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Controlling Ancillary Emissions Under the Clean Air Act: Consideration of Energy Storage as Best Available Control Technology

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Controlling Ancillary Emissions Under the Clean Air Act: Consideration of Energy Storage as Best Available Control Technology

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Renewable energy is being deployed throughout the country to reduce air pollution and greenhouse gases. Reliance on increasing amounts of renewable energy, however, may lead to significant unanticipated increases in pollution because of the likelihood of fossil fuel facilities starting, stopping, and running more often to back up renewable resources. Estimates show that these emissions increases can drastically undercut the potential emission benefits of increased renewable penetration. To date, this changing role of fossil fuel facilities has not been thoughtfully evaluated in Clean Air Act permitting decisions for new and modified sources, even though the Act requires consideration of all methods to reduce air emissions.

This Article describes why the Clean Air Act requires permitting authorities to fully evaluate the changing role of utilities in permitting decisions. This Article further describes why this evaluation should necessarily consider all available methods for reducing backup emissions, which includes energy storage and renewable energy resources. Consideration of energy storage or renewable energy to minimize ancillary emissions is consistent with the definition of Best Available Control Technology, and does not lead to a redefinition of the source.

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INTRODUCTION

Federal, state, and local governments are evaluating and implementing different methods to reduce greenhouse gas (GHG) emissions.[1] Many of these efforts are focused on electrical generation, since approximately 40 percent of carbon dioxide (CO_2) emissions in the United States derive from burning fossil

1. *See, e.g.*, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830, 34,830 (June 18, 2014) (to be codified at 40 C.F.R. pt. 60); PEW CTR. ON GLOBAL CLIMATE CHANGE, CLIMATE CHANGE 101: STATE ACTION 3 (2011), http://www.pewclimate.org/docUploads/climate101-state.pdf (summarizing the policies that states and regions are developing as related to climate change).

fuels to create electricity.[2] To reduce GHG emissions in the electrical sector, many GHG reduction plans require increased generation of electricity through less-polluting renewable resources or increased conservation and efficiency measures.[3] Areas throughout the country also focus on shifting from reliance on coal to natural gas. These developments have already started to, and will continue to, change the way that electricity is generated. In particular, renewable energy technologies, such as solar and wind, are likely to meet increasing levels of energy needs. Due to these changes, natural gas facilities will be called upon to start, stop, and run more often to back up renewables. This shift in the way electricity is generated could lead to significant increases in GHG emissions and air pollution, which needs to be accounted for.

The Clean Air Act's (CAA) Prevention of Significant Deterioration (PSD) program is an important tool in this regard, as it requires consideration of how to reduce GHGs and other harmful emissions from large stationary sources, such as electrical generating facilities.[4] The PSD program requires new and modified facilities to implement Best Available Control Technology (BACT) to reduce emissions by the maximum degree achievable.[5] Greenhouse gases must be considered for new and modified facilities that are already subject to PSD.[6]

To date, many PSD permits only artificially consider ways to reduce startup and shutdown emissions, and there is generally no discussion of how to

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2. *See* Press Release, Presidential Memorandum—Power Sector Carbon Pollution Standards (June 25, 2013), https://www.whitehouse.gov/the-press-office/2013/06/25/presidential-memorandum-power-sector-carbon-pollution-standards; *Electricity and the Environment*, ENERGY INFO. ADMIN., http://www.eia.doe.gov/energyexplained/index.cfm?page=electricity_environment; EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2012 (2014), http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2014-Main-Text.pdf. The total net GHG emissions in the United States in 2012 were 5,546.3 teragrams (or million metric tons) of CO_2 equivalent, and the total CO_2 from fossil fuel was 2,022.7 teragrams of CO_2. *Id.* at ES-5 to ES-7. These values account for 979.3 teragrams of CO_2 equivalent of sinks, which include forest-based and other processes that store GHG emissions. *Id.*

3. *See, e.g.*, Richard B. Alley et al., *Summary for Policymakers*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS (Susan Solomon et al. eds., 2007) (recommending that policy makers reduce reliance on fossil fuel generated electricity as part of any climate change mitigation plan); Tom Schueneman, *Emissions Market to Grow Renewable Energy and Reduce Greenhouse Gases*, THE ENERGY COLLECTIVE (Apr. 2, 2013), http://theenergycollective.com/globalwarmingisreal/204131/how-rggi-growing-renewable-energy-and-reducing-ghgs.

4. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514, 31,514 (June 3, 2010) (to be codified at 40 C.F.R. pts. 51, 52, 70, 71). In *Utility Air Regulatory Group v. EPA (UARG)*, the Supreme Court upheld EPA's authority to regulate "anyway" sources that need PSD permits for other air pollutants anyway. 134 S. Ct. 2427, 2449 (2014).

5. Clean Air Act, 42 U.S.C. § 7479(3) (2012) (defining the requirement as "an emission limitation based on the maximum degree of reduction of each pollutant . . . emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility").

6. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. at 31,514; *see UARG*, 134 S. Ct. at 2449 (limiting EPA's ability to regulate GHG emission under the PSD program to sources that would be subject to the permitting requirements "anyway").

reduce potential emissions when a facility is operating, or "spinning," to back up renewables. This lack of attention can lead to significant increases in emissions. Although permitting authorities often require highly effective pollution controls for air pollutants that can reduce emissions more than 90 percent when operating,[7] these controls are not nearly as effective during startups and shutdowns, and when the facility is not operating at full capacity.[8] And the reductions achieved for GHGs under PSD have been minimal, at best, during any time that the facility is operating.[9]

A closer look at the CAA demonstrates that the Environmental Protection Agency (EPA) and other permitting authorities interpret BACT too narrowly. Specifically, permitting authorities need to more fully consider how often electric generating facilities are expected to start up, shut down, and spin in order to back up renewable resources. These ancillary services are likely to greatly increase emissions of GHGs and other air pollutants.[10] One way to reduce startup and shutdown emissions that permitting authorities have not thoughtfully considered is requiring energy storage or renewable energy as an add-on control to back up renewable energy.[11] Onsite energy storage would significantly reduce the number of starts and the amount of time that a facility needed to spin to back up renewable energy. Renewable energy could be also used to pre-heat the water or otherwise reduce fossil fuel plants' startup time. These potential technical applications could lead to significant emission reductions. Thus, given BACT's broad definition, regulators should consider renewable energy and energy storage as potential control technology to reduce emissions from electric generating facilities. The CAA's statutory and regulatory language supports this broader reading, and the potential impacts from climate change and additional air pollution demand this consideration.

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7. *See, e.g.*, EPA, POLLUTION CONTROL FACT SHEET: SELECTIVE CATALYTIC CONVERTER 1, http://www.epa.gov/ttncatc1/dir1/fscr.pdf.

8. *See infra* Part II.B (describing the increases in emissions from facilities during startups, shutdowns, and spinning).

9. PSD permits to date generally have required heat rate or energy efficiency improvements. *See* Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. at 31,514 (describing heat rate improvements as one of the main available controls). Heat rate improvements to electric generating units are often minimal. *See, e.g.*, EPA, GHG ABATEMENT MEASURES, 2–12, tbl. 2–2 (2014), http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-ghg-abatement-measures.pdf.

10. *See infra* Part II.B.

11. In February 2015, EPA rejected consideration of energy storage as BACT to fully or partially replace a natural gas facility's electricity demand. It did not analyze whether energy storage could effectively mitigate emissions from ancillary services. *See* EPA, RESPONSE TO PUBLIC COMMENTS: SOUTH TEXAS ELECTRIC COOPERATIVE, INC. — RED GATE POWER PLANT PREVENTION OF SIGNIFICANT DETERIORATION PERMIT FOR GREENHOUSE GAS EMISSIONS 4–11 (2015), http://www.epa.gov/region6/6pd/air/pd-r/ghg/stec-redgate-final-rtc.pdf.

I. OVERVIEW OF BEST AVAILABLE CONTROL TECHNOLOGY REQUIREMENTS

A. New Source Review Requirements

The purpose of the PSD program is to "protect public health and welfare from any actual or potential adverse effect which in [EPA's] judgment may reasonably be anticipate[d] to occur from air pollution . . . notwithstanding attainment and maintenance of all national ambient air quality standards."[12] Congress added the PSD provisions as part of the 1977 CAA amendments, which were intended to "strengthen the safeguards that protect the nation's air quality."[13] As the D.C. Circuit summarized, Congress intended to identify, and focus PSD regulation on, "facilities which, due to their size, are financially able to bear the substantial regulatory costs imposed by the PSD provisions and which, as a group, are primarily responsible for emissions of the deleterious pollutants that befoul our nation's air."[14]

The PSD provisions apply to air pollution in "attainment" areas that either meet or exceed the national ambient air quality standards.[15] The PSD provisions may also apply to areas that EPA has not classified as either attaining or not attaining the standards.[16] Pursuant to PSD requirements, new facilities that have the potential to emit over a certain threshold, called "major stationary sources," and modifications projected to emit over a certain threshold, called "major modifications," are required to obtain a permit before commencing construction.[17] The CAA defines a new major stationary source or "major emitting facility" as a stationary source that has the potential to emit at least 100 tons per year if the source is in one of the listed source categories or 250 tons per year if it is not one of the listed source categories of "any air pollutant."[18] EPA regulations further define a "new major stationary source" as one that triggers PSD when it begins actual construction.[19]

The CAA defines a "major modification" as a physical or operational change that increases the amount of any air pollutant emitted by the source.[20] EPA regulations further define modification as "any physical change in or change in the method of operation of a major stationary source that would result in: a significant emissions increase [ ] of any regulated NSR pollutant . . .

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12. 42 U.S.C. § 7470(1) (2012).

13. New York v. EPA, 413 F.3d 3, 10 (D.C. Cir. 2005).

14. Ala. Power Co. v. Costle, 636 F.2d 323, 353 (D.C. Cir. 1980).

15. §§ 7470–7479.

16. *Id.*; *see also* Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 52.21 (2015) (EPA's PSD regulations).

17. 42 U.S.C. §§ 7475(a), 7479(1). The PSD provisions provide that: "No major emitting facility on which construction is commenced after August 7, 1977, may be constructed in any area to which this part applies unless" certain requirements are met. § 7475(a).

18. § 7479(1).

19. 40 C.F.R. § 52.21(b)(11). EPA regulations also use the 100 ton per year threshold for listed source categories and 250 tons per year as thresholds. § 52.21(b)(1)(i).

20. 42 U.S.C. § 7411(a)(4).

and a significant net emissions increase of that pollutant from the major stationary source."[21] To determine whether an increase triggers PSD requirements, EPA regulations define the significance threshold for certain pollutants.[22] To avoid PSD permitting requirements, a source may limit its potential to emit by agreeing to enforceable production or operational limits.[23] A source may also agree to an enforceable, plant-wide applicability limit at its facility for one or more of the regulated pollutants.[24]

The CAA also contains a separate program for nonattainment areas called Nonattainment New Source Review (NNSR).[25] Although NNSR shares many similarities to the PSD program, new sources and modifications in nonattainment areas must achieve the lowest emissions rate or LAER instead of the "less demanding" BACT.[26] Under NNSR, new sources and modifications also must offset their pollution.[27]

B. Pollutants That Trigger New Source Review

Electric generating facilities emit a variety of pollutants that trigger either the PSD or the NNSR permitting requirements. Coal electric generating facilities generally trigger permitting requirements for their emissions of sulfur dioxide, nitrogen oxides (NOx), particulate matter, and GHGs.[28] Natural gas electric generating facilities generally trigger permitting requirements for their emissions of NOx, carbon monoxide, particulate matter, and GHGs.[29] For new facilities, permitting requirements are triggered if an electric generating facility emits over 100 tons per year of a pollutant regulated under the CAA.[30] Modified facilities trigger permitting requirements if the modification is projected to increase sulfur dioxide emissions by forty tons per year, nitrogen dioxide emissions by forty tons per year, carbon monoxide emissions by forty tons per year, or fine particulate matter by fifteen tons per year.[31]

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21. 40 C.F.R. § 52.21(b)(2)(i).

22. 40 C.F.R. § 52.21(b)(23)(i)–(iii). For pollutants not listed in the regulation, any increase is assumed to be significant. § 52.21(b)(23)(ii).

23. *See* 40 C.F.R. § 52.21; Memorandum from Terrell E. Hunt, Assoc. Enforcement Counsel, Air Enforcement Div., Office of Enforcement & Compliance Monitoring, EPA, to John S. Seitz, Dir., Stationary Source Compliance Div., EPA (June 13, 1989), http://www.epa.gov/reg3artd/permitting/t5_epa_guidance.htm.

24. *See* 40 C.F.R. § 52.21(a)(2)(v), (b)(2)(iv), (aa)(1)(ii).

25. *See* 42 U.S.C. §§ 7501–7515 (2012).

26. *See* New York v. EPA, 413 F.3d 3, 13 (D.C. Cir. 2005).

27. *See* § 7503.

28. *See generally eGRID*, EPA, http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html (last updated June 4, 2015).

29. *Id.*

30. *See supra* Part I.A (discussing 100-ton prerequisite for certain source categories).

31. *See* Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 52.21 (2015).

GHGs are a regulated pollutant under the PSD program when the facility or modification already falls under PSD requirements.[32] In *Utility Air Regulatory Group v. EPA*, the Supreme Court rejected EPA's attempt to require PSD compliance for new sources that only exceeded the PSD review threshold through GHG emissions, but affirmed EPA's authority to regulate GHG emissions from sources that would be subject to PSD anyway due to their emissions of other pollutants.[33] The Supreme Court found that "nothing in the statute categorically prohibits EPA from interpreting the BACT provision to apply to greenhouse gases emitted by 'anyway' sources."[34] EPA classifies GHGs as a single air pollutant, which includes the aggregate of six gases: CO_2, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.[35] PSD requirements for GHGs apply to any source that has already triggered PSD requirements for other air pollutants and emits more than a de minimis level of GHGs.[36] In addition to determining emissions increases,

32. *See UARG*, 134 S. Ct. 2427, 2449 (2014); *see, e.g.*, Reconsideration of Interpretation of Regulations that Determine Pollutants Covered by Clean Air Act Permitting Programs, 75 Fed. Reg. 17,004 (Apr. 2, 2010) (to be codified at 40 C.F.R. pts. 50, 51, 70, 71) (discussing EPA's application of interpretation that PSD applies to pollutants that have been "subject to regulation" under the CAA).

33. *UARG*, 134 S. Ct. at 2449. Under EPA's vacated tailoring rule for permits issued after July 1, 2011, a new source can trigger PSD for its GHG emissions if it: (1) already triggered PSD for another pollutant; or (2) the potential GHG emissions from the new source are equal to or greater than 100,000 tons per year of carbon dioxide equivalent emissions and the total GHG emissions are greater than or equal to the applicable major source threshold. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514, 31,523 (June 3, 2010) (to be codified at 40 C.F.R. pts. 51, 52, 70, 71). For permits issued after July 1, 2011, a modified source can trigger PSD for its GHG emissions if it: (1) already triggered PSD for another pollutant and the emissions increase and the net emissions increase is equal to or greater than 75,000 tons per year of carbon dioxide equivalent emissions and greater than zero tons per year on a mass basis; (2) the potential GHG emissions from the source are equal to or greater than 100,000 tons per year of carbon dioxide equivalent emissions and the requirements for the first step are met; or (3) the actual or potential emissions from the modification alone are equal to or greater than 100,000 tons per year on a carbon dioxide equivalent basis and equal to or greater than the applicable major source threshold on a mass basis. *Id.* at 31,523–24. For permits issued from January 2, 2011 to June 30, 2011, PSD applies to the GHG emissions if the source was otherwise subject to PSD and the potential emissions were greater than or over 75,000 tons per year of carbon dioxide equivalent emissions. *Id.* at 31,523. EPA calls these "anyway sources" and "anyway modifications." *See, e.g.*, Memorandum from Janet McCabe, Acting Assistant Admin., Office of Air & Radiation, & Cynthia Giles, Assistant Admin., Office of Enforcement & Compliance Assurance, to Reg'l Admins., Regions, 1–10, EPA (July 24, 2014), http://www.epa.gov/nsr/documents/20140724memo.pdf.

34. *See UARG*, 134 S. Ct. at 2449.

35. *See* 40 C.F.R. § 52.21(b)(49)(i).

36. Shortly after the Supreme Court decision, EPA stated that it intends to "continue applying BACT to GHG at 'anyway sources' and processing PSD permit applications for 'anyway sources' using a 75,000 tpy [tons per year] CO_2e [carbon dioxide equivalent] threshold to determine whether a permit must include a BACT limitation for greenhouse gases." McCabe & Giles, *supra* note 33. The Supreme Court gave the following instruction to EPA: "EPA may establish an appropriate de minimis threshold below which BACT is not required for a source's greenhouse-gas emissions." *UARG*, 134 S. Ct. at 2449. EPA's Tailoring Rule also had required permitting authorities to look at the carbon dioxide potential. EPA determines carbon dioxide equivalent emissions by adjusting each GHG for its global warming potential. EPA published a table defining the global warming potential in the regulations. *See*

a permitting authority also needs to consider all creditable emission increases and decreases to determine whether a modification or new facility triggers PSD requirements.[37]

C. *Definition of Best Available Control Technology*

If a source triggers PSD permitting requirements, the primary requirement of a PSD permit is the application of BACT for each regulated pollutant.[38] In relevant part, the CAA defines BACT as:

> an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation . . . which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant.[39]

BACT determinations are made on a case-by-case basis after considering the record.[40] EPA has historically recommended a five-step, "top-down" process to determine BACT[41] as a way of improving BACT's application and providing consistency.[42] Indeed, the agency has specifically recommended this approach

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40 C.F.R. pt. 98, subpt. A, tbl. A-1. Since the Supreme Court vacated the Tailoring Rule, permitting authorities may only need to examine the total mass of GHG emissions.

37. *See* § 52.21(b).

38. Clean Air Act, 42 U.S.C. § 7479 (2012). In addition to application of BACT, PSD permits have other requirements including a requirement to monitor as necessary to determine the effect the emissions may have on the area's air quality. *See* § 7475(a) (describing permitting preconstruction requirements for the PSD program).

39. § 7479(3).

40. As EPA's own Environmental Appeals Board puts it, BACT determinations are made "on a case-by-case basis, taking a careful and detailed look, attentive to the technology or methods appropriate for the particular facility, [] to seek the result tailor-made for that facility and that pollutant." N. Mich. Univ. Ripley Heating Plant, PSD Appeal No. 08-02, 2009 WL 443976, at *12 (Envtl. Appeals Bd. Feb. 18, 2009) (citations and quotations omitted).

41. EPA initially set forth the top-down method in a 1990 draft guidance for permitting authorities that has been referred to as the "NSR Manual." *See* EPA, NEW SOURCE REVIEW WORKSHOP MANUAL: PREVENTION OF SIGNIFICANT DETERIORATION AND NONATTAINMENT AREA PERMITTING B.2 (1990), http://www.epa.gov/NSR/ttnnsr01/gen/wkshpman.pdf [hereinafter EPA, NEW SOURCE REVIEW WORKSHOP MANUAL]; *see also* EPA, INTERIM PHASE I REPORT OF THE CLIMATE CHANGE WORK GROUP OF THE PERMITS, NEW SOURCE REVIEW AND TOXICS SUBCOMMITTEE, CLEAN AIR ACT ADVISORY COMMITTEE 16 (2010), http://www2.epa.gov/sites/production/files/2014-10/documents/2010_02_interimphaseireport.pdf (recognizing that a top-down method is the "predominant method for determining BACT").

42. *See* Memorandum from Craig Potter, Assistant Admin. for Air & Radiation, to Reg'l Admins., Regions I–X, EPA 3 (Dec. 1, 1987); Memorandum from John Calcagni, Dir., Air Quality Mgmt. Div., to Dir., Air Mgmt. Divs., Regions I, III & IX et al. 1 (June 13, 1989), http://www.epa.gov/region7/air/nsr/nsrmemos/topdawn.pdf; *see also* Steel Dynamics, 9 E.A.D. 165, 183 (EAB 2000) ("top-down analysis is not a mandatory methodology, but it is frequently used by permitting authorities to ensure that a defensible BACT determination, involving consideration of all requisite statutory and regulatory criteria, is reached").

for evaluating BACT for GHGs.[43] Still, although EPA recommends a top-down process, the agency does not require it.[44]

Instead, state permitting authorities are free to apply whatever BACT methodology they wish so long as it complies with applicable federal and state requirements.[45] Whatever method a permitting authority applies, EPA has authority to review it to ensure that it is reasoned and consistent with the applicable requirements.[46] As EPA describes it, the five steps for a top-down BACT analysis are: (1) identify all available control technologies; (2) remove technically infeasible options; (3) rank the remaining control technologies; (4) evaluate most effective controls; and (5) select BACT.[47]

For the first step of the top-down BACT analysis, the permitting authority should identify all available control technologies. In general, EPA guidance states that three control categories should be examined: "Inherently Lower-emitting Processes/Practices/Designs," "Add-on Controls," and a combination of the two.[48] EPA encourages permitting authorities to "cast a wide net" when identifying control options, but the agency also recognizes that options that "fundamentally redefine the nature of the source proposed by the permit applicant" do not need to be included.[49] Although the statutory language is broad, EPA believes that inclusion of all clean fuel alternatives may not be necessary[50] even though the CAA includes "clean fuels" in the definition of BACT.[51] EPA has not modified its PSD regulations to include "clean fuels" in the definition of BACT[52] and maintains that "a BACT analysis does not need to include 'clean fuel' options that would fundamentally redefine the source."[53]

In the second step of the analysis, a permitting authority eliminates technically infeasible options.[54] Usually a technology is technically feasible if it either has operated on the same source or is available and can be applied to

43. EPA, PSD AND TITLE V PERMITTING GUIDANCE FOR GREENHOUSE GASES 17 (2011), http://www.epa.gov/nsr/ghgdocs/ghgpermittingguidance.pdf [hereinafter EPA, PERMITTING GUIDANCE].

44. *See* Alaska Dep't of Envtl. Conservation v. EPA, 540 U.S. 461, 476 n.7 (2004) ("Nothing in the Act or its implementing regulations mandates top-down analysis.").

45. Cardinal FG Company, 12 E.A.D. 153, 162 (EAB 2005).

46. *Alaska Dep't of Envtl. Conservation*, 540 U.S. at 502.

47. *See* EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.5–B.9.

48. EPA, PERMITTING GUIDANCE, *supra* note 43, at 25; *see also* EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.5.

49. EPA, PERMITTING GUIDANCE, *supra* note 43, at 26.

50. *Id.* at 26–27; *see generally* EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41.

51. Clean Air Act, 42 U.S.C. § 7579(3) (2012).

52. Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 52.21(b)(12) (2015); Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 51.166(b)(12), *invalidated by* UARG, 134 S. Ct. 2427 (2014).

53. EPA, PERMITTING GUIDANCE, *supra* note 43, at 27.

54. EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.7 ("A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review.").

the source under review.[55] In the third step of BACT analysis, after removing the technically infeasible options, the permitting authority ranks the remaining control options by their effectiveness.[56] The control option that achieves the greatest emissions reduction ranks first.[57] The permitting authority needs to determine the best metric for completing this ranking. For example, the authority could use a pounds per megawatt (MW) of electricity standard.[58] In accordance with these standards, EPA recommends that the "overall control effectiveness" be evaluated to ensure that the facility with the lowest net GHG emissions ranks first.[59]

In the fourth step of BACT analysis, the permitting authority considers the economic, energy, and environmental impacts of the various remaining control options.[60] Economic impacts measure the cost effectiveness of the control measure in terms of cost per pollutant removed.[61] To eliminate an emissions reduction measure on cost grounds, the applicant must show that the costs are disproportionately high.[62] To analyze energy impacts, EPA has stated that the permitting authority should evaluate "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."[63] EPA has referred to the evaluation of environmental impacts as the "collateral impacts analysis" because the analysis considers the indirect effect of the emissions reduction measure.[64] When assessing the GHG reductions' environmental impacts, EPA recommends determining the total reduction of GHGs rather than trying to model their potential impacts due to the complexity associated with climate modeling.[65]

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55. *Id.* at B.18 ("Deployment of the control technology on an existing source with similar gas stream characteristics is generally sufficient basis for concluding technical feasibility barring a demonstration to the contrary.").

56. EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.22.

57. *Id.* EPA includes several factors that should be evaluated when ranking alternatives including: expected emission rate, emissions performance level, expected emissions reduction, economic impacts, environmental impacts, and energy impacts. *Id.* at B.25.

58. *Id.*

59. EPA, PERMITTING GUIDANCE, *supra* note 43, at 37.

60. EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.26.

61. *Id.* at B.31.

62. *Id.* at B.31 to B.32 ("primary consideration should be given to quantifying the cost of control and not the economic situation of the individual source").

63. EPA, PERMITTING GUIDANCE, *supra* note 43, at 39; EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.29 ("Applicants should examine the energy requirements of the control technology and determine whether the use of that technology results in any significant or unusual energy penalties or benefits.").

64. *See, e.g.*, Hillman Power Co., 10 E.A.D. 673, 683 (EAB 2002).

65. EPA, PERMITTING GUIDANCE, *supra* note 43, at 41–42 ("EPA recommends that permitting authorities focus on the amount of GHG emission reductions that may be gained or lost by employing a particular control strategy and how that compares to the environmental or other impacts resulting from the collateral emissions increase of other regulated NSR pollutants").

In the final step of the process, the permitting authority should choose the most effective remaining option for BACT.[66] Here, the permitting authority should define an emissions limit in the permit. EPA recommends that metrics for GHG limits focus on longer-term averages since EPA is concerned about GHGs' cumulative impact instead of their short-term effects.[67] In general, a permit applicant should take the highest-ranked, technically feasible option—the one that reduces emissions to the greatest extent.[68]

II. WHY EMISSIONS FROM STARTUPS, SHUTDOWNS, AND SPINNING SHOULD BE FULLY EVALUATED UNDER THE CLEAN AIR ACT

A. The Grid is Changing by Increasing Renewable Energy to Mitigate for Climate Change

The effects of climate change will only grow over time. For instance, as a recent United Nations report summarizes, poverty will increase: "Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps."[69] Recent assessments of the impacts of climate change illustrate the urgent need to reduce GHG emissions.[70] Scientists have found that we are nearing a tipping point beyond which climate change impacts will become irreversible.[71] Nevertheless, despite broad awareness of climate change and its impacts, the concentration of CO_2 in the atmosphere continues to rise.[72]

66. EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.53–B.54 ("the BACT selection essentially should default to the highest level of control for which the applicant could not adequately justify its elimination based on energy, environmental and economic impacts").

67. EPA, PERMITTING GUIDANCE, *supra* note 43, at 45–46.

68. *See* EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.53–B.54.

69. Alley et al., *supra* note 3, at 19.

70. *See, e.g.*, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830, 34,842 (June 18, 2014) (to be codified at 40 C.F.R. pt. 60) ("Absent a reduction in [GHG] emissions, a recent National Research Council of the National Academies assessment projected that concentrations by the end of the century would increase to levels that the Earth has not experienced for millions of years.").

71. *See* James Hansen et al., *Target CO_2: Where Should Humanity Aim?*, 2 OPEN ATMOSPHERIC SCI. J. 217, 217–31 (2008) (finding that if the current rates of increasing greenhouse gas emissions are not reversed, "there is a possibility of seeding irreversible catastrophic effects").

72. *See* NAT'L OCEANIC & ATMOSPHERIC ADMIN., THE NOAA ANNUAL GREENHOUSE GAS INDEX (IGGI) (2015), http://www.csrl.noaa.gov/gmd/aggi/aggi.html (estimating that humans have increased the influence of GHGs by 36 percent since 1990); Leora Falk, *NOAA Says 2010 Among Warmest on Record; Pew Links Climate, Harsh Weather Frequency*, 42 ENV'T REP. 1449 (2011) (the executive director from Scientific American stated "the existence of the link between climate change and extreme weather is not so much theoretical anymore as it is observational"); Jessica Blunden et al., *State of the Climate in 2010: Special Supplement to the Bulletin of the American Meteorological Society*, 92 BULL. OF AM. METEOROLOGICAL SOC'Y S27, S27 (2011).

Renewable energy is currently one of the most feasible ways to reduce GHG emissions from the energy sector.[73] Other potential controls that would mitigate GHG emissions are not as developed as they are for other pollutants.[74] For example, EPA acknowledges that opportunities for efficiency improvements in individual heat rates at electric generating units are small.[75] Hence renewable energy will be crucial for meeting future climate goals.[76] As the Executive Director of the International Energy Agency recently acknowledged, "[g]as without carbon . . . is not a low carbon technology."[77] Consequently, in its June 2, 2014 proposed Existing Source Performance Standards (ESPS) rule, EPA concluded that the "most *cost-effective* system of emission reduction for GHG emissions . . . entails not only improving the efficiency of fossil fuel-fired [electrical generating units], but also addressing their utilization by taking advantage of opportunities for lower-emitting generation and reduced electricity demand."[78]

This new focus on renewable energy could lead to higher startup, shutdown, and spinning emissions. One of EPA's proposed recommendations is either switching to natural gas or requiring dispatch to favor natural gas facilities.[79] Indeed, since natural gas facilities often start and stop faster than coal facilities, grid operators will rely upon them more often to back up renewable energy. Problematically, however, natural gas plants emit GHGs, and their GHG life-cycle emissions may be higher than those of coal plants.[80] Contrary to popular belief, recent studies have shown that natural gas may be as harmful to the climate as coal plants.[81] Studies estimate that in recent years the

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73. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. at 34,882.

74. EPA, PERMITTING GUIDANCE, *supra* note 43, at 29 (stating that energy efficiency "is a particularly important consideration for GHGs since the use of add-on controls to reduce GHG emissions is not as well-advanced as it is for most combustion-derived pollutants").

75. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830, 34,856 (June 18, 2014) (to be codified at 40 C.F.R. pt. 60) ("the available reductions were relatively limited in quantity"). EPA estimated reductions between 1.3 and 6.7 percent from adopting best practice and up to 4 perfect from equipment upgrades. *Id.*

76. *See, e.g.*, INTL. ENERGY AGENCY, EXECUTIVE SUMMARY: THE POWER OF TRANSFORMATION: WIND, SUN AND THE ECONOMICS OF FLEXIBLE POWER SYSTEMS 13 (2014), http://www.iea.org/Textbasc/npsum/GIVAR2014sum.pdf.

77. Rick Mitchell, *IEA Says Flexible Natural Gas Plants Important in Switch to Renewable Power*, 45 ENVTL. REP. 580–81 (2014).

78. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. at 34,832 (emphasis added).

79. *Id.* at 34,857 ("Natural gas co-firing or conversion at coal-fired steam EGUs offers greater potential CO_2 emission reductions than heat rate improvements . . . . converting a coal-fired steam EGU to burn only natural gas would reduce the unit's CO_2 emissions by approximately 40 percent.").

80. *See, e.g.*, Phil McKenna, *The EPA's Natural Gas Problem*, NOVANEXT (Feb. 11, 2015), http://www.pbs.org/wgbh/nova/next/earth/methane-regulations/.

81. *See, e.g., id.*; Gayathri Vaidyanathan, *Research Raises New Concerns About Climate Impact of Natural Gas*, CLIMATEWIRE (June 26, 2014), http://www.eenews.net/stories/1060001996. EPA dismisses this argument in its proposed ESPS rule concluding that "any net impacts from methane emissions are likely to be small compared to the CO_2 emissions reduction impacts of shifting power

natural gas industry leaks anywhere from 1.2 to 9 percent of the gas it produced in recent years, and leakage over 3 percent makes natural gas as harmful to the climate as coal.[82]

B. Grid Changes Will Likely Lead to Increases in Emissions from Backup Facilities

Many states are increasing the construction of renewable resources, including solar and wind facilities, due to the increased emphasis on using renewable energy to mitigate climate change.[83] As electrical grids increasingly rely upon renewable resources, grid operators, states, and public utility commissions are examining how to integrate these resources into the grid.[84] One of their main concerns is how to provide backup for the increasing penetrations of variable renewable resources.[85] As states increase the amount of variable renewable energy on the grid, the need for ancillary or backup resources will significantly increase.[86]

One type of backup reserve is a spinning or regulation reserve—a resource that will immediately be available to provide capacity if needed.[87] Spinning reserves include flexible facilities that are operated at low capacity so that they can quickly respond to changes in generation levels to meet demand. For example, system operators will operate, or "spin," fossil fuel facilities to ensure that the power supply needed to back up renewables is available; even if the facility's power is not actually needed for providing energy. Other resources, such as energy storage resources, can also provide regulation services. Another type of reserve resource is a "load following" reserve, which is available in a short period of time rather than immediately like regulation resources.[88] As a

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generation from coal-fired steam EGUs to NGCC units." Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. at 34,862.

82. *See, e.g.*, Vaidyanathan, *supra* note 81. The results were presented in studies published in the Environmental Science & Technology and ACE Sustainable Chemistry and Engineering.

83. *See Database of State Incentives for Renewables & Efficiency*, N.C. CLEAN ENERGY TECH. CTR., http://www.dsireusa.org/ (last visited June 19, 2015) (providing information about state renewable requirements).

84. *See, e.g.*, Cal. Pub. Util. Comm'n, *Long-Term Procurement Plan History*, http://www.cpuc.ca.gov/PUC/energy/procurement/LTPP/ltpp_history.htm (last modified May 4, 2014) (examining how to integrate system to increasing levels of renewable penetration).

85. *See generally* ANDREW MILLS ET AL., ARGONNE NAT'L LAB., INTEGRATING SOLAR PV IN UTILITY SYSTEM OPERATIONS (2014), http://emp.lbl.gov/publications/integrating-solar-pv-utility-system-operations (providing a general description of the types of integration concerns related to variability of solar).

86. ETHAN ELKIN, THE POWER OF ENERGY STORAGE: HOW TO INCREASE DEPLOYMENT IN CALIFORNIA TO REDUCE GREENHOUSE GAS EMISSIONS 9 (2010), https://www.law.berkeley.edu/files/Power_of_Energy_Storage_July_2010.pdf.

87. *See, e.g.*, Third-Party Provision of Ancillary Services, 146 F.E.R.C. ¶ 61,114, Order No. 784-A, at 6 (Feb. 20, 2014) (defining Operating Reserve-Spinning as a resource "available to serve load 'immediately' in the event of a contingency").

88. *See, e.g.*, *id.* at 5 (defining Operating Reserve-Supplemental as "resources that are available within a short period of time.'").

result of the need to back up renewable resources on the grid, operators are likely to start up, shut down, and spin fossil fuel facilities more often than before.[89]

Using a facility as a spinning resource could significantly impact its emissions. While emissions increases logically result from keeping a facility in spinning mode, studies show that the emission impacts of spinning reserves vary. Some studies found that using fossil fuel resources to back up renewable energy can significantly impact emission reductions from the renewable energy.[90] In fact, one commentator believes that "[t]o maintain secure reserve margins, each MW of wind generating capacity has to be backed by approximately 1 MW of generating plant which can be run on demand," and because natural gas plants are spinning to provide backup, "there is absolutely no saving in CO_2 emissions because the gas plants carry on running as before but they are just feeding less electricity into the grid."[91]

In contrast, other studies found that the emissions impacts of spinning facilities will not be as significant.[92] The difference in estimated impacts is partly due to whether the analysis assumed grid operators would use natural gas or coal to back up the facility, since gas facilities have a faster start time.[93] It is also due to disagreements between system operators and renewable integration analysts over the quantity of backup that is necessary.[94] Regardless, studies have consistently found that the changes on the grid will result in a greater need

89. *See* CAL. INDEP. SYS. OPERATOR, INTEGRATION OF RENEWABLE RESOURCES: TECHNICAL APPENDICES FOR CALIFORNIA ISO RENEWABLE INTEGRATION STUDIES VERSION 1 63 (2010), http://www.caiso.com/282d/282d85c9391b0.pdf (renewable integration "is likely to include more frequent starts, stops and cycling"); CAL. INDEP. SYS. OPERATOR, SUMMARY OF PRELIMINARY RESULTS OF 33% RENEWABLE INTEGRATION STUDY 43–45 (2011), http://www.caiso.com/Documents/SummaryPreliminaryResults33PercentRenewableIntegrationStudy2010CPUCLongTermProcurementPlanDocketNoR10-05-006.pdf.

90. *See, e.g.*, BENTEK ENERGY, HOW LESS BECAME MORE . . . WIND, POWER, AND THE UNINTENDED CONSEQUENCES IN THE COLORADO ENERGY MARKET 25–33 (2010), www.bentekenergy.com/windcoalandgasstudy.aspx; *see also* Warren Katzenstein & Jay Apt, *Air Emissions Due to Wind and Solar Power*, 43 ENVTL. SCI. & TECH. 253, 253 (2009).

91. *See* Gordon Hughes, *Wind Power Does Not Reduce CO_2 Emissions as Much as Claimed*, NAT'L WIND WATCH (Oct. 4, 2012), https://www.wind-watch.org/documents/wind-power-does-not-reduce-co-emissions-as-much-as-claimed/.

92. *See, e.g.*, Matthias Fripp, *Greenhouse Gas Emissions from Operating Reserves Used to Backup Large-Scale Wind Power*, 45 ENVT. SCI. & TECH. 9405, 9413 (2011); D. LEW ET AL., NAT'L RENEWABLE ENERGY LAB., THE WESTERN WIND AND SOLAR INTEGRATION STUDY PHASE 2: EXECUTIVE SUMMARY 10 (2013), http://www.nrel.gov/docs/fy13osti/58798.pdf.

93. *See* LEW, *supra* note 92, at 19 ("Because wind tended to displace more coal compared to solar, and because coal emission rates of CO_2, NOx, and SO_2 are higher than those of gas, higher penetrations of wind resulted in higher levels of avoided emissions.").

94. *See, e.g.*, David Wagman, *Rethinking Wind's Impact on Emissions and Cycling Costs*, NAT'L WIND WATCH (Mar. 5, 2013), https://www.wind-watch.org/documents/rethinking-winds-impact-on-emissions-and-cycling-costs/; Hughes, *supra* note 91.

for resources to be available immediately.[95] These changes will impact the overall emissions that are expected from facilities.

In addition, units that are spinning and operating at partial load generally emit more pollutants per megawatt hour (MWh) than units operating at full capacity. The National Renewable Energy Laboratory estimated the emissions "penalty" for partial load operation in terms of percent increase in CO_2 emissions per MWh. It found a 5 percent increase for coal units; a 9 percent increase for combined cycle gas units; and 18 percent increase for combined; and a 6 percent increase for gas steam units.[96] For NOx, a combined cycle gas unit has a 22 percent increase in emissions per MWh in partial load operation, and a combustion turbine unit has a 15 percent increase in emissions per MWh.[97] Natural gas steam units and coal units have on average a 14 percent lower NOx emission rate during partial load.[98]

Along with increased use of fossil fuel facilities as spinning reserves, generating facilities are also likely to see increases in starts and stops. These facilities could potentially start and stop several times per day depending on how they are dispatched. Problematically, power plants emit pollutants at even higher rates during the shutdown and startup phases of operations[99] because the pollution control devices are not fully operating during these times.[100] Consequently, startups can emit more pollution than many hours of continuous operation.[101] For example, a natural gas turbine in California is only permitted to emit up to 10 pounds of carbon monoxide per hour during steady-state operation but up to 541.3 pounds per hour during a simple-cycle startup.[102] Another facility's gas turbines are permitted to emit up to 16.5 pounds of NOx per hour during regular operation but up to 480 pounds during a cold start.[103]

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95. *See* MILLS ET AL., *supra* note 85, at 8 (citing studies from General Electric, Black & Veatch, CAISO, and Navigant that show that the amount of generation available will need to be increased).

96. *See* LEW, *supra* note 92, at 15.

97. *See id.* The NREL report explained what causes the fluctuations in NO_x emissions: "Most of the NO_x from all units is created from nitrogen in the combustion air ('thermal' NO_x), as opposed to in the fuel, so flame temperature is likely a primary driver of NO_x emissions." *Id.*

98. *See id.*

99. *See, e.g.*, CAL. COUNCIL ON SCI. & TECH., CALIFORNIA'S ENERGY FUTURE: THE VIEW TO 2050, at 4 (2001), http://www.ccst.us/publications/2011/2011energy.pdf (finding that if fossil fuel plants are the predominant resource used to back up renewables, this "would likely result in greenhouse gas emissions that would alone exceed the 2050 target for the entire economy").

100. *See* LEW, *supra* note 92, at 15.

101. *See, e.g.*, BAY AREA AIR QUALITY MGMT. DIST., ENGINEERING EVALUATION FOR PROPOSED AMENDED AUTHORITY TO CONSTRUCT AND DRAFT PSD PERMIT: GATEWAY GENERATING STATION, APPLICATION 17182 at Appendix A (2008), http://yosemite.epa.gov/OA/EAB_WEB_Docket.nsf/Verity%20View/E3C1932C1FF58D4D852575AE006CE69B/$File/gatewayevaluationbaaqmdEX2B...4.pdf ; *see also* LEW, *supra* note 92, at 16 ("During starts, [combined cycle units] emit the same NO_x as approximately 7 hours of full-load operation.").

102. BAY AREA AIR QUALITY MGMT. DIST., FINAL DETERMINATION OF COMPLIANCE: MARSH LANDING GENERATING STATION, APPLICATION 18404, at 16–17 (2010), http://www.energy.ca.gov/sitingcases/marshlanding/documents/other/2010-06-29_BAAQMD_FDOC.pdf.

103. BAY AREA AIR QUALITY MGMT. DIST., PREVENTION OF SIGNIFICANT DETERIORATION PERMIT ISSUED PURSUANT TO THE REQUIREMENTS OF 40 CFR § 52.21, at 9–10 (2010),

The energy industry is anticipating these changes to emissions. Facilities used to back up renewables will have a harder time meeting emissions limitations than facilities used primarily used to continuously generate electricity. Thus, in response to the proposed ESPS rule, industry recently requested that EPA weaken the requirements applied to natural gas plants used to back up renewable energy.[104]

Impending changes to the grid will likely cause significant increases in emissions from fossil fuel facilities being utilized as backup for renewable resources. Starting, stopping, and spinning can produce significant GHGs and other air pollutants. Control of these emissions is important to ensure that renewable energy has the anticipated emission reduction benefit.

C. *EPA's Current Application of BACT Does Not Meaningfully Consider Grid Changes*

To appropriately consider BACT, permitting authorities should examine control technologies that could limit emissions from these types of fluctuating operations. Spinning reserves are one of the primary reasons that states may not see sought-after reductions in GHGs despite increased production of renewable energy. The question of how much spinning reserves will cut into the reduction in GHGs from renewable energy is primarily a question of how independent system operators plan to maintain grid reliability.[105]

However, EPA has yet to explain how permitting authorities should analyze the future operation of ancillary facilities when considering the increased integration of renewable energy into energy portfolios. For instance, EPA's lengthy proposed ESPS rule often mentions the importance of maintaining reliability but fails to discuss the problem of spinning reserves.[106] Nevertheless, the agency acknowledges that fossil fuel facilities are generally used to respond to changes in demand.[107] Still, EPA does not explain how it

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http://www.baaqmd.gov/~/media/Files/Engineering/Public%20Notices/2010/15487/PSD%20Permit/B3161_nsr_15487_psd-permit_020410.ashx (cold startup occurs more than forty-eight hours after a gas turbine shutdown while hot startup occurs within eight hours of shutdown).

104. *See Industry Urges EPA to Ease NSPS for Natural Gas Plants Tied to Renewables*, INSIDE CAL/EPA, July 4, 2014.

105. *See, e.g.*, Am. Wind Energy Ass'n, *Wind Energy, Backup Power, and Emissions: The "No Reduction in Emissions" Myth*, http://www.awea.org/Issues/Content.aspx?ItemNumber=5454 (last visited July 25, 2015).

106. *See generally* Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830, 34,830 (June 18, 2014) (to be codified at 40 C.F.R. pt. 60).

107. *Id.* at 34,880 ("The electricity system similarly allows increased generation resulting from expansion of the amount of available low- or zero-carbon generating capacity connected to the electric grid (building block 3), as well as avoided generation resulting from reductions in electricity demand (building block 4), to substitute for fossil fuel-fired generation, thereby reducing CO_2 emissions from affected EGUs.").

will account for emissions from electric generation facilities when those facilities are not producing electricity.[108]

In fact, EPA's proposed ESPS rule is unlikely to account for spinning reserves. ESPS regulates by "rate," which may not account for spinning reserves.[109] An NRDC analysis, cited as part of the basis of EPA's proposed rule, highlights this issue by simply calculating the rate of pounds of CO_2 per MWh.[110] The NRDC analysis accounts for the percentage of electricity generated by different types of facilities by calculating percentages of electricity from the various types of generating facility such as 90 percent from coal and 10 percent from natural gas.[111] However, this calculation does not account for time when a given facility is operating but not producing power. EPA describes rate calculation as simply an attempt to estimate the rates and percentages of different types of generation.[112]

Similarly, EPA has told permitting authorities to focus on ways to improve the energy efficiency at the source when describing how to evaluate application of BACT to GHG emissions.[113] Although increasing the energy efficiency at the source reduces emissions of GHGs and other pollutants, it does not

108. *See generally id.* at 34,830.

109. The proposal provides flexibility for states to build upon their progress, and the progress of cities and towns, in addressing GHGs. It also allows states to pursue policies to reduce carbon pollution that: "(1) Continue to rely on a diverse set of energy resources, (2) ensure electric system reliability, (3) provide affordable electricity, (4) recognize investments that states and power companies are already making, and (5) can be tailored to meet the specific energy, environmental and economic needs and goals of each state." *Id.* at 34,833. EPA proposes to give states flexibility to decide what type of "goal" it will work towards: "[a] state could adopt the rate-based form of the goal established by the EPA or an equivalent mass-based form of the goal." *Id.* at 34,837.

110. NAT. RES. DEF. COUNCIL, CLEANER AND CHEAPER: USING THE CLEAN AIR ACT TO SHARPLY REDUCE CARBON POLLUTION FROM EXISTING POWER PLANTS, DELIVERING HEALTH, ENVIRONMENTAL, AND ECONOMIC BENEFITS 5 (2014), http://www.nrdc.org/air/pollution-standards/files/pollution-standards-IB-update.pdf.

111. *Id.* ("The EPA would first tally up the share of electricity generated by coal and gas-fired plants in each state during the baseline years . . . . Then the agency would set a target emission rate for each state for 2020, based on the state's baseline share of coal and gas generation.").

112. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. at 34,871 ("By reducing electricity consumption, energy efficiency avoids greenhouse gas emissions associated with electricity generation. Because fossil fuel-fired EGUs typically have higher variable costs than other EGUs (such as nuclear and renewable EGUs), their generation is typically the first to be replaced when demand is reduced. Consequently, reductions in the utilization of fossil fuel-fired EGUs can be supported by reducing electricity consumption and, by the same token, reductions in electricity consumption avoid the CO_2 emissions associated with the avoided generation.") Under the proposed goals, the emission rate computation includes an adjustment designed to reflect those mass emission reductions. *Id.* "The adjustment is made by estimating the annual net generation associated with an achievable amount of qualifying new low-carbon and zero-carbon generating capacity, as well as the annual avoided generation associated with an achievable portfolio of demand-side energy efficiency measures, and adding those MWh amounts to the energy output from affected units that would have been used in an unadjusted output-weighted-average emission rate computation." *Id.* at 34,895.

113. *See* EPA, PERMITTING GUIDANCE, *supra* note 43, at 21 ("EPA believes that it is important in BACT reviews for permitting authorities to consider options that improve the overall energy efficiency of the source or modification—through technologies, processes and practices at the emitting unit.").

necessarily reduce the number of startups, shutdowns, or the time that the facility is spinning.[114] To make a BACT determination related to energy efficiency, a permitting authority needs to determine a benchmark to evaluate whether better performance is achievable.[115]

Despite not acknowledging or considering the role that spinning units will play in emissions, EPA has considered startups and shutdowns in BACT analysis in more general terms. For example, for the Palmdale Hybrid Power Plant, while EPA found that it was technically feasible to apply pollution controls to startups and shutdowns, it decided that "BACT is achieved by minimizing the time for startup and shutdown."[116] A permit for a similar facility found that "a facility can only rely on good combustion practices to minimize emissions" from startup and shutdown emissions.[117] EPA has also instructed that PSD permits should provide limits for startup and shutdown periods.[118] EPA, however, has generally not required physical controls to limit the startup and shutdown emissions. Additionally, EPA has proposed to regulate the electric utility industry's GHG emissions largely through requiring energy efficiency improvements, which does not necessarily account for changes in the grid.

III. ENERGY STORAGE AND RENEWABLE ENERGY CAN AND SHOULD BE CONSIDERED AS BACT TO MINIMIZE EMISSIONS FROM FACILITIES' ANCILLARY SERVICES

A. Requiring A Reliable Projection of Projected Startups, Spinning and Shutdowns

A permitting authority must carefully examine the role a proposed generating facility is likely to play on the grid to ensure that the emissions estimate is reasonable. As renewable energy penetration increases, many

114. This is because a more efficient process uses less fuel. Therefore, a more efficient process would reduce the other pollutants that are emitted as a result of the combustion of fossil fuel such as particular matter.

115. EPA has various databases that it recommends permitting authorities review to evaluate whether energy efficiency measures are achievable. EPA, PERMITTING GUIDANCE, *supra* note 43, at 22 (recommending a tool called the "Energy Performance Indicators" and the "ENERGY STAR" Energy Guide).

116. *See* EPA, FACT SHEET AND AMBIENT AIR QUALITY IMPACT REPORT: FOR A CLEAN AIR ACT PREVENTION OF SIGNIFICANT DETERIORATION PERMIT, PALMDALE HYBRID POWER PROJECT PSD PERMIT NUMBER SE 09-01 at 31 (2011), http://www.epa.gov/region9/air/permit/palmdale/palmdale-hybrid-power-project-fact-sheet-aaqir.pdf.

117. EPA, FACT SHEET: PIONEER VALLEY ENERGY CENTER, AMPAD ROAD, WESTFIELD, MA, EPA DRAFT PERMIT (REVISED), PERMIT NUMBER 052-042-MA14, at 25 (2011), http://www.epa.gov/region1/communities/pdf/PioneerValley/FactSheet.pdf.

118. *See, e.g.*, Letter from Mark A. Smith, Chief, Air Permitting & Compliance Branch, Air & Waste Mgmt. Div., to David Phelps, Supervisor, Construction Permit Section, Air Quality Bureau, (May 6, 2011), http://www.epa.gov/region7/air/nsr/archives/2011/r7comments/midamerican_gnealsouth_draft_psd_permit_comments.pdf ("BACT limits should apply during startup and shutdown").

facilities are likely to see their roles change from producing baseload to peaking power.[119] In addition, many plants will provide backup services for renewable energy.[120] A permitting authority must determine how operators will employ the particular facility in order to predict emissions from starts, stops, and spinning time.[121] EPA has confirmed that a unit's projected utilization—such as whether it is projected to be a peaking or baseload unit—is a relevant consideration when determining BACT.[122] Projected utilization dictates how often the facility starts and how often the facility remains online even when its electricity is not needed. The projected efficiency of the plant, or heat rate, may include how often the plant will be dispatched or called upon to produce electricity.[123] To determine how the facility will be utilized, the permitting authority needs to obtain information on: the overall projected utilization of the facility, the anticipated number of starts and stops, and the role the facility will play for backing up renewables by providing spinning services.

The PSD regulations provide permitting authorities with general guidance as to the type of information they should consider by requiring that the facility submit a "complete" application for a permit.[124] An application is "complete" when it contains "all of the information *necessary* for processing the application."[125] The regulations further require that, to determine "projected actual emissions," permitting authorities must consider at least the following information: "historical operational data, the company's own representations, the company's expected business activity and the company's highest projections of business activity, the company's filings with the State or Federal regulatory authorities, and compliance plans under the approved State Implementation Plan."[126]

Gathering the comprehensive information specified in this regulatory list is a critical step for determining the emissions from starts, stops, and spinning. It is essential to look at documents that the facility submits to other agencies for review to ensure that it is describing its operations consistently in each submission. For example, if an application requests ratepayer funding, a facility

119. *See supra* Part II.A (discussing the changing grid and the changing role of generators).

120. *See supra* Part II.

121. *See, e.g.*, Russell City Energy Ctr., PSD Appeal Nos. 10-01, 10-02, 10-03, 10-04 & 10-05, 2010 WL 5573720, at *19–20 (Envtl. Appeals Bd. Nov. 18, 2010) (describing the connection between utilization and the number of starts and stops).

122. EPA, PERMITTING GUIDANCE, *supra* note 43, at 27. EPA qualifies this statement by admitting that the energy impacts are more appropriately considered later in the top-down BACT analysis. *Id.*

123. *See, e.g.*, *Russell City Energy Ctr.*, 2010 WL 5573720, at *19–20. EAB discussed this relationship, stating, "One clear indication [that the facility will be used for intermediate to baseload operation] is that the facility has been designed and proposed to maximize energy efficiency, which is being prioritized over fast start times. This tradeoff between a low heat rate (an indication of energy efficiency) and quicker startups times is what determines how power plants are dispatched—that is, whether they are kept on-line or whether they are turned off when demand is not at peak." *Id.*

124. *See* Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 52.21(b)(22) (2015).

125. *Id.* (emphasis added).

126. § 52.21(b)(41)(ii).

has an incentive to overstate its availability. By contrast, an emissions permit application encourages it to limit its projected utilization. Regulators must examine the potential differences between these two submissions to determine the most likely operating profile. In addition, a permitting authority should review whether the facility intends to operate pursuant to a contract or if it will operate as a merchant facility on the free market.[127] If it will operate pursuant to a contract, which many new facilities do, the permitting authority should review the contract and its requirements to determine how the facility will likely be used.[128]

The list from the regulations, however, does not include some information that may be essential for determining how a facility is used to back up renewable energy. One critical set of information not listed is how the grid operator intends to utilize the facility.[129] In many areas of the country, a separate grid operating entity called a regional transmission operator or an independent systems operator determines how often and in what capacity a facility will be called upon.[130] The grid operator also determines how it will meet demand even if intermittent renewable energy goes offline. Understanding the role that the facility will play in the electrical system as a whole is a critical component of estimating emissions. This aspect of emissions projections has been largely absent from the analyses that agencies and permitting authorities conduct. However, EPA would not need to promulgate new rules to start requiring consideration of how grid operators intend to use facilities. Instead, the agency could issue guidance explaining that information from the grid operator about the facility's intended use is "necessary."[131] This guidance would then be a description of how to meet the current regulatory requirements for a "complete" application.[132]

The regulations also require that the data include the "company's highest projections of business activity."[133] Yet given the role that electric generating facilities are likely to play in the grid, the highest projection may mean not operating for the most hours in a year. As described above, facilities often emit

127. As opposed to a contractual agreement, some facilities may be operated as merchant plants "which means the company will sell electric power on the retail or wholesale spot markets, where electricity prices are determined by supply and demand, rather than entering into traditional long-term electric power purchase agreements." Indeck-Niles Energy Ctr., PSD Appeal No. 04-012004, 2004 WL 3214477, at *2 (Envtl. Appeals Bd. Sept. 30, 2004).

128. These contracts often include a commitment of time that the particular facility is expected to be available. *See, e.g.*, Application of San Diego Gas & Electric for Approval of Power Purchase Agreements (May 19, 2011) (Cal. Pub. Util. Comm'n) (Application No. 11-05-023) (describing contractual terms for approval of three contracts with electricity generation providers).

129. *See generally* § 52.21(b)(22).

130. *See Map of Regional Transmission Operator and Independent Systems Operator*, FED. ENERGY REGULATORY COMM'N, http://www.ferc.gov/industries/electric/indus-act/rto.asp (last updated June 15, 2015).

131. *See* § 52.21(b)(22).

132. *Id.*

133. § 52.21(b)(41)(ii)(a).

considerably more pollutants during startup and shutdown events than they do during regular operations.[134] Therefore, the highest projection of a proposed facility's emissions must be carefully scrutinized.

Given emissions' dependence on starts, stops, and spinning time, permitting authorities should consider setting federally enforceable limits to ensure that the facility operates such that the amount of each is actually at the same level relied on in permitting.[135] EPA's Environmental Appeals Board (EAB) recommends that permitting authorities "carefully circumscribe in the permit the conditions" under which the facility is permitted to start up and shut down.[136] In addition, EAB has suggested that a permitting authority "may also wish to consider establishing secondary PSD limits that would apply to pollutants emitted during startup/shutdown periods; [and] if it does so, such limits must be made part of the PSD permit and justified as BACT."[137] This same reasoning should also apply to the number and length of starts and shutdowns.

B. BACT Analysis Should Consider All Technologies that Reduce Spinning, Startup, and Shutdown Emissions

It is well established that BACT applies to emissions during startups, shutdowns, and malfunctions.[138] EPA guidance has repeatedly said that startup and shutdown "are part of the normal operation of a source and should be accounted for in the planning, design and implementation of operating procedures for the process and control equipment."[139] Although the agency has not explicitly stated so, spinning time is also "part of the normal operation" of energy generation facilities used to back up renewables and thus should be accounted for in the BACT analysis. Accordingly, a permitting authority should consider ways to change the design or other possible changes to reduce

134. *See supra* Part II.B.

135. *See* § 52.21(b)(17) (defining federally enforceable as: "all limitations and conditions which are enforceable by the Administrator, including . . . any permit requirements established pursuant to [the PSD regulations]").

136. Tallmadge Generating Station, PSD Appeal No. 02-12, 2003 WL 21500414, at *11–13 (Envtl. Appeals Bd. May 22, 2003).

137. *Id.*

138. *See, e.g.*, Mich. Dep't of Envtl. Quality v. Browner, 230 F.3d 181, 185 (6th Cir. 2000) (affirming EPA's rejection of Michigan's SIP revision for not including consideration of startup, shutdown, and malfunction periods from emission limitations); *Tallmadge Generating Station*, 2003 WL 21500414, at *11–12 ("BACT requirements cannot be waived or otherwise ignored during periods of startup and shutdown.")

139. Memorandum from John B. Rasnic, Dir., EPA Stationary Source Compliance Div., to Linda M. Murphy, Dir., EPA Region 1 Air, Pesticides & Toxics Mgmt. Div. (Jan. 28, 1983); *see also* Memorandum from Kathleen M. Bennett, EPA Assistant Adm'r for Air, Noise & Radiation, to EPA Reg'l Adm'rs, Regions 1–10 (Feb. 15, 1983).

emissions from startups, shutdowns, and spinning.[140] Specifically, the permitting authority must include "permit provisions that regulate emissions during facility startup and shutdown . . . [and] describe what design, control, methodological, or other changes are appropriate for inclusion in the permit to minimize the authorized excess emissions during startup and shutdown."[141] A permitting authority "may also require that once the facility is operational any permit provisions designed to reduce emissions during startup and shutdown should be refined over time so as to increase their efficiency and effectiveness."[142]

The two primary methods for reducing startups, shutdowns, and spinning are (1) reducing the time that the facility is used for these functions; and (2) reducing the number of times that the facility has to start, stop, or spin. The BACT analyses to date have focused primarily on reducing the amount of time that a facility spends starting up or shutting down. This type of analysis should continue. In addition, permitting authorities should start to examine the installation of energy storage and renewable energy as a control option for reducing startup, shutdown, and spinning times.

C. Regulators Should Examine All Methods to Reduce Startup Time Which Have Been Part of Previous BACT Determinations

The broad regulatory definition of BACT contemplates examining production processes, available methods, systems, and techniques or design, equipment, work practice, and operational standards.[143] Some permitting authorities have looked at a variety of methods for reducing startup and shutdown times in permits, but they have not uniformly assessed them across similar permits. The three general ways that a few permitting authorities have examined to date are equipment changes, adding on equipment, and changing equipment. Permitting authorities should examine each of these methods in all future CAA permits.

Software exists to optimize the operation of facilities and reduce startup and shutdown emissions. One example is OpFlex, a General Electric product designed to "reduce both the duration of startups and the number of startups and shutdowns . . . and the higher . . . emissions that result from startups and shutdowns."[144] Opflex has been installed at facilities in California to reduce

140. *See, e.g.*, RockGen, 8 E.A.D. 536, 553 (EAB 1999) (requiring permitting authority to consider "design or other possible changes to the proposed facility to address [startup and shutdown emissions]").

141. *Tallmadge Generating Station*, 2003 WL 21500414, at *11–13.

142. *RockGen*, 8 E.A.D. at 554.

143. *See* Prevention of Significant Deterioration of Air Quality, 40 C.F.R. 52.21(b)(12) (2015); *see also RockGen*, 8 E.A.D. at 554.

144. United States v. Pac. Gas & Elec., 2011 U.S. Dist. LEXIS 27022, at *1015 (Mar. 3, 2011).

emissions from startups.[145] EPA found that Opflex reduced NOx emissions by 47 pounds per startup for one of these facilities.[146] Recently, a draft permit for a facility in Idaho required Opflex installation in a draft permit for a facility in Idaho to enhance production during cold days.[147]

Adding equipment such as auxiliary boilers can keep the unit warm when it is shut down, reducing startup emissions. At least two different facilities' permits have required an auxiliary boiler as a way to minimize startup emissions. For example, the permit for the Lake Side Power Plant in Utah states that: "[t]he auxiliary boiler will be operated when the plant is not operational . . . . The benefit of the auxiliary boiler is reduced startup times."[148] Mankato Energy Center also installed an auxiliary boiler as part of its BACT determination.[149] An analysis of the Mankato Energy Center's auxiliary boiler found that the boiler reduces "fuel usage (and consequently emissions) by approximately 18 [percent] for warm startups and approximately 31 [percent] for cold startups."[150]

Another method of reducing startup and shutdown time is to physically change to a different turbine. Combined cycle turbines have longer startup times than turbines with a fast-start design.[151] The fast-start technology "allow[s] power plant operators to maximize energy production, but ha[s] the collateral benefit of reducing startup emissions by reducing startup times."[152] Initial reports from a fast-start plant constructed in 2013 in California state that it is working well.[153]

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145. *See* EPA, RESPONSE TO COMMENTS REGARDING CONSENT DECREE FOR GATEWAY GENERATING STATION 19, http://yosemite.epa.gov/OA/EAB_WEB_Docket.nsf/Verity%20View/D293DD1157438CA3852577360063D6DA/$File/Exhibit%201%20Gateway%20Response%20to%20Comments-2...101.01.pdf (citing a settlement that found "EPA is requiring use of this product [OpFlex startup] in order to reduce the higher NOx emissions associated with startups").

146. *See id.*

147. *See* SHAWNEE CHEN, RATHDRUM POWER, LCC, STATEMENT OF BASIS: TIER I OPERATING PERMIT NO. T1-2014.0032 5–6 (2014), http://www.deq.idaho.gov/media/1118476/rathdrum-power-rathdrum-t1-statement-1214.pdf.

148. *See* UTAH DEP'T OF ENV'T, ENG'RING REVIEW: SUMMIT VINEYARD, L.L.C. LAKE SIDE POWER PLANT 6–7 (2004), http://yosemite.epa.gov/oa/eab_web_docket.nsf/Filings%20By%20Appeal%20Number/9413D93E69EF5E1A852576F000638E91/$File/Chabot%20RCEC%20Exh%204%20Utah%20Division%20of%20Air%20Quality...2.10.pdf.

149. MINN. POLLUTION CONTROL AGENCY, AIR PERMIT NO. 01300098-001, at 4–5 (2004), http://www.pca.state.mn.us/index.php/view-document.html?gid=1402.

150. *See* BAY AREA AIR QUALITY MGMT. DIST., *supra* note 101, at 114.

151. As one proposed permit explained, "combined-cycle turbines cannot start up faster [because of] the need to slowly heat the thick-walled steam drum . . . for safety and reliability purposes. Steam drum re-designs that eliminate the steam drum or use one-through steam technology, and designs using a steam drum with thinner walls have been developed to reduce startup times." BOWIE POWER STATION, CLASS 1 PERMIT APPLICATION 4–17 (2013), http://www.azdeq.gov/environ/air/permits/download/Bowie%20Power%20Station%20Class%201%20Permit%20Application%20September%202013.pdf.

152. *Id.* at 4–18.

153. *See id.*; *see also* Team CCJ, *Early Experience with Fast-Start Combined Cycles Positive Say Plant Personnel*, COMBINED CYCLE J. (Oct. 14, 2013), http://www.ccj-online.com/early-experience-with-fast-start-combined-cycles-positive-say-plant-personnel/.

D. Energy Storage and Renewable Energy Should Be Examined As Ways to Reduce Startup, Shutdown, and Spinning Time

Perhaps the simplest way to reduce a backup facility's startup, shutdown, and spinning emissions is to make using it unnecessary. Grid operators can use a variety of methods to reduce the need for backup including reducing the scheduling intervals to shorter time periods and require better forecasting to predict when wind and solar resources are available.[154] If a backup need still exists, grid operators will call on resources to fill projected backup needs to help ensure a reliable supply of electricity. Although a BACT determination cannot change the decision making of the grid operators, it can help ensure that using fossil fuel facilities as backup is minimized to reduce emissions.

A variety of resources can be used to reduce spinning, startups, and shutdowns including energy storage and onsite renewable energy. These resources should be examined for BACT since they can directly reduce emissions. To successfully argue that regulators should consider energy storage or renewable energy in a BACT analysis, a commenter will need to provide comments describing exactly what should be considered. In a permit where a solar component was added to the facility, EAB stated that "[t]he [EPA] Region's incorporation of the solar power component . . . as a condition of the permit was a 'logical outgrowth' of the permitting process . . . . The change was directly responsive to the public comments received."[155] Since current permits have not examined how to reduce spinning and backup emissions with energy storage and renewable energy,[156] this Article discusses why this analysis is appropriate.

E. Energy Storage and Renewable Energy Can Reduce Spinning, Startup, and Shutdown Emissions

Storage technology can limit ancillary services' startup and shutdown times. Energy storage facilities operate throughout the country and the world.[157] Energy storage systems have also been integrated directly into electrical generating facilities.[158] By backing up intermittent renewable

154. *See* MILLS ET AL., *supra* note 85, at xix (describing how probabilistic forecasts could be used to reduce reserve requirements by ensuring "that there was low probability of clouds before reserves would be reduced."). The authors of the study defined "regulation reserves" as resources that respond in the 4 second to 5 minute time scale. *Id.* at 8.

155. City of Palmsdale, PSD Appeal No. 11-07, 2012 WL 4320533, at *16 (Envtl. Appeals Bd. Sept. 17, 2012).

156. *See* EPA, *supra* note 11 (description of Red Gate permit). EPA has limited its analysis to examining whether to consider energy storage as a capacity replacement BACT.

157. *See* U.S. Dep't of Energy & Sandia Nat'l Labs., *DOE Global Energy Storage Database*, http://www.energystorageexchange.org/projects (last visited June 17, 2015) (listing projects throughout the country and the world).

158. *Id.*; *see also* Barry Cassell, *EPA Grants Permit for Texas Plant, Compressed Air Energy Storage Project*, ELEC. LIGHT & POWER (Apr. 17, 2014), http://www.elp.com/articles/2014/04/epa-grants-permit-for-texas-gas-plant-compressed-air-energy-storage-project.html.

generation, these storage systems can effectively reduce the frequency of startups and therefore drastically reduce a power plant's pollution output.[159] For instance, a study by an energy consultancy found that a 20 MW flywheel energy storage system emits 55 percent less CO_2 than a natural gas power plant providing equivalent backup capability.[160] More generally, such energy storage resources can back up renewables with minimal emission and constant availability.[161] This is crucial, since most renewable energy sources rely on natural cycles and hence cannot adjust output to meet rapid changes in energy demand.[162] As the California Legislature has found:

> Expanded use of energy storage systems will reduce the use of electricity generated from fossil fuels to meet peak load requirements on days with high electricity demand and can avoid or reduce the use of electricity generated by high carbon-emitting electrical generating facilities during those high electricity demand periods.[163]

In sum, storage technology can "spur monumental reductions in GHG emissions while altering the way that electricity is traditionally generated and consumed."[164]

The energy sector can also integrate renewable resources into conventional generation to reduce emissions. For example, the Department of Energy is developing a way to use solar power to increase the heat rate, or energy content, of natural gas.[165] Generating facilities can use solar energy to preheat water in steam turbines to increase the energy output of the turbines

159. RECOMMENDATIONS OF THE ECONOMIC AND TECHNOLOGY ADVANCEMENT ADVISORY COMMITTEE (ETAAC) FINAL REPORT: TECHNOLOGIES AND POLICIES TO CONSIDER FOR REDUCING GREENHOUSE GAS EMISSIONS IN CALIFORNIA 5–3 (2008), http://www.arb.ca.gov/cc/etaac/ETAACFinalReport2-11-08.pdf; *see also* PEW CTR. ON GLOBAL CLIMATE CHANGE, ELECTRIC ENERGY STORAGE 1 (2009), http://www.c2es.org/docUploads/Energy-Storage-Fact-Sheet.pdf ("Electric energy storage (EES) technology has the potential to facilitate the large-scale deployment of variable renewable electricity generation, such as wind and solar power, which is an important option for reducing GHG emissions from the electric power sector.").

160. KEMA, INC., EMISSIONS COMPARISON FOR A 20 MW FLYWHEEL-BASED FREQUENCY REGULATION POWER PLANT 6 (2007), http://energystorage.org/system/files/resources/beaconemissionreport_1_8_07.pdf.

161. CAL. ENERGY STORAGE ALLIANCE, COMMENTS OF THE CALIFORNIA ENERGY STORAGE ALLIANCE ON ADMINISTRATIVE LAW JUDGE'S RULING SEEKING COMMENT ON WORKSHOP TOPICS 2, App'x A (2012), http://www.storagealliance.org/sites/default/files/Filings/2012-10-09-CESA-LTPP-Storage-Workshop-Comments-FINAL.pdf.

162. CHI-JEN YANG & ERIC WILLIAMS, CLIMATE CHANGE POLICY P'SHIP, ENERGY STORAGE FOR LOW-CARBON ELECTRICITY 4 (2009), https://nicholasinstitute.duke.edu/sites/default/files/publications/energy-storage-for-low-carbon-electricity-paper.pdf.

163. A.B. 590, 2009–2010 Assemb., Reg. Sess. § 1(d) (Cal. 2009).

164. ECON. & TECH. ADVANCEMENT ADVISORY COMM., RECOMMENDATIONS OF THE ECONOMIC AND TECHNOLOGY ADVANCEMENT ADVISORY COMMITTEE (ETAAC) FINAL REPORT 5–3 (2008), http://www.arb.ca.gov/cc/etaac/ETAACFinalReport2-11-08.pdf.

165. *See* Matthew L. Wald, *New Solar Process Gets More Out of Natural Gas*, N.Y. TIMES (Apr. 10, 2013), http://www.nytimes.com/2013/04/11/business/energy-environment/new-solar-process-gets-more-out-of-natural-gas.html.

and decrease the fossil fuel use.[166] Consequently, integration of solar energy into a gas turbine plants can potentially provide reliable power with less emissions.[167]

Nor is this the only example. EPA has developed guidance for states that want to credit emission reductions from renewable energy for use in areas that are not attaining ambient air quality standards.[168] In it, EPA provides several examples of renewable energy measures that the energy sector could use to reduce emissions including wind-powered generation, solar-powered generation and fuel cell power generation.[169] EPA also facilitated the use of these technologies by providing a simplified method for determining the reduction of emissions resulting from renewable energy:

> The answer [to how much energy would be displaced by the renewable energy project] would be the total amount of energy provided to the grid by the renewable energy source. The same is true for less polluting sources of new energy, such as co-generation or fuel cells. Any estimates of emissions associated with renewable energy should also be made.[170]

Previous EPA guidance had provided several different methodologies to determine how the addition of renewable energy would reduce a facility's production due to the addition of renewable energy and how to estimate its new emissions rate.[171]

F. Energy Storage and Renewable Energy Add-On Controls Fit Within the Definition of BACT

BACT analysis should include an examination of methods for reducing facilities' emissions from spinning, starting, and shutting down. The CAA defines BACT as an emission limitation to achieve the "maximum" degree of reduction of each pollutant subject to regulation.[172] BACT applies to all types

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166. *See* CS Energy, *The Largest Project of Its Kind in the World*, KOGAN CREEK SOLAR BOOST PROJECT, http://kogansolarboost.com.au/about (stating that the Kogan Creek Solar Boost Project will "augment the Kogan Creek Power Station's steam generation system to increase the station's electrical output and fuel efficiency"); Kevin Bullis, *Mixing Solar with Coal to Cut Costs*, MIT TECH. REV. (Sept. 4, 2009), http://www.technologyreview.com/news/415156/mixing-solar-with-coal-to-cut-costs/, http://www.technologyreview.com/news/415156/mixing-solar-with-coal-to-cut-costs/ (describing how integrating solar power into a coal plant could reduce emissions and increase the plant's efficiency).

167. *See* Craig Turohi & Zhiwen Ma, *Gas Turbine / Solar Parabolic Trough Hybrid Designs*, NAT'L RENEWABLE ENERGY LABS. (Mar. 2011), http://www.nrel.gov/docs/fy11osti/50586.pdf (describing a "novel gas turbine / parabolic trough hybrid design that combines solar contribution of 57% and higher with gas heat rates that rival that for combined cycle natural gas plants").

168. *See* EPA, GUIDANCE ON STATE IMPLEMENTATION PLAN (SIP) CREDITS FOR EMISSION REDUCTIONS FROM ELECTRIC-SECTOR ENERGY EFFICIENCY AND RENEWABLE ENERGY MEASURES 1 (2004), http://epa.gov/ozoneadvance/pdfs/gm040805_cac_energy-efficiency.pdf.

169. *Id.* at 3–4.

170. *Id.* at 12.

171. *See id.* at 14–15.

172. Clean Air Act, 42 U.S.C. § 7479(3) (2012) ("[t]he term [BACT] means an emission limitation based on the maximum degree of reduction of each pollutant. . ."); *see also* Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 52.21(b)(12) (2015).

of operation of the facility and is not limited to regular operation. It is generally described as a numerical limit, but EPA regulations allow consideration of "design, equipment, work practice[s], operational standard[s], or combination thereof."[173] EPA acknowledges that permitting authorities have the discretion to "apply alternative approaches" to BACT and to apply more stringent requirements.[174] Thus, under BACT, a permitting authority can consider methods related to the design and operation of the facility that could reduce emissions.

Importantly, "a control option [for BACT] may be an 'add-on' air pollution control technology that removes pollutants from a facility's emissions stream, or an 'inherently lower-polluting process/practice' that prevents emissions from being generated in the first instance."[175] Further, EPA has encouraged permitting authorities to look broadly at potential ways to reduce GHG emissions, and in particular to consider ways of increasing energy efficiency.[176]

Requiring add-on technologies of energy storage or renewable energy would have some similarities to energy efficiency improvements. Energy efficiency improvements usually increase the amount of electricity produced relative to the amount of fossil fuel combusted.[177] In its GHG BACT guidance, EPA gave the following example of energy efficiency: "[C]ombined cycle combustion turbines, which generally have higher efficiencies than simple cycle turbines" for proposals to construct a natural gas facility.[178] EPA has also recommended that permitting authorities evaluate possible process improvements that reduce energy usage at the facility to increase efficiency.[179]

Facility operators could site energy storage and renewable energy resources that will be potentially utilized to reduce startup, shutdown, and spinning time in the boundary of the facility instead of the narrower boundary of the emissions unit.[180] Nonetheless, a permitting authority can consider reductions beyond the particular emissions unit when applying BACT to new facilities. Although EPA regulations and interpretations have required application of BACT to the particular emissions units being modified, a closer

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173. *See* § 52.21(b)(12).

174. 42 U.S.C. § 7416 (2012).

175. Knauf Fiberglass, GMBH, 8 E.A.D. 121, 129 (EAB 1999) (remanding decision that failed to consider alternative process for manufacturing fiberglass that would result in lower emissions).

176. EPA, PERMITTING GUIDANCE, *supra* note 43, at 44.

177. *See, e.g.*, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830, 34,874 (June 18, 2014) (to be codified at 40 C.F.R. pt. 60); EPA, PERMITTING GUIDANCE, *supra* note 43, at 29.

178. EPA, PERMITTING GUIDANCE, *supra* note 43, at 29.

179. This option, according to EPA, should be evaluated when new facilities create energy for their own use. *Id.* EPA recommends that the evaluation of the facility's overall energy efficiency focus on the largest units because the burden of analyzing every conceivable option for improving energy efficiency "would likely outweigh any gain in emissions reduction achieved." *Id.* at 31 (citing Sierra Club v. EPA, 499 F.3d 653, 655 (7th Cir. 2007)).

180. As described below, BACT applies to the facility not to the emissions unit. *See id.*

look at the plain language of its definition demonstrates that BACT applies to the facility—not the emissions unit.[181] In particular, the CAA's statutory language applies BACT to pollutants "emitted from any major emitting facility."[182] The terms "facility" and "source" as defined under PSD requirements include the entire facility, not just the individual emissions unit.[183] The CAA defines "major emitting facility" as "stationary sources of air pollutants" including "fossil-fuel fired steam electric plants of more than two hundred and fifty million British thermal units per hour heat input."[184]

Although the renewable energy and energy storage could be sited at the facility, it might also potentially need to be off site. The definition of BACT does not explicitly limit application of available emission reduction methods to the "facility."[185] Indeed, the CAA's language states that the emissions limitation must be "achievable for the facility" not achievable *at* the facility.[186] This interpretation, however, would likely be subject to legal challenges.

There has also been significant disagreement over the appropriate interpretation of CAA language related to a similar program: ESPS.[187] Commentators have argued that the broad language under the CAA may not allow permitting authorities to require emissions reduction measures outside of the facility's "fence line."[188] EPA's recent proposed requirements for GHGs recommend consideration of emission reductions beyond the fence line, including energy efficiency and renewable energy measures.[189] The fence line

181. *See* Clean Air Act, 42 U.S.C. § 7479(3) (2012) (BACT is the emission reduction for "each pollutant subject to regulation under this chapter emitted from or which result from any major emitting facility . . . [that] is achievable for such facility. . . ."); *see also UARG*, 134 S. Ct. 2427, 2448 (2014) ("BACT is based on 'control technology' for the applicant's 'proposed facility.'") (quoting 42 U.S.C. § 7475(a)(4) (2012)).

182. *See id.*

183. Prevention of Significant Deterioration of Air Quality, 40 C.F.R. § 52.21 (2015).

184. § 7479(1).

185. § 7479(3).

186. *Id.*

187. *See* Anthony Adragna, *Panelists Disagree on the Scope of Air Act for Achieving Carbon Dioxide Reductions*, 45 ENVTL. REP. 564–65 (Feb. 28, 2014) (a representative from an environmental organization asserted that the "Clean Air Act provides substantial flexibility to account for emissions reductions that occur outside the boundary of a facility" while an industry attorney asserted that the Clean Air Act was not that broad).

188. *See id.* (attorney representing the Environmental Defense Fund arguing that "allowing reductions outside [a power plant's] fence line would be cost-effective").

189. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830, 34,856 (June 18, 2014) (to be codified at 40 C.F.R. pt. 60). The strategies that EPA proposes to employ in the proposed GHG ESPS are "improvements in efficiency at carbon-intensive power plants, programs that enhance the dispatch priority of, and spur private investments in, low emitting and renewable power sources, as well as programs that help homes and businesses use electricity more efficiently." *Id.* at 34,833. Specifically, the "building blocks" that EPA specifies in its NSPS proposal are: "1. Reducing the carbon intensity of generation at individual affected EGUs through heat rate improvements. 2. Reducing emissions from the most carbon-intensive affected EGUs in the amount that results from substituting generation at those EGUs with generation from less carbon-intensive affected EGUs (including NGCC units under construction). 3. Reducing emissions from affected EGUs in the amount that results from substituting generation at those EGUs with

issue has been discussed extensively in recent commentary,[190] and this Article will not discuss it further here.

G. *Energy Storage Is Available, Technically Feasible, and Can Reduce Start, Stop, and Spin Emissions*

Renewable energy and energy storage meet BACT's requirements that control technologies be available, feasible, and reduce emissions. A "control technology [that] has been installed and operated successfully on the type of source under review [] is demonstrated and [] is technically feasible."[191] An undemonstrated technology is feasible if it is available and applicable.[192] In turn, a control technology is "available . . . if it has reached the licensing and commercial stage of development."[193] In other words, "available" means the technology "has a potential for practical application to the emissions unit and the regulated pollutant under evaluation."[194] This standard reflects that "[t]he question of availability for purposes of BACT is a practical, fact determination, using conventional notions of whether the technology can be put into use."[195] Renewable energy and energy storage meet all of these requirements.

Renewable energy and energy storage add-ons are "available," and thus BACT evaluation should include them as ways to reduce spinning, startups, and shutdowns.[196] Energy storage projects are being developed and deployed throughout the country.[197] One energy reporter predicts that "2015 should see storage deployed in numerous markets and in various incarnations."[198] As evidence of storage's increasing availability, a California utility recently

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expanded low- or zero-carbon generation. 4. Reducing emissions from affected EGUs in the amount of generation required." *Id.* at 34,858. EPA's ESPS proposal thus grants states considerable flexibility to achieve reductions outside of the "fence line."

190. *See* Adragna, *supra* note 187, at 564–65.

191. EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.17.

192. *Id.*

193. *Id.* at B.18.

194. EPA, PERMITTING GUIDANCE, *supra* note 43, at 32, n.87.

195. Pennsauken Cnty., 2 E.A.D. 667, 671–72 (EAB 1988).

196. The reduction in emissions from the addition of energy storage is evidenced by the GHG emission rates in permits EPA has granted for compressed air energy storage facilities. *See, e.g.*, EPA, PREVENTION OF SIGNIFICANT DETERIORATION PERMIT FOR GREENHOUSE GAS EMISSIONS ISSUED PURSUANT TO THE REQUIREMENTS AT 40 CFR § 52.21, at 2 (setting a GHG limit of 575 lb CO_2 / MWh), http://www.epa.gov/earth1r6/6pd/air/pd-r/ghg/chamisa-final-permit032114.pdf. In contrast, natural gas facilities can emit approximately 800 to 950 lb CO_2/MWh. *See, e.g.*, EPA, DRAFT STATEMENT OF BASIS, PINECREST 15–17 (2014), http://www.epa.gov/earth1r6/6pd/air/pd-r/ghg/pinecrest-draft-sob061814.pdf.

197. For example, EPA has permitted compressed air energy storage facilities that combine natural gas with compressed air storage. *See, e.g.*, Cassell, *supra* note 158; *see also* Peter Kelly-Detwiler, *2014 Energy Story #2: Storage Entered the Game*, FORBES (Jan. 7, 2015), http://www.forbes.com/sites/peterdetwiler/2015/01/07/2014-energy-story-2-storage-entered-the-game/.

198. Kelly-Detwiler, *supra* note 197. He also predicts that we will see "storage ramp up, [and] costs of deployment come down." *Id.*

procured over 260 MW of energy storage even though it was only required to procure 50 MW.[199]

Renewable energy and energy storage add-in technology also satisfy BACT's requirement for reducing emissions. EPA admits that renewable energy can play a key role for reducing GHG emissions.[200] Notably, the agency has included it as part of its proposed new source performance standards noting that utilization of renewable energy decreases the demand for generation by higher emitting units.[201] In its permit for the Palmsdale facility, EPA noted that the design, which includes 50 MW of solar, "represents an inherently lower-emitting technology for the facility as a whole."[202]

An option for BACT should only be rejected on economic feasibility grounds if it results in either employee layoffs or potentially higher prices for electricity.[203] Neither of those issues likely applies to energy storage or renewable energy. The economic competiveness of renewable energy combined with storage was recently recognized by a move to downgrade the rating of utility bonds.[204] Barclay Credit Research predicts that "solar plus storage could reconfigure the organization and regulation of the electric power business over the coming decade."[205] Across the country, utilities are procuring energy storage resources as a substitute for fossil fuel resources suggesting that the resources are becoming more economically viable.[206] In addition, commentators are optimistic that energy storage costs will decrease as market penetration increases.[207]

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199. *See Local Capacity Requirements Contract Selection*, S. CAL. EDISON, https://www.sce.com/wps/portal/home/procurement/solicitation/lcr/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfGjzOK9PF0cDd1NjDz9nQxdDRyDPS1cXD1cDYL9zfQLsh0VAQ4EJ6E!/#/accordionGrp2-7 (last visited Aug. 28, 2015); Matthew L. Wald, *Energy-Storage Plans Gain Ground in California*, N.Y. TIMES (Dec. 21, 2014), http://www.nytimes.com/2014/12/22/business/energy-environment/california-picks-energy-storage-over-some-new-power-plant-bids.html?_r=0.

200. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830, 34,866 (June 18, 2014) (to be codified at 40 C.F.R. pt. 60).

201. *Id.* at 34,901.

202. EPA, *supra* note 116, at 27 n.28.

203. *See* Alaska Dep't of Envtl. Conservation. v. EPA, 540 U.S 461, 498–99 (2004) (rejecting ADEC's determination of economic feasibility finding, "No record evidence suggests that the mine, were it to use SCR for its new generator, would be obliged to cut personnel or raise zinc prices.").

204. *See* Herman K. Trabish, *Barclays Downgrades Entire US Electric Utility Sector*, UTILITYDIVE (May 26, 2014), http://www.utilitydive.com/news/barclays-downgrades-entire-us-electric-utility-sector/266936/; Elias Hinckley, *Barclays Just Threw Gasoline on the Fire that Is the Battle Between Utilities and the Solar Industry*, ENERGY TRENDS INSIDER (May 28, 2014), http://www.energytrendsinsider.com/2014/05/28/barclays-just-threw-gasoline-on-the-fire-that-is-the-battle-between-utilities-and-the-solar-industry/; *see also* Peter Bahr, *Rooftop Solar Advances Cloud the Appeal of Utility Bonds*, ENERGYWIRE (July 2, 2014), http://www.eenews.net/energywire/stories/1060002262/print (the Barclay analysis found "the cost of solar and storage for residential consumers of electricity is already competitive with the price of utility grid power in Hawaii").

205. Bahr, *supra* note 204.

206. U.S. Dep't of Energy & Sandia Labs, *supra* note 157 (listing projects throughout the country and the world).

207. *See, e.g.*, Mark Scott, *Energy for a Rainy Day or a Windless One*, N.Y. TIMES (Oct. 7, 2014), http://www.nytimes.com/2014/10/08/business/energy-for-a-rainy-day-or-a-windless-one.html.

H. Requiring Add-On Controls to Limit Spinning, Startups, and Shutdowns Does Not Redefine the Facility

Certain interpretations of BACT maintain that a permitting authority cannot require changes that would redefine the facility. Critics could employ the same reasoning to argue against consideration of energy storage and renewable energy resources as BACT.

When examining this argument, it is initially important to recognize that the definition of BACT is broad and not limited by whether a proposal "redefines" the source. The definition of BACT also provides discretion to a permitting authority to make case-by-case decisions about whether it should reject an alternative for economic or other reasons.[208] Within the broad BACT statutory framework, EPA has interpreted via guidance and precedent that permitting authorities may reject alternatives that redefine the source.[209] Specifically, EPA has stated that it "does not interpret the [CAA] to prohibit fundamentally redefining the source and has recognized that permitting authorities have the discretion to conduct a broader BACT analysis if they desire."[210] EPA has further stated that "[t]he 'redefining the source' issue is ultimately a question of degree that is within the discretion of the permitting authority."[211] This distinction is not unlimited—"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."[212]

EPA has roughly defined the test that permitting authorities should use to determine whether proposed BACT constitutes redefining the facility:

> [T]he permit applicant initially "defines the proposed facility's end, object, aim, or purpose—that is the facility's basic design," although the applicant's definition must be "for reasons independent of air permitting." . . . . [Then] [t]he permit issuer . . . should take a "hard look" at the applicant's determination in order to discern which design elements are inherent for the applicant's purpose and which design elements "may be changed to achieve pollutant emissions reductions without disrupting the applicant's basic business purpose for the proposed facility," while keeping in mind that BACT, in most cases, should not be applied to regulate the applicant's purpose or objective for the proposed facility.[213]

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208. *See supra* Part I.C (discussing definition of BACT).

209. *See* EPA, NEW SOURCE REVIEW WORKSHOP MANUAL, *supra* note 41, at B.13; La Paloma Energy Ctr., PSD Appeal No. 13-10, 2014 WL 1066556, at *24 (Envtl. Appeals Bd. Mar. 14, 2014).

210. EPA, PERMITTING GUIDANCE, *supra* note 43, at 27 (citing Hawaiian Commercial & Sugar Co., 4 E.A.D. 95, 100 (EAB 1992); Knauf Fiber Glass, GMBH, 8 E.A.D. 121, 136 (EAB 1999)).

211. *Id.*

212. *Id.* at 27.

213. Desert Rock Energy, 14 E.A.D. 484, 530 (EAB 2009); *see also* Utah Chapter of Sierra Club v. Air Quality Bd., 226 P.3d 719, 732–33 (Utah 2009).

Proposals for potential fuel switches illustrate how this framework is applied, since they often raise the issue of whether the change redefines the source. Initially, it is important to note that EPA amended the definition of BACT to ensure that it was broadly read to include potential changes in fuel use.[214] Despite this clear intent, some courts have found that a facility would be redefined if it were powered by a different form of energy.[215] For instance, courts reviewing whether a permitting authority should review coal gasification for a coal facility are split on whether it constitutes a redefinition of the facility.[216] EPA guidance has also been split on the gasification issue.[217] EAB, however, found that permitting authorities should consider coal gasification even though implementing it would require a differently designed power block.[218] Similarly, EAB has found that a fuel change can be examined as part of BACT analysis if a change in the fuel will not impact the product or purpose of the facility.[219] EAB reasoned that "EPA regulations define major stationary sources by their product or purpose (e.g., 'steel mill,' 'municipal incinerator,' 'taconite ore processing plant,' etc.), not by fuel choice."[220] Since the facility

214. ENVIRONMENTAL POLICY DIV., LIBRARY OF CONGRESS, 95TH CONG., 2D SESS., A LEGISLATIVE HISTORY OF THE CLEAN AIR ACT AMENDMENTS OF 1977: A CONTINUATION OF THE CLEAN AIR ACT AMENDMENTS OF 1970 1054 (1978) (Senator Huddleston's proposed amendment, number 387).

215. Sierra Club v. EPA, 499 F.3d 653, 654 (7th Cir. 2007) (deferring to EPA's interpretation that BACT "does not include redesigning the plant proposed by the permit applicant"); Blue Skies Alliance v. Tex. Comm'n on Envtl. Quality, 283 S.W.3d 525, 535 (Tex. App. 2009) ("BACT analysis . . . does not need to consider any control technology that would require such a redesign of the facility that it would constitute an alternative proposal."). *See Utah Chapter of Sierra Club,* 226 P.3d at 733 ("[T]he basic design of the Power Company's proposed facility is an electric power generating plant fueled by coal. With this purpose, it is evident that the Power Company was not required to consider wind generation for electric power as an alternative process. . . ."); Powder River Basin Res. Council v. Wyo. Dep't of Envtl. Quality, 226 P.3d 809, 822 (Wyo. 2010) ("[A]pplicants proposing to construct a coal-fired electric generator . . . have not been required by EPA as part of a BACT analysis to consider building a natural gas-fired electric turbine although the turbine may be inherently less polluting per unit product.") (internal quotations omitted); *Sierra Club v. EPA,* 499 F.3d at 657 (upholding EAB's decision that requiring a proposed mine-mouth plant to consider a different fuel source would redefine the "fundamental purpose or basic design of [the] proposed Facility").

216. *Compare Utah Chapter of Sierra Club*, 226 P.3d at 732–33 (finding that IGCC technology would not require power company to redefine the design of its proposed facility) *with Blue Skies Alliance,* 283 S.W.3d at 537 ("It is clear that an IGCC process . . . is significantly different from the pulverized coal power plant"; appellants failed to offer any evidence that IGCC technology is a process that could be applied to the proposed power plant.); Longleaf Energy Assocs. LLC v. Friends of Chattahoochee, Inc., 681 S.E.2d 203, 210–11 (Ga. Ct. App. 2009) (rejecting lower court ruling that imposition of IGCC technology on a proposed pulverized coal facility would not redefine the source).

217. *Compare* Letter from Stephen D. Page, Dir., Office of Air Quality, Planning & Standards, to Paul Plath, Senior Partner, E3 Consulting, LLC (Dec. 13, 2005), http://www.epa.gov/region 07/air/nsr/nsrmemos/igccbact.pdf *with* EPA, PERMITTING GUIDANCE, *supra* note 43, at 30 n.83.

218. Desert Rock Energy, 14 E.A.D. at 525–26.

219. Hibbing Taconite Co., 2 E.A.D. 838, 843 (EAB 1989) (reasonable to examine burning natural gas where coal plant was already able to burn natural gas).

220. *Id.*

would manufacture the same product regardless of the fuel choice, the Board found that a change in fuel should be considered under the BACT analysis.[221]

Requirements for minimum percentages of renewable-based electricity also raise the issue of redefining the source. There has been disagreement over whether EPA can require a facility to be redefined as a different type of facility—for example, by mandating that a coal plant becomes a natural gas plant.[222] EAB rulings have been sympathetic to permitting decisions that do not require an increase in the use of renewable energy or an alternative fuel. EAB upheld a determination that rejected greater use of natural gas or solar power because it was inconsistent with the primary purpose of a proposed facility's purpose of burning excess wood waste.[223] It also upheld a determination that a facility that proposed to use 10 percent solar power and 90 percent natural gas could not be an all-solar facility because it was inconsistent with the business purpose of being a baseload facility, and there was not enough space to significantly increase the solar energy component.[224]

In an attempt to better define whether adding renewables constitutes a redefinition of the source, EPA has set forth parameters for deciding whether "technical considerations such as space constraints and geography may be considered by permitting authorities in determining whether suggestions to add or increase the use of supplemental solar power would constitute redesign of the source."[225] The agency requires a case-specific assessment to determine whether adding solar capacity would redefine a source.[226] Specifically, a permitting authority must determine whether the facts are "consistent with the NSR Manual, the GHG Permitting Guidance, or [EAB] precedent."[227] EPA believes that technical considerations can prevent an alternative being deemed BACT if the permitting facility finds that it would be "logistically difficult for

221. *Id.* ("Here, Hibbing will continue to manufacture the same product (i.e., taconite pellets) regardless of whether it burns natural gas or petroleum coke . . . . The record here indicates that there are other taconite plants that burn natural gas, or a combination of natural gas and other fuels. Thus, it is reasonable for Hibbing to consider natural gas as an alternative in its BACT analysis.").

222. *See* Carolyn Whetzel, *EPA Urged to Stay Within Air Act Authority in Regulating Existing Power Plant Emissions*, 45 ENVTL. REP. 972–73 (Apr. 4, 2014) (discussing how an attorney who has represented industry stated that EPA should not try to redefine a source and that the Clean Air Act should not be a tool to reshape the entire economy while an attorney with the Environmental Defense Fund said that EPA has broad authority under the Statute).

223. *See* Sierra Pac. Indus., PSD Appeal Nos. 13-01 to 13-04, 2013 WL 3791510, at *37–40 (EPA Envtl. Appeals Bd. July 18, 2013) ("Solar power in particular would displace the applicant's proposal with an alternative energy source that, even though renewable like biomass, would play absolutely no role in putting to beneficial use Sierra Pacific's millions of tons of wood waste.").

224. *See* City of Palmdale, PSD Appeal No. 11-07, 2012 WL 4320533, at *2, *29 (Sept. 17, 2012).

225. La Paloma Energy Center, 2014 WL 1066556, PSD Appeal No. 13-10 (Mar. 14, 2014) (citing *City of Palmdale*, 2012 WL 4320533, at *48–52).

226. EPA requires a hard-look at the facts to make this determination. *See id.* at *29, *33 ("The Board emphasizes . . . that permitting authorities should include in their Response to Comments a clear and full explanation of any decision to reject comments suggesting the use of a solar component at a proposed facility on the grounds that it would require redefinition of the source.").

227. *Id.* at *30.

the applicant to incorporate a significant solar component into the facility."[228] EAB has relied on this factor to uphold decisions to not include a greater percentage of solar generation. In *La Paloma*, EAB found that it would be "logistically difficult" for a natural gas facility to include solar in its facility because "very little solar power could be generated there without either significantly expanding the site or relocating the facility."[229]

In contrast to these decisions, the permitting authority would not change the fundamental purpose of the source—providing electricity—by requiring consideration of energy storage or renewable energy to mitigate emissions from startup, shutdown, and spinning. A utility may argue that a fundamental purpose of an electric generating facility is to provide backup for intermittent renewable energy, and thus, changing the way that the facility backs up renewable energy is redefining the source. This argument should be rejected. EPA's longstanding precedent has found that startup and shutdown emissions should be considered and minimized in BACT analyses.[230] Indeed, previous BACT analyses have required construction of a completely new auxiliary boiler to reduce startup emissions.[231] Permitting authorities should view requiring the addition of energy storage or renewable energy to a facility in the same light; they do not redefine the source.

CONCLUSION

As penetration of renewable resources increases, the role of fossil fuel electric generating units will change from generating electricity to providing backup for renewable energy. To ensure that these changes do not result in unanticipated increases in air pollution and GHGs, permitting authorities should first require sources to supply reliable information predicting how facilities will be dispatched. To mitigate emissions that result from facilities providing ancillary services, permitting authorities should consider all available control options for minimizing emissions from startups, shutdowns, and spinning. This evaluation should include the potential of installation of energy storage or renewable energy resources. Consideration of energy storage or renewable energy to minimize ancillary emissions is consistent with the definition of BACT, and does not lead to a redefinition of the source. These technologies can decrease emissions and have been installed throughout the country to perform these functions. The price of energy storage is expected to decrease in upcoming years, making this control option increasingly feasible.

228. *Id.*

229. *Id.* at *30–31. EAB estimated that 39 acres were available for solar development and that eight acres are required to generate one megawatt of electricity. *Id.* EAB further found that relocating the facility would "subvert" its business purpose because the facility was proposed to be located in close proximity to natural gas lines and reclaimed wastewater that it planned to use to cool its facility. *Id.* at 31.

230. *See supra* Part III.

231. *See supra* Part III.C

The changing grid requires a new look at how facilities are evaluated under the CAA. Consideration of all available methods of how to reduce ancillary emissions from fossil fuel resources backing up renewable energy will be a critical component for attaining the GHG reductions necessary to hopefully mitigate some of the devastating impacts of climate change.
