Closing the Gap: Using the Clean Air Act to Control Lifecycle Greenhouse Gas Emissions from Energy Facilities

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I. INTRODUCTION

As the United States moves forward with regulations to address climate change and policies to achieve a low-carbon energy mix, regulators and utilities should undertake a full and accurate comparison of the greenhouse gas consequences of available energy resources.[1] Specifically, a lifecycle analysis (LCA) of greenhouse gas emissions that includes emissions at all stages of production will help determine the total climate impact of gener-

1. The Environmental Protection Agency is using a phased approach to regulate greenhouse gas emissions from new energy facilities and other stationary sources. The journey toward regulating greenhouse gas emissions began with *Massachusetts v. Environmental Protection Agency*, in which case the United States Supreme Court held that EPA improperly denied a petition for a rulemaking to regulate greenhouse gas emissions from domestic automobiles under section 211 of the Clean Air Act because greenhouse gas emissions fit the definition of "pollution" in the Act, and EPA failed to determine whether greenhouse gas emissions "cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." 549 U.S. 497, 534 (2007); *see* Clean Air Act § 211(c)(1), 42 U.S.C. § 7545(c)(1) (2006).

In 2008, Administrator Stephen Johnson issued an interpretative memorandum concluding that "regulated NSR pollutants" under the Prevention of Significant Deterioration section of the Clean Air Act includes "only those pollutants subject to a statutory or regulatory provision that requires actual control of emissions of that pollutant." Memorandum from Administrator Stephen L. Johnson, Envtl. Prot. Agency, EPA's Interpretation of Regulations that Determine Pollutants Covered By Federal Prevention of Significant Deterioration (PSD) Permit Program to Regional Administrators (Dec. 18, 2008), *available at* http://www.epa.gov/NSR/documents/psd_interpretive_memo_12.18.08.pdf.

After reconsideration, EPA affirmed this interpretation and determined that greenhouse gas emissions from stationary sources would become regulated pollutants if and when EPA issued regulations for greenhouse gas regulations from automobiles. Reconsideration of Interpretation of Regulations That Determine Pollutants Covered by Clean Air Act Permitting Programs, 75 Fed. Reg. 17,004, 17,019 (Apr. 2, 2010) (codified at 40 C.F.R. pts. 50, 51, 70, and 71). EPA subsequently issued its final determination that six greenhouse gases endanger public health or welfare. Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,517–36 (Dec. 15, 2009).

Next, EPA and the U.S. Department of Transportation collaborated on a new regulation for automobiles. Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards, 75 Fed. Reg. 25,324 (May 7, 2010) (codified at 40 C.F.R. pts. 85, 86, and 600). In anticipation of greenhouse gas emissions from stationary sources becoming regulated pollutants under the Clean Air Act on January 2, 2011, the date that EPA's automobile regulations took effect, EPA adopted a phased approach to apply greenhouse gas regulations to the largest sources first and exempt sources that emit less than 75,000 tons per year. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31,514, 31,516 (June 3, 2010) (codified at 40 C.F.R. pts. 50, 51, 70, and 71) [hereinafter Tailoring Rule]. Without this approach, numerous other small sources would have immediately been subject to the regulations. *Id.*

ating electricity with a particular resource. This accounting is necessary in order to ensure that national energy policy and utilities' decisions about energy resource options will reduce the United States' greenhouse gas emissions as much and as efficiently as possible.

As greenhouse gases become subject to regulation under the Clean Air Act, taking lifecycle emissions into account could help encourage innovation in reducing emissions associated with electricity generation. In 2008, several utilities, technology companies, and nonprofit environmental organizations recognized the benefit of this type of analysis. The coalition of businesses and the Environmental Defense Fund released a set of principles for regulating greenhouse gases in the wake of the United States Supreme Court's decision in *Massachusetts v. EPA*.[2] Although the coalition acknowledged "divergent views" on the Environmental Protection Agency's role in regulating greenhouse gases absent new legislation,[3] its members nevertheless agreed that "EPA's leadership in understanding and addressing the development of rigorous lifecycle analysis, the interactions among various pollutants, and the promise of emerging technologies will be invaluable."[4] As these businesses and environmental organizations suggest, "rigorous lifecycle analyses" are necessary in order to understand the full implications of our nation's greenhouse gas emissions and can help make reducing emissions more cost effective.[5]

Congress has already recognized the need for this type of analysis in a limited context. The Energy Independence and Security Act of 2007 (EISA) amended the Clean Air Act to require that some biofuels undergo lifecycle analysis to ensure that their use actually yields net emission reductions.[6] In addition, Congress

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2. Massachusetts v. Envtl. Prot. Agency, 549 U.S. 497 (2007).

3. Press Release, Envtl. Def. Fund, Major Businesses and Envtl. Def. Fund Announce Joint Principles to Inform Envtl. Prot. Agency Regulation of Greenhouse Gas Emissions (Dec. 2, 2008), *available at* http://www.edf.org/pressrelease.cfm?ContentID=8884.

4. *Id.*

5. *See id.* Even organizations that support limiting EPA's statutory authority to regulate greenhouse gas emissions have suggested that they support innovative efforts to reduce the cost of regulating greenhouse gas emissions. *See* Am. Pub. Power Ass'n, CLEAN AIR ACT AND EPA'S DISCRETIONARY AUTHORITY TO SET STANDARDS, REVISE STANDARDS, AND IMPOSE DEADLINES FOR COMPLIANCE (2011), *available at* http://www.publicpower.org/files/PDFs/11-06-EPA%20Regs%20FINAL-3.1.11.pdf.

6. Clean Air Act § 211(o), 42 U.S.C.S. § 7545(o) (2007).

explicitly prohibited the federal government from entering into long-term contracts for synthetic petroleum fuels with higher lifecycle greenhouse gas emissions than conventional petroleum.[7] In contrast, legislators and regulators have paid little attention to the lifecycle emissions from electricity generation.

This comment identifies a legal framework for reducing lifecycle emissions from electric power plants. First, this comment reviews the need for full lifecycle analysis and summarizes the results of attempts to quantify the full lifecycle impact of different energy resources. Second, this comment explores whether the Clean Air Act authorizes the United States Environmental Protection Agency (EPA), the agency chiefly responsible for implementing the nation's environmental laws, to require consideration of lifecycle analysis in Clean Air Act regulations for greenhouse gas-emitting power plants. Finally, this comment explores how lifecycle analysis may be applied to non-emitting renewable resources that might not be subject to Clean Air Act regulations.

II.
BEHIND THE SCENES: LIFECYCLE ANALYSIS DEMONSTRATES THAT FOCUSING ON SMOKESTACK EMISSIONS IGNORES ADDITIONAL EMISSIONS

Analysis of power plant emissions should include full lifecycle accounting because a significant quantity of the emissions from generating electricity occurs at some stage of production prior to the smokestack. For example, as much as a quarter of the total emissions from coal- or natural gas-fired power plants occur "upstream" in the production process.[8] Resources such as wind and solar do not generate greenhouse gases directly, yet they are not completely benign from a climate change standpoint. Rather, most greenhouse gas emissions from non-emitting resources such as wind and solar occur prior to the point of generation during manufacturing, transportation, and installation.[9]

7. Energy Independence and Security Act of 2007 § 526, 42 U.S.C.S. § 17142 (2007).

8. Daniel Weisser, *A Guide to Life-cycle Greenhouse Gas (GHG) Emissions from Electric Supply Technologies,* 32 ENERGY 1543, 1548 (2007).

9. *Id.* These "upstream" emissions generally include emissions from extracting and transporting the natural resources used to generate electricity or construct the facility but can also include "manufacture of equipment and intermediate materials . . . , decommissioning, and any necessary waste disposal." MARGARET K. MANN

For this reason, lifecycle emissions are "an important indicator for mitigation strategies in the power sector."[10] As one researcher put it, applying lifecycle analysis, which includes "all processes directly and indirectly associated with the production of electricity," provides the means for "a consistent evaluation of complete energy chains."[11] Although taking a regulated power source's upstream emissions into account could present some risk of double counting, accurate monitoring and emissions reporting could minimize this risk.[12]

The Clean Air Act section regulating transportation fuels defines "lifecycle greenhouse gas emission" as the

> aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.[13]

Pursuant to this definition, and based on significant scientific assessment and peer review, EPA has developed a method for calculating lifecycle emissions for a variety of renewable transportation fuels.[14] Although a review of EPA's analytical frame-

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& PAMELA L. SPATH, NAT'L RENEWABLE ENERGY LAB., LIFE CYCLE ASSESSMENT COMPARISONS OF ELECTRICITY FROM BIOMASS, COAL, AND NATURAL GAS 1 (2002), *available at* http://www.dep.state.fl.us/Air/emission/bioenergy/Tallahassee/appendix_a.pdf.

10. Weisser, *supra* note 8, at 1543.

11. CHRISTIAN BAUER, PAUL SCHERRER INST., LIFE CYCLE ASSESSMENT OF FOSSIL AND BIOMASS POWER GENERATION CHAINS 10 (2008).

12. PEW CTR. ON GLOBAL CLIMATE CHANGE, CLIMATE CHANGE: SCIENCE, STRATEGIES, & SOLUTIONS 343 (Eileen Claussen ed., 2001). In January 2012, EPA released data from the Greenhouse Gas Reporting Program for the year 2010. The database includes data about direct emitters and suppliers of products that emit greenhouse gases when combusted. EPA reports that the database does not include data of emissions from land use change or emitters who release less than 25,000 tons annually. Furthermore, EPA estimates that direct emitters account for roughly half of the nation's total greenhouse gas emissions. *Greenhouse Gas Data*, ENVTL. PROT. AGENCY, http://epa.gov/climate change/emissions/ghgdata/faq.html (last updated Jan. 11, 2012). Perhaps information from this datatbase will help paint a clearer picture of lifecycle emission from participating industries.

13. Clean Air Act § 211(o), 42 U.S.C.S. § 7545(o) (2007).

14. ENVTL. PROT. AGENCY, OFFICE OF TRANSP. & AIR QUALITY, ENVTL. PROT. AGENCY LIFECYCLE ANALYSIS OF GREENHOUSE GAS EMISSIONS FROM RENEWABLE FUELS, *available at* http://www.epa.gov/oms/renewablefuels/420f10006.htm.

work is outside the scope of this comment, these processes demonstrate that EPA has the expertise and resources to conduct lifecycle analysis. If EPA sought to apply lifecycle analysis to stationary power sources, it could easily draw on lessons from the transportation sector.

Upstream emissions from fossil fuel resources are significant and varying as a result of the processes involved in extraction and generation.[15] In addition, fossil fuel resources vary in the amounts of energy they produce per unit of fuel. In order to compare emissions from fossil fuel resources with different production processes and efficiency rates, researchers use aggregate data to determine emission factors per unit of heat produced (measured in pounds of pollutants per million Btu).[16] Additionally, because power generation produces several different greenhouse gases, most studies reflect lifecycle emissions in terms of carbon dioxide equivalent (CO_2e) for consistent comparison.

A. *Lifecycle Emissions from Coal*

The coal lifecycle is relatively straightforward. The major steps include mining and processing, transportation, and use and combustion.[17] Emissions at each of these stages can be significant. Emissions at this stage can include emissions due to transportation or mining. Still, most of the emissions associated with coal generation occur at the smokestack.

The vast majority of coal transportation occurs by rail, followed by barge and truck.[18] One study using an economic model developed at Carnegie Mellon University found that rail transport produces 43.6 tons of CO_2e per million-ton miles of transportation and that truck transportation produces 69 tons of CO_2e. Meanwhile, barge or water-based transportation produces 5.89 tons of CO_2e.[19] Coal mining also contributes significantly to upstream emissions. For example, above-ground strip mining,

15. Weisser, *supra* note 8, at 1548.

16. *See generally* Paulina Jaramillo et al., *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, 41 ENVTL. SCI. TECH. 6290 (2007).

17. *Id.* at 6291.

18. *Id.* In December 2011, EPA and the National Highway Traffic Safety Administration set greenhouse gas regulations for heavy-duty trucks, which would bring some of these vehicles under regulation. Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 76 Fed. Reg. 57106 (Sept. 15, 2011).

19. Jaramillo et al., *supra* note 16, at 6292.

which includes mountaintop-removal coal mining, accounts for approximately two-thirds of domestic coal extraction.[20] Because strip mining permanently alters landscapes that otherwise could store carbon, much of the carbon stored in forests and fields is lost. As a result, such mining can increase the total lifecycle emissions associated with coal-fired electricity generation by up to twelve percent.[21]

To be sure, upstream emissions are relatively minor compared to emissions at the smokestack.[22] Indeed, "the life-cycle [greenhouse gas] emissions of electricity generated with coal are dominated by combustion."[23] Yet upstream emissions are not insignificant. The upstream emissions associated with coal use range from 220 to 500 pounds per megawatt-hour of electricity.[24] Moreover, lifecycle emissions from coal are greater than that of other resources,[25] but that is because they produce so much at the stage of combustion. As with upstream emissions from other resources, this area might offer additional, cost-effective opportunities to reduce emissions.

B. *Lifecycle Emissions from Natural Gas*

Emissions from natural gas power production are similar to those caused by coal power production in that most of the emissions occur at the power plant. Yet, when it comes to upstream emissions, the lifecycle for natural gas power production is more complicated than that of coal. Natural gas is produced from wells, and then sent into the transmission system for storage or power generation. Liquefied, synthetic, and shale-derived natural gas undergo additional stages of processing. For example, liquefied natural gas is extracted as a gas, liquefied for transport, and then re-gasified when it reaches its destination.[26] These processes require additional energy and contribute significantly to the

20. Weisser, *supra* note 8, at 1550.

21. *See* James F. Fox & J. Elliot Campbell, *Terrestrial Carbon Disturbances from Mountaintop Mining Increases Lifecycle Emissions for Clean Coal*, 44 ENVTL. SCI. TECH. 2144 (2010) (concluding that the "contribution of the nonsoil carbon disturbance to net CO_2 emissions [from mountaintop removal] depends on the wood harvest, natural regrowth, and foregone sequestration").

22. Jaramillo et al., *supra* note 16, at 6292.

23. *Id.*

24. Weisser, *supra* note 8, at 1550.

25. MANN & SPATH, *supra* note 9, at 7 fig. 1.

26. Jaramillo et al., *supra* note 16, at 6290–91.

amount of upstream emissions produced.[27] These upstream emissions range from 130 to 280 pounds per megawatt-hour.[28]

Most of the upstream natural gas emissions result from "gas processing, venting wells, pipeline operation . . . and system leakage in transportation and handling."[29] In particular, the United States Department of Energy reports that "nearly 10 [percent] of natural gas is lost before reaching the power plant."[30] This loss creates significant upstream emissions because natural gas consists primarily of methane, a potent, albeit short-lived, greenhouse gas.[31]

In 2010, the Government Accountability Office reviewed data, collected by the United States Department of Interior, that measures flared and vented gas on federal gas production leases.[32] The study found that cost-effective measures using currently available technologies could reduce the gas lost during production on federal leases by approximately forty percent.[33] Since flaring and venting gas releases carbon dioxide and methane, reducing the lost gas by forty percent would be equivalent to the annual emissions of 3.1 million automobiles.[34] This example demonstrates that cost-effective measures could help substantially improve the balance of total emissions to energy produced.

Although both the upstream and cumulative emissions caused by natural gas are lower than emissions from coal, some researchers have found that the upstream emissions from liquefied, synthetic, or shale-derived natural gas rival or exceed that of

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27. *Id.*

28. Weisser, *supra* note 8, at 1550. Upstream emissions alone could, therefore, contribute up to 128.8 million tons of CO_2e. *See* ENERGY INFO. ADMIN., ELEC. POWER ANNUAL, ELEC. POWER INDUS. 2010: YEAR IN REVIEW (2011), *available at* http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html (showing that natural gas supplies more than 920 million MWh annually and, therefore, up to 128.8 million tons of CO_2e).

29. *Id.*; *see also* U.S. GOV. ACCOUNTABILITY OFFICE, FEDERAL OIL AND GAS LEASES: OPPORTUNITIES EXIST TO CAPTURE VENTED AND FLARED NATURAL GAS, WHICH WOULD INCREASE ROYALTY PAYMENTS AND REDUCE GREENHOUSE GAS EMISSIONS 5 (OCT. 2010) [hereinafter GAO REPORT] (explaining that natural gas producers flare and vent gas throughout the production process and that fugitive emissions also escape throughout the production process).

30. Weisser, *supra* note 8, at 1550.

31. GAO REPORT, *supra* note 29, at 6 ("Methane is considered particularly harmful . . . , as it is roughly 25 times more potent by weight than CO_2 in its ability to warm the atmosphere . . . .").

32. *See generally id.* In particular, flaring natural gas emits CO_2, while venting the gas emits methane. *Id.*

33. *Id.* at 19–26.

34. *Id.* at 25.

coal. This is particularly true for liquefied natural gas. Lifecycle emissions from synthetic natural gas derived from coal vastly exceed the lifecycle emissions from coal and traditional natural gas.[35]

New technological and cost improvements have increased access to natural gas from domestic shale formations. Accessing and processing these resources is energy and chemical intensive, which adds to the upstream emissions associated with natural gas.[36] Recent analysis suggests that "[a] complete consideration of all emissions from using natural gas seems likely to make natural gas . . . not significantly better than coal in terms of the consequences for global warming."[37] Furthermore, many of the chemicals used in mining shale are not reported, which keeps the true lifecycle impact of shale gas a mystery. Still, lifecycle emissions from shale gas could be two to four times greater than emissions from conventional natural gas.[38] As a result, emissions

35. Jaramillo et al., *supra* note 16, at 6293.

36. *See* Mike Soraghan, *Natural Gas: Industry Backs Voluntary Disclosure of Fracking Chemicals Through States*, GREENWIRE (Dec. 3, 2010), http://www.eenews.net/Greenwire/2010/12/03/9 (discussing that oil and gas drilling companies are moving toward voluntary disclosure of the chemicals used for hydraulic fracturing).

37. ROBERT W. HOWARTH, PRELIMINARY ASSESSMENT OF GREENHOUSE GAS EMISSIONS FROM NATURAL GAS OBTAINED BY HYDRAULIC FRACTURING 1 (2010) (on file with author), *available at* http://www.technologyreview.com/blog/energy/files/39646/GHG.emissions.from.Marcellus.Shale.April12010%20draft.pdf; *see also* Robert Howarth et al., Greenhouse Gas Emissions from Shale Gas: How Clean is Natural Gas?, Earthworks' People's Oil and Gas Summit (Nov. 20, 2010), *available at* http://earthworksaction.org/2010summit/Panel7_BobHowarth_Cornell.pdf. On the other hand, at least two studies have shown that overall emissions from shale gas are comparable, if not lower, than emissions from conventional gas or coal resources. An Argonne National Laboratory study recently concluded that, while shale gas has greater upstream emissions attributable to infrastructure, overall emissions are lower than conventional gas and coal. Andrew Burnham et al., *Life-Cycle Greenhouse Gas Emissions of Shale Gas, Natural Gas, Coal, and Petroleum*, ENVTL. SCI. & TECH., Nov. 22, 2011, at 624.

Nevertheless, the study concludes: "Inherently, natural gas combustion produces significantly less GHG emissions as compared to coal," but "upstream fuel production impacts can result in different conclusions." *Id.* at 625. Similarly, researchers from Carnegie Mellon University recently challenged Howarth's conclusion, finding that "[t]he GHG emission estimates shown here for Marcellus gas are similar to current domestic gas." Mohan Jiang et al., *Life Cycle Greenhouse Gas Emissions of Marcellus Shale Gas*, ENVTL. RES. LTRS., Aug. 5, 2011, at 8. However, the researchers acknowledge, "Marcellus shale gas production is still in its infancy. Thus, industry practice is evolving and even single well longevity is unknown. Assumptions related to production rates and ultimate recovery have considerable uncertainty." *Id.* at 3. As a result, the full lifecycle consequences of Marcellus shale gas production may not be fully understood, and it is this lack of understanding that requires caution in increasing the nation's reliance on shale gas.

38. HOWARTH, *supra* note 37, at 1.

from shale gas could rival those of coal derived from mountaintop-removal mining.[39] By way of comparison, analysis of oil derived from shale resources shows that lifecycle emissions caused by such oil are between twenty-one and forty-seven percent higher than lifecycle emissions caused by conventional petroleum.[40] These figures demonstrate that lifecycle accounting is needed not only to understand and compare the full greenhouse gas implications of using particular resources, but also to indicate that the trend in natural gas use may be toward increasing, rather than reducing, overall emissions.

C. *Lifecycle Emissions from Biomass*

Greenhouse gas emissions related to the use of biomass[41] for transportation fuels or electricity has become a hotly debated topic. Conventional wisdom suggests that using biomass to generate electricity is "carbon-neutral" because the carbon emissions absorbed during plant growth "cancels out" those released during combustion.[42] For example, in November 2010, EPA published a guidance document describing how to apply new greenhouse gas regulations to emissions from biomass. The guidance document explained that numerous entities requested that EPA exempt biomass emissions from these regulations because of the positive climate benefits associated with growing biomass resources.[43] Later, in July 2011, EPA finalized a rule deferring application of the greenhouse gas regulations to biomass emis-

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39. *Id.*

40. Adam R. Brandt, *Converting Oil Shale to Liquid Fuels: Energy Inputs and Greenhouse Gas Emissions of the Shell in Situ Conversion Process*, 42 ENVTL. SCI. & TECH. 7489, 7489 (2008), *available at* http://pubs.acs. org/doi/abs/10.1021/es800531f.

41. Federal law provides several definitions of biomass. Typically, biomass is understood to include plants such as soy, corn, and dedicated energy crops; trees, other wood, and wood waste; grasses like switchgrass and others; fibers; animal waste; and other biogenic resources. *See, e.g.*, 7 U.S.C. § 8101(12) (2006).

42. Timothy D. Searchinger, *Biofuels and the Need for Additional Carbon*, ENVTL. RES. LTRS, June 1, 2010, at 2 (describing that most lifecycle analyses for biofuels "treat biofuels as 'carbon neutral,'" disregarding biofuels emissions "on the theory that plant growth cancels them out").

43. ENVTL. PROT. AGENCY, OFFICE OF AIR QUALITY PLANNING & STANDARDS, PSD AND TITLE V PERMITTING GUIDANCE FOR GREENHOUSE GASES 9 (2010) [hereinafter BACT]. In March 2011, EPA issued additional guidance for determining the best available control technology for greenhouse gas emissions from bioenergy production. *See* ENVTL. PROT. AGENCY, OFFICE OF AIR & RADIATION, GUIDANCE FOR DETERMINING BEST AVAILABLE CONTROL TECHNOLOGY FOR REDUCING CARBON DIOXIDE EMISSIONS FROM BIOENERGY PRODUCTION (2011).

sions for three years.[44] Part of the justification for this decision was to "consider the unique characteristics and attributes" of greenhouse gas emissions from biomass.[45]

Recent analysis demonstrates a more complex understanding of the emissions associated with using biomass to produce fuel or generate electricity. For example, in its decision to defer greenhouse gas regulations for biomass emissions, EPA cited the "complexity and uncertainty" of "attempting to determine the net carbon cycle impact of particular facilities combusting particular types of biomass feedstocks."[46] In addition, recent scientific analysis suggests that the "carbon neutral" perception of the use of biomass ignores key differences in the types of biomass resources, the period of time it takes for the resource to re-grow, and the emissions resulting from other elements of the production process, such as land conversion.[47] In 2007, concern over the total emissions from biofuels led Congress to include lifecycle accounting requirements in the federal renewable fuels mandate.[48] In 2010, concern over lifecycle emissions from biomass led Massachusetts to suspend biomass from its renewable portfolio standard, a mandate that requires electric utilities to generate a portion of their electricity from renewable energy resources.[49]

Bioenergy provides the quintessential example of the need for full lifecycle accounting. For example, biomass-based electricity generation does not inherently generate fewer emissions than

44. Deferral for CO_2 Emissions from Bioenergy and Other Biogenic Sources Under the Prevention of Significant Deterioration (PSD) and Title V Programs, 76 Fed. Reg. 43,490 (July 20, 2011) (to be codified at 40 C.F.R. pts. 51, 52, 70, and 71).

45. *Id.* at 43,497.

46. *Id.*

47. *See generally id.*; Timothy D. Searchinger et al., *Fixing a Critical Climate Accounting Error*, 326 SCIENCE 527 (2009) [hereinafter Searchinger, *Accounting Error*]; MANOMET CTR. FOR CONSERVATION SCIS., BIOMASS SUSTAINABILITY AND CARBON POL'Y STUDY (2010).

48. In 2007, Congress updated the national renewable fuels mandate that brought attention to the relationship between the use of ethanol for fuel, global food prices, and total greenhouse gas reductions given the energy-intensive nature of producing ethanol. One major component of the amendment included a requirement for a reduction in total lifecycle emissions from biofuels, demonstrating a new concern for lifecycle consequences of bioenergy. Energy Independence and Security Act of 2007, Clean Air Act § 211, 42 U.S.C.S. § 7545(o) (2007).

49. Letter from Hon. Ian Bowles, Sec'y, Commonwealth of Mass., Office of Energy & Envtl. Affairs, to Comm'r Philip Giudice, Dept. of Energy Res. (July 7, 2010), *available at* http://www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Energy%2c+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Biomass&sid=Eoeea&b=terminalcontent&f=doer_renewables_biomass_q-and-a&csid=Eoeea.

coal, which is widely recognized for the significant quantity of greenhouse gas emissions released during combustion.[50] Rather, the emissions benefits of using biomass depend primarily on certain factors that exist upstream from the smokestack or tailpipe. A study prepared for Massachusetts found that the total emissions from biomass-based energy generation depend primarily on the type of resource used, the production methods employed to grow and harvest the resource, and the time required to re-grow the biomass resource.[51] As a result, an emissions analysis that focuses solely on the smokestack would not recognize biomass's potential to produce net climate benefits. Similarly, a blanket assumption that all biomass resources are "carbon neutral" ignores the factors upon which biomass's emissions benefits depend.

The type of feedstock will affect the "energy intensity of the fuel cycle, the bio-fuel properties, as well as the plant technology and its specific thermal conversion efficiency."[52] Studies put the range of lifecycle emissions for biomass between 77 and 218 pounds of CO_2e per megawatt-hour.[53] The ability of biomass to reduce greenhouse gas emissions depends primarily on the source of the biomass and the greenhouse gases that result from land use changes to grow or harvest the resource. One researcher has noted that "[r]eplacing fossil fuels with bioenergy does not by itself reduce carbon emissions."[54] Rather, bioenergy feedstocks only reduce greenhouse gas emissions if the feedstocks capture more carbon throughout their period of growth than would otherwise be captured.[55] Without a full lifecycle accounting for biomass, using these resources might not result in the intended emission reductions.

50. MANOMET CTR. FOR CONSERVATION SCIS., *supra* note 47, at 96 ("[B]iomass generally produces greater quantities of [greenhouse gas emissions] than coal, oil or natural gas. If this were not the case, then substituting biomass for fossil fuels would immediately result in lower . . . emissions. The benefits of biomass energy accrue only over time as the 'excess' . . . emissions from biomass are recovered from the atmosphere by growing forests.").

51. *See id.* at 95–114.

52. Weisser, *supra* note 8, at 1553.

53. *Id.* (explaining that combustion emissions are excluded because they are "believed to be carbon neutral").

54. Searchinger et al., *Accounting Error*, *supra* note 47, at 528 ("Replacing fossil fuels with bioenergy does not by itself reduce carbon emissions . . . .").

55. *See id.* ("Bioenergy . . . reduces greenhouse emissions only if the growth and harvesting of the biomass for energy captures carbon above and beyond what would be sequestered anyway and thereby offsets emissions from energy use.").

D. *Lifecycle Emissions from Nuclear and Non-emitting Renewables*

Nuclear and renewable energy technologies, such as wind and solar, are typically not associated with greenhouse gas emissions. Certainly, these renewable energy technologies do not have smokestacks, and nuclear energy produces minimal greenhouse gases at the smokestack. Yet these resources do create upstream emissions, so "[a]n evaluation of alternative energy technologies for their potential to decrease [greenhouse gas] emissions requires careful analyses of all the stages in the life of the fuels and devices."[56] These resources should also undergo lifecycle analysis in order to inform decision making about the selection and development of alternative energy technologies.

In the case of nuclear energy, most greenhouse gas emissions occur upstream in the production cycle. Greenhouse gases are emitted throughout the production lifecycle, during "uranium mining (open pit and underground), milling, conversion, enrichment (diffusion and centrifuge), fuel fabrication, . . . reprocessing, conditioning of spent fuel, interim storage of radioactive waste, and final repositories."[57] Upstream emissions from nuclear reactors range from twelve to forty-seven pounds of CO_2e per megawatt-hour, depending largely on the enrichment process and type of reactor.[58] A recent report by the International Atomic Energy Agency maintains that nuclear is a low carbon technology but acknowledges the potential to further reduce the greenhouse gas emissions associated with nuclear power.[59]

Because nuclear power generates a low level of emissions at the smokestack, the opportunities to reduce the emissions associated with nuclear power would likely occur earlier in the production process. In fact, a Stanford University study confirms that lifecycle emissions from nuclear energy generation can range higher than lifecycle emissions from other alternative energy sources, such as solar photovoltaics, wind, geothermal, and hy-

56. V.M. Fthenakis & H.C. Kim, *Quantifying the Life-Cycle Environmental Profile of Photovoltaics and Comparisons with Other Electricity-Generating Technologies*, National PV EH&S Research Ctr., Brookhaven National Lab., 2006, at 4.

57. Weisser, *supra* note 8, at 1552.

58. *Id.*

59. Int'l Atomic Energy Agency, *Climate Change and Nuclear Power*, at 9 (2009) *available at* http://www.iaea.org/Publications/Booklets/ClimateChange/climate_change.pdf.

droelectric.[60] For example, the study concludes that solar photovoltaics generate between nineteen and fifty-nine units of greenhouse gas emissions per kilowatt-hour of electricity and wind generates between 2.8 and 7.4 units of emissions per kilowatt-hour, while nuclear power can generate up to seventy units of emissions per kilowatt-hour of electricity.[61] Though widely recognized as a low- or zero-carbon energy source, nuclear energy does contribute to greenhouse gas emissions throughout its lifecycle.

Similarly, the vast majority of greenhouse gases associated with solar and wind energy occur prior to the generation site. Manufacturing is responsible for fifty to eighty percent of the total greenhouse gases from solar energy and seventy-two to ninety percent of the emissions from wind energy.[62] In particular, upstream emissions for solar energy range from ninety-four to 160 pounds of CO_2e per megawatt-hour, while wind-related emissions range from eighteen to sixty-six pounds.[63] Because the emissions from solar and wind depend mostly on the installation site and the type of systems used,[64] full lifecycle analysis could minimize the upstream greenhouse gas emissions by identifying an optimal system and site.

III. EPA Authority to Require Lifecycle Analysis for Greenhouse Gas-Emitting Energy Facilities

A. *Statutory Authority for Lifecycle Analysis in Section 211 of the Clean Air Act*

When Congress amended the Renewable Fuels Standard under the Clean Air Act in 2007, it required EPA to conduct lifecycle analysis of greenhouse gas emissions from certain biofuels, but it did not apply that requirement anywhere else in the

60. *See* Mark Z. Jacobson, *Review of Solutions to Global Warming, Air Pollution, and Energy Security*, ENERGY & ENVTL. SCI. 148, 154 (2009) (comparing lifecycle carbon dioxide equivalent per kilowatt hour of electricity from solar photovoltaic, wind, geothermal, hydroelectric, and other alternative resources).

61. *Id.*

62. Weisser, *supra* note 8, at 1552.

63. *Id.*; *see also* Jacobson, *supra* note 60, at 154 (identifying the lifecycle emissions associated with wind energy as the lowest of any energy resource).

64. Wind energy emissions are also site specific, depending on the terrain, access to wind and other factors. *See* Weisser, *supra* note 8, at 1552.

Clean Air Act.[65] As a result, the sections of the Act that apply to energy facilities do not even mention lifecycle emissions. Although EPA has conducted lifecycle analysis of greenhouse gas emissions through the National Risk Management Research Laboratory,[66] the 2007 requirement to consider the lifecycle greenhouse gas emissions from renewable biofuels reportedly represented the "first-ever use of lifecycle analysis of greenhouse gas [ ] emissions in a regulatory program."[67] Absent a specific statutory prohibition; however, EPA should have the authority to require new energy facilities to undergo this analysis.

The fact that Congress amended the Clean Air Act to require a lifecycle analysis in a regulatory program authorized in one section of the Act, but not in others, does not foreclose EPA from applying that requirement under another section of the Act. The general rule is that "where Congress includes particular language in one section of the statute but not in another[,] it is . . . presumed that Congress acts intentionally and purposely in the disparate inclusion or exclusion."[68] Under this canon of statutory construction, Congress's inclusion of a requirement for lifecycle greenhouse gas analysis of only transportation biofuels means that Congress did not intend to authorize EPA to require lifecycle analysis of stationary energy facilities. However, because the Clean Air Act does not specifically prohibit EPA from performing lifecycle analysis of energy facilities, Congress may have merely intended not to require EPA to perform this particular analysis. The absence of an explicit prohibition also does not mean that EPA may not conduct that type of analysis if it so chooses. Further, the choice to require lifecycle analysis is consistent with the statute's existing language. Moreover, the presumption that Congress intentionally created a distinction in the statute is rebuttable with sufficient evidence to the contrary.

Indeed, under certain circumstances, the presumption carries less weight. For example, the presumption is weaker when the

65. *Compare* Clean Air Act § 211(o), 42 U.S.C.S § 7545(o) (2007), *with* § 160, 42 U.S.C.S § 7470 (2007), *and* § 111, 42 U.S.C.S § 7411 (2007) (under which sections EPA regulates regulations greenhouse gas emissions from motor vehicles, power plants, and other factories).

66. *Life Cycle Assessment Research*, ENVTL. PROT. AGENCY (Jan. 5, 2012), http://www.epa.gov/nrmrl/lcaccess/.

67. *EPA Proposes New Renewable Fuel Standard Regulations Using Lifecycle Greenhouse Gas Analysis*, BEVERIDGE & DIAMOND, P.C. (May 8, 2009), http://www.bdlaw.com/news-567.html.

68. Keene Corp. v. United States, 508 U.S. 200, 208 (1993) (quoting Russello v. United States, 464 U.S. 16, 23 (1983)) (internal quotations omitted).

distinction in terminology was not created as part of a "unified overhaul" of the statute.[69] Unlike other revisions of the Clean Air Act, the Energy Independence and Security Act of 2007, which added the lifecycle analysis requirement for biofuels, did not "overhaul" the Clean Air Act. The last major statutory renovation of the Clean Air Act took place in 1990.[70] One architect of the 1990 renovation declared that the amendments "dwarf[ed] previous environmental laws."[71] In contrast, the 2007 changes were not insignificant, but they were more of a targeted repair than a wholesale renovation. In fact, the Energy Independence and Security Act of 2007 hardly concerned the sections of the Clean Air Act that regulate energy facility emissions.[72] As a result, there is no need to presume that Congress purposefully distinguished between lifecycle analysis of transportation biofuels and biomass used for heat or electricity generation.

The strength of such a presumption also depends on the relationship between the sections of the statute at issue. "[W]hen the sections in question are dissimilar and scattered at distant points of a lengthy and complex enactment," the presumption is weaker.[73] In describing the Clean Air Act's confounding complexity, Senator Barry Goldwater called the Act a "maze into which only the foolhardy attempt to enter and from which only the exhausted, depleted, and defeated emerge."[74] In 2007, Congress did not wander very far into that maze. The sections in which Congress included a lifecycle greenhouse gas requirement both dealt with transportation fuels.[75] As mentioned above, the Energy Independence and Security Act hardly mentioned the sections regulating emissions from stationary sources like power

69. *See* Nken v. Holder, 129 S. Ct. 1749, 1758 (2009) (applying the canon of statutory interpretation with particular force because a limit on injunctive relief was "enacted as part of a unified overhaul of judicial review procedures").

70. *See* Hon. Henry A. Waxman, *Overview and Critique: An Overview of the Clean Air Act Amendments of 1990*, 21 ENVTL. L. 1721, 1723 (1991) (describing the amendments' "substantive requirements, . . . enhanced enforcement authorities, expanded opportunities for citizen lawsuits, and . . . sweeping new permit program").

71. *Id.* at 1723–24.

72. *See* Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492 (2007).

73. United States v. Granderson, 511 U.S. 39, 63 (1994).

74. 122 CONG. REC. 23,843 (1976).

75. Section 526 of the Energy Independence and Security Act of 2007 also prohibits the federal government from entering into long-term contracts for synthetic petroleum fuels that have a higher lifecycle greenhouse gas content than conventional petroleum. 42 U.S.C.S § 17142 (2007).

plants.[76] These sections, although they may control similar pollutants, regulate entirely different kinds of pollution sources. The different nature of the sections and the Clean Air Act's substantial complexity warrant a weaker application of the presumption of intentional exclusion of statutory language.

Unfortunately, the Energy Independence and Security Act's legislative history does not clearly reveal whether Congress intended to include the lifecycle requirement in the section regulating transportation fuels and to exclude it from the section that applies to stationary sources of emissions, such as energy facilities. In fact, one member of Congress expressed dismay that the legislation produced no written history at all because it was produced through a series of amendments rather than through conference.[77] Thus, it is not clear that Congress, in requiring a lifecycle greenhouse gas analysis for regulation in one section, intended to prohibit EPA from applying that analysis to stationary facilities. Whether EPA has the authority to require lifecycle analysis of stationary facilities should depend on whether such a requirement would be consistent with the existing language of the Clean Air Act.

Absent a specific prohibition, EPA should have the discretion to require lifecycle greenhouse gas analysis if it falls within the type of regulatory control required by the Clean Air Act. Presently, EPA is moving forward with greenhouse gas regulations under the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act.[78] EPA will also promulgate New Source Performance Standards (NSPS) for greenhouse gas emissions,[79] and some scholars have posited that EPA has significant flexibility in developing an NSPS.[80] This comment next considers

76. The lifecycle requirement now appears only in section 211 of the Clean Air Act, which regulates motor vehicles. The sections under which lifecycle analysis might apply to greenhouse gases from stationary sources like power plants include sections 111 and 165.

77. 153 CONG. REC. E2665 (2007) (The bill was "not the product of a formal conference, but rather the result of amendments being passed between the House and Senate as a means of resolving the differences." (statement of Rep. Dingell)).

78. Clean Air Act § 165, 42 U.S.C. § 7475 (2006). Greenhouse gas emissions became regulated pollutants under this section on January 2, 2011. Tailoring Rule, *supra* note 1, at 35,514.

79. Tom LoBianco & Beth Ward, *Critics Promise Combat, Vow to Seek Delays as EPA Greenhouse Gas Rules Take Effect*, ELEC. UTIL. WEEK, Jan. 3, 2011 (EPA "is beginning to draft . . . new source performance standards for fossil-fueled power plants and refineries.").

80. *See* INIMAI M. CHETTIAR & JASON A. SCHWARTZ, THE ROAD AHEAD: EPA'S OPTIONS AND OBLIGATIONS FOR REGULATING GREENHOUSE GASES (2009); NA-

whether EPA has the authority to require lifecycle analysis under either of these two sections of the Clean Air Act.

B. *Lifecycle Analysis Under the Clean Air Act's PSD Regulations*

On January 2, 2011, EPA's PSD regulations for greenhouse gas emissions from stationary facilities took effect. This provision requires "major emitting facilit[ies]" to apply the "best available control technology" (BACT) to control particular pollutants.[81] EPA defines BACT as

> an emissions limitation . . . based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant.[82]

EPA has resolved to apply its traditional procedure for determining BACT to greenhouse gas emissions.[83] Because these PSD regulations apply to particular pollutants, they might offer the right framework for reducing lifecycle greenhouse gas emissions, which will occur away from the facility under review. While EPA's traditional BACT analysis applies to emissions from stationary sources, consideration of lifecycle emissions is plausibly consistent with the regulatory definition of BACT.[84] Nevertheless, EPA has made recommendations regarding the application of BACT to greenhouse gases suggesting that considering lifecycle emissions may work under the agency's traditional BACT approach.

THAN RICHARDSON, RES. FOR THE FUTURE, GREENHOUSE GAS REGULATION UNDER THE CLEAN AIR ACT: DOES *Chevron v. NRDC* Set the EPA Free? (2009); Jonas Monast et al., Nicholas Inst. for Envtl. Policy Solutions, Duke Univ., Avoiding the Glorious Mess: A Sensible Approach to Climate Change and the Clean Air Act (Working Paper, 2010).

81. § 165(a)(4), 42 U.S.C. § 7475(a)(4).

82. 40 C.F.R. § 52.21(b)(12) (2011).

83. BACT, *supra* note 43, at 19.

84. ENVTL. PROT. AGENCY, NEW SOURCE REVIEW WORKSHOP MANUAL: PREVENTION OF SIGNIFICANT DETERIORATION AND NONATTAINMENT AREA PERMITTING A.45 (1990), *available at* www.epa.gov/ttn/nsr/gen/wkshpman.pdf [hereinafter WORKSHOP MANUAL].

The guidance manual EPA published in 1990 describes how to implement BACT through a "top-down" approach.[85] Under this approach, the regulator considers all available controls in descending order of effectiveness.[86] The regulator accepts the most effective control option unless the permit applicant successfully demonstrates that, due to technical considerations or energy, environmental, or economic impacts, the option is not "achievable" for purposes of the regulation.[87] Thus, if lifecycle emissions analysis is to be considered, it would have to be considered within the top-down analysis.

The BACT analysis begins with identifying all available control technologies. Available control options are those "air pollution control technologies or techniques with a practical potential for application to the emission unit and regulated pollutant under evaluation."[88] Such options could include using cleaner fuels or production processes that produce fewer emissions.[89] Control options for lifecycle emissions would likely fall under "techniques," since a specific technology at the facility under review might not capture upstream emissions related to manufacturing components or mining raw materials.

The purpose of the second step in the BACT analysis is to eliminate all technically infeasible options.[90] "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."[91] At this particular step, lifecycle analysis would not come into play. Infeasibility could be based, at least in part, on "offsite logistical barriers."[92] Potentially, an applicant could demonstrate that trying to reduce upstream emissions through some available pathway was technically infeasible. Additionally, this demonstrates that EPA does, at least to some degree, allow considerations of off-site factors in the BACT analysis. Whether that consideration extends to offsite emissions, such as lifecycle emissions, is a matter that the next steps address specifically.

85. *Id.* at B.2.
86. *Id.*
87. *Id.*
88. *Id.* at B.5.
89. *Id.*
90. *Id.* at B.7.
91. *Id.*
92. BACT, *supra* note 43, at 36.

The options are ranked in order of effectiveness in Step Three,[93] and in Step Four, the applicant evaluates the energy, environmental, and economic impacts of each option "to arrive at the final level of control."[94] Here, the applicant must objectively consider the "associated impacts" of each option.[95] According to EPA's BACT guidance for greenhouse gas emissions, this review applies to "both direct and indirect impacts" of each option.[96] In this way, EPA's regulations implementing BACT allow for consideration of emissions that occur somewhere other than the proposed site, which is relevant to lifecycle emissions since most lifecycle emissions occur off-site.

Specifically, EPA allows for the consideration of "secondary emissions" in the fourth step. In fact, EPA's BACT guidance manual "recommends that permitting authorities consider in a portion of the BACT analysis (Step Four) how available strategies for reducing GHG emissions from a stationary source may affect secondary emissions from offsite locations."[97] EPA defines "secondary emissions" as

> emissions which occur as a result of the construction or operation of a major stationary source or major modification, but do not come from the major stationary source or major modification itself. . . . [S]econdary emissions must be specific, well defined, quantifiable, and impact the same general areas as the stationary source modification which causes the secondary emissions. Secondary emissions include emissions from any offsite support facility which would not be constructed or increase its emissions except as a result of the construction or operation of the major stationary source or major modification. Secondary emissions do not include any emissions which come directly from a mobile source, such as emissions from the tailpipe of a motor vehicle, from a train, or from a vessel.[98]

In order for lifecycle emissions associated with a particular facility to fall under this definition, the source of the lifecycle emissions would have to be considered a "support facility." Although a mine, field, or forest that supplies the raw materials might be considered a support facility, it is unlikely that facilities manufacturing components for the new energy facilities would be consid-

93. WORKSHOP MANUAL, *supra* note 84, at B.7.
94. *Id.*
95. *Id.* at B.8.
96. BACT, *supra* note 43, at 38.
97. *Id.* at 24.
98. 40 C.F.R. § 52.21(b)(18) (2011).

ered support facilities even though they might be subject to BACT based on their own direct emissions.

Additionally, the lifecycle emissions would have to be clearly identifiable and located near the primary facility. Tracking emissions is becoming more sophisticated, and several companies voluntarily track and report emissions across their supply chains.[99] The scope of secondary emissions; however, does not reach transportation-related emissions. To the extent that transportation fuels or vehicles are otherwise subject to greenhouse gas regulations, this limitation may be immaterial. Nevertheless, while some elements of a lifecycle analysis might likely fall under "secondary emissions," several elements of a full lifecycle analysis would be excluded from analysis. Moreover, considering lifecycle emissions at this stage of the BACT analysis only helps to choose one option over another. In contrast, applying lifecycle analysis at Step One, when determining what control options to consider, or when determining whether PSD regulations apply to the source at all, would present the opportunity to include additional control options in the BACT analysis.

In the final step of the BACT analysis, the applicant selects the final control technology. At this point, the applicant must select the "most effective control option not eliminated in Step [Four]" to propose to the regulating authority.[100] Traditional application of the BACT analysis might offer the opportunity to consider lifecycle emissions or propose options that control those emissions. Indeed, some of the control options that EPA recommends for BACT necessarily turn the focus away from emissions at the source to offsite emissions.

C. *Using Biomass and Energy Efficiency as BACT Control Options Implicates Analysis of Offsite Emissions*

As discussed earlier, significant disagreement exists regarding whether the use of biomass has "carbon neutral" lifecycle effects, such that biomass-generated electricity produces no net emissions. Interestingly, although a biomass-fired power plant could trigger PSD and BACT requirements, biomass is also touted as a fuel that could serve as the best available control technology for greenhouse gas emissions. Whether applying BACT to a biomass

99. *See* PEW CTR. ON GLOBAL CLIMATE CHANGE, *supra* note 12, at 343 (describing commercial emission inventories).

100. WORKSHOP MANUAL, *supra* note 84, at B.9.

facility or considering biomass as BACT for greenhouse gas emissions, any decision should rest on a lifecycle analysis.

EPA is in the process of determining how to take into account lifecycle emissions of biomass. In its final rule applying BACT to greenhouse gas emissions, EPA decided not to exclude biomass emissions from BACT applicability.[101] As a result, anyone proposing a biomass facility that produces emissions that reach a certain threshold must apply BACT, but EPA noted that "there is flexibility to apply the existing regulations and policies regarding BACT in ways that take into account their lifecycle effects on [greenhouse gas] concentrations."[102] In its BACT guidance, EPA makes clear that this flexibility includes considering lifecycle emissions during Step Four of the BACT analysis.[103] Interestingly, this guidance focuses on "the benefits that may accrue from the use of certain types of biomass."[104] The singular focus on the benefits of using biomass is at variance with EPA's previous guidance on BACT implementation, which makes clear that the applicant must focus on the "beneficial and adverse impacts" of a particular option.[105] Full lifecycle analysis should be required of any energy facility that uses a fuel source that will require BACT in order to compare each resource fairly. This information affects the regulatory costs associated with building an energy facility and already affects decisions about what type of facility to build.[106]

EPA, in asserting that biomass could qualify as BACT, necessarily opened the door to requiring a lifecycle analysis and allowing offsite emission reductions. Because biomass emits the same, if not more, greenhouse gas emissions as coal from the smokestack, any reduction in emissions from biomass is a result of the lifecycle consequences of using biomass, and any reductions necessarily occur offsite. By logical extension of this variation, proponents of an energy facility should be able to look to lifecycle emissions for places to find controls that would satisfy BACT.

101. Tailoring Rule, *supra* note 1, at 31,526.

102. *Id.* at 31,591.

103. BACT, *supra* note 43, at 9.

104. *Id.*

105. WORKSHOP MANUAL, *supra* note 84, at B.8.

106. *See EPA Considers GHG Rules as Economic Forces Mount Against Biomass*, WASTE BUS. J. (Dec. 6, 2010), http://www.wastebusinessjournal.com/cgiin/print/printpage.pl?url=news/wbj20101207F.htm (arguing that uncertainty about how EPA will treat biomass under these regulations is resulting in project cancellations).

Some environmental advocates have proposed that, at this step, EPA might consider whether fuels like biomass constitute a "clean fuel."[107] They note that whether a resource qualifies as a "clean fuel" has typically depended on the "'inherent cleanliness of the fuel.'"[108] Without any other guidance, it is unclear whether a "clean fuel" could be one that is based on lower lifecycle emissions rather than lower smokestack emissions.[109] In its recent BACT guidance document, EPA goes on to say that "a permitting authority may consider that some types of coal can have lower emissions of [greenhouse gases] than other forms of coal, and they may insist that the lower emitting coal be evaluated in the BACT review."[110] According to the literature reviewed above, differences in total coal emissions of greenhouse gases are more likely to result from differences in upstream emissions rather than from emissions at the smokestack.

Similarly, biomass is not inherently cleaner, but it has the potential to result in a net reduction in emissions. In order to consider biomass a "clean fuel," EPA should apply a lifecycle analysis.[111] Under this theory, coal derived from less energy-intensive mining practices, or from practices that do not result in land-use related emissions, could potentially meet this standard. In any instance, whether a particular source of coal or biomass outperformed the proposed fuel would depend on several factors and would have to be determined on a case-by-case basis.

EPA advises that "energy efficiency should also be considered in BACT determinations for all regulated . . . pollutants."[112] However, efficiency improvements are limited to "technologies, processes and practices *at the emitting unit*."[113] Additionally, EPA's regulations foreclose the use of efficiency improvements that reduce "secondary emissions."[114] Yet, at least some entities

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107. CLEAN AIR TASK FORCE ET AL., COMMENTS OF CLEAN AIR TASK FORCE ET AL. TO THE ENVIRONMENTAL PROTECTION AGENCY'S CALL FOR INFORMATION: INFORMATION ON GREENHOUSE GAS EMISSIONS ASSOCIATED WITH BIOENERGY AND OTHER BIOGENIC SOURCES 9, *available at* http://www.catf.us/resources/filings/EPA_GHG_Tailoring_Rule/20100913-CATF_et_al_Comments_on_EPA-HQ-OAR-2010560_Call_for_Info_on_Biogenic_Emissions.pdf.

108. *Id.* (quoting *In re* Inter-power of New York, 5 E.A.D. 130, 134 & n.7 (1994)).

109. *Id.*

110. BACT, *supra* note 43, at 29.

111. CLEAN AIR TASK FORCE ET AL., *supra* note 107, at 9–10.

112. BACT, *supra* note 43, at 21.

113. *Id.* (emphasis added).

114. *Id.* at 44 n.113 ("[E]nergy efficiency improvements that only function to reduce the secondary emissions associated with offsite combustion to produce energy

subject to EPA's regulations propose that emissions away from the regulated unit should be considered. These proponents posit that regulated entities should be able to purchase "offsets" or credits from projects that reduce emissions elsewhere in order to satisfy BACT. They argue that "whether the reductions associated with a particular facility occur inside or outside the physical boundaries of the facility makes no difference from a science or policy perspective" and that, moreover, "[n]othing in the text or legislative history of the Clean Air Act would foreclose this approach."[115] If the source at issue is an energy facility, then perhaps the "offsets" might include efficiency projects that reduce the need for the facility.

In order to compare the full greenhouse gas consequence of each energy resource and to identify additional control measures, EPA should apply a lifecycle analysis at Step One. Even if EPA does not apply the analysis until a later step, the analysis will assist in fully understanding the consequences of control options and in identifying additional, and potentially more cost-effective, opportunities for reducing emissions associated with a particular source.

D. *EPA May Regulate Lifecycle Emissions Through the Clean Air Act's New Source Performance Standards*

While the Tailoring Rule addresses emissions from new or modified stationary sources, EPA has also agreed to promulgate New Source Performance Standards (NSPS) for new and existing energy facilities and refineries.[116] These regulations offer another

at another location should not be considered as options in the BACT analysis under existing EPA interpretations of its regulations.").

115. Geoffrey Craig, *Carbon Offset Group Urges EPA to Allow Offsets for Greenhouse Gas Rule Compliance*, ELEC. UTIL. WEEK, Dec. 6, 2010.

116. EPA entered into settlement agreements to issue New Source Performance Standards in December 2010. Under the agreement, as amended, EPA must propose the regulations by September 30, 2011 and finalize them by May 26, 2012. Settlement Agreement, New York v. Envtl. Prot. Agency, No. 06-1322 (D.C. Cir. Dec. 21, 2010), *available at* http://www.epa.gov/airquality/ghgsettlement.html; Modification to Settlement Agreement, New York v. Envtl. Prot. Agency, No. 06-1322 (D.C. Cir. June 13, 2011), *available at* http://www.epa.gov/airquality/ghgsettlement.html; *see also* MONAST ET AL., *supra* note 80, at 13 (citing National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants, 75 Fed. Reg. 54,970, 54,997). Note that, as of this publication, EPA had not yet proposed performance standards for electric generating units. Additionally, EPA has proposed standards of performance for new stationary source in the oil and gas industry. *See* Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for

opportunity for EPA to require energy facilities to undergo lifecycle greenhouse gas analysis. Although the BACT process likely offers the best opportunity, NSPS cannot be ignored. NSPS provides supplemental regulation for pollutants already subject to some regulatory controls.[117] However, because NSPS regulates source categories and not particular pollutants,[118] it seems counterintuitive that regulation or analysis could reach beyond the source itself. Some evidence nevertheless suggests that this language does not foreclose consideration of lifecycle emissions.

Under sections 111(b) and 111(d) of the Clean Air Act, EPA establishes "standards of performance" for new and existing sources.[119] A "standard of performance" is

> a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.[120]

While some scholars have argued that a "standard of performance" could arguably include emission reductions that occur offsite,[121] the Third Circuit has considered the issue of whether pollution standards could apply to facilities located offsite or somewhere other than the source itself. Its conclusion suggests that offsite emissions would neither be subject to an NSPS nor be considered to determine whether NSPS applies.

Hazardous Air Pollutant Reviews, 76 Fed. Reg. 66886 (proposed Oct. 28, 2011) (to be codified at 40 C.F.R. pts. 60, 63), *available at* http://www.epa.gov/airquality/oilandgas/actions.html.

117. *See* PPG Indus., Inc. v. Harrison, 660 F.2d 628, 630 (5th Cir. 1981) ("New Source Performance Standards . . . were largely designed as a supplement to EPA's regulation of criteria pollutant.").

118. *See* Clean Air Act § 111(b), 42 U.S.C. § 7411(b) (2006).

119. § 111(b)(1)(B), 42 U.S.C. § 7411(b)(1)(B); § 111(d)(1), 42 U.S.C. § 7411 (d)(1).

120. § 111(a)(1), 42 U.S.C. § 7411(a)(1).

121. *See* MONAST ET AL., *supra* note 80, at 11–12. Scholars have argued that NSPS could be used to establish a regulatory cap-and-trade program. *Id.* at 11. However, EPA officials have signaled that the Agency will not use NSPS to create a cap-and-trade program. Gabriel Nelson, *Climate: EPA Agrees to Limit Emissions from Power Plants, Refineries*, GREENWIRE (Dec. 23, 2010), http://www.eenews.net/Greenwire/2010/12/23/1; Dina Fine Maron, *Regulation: EPA Official Says Cap and Trade Won't Be Part of Forthcoming CO2 Rules*, CLIMATEWIRE (Feb. 7, 2011), http://www.eenews.net/climatewire/print/2011/02/07/3.

In *Star Enterprise v. EPA*, the Third Circuit reviewed a NSPS to control sulfur dioxide emissions from petroleum refineries.[122] EPA sought to apply the performance standard for petroleum refineries to a pair of gas turbines located adjacent to a petroleum refinery.[123] The regulations for petroleum refineries applied to certain enumerated "affected facilities," including fuel gas combustion devices located "in petroleum refineries."[124] EPA determined that the offsite gas turbines were fuel gas combustion devices and that they were subject to the NSPS, because the turbines were adjacent to the refinery, provided electricity and steam to the refinery, and were owned by the refinery owners.[125]

The Third Circuit rejected EPA's argument that the adjacent turbines were "in" the refinery. The court announced that "in determining what facilities are 'in petroleum refineries,' the touchstone of such a determination is the physical location of the facilities in question."[126] The court found "untenable" the assertion that the turbines were part of the refinery because they were "under common ownership and control."[127] According to the court, such reasoning would "also be sufficient to establish that any independent, free-standing facility owned by [the refinery owner] and built on land adjacent to . . . [the] petroleum refinery is part of [the] petroleum refinery."[128] The court emphasized that the turbines were "located in a free-standing building" and "physically separate and distinct" from the petroleum refinery.[129] In contrast, the current NSPS for electric generating units, which would include coal plants, biomass plants, and natural gas plants, does not explicitly impose a location requirement.[130] Under regulations that impose a location requirement, like the regulations for petroleum refineries, it would be difficult to argue that upstream emissions could fall subject to the NSPS. However, the petroleum refinery regulations demonstrate that their scope is a function of the regulatory language itself.

122. 235 F.3d 139 (3d Cir. 2000).

123. *Id.* at 142.

124. *Id.* (citing 40 C.F.R. § 60.100(a) (1999)).

125. *Id.* at 144–45.

126. *Id.* at 151 (citing 40 C.F.R. § 60.100(a)).

127. *Id.* at 149 (internal quotations omitted).

128. *Id.*

129. *Id.*

130. *See* 40 C.F.R. § 60.40Da(a) (2011) ("[T]he affected facility to which this subpart applies is each electric utility steam generating unit[.]").

In arguing that the turbines were "in" the petroleum refinery, EPA also pointed out that they were an "integral part" of the refinery.[131] The court, however, disagreed.[132] According to the court, a mutually beneficial relationship between the facilities did not bring the turbines "in" the petroleum refinery.[133] However, the court acknowledged that EPA's argument might prevail if the turbines were "essential to the operation of the refinery." In this case, the turbines were not essential because the refinery could have purchased the required electricity.[134] EPA's argument, to some degree, reflected the idea behind "secondary emissions," because the turbines would not exist but for the need that the refinery presented.[135] Rejecting this argument because the power could have been purchased and the turbines were therefore not necessary, the court intimated that the availability of raw materials might meet this requirement.[136] Under this analysis, raw materials needed to fuel an energy facility could constitute a necessity for the regulated source and, therefore, might come under the scope of the NSPS. For example, biomass resources, natural gas, or coal necessary to produce electricity could constitute part of the source due to their necessity. Yet EPA may control the scope of the NSPS. As a result, lifecycle analysis might not hinge on the element of necessity. Rather, the location requirement is a function of the specific language used in the NSPS. EPA could potentially exclude the need to demonstrate that the ancillary source is "in" the source under review. An NSPS for energy facility greenhouse gas emissions need not include a site-specific location requirement.

Although a "standard of performance" is usually expressed as a maximum emission rate,[137] evidence suggests that the standard could include control for lifecycle emissions. Importantly, the

131. *Star Enter.*, 235 F.3d at 149.

132. *Id.* ("[The turbines are] neither part of the adjacent petroleum refinery nor necessary to the refinery's operations.").

133. *Id.* at 150.

134. *Id.* at 151.

135. *See id.* ("[T]he refinery in its current form could not operate with the current 'power plant' . . . , and it is not likely that the current 'power plant' . . . would exist . . . without the remainder of the refinery.").

136. *See id.* ("Presumably, the only limitations on refinery capacity would be the limitations on available power and available raw materials.").

137. *See* 40 C.F.R. § 60.40Da–60.47Da (2011) (establishing emission limits for fossil-fuel fired steam generators).

"best system of emission reduction" need not be technological.[138] For example, EPA once proposed an NSPS for municipal waste incinerators that would have required incinerators to remove certain types of waste so that they are not incinerated and would have prohibited altogether the incineration of some materials such as lead-acid vehicle batteries.[139] Although at the time the President's Council on Competitiveness objected that a "materials separation requirement did not constitute a 'performance standard,'" the D.C. Circuit suggested that EPA could not base its determination on the Council's opinion alone.[140] EPA decided to abandon the materials separation requirement, in part, because "it was unable to reliably quantify the emission reductions attributable to materials separation."[141] Materials separation would have ultimately reduced the emissions from the smokestack itself,[142] but the proposal is analogous to controlling lifecycle emissions that occur before raw materials are combusted at a source to generate electricity. Rather than removing materials from waste that will be incinerated, controlling lifecycle emissions would separate materials (the emissions) before they reach the source. In this case, it would be much like requiring the incinerator to recycle materials, thereby avoiding emissions, rather than controlling emissions through a smokestack device.

Some scholars have also suggested that an emissions trading system could qualify as a "standard of performance."[143] Proponents point out that EPA used an emissions trading program to control mercury emissions from electric generating units.[144] An

138. *See* MONAST ET AL., *supra* note 80, at 12 (citing Clean Air Act § 111(a)(1) and (7), 42 U.S.C. § 7411(a)(1) and (7) (1988) (demonstrating that the 1990 Amendments to the Clean Air Act removed "technological" from the term "best system of emission reduction").

139. *See* New York v. Reilly, 969 F.2d 1147, 1148–49 (D.C. Cir. 1992).

140. *Id.* at 1150. Petitioners argued that "EPA acted improperly in relying on the opinion of the Council rather than exercising its own expertise," but the court found that EPA "did exercise its expertise." *Id.* at 1152.

141. *Id.* at 1151. Note that tracing emission pathways has matured. *See* PEW CTR. ON GLOBAL CLIMATE CHANGE, *supra* note 12.

142. *See* Reilly, 969 F.2d at 1148 ("EPA has labelled its goal in setting a standard of performance as selection of the 'best demonstrated technology'. . . . EPA's [best demonstrated technology analysis] resulted in proposed rules which focused primarily on limiting emissions from incinerator smokestacks.").

143. MONAST ET AL., *supra* note 80, at 11.

144. Although the D.C. Circuit struck down this trading program, it was not because a trading program cannot constitute a "standard of performance." *See* New Jersey v. Envtl. Prot. Agency, 517 F.3d 574, 578 (D.C. Cir. 2008) (striking down EPA's rule to control mercury emissions from electric generating units through a trading program because it violated the Clean Air Act in removing mercury emis-

emissions trading system would also take advantage of emission reductions that occur offsite through a credit exchange program. An emissions trading program would unlock the door to consideration of lifecycle emissions. For example, a lifecycle analysis could assist an exchange program in identifying opportunities to control emissions that were directly tied to the source category. Although credit exchange programs are lauded because they increase cost-effectiveness without sacrificing total emission reductions,[145] a lifecycle analysis could expand opportunities for emission reduction from other sources within the same category to upstream sources that provide materials to the source category.

Furthermore, the legislative history of section 111 of the Clean Air Act suggests that Congress has contemplated offsite emissions reductions in NSPS. In 1977, Congress became concerned that NSPS for coal could be satisfied by switching to low-sulfur coal rather than by applying emissions control technology.[146]

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sions from the list of regulated hazardous air pollutants in order to establish the trading program).

145. *See* Craig, *supra* note 115, at 6.

146. H.R. REP. No. 95-294, at 187 (1977). As noted above, a standard of performance need not be technological. However, in 1977, Congress amended the definition of "standard of performance" for new sources to mean "the standard which reflects the degree of emission reduction achievable through the application of the best *technological* system of continuous emission reduction[.]" Clean Air Act § 111(a)(1), 42 U.S.C. § 7411(a)(1) (1982) (emphasis added). Later, in 1990, Congress amended the definition again, returning to the original 1970 definition and reflecting the definition as it exists today. Clean Air Act § 111(a)(1), 42 U.S.C. § 7411(a)(1) (1994) ("The term 'standard of performance' means a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction[.]"). Explaining the need to revise the definition in 1977, Representative Paul Rogers, Chair of the Subcommittee on Health and the Environment, noted:

> The intent of the House provision and of the Conference agreement is to require the Administrator to revise and strengthen current lax standards for new sources under Section 111 of the Act. Particularly troublesome are EPA's current SO_2 control standards and particulate control standards for coal-fired boilers. . . . For example, instead of prescribing standards which effectively required use of the best practical control technology for new coal-fired power plants, the Administrator set levels which could be met either by use of untreated low-sulfur coal or scrubbers. These standards (e.g. 1.2 lbs. of SO_2 million Btu's)—by not requiring use of best practicable control technology—directly conflict with the aforementioned purposes in several respects: 1. The standards give a competitive advantage to those States with cheaper low-sulfur coal and create a disadvantage for Midwestern and Eastern States where predominately higher sulfur coals are available; 2. These standards do not provide for maximum practicable emission reduction using locally available fuels, and therefore do not maximize potential for long-term growth; 3. These standards do not help to expand the energy resources (this is,

Congress amended section 111 to require percentage reduction targets in NSPS for new sources.[147] Managing debate on the conference report in the Senate, Senator Edmund Muskie described the major sections of the conference bill. Senator Muskie noted that "[i]n requiring a percentage removal standard EPA is authorized to give credit for minemouth and other precombustion fuel treatment processes whether or not undertaken by the source itself."[148] Senator Muskie might not have intended that reducing emissions in the production process itself could reduce a resource's total contribution of emissions. However, he encouraged the agency to consider looking at operations in the production process to reduce emissions.

The House of Representatives, on the other hand, more explicitly suggested that EPA could seek to reduce emissions in the production process itself. For example, the House committee that proposed the changes to the definition recognized the potential for reducing emissions throughout the production process.[149] The committee noted: "[t]here may doubtlessly be many pretreatment techniques and/or *process modifications* capable of achieving comparable or improved degrees of emissions control in

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> higher sulfur coal) that could be burned in compliance with emission limits as intended; 4. These standards aggravate compliance problems for existing coal-burning stationary sources which cannot retrofit and which must compete with larger, new sources for low-sulfur coal; 5. These standards increase the risk of early plant shutdowns by existing plants (for the reasons stated above), with greater risk of unemployment; and 6. These standards operate as a disincentive to the improvement of technology of new sources, since untreated fuels could be burned instead of using such new, more effective technology. Similar problems exist with respect to the standards for new oil-burning stationary sources.

123 Cong. Rec. 27,066, 27,071 (1977) (CLEAN AIR ACT CONFERENCE REPORT: STATEMENT OF INTENT, CLARIFICATION OF SELECTED PROVISIONS, inserted into record by Rep. Paul Rogers). As this statement suggests, a desire to keep all domestic coal competitive motivated the push to change the definition and discourage fuel switching as a means of satisfying the performance standard. In today's political landscape, a standard that brought additional upstream emissions into the scope of a performance standard might face significant resistance from some quarters. Yet, on the other hand, providing an opportunity to satisfy a performance standard by reducing upstream emissions might garner support because it could reduce the cost and increase the flexibility of compliance without necessarily conflicting with the purposes that Representative Rogers describes.

147. *See* § 111(a)(1)(A)(i)–(ii), 42 U.S.C. § 7411(a)(1)(A)(i)–(ii) (1982).

148. 123 Cong Rec. 26,846 (1977) (statement of Sen. Edmund Muskie).

149. The House bill served as the basis for the final language adopted in the conference report. 123 CONG. REC. 27,071 (1977) (CLEAN AIR ACT CONFERENCE REPORT: STATEMENT OF INTENT, CLARIFICATION OF SELECTED PROVISIONS," inserted into record by Rep. Paul Rogers) ("The Conferees agreed to Section 111 of the House bill with minor modifications.").

fossil-fired boilers."[150] Furthermore, the House committee advised that "the Administrator should take into consideration all of the processing steps performed on a material from its natural state through to final usage in determining the requirements under this section."[151] These recommendations suggest that the chamber that was responsible for the amendment to the definition of "standard of performance" under section 111 was aware of the potential to reduce emissions upstream from the source itself. Therefore, looking to the lifecycle emissions from power plants subject to new source performance standards is consistent with how Congress intended EPA to implement section 111.

Based on this analysis, in addition to traditional agency deference, it seems that a colorable argument can be made that EPA has the authority, either through BACT or NSPS, to either require or allow control of lifecycle emissions, even if those emissions are not included when calculating whether a source produces enough emissions to be subject to BACT requirements. Including those emissions in such a determination, however, could make the argument more powerful.

IV.
CONTROLLING LIFECYCLE EMISSIONS FROM NON-EMITTING ENERGY RESOURCES

This comment has thus far reviewed opportunities for lifecycle analysis to be applied to emitting sources of electricity generation. However, as discussed in Part I, renewable energy technologies and nuclear power also have greenhouse gas consequences, even though they are not reflected through smokestack emissions. These resources are becoming increasingly attractive to utilities and other power companies, in part because of emerging regulatory controls for greenhouse gas emissions from conventional power sources like coal. However, these non-emitting resources are not likely to be subject to Clean Air Act regulatory review because they do not emit pollution directly. If lifecycle emissions were included in applicability determinations for regulatory programs such as NSPS, then even non-emitting resources like wind and solar might become subject to the performance standard. In order to ensure that switching to alternative energy sources maximizes reductions in total greenhouse gas emissions,

150. H.R. REP. NO. 95-294, at 189 (emphasis added).
151. *Id.*

a comprehensive regulatory regime must address upstream emissions rather than only emissions at the smokestack. However, absent such an expansion of the applicability of NSPS, Congress could subject renewable energy projects to lifecycle analysis through a national renewable portfolio standard (RPS).[152]

Much like the renewable fuels standard mandating a certain percentage of the United States fuel supply to come from renewable biofuels, an RPS is a mandate requiring utilities to obtain a particular percentage of their electricity from renewable energy resources. More than thirty states have implemented an RPS, and their success is expected to increase national renewable energy generation to ten percent of total domestic electricity generation by 2030.[153] Until March 2011, a federal RPS maintained some bipartisan support in Congress.[154] A national portfolio standard that imposes a lifecycle analysis requirement could help avoid unintended greenhouse gas emissions from renewable energy resources, but this no longer remains a serious topic of consideration.[155] As previously noted, Congress imposed a lifecycle analysis requirement for some biofuels in response to growing concern that the use of biofuels does not effectively reduce greenhouse gas emissions as originally intended. In addition, Massachusetts recently proposed a lifecycle requirement for bio-

152. A federal renewable portfolio standard would be implemented through an amendment to the Public Utility Regulatory Policies Act. *See* Public Utility Regulatory Policies Act of 1978, 16 U.S.C. § 2601 (2010). *See generally*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 101 (2009).

153. *See* ENERGY INFO. ADMIN., DOE/EIA- 0383, ANNUAL ENERGY OUTLOOK 2010 WITH PROJECTIONS TO 2035, at 56 (2010).

154. Katie Howell, *Energy Policy: Senate CES Talks Have Stalled–Graham*, E&E NEWS PM (Mar. 8, 2011), http://www.eenews.net/pm/sample/print/5. In March 2011, the Senate Committee on Energy and Natural Resources published a white paper previewing several factors and options related to enacting a "clean energy standard." The committee solicited comments on how it should define "clean energy," but it is unclear whether the committee's inquiry will result in new legislation. SEN. JEFF BINGAMAN & SEN. LISA MURKOWSKI, WHITE PAPER ON A CLEAN ENERGY STANDARD 3 (2011), *available at* http://energy.senate.gov/public/_files/CESWhite Paper.pdf.

155. Interestingly, as a senator, President Barack Obama merged the ideas of a mandate for renewable fuel production with a lifecycle greenhouse gas ceiling in the National Low Carbon Fuel Standard Act of 2007. S. 1324, 110th Cong. (2007). In addition to increasing the volume of renewable fuels required under the Clean Air Act, the bill would have required EPA to identify fuels that achieve "a substantial reduction in petroleum content over the lifecycle of the fuel." *Id.* § 4(b), 250. Adapting this idea to electricity generation, a federal RPS or clean energy standard could also incorporate a requirement to assess the lifecycle greenhouse gas emissions from each resource.

mass resources to comply with its state RPS.[156] A lifecycle analysis as part of a national RPS could be used to set a maximum threshold for lifecycle emissions associated with renewable energy projects in the way that this analysis was applied to transportation fuels.

Some members of Congress prefer a "clean energy standard" that would expand the scope of the mandate to include some natural gas, coal, or nuclear resources.[157] Renewable energy advocates disfavor this type of proposal,[158] but a "clean energy standard" that imposes lifecycle emission requirements might allay some opposition. Moreover, this type of proposal warrants a lifecycle analysis requirement even more than a standard that applies strictly to renewable resources does. To determine what a "clean" resource is, the legislation could require that the resource or project meet a maximum lifecycle emission limit or reduce lifecycle emissions below a baseline for similar energy resources or generation stations.[159] Subjecting renewable energy resources to lifecycle emissions requirements in this manner could help avoid unintended greenhouse gas emissions.

V.
CONCLUSION

The need to control greenhouse gas emissions related to electricity generation extends to all emissions associated with this activity. By ignoring emissions that occur upstream from the generation site, regulators miss an opportunity to control otherwise unregulated emissions. Full lifecycle analysis could expand the reach of greenhouse gas regulations, potentially even reaching non-emitting renewable energy resources, and help identify additional opportunities to control emissions related to specific energy facilities or generating units. In the absence of congressional action to address climate change, EPA, using existing au-

156. Draft Proposed Regulation, Renewable Energy Portfolio Standard, 225 MASS. CODE REGS. § 14.05(f), *available at* http://mass.gov/Eoeea/docs/doer/renewables/biomass/225%20CMR%2014.00%20091710%20to%20SoS.PDF.

157. *See supra* text accompanying note 154.

158. *See* Letter from More Than 140 Renewable Energy and Public Health Advocates to Sen. Harry Reid, U.S. Sen. Majority Leader (Feb. 24, 2011) (on file with author) ("A standard that includes nuclear reactors, coal, natural gas or biomass is really a 'dirty energy standard' and will jeopardize our ability to achieve the long term greenhouse gas emissions needed to avoid the worst effects on our climate . . . .").

159. *See* BINGAMAN & MURKOWSKI, *supra* note 154.

thority under the Clean Air Act, has the flexibility to adapt its traditional analysis without straying far from its traditional procedures to close the gap on unregulated greenhouse gas emissions.