to make regional haze-related emission limitations enforceable).
[77] *See* CAA section 169A(b)(2) and 40 CFR § 51.308(f)(2).

second implementation period must make such operation of the device (or attainment of an equivalent level of emission control) enforceable. EPA recommends that the state consult with its EPA Regional office in such a situation.

Regulatory mechanisms to incorporate emission limits within a SIP

A state may adopt a numerical emission limit or other measure via a state regulatory requirement (e.g., a general rule or a source-specific rule) and then incorporate that regulatory document (including the relevant emission limits and associated monitoring, recordkeeping, and reporting provisions) into the SIP. Similarly, if a permit issued under a SIP-approved minor or major source PSD or nonattainment NSR program, or a federally enforceable state operating permit program includes a relevant requirement that the state is relying upon for regional haze purposes, the state may want to consult with the EPA Regional office to ensure that limit is appropriately included into the SIP. This can often be accomplished by what is commonly referred to as a source-specific SIP revision. Another avenue may be that a limit is included in an enforcement order, and that key aspects of the limit (and associated monitoring, recordkeeping, and reporting provisions) are then included into the SIP for regional haze purposes. Due to the fact-specific circumstances typically surrounding these activities, states are encouraged to collaborate with their EPA Regional offices on these matters. As states consider limits, the rule also requires that additional consideration be given to ensuring that not only the limit, but also the appropriate monitoring, recordkeeping, and reporting provisions needed to make those limits practicably enforceable are included. The limit itself may take different forms, and some information about that is provided below.

Averaging period and units

We recommend that the averaging period for an emission limit be short enough to make enforcement practicable, i.e., so that special compliance stack testing if needed can be reasonably short in duration and thus also be conducted at a reasonable cost, and so that an ongoing upset causing abnormally high emissions will constitute an actionable violation within a reasonably short period. Additionally, we recommend that the averaging period be long enough for natural variations in source emissions to average out without causing a noncompliance situation when the source and the emission controls are properly maintained and operated. For sources equipped with a continuous emissions monitoring system or that will be so equipped, 30 days is a common averaging period.

Generally, we recommend that a state that has determined that a technology-based measure is necessary for reasonable progress initially consider emissions limits expressed in terms of pounds per throughput (i.e., input or output) based on the capability of that measure. EPA recommends that such a throughput-based emission limit apply to the ratio of the sum of the emissions and the sum of the throughput during the operating days in the averaging period, rather applying to the average of shorter-period ratios. Such a ratio-based approach excludes days with no operation from the averaging period.

The Regional Haze Rule also allows SIPs to contain limits on mass emissions during a particular time period (*e.g.*, a cap on 30-operating day mass emissions). A mass-based emission limit could allow a source that sufficiently reduces its operating level to cease operating the emission controls equipment that the state had determined to be reasonable (or to cease combustion of a cleaner fuel that the state had determined to be reasonable) and still be in compliance. If the state

has determined, independent of the forecasted operating level, that operation of the emission control equipment (or use of the cleaner fuel) is necessary to make reasonable progress, a mass-based emission limit may not be appropriate. For example, if the annualized cost of the measure is dominated by costs that are incurred only during operating hours (such as for fuel or reagent), the state's determination may be independent of the operating level scenario, in which case a mass-based emission limit may not be appropriate. On the other hand, if the annualized cost for a measure is dominated by fixed capital costs, the state may have determined that the measure is necessary to make reasonable progress if the operating level is high (making cost/ton and cost/Mm^{-1} relatively low) but not if the operating level is low (making cost/ton and cost/Mm^{-1} relatively high). In this case, a mass-based emission limit may be reasonable because it could relieve the source of the requirement to install the control if it manages its operating level strategically.

Section II.B.4.a of this document indicated that in addition to considering technology-based emission control measures, a state may consider restrictions on hours of operation, fuel input, or product output. Such restrictions could be implemented directly or by a time-based limit on mass emissions.

We note that under other requirements flowing from other CAA provisions and EPA rules, sources may be subject to other emission limits that have averaging periods as short as 1 hour. The need for such short averaging periods generally does not apply in the context of regional haze.

Establishing compliance deadlines

The state may establish a compliance deadline that provides reasonable time for an affected source to come into compliance in an efficient manner, without unusual amounts of overtime, above-market wages and prices, or premium charges for expedited delivery of control equipment. In addition, compliance deadlines should be specific and objectively determined, considering available historical data regarding time necessary for the installation of similar control measures.

A state may reasonably tie the compliance deadline for a new requirement to EPA approval of the specific SIP provision containing that new requirement. The time necessary for compliance generally is considered to be a source-by-source question, with each source required to comply by a date that is reasonable for that source. In setting a reasonable compliance date, a state may coordinate the compliance deadline with an already planned source outage, so that installation of needed equipment does not require an additional outage that would increase costs. A state may set a staggered compliance schedule that appropriately takes into account the risks of taking multiple electrical generating units serving the same market off line at the same time if these risks have been well researched and documented.[78]

[78] In the first implementation period, EPA considered and invited public comment on the question in Wyoming of whether requiring multiple EGUs to install SCR units (as BART) close in time would be overly risky to power system reliability, or would cause unreasonable additional cost to purchase replacement power, given that each unit would have to be taken off line during construction.

6. Step 6: Regional scale modeling of the LTS to set the RPGs for 2028

a) Overview

The relationship between the LTS and the RPGs for the clearest and most impaired days is a key concept in the regional haze program, as the two RPGs provide a way for the states to check the projected outcome of the LTS against the goals for visibility improvement. After a state with a Class I area has determined the emissions controls necessary to make reasonable progress based on consideration of the four factors and visibility benefits of specific measures applied to selected sources (Sections II.B.5.a-d of this document) and incorporated those measures into its LTS (Section II.B.5.e of this document), the state must project the average of the daily visibility conditions on the 20 percent most anthropogenically impaired and on the 20 percent clearest days at each Class I area within the state as of the end of the implementation period.[79] (States with no Class I areas do not set RPGs.) The state typically does this via photochemical air quality modeling. The modeling run uses emissions that reflect the measures in its own LTS, the measures that other contributing states have determined to be necessary to make reasonable progress (whether or not they have already been adopted in enforceable form or submitted as a SIP revision),[80] and measures that have been adopted by the states or EPA to meet other requirements of the CAA. These projections of the visibility outcomes at the end of the implementation period (in deciviews) are the RPGs.[81]

Thus, the content of the LTS determines the RPGs. The two RPGs are a projected outcome, rather than visibility conditions established directly, and meeting the RPGs is not an enforceable requirement of the Regional Haze Rule.[82] Once adopted, the RPGs are not themselves

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[79] 40 CFR 51.308(f)(3)(i).

[80] 40 CFR 51.308(f)(3)(i) provides that the RPGs are to be based, in part, on the enforceable emissions limitations and compliance schedules in a state's own LTS and "other measures required under paragraph (f)(2) of this section" that can be fully implemented by the end of the applicable implementation period. EPA interprets "other measures required under paragraph (f)(2) of this section" to include all measures that other contributing states have determined are necessary to make reasonable progress, because a state only makes such determinations in order to meet the requirements of paragraph (f)(2). If another contributing state has submitted its SIP for the second implementation period, that SIP will make it clear what measures that state has determined to be necessary to make reasonable progress because those will be the measures in its LTS. However, even if the SIP revision for another state has not been fully developed and submitted to EPA, it may still be that the state has already officially made some such determinations and is in the process of completing its SIP development and submission work. If so, the state projecting the RPGs should account for those determinations. If another contributing state has not yet even determined the measures that are necessary to make reasonable progress at the jointly affected Class I area, then the state with the Class I area must set the RPGs based on whatever measures that the contributing state has actually adopted to meet the requirements for the first implementation period and other CAA requirements. The state with the Class I area may not base its RPGs on speculation about what another state will do. We encourage regional cooperation between states in conducting this modeling, especially with respect to establishing a common understanding on emissions inventory assumptions and inputs.

[81] 40 CFR 51.308(f)(3). EPA recognizes that for practical reasons involving schedules and resources, it may not be possible for the state setting the RPG to include in its final air quality model run all of the control measures that 40 CFR 51.308(f)(3) and this guidance indicate should be included. If this is the case, the Regional Haze Rule does not preclude later adjustments to the modeling outputs to account for the excluded measures. *See* Section II.B.6.b. of this document.

[82] Given the regulatory structure, it would not be consistent with the Regional Haze Rule as well as the accepted practice during the first implementation period, to establish RPGs first, as some stakeholder comments have suggested, and then work backwards to develop an LTS that supports such RPGs. *See* 40 CFR 51.308(f)(3)(i).

enforceable but they enable states to project the visibility impact of the LTS and to compare ambient visibility levels during later portions of the implementation period to those goals. So, in summary, although RPGs are not enforceable, they provide a useful metric for evaluating progress.

There are no requirements in the Regional Haze Rule regarding the method and tools used to project the RPGs, e.g., the details of the air quality modeling platform including the base period of air quality data and the year of the base modeling inventory. However, many of the details associated with the EPA-recommended modeling process for projecting RPGs are explained in EPA's SIP Modeling Guidance,[83] section 5 of which directs states through the recommended steps to apply base period and future year air quality model simulation results to ambient data, resulting in future year visibility projections.

The RPGs for the second implementation period are to be based only on the combined effect of the LTS measures with compliance dates on or before December 31, 2028. Given the July 31, 2021, SIP revision submission deadline, the CAA deadline for EPA action on a SIP (12 months from the completeness determination), and the time needed to implement even the most complicated controls, we expect that all measures included in a timely SIP for the second implementation period to be implementable and implemented by December 31, 2028. Thus, the RPGs generally will reflect all measures in the LTS.

Readily available air quality modeling platforms may not encompass Alaska, Hawaii, or the Virgin Islands. The SIPs for these jurisdictions may use any reasonable method to set the RPGs provided the method adheres to the above-stated principle about reflecting a certain set of emission control measures. EPA recommends that these jurisdictions consult with the appropriate EPA Regional office regarding appropriate methods.

b) Adjustment of RPGs using a post-modeling approach[84]

At the time a state (or an RPO on behalf of a state) is prepared to model the impacts of states' LTSs, the outcome of some final state decisions on emission control measures may not be known. That modeling will, therefore, be based on known decisions and possibly also on anticipated decisions. Because the air quality modeling to calculate RPGs is resource intensive and time consuming, EPA does not always expect the modeling to be repeated after a subsequent change in the content of a state's own LTS, after a new determination by another state that an emission control measure is necessary to make reasonable progress, or after another state decides contrary to expectations that a measure is not necessary to make reasonable progress. However, the comparison of the RPG for the 20 percent most anthropogenically impaired days to the URP

(RPGs "reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period *as a result* of those enforceable emissions limitations, compliance schedules, and other measures required under paragraph (f)(2) of this section" (emphasis added). *See*, also, 82 FR at 3091–92 (explaining that EPA's regulations require states to establish RPGs that reflect, among other things, the measures in their LTS as determined by applying the four factors to sources).

[83] Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 (*https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf*).

[84] EPA considers a post-modeling approach to be an approach that adjusts existing modeling results without conducting additional air quality modeling.

glidepath must be done with an RPG value that reflects only measures that have been adopted or that have at least already been determined to be necessary to make reasonable progress (and, hence, will be adopted before submission of the relevant SIP).[85] Therefore, if the modeling run did not include all such measures or included any other measures, a state may need to adjust its RPGs to reconcile the scenarios before the SIP revision with the RPGs is submitted.

We recommend that any state using a post-modeling approach to adjust an RPG consult with EPA about an appropriate method for doing so, which may depend on the specifics of the case and the information that is available. If overall baseline impacts on PM species have been determined for a specific source, it may be appropriate to make these adjustments by assuming a proportionality between source emissions of the relevant species precursor and the PM species concentration. Any adjustment must be clearly documented in the SIP submission.

7. Step 7: Progress, degradation, and URP glidepath checks

After a state containing a Class I area projects the visibility conditions for the end of the implementation period (step 6, Section II.B.6 of this document), the Regional Haze Rule requires a comparison of these RPGs to the baseline period visibility conditions and to the URP glidepath (possibly including certain adjustments to the glidepath).

a) Checking for improvement in visibility on the 20 percent most impaired days

The 2028 RPG for the 20 percent most anthropogenically impaired days is to be compared to the 2000-2004 baseline period visibility condition for the same set of days and must provide for visibility improvement since the baseline period. *See* 40 CFR 51.308(f)(3)(i). This set of most anthropogenically impaired days is determined from IMPROVE data, and EPA's recommended approaches are explained in a separate 2018 guidance document[86] for separating natural light extinction from anthropogenic light extinction for each day or another method justified by the state as reasonable. Once the most anthropogenically impaired days are determined, the IMPROVE estimates of overall light extinction for those days are converted to deciview values and the deciview values are averaged.

b) Checking for no visibility degradation on the 20 percent clearest days

The 2028 RPG for the 20 percent clearest days is to be compared to the 2000-2004 baseline period visibility condition for the 20 percent clearest days and must ensure that no visibility degradation from the baseline period is projected. *See* 40 CFR 51.308(f)(3)(i). This set of clearest days is directly determined from IMPROVE estimates of overall light extinction. Once the clearest days are determined, the IMPROVE estimates of overall light extinction for those days are converted to deciview values and the deciview values are averaged.

A state may face a special issue in making the check for no visibility degradation on the 20 percent clearest days, stemming from the comparison of light extinction values influenced by possibly inconsistent meteorology patterns. Typically, the RPG for the 20 percent clearest days will be predicted by air quality modeling that is based on meteorology from a year in the range of

[85] A state may not affect this comparison by assuming that its neighboring states will adopt additional controls that are still only under consideration or that have been rejected by the other states.

[86] Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, November 2018 (*https://www3.epa.gov/ttn/scram/guidance/guide/O3-PM-RH-Modeling_Guidance-2018.pdf*).

2011 to 2017, depending on the SIP submittal date, the timing of SIP development, and the state's determination of what year of meteorology is most reasonable to use. There will always be differences between the meteorology in the 2000-2004 period that influenced the "baseline visibility condition" and the meteorology used in the air quality modeling. These differences could introduce some artifacts into the comparison between the 2000-2004 clearest days and the 2028 clearest days that are large enough to affect the no degradation check. The clearest days are susceptible to such artifacts because reductions in anthropogenic emissions between the two periods may not have had a strong effect on the clearest days. If this situation occurs, we recommend that a state consult with its EPA Regional office on this point.[87]

Also, EPA has observed a few cases in which the sea salt component of PM during the 20 percent clearest days has increased when comparing recent IMPROVE data to data from the 2000-2004 period, in particular at some Class I areas near an ocean. The projection of the 2028 sea salt concentration typically would reflect the sea salt concentration in the recent period of IMPROVE data used for the photochemical modeling process. This use of sea salt concentrations from two widely separated periods of IMPROVE data might then be a factor in the check for degradation on the 20 percent clearest days. States with Class I areas near an ocean may wish to be alert to this type of situation and consult with their EPA Regional office if a projected increase in sea salt concentrations in 2028 appears to be the reason for an inability to show no degradation in overall visibility compared to 2000-2004 for the 20 percent clearest days.[88]

c) URP glidepath check

Under 40 CFR 51.308(f)(3)(ii)(A) and (B), a state with a Class I area, or with sources that contribute to visibility impairment in a Class I area in another state, must compare the RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath. Prior to making the comparison described here, a state may adjust the URP glidepath for impacts from international anthropogenic sources and certain prescribed fires on wildland, subject to the Administrator's approval. Section 3 of a separate 2018 guidance document provides information on making these adjustments.[89]

It should be noted that the Regional Haze Rule neither establishes the URP glidepath as the amount of visibility improvement that constitutes "reasonable progress," nor requires that a state

[87] Inconsistent meteorology can also create artifacts in the comparisons for the 20 percent most impaired days. However, because of the amount of progress in reducing light extinction on the 20 percent most anthropogenically impaired days stemming from emission reductions between these two periods, we do not believe an inconsistency in meteorology could affect the outcome of the check that there has been visibility improvement on the 20 percent most impaired days.

[88] This use of sea salt concentrations from two widely separated periods of IMPROVE data can also create artifacts in the progress check for the 20 percent most impaired days. However, because of the amount of progress in reducing light extinction due to other PM components on the 20 percent most anthropogenically impaired days stemming from emission reductions between these two periods, we do not believe an inconsistency in meteorology could affect the outcome of the progress check for the 20 percent most impaired days. Similarly, we believe it is unlikely that this sea salt issue could affect the outcome of the URP glidepath check because it is also based on the 20 percent most impaired days.

[89] Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program, U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018. In addition, EPA will provide modeling results that may be useful to states interested in proposing URP glidepath endpoint adjustments from international anthropogenic sources and prescribed fire impacts.

achieve the URP glidepath if measures that are reasonably determined to be needed to make reasonable progress pursuant to 40 CFR 51.308(f)(2) do not accomplish that result.[90]

If the 2028 RPG for the 20 percent most impaired days is below the URP glidepath, that does not exempt states from any of the requirements of the CAA or the Regional Haze Rule, in particular the requirement to include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress as determined by taking into consideration the four statutory factors.[91] Rather, these analyses must be included with the SIP submittal, along with any measures, explaining how the state complied with the second implementation period requirements. If the 2028 RPG for the 20 percent most impaired days for a Class I area is above the URP glidepath, the rule requires the state with the Class I area and any other state with sources affecting that area to make a "robust demonstration" that there are no additional emission reduction measures for sources that may reasonably be anticipated to contribute to visibility impairment that would be reasonable to include in the LTS. The robust demonstration requires an analysis to ensure there are no additional emission reduction measures that would be reasonable to include in the LTS. This section discusses considerations for making this demonstration.

EPA does not interpret 40 CFR 51.308(f)(3)(ii) as requiring a state in this position to perform an additional analysis of control measures for every source in the state. Also, EPA does not interpret this rule provision as meaning that a state with an RPG above the URP glidepath must weigh the factors differently than a state with an RPG below the URP glidepath. A state does not have to demonstrate that it would not be reasonable to adopt measures sufficient to be on the URP glidepath.[92]

To address this rule provision, a state could provide within its SIP submission a narrative explanation of how the state has already conducted the source selection and control measures analyses in such a manner that addresses the requirements of 51.308(f)(3)(ii). Such a narrative explanation would essentially describe how the initial analyses constitute the required robust demonstration. Other possible approaches to satisfying this rule requirement focus on demonstrating whether it would be reasonable for a state to expand the set of sources selected for control analysis; examples of such approaches are listed below. There may be other approaches to this demonstration that would also be approvable, such as:

- If the state has eliminated a PM species from consideration, it may reconsider this decision.
- If the state has removed low emitting sources prior to its visibility impact-based source selection analysis, it may reconsider its emissions threshold.
- The state may compare the visibility impact (e.g., light extinction) threshold it has used to select sources to the thresholds used by other states that contribute to visibility impairment at the same Class I area. If the state's threshold is significantly higher than

[90] 40 CFR 51.308(d)(1)(ii) which applied to the first implementation period contains a requirement for a state that is not achieving the URP to demonstrate that the URP is not reasonable, but this section does not apply in the second and subsequent implementation periods.
[91] *See* the discussion of this subject in the preamble to the 2017 final rule, at 82 FR 3078 at 3093 and 3099-3100, January 10, 2017.
[92] A provision of 40 CFR 51.308(d)(1)(ii) to this effect, applicable only to the first implementation period, has no counterpart in 51.308(f).

used by other states, the state may consider repeating the source selection with a lower threshold than it used initially. If another state has used a different approach to source selection, for example a different surrogate for visibility impact, the state may consider whether the other approach would bring more of its own sources forward for analysis of control measures.

- The state may reconsider any cost/ton, cost/light extinction, and/or light extinction thresholds it used in its initial analysis of control measures.
- If the state has used recent emissions in the source selection process and/or to estimate visibility benefits in its analyses of control measures, the state may reconsider its source selection step and analyses of control measures using projected 2028 emissions. For a sector that is growing, this may lead to a conclusion to bring additional sources forward for analysis of control measures and a conclusion that additional controls are necessary to make reasonable progress.
- If a technically feasible control was rejected for a source because the cost/ton for the measure was higher than for prior regulatory requirements at similar sources, the state may consider whether there are distinguishing features that would make the cost of compliance with the measure reasonable for that source.
- The state may revisit how it has considered the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress. For example, the state may not have already considered those measures for all its own sources of the same types and may revisit its reasoning for that choice. (*See* Section II.B.4.a. of this document)
- The state may revisit its responses to other states' requests for analysis of control measures of particular sources or better emissions control at particular sources.

d) Calculation of the number of years it would take to attain natural visibility conditions

Section 51.308(f)(3)(ii) of the Regional Haze Rule requires that if a state adopts an RPG for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress, i.e., if the RPG is above the URP glidepath, it must include within its SIP submission an assessment of the number of years it would take to attain natural visibility conditions if visibility improvement were to continue at the rate of progress selected by the state as reasonable for the implementation period.

The number of years (N) beyond 2004 it would take to attain natural visibility conditions can be calculated as follows.[93]

$$N = \frac{(Baseline\ visibility\ conditions - Natural\ visibility\ conditions)}{[(Baseline\ visibility\ conditions - RPG_{2028})/24]}$$

[93] This equation calculates the number of years needed to reach natural visibility conditions based on the rate of progress that will be achieved between the baseline period of 2000-2004 and 2028. An alternative approach is to make this calculation by starting with visibility conditions in a period closer to SIP submission. This alternative approach is also allowed by the Regional Haze Rule.

8. Step 8: Additional requirements for regional haze SIPs

a) Consultation and discussions with other parties

Consultation with other states

The Regional Haze Rule requires states to consult with those other states that have emissions that are reasonably anticipated to contribute to visibility impairment in the same Class I area or areas, in order to develop coordinated emission management strategies for making reasonable progress. 40 CFR 51.308(f)(2)(ii). The rule does not provide a definition of coordinated emission management strategies. EPA believes that this requirement is procedural in nature and is meant to ensure that states share and consider each other's technical information, and does not mean that states' strategies must be developed with the same thresholds and other decision approaches or that states must apply the same measures to similar sources.

Three more specifically stated requirements are described in subparagraphs A, B, and C of 40 CFR 51.308(f)(2)(ii), which are addressed below. These requirements apply regardless of when a state plans to submit its SIP revision, but the nature of the consultation that is possible and reasonable may be affected by the stage of SIP development that the other contributing states have reached by the time any one state submits its SIP revision. Regardless of individual SIP development timeframes, states must demonstrate that they have reasonably consulted with each of the states having emissions that are reasonably anticipated to contribute to visibility impairment in the affected Class I area. EPA understands that states are proceeding with SIP development on different timelines, and we do not expect these different timelines to impact our evaluations of SIPs vis-à-vis the regulatory requirements. States may initiate their own consultation process whenever it makes sense and should engage with other states in a timely manner.

A downwind state with a Class I area may request that an upwind state adopt specific measures that the downwind state believes are reasonable. Similarly, an upwind contributing state may request actions by the downwind state with respect to the downwind state's own sources. Such requests do not by themselves obligate the other state to take the requested action in order for its second implementation period SIP submission to be approvable. We recommend that a state respond in writing to any request by explaining its view of the facts regarding the sources and measures at issue. The state can confirm its intention to require the identified measures, explain why it chooses not to require the requested controls based on consideration of the relevant factors, or explain that it has not reached the point in its analysis and decision process to be able to provide its intentions regarding the identified measures. We expect that the analysis each state will be preparing to support its own SIP will be informative to use in such a response.

In the interest of efficient use of resources, states may wish to consult early on a plan for the development of factual information, for example information on sources' contributions to the visibility impairment in Class I areas. Generally, the state with the source will be in the best position to obtain and share information on the source's physical configuration, recent emissions, already planned modifications or shut down, and existing and potential additional emission controls.

40 CFR 51.308(f)(2)(ii)(A) requires a state to demonstrate that it has included in its implementation plan all measures agreed to during state-to-state consultations or a regional

planning process, or measures that will provide equivalent visibility improvement. If the consultations between states have not otherwise resulted in an official commitment on the part of one or both participating states to adopt specific measures, this provision does not require the states to arrive at a set of agreed upon measures. In particular, the fact that a state's modeling has assumed certain controls at a particular source in another state when forecasting future visibility does not constitute an agreement among the participating states, even if there has been no objection to such an assumption by the participating state where the source is located. If there is an official agreement, then the individual SIP submissions must include the agreed measures, or measures that will provide equivalent visibility improvement. EPA recommends that a state wishing to take the path of providing equivalent visibility improvement consult with its EPA Regional office regarding the base case scenario that it intends to use to demonstrate equivalency, as there may be complex issues of potential double counting.

40 CFR 51.308(f)(ii)(B) requires a state to consider the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress in the Class I area, and this rule requirement is addressed in Section II.B.4.a of this document.

40 CFR 51.308(f)(ii)(C) requires that in any situation in which a state cannot agree with another state on the emission reduction measures necessary to make reasonable progress in a Class I area, the state must include in its implementation plan a description of the actions taken to resolve the disagreement. Consultation may include efforts to reach agreement on the measures that each state will apply to its sources, or agreement on decision thresholds and other decision approaches, but it does not require such effort by any state and does not require that agreements be reached. If neither consulting state has sought an agreement about measures to be included in their SIP revisions, neither state is required to include in its implementation plan the description mentioned in this requirement. However, if one state has formally asked another state to adopt a particular measure for a particular source, and the second state has not adopted that measure and also has not adopted an equivalent measure(s) as described in 40 CFR 51.308(f)(2)(ii)(A), then both states are subject to this requirement to describe the actions taken to resolve the disagreement.[94] This provision does not specify that any particular actions towards resolution be taken. If the two states submit SIP revisions that disagree on the controls in each state that are needed for reasonable progress, the Regional Haze Rule provides for EPA to consider the technical information and explanations presented by both states when considering whether to approve each state's SIP.

Consultation, notification, and information sharing between a state and FLMs

In-person consultation on Regional Haze SIPs - Section 51.308(i)(2) of the Regional Haze Rule requires the state to offer an in-person consultation meeting with FLMs early enough to allow consideration of FLM input by the state before important decisions are made by state decision makers as to what *proposed* LTS will be presented for public comment. *See* section 51.308(i)(2) of the Regional Haze Rule.[95] The Regional Haze Rule requires that this consultation meeting be

[94] If a state has made a request of another state and as of the time that state is making its SIP submission the other state has not responded or has indicated that it is not yet able to respond to the request, we recommend that this be treated as an inability to agree.

[95] On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address the FLM consultation provisions of the

offered no less than 60 days before the start of a public comment period or public hearing on the planned SIP submittal. The rule also provides that the in-person consultation meeting will be considered to meet the requirement that it be "early enough" if it takes place at least 120 days before the start of a public comment period or public hearing on the draft SIP submission for the LTS.

The rule requires that the state offer FLMs an in-person meeting, but FLMs may agree to a conference call instead or to having an opportunity to comment on the SIP materials that are about to be made available for public comment.

Section 51.308(i)(3) of the Regional Haze Rule requires that when a state submits a SIP revision to EPA, the state must include a description of how it addressed any comments provided by FLMs.

Continuing consultation on Regional Haze SIPs – Section 51.308(i)(4) of the Regional Haze Rule requires each SIP to provide procedures for continuing consultation between a state and FLMs on the implementation of the visibility protection program required by the rule, including development and review of implementation plan revisions and progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in Class I areas. Topics that may be discussed during this consultation include discussions about the approach a state anticipates taking in its SIP development, the state's planned technical work, and the decisions about the sources and source categories to be subject to analysis of control measures. "Procedures for continuing consultation" encompasses plans for when and how consultation will be initiated, in addition to the identification of participants and topics. Engagements with FLMs as part of multistate meetings and conference calls can be an element of the procedures.

Discussions with EPA

Discussions with the EPA Regional office about the state's plans and progress in developing its regional haze SIP are likewise encouraged to begin early and continue throughout the SIP development process. In these discussions, EPA can provide feedback to the state on how the provisions of the Regional Haze Rule and the recommendations in this guidance document can be applied in the context of the state's SIP. EPA encourages collaboration between Regional offices and multi-state organizations. EPA will share EPA technical products, as appropriate and relevant.

Discussions with tribes

Because the content of SIPs may affect air quality in and around tribal land, EPA recognizes the value in EPA, states, and multi-state organizations maintaining a dialogue with tribes through all stages of developing regional haze SIPs.

It may be that the tribe or EPA that has responsibility for regulating a source on tribal land for purposes of regional haze, depending on the status of the tribe for purposes of implementing CAA programs. If a state believes that control of a source on tribal land is appropriate, the state

Regional Haze Rule. *See https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions.*

may contact the EPA Regional office to discuss the issue further. EPA will consult with tribes under its tribal consultation policy as appropriate.

b) Progress report elements

Section 51.308(f)(5) of the Regional Haze Rule requires a state to address in the plan revision the requirements of paragraphs 51.308 (g)(1) through (5), so that the plan revision due in 2021 will serve also as a progress report addressing the period since submission of the progress report for the first implementation period.[96] The progress report for the first implementation period was only able to report on visibility levels, emissions, and implementation status up to a date sometime before it was submitted. To fully inform the public and EPA about past implementation activities, we recommend that the 2021 SIP cover a period approximately from the first full year that was not actually incorporated in the previous progress report through a year that is as close as possible to the submission date of the 2021 SIP.

c) Monitoring strategy and other elements

There are six parts to section 51.308(f)(6) of the Regional Haze Rule. With respect to sections 51.308(f)(6)(i) through (iv) regarding monitoring of ambient visibility conditions, we recommend that all states with Class I areas confirm in their SIPs that they participate in the IMPROVE monitoring program through the representation of their interests by a state air agency representative on the IMPROVE Steering Committee and through the allocation of CAA air management grant funding to the IMPROVE program. The SIP could also describe any other, more direct participation in the IMPROVE program, for example any state assistance in quality assurance checks at IMPROVE monitoring sites. The IMPROVE program's practice of providing data directly to EPA satisfies the requirements in sections 51.308(f)(6)(iv) and (vi) of the Regional Haze Rule for the regional haze SIP to provide for reporting of visibility monitoring data to the Administrator at least annually.

Regarding section 51.308(f)(6)(v) of the Regional Haze Rule on emission inventories, we first note that the requirement in the rule is to provide for the preparation of emission inventories. The emission inventories themselves are not required SIP elements and so are not required to be submitted according the procedures for SIP revisions. The emission inventories themselves are not subject to EPA review. We also note that the 2017 revisions to the Regional Haze Rule clarified that SIPs for the second and later implementation period do not need to provide for a statewide inventory for a baseline year, because SIPs for the first implementation period provided for that one-time inventory. A state may note in its regional haze SIP that its compliance with the Air Emissions Reporting Requirements in 40 CFR Part 51 Subpart A satisfies the requirement to provide for an emissions inventory for the most recent year for which data are available. To satisfy the requirement to provide estimates of future projected emissions, a state may explain in its SIP how projected emissions are developed for use in establishing RPGs for its own and nearby Class I areas. Typically, these projections are developed through a regional planning process, in some cases using projections provided by EPA as a starting point or

[96] The 2017 revisions to the Regional Haze rule eliminated the requirement for any other progress report that would otherwise have been due before the 2021 SIPs are due.

point of comparison. States will also find relevant explanations and advice in a separate EPA guidance document on the preparation of SIP emission inventories.[97]

III. Conclusion

This non-binding guidance document is intended to help states prepare regional haze SIPs for the second implementation period ending in 2028 (SIPs due by July 31, 2021). We encourage states to discuss any SIP preparation questions and/or plans with their EPA Regional offices.

[97] Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, July 2017, available at *https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf*.

APPENDIX A

Clean Air Act Provisions, and EPA Rulemakings, and EPA Guidance Documents Related to SIPs Addressing Visibility Protection

Clean Air Act (CAA) Provisions

In section 169A of the 1977 Amendments to the CAA, Congress established a program for protecting and restoring visibility in certain national parks, wilderness areas, and other Class I areas due to their "great scenic importance."[1] This section of the CAA establishes as a national goal the "prevention of any future, and the remedying of any existing, impairment of visibility in Class I areas which impairment results from manmade air pollution." This section also requires EPA to issue regulations requiring states to adopt SIPs containing emission limits as may be necessary to make reasonable progress towards meeting this goal, including Best Available Retrofit Technology (BART) limits for particular types of large industrial sources. Section 169A of the CAA specifies the five statutory factors for determining BART. This section also provides that in determining reasonable progress there must be taken into consideration four factors (often referred to as the "four statutory factors"): the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any existing source subject to such requirements.

In 1990, Congress added section 169B to the CAA. Among other things, this section includes provisions for EPA to conduct visibility research with the National Park Service and other federal agencies, and to provide periodic reports to Congress on visibility improvements due to implementation of other air pollution protection programs. CAA section 169B also allows the Administrator to establish visibility transport commissions and specifically required the Administrator to establish a commission for the Grand Canyon area. It also created a mandatory duty for the Administrator to carry out the regulatory responsibilities in CAA section 169A within 18 months of receiving the report from a visibility transport commission, including establishing criteria for measuring reasonable progress toward the national goal.

1980 Reasonably Attributable Visibility Impairment (RAVI) Rule

In 1980, EPA promulgated regulations to address visibility impairment in Class I areas, including but not limited to impairment that is "reasonably attributable" to a single source or small number of sources, i.e., "reasonably attributable visibility impairment" or "RAVI." 45 FR 80084 (December 2, 1980). These regulations, codified at 40 CFR 51.300 through 51.307, represented the first phase in addressing visibility impairment from existing sources. The regulations on RAVI originally promulgated in 1980 were revised in 2017.

1999 Regional Haze Rule

In 1999, EPA promulgated additional regulations to address regional haze. 64 FR 35714 (July 1, 1999). The 1999 Regional Haze Rule established a more comprehensive visibility protection program for Class I areas. The 1999 Regional Haze Rule added 40 CFR 51.308 and 51.309 and

[1] H.R. Rep. No. 294, 95th Cong. 1st Sess. at 205 (1977).

amended some parts of 51.300-307. Some key features of the 1999 Rule are the following (with mention of the subsequent revisions of January 2017 as needed to avoid confusion).

Applicability. All 50 states, the District of Columbia, and the Virgin Islands ("states") became subject to the requirements of the Regional Haze Rule and were required to submit regional haze SIPs.

Schedule for SIPs. States were required to submit the first implementation plans (SIPs) addressing regional haze visibility impairment no later than December 17, 2007. 70 FR 39104. (This December 17, 2007, SIP due date is a Congressionally mandated revision to the due date initially set in the 1999 Rule.) Further, under 40 CFR 51.308(f) as promulgated in 1999, states were required to submit periodic comprehensive revisions no later than July 31, 2018, and every 10 years thereafter. (The July 31, 2018, SIP due date was revised in 2017 to July 31, 2021.)

Content of periodic SIPs. The periodic SIP revisions were required to address a number of elements, including quantification of baseline, current, and natural visibility conditions, actual progress made toward natural conditions during the previous implementation period, a long-term strategy (LTS), and reasonable progress goals (RPGs).

RPGs. States were required to set RPGs, calculated in deciviews, in every implementation period for each Class I area within the state that provide for reasonable progress towards achieving natural visibility conditions. For each Class I area, states were required to set two RPGs, one for the 20 percent most anthropogenically impaired days and one for the 20 percent least impaired days. The goal for the most impaired days must provide for an improvement in visibility over the period of the SIP, and the goal for the least impaired days must ensure no degradation of visibility over the period of the SIP. In addition, the 1999 Rule required a state to consider the four statutory factors when establishing its reasonable progress goals.[2]

LTS. Each state was required to submit an LTS that addresses visibility impairment at Class I areas affected by the state. The strategy includes enforceable emissions limitations and compliance schedules. The contents of the LTS form the basis for the calculation of the visibility improvement expected over the period of the SIP and the development of the RPGs.

Progress reports. 40 CFR 51.308(g) as promulgated in 1999 required each state to submit progress reports, in the form of SIP revisions, every 5 years following the submission of the initial SIP due on December 17, 2007. These progress reports must evaluate the progress made towards the RPGs for Class I areas located within the state as well as those Class I areas located outside the state that may be affected by emissions from within the state. (The schedule and the form for progress reports were revised in 2017.)

Coordination with planning to address RAVI. The 1999 Regional Haze Rule sought to improve efficiency and transparency by requiring states to coordinate their regional haze

[2] In the 2017 revisions, the requirement for a state to consider the four statutory factors is associated with the development of the LTS, rather than the setting of the RPGs. The 2017 revisions also affect how the most impaired days are to be selected.

planning obligations with their planning obligations under the 1980 RAVI rule, so that one SIP revision would address both aspects.

Uniform rate of Progress (URP) framework.[3] States were required to analyze and determine the consistent rate of progress over time, starting at the baseline period of 2000-2004, that would be needed to attain the natural visibility condition on the 20 percent most anthropogenically impaired days by the year 2064.[4] This hypothetical straight-line path is referred to in this document as the URP glidepath. The URP is the slope of this line. In establishing their RPGs for the first SIPs, states were required to consider the URP and the emission reduction measures needed to achieve this level of improvement in visibility for the time period covered by the SIP. When the progress anticipated in the SIP for the implementation period is less than the URP, a state was required to project when (after 2064) the natural visibility condition for the 20 percent worst days would be reached if the SIP's rate of progress were to continue beyond the end of the implementation period. Attaining natural visibility conditions by the end of 2064 is not an enforceable requirement of the regional haze program.[5]

BART. As a one-time requirement during the first implementation period, 40 CFR 51.308(e) directed states to evaluate potential BART controls at certain larger, often uncontrolled, older stationary sources in order to address visibility impacts from these sources. States were required to conduct five-factor BART determinations for "BART-eligible" sources that are anticipated to cause or contribute to any visibility impairment in a Class I area. As an alternative to requiring source-specific BART controls, states have the flexibility to adopt an emissions trading program or other alternative program as long as the alternative provides greater reasonable progress towards improving visibility than BART and meets certain other requirements set out in 40 CFR 51.308(e)(2).

2003 Guidance Documents on Tracking Progress and Estimating Natural Visibility Conditions

In 2003, EPA published two guidance documents:

- Guidance for Tracking Progress Under the Regional Haze Rule.
- Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule.

Tracking progress and estimating natural visibility conditions have been more recently addressed in the 2018 EPA technical guidance document on progress tracking cited at the end of this appendix.

[3] The term URP framework refers to the interrelated Regional Haze Rule requirements regarding the quantification of historical and projected visibility conditions using specific metrics, the quantification of natural conditions, the quantification of the uniform progress that would achieve natural visibility conditions for the 20 percent most anthropogenically impaired days in 2064, the determination of the URP glidepath, the setting of RPGs for the end of the implementation period, and the comparison of the RPG for the 20 percent most anthropogenically impaired days to the URP glidepath.

[4] The reason the specific year of 2064 plays a role in determining the URP is explained in the preamble to the 1999 Regional Haze Rule. 64 FR 35731; July 1, 1999.

[5] The 2017 revisions established a separate section (40 CFR 51.308(f)) applicable to the second and subsequent implementation period, with somewhat different requirements for what the state must consider as part of the URP framework.

2005 BART Guidelines

In 2005, EPA published the Guidelines for BART Determinations Under the Regional Haze Rule at Appendix Y to 40 CFR Part 51 (BART Guidelines) to assist states in determining which of their sources are subject to the BART requirements and in setting appropriate emission limits for each applicable source. 70 FR 39104 (July 6, 2005). In this rulemaking, EPA also established that the Clean Air Interstate Rule (CAIR) would result in greater reasonable progress than source-specific BART, and adopted regulations allowing states to rely on participation in CAIR to meet the BART requirements with respect to SO_2 and NOx emissions from electric generating units subject to CAIR.

States undertook the BART determination process during the first regional haze implementation period; thus, this guidance document for the second implementation period does not address the process for establishing BART emission limitations. Although the BART process is not repeated in subsequent implementation periods, BART-eligible sources may be re-assessed for more control in later implementation periods as part of the requirement to provide for reasonable progress, which is addressed in this guidance document.

The BART Guidelines are not requirements that states must meet when addressing reasonable progress.

2006 Guidance Memorandum on BART

In 2006, the EPA Office of Air Quality Planning and Standards widely distributed a memorandum addressing the issue of pollutant-specific modeling of BART-eligible sources to determine if they are subject to BART for PM when SO_2 and NOx BART requirements are addressed through participation in a trading program, and the issue of the acceptable averaging period for natural visibility conditions used in a subject-to-BART determination. Although this memorandum has little relevance to SIPs for the second implementation period, it is included here for completeness.[6]

2006 Questions and Answers from EPA

In 2006, EPA informally distributed to the states a document titled "Additional Regional Haze Questions, September 27, 2006 Revision." Most of these questions and answers related to the BART requirements.

2007 EPA Guidance on Reasonable Progress

In 2007, EPA issued a guidance document titled, "Guidance for Setting Reasonable Progress Goals Under the Regional Haze Program," June 1, 2007, revised.

2012 CSAPR Better-than-BART rule

As mentioned above, EPA's regulations allowed states to rely on participation in CAIR to meet the BART requirements with respect to SO_2 and NOx emissions from BART-eligible EGUs. Subsequent to EPA's 2005 rule allowing for this, CAIR was remanded by the United States

[6] Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determination, memorandum from Joe W. Paisie to Kay Prince, EPA Region 4, July 19, 2006, *https://www.epa.gov/sites/production/files/2016-02/documents/memo_2006_07_19.pdf.*

Court of Appeals for the District of Columbia Circuit, and EPA promulgated the Cross-State Air Pollution Rule (CSAPR) to replace CAIR. In 2012, EPA finalized a rule that allowed participation in the CSAPR trading programs to serve as an alternative to BART with respect to SO_2 and NOx emissions from EGUs subject to CSAPR. In the 2012 rulemaking, EPA also finalized limited disapprovals of certain states' regional haze SIPs that previously relied on CAIR to improve visibility and substituted federal implementation plans (FIPs) that rely on CSAPR for some but not all of the states affected by these disapprovals. 77 FR 33642.

2016 and 2017 Revisions to CSAPR and Affirmation that CSAPR as Updated is Better-than-BART

EPA revised the CSAPR ozone season NOx trading program in a rulemaking completed in September 2016. 81 FR 74504. The revisions changed the states subject to the trading program and the state level allowances. In October 2017, EPA removed Texas from the annual SO_2 and NOx trading programs. 81 FR 74504. In the same action, EPA re-affirmed that CSAPR as updated remained a better-than-BART alternative for states participating in the CSAPR trading programs, on a pollutant-specific basis.

2017 Revisions to the Visibility Protection Program for Class I Areas

In 2017, EPA issued a final rule revising portions of the visibility protection rule promulgated in 1980 and the Regional Haze Rule promulgated in 1999.[7] The revised rule governs EPA review of periodic SIPs developed for the second and subsequent implementation periods and EPA review of progress reports submitted subsequent to those plans. A summary of key changes to the rule in 2017, including changes to 40 CFR 51.308(f), is provided below.

- *Extension of the 2018 due date for SIPs*. EPA extended the due date for the second implementation period regional haze SIPs, from July 31, 2018, to July 31, 2021. The second implementation period still ends in 2028.
- *Relationship between the long-term strategy (LTS) and the reasonable progress goals (RPGs).* EPA clarified (1) the relationship between LTS and RPGs in state plans[8] and (2) the LTS obligation of all states.[9]
- *Progress tracking.* EPA revised the way in which some days during each year are to be selected as the 20 percent most impaired days and then used for purposes of tracking progress towards natural visibility conditions. This will focus attention on days when anthropogenic emissions impair visibility and away from days when wildfires and natural dust storms are the greatest contributors to reduced visibility.
- *Possible adjustment of the uniform rate of progress (URP) for the impacts of anthropogenic sources outside the U.S. (i.e., international sources) and certain types of wildland prescribed fire.* EPA added a provision that allows EPA to approve adjustments to the URP to reflect the impacts of these causes of visibility impairment, if an

[7] Final Rule: Protection of Visibility: Amendments to Requirements for State Plans, 82 FR 3078, January 10, 2017.
[8] This clarification of the existing requirements was accomplished primarily by a reordering of the subsections of 40 CFR 51.308(f) compared to the ordering of similar-topic subsections of 40 CFR 51.308(d), and by a discussion in the preamble to final rule. *See* 82 FR 3090.
[9] In particular, EPA clarified that all states, even states with no Class I area, are required to develop an LTS based on analysis of emission control measures and may be required to provide a robust demonstration that there are no additional emission control measures that are necessary for reasonable progress. *See* 40 CFR 51.308(f)(3) and 82 FR 3099.

adjustment has been developed through scientifically valid data and methods. These adjustments would be developed and applied separately, although they would both be accomplished by adding an estimate of the impact of the relevant source type or types to the value of the natural visibility condition for the 20 percent most anthropogenically impaired days, for the purposes of calculating the URP. The wildland prescribed fires that are eligible under the Regional Haze Rule to be included in this adjustment are those conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied.[10]

- *Progress reports*. EPA revised the due dates for progress reports and removed the requirement for progress reports to be SIP revisions for the second and subsequent implementation periods.
- *Reasonably attributable visibility impairment* (*RAVI)*. EPA updated, simplified, and extended to all states the provisions for RAVI. At the same time, EPA revoked existing FIPs implementing the 1980 RAVI requirements.[11]
- *Federal land manager (FLM) consultation*. EPA made changes to FLM consultation requirements.[12]
- *Monitoring strategy*. EPA removed the requirement for progress reports submitted for the second and later implementation periods to re-address the monitoring strategy for regional haze. The requirement for periodic SIP revisions to re-address the monitoring strategy was retained.

2018 Regional Haze Reform Roadmap

In 2018, EPA issued the Regional Haze Reform Roadmap[13] which outlined the implementation tools and guidance documents that EPA will release over the next year to help focus states' efforts and reduce and streamline the time and resources needed to meet the statutory and regulatory requirements under the regional haze program. This information will support states in their SIP development processes and provide key improvements for the upcoming second implementation period.

2018 Technical Guidance on Tracking Visibility Progress

In 2018, EPA issued a technical guidance document focused on the data analysis tasks specified in 40 CFR 51.308(f)(1). This guidance document includes EPA's final recommendations on (1) methods for selecting the 20 percent most impaired days to track visibility and determining natural visibility conditions; and (2) methods for accounting for anthropogenic international

[10] 40 CFR 51.308(f)(1)(vi)(B).
[11] On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address the RAVI provisions of the Regional Haze Rule. *See https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions*.
[12] On January 17, 2018, the EPA Administrator announced in a letter to several petitioners that EPA intends to commence a notice-and-comment rulemaking in which EPA will address the FLM consultation provisions of the Regional Haze Rule. *See https://www.epa.gov/visibility/epas-decision-revisit-aspects-2017-regional-haze-rule-revisions.*
[13] *https://www.epa.gov/visibility/epa-releases-regional-haze-reform-roadmap*

impacts to adjust the uniform rate of progress (i.e., the URP glidepath) for the second implementation period.[14]

[14] Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program, U.S. Environmental Protection Agency, EPA-454/R-18-010, December 2018.

APPENDIX B

Relevant Provisions of the Regional Haze Rule (40 CFR Part 51) as Revised in 2017

51.300 Purpose and applicability.

(a) *Purpose*. The primary purposes of this subpart are to require States to develop programs to assure reasonable progress toward meeting the national goal of preventing any future, and remedying any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution; and to establish necessary additional procedures for new source permit applicants, States and Federal Land Managers to use in conducting the visibility impact analysis required for new sources under §51.166. This subpart sets forth requirements addressing visibility impairment in its two principal forms: "reasonably attributable" impairment (i.e., impairment attributable to a single source/small group of sources) and regional haze (i.e., widespread haze from a multitude of sources which impairs visibility in every direction over a large area).

(b) *Applicability.* The provisions of this subpart are applicable to all States as defined in section 302(d) of the Clean Air Act (CAA) except Guam, Puerto Rico, American Samoa, and the Northern Mariana Islands.

51.301 Definitions.

For purposes of this subpart:

Adverse impact on visibility means, for purposes of section 307, visibility impairment which interferes with the management, protection, preservation, or enjoyment of the visitor's visual experience of the Federal Class I area. This determination must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments, and how these factors correlate with (1) times of visitor use of the Federal Class I area, and (2) the frequency and timing of natural conditions that reduce visibility. This term does not include effects on integral vistas.

* * *

Baseline visibility condition means the average of the five annual averages of the individual values of daily visibility for the period 2000–2004 unique to each Class I area for either the most impaired days or the clearest days.[1]

* * *

Building, structure, or *facility* means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities must be considered as part of the same industrial grouping if they belong to the same Major Group (i.e., which have the same two-digit code) as described in the Standard Industrial Classification Manual, 1972 as amended by the 1977 Supplement (U.S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0 respectively).

Clearest days means the twenty percent of monitored days in a calendar year with the lowest values of the deciview index.

Current visibility condition means the average of the five annual averages of individual values of daily visibility for the most recent period for which data are available unique to each Class I area for either the most impaired days or the clearest days.

Deciview is the unit of measurement on the deciview index scale for quantifying in a standard manner human perceptions of visibility.

Deciview index means a value for a day that is derived from calculated or measured light extinction, such that uniform increments of the index correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to very obscured. The deciview index is calculated based on the following equation (for the

[1] In this guidance document, the term "baseline period visibility condition" is used instead of "baseline visibility condition."

purposes of calculating deciview using IMPROVE data, the atmospheric light extinction coefficient must be calculated from aerosol measurements and an estimate of Rayleigh scattering):

Deciview index = 10 ln (b_{ext}/10 Mm^{-1}).

b_{ext} = the atmospheric light extinction coefficient, expressed in inverse megameters (Mm−1).

End of the applicable implementation period means December 31 of the year in which the next periodic comprehensive implementation plan revision is due under §51.308(f).

* * *

Federal Class I area or *Class I Federal area* means any Federal land that is classified or reclassified Class I.

Federal Land Manager means the Secretary of the department with authority over the Federal Class I area (or the Secretary's designee) or, with respect to Roosevelt-Campobello International Park, the Chairman of the Roosevelt-Campobello International Park Commission.

Federally enforceable means all limitations and conditions which are enforceable by the Administrator under the Clean Air Act including those requirements developed pursuant to parts 60 and 61 of this title, requirements within any applicable State Implementation Plan, and any permit requirements established pursuant to §52.21 of this chapter or under regulations approved pursuant to part 51, 52, or 60 of this title.

Fixed capital cost means the capital needed to provide all of the depreciable components.

* * *

Implementation plan means, for the purposes of this part, any State Implementation Plan, Federal Implementation Plan, or Tribal Implementation Plan.

Indian tribe or *tribe* means any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village, which is federally recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

* * *

Installation means an identifiable piece of process equipment.

* * *

Least impaired days means the twenty percent of monitored days in a calendar year with the lowest amounts of visibility impairment.

Major stationary source and *major modification* mean major stationary source and major modification, respectively, as defined in §51.166.

Mandatory Class I Federal Area or *Mandatory Federal Class I Area* means any area identified in part 81, subpart D of this title.

Most impaired days means the twenty percent of monitored days in a calendar year with the highest amounts of anthropogenic visibility impairment.

Natural conditions reflect naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast, or coloration, and may refer to the conditions on a single day or a set of days. These phenomena include, but are not limited to, humidity, fire events, dust storms, volcanic activity, and biogenic emissions from soils and trees. These phenomena may be near or far from a Class I area and may be outside the United States.

Natural visibility means visibility (contrast, coloration, and texture) on a day or days that would have existed under natural conditions. Natural visibility varies with time and location, is estimated or inferred rather than directly measured, and may have long-term trends due to long-term trends in natural conditions.

Natural visibility condition means the average of individual values of daily natural visibility unique to each Class I area for either the most impaired days or the clearest days.

* * *

Prescribed fire means any fire intentionally ignited by management actions in accordance with applicable laws, policies, and regulations to meet specific land or resource management objectives.

Reasonably attributable means attributable by visual observation or any other appropriate technique.

Reasonably attributable visibility impairment means visibility impairment that is caused by the emission of air pollutants from one, or a small number of sources.

* * *

Regional haze means visibility impairment that is caused by the emission of air pollutants from numerous sources located over a wide geographic area. Such sources include, but are not limited to, major and minor stationary sources, mobile sources, and area sources.

Secondary emissions means emissions which occur as a result of the construction or operation of an existing stationary facility but do not come from the existing stationary facility. Secondary emissions may include, but are not limited to, emissions from ships or trains coming to or from the existing stationary facility.

* * *

State means "State" as defined in section 302(d) of the CAA.

Stationary Source means any building, structure, facility, or installation which emits or may emit any air pollutant.

Visibility means the degree of perceived clarity when viewing objects at a distance. Visibility includes perceived changes in contrast, coloration, and texture elements in a scene.

Visibility impairment or *anthropogenic visibility impairment* means any humanly perceptible difference due to air pollution from anthropogenic sources between actual visibility and natural visibility on one or more days. Because natural visibility can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured.

Wildfire means any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.

Wildland means an area in which human activity and development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

* * *

51.308 Regional haze program requirements

(a) *What is the purpose of this section?* This section establishes requirements for implementation plans, plan revisions, and periodic progress reviews to address regional haze.

(b) *When are the first implementation plans due under the regional haze program?* Except as provided in §51.309(c), each State identified in §51.300(b) must submit, for the entire State, an implementation plan for regional haze meeting the requirements of paragraphs (d) and (e) of this section no later than December 17, 2007.

(c) [Reserved]

* * *

(f) *Requirements for periodic comprehensive revisions of implementation plans for regional haze.* Each State identified in §51.300(b) must revise and submit its regional haze implementation plan revision to EPA by July 31, 2021, July 31, 2028, and every 10 years thereafter. The plan revision due on or before July 31, 2021, must include a commitment by the State to meet the requirements of paragraph (g). In each plan revision, the State must address regional haze in each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State that may be affected by emissions from within the State. To meet the core requirements for regional haze for these areas, the State must submit an implementation plan containing the following plan elements and supporting documentation for all required analyses:

(1) *Calculations of baseline, current, and natural visibility conditions; progress to date; and the uniform rate of progress.* For each mandatory Class I Federal area located within the State, the State must determine the following:

(i) *Baseline visibility conditions for the most impaired and clearest days*. The period for establishing baseline visibility conditions is 2000 to 2004. The State must calculate the baseline visibility conditions for the most

impaired days and the clearest days using available monitoring data. To determine the baseline visibility condition, the State must calculate the average of the annual deciview index values for the most impaired days and for the clearest days for the calendar years from 2000 to 2004. The baseline visibility condition for the most impaired days or the clearest days is the average of the respective annual values. For purposes of calculating the uniform rate of progress, the baseline visibility condition for the most impaired days must be associated with the last day of 2004. For mandatory Class I Federal areas without onsite monitoring data for 2000-2004, the State must establish baseline values using the most representative available monitoring data for 2000-2004, in consultation with the Administrator or his or her designee. For mandatory Class I Federal areas with incomplete monitoring data for 2000-2004, the State must establish baseline values using the 5 complete years of monitoring data closest in time to 2000-2004.

(ii) *Natural visibility conditions for the most impaired and clearest days.* The State must calculate natural visibility condition by estimating the average deciview index existing under natural conditions for the most impaired days and the clearest days based on available monitoring information and appropriate data analysis techniques; and

(iii) *Current visibility conditions for the most impaired and clearest days.* The period for calculating current visibility conditions is the most recent 5-year period for which data are available. The State must calculate the current visibility conditions for the most impaired days and the clearest days using available monitoring data. To determine the current visibility condition, the State must calculate the average of the annual deciview index values for the most impaired days and the clearest days for each year in the 5-year period. The current visibility condition for the most impaired or the clearest days is the average of the respective annual values.

(iv) *Progress to date for the most impaired and clearest days*. The State must calculate the actual progress made towards the natural visibility condition since the baseline period, and actual progress made during the previous implementation period up to and including the period for calculating current visibility conditions, for the most impaired days and for the clearest days.

(v) *Differences between current visibility condition and natural visibility condition.* The number of deciviews by which the current visibility condition exceeds the natural visibility condition, for the most impaired and for the clearest days.

(vi) *Uniform rate of progress*. (A) The uniform rate of progress for each mandatory Class I Federal area in the State. To calculate the uniform rate of progress, the State must compare the baseline visibility condition for the most impaired days to the natural visibility condition for the most impaired days in the mandatory Class I Federal area and determine the uniform rate of visibility improvement (measured in deciviews of improvement per year) that would need to be maintained during each implementation period in order to attain natural visibility conditions by the end of 2064.

(B) As part of its implementation plan submission, the State may propose (1) an adjustment to the uniform rate of progress for a mandatory Class I Federal area to account for impacts from anthropogenic sources outside the United States and/or (2) an adjustment to the uniform rate of progress for the mandatory Class I Federal area to account for impacts from wildland prescribed fires that were conducted with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems, to reduce the risk of catastrophic wildfires, and/or to preserve endangered or threatened species during which appropriate basic smoke management practices were applied. To calculate the proposed adjustment(s), the State must add the estimated impact(s) to the natural visibility condition and compare the baseline visibility condition for the most impaired days to the resulting sum. If the Administrator determines that the State has estimated the impact(s) from anthropogenic sources outside the United States and/or wildland prescribed fires using scientifically valid data and methods, the Administrator may approve the proposed adjustment(s) to the uniform rate of progress.

(2) *Long-term strategy for regional haze.* Each State must submit a long-term strategy that addresses regional haze visibility impairment for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State that may be affected by emissions from the State. The long-term strategy must include the enforceable emissions limitations, compliance schedules, and other measures that are necessary to make reasonable progress, as determined pursuant to (f)(2)(i) through (iv). In establishing its long-term strategy for regional haze, the State must meet the following requirements:

(i) The State must evaluate and determine the emission reduction measures that are necessary to make reasonable progress by considering the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected anthropogenic source of visibility impairment. The State should consider evaluating major and minor stationary sources or groups of

sources, mobile sources, and area sources. The State must include in its implementation plan a description of the criteria it used to determine the sources or groups of sources it evaluated and how the four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy. In considering the time necessary for compliance, if the State concludes that a control measure cannot reasonably be installed and become operational until after the end of the implementation period, the State may not consider this fact in determining whether the measure is necessary to make reasonable progress.

(ii) The State must consult with those States that have emissions that are reasonably anticipated to contribute to visibility impairment in the mandatory Class I Federal area to develop coordinated emission management strategies containing the emission reductions necessary to make reasonable progress.

(A) The State must demonstrate that it has included in its implementation plan all measures agreed to during state-to-state consultations or a regional planning process, or measures that will provide equivalent visibility improvement.

(B) The State must consider the emission reduction measures identified by other States for their sources as being necessary to make reasonable progress in the mandatory Class I Federal area.

(C) In any situation in which a State cannot agree with another State on the emission reduction measures necessary to make reasonable progress in a mandatory Class I Federal area, the State must include in its implementation plan a description of the actions taken to resolve the disagreement. In reviewing the State's implementation plan, the Administrator will take this information into account in determining whether the plan provides for reasonable progress at each mandatory Class I Federal area that is located in the State or that may be affected by emissions from the State. All substantive interstate consultations must be documented.

(iii) The State must document the technical basis, including modeling, monitoring, cost, engineering, and emissions information, on which the State is relying to determine the emission reduction measures that are necessary to make reasonable progress in each mandatory Class I Federal area it affects. The State may meet this requirement by relying on technical analyses developed by a regional planning process and approved by all State participants. The emissions information must include, but need not be limited to, information on emissions in a year at least as recent as the most recent year for which the State has submitted emission inventory information to the Administrator in compliance with the triennial reporting requirements of subpart A of this part. However, if a State has made a submission for a new inventory year to meet the requirements of subpart A in the period 12 months prior to submission of the SIP, the State may use the inventory year of its prior submission.

(iv) The State must consider the following additional factors in developing its long-term strategy:

(A) Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;

(B) Measures to mitigate the impacts of construction activities;

(C) Source retirement and replacement schedules;

(D) Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs; and

(E) The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy.

(3) *Reasonable progress goals.* (i) A State in which a mandatory Class I Federal area is located must establish reasonable progress goals (expressed in deciviews) that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of those enforceable emissions limitations, compliance schedules, and other measures required under paragraph (f)(2) that can be fully implemented by the end of the applicable implementation period, as well as the implementation of other requirements of the CAA. The long-term strategy and the reasonable progress goals must provide for an improvement in visibility for the most impaired days as compared to the baseline visibility condition and ensure no degradation in visibility for the clearest days as compared to the baseline visibility condition.

(ii)(A) If a State in which a mandatory Class I Federal area is located establishes a reasonable progress goal for the most impaired days that provides for a slower rate of improvement in visibility than the uniform rate of progress calculated under paragraph (f)(1)(vi) of this section, the State must demonstrate, based on the analysis required by paragraph (f)(2)(i) of this section, that there are no additional emission reduction measures for anthropogenic

sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the long-term strategy. The State must provide a robust demonstration that includes a description of the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy. The State must provide to the public for review as part of its implementation plan an assessment of the number of years it would take to attain natural visibility conditions if visibility improvement were to continue at the rate of progress selected by the State as reasonable for the implementation period.

(B) If a State contains sources which are reasonably anticipated to contribute to visibility impairment in a mandatory Class I Federal area in another State for which a demonstration by the other State is required under (f)(3)(ii)(A), the State must demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the State that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in its own long-term strategy. The State must provide a robust demonstration that includes a description of the criteria used to determine which sources or groups or sources were evaluated and how the four factors required by paragraph (f)(2)(i) were taken into consideration in selecting the measures for inclusion in its long-term strategy.

(iii) The reasonable progress goals established by the State are not directly enforceable but will be considered by the Administrator in evaluating the adequacy of the measures in the implementation plan in providing for reasonable progress towards achieving natural visibility conditions at that area.

(iv) In determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions, the Administrator will also evaluate the demonstrations developed by the State pursuant to paragraphs (f)(2) and (f)(3)(ii)(A) of this section and the demonstrations provided by other States pursuant to paragraphs (f)(2) and (f)(3)(ii)(B) of this section.

(4) If the Administrator, Regional Administrator, or the affected Federal Land Manager has advised a State of a need for additional monitoring to assess reasonably attributable visibility impairment at the mandatory Class I Federal area in addition to the monitoring currently being conducted, the State must include in the plan revision an appropriate strategy for evaluating reasonably attributable visibility impairment in the mandatory Class I Federal area by visual observation or other appropriate monitoring techniques.

(5) A comprehensive periodic plan revision must also meet the requirements of paragraphs (g)(1), (g)(2), (g)(4), and (g)(5) of this section for the period of time since the most recent progress report.

(6) *Monitoring strategy and other implementation plan requirements*. The State must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State. Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network. The implementation plan must also provide for the following:

(i) The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.

(ii) Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas both within and outside the State.

(iii) For a State with no mandatory Class I Federal areas, procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.

(iv) The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.

(v) A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

* * *

(i) *What are the requirements for State and Federal Land Manager coordination?* (1) By November 29, 1999, the State must identify in writing to the Federal Land Managers the title of the official to which the Federal Land Manager of any mandatory Class I Federal area can submit any recommendations on the implementation of this subpart including, but not limited to:

(i) Identification of impairment of visibility in any mandatory Class I Federal area(s); and

(ii) Identification of elements for inclusion in the visibility monitoring strategy required by §51.305 and this section.

(2) The State must provide the Federal Land Manager with an opportunity for consultation, in person at a point early enough in the State's policy analyses of its long-term strategy emission reduction obligation so that information and recommendations provided by the Federal Land Manager can meaningfully inform the State's decisions on the long-term strategy. The opportunity for consultation will be deemed to have been early enough if the consultation has taken place at least 120 days prior to holding any public hearing or other public comment opportunity on an implementation plan (or plan revision) for regional haze required by this subpart. The opportunity for consultation on an implementation plan (or plan revision) or on a progress report must be provided no less than 60 days prior to said public hearing or public comment opportunity. This consultation must include the opportunity for the affected Federal Land Managers to discuss their:

(i) Assessment of impairment of visibility in any mandatory Class I Federal area; and

(ii) Recommendations on the development of the reasonable progress goal and on the development and implementation of strategies to address visibility impairment.

(3) In developing any implementation plan (or plan revision) or progress report, the State must include a description of how it addressed any comments provided by the Federal Land Managers.

(4) The plan (or plan revision) must provide procedures for continuing consultation between the State and Federal Land Manager on the implementation of the visibility protection program required by this subpart, including development and review of implementation plan revisions and progress reports, and on the implementation of other programs having the potential to contribute to impairment of visibility in mandatory Class I Federal areas.

APPENDIX C

Explanation of Certain Terms Used in This Guidance

AERMOD – American Meteorological Society/Environmental Protection Agency Regulatory Model.

AirControlNet – A database tool for conducting pollutant emissions control strategy and costing analysis, no longer supported by EPA.

Analysis of control measures – The analysis of what emission control measures are necessary for a particular source in order to make reasonable progress. The analysis of controls measures must include consideration of the four statutory factors for reasonable progress. It must include consideration of the five additional factors listed in 40 CFR 51.308(f)(2)(iv) unless these five factors have already been considered in the selection of the sources for which the state will complete an analysis of control measures. It may include the consideration of visibility benefits.

Baseline period – The years 2000 to 2004. The end of the baseline period is December 31, 2004.

Baseline visibility condition or *baseline period visibility condition* – The average of the five annual averages of the individual values of daily visibility for the baseline period of 2000-2004, unique to each Class I area, for either the most impaired days or the clearest days. The Regional Haze Rule uses the term *baseline visibility condition*. This document uses the term *baseline period visibility condition* for greater clarity.

Baseline visibility impact or impacts of a source – Baseline visibility impacts of a source are estimates of a source's impacts on visibility at a Class I area in the absence of additional reasonable progress measures for the second implementation period. Estimates of baseline visibility impacts may be represented by either a source's current visibility impacts or impacts it will have on a future date, e.g., 2028, under existing regulatory requirements. Baseline visibility impact can be expressed in delta deciview units or inverse megameters of light extinction. Baseline visibility impacts can be used to select sources for analysis of emission control options and as the baseline for quantifying visibility benefits of additional emission control measures.

Basic smoke management practices – Types of actions that the manager of a prescribed fire can take to reduce the amount of smoke generated by a prescribed fire and/or to reduce public exposure to the smoke that is generated.

b_{ext} – Light extinction coefficient, expressed in inverse megameters (Mm^{-1}).

CALPUFF – A particular Lagrangian puff air quality modeling system. *See https://www.epa.gov/scram/air-quality-dispersion-modeling-alternative-models#calpuff.*

Characterize or *characterization* – To quantify or qualitatively describe the facts about a source or about an emission control measure that are relevant to selecting the source for analysis of control measures and/or to determining what emission control measures are necessary to make reasonable progress.

Class I area – A mandatory Class I Federal area (also referred to as a "mandatory Federal Class I area" in some sections of EPA's visibility protection rules) where visibility is an important value, as identified in 40 CFR part 81 subpart D.

Clearest days – The 20 percent of monitored days in a calendar year with the lowest values of the deciview index.

CoST – Control Strategy Tool, part of EPA's emissions modeling framework.

Current visibility condition – The average of the five annual averages of individual values of daily visibility for the most recent period for which data are available unique to each Class I area, for either the most impaired days or the clearest days.

Deciview or *dv* – The unit of measurement on the deciview index scale for quantifying human perceptions of visibility in a standard manner.

Deciview index – A value for a day that is derived from calculated or measured light extinction, such that uniform increments of the index correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to very obscured. The deciview index is calculated based on the following equation (for the purposes of calculating deciview using IMPROVE data, the atmospheric light extinction coefficient must be calculated from aerosol measurements and an estimate of Rayleigh scattering):

Deciview index = 10 ln (b_{ext}/10 Mm^{-1}).

b_{ext} = the atmospheric light extinction coefficient, expressed in inverse megameters (Mm^{-1}).

Delta deciview – The difference in the deciview index for two different ambient conditions. This difference can express the visibility impact of a source or the visibility benefit of an emission control measure. For example, the daily visibility impact of a source in delta deciview units is the difference between the deciview index value that would exist if the source were the only anthropogenic source, added to the natural background, and the daily visibility that would exist due to the natural background alone. Because of the logarithmic nature of the deciview scale, the delta deciview value between two ambient conditions with a certain difference in light extinction values depends on the value of the overall light extinction of the less polluted condition and not only on the difference in light extinction. This guidance recommends the use of light extinction units to express visibility impacts and visibility benefits instead of the use of delta deciviews.

End of the applicable implementation period – December 31 of the year in which the next periodic implementation plan revision is due under 40 CFR 51.308(f).

Federal Land Manager – The Secretary of the department with authority over the Class I area (or the Secretary's designee) or, with respect to Roosevelt-Campobello International Park, the Chairman of the Roosevelt-Campobello International Park Commission.

Fine soil – The portion, species, or component of $PM_{2.5}$ attributable to crustal material, as estimated based on the quantity of certain chemical elements in a sample of $PM_{2.5}$.

Four statutory factors for reasonable progress or *four factors* – The costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any existing source subject to such requirements.

IMPROVE – The Interagency Monitoring of Protected Visual Environments monitoring program.

Light extinction budget – An apportionment of light extinction to the chemical components of the PM aerosol and the Rayleigh scattering effect causing the light extinction.

Long-term strategy or *LTS* – The compilation of enforceable emissions limitations, compliance schedules, and other measures in a periodic regional haze SIP submission that a state has determined are necessary to make reasonable progress for Class I areas within the state and affected by the state. The LTS also includes measures that a state had adopted pursuant to an agreement reached during interstate consultation, as required by 40 CFR 51.308(f)(2)(ii)(A). The LTS was first established in the implementation plan for the first implementation period. Subsequent SIP submissions add to the LTS.

Mm – Millions of meters or megameters.

Mm^{-1} – Inverse megameters (used to indicate division by the number of megameters). This unit is used to quantify light extinction.

Most impaired days – The 20 percent of monitored days in a calendar year with the highest amounts of anthropogenic visibility impairment.

Natural conditions – Naturally occurring phenomena that reduce visibility as measured in terms of light extinction, visual range, contrast, or coloration, and may refer to the conditions on a single day or a set of days. These phenomena include, but are not limited to, humidity, fire events, dust storms, volcanic activity, and biogenic emissions from soils and trees. These phenomena may be near or far from a Class I area and may be outside the U.S.

Natural visibility – The visibility (contrast, coloration, and texture) on a day or days that would have existed under natural conditions. Natural visibility varies with time and location, is estimated or inferred rather than directly measured, and may have long-term trends due to long-term trends in natural conditions.

Natural visibility condition – The average of individual values of daily natural visibility unique to each Class I area for either the most impaired days or the clearest days.

Prescribed fire – Any fire intentionally ignited by management actions in accordance with applicable laws, policies, and regulations to meet specific land or resource management objectives.

Rayleigh scattering – The scattering of sunlight off the gas molecules of the atmosphere.

Reasonably attributable – Attributable by visual observation or any other appropriate technique.

Reasonably attributable visibility impairment or *RAVI* – Visibility impairment that is caused by the emission of air pollutants from one or a small number of sources.

Reasonable progress goal or *RPG* – A visibility goal for a Class I area, in deciviews, as of the end of an implementation period, that provides for reasonable progress towards achieving natural visibility conditions. There are two RPGs for each Class I area for an implementation period: one for the most impaired days and one for the clearest days.

Regional haze – Visibility impairment that is caused by the emission of air pollutants from numerous anthropogenic sources located over a wide geographic area. Such sources include, but are not limited to, major and minor stationary sources, mobile sources, and area sources.

Smoke management program – A framework to minimize the impact of smoke from prescribed agricultural and/or wildland management burning operations that includes enforceable restrictions on prescribed fire.

Stationary source, source, group of sources, or *source category* – The Regional Haze Rule defines a stationary source as "any building, structure, facility or installation which emits or may emit any air pollutant." In this document, the terms *stationary source* and *source*, depending on context, may also refer to a single emission release point, process, or unit at a building, structure, facility, or installation. *Group of sources* and *source category* are used interchangeably in this guidance document. In addition, the use of *source* in a statement does not necessarily exclude the application of a concept or step to a group of sources or source category, nor exclude the application of a concept or step to only one unit or emissions process at a source. Statements in this document that include the word "source" are not meant to interpret any provisions of the Regional Haze Rule that use that term.

URP framework – The interrelated Regional Haze Rule requirements regarding the quantification of historical and projected visibility conditions using specific metrics, the quantification of natural conditions, the quantification of the uniform rate of progress that would achieve natural visibility conditions for the 20 percent most anthropogenically impaired days in 2064, the URP glidepath, the setting of RPGs for the end of the implementation period, and the comparison of the RPG for the 20 percent most anthropogenically impaired days to the URP glidepath.

URP glidepath – The hypothetical straight-line path on the deciview scale between the baseline period visibility condition in 2000-2004 (associated with December 31, 2004) and the sum of the natural visibility condition and optional adjustments for international anthropogenic impacts and impacts from certain wildland prescribed fires (associated with December 31, 2064), for the 20 percent most anthropogenically impaired days for a particular Class I area.

Visibility – The degree of perceived clarity when viewing objects at a distance. Visibility includes perceived changes in contrast, coloration, and texture elements in a scene.

Visibility impairment or *anthropogenic visibility impairment* – The Regional Haze Rule defines these terms as "any humanly perceptible difference due to air pollution from anthropogenic sources between actual visibility and natural visibility on one or more days. Because natural visibility can only be estimated or inferred, visibility impairment also is estimated or inferred rather than directly measured." This document uses these two terms interchangeably.

Wildfire – Any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.

Wildland – An area in which human activity and development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

APPENDIX D

More Detail on Steps in Developing a Regional Haze SIP

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
1 All states.	Take inventory of information resources available for SIP development.	Not explicitly addressed.
2 All states.	Determine Class I areas in other states that may be affected by emission sources in the state.	40 CFR 51.308(f)(2)
3 All states.	Determine which other states have sources that may be reasonably anticipated to affect in-state Class I areas.	40 CFR 51.308(f)(2)(ii)
4 All states.	Consult with these states, through multi-state organizations and directly.	40 CFR 51.308(f)(2)(ii)
5 All states.	Consult with FLMs for all in-state Class I areas and affected out-of-state Class I areas on an ongoing basis.	40 CFR 51.308(i)(4)
6 States with Class I areas.	Analysis of visibility monitoring data Determine the baseline (2000-2004) visibility condition and the current visibility condition (as defined in section 51.301) for the 20 percent most anthropogenically impaired days and for the 20 percent clearest days, for each in-state Class I area. This must be done based on using available monitoring data. Determine the natural visibility condition (as defined in section 51.301) for the 20 percent most anthropogenically impaired days and for the 20 percent clearest days, for each in-state Class I area. This must be done based on using available monitoring data and appropriate data analysis techniques. Determine the difference between the baseline period visibility condition and the current visibility condition, for both sets of days. This is the "actual progress made towards the natural visibility condition since the baseline period." Determine the difference between the average visibility condition in the period of 2003-2007 and the average visibility condition for each subsequent 5-year period, up to and including the 5-year period that determines current visibility conditions, for both sets of days. This is the "actual progress made during the previous implementation period up to and including the period for calculating current visibility conditions."	40 CFR 51.308(f)(1)
6 States with Class I areas.	Determine the difference between the current visibility conditions and natural visibility conditions, for both sets of days.	

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
7 States with Class I areas.	(Optional) Develop current extinction budgets for each Class I area.	Not explicitly addressed.
8 All states.	Identify significant future trends in emissions.	40 CFR 51.308(f)(2)(iv)(A)
9 All states.	(Optional) Conduct source apportionment modeling and/or review available results from such modeling by other parties.	Not explicitly addressed.
10 All states.	(Optional) Conduct modeling to predict visibility levels for the 20 percent most impaired and 20 percent clearest days as of the end of the implementation period assuming already adopted emissions controls and/or review available results from such modeling by other parties. A comparison of these projected levels to current visibility conditions is a factor that may be considered in the source selection step (step 12 on this list).	Not explicitly addressed
11 All states.	(Optional) Estimate baseline visibility impacts for source selection purposes.	Not explicitly addressed.
12 All states.	Select sources for analysis of control measures.	40 CFR 51.308(f)(2)(i)
13 All states.	Identify emission control measures to be considered for these sources.	40 CFR 51.308(f)(2)(i)
14 All states.	Characterize the four factors for these sources and measures.	40 CFR 51.308(f)(2)(i)
15 All states.	(Optional) Quantify visibility benefits for these sources and measures.	Not explicitly addressed.
16 All states.	Consider evaluating major and minor stationary sources or groups of sources, mobile sources, and area sources.	40 CFR 51.308(f)(2)(i)
17 All states.	Document the criteria used to determine the sources or groups of sources that have been evaluated and how the four factors were taken into consideration in selecting the measures for inclusion in the long-term strategy (LTS).	40 CFR 51.308(f)(2)(i)
18 All states.	Document the technical basis, including information on the four factors and modeling, monitoring, and emissions information on which the state is relying to determine the emission reductions from anthropogenic sources in the state that are necessary for achieving reasonable progress towards natural visibility conditions in each Class I area it affects.	40 CFR 51.308(f)(2)(iii)
19 All states.	Identify the emissions information on which the state's strategies are based and explain how this information meets the Regional Haze Rule's requirements regarding the year(s) represented in the information, i.e., the tie to the submission of information to the NEI.	40 CFR 51.308(f)(2)(iii)

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
20 All states.	Consult with those states that have emissions that are reasonably anticipated to contribute to visibility impairment in the in-state Class I areas to develop coordinated emission management strategies containing the emission reductions necessary to make reasonable progress. This consultation could include the exchange of relevant portions of analyses of control measures and associated technical information.	40 CFR 51.308(f)(2)(ii)
21 All states.	Include in the SIP all measures agreed to during state-to-state consultations or a regional planning process, or measures that will provide equivalent visibility improvement.	40 CFR 51.308(f)(2)(ii)(A)
22 All states.	Consider the emission reduction measures identified by other states for their sources as being necessary to make reasonable progress in the Class I area.	40 CFR 51.308(f)(2)(ii)(B)
23 All states.	Include in the SIP a description of the actions taken to resolve any disagreements with other states regarding measures that are necessary to make reasonable progress at jointly affected Class I areas.	40 CFR 51.308(f)(2)(ii)(C)
24 All states.	Consider emission reductions due to ongoing air pollution control programs, including measures to address RAVI.	40 CFR 51.308(f)(2)(iv)(A)
25 All states.	Consider measures to mitigate the impacts of construction activities.	40 CFR 51.308(f)(2)(iv)(B)
26 All states.	Consider source retirement and replacement schedules.	40 CFR 51.308(f)(2)(iv)(C)
27 All states.	Consider basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs. After consideration of basic smoke management practices, states have the option to include the practices into their SIP submittal, but it is not required.	40 CFR 51.308(f)(2)(iv)(D)
28 All states.	Consider the anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the LTS.	40 CFR 51.308(f)(2)(iv)(E)
29 All states.	Select measures for inclusion in the LTS.	40 CFR 51.308(f)(2)
30 All states.	Set emission limits, averaging periods and monitoring and record keeping requirements.,	40 CFR 51.308(f)(2) – opening text
31 All states.	Set compliance deadlines.	40 CFR 51.308(f)(2) – opening text
32 States with Class I areas.	Project the 2028 RPGs for the 20 percent most anthropogenically impaired and 20 percent clearest days.	40 CFR 51.308(f)(3)
33 All states.	*URP Glidepath Check*	

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
33A States with Class I areas.	Determine the URP using the baseline period visibility condition value and the natural visibility conditions value for the 20 percent most anthropogenically impaired days. The URP may be adjusted for impacts from anthropogenic sources outside the U.S. and from certain types of prescribed fires, subject to EPA approval as part of EPA's action on the SIP submission.	40 CFR 51.308(f)(1)(vi)
33B All states.	Compare 2028 RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath. If the 2028 point is above the glidepath demonstrate that there are no additional emission reduction measures for anthropogenic sources or groups of sources in the state that may reasonably be anticipated to contribute to visibility impairment in the Class I area that would be reasonable to include in the LTS.	40 CFR 51.308(f)(3)(ii)
33C All states.	If the 2028 RPG for the 20 percent most anthropogenically impaired days is above the 2028 point on the URP glidepath, Calculate the number of years it would take to reach natural conditions at the rate of progress provided by the SIP for the implementation period.	40 CFR 51.308(f)(3)(ii)(A)
34 States with Class I areas.	Compare the 2028 RPG for the 20 percent clearest days to the 2000-2004 conditions for the same days, and strengthen the LTS if there is degradation. Also, compare the 2028 RPG for the 20 percent most anthropogenically impaired days to the 2000-2004 conditions for the same days, and strengthen the LTS if the RPG does not show an improvement.	40 CFR 51.308(f)(3)(i)
35 States with Class I areas.	Submit a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all Class I areas within the state.	40 CFR 51.308(f)(6)
36 States with Class I areas.	Provide for the establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all Class I areas within the state are being achieved.	40 CFR 51.308(f)(6)(i)
37 States with Class I areas.	Provide for procedures by which monitoring data and other information are used in determining the contribution of emissions from within the state to regional haze visibility impairment at Class I areas both within and outside the state.	40 CFR 51.308(f)(6)(ii)
38 States without a Class I area.	For a state with no Class I areas, provide for procedures by which monitoring data and other information are used in determining the contribution of emissions from within the state to regional haze visibility impairment at Class I areas in other states.	40 CFR 51.308(f)(6)(iii)
39 States with Class I areas.	Provide for reporting of all visibility monitoring data to the Administrator at least annually for each Class I area in the state. To the extent possible, the state should report visibility monitoring data electronically.	40 CFR 51.308(f)(6)(iv)

Applicability	Step or Task	Relevant Regional Haze Rule Provisions
40 All states.	Provide for a statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any Class I area. The inventory must include emissions for the most recent year for which data are available, and estimates of future projected emissions. The state must also include a commitment to update the inventory periodically.	40 CFR 51.308(f)(6)(v)
41 States with Class I areas.	Provide other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.	40 CFR 51.308(f)(6)(vi)
42 All states.	Commit to submit the January 31, 2025, progress report.	40 CFR 51.308(f) opening text
43 All states.	Offer an in-person consultation meeting with responsible FLMs at a point early enough in the state's policy analyses of its LTS emission reduction obligation so that information and recommendations provided by the Federal Land Manager can meaningfully inform the state's decisions on the LTS.	40 CFR 51.308(i)(2).
44 All states.	Include in the SIP submission a description of how the state addressed any comments provided by the FLMs.	40 CFR 51.308(i)(3)

United States Environmental Protection Agency	Office of Air Quality Planning and Standards Air Quality Policy Division Research Triangle Park, NC	Publication No. EPA-457/B-19-003 August 2019

Attachment F:
Hawaiian Electric Letter on
December 2, 2022

KARIN KIMURA
Director
Environmental Division

December 2, 2022

SENT VIA EMAIL [redacted]

Ms. Marianne Rossio
Clean Air Branch
State of Hawai'i Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawai'i 96782

Subject: **Regional Haze Boiler Shutdown Extension Request**
Maui Electric Company, Ltd.
Hawai'i Electric Light Company, Inc.

Dear Ms. Rossio:

Hawaiian Electric[1] respectfully requests a one year extension to December 31, 2028 from the current deadline of December 31, 2027 for the shutdown of the Kahului Generating Station (Kahului) and Kanoelehua-Hill Generating Station (Hill) boilers, as set out in the recently revised Covered Source Permits (No. 0234-01-C for Hill and 0232-01-C for Kahului). The extension to December 31, 2028 is required to assure system reliability that may be affected by the significant change in circumstances that has occurred since the time Hawaiian Electric initially agreed to the December 31, 2027 shutdown date, in addition to further direction obtained from the United States Environmental Protection Agency (EPA). The justification and factual support for the extension request are provided below.

Pursuant to the Clean Air Act Regional Haze Rule (Rule) (40 CFR §51.308), on August 11, 2022, the State of Hawai'i submitted a draft State Implementation Plan (SIP) to the EPA to demonstrate compliance with the Rule. Under the draft SIP, Hawaiian Electric agreed to include in its revised Covered Source Permits (CSPs) control measures for certain units as well as the shutdown of several boilers at two of its generating facilities in lieu of air pollution control measures.

The December 31, 2027 shutdown requirement for the Kahului and Hill boilers are reflected in the facilities' CSPs that were amended in conjunction with the submission of the SIP to the EPA. During the public comment period for the CSPs, Hawaiian Electric commented that the December 31, 2027 shutdown date that was initially proposed, should be extended until

[1] "Hawaiian Electric" or the "Company" refers to Hawaiian Electric Company, Inc. (or "HE"), Hawai'i Electric Light Company, Inc. (or "HL") and/or Maui Electric Company, Limited (or "ME"). On December 20, 2019, the State of Hawai'i Department of Commerce and Consumer Affairs ("DCCA") approved Hawaiian Electric Company, Inc., Hawai'i Electric Light Company, Inc. and Maui Electric Company, Limited's application to do business under the trade name "Hawaiian Electric" for the period from December 20, 2019 to December 19, 2024. See Certificate of Registration No. 4235929, filed December 20, 2019 in the Business Registration Division of the DCCA.

December 31, 2028 due to circumstances that have significantly changed since Hawaiian Electric agreed to the December 31, 2027 shutdown date.

Hawaiian Electric initially agreed that it would accept the December 31, 2027 date, it was also relying upon representations made by the DOH that December of 2027 was the latest shutdown date permissible to implement controls to meet the Regional Haze deadlines. Subsequent to that time, Hawaiian Electric was informed that the EPA had confirmed that a shutdown date of December 31, 2028 is acceptable for these types of sources to show sufficient progress to meet the requirements for the second decadal period as set out in the Rule.

In response to the comments submitted related to these extensions made during the SIP public comment period, Hawaiian Electric was informed that, despite the timely submittal of the comments because of the ending SIP deadlines, the DOH believed that it was too late to make a change at the time but the DOH would review the request shortly thereafter. This letter is a follow up to those comments. Additionally, as discussed in more detail below, circumstances have occurred beyond the Company's control, including delays to the schedule for the anticipated renewable projects that would have allowed for the closure of these units, as well as the unexpected difficulties with maintaining existing equipment, justifying the current request for an extension. The shutdowns are dependent on other projects that need to be in place on time and the ability to shutdown units depends on a variety of a factors include the schedule for activating additional renewable sources.

While moving forward with urgency is critical to meet the Regional Haze requirements and Hawaiian Electric's generation and reliability needs and decarbonization and RPS goals, the transition must not be done at the expense of reliability, resilience, and flexibility to respond to changing or unforeseen circumstances. While the Company is currently targeting a 2027 shutdown at least for the Kahului boilers, there are numerous dynamic factors that affect the possibility of retiring these fossil fuel boilers by 2027, as various interdependent events must proceed without issue or further delay. Prematurely shutting down the Kahului and Hill boilers could potentially put both the Company's system resilience and ability to reliably serve customers at risk. Many of these circumstances that affect these factors have changed since the initial discussions between Hawaiian Electric and the DOH with respect to these shutdowns. Clearly the key to managing the shutdowns is the onboarding of additional resources to replace these units prior to their shutdown.

Island of Maui – Kahului

Although Hawaiian Electric is taking actions to ensure continued reliability of electricity supply for the island of Maui, there are numerous factors that must be considered more broadly than the retirement of the Kahului boilers in isolation of other generating assets such as the energy market conditions that affect projects currently in the pipeline and the ability to acquire necessary future resources. There is currently some uncertainty with the timeline of availability of resources on Maui due to delays to renewable projects in development, concerns regarding the Maalaea Generating Station (Maalaea) Units M10 through M13, and delays in the issuance of the Maui Stage 3 Request for Proposal (RFP) for additional generation sources.

When Hawaiian Electric agreed to a shutdown date of December 31, 2027 for the Kahului boilers, it was believed that all of the Maalaea units would continue operations past 2027. However, Hawaiian Electric received a recent unforeseen notification from the manufacturer of the Maalaea Mitsubishi Reciprocating Internal Combustion Engines, Units M10 through M13, that it would not manufacture spare parts and provide maintenance support for these generating units which provide 50 megawatts (MW) of generation to the Maui system (out of a 200 MW peak load). Therefore, unless replacement generation is brought online by 2027, Hawaiian Electric may not be able to shutdown the Kahului boilers without jeopardizing its ability to consistently and reliably serve Maui residents and businesses. These spare parts are necessary approximately every two years to overhaul and continue operation of Maalaea Units M10 through M13.

Because of the supply chain risks and concerns caused by the ongoing global pandemic, Hawaiian Electric has been reaching out to suppliers to determine spare parts availability and lead times on materials in order to ensure the maintenance of these facilities is possible. Hawaiian Electric reached out to Mitsubishi Heavy Industries Engine & Turbocharger (MHIE), the manufacturer of Maalaea Units M10 though M13, as part of the process to procure additional spare parts for these units and was advised that MHIET would not guarantee parts supply. These particular units are over 40 years old and facing obsolescence. In addition to the question of parts availability, units at Maalaea are also seeing problems with cracks in the engine blocks, making it even more difficult to extend life of these units beyond 2027. While the Company continues to work with MHIET to obtain additional spare parts, it may not be possible to retire Kahului Units K1 through K4 prior to sufficient capacity being in service to replace the 36 MW they represent as well as the 50 MW supplied by Maalaea Units M10 through M13, and still maintain the system reliability requirements.

The Company's analysis shows that to initiate the process of retiring the Kahului boilers and Maalaea Units M10 through M13, a portfolio that consists of at least 215 MW of solar paired with storage and/or standalone storage, approximately 15 MW of customer cited distributed energy resources as part of the Company's battery bonus program, and 180 gigawatt-hours (GWh) of new renewable energy is required. In order to meet this need, **all** remaining Stage 1 and 2 projects will be required to be online in addition to resources expected to be procured as part of the Maui Stage 3 RFP, the Company's Community Based Renewable Energy Program, the Company's Battery Bonus program, and a proposal by the Company for a solar plus storage facility at its Waena location. This portfolio would approximately meet the 30% energy reserve margin while allowing for the retirement of the Kahului boilers and mitigate risks associated with M10 through M13. If system conditions change (i.e., higher than forecasted load growth) or the resource technologies change, the required portfolio to support retirement of the Kahului boilers and M10 through M13 may also change.

However, several solar plus storage projects, contracted through procurements by the Company in 2018 and 2019 known as the Company's Stage 1 and Stage 2 projects, are facing unexpected issues that have resulted in delays to the projects. These issues include the COVID-19 global pandemic and the resulting supply chain crisis and shipping disruptions, soaring inflation leading to increased cost of goods, the war in Ukraine, and unanticipated new government regulations resulting in the delay of equipment and materials reaching Hawai‘i. These issues in turn, have prevented the importation of certain goods, led to the stop in production of certain products, and caused other delays. To combat these issues, developers have had to change equipment used, find new suppliers, redesign aspects of projects, and delay construction until materials could be received. Delays in receipt of local permits and increased environmental and cultural resource scrutiny have also delayed construction for several projects.

As of October 2022, three of the four independent power producers of solar plus battery storage Stage 1 and 2 projects in development on Maui are pursuing revised pricing and extensions to their commercial operations dates (COD) through Power Purchase Agreement (PPA) amendments to account for these changed circumstances. Although Hawaiian Electric is working diligently with each of the project developers to assist in addressing these delays and to ensure that projects are installed no later than 2024, the full schedule impacts of these requests are unknown at this time as the anticipated COD are dependent upon reaching timely agreement on the amendments, receiving State of Hawai'i Public Utilities Commission (PUC) approval, and no additional unforeseen delays. In addition, if the PUC were to deny approval of such amendments the project developers have indicated they will not move forward with the completion of such projects, putting further risk on project execution. Further, the 40MW Waena standalone storage project selected via the Stage 2 RFP has not yet been approved by the PUC (if approved by the PUC, the Company will proceed urgently with installation of this project). The current statues of the projects are summarized in the following table:

[2] *November 2022 Monthly Update*, Docket No. 2021-0024, Exhibit 1 at 11.
[3] *November 2022 Monthly Update*, Docket No. 2021-0024, Exhibit 1 at 30.
[4] *November 2022 Monthly Update*, Docket No. 2021-0024, Exhibit 1 at 6.
[5] *November 2022 Monthly Update*, Docket No. 2021-0024, Exhibit 1 at 71, 75.

Stages 1 and 2 Renewable Projects on Maui

Project	Docket Number	Guaranteed Commercial Operation Date (GCOD)	Anticipated COD	Current Project Status/Risk(s)
AES Kuihelani Solar	2018-0436	10/27/23	10/27/23	The project schedule is mainly being impacted by: (1) delays in completion of Seller's engineering drawings for Company review and (2) Force Majeure based on the US Customs and Border Protection Withhold Release Order's impact on the delivery of panels to the project. Seller and Company are working together on ways to minimize impacts from above.[2]
Paeahu Solar	2018-0433	4/28/23	Unknown	The project schedule is mainly being impacted by: (1) pending contested case hearing on the re-approval of the Conditional Use/Ph2 permit; (2) pending approval of the overhead line; (3) the need to source alternative photovoltaic (PV) battery energy storage system (BESS) inverters and (4) Seller has indicated revised pricing would be needed to complete the project. These issues are ongoing and will continue to impact the schedule. An Anticipated COD is unknown as the full impacts of the above are not determined at this time.[3]
Kamaole Solar	2021-0026	7/25/23	12/27/24	The project schedule is mainly being impacted by: (1) market conditions and impacts from the ongoing COVID-19 pandemic and (2) the PPA amendment to address the market conditions filed for PUC approval on 10/21/22. Company requested an expedited decision from the PUC on 12/2/22.[4]
Kahana Solar	2020-0142	12/29/2023	12/5/24	The project schedule is mainly being impacted by the need to source alternative PV BESS inverters. Seller has submitted a revised pricing and commercial operation date proposal to the Company for review and consideration. The sourcing of alternative PV BESS inverters is ongoing. The Anticipated COD may further change as a result of these issues.[5]

Project	Docket Number	Guaranteed Commercial Operation Date (GCOD)	Anticipated COD	Current Project Status/Risk(s)
Waena BESS	2020-0132	10/25/24	Unknown	Not yet approved.[6] GCOD continues to be extended on a day for day basis pending Commission approval.[7]

The Company is also in the final stages of development of a Stage 3 RFP for Maui. This RFP specifically seeks 40 MW of renewable firm capacity, in addition to 350 GWh/year of energy by the end of 2027. The Company anticipates the need to urgently issue this RFP for additional resources to be in place by 2027. The first draft of the Stage 3 RFP for Maui was submitted to the PUC in May 2022. On October 20, 2022, in response to a PUC Order, the Company invited stakeholder feedback within 30 days on the Maui and O'ahu grid needs assessments that underly the scope of the Stage 3 RFPs. Assuming that the PUC will require time to review responses to the numerous information requests and any stakeholder comments received, it is expected the earliest date of further PUC guidance on the Maui and

[6] Order No. 38439, issued June 23, 2022 in Docket No. 2020-0132, amended the procedural schedule to require Maui Electric to submit completed analysis and proposal for integrating solar generation into the Waena Battery Energy Storage System Project within 60 days of the date of the order.
[7] *Project Update*, filed on July 20, 2022, Docket No. 2020-0132, enclosure at 1.

O'ahu Stage 3 RFPs would be December 2022. As a result, RFP issuance would likely be delayed until January 2023 and responses to April 2023. This delayed schedule will severely impact the ability for proposed firm and variable projects to meet a 2027 timeframe.

Hawaiian Electric is also pursuing a contingency plan of new firm generation up to approximately 30 MW or 40 MW of engines at Waena, with an in-service date of 2027. The Waena contingency project that will enable the Company to retire older less efficient fossil fueled generators to integrate more solar, storage, wind projects and additional distributed energy resources. The generating fleet on Maui is aged and being pushed harder than ever and in ways it was not designed for, and it is vital to increase reliability on the system by replacing these aging assets with flexible generation. Newer firm generation that is suited to a fast ramping and starting environment will enable more renewables. However, the contingency plan is not free of its own risks as it would also require PUC approval, permitting, and would have a very tight construction timeline. To be in service by the end of 2027 will require this project to face no obstacles or unforeseen issues between now and then.

Therefore, while the Company is doing everything in its power to ensure that sufficient replacement generation is available by December 31, 2027 to retire Kahului, as can be seen above, unforeseen circumstances have put the potential to have such generation at place at severe risk. Therefore, while the Company will continue to plan for a 2027 retirement date, flexibility to allow a December 31, 2028 date will provide assurances that the Company can meet the generation needs of Maui in the event that such replacement generation is not on the system in time.

Hawai'i Island - Hill

The 2027 retirement of the Hill boilers faces many of the same risks as Kahului. As with the Stage 1 and 2 projects on Maui, projects in the pipeline on Hawai'i Island are dealing with delays and request for amendments to PPAs due to the unexpected circumstances discussed above. In fact, two 60 MW solar plus storage projects that would have provided additional capacity margins to facilitate the retirement of the Hill boilers have completely withdrawn from the process and remaining are two 30 MW solar plus storage projects from Stage 1. In June 2022, one of the remaining 30 MW projects, AES Waikoloa Solar, received approval of a second amendment to its PPA which minimizes the effects of a force majeure event due to unanticipated new government regulations and allows for a portion of the project to be placed in-service. Additionally, work has been suspended on Hale Kuawehi Solar, the only other solar plus storage project on the island, as the developer evaluates changes to BESS equipment due to various force majeure events related to transportation disruption resulting from the war in Ukraine, government lockdowns and restrictions in China relating to COVID-19, labor disruptions at equipment suppliers, and unanticipated new government regulations. In light of these circumstances, the developer presented the Company with a proposal to revise pricing and GCOD for the Company's consideration. This proposal is currently under review by the Company. Although Hawaiian Electric is working diligently with the project developer to assist in addressing these matters, the full schedule

[8] *November 2022 Monthly Update*, Docket No. 2021-0024, Exhibit 1 at 8, 9.
[9] *November 2022 Monthly Update*, Docket No. 2021-0024, Exhibit 1 at 16.
[10] See 1) https://www.hawaiianelectric.com/hawaii-island-customers-asked-to-conserve-power-this-week

impacts of these requests are unknown at this time as the anticipated COD is dependent upon reaching timely agreement, receiving PUC approval on any proposed amendment, and no additional unforeseen delays. As noted above, PUC approval of any agreement will be required and the developer has indicated that it may not move forward with the project without such approval.

Stage 1 Renewable Projects on Hawai'i Island

Project	Docket Number	GCOD	Anticipated COD	Current Project Status/Risk(s)
AES Waikoloa	2018-0430	4/21/23	3/9/23	AES has actively evaluated options to mitigate the delays attributed to the PV module Force Majeure event and has contracted with an alternate supplier. All modules have been received. Testing started in Nov. 2022 to support partial commissioning of approximately 21 MW.[8]
Hale Kuawehi Solar	2018-0432	12/2/22	Unknown	The BESS Force Majeure event will require re-engineering of the PV BESS Inverter system and model updates. The GCOD will be missed, and the Seller is unable to determine the full extent of the delay at this time due to the BESS related Forced Majeure notice. Proposal for a price increase request received in Sep. 2022 and negotiations for a PPA amendment are ongoing.[9]

The Company issued the Stage 3 Hawai'i Island RFP on November 21, 2022. This RFP specifically seeks proposals to acquire up to 325 GWh/year of energy, and up to 65 MW of capacity to meet potential energy reserve margin needs for Hawai'i Electric Light's system. The Company has issued this RFP for additional resources to be in place by 2030 in anticipation of the 60 MW Hamakua Energy Partners PPA expiring in 2030 and the 20.5 MW Pakini Nui wind farm PPA expiring in 2027. Extending the shutdown of the Hill boilers from 2027 to 2028 will allow more time for the expected resources from the Stage 3 RFP to reach commercial operations. The need for additional generating resources prior to removing any existing generating sources was highlighted by recent calls for conservation by Hawaiian Electric to avoid rolling blackouts.[10]

In addition to future resources, Hawai'i Island continues to be impacted by Puna Geothermal Venture (PGV). PGV was shut down in 2018 due to the Kilauea volcano eruption and has been slow to return to service (with partial operations resuming in November 2020). The plant was capable of generating 38 MW prior to the disruption caused by the lava flow. While PGV has been diligently working to increase its capacity, its current capacity is set at 25.7 MW. It is anticipated to reach 30 MW by the end of December 2022, but it is not anticipated to return to the full 38 MW until September of 2023. The Company also executed an Amended and Restated PPA with PGV to increase the capacity of the facility form 38 MW to 46 MW by January 2022 or 18 months from receipt of the PUC approval order, whichever was later. However, this Amended and Restated PPA took over 2.5 years to receive PUC approval on March 16, 2022, subject to conditions. Due to such delays the project expansion has been hampered by the supply chain and shipping disruptions noted above and the developer has requested an amendment to the PPA in order to continue with such expansion. If Hawaiian Electric is able to reach agreement to an amendment and then

2) https://www.hawaiianelectric.com/conservation-alert-hawaii-island-customers-asked-to-reduce-electricity-use-from-5-9-pm-tonight

3) https://www.hawaiianelectric.com/conservation-alert-hawaii-island-customers-asked-to-reduce-electricity-use-until-9-pm-tonight

In addition to future resources, Hawai'i Island continues to be impacted by Puna Geothermal Venture (PGV). PGV was shut down in 2018 due to the Kilauea volcano eruption and has been slow to return to service (with partial operations resuming in November 2020). The plant was capable of generating 38 MW prior to the disruption caused by the lava flow. While PGV has been diligently working to increase its capacity, its current capacity is set at 25.7 MW. It is anticipated to reach 30 MW by the end of December 2022, but it is not anticipated to return to the full 38 MW until September of 2023. The Company also executed an Amended and Restated PPA with PGV to increase the capacity of the facility form 38 MW to 46 MW by January 2022 or 18 months from receipt of the PUC approval order, whichever was later. However, this Amended and Restated PPA took over 2.5 years to receive PUC approval on March 16, 2022, subject to conditions. Due to such delays the project expansion has been hampered by the supply chain and shipping disruptions noted above and the developer has requested an amendment to the PPA in order to continue with such expansion. If Hawaiian Electric is able to reach agreement to an amendment and then receive PUC approval of such amendment, it is anticipated that the earliest the expansion would reach commercial operations is 36 months after such approval, which in a best-case scenario would move this to 2026 or 2027.

The Company's assessment of Hawai'i Island's capacity needs indicates that at least one of the 30 MW solar plus storage resources must be added and replacement generation for the potential loss of the Hamakua Energy Partners power plant and Pakini Nui wind farm to meet its minimum reliability planning criteria if the Hill boilers are removed from the system. If system conditions change (i.e., higher than forecasted load growth, declining performance of other resources, adverse weather conditions) or the resource technologies change or are further delayed, the required portfolio of resources to support retirement of the Hill boilers may be subject to change.

Therefore, similar to Maui, while the Company is working diligently to have replacement generation on the system prior to December 31, 2027 in order to retire the Hill boilers, the Company is seeking a one year extension in the event that due to aforementioned unforeseen circumstances such generation is not in place by December 31, 2027.

As requested by Mr. Michael Madsen of your office, Hawaiian Electric will submit significant modification applications for revisions to the boiler shutdown dates within the Kahului and Hill CSPs before the end of 2022.

Conclusion

Based on the circumstances set forth above, as well as the additional confirmation from the EPA regarding unit shutdown dates, Hawaiian Electric requests that the shutdown dates of the Kahului and Hill units reflected in the most current CSPs be extended to December 31, 2028. This extension is required to assure the continued ability of the Company to have the flexibility to meet the demand for generation on Maui and Hawai'i Island and will still allow the State to comply with the requirements of the Regional Haze Rule for the second planning period.

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2) https://www.hawaiianelectric.com/conservation-alert-hawaii-island-customers-asked-to-reduce-electricity-use-from-5-9-pm-tonight
3) https://www.hawaiianelectric.com/conservation-alert-hawaii-island-customers-asked-to-reduce-electricity-use-until-9-pm-tonight

Should you have any questions or concerns, please contact Marisa Melzer at [redacted] or [redacted]

Sincerely,

Ec: Marianne Rossio [redacted]
Michael Madsen [redacted]
Lyle T. Leonard [redacted]
Dale Hamamoto [redacted]
Colin Erickson [redacted]
Clayton Takamoto [redacted]

Attachment G:
Revised Cost Tables for Regional Haze Maalaea Generating Station on January 20, 2023

KARIN KIMURA
Director
Environmental Division

January 20, 2023

SENT VIA EMAIL [redacted]

Ms. Marianne Rossio
Clean Air Branch
State of Hawai'i Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawai'i 96782

Subject: Revised Cost Tables for Regional Haze
Maalaea Generating Station (Maalaea)
Maui Electric Company, Ltd.

Dear Ms. Rossio:

In order to address the Department of Health's (DOH) response to comments in the recent *Hawaii State Department of Health Regional Haze State Implementation Plan Second Planning Period* (SIP) dated August 12, 2022, and subsequent discussions with DOH, Hawaiian Electric is providing updated cost estimates for the Maalaea Regional Haze Four-Factor Analysis Cost Effectiveness of Selective Catalytic Reduction (SCR) on units M1 – M13, X1, and X2. Attached for your reference is a revised Table 4-3 (Revised 1/13/2023) which reflects the updated estimates.

Based on these updated estimates, Hawaiian Electric[1] (Company) formally requests that the DOH include in the SIP staggered shutdown dates for the Maalaea units M10 – M13. These proposed shutdown dates impact the cost effectiveness of SCR and ultimately provide an overall benefit to the Regional Haze program while affording electric grid reliability for Hawaiian Electric and its customers on the island of Maui. Hawaiian Electric proposes the following shutdown dates for the Maalaea units M10 – M13:

- M10 and M11: December 31, 2032 with a remaining useful life of 5 years
- M12 and M13: December 31, 2037 with a remaining useful life of 10 years

The remaining useful life for all other units continues to be 20 years. Supporting information for Hawaiian Electric's request is below.

The Company provides Table 4-3, NO_X Cost Effectiveness of SCR on the Maalaea Diesel Engine Generators (Revised 1/13/2023), which updates the cost tables for the Maalaea Four-Factor Analysis and is the underlying basis for the estimates with respect to the

[1] "Hawaiian Electric" or the "Company" refers to Hawaiian Electric Company, Inc. (or "HE"), Hawai'i Electric Light Company, Inc. (or "HL") and/or Maui Electric Company, Limited (or "ME"). On December 20, 2019, the State of Hawai'i Department of Commerce and Consumer Affairs ("DCCA") approved Hawaiian Electric Company, Inc., Hawai'i Electric Light Company, Inc. and Maui Electric Company, Limited's application to do business under the trade name "Hawaiian Electric" for the period from December 20, 2019 to December 19, 2024. See Certificate of Registration No. 4235929, filed December 20, 2019 in the Business Registration Division of the DCCA.

proposed shutdown schedule. Based on the table, the updated costs for SCR for each unit exceeds the $5,800/ton threshold established by DOH in the current SIP document, including M7. The cost effectiveness for M10 - M13, exceed the threshold in part because the Company is committing to staggered shutdowns for those units in 2032 (for M10 and M11) and 2037 (for M12 and M13).

The estimated costs for these units are:

Unit	Remaining Useful Life (years)	Proposed Shutdown Date	Cost Effectiveness ($/ton)
M10	5	2032	6,505
M11	5	2023	7,457
M12	10	2037	7,408
M13	10	2037	7,168

Hawaiian Electric previously used an internal engineering report prepared by Black and Veatch in 2012 to estimate the capital costs of installing SCR systems for the Maalaea engines. Annual operating costs were estimated based on the Environmental Protection Agency's (EPA) technical support document dated 2015.[3] Due to comments to the SIP regarding the costs and age of the estimates, Hawaiian Electric prepared updated cost estimates.

The updated capital cost estimates for the installation of SCR are based on vendor quotes and estimates obtained in 2022 specifically for installation at Maalaea for units M1 - M13, X1 and X2. Annual operating and maintenance costs estimates used in Table 4-3 are based on the average costs incurred for SCR operation at Hawaiian Electric's Schofield Generating Station between from 2020 through 2022 and vendor estimates on costs and recommendations on maintenance frequency. These costs were reflected in the Cost Calcs tab of the attached workbook.

Given the ongoing challenges of maintaining older units such as the Maalaea Mitsubishi engines (units M10 - M13) outlined in Hawaiian Electric's Regional Haze Boiler Shutdown Extension Request for the Kahului and Kanoelehua-Hill Generating Station boiler units dated December 2, 2022 and the cost effectiveness numbers based on the updated information and vendor estimates, Hawaiian Electric proposes to shut down the M10 – M13 units in a phased manner to continue to provide flexibility and reliability for the Maui electric grid as fossil fuel units are retired and renewable generation projects are added. The cost effectiveness calculations have been updated to reflect these shutdowns based on the useful life in accordance with a Regional Haze guidance and 40 CFR Appendix Y to Part 51 which indicates that the useful life would run from the date that the controls would have been installed.[6] An emissions controls operating date of December 31, 2027 was determined to be

[3] Assessment of Non-EGU NOX Emission Controls, Cost of Controls, and Time for Compliance, Technical Support Document (TSD) for the Cross-State Air Pollution Rule for the 2008 Ozone NAAQS Docket ID No. EPA-HQ-OAR-2015-0500, November 2015.

[6] 2. For purposes of these guidelines, the remaining useful life is the difference between:
(1) The date that controls will be put in place (capital and other construction costs incurred before controls are put in place can be rolled into the first year, as suggested in EPA's OAQPS Control Cost Manual); you are conducting the BART analysis; and (2) The date the facility permanently stops operations. Where this affects the BART determination, this date should be assured by a federally- or State-enforceable restriction preventing further operation. 40 C.F.R. § Pt. 51, App. Y (IV)(D)(4)(k)(2)(2).

appropriate by the DOH as stated in its State Implementation Plan[7] for the operation of SCR at M7; therefore, the SCR operation date of December 31, 2027 for units M10 - M13 was used.

For units M10 and M11, Hawaiian Electric proposes a shutdown date of December 31, 2032 with a remaining useful life of 5 years. For units M12 and M13, Hawaiian Electric proposes a shutdown date of December 31, 2037 with a remaining useful life of 10 years. The remaining useful life for all other units continues to be 20 years.

The DOH recognized in the SIP that enforceable shutdowns were acceptable control measures (SIP at p. 74) and that EPA guidance allows the use of an enforceable shutdown date as the end of the remaining useful life (SIP at p.104). The Company's position on post-2028 shutdowns is further supported by the August 20, 2019 *Guidance on Regional Haze State Implementation Plans for the Second Implementation:*

> a state may be able to justify not selecting a source for analysis of control measures because there is an enforceable requirement for the source to cease operation by a date after 2028. The remaining useful life factor is closely related to the cost of compliance factor, with the calculated cost of compliance generally increasing with a shorter remaining useful life based on the decreasing amortization period. August 20, 2019 *Guidance* p. 20-21

Although the Guidance also recognizes that the further removed from 2028 the more complex this decision becomes, in this instance the dates are 4 and 10 years removed from 2028 and indicate that the cost threshold is significantly exceeded. Here the shutdown of these facilities will still advance the Regional Haze rule requirement for visibility improvement and reduce additional emissions including those associated with the Maalaea M10 – M13 units. The DOH determined in the SIP that Reasonable Progress would be met before imposing any controls on the Maalaea Generating Station units. The shutdown of units M10 – M13 without the requirement to include SCR are also a significant cost savings to Maui customers for an electric system that is already recognized to have some of the higher rates in the country.

As such the Company is willing to accept amendments to the Maalaea Covered Source Permit to incorporate enforceable shutdowns, provided the DOH finds that based on the provided cost-effective tables SCR should not be required for the short remaining useful life of these units. Additionally, based on the updated cost estimates, using the default 20 year remaining useful life, the remainder of the units also exceed the threshold and no SCR controls should be required at Maalaea.

Please find the enclosed tables and workbook revised on January 13, 2023.

[7] Hawaii's Regional Haze State Implementation Plan, DOH, August 11, 2022.

Should you have any questions or concerns, please contact Marisa Melzer at [redacted] or [redacted]

Sincerely,

Enclosure: Revised SCR Cost Tables for Maalaea Diesel Engine Generators 2022 Dollars (Revised January 13, 2023)

Attachment: Revised Excel Workbook, Maalaea DG SCR Costing Tables 2022 Dollars (Revised January 13, 2023)

Ec w/ Encl and Att:
Michael Madsen ([redacted])
Dale Hamamoto ([redacted])
Colin Erickson ([redacted])
Clayton Takamoto ([redacted])

Table 4-3. NO_X Cost Effectiveness of SCR on the Maalaea Diesel Engine Generators (Revised 1/13/2023)

	Design Nominal Output (MW)	Nominal Engine Power (Hp)	Control Option	2017 NO_X Emissions [A] (tpy)	2017 Operating Hours (hrs/yr)	2017 Generation (MWh)	Control Efficiency	Controlled NO_X Emissions (tpy)	NO_X Reduced (tpy)	Remaining Useful Life (years)	Capital Recovery [B] ($)	Annual Operating Cost [C] ($)	Annual SCR Maint. Cost [D] ($)	Total Annualized Cost [E] ($)	NO_X Cost Effectiveness ($/ton)
M1	2.5	3,600	SCR	10.0	346.4	618	90%	1.0	9.0	20	396,568	8,283	Not Applicable	404,851	44,983
M2	2.5	3,600	SCR	5.8	206.8	360	90%	0.6	5.2	20	396,568	4,823	Not Applicable	401,392	76,895
M3	2.5	3,600	SCR	10.0	340.9	617	90%	1.0	9.0	20	396,568	8,273	Not Applicable	404,841	44,982
M4	5.6	7,762	SCR	80.8	1,698.0	5,007	90%	8.1	72.7	20	436,754	238,799	31,564	707,116	9,724
M5	5.6	7,762	SCR	82.7	1,110.0	3,816	90%	8.3	74.4	20	436,754	238,799	31,564	707,116	9,500
M6	5.6	7,762	SCR	61.1	1,252.0	3,787	90%	6.1	55.0	20	436,754	238,799	31,564	707,116	12,859
M7	5.6	7,762	SCR	122.9	1,299.0	4,268	90%	12.3	110.6	20	436,754	238,799	31,564	707,116	6,393
M8	5.6	7,798	SCR	61.3	1,257.0	3,795	90%	6.1	55.2	20	600,934	238,799	41,437	881,169	15,972
M9	5.6	7,798	SCR	102.2	1,929.0	6,330	90%	10.2	92.0	20	600,934	238,799	41,437	881,169	9,580
M10	12.5	17,520	SCR	580.3	5,335.8	39,885	90%	58.0	522.3	5	1,660,578	1,462,344	274,480	3,397,402	6,505
M11	12.5	17,520	SCR	506.2	4,677.7	34,881	90%	50.6	455.6	5	1,660,578	1,462,344	274,480	3,397,402	7,457
M12	12.5	17,520	SCR	405.9	5,291.4	39,691	90%	40.6	365.3	10	969,406	1,462,344	274,480	2,706,229	7,408
M13	12.5	17,520	SCR	419.5	4,944.2	38,309	90%	42.0	377.6	10	969,406	1,462,344	274,480	2,706,229	7,168
X1	2.5	3,600	SCR	5.2	235.0	645	90%	0.5	4.7	20	556,689	8,656	Not Applicable	565,345	120,800
X2	2.5	3,600	SCR	5.3	228.6	649	90%	0.5	4.8	20	556,689	8,700	Not Applicable	565,389	118,530

[A] Calendar year 2017 actual emissions from the 2018 Criteria Pollutant Annual Fee Summary for Covered Sources (Form F-1CP).

[B] Capital recovery is based on a cost were developed by Hawaiian Electric's Engineering Department for installation in 2025. See Appendix A for details.

[C] Annual operating cost were developed by Hawaiian Electric's Engineering Department. See Appendix A for details.

[D] Annual SCR Maint. Cost is based on a cost were developed by Hawaiian Electric's Engineering Department. See Appendix A for details.

[E] Total Annualized Cost = Capital Recovery + Annual SCR Maint. Cost + Annual Operating Cost

Note: The Remaining Useful Life for M10 and M11 are based on shutdown in 2032 and 2037 for M12 and M13.

Attachment H:
Revised Cost Tables For
Maalaea Generating Station
on March 6, 2023

KARIN KIMURA
Director
Environmental Division

March 6, 2023

SENT VIA EMAIL [redacted]

Ms. Marianne Rossio
Clean Air Branch
State of Hawai'i Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawai'i 96782

Subject: Revised Cost Tables for Regional Haze
Maalaea Generating Station (Maalaea)
Maui Electric Company, Ltd.

Dear Ms. Rossio:

On January 27, 2023, the Department of Health (DOH) and Hawaiian Electric[1] met via video conference to discuss revisions to Table 4-3, NO_X Cost Effectiveness of SCR on the Maalaea Diesel Engine Generators (Revised 1/13/2023) based on more recent estimates and proposed shutdown dates for Maalaea units M10 – M13 that were submitted on January 20, 2023. The shutdown dates were proposed pursuant to guidance in various Regional Haze documents that permit enforceable shut down dates in lieu of adding control equipment to comply with the Regional Haze Rule (RHR).

During this meeting, the DOH informed Hawaiian Electric that the cost effectiveness threshold of $5,800/ton and interest rate of 5.31% had been adjusted to $6,800/ton and the interest rate was increased to 7.5% due to inflation. Based on this new information, Hawaiian Electric re-evaluated the cost effectiveness results included in its January 20, 2023 correspondence and proposes the following shutdown dates with their corresponding useful lives for the Maalaea units M7 and M10 through M13. The results are set out in the table below and are based on the attached calculations. Also shown are the resulting cost effectiveness values.

[1] "Hawaiian Electric" or the "Company" refers to Hawaiian Electric Company, Inc. (or "HE"), Hawai'i Electric Light Company, Inc. (or "HL") and/or Maui Electric Company, Limited (or "ME"). On December 20, 2019, the State of Hawai'i Department of Commerce and Consumer Affairs ("DCCA") approved Hawaiian Electric Company, Inc., Hawai'i Electric Light Company, Inc. and Maui Electric Company, Limited's application to do business under the trade name "Hawaiian Electric" for the period from December 20, 2019 to December 19, 2024. See Certificate of Registration No. 4235929, filed December 20, 2019 in the Business Registration Division of the DCCA.

Unit	Remaining Useful Life (years)	Proposed Shutdown Date	Cost Effectiveness based on 2017 Baseline ($/ton)
M7	10	12/31/2037	8,539
M10	5	12/31/2032	7,027 [average of 6,548 (M10) and 7,506 (M11)]
M11	5	12/31/2032	
M12	10	12/31/2037	7,470
M13	10	12/31/2037	7,228

The remaining useful life for all other Maalea units except M10 and M11 continues to be 20 years. The shutdown date for M10 and M11 are 2032 resulting in a remaining useful life of 5 years.

Because generating units M10 and M11 are identical sources (same make, model, and capacity), have identical emissions performance (lb/kWh), and have similar utilitzation, Hawaiian Electric has averaged their cost effectiveness for purposes of evaluating the cost-effectiveness of SCR. The M10 and M11 average cost effectiveness of $7,027 is above the $6,800/ton threshold.[2] Hawaiian Electric believes it is appropriate to average the cost effectiveness for M10 and M11 for the following reasons:

- Because these are identical units, the difference between the calculated individual cost effectiveness of the two units is only an artifact of their slightly different unit run times during the baseline period (2017). Over time, their individual average utilizations and the cost-effectiveness of add-on controls would be expected to be the same.
- The individual cost effectiveness of $6,548/ton for M10 is well above the original cost effectiveness threshold, close to the newly proposed $6,800/ton threshold and the high cost to customers is not warranted given the proposed shutdown in 2032.
- The flexibility to continue to operate these units until 2032, as has been previously stated, is essential to ensure the reliability for the Maui electric grid as fossil fuel units are retired and renewable generation projects are added.

In addition, with respect to M7 given the need for flexibility to maintain the integrity of the grid, Hawaiian Electric requests that the condition for M7 be listed in the alternative, that is Hawaiian Electric will either the install SCR by December 31, 2028, or the unit will continue to run at some level but will be shut down no later than the end of 2037. In either event, the goals of the RHR rule are met, and Hawaiian Electric will have additional flexibility to continue to operate M7 if it appears to be required

Hawaiian Electric provides herewith Table 4-3, NO_X Cost Effectiveness of SCR on the Maalaea Diesel Engine Generators (Revised 2/16/2023), which updates the remaining useful life values and interest rate discussed above. Based on the information in the table, including the updated costs and shutdowns resulting in revised useful lives, SCR for each unit exceeds the revised $6,800/ton threshold established by DOH, including M7.
Please find the enclosed tables and workbook revised on February 16, 2023.

[2] The individual cost effectiveness for M10 and M11 are $6,548/ton and $7,506/ton respectively using 2017 operations as the baseline year and based on the earliest possible shutdown date, 2032, with a remaining useful life of 5 years.

Should you have any questions or concerns, please contact Marisa Melzer at [redacted] or [redacted]

Sincerely,

Enclosure: Revised SCR Cost Tables for Maalaea Diesel Engine Generators 2022 Dollars (Revised February 16, 2023)

Attachment: Revised Excel Workbook, Maalaea DG SCR Costing Tables 2022 Dollars (Revised February 16, 2023)

Ec w/ Encl and Att: Michael Madsen [redacted]
Colin Erickson [redacted]
Clayton Takamoto [redacted]
Lyle T. Leonard [redacted]

Table 4-3. NO_X Cost Effectiveness of SCR on the Maalaea Diesel Engine Generators (Revised 02/16/2023)

	Design Nominal Output (MW)	Nominal Engine Power (Hp)	Control Option	2017 NO_X Emissions [A] (tpy)	2017 Operating Hours (hrs/yr)	2017 Generation (MWh)	Control Efficiency	Controlled NO_X Emissions (tpy)	Remaining Useful Life (years)	NO_X Reduced (tpy)	Capital Recovery [B] ($)	Annual Operating Cost [C] ($)	Annual SCR Maint. Cost [D] ($)	Total Annualized Cost [E] ($)	NO_X Cost Effectiveness ($/ton)
M1	2.5	3,600	SCR	10.0	346.4	618	90%	1.0	20	9.0	412,110	8,283	Not Applicable	420,393	46,710
M2	2.5	3,600	SCR	5.8	206.8	360	90%	0.6	20	5.2	412,110	4,823	Not Applicable	416,933	79,872
M3	2.5	3,600	SCR	10.0	340.9	617	90%	1.0	20	9.0	412,110	8,273	Not Applicable	420,382	46,709
M4	5.6	7,762	SCR	80.8	1,698.0	5,007	90%	8.1	20	72.7	453,870	238,799	31,564	724,233	9,959
M5	5.6	7,762	SCR	82.7	1,110.0	3,816	90%	8.3	20	74.4	453,870	238,799	31,564	724,233	9,730
M6	5.6	7,762	SCR	61.1	1,252.0	3,787	90%	6.1	20	55.0	453,870	238,799	31,564	724,233	13,170
M7	5.6	7,762	SCR	122.9	1,299.0	4,268	90%	12.3	10	110.6	674,086	238,799	31,564	944,448	8,539
M8	5.6	7,798	SCR	61.3	1,257.0	3,795	90%	6.1	20	55.2	624,484	238,799	41,437	904,720	16,399
M9	5.6	7,798	SCR	102.2	1,929.0	6,330	90%	10.2	20	92.0	624,484	238,799	41,437	904,720	9,836
M10	12.5	17,520	SCR	580.3	5,335.8	39,885	90%	58.0	5	522.3	1,682,870	1,462,344	274,480	3,419,694	6,548
M11	12.5	17,520	SCR	506.2	4,677.7	34,881	90%	50.6	5	455.6	1,682,870	1,462,344	274,480	3,419,694	7,506
M12	12.5	17,520	SCR	405.9	5,291.4	39,691	90%	40.6	10	365.3	991,932	1,462,344	274,480	2,728,755	7,470
M13	12.5	17,520	SCR	419.5	4,944.2	38,309	90%	42.0	10	377.6	991,932	1,462,344	274,480	2,728,755	7,228
X1	2.5	3,600	SCR	5.2	235.0	645	90%	0.5	20	4.7	578,506	8,656	Not Applicable	587,162	125,462
X2	2.5	3,600	SCR	5.3	228.6	649	90%	0.5	20	4.8	578,506	8,700	Not Applicable	587,206	123,104

[A] Calendar year 2017 actual emissions from the 2018 Criteria Pollutant Annual Fee Summary for Covered Sources (Form F-1CP).

[B] Capital recovery is based on a cost were developed by Hawaiian Electric's Engineering Department for installation in 2025. See Appendix A for details.

[C] Annual operating cost were developed by Hawaiian Electric's Engineering Department. See Appendix A for details.

[D] Annual SCR Maint. Cost is based on a cost were developed by Hawaiian Electric's Engineering Department. See Appendix A for details.

[E] Total Annualized Cost = Capital Recovery + Annual SCR Maint. Cost + Annual Operating Cost

Note: The Remaining Useful Life for M7, M12, and M13 is based on a shutdown in 2037 and for M10 and M11 are based on shutdown in 2032.

Attachment I:
Hawaiian Electric Regional Haze Rule Extension of Shutdown Dates on October 7, 2024

KARIN KIMURA
Director
Environmental Division

October 7, 2024

SENT VIA EMAIL (marianne.rossio@doh.hawaii.gov)

Ms. Marianne Rossio
Clean Air Branch
State of Hawai'i Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawai'i 96782

Subject: Regional Haze Rule Extension of Shutdown Dates to Assure Reliability of Service
Kahului and Kanoelehua-Hill Generating Stations

Dear Ms. Rossio:

Because of recent events that have emphasized Hawaiian Electric's[1] need to assure reliability on Maui and Hawai'i Island, Hawaiian Electric respectfully requests modifications to the Covered Source Permit Regional Haze Amendments issued on January 16, 2024 to allow the units to operate on a contingency basis under exigent circumstances. The existing Amendments require Kahului and Kanoelehua-Hill Generating Station's boilers to permanently shut down by December 31, 2028. Hawaiian Electric specifically requests revisions to the existing permits to include temporary contingency operations to provide electric resiliency and reliability in the event there are periods of generation need caused by delay in renewable projects or unexpected outages.

Notwithstanding the fact that the temporary contingency periods extend beyond the current shutdown deadlines, they terminate in 2030 or 2031 and under the draft provisions, additional controls as contemplated in the Regional Haze Rule Four-Factor analyses continue to be above the cost threshold for that period. Because the contingencies, if they are ever exercised, are intended to be temporary, there should be little to no effect on reasonable progress.

[1] "Hawaiian Electric" or the "Company" refers to Hawaiian Electric Company, Inc. (or "HE"), Hawai'i Electric Light Company, Inc. (or "HL") and/or Maui Electric Company, Limited (or "ME"). On December 20, 2019, the State of Hawai'i Department of Commerce and Consumer Affairs ("DCCA") approved Hawaiian Electric Company, Inc., Hawai'i Electric Light Company, Inc. and Maui Electric Company, Limited's application to do business under the trade name "Hawaiian Electric" for the period from December 20, 2019 to December 19, 2024. See Certificate of Registration No. 4235929, filed December 20, 2019 in the Business Registration Division of the DCCA.

In summary, to assure reliability, Hawaiian Electric proposes the following contingency measures:

1) Kahului, Maui

   Kahului Units K-1 through K-4 may operate on Fuel oil No. 6 temporarily during periods of generation need until December 31, 2030, with an annual fuel use limit for K-3. All boilers shall be permanently shut down by December 31, 2030.

2) Kanoelehua-Hill, Hawai'i Island

   Kanoelehua-Hill Unit Hill 6 may operate on Fuel oil No. 6 temporarily during periods of generation need, with an annual fuel use limit. Hill 6 shall permanently shut down by June 30, 2031.

The request is described in detail below along with draft permit language.

Background

Hawaiian Electric is currently negotiating Power Purchase Agreements with new power generation projects selected as part of the Stage 3 Requests for Proposals. The Maui and Hawai'i Island projects are expected to be online within the next few years, see table below.

Island	Stage 3 Project	Size	Estimated Completion
Maui	Kuihelani Phase 2 Solar	40 MW + BESS	2027
Maui	Pulehu Solar & Storage	20 MW + BESS	2027
Maui	Ukiu Energy	40 MW	2027
Hawai'i	Keamuku Solar	86 MW + BESS	2030
Hawai'i	Puako Solar	60 MW + BESS	2028
Hawai'i	Kaiwiki Solar	55 MW + BESS	2028

As we have seen with the previous stages, for reasons out of Hawaiian Electric's control including the pandemic, many expected projects may be significantly delayed or canceled. For example, only three of thirteen Stage 2 generation projects that were selected based in part on grid reliability and resilience, are currently either online or expected to be online shortly.

Island	Stage 2 Project	Original Operation Date	Status	Operation Date
Oahu	Kupono Solar	April 2024	In service	June 2024
Oahu	Barber's Point Solar	December 2023	Canceled	--
Oahu	Mehana Solar	March 2022	Canceled	--
Oahu	Kupehau Solar	May 2022	Canceled	--
Oahu	Kaukonahua Solar	--	Canceled	--
Oahu	Waiawa Phase 2 Solar	October 2023	Estimated completion in 2024	--

Island	Stage 2 Project	Original Operation Date	Status	Operation Date
Oahu	Mountain View Solar	May 2023	Estimated completion in 2024	--
Oahu	Mahi Solar	December 2023	Canceled	--
Maui	Kahana Solar	December 2023	Canceled	--
Maui	Kamaole Solar	April 2023	Canceled	--
Maui	Pulehu Solar	April 2023	Canceled	--
Hawai'i Island	Puako Solar	September 2023	Canceled	--
Hawai'i Island	Waikoloa Village	December 2023	Canceled	--

Generation forecast models indicate that if the Stage 3 projects do not come online as scheduled, the Maui and Hawai'i Island grids are in danger of experiencing generation shortfalls or reliability issues that would result in rolling outages for customers. Hawaiian Electric has concerns with completely shutting down Kahului and Kanoelehua-Hill generating units before adequate replacement generation is available and must be able to provide reliable electricity to its customers. The contingency measures are suggested as a method of increasing reliability while still meeting the bounds of the Regional Haze Rule Four-Factor analysis and with little to no effect on attaining reasonable progress.

Hawaiian Electric's Request for Kahului Generating Station

Hawaiian Electric proposes temporary contingency periods that extend beyond 2028 for boilers K-1, K-2, K3, and K-4. Additional controls are not cost effective for the short period of continued contingency operation proposed as shown in the enclosed cost analysis.

The proposed revision is to allow the units to operate within the provisions of the below specified conditions on Fuel oil No. 6 (current fuel) until December 31, 2030, at which time they would shut down permanently. Below are the proposed permit conditions with contingency provisions for Kahului.

Proposed Attachment II – RH, Special Condition C:

1. Boilers K-1 through K-4 shall cease standard operations by December 31, 2028 and permanently shut down by December 31, 2030. During that interim two-year period K-1 through K-4 may temporarily operate during the periods described in C.1.a and C.1.b of this section:
   a. During that interim two year period, in order to avoid power outages, in the event that the Maui System is in an actual, or within twelve hours of a forecasted, generation deficit, boilers K-1 through K-4 may operate on a temporary basis on fuels specified in Attachment II, Special Condition No. B.1 until the capacity level returns to a level that will meet that demand. A generation deficit is defined as a period during which the available generating capacity cannot meet the forecasted system peak demand.
   b. K-1 through K-4 may temporarily operate on fuels specified in Attachment II, Special Condition No. B.1 during that interim period to stabilize the Maui grid during any

limited periods that the Public Safety Power Shutoff Plan is activated on Maui as a wildfire prevention strategy that is designed to shut off power in high-risk areas during extreme weather conditions.

2. For K-3, during the operation described in C.1.a and C.1.b of this section, operation will be limited to 650,000 MMBtu per rolling 12-month period.

Hawaiian Electric has enclosed a cost analysis of potential controls for boilers K-1 through K-4 following the same methodology as used in the Reginal Haze Rule Four-Factor analyses previously submitted to the Department of Health but reflecting the shortened remaining equipment life proposed. Given that the current requirement is to shutdown K-1 through K-4 by December 31, 2028, Hawaiian Electric for these purposes assumes that if controls were to be required, December 31, 2028 would be a reasonable date for the DOH to require these controls. This analysis demonstrates that no additional emissions controls are cost-effective for the short period of continued potential operation after 2028 during which controls, if required, could be in place.

Hawaiian Electric's Request for Kanoelehua-Hill Generating Station

Hawaiian Electric proposes a temporary contingency period allowing Hill 6 to continue to operate past 2028 on its current fuel, on a contingency basis, to June 30, 2028 with a reduced allowable maximum heat input. As with Kahului, additional controls are not cost effective for the short period of proposed operation for Hill 6.

No changes are proposed for Hill 5 which will discontinue operation as currently required December 31, 2028. Below are the proposed changes for Hill 6.

Proposed Attachment II – RH, Special Condition C:

1. Boiler Hill 5 shall be permanently shut down by December 31, 2028.
2. Boiler Hill 6 shall cease standard operations by December 31, 2028 and operate only during periods specified in C.2.a of this section. Hill 6 shall be permanently shut down by June 30, 2031.
    a. a. During that interim period between January 1, 2029 and June 30, 2031, in order to avoid power outages, in the event that the Hawai‘i Island System is in an actual, or within twelve hours of a forecasted, generation deficit, Hill 6 may operate on a temporary basis until the capacity level returns to a level that will meet that demand. A generation deficit is defined as a period during which the available generating capacity cannot meet the forecasted system peak demand. Operation shall not exceed 650,000 MMBtu per rolling 12-month period.

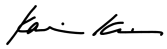
Hawaiian Electric has enclosed a cost analysis of potential controls for Hill 6 following the same methodology as used in the Reginal Haze Rule Four-Factor analyses previously submitted to the DOH. This analysis demonstrates that no additional emissions controls are cost-effective for the short period of continued potential operation proposed.

Conclusion

Hawaiian Electric recognizes that the DOH needs to submit its Regional Haze State Implementation Plan to the EPA and requests the DOH to consider the proposed permit modifications which would provide contingency options for resilience and reliability for the electric grids on Hawai‘i Island and Maui in the event renewable projects are delayed or canceled. These changes are critical to the Company’s ability to serve the Maui and Hawai‘i Island grids reliably in the event that any of the Stage 3 projects are either delayed or canceled.

If you would like to schedule a meeting to discuss the request, please contact Marisa Melzer at (808) 543-4513 or marisa.melzer@hawaiianelectric.com.

Sincerely,



Enclosures: 1) Cost Effectiveness Calculations for K-1 through K-4
2) Cost Effectiveness Calculations for Hill 6

Ec: Michael Madsen (michael.madsen@doh.hawaii.gov)

Enclosure 1
SO_2 and NOx Control Cost Effectiveness Calculations for Kahului Generating Station Units K-1 through K-4 October 2024

Kahului Units K-1 through K-4 are currently required by their permits to permanently shutdown by December 31, 2028 as part of Hawaii's efforts to make reasonable progress with the goals of the Regional Haze Rule (RHR). However, at this time, Hawaiian Electric is requesting revisions to the existing permits for Units K-1 through K-4 to allow temporary contingency operations for a 2-year period from January 1, 2029 to Dec. 31, 2030 to provide electric resiliency and reliability in the event there are periods of generation need caused by delay in renewable projects or unexpected outages.

In order to evaluate whether additional SO_2 or NOx controls might be reasonably cost-effective given this additional period of potential operation, Hawaiian Electric has prepared the attached cost-effectiveness calculations of possible control measures. These calculations follow the methodology used in Hawaiian Electric's previously submitted RHR Four-Factor analyses. Likewise, all the assumptions previously used, remain unchanged except for the use of a shorter period of equipment life (consistent with the proposed contingency period) and a few other modified assumptions specifically noted herein.

These calculations verify that no additional controls are cost-effective for the relatively short duration of proposed continued contingency operation.

Key assumptions/basis for these cost analyses include:

1) The SO_2 control considered is a switch from existing Fuel Oil # 6 (Residual Fuel) to Ultra Low Sulfur Diesel Fuel (ULSD). A fuel switch would also slightly benefit particulate matter (PM) emissions and NOx, which are also included in the cost-analysis.
2) NOx controls considered are combustion controls (low NOx burners), selective non-catalytic reduction (SNCR), selective catalytic reduction (SCR) and combinations of combustion controls with either SNCR or SCR.
3) Cost-effectiveness analysis for K-1, K-2, and K-4 use the 2017 actual firing rate and actual performance as the "baseline" for the cost analysis consistent with the previous Four-Factor analyses. For K-3, Hawaiian Electric is proposing limiting the allowable firing rate to no more than 650,000 MMBtu/yr (rolling 12 month) during this period. This is about half the 2017 firing rate and this lower, proposed, rate is used in the cost analysis.
4) For amortization of capital expenditures, an equipment life of 2 years was used. Given that the current requirement is to shutdown K-1 through K-4 by December 31, 2028, Hawaiian Electric for these purposes assumes that if controls were to be required, December 31, 2028 would be a reasonable date for the Department of Health to require these controls. Additionally, this is consistent with the amount of time Hawaiian Electric would need to implement these controls.
5) All capital costs are conservatively expressed in 2019 Dollars, consistent with earlier Hawaiian Electric RHR Four-factor analyses. Actual capital costs would be greater today.
6) For amortization of capital expenditures, an interest rate of 8.25% was used which is the Hawaiian Electric firm-specific cost of capital as previously documented to Department of Health. However, given the very short equipment life, the interest rate has very little effect

on the annualized value. (For example, an interest rate of 7% would have less than a 2% impact on cost-effectiveness).

7) For evaluation of the costs for switching to ULSD, Hawaiian Electric used average 2023 fuel costs. Additionally, the fuel-switch cost analyses include the previously documented capital expenditures for tank berm lining and atomization equipment needed due to the physical and chemical differences in the fuels.

The following series of tables document the results of the cost-effective analysis and the calculation methods. As these tables show, none of the potential controls is cost-effective. SO_2 control cost-effectiveness for these four boilers ranges from about $8,800/ton to $9,500/ton on an SO_2-only basis and $7,800 to $8,100/ton including the NOx and particulate emissions reductions.

The most cost-effective NOx control would be the addition of combustion controls (LNB). However, for these boilers combustion control costs range from a low of $7,560/ton for K-3 to over $13,000/ton for the other three boilers (K-1, K-2 and K-4).

All of these costs are above levels than Hawaii Department of Health have previously considered reasonable under the RHR program.

Kahului SO2 Potential Controls – Cost Analysis Tables

Table 1-1. SO2 Cost Effectiveness of Switching to ULSD (Updated Oct 2024)

Unit	Current Residual Oil (1.69% actual Sulfur)				ULSD (0.0015% maximum Sulfur)				Cost Difference/Cost-Effectiveness		
	2017 Annual Heat Input (MMBtu/yr)	Annual Fuel Usage (gal/yr)	2017 SO2 Emissions [D] (tpy)	Residual Fuel Cost $/yr	Annual Fuel Usage (gal/yr)	Controlled SO2 Emissions (tpy)	SO2 Reduced (tpy)	ULSD Fuel Cost $/yr	Fuel Cost Differential ($/year)	Total Annual Capital + Fuel Cost $/yr	SO2 Cost Effectiveness ($/ton)
K1	313,473	2,075,864	293.1	$4,042,332	2,272,639	0.24	292.86	$6,263,891	$2,221,560	$2,721,160	9,292
K2	270,907	1,793,982	253.3	$3,493,424	1,964,037	0.21	253.09	$5,413,319	$1,919,894	$2,419,494	9,560
K3 (limited)	*650,000*	4,304,391	607.8	$8,381,946	4,712,412	0.50	607.26	$12,988,443	$4,606,497	$5,587,697	9,202
K4	829,725	5,494,558	775.8	$10,699,560	6,015,398	0.64	775.16	$16,579,758	$5,880,197	$6,861,397	8,852

[A] Based on 2017 average fuel properties and fuel usage (except K3 which is proposed with operation limited to 650,000 MMBtu/yr max.)

[B] Based on 2017 average HHV and density and contract fuel sulfur limit.

[C] Updated fuel cost basis: 2023 Average fuel costs.

[D] Calendar year 2017 actual emissions from the 2018 Criteria Pollutant Annual Fee Summary for Covered Sources (Form F-1CP).

Kahului Table 1-2. Total Cost Effectiveness of Fuel Switching updated Oct 2024

Unit	Control Option	SO_2 Reduced [A]	NO_X Reduced [A]	PM_{10} Reduced [A]	Total SO_2, NO_X, and PM_{10}	Total Annual Cost [B]	Cost Effectiveness (all pollutants)	Cost Effectiveness (SO2 only)
		(ton/yr)	(ton/yr)	(ton/yr)	(ton/yr)	($/yr)	($/ton)	($/ton)
K1	ULSD	292.9	40.1	12.4	345.4	$2,721,160	$7,878	$9,292
K2	ULSD	253.1	38.0	8.9	300.0	$2,419,494	$8,064	$9,560
K3 (limited)[C]	ULSD	607.3	89.1	22.1	718.4	$5,587,697	$7,778	$9,202
K4	ULSD	775.2	82.2	17.6	875.0	$6,861,397	$7,842	$8,852

The SO_2, NO_X are from Tables 1-1 and 2-1 respectively. PM_{10} is from original 4 Factor analysis (and adjusted for K3 based on reduced allowable firing.)

Annual costs for switching to ULSD are from Tables 1-1 and include capital expenditure and fuel cost differential

K3 Unit proposed to be limited to no more than 650,000 MMBtu/yr.

Table 1-3 Capital Costs for ULSD Atomization and Tank Containment Liners

	Cost for Atomization	Tankage Berm Liner	Total: Liner plus Atomization	Capital Cost Annualized
Kahului K-1	$312,000	$575,800	$887,800	$499,600
Kahului K-2	$312,000	$575,800	$887,800	$499,600
Kahului K-3	$496,000	$1,247,700	$1,743,700	$981,200
Kahului K-4	$496,000	$1,247,700	$1,743,700	$981,200

Life	2	yrs
Interest rate	8.25%	Firm-specific cost of capital.
CRF	0.5627	Capital recovery factor

Capital Recovery Factor (CRF) = [I x (1+i)^a]/[(1+i)^a - 1]

Where:

I = Interest Rate (% interest)

a = Equipment life (yrs)

Table 1-4 Fuel Property Data and Fuel Cost Supporting Data (Kahului Station)

	2017 Annual Average [1]		Sulfur Limit	Fuel Cost [2]	
Fuel	(lb/gal)	(Btu/gal)	% S	$/BBL	$/Gal
Residual	8.34	151,009	2.00%	$ 81.79	1.95
ULSD	7.04	137,934	0.0015%	$ 115.76	2.76

1 Calendar year 2017 annual average fuel properties from company records.

2 Updated based on 2023 actual fuel costs

Kahului NOx Potential Controls – Cost Analysis Tables

Kahului Table 2-1. NO_X Cost Effectiveness Summary updated Oct. 2024

Unit	Control Option	2017 NO_X Emissions [A] (tpy)	Controlled Emission Level [B,C] (lb/MMBtu)	2017 Annual Heat Input (MMBtu/yr)	Controlled NO_X Emissions (tpy)	NO_X Reduced (ton/yr)	Total Annual Cost [D,E] ($/yr)	Cost Effectiveness ($/ton)
K1	**Actual 2017 uncontrolled**	**65.8**	**0.42**	**313,473**				
	ULSD [D]	65.8	0.16	313,473	25.7	40.1	$2,721,160	$67,795
	Combustion Controls (LNB)	65.8	0.30	313,473	47.0	18.8	$461,865	$24,595
	SNCR	65.8	0.30	313,473	47.0	18.8	$819,787	$43,654
	SNCR+Combustion Controls	65.8	0.20	313,473	31.3	34.5	$1,281,652	$37,200
	SCR	65.8	0.10	313,473	15.7	50.1	$1,524,306	$30,409
	SCR+Combustion Controls	65.8	0.05	313,473	7.8	58.0	$1,986,171	$34,266
K2	**Actual 2017 uncontrolled**	**62.3**	**0.46**	**270,907**				
	ULSD [D]	62.3	0.18	270,907	24.3	38.0	$2,419,494	$63,666
	Combustion Controls	62.3	0.30	270,907	40.6	21.7	$466,365	$21,527
	SNCR	62.3	0.30	270,907	40.6	21.7	$836,114	$38,595
	SNCR+Combustion Controls	62.3	0.20	270,907	27.1	35.2	$1,302,479	$36,992
	SCR	62.3	0.10	270,907	13.5	48.8	$1,539,737	$31,581
	SCR+Combustion Controls	62.3	0.05	270,907	6.8	55.5	$2,006,102	$36,128
K3	**Actual 2017 uncontrolled**	**292.6**	**0.61**	**960,954**				
		Adjusted Baseline (at 650,000 MMBtu/yr)						
	ULSD [D]	197.9	0.33	650,000	108.9	89.1	$5,587,697	$62,739
	Combustion Controls	197.9	0.30	650,000	97.5	100.4	$759,890	$7,567
	SNCR	197.9	0.30	650,000	97.5	100.4	$1,170,446	$11,656
	SNCR+Combustion Controls	197.9	0.20	650,000	65.0	132.9	$1,930,336	$14,523
	SCR	197.9	0.10	650,000	32.5	165.4	$2,572,490	$15,551
	SCR+Combustion Controls	197.9	0.05	650,000	16.3	181.7	$3,332,381	$18,343
K4	**Actual 2017 uncontrolled**	**182.7**	**0.44**	**829,725**				
	ULSD [D]	182.7	0.24	829,725	100.5	82.2	$6,861,397	$83,457
	Combustion Controls	182.7	0.30	829,725	124.5	58.2	$769,754	$13,217
	SNCR	182.7	0.30	829,725	124.5	58.2	$1,126,025	$19,334
	SNCR+Combustion Controls	182.7	0.20	829,725	83.0	99.7	$1,895,779	$19,010
	SCR	182.7	0.10	829,725	41.5	141.2	$2,573,799	$18,226
	SCR+Combustion Controls	182.7	0.05	829,725	20.7	162.0	$3,343,552	$20,645

[A] Calendar year 2017 actual emissions from the 2018 Criteria Pollutant Annual Fee Summary for Covered Sources (Form F-1CP). (Except K-3 which is based on proposed restricted operation)

[B] The controlled emission level for ULSD is based on the No. 2 fuel oil emission factor from AP-42, Table 1.3-1, dated May 2010.

[C] Controlled emission levels based on "Alternative Control Techniques (ACT) Document – NO_X Emissions from Utility Boiler" EPA, 1994. Same basis as previous RHR 4-Factor

[D] Annual costs for switching to a ULSD are from Tables 1-2.

[E] See Additional tables for total annual cost calculations for other NOx controls

Table 2-2 Combustion Controls Capital and O&M Cost Estimate updated October 2024

Parameters/Costs	Equation	K1	K2	K3	K4
Boiler design capacity, mmBtu/hr (C)		94	94	172	181
2017 Annual Heat Input, MMBtu/yr (H)		313,473	270,907	960,954	829,725
Unit Size, kW (kW)		5,900	6,000	12,700	13,000
Unit Size, MW (MW)		5.9	6.0	12.7	13.0
Capital recovery factor a. Equipment CRF, 2-yr life, 8.25% interest	= [I x (1+i)^a]/[(1+i)^a - 1], where I = interest rate, a = equipment life	0.5627	0.5627	0.5627	0.5627
Cost Index (CI) [A] a. 2019 b. 2004	 607.5 444.2				
Total Capital Investment [B,C] TCI ($)	= $24/kW x kW x (300/MW)^0.359 x (CI_{2019}/CI_{2004})	$793,563	$802,159	$1,297,190	$1,316,750
Direct Annual Operating Costs $/yr Variable O&M Costs [D]	= ($0.08 mills/kW-hr/1000) x (1 kW-hr/10,000 Btu) x H x 10^6 Btu/mmBtu x (CI_{2019}/CI_{2004})	$3,430	$2,964	$10,514	$9,078
Indirect Annual Costs, $/yr 1. Fixed O&M Costs [E]	= $0.36/kW x Nameplate capacity (MW) x (1000 kW/MW) x (300/MW)^0.359 x (CI_{2019}/CI_{2004})	$11,903	$12,032	$19,458	$19,751
2. Capital recovery	= Equipment CRF x TCI	$446,532	$451,369	$729,919	$740,925
Total Annual Cost $/yr	= Direct Annual Costs + Indirect Annual Costs	**$461,865**	**$466,365**	**$759,890**	**$769,754**

Source: All costs were estimated using Section 4.3 and Appendix D of the WRAP guidance document, *Analysis of Combustion Controls for Reducing NOx Emissions from Coal-fired EGUs in the WRAP Region,* dated September 6, 2005. The cost method developed for coal-fired EGUs was utilized for the residual oil-fired boilers being addressed by this report, since the number of EGUs of similar size and fuel type to the boilers being addressed by this report is small and cost estimates are not as established. Further, pulverized coal can burn similar to oil, and thus combustion control system options for both fuel types are similar.

[A] Cost Index: Chemical Engineering Plant Cost Index (CEPCI). Chemical Engineering Journal. Costs expressed in 2019 dollars. (2023 dollars would be ~ 30% higher.)

[B] TCI for LNB and LNB w/over fire air for wall boilers ranges from $6/kW to $24/kW, the high end of the range was used due to Hawaii's remote location. The cost of FGR and OFA are expected to be covered by this range and have an expected similar level of NO_X control.

[C] Scaling factor = (300/Nameplate capacity)^0.359

[D] The variable O&M costs for LNB and LNB w/over fire air for wall boilers ranges from 0.05 mills/kW-hr to 0.08 mills/kW-hr, the high end of the range was used due to Hawaii's remote location. The cost of FGR and OFA are expected to be covered by this range and have an expected similar level of NO_X control.

[E] The fixed O&M costs for LNB and LNB w/over fire air for wall boilers ranges from $0.09/kW to $0.36/kW, the high end of the range was used due to Hawaii's remote location.

Table 2-3 SCR Capital and O&M Cost Estimate Updated Oct. 2024

			K1	K2	K3	K4
MW			5.9	6.0	12.7	13.0
Baseline NOx Emission Rate (lb/MMBtu)			0.42	0.46	0.61	0.44
2017 Annual Heat Input, MMBtu/yr			313,473	270,907	960,954	829,725
Max Heat Input (MMBtu/hr)			94	94	172	181
Capital Recovery Factor (CRF) (2 yr, 8.25% Interest)			0.563	0.563	0.563	0.563
Cost Index [A]						
	2019	607.5				
	1999	390.6				
B =	(lb/MMBtu)		0.42	0.46	0.61	0.44
C =	(%)		90	90	90	90
A =	(kW)		5,900	6,000	12,700	13,000
Z (Eq. 1) =			0.90	0.90	0.92	0.90
Capital Cost (Eq. 2)	($/kW)		$286	$285	$220	$217
Capital Cost (2019)	($)		$2,623,236	$2,656,291	$4,345,933	$4,387,432
Maui Construction Cost Multiplier [B]			1.000	1.000	1.000	1.000
Maui Capital Cost (2019)			$2,623,236	$2,656,291	$4,345,933	$4,387,432
Annualized Capital Cost	($/yr)		$1,476,074	$1,494,674	$2,445,422	$2,468,773
G =			0.38	0.33	0.64	0.52
H =	(MMBtu/hr)		94	94	172	181
D =	($/kW)		$445	$443	$342	$337
Fixed O&M[C] (Eq. 3)	($/yr)		$17,313	$17,532	$28,683	$28,957
Variable O&M Cost (Eq. 4)	($/yr)		$30,918	$27,532	$98,385	$76,068
Total Annual Cost	($/yr)		$1,524,306	$1,539,737	$2,572,490	$2,573,799

Equations used in SCR cost calculations (Table 2-3)

$$Z = \left[(B/1.5)^{0.05} (C/100)^{0.4} \right]$$ Equation 1

$$D = 75 \left\{ 300{,}000 \frac{Z}{A} \right\}^{0.35}$$ Equation 2

Where:

D = Capital cost ($/kW)
B = NO_X (lb/10^6 Btu) at the inlet of the SCR reactor
C = NO_X removal efficiency (%)
A = Plant capacity (kW)

$$E = D \times A \times C$$ Equation 3

Where:

E = Fixed O&M cost ($/yr)
D = Capital cost ($/kW) from Equation 1
A = Plant capacity (kW)
C = A constant, 0.0066 yr-1

$$F = G\{225 \times [0.37B \times H \times (C/100) \times (8760/2000)] \times 1.005 \times 1.05 + 0.025 \times D \times A \times Z + 1.45 \times A\}$$ Equation 4

Where:

F = Variable O&M Cost ($/yr)
G = Annual capacity factor (expressed as a fraction)
B = Inlet NO_X (lb/MMBtu); range of 0.15 - 2.5 lb/MMBtu
H = Heat input (MMBtu/hr)
C = NO_X removal efficiency; range of 80-95%
D = Capital cost ($/kW)
A = Plant capacity (kW)

Capital Recovery Factor (CRF) = [I x (1+i)^a]/[(1+i)^a - 1] CRF = 0.563

Where:

I = Interest Rate (8.25% interest)
a = Equipment life (2 yrs)

Source: *Cost of Selective Catalytic Reduction (SCR) Application for NOx Control on Coal-Fired Boilers*, EPA/600/R-01/087, October 2001. A cost method developed for coal-fired EGUs was utilized for the residual oil-fired boilers being addressed by this report, since the number of EGUs of similar size and fuel type to the boilers being addressed by this report is small and cost estimates are not as established. Further, pulverized coal can burn similar to oil, and thus combustion control system options for both fuel types are similar.

[A] Cost Index: Chemical Engineering Plant Cost Index (CEPCI). Chemical Engineering Journal.

[B] The Maui construction cost multiplier is based on cost of construction geographical multipliers from the *RSMeans Mechanical Cost Data 2016 to account for factors unique to Maui's location plus an additional factor to account for additional Hawaiian Electric loadings and overhead.*

[C] Fixed Costs include elements such as labor, station power, capital additions/improvements

Table 2-4 SNCR Cost Calculation Key Boiler-specific Parameters				
	Maximum Heat Input Rate (QB)	Estimated Actual Annual Fuel Consumption	Inlet NOx Emissions to SNCR	Outlet NOx Emissions from SNCR
	MMBtu/hr	Gallons/yr	Lb/MMBtu	Lb/MMBtu
K-1	94	2,075,864	0.42	0.3
K-2	94	1,793,982	0.46	0.3
K-3	174	4,304,391	0.609	0.3
K-4	181	5,494,558	0.44	0.3

SNCR capital and operating costs are calculated using EPA's SNCR cost spreadsheet available at the following hyperlink which follows the methodology in US EPA's cost control manual..

https://www.epa.gov/sites/default/files/2019-06/scrcostmanualspreadsheet_june-2019vf.xlsm

The next several pages show a printout of that spreadsheet calculating SNCR costs for Kahului K-1 Boiler. The other 3 Kahului boilers are calculated identically except using the different boiler-specific parameters shown in above Table 2-4.

Table 2-5. Kahului K1 - SNCR Costing

Data Inputs

Enter the following data for your combustion unit:

Is the combustion unit a utility or industrial boiler?	Industrial
What type of fuel does the unit burn?	Fuel Oil
Is the SNCR for a new boiler or retrofit of an existing boiler?	Retrofit
Please enter a retrofit factor equal to or greater than 0.84 based on the level of difficulty. Enter 1 for projects of average retrofit difficulty.	1

Complete all of the highlighted data fields:

What is the maximum heat input rate (QB)?	94	MMBtu/hour
What is the higher heating value (HHV) of the fuel?	151,009	Btu/gallon
What is the estimated actual annual fuel consumption?	2,075,864	gallons/year
Is the boiler a fluid-bed boiler?	No	
Enter the net plant heat input rate (NPHR)	11.0000	MMBtu/MW

If the NPHR is not known, use the default NPHR value:

Fuel Type	Default NPHR
Coal	10 MMBtu/MW
Fuel Oil	11 MMBtu/MW
Natural Gas	8.2 MMBtu/MW

Not applicable to units burning fuel oil or natural gas

Type of coal burned: Not Applicable

Enter the sulfur content (%S) = _____ percent by weight

or

Select the appropriate SO_2 emission rate: Not Applicable

Ash content (%Ash): _____ percent by weight

Not applicable to units buring fuel oil or natural gas

Note: The table below is pre-populated with default values for HHV, %S, %Ash and cost. Please enter the actual values for these parameters in the table below. If the actual value for any parameter is not known, you may use the default values provided.

	Fraction in Coal Blend	%S	%Ash	HHV (Btu/lb)	Fuel Cost ($/MMBtu)
Bituminous	0	1.84	9.23	11,841	2.4
Sub-Bituminous	0	0.41	5.84	8,826	1.89
Lignite	0	0.82	13.6	6,626	1.74

Please click the calculate button to calculate weighted values based on the data in the table above.

Table 2-5. Kahului K1 - SNCR Costing

Enter the following design parameters for the proposed SNCR:

Number of days the SNCR operates (t_{SNCR})	365	days
Inlet NO_x Emissions (NOx_{in}) to SNCR	0.420	lb/MMBtu
Oulet NO_x Emissions (NOx_{out}) from SNCR	0.3	lb/MMBtu
Estimated Normalized Stoichiometric Ratio (NSR)	1.22	
Concentration of reagent as stored (C_{stored})	29	Percent
Density of reagent as stored (ρ_{stored})	56	lb/ft^3
Concentration of reagent injected (C_{inj})	10	percent
Number of days reagent is stored ($t_{storage}$)	14	days
Estimated equipment life	2	Years
Select the reagent used	Ammonia	

Plant Elevation	10	Feet above sea level

Densities of typical SNCR reagents:

50% urea solution	71 lbs/ft^3
29.4% aqueous NH_3	56 lbs/ft^3

Enter the cost data for the proposed SNCR:

Desired dollar-year	2019				
CEPCI for 2019	607.5	Enter the CEPCI value for 2019	541.7	2016 CEPCI	CEPCI = Chemical Engineering Plant Cost Index
Annual Interest Rate (i)	8.25	Percent			
Fuel ($Cost_{fuel}$)	10.13	$/MMBtu			Actual Data Used
Reagent ($Cost_{reag}$)	0.293	$/gallon for a 29 percent solution of ammonia			Default Value Used
Water ($Cost_{water}$)	0.0042	$/gallon			Default Value Used
Electricity ($Cost_{elect}$)	0.2521	$/kWh			Actual Data Used
Ash Disposal (for coal-fired boilers only) ($Cost_{ash}$)		$/ton			

Note: The use of CEPCI in this spreadsheet is not an endorsement of the index, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Maintenance and Administrative Charges Cost Factors:

Maintenance Cost Factor (MCF) =	0.015
Administrative Charges Factor (ACF) =	0.03

Table 2-5. Kahului K1 - SNCR Costing

Data Sources and Default Values Used in Calculations:

Data Element	Default Value	Sources for Default Value	If you used your own site-specific values, please enter the value used and the reference source . . .
Reagent Cost ($/gallon)	$0.293/gallon of 29% Ammonia	U.S. Geological Survey, Minerals Commodity Summaries, January 2017 (https://minerals.usgs.gov/minerals/pubs/commodity/nitrogen/mcs-2017-nitro.pdf	
Water Cost ($/gallon)	0.00417	Average water rates for industrial facilities in 2013 compiled by Black & Veatch. (see 2012/2013 "50 Largest Cities Water/Wastewater Rate Survey." Available at http://www.saws.org/who_we_are/community/RAC/docs/2014/50-largest-cities-brochure-water-wastewater-rate-survey.pdf.	
Electricity Cost ($/kWh)	0.2521	U.S. Energy Information Administration. Electric Power Monthly with Data for September 2019. Table 5.6.a for Hawaii Industrial Sector.	
Fuel Cost ($/MMBtu)	10.13	2019 Fuel Cost	
Ash Disposal Cost ($/ton)	-	Not applicable	Not Applicable
Percent sulfur content for Coal (% weight)	-	Not applicable	Not Applicable
Percent ash content for Coal (% weight)	-	Not applicable	Not Applicable
Higher Heating Value (HHV) (Btu/gal)	151,009	2017 Annual Average	
Interest Rate (%)		Office of Management and Budget (OMB) default social interest for capital projects	

Table 2-5. Kahului K1 - SNCR Costing

SNCR Design Parameters

The following design parameters for the SNCR were calculated based on the values entered on the *Data Inputs* tab. These values were used to prepare the costs shown on the *Cost Estimate* tab.

Parameter	Equation	Calculated Value	Units	
Maximum Annual Heat Input Rate (Q_B) =	HHV x Max. Fuel Rate =	94	MMBtu/hour	
Maximum Annual fuel consumption (mfuel) =	(QB x 1.0E6 Btu/MMBtu x 8760)/HHV =	5,452,934	gallons/year	
Actual Annual fuel consumption (Mactual) =		2,075,864	gallons/year	
Heat Rate Factor (HRF) =	NPHR/10 =	1.10		
Total System Capacity Factor (CF_{total}) =	(Mactual/Mfuel) x (tSNCR/365) =	0.38	fraction	
Total operating time for the SNCR (t_{op}) =	CF_{total} x 8760 =	3335	hours	
NOx Removal Efficiency (EF) =	(NOx_{in} - NOx_{out})/NOx_{in} =	29	percent	
NOx removed per hour =	NOx_{in} x EF x Q_B =	11.28	lb/hour	
Total NO_x removed per year =	(NOx_{in} x EF x Q_B x t_{op})/2000 =	18.81	tons/year	
Coal Factor ($Coal_F$) =	1 for bituminous; 1.05 for sub-bituminous; 1.07 for lignite (weighted average is used for coal blends)			Not applicable; factor applies only to coal-fired boilers
SO_2 Emission rate =	(%S/100)x(64/32)*($1x10^6$)/HHV =			Not applicable; factor applies only to coal-fired boilers
Elevation Factor (ELEVF) =	14.7 psia/P =			Not applicable; elevation factor does not apply to plants located at elevations below 500 feet.
Atmospheric pressure at 10 feet above sea level (P) =	$2116x[(59-(0.00356xh)+459.7)/518.6]^{5.256}$ x (1/144)* =	14.7	psia	
Retrofit Factor (RF) =	Retrofit to existing boiler	1.00		

* Equation is from the National Aeronautics and Space Administration (NASA), Earth Atmosphere Model. Available at https://spaceflightsystems.grc.nasa.gov/education/rocket/atmos.html.

Table 2-5. Kahului K1 - SNCR Costing

Reagent Data:

Type of reagent used: Ammonia

Molecular Weight of Reagent (MW) = 17.03 g/mole

Density = 56 lb/gallon

Parameter	Equation	Calculated Value	Units
Reagent consumption rate ($m_{reagent}$) =	(NOx_{in} x Q_B x NSR x MW_R)/(MW_{NOx} x SR) = (whre SR = 1 for NH_3; 2 for Urea)	18	lb/hour
Reagent Usage Rate (m_{sol}) =	$m_{reagent}/C_{sol}$ =	61	lb/hour
	(m_{sol} x 7.4805)/Reagent Density =	8.2	gal/hour
Estimated tank volume for reagent storage =	(m_{sol} x 7.4805 x $t_{storage}$ x 24 hours/day)/Reagent Density =	2,800	gallons (storage needed to store a 14 day reagent supply rounded up to the nearest 100 gallons)

Capital Recovery Factor:

Parameter	Equation	Calculated Value
Capital Recovery Factor (CRF) =	$i(1+i)^n/(1+i)^n - 1$ = Where n = Equipment Life and i= Interest Rate	0.5627

Parameter	Equation	Calculated Value	Units	
Electricity Usage: Electricity Consumption (P) =	(0.47 x NOx_{in} x NSR x Q_B)/NPHR =	2.1	kW/hour	
Water Usage: Water consumption (q_w) =	(m_{sol}/Density of water) x ((C_{stored}/C_{inj}) - 1) =	14	gallons/hour	
Fuel Data: Additional Fuel required to evaporate water in injected reagent (ΔFuel) =	Hv x $m_{reagent}$ x ($(1/C_{inj})$-1) =	0.14	MMBtu/hour	
Ash Disposal: Additional ash produced due to increased fuel consumption (Δash) =	(Δfuel x %Ash x $1x10^6$)/HHV =	0.0	lb/hour	Not applicable - Ash disposal cost applies only to coal-fired boilers

Table 2-5. Kahului K1 - SNCR Costing

Cost Estimate

Total Capital Investment (TCI)

For Coal-Fired Boilers:

$$TCI = 1.3 \times (SNCR_{cost} + APH_{cost} + BOP_{cost})$$

For Fuel Oil and Natural Gas-Fired Boilers:

$$TCI = 1.3 \times (SNCR_{cost} + BOP_{cost})$$

Capital costs for the SNCR ($SNCR_{cost}$) =	$422,492 in 2019 dollars
Air Pre-Heater Costs (APH_{cost})* =	$0 in 2019 dollars
Balance of Plant Costs (BOP_{cost}) =	$648,510 in 2019 dollars
Total Capital Investment (TCI) =	$1,392,303 in 2019 dollars

* Not applicable - This factor applies only to coal-fired boilers that burn bituminous coal and emits equal to or greater than 0.3lb/MMBtu of sulfur dioxide.

SNCR Capital Costs ($SNCR_{cost}$)

For Coal-Fired Utility Boilers:

$$SNCR_{cost} = 220{,}000 \times (B_{MW} \times HRF)^{0.42} \times CoalF \times BTF \times ELEVF \times RF$$

For Fuel Oil and Natural Gas-Fired Utility Boilers:

$$SNCR_{cost} = 147{,}000 \times (B_{MW} \times HRF)^{0.42} \times ELEVF \times RF$$

For Coal-Fired Industrial Boilers:

$$SNCR_{cost} = 220{,}000 \times (0.1 \times Q_B \times HRF)^{0.42} \times CoalF \times BTF \times ELEVF \times RF$$

For Fuel Oil and Natural Gas-Fired Industrial Boilers:

$$SNCR_{cost} = 147{,}000 \times ((Q_B/NPHR) \times HRF)^{0.42} \times ELEVF \times RF$$

SNCR Capital Costs ($SNCR_{cost}$) =	$422,492 in 2019 dollars

Air Pre-Heater Costs (APH_{cost})*

For Coal-Fired Utility Boilers:

Table 2-5. Kahului K1 - SNCR Costing

$$APH_{cost} = 69{,}000 \times (B_{MW} \times HRF \times CoalF)^{0.78} \times AHF \times RF$$

For Coal-Fired Industrial Boilers:

$$APH_{cost} = 69{,}000 \times (0.1 \times Q_B \times HRF \times CoalF)^{0.78} \times AHF \times RF$$

Air Pre-Heater Costs (APH_{cost}) =	$0 in 2019 dollars

* Not applicable - This factor applies only to coal-fired boilers that burn bituminous coal and emit equal to or greater than 3lb/MMBtu of sulfur dioxide.

Table 2-5. Kahului K1 - SNCR Costing

Balance of Plant Costs (BOP_{cost})

For Coal-Fired Utility Boilers:

$$BOP_{cost} = 320{,}000 \times (B_{MW})^{0.33} \times (NO_x\text{Removed/hr})^{0.12} \times BTF \times RF$$

For Fuel Oil and Natural Gas-Fired Utility Boilers:

$$BOP_{cost} = 213{,}000 \times (B_{MW})^{0.33} \times (NO_x\text{Removed/hr})^{0.12} \times RF$$

For Coal-Fired Industrial Boilers:

$$BOP_{cost} = 320{,}000 \times (0.1 \times Q_B)^{0.33} \times (NO_x\text{Removed/hr})^{0.12} \times BTF \times RF$$

For Fuel Oil and Natural Gas-Fired Industrial Boilers:

$$BOP_{cost} = 213{,}000 \times (Q_B/NPHR)^{0.33} \times (NO_x\text{Removed/hr})^{0.12} \times RF$$

Balance of Plant Costs (BOP_{cost}) =	$648,510 in 2019 dollars

Annual Costs

Total Annual Cost (TAC)

TAC = Direct Annual Costs + Indirect Annual Costs

Direct Annual Costs (DAC) =	$35,712 in 2019 dollars
Indirect Annual Costs (IDAC) =	$784,075 in 2019 dollars
Total annual costs (TAC) = DAC + IDAC	$819,787 in 2019 dollars

Direct Annual Costs (DAC)

DAC = (Annual Maintenance Cost) + (Annual Reagent Cost) + (Annual Electricity Cost) + (Annual Water Cost) + (Annual Fuel Cost) + (Annual Ash Cost)

Annual Maintenance Cost =	0.015 x TCI =	$20,885 in 2019 dollars
Annual Reagent Cost =	$q_{sol} \times Cost_{reag} \times t_{op}$ =	$8,024 in 2019 dollars
Annual Electricity Cost =	$P \times Cost_{elect} \times t_{op}$ =	$1,730 in 2019 dollars
Annual Water Cost =	$q_{water} \times Cost_{water} \times t_{op}$ =	$195 in 2019 dollars
Additional Fuel Cost =	$\Delta Fuel \times Cost_{fuel} \times t_{op}$ =	$4,878 in 2019 dollars

Table 2-5. Kahului K1 - SNCR Costing

Additional Ash Cost =	$\Delta Ash \times Cost_{ash} \times t_{op} \times (1/2000)$ =	$0 in 2019 dollars
Direct Annual Cost =		$35,712 in 2019 dollars

Indirect Annual Cost (IDAC)

IDAC = Administrative Charges + Capital Recovery Costs

Administrative Charges (AC) =	0.03 x Annual Maintenance Cost =	$627 in 2019 dollars
Capital Recovery Costs (CR)=	CRF x TCI =	$783,449 in 2019 dollars
Indirect Annual Cost (IDAC) =	AC + CR =	$784,075 in 2019 dollars

Table 2-5. Kahului K1 - SNCR Costing

Cost Effectiveness		
Cost Effectiveness = Total Annual Cost/ NOx Removed/year		
Total Annual Cost (TAC) =	$819,787	per year in 2019 dollars
NOx Removed =	18.8	tons/year
Cost Effectiveness =	$43,586	per ton of NOx removed in 2019 dollars

Enclosure 2
SO_2 and NOx Control Cost Effectiveness Calculations for Kanoelehua-Hill Generating Station Unit Hill 6 October 2024

Kanoelehua-Hill Unit Hill 6 is currently required by its permits to permanently shutdown by December 31, 2028 as part of Hawaii's efforts to make reasonable progress with the goals of the Regional Haze Rule (RHR). However, at this time, Hawaiian Electric is requesting a revision to the existing permit for Unit Hill-6 to allow temporary contingency operations for a 2.5-year period from January 1, 2029 to June 30, 2031 to provide electric resiliency and reliability in the event there are periods of generation need caused by delay in renewable projects or unexpected outages.

To evaluate whether additional SO_2 or NOx controls might be reasonably cost-effective given this additional period of potential operation, Hawaiian Electric has prepared the attached cost-effectiveness calculations of possible pollution control measures. These calculations follow the methodology used in Hawaiian Electric's previously submitted RHR Four-Factor analyses. Likewise, all the assumptions previously used remain unchanged except for the use of a shorter period of equipment life (consistent with the proposed contingency period) and a few other modified assumptions specifically noted herein.

These calculations verify that no additional controls are cost-effective for the relatively short duration of proposed continued contingency operation.

Key assumptions/basis for these cost analyses include:

1) The SO_2 control considered is a switch from existing Fuel Oil # 6 (Residual Fuel) to Ultra Low Sulfur Diesel Fuel (ULSD). A fuel switch would also slightly benefit particulate matter (PM) emissions and NOx, which are also included in the cost-analysis.
2) NOx controls considered are combustion controls (low NOx burners), selective non-catalytic reduction (SNCR), selective catalytic reduction (SCR) and combinations of combustion controls with either SNCR or SCR.
3) The previous RHR Four-Factor cost-effectiveness analysis for Hill 6 used the 2017 actual firing rate and actual performance as the "baseline". However, for Hill 6's operation during the requested 2.5 year contingency period, Hawaiian Electric is proposing limiting the allowable firing rate to no more than 650,000 MMBtu/yr (rolling 12 month). This is less than half the 2017 firing rate and this lower proposed rate is used in the cost analysis.
4) For amortization of capital expenditures, an equipment life of 2.5 years was used. Given that the current requirement is to shutdown Hill 6 by December 31, 2028, Hawaiian Electric for these purposes assumes that if controls were to be required, December 31, 2028 would be a reasonable date for the Department of Health to require these controls. Additionally, this is consistent with the amount of time Hawaiian Electric would need to implement these controls.
5) All capital costs are conservatively expressed in 2019 Dollars, consistent with earlier Hawaiian Electric RHR Four-Factor analyses. Actual capital costs would be greater today.
6) For amortization of capital expenditures, an interest rate of 8.25% was used which is the Hawaiian Electric firm-specific cost of capital as previously documented to Department of Health. However, given the very short equipment life, the interest rate has very little effect on the annualized value. (For example, an interest rate of 7% would have less than a 2% impact on cost-effectiveness).
7) For evaluation of the costs for switching to ULSD, Hawaiian Electric used average 2023 fuel costs. Additionally, the fuel-switch cost analysis includes the previously documented capital

expenditures for tank berm lining and atomization equipment needed due to the physical and chemical differences in the fuels.

The following series of tables document the results of the cost-effective analysis and the calculation methods. As these tables show, none of the potential controls is cost-effective. SO_2 control cost-effectiveness for switching to low sulfur diesel for this boiler is $10,200/ton on an SO_2-only basis and $9,500 including the NOx and particulate emissions reductions.

The most cost-effective NOx control would be the addition of combustion controls (LNB). However, for this boiler, the cost for combustion controls is $7,200/ton based on maximum firing rate limit proposed for this unit. All other NOx controls are even more expensive on a $/ton basis.

These costs are above levels than Hawaii Department of Health have previously considered reasonable under the RHR program.

Kanoelehua-Hill Unit 6 SO_2 Potential Controls – Cost Analysis Tables

Table 3-1 SO_2 Cost Effectiveness of Switching to ULSD Updated Oct. 2024

	Current Residual Oil (1.69% actual sulfur)				ULSD (0.0015% maximum Sulfur)				Cost Difference/Cost-Effectiveness			
Unit	2017 Annual Heat Input (MMBtu/yr)	Annual Fuel Usage (gal/yr)	SO_2 Emissions (tpy)	Residual Fuel Cost $/yr	Annual ULSD Fuel Usage (gal/yr)	Controlled SO_2 Emissions (tpy)	SO_2 Reduced (tpy)	ULSD Fuel Cost $/yr	Fuel Cost Differential ($/year)	Annualized Capital Cost $/yr	Total Annual Cost $/yr	SO2 Cost Effectiveness ($/ton)
Hill 6	650,000	4,305,058	607.2	$8,383,245	4,690,990	0.50	606.70	$12,929,399	$4,546,154	$1,629,300	$6,175,454	$10,179

A Based on 2017 average fuel properties except Hill 6 heat input which is proposed with operation limited to 650,000 MMBtu/yr max.

B Based on 2017 average HHV and density and contract fuel sulfur limit.

C Updated fuel cost basis: 2023 average fuel costs.

K-Hill Table 3-2 Total Cost Effectiveness of Fuel Switching - Updated Oct. 2024

Unit	Control Option	SO_2 Reduced [A] (ton/yr)	NO_X Reduced [A] (ton/yr)	PM_{10} Reduced [A] (ton/yr)	Total SO_2, NO_X, and PM_{10} Reduced (ton/yr)	Total Annual Cost [B] ($/yr)	Cost Effectiveness (All Pollutants) ($/ton)	Cost Effectiveness (SO2 Only) ($/ton)
Hill 6	ULSD	606.7	31.9	12.4	650.99	$6,175,454	$9,486	$10,179

A The SO2, NOX are from Tables 3-1 and 4-1 respectively. PM10 is from original 4 Factor analysis (and adjusted for Hill 6 based on reduced allowable firing.)

B Annual costs for switching to ULSD are from Tables 3-1 and include capital expenditure and fuel cost differential

Table 3.3 K-Hill Capital Costs for ULSD Atomization and Tank Containment Liners

	Cost for Atomization	Tankage Berm Liner	Total: Liner plus Atomization	Capital Cost Annualized
Hill 5	$519,000	$1,735,600	$2,254,600	$1,034,600
Hill 6	$699,000	$2,851,400	$3,550,400	$1,629,300

Note: Capital costs for ULSD facilities presented to HDOH previously, but annual capital recovery re-calculated based on reduced years of service.

Life	2.5	yrs
Interest rate	8.25%	Firm-specific cost of capital.
CRF	0.4589	Capital recovery factor

Capital Recovery Factor (CRF) = [I x (1+i)^a]/[(1+i)^a - 1]

Where:

I = Interest Rate (%)

a = Equipment Life (yrs)

K- Hil Table 3-4 Fuel Property Data and Fuel Cost Supporting Calculations

	2017 Annual Average [1]		Sulfur Limit	Fuel Cost [2]	
Fuel	(lb/gal)	(Btu/gal)	% S	$/BBL	$/Gal
Residual Oil	8.33	150,985	2.00%	$ 81.79	1.95
ULSD	7.10	138,564	0.0015%	$ 115.76	2.76

1 Calendar year 2017 annual average fuel properties from company records.

2 Based on current (2024 fuel costs)

Kanoelehua-Hill NOx Potential Controls – Cost Analysis Tables

Table 4-1. NO_X Cost Effectiveness Summary Updated October 2024

Unit	Control Option	2017 NO_X Emissions [A] (tpy)	Controlled Emission Level [B,C] (lb/MMBtu)	2017 Annual Heat Input (MMBtu/yr)	Controlled NO_X Emissions (tpy)	NO_X Reduced (ton/yr)	Total Annual Cost [D,E] ($/yr)	Cost Effectiveness ($/ton)
Hill 6	**Actual 2017 uncontrolled**	**353.6**	**0.49**	**1,441,517**				
		Adjusted Baseline (at 650,000 MMBtu/yr)						
	ULSD [D]	159.4	0.39	650,000	127.6	31.9	6,175,454	193,657
	Combustion Controls	159.4	0.20	650,000	65.0	94.4	680,559	7,206
	SNCR	159.4	0.20	650,000	65.0	94.4	1,115,344	11,810
	SNCR+Combustion Controls	159.4	0.15	650,000	48.8	110.7	1,795,904	16,224
	SCR	159.4	0.10	650,000	32.5	126.9	3,110,266	24,501
	SCR+Combustion Controls	159.4	0.05	650,000	16.3	143.2	3,790,825	26,474

[A] Calendar year 2017 actual emissions from the 2018 Criteria Pollutant Annual Fee Summary for Covered Sources (Form F-1CP) adjusted for proposed max. firing

[B] The controlled emission level (lb/mmbtu) consistent with previous Four-Factor analyses submittals to HDOH.

[C] Controlled emission levels based on "Alternative Control Techniques (ACT) Document – NO_X Emissions from Utility Boiler" EPA, 1994.

[D] Annual costs for switching to ULSD are from Tables 3-1.

[E] See the following additional tables for total annual cost calculations for other NOx controls

Table 4-2 Combustion Controls Capital and O&M Cost Estimate

Parameters/Costs	Equation	Hill 6
Boiler design capacity, mmBtu/hr (C)		249
Boiler Type		Tangential
2017 Annual Heat Input, MMBtu/yr (H)		1,441,517
Unit Size, kW (kW)		23,000
Unit Size, MW (MW)		23.0
Capital recovery factor a. Equipment CRF, 2.5-yr life, 8.25% interest	= [I x (1+i)^a]/[(1+i)^a - 1], where I = interest rate, a = equipment life	0.4589
Cost Index (CI) [A] a. 2019 b. 2004	 607.5 444.2	
Total Capital Investment [B,C] TCI ($)	 =$24/kW x kW x (300/MW)^0.359 x (CI_{2019}/CI_{2004}) - Wall =$18/kW x kW x (300/MW)^0.359 x (CI_{2019}/CI_{2004}) - Tangential	 $1,423,621
Direct Annual Operating Costs $/yr Variable O&M Costs [D]	 =($0.08 mills/kW-hr/1000) x (1 kW-hr/10,000 Btu) x H x 10^6 Btu/mmBtu x (CI_{2019}/CI_{2004}) - Wall =$0.03 mills/kW-hr/1000) x (1 kW-hr/10,000 Btu) x H x 10^6 Btu/mmBtu x (CI_{2019}/CI_{2004}) - Tangential	 $5,914
Indirect Annual Costs, $/yr 1. Fixed O&M Costs [E] 2. Capital recovery	 = $0.36/kW x Nameplate capacity (MW) x (1000 kW/MW) x (300/MW)^0.359 x (CI_{2019}/CI_{2004}) - Wall = $0.27/kW x Nameplate capacity (MW) x (1000 kW/MW) x (300/MW)^0.359 x (CI_{2019}/CI_{2004}) - Tangential = Equipment CRF x TCI	 $21,354 $653,291
Total Annual Cost $/yr	=Direct Annual Costs + Indirect Annual Costs	**$680,559**

Source: All costs were estimated using Section 4.3 and Appendix D of the WRAP guidance document, *Analysis of Combustion Controls for Reducing NOx Emissions from Coal-fired EGUs in the WRAP Region,* dated September 6, 2005. The cost method developed for coal-fired EGUs was utilized for the residual oil-fired boilers being addressed by this report, since the number of EGUs of similar size and fuel type to the boilers being addressed by this report is small and cost estimates are not as established. Further, pulverized coal can burn similar to oil, and thus combustion control system options for both fuel types are similar.

[A] Cost Index: Chemical Engineering Plant Cost Index (CEPCI). Chemical Engineering Journal.

[B] TCI for LNB and LNB w/over fire air ranges from $6/kW to $24/kW for wall boilers and $10/kW to $18/kW for tangential boilers, the high end of the range was used due to Hawaii's remote location. The cost of FGR and OFA are expected to be covered by this range and have an expected similar level of NO_X control.

[C] Scaling factor = (300/Nameplate capacity)^0.359

[D] The variable O&M costs for LNB and LNB w/over fire air ranges from 0.05 mills/kW-hr to 0.08 mills/kW-hr for wall boilers and 0.027 mills/kW-hr to 0.03 mills/kW-hr for tangential boilers, the high end of the range was used due to Hawaii's remote location. The cost of FGR and OFA are expected to be covered by this range and have an expected similar level of NO_X control.

[E] The fixed O&M costs for LNB and LNB w/over fire air ranges from $0.09/kW to $0.36/kW for wall boilers and $0.15/kW to $0.27/kW for tangential boilers, the high end of the range was used due to Hawaii's remote location.

Table 4-3 SCR Capital and O&M Cost Estimate Updated October 2024

			Hill 5	Hill 6
MW			14.1	23.0
Baseline NOx Emission Rate (lb/MMBtu)			0.57	0.49
2017 Annual Heat Input, MMBtu/yr			878,441	1,441,517
Max Heat Input (MMBtu/hr)			197	249
Capital Recovery Factor (CRF) (2.5yrs, 8.25% interest)			0.4589	0.4589
Cost Index [A]				
	2019	607.5		
	1999	390.6		
B =		(lb/MMBtu)	0.57	0.49
C =		(%)	90	90
A =		(kW)	14,100	23,000
Z (Eq. 1) =			0.91	0.91
Capital Cost (Eq. 2)		($/kW)	$212	$178
Capital Cost (2019)		($)	$4,646,597	$6,369,287
Hawai'i Island Construction Cost Multiplier [B]			1.000	1.000
Hawai'i Island Capital Cost (2019)			$4,646,597	$6,369,287
Annualized Capital Cost		($/yr)	$2,132,294	$2,922,825
G =			0.51	0.66
H =		(MMBtu/hr)	197	249
D =		($/kW)	$330	$277
Fixed O&M[C] (Eq. 3)		($/yr)	$30,668	$42,037
Variable O&M Cost (Eq. 4)		($/yr)	$84,318	$145,403
Total Annual Cost		**($/yr)**	**$2,247,279**	**$3,110,266**

Equations used in SCR Cost Calculations (Table 4-3)

$$Z = \left[(B/1.5)^{0.05}(C/100)^{0.4}\right]$$ Equation 1

$$D = 75\left\{300{,}000\,\frac{Z}{A}\right\}^{0.35}$$ Equation 2

Where:

D = Capital cost ($/kW)
B = NO_X (lb/10^6 Btu) at the inlet of the SCR reactor
C = NO_X removal efficiency (%)
A = Plant capacity (kW)

$$E = D \times A \times C$$ Equation 3

Where:

E = Fixed O&M cost ($/yr)
D = Capital cost ($/kW) from Equation 1
A = Plant capacity (kW)
C = A constant, 0.0066 yr-1

$$F = G\{225 \times [0.37B \times H \times (C/100) \times (8760/2000)] \times 1.005 \times 1.05 + 0.025 \times D \times A \times Z + 1.45 \times A\}$$ Equation 4

Where:

F = Variable O&M Cost ($/yr)
G = Annual capacity factor (expressed as a fraction)
B = Inlet NO_X (lb/MMBtu); range of 0.15 - 2.5 lb/MMBtu
H = Heat input (MMBtu/hr)
C = NO_X removal efficiency; range of 80-95%
D = Capital cost ($/kW)
A = Plant capacity (kW)

Capital Recovery Factor (CRF) = [I x (1+i)^a]/[(1+i)^a - 1] CRF = 0.4589

Where:

I = Interest Rate (8.25% interest)
a = Equipment life (2.5 yrs)

Source: *Cost of Selective Catalytic Reduction (SCR) Application for NOx Control on Coal-Fired Boilers*, EPA/600/R-01/087, October 2001. A cost method developed for coal-fired EGUs was utilized for the residual oil-fired boilers being addressed by this report, since the number of EGUs of similar size and fuel type to the boilers being addressed by this report is small and cost estimates are not as established. Further, pulverized coal can burn similar to oil, and thus combustion control system options for both fuel types are similar.

[A] Cost Index: Chemical Engineering Plant Cost Index (CEPCI). Chemical Engineering Journal.

[B] The Hawai'i Island construction cost multiplier is based on cost of construction geographical multipliers from the *RSMeans Mechanical Cost Data 2016 to account for factors unique to Maui's location plus an additional factor to account for additional Hawaiian Electric loadings and overhead.*

[B] Fixed Costs include elements such as labor, station power, capital additions/improvements

SNCR Cost Calculation - SNCR capital and operating costs are calculated using EPA's SNCR cost spreadsheet available at the following hyperlink which follows the methodology in US EPA's cost control manual.

https://www.epa.gov/sites/default/files/2019-06/scrcostmanualspreadsheet_june-2019vf.xlsm

The next several pages show a printout of that spreadsheet calculating SNCR capital and operating costs for Hill 6.

Table 4-4 K-Hill - SNCR Costing

Data Inputs - Hill 6 SNCR

Enter the following data for your combustion unit:

Is the combustion unit a utility or industrial boiler? Industrial

What type of fuel does the unit burn? Fuel Oil

Is the SNCR for a new boiler or retrofit of an existing boiler? Retrofit

Please enter a retrofit factor equal to or greater than 0.84 based on the level of difficulty. Enter 1 for projects of average retrofit difficulty. 1

Complete all of the highlighted data fields:

What is the maximum heat input rate (QB)?	249	MMBtu/hour
What is the higher heating value (HHV) of the fuel?	150,985	Btu/gallon
What is the estimated actual annual fuel consumption?	4,305,058	gallons/year
Is the boiler a fluid-bed boiler?	No	
Enter the net plant heat input rate (NPHR)	11.0000	MMBtu/MW

If the NPHR is not known, use the default NPHR value:

Fuel Type	Default NPHR
Coal	10 MMBtu/MW
Fuel Oil	11 MMBtu/MW
Natural Gas	8.2 MMBtu/MW

Not applicable to units burning fuel oil or natural gas

Type of coal burned: Not Applicable

Enter the sulfur content (%S) = percent by weight

or

Select the appropriate SO_2 emission rate: Not Applicable

Ash content (%Ash): percent by weight

Not applicable to units buring fuel oil or natural gas

Note: The table below is pre-populated with default values for HHV, %S, %Ash and cost. Please enter the actual values for these parameters in the table below. If the actual value for any parameter is not known, you may use the default values provided.

	Fraction in Coal Blend	%S	%Ash	HHV (Btu/lb)	Fuel Cost ($/MMBtu)
Bituminous	0	1.84	9.23	11,841	2.4
Sub-Bituminous	0	0.41	5.84	8,826	1.89
Lignite	0	0.82	13.6	6,626	1.74

Please click the calculate button to calculate weighted values based on the data in the table above.

Enter the following design parameters for the proposed SNCR:

Number of days the SNCR operates (t_{SNCR})	365	days
Inlet NO_x Emissions (NOx_{in}) to SNCR	0.491	lb/MMBtu
Oulet NO_x Emissions (NOx_{out}) from SNCR	0.20	lb/MMBtu
Estimated Normalized Stoichiometric Ratio (NSR)	1.22	
Concentration of reagent as stored (C_{stored})	29	Percent
Density of reagent as stored (ρ_{stored})	56	lb/ft^3
Concentration of reagent injected (C_{inj})	10	percent
Number of days reagent is stored ($t_{storage}$)	14	days
Estimated equipment life	2.5	Years
Select the reagent used	Ammonia	

Plant Elevation: 10 Feet above sea level

Densities of typical SNCR reagents:

50% urea solution	71 lbs/ft^3
29.4% aqueous NH_3	56 lbs/ft^3

Enter the cost data for the proposed SNCR:

Desired dollar-year	2019			
CEPCI for 2019	607.5	Enter the CEPCI value for 2019	541.7	2016 CEPCI
Annual Interest Rate (i)	8.25	Percent		
Fuel ($Cost_{fuel}$)	10.80	$/MMBtu		Actual Data Used
Reagent ($Cost_{reag}$)	0.293	$/gallon for a 29 percent solution of ammonia		Default Value Used
Water ($Cost_{water}$)	0.0042	$/gallon		Default Value Used
Electricity ($Cost_{elect}$)	0.0676	$/kWh*		Actual Data Used
Ash Disposal (for coal-fired boilers only) ($Cost_{ash}$)		$/ton		

CEPCI = Chemical Engineering Plant Cost Index

Note: The use of CEPCI in this spreadsheet is not an endorsement of the index, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Maintenance and Administrative Charges Cost Factors:

Maintenance Cost Factor (MCF) =	0.015
Administrative Charges Factor (ACF) =	0.03

Data Sources and Default Values Used in Calculations:

Data Element	Default Value	Sources for Default Value	If you used your own site-specific values, please enter the value used and the reference source . . .
Reagent Cost ($/gallon)	$0.293/gallon of 29% Ammonia	U.S. Geological Survey, Minerals Commodity Summaries, January 2017 (https://minerals.usgs.gov/minerals/pubs/commodity/nitrogen/mcs-2017-nitro.pdf	

Table 4-4 K-Hill - SNCR Costing

Water Cost ($/gallon)	0.00417	Average water rates for industrial facilities in 2013 compiled by Black & Veatch. (see 2012/2013 "50 Largest Cities Water/Wastewater Rate Survey." Available at http://www.saws.org/who_we_are/community/RAC/docs/2014/50-largest-cities-brochure-water-wastewater-rate-survey.pdf.	
Electricity Cost ($/kWh)	0.2521	U.S. Energy Information Administration. Electric Power Monthly with Data for September 2019. Table 5.6.a for Hawaii Industrial Sector.	
Fuel Cost ($/MMBtu)	10.796	2019 Fuel Cost	
Ash Disposal Cost ($/ton)	-	Not applicable	Not Applicable
Percent sulfur content for Coal (% weight)	-	Not applicable	Not Applicable
Percent ash content for Coal (% weight)	-	Not applicable	Not Applicable
Higher Heating Value (HHV) (Btu/gal)	150,985	2017 Annual Average	
Interest Rate (%)	8.25	This is HELCO's firm-specific nominal interest rate. This weighted average cost of capital is from the most recent approval by Public Utility Commission for HELCO. It is the weighted interest rate/cost of capital for project financing based on a split of allowed return on equity (stock), long term dept (bonds) and short term debt (loans).	

Hill 6 SNCR Design Parameters

The following design parameters for the SNCR were calculated based on the values entered on the *Data Inputs* tab. These values were used to prepare the costs shown on the *Cost Estimate* tab.

Parameter	Equation	Calculated Value	Units	
Maximum Annual Heat Input Rate (Q_B) =	HHV x Max. Fuel Rate =	249	MMBtu/hour	
Maximum Annual fuel consumption (mfuel) =	(QB x 1.0E6 Btu/MMBtu x 8760)/HHV =	14,446,714	gallons/year	
Actual Annual fuel consumption (Mactual) =		4,305,058	gallons/year	
Heat Rate Factor (HRF) =	NPHR/10 =	1.10		
Total System Capacity Factor (CF_{total}) =	(Mactual/Mfuel) x (tSNCR/365) =	0.30	fraction	
Total operating time for the SNCR (t_{op}) =	CF_{total} x 8760 =	2610	hours	
NOx Removal Efficiency (EF) =	(NOx_{in} - NOx_{out})/NOx_{in} =	59	percent	
NOx removed per hour =	NOx_{in} x EF x Q_B =	72.46	lb/hour	
Total NO_x removed per year =	(NOx_{in} x EF x Q_B x t_{op})/2000 =	94.58	tons/year	
Coal Factor ($Coal_F$) =	1 for bituminous; 1.05 for sub-bituminous; 1.07 for lignite (weighted average is used for coal blends)			Not applicable; factor applies only to coal-fired boilers
SO_2 Emission rate =	(%S/100)x(64/32)*(1x10^6)/HHV =			Not applicable; factor applies only to coal-fired boilers
Elevation Factor (ELEVF) =	14.7 psia/P =			Not applicable; elevation factor does not apply to plants located at elevations below 500 feet.
Atmospheric pressure at 10 feet above sea level (P) =	2116x[(59-(0.00356xh)+459.7)/518.6]$^{5.256}$ x (1/144)* =	14.7	psia	
Retrofit Factor (RF) =	Retrofit to existing boiler	1.00		

* Equation is from the National Aeronautics and Space Administration (NASA), Earth Atmosphere Model. Available at https://spaceflightsystems.grc.nasa.gov/education/rocket/atmos.html.

Reagent Data:

Type of reagent used: Ammonia

Molecular Weight of Reagent (MW) = 17.03 g/mole

Density = 56 lb/gallon

Parameter	Equation	Calculated Value	Units
Reagent consumption rate ($m_{reagent}$) =	(NOx_{in} x Q_B x NSR x MW_R)/(MW_{NOx} x SR) = (whre SR = 1 for NH_3; 2 for Urea)	55	lb/hour
Reagent Usage Rate (m_{sol}) =	$m_{reagent}$/C_{sol} =	190	lb/hour
	(m_{sol} x 7.4805)/Reagent Density =	25.4	gal/hour
Estimated tank volume for reagent storage =	(m_{sol} x 7.4805 x $t_{storage}$ x 24 hours/day)/Reagent Density =	8,600	gallons (storage needed to store a 14 day reagent supply rounded up to the nearest 100 gallons)

Capital Recovery Factor:

Parameter	Equation	Calculated Value
Capital Recovery Factor (CRF) =	i (1+ i)^n/(1+ i)^n - 1 = Where n = Equipment Life and i= Interest Rate	0.4589

Parameter	Equation	Calculated Value	Units	
Electricity Usage: Electricity Consumption (P) =	(0.47 x NOx_{in} x NSR x Q_B)/NPHR =	6.4	kW/hour	
Water Usage: Water consumption (q_w) =	(m_{sol}/Density of water) x ((C_{stored}/C_{inj}) - 1) =	43	gallons/hour	
Fuel Data: Additional Fuel required to evaporate water in injected reagent (ΔFuel) =	Hv x $m_{reagent}$ x ((1/C_{inj})-1) =	0.45	MMBtu/hour	
Ash Disposal: Additional ash produced due to increased fuel consumption (Δash) =	(Δfuel x %Ash x 1x10^6)/HHV =	0.0	lb/hour	Not applicable - Ash disposal cost applies only to coal-fired boilers

Table 4-4 K-Hill - SNCR Costing

Hill 6 SNCR Cost Estimate

Total Capital Investment (TCI)

For Coal-Fired Boilers:

$$TCI = 1.3 \times (SNCR_{cost} + APH_{cost} + BOP_{cost})$$

For Fuel Oil and Natural Gas-Fired Boilers:

$$TCI = 1.3 \times (SNCR_{cost} + BOP_{cost})$$

Capital costs for the SNCR ($SNCR_{cost}$) =	$636,075 in 2019 dollars
Air Pre-Heater Costs (APH_{cost})* =	$0 in 2019 dollars
Balance of Plant Costs (BOP_{cost}) =	$1,118,058 in 2019 dollars
Total Capital Investment (TCI) =	$2,280,373 in 2019 dollars

* Not applicable - This factor applies only to coal-fired boilers that burn bituminous coal and emits equal to or greater than 0.3lb/MMBtu of sulfur dioxide.

SNCR Capital Costs ($SNCR_{cost}$)

For Coal-Fired Utility Boilers:

$$SNCR_{cost} = 220{,}000 \times (B_{MW} \times HRF)^{0.42} \times CoalF \times BTF \times ELEVF \times RF$$

For Fuel Oil and Natural Gas-Fired Utility Boilers:

$$SNCR_{cost} = 147{,}000 \times (B_{MW} \times HRF)^{0.42} \times ELEVF \times RF$$

For Coal-Fired Industrial Boilers:

$$SNCR_{cost} = 220{,}000 \times (0.1 \times Q_B \times HRF)^{0.42} \times CoalF \times BTF \times ELEVF \times RF$$

For Fuel Oil and Natural Gas-Fired Industrial Boilers:

$$SNCR_{cost} = 147{,}000 \times ((Q_B/NPHR) \times HRF)^{0.42} \times ELEVF \times RF$$

SNCR Capital Costs ($SNCR_{cost}$) =	$636,075 in 2019 dollars

Air Pre-Heater Costs (APH_{cost})*

For Coal-Fired Utility Boilers:

$$APH_{cost} = 69{,}000 \times (B_{MW} \times HRF \times CoalF)^{0.78} \times AHF \times RF$$

For Coal-Fired Industrial Boilers:

$$APH_{cost} = 69{,}000 \times (0.1 \times Q_B \times HRF \times CoalF)^{0.78} \times AHF \times RF$$

Air Pre-Heater Costs (APH_{cost}) =	$0 in 2019 dollars

* Not applicable - This factor applies only to coal-fired boilers that burn bituminous coal and emit equal to or greater than 3lb/MMBtu of sulfur dioxide.

Balance of Plant Costs (BOP_{cost})

For Coal-Fired Utility Boilers:

$$BOP_{cost} = 320{,}000 \times (B_{MW})^{0.33} \times (NO_x Removed/hr)^{0.12} \times BTF \times RF$$

For Fuel Oil and Natural Gas-Fired Utility Boilers:

$$BOP_{cost} = 213{,}000 \times (B_{MW})^{0.33} \times (NO_x Removed/hr)^{0.12} \times RF$$

For Coal-Fired Industrial Boilers:

$$BOP_{cost} = 320{,}000 \times (0.1 \times Q_B)^{0.33} \times (NO_x Removed/hr)^{0.12} \times BTF \times RF$$

For Fuel Oil and Natural Gas-Fired Industrial Boilers:

$$BOP_{cost} = 213{,}000 \times (Q_B/NPHR)^{0.33} \times (NO_x Removed/hr)^{0.12} \times RF$$

Balance of Plant Costs (BOP_{cost}) =	$1,118,058 in 2019 dollars

Annual Costs

Total Annual Cost (TAC)

TAC = Direct Annual Costs + Indirect Annual Costs

Table 4-4 K-Hill - SNCR Costing

Direct Annual Costs (DAC) =	$67,855	in 2019 dollars
Indirect Annual Costs (IDAC) =	$1,047,489	in 2019 dollars
Total annual costs (TAC) = DAC + IDAC	$1,115,344	in 2019 dollars

Direct Annual Costs (DAC)

DAC = (Annual Maintenance Cost) + (Annual Reagent Cost) + (Annual Electricity Cost) + (Annual Water Cost) + (Annual Fuel Cost) + (Annual Ash Cost)

Annual Maintenance Cost =	0.015 x TCI =	$34,206 in 2019 dollars
Annual Reagent Cost =	q_{sol} x $Cost_{reag}$ x t_{op} =	$19,450 in 2019 dollars
Annual Electricity Cost =	P x $Cost_{elect}$ x t_{op} =	$1,125 in 2019 dollars
Annual Water Cost =	q_{water} x $Cost_{water}$ x t_{op} =	$472 in 2019 dollars
Additional Fuel Cost =	ΔFuel x $Cost_{fuel}$ x t_{op} =	$12,602 in 2019 dollars
Additional Ash Cost =	ΔAsh x $Cost_{ash}$ x t_{op} x (1/2000) =	$0 in 2019 dollars
Direct Annual Cost =		$67,855 in 2019 dollars

Indirect Annual Cost (IDAC)

IDAC = Administrative Charges + Capital Recovery Costs

Administrative Charges (AC) =	0.03 x Annual Maintenance Cost =	$1,026 in 2019 dollars
Capital Recovery Costs (CR)=	CRF x TCI =	$1,046,463 in 2019 dollars
Indirect Annual Cost (IDAC) =	AC + CR =	$1,047,489 in 2019 dollars

Cost Effectiveness

Cost Effectiveness = Total Annual Cost/ NOx Removed/year

Total Annual Cost (TAC) =	$1,115,344	per year in 2019 dollars
NOx Removed =	95	tons/year
Cost Effectiveness =	$11,793	per ton of NOx removed in 2019 dollars

Attachment J:
CAB Response To Request For Extending Boiler Shutdown Dates on November 18, 2024

JOSH GREEN, M.D.
GOVERNOR OF HAWAI'I
KE KIA'ĀINA O KA MOKU'ĀINA 'O HAWAI'I

KENNETH S. FINK, MD, MGA, MPH
DIRECTOR OF HEALTH
KA LUNA HO'OKELE

STATE OF HAWAII
DEPARTMENT OF HEALTH
KA 'OIHANA OLAKINO
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
File:

24-481E CAB

November 18, 2024

Ms. Karin Kimura
Director, Environmental Division
Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-001

Dear Ms. Kimura:

SUBJECT: Response to Request for Extending Boiler Shutdown Dates Specified in Air Permits for Hawaii's Regional Haze State Implementation Plan

The Department of Health Clean Air Branch (CAB), acknowledges receipt of your letter dated October 7, 2024, requesting an extension of the December 31, 2028, boiler shutdown dates currently specified as regional haze control measures in the Kahului and Kanoelehua-Hill Generating Station air permits. As part of Hawaii's Second Planning Period Regional Haze State Implementation Plan (RH-SIP), these permits were initially issued on August 10, 2022, to incorporate RH requirements. As requested in your letter dated August 11, 2022, the permits were revised and reissued again on January 16, 2024, to extend shutdown dates from December 31, 2027, to December 31, 2028, to accommodate delays in renewable project timelines. Your current request is that CAB modify these permits once more as a contingency to allow:

1) Kahului Generating Station Boilers K-1 through K-4 on Maui Island to burn fuel oil No. 6 temporarily during periods of generation need until December 31, 2030, and permanently shut down the boilers by December 31, 2030; and
2) Kanoelehua-Hill Boiler Hill 6 on Hawaii Island to burn fuel oil No. 6 temporarily during periods of generation need, with an annual fuel use limit and permanently shut down the boiler by June 30, 2031.

According to your letter, additional permit modifications are required to assure reliability for providing power if renewable projects replacing fossil fuel generation are delayed or cancelled. You also indicated that if the renewable projects do not come online as scheduled, the Maui and Hawaii Island grids are in danger of experiencing generation shortfalls or reliability issues that would result in rolling outages for customers.

To comply with U.S. Environmental Protection Agency (EPA) deadlines, CAB submitted the initial RH-SIP and associated permits to EPA on August 12, 2022, and Revision 1 of the RH-SIP, incorporating the December 31, 2028, extension, to EPA on August 2, 2024. EPA is currently working on approving, denying, or partially approving the RH-SIPs that were submitted.

We have reviewed your request, and after discussions with EPA Region 9, determined that performing cost evaluations for your proposal to operate beyond permitted shutdown dates already established in accordance with the RHR, modifying permits and the RH-SIP to reestablish reasonable progress goals, and undergoing another Federal Land Manager (FLM) consultation, public comment, and public hearing participation process would result in EPA issuing Hawaii a "Finding of Failure to Submit." A Finding of Failure to Submit can trigger a number of severe consequences including legal action, sanctions, and loss of federal funding provided to our state. Therefore, CAB is unable to grant your request for this regional haze second planning period (2018 – 2028).

Although your request cannot be granted at this time, CAB may consider your proposal, or other options in place of your proposal, as part of the third regional haze planning period (2028 -2038) RH-SIP. Please note that revising the RH-SIP is a very time intensive undertaking, involving review by the EPA, FLMs, and public prior to finalizing the plan. We understand the need to assure reliability for providing power and we encourage further discussion as well as exploration of alternative contingency measures as discussed at the May 29, 2024, meeting with CAB.

Please refer to the enclosed attachment regarding the timing of your request and the lengthy RH-SIP approval process.

If you have any questions regarding this matter, please contact Mr. Mike Madsen of my staff at (808) 586-4200.

Sincerely,

MARIANNE ROSSIO, P.E.
Manager, Clean Air Branch

MM:rkb

c: Marisa Melzer, Hawaiian Electric Company, Inc.

The timing of your request is after the following events:

1) September 2019 – CAB notified Hawaiian Electric to provide four-factor analyses for the Kahe, Kahului, Kanoelehua-Hill, Puna, Maalaea, and Waiau Generating Stations.

2) 2019 to 2021 – CAB reviewed and corrected multiple revisions to four-factor-analyses deemed incomplete for establishing reasonable progress goals. We ultimately determined that fuel switching to ultra-low sulfur diesel (ULSD) and add-on nitrogen oxide (NO_X) controls were cost effective for boilers at the Kahului and Kanoelehua-Hill Generating Stations. We also found that NO_X controls for the Maalaea Generating Station and a fuel switch for the Puna Generating Station boiler were cost effective.

3) May 2021 – CAB notified Hawaiian Electric of control measures selected for the Kahului, Kanoelehua-Hill, Maalaea, and Puna Generating Stations and requested applications to modify the permits for these facilities.

4) June 2021 – Hawaiian Electric notified CAB that permit applications would not be provided until the RH-SIP is approved. New information was also provided on secondary tank fuel liners and fuel atomization systems for switching fuel to ULSD and the use of higher interest rates for the cost-effectiveness analysis.

5) October 7, 2021 – Hawaiian Electric, at a meeting with CAB, chose to shut down boilers at the Kahului and Kanoelehua-Hill Generating Stations by December 31, 2027, as their regional haze control measure to make reasonable progress.

6) November 2021 – CAB response letter confirms Hawaiian Electric's choice to shut down boilers at the Kahului and Kanoelehua-Hill Generating Stations by December 31, 2027, instead of implementing controls as EPA guidance allows a unit to be excluded from the four-factor analysis if there is a federally enforceable limit to shut down the unit by 2028. The December 31, 2027, deadline was based on a compliance time of up to five years to implement controls for the boilers as indicated in the four-factor analyses. If Hawaiian Electric selected controls, the boilers could operate beyond 2028.

7) March 2022 – CAB initiates the 60-day FLM consultation period in accordance with 40 Code of Federal Regulations (CFR) §51.308(i)(2) and receives comments from the FLMs in May of 2022.

8) June 2022 – Permit modifications, technical support documents, the RH-SIP, and associated appendices were drafted pursuant to the RHR and Hawaii Administrative Rules (HAR) §11-60.1-10. FLM comments were also addressed regarding regional control measures for the Kahului, Kanoelehua-Hill, and Puna Generating Stations. The four-factor analysis for Maalaea Generating Station was still incomplete at the time.

9) June 24, 2022, to July 24, 2022 – CAB provided a 30-day public comment period for the RH-SIP and associated permits in accordance with 40 CFR §51.102 and HAR Chapter 11-60.1.

10) July 1, 2022, to July 30, 2022 – CAB provided a 30-day public comment period for the permit amendments to incorporate regional haze control measures in accordance with Hawaii Revised Statutes (HRS) Chapter 342B and HAR Chapter 11-60.1.

11) Comments on the RH-SIP and associated permits were received in July 2022 from the National Park Service, Hawaiian Electric, and the National Parks Conservation Association & Coalition to Protect America's National Parks. One comment from Hawaiian Electric was to change the boiler shutdown date for the Kahului and Kanoelehua-Hill Generating Stations from December 31, 2027, to December 31, 2028, which required additional permit revisions, FLM review, and public participation process for the modifications. The decision to extend shutdown dates was made after EPA's Office of Air Quality Planning and Standards (OAQPS) provided confirmation that a unit may be excluded from a four-factor analysis if there is an enforceable closure date as late as the end of 2028. Please note that your consultant received OAQPS confirmation on this in June of 2021 which was approximately one year before initiating the public comment period and also before selecting December 31, 2027, as the shutdown date to exclude the boilers from a four-factor analysis.

12) August 12, 2022 - CAB submitted the RH-SIP and associated permits to EPA to meet an August 15, 2022, deadline for avoiding "Findings of Failure to Submit." The submittal was provided after addressing comments received during the public participation process and incorporating the comments and our responses in an appendix to finalize the RH-SIP for EPA approval. Compliance with the submittal deadline was necessary to meet federal requirements and avoid potential sanctions on our state. CAB also received a letter from Hawaiian Electric on this date, dated August 11, 2022, following up on the August 5, 2022, meeting between Hawaiian Electric and CAB, urging CAB to extend the shutdown dates of the boilers at Kahului and Kanoelehua-Hill Generating Stations to December 31, 2028.

13) August 16, 2022 – EPA determined Hawaii's RH-SIP submittal to be complete.

14) September 16, 2022 – CAB letter informs Hawaiian Electric that although an extension of the compliance date for retiring the boilers at the Kahului and Kanoelehua-Hill Generating Stations was not incorporated into Hawaii's August 2022 SIP submittal, the CAB will consider this extension when addressing RH controls for the Maalaea Generating Station and Mauna Loa Macadamia Nut Corporation Plant in the upcoming SIP revision.

15) January 2023 – Hawaiian Electric provides permit applications for the Kahului and Kanoelehua-Hill Generating Stations to extend boiler shutdown dates from December 31, 2027, to December 31, 2028.

16) January 2023 – Hawaiian Electric provides updated cost estimates for the Maalaea Generating Station four-factor analysis.

17) March 2023 – Hawaiian Electric provides additional cost estimates for the Maalaea Generating Station four-factor analysis.

18) May 2023 – Hawaiian Electric provides updated selective catalytic reduction (SCR) cost estimates for the Maalaea Generating Station four-factor analysis.

19) June 7, 2023 – CAB notified the National Park Service to initiate the 60-day FLM consultation period in accordance with 40 CFR §51.308(i)(2) and receives comments from the FLMs in July 2023.

20) November 2023 – CAB completes a draft of the Maalaea Generating Station permit modification and TSD. Draft permit amendments for the Kahului and Kanoelehua-Hill Generating Stations were also completed pursuant to permit applications received for extending the boiler shutdown dates.

21) November 27, 2023, to December 26, 2023 – CAB provided a 30-day public comment period for Revision 1 of the RH-SIP and associated permits in accordance with 40 CFR §51.102 and HAR Chapter 11-60.1.

22) November 27, 2023, to December 26, 2023 – CAB provided a 30-day public comment period for permit amendments to incorporate regional haze control measures in accordance with HRS Chapter 342B and HAR Chapter 11-60.1.

23) March 11, 2024 – CAB provided notification that a public hearing would be held on April 19, 2024, for Revision 1 of the RH-SIP in accordance with HRS §342B-13(c).

24) April 19, 2024 – CAB held a public hearing on Revision 1 of the RH-SIP in person and virtually at 9:00 a.m. Hawaii Standard Time.

25) May 29, 2024 – Meeting with Hawaiian Electric disclosed Hawaiian Electric's investigation of potential extension of boiler shutdown dates related to regional haze and the potential to bring in mobile combustion turbine/nonroad generators for contingency/emergency use, including to avoid outage.

26) August 2, 2024 – CAB submits Revision 1 of the state adopted RH-SIP to EPA for their review and approval to avoid a "Finding of Failure to Submit."

Attachment K:
Hawaiian Electric Letter for
Regional Haze Reconsideration
Request
on June 10, 2025

KARIN KIMURA
Director
Environmental Division

June 10, 2025

SENT VIA EMAIL (marianne.rossio@doh.hawaii.gov)

Ms. Marianne Rossio
Clean Air Branch
State of Hawai'i Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawai'i 96782

Subject: Regional Haze Reconsideration Request
Hawai'i Electric Light Company, Inc.
Maui Electric Company, Ltd.

Dear Ms. Rossio:

As you may be aware, in the last few weeks, the EPA has published proposed Regional Haze State SIP approvals for several states, including Vermont, South Dakota, and Texas. In those approvals, the EPA (See 90 Fed. Reg. 16478 April 18, 2025), provided a new policy for its review of second planning period SIPs that includes revised presumptions concerning reasonable progress and the state's four-factor analysis. Based on this new policy, as well as macro-level economic trends that have increased the costs associated with previously assessed control technologies and replacement generation development, Hawaiian Electric respectfully requests a meeting with DOH to discuss potential revisions to the Hawaii regional haze SIP that would account for these recent developments.

This revised policy, in conjunction with several changes in circumstances affecting the Hawaiian Electric[1] system, warrants the submission of additional information to be provided to the EPA for reconsideration. These facts include the significant increase in costs for emission control projects, such as SCR and fuel switches. This is in addition to the increased pressure placed on Hawaiian Electric's firm generation facilities due to a number of renewable projects and firm projects that have been delayed or cancelled over the last several years, making the closure of the firm facilities due to the Regional Haze rule difficult. All of these issues affect Hawaiian Electric's customers as well as the future security and sustainability of the Hawaiian Electric system.

[1] "Hawaiian Electric" or the "Company" refers to Hawaiian Electric Company, Inc. (or "HE"), Hawai'i Electric Light Company, Inc. (or "HL") and/or Maui Electric Company, Limited (or "ME"). On December 20, 2019, the State of Hawai'i Department of Commerce and Consumer Affairs ("DCCA") approved Hawaiian Electric Company, Inc., Hawai'i Electric Light Company, Inc. and Maui Electric Company, Limited's application to do business under the trade name "Hawaiian Electric" for the period from December 20, 2019 to December 19, 2029. See Certificate of Registration No. 4235929, filed December 20, 2019 in the Business Registration Division of the DCCA.

We would like to schedule a meeting as soon as possible to discuss these issues, given the short timeframe available. Our VP of Power Supply will be in Washington, D.C. this week and plans to discuss these issues with the EPA Headquarters if a meeting can be scheduled.

Should you have any questions or concerns, please contact Myrna Tandi at (808) 543-4535 or myrna.tandi@hawaiianelectric.com.

Sincerely,

Ec: Michael DeCaprio, Hawaiian Electric
Michael Madsen (michael.madsen@doh.hawaii.gov)
Dale Hamamoto (dale.hamamoto@doh.hawaii.gov)
Colin Erickson (colin.erickson@doh.hawaii.gov)
Clayton Takamoto (clayton.takamoto@doh.hawaii.gov)

Attachment L:
Regional Haze Developments
Hawaiian Electric Presentation,
on June 27, 2025

Hawaiian Electric

Regional Haze Developments

June 27, 2025

Presented to Clean Air Branch

State of Hawaii, Department of Health

Summary

Based on Recent Developments in EPA Regional Haze Policy, including recent Executive Orders

Continuing challenges with isolated island electrical grids

Change in Circumstances

Reliability Concerns, Energy Security

Increasing Costs

Request DOH to supplement SIP submittal and request EPA seek an extension of court-ordered deadline

New Developments Warranting SIP Supplement

1. **Tariffs** – increased cost of controls and supply chain challenges for installation. Increased cost of renewable/storage generation.
2. **Slowdown of RFP Process** – lower availability of renewable resources to replace capacity of retiring units as a result of Tariffs and potential tax credit changes.
3. **Change in EPA Policy** – additional flexibility for states in recent actions on regional haze plans.

EPA has an upcoming deadline to act on Hawaii's Regional Haze Plan by **Sep. 30, 2025**

Factors

Reliability/Sustainability, Energy Security

Communities rely on reliable, affordable energy.

Poor reliability present both economic and security challenges.

Recent Developments with respect to Projects that Affect Reliability

60 MW + 55 MW of Solar BESS projects cancelled on Hawaii Island

20 MW of Solar BESS projects cancelled on Maui

Multiple stage 3 project approvals have been put on hold by the PUC until grid stability studies completed potentially resulting in commercial operation dates later than planned

More projects may fall out as a result of tariffs & investment tax credits

Current SIP Requirements

- **Hawaii Island**:
  - Kanoelehua Hill - Permanent shut down of Boilers Hill 5 and Hill 6 by the end of 2028
  - Puna - Fuel switch from fuel oil No. 6 to ULSD of Puna Boiler by August 2026

- **Maui Island**:
  - Kahului - Permanent shut down of Boilers K-1, K-2, K-3, and K-4 by the end of 2028
  - Maalaea –
    - Fuel injection timing retard (FITR) for Diesel Engine Generators M1 and M3 by the end of 2027
    - SCR for M7, M10, M11, M12, M13 by end of 2027 or shutdown by the end of 2037 (for M7, M12, M13) and 2030 (for M10 and M11) or 2032 (for M10 or M11)

Maui and Hawaii Island Firm Generation

- **Maui: 273 MW**
  - 89.6 MW at Maalaea and Kahului are subject to RH SIP unit modifications
- **Hawaii Island: 278 MW**
  - 52.6 MW at Hill and Puna are subject to RH SIP unit modifications
  - 182.5 MW are company-owned firm generation

EPA Review of SIP Submittals

EPA is seeking to increase nationwide consistency in review of RHR SIPs – Headquarters taking the lead in review process

- **Lower Cost-Effectiveness Threshold**: EPA recently proposed to find that Indiana and South Dakota reasonably rejected controls based on a cost-effectiveness value ranging from $1,679 to $4,941/ton for SNCR
- **Higher Interest Rate**: EPA recently proposed to approve Texas' cost assessment based on an interest rate of 10%.
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  - Reassess unit retirements based on trends in availability of replacement firm generation resources

2024 URP Glidepath Estimates

Figure 8.2-1 Modeling Results for Haleakala National Park

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National Park	URP Glidepath	EPA Whitepaper	Zero Out	Measured (2019)
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Hawaii Volcanoes	12.0 dv	16.1 dv	14.6 dv	10.5 dv

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EPA's recent actions on Regional Haze plans provide States with additional flexibility to account for visibility trends/ data in analyzing URP glidepaths

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DOH can point to significant emissions reductions already achieved between 2005 and 2017, as well as DOH's conservative modeling approach (not all volcanic activity screened out, "zero out" approach may underestimate contributions from the mainland (for Hawaii – International sources))

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48% decrease in overall SO_2 emissions

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Other technical factors

- Wind Patterns Affecting Maui
- NOx in Hawaii
- International Emissions Impact

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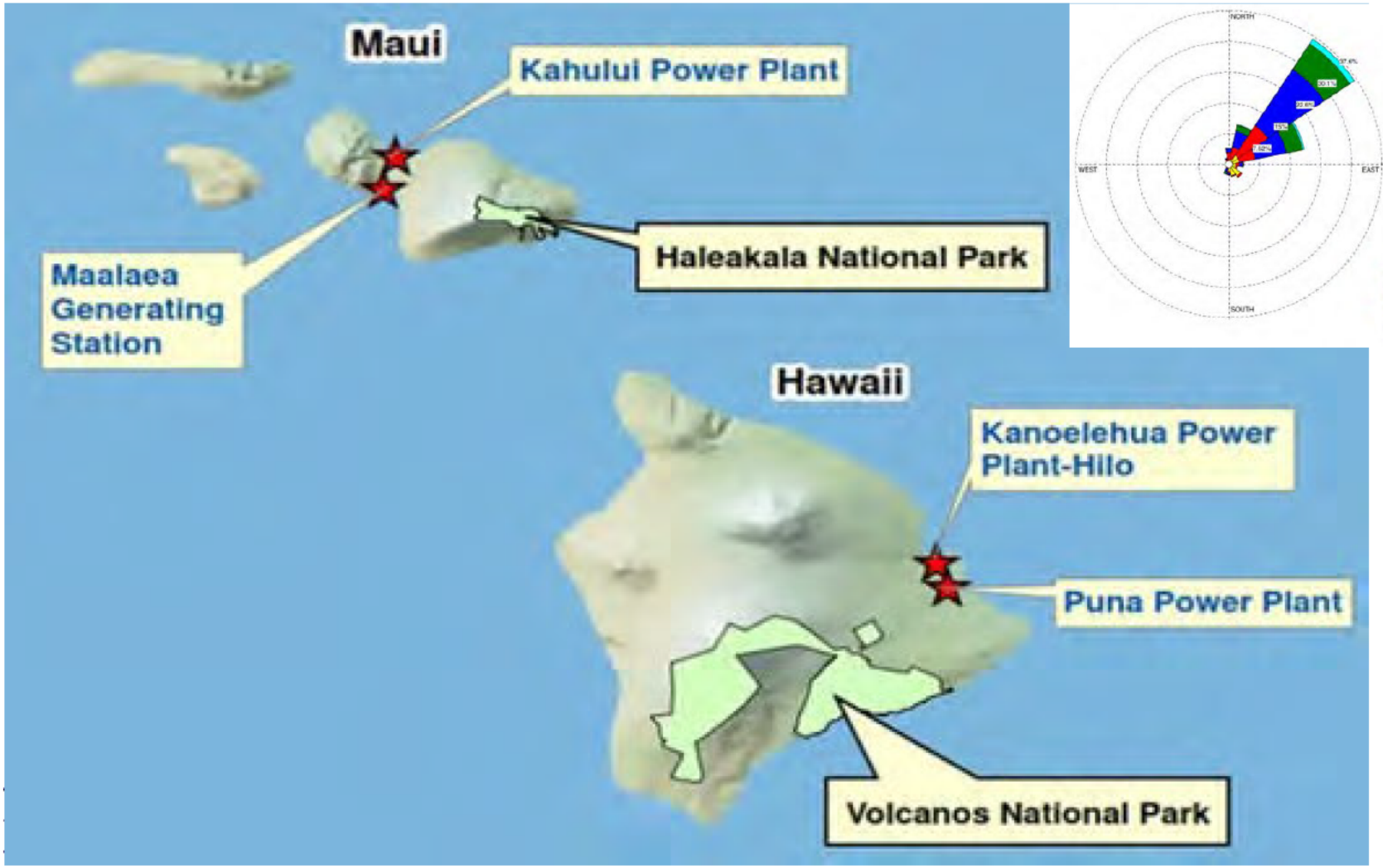

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- **From the draft SIP**: The potential for haze from NOx emissions is considered to be low in Hawaii due to warm weather conditions year-round.
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Cost-Effectiveness of Controls

HECO Facility	Selected Controls	2024 SIP Cost-Effectiveness Estimate	Preliminary Cost-Effectiveness Estimate
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Puna Boiler – 15.5 MW	Fuel Switch to ULSD (0.0015% S)	$4,690/ton - $6,014/ton	10 yrs, 7.5% int: $8,829/ton
Kahului K-1 & K-2 – 5 MW each K-3 – 11.5MW K-4 – 12.5MW	Fuel Switch to ULSD (0.0015% S)	$4,910/ton - $5,156/ton	10 yrs, 7.5% int: K1-$5,153/ton, K2-$5,225/ton, K3 -$5,128/ton, K4-$5,033/ton
	SCR + combustion controls	$1,769/ton - $4,595/ton	10 yrs, 7.5% int: K1-$11,102/ton, K2-$11,639/ton, K3 - $4,188/ton, K4 - $6,838/ton
Maalaea M-7 – 5.6MW M10-M13 – 12.5MW each	FITR	$3,030/ton - $5,225/ton	10 yrs, 7.5% int: M1&M3 - $8,455/ton, M2 - $14,578/ton
	SCR	M7 - $5,530/ton M10-13 - $8,757 - $11,292)	10 yrs, 7.5% int: M7-$9,141/ton M10-$10,296/ton, M11-$10,690/ton, M12-$14,626/ton, M13-$13,444/ton

**Preliminary revised estimates based on 10 yrs of equipment life, interest rate of 7.5%, and 2024 cost index per CEPCI and do not include costs for contingency generation. Work on actual cost updates are ongoing.

Conclusion

Given changing circumstances, requiring shutdown/ installation of costly controls is unnecessary and may interfere with long-term resource adequacy

Recommendations

- Reassess costs/ control requirements in line with EPA's recent regional haze actions
- DOH to prepare SIP supplement
- Hawaiian Electric and DOH to confer with EPA regarding SIP supplement and request for EPA to seek an extension of consent decree deadline. Hawaiian Electric currently has a meeting scheduled for July 9.

Attachment M:
Hawaiian Electric Follow-Up Email and Presentation for Regional Haze Reconsideration Meeting with Hawaii Department of Health on June 27, 2025

KARIN KIMURA
Director
Environmental Division

July 3, 2025

SENT VIA EMAIL (marianne.rossio@doh.hawaii.gov)

Ms. Marianne Rossio
Clean Air Branch
State of Hawai‘i Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawai‘i 96782

Subject: **Regional Haze**
Request for Supplemental SIP Meeting
Hawai‘i Electric Light Company, Inc.
Maui Electric Company, Ltd.

Dear Ms. Rossio:

Thank you for meeting with us on short notice last week regarding the Hawai‘i Regional Haze State Implementation Plan (RH SIP) for the second implementation period. Attached please find a copy of the PowerPoint presentation that we presented at the June 27, 2025 meeting.

In summary, Hawaiian Electric[1] respectfully requests that the State of Hawai‘i submit a supplemental SIP to the U.S. Environmental Protection Agency (EPA) to address the changes in circumstances that may affect the Company's flexibility to respond to energy shortages and which are anticipated to increase control costs affecting already highly impacted customers. A supplemental SIP would allow the State to address these significant economic and energy reliability concerns and is appropriate in light of a recent change in EPA policy that provides states with more flexibility and discretion in their RH SIPs to accommodate circumstances unique to each State. We recognize that the EPA currently faces a court-ordered deadline to finalize its review of the Hawai‘i SIP by December 19, 2025, extended from EPA’s prior deadline of September 30, 2025.[2] However, if Hawai‘i were to commit to submitting a supplemental SIP, EPA would have grounds to request a further extension of this deadline.[3]

Our primary concern is maintaining grid integrity. As described in our meeting, significant challenges have arisen for numerous renewable projects on which the Company was relying to replace generation that must be retired under the current SIP, as well as to ensure grid

[1] “Hawaiian Electric” or the “Company” refers to Hawaiian Electric Company, Inc. (or “HE”), Hawai‘i Electric Light Company, Inc. (or “HL”) and/or Maui Electric Company, Limited (or “ME”). On December 20, 2019, the State of Hawai‘i Department of Commerce and Consumer Affairs ("DCCA") approved Hawaiian Electric Company, Inc., Hawai‘i Electric Light Company, Inc. and Maui Electric Company, Limited's application to do business under the trade name "Hawaiian Electric" for the period from December 20, 2019 to December 19, 2029. See Certificate of Registration No. 4235929, filed December 20, 2019 in the Business Registration Division of the DCCA.

[2] Stipulation, Sierra Club v. EPA, No. 1:23-cv-01744 (Jun. 25, 2025, D.D.C.).

[3] EPA was able to obtain an extension of deadlines for seven other regional haze SIPs based on a showing of good cause related to state-specific considerations. See Order, Sierra Club v. EPA, No. 1:23-cv-01744 (Mar. 20, 2025, D.D.C.).

reliability during the implementation of SIP-mandated controls.[4] Certain projects have been permanently halted and others face significant delays in permitting and implementation. Additionally, macro-level economic changes have occurred since the development of the SIP that impact both the timing of replacement generation as well as the costs of controls required by the SIP. Recent tariffs and changes in renewable tax incentives have resulted in the delay or cancelation of renewable and firm renewable projects and potential delay or cancellation of other renewable projects. These factors also are impacting the price of controls, making it appropriate to revisit the cost per ton of emission reductions relied upon in the SIP to justify the imposition of controls.

We understand that EPA Headquarters is taking the lead on review of pending RH SIPs, rather than the EPA Regional offices as before. In its recent proposed SIP approvals, the EPA has adopted a new policy regarding the determination of Reasonable Progress that provides more deference to individual states to consider visibility progress and control costs for the second implementation period. That deference includes allowing states to use a lower range of cost-effectiveness thresholds than we have seen in the past, including levels as low as $1,695 per ton.[5] EPA also has articulated in its new policy that a SIP is presumptively approvable where visibility is below the Uniform Rate of Progress (URP) or "glidepath" for the second implementation period, and the state has conducted a four-factor analysis, even if the state has determined that no additional control measures are necessary.[6]

In considering visibility, the EPA has taken into account a variety of factors to assess progress, including a range of modeling results, recent air monitoring data, and the limitations on models that tend to overestimate visibility impairment. For example, in the proposed Texas RH SIP approval, the EPA concluded that even where the State's modeling projected higher levels of visibility impairment, recent visibility trends and additional emission reductions not captured by the modeling were sufficient to show that visibility conditions were likely to be below the URP glidepath, particularly since the State's modeling was conservative in its estimate of international emissions impacts on regional haze.[7]

These factors are directly applicable to the current situation in Hawai‘i. As we discussed, the models showing visibility above the glidepath for the two Class I areas in Hawai‘i tend to overestimate impairment, as EPA noted in its proposed Texas action. Further, recent monitoring data collected during a period with fewer volcanic eruptions demonstrates that visibility is below the glidepath. Finally, even without adjusting the costs of controls to account for recent economic developments, it would be defensible to determine that the costs are not reasonable. Given the State's inherent interest in maintaining grid reliability while meeting the 2045 deadline for 100% renewable energy, lowering energy costs, and the current EPA policy of deference to states, it would also seem to be in the State's interest to work with Hawaiian Electric to better address these issues in a supplemental SIP.

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[4] Hawaiian Electric also is relying on these projects to meet its sustainable grid goal of 100% renewable energy by 2045.

[5] See Air Plan Approval; Indiana; Regional Haze Plan for the Second Implementation Period, 90 Fed. Reg. 25,944, 25,954 (Jun. 18, 2025).

[6] See Air Plan Approval; West Virginia; Regional Haze State Implementation Plan for the Second Implementation Period, 90 Fed. Reg. 16,478, 16,483-84 (Apr. 18, 2025).

[7] See Air Plan Approval; Texas and Oklahoma; Texas Regional Haze Plans for the First and Second Implementation Periods and Five-Year Progress Report; Oklahoma Regional Haze Plan for the First Implementation Period, 90 Fed. Reg. 22,166, 22,191 (May 23, 2025).

Importantly, data shows that the unit retirements and controls required by the RH SIP for the second implementation period will have minimal impact on visibility at Hawai‘i’s Class I areas. The Maui sources are downwind of the Class I areas, and emissions from volcanic eruptions are the primary contributors to haze formation in the region. Accordingly, project availability issues, in conjunction with significant cost increases for controls, as well as a substantial change in the EPA's review policy, merit the development of a supplemental SIP, and it would be appropriate to determine that no further controls are required for this period. Revisiting these issues is necessary to address the extreme effects that the current SIP requirements could have on system reliability on Hawai‘i Island and Maui, with little to no actual impact on visibility in the Class I areas in Hawai‘i. Recent tariffs, changes in renewable tax incentives, and projects that have been delayed or cancelled only serve to put more pressure on Hawaiian Electric's firm generation facilities, making it more crucial than before that the Company has the flexibility to continue operating these units past the current deadlines if necessary. We note that the State will have the opportunity to consider whether controls are required for the third implementation period in its SIP that currently is due to EPA on July 31, 2028, a deadline for which EPA has proposed an extension of three years.[8]

As briefly discussed in the meeting, although there is always the potential for litigation over a SIP, we are not aware of any public comments that were received during the current SIP or the permit approval process. Given the substantial evidence available to the State to support this additional review, we believe that a supplemental SIP with a revised reasonable progress determination would be defensible. Further, litigation over Regional Haze SIPs typically involves challenges to the EPA’s final approval or disapproval of a SIP. If such a challenge were filed with respect to the EPA’s future action on Hawai‘i’s SIP, it would be within the discretion of the State to intervene, or not, in that action.

In conclusion, Hawaiian Electric requests that the Clean Air Branch commit to developing a supplement RH SIP to address these concerns and communicate this commitment to the EPA so that the EPA may request any necessary extension of the court-ordered deadline for its review of the Hawaii RH SIP.

Should you have any questions or concerns, please contact Myrna Tandi at (808) 543-4535 or myrna.tandi@hawaiianelectric.com.

Sincerely,

Ec: Michael DeCaprio, Hawaiian Electric
Michael Madsen (michael.madsen@doh.hawaii.gov)
Colin Erickson (colin.erickson@doh.hawaii.gov)

[8] Regional Haze Third Implementation Period; Extension of the State Implementation Plan Due Date, 89 Fed. Reg. 104,471 (Dec. 23, 2024).

Hawaiian Electric

Regional Haze Developments

June 27, 2025

Presented to Clean Air Branch

State of Hawaii, Department of Health

Summary

Based on Recent Developments in EPA Regional Haze Policy, including recent Executive Orders

Continuing challenges with isolated island electrical grids

Change in Circumstances

Reliability Concerns, Energy Security

Increasing Costs

Request DOH to supplement SIP submittal and request EPA seek an extension of court-ordered deadline

New Developments Warranting SIP Supplement

1. **Tariffs** – increased cost of controls and supply chain challenges for installation. Increased cost of renewable/storage generation.
2. **Slowdown of RFP Process** – lower availability of renewable resources to replace capacity of retiring units as a result of Tariffs and potential tax credit changes.
3. **Change in EPA Policy** – additional flexibility for states in recent actions on regional haze plans.

EPA has an upcoming deadline to act on Hawaii's Regional Haze Plan by **Sep. 30, 2025**

Factors

Reliability/Sustainability, Energy Security

Communities rely on reliable, affordable energy.

Poor reliability present both economic and security challenges.

Recent Developments with respect to Projects that Affect Reliability

60 MW + 55 MW of Solar BESS projects cancelled on Hawaii Island

20 MW of Solar BESS projects cancelled on Maui

Multiple stage 3 project approvals have been put on hold by the PUC until grid stability studies completed potentially resulting in commercial operation dates later than planned

More projects may fall out as a result of tariffs & investment tax credits

Current SIP Requirements

- **Hawaii Island**:
  - Kanoelehua Hill - Permanent shut down of Boilers Hill 5 and Hill 6 by the end of 2028
  - Puna - Fuel switch from fuel oil No. 6 to ULSD of Puna Boiler by August 2026

- **Maui Island**:
  - Kahului - Permanent shut down of Boilers K-1, K-2, K-3, and K-4 by the end of 2028
  - Maalaea –
    - Fuel injection timing retard (FITR) for Diesel Engine Generators M1 and M3 by the end of 2027
    - SCR for M7, M10, M11, M12, M13 by end of 2027 or shutdown by the end of 2037 (for M7, M12, M13) and 2030 (for M10 and M11) or 2032 (for M10 or M11)

Maui and Hawaii Island Firm Generation

- **Maui: 273 MW**
  - 89.6 MW at Maalaea and Kahului are subject to RH SIP unit modifications
- **Hawaii Island: 278 MW**
  - 52.6 MW at Hill and Puna are subject to RH SIP unit modifications
  - 182.5 MW are company-owned firm generation

EPA Review of SIP Submittals

EPA is seeking to increase nationwide consistency in review of RHR SIPs – Headquarters taking the lead in review process

- **Lower Cost-Effectiveness Threshold**: EPA recently proposed to find that Indiana and South Dakota reasonably rejected controls based on a cost-effectiveness value ranging from $1,679 to $4,941/ton for SNCR
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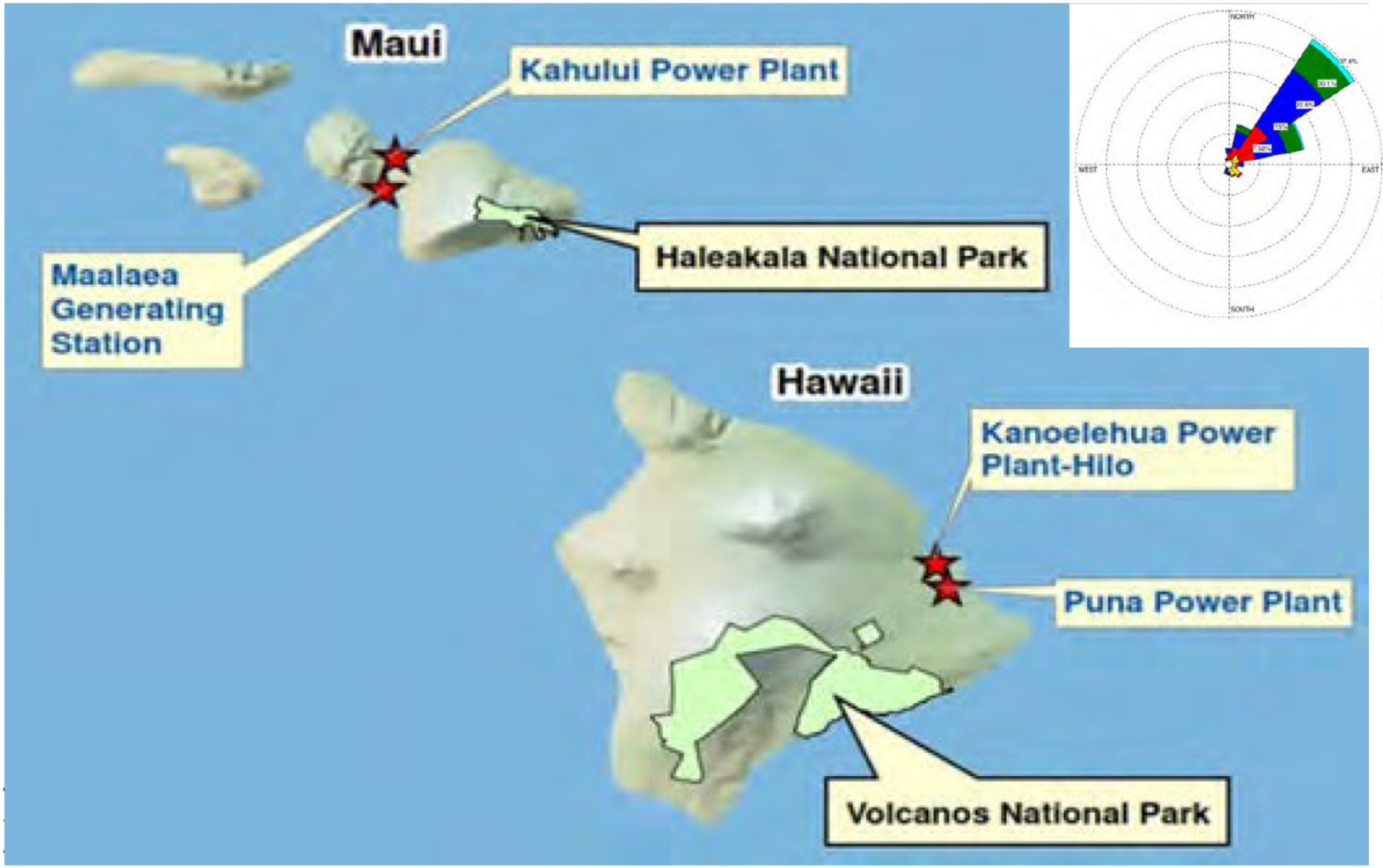

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Kanoelehua-Hill Hill 5 – 14.1 MW Hill 6 – 23 MW	Fuel Switch to ULSD (0.0015% S)	$4,319/ton - $4,684/ton	10 yrs, 7.5% int: Hill 5 - $5,318/ton, Hill6 - $5,578/ton
	SCR + combustion controls	$2,041/ton - $2,116/ton	10 yrs, 7.5% int: Hill5 - $5,982/ton, Hill6 - $5,855/ton
Puna Boiler – 15.5 MW	Fuel Switch to ULSD (0.0015% S)	$4,690/ton - $6,014/ton	10 yrs, 7.5% int: $8,829/ton
Kahului K-1 & K-2 – 5 MW each K-3 – 11.5MW K-4 – 12.5MW	Fuel Switch to ULSD (0.0015% S)	$4,910/ton - $5,156/ton	10 yrs, 7.5% int: K1-$5,153/ton, K2-$5,225/ton, K3 -$5,128/ton, K4-$5,033/ton
	SCR + combustion controls	$1,769/ton - $4,595/ton	10 yrs, 7.5% int: K1-$11,102/ton, K2-$11,639/ton, K3 - $4,188/ton, K4 - $6,838/ton
Maalaea M-7 – 5.6MW M10-M13 – 12.5MW each	FITR	$3,030/ton - $5,225/ton	10 yrs, 7.5% int: M1&M3 - $8,455/ton, M2 - $14,578/ton
	SCR	M7 - $5,530/ton M10-13 - $8,757 - $11,292)	10 yrs, 7.5% int: M7-$9,141/ton M10-$10,296/ton, M11-$10,690/ton, M12-$14,626/ton, M13-$13,444/ton

**Preliminary revised estimates based on 10 yrs of equipment life, interest rate of 7.5%, and 2024 cost index per CEPCI and do not include costs for contingency generation. Work on actual cost updates are ongoing.

Conclusion

Given changing circumstances, requiring shutdown/ installation of costly controls is unnecessary and may interfere with long-term resource adequacy

Recommendations

- Reassess costs/ control requirements in line with EPA's recent regional haze actions
- DOH to prepare SIP supplement
- Hawaiian Electric and DOH to confer with EPA regarding SIP supplement and request for EPA to seek an extension of consent decree deadline. Hawaiian Electric currently has a meeting scheduled for July 9.

Attachment N:
Hawaiian Electric Presentation for Regional Haze Reconsideration Request on August 25, 2025

Hawaiian Electric

Hawaii Regional Haze SIP: *Supplement Needed to Address New Reliability Concerns*

August 25, 2025

Presented to Region 9

United States Environmental Protection Agency

Overview Regional Haze Rule

- Under the Clean Air Act, the Regional Haze Rule (RHR) calls for state and federal agencies to work together to improve visibility in 156 national parks and wilderness areas
- The two areas at issue for Hawaii are the National Parks at Haleakala on Maui and Volcanoes on Hawaii Island
- The current Draft Hawaii RHR SIP calls for Hawaiian Electric to either include costly controls or shut down certain firm units on a schedule.
- Hawaii DOH submitted revised Hawaii's RH-SIP to the EPA in August 2024. EPA is required to act on Hawaii SIP by 12/19/25 or request an extension

Changes Affecting the SIP

- Post-SIP economic changes and replacement generation project delays and failures have made SIP-mandated controls and retirements a threat to grid reliability
- A SIP supplement is necessary to revise these restrictions
  - Controls/retirements not necessary for reasonable progress this planning period
- Recent changes in EPA policy that are reflected in EPA proposed SIP approvals/disapprovals (see in particular Colorado partial disapproval based on grid reliability)
- Hawaiian Electric met to discuss this with DOH on May 29 and EPA Headquarters on July 10 including Aaron Szabo and Abigale Tardif who in turn suggested we discuss with Region 9.

Request for EPA's Consideration

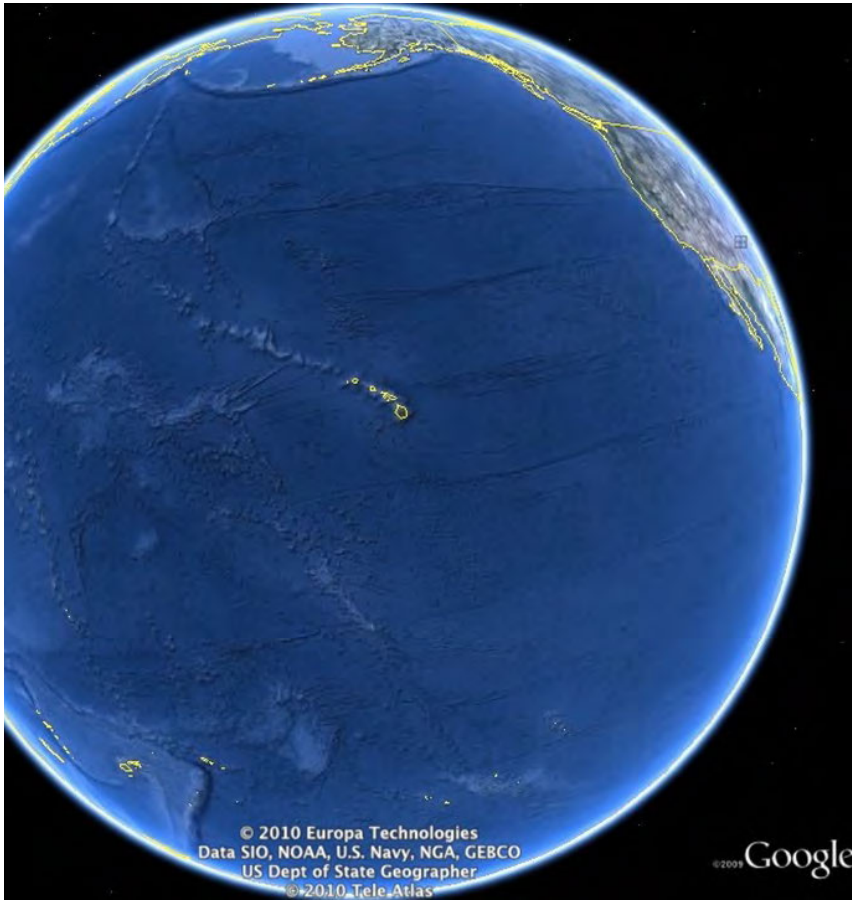
As appropriate, discuss with Hawaii need for supplemental SIP to ensure reliability

> We have asked State to develop supplement

> We have met with EPA OAR to share same information

If needed, seek extension of court-ordered deadline for review of SIP to allow time for State to develop supplement.

Introduction to Hawaiian Electric



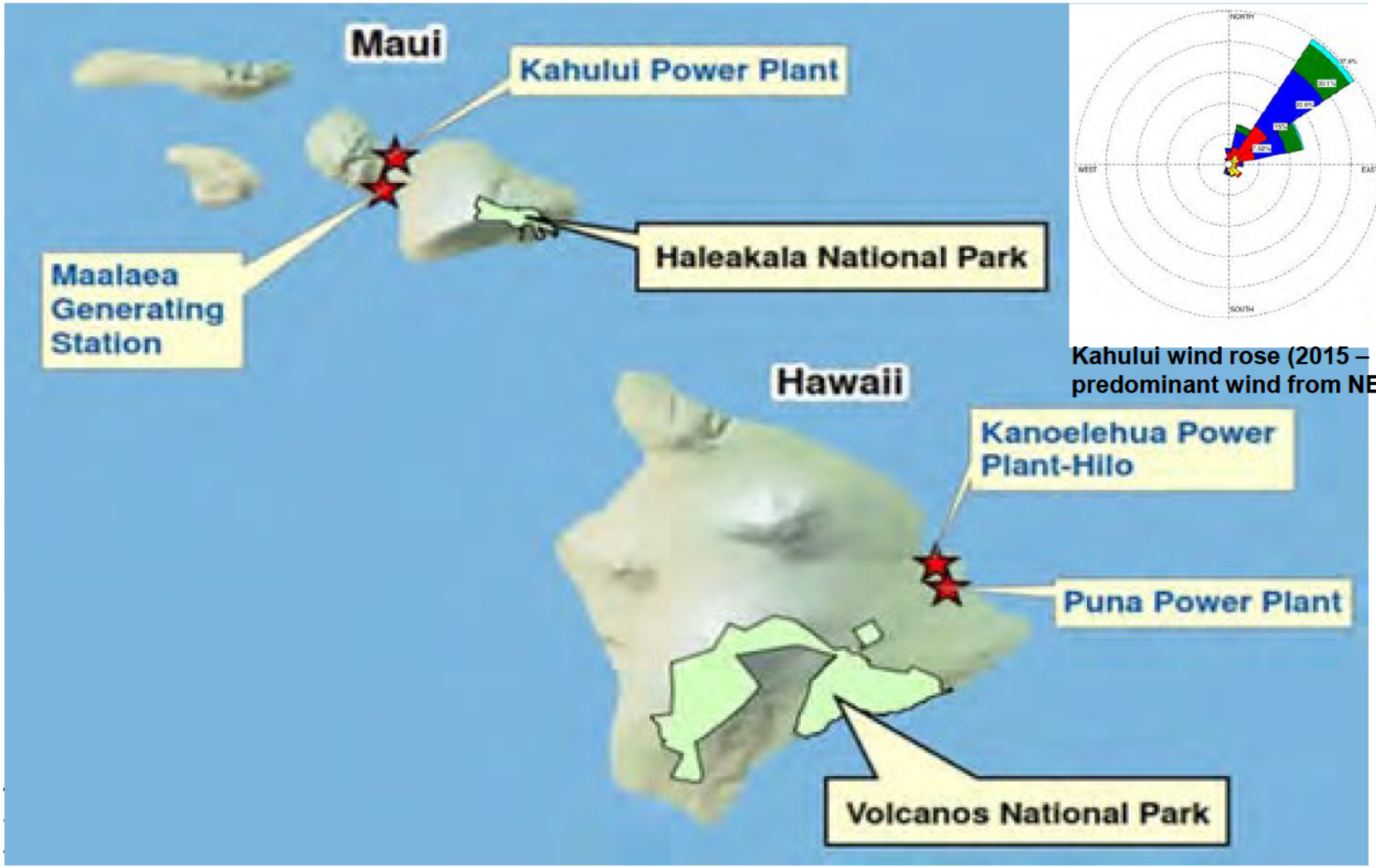
- Hawaiian Electric serves 95% of Hawaii's 1.4 million residents on the islands of Oahu, Maui, Hawaii, Lanai and Molokai.
- Unlike the continental US, in Hawaii, each island grid must stand alone without backup from other utilities thus requiring maximum flexibility to address future circumstances.
- The shutdown of firm units as required under the current SIP threatens the future reliability of the grids on Maui and Hawaii Island.

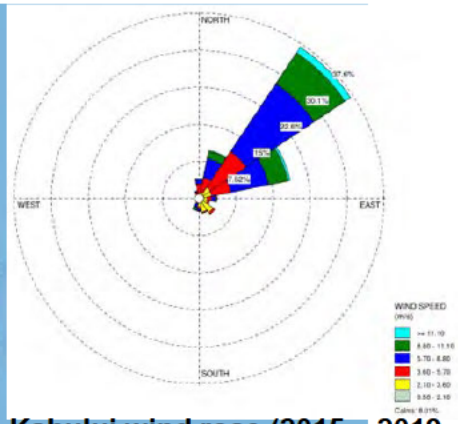
Hawaiian Electric Largest Customer is DoD

- Hawaiian Electric Largest Customer is the DoD.
- Hawaii is headquarters of the US Indo-Pacific Command (USINDOPACOM) – The largest warfighting command in the world
- No other utility in the U.S. supports such a large command and all services.
  - U.S. Navy Pacific Fleet
  - U.S. Army Pacific
  - U.S. Marine Forces Pacific
  - U.S. Pacific Air Forces
- Reliable and Resilient Electric service is critical to national security as it is to the lives of Hawaii's residents.

Hawaiian Electric

Wind Patterns Rule out Controls for Maui Sources





Kahului wind rose (2015 – 2019 predominant wind from NE)

Since Hawaii SIP Submittal in 2024, EPA has been seeking to increase nationwide consistency in review of RHR SIPs –

- **Lower Cost-Effectiveness Threshold**: EPA approved thresholds ranging from $1,679 to $4,941/ton (Hawaii used $6,800/ton).
- **Higher Interest Rate**: EPA recently proposed an interest rate of 10%. (Hawaii used 7%)
- **URP Glidepath**: EPA has announced a new policy that (i) where Class I areas impacted by a State are projected to be below the URP in 2028, and (ii) the State has considered the four statutory factors, the State has presumptively demonstrated reasonable progress without the need for additional controls
- **Visibility Benefit**: EPA recognized in the Texas proposal, the state's flexibility in considering reasonability, to go beyond the four factors and weigh the visibility benefit of proposed controls against the estimated costs.

EPA Reg10 Draft Approval/Disapproval of Colorado SIP based on **Grid Reliability** and **Forced Closures**

- Primarily, the EPA found that Colorado did not "adequately consider the energy and non-air quality environmental impacts of compliance statutory factor as it pertains to the enforceable source closures."
  - "More specifically, we find Colorado did not sufficiently assess the closures' impacts on maintaining grid reliability and utilities' ability to meet energy demand." 90 Fed Reg 31937-8 (July 16, 2025)
- Further they found that forced plant closures were not consistent with CAA Sec. 110 (SIP) or Sec. 169a (RHR) as those rules did not contemplate plant closure and were potential violations of the takings Clause.

Maui and Hawaii Island Firm Generation:
Current SIP Requirements Jeopardize Reliability

- **Maui: 273 MW of Firm Generation**
  - 89.6 MW (33% of island firm power) at Maalaea and Kahului are subject to costly controls or retirement
- **Hawaii Island: 278 MW of Firm Generation**
  - 52.6 MW (19% of island firm power) at Hill and Puna are subject to costly controls or retirement

Control costs effectively mandate unit shutdowns

Delayed and Cancelled Projects

Shutdowns create reliability issues, particularly with replacement generation project delays and failures

Recent Project Developments

- 115MW projects **cancelled** on Hawaii Island
- Existing Hawaii Island firm projects operating **below expected levels**
- 20 MW of projects **cancelled** on Maui

Additional projects may fall out as a result of supply chain issues and changes in investment tax credits

Increased Costs

- Costs have increased significantly since SIP was submitted.
  - *Ex:* Fuel switch at Puna is now $8,829/ton (up from $6,014/ton)

- Hawaii determined controls were reasonable at costs up to $6,800/ton, significantly higher than thresholds used by other states.
  - *Ex:* Indiana at $1,679/ton
  - *Ex:* South Dakota at $4,941/ton

SIP Requirements Not Necessary for Reasonable Progress

- Impairment likely below the glidepath
  - Measured impairment below the URP
  - RH-related anthropogenic emissions trending down
  - Limited model runs showing impairment above URP have known over-estimation bias
- Wind rarely blows from Maui facilities toward Class I areas
- On Hawaii Island, the volcano in the park itself has significantly high emissions even when inactive

Controls Not Necessary to Meet URP

National Park	URP Glidepath	EPA Whitepaper	Zero Out	Measured (2019)
Haleakala	6.4 dv	7.1 dv	6.3 dv	6.1 dv
Hawaii Volcanoes	12.0 dv	16.1 dv	14.6 dv	10.5 dv

- **Measured data: Shows impairment below glidepath.** Data from monitor at each Park after Kilauea active eruption had ceased
- **Modeled impairment is overly conservative.**
  - **EPA Whitepaper**: Based on EPA's 2018 Technical Guidance and June 2020 Memo – *Hawaii found that "volcanic impacts would not be completely screened out" using this data*
  - **"Zero Out" Approach**: Sets all mainland U.S. anthropogenic emissions to zero – *EPA TX Proposal found this approach may still underestimate total contribution from mainland sources*

Conclusion

Given changing circumstances, requiring shutdown and installation of costly controls is unnecessary and may interfere with long-term resource reliability/adequacy.

If EPA believes it is appropriate, a conversation with the state about support for a potential SIP supplement may help move this process forward.

Hawaii's preparation of a SIP Supplement would give EPA good cause to ask for a further extension of the current deadline.

Attachment O: Hawaiian Electric Letter and Supplemental Information sent to EPA, letter dated August 29, 2025

KARIN KIMURA
Director
Environmental Division

August 29, 2025

SENT VIA EMAIL (cook.josh@epa.gov)

Mr. Josh F.W. Cook
Regional Administrator
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, California 94105

Subject: Hawai‘i Regional Haze SIP for the Second Planning Period
Hawai‘i Electric Light Company, Inc.
Maui Electric Company, Ltd.

Dear Regional Administrator Cook:

Thank you again for meeting with us on August 25, 2025, to discuss Hawaiian Electric's[1] (the "Company") grid reliability concerns raised by the State of Hawai‘i's Regional Haze State Implementation Plan (SIP) for the second planning period under the Regional Haze Rule (RHR), which is pending EPA's review. We agreed at the conclusion of the meeting to provide Region 9 with additional information in support of our concerns. While the Company will comply with all duly issued permit requirements and other obligations as imposed by the SIP, it is critical that the closures be reconsidered to allow the Company to maintain flexibility in its operations to provide reliable service to its customers[2]. As we discussed during the meeting, the SIP-induced reliability issues could be addressed either, time permitting, through a supplemental SIP submittal by the State, or through an action by EPA to partially or fully disapprove the SIP currently before it for review.

Recent Developments Have Created Reliability Challenges Around the SIP Requirements

As explained during our meeting, the Company was forced under the SIP to accept enforceable retirement deadlines for units the Company plans to retire, due the high costs of controls and fuels switches. However, these retirement deadlines are no longer acceptable because of potential negative impacts to generation reliability due to actual

[1] "Hawaiian Electric" or the "Company" refers to Hawaiian Electric Company, Inc. (or "HE"), Hawai‘i Electric Light Company, Inc. (or "HL") and/or Maui Electric Company, Limited (or "ME"). On December 20, 2019, the State of Hawai‘i Department of Commerce and Consumer Affairs ("DCCA") approved Hawaiian Electric Company, Inc., Hawai‘i Electric Light Company, Inc. and Maui Electric Company, Limited's application to do business under the trade name "Hawaiian Electric" for the period from December 20, 2019 to December 19, 2029. See Certificate of Registration No. 4235929, filed December 20, 2019 in the Business Registration Division of the DCCA.

[2] Hawaiian Electric serves 95% of Hawai‘i's 1.4 million residents on the islands of O‘ahu, Maui, Hawai‘i, Lāna‘i and Moloka‘i. Customers on O‘ahu include the entirety of the U.S. Indo-Pacific Command.

or potential cancellations and delays in replacement generation projects that were planned by independent power producers.

The following units on both islands were required to incorporate enforceable shutdown dates or costly controls in their air permits:

Facility	Island	Unit	Size (MW)	Requirements	Due Date
Kanoelehua-Hill	Hawaii	Hill 5 boiler	14.1	Permanent shut-down	End of 2028
		Hill 6 boiler	23	Permanent shut-down	End of 2028
Puna		Puna boiler	15.5	Fuel switch to ULSD	August 2026
Kahului	Maui	K-1 boiler	5	Permanent shut-down	End of 2028
		K-2 boiler	5	Permanent shut-down	End of 2028
		K-3 boiler	11.5	Permanent shut-down	End of 2028
		K-4 boiler	12.5	Permanent shut-down	End of 2028
Maalaea		M-1 RICE	2.5	Fuel Injection Timing Retard (FITR)	End of 2027
		M-3 RICE	2.5	FITR	End of 2027
		M-7 RICE	5.6	Selective Catalytic Reduction (SCR) by end of 2027 or permanent shut-down by end of 2037	
		M-12 RICE	12.5		
		M-13 RICE	12.5		
		M-10 RICE	12.5	SCR by end of 2027 or permanent shut-down by 2030 for one unit and by 2032 for the other one.	
		M-11 RICE	12.5		

Our primary concern is that the proposed dates of these unit retirements may not allow for enough time to successfully procure and place in service replacement projects needed to maintain grid reliability and integrity. Significant challenges have arisen for numerous renewable projects on which the Company was relying to replace generation that must be retired under the current SIP, as well as to ensure grid reliability during the implementation of SIP-mandated controls.[3] Certain replacement generation projects have been permanently cancelled and others face significant delays in permitting and implementation. Additionally, macro-level economic changes have occurred since the development of the SIP that impact the timing of replacement generation. Recent tariffs and changes in renewable tax incentives have or may resulted in the delay or cancelation of renewable projects.

[3] Hawaiian Electric also is relying on these projects to meet the State's Renewable Portfolio Standard law sustainable grid goal of 100% renewable energy by 2045.

As discussed during our meeting, 115 MW of planned generation have been cancelled on Hawai‘i Island, and 20 MW of planned generation have been cancelled on Maui that were originally selected as part of the Company’s Stage 3 Request for Proposal (RFP) final award group in December 2023. As a result of the withdrawal of the replacement generation projects on Hawai‘i Island, grid reliability will be at risk in 2029 following the retirement of the Kanoelehua-Hill boilers. To address this loss, Hawaiian Electric currently has a new RFP before the Hawai‘i Public Utilities Commission to procure additional capacity and energy; however, these projects are not expected to be online until November 2030.

For Maui, several projects were expected to provide additional capacity and energy by the end of 2027. However, the current environment may put these projects at risk of being delayed or cancelled, including an onshore wind project and a proposed firm generation project that is subject to a very aggressive schedule that may be difficult to meet. Both Maui projects were expected to provide additional capacity and energy by the end of 2027.[4] Due to the uncertainty of these proposed projects coming into fruition or meeting their expected commercial operations dates, a delay to the shutdown of the Kahului boilers and Maalaea generating units would reduce reliability risks should there be any delays with these projects. Thus, retirement of the generating units as required by the SIP deadlines will create higher probability of energy reserve margin shortfalls that increase risk to reliability on both islands as explained further in the Hawai‘i Electric Light Company, Inc. and Maui Electric Company Ltd. Adequacy of Supply Reports dated January 30, 2025.[5] As we discussed during our meeting, the consequences of a generation shortfall in Hawai‘i are dire; each island must be entirely self-sufficient and cannot rely on power by wire transmission from other jurisdictions as is common in the continental United States to address reliability emergencies.

The EPA has addressed grid reliability issues with respect to other SIPs. In its July 2025 proposed partial approval and partial disapproval of the Colorado SIP, the EPA stressed that states must “weigh the energy impacts of the closure measures against its substantial progress toward natural visibility conditions in a manner consistent with issued executive orders’ priority on energy generation”[6] and should fully account for grid reliability and the utilities’ ability to meet energy demand.[7] Further, unit shutdowns are an extraordinary form of controls under the Regional Haze Program; indeed, EPA has asserted that forced closures are not consistent with Clean Air Act sections 110 (addressing state implementation plans) and Section 169A (establishing the Regional Haze Program), which do not contemplate forced closures as a means to achieve compliance.[8] EPA has further noted that forced closures potentially constitute a taking under the Takings Clause of the

[4] See https://www.whitehouse.gov/presidential-actions/2025/01/temporary-withdrawal-of-all-areas-on-the-outer-continental-shelf-from-offshore-wind-leasing-and-review-of-the-federal-governments-leasing-and-permitting-practices-for-wind-projects/

[5] Adequacy of Supply Report (January 30, 2025), https://puc.hawaii.gov/reports/energy-reports/adequacy-of-supply/

[6] Air Plan Partial Approval and Partial Disapproval; Colorado; Regional Haze Plan for the Second Implementation Period, 90 Fed. Reg. 31926, 31937-38 (July 16, 2025).

[7] *Id.*

[8] *Id.*

Fifth Amendment to the U.S. Constitution, which states that private property shall not be taken for public use without just compensation.[9] The extraordinary nature of forced shutdowns is particularly acute where the closures are unnecessary to ensure reasonable progress, which is the case in Colorado and, as discussed below, also in Hawai‘i.

Neither Controls nor Shutdowns Are Necessary for Reasonable Progress

Visibility data, modeling, and emissions trends support a conclusion that the two Class I areas in Hawai‘i – Haleakala National Park and Volcanoes National Park – are below the Uniform Rate of Progress (URP) or “glidepath” for the second planning period. In considering visibility, EPA has taken into account a variety of factors to assess progress, including a range of model results, recent air monitor data, and the limitations on models that tend to overestimate impairment. For example, in its recent proposed approval of the Texas Regional Haze SIP, EPA concluded that even where the state’s modeling projected higher levels of visibility impairment, recent visibility trends and additional emission reductions not captured by the modeling were sufficient to show that visibility conditions were likely to be below the URP glidepath, particularly since the state’s modeling was conservative in its estimate of international emissions impacts on regional haze.[10]

As we discussed during our meeting, the models showing visibility above the glidepath for the two Class I areas in Hawai‘i tend to overestimate impairment. First, the EPA Whitepaper approach, which builds on the recommendations in EPA’s 2018 Technical Guidance[11] and June 2020 Memorandum,[12] fails to fully screen out volcanic impacts, as the Hawai‘i Department of Health itself recognizes.[13] Second, the “Zero Out approach,” in which Hawai‘i set all mainland U.S. anthropogenic emissions to zero, may still underestimate the total contribution from “zeroed out” sources, as EPA itself noted in the Texas proposal with respect to “zeroed out” international emissions.[14] Importantly, in the Texas proposal, EPA concluded that visibility impairment at Salt Creek Wilderness Area

[9] *Id.*

[10] *See* Air Plan Approval; Texas and Oklahoma; Texas Regional Haze Plans for the First and Second Implementation Periods and Five-Year Progress Report; Oklahoma Regional Haze Plan for the First Implementation Period, 90 Fed. Reg. 22,166, 22,191 (May 23, 2025).

[11] Memorandum from Richard A. Wayland, Division Director, to Regional Air Division Directors, *Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program* (Dec. 20, 2018), https://www.epa.gov/sites/default/files/2018-12/documents/technical_guidance_tracking_visibility_progress.pdf.

[12] Memorandum from Richard A. Wayland, Division Director, to Regional Air Division Directors, *Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program* (Jun. 3, 2020), https://www.epa.gov/sites/default/files/2020-06/documents/memo_data_for_regional_haze_0.pdf.

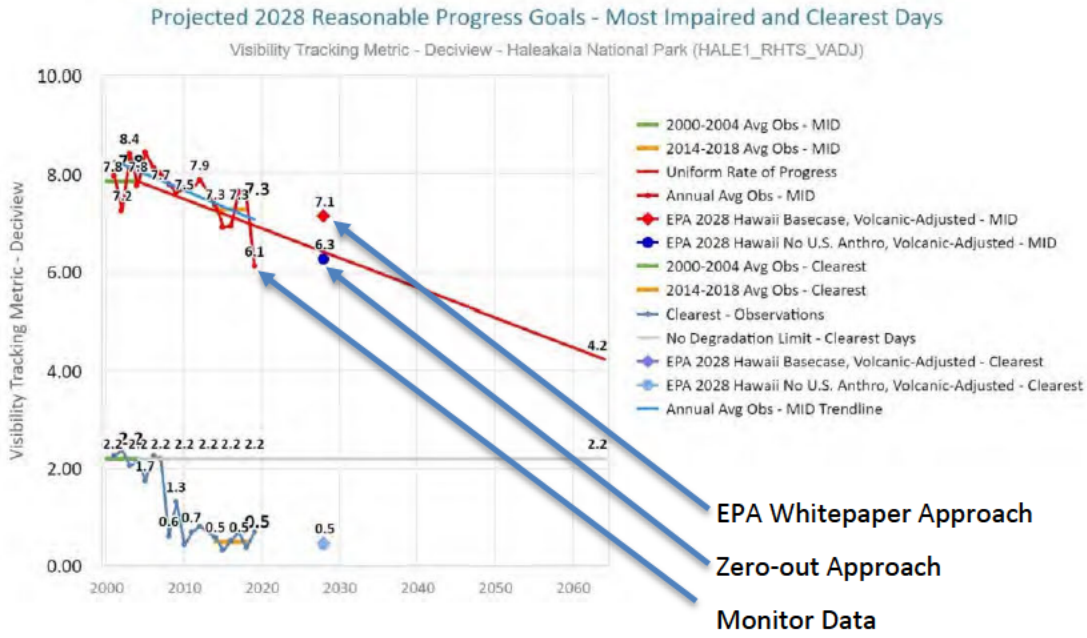
[13] HDOH, *Hawaii’s Regional Haze State Implementation Plan (RH-SIP), Revision 1, Second Planning Period (2018-2028)*, 131, 133 (Aug. 2, 2024), https://health.hawaii.gov/cab/files/2025/01/FINAL-2021HI-RHSIPrev8_2_24.pdf (“2024 Hawaii SIP”) (“[V]olcanic impacts would not be completely screened out after adjusting the IMPROVE data for episodic events due to the continuous nature of the Kilauea eruption. Therefore, projections from scaling 2028 modeling results with the observed 2014 to 2017 or 2014 to 2018 IMPROVE data on the most impaired days would still be influenced by volcanic activity.”).

[14] Air Plan Approval; Texas and Oklahoma; Texas Regional Haze Plans for the First and Second Implementation Periods and Five-Year Progress Report; Oklahoma Regional Haze Plan for the First Implementation Period, 90 Fed. Reg. 22,166, 22,192 (May 23, 2025) (“Texas RH Proposal”) (“[I]t is likely that the TCEQ’s zero-out approach results in more light extinction attributed to the U.S. modeled emission sources and underestimates the total contribution from international anthropogenic emissions.”).

will be below the URP despite Texas's zero-out modeling predicting impairment above the glidepath, due to the inherent conservatism of the model attributable to its inability to fully account for international emissions, as well as to monitor data trends.[15] Not only does the Hawai'i Zero Out approach likely underestimate impacts from mainland emissions that it attemps to zero out, it also fails to account for international anthropogenic sources and wildland prescribed fires that also should be "zeroed out.".[16]

For Maui, Figure 1 demonstrates that the Zero Out approach is below the glidepath while the more conservative Whitepaper approach is over the glidepath. Importantly, the monitor data in Figure 1 demonstrates that visibility is, in fact, below the glidepath. In 2019, impairment was measured at 6.1 deciviews (dv) in Haleakala National Park, compared with the 2024 glidepath goal of 6.4 dv, demonstrating the that the current SIP modeling is overly conservative and should not be the basis for concluding that impairment is above the glidepath.

Figure 1. 2024 Modeling Glidepath Estimate for Haleakala National Park[17]



[15] *Id.* At 22192-93.

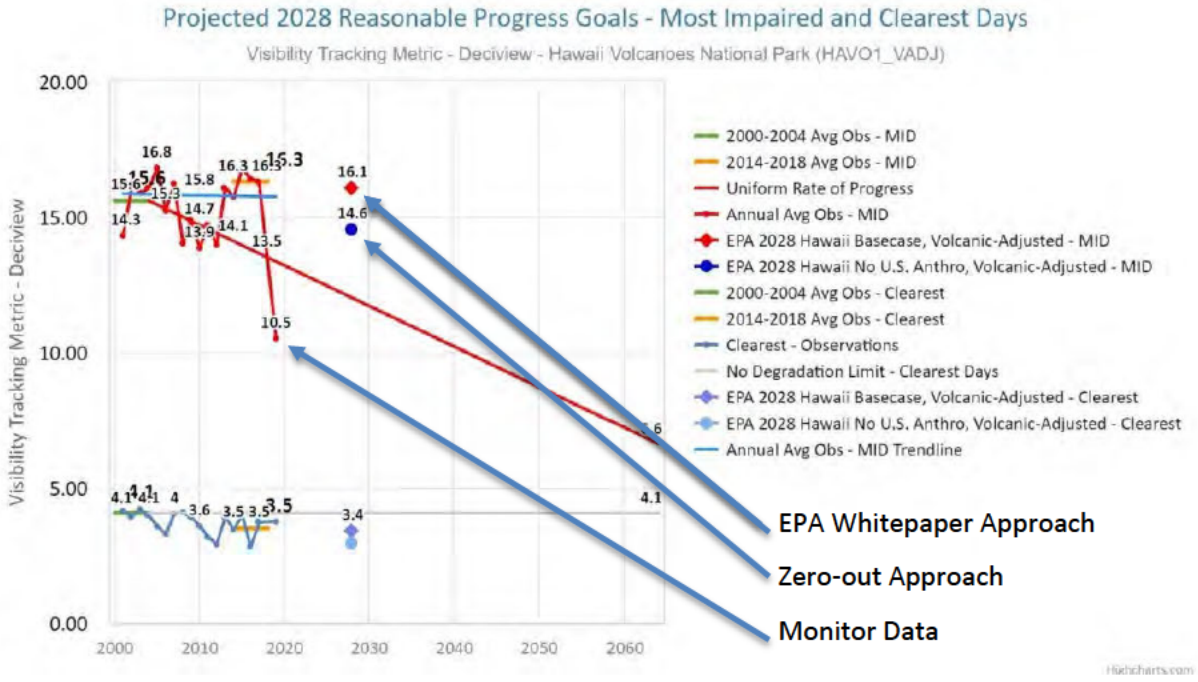
[16] Hawaii State Department of Health Regional Haze State Implementation Plan, Revision 1, Second Planning Period, August 2, 2024, page 3 of the Executive Summary and page 133, https://health.hawaii.gov/cab/files/2025/01/FINAL-2021HI-RHSIPrev8_2_24.pdf (Hawai'i Department of Health did not adjust the glidepaths in its SIP for international emissions or wildland prescribed fires).

[17] 2024 Hawaii SIP at 130 (Figure 8.2-1).

For Hawai'i Island, recent monitor data collected during a period with fewer volcanic eruptions[18] also is well below both the modeled impairment estimates and the glidepath. Impairment was measured at 10.5 dv in Hawai'i Volcanoes National Park, compared with a glidepath goal of 12.0 dv. As explained above and consistent with Maui the overly conservative modeling should not support a conclusion that impairment is above the glidepath.[19] See Figure 2.

These recent monitor data are consistent with recent emissions trends that show significant decreases in visibility-impairing emissions of SO_2, NOx, and PM, demonstrating that Hawai'i has made significant progress in the past decade, including a nearly 50% decrease in SO_2 emissions between 2005 and 2017. *See* Tables 1 through 3 following Figure 2.

Figure 2. 2024 Modeling Glidepath Estimate for Hawai'i Volcanoes National Park[20]



[18] Volcanic eruptions release significant amounts of sulfur dioxide (SO_2), a haze-forming pollutant.

[19] *See* 2024 Hawaii SIP at 131, 134.

[20] 2024 Hawaii SIP at 132 (Figure 8.3-1).

Table 1. Difference in Statewide Anthropogenic SO_2 Emissions[21]

Table 4.2-1 Difference in Statewide Anthropogenic SO_2 Emissions							
Source Category	Statewide SO_2 (TPY)						
	2005	2011	2014	2016	2017	Difference	Percent Change
Point Sources	27,072	22,047	19,543	19,248	17,265	-9,807	-36%
Area Sources	3,716	3,331	98	98	1,141	-2,575	-69%
Agricultural Burning	178	178	197	30	-	-178	-100%
Other Fire/Prescribed Burning	-	36	534	-	50	50	
On-Road Mobile Sources	321	102	104	63	52	-269	-84%
Non-Road Mobile Sources	669	7	9	8	5	-664	-99%
Marine	3,619	2,037	229	267	110	-3,509	-97%
Total Anthropogenic	**35,575**	**27,738**	**20,714**	**19,715**	**18,623**	**-16,952**	**-48%**

Table 2. Difference in Statewide Anthropogenic NOx Emissions[22]

Table 4.2-2 Difference in Statewide Anthropogenic NO_X Emissions							
Source Category	Statewide NO_X (TPY)						
	2005	2011	2014	2016	2017	Difference	Percent Change
Point Sources	22,745	28,982	26,163	23,585	21,596	-1,149	-5%
Area Sources	1,509	1,176	463	464	807	-702	-46%
Agricultural Burning	406	405	359	55	-	-	
Other Fire/Prescribed Burning	1	389	6,153	-	90	89	>100%
On-Road Mobile Sources	20,642	15,503	12,077	10,387	9,327	-11,315	-55%
Non-Road Mobile Sources	6,296	3,842	3,228	3,442	3,288	-3,008	-48%
Marine	5,624	4,895	1,131	8,984	4,401	-1,223	-22%
Total Anthropogenic	**57,223**	**55,192**	**49,574**	**46,917**	**39,509**	**-17,714**	**-31%**

[21] *Id.* at 41.

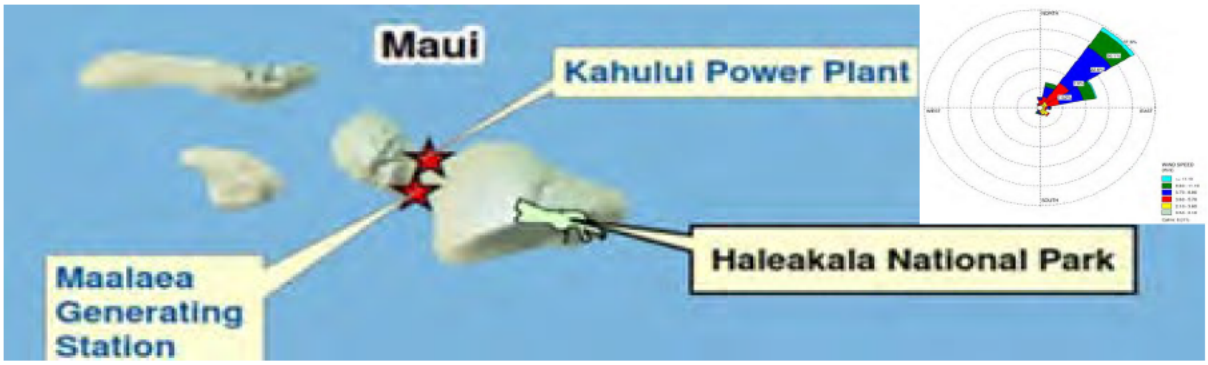
[22] *Id.* at 42.

Table 3. Difference in Statewide Anthropogenic PM Emissions[23]

Table 4.2-4 Difference in Statewide Anthropogenic PM_{10} Emissions							
Source Category	Statewide PM_{10} (TPY)						
	2005	2011	2014	2016	2017	Difference	Percent Change
Point Sources	3,536	2,813	2,583	2,280	2,108	-1,428	-40%
Area Sources	33,408	34,803	54,626	37,780	18,908	-14,500	-43%
Agricultural Burning	1,567	1,567	583	93	-	-1,567	-100%
Other Fire/Prescribed Burning	7	853	14,086	-	673	666	>100%
On-Road Mobile Sources	638	305	770	630	841	203	32%
Non-Road Mobile Sources	649	403	356	339	327	-322	-50%
Marine	398	338	37	185	102	-296	-74%
Total Anthropogenic	**40,203**	**41,082**	**73,042**	**41,307**	**22,958**	**-17,245**	**-43%**

Additionally, because volcanic eruptions are the primary contributors to haze formation in the region, the retirements and controls required by the SIP will have minimal impact on visibility at Hawai'i's Class I areas. This is due in part to the prevailing winds data on Maui (*see* Figure 3), and to the active volcanoes in the National Park on Hawai'i Island.

Figure 3. Kahului Wind Rose (2015 – 2019) Predominant Wind from the Northeast



[23] *Id.* at 44.

Consistent with EPA's consideration of visibility modeling limitations, measured impairment, and emissions trends in the proposed action on the Texas SIP, it would be appropriate to determine that visibility in Hawai'i is below the URP for the second planning period. Such a determination would further support a decision that the forced unit retirements and other SIP-mandated controls are not necessary during this planning period.[24]

Recent Developments Have Revealed Shortcomings in the SIP's Control Cost Assessments

Developments that were not predicted in the SIP have transpired since Hawai'i submitted its SIP to EPA one year ago have revealed additional shortcomings in the SIP. Macro-level economic changes described above have impacted the costs of controls required by the SIP, making it appropriate to revisit the cost per ton of emission reductions relied upon in the SIP to justify the imposition of controls. The SIP requires controls at costs as high as $6,800/ton, which is significantly higher than the cost-effectiveness values used by other states that EPA has proposed to approve (including a determination as low as $1,695 per ton, in Indiana).[25] These costs have increased significantly since DOH made its cost-effectiveness determinations. Just accounting for the increase in values based on updates to the Chemical Engineering Plant Cost Index (CEPCI) has raised the cost of the controls significantly. In light of Hawai'i's significant improvements in reducing haze, it would be defensible to determine that these costs are not reasonable.

[24] EPA's new stated policy is that a SIP is presumptively approvable where visibility is below the URP and the state has conducted a four-factor analysis, even if no additional control measures are necessary. *See* Air Plan Approval; West Virginia; Regional Haze State Implementation Plan for the Second Implementation Period, 90 Fed. Reg. 16,478, 16,483-84 (Apr. 18, 2025).

[25] *See* Air Plan Approval; Indiana; Regional Haze Plan for the Second Implementation Period, 90 Fed. Reg. 25,944, 25,954 (Jun. 18, 2025).

Table 4: Control Cost Updates[26]

HECO Facility	Selected Controls	2024 SIP Cost-Effectiveness Estimate	Revised Preliminary Cost-Effectiveness Estimate
Kanoelehua-Hill **Hill 5 – 14.1 MW** **Hill 6 – 23 MW**	Fuel Switch to ULSD (0.0015% S)	$4,319/ton - $4,684/ton	10 yrs, 7.5% int: Hill 5 - **$5,318/ton**, Hill6 - **$5,578/ton**
	SCR + combustion controls	$2,041/ton - $2,116/ton	10 yrs, 7.5% int: Hill5 - $**5,982/ton**, Hill6 - **$5,855/ton**
Puna **Boiler –** **15.5 MW**	Fuel Switch to ULSD (0.0015% S)	$4,690/ton - $6,014/ton	10 yrs, 7.5% int: **$8,829/ton**
Kahului **K-1 & K-2 – 5 MW each**	Fuel Switch to ULSD (0.0015% S)	$4,910/ton - $5,156/ton	10 yrs, 7.5% int: K1-**$5,153/ton**, K2-**$5,225/ton,** K3 -$5,128/ton, K4-**$5,033/ton**
K-3 – 11.5MW **K-4 – 12.5MW**	SCR + combustion controls	$1,769/ton - $4,595/ton	10 yrs, 7.5% int: K1-**$11,102/ton**, K2-**$11,639/ton**, K3 - **$4,188/ton**, K4 - **$6,838/ton**
Maalaea **M-7 – 5.6MW** **M10-M13 – 12.5MW each**	FITR	$3,030/ton - $5,225/ton	10 yrs, 7.5% int: M1&M3 - **$8,455/ton,** M2 - **$14,578/ton**
	SCR	M7 - $5,530/ton M10-13 - $8,757 - $11,292)	10 yrs, 7.5% int: M7-**$9,141/ton** M10-**$10,296/ton**, M11-**$10,690/ton,** M12-**$14,626/ton**, M13-**$13,444/ton**

[26] Preliminary revised estimates are based on 10 yrs of equipment life, interest rate of 7.5%, and 2024 cost index per CEPCI and do not include costs for contingency generation.

Potential Solutions

The deficiencies in the Hawai‘i SIP could be addressed either through a supplemental SIP submittal by the State, or an action by EPA to partially or fully disapprove the SIP currently before it for review, as EPA has proposed to do with the Colorado SIP. Under either pathway, revisions to the SIP to better consider reliability impacts and the progress made along the URP would be consistent with EPA's recent proposed actions on other state regional haze SIPs.

Hawaiian Electric previously requested that the State of Hawai‘i submit a supplemental SIP to EPA to address the changes in circumstances that may affect the Company's flexibility to respond to energy shortages and which are anticipated to increase control costs affecting already highly impacted customers. A supplemental SIP would allow the State to address these significant economic and energy reliability concerns and is appropriate considering EPA's new policy that provides states with more flexibility and discretion in their regional haze SIPs to accommodate circumstances unique to each State, especially where visibility is projected to be below the URP. To date, the Company has received no formal response from the Hawai‘i Department of Health, presumably in part due to the short time frames required.

The Company recognizes that a supplemental SIP submittal would require EPA to request an extension of the deadline in the consent decree governing its action on numerous SIP submittals, including Hawai‘i's.[27] While an anticipated supplemental SIP from the state could provide EPA with sufficient justification to seek agreement from the plaintiffs to extend the deadline, or justify an opposed motion to the court for an extension on the grounds that it would be an inefficient use of Agency resources to act on a SIP that the State is in the process of supplementing, we understand that the timeline for a supplemental SIP may simply be too short in light of the litigation.

Accordingly, an action by EPA to disapprove the SIP, in whole or in part, could address the issues Hawaiian Electric has identified. Such an action would allow EPA to meet the deadline to act required by the consent decree and trigger the two-year clock for Hawai‘i to revise the SIP itself to address the reliability and cost considerations or failing that for EPA to issue a replacement federal implementation plan (FIP).[28]

In conclusion, revisiting these issues is necessary to address the extreme effects that the current SIP requirements could have on system reliability on Hawai‘i Island and Maui, with little to no actual impact on visibility in the Class I areas in Hawai‘i. Recent tariffs, changes in renewable tax incentives, and projects that have been delayed or cancelled only serve to put more pressure on Hawaiian Electric's firm generation facilities,[29] making it more crucial than before that the Company has the flexibility to continue operating these units

[27] *See Sierra Club v. EPA*, No. 1:23-cv-01744 (D.D.C.).

[28] The Company notes that an EPA action disapproving the Hawai‘i SIP would be subject to public comment and potentially an appeal. This risk could potentially be avoided if Hawai‘i instead intends to supplement the SIP, and EPA is able to secure an extension of the consent decree deadline.

[29] "Firm generation" refers to electric generation that is always available except for periodic downtime for maintenance, as compared with intermittent generation like wind or solar.

past the current deadlines if necessary. We note that the State will have the opportunity to consider whether controls are required for the third planning period in its SIP that currently is due to EPA on July 31, 2028, a deadline for which EPA has proposed an extension of three years.[30]

Thank you again for the meeting. If you have any questions regarding this submittal, or require any additional information, please contact me at karin.kimura@hawaiianelectric.com or 808-543-4500.

Sincerely,

Ec: Gong, Kevin (Gong.Kevin@epa.gov)
Espinoza, Claudia (Espinoza.Claudia@epa.gov)
Lee, Anita (Lee.Anita@epa.gov)
Mebust, Anna (Mebust.Anna@epa.gov)
Slay, Hudson (Slay.Hudson@epa.gov)
Peterson, Cheree (Peterson.Cheree@epa.gov)
Rossio, Marianne Fuji (marianne.rossio@doh.hawaii.gov)
Michael DeCaprio (michael.decaprio@hawaiianelectric.com)
Lee N. Smith (lee.smith@hawaiianelectric.com)
Myrna Tandi (myrna.tandi@hawaiianelectric.com)
Allison Watkins Mallick (Allison.mallick@bakerbotts.com)

[30] Regional Haze Third Implementation Period; Extension of the State Implementation Plan Due Date, 89 Fed. Reg. 104,471 (Dec. 23, 2024).

Attachment P:
DCCA Release: As Iran conflict pushes up oil prices, electric bill will be higher in coming months, April 3, 2026

Release: As Iran conflict pushes up oil prices, electric bills will be higher in coming months

April 3, 2026 at 1:09 am

CONTACT: Darren Pai 808.223.9932
darren.pai@hawaiianelectric.com

HONOLULU, April 1, 2026 – Hawaiian Electric customers should prepare for potential increases in energy costs in the coming months, driven by rising global oil prices linked to escalating geopolitical tensions, including the ongoing conflict involving Iran.

As an island state that relies heavily on imported fuel for electricity generation and transportation, Hawai'i is particularly sensitive to global fossil fuel price fluctuations. These increases will affect electric bills, fuel prices and other commodities.

"We recognize that Hawai'i already faces a high cost of living and that any increase in energy costs places an additional burden on our families and businesses," said Rebecca

Dayhuff
Matsushima, Vice President of Customer Service at Hawaiian Electric. "We want our customers
to be informed, prepared and supported as we navigate this period together."

Hawaiian Electric is forecasting that typical residential bills may rise between 20% and 30%
over the next several months. Oʻahu customers will start seeing higher April bills, followed by
Hawaiʻi Island and Maui County customers who will see increases in May and June.

To help ease the impact and provide greater financial flexibility, starting April 6 Hawaiian Electric
is offering options to help smooth short-term billing spikes, including interest-free payment plans
for up to six months. Customers service representatives are ready to assist in helping to create
the best plan based on individual needs.

"We're committed to supporting our communities during times of uncertainty and we're hopeful
this price surge ends quickly," Dayhuff Matsushima said. "Providing interest-free payment
options is one way we can help customers manage through temporary cost pressures while
continuing to meet their energy needs."

Why This Matters for Hawaiʻi's Energy Future

This moment also underscores why Hawaiʻi is on a long-term path to reduce and ultimately
eliminate its dependence on imported oil. Global events like today's highlight the risks of relying
on fuel sources that are subject to geopolitical instability and price volatility. That's why
Hawaiian Electric has been working to diversify the resources used to generat electricity—
expanding renewable energy such as solar, wind, and storage, while also pursuing a broader
mix of technologies and fuels to strengthen reliability and resilience.

The progress Hawaiʻi has made in transitioning to renewable energy is already

helping to
reduce exposure to fossil fuel price swings. Continued focus on this path is critical for achieving
the state's clean energy goals and providing more stable and predictable energy costs for
customers over the long term.
Hawaiian Electric has reduced its use of oil by 55 million gallons annually since 2008 and is
bringing more than a dozen fixed-price renewable energy projects online in the coming years.
"A more diverse and locally sourced energy portfolio is essential for Hawai'i," Dayhul Matsushima said. "It strengthens our energy security, reduces our exposure to globc market
volatility, and supports a more affordable and sustainable future for our communities."

What Customers Can Do
Options are available to help customers manage their energy bills, including payment arrangements. Links to resources are available at hawaiianelectric.com.
Hawai'i Energy is an expert resource that offers rebates and practical energy-saving tips at
hawaiienergy.com. Some actions to take now:

- Reduce the use of anything that generates heat – water heater, oven, clothes dryer,
stove. Consider a heat pump water heater, now available with a rebate of up to $700
from Hawai'i Energy. It could cut your bill by up to 40%.
- Turn off air conditioning or set it at 78 degrees. Even turning it off for an hour helps.
- Use smart plugs or unplug electronics when not in use, including computers, printers,
cable boxes, game devices and chargers.
- Consider rooftop solar. Hawaiian Electric offers Smart Renewable Energy programs
designed to be simpler and more equitable in the long term.

Hawaiian Electric remains committed to serving as a company of and for Hawai'i — focused on
safety, reliability, resilience, and affordability — while continuing to invest in a cleaner, more

secure energy future for the islands.

Oil prices surged immediately after the Iran conflict began on Feb. 28 and have risen about 50%
in March. Because of the volatility of the oil market and the constantly changing geopolitical
situation, it is difficult to forecast how long Hawai'i will see higher prices for gas, electricity,
shipping and other oil-related commodities.

The formula for rates is regulated by the Public Utilities Commission and includes fu costs that
fluctuate with world markets. Hawaiian Electric makes no profit on the fuel used to generate
electricity. Under a fuel-cost risk-sharing regulatory mechanism, the company's shareholders
are required to pay some of the cost when oil prices rise too high, resulting in a slightly lower
rate for customers.

###

Our mission at the Department of Commerce and Consumer Affairs is to protect Hawai'i's consumers and service its business community with respect and fa o the interests of both.

Contact Us

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FAQs

About

Revised Statutes

Administrative Rules

Proposed Rule making

Legislative Reporting

Landlord Tenant Information

Open Record Request

Terms of use

Accessibility

Privacy Policy

Jobs

Feedback

Attachment Q:
MECO - Kahului Power Plant Property Assessment by the Maui County Tax Assessor's Office

Parcel Information

Parcel Number	370110200000
Location Address	200 HOBRON AVE KAHULUI HI 96732
Neighborhood Code	3824-4
Legal Information	
Land Area	4.002 Acres
Zoning	M2 - M-2 Heavy Industrial
Parcel Note	Non taxable

View Map

Damage
Reentry Zone
Zone Color

Owner Information

Owner Names
MAUI ELECTRIC CO LTD Fee Owner

Mailing Address
MAUI ELECTRIC CO LTD
ATTN: LAND DIVISION, ENGINEERING
P O BOX 398
KAHULUI HI 96733

Assessment Information

Show Historical Assessments

Year	Tax Class	Market Land Value	Agricultural Land Value	Assessed Land	Building Value	Total Assessed Value	Total Exemption Value	Total Net Taxable Value
2026	INDUSTRIAL	$4,138,100	$0	$4,138,100	$2,895,700	$7,033,800	$7,033,800	$0

How to calculate real property taxes

Maui's Automated Planning & Permitting System

Click Here to View All Planning and Permitting Info Regarding This TMK

Permit Information

Maui's Automated Planning & Permitting System link

Date	Permit Number	Reason	Permit Amount
9/27/2001	1804	Truss/Roof	$50,000

Recent Sales In Area

Sale date range:

From: 04 / 02 /

To: 04 / 02 /

Search Sales by Neighborhood

Distance: 1500

Units: Feet

Search Sales by Distance

Generate Owner List by Radius

Distance:

100 Feet

Use Address From:

(•) Owner ( ) Property

Select export file format:

Address labels (5160)

International mailing labels that exceed 5 lines are not supported on the Address labels (5160). For international addresses, please use the xlsx, csv or tab download formats.

[x] Show All Owners

[ ] Show Parcel ID on Label

Skip Labels 0

Download

No data available for the following modules: Assessment Notices, Tax Bills, Agricultural Assessment Information, Current Tax Bill Information, Historical Tax Information, Appeal Information, Home Exemption Information, Improvement Information, Additions, Commercial Improvement Information, Accessory Information, Sales Information, Sketches.

Attachment R:
HELCO - Kanoelehua Hill Generating Station Property Assessment by the County of Hawaii Real Property Tax Office

Parcel Information

Parcel Number	220580190000
Location Address	54 HALEKAUILA STREET
Project Name	
Property Class	INDUSTRIAL
	Property Class refers to Tax Classification ONLY. For Zoning information, please go to Planning Department GIS Public Layers (hawaiicounty.gov) or email planning@hawaiicounty.gov
Neighborhood Code	2228-4
Legal Information	
Land Area (acres)	14.5240
Land Area (approximate sq ft)	632,665

View Map

Plat (TMK) Maps

Owner Information

Owner Names
HAWAII ELECTRIC LIGHT CO INC Fee Owner

Mailing Address
HAWAII ELECTRIC LIGHT CO INC
ATTN LAND DIVISION, HSL
PO BOX 1027
HILO HI 96721 1027

Assessment Information

⊞ Show Historical Assessments

Year	Property Class	Market Land Value	Dedicated Use Value	Assessed Land Value	Market Building Value	Assessed Building Value	Total Market Value	Total Assessed Value	Total Exemption Value	Total Taxable Value
2026	INDUSTRIAL	$7,732,400	$0	$7,732,400	$9,939,700	$9,939,700	$17,672,100	$17,672,100	$17,672,100	$0

Land Information

Property Class	Square Footage	Acreage	Agricultural Use Indicator
INDUSTRIAL	632,665	14.524	

Commercial Improvement Information

Property Class		**Units**	1
Building Card	2	**Structure Type**	COMMERCIAL C-2 (MAS)
Building Number	0002	**Year Built**	1995
Improvement Name	CONTROL CENTER	**Effective Year Built**	1995
Identical Units	1	**Gross Building Description**	

Card	Section	Floor #	Area	Perimeter	Occupancy	Wall Height	Exterior Wall	Construction
2	1	01	3,817	294	Office Building	16	MASONRY	MASONRY

Other Features

Description	Measurements	Identical Units
CANOPY ONLY	32 x 1	1

Property Class		**Units**	0
Building Card	3	**Structure Type**	WAREHOUSE MET/AVG
Building Number		**Year Built**	2009
Improvement Name	PRODUCTION SHOP	**Effective Year Built**	2009
Identical Units	0	**Gross Building Description**	

Card	Section	Floor #	Area	Perimeter	Occupancy	Wall Height	Exterior Wall	Construction
3	01	01	7,525	564	Shell, Industrial	20	MASONRY	STEEL

Property Class		**Units**	0
Building Card	4	**Structure Type**	COMMERCIAL C-4 (MAS)
Building Number		**Year Built**	1995
Improvement Name	OFFICES	**Effective Year Built**	1995
Identical Units	0	**Gross Building Description**	

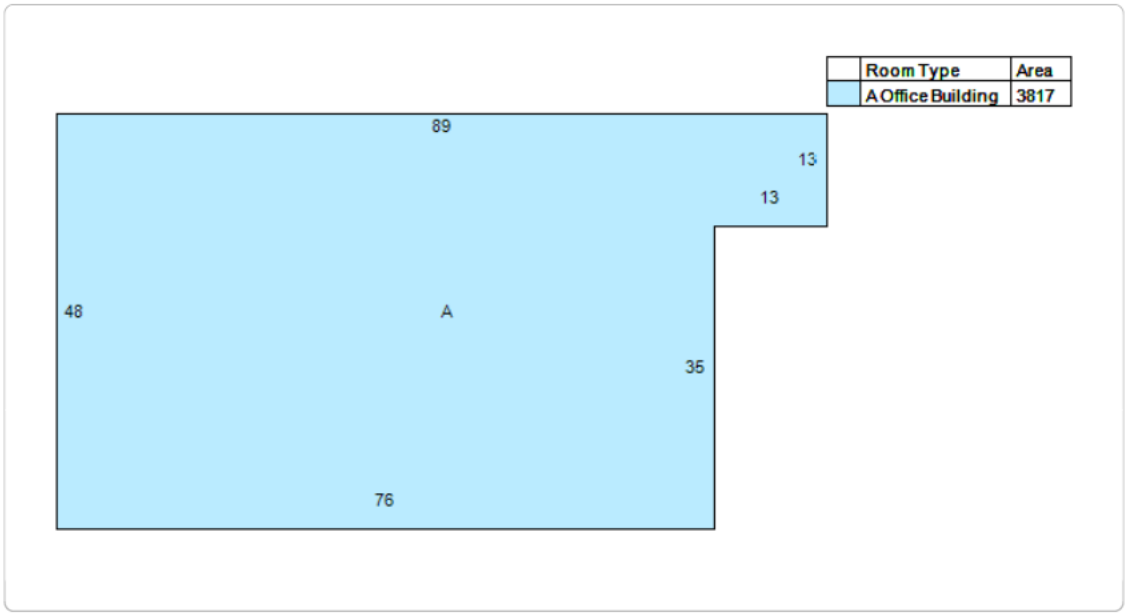
Card	Section	Floor #	Area	Perimeter	Occupancy	Wall Height	Exterior Wall	Construction
4	1	1	19,604	756	Office Building	8	MASONRY	MASONRY
4	1	1	4,280	324	Office Building	8	MASONRY	MASONRY
4	1	1	2,008	202	Office Building	8	MASONRY	MASONRY
4	1	1	2,480	204	Shell, Industrial	12	MASONRY	STEEL/MASONRY

Other Features

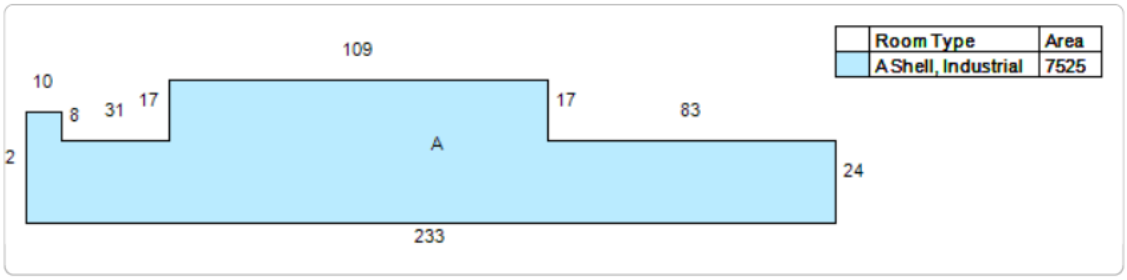
Description	Measurements	Identical Units

Description	Measurements	Identical Units
UTILITY BLDG - FRAME	320 x 1	1
DECK - CONCRETE	368 x 1	1

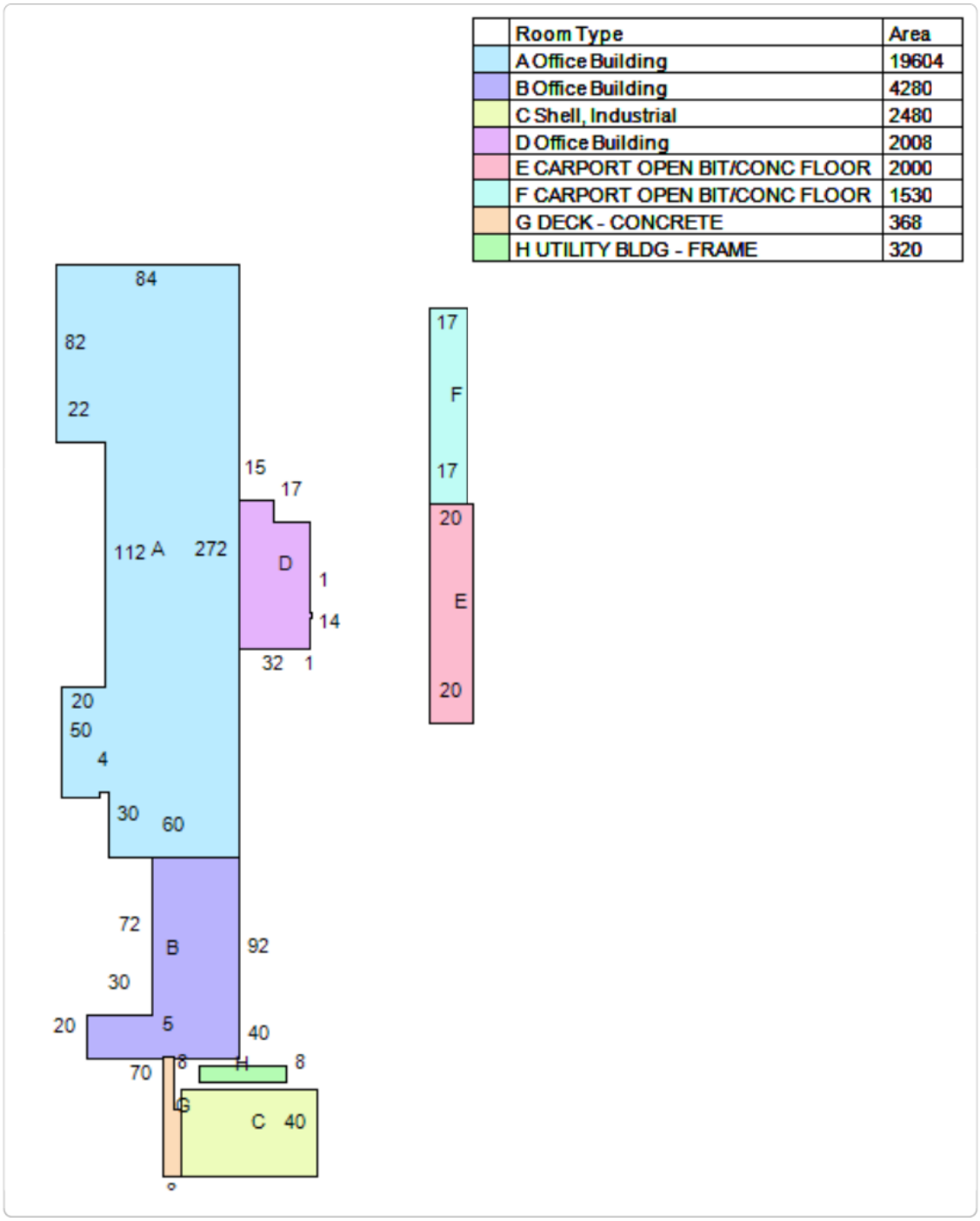
Sketches



Building 3


109
10
8
31
17
17
83
A
2
24
233
Room Type
Area
A Shell, Industrial
7525

Building 4



Other Building and Yard Improvements

Description	Quantity	Year Built	Area	Gross Building Value
MASONRY UTILITY SHED	1	1995	120	$10,591
CARPORT OPEN BIT/CONC FLOOR	1	1961	1,530	$8,900
CARPORT OPEN BIT/CONC FLOOR	1	1961	2,000	$11,620

Permit Information

The permit data reflected in this section is for the purposes of Real Property Tax assessments. For Building permit information or updates, please refer to the link below under the Building Division Permit and Inspections Information.

Date	Permit Number	Reason	Status	Permit Amount
5/26/2023	PW.B2022-003237			$80,000
3/13/2017	BH2017-00206			$29,710
6/30/2016	BH2016-00891		CANCELLED PERMIT	$3,000,000
6/30/2016	BH2016-00890			$200,000
12/28/2015	BH2015-02507			$191,000
8/17/2015	BH2015-01581	Alteration	PERMIT COMPLETED	$80,000

Date	Permit Number	Reason	Status	Permit Amount
3/24/2015	BH2015-00469		PERMIT COMPLETED	$425,000
1/22/2015	BH2015-00089		PERMIT COMPLETED	$157,007
9/16/2014	BH2014-01499	Addition	PERMIT COMPLETED	$1,500,000
4/10/2013	BH2013-00456	Photovoltaic	PERMIT COMPLETED	$135,000
11/14/2011	B2011-1535H	Alteration	PERMIT COMPLETED	$317,338
10/11/2006	B2006-2740H		PERMIT COMPLETED	$39,400
9/25/2003	031907		PERMIT COMPLETED	$50,000
11/30/1999	0991438		PERMIT COMPLETED	$250,000
5/4/1995	0950729		PERMIT COMPLETED	$1,060,000

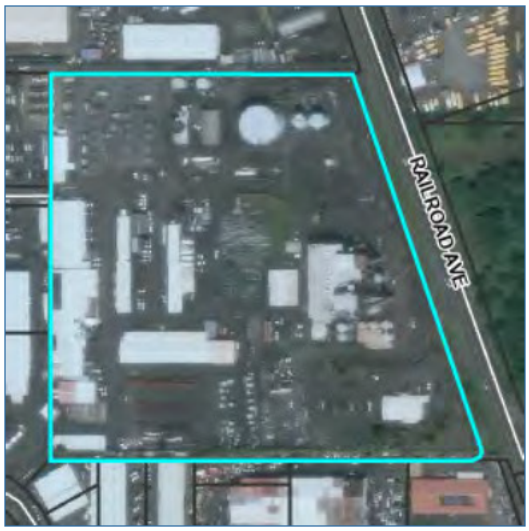
Building Division Permit & Inspections Information

https://hawaiicountyhi-energovpub.tylerhost.net/Apps/SelfService#/home

Historical Tax Information

Year	Tax	Payments and Credits	Penalty	Interest	Other	Amount Due
⊞ 2000	$43,907.25	($43,907.25)	$0.00	$0.00	$0.00	$0.00

Map



Recent Sales in Area

Sale date range:

From: 04 / 06 /

To: 04 / 06 /

Search Sales by Neighborhood

Distance: 1500

Units: Feet

Search Sales by Distance

No data available for the following modules: Condominium/Apartment Unit Information, Agricultural Assessment Information, Residential Improvement Information, Sales Information, Current Tax Bill Information.

Attachment S:
MECO - Maalaea Generating Station Property Assessment by the Maui County Tax Assessor's Office

Parcel Information

Parcel Number	380050250000
Location Address	1000 N KIHEI RD KIHEI HI 96753
Neighborhood Code	3878-4
Legal Information	
Land Area	24.589 Acres
Zoning	M2 - M-2 Heavy Industrial
Parcel Note	Non taxable

View Map

Damage
Reentry Zone
Zone Color

Owner Information

Owner Names
MAUI ELECTRIC CO LTD Fee Owner

Mailing Address
MAUI ELECTRIC CO LTD
ATTN: LAND DIVISION, ENGINEERING
P O BOX 398
KAHULUI HI 96732

Assessment Information

Show Historical Assessments

Year	Tax Class	Market Land Value	Agricultural Land Value	Assessed Land	Building Value	Total Assessed Value	Total Exemption Value	Total Net Taxable Value
2026	INDUSTRIAL	$3,442,500	$0	$3,442,500	$10,316,600	$13,759,100	$13,759,100	$0

How to calculate real property taxes

Sales Information

Sale Date	Price	Instrument Number	Instrument Type	Valid Sale or Other Reason	Document Type	Record Date	Land Court #	Land Court Cert
8/27/1990	$0	0000000000						

Maui's Automated Planning & Permitting System

Click Here to View All Planning and Permitting Info Regarding This TMK

Permit Information

Maui's Automated Planning & Permitting System link

Date	Permit Number	Reason	Permit Amount
6/9/2005	B20051124	Other see notes	$74,603
11/26/1991	B912768		$252,453
8/22/1989	B892049		$102,200
6/9/1989	B891412		$130,000
11/16/1988	B883480	New commercial bldg	$10,000

Recent Sales In Area

Sale date range:

From: 04 / 06 /

To: 04 / 06 /

Search Sales by Neighborhood

Feet

Distance: 1500 Units: Feet Search Sales by Distance

Generate Owner List by Radius

Distance: 100 Feet

Use Address From: Owner Property

Select export file format: Address labels (5160)

International mailing labels that exceed 5 lines are not supported on the Address labels (5160). For international addresses, please use the xlsx, csv or tab download formats.

Show All Owners

Show Parcel ID on Label

Skip Labels 0

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No data available for the following modules: Assessment Notices, Tax Bills, Agricultural Assessment Information, Current Tax Bill Information, Historical Tax Information, Appeal Information, Home Exemption Information, Improvement Information, Additions, Commercial Improvement Information, Accessory Information, Sketches.