Regional Haze Rule Emissions Control Analysis

The Regional Haze Rule emissions review is complex and has the potential to subject a facility to very expensive retrofit emission controls.

Areas of Expertise

- FGD and SCR Systems
- Air Pollution Control
- Cost Estimation
- Air Pollution Control Construction

More Information

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Key Reference Material:
Regional Haze Rule Emission Control Assessments

- Final Rulemaking: Amendments to Regulatory Requirements for State Regional Haze Plans (https://www.epa.gov/visibility/final-rulemaking-amendments-regulatory-requirements-state-regional-haze-plans)
- Draft Guidance for the Second Implementation Period of the Regional Haze Rule (https://www.epa.gov/visibility/draft-guidance-second-implementation-period-regional-haze-rule)

Overview

The Regional Haze Rule (RHR) requires states to submit a series of state implementation plans (SIPs), once every 10 years, to protect visibility in certain national parks and wilderness areas, known as mandatory Federal Class I areas. The ultimate goal is to reach "natural conditions" by the year 2064. The second of these 10 year periods covers the period through 2028, and each state needs to develop and submit regional haze SIPs for this period by July 31, 2021.

EPA recently updated their guidance to states for this implementation period, proposed in 2016 and promulgated in early 2017. Although the current EPA has announced plans to revisit some areas of the guidance, there has been no progress in this area yet. Therefore, states are moving forward at this time because much work is needed in preparation for the SIP submittals.

The key feature of this implementation period is that states should identify pollutants that result in at least 10% of haze on the 20% most impaired days at Class I areas in that state or adjacent states. Pollutants that are likely to qualify are SO_2 and NO_x. States must then identify emission sources within the state that are likely to cause 80% of the visibility impairment on the 20% worst haze days. The method used by each state may differ, but will likely be related to the magnitude of the SO_2 and NO_x (and possibly direct PM) emissions and the distance of the source from the nearest Class I area. The end result is that large emitters of SO_2 and NO_x are identified for further review by the state.

The review that the state will request, to enable it to make reasonable progress toward the goal of natural conditions, is a "4-factor" analysis. Basically, this analysis is a review of all possible emission controls (for SO_2 and NO_x) for identified emission units. The state review features the following elements:

STEP 1: identify all available control technologies to control the pollutant of interest.

STEP 2: eliminate technically infeasible control options (a very important and possibly contentious step).

STEP 3: determine the control effectiveness (% of pollutant removed) for the feasible options.

STEP 4: evaluate 4 factors for these feasible options, which are:

- **FACTOR 1:** cost of compliance (cost to install and operate the controls, with depreciation of capital costs)
- **FACTOR 2:** time necessary for compliance (period involved in studying, designing, procuring, installing, and operating the controls; must be within 5 years)
- **FACTOR 3:** energy and non-air quality impacts (side effects that operation of the controls cause that will result in a need for more energy or other effects such as waste disposal, water consumption, etc.)
- **FACTOR 4:** remaining useful life (limitations in the life of the source less than 20 years could affect the cost effectiveness of the controls).

The analysis of the cost of feasible controls is important because any feasible option that has a reasonable cost-effectiveness (e.g., no more than $5,000 per ton of pollutant removed) could be determined to be helpful for the state to achieve reasonable progress toward the RHR goal, and would likely be required by the state for installation, with the cost borne by the source. Therefore, the cost evaluation needs to realistically account for all site-specific considerations that need to be factored in. This involves highly technical analyses that require experienced air engineers. The consequences of the analysis are very important because the requirement for installation of controls can easily result in the expenditure of tens or hundreds of millions of dollars, which generally do not provide any production benefits for the source; they are environmental costs that may result in facility closure. The importance of having competent air engineering consultants conducting the 4-factor analysis cannot be overstated.

Our Approach

The following steps would be taken for carrying out the 4-factor analysis:

- **STEP 1: ESTABLISH SITE DESIGN AND ECONOMIC CRITERIA.** This task is typically completed by first submitting a datasheet request to the facility for completion. AECOM would then follow up with a site visit to discuss retrofit options with plant staff, determine areas appropriate for emissions control equipment installation, identify constructability issues related to the retrofit, and at the same time collect any outstanding design basis information that is needed.
- **STEP 2: SIZE EMISSIONS CONTROL SYSTEM EQUIPMENT.** Using the plant design criteria, AECOM would calculate the design gas flows and compositions for each unit. This information would then be used to size the major components of the emissions control equipment and the systems required to support their operation.
- **STEP 3: CONDUCT SITE VISIT.** The site visit would confirm current plant layouts and equipment operation limitations. Existing plant layout drawings would be marked up to identify potential locations of new retrofit components. A member of the AECOM construction group would evaluate the constructability of the equipment being considered for each source emission component. Tie-ins to and/or new major electrical equipment would then be included in the cost estimates provided.
- **STEP 4: CONCEPTUAL LAYOUT SKETCHES.** Once the equipment is sized and the locations for equipment construction, construction laydown and duct tie-ins are confirmed with plant staff, AECOM would produce conceptual layout sketches (plan views only) to identify the proposed locations for each emissions control system considered. These drawings would be handled as revisions to existing electronic/CADD files provided by the client where available.
- **STEP 5: TECHNICAL AND ECONOMIC ANALYSIS.** Using the layout drawings and the information gathered during the site visits, AECOM would then assess the performance, applicability, and constructability of various AQSC configurations for each of the affected units. The technical assessment, retrofit constructability evaluation and design criteria would serve as the basis for the development of the capital and operating costs for each technology considered. Capital and operating costs would be developed using established cost estimating procedures.
- **STEP 6: FINAL REPORT.** The results of the analyses would be summarized in a final report that would be reviewed with the client at the end of the project.

Areas of Expertise

In addition to knowledge of the RHR requirements, AECOM has extensive experience with air pollution control retrofits. Among our key strengths are:

1. **FLUE-GAS DESULFURIZATION (FGD) AND/ OR SELECTIVE CATALYTIC REDUCTION (SCR) PROJECTS.** AECOM scientists have extensive experience and are recognized industry experts in both the study and execution phases of adding air pollution control equipment to facilities subject to the Regional Haze Rule, such as coal-fired power plants.
2. **AIR POLLUTION CONTROL.** AECOM has unparalleled experience in air pollution control projects – from the conceptual engineering phase through construction and start-up of the facility.
3. **COST ESTIMATION.** AECOM's recent experience with SCR and FGD projects gives us an outstanding reference database for estimating the cost of the potential retrofits. In addition to our estimating systems and databases, we authored the series of "Economic Evaluation of FGD Systems" reports for the Electric Power Research Institute (EPRI) that provide cost comparisons for more than 40 different FGD system configurations.
4. **AIR POLLUTION CONTROL CONSTRUCTION.** In addition to the technical aspects of an air pollution control retrofit project, it is important to factor the ultimate construction of the project into the scope development phase. We have seen many projects that may be scoped in a technologically acceptable manner – but are incredibly expensive and difficult to actually build. AECOM has strong construction experience in air pollution control projects.

Key AECOM Attributes

- **PERFORMANCE AND PROCESS GROUP (GROUP).** This in-house center of engineering and technology experts provides a wide range of consulting to ensure the efficient and cost effective operation of industrial facilities. Consulting assignments range from small conceptual studies to extensive performance and equipment evaluations.
- **THERMAL CYCLE DESIGN AND OPTIMIZATION.** Our 30 recognized industry experts in this field include power block equipment specialists, most of whom have held prominent positions with major equipment manufacturers (Combustion Turbine, HSRG, Steam Turbine, Condenser, Cooling Tower, Air Quality Control System [AQCS], etc.). The group also includes specialists in emission calculations, availability/reliability analysis, performance testing, and economic analysis. Their activities encompass project development and front-end engineering support, technology screening, plant performance assessment and guarantees, economic optimization studies, risk analysis, performance testing, and consulting services for major power plant components.
- **DESIGN AND ANALYSIS OF RANKINE CYCLE, COMBINED CYCLE, AND COGENERATION POWER PLANTS WITH STEAM EXPORT.** We provide this service to campuses, paper mills, steel mills, refineries, desalination plants, and other thermal hosts. The Group utilizes Gate Cycle, GT PRO, and PEPSE software to design, analyze, and optimize power plant thermal cycles. The application of these programs, coupled with an extensive AECOM cost database, enables the optimization of cycle design and configurations.
- **COLLECTION OF CRITICAL INFORMATION THROUGH STUDIES.** Our Group provide specialized internal engineering and technology support needed to make sound assessments, equipment selection and O&M decisions, as well as recommend strategic direction. The Group has performed a number of financial performance reviews for owners as they evaluated BOP equipment selection, helping them choose the correct equipment to reconcile their competing capital and O&M budget demands.
- **SIGNIFICANT COST SAVINGS THROUGH THE OPTIMIZATION OF EQUIPMENT AND CONTROL SYSTEMS.** As leaders in this specialty field, AECOM's engineers have carried out hundreds of assignments at a wide variety of worldwide industrial clients to both resolve design or operating issues with air pollution control systems and minimize the cost of plant expansions, upgrading and modifications. By evaluating key measures of plant efficiency as well as recommending component changes and other improvements, the plant efficiency can be greatly increased while reducing operating costs.