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GUIDANCE FOR DETERMINING BEST AVAILABLE CONTROL TECHNOLOGY FOR REDUCING CARBON DIOXIDE EMISSIONS FROM BIOENERGY PRODUCTION

Guidance for Determining Best Available Control Technology for Reducing Carbon Dioxide Emissions from Bioenergy Production

Prepared by the

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Disclaimer

This document explains the requirements of EPA regulations, describes EPA policies, and recommends procedures for permitting authorities to use to ensure that permitting decisions are consistent with applicable regulations. This document is not a rule or regulation, and the guidance it contains may not apply to a particular situation based upon the individual facts and circumstances. This guidance does not change or substitute for any law, regulation, or any other legally binding requirement and is not legally enforceable. The use of non-mandatory language such as "guidance," "recommend," "may," "should," and "can," is intended to describe EPA policies and recommendations. Mandatory terminology such as "must" and "required" are intended to describe controlling requirements under the terms of the Clean Air Act and EPA regulations, but this document does not establish legally binding requirements in and of itself.

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I. Introduction

This guidance provides an illustration of reasoning that a Prevention of Significant Deterioration (PSD) permitting authority may use to support the conclusion that the best available control technology (BACT) for carbon dioxide (CO_2) emissions at a bioenergy facility[1] is the combustion of biogenic fuels by itself. As of January 2, 2011, greenhouse gases (GHG), including CO_2, became a pollutant subject to regulation under the Clean Air Act (CAA).[2] Under existing PSD program regulations and EPA interpretations of those regulations, stationary sources of air pollution that require a PSD permit to authorize construction,[3] and that would have the potential to emit (or would increase GHG emissions by) 75,000 tons CO_2 equivalent (CO_{2e}) per year (tpy) or more or are requesting to increase GHG emissions by 75,000 tons CO_2e per year (tpy) but that did not obtain such a permit prior to January 2, 2011,[4] will need to demonstrate to the appropriate reviewing authority[5] that the proposed facility will meet GHG emission limitations through application of BACT.[6] To assist PSD permit applicants and reviewing authorities with making this determination, EPA provided guidance on November 10,

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[1] A 'bioenergy facility' is defined, for the purposes of this guidance, as a facility that generates energy via the combustion of biologically-derived material other than fossil fuels, for example wood, biosolids, or agricultural products. This could be undertaken either alone or in addition to traditional fossil fuels.

[2] 75 FR 17004 (April 2, 2010); 75 FR 31514 (June 3, 2010).

[3] On June 3, 2010, EPA issued a final rule that "tailors" the applicability provisions of the PSD and title V programs to enable EPA and states to phase in permitting requirements for GHGs in a common sense manner ("Tailoring Rule"). The first Tailoring Rule step begins on January 2, 2011, and ends on June 30, 2011, and this step covers what EPA has called "anyway sources" and "anyway modifications" that would be subject to PSD "anyway" based on emissions of pollutants other than GHGs. The second step begins on July 1, 2011, and continues thereafter to cover both anyway sources and certain other large emitters of GHGs.

[4] 75 FR 17021 (April 2, 2010); 75 FR 31526 (June 3, 2010)

[5] This may be EPA or a state or local government authority depending on the status of implementation. See 75 FR 77698 (December 13, 2010); 75 FR 81874 (December 29, 2010); 75 FR 82246 - 82536 (December 30, 2010); 76 FR 752 (January 6, 2011); 76 FR 2070 (January 12, 2011); 76 FR 2581 (January 14, 2011); 76 FR 2591 (January 14, 2011).

[6] 40 CFR 52.21(b)(49)-(50); 40 CFR 51.166(b)(48)-(49); 40 CFR 52.21(b)(12); 40 CFR 51.166(b)(12); 40 CFR 52.21(j)(2)-(3); 40 CFR 51.166(j)(2)-(3); 75 FR 17004 (April 2, 2010); 75 FR 31514 (June 3, 2010).

2010 entitled *PSD and Title V Permitting Guidance for Greenhouse Gases* ("2010 GHG Permitting Guidance"),[7] which includes a section on determining BACT for GHG. In addition to the November 10, 2010 guidance EPA also released technical white papers[8] for several industry sectors.

Any stationary source, including a bioenergy facility, that qualifies as a major stationary source required to obtain a PSD permit must address the BACT requirement for GHGs if it emits or increases its emission of this regulated pollutant in amounts greater than 75,000 tons on a CO_2e basis.[9] This guidance on determining BACT for CO_2 emissions from a bioenergy facility is intended to supplement the 2010 GHG Permitting Guidance, and not to supersede it. This guidance applies to sources that generate energy from biologically–based material, and it does not apply to other sources that may emit biogenic CO_2 but do not generate energy from the biological material. For the sources with biogenic emissions not covered by this guidance document, one should consult the 2010 GHG Permitting Guidance and prior guidance EPA has provided on the top-down BACT process.

Concurrent with the release of this guidance, EPA is issuing a proposed rule to defer application of PSD permitting requirements to CO_2 emissions from biologically-based material (biogenic CO_2 emissions) for a three-year period. The scope of the proposed deferral is wider than the scope of this guidance: the deferral is intended to cover all sources of biogenic CO_2 emissions, including those that emit CO_2 from biologically-based material but do not generate energy from it.

EPA expects to take final action on the proposed deferral rule in the July 2011 timeframe. In the event that EPA finalizes the deferral for the PSD program as proposed, states may require

[7] http://www.epa.gov/nsr/ghgdocs/epa-hq-oar-2010-0841-0001.pdf
[8] http://www.epa.gov/nsr/ghgpermitting.html
[9] 75 Fed. Reg. at 31606-07; 40 CFR 52.21(b)(49); 40 CFR 52.166(b)(48).

additional time to review their state laws to incorporate the deferral established by that rule. To the extent no such deferral is available under the PSD permitting regulations applicable at the time a permitting authority issues a PSD permit for a bioenergy facility, the reasoning described below may be used on an interim basis to support a conclusion in such a permit that BACT for CO_2 is combustion of biomass fuels alone.

This document does not provide a final determination of BACT for a particular source, since such determinations can only be made by individual permitting authorities on a case-by-case basis after consideration of the record in each case. Upon considering the record in an individual case, if a permitting authority has a reasoned basis to address particular issues discussed in this document in a different manner than EPA recommends here, permitting authorities (including EPA) have the discretion to do so in decisions on individual permit applications consistent with the relevant requirements in the CAA and regulations. However, EPA believes the analysis described below will be sufficient in most cases to support the conclusion that utilization of biomass fuel alone is BACT for a bioenergy facility.

It is also important to note that this guidance is meant to be interim guidance only and that once EPA completes the detailed examination of the science and technical issues associated with accounting for biogenic CO_2 emissions from stationary sources, as discussed in the proposed deferral, those analyses may outweigh many of the considerations mentioned in this guidance.

II. CO_2 Emissions from Bioenergy and the Carbon Cycle

Carbon dioxide emissions from bioenergy facilities are generated during the combustion of biologically-based material (e.g., forest or agricultural products) for energy. The term 'CO_2 emissions from bioenergy' is used in this guidance to describe biogenic CO_2 emissions from a stationary source that directly result from the combustion of biologically-based materials other than fossil fuels when these materials are used to generate energy. Although every molecule of CO_2 has the same radiative forcing in the atmosphere regardless of its source, CO_2 emissions from bioenergy merit unique consideration in the BACT analysis because land-based biomass carbon stocks can be replenished more quickly than fossil fuel carbon stocks, and thus these biogenic carbon stocks can act as a sink on a shorter time scale than fossil carbon. For example, many coal deposits in North America originated hundreds of millions of years ago. In contrast, the reservoirs of carbon found on the surface of Earth, in pools such as tree biomass and cropland soils, have accumulated over decades, not millennia.

Through relatively rapid photosynthesis, plants absorb CO_2 from the atmosphere and add it to their biomass, which contains roughly 50% carbon by weight, through a process called sequestration. When biological material such as plant biomass is harvested or cleared from the land and burned for energy, the material acts as a source of carbon, releasing its stored carbon back to the atmosphere as CO_2. Over large spatial scales such as states, regions, or continents, if more carbon is sequestered in plant biomass than is emitted to the atmosphere through processes such as harvest, fire, or natural decomposition, plant biomass acts as a net sink for carbon. Conversely, if more carbon is released than is sequestered, plant biomass acts as a net source for carbon.

EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks (the Inventory)[10] tracks annual GHG emissions and sinks including emissions of CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). That report estimates all anthropogenic sources and sinks of GHG emissions at the national

[10] US EPA. 2010. Inventory of U.S Greenhouse Gas Emissions and Sinks: 1990-2008. U.S. EPA #430-R-10-06.

scale, classified into six broad sectors: Energy, Industrial Processes, Solvents and Other Product Uses, Agriculture, Land-Use, Land-Use Change and Forestry (LULUCF), and Waste. The Energy Sector includes all GHGs emitted during the production, transformation, handling and consumption of energy commodities, including fuel combustion. The LULUCF Sector includes emissions and sequestration resulting from human activities that influence the way land is used or that affect the size of carbon stocks on land. Thus, at the national level, CO_2 emissions from biomass combustion are not included in the estimate of emissions from a country's Energy Sector, even though the emissions physically occur at the time and place in which useful energy is being generated (e.g., power plant or automobile).

Averaged over the years 1990-2008, data from the Inventory show that the LUCF sector in the United States has been a net sink of 841 Teragrams carbon dioxide equivalent (CO_2e) per year.[11] This sink is roughly 12% of the average gross emissions from all other sources combined in the United States over the same time period. Future national projections under business as usual (BAU), as reported in the Fifth U.S Climate Action Report (CAR) submitted to the UNFCCC in 2010, suggest that this LUCF sink is likely to continue, if not increase in size, at least until 2020.[12]

Biogenic CO_2 emissions are distinct from other regulated pollutants at bioenergy facilities because, unlike other pollutants and other GHGs, CO_2 emissions can participate directly in the global carbon cycle through photosynthesis, which is critical for the maintenance of life on Earth. Further, emissions of CO_2 can dwarf emissions of other GHGs from biomass combustion. For example, CO_2 makes up 97.9% of the global warming potential (GWP) of the GHG

[11] See Tables 1 and 2 in Appendix.

[12] U.S. Climate Action Report 2010. Fifth National Communication of the United States of America under the United National Framework Convention on Climate Change. Chapter 5 Projected Greenhouse Gas Emissions, page 81. www.state.gov/documents/organization/140636.pdf

emissions from wood and wood residuals.[13] Finally, because sequestration of CO_2 emissions in living plant material outside the boundaries of the facility may counteract the emissions from such facilities on a continuous basis, this unique dynamic merits consideration in the BACT analysis. This argument is underlined by the fact that GHGs such as CO_2 are well-mixed in the atmosphere at large spatial scales; therefore, the need to reduce them directly at the facility is of lesser importance so long as their net atmospheric impact is accounted for and is negative or zero.

III. EPA's Previous Actions Relating to Application of the PSD Program to Biogenic CO_2 Emissions

On the basis of the Inventory results described above and other considerations, stakeholders have requested that EPA exclude, either partially or wholly, biogenic CO_2 emissions for the purposes of the BACT analysis and the PSD program based on the view that the biological material used to generate energy can also serve as a sink for carbon. In its notice proposing the PSD and Title V Greenhouse Gas Tailoring Rule, EPA referenced the Inventory for the applicable global warming potential (GWP) values and guidance on how to calculate a source's GHG emissions in tons per year (tpy) CO_2e. While EPA referred to the Inventory for GWP identification purposes only, several commenters appeared to misunderstand our intent. The narrow reference to the use of GWP values for estimating GHG emissions was provided to offer consistent guidance on how to calculate these emissions and was not intended as an indication, direct or implied, that biogenic emissions would be excluded from permitting applicability merely by association with the national Inventory.[14] As noted above, the Inventory

[13] See CO_2, CH_4 and N_2O GWPs in Table A-1 of 40 CFR Part 98 Subpart A; and emission factors for CO_2, CH_4 and N_2O from combustion of wood and wood residuals in Tables C-1 and C-2 of 40 CFR Part 98 Subpart C.
[14] *See* 74 FR 55351, under the definition for 'carbon dioxide equivalent'

does not exclude these emissions, but simply includes them in the LUCF Sector rather than the Energy Sector to avoid double-counting at the national scale.

In response, when finalizing the Tailoring Rule, EPA acknowledged the role that biogenic fuels and feedstocks could play in reducing anthropogenic GHG emissions, and did not dispute the commenters' observations that many state, federal, and international rules and policies treat biogenic sources and fossil sources of CO_2 emissions differently.[15] Nevertheless, we determined that we lacked a sufficient record at that time to apply the legal rationales utilized in the Tailoring Rule to exclude emissions of CO_2 from biogenic sources in determining permitting applicability provisions. At that time, we had not requested and did not obtain public comments addressing the particular administrative burden of permitting projects that specifically involve biogenic CO_2 emissions from energy production. Although EPA did not promulgate an applicability exclusion for biogenic emissions in the final Tailoring Rule, EPA did observe that flexibility exists to apply the existing regulations and policies regarding BACT in ways that take into account their net effects on atmospheric GHG concentrations.

In order to explore the issue further following the promulgation of the Tailoring Rule, in July 2010 EPA solicited views from the public through a Call for Information (CFI) on approaches to accounting for biogenic emissions, including whether some or all of a source's biogenic CO_2 emissions could be discounted based on a determination that they are canceled out by the CO_2 absorption associated with growing the fuel. Also, we solicited information on the means to estimate and measure CO_2 emissions from a variety of biogenic fuels.

EPA issued its *PSD and Title V Permitting Guidance for Greenhouse Gases* on November 10, 2010 ("2010 GHG Permitting Guidance"), which discusses the basic information

[15] *See* 75 FR 31514.

that permit writers and applicants need to address GHG emissions in permits.[16] To assist permitting authorities carrying out BACT analyses for GHGs pending further EPA action, the guidance indicated that permitting authorities may consider the environmental, energy and economic benefits that may accrue from the use of certain types of biogenic fuels (e.g., biogas from landfills) for energy generation, consistent with existing air quality standards. Noting that a variety of federal and state policies have recognized that some biogenic fuels can be part of a national strategy to reduce dependence on fossil fuels and to reduce emissions of GHGs, EPA determined that it is appropriate for permitting authorities to account for both existing federal and state policies and their underlying objectives in evaluating the environmental, energy and economic benefits of biogenic fuels. EPA observed that, based on these considerations, permitting authorities might determine in the GHG component of the BACT analysis for new or modified bioenergy facilities, as defined in Section I, that such utilization of biogenic fuels is inherently BACT for GHGs. To assist permitting authorities further in considering these factors, EPA announced its intent to issue guidance that will provide a suggested framework for undertaking an analysis of the environmental, energy and economic impacts of using biogenic fuels in Step 4 of the top-down BACT process.

IV. Summary of the Top-Down BACT Process

On November 10, 2010, EPA issued the 2010 GHG Permitting Guidance, which supplements prior EPA guidance on determining BACT, including EPA's *1990 Draft New Source Review Workshop Manual* ("1990 Workshop Manual").[17] In the 2010 GHG Permitting

[16] PSD and Title V Permitting Guidance for Greenhouse Gases. Prepared by EPA staff. November 2010. Available at: http://www.epa.gov/nsr/ghgdocs/epa-hq-oar-2010-0841-0001.pdf

[17] "PSD and Title V Permitting Guidance for Greenhouse Gases." Prepared by EPA staff. November 2010. Available at: http://www.epa.gov/nsr/ghgdocs/epa-hq-oar-2010-0841-0001.pdf;
"New Source Review Workshop Manual; Draft." October 1990.
Available at: http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf.

Guidance, EPA recommends that permitting authorities continue to use the Agency's five-step "top-down" BACT process to determine BACT for GHGs. In brief, the top-down process calls for all available control technologies for a given pollutant to be identified and ranked in descending order of control effectiveness. A permit applicant should first examine the highest-ranked ("top") option. The top-ranked option(s) should be established as BACT unless the permit applicant demonstrates to the satisfaction of the permitting authority that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the top-ranked technology is not "achievable" in that case. If the most effective control strategy is eliminated in this fashion, then the next most effective alternative should be evaluated, and so on, until an option is selected as BACT.[18] This analysis should be conducted for each regulated NSR pollutant that is subject to the BACT requirement in a given case.

EPA has broken down this analytical process into the following five steps, some of which are discussed in detail later in this section.

Step 1: Identify all available control technologies.

Step 2: Eliminate technically infeasible options.

Step 3: Rank remaining control technologies.

Step 4: Evaluate most effective controls and document results.

Step 5: Select BACT.

For additional detail on this process, consult the 2010 GHG Permitting Guidance and references contained therein. As this guidance focuses on unique considerations for bioenergy facilities, the discussion that follows elaborates only on those steps where EPA believes such considerations are most likely to arise.

[18] 2010 GHG Permitting Guidance at 18.

V. Step 1 of the Top-Down BACT Process

A. Traditional Application of Step 1

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. They typically include the application of alternative production processes, methods, systems, and techniques, including clean fuels or treatment or innovative fuel combustion for control of the affected pollutant.[19]

However, while Step 1 is intended to capture a broad array of potential options for pollution control, this step of the process is not without limits. EPA has recognized that a Step 1 list of options need not necessarily include inherently lower polluting processes that would fundamentally redefine the nature of the source proposed by the permit applicant.[20] BACT should generally not be applied to regulate the applicant's purpose or objective for the proposed facility. In assessing whether an option would fundamentally redefine a proposed source, EPA recommends[21] that permitting authorities apply the analytical framework recently articulated by the Environmental Appeals Board. [22] The underlying record will be an essential component of a

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[19] See pages 25-34 of "PSD and Title V Permitting Guidance for Greenhouse Gases." (November 2010) for more general background on Step 1 of the top-down process.

[20] *In re Prairie State Generating Company*, 13 E.A.D. 1, 23 (EAB 2006).

[21] *See, generally, In the Matter of American Electric Power Service Corporation, Southwest Electric Power Company, John W. Turk Plant*, Petition No. VI-2008-01 (Order on Petition) (December 15, 2009) (title V order referencing and applying framework developed by the EAB) ; *In the Matter of Cash Creek Generation, LLC*, Petition Nos. IV-2008-1 & IV-2008-2 (Order on Petition) (December 15, 2009) (same).

[22] The EPA Environmental Appeals Board has applied this framework for evaluating redefining the source questions in three cases involving coal-fired power plants. *In re Desert Rock Energy Company*, PSD Appeal No. 08-03 et al. (EAB Sept. 24, 2009); *In re Northern Michigan University*, PSD Appeal No. 08-02 (EAB Feb. 18, 2009); *In re Prairie State Generating Company*, 13 E.A.D. 1 (EAB 2006). For additional examples of how EPA approached the redefining the source issue in the context of power plants prior to developing this analytical framework, see the following decisions. *In re Old Dominion Electric Cooperative*, 3 E.A.D. 779 (Adm'r 1992); *In re Hawaiian Commercial & Sugar Co.*, 4 E.A.D. 95 (EAB 1992); *In re SEI Birchwood Inc*., 5 E.A.D. 25 (EAB 1994). EPA also considered this issue in the context of waste incinerators prior to developing the recommended analytical framework. *In re Pennsauken*, 2 E.A.D. 667 (Adm'r 1988); *In the Matter of Spokane Regional Waste-to-Energy*

supportable BACT determination that a candidate control technology redefines the source.[23] The "redefining the source" issue is ultimately a question of degree that is within the discretion of the permitting authority. Ultimately, any decision to exclude an option on "redefining the source" grounds must be explained and documented in the permit record, especially where such an option has been identified as significant in public comments.[24] The 2010 GHG Permitting Guidance provides more information that permit writers and applicants may consult on this topic.

The CAA includes "clean fuels" in the definition of BACT.[25] While clean fuels that would reduce GHG emissions should be considered, EPA has recognized that the initial list of control options for a BACT analysis does not need to include "clean fuel" options that would fundamentally redefine the source. Such options include those that would require a permit applicant to switch to a primary fuel type (e.g., coal, natural gas, or biomass) other than the type of fuel that an applicant proposes to use for its primary combustion process.

B. Previous EPA Guidance on GHG Control Strategies

As EPA discussed in the 2010 GHG Permitting Guidance, for the purposes of a BACT analysis for GHGs, EPA classifies carbon capture and sequestration as an add-on pollution control technology[26] that is "available"[27] for large CO_2-emitting facilities including fossil fuel-

Facility, 2 E.A.D. 809 (Adm'r 1989); *In the Matter of Brooklyn Navy Yard Resource Recovery Facility*, 3 E.A.D. 867 (EAB 1992); *In re Hillman Power Co., LLC*, 10 E.A.D. 673, 684 (EAB 2002). In another case, EPA considered this question in the context of a conversion of a natural-gas fired taconite ore facility to a petcoke fuel. *In re Hibbing Taconite Co*., 2 E.A.D. 838 (Adm'r 1989). For an example of the application of this concept to a fiberglass manufacturing facility, see *In re Knauf Fiber Glass*, 8 E.A.D 121 (EAB 1998).

[23] *In re Desert Rock Energy Company*, PSD Appeal No. 08-03 et al. (EAB Sept. 24, 2009), slip op. at 65, 76.

[24] *In re Desert Rock Energy Company*, slip op. at 70-71, 76-77; *In the Matter of Cash Creek Generation*, Order at 7-10.

[25] 42 USC 7579(3). EPA has not yet updated the definition of BACT in the PSD regulations to reflect the addition of the "clean fuels" language that occurred in the 1990 amendments to the Clean Air Act. 40 CFR 52.21(b)(12); 40 CFR 51.166(b)(12). Nevertheless, EPA reads and applies its regulations consistent with the terms of the Clean Air Act.

[26] EPA recognizes that CCS systems may have some unique aspects that differentiate them from the types of equipment that have traditionally been classified as add-on pollution controls (*i.e.*, scrubbers, fabric filters, electrostatic precipitators). However, since CCS systems have more similarities to such devices than inherently

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). For these types of facilities, CCS should be listed in Step 1 of a top-down BACT analysis for GHGs. This does not necessarily mean CCS should be selected as BACT for such sources, since other considerations such as technical feasibility or economic impacts may justify elimination of such options at later steps of the process.

In addition, EPA has observed that the application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity that falls under the category of "lower-polluting processes/practices." Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions in these BACT reviews. EPA has encouraged permitting authorities to use the discretion available under the PSD program to include the most energy efficient options in BACT analyses for both GHG and other regulated New Source Review (NSR) pollutants. Since the use of add-on controls to reduce GHG emissions is not as well-advanced as it is for most combustion-derived pollutants,

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lower-polluting processes, EPA believes that CCS systems are best classified as add-on controls for purposes of a top-down BACT analysis.

[27] As noted above, a control option is "available" if it has a potential for practical application to the emissions unit and the regulated pollutant under evaluation. Thus, even technologies that are in the initial stages of full development and deployment for an industry, such as CCS, can be considered "available" as that term is used for the specific purposes of a BACT analysis under the PSD program. In 2010, the Interagency Task Force on Carbon Capture and Storage was established to develop a comprehensive and coordinated federal strategy to speed the commercial development and deployment of this clean coal technology. As part of its work, the Task Force prepared a report that summarizes the state of CCS and identified technical and non-technical challenges to implementation. EPA, which participated in the Interagency Task Force, supports the Task Force's recommendations concerning ongoing investment in demonstrations of the CCS technologies based on the report's conclusion that: "Current technologies could be used to capture CO_2 from new and existing fossil energy power plants; however, they are not ready for widespread implementation primarily because they have not been demonstrated at the scale necessary to establish confidence for power plant application. Since the CO_2 capture capacities used in current industrial processes are generally much smaller than the capacity required for the purposes of GHG emissions mitigation at a typical power plant, there is considerable uncertainty associated with capacities at volumes necessary for commercial deployment." See Report of the Interagency Task Force on Carbon Capture and Storage, p.50 (http://www.epa.gov/climatechange/policy/ccs_task_force.html).

initially, in many instances energy efficient measures may serve as the foundation for a BACT analysis for GHGs with add-on pollution control technology and other strategies added as they become more accessible.

C. Application of Step 1 to Bioenergy Facilities

At the outset, when considering an application to construct or modify a bioenergy facility, it will be important to address the extent to which the BACT analysis for GHGs should include comparative evaluation of biogenic fuels and other types of fuels, including fossil fuels. However, where a proposed bioenergy facility can demonstrate that utilizing a particular type of biogenic fuel is fundamental to the primary purpose of the project, then at the first step of the top-down process, permitting authorities can rely on that to determine that use of another fuel would redefine the proposed source.

To the extent this showing is made by a permit applicant proposing to construct or modify an electric generating facility that would utilize biomass fuels alone in the primary production process, the options listed as Step 1 of a top-down BACT analysis for GHGs may be limited to (1) utilization of biomass fuel alone, (2) energy efficiency improvements, and (3) carbon capture and sequestration if the source meets the characteristics summarized above and described in more detail in the 2010 GHG Permitting Guidance.

In cases where a permit applicant proposes to co-fire or combine biomass fuels with another primary fuel type, the list of BACT options should include the option of utilizing both types of primary fuels in different combinations. If the applicant proposes a specific proportional allocation or fuel mix (i.e., $\leq$5 percent biomass, $\geq$95 percent fossil fuel) and believes other allocations should be eliminated from consideration in the BACT analysis for GHGs, the permit application should provide an explanation as to why the particular allocation desired by the applicant is necessary to achieve a fundamental business objective of the project. If the permit applicant is unable to demonstrate that a different allocation of primary fuels would fundamentally redefine the proposed source, the options at Step 1 should include varying allocations of the two primary fuels if the proportional allocation of fuels has the potential to affect the amount of GHGs emitted from the facility or the net atmospheric GHG concentrations.

Although not necessarily a bioenergy facility, recovery furnaces at kraft pulp and paper mills may not have the option of considering alternative fuels. The fundamental purpose of recovery furnaces used at this type of facility is to recover and regenerate the cooking chemicals (used in the pulping process) from the spent liquor or "black liquor" exiting the digesters and evaporators. As a secondary benefit, this process also produces energy. Requiring such a recovery furnace that is fully integrated into the production process to utilize a fuel other than the black liquor to generate this energy would frustrate the primary purpose of these furnaces to recover and regenerate the cooking chemicals. Thus, EPA believes the option of using alternative fuels in a recovery furnace would fundamentally redefine this type of unit. Facilities proposing to use black liquor in the recovery furnace of the kraft pulping process need not include fuels other than black liquor at Step 1 of a top-down BACT analysis for such a unit.

VI. Step 2 – Eliminate technically infeasible options

Step 2 of the top-down BACT analysis should be conducted in the same manner for bioenergy facilities as other types of sources. Step 2 is discussed in detail in the 2010 GHG Permitting Guidance. With respect to facilities that are co-firing biomass and other fuels, if the record shows that an option that involves using a greater proportion of biomass fuels than proposed by the permit applicant is not technically feasible, it may be eliminated from further consideration at this step with an appropriate justification.

VII. Step 3 – Rank remaining control technologies

As with Step 2, EPA recommends applying the same consideration in Step 3 of the BACT analysis for a bioenergy facility that would apply to other types of sources. Step 3 is discussed in detail in the 2010 GHG Permitting Guidance.

VIII. Step 4 – Energy, Environmental, and Economic Impacts

A. Traditional Step 4 Considerations

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. The "top" control option should be established as BACT unless the applicant demonstrates, and the permitting authority agrees, that the energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not "achievable" in that case. If the most stringent technology is eliminated in this fashion, then the next most stringent alternative is considered, and so on.

1. Environmental impacts

EPA and other permitting authorities have most often used this analysis to eliminate more stringent control technologies with significant or unusual effects that are unacceptable in favor of the less stringent technologies with more acceptable collateral environmental effects. However, EPA has also interpreted the BACT requirements to allow for a more stringent technology to remain in consideration as BACT if the collateral environmental benefits of choosing such a technology outweigh the economic or energy costs of that selection.[28] In other words, the permitting authority is not limited to evaluating the impacts of only the "top" or most effective technology but can assess the impacts of all technologies under consideration.[29] The same principle applies when assessing technologies for controlling GHGs.

In BACT Step 4, the applicant and permitting authority should consider both direct and indirect impacts of the emissions control option or strategy being evaluated. EPA has previously referred to BACT Step 4 as the "collateral impacts analysis,"[30] but this term is primarily applicable only to the environmental impact analysis. Overall, the Step 4 analysis is more accurately described as an environmental, economic, and energy impacts analysis that includes both direct and indirect (*i.e.,* collateral) considerations.

Since a BACT limitation must reflect the maximum degree of reduction achievable for each regulated pollutant, EPA has emphasized that the environmental impacts analysis in Step 4 should concentrate on impacts other than direct impacts due to emissions of the regulated pollutant that is the subject of the BACT analysis. EPA has recognized that consideration of a wide variety of environmental impacts is appropriate, such as solid or hazardous waste generation, discharges of polluted water from a control device, visibility impacts, demand on local water resources, and emissions of other pollutants subject to NSR or pollutants not regulated under NSR such as air toxics.[31] In discussing the particulars of a BACT analysis for GHGs, EPA reiterated in the 2010 GHG Permitting Guidance that the environmental impact

[28] *In the Matter of North County Resource Recovery Assoc.*, 2 E.A.D. at 230-31.
[29] *In re Knauf Fiber Glass,* 8 E.A.D. at 131 n. 15.
[30] *In re Hillman Power*, 10 E.A.D. at 683; *In the Matter of Columbia Gulf Transmission Co*., 2 E.A.D. 824, 828 n. 5 (Adm'r 1989); In re Kawaihae Cogeneration Project, 7 E.A.D. 107, 116-17 (EAB 1997).
[31] 1990 Workshop Manual at B.46; *In the Matter of North County Resource Recovery Assoc.*, 2 E.A.D. 229, 230 (Adm'r 1986).; *In the Matter of Columbia Gulf Transmission Co*., 2 E.A.D. at 828.

analysis should continue to concentrate on impacts other than the direct impacts due to emissions of the regulated pollutant that is the subject of the BACT analysis.

2. Economic impacts

EPA has previously advised that the economic impacts component of the analysis should focus on direct economic impacts calculated in terms of cost effectiveness (dollars per ton of pollutant emission reduced). This cost effectiveness should be addressed on both an average basis for each measure and combination of measures, and on an incremental basis comparing the costs and emissions performance level of a control option to the cost and performance of the next most stringent control option.[32] The emphasis should be on the cost of control relative to the amount of pollutant removed, rather than economic parameters that provide an indication of the general affordability of the control alternative relative to the source. To justify elimination of an option on economic grounds, the permit applicant should demonstrate that the costs of pollutant removal for that option are disproportionately high.[33]

3. Energy impacts

EPA has traditionally called for the energy impacts analysis to consider only direct energy consumption and not indirect energy impacts, such as the energy required to produce raw materials for construction of control equipment.[34] Direct energy consumption impacts include the consumption of fuel and the consumption of electrical or thermal energy. This energy impacts analysis should include an assessment of demand for both electricity that is generated onsite and power obtained from the electrical grid, and may include an evaluation of impacts on fuel scarcity or a locally desired fuel mix in a particular area. Applicants and permitting

[32] 1990 Workshop Manual, Section IV.D.2.b (B.36 – B.44).
[33] 1990 Workshop Manual at B.31-32.
[34] *In re Power Holdings*, PSD Appeal No. 09-04 (EAB Aug. 13, 2010), slip op. at 22, n.17 (citing 1990 Workshop Manual at B.30).

authorities should examine whether the energy requirements for each control option result in any significant or unusual energy penalties or benefits.[35] The costs associated with direct energy impacts should be calculated and included in the economic impacts analysis (i.e., cost analysis).[36]

B. Specific Considerations at Step 4 for Bioenergy Facilities

While the more traditional approach that EPA has applied in the Step 4 analysis is to eliminate options from the top-down BACT analysis based on unacceptable adverse energy, environmental, or economic impacts, this is not the only way to conduct a Step 4 analysis. EPA has recognized a permitting authority is not limited to evaluating the impacts of only the "top" or most effective technology (based on the ranking options based on control of released from the facility) but can assess the impacts of all technologies under consideration.[37] This approach may include an evaluation of the energy, environmental, and environmental benefits of all options under consideration without explicitly eliminating options based on adverse impacts.

1. Environmental impacts

Although EPA has not recommended focusing on the environmental impacts of the pollutant that is the subject of the BACT analysis, with respect to CO_2 emissions from bioenergy facilities, EPA believes a different frame of reference should be considered because of the nature of the carbon cycle and the fact that the production of biomass entails carbon sequestration. Within the context of the PSD program, a potential justification that biogenic CO_2 emissions can be accounted for differently than non-biogenic CO_2 emissions at the facility relies on the argument that sequestration occurs. This sequestration occurs offsite, outside the boundaries of

[35] 1990 Workshop Manual at B.29.
[36] 1990 Workshop Manual at B.30.
[37] *In re Knauf Fiber Glass,* 8 E.A.D. at 131 n. 15.

the facility. Therefore, given its traditional focus on “collateral” environmental impacts and benefits, Step 4 of the BACT analysis seems well-suited to enable permitting authorities to consider the potential sequestration of carbon in biogenic resources outside the boundaries of the facility when evaluating BACT for greenhouse gases. This approach was reinforced by CFI comments, which emphasized the importance of reconciling the focus of the PSD and Title V program regulations on the amount of emissions released from each individual facility with the role that land-based sequestration may play in mitigating the net atmospheric GHG impact of emissions from individual sources. Because other pollutants and non-CO_2 GHGs do not participate in natural biogeochemical carbon cycles to the same extent that CO_2 does, this frame of reference – in which the potential for sequestration outside the facility of pollutant subject to the BACT analysis is considered as part of the environmental impacts at Step 4 – is not relevant for those other pollutants.

In addition to using this frame of reference in which sequestration outside the boundaries of the facility is considered, it may also be appropriate to consider broad categories of feedstocks in terms of their net impact on atmospheric GHG stocks. A complete accounting of the net atmospheric GHG impact of a facility utilizing particular feedstocks would rely on a case-by-case, facility-specific assessment of the impact of the proposed facility. This type of facility-specific approach would also likely be the most scientifically sound approach for assessing the direct carbon cycle impact of specific biogenic fuels used at the facility, because there is inherent variability in biological processes, as well as the variability in space and time common to estimates of sequestration.

The BACT analysis should consider a variety of factors that may influence the net amount of carbon added to the atmosphere from and utilization of bioenergy at a facility. An important area of consensus from commenters on the CFI was the idea that feedstocks are different, and that the net impact of bioenergy and other biogenic emissions is associated with the feedstock that is used. The level of sequestration that occurs naturally on the landscape without additional intervention can be considered the “business as usual” (BAU) case. In other words, this level of sequestration (or emissions) will likely continue into the future without additional action. For example, if enhanced plant growth causes sequestration to increase beyond the level expected in the BAU case for that region, then more carbon will be taken out of the atmosphere than expected in the BAU case. Similarly, if certain activities, such as logging, are accelerated in a particular region over a certain period of time, and associated emissions are thereby increased, then sequestration on land will decline and net atmospheric carbon stocks will increase over the BAU case. For bioenergy and other biogenic CO_2 emissions, where such a wide variety of potential feedstocks exists, the BAU case might be considered the emissions that “would have happened anyway.” Using this approach, a permitting authority would have to assess the extent to which a policy action or an activity increases or reduces CO_2 emissions above or below what would have occurred in comparison to the BAU case. From the perspective of bioenergy and other biogenic CO_2 emissions , emissions that would have occurred regardless of whether or not the facility captured the energy from the biofuel use or carried out the process using biological material as a feedstock might demonstrate that the cost of additional pollutant controls for CO_2 emissions is not justified.

Land use change has a separate set of considerations under the BAU case. Specifically, if the rate of transition of land use from forest to agricultural use were to increase over and above that which occurred in the BAU case, and if this increase were attributable to market demand for the bioenergy crop, then it would be possible that these emissions would be additional to the emissions expected under BAU. In that situation, the BAU case is the non-bioenergy case, such that the bioenergy use might result in increased atmospheric CO_2 levels.

However, such a case-by-case analysis of the net atmospheric impact of biomass fuels would likely be prohibitively time-consuming and complex for facilities and permitting authorities. The information we have collected to this point indicates that at present, attempting to determine the net carbon cycle impact of particular facilities combusting particular types of biomass feedstocks would require extensive analysis and would therefore entail extensive workload requirements. Further, additional detailed examination of science and technical issues is needed to ensure that permitting authorities would be able to reasonably calculate and implement accounting for the amount of GHG emissions above BAU in particular instances, or to assure consistency among the calculation methodologies of the various permitting authorities. Given the challenge of conducting a complete analysis for each permit application, a more practical approach to accounting is needed. Absent this, the burden on permitting authorities is likely to be overwhelming.

For at least one category of biomass feedstocks that may be used in energy production, it does appear possible at this time to conclude that the atmospheric impact is negligible. Some commenters on the CFI suggested that utilizing mill residue (e.g. sawdust, planar shavings, panel trim) to generate energy, rather than leaving the residue to decompose, likely would not cause emissions over and above that which would have taken place if the energy use did not occur. Given that this material would have decomposed under natural circumstances in a short period of time (e.g., 10-15 years) in the absence of utilization as bioenergy, this conclusion appears credible.

In some cases, the use of biological material as a fuel would clearly reduce net atmospheric CO_2 stocks in comparison with BAU fossil fuel emissions. In these cases, requiring permitting at this time, before conducting the detailed analysis required to develop an appropriate accounting system for bioenergy and other biogenic sources, might actually discourage projects that would have a net benefit for the atmosphere. For example, requiring permitting for facilities seeking to generate energy from the combustion of dead trees, especially those killed due to a widespread event like the mountain pine beetle epidemic (that would emit CO_2 anyway through natural decomposition), is likely to discourage the utilization of a readily available resource that would clearly reduce CO_2 emissions, in comparison with BAU fossil fuel-related emissions.

In November 2010, EPA said it would provide guidance containing qualitative information on useful issues to consider with respect to biomass combustion, such as specific feedstock types and trends in carbon stocks at different spatial scales (e.g. national, regional, state). Upon further review, EPA has concluded that it requires further discussion with partners and scientists both inside and outside the federal government, as well as engagement with an independent scientific panel, before it can make more qualitative characterizations beyond the one described above for residue material.

2. Economic impacts

As discussed earlier in this section, EPA has previously advised that the economic impacts component of BACT analysis should focus on direct economic impacts calculated in terms of cost effectiveness (dollars per ton of emission reduction). As noted in the 2010 GHG Permitting Guidance, EPA recognizes that at present add-on controls for CO_2 are generally expensive technologies, largely because of the costs associated with CO_2 capture and storage. As with other electric generating facilities, these direct costs will generally make the price of electricity from bioenergy used in conjunction with add-on control technologies for CO_2 uncompetitive compared to electricity from plants with other GHG controls, such as bioenergy alone.

In addition to the direct economic impacts component of the BACT analysis, permitting authorities may also consider indirect economic impacts, including potential economic benefits. Such indirect considerations may include economic growth and the availability of employment opportunities generated within a particular region or community by the utilization of biomass fuels. As EPA noted in the 2010 GHG Permitting Guidance, it is appropriate for permitting authorities to account for the underlying objectives of federal and state policies to foster expansion of renewable resources and promote biomass. Tax incentives are an example of such policies. Where one of the underlying objectives of a tax incentive or other type of policy promoting renewable energy or biomass utilization is to foster economic growth and create jobs in particular area, this may be considered as a relevant indirect economic impact or benefit that can be considered in Step 4 of a BACT analysis. Where selecting a particular option as BACT would further the goals of such policy, this may form part of the basis for selecting that option as BACT. Likewise, where the record shows that requiring a particular control option as BACT would counteract, or work at cross purposes from, policies that are intended to promote renewable energy and biomass, this may form part of the justification for eliminating an option from further consideration at Step 4 of the BACT analysis.

Many federal and state policies, along with a number of regional efforts, are currently underway to foster the expansion of renewable resources and promote bioenergy projects as a way of addressing climate change, increasing domestic alternative energy production, enhancing forest management and creating related employment opportunities. For example, the federal

Renewable Electricity Production Tax Credit, a per-kilowatt-hour tax credit for electricity generated by qualified energy resources including biomass, was originally enacted by the Energy Policy Act of 1992 (largely by amending the Internal Revenue Code of 1986). Numerous pieces of federal legislation, the most recent being the American Recovery and Reinvestment Tax Act of 2009, have since been passed to extend certain related expiring tax provisions and expand the scope of qualified biomass feedstocks, with the duel aims of domestic job creation and economic stabilization.[38,39] Such policies can improve the economy, especially in rural communities, by generating jobs, income, and taxes through demand for local biogenic resources and construction of bioenergy conversion facilities. Specifically, an improved market for biogenic fuels and forest land could affect economic stabilization through increased incomes (from new jobs), higher local tax base and possibly through the diversification of local energy sources, and increased competition could lower energy prices.

As another example of such economic impacts, the Record of Decision for the Biomass Crop Assistance Program (BCAP) –a program created by the 2008 Farm Bill that provides financial assistance to biomass conversion facilities and owners of agricultural and non-industrial private forest land who wish to establish, produce, and deliver biomass feedstocks – estimated the total economic impact from broad BCAP implementation to include $88.5 billion in related economic activity and the creation of nearly 700,000 jobs.[40] Other potential indirect economic considerations from biomass utilization as BACT could include, but are not limited to, increased

[38] American Recovery and Reinvestment Tax Act of 2009. The Library of Congress. http://thomas.loc.gov/home/h1/Recovery_Bill_Div_B.pdf
[39] H. R. 1424 Emergency Economic Stabilization Act of 2008. The Library of Congress. http://thomas.loc.gov
H. R. 4520 American Jobs Creation Act of 2004. The Library of Congress. http://thomas.loc.gov
H. R. 3090 Job Creation and Worker Assistance Act of 2002. The Library of Congress. http://thomas.loc.gov
[40] USDA Farm Service Agency. 2010. www.apfo.usda.gov/FSA
Programmatic Environmental Impact Statement for the Biomass Crop Assistance Program. 2010. http://public.geo-marine.com/report.aspx?id=26

demand for traditional or new biogenic crops and reduced disposal costs for biogenic materials that would otherwise be landfilled or destroyed.

3. Energy impacts

With respect to energy impacts, the BACT analysis should assess the relative energy demands of the options under consideration for reducing emissions from the facility obtaining a permit and may include an evaluation of impacts on fuel scarcity or a locally desired fuel mix in a particular area. For bioenergy facilities, it is appropriate to broaden the scope of the energy impacts analysis to consider policies that seek to promote diversity in fuels used in a local area, within a state, or nationally.

A variety of federal and state policies have recognized that some types of biomass can be part of a national strategy to reduce dependence on fossil fuels. Renewable fuels policies, which in some cases provide incentives for the substitution of renewable fuels for fossil fuels, have not traditionally been part of the BACT energy impacts analysis. However, consideration of renewable energy policies could become part of the BACT analysis, especially if state policies mandate the replacement of fossil fuel with biogenic fuel.[41] In addition to numerous federal programs, as of February 2011, 48 states have some kind of state-level financial or conservation incentive program that includes biomass production and almost as many states have rules, regulations or policies that promote bioenergy use.[42] For example, certain states, such as California[43], Washington,[44] and Massachusetts[45] have policies and programs to incentivize forest

[41] See p. B.30 of the 1990 NSR Guidance, discussing locally scarce fuels.

[42] Database of State Incentives for Renewables & Efficiency. Accessed February 1, 2011. www.dsireusa.org/incentives/

[43] 2009 Progress to a Plan: Bioenergy Action Plan for California. California Energy Commission. 2009. www.energy.ca.gov/2010publications/CEC-500-2010-007/CEC-500-2010-007.PDF
Integrated Energy Policy Report. California Energy Commission. 2007. www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF

management for biomass production. California, for example, as of 2009, has the technical potential for 14.2 million bone dry tons a year available from forest residues.[46] After trees are harvested for timber, such forest residues are typically left in the forest or disposed of via open burning because only timber of a certain quality can be used in lumber mills and other processing facilities. An advantage of using forest residues for bioenergy production is that a collection infrastructure is already in place to harvest the wood, it reduces the incidence of open burning and provides an additional stream of revenue for forest owners. Programs and policies established to meet the multiple goals of forest management plans -- to establish healthy and naturally diverse forests with a balance between productive harvest and natural ecosystem and wildlife health – can act as a foundation for sustainable bioenergy production.[47]

Conversely, if the proposed biogenic feedstock is scarce in the localized area of the proposed project, then the scarcity of available fuel for the project might be an energy impact suggesting that the proposed feedstock should not be selected as BACT.

C. Potential Conclusions in Step 4 Analysis

The considerations described above can support a conclusion that the exclusive utilization of biomass fuel is BACT for greenhouse gases at a bioenergy facility. As discussed above and in earlier EPA guidance, the costs of applying add-on pollution controls for greenhouse gas emissions are expected to be expensive and thus would in most cases justify

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Senate Bill (SB) 71. Economic Development: Sales And Use Tax Exclusions. Environmental Technology Project California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA). www.treasurer.ca.gov/caeatfa/sb71/index.asp

[44] Washington State Bioenergy Policy Framework. www.bioenergy.wa.gov/BiofuelIncentives.aspx

[45] Massachusetts Green Power Purchasing Commitment, 2007, and Renewable Portfolio Standard. 2010. www.dsireusa.org/incentives/index.cfm?EE=0&RE=1&SPV=0&ST=0&implementingsector=S&state=MA&technology=Biomass&sh=1

Act Related to Green Communities. Commonwealth of Massachusetts. 2008. www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169

[46] 2009 Progress to a Plan: Bioenergy Action Plan for California. California Energy Commission. 2009. www.energy.ca.gov/2010publications/CEC-500-2010-007/CEC-500-2010-007.PDF

[47] California Forest Practice Rules. The California Department of Forestry and Fire Protection. 2011. www.fire.ca.gov/resource_mgt/downloads/2011_FP_Rulebook_with_Diagrams_with_Tech_Rule_No_1.pdf.

elimination of this option based on direct economic impacts. However, EPA does not expect that the projected cost of energy efficient technology will by itself justify eliminating this option for biogenic CO_2 emissions from consideration at bioenergy facilities. Nevertheless, where a bioenergy facility is projected to provide the energy and economic benefits described above in accordance with existing federal or state policies promoting utilization of biomass for energy production, these considerations may justify selecting the option of exclusively using a biomass fuel as BACT for biogenic CO_2 emissions from a bioenergy facility. Furthermore, in the case of residue material that would otherwise decompose in a 10-15 year time frame, the net carbon cycle impact of this biomass fuel is expected to be negligible. Thus for a feedstock composed of such residue material, the costs of applying strategies to reduce emissions from the facility do not appear justified at this time because the carbon dioxide emissions from the individual facility would not be increasing atmospheric impacts above the business as usual case. As discussed above, additional information is needed before similar conclusions can be supported for other types of biomass feedstocks, but EPA believes the energy and economic benefits of this fuel is sufficient at this time to justify selecting biomass fuel as BACT for greenhouse gases without further control.[48]

For facilities that are co-firing biomass with a primary fuel, the permitting record should provide a reasoned justification for basing BACT for greenhouse gases on a specific proportional

[48] This guidance is applicable to an assessment of BACT for greenhouse gases. When conducting a BACT analysis for other regulated NSR pollutants at the type of source covered by this guidance, EPA recommends continuing to focus on guidance EPA has previously provided on determining BACT using the top-down process. The considerations described here, in terms of federal and state incentives for bioenergy production and sustainable forest management, may still be relevant considerations in Step 4 of a top-down BACT analysis for another regulated NSR pollutant, but these factors should be considered in the context of the particular pollutant for which the BACT analysis is conducted. These considerations may not apply in the same manner to pollutants other than GHGs, particularly where there is a more established record of the range of costs that have been acceptable in previous BACT determinations for the pollutant.

allocation of fuels.[49] The factors described above may be used to justify a higher proportional allocation of biomass fuels as BACT (to the extent technically feasible) but not necessarily to eliminate other strategies for reducing greenhouse gas emissions from a facility that utilizes some proportion of fossil fuels. The costs of add-on pollution controls will still, in most cases, justify eliminating this technology from a facility that utilizes biomass and another primary fuel type. However, application of methods, systems, or techniques to increase energy efficiency will remain a key GHG-reducing opportunity for facilities that utilize a significant proportion of fossil fuels and cannot demonstrate the same degree of energy and economic benefits achieved from the exclusive utilization of the biomass fuels, as described above. While some utilization of biomass fuels will have some impact on reducing dependence on fossil fuels and promoting economic growth in areas that supply biomass fuels, a small proportion of biomass fuel use may not justify bypassing opportunities to reduce GHG emissions by improving energy efficiency at a facility that still combusts a significant proportion of fossil fuels. However, when assessing the proportional allocation for biomass and other fuel types at a co-fired energy facility, a permitting authority may consider the relative benefit of using a greater proportion of biomass fuels and the effect this may have on GHG emissions from an individual facility. Where a residue material is utilized, any loss of energy efficiency attributable to the use of this type of biomass feedstock may be offset by the absence of a significant net carbon cycle impact above the business as usual case.

IX. Step 5 – Selecting BACT

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[49] See, In re: Northern Michigan University Ripley Heating Plant. PSD Appeal No. 08-02, Slip. Op at 18-23, 28 (EAB 2009) (remanding a permit for a co-fired electric generating facility where record did not contain justification for establishing BACT limits based on specific proportional allocation of wood and coal).

When setting GHG emissions limitations for sources of biogenic CO_2 emissions, one should conduct the same evaluation as that described in the 2010 GHG Permitting Guidance.[50] The permitting authority is responsible for defining the form of the BACT limits and making them enforceable as a practical matter.[51] In determining the form of the limit, the permitting authority should consider issues such as averaging times and units of measurement.

For example, in the case of co-fired facilities, a final permit may include a standard that specifies the proportional allocation of fuels to be used, thus limiting the options to the fuel mix justified as BACT. When making sure the limit is practically enforceable, the permitting authority must include information regarding the methods that will be used for determining compliance with the limits (such as operational parameters, timing, testing methods, etc.) and ensure that there is no ambiguity in the permit terms themselves.[52] The permitting authority bears the responsibility in Step 5 to fully justify the BACT decision in the permit record. Regardless of the control level or feedstock proposed by the applicant as BACT, the ultimate determination of BACT is made by the permitting authority.

[50] 2010 GHG Permitting Guidance at 45-47.
[51] *See generally* EPA Guidance on Limiting Potential to Emit (PTE) in New Source Permitting (June 13, 1989), *available at* http://www.epa.gov/reg3artd/permitting/t5_epa_guidance.htm.
[52] *In re Prairie State Generating Company*, 13 E.A.D. at 83, 120.

Appendix: LULUCF data from the Inventory

Table 1: Carbon sequestered by LULUCF sinks as reported in the Inventory (Tg CO_2 Eq.)[53], ranked in order of magnitude. Forest Land Remaining Forest Land has been further broken up into forest and harvested wood carbon pools.

IPCC Source Category	LULUCF Sink	2008	*1990–2008 Average
Forest Land Remaining Forest Land (Carbon Stock Changes)	Total Forest Sector C Stock Change	(791.9)	(688.0)
	Forest	(703.9)	(576.7)
	Aboveground Biomass	(397.2)	(373.5)
	Soil Organic Carbon	(145.9)	(68.0)
	Belowground Biomass	(78.8)	(74.1)
	Litter	(55.9)	(35.8)
	Dead Wood	(26.2)	(25.3)
	Harvested Wood	(88.0)	(111.2)
	SWDS	(63.6)	(63.7)
	Products in Use	(24.4)	(47.6)
Settlements Remaining Settlements	C Stock Changes in Urban Trees	(93.9)	(75.5)
Cropland Remaining Cropland	Soil C Stock Changes for Mineral Soils	(45.7)	(51.5)
Land Converted to Grassland	Soil C Stock Changes for Mineral Soils	(25.1)	(24.0)
Grassland Remaining Grassland	Soil C Stock Changes in Mineral Soils	(12.4)	(23.3)
Other	Changes in Yard Trimming and Food Scrap C Stocks in Landfills	(9.5)	(13.6)
Gross Sequestration from LULUCF Sinks		**(978.5)**	**(875.9)**

* The U.S. Greenhouse Gas Inventories submitted to the UNFCCC provide annual estimates from 1990.

[53] The *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 –2008* (April 2010) and the archive of previous inventories are available online from the Environmental Protection Agency Inventory Report Web site, located at http://www.epa.gov/climatechange/emissions/usinventoryreport.html.

Table 2: Emissions from LULUCF sources as reported in the Inventory (Tg CO_2 Eq.), ranked in order of magnitude.

IPCC Source Category	LULUCF Source	2008	*1990–2008 Average
Cropland Remaining Cropland	Soil C Stock Changes in Organic Soils	27.7	27.6
Forest Land Remaining Forest Land	Non-CO_2 Emissions from Forest Fires	21.7	15.7
Land Converted to Cropland	Soil C Stock Changes for Mineral and Organic Soils	5.9	2.8
Cropland Remaining Cropland	Liming of Agricultural Soils	3.8	4.4
Cropland Remaining Cropland	Urea Fertilization	3.8	3.1
Grassland Remaining Grassland	Soil C Stock Changes in Organic Soils	3.7	3.7
Settlements Remaining Settlements	Direct N_2O Fluxes from Settlement Soils	1.6	1.2
Wetlands Remaining Wetlands	CO_2 and N_2O Emissions from Peatlands Remaining Peatlands	0.9	1.0
Land Converted to Grassland	Soil C Stock Changes in Organic Soils	0.9	0.8
Forest Land Remaining Forest Land	Direct N_2O Emissions from Forest Soils	0.4	0.3
Gross Emissions from LULUCF Sources		**70.4**	**60.6**

* The U.S. Greenhouse Gas Inventories submitted to the UNFCCC provide annual estimates from 1990.