EPA's BACT Guidance for Greenhouse Gases from Stationary Sources

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Summary

Stationary sources—a term that includes power plants, petroleum refineries, manufacturing facilities, and other non-mobile sources of air pollution—are not yet subject to any greenhouse gas (GHG) emission standards issued by the EPA; but because of the Clean Air Act's wording, such stationary sources *will become subject to permit requirements* for their GHG emissions beginning on January 2, 2011. Affected units will be subject to the permitting requirements of the Prevention of Significant Deterioration (PSD) and Title V provisions. For PSD, this will include state determinations of what constitutes Best Available Control Technology (BACT) that affected facilities will be required to install. On November 10, 2010, EPA released guidance and technical information to assist state authorities in issuing permits and determining BACT.

Among the sources likely to be affected by implementation of the PSD permit requirements are new and modified electric generating units of all kinds, but particularly those fired by coal. These sources emit substantially more than EPA's threshold of 100,000 metric tons of CO_2 annually: for example, a 500 megawatt (MW) coal-fired baseload power plant would emit on the order of three million metric tons of CO_2 annually. The coal mining industry and coal-fired electric utilities face at least half a dozen major regulatory actions over the next few years; industry supporters view these rules collectively as a significant threat to the future of coal. Viewed in this context, the permit requirement is one more nail in what increasingly appears to them as coal's future coffin.

In its new guidance, EPA retains the basic five-step process for determining BACT that it has recommended to state authorities for 20 years. The primary foci of the EPA guidance package are on state discretion in determining BACT and on energy efficiency as the most likely result of a GHG BACT analysis. These foci are evident through EPA's guidance for each of the five steps.

For those looking for bright lines and specific recommendations with respect to GHG BACT technologies, particularly with respect to coal-fired facilities, the released package does not provide them. Indeed, EPA's supplemental "Questions and Answers" release on the guidance seems to stress that it did not draw such conclusions. For example:

- Do these tools identify BACT for specific types of industrial facilities? No.
- Does this guidance say that fuel switching (coal to natural gas) should be selected as BACT for a power plant? No.
- Does this guidance say that carbon capture and storage (CCS) should be selected as BACT? No.

Likewise, the guidance provides no cost thresholds for permitting authorities to consider in determining the economic impacts of alternatives nor proposes a new approach to selecting BACT for GHG emissions. Instead, the guidance focuses on the discretionary authority that states have in determining BACT—discretion that ensures that BACT will continue to be determined on a case-by-case basis with states differing in what they consider appropriate control measures and what constitutes BACT. Whether industry will find such discretion provides sufficient regulatory certainty to invest billions in new plants remains to be seen.

In short, the EPA GHG guidance is a simple expansion of the five-step BACT process that has been used for two decades to include greenhouse gases. Whether that is an adequate response will be determined by applicants, state authorities, and future EPA regulatory actions under related parts of the act, such as Section 111 (NSPS), to which BACT is linked.

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Introduction

Over the past year, there has been increasing congressional interest in steps being taken by the Environmental Protection Agency (EPA) to address emissions of greenhouse gases (GHGs).[1] During that time, EPA has promulgated rules to (1) require reporting of GHG emissions by stationary sources that emit 25,000 tons or more of carbon dioxide equivalents (CO_2e); (2) set GHG emission standards for light duty motor vehicles (cars, minivans, SUVs, and light trucks); and (3) address several issues related to permit requirements for stationary sources of GHGs.[2]

Stationary sources—a term that includes electric power plants, petroleum refineries, manufacturing facilities, and other non-mobile sources of air pollution—have not yet been subject to any GHG emission standards issued by EPA; but because of the Clean Air Act's wording, such stationary sources *will become subject to permit requirements* for their GHG emissions beginning on January 2, 2011.

Among the sources likely to be affected by implementation of the Prevention of Significant Deterioration (PSD) permit requirements are new and modified electric generating units of all kinds, but particularly those fired by coal. These sources emit substantially more than EPA's threshold of 100,000 metric tons of CO_2 annually: for example, a 500 megawatt (MW) coal-fired baseload power plant would emit on the order of 3 million metric tons of CO_2 annually. The coal mining industry and coal-fired electric utilities face at least half a dozen major regulatory actions over the next few years;[3] industry supporters view these rules collectively as a significant threat to the future of coal. Viewed in this context, the PSD permit requirement is one more nail in what increasingly appears to them as coal's future coffin.

Of particular concern is Section 165's requirement that PSD permits require new and modified major sources to install the Best Available Control Technology (BACT) for each pollutant subject to regulation under the act.

This report reviews the development of EPA's November 10, 2010 GHG BACT guidance and discusses the elements of the guidance, with particular attention to their potential impact on coal-fired electric generating units.

[1] GHGs addressed by EPA include four different gases and two categories of substances: the individual gases are carbon dioxide (CO_2), methane, nitrous oxide (N_2O), and sulfur hexafluoride (SF_6); the two categories are hydrofluorocarbons (HFCs) and perflourocarbons (PFCs). Each of these substances has a different global warming potential. To facilitate analysis, the emissions of each are converted to the equivalent amount of CO_2 emissions, based on how potent the substance is as compared to CO_2. For example, SF_6 has a global warming potential 22,800 times as great as CO_2. SF_6 emissions accounted for 16.5 million metric tons of CO_2-equivalent in 2007, although actual emissions expressed as SF_6, were only 690 metric tons in that year.

[2] For more information, see CRS Report R40506, *Cars, Trucks, and Climate: EPA Regulation of Greenhouse Gases from Mobile Sources*, by James E. McCarthy

[3] These include more stringent regulation of mountaintop removal mining, standards for disposal of coal combustion waste, cooling water intake rules, steam electric utility effluent guidelines, the Maximum Achievable Control Technology (MACT) rule for hazardous air pollutants such as mercury, the Clean Air Transport Rule for emissions of sulfur dioxide and nitrogen oxides, and a possible New Source Performance Standard (NSPS) for greenhouse gases. For differing views on the potential impact of these proposed actions, see M.J. Bradley & Associates LLC, and Analysis Group, *Ensuring a Clean, Modern Electric Generating Fleet while Maintaining Electric System Reliability* (August 2010), and North American Electric Reliability Corporation, *2010 Special Reliability Scenario Assessment: Resource Adequacy Impacts of Potential U.S. Environmental Regulations* (October 2010).

Best Available Control Technology

What is PSD-BACT?

> "the proposed facility is subject to the best available control technology for each pollutant subject to regulation under this Act emitted from, or which results from, such facility." (Section 165(a)(4))

Under Sections 165-169 of the Clean Air Act, any new or modified facility emitting (or potentially emitting) over 100 or 250 tons[4] of any regulated pollutant[5] must undergo preconstruction review and permitting. This process, called New Source Review (NSR), has four major requirements:

- *Best Available Control Technology (BACT)*—determining the emissions limitation that will achieve the maximum degree of emissions reductions through application of production processes and available methods, systems, and techniques, taking into consideration energy, environmental and economic impacts.
- *Air Quality Analysis*—assessing existing ambient concentrations of air pollutants and modeling anticipated pollutant concentrations resulting from the proposed or modified project and from future growth associated with the project.
- *Impact Analysis*—assessing the air, ground, and water pollution impacts on soils, vegetation, and visibility from pollutant increases projected to result from the proposed or modified project.
- *Public Involvement*—providing opportunities for public involvement during the permit process, including hearings and appeals.

BACT is determined by state permitting agencies on a case-by-case basis, taking into account a proposed control measure's energy, environmental, and economic impacts. BACT cannot be less stringent than the federal New Source Performance Standards (NSPS), but it can be more so.[6] EPA issues guidance to states to assist them in making BACT determinations.

Greenhouse gases will be subject to regulation beginning on January 2, 2011, when the emission standards for light duty motor vehicles take effect. Thus, as of that date, new and modified major stationary sources of greenhouse gases will require permits for construction and operation.

Who Will Have to Get a GHG Permit?

As noted above, major stationary sources are defined in the statute as those that have the potential to emit more than 100 tons or 250 tons of pollutants subject to regulation annually. For greenhouse gases, this is a relatively low threshold: EPA has estimated that more than six million existing stationary sources emit 100 tons or more of GHGs annually. The agency estimates that currently about 280 sources have required PSD permits annually, and that a 100/250 ton threshold for GHGs would increase that number by 140-fold.[7] EPA argues that expanding the PSD permit

[4] Section 169(1) lists 28 categories of sources for which the PSD-NSR threshold is to be 100 tons of emissions per year. For all other sources, the PSD-NSR threshold is 250 tons.

[5] Except those pollutants regulated under Sections 112 (hazardous air pollutants) and 211(o).

[6] Currently, there is no NSPS for any greenhouse gas.

[7] U.S. EPA, "Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule" *Federal Register*

program 140-fold would pose an extraordinary burden on itself and state permitting authorities, in addition to the burden it would pose for the regulated emission sources.

The agency has sought to limit this burden through a priority-setting regulation called the "Tailoring Rule."[8] (The rule would limit the reach of both the PSD permitting program as well as the broader permit requirement for *existing* sources of GHGs under Title V of the act.) Faced with what it considers the "absurd results" of following the letter of the law, EPA in September 2009 proposed that the agency and state permitting authorities would, out of "administrative necessity," focus first on the largest facilities. As proposed, the Tailoring Rule would initially have limited the PSD and Title V permit requirements to facilities that emit more than 25,000 metric tons per year of carbon dioxide (or its equivalent in other GHGs). In the final version of the rule, the threshold was increased to 75,000 metric tons for sources that were otherwise subject to permit requirements, or 100,000 tons if the source's emissions of other pollutants would not be sufficient to require a permit.

What Is EPA's Role in Determining BACT?

To assist states in making BACT determinations, EPA has provided a recommended procedure for states to use and guidance with respect to acceptable methodologies and requirements in making a determination. In addition, EPA reviews state determinations for BACT and hears appeals from parties dissatisfied with the state's determination.

The EPA procedure for determining BACT (required for federally run programs, encouraged for EPA-approved, state-run programs) is a fairly straightforward "top-down" process.[9] The overall presumption of the process is that the measure that results in the maximum reduction in the pollutant should be installed unless energy, environmental, and economic impacts of that choice justify its rejection. The five-step process, as used by EPA is as follows:

1. *Identify Available Control Options*—there are at least five categories of control options that states can review in identifying possible BACT in an individual case:[10] (a) existing control technologies for sources of that type; (b) technically feasible options that are used on other source categories, but not the one under review; (c) innovative control technology that has never been commercially demonstrated (*inclusion not required*); (d) inherently lower polluting production processes, fuels, and coatings that can be evaluated alone or in combination with other control devices; and (e) specific design or operational parameters that may include such factors as combustion control techniques. These categories of options are not mutually exclusive. As stated by EPA in its guidance: "Combinations of inherently lower-polluting processes/practices (or a process made to be inherently less polluting) and add-on controls are likely to yield more effective means of emission control than either approach alone."[11] Data for

(June 3, 2010), p. 31535.

[8]U.S. EPA, "Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule" *Federal Register* (June 3, 2010), pp. 31514-31608.

[9] Environmental Protection Agency, *New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting* (draft, October 1990).

[10] Categories taken from: Northeast States for Coordinated Air Use Management (NESCAUM), *NESCAUM BACT Guideline* (June 1991), p. 4.

[11] Environmental Protection Agency, *New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting* (draft, October 1990), p. B-14.

control options include EPA's BACT/LAER[12] Clearinghouse, existing EPA or state permits, equipment vendors, trade associations, permitting engineers, and technical papers and journals.

2. *Eliminate Technically Infeasible Control Options*—control options need to be either demonstrated on a like facility or determined to be both available and applicable in the particular case. If not, the option is eliminated from the list.
3. *Rank Remaining Options Based on Pollutant Reduction*—a variety of performance metrics may be necessary to determine comparative control efficiencies among different options.
4. *Eliminate Options that Fail Energy, Environmental, or Economic Criteria*—the permitting agency has discretion in weighting the three statutory criteria for exclusion.
5. *Determine BACT*—the most effective option remaining after the steps above have been taken is determined to be BACT and the permitting agency establishes a corresponding emissions limit.

A substantial record is built during the NSR process. A completed permit application is reviewed not only by the permitting agency, but also by the Regional EPA office, Federal Land Managers (if a PSD Class I area is involved), and by the public. Conflicts among these parties and the applicant can send the permit application through a series of state and federal administrative appeals processes, along with state and federal litigation. The specifics on this process vary from state to state.

EPA provides guidance to the states in determining BACT by identifying appropriate methodologies and requirements to assist the states in identifying all potential BACT options and in eliminating options that don't meet statutory criteria.

What Are the Options for Coal-Fired Power Plants?

Much of the discussion about EPA's guidance for GHG BACT has focused on coal-fired power plants. Coal-fired electric generating facilities are responsible for about 28% of the country's total greenhouse gas emissions. As noted, in general, there are five categories of control options that are considered in a BACT analysis:[13] A review of the categories of GHG control options for coal-fired facilities reveals few readily available alternatives to significantly reduce emissions.

1. *Existing Control Technology*: a technology proven to work for the particular source category being permitted. There are no existing add-on technologies to reduce carbon dioxide emissions from coal-fired facilities.
2. *Technically Feasible Technology*: a technology proven to work for other source categories, but not demonstrated on the particular source category being permitted. While an argument could be made that capture technology is commercially available for industrial facilities (to separate carbon dioxide from a

[12] LAER refers to Lowest Available Emissions Rate—essentially technology that represents the "best of the best" emissions control. It is required by new facilities locating in an area that is in non-attainment with one of the country's National Ambient Air Quality Standards (NAAQS).

[13] See Environmental Protection Agency, *New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting* (draft, October 1990), pp. B-10-14; and Northeast States for Coordinated Air Use Management (NESCAUM), *NESCAUM BACT Guideline* (June 1991), p. 4.

facility's other emissions), there is no such available technology with respect to the storage of any captured carbon dioxide. It is possible in some cases that the carbon dioxide could be piped to a facility needing carbon dioxide (such as an oil field using enhanced oil recovery (EOR)), but those opportunities would be very site-specific.

3. *Innovative Control Technology*: a technology that has never been commercialized on any source category; it is in the pilot-plant or demonstration stage of development or deployment (for example, oxygen combustion [also called oxy-fuel]). Deployment of an innovative technology on a coal-fired power plant would likely involve substantial costs and risks—costs and risks that could jeopardize the facility's viability.
4. *Inherently Lower Polluting Production Processes, Fuels, and Coatings*: an individual adjustment or combination of adjustments in a facility's production process, its source of fuel, and its use of coatings. Inherently lower emitting fuels are available that could either partially (co-fired) or completely replace coal. Two such alternatives would be natural gas and biomass. However, these alternatives could arguably change (or "redefine") the fundamental purpose of the source (a change EPA does not require under its BACT guidance), and eliminate some of the advantages of building a coal-fired facility.
5. *Specific Design or Operational Parameters*: adjustments in a facility's design and/or inclusion of inherently less polluting work practices in the facility's operation. For a coal-fired facility, the BACT analysis would probably focus on this last category—specifically, either changing the coal-fired design to better accommodate future technology advancements (such as using integrated gasification combined cycle technology) or employing energy-efficient control measures, as discussed later.

With a multi-billion dollar investment in a project designed to operate for decades at stake, the lack of a definitive option arguably adds more uncertainty to future coal-fired power plants.

What Work Has EPA Already Done on BACT?

With the options currently limited with respect to BACT for coal-fired power plants, much of EPA's work has focused on energy efficiency and innovative control measures, as discussed below.

Bush Administration's ANPR

In April 2007, in a case involving a petition to EPA to establish GHG emission standards for motor vehicles, the Supreme Court ruled that EPA must address the question of whether GHGs cause or contribute to air pollution that endangers public health or welfare. The case was Massachusetts v. EPA.[14] For nearly two years following the Supreme Court's decision the Bush Administration's EPA did not respond to the original petition nor make a finding regarding endangerment. Its only formal action following the Court decision was to issue a detailed

[14] For background information on the landmark case, see CRS Report RS22665, *The Supreme Court's Climate Change Decision: Massachusetts v. EPA*, by Robert Meltz.

information request, called an Advance Notice of Proposed Rulemaking (ANPR), on July 30, 2008.[15]

The ANPR occupied 167 pages of the *Federal Register*. Besides requesting information, it took the unusual approach of presenting statements from the Office of Management and Budget, four Cabinet Departments (Agriculture, Commerce, Transportation, and Energy), the Chairman of the Council on Environmental Quality, the Director of the President's Office of Science and Technology Policy, the Chairman of the Council of Economic Advisers, and the Chief Counsel for Advocacy at the Small Business Administration, each of whom expressed their objections to regulating greenhouse gas emissions under the Clean Air Act. The OMB statement began by noting that, "The issues raised during interagency review are so significant that we have been unable to reach interagency consensus in a timely way, and as a result, this staff draft cannot be considered Administration policy or representative of the views of the Administration."[16] It went on to state that "... the Clean Air Act is a deeply flawed and unsuitable vehicle for reducing greenhouse gas emissions."[17] The other letters concurred.

In its Technical Support Document for its ANPR, EPA took a narrow view of the alternatives available to it in imposing greenhouse gas performance standards.[18] For existing electric generating sources, the EPA focused on incremental improvements in the heat rates of existing units through options that "are well known in the industry" with an overall improvement in efficiency likely to be less than 5%. For new electric generating sources, EPA noted the availability of more efficient supercritical coal units, the future availability of ultra-supercritical units, and the possibility of limited biomass co-firing.

Continuing along this line of reasoning, EPA also suggested that it could develop regulations that anticipate future technology. For example, a phase-in approach to applying CO_2 standards to power plants would be to mandate that "carbon-ready" generating technology be required for new construction. The objective would be to anticipate the widespread need for some form of carbon capture technology in the future by preparing for it with compatible fossil-fuel combustion technology now. The technology most discussed is integrated-gasification, combined-cycle (IGCC). With respect to some of the carbon capture technology under development, IGCC has certain advantages over pulverized coal technology. However, just how much IGCC is "carbon ready" is subject to debate. EPA stated in its ANPR that it believes such a staged approach is available to it under section 111 (the statutory floor for BACT determinations, and a possibility that EPA is also exploring for its BACT guidance):

> EPA believes that section 111 may be used to set both single-phase performance standards based upon current technology and to set two-phased or multi-phased standards with more stringent limits in future years. Future-year limits may permissibly be based on technologies that, at the time of the rulemaking, we find adequately demonstrated to be available for use at some specified future date.[19]

The technical support document does not mention some more aggressive options. These include a fuel-neutral standard or a technology-based standard. For example, for carbon dioxide emissions

[15] U.S. EPA, "Regulating Greenhouse Gas Emissions Under the Clean Air Act," 73 *Federal Register* 44354, July 30, 2008.

[16] "Regulating Greenhouse Gas Emissions Under the Clean Air Act," 73 *Federal Register* 44356, July 30, 2008.

[17] Ibid.

[18] *U.S. Environmental Protection Agency, Technical Support Document for the Advanced Notice of Proposed Rulemaking for Greenhouse Gases; Stationary Sources, Section VII* (June 5, 2008), final draft.

[19] 73 *Federal Register* 44490, July 30, 2008.

from a newly-constructed power plant, a fuel-neutral standard could follow the example set by the 1997 and 2005 NSPS for nitrogen oxides (NOx) and the 2005 NOx NSPS for modified existing sources. Under those regulations, the NOx emissions standard is the same, regardless of the fuel burned—solid, liquid, or gaseous.[20] This standard is much more expensive for coal-fired facilities to comply with than for natural-gas-fired facilities, thus encouraging the lower-carbon gas-fired technologies. Likewise, EPA could choose to set a newly-constructed power plant standard based on the performance of natural gas burned in a combined-cycle configuration—the fuel and technology of choice for construction of new power plants for the last two decades. If EPA wanted to encourage the rollover of the existing coal-fired power plant fleet to natural gas, nuclear, or renewable sources, it could apply a fuel-neutral standard to modified sources as well. For example, a CO_2 emission standard of 0.8 lb. per kilowatt-hour output could be met by a new natural gas-fired, combined-cycle facility, as well as any non-emitting generating technology, such as nuclear power or renewables. In contrast, the standard would require a 60% reduction in emissions from a new coal-fired facility—forcing the development of a carbon control technology, such as carbon capture and storage (CCS), in order for a new coal-fired facility to be built or modified.

The viability of these options, or even more aggressive technology-forcing standards, would depend on how EPA determined whether a technology had been "adequately demonstrated" and its assessment of the seriousness of the technology's costs and energy requirements. As NSPS and BACT determinations are linked, EPA's NSPS determination will have a substantial impact on state-determined BACT actions.

Clean Air Act Advisory Committee GHG BACT Workgroup

After EPA responded to the Supreme Court's decision in *Massachusetts v. EPA* in April 2009 with a finding that GHGs endangered public health and welfare, its Clean Air Act Advisory Committee (CAAAC) established a Climate Change Work Group in October 2009. The Work Group originally consisted of 35 members, representing a wide variety of industries, state and local government, and environmental and public health organizations. EPA asked the group to:

> discuss and identify the major issues and potential barriers to implementing the PSD Program under the CAA for greenhouse gases. The Work Group should focus initially on the BACT requirements, including information and guidance that would be useful for EPA to provide concerning the technical, economic, and environmental performance characteristics of potential BACT options. In addition the Work Group should identify and discuss approaches to enable state and local permitting authorities to apply the Act's criteria in a consistent, practical and efficient manner.[21]

Over a six-month period, EPA requested two reports from the Group: (1) a relatively brief interim report that identified informational needs of permitting authorities and affected sources; and (2) a final report that contained recommendations to EPA addressing the potential barriers with implementing BACT for GHGs. However, the Work Group had a basic disagreement on the scope of its work. Some felt that the Work Group should assume that the BACT process would apply to GHGs in the same manner that it does for criteria air pollutants, arguing that existing

[20] Under Sec. 60.44Da(d)(1), the 1997-2005 NSPS is set at 1.6 lb. per megawatt-hour gross energy output, based on a 20-day rolling average; it is lowered to 1.0 lb. per megawatt-hour gross energy output for power plants commencing construction after February 28, 2005 (Sec. 60.44Da(e)(1). Under Section 60.44Da(e)(3), the 2005 NSPS for modified sources is at either 1.4 lb./MWh on an output basis or 0.15 lb./MMBtu on an input basis. A fuel-neutral standard is also set for reconstructed power plants.

[21] Climate Change Work Group of the Permits, New Source Review and Toxics Subcommittee, Clean Air Act Advisory Committee, *Interim Phase 1 Report* (February 3, 2010), p. 2.

BACT case law and EPA guidance were sufficiently broad to address GHGs. Others argued that the Work Group should explore whether another approach to BACT and GHGs would be more appropriate. The split was resolved by the Work Group agreeing to a two-phase strategy with the first phase focused on providing recommendations to EPA based on current BACT practices and procedures, and a second phase focused on possible alternative or supplementary approaches to GHG BACT.

Phase I Report

Forming four subgroups to address Phase 1 issues, the Work Group found consensus on the following points:[22]

1. *Affected Sources*: BACT should continue to apply to new units and existing units that are undergoing a physical or operational change.
2. *Criteria for Determining Feasible Control Technologies*: Three over-arching recommendations for EPA: (a) expand its RACT[23]-BACT-LAER Clearinghouse to include information on GHG related project activities, expand its Office of Research and Development (ORD) GHG mitigation database, and include foreign activities; (b) explore ways to encourage adoption of innovative GHG control technologies; and (c) provide guidance on a sector-by-sector basis regarding evaluating energy efficiency in a BACT analysis.
3. *Criteria for Eliminating Technologies*: With respect to the three basic criteria: (a) *Environmental impacts*: EPA should continue to allow permitting authorities to consider the overall environmental impacts of a GHG application. These impacts include effects on criteria air pollutant levels, water-related impacts, threatened or endangered species, hazardous and solid waste effects, and soils and vegetation. (b) *Energy impacts*: Scope of BACT assessment for energy efficiency is very important. (c) *Economic Impacts*: BACT analysis should be done on a carbon-dioxide-equivalent basis.
4. *Needs of States and Stakeholders*: Several areas of recommendations were agreed to with respect to (a) timely communications with all stakeholders; (b) EPA guidance on appropriate cost methodologies, approaches, and technologies for GHG reductions; (c) steps to expedite, streamline and provide certainty to the BACT determination process; (d) guidance on netting of GHG emissions; and (e) training for permitting agencies, regulated community and other stakeholders.

Despite many areas of agreement, the Work Group did not provide recommendations with respect to specific control methods or cost thresholds. Carbon Capture and Sequestration (CCS) was discussed by the group, which noted that feasibility would have to be determined on a case-by-case basis. However, there was no attempt to determine the number of CCS systems that must be in use, or whether there must be commercial orders (and how many) before CCS is considered available. The cost thresholds suggested by group members ranged for $3-$15 per ton of carbon dioxide equivalence (CO_2e) to $30-$150, with others opposed to any fixed monetary values in favor of EPA guidance to permitting authorities on cost-effectiveness values based on the status of various technologies. In addition, no agreement was achieved on an approach in determining the

[22] A compilation of the Work Group's reports can be located on EPA's Website at http://www.epa.gov/oar/caaac/climatechangewg.html.

[23] RACT refers to Reasonably Available Control Technology—essentially emissions control technology that is readily available for retrofit on existing facilities. RACT is required on existing facilities located in an area that is in non-attainment for a National Ambient Air Quality Standard.

carbon neutrality of biomass, or on the advisability or legality of permits conditioned on the future availability of a control technology or measure.

Phase II Report

At the request of EPA, the Work Group focused its Phase 2 efforts on encouraging development of energy efficient measures and how the Clean Air Act's Innovative Control Technology (ICT) waiver could be used to promote technology development and application.[24] As with the previous report, the expanded 45-member Work Group did not explore specific control methods or cost thresholds.

With respect to better incorporating energy-efficient processes and technologies into the current top-down BACT process, the Work Group provided an analytical framework for determining and evaluating such technologies and processes. The five steps outlined are as follows:

1. *Identify energy efficient options*. Examples cited include (a) comparing a unit's energy performance with a benchmark to reveal any additional energy efficiency possibilities; (b) identifying options demonstrated overseas, but not in the United States; (c) examining combinations of technologies and/or processes.
2. *Eliminating technically infeasible options*. Technically infeasible energy efficiency measures should be eliminated in a manner consistent with current EPA guidance. The review of options may include reliability and operational characteristics of the alternative.
3. *Rank technically feasible energy efficient measures*. Options should be ranked according to specific GHG CO_2e reduction potential for the new facility.
4. *Evaluate most effective energy efficient measures.* Evaluation should include the energy efficiency and GHG impacts, economic impacts, and environmental impact on other pollutants and media (water, solid waste, etc). Permitting authorities need to assess the tradeoffs between all BACT analyses for each regulated pollutant. The analysis should include a clear justification for elimination of any top candidates.
5. *Incorporate energy efficient measures into GHG BACT emissions limit*. Besides appropriate monitoring and compliance determination methods, other elements that could be considered in setting the limits include (a) performance standards; (b) operating limits; (c) work practice standards; and (d) design requirements.

With respect to the level at which BACT analysis should occur (individual equipment, entire production line, or entire facility) the Work Group did not reach any specific consensus.

The Work Group's discussion of introducing ways to encourage inherently efficient and lower emitting processes and practices for GHGs focused primarily on the existing Innovative Control Technology (ICT) waiver provided under the Clean Air Act.[25] EPA may grant an ICT waiver from otherwise applicable NSPS requirements to encourage development of an "innovative technological system or systems of continuous emission reduction" that has a substantial likelihood of achieving greater, or at least equivalent, emission reductions than current technology with lower energy, economic, or nonair environmental impacts. The waiver applies to

[24] Climate Change Work Group, New Source Review and Toxics Subcommittee,, Clean Air Act Advisory Committee, *Phase II Report of the Climate Change Work Group of the Permits, New Source Review and Toxics Subcommittee, Clean Air Act Advisory Committee* (August 5, 2010), p. 1.

[25] 42 USC 7411(j)(1)(A). BACT waiver regulations can be found at 40 CFR 52.21(b)(19), 52.21(v), 51.166(b)(19) and 51.166(s).

the portion of the source on which it is installed and applies to the deadline for compliance, not the underlying NSPS. The deadline extension is up to seven years after the waiver is granted, or four years after a source commences operation (whichever is earlier). If the technology fails, the waiver may be extended up to three years to allow the facility to comply with the NSPS through other means. EPA may grant only sufficient waivers for a given technology to ascertain whether the technology works and satisfies the energy, economic, and environmental impact criteria.

Although the statutory language applies to NSPS, waiver authority has been included in PSD-BACT regulations since 1980. The addition of BACT to the waiver provisions reflects the interaction between NSPS and BACT. In addition, EPA draft NSR guidance has narrowly defined the need for multiple waivers for an individual technology: "as a practical matter, … granting of additional waivers to similar sources is highly unlikely since the subsequent applicants are no longer 'innovative.'"[26] The PSD-BACT ICT waiver has been rarely used.

The Workgroup had several recommendations to encourage the use of ICT waivers, consistent with existing statutory authority. In urging EPA to make the ICT waiver more attractive to facilities seeking permits, the Workgroup made the following recommendations:[27]

1. EPA should disavow its current guidance that an ICT waiver is available for only one application of a technology. Multiple waivers for a technology should be allowed as appropriate to encourage commercialization of the technology;
2. EPA should formally and publicly state its views about the waiver's availability in terms of a technology's deployment status and breadth of use among different types of facilities;
3. EPA should reevaluate the maximum time a waiver can be issued for, on a case-by-case basis;
4. EPA should work expeditiously with permitting authorities that wish to issue permits with limits based on innovative technologies (including waivers as needed) and foster information sharing to encourage flexibility in encouraging new and innovative technologies.

EPA's GHG Guidance

On November 10, 2010, the EPA released its package of guidance and technical information to assist local and state permitting authorities in implementing PSD and Title V permitting for greenhouse gas emissions.[28] The four primary elements of the guidance with respect to PSD permitting are:

1. Basic guidance on implementing PSD permitting, entitled: *PSD and Title V Permitting Guidance for Greenhouse Gases,* that focuses on the five-step permitting process favored by EPA, with particular attention given to determining BACT.

[26] Environmental Protection Agency, *New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting* (draft, October 1990), p. B-13.

[27] Climate Change Work Group, New Source Review and Toxics Subcommittee,, Clean Air Act Advisory Committee, *Phase II Report of the Climate Change Work Group of the Permits, New Source Review and Toxics Subcommittee, Clean Air Act Advisory Committee* (August 5, 2010), pp. 21-22.

[28] EPA's package of GHG permitting guidance and technical resources can be found at its website at http://www.epa.gov/nsr/ghgpermitting.html.

2. GHG Control Measures White Papers that summarize basic technical information on control techniques and measures to reduce GHG emissions from various industries. The information is general and does not define BACT for any sector. The November 10, 2010 release includes white papers for electric generating units, large industrial/commercial/institutional boilers, pulp and paper, cement, nitric acid, and iron and steel.
3. GHG Mitigation Strategies Database that provides data on performance, cost, and environmental effects on available and developing GHG control measures. Data are currently available for electric generating and cement production.
4. Enhancements to the Control Technology Clearinghouse to assimilate information and decisions about GHG control measures required by permits used by state and local authorities.

This package is not a formal rulemaking, although EPA is taking public comment on it and may release a refinement of the package if warranted. EPA will focus on comments pertaining to calculations and other technical errors. Because the guidance is not a formal rulemaking action, while EPA states it will consider other comments as the process proceeds, it does not intend to formally respond to them.

What Guidance Did EPA Give?

EPA retains the basic five-step process it has recommended to state and local authorities for 20 years.[29] The primary foci of the EPA guidance package are on state discretion in determining BACT and on energy efficiency as the most likely result of a GHG BACT analysis. These foci are evident through EPA's guidance for each of the five steps. The highlights of that guidance are discussed below.

Step 1 Guidance

The focus of EPA's Step 1 guidance is on inclusion of all potentially applicable control alternatives. In determining inclusion, the guidance discusses the definition of "redefining" (i.e., whether a potential control measure changes the fundamental purpose of the proposed source); the use of energy efficiency measures in BACT analysis; and the possibility for the installation of carbon capture and storage technology under BACT.[30]

A limiting factor in determining the Step 1 list of alternatives is whether an option would fundamentally redefine the nature of the source proposed. If an option is determined by permitting authorities to fundamentally redefine a source, they may exclude it from further consideration. The issue of what alternatives redefine a source has been a subject of contention over the past several years. In three highly publicized cases involving coal-fired power plants—Sithe Global Power's Desert Rock Energy Facility, Deseret Power Electric Cooperative's Bonanza Power Plant, and American Electric Power's John W. Turk Jr. Power Plant—state and regional EPA offices chose not to include integrated gasification combined-cycle technology (IGCC) as a control option in the initial BACT analysis because, based on a 2005 EPA opinion,

[29] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 18.

[30] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), pp. 25-34.

the technology would redefine the source proposed (which are facilities based on steam boiler technology).[31]

Various petitioners appealed these decisions to EPA's Environmental Appeals Board (EAB). In 2009, the EAB issued a series of opinions that rejected the 2005 EPA opinion and remanded these cases back to their respective state or EPA regional offices for further review. Reiterating its opinion in the Desert Rock case, the EAB stated in the John W Turk Jr. case:

> However, as was the case with EPA Region 9's response to comment in the Desert Rock permit, the ADEQ [Arkansas Department of Environmental Quality] has not in fact followed EPA's interpretation on this issue because it has not applied the analytical framework outlined by the EAB in a prior decision, despite citing to that decision as part of its rationale. ADEQ has thus made the same error as EPA Region 9 by not taking a hard look at how AEP defined its project and to "discern which design elements were inherent to that purpose and which design elements could be changed to achieve pollutant emissions reductions without disrupting [the applicant's] basic business purpose." See Desert Rock, Slip Op. at 69.[32]

In the EPA guidance, EPA suggests permitting authorities look to the EAB decision, stating: "in assessing whether an option would fundamentally redefine a proposed source, EPA recommends that permitting authorities apply the analytical framework recently articulated by the Environmental Appeals Board."[33] Indeed, EPA states clearly that it "no longer subscribes to the reasoning used by the Agency in a 2005 letter to justify excluding IGCC from consideration in all cases on redefining the source grounds." [34]

While EPA recommends the EAB framework, it does not restrict states to it: "The "redefining the source" issue is ultimately a question of degree that is within the discretion of the permitting authority."[35] This discretionary authority is evident as the guidance document discusses "clean fuel" options, such as whether a natural gas electric generating facility is a control option for a proposed coal-fired electric generating facility:

> For example, when an applicant proposes to construct a coal-fired steam electric generating unit, EPA continues to believe that permitting authorities can show in most cases that the option of using natural gas as a primary fuel would fundamentally redefine a coal-fired generating unit. [footnote omitted] Ultimately, however, a permitting authority retains the discretion to conduct a broader BACT analysis and to consider changes in the primary fuel in Step 1 of the analysis.[36]

EPA does believe that energy efficiency measures will have a significant role in GHG BACT analysis. In its guidance, EPA divides energy efficiency measures into two categories. The first category includes technologies and/or processes that maximize the overall efficiency of the proposed facility. In examining these alternatives EPA recommends authorities focus on improving the efficiency of large components and on suites of techniques that can be judged against established benchmarks.

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[31] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010). See EPA's discussion of 2005 decision and its reversal on p. 31, footnote 78.

[32] U.S. EPA, "In the Matter of American Electric Power Service Corporation, Southwest Electric Power Company, John W. Turk Plant, Fulton, Arkansas," Permit Number 2123-AOP-RO (signed December 15, 2009), p. 10.

[33] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 27.

[34] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 31, footnote 78.

[35] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 28.

[36] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 29.

The second category of energy efficiency options includes options that improve the use of thermal energy and electricity that is generated and used on site.

In contrast, EPA classifies CCS as an add-on pollution control technology that is available for all CO_2 emitting facilities, such as coal-fired power plants. Therefore, EPA believes it should be listed in Step 1 for such facilities. However, EPA believes it will likely be eliminated in later steps: "Many other case-specific factors, such as the technical feasibility and cost of CCS technology for the specific application, size of the facility, proposed location of the source, and availability and access to transportation and storage opportunities, should be assessed at later steps of a top-down BACT analysis."[37]

Step 2 Guidance

EPA's specific GHG guidance for Step 2 is primarily focused on CCS.[38] Once again, EPA makes clear that it is the permitting authority that is responsible for deciding technical feasibility:

> Evaluations of technical feasibility should consider all characteristics of a technology option, including its development stage, commercial applications, scope of installations, and performance data. The applicant is responsible for providing evidence that a potential control measure is technically infeasible. However, the permitting authority is responsible for deciding technical feasibility. The permitting authority may require the applicant to address the availability and applicability of a new or emerging technology based on information that becomes available during the consideration of the permit application.[39]

With respect to CCS, EPA expects this step to be a major barrier: "While CCS is a promising technology, EPA does not believe that at this time CCS will be a technically feasible BACT option in certain cases."[40] Particularly, technical hurdles with transport and storage of CO_2 may prevent the technology from being reasonably installed and operated in many cases.

Step 3 Guidance

EPA's specific GHG guidance for Step 3 is primarily focused on energy efficiency measures.[41] Specifically, EPA notes that the concept of overall control effectiveness will need to be refined to ensure that the package of measures with the lowest net emissions is the top-ranked measure. EPA suggests that the ranking be based on the options' net output-based emissions (i.e., include both the emissions reduced and any emissions created by the operation of the control measure to determine net result).

Step 4 Guidance

Step 4 is the critical step for many control options. As stated by EPA:

> In conducting the energy, environmental and economic impacts analysis, permitting authorities have "a great deal of discretion" in deciding the specific form of the BACT analysis and the weight to be given to the particular impacts under consideration. [footnote omitted] EPA and other permitting authorities have most often used this analysis to eliminate more stringent control technologies with significant or unusual effects that are

[37] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 34.

[38] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), pp. 34-38.

[39] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 35.

[40] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 37.

[41] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), pp. 38-39.

> 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. [footnote omitted] ... The same principle applies when assessing technologies for controlling GHGs.[42]

In comparing the environmental impacts of GHG emissions and other regulated pollutants, EPA recommends focusing on the relative levels of emissions rather than on endpoint impacts. Because of the global nature of climate change, the impact of any individual project is likely to be slight. Thus, EPA recommends that the permitting authorities focus on the amount of GHG emissions reductions that would be gained or lost by a specific control measure and how that compares with the collateral increase for other regulated pollutants. EPA states that relatively small collateral increases of another regulated pollutant need not be of concern, "unless even that small increase would be significant, such as a situation where an area is close to exceeding a NAAQS or PSD increment and the additional increase could push the area into nonattainment."[43]

In discussing economic impacts, EPA notes that because of the large volumes of GHGs created by many projects compared with their emissions of other regulated pollutants, it is reasonable that cost effectiveness numbers (in $/ton of CO_2e) for GHG control measures will be "significantly lower" than those for other regulated pollutant controls.[44]

As part of its continuing commentary on CCS, EPA states that "even if not eliminated in Step 2 of the BACT analysis, on the basis of the current costs of CCS, we expect that CCS will often be eliminated from consideration in Step 4 of the BACT analysis, even in some cases where underground storage of the captured CO_2 near the power plant is feasible."[45] EPA notes that there may be cases where the economics do work out and that future research and development may make CCS more viable in the future.

With respect to energy issues, EPA recommends that permitting authorities consider the impact that a particular control measure would have on the amount of energy that would be produced at an offsite location (e.g., a utility power plant) to support the operation of the proposed facility.

Step 5 Guidance

Initially, EPA expects many new GHG permits to focus on energy efficiency. In line with that expectation, EPA "encourages permitting authorities to consider establishing an output-based BACT emission limit, or a combination of output- and input-based limits, whenever feasible and appropriate to ensure that BACT is complied with at all levels of operation."[46] EPA notes that in addition to this limit, permits can also include work practice requirements focused on energy efficiency as part of the BACT analysis.

What About Coal?

The guidance above does not prescribe a specific technology or cost threshold for coal-fired electric generating units. Among the points it does make are the following:

[42] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 42.

[43] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 43.

[44] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), p. 44.

[45] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases," (November 2010) p. 43.

[46] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases," (November 2010) p. 46.

- IGCC does not "redefine" a coal-fired source and should be included in Step 1. States have the discretion with respect to its evaluation under Step 4.
- CCS is an available add-on control measure that should be included in Step 1. EPA expects CCS will generally be eliminated from consideration under Step 2 or Step 4. However, states have the discretion with respect to its evaluation under Step 2 and Step 4.
- Natural gas substitution for coal in a facility is generally considered by EPA to be an option that redefines the source and thus can be excluded under Step 1. However, states have the discretion to determine whether they believe it redefines the source and to evaluate it accordingly.

EPA's focus on energy efficiency for coal-fired facilities is evident in the White Paper that accompanies the guidance document.[47] The White Paper focuses entirely on energy efficiency improvements and carbon capture and storage technologies. Other alternatives—such as co-firing with biomass or natural gas, or natural gas substitution—are not discussed. The White Paper provides an example of a coal-fired unit BACT analysis based on the 2007 air permit application of Consumers Energy Company for an 830 MW supercritical pulverized-coal (PC)-fired unit. During the analysis, the applicant provided an analysis that compared five generating technologies: (1) supercritical PC-fired unit with and without CCS, (2) subcritical PC-fired unit without CCS, (3) subcritical and supercritical circulating fluidized bed (CFB) units without CCS; (4) IGCC unit without CCS, and (5) ultra-supercritical PC-fired unit without CCS. EPA notes that of the units without CCS, the ultra-supercritical PC-fired unit had the lowest projected heat rate and the lowest GHG emissions rate. However, despite stating that ultra-supercritical units "burning various coal ranks are being widely deployed throughout the world" EPA cites a 2007 NETL study to say that "the availability and reliability of materials required to support the elevated temperature environment for high sulfur or chlorine applications, although extensively demonstrated in the laboratory, has not been fully demonstrated commercially."[48] Apparently, the state of Michigan agreed and approved the permit based on the original supercritical design in December 2009.

What About Innovative Controls?

The new guidance from EPA on innovative technologies is two-fold.[49] First, EPA notes the existence of the innovative control technology waiver for applicants evaluating the use of an innovative technology. Second, EPA reverses its 1990 guidance, and states it will consider granting of multiple waivers for the same or similar technology being proposed at different locations.

[47] U.S. EPA, "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions Form Coal-Fired Electric Generating Units," (October, 2010).

[48] U.S. EPA, "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions From Coal-Fired Electric Generating Units" (October, 2010), p. 30.

[49] U.S. EPA, "PSD and Title V Permitting Guidance for Greenhouse Gases" (November 2010), pp. 29-30.

Illustrating How It May Work: California's GHG Permitting of a Natural Gas Combined-Cycle Power Plant

In February 2010, California's Bay Area Air Quality Management District (BAAQMD) finalized the nation's first PSD permit that includes GHGs in its BACT analysis.[50] The Russell City Energy Center is a 612 MW natural gas-fired combined cycle project to be constructed in Hayward, CA, by an affiliate of Calpine Corporation. In addition to agreeing to greenhouse gas emission limitations, Calpine will also have to install dry low NOx combustors, selective catalytic reduction (SCR), and an oxidation catalyst to limit emissions of other pollutants (particularly NOx). Petitions to the EAB by environmental groups challenging the permit were rejected by the EAB on November 18, 2010.[51]

The permit places limits on greenhouse gas emissions in carbon dioxide equivalence from the facility's two gas turbines and heat recovery steam generators (i.e., the combined-cycle), its fire pump diesel engine, and its five circuit breakers. For the combined-cycle, the limitations are 242 metric tons hourly, 5,802 metric tons daily, and 1,928,182 metric tons annually.[52] In addition, the heat rate of the power plant is not allowed to exceed 7,730 Btu per kilowatt-hour.[53] If the power plant maintains the efficiency required by the permit, it would be allowed to operate at about an 85% capacity factor.

In making this determination, the five-step BACT approach was used. In identifying potential control technology, the technologies identified were thermal efficiency and carbon capture and storage. Some commenters argued in favor of non-fossil electricity generation as an alternative to the proposed plant. However, BAAQMD noted that the 1990 draft EPA guidance does not require consideration of non-fossil-fuel-fired alternatives and deferred to the California Energy Commission. The CCS option was eliminated in step 2 as CCS was considered not commercially available, and no appropriate storage option had been demonstrated.[54] This left efficiency as the only option to achieve GHG reductions.

How Much Guidance Is There?

For those looking for bright lines and specific recommendations with respect to GHG BACT technologies, particularly with respect to coal-fired facilities, the released package does not

[50] Bay Area Air Quality Management District, "Air District Approves Landmark Permit for Hayward Plant" (February 4, 2010), available at http://www.baaqmd.gov/~/media/Files/Communications%20and%20Outreach/Publications/News%20Releases/2010/020410%20Russell%20City.ashx. The permit and related information on the permit is available on the BAAQMD website at http://www.baaqmd.gov/Divisions/Engineering/Public-Notices-on-Permits/2010/020410-15487/Russell-City-Energy-Center.aspx.

[51] U.S. EPA, "Order Denying Review," In re: Russell City Energy Center, LLC, PSD Permit No. 15487, before the Environmental Appeals Board (November 18, 2010), slip opinion.

[52] Broken down by greenhouse gas, the annual limits are (in metric tons): 1,926,399 for CO2, 675 for CH4, and 1,108 for N2O. See Calpine, *GHG BACT Analysis Case Study: Russell City Energy Center* (updated February 3, 2010), p. 10.

[53] Bay Area Air Quality Management District, Prevention of Significant Deterioration Permit Issued Pursuant to the Requirement of 40 CFR 52.21, Permit Application No. 15487 (approved February 4, 2010), p. 17. Heat input refers to higher heating value (HHV).

[54] Calpine, *GHG BACT Analysis Case Study: Russell City Energy Center* (updated February 3, 2010), p. 6.

provide them. Indeed, EPA's supplemental "Questions and Answers" release on the guidance seems to stress that it did not draw such conclusions.[55] For example:[56]

- Do these tools identify BACT for specific types of industrial facilities? No.
- Does this guidance say that fuel switching (coal to natural gas) should be selected as BACT for a power plant? No.
- Does this guidance say that carbon capture and storage (CCS) should be selected as BACT? No.

Likewise, the guidance provides no cost thresholds for permitting authorities to consider in determining the economic impacts of alternatives or propose a new approach to selecting BACT for GHG emissions. Instead, the guidance focuses on the discretionary authority that states have in determining BACT; discretion that ensures that BACT will continue to be determined on a case-by-case basis, with states differing in some cases in what they consider appropriate control measures and what constitutes BACT. Whether industry will find such discretion provides sufficient regulatory certainty for it to invest billions in new plant remains to be seen.

In short, the EPA GHG guidance is a simple expansion of the five-step BACT process that has been used for two decades to include greenhouse gases. Whether that is an adequate response will be determined by applicants, state authorities, and future EPA regulatory actions under related parts of the act, such as Section 111 (NSPS), to which BACT is linked.

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This report was written by Larry Parker, who has now retired from CRS.

[55] U.S. EPA, "Clean Air Act Permitting for Greenhouse Gases: Guidance and Technical Information Questions and Answers" (November 10, 2010).

[56] U.S. EPA, "Clean Air Act Permitting for Greenhouse Gases: Guidance and Technical Information Questions and Answers" (November 10, 2010), pp. 1, 4-5.

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