PART E – POLICY AND PROCEDURES FOR FACILITIES SUBJECT TO PREVENTION OF SIGNIFICANT DETERIORATION FOR GREENHOUSE GASES

Chapter 1 - GHG BACT

This chapter explains the requirements of greenhouse gases (GHG) BACT regulations according to U.S. EPA, describes the Top-Down Process, shows how to calculate GHG emissions and explains the Prevention of Significant Deterioration (PSD) Applicability for GHGs for new sources as well as modified sources. The guidance in this chapter is applicable to the U.S. EPA requirements in place as of the date of these guidelines, and takes into consideration the U.S. Supreme Court decision in *Utility Air Regulatory Group v. Environmental Protection Agency, 134 S. Ct. 2427 (2014)*[1].

BACKGROUND

U.S. EPA has found that GHG, made of up of six combined compounds, constitute air pollution that endanger public health and welfare. ~~EPA~~U.S. EPA's adopted requirements for GHG under 40 CFR 52.21 in May 2010, which were revised in October 2015, to establish a way to permit GHG emissions under PSD and Title V. Through this rule, permitting focused on the major industrial sources, which emit nearly 70 percent of the greenhouse gas pollution from stationary sources. At this time, smaller businesses and sources are not be subject to these requirements.

The requirements of this rule apply only to GHG as defined by ~~EPA~~U.S. EPA as a total group of six GHG which are: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). All other attainment air contaminants, as defined in South Coast AQMD Rule 1702 subdivision (a), shall be regulated for the purpose of PSD.

PERMITTING GUIDANCE FOR GHG

~~EPA~~U.S. EPA's "PSD and Title V Permitting Guidance for Greenhouse Gases" provides the basic information that permit writers and applicants need to address GHG emissions in permits[2]. Although this guidance was issued prior to the revision of 40 CFR 52.21 in 2015, there are parts still applicable to the current requirements. The applicable parts of the guidance document are summarized in these Guidelines. The guidance:

- applies long-standing PSD and Title V permitting requirements and processes to GHG;
- reiterates that BACT determinations will continue to be a state, and project specific decision;
- does not prescribe GHG BACT for any source type;

[1] The UARG v. EPA decision limited the scope originally envisioned by the Tailoring Rule, and now only "anyway sources" are subject to GHG BACT. On October 3, 2016, EPA proposed revising 40 CFR 52.21 to establish a Significant Emissions Rate for GHGs at the same threshold of 75,000 ton per year CO2e as Step 1 of the Tailoring Rule for "anyway" sources.

[2] https://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases

  - emphasizes the importance of BACT options that improve energy efficiency;
- points out that Carbon Capture and Sequestration (CCS) is a promising technology in the early stage of demonstration and commercialization (it should be identified as an available control measure in the first step of BACT, it is currently an expensive technology and unlikely to be selected as BACT in most cases);
- notes that biomass could be considered BACT after taking into account environmental, energy, and economic considerations and state and federal policies that promote biomass for energy-independence and environmental reasons. In its memorandum[3] dated November 19, 2014, ~~EPA~~U.S. EPA states that it is still assessing and monitoring biogenic feedstocks and will provide further guidance. Further updates can be found at ~~EPA~~U.S. EPA's webpage "CO2 Emissions Associated with Biomass Use at Stationary Sources."
- provides flow charts and examples that illustrate the key points of the traditional five-step process for determining BACT for GHG; and
- identifies technical resources related to GHG emissions and controls.

FEDERAL PSD APPLICABILITY FOR GHG

Beginning January 2, 2011, GHG BACT applies when a new or modified facility is subject to PSD requirements for GHG. The first step for PSD applicability determination for new or modified sources is listed in the Tables 7 and 8 below that address the requirements in 40 CFR 52.21. A second step for PSD applicability is contemporaneous netting. For detailed guidance on this topic, ~~EPA~~U.S. EPA's "PSD and Title V Permitting Guidance for Greenhouse Gases" (March 2011) should be referenced, but should be used in accordance with ~~EPA~~U.S. EPA's clarifying documents regarding the U.S. Supreme Court decision in *Utility Air Regulatory Group v. Environmental Protection Agency*[4] and the current requirements under 40 CFR 52.21.

In determining PSD applicability, a differentiation between GHG CO_2e and mass basis must be made. GHG mass basis is simply the sum of all six GHG compound mass emissions. However, to obtain GHG CO_2e, the mass emissions of each individual GHG compound must be multiplied by its 100-year Global Warming Potential (GWP). The individual GHG CO_2e are then summed to obtain the total CO_2e for the source. Current GWP factors should be obtained from ~~EPA~~U.S. EPA's website when performing these calculations.

[3] EPA Memo: "Addressing Biogenic Carbon Dioxide Emissions from Stationary Sources, (2014 November 9)

[4] EPA Memo: Next Steps and Preliminary Views on the Application of Clean Air Act Permitting Programs to Greenhouse Gases Following the Supreme Court's Decision, (2014, July 24)

Table 7
GHG PSD Applicability for New Sources

PSD applies to GHG if:
1. The source is otherwise subject to PSD for another regulated NSR pollutant, **AND** 2. The source has a GHG PTE ≥ 75,000 tons per year (TPY) CO_2e;

Table 8
GHG PSD Applicability for Modified Sources

PSD applies to GHG if:
1. The modification is otherwise subject to PSD for another regulated NSR pollutant, **AND** 2. The modification results in a GHG emissions increase and net emissions increase: a. ≥ 75,000 TPY CO_2e, **AND** b. > zero TPY mass basis

Contemporaneous Netting

Contemporaneous netting is the process of considering all of the creditable emission increases and decreases that have occurred during the period beginning five years before the proposed construction of the modification through the date that the emission increase from the modification occurs. When calculating the net emissions increase in Table 8 above for PSD applicability, it must include all emission increases and decreases during this period.

SOUTH COAST AQMD PSD APPLICABILITY FOR GHG

South Coast AQMD adopted Rule 1714 in 2010 to implement the PSD GHG requirements set forth by 40 CFR 52.21. South Coast AQMD Rule 1714 incorporates the provisions of 40 CFR 52.21 by reference, excluding the sections listed under South Coast AQMD Rule 1714 (c)(1). South Coast AQMD PSD applicability should be determined following the applicable sections of the Code of Federal Regulation identified in the rule.

TOP-DOWN BACT PROCESS

~~EPA~~U.S. EPA recommends that permitting authorities continue to use the ~~EPA~~U.S. EPA's five-step "Top-Down" BACT process to determine BACT for GHG (U.S. EPA, 2011)[5]. While this section summarizes the steps in the process,

[5] U.S. EPA (2011). PSD and Title V Permitting Guidance for Greenhouse Gases

further details for each of the steps can be referenced in ~~EPA~~U.S. EPA's guidance document.

BACT Step 1 – Identify All Available Control Options

The first step in the top-down BACT process is to identify all "available" control options. Available control options are those air pollution control technologies or techniques (including lower-emitting processes and practices) that have the potential for practical application to the emissions unit and the regulated pollutant under evaluation.

Permit applicants and permitting authorities should identify all "available" GHG control options that have the potential for practical application to the source under consideration.

The application of BACT to GHG does not affect the discretion of a permitting authority to exclude options that would fundamentally redefine a proposed source. GHG control technologies are likely to vary based on the type of facility, processes involved, and GHG being addressed. ~~EPA~~U.S. EPA has emphasized the importance of energy efficiency improvements.

For the purposes of a BACT analysis for GHG, ~~EPA~~U.S. EPA classifies CCS as an add-on pollution control technology that is "available" for large CO_2-emitting facilities including fossil fuel-fired power plants and industrial facilities with high-purity CO_2 streams (*e.g.,* hydrogen production, ammonia production, natural gas processing, ethanol production, ethylene oxide production, cement production, and iron and steel manufacturing).

BACT Step 2 – Eliminate Technically Infeasible Options

Under the second step of the top-down BACT analysis, a potentially applicable control technique listed in Step 1 may be eliminated from further consideration if it is not technically feasible for the specific source under review. ~~EPA~~U.S. EPA generally considers a technology to be technically feasible if it has been successfully operated on the same type of source under review or is available and applicable to the source under review.

Assuming CCS has been included in Step 1 of the top-down BACT process for such sources, it now must be evaluated for technical feasibility in Step 2. CCS is composed of three main components: CO_2 capture and/or compression, transport, and storage. CCS may be eliminated from a BACT analysis in Step 2 if it can be shown that there are significant differences pertinent to the successful operation for any of these three main components from what has already been applied to a differing source type. For example, the temperature, pressure, pollutant concentration, or volume of the gas stream to be controlled, may differ so significantly from previous applications that it is uncertain the control device will work in the situation currently undergoing review. CCS may be eliminated from a BACT analysis in Step 2 if the three components working together are deemed technically infeasible for the proposed source, taking into account the integration of the CCS components with the base facility and site-specific considerations (*e.g.,* space for CO_2 capture equipment at an existing facility, right-of-ways to build a pipeline or access to an existing pipeline, access to suitable geologic reservoirs for sequestration, or other storage options).

BACT Step 3 – Ranking of Controls

After the list of all available controls is winnowed down to a list of the technically feasible control technologies in Step 2, Step 3 of the top-down BACT process calls for the remaining control technologies to be listed in order of overall control effectiveness for the regulated NSR pollutant under review. The most effective control alternative (*i.e.,* the option that achieves the lowest emissions level) should be listed at the top and the remaining technologies ranked in descending order of control effectiveness. The ranking of control options in Step 3 determines where to start the top-down BACT selection process in Step 4.

The options considered in a BACT analysis for GHG emissions will likely include, but not necessarily be limited to, control options that result in energy efficiency measures to achieve the lowest possible emission level. Where plant-wide measures to reduce emissions are being considered as GHG control techniques, the concept of overall control effectiveness will need to be refined to ensure the suite of measures with the lowest net emissions from the facility is the top-ranked measure. Ranking control options based on their net output-based emissions ensures that the thermal efficiency of the control option, as well as the power demand of that control measure, is fully considered when comparing options in Step 3 of the BACT analysis. Finally, to best reflect the impact on the environment, the ranking of control options should be based on the total CO_2e rather than total mass or, mass for the individual GHG.

BACT Step 4 – Economic, Energy, and Environmental Impacts

Under Step 4 of the top-down BACT analysis, permitting authorities must consider the economic, energy, and environmental impacts arising from each option remaining under consideration. Accordingly, after all available and technically feasible control options have been ranked in terms of control effectiveness (BACT Step 3), the permitting authority should consider any specific energy, environmental, and economic impacts identified with those technologies to either confirm that the top control alternative is appropriate or determine it to be inappropriate.

There are compelling public health and welfare reasons for BACT to require all GHG reductions that are achievable, considering economic impacts and the other listed statutory factors. As a key step in the process of making GHG a regulated pollutant, ~~EPA~~U.S. EPA has considered scientific literature on impacts of GHG emissions and has made a final determination that emissions of six GHG endanger both the public health and the public welfare of current and future generations. Potential impacts that may be considered in this step based on the ~~EPA~~U.S. EPA's January 2010 Endangerment Finding[6] are detailed in ~~EPA~~U.S. EPA's guidance document.

When conducting a BACT analysis for GHG, the environmental impact analysis should continue to concentrate on impacts other than the direct impacts due to emissions of the regulated pollutant in question. Where GHG control strategies affect emissions of other regulated pollutants, applicants and permitting authorities should consider the potential trade-offs of selecting particular GHG control strategies.

[6] https://www3.epa.gov/climatechange/endangerment/

BACT Step 5 – Selecting BACT

In Step 5 of the BACT determination process, the most effective control option not eliminated in Step 4 should be selected as BACT for the pollutant and emissions unit under review and included in the permit. For energy-producing sources, one way to incorporate the energy efficiency of a process unit into the BACT analysis is to compare control effectiveness in BACT Step 3 based on output-based emissions of each of the control options. Establishing an output-based BACT emissions limit, or a combination of output- and input-based limits, wherever feasible and appropriate to ensure that BACT is complied with at all levels of operation should be considered.

GHG CONTROL MEASURES WHITE PAPERS

~~EPA~~U.S. EPA has a series of technical "white papers" that summarize readily available information on control techniques and measures to reduce GHG emissions from specific industrial sectors. These papers provide basic technical information which may be useful in a BACT analysis, but they do not define BACT for each sector. The industrial sectors covered include:

- Electric Generating Units (PDF) (48pp, 805k)
  ~~EPA~~U.S. EPA Contact: Christian Fellner (919-541-4003 or fellner.christian@epa.gov)
- Large Industrial/Commercial/Institutional Boilers (PDF) (39pp, 337k)
  ~~EPA~~U.S. EPA Contact: Jim Eddinger (919-541-5426 or eddinger.jim@epa.gov)
- Pulp and Paper (PDF) (62pp, 421k)
  ~~EPA~~U.S. EPA Contact: Bill Schrock (919-541-5032 or schrock.bill@epa.gov)
- Cement (PDF) (48pp, 220k)
  ~~EPA~~U.S. EPA Contact: Keith Barnett (919-541-5605 or barnett.keith@epa.gov)
- Iron and Steel Industry (PDF) (78pp, 620k)
  ~~EPA~~U.S. EPA Contact: Donna Lee Jones (919-541-5251 or jones.donnalee@epa.gov)
- Refineries (PDF) (42pp, 707k)
  ~~EPA~~U.S. EPA Contact: Brenda Shine (919-541-3608 or shine.brenda@epa.gov)
- Nitric Acid Plants (PDF) (31pp, 544k)
  ~~EPA~~U.S. EPA Contact: Nathan Topham (919-541-0483 or topham.nathan@epa.gov)
- Landfills (PDF) (28pp, 250k)
  ~~EPA~~U.S. EPA Contact: Hillary Ward (919-541-3154 or ward.hillary@epa.gov)