

**EPA’S CLEAR LEGAL AUTHORITY AND DISCRETION TO
DIFFERENTIATE BIOGENIC CO₂ EMISSIONS FROM OTHER GHG EMISSIONS
UNDER THE CLEAN AIR ACT.**

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Introduction

The Clean Air Act (“CAA”) and supporting case law provide EPA clear legal authority to distinguish between carbon dioxide (“CO₂”) emissions from biomass combustion (“biogenic CO₂ emissions”) and greenhouse gas (“GHG”) emissions from other sources, and thus exclude biogenic CO₂ emissions from CAA regulatory and permitting regimes or, at a minimum, establish a differential regulatory scheme for biogenic CO₂ emissions. In particular, EPA has significant authority and discretion to not bring such emissions within the CAA framework at the outset on *de minimis* grounds because CO₂ emissions from biogenic sources do not increase net atmospheric CO₂ concentrations and, therefore, do not cause or contribute to climate change. Thus, EPA need not reach the question of how to treat such emissions under the Prevention of Significant Deterioration (“PSD”) permitting program, as there is ample authority for not bringing such emissions within the framework of PSD—if not the CAA—in the first instance, given the lack of any adverse affect of such emissions on the climate.¹ However, even if EPA were to include biogenic CO₂ emissions in the PSD permitting program, there are established grounds for treating biogenic CO₂ emissions differently from fossil fuel CO₂ emissions. This paper is intended to summarize a range of legal theories that offer flexibility to EPA to differentiate biogenic CO₂ emissions from other GHG emissions as it seeks to implement its ultimate policy decision regarding the treatment of biogenic CO₂ emissions under the PSD and Title V permitting programs. In addition, it will provide a summary of the scientific evidence supporting differential treatment for biogenic CO₂ emissions.

As described below, EPA historically has excluded certain air emissions from the PSD and other CAA programs—even when pollutants that comprise such emissions are otherwise regulated in some contexts. In the context of GHG regulations, EPA has relied on a variety of regulatory approaches to distinguish between GHGs, completely excluding some from regulation, while providing differential treatment for others. The case for declining to bring biogenic CO₂ emissions within the PSD program (or at a minimum providing differential treatment for such emissions) is even stronger than this past precedent, given the lack of any net adverse effect on the climate from such emissions. In fact, the Supreme Court confirmed that certain GHG emissions from stationary sources should be excluded from regulation under the Clean Air Act based on *de minimis* principles. *Utility Air Regulatory Group v. EPA*, 134 S. Ct. 2427, 2449 (2014). In making such a decision to exclude biogenic CO₂ emissions, EPA can also properly consider any net GHG benefits that utilizing biomass for power generation or industrial processes provides vis-à-vis other fuels or feedstocks.

This paper is divided into four sections. Section I explains the legal basis for declining to regulate biogenic CO₂ emissions under the CAA at this time because those emissions do not adversely affect the environment. In the alternative, Section II explains that even if EPA were to conclude that it has the authority to consider the regulation of biogenic CO₂ emissions to some extent, it retains significant authority and discretion to exclude or provide different treatment for such emissions. The section provides several legal bases on which EPA could justify treating

¹ This white paper focuses on the PSD permitting program as an example for how EPA has solid legal authority to treat biogenic CO₂ emissions differently from other GHG emissions. However, the rationales, justification, and support provided here apply as well to other regulatory programs for addressing GHG emissions under the CAA, and also provide policy and technical support for making such distinctions in other government programs.

biogenic and fossil CO₂ emissions differently. Section III explains that the recent decision in *Center for Biological Diversity*, 722 F.3d 401 (D.C. Cir. 2013) does not foreclose EPA’s discretion to provide different and preferential treatment for biogenic CO₂ emissions on a permanent basis. Finally, Section IV provides an expanded summary of the key factual bases for differentiating between biomass emissions and other GHG emissions in CAA permitting as well as a brief description of the scientific literature supporting each point.

I. EPA Has Legal Authority to Conclude that the Clean Air Act Does Not Authorize EPA to Regulate Emissions Which Do Not Adversely Affect the Environment.

A core principle underlying much of EPA’s regulatory authority under the CAA is that EPA shall regulate only air pollutants that endanger human health or public welfare. Unlike CO₂ emissions from fossil sources, emissions from the combustion of biomass do not increase net atmospheric levels of CO₂.² Domestic forests constitute the nation’s leading carbon sink. EPA itself has recognized the lack of any adverse effect from biogenic CO₂ emissions in other contexts. For example, EPA’s Mandatory Reporting of Greenhouse Gases Rule distinguishes biogenic CO₂ from other emissions. *See generally* 75 Fed. Reg. 56,260 (Oct. 30, 2009). Likewise, in the Renewable Fuel Standard 2 rulemaking, EPA explained that “[f]or renewable fuels, tailpipe emissions only include non-CO₂ gases, because the carbon emitted as a result of fuel combustion is offset by the uptake of biogenic carbon during feedstock production.” 75 Fed. Reg. 14,669, 14,787 (March 26, 2010). In addition, the Department of Energy and virtually every government agency in the world to take up the issue have similarly recognized the lack of any adverse effect from biogenic CO₂ emissions.³ *See also* NAFO’s submission on EPA’s Call for Information.

² As described more fully in Section IV, and in numerous other contexts, net fluxes of biogenic CO₂ to the atmosphere from the combustion of biomass in the United States are, at a minimum, “carbon neutral” in that any CO₂ emissions associated with the combustion of biomass are offset completely by the significant role domestic forests play in sequestering carbon as the nation’s leading carbon sink. Thus, when viewed over appropriate time and spatial scales, the combustion of biomass for energy produces significant GHG emissions reductions in comparison to fossil fuel alternatives. As long as domestic forest carbon stocks are stable or increasing, as they are today, the combustion of forest-based biomass for energy will not increase net atmospheric CO₂ concentrations, regardless of the source. In fact, strong demand for forest products—including biomass for energy—has been shown to increase, rather than decrease, forest carbon stocks through increased investments by forest owners. Thus, even under high-demand scenarios, biomass energy demand can be met without significantly affecting markets for high-value timber products. Further, use of certain biomass feedstocks for energy—including harvest residues, mill residuals, and biomass derived from thinning treatments and timber stand management—offer significant GHG reduction benefits because their combustion typically has a *de minimis* impact on overall atmospheric carbon.

³ DOE, *Technical Guidelines: Voluntary Reporting of Greenhouse Gases (1605(b)) Program* (January 2007) at 77 (“Reporters that operate vehicles using pure biofuels within their entity should not add the carbon dioxide emissions from those fuels to their inventory of mobile source emissions because such emissions are considered biogenic and the recycling of carbon is not credited elsewhere.”); IPCC *Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Institute for Global Environmental Strategies, Hayama, Kanagawa, Japan: IPCC National Greenhouse Gas Inventories Programme (2006); Commission Regulation (EU) No. 601/2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council, Article 38.2 (The emission factor of biomass shall be zero.”), available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0030:0104:EN:PDF>.

Because biogenic CO₂ emissions have no adverse effect on the climate and in the absence of specific direction from Congress to regulate such emissions under the CAA, EPA could reasonably conclude that it lacks a basis for regulating them in the first instance. In the Endangerment Finding, EPA specifically concluded that the combined emissions of GHGs from new motor vehicles and new motor vehicle engines cause and contribute to air pollution that endangers public health and welfare. EPA reached this conclusion after noting that fossil fuel GHG emissions associated with these sources represented 23 percent of total U.S. emissions of well-mixed GHGs. 74 Fed. Reg. 66,496, 66,540 (Dec. 15, 2009).⁴ Because they do not increase net atmospheric CO₂ concentrations, *see infra* Section IV, biogenic CO₂ emissions are fundamentally different from GHGs emitted from fossil fuel sources regulated under Section 202(a) of the CAA. Biogenic CO₂ emissions do not contribute to climate change and, therefore, do not cause or contribute to the endangerment of public health or welfare. Thus, EPA could reasonably conclude that biogenic CO₂ emissions should be excluded from the scope of its CAA regulatory authority based on the lack of any adverse effects.⁵

II. EPA Has Substantial Discretion in Applying the Clean Air Act to Biogenic CO₂ Emissions and in Implementing PSD and Title V Permitting Programs.

In its landmark *Massachusetts v. EPA* decision, the Supreme Court recognized from the outset that EPA has significant discretion regarding the scope of climate change regulations. While the Supreme Court held that EPA has the authority to regulate GHG emissions from new motor vehicles based on the Court's finding that GHGs fit within the CAA's definition of "air pollutant," the Court also made clear that EPA's determination as to when and how such regulation should proceed is within the discretion of the Agency. *Massachusetts v. EPA*, 549 U.S. 497, 528-29, 533 (2007). "[A]n agency has broad discretion to choose how best to marshal its limited resources and personnel to carry out its delegated responsibilities." *Id.* at 527 (citing *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-845 (1984)); *see also Am. Coke & Coal Chems. Inst. v. EPA*, 452 F.3d 930, 941-42 (D.C. Cir. 2006) ("The court owes particular deference to EPA when its rulemakings rest upon matters of scientific and statistical judgment within the agency's sphere of special competence and statutory

⁴ EPA's assessment of motor vehicle GHG emissions as a share of United States GHG emissions specifically excluded biogenic CO₂ emissions because it was based on the United States Greenhouse Gas Inventory. *See* 74 Fed. Reg. at 66,539 n.41 and 66,540; Inventory of U.S. Greenhouse Gas Emissions and Sinks (April 2009) p. 2-5 Table 2-1 n. b and p. 3-1 (excluding biogenic CO₂ emissions based on principles of carbon neutrality). The 2009 Inventory states at page 3-1: "Carbon dioxide emissions from [combustion of biomass and biomass-based fuels] are not included in national emissions totals because biomass fuels are of biogenic origin. It is assumed that the C released during consumption of biomass is recycled as U.S. forest and crops regenerate, causing no net addition of CO₂ to the atmosphere." *See also EPA's Response to Public Comments, Volume 9: The Endangerment Finding* (EPA-HQ-OAR-2009-0171-11676) at 6 (finding that motor vehicle emissions contribute to endangerment does not address biomass burning).

⁵ As explained in Section IV, *infra*, this conclusion would be based on the fact that biogenic CO₂ emissions are offset by the sequestration of atmospheric CO₂ by domestic forests. If, at some later date, EPA determined that carbon stocks were no longer stable or increasing, it could revisit the conclusion that biogenic CO₂ emissions from forest stocks do not adversely affect the environment and, if necessary, apply the legal theories described in Section III, *infra*, to determine how biogenic CO₂ emissions should be addressed under the PSD and Title V permitting programs.

jurisdiction.”).⁶ The Supreme Court confirmed that discretion in *UARG*, distinguishing between the broad definition of “any air pollutant” in 42 U.S.C. §7602(g) which was at issue in *Massachusetts v. EPA* and the narrower definition adopted by EPA in substantive regulatory provisions. *See UARG*, 134 S. Ct. at 2440; *see also id.* at 2449 (directing EPA to establish a *de minimis* threshold below which GHG emissions need not be regulated).

In the Tailoring Rule and related regulations, EPA surgically exercised such discretion to limit the scope and reach of GHG regulation under the CAA. First, EPA specifically defined the precise “greenhouse gases” that are “subject to regulation” as set forth in that rulemaking. *See* 75 Fed. Reg. at 31,606. EPA limited its definition of “greenhouse gases” to “the aggregate group of six” chemicals and excluded other chemicals that may also have climate impacts. *Id.* Second, EPA invoked a series of administrative law doctrines to increase the emissions thresholds for GHGs far beyond those of conventional pollutants regulated under the PSD program. *See, e.g., id.* at 31,533 (asserting authority “to depart[] from a literal interpretation of statutory provisions”). As a result of these regulatory thresholds, EPA excluded a significant number of sources from the PSD and Title V permitting programs. While the Supreme Court concluded “that EPA was mistaken in thinking that the [Clean Air] Act *compelled* a greenhouse-gas-inclusive interpretation of the PSD and Title V triggers,” *UARG*, 134 S. Ct. at 2443, it supported the proposition that not all GHG emissions should be regulated. However, the Court indicated thresholds could be justified on *de minimis* grounds rather than the administrative law doctrines on which EPA relied in the Tailoring Rule. *Id.* at 2449 (“We do not hold that 75,000 tons per year CO₂ necessary exceeds a true *de minimis* level, only that EPA must justify its selection on proper terms.”).

EPA’s discretion is further supported by its past practice in other contexts. For example, EPA has long differentiated biogenic CO₂ emissions from fossil fuel CO₂ emissions in its Inventory of U.S. Greenhouse Gas Emissions and Sinks. Likewise, EPA has relied on a variety of administrative law doctrines and other procedures to exclude certain emissions and air pollutants from regulation under the CAA or to distinguish between different types of regulated emissions. The remainder of this section outlines the legal theories and doctrines that EPA could rely upon to exclude biogenic CO₂ emissions from the PSD and Title V permitting programs or, at a minimum, distinguish between biogenic and fossil fuel CO₂ emissions in a manner that recognizes the substantial climate benefits of biomass combustion when compared to fossil fuel alternatives.

⁶ Courts specifically have affirmed EPA’s discretion regarding the timing and approach to the regulation of GHGs following the Court’s decision in *Massachusetts v. EPA*. In rejecting a petition to compel the regulation of GHGs after the *Massachusetts* decision, Judge Tatel observed that “nothing in section 202, the Supreme Court’s decision in *Massachusetts v. EPA*, or our remand order imposes a specific deadline by which EPA must determine whether a particular air pollutant poses a threat to public health or welfare.” *Commonwealth of Massachusetts v. EPA*, No. 03-1361, separate statement of Tatel, J. concurring in part and dissenting in part from denial of petition, June 26, 2008, at 1. Similarly, the Northern District of California also rejected an argument that EPA is compelled to regulate all GHGs following *Massachusetts*. *S.F. Chapter of A. Philip Randolph Inst. v. EPA*, 2008 U.S. Dist. LEXIS 27794 at *10-11 (N.D. Cal. Mar. 28, 2008). Consistent with the D.C. Circuit’s conclusion, the California court recognized that “[t]he Supreme Court was careful not to place a time limit on the EPA, and indeed did not even reach the question whether an endangerment finding had to be made at all.”

A. Exclusion of *De Minimis* Emissions

When establishing PSD regulations, EPA has routinely exercised its discretion to avoid bringing certain air pollutants within the reach of the PSD program. In *Alabama Power Co. v. Costle*, 636 F.2d 323, 400 (D.C. Cir. 1979), the D.C. Circuit recognized EPA's discretion, in administering the CAA's provision requiring PSD review for any "modification" of a major emitting facility, "to exempt from PSD review some emission increases on grounds of *de minimis* or administrative necessity." The Court explained that such an exemption was justified when regulation would "yield a gain of trivial or no value." *Id.* at 361.

Invoking similar grounds, EPA has limited PSD permitting to those pollutants that are "subject to regulation" under the CAA, although the statute states that the PSD permitting requirements should apply to "any pollutant." *See Alabama Power*, 636 F.2d at 352 n.57. Likewise, even though the CAA may be read to require PSD permitting for any change to a major source that increases emissions of any air pollutant by any amount, *see* CAA §§ 111(a)(4), 169(2)(C), EPA has limited the permitting requirements to modifications that result in a "significant" net increase in actual emissions. *See* 40 C.F.R. §§ 52.21(b)(2)(i), 52.21(i); *see also United States v. DTE Energy Co.*, 711 F.3d 643, 645 (6th Cir. 2013).⁷ For example, carbon monoxide emissions increases of up to 99 tons per year are considered insignificant (or *de minimis*) under EPA's implementing regulations. 40 C.F.R. § 52.21(b)(23)(i); *see also* 45 Fed. Reg. 52,676, 52,705-09 (Aug. 7, 1980) (setting significance levels for PSD permitting programs based on *de minimis* exception). Thus, EPA has a long-standing policy of applying the *de minimis* doctrine to exclude from regulation under the PSD and Title V permitting programs those sources whose emissions increases are deemed insignificant from an air quality perspective, despite the fact that the literal language of the CAA requires permits for *any* emissions increase. *See* 40 C.F.R. § 52.21(b)(23)(i) and (j)(2); 45 Fed. Reg. at 52,722; *Alabama Power*, 636 F.2d at 405.⁸

More recently, the Supreme Court, in *Utility Air Regulatory Group v. EPA*, 134 S. Ct. 2427 (2014), further bolstered EPA's authority to rely on *de minimis* principles to exclude certain air pollutants or sources from regulation under the Clean Air Act. The Court noted that "[i]t is plain as day that the [Clean Air] Act does not envision an elaborate, burdensome permitting process for major emitters of steam, oxygen, or other harmless airborne substances." *Id.* at 2440. The Court then rejected EPA's argument that it was compelled by the plain language of the Clean Air Act to subject stationary sources to PSD and Title V permitting obligations based solely on their emission of GHGs. *Id.* at 2442. However, after affirming EPA's authority to regulate GHG emissions from stationary sources that triggered PSD

⁷ Relying on a similar legal theory, EPA has also excluded routine maintenance, repair, and replacement ("RMRR") from triggering New Source Review program requirements. *See Wisconsin Electric Power Co. v. Reilly*, 893 F.2d 901, 905 (7th Cir. 1990) (EPA adopted exclusion for RMRR to avoid regulating "the most trivial activities"); *see also* 40 C.F.R. parts 51-52.

⁸ In addition, the *Chevron* decision also addressed EPA's discretion to define the scope of CAA permitting programs, overturning the D.C. Circuit decision that failed to defer to EPA's interpretation of what constitutes a "stationary source" subject to special permitting conditions in nonattainment areas. *Chevron, U.S.A., Inc. v. NRDC*, 467 U.S. 837, 841-42 (1984).

permitting obligations for other pollutants, the Court confirmed that the *de minimis* doctrine applied to EPA’s regulation of GHG emissions from stationary sources: “EPA may require an ‘anyway’ source to comply with greenhouse-gas BACT only if the source emits more than a *de minimis* amount of greenhouse gases. . . . EPA may establish an appropriate *de minimis* threshold below which BACT is not required for a source’s greenhouse gas emissions.” *Id.* at 2449. Plainly then, the Court has permitted—if not directed—EPA to exclude certain GHG emissions from regulation under the Clean Air Act if they satisfy *de minimis* principles.

EPA would be justified in applying a *de minimis* exception for biogenic CO₂ emissions. As explained above, CO₂ emissions from the combustion of biomass are part of the natural carbon cycle and, as a result, do not result in any net increase in atmospheric CO₂ concentrations.⁹ Thus, as long as forest carbon stocks are stable or increasing and carbon sequestration is sufficient to offset biogenic CO₂ emissions, the emissions associated with biomass energy can be considered insignificant or *de minimis* from a climate perspective.

B. Exclusion of Individual Constituents from Pollutant Categories

In cases where EPA defines and regulates a category of pollutants—as it has done for GHGs—the Agency has repeatedly exercised its discretion by distinguishing between individual constituents and excluding those that have negligible environmental impacts. For example, EPA excludes emissions of certain volatile organic compounds (“VOCs”) from otherwise applicable PSD permitting requirements. *See* 40 C.F.R. § 51.100(s); *see also* 40 C.F.R. §§ 52.21(b)(2)(ii) and 52.21(b)(30). Despite the fact that these compounds are both “volatile” and “organic” and, therefore, meet EPA’s definition of VOCs, they are excluded from regulation because they do not cause environmental impacts. *See* 40 C.F.R. § 51.100(d); 57 Fed. Reg. 3,941, 3,943-44 (Feb. 3, 1992) (disagreeing with comment that definition exceeded EPA’s statutory authority and asserting that “it is an administrative necessity and reasonable to define VOC to include all organic compounds except those EPA has determined to be negligibly reactive”). Notably, EPA has excluded these volatile organics from the PSD permitting program and other CAA regulations, not based on an analysis of their direct effects on human health and welfare, but rather based on their lack of contribution, once emitted and mixed with other gases in the environment, to the formation of ground-level ozone through photooxidation.

Likewise, EPA has distinguished among different categories of particulate matter (“PM”) based on differences in environmental and public health impacts. *See Alabama Power*, 636 F.2d at 369 n.131 (“EPA has discretion to define the pollutant termed ‘particulate matter’ to exclude particulates of a size or composition determined not to present substantial public health or welfare concerns.”). Thus, EPA has distinguished between fine and coarse PM and established distinct significance levels for particulate matter smaller than 10 microns in diameter and smaller than 2.5 microns in diameter based on the particle size’s impact on public health. 40 C.F.R. § 52.21(b)(23)(i).

⁹ Likewise, CO₂ emissions from fermentation of biomass or from microbial treatment of wastewater containing bio-materials are part of the natural carbon cycle and, hence, do not result in a net increase in atmospheric CO₂ concentrations.

In addition, EPA has already relied on this regulatory approach to limit the GHGs that are subject to regulation under the CAA. In the Tailoring Rule and other GHG regulations, EPA exercised its discretion to limit the scope and reach of its GHG regulations by specifically defining the pollutants that qualify as “greenhouse gases.” EPA chose to limit its definition of “greenhouse gases” to “the aggregate group of six” specified chemicals and excluded other chemicals that also have climate impacts. *See* 75 Fed. Reg. 25,324, 25,397 (May 7, 2010) (identifying the six compounds as “the primary greenhouse gases of concern”); *id.* at 25,398-99 (describing those six compounds as a “single air pollutant”). EPA limited the pollutant GHG to these six compounds despite its findings that they only account for 75% of total anthropogenic heating. 74 Fed. Reg. at 66,517, 66,520 (excluding other gases because they are not thought to be a primary driver of radiative heating, or because their climate impact is unknown). Further, after identifying these six compounds as the single pollutant, GHGs, EPA only elected to regulate emissions of four of the six compounds in the light-duty vehicle rule. *Id.* at 25,396-97. Likewise, in the proposed NSPS rule for power plants, EPA asserts that it is regulating the air pollutant GHGs, but is only establishing emissions limits for a single compound, CO₂. 79 Fed. Reg. 1430, 1455 (“The fact that we are not regulating the other five GHGs does not mean that we are required to identify the air pollution as CO₂ alone rather than the mix of six GHGs.”).

This existing precedent under the CAA—and specifically with respect to GHGs—establishes EPA’s regulatory authority to differentiate between certain compounds and exclude some from regulation based on different environmental and public health impacts. As a result, EPA could exercise its discretion to amend its existing regulations to differentiate or exclude from regulation biogenic CO₂ emissions. For example, as it did in the light-duty vehicle rule and the proposed NSPS for power plants, EPA could simply exclude biogenic CO₂ emissions, even though they may technically fall within the broad definition of GHGs. EPA could also redefine its regulatory definition of “greenhouse gases,” to exclude biogenic CO₂ emissions based on the conclusion that biogenic CO₂ emissions do not increase net atmospheric CO₂ concentrations. EPA could also amend its Endangerment Finding to explicitly exclude biogenic CO₂ emissions based on the conclusion that simultaneous carbon sequestration in working forests mitigates any climate impacts associated with biogenic CO₂ emissions¹⁰ In fact, in his concurring opinion in *CBD v. EPA*, discussed *infra*, Judge Kavanaugh suggested that EPA could presumably exclude biogenic CO₂ emissions by “tinker[ing] with the Endangerment Finding.” *CBD*, 722 F.3d at 413 n.1 (Kavanaugh, J. concurring).

C. Distinguishing Among GHGs Based on Global Warming Potential

In the Tailoring Rule, EPA based PSD applicability for GHG emissions on an artificial, calculated emission rate—carbon dioxide equivalents (“CO₂e”)—that takes into account the

¹⁰ Alternatively, EPA’s determination that motor vehicle emissions contribute to endangerment of public health and welfare could be interpreted to exclude biogenic CO₂ emissions. The Endangerment Finding was based primarily on the IPCC Fourth Assessment Report of 2007 and EPA’s annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, both of which exclude biogenic CO₂ emissions from Energy Sector emissions expressly on the basis of their carbon neutrality. 75 Fed. Reg. at 66,510; 66,537; *see also supra* n.3. Thus, EPA never explicitly considered whether biogenic CO₂ emissions contribute to that endangerment in light of their role in the carbon cycle. As a result, EPA could now reasonably conclude that biogenic CO₂ is not among the air pollutants covered by its endangerment determination.

different global warming potential (“GWP”) of different components of the regulated pollutant “greenhouse gases.” See 40 C.F.R. §§ 52.21(b)(49)(ii)-(v); 75 Fed. Reg. at 31,522. Thus, under current PSD regulations a new source could emit 25 times more CO₂ without obtaining a PSD permit than it could methane. See 40 C.F.R. §§ 52.21(b)(49)(ii) and 40 C.F.R. pt. 98 subpt. A Table A-1. This deviation from a literal application of the statutory PSD provisions is not based on EPA’s GHG regulations for light-duty vehicles, since those rules set separate emission standards for CO₂, methane, and nitrous oxide, and do not involve aggregating emissions of the three compounds or applying weighting factors. See 75 Fed. Reg. at 25,421. Rather, EPA implemented the GWP weighting factors specifically for stationary sources in order to determine whether a new or modified source will require a PSD permit in recognition that emissions of the same annual quantity of different “greenhouse gases” can have very different potential impacts on climate change.¹¹ See 75 Fed. Reg. at 31,531 (using CO₂e, which incorporates global warming potential weighting factors, for determining PSD applicability “best addresses the relevant environmental endpoint”); *id.* at 31,531-32 (rejecting comment that EPA has no discretion to depart from actual annual mass emissions in determining PSD applicability).

EPA could employ similar discretion in the PSD permitting program to distinguish between the global warming potential of biogenic and fossil CO₂ emissions, given that biogenic emissions in the United States do not increase net atmospheric CO₂ and serve to offset the utilization of fossil fuels for combustion.¹² Thus, by applying a GWP of zero to biogenic CO₂ emissions, EPA could effectively exclude biogenic CO₂ emissions from regulation under the PSD permitting program. EPA has discretion to recognize the readily apparent benefits of substituting a carbon neutral fuel for one that releases carbon which may have been stored, and would otherwise remain stored, for millions of years. Such discretion is further supported by past practice; EPA has long differentiated biogenic emissions from fossil fuel emissions in its Inventory of U.S. Greenhouse Gas Emissions and Sinks and in other regulations. See 40 C.F.R. § 98.2(b)(2) (excluding biogenic CO₂ emissions from calculation of thresholds for determining which facilities are required to report GHG emissions).¹³ Alternatively, even if EPA concluded that a complete exclusion for biogenic CO₂ emissions was unwarranted, it could apply a smaller GWP to biogenic CO₂ emissions to distinguish between the climate impacts of biogenic and fossil CO₂ emissions in the PSD and Title V permitting programs.¹⁴

¹¹ EPA’s use of CO₂e and GWP is consistent with EPA’s practice under the annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* and with international practice under the Intergovernmental Panel on Climate Change.

¹² EPA has described the “air pollutant” that it is seeking to regulate as the flow of GHGs that changes the total, cumulative stock of greenhouse gases in the atmosphere. 74 Fed. Reg. at 66,536. It would therefore be appropriate for EPA to recognize in the PSD regulations that biogenic CO₂ emissions, which return to the atmosphere CO₂ that was recently removed from the atmosphere in the production of the biomass fuel, and that will be removed again through photosynthesis to replace that biomass, do not add to the total, cumulative stock of GHGs in the atmosphere and therefore represent a net flow of zero.

¹³ See also, NAFO’s submission on EPA’s Call for Information at 3-4; EPA, DRAFT *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012* (Feb. 21, 2014).

¹⁴ Applying a smaller GWP for biogenic CO₂ emissions from forest stocks may also be warranted if, at some future time, carbon stocks are no longer stable or increasing and EPA seeks to account for the incremental effect of the partial, rather than complete, offsetting of biogenic CO₂ emissions through sequestration.

D. Applying Sector-Based Emissions Thresholds Under The Tailoring Rule

In the Tailoring Rule, EPA relied on three administrative law doctrines—absurd results, administrative necessity, and one-step-at-a-time—to adjust the PSD and Title V emissions thresholds for GHGs. EPA reasoned that applying PSD and Title V permitting requirements at the relatively low statutory levels intended for criteria pollutants would, in the context of GHGs, place excessive burdens on small sources and on the state and local permitting authorities that implement these permitting programs. *See, e.g.*, 75 Fed. Reg. at 31,517. Instead, EPA adopted a phased-in approach that would begin by regulating the largest emitting sources and potentially adjust the permitting thresholds downward as state and local permitting authorities gained the experience and capacity to process larger quantities of permits. By focusing the phased-in permitting program on the largest sources, EPA explained that it would “direct limited administrative resources to those new sources with the greatest impact on GHG emissions.” *Id.* at 31,529; *see also id.* at 31,531 (addressing “sources and modifications that have the greatest impact on radiative forcing of the GHGs emitted”).

Although EPA did not consider making adjustments in the Tailoring Rule based on the source of the emissions, *id.* at 31,591, it suggested that it would consider source-based adjustments in future rulemakings that would occur under the Tailoring Rule’s phased-in approach. *See, e.g., id.* at 31,516, 31,524, 31,525, 31,590-91. In a future rulemaking under the Tailoring Rule, EPA could justify source-specific regulations for biomass combustion facilities based on the conclusion that biogenic CO₂ emissions are part of the natural carbon cycle and, therefore, are different than fossil fuel emissions. In fact, EPA specifically addressed this possibility in the Tailoring Rule:

[T]he decision not to provide this type of an exclusion [for biogenic emissions] at this time does not foreclose EPA’s ability to either (1) provide this type of an exclusion at a later time when we have additional information about an overwhelming permitting burdens due to biomass sources, or (2) provide another type of exclusion or other treatment based on some other rationale. Although we do not take a final position here, we believe that some commenters’ observations about a different treatment for biomass combustion warrants further exploration as a possible rationale.

Id. at 3,1591. In the event that EPA finds that biogenic CO₂ emissions have a negligible (or even positive) effect on atmospheric CO₂ concentrations, a permanent exclusion may be justified under one or more of the administrative law doctrines that EPA relied upon in issuing the Tailoring Rule. Alternatively, even if EPA determines that a full exclusion is not warranted at this time, it could institute even higher emissions thresholds for biogenic CO₂ emissions in recognition that the combustion of biomass for energy reduces GHG emissions when compared to fossil fuel combustion. Based on such a finding, EPA would be justified in concluding that administrative resources could be better spent by focusing on other sectors where emissions have a greater net effect on radiative forcing. EPA could also conclude that applying the same permitting thresholds to biogenic CO₂ emissions as to emissions of CO₂ from fossil fuels would produce absurd results because it would discourage construction of new sources using biomass

fuel or modification of existing sources to burn biomass fuel, despite the fact that burning fossil fuel accumulates more CO₂ to the global atmosphere.¹⁵

III. The D.C. Circuit Decision in *CBD v. EPA* Does Not Limit EPA’s Discretion to Exclude Biogenic CO₂ Emissions from PSD and Title V Permitting Requirements.

In July 2011, in response to the National Alliance of Forest Owners’ petition for administrative reconsideration, EPA temporarily deferred the applicability of PSD and Title V permitting requirements to biogenic CO₂ emissions so that the Agency could study the climate impact of biogenic CO₂ emissions and determine how such emissions should be permanently treated under the PSD and Title V permitting programs. 76 Fed. Reg. 43,490 (July 20, 2011). In the so-called “Deferral Rule,” EPA invoked the same administrative law doctrines as it did in the Tailoring Rule. *Id.* at 43,496-99. Center for Biological Diversity and other petitioners sought review of the Deferral Rule.

In *CBD*, the D.C. Circuit issued a decision, split three ways, vacating the Deferral Rule. 722 F.3d 401 (D.C. Cir. 2013). The majority’s holding was based on the conclusion that the Deferral Rule’s invocation of various administrative law doctrines was not adequately supported by the rulemaking record. *Id.* at 410 (EPA “failed to explain” why the one-step-at-a-time doctrine applied); *id.* at 411 (EPA “should have explained why it rejected” a potentially less restrictive alternative under the administrative necessity doctrine); *id.* at 412 (finding EPA’s reliance on the absurd results doctrine to be “post hoc”). Significantly, however, none of the three opinions suggested that EPA lacked authority to permanently exclude biogenic CO₂ emissions from the PSD and Title V permitting programs. Two of the opinions suggested that EPA retained the broad authority described above to permanently exclude biogenic CO₂ emissions, provided the Agency justified its decision in the rulemaking record. *Id.* (“leav[ing] for another day the question whether the agency has authority under the Clean Air Act to permanently exempt biogenic carbon dioxide sources from the PSD permitting program”); *id.* at 420 (Henderson, J. dissenting) (recognizing the “availability of a *de minimis* exception” to permanently exclude biogenic CO₂ emissions from PSD and Title V). Even the concurring opinion, which asserted that EPA’s regulatory discretion was limited by the Agency’s prior interpretation of its CAA authority, suggested that EPA retained some limited options to permanently exclude biogenic CO₂ emissions. *Id.* at 413 n.1 (Kavanaugh, J., concurring) (suggesting that EPA could exclude biogenic CO₂ emissions by amending its Endangerment Finding). Thus, while the Deferral Rule litigation highlighted the importance of providing a compelling legal and factual basis for excluding biogenic CO₂ emissions from regulation, nothing in the decision suggested that EPA was foreclosed from seeking permanent exclusion at the conclusion of its reconsideration process.

¹⁵ Because fossil fuels typically have higher heat value than biomass fuels, conversion from fossil fuel to biomass usually would result in an increase in the mass of CO₂ emissions, despite the fact that it would reduce the accumulation of CO₂ in the atmosphere. Also, because the equipment to burn biomass fuels often is more costly than for fossil fuels, and the pollution control costs for non-GHG pollutants may be comparable or greater, applying the same permitting requirements to both types of fuels reduces the incentive for sources to choose the biomass fuel route.

IV. Summary of the Factual Bases for Differentiating Biogenic CO₂ Emissions from Other GHG Emissions in CAA Permitting

While EPA has clear legal authority to exclude biogenic CO₂ emissions from the PSD and Title V permitting programs, there is also an extensive technical and factual record supporting a decision to differentiate biogenic CO₂ emissions from fossil fuel GHG emissions. This Section demonstrates that there is ample scientific support in the existing record before the Agency to support a regulation both excluding biogenic CO₂ emissions from the PSD and Title V permitting programs and supporting a distinction between biomass and other fuels. First and foremost, there is scientific consensus that, because it is part of the natural carbon cycle, biogenic carbon is fundamentally different than fossil carbon. Thus, when forests are managed sustainably, biogenic CO₂ emissions are balanced by carbon sequestered during regrowth. Relying on this scientific premise, studies repeatedly show that combusting biomass for energy offers substantial GHG mitigation benefits when compared to fossil fuel alternatives. Second, there is strong evidence that forests are currently being managed sustainably and will be for the foreseeable future. Thus, when forest carbon stocks are evaluated over appropriate time and spatial scales, there is ample support for the proposition that forests are capable of meeting increased demand without reducing overall forest carbon stocks. This section and annotated bibliography will address in turn the key principles needed to support an exclusion for biogenic CO₂ emissions based on the record that is presently before EPA.¹⁶

- A. Because they are part of the forest carbon cycle, CO₂ emissions from the combustion of biomass are offset by carbon sequestration during regrowth.

It is well-established that all wood products—including biomass combusted for energy—are part of the natural forest carbon cycle. CO₂ is sequestered in forests through photosynthesis and emitted through decomposition and combustion. Thus, as long as forests are managed sustainably and forest carbon stocks remain stable (or increase) over time, biomass energy and other parts of the forest products sector do not increase net atmospheric GHG concentrations. In contrast, CO₂ emissions from fossil fuel combustion permanently increase atmospheric GHG concentrations because they release carbon that has been geologically stored for millennia. Active, sustainable management of forested lands provide a number of distinct climate change mitigation benefits which serve to reduce net GHG emissions over time: (1) durable forest products such as lumber used in construction continue to store carbon for decades after harvest, (2) manufacturing forest products is much less carbon intensive than alternative products such as concrete or steel, and (3) biomass used for energy can directly displace fossil fuel emissions over multiple harvest cycles. These scientific principles have been affirmed by the Science Advisory Board and many other qualified experts:

¹⁶ The articles and studies cited in this section comprise only a portion of the literature that supports differential treatment of biomass emissions. The vast majority of the material presented here has already been submitted to EPA and/or the EPA Science Advisory Board in prior comments and thus is already part of the administrative record. NAFO has included a few more recent articles that provide further support for differential treatment for biomass emissions. Further, virtually all of these articles and studies are either published in peer-reviewed journals or are publicly available and accessible by EPA. NAFO is willing to provide EPA with copies of any materials cited here that are not readily available to the Agency for review.

- Science Advisory Board, *Review of EPA's Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources* at 7, EPA-SAB-12-011 (Sept. 22, 2012) (concluding that “[t]here are circumstances under which biomass is grown, harvested, and combusted in a carbon neutral fashion”).
- Lippke, B., *et al.*, Letter from 113 Scientists to Sen. Boxer and Rep. Waxman (July 20, 2010) (explaining that biomass combustion does not increase net atmospheric CO₂ concentrations because “carbon dioxide released from the combustion or decay of woody biomass is part of the global cycle of biogenic carbon”).
- Martin, R.M., *Deforestation, land-use change and REDD*, *Unasylva* 59(230): 3-11 (2008) (“If the land is encouraged or allowed to regenerate a new forest, the ecosystem effect of harvesting is carbon neutral. . . . The atmospheric effect becomes problematic if the cycle is broken and the land is converted to another use.”).
- Lippke, B., *et al.*, CORRIM, *Life-cycle Environmental Performance of Renewable Building Materials*, *Forest Prod. J.*, 54: 8 (2004) (highlighting climate benefits of using wood products as substitutes for other materials that have larger carbon footprints).
- Miner, R., NCASI, *Biomass Carbon Neutrality* (Apr. 15, 2010), available at <http://www.nafoalliance.org/wp-content/uploads/NCASI-Biomass-carbon-neutrality.pdf> (explaining that biomass is carbon neutral due to its role in the carbon cycle and that additional climate benefits occur over each management cycle as additional carbon sequestration occurs through regrowth).
- Lattimore, B. *et al.*, *Environmental Factors in woodfuel production: Opportunities, risks, and criteria and indicators for sustainable practices and utilization*, *Biomass and Energy*, 33: 1321-42 (2009) (explaining that biomass energy from sustainably managed forests is carbon neutral).
- Cherubini, F., *GHG balances of bioenergy systems – Overview of key steps in the production chain and methodological concerns*, *Renewable Energy* 35: 1565-73 (2010) (“When biomass is combusted, the resulting CO₂ is not counted for a GHG because C has a biological origin and combustion of biomass releases almost the same amount of CO₂ as was captured by the plant during its growth.”).
- Gower, S., *Patterns and mechanisms of the forest carbon cycle*, *Annual Review of Environment and Resources* 28: 169-204 (2003) (“The CO₂ emitted when wood and paper waste is burned is equivalent to the atmospheric CO₂ that was sequestered by the tree during growth and transformed into organic carbon compounds; hence there is no net contribution to the atmospheric CO₂ concentration; and the material is considered C neutral.”).
- Sedjo, R.A., *Biomass: Short-Term Drawbacks, But Long-Term Climate Benefits*, *The Energy Daily* (Sept. 20, 2010) (concluding that unlike fossil fuel emissions, biogenic CO₂ emissions have no net impact on atmospheric GHG concentrations).

- Bowyer, J., *et al.*, *Life Cycle Impacts of Forest Management and Bioenergy Production* 1-13 (July 2011), *available at* <http://www.dovetailinc.org/files/DovetailLCABioenergy0711.pdf> (finding that sustainably managed forest are better than carbon neutral when regeneration, displacement of fossil fuels, and long-term carbon storage in durable forest products is considered)
- Sedjo, R, *Carbon Neutrality and Bioenergy: A Zero-Sum Game?*, Resources for the Future Discussion Paper 1-9 (Apr. 2011), *available at* <http://www.rff.org/documents/RFF-DP-11-15.pdf> (concluding that there are no net CO₂ emissions from biomass energy as long as forest carbon stocks are stable or increasing because CO₂ emissions will be offset entirely by carbon sequestration).
- Lippke, B., *et al.*, *Life cycle impacts of forest management & wood utilization on carbon mitigation: knowns and unknowns*, *Carbon Management* 2(3): 303-33 (2011) (concluding that combustion of biomass for energy produces no net CO₂ emissions as long as forest carbon stocks are stable or increasing).
- Malmshimer, R.W., *et al.*, *Managing Forests Because Carbon Matters: Integrating Energy, Products, and Land Management Policy*, *Journal of Forestry* 109(7S) (2011) (concluding that there will be no net CO₂ emissions from biomass energy as long as forest carbon stocks are stable or increasing because emissions will be offset entirely by carbon sequestration).
- Fargione, J., *et al.*, *Land clearing and the biofuel carbon debt*, *Science* 319: 1235-38 (2008) (“[B]iofuels made from waste biomass or from biomass grown on degraded and abandoned agricultural lands planted with perennials incur little or no carbon debt and can offer immediate and sustained GHG advantages.”).
- Lippke, B. and E. Oneil, CORRIM, *Unintended Consequences of the Proposed EPA Tailoring Rule Treatment of Biomass Emissions the Same as Fossil Fuel Emissions* (2010) (“Life cycle research results accumulated over the last decade . . . demonstrate that the emissions from burning biomass for energy are being offset by the sustained growth in forest carbon.”).

B. Scientific studies have repeatedly shown that biomass combustion for energy results in significant GHG emissions reductions when compared to fossil fuel alternatives.

Over the past 20 years scientific studies evaluating biomass energy have consistently found significantly lower net GHG emissions when compared to fossil fuel combustion. In particular, a number of recent studies focused directly on the question of carbon neutrality have determined that there are no net CO₂ emissions from woody biomass as long as forests are managed sustainably. Other studies—including a number of life cycle analyses—have attempted to quantify in absolute terms the GHG mitigation benefit of substituting biomass energy for fossil fuels. These studies also identify substantial reductions in GHG emissions, but do not directly answer the question whether biomass combustion for energy results in any net CO₂

emissions. However, these studies consistently conclude that active forest management focused on supplying forests products and biomass energy produces the greatest GHG mitigation benefits from forested lands. While many life cycle analyses show small net GHG emissions from biomass energy, they include certain emissions sources, such as those associated with the harvest and transport of biomass feedstocks, that should be excluded when considering net CO₂ emissions for purposes of PSD and Title V permitting under the Clean Air Act. *See* Science Advisory Board, *Review of EPA's Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources* at 7, EPA-SAB-12-011 (Sept. 22, 2012) (“While EPA’s primary goal is to account for this offsetting sequestration, its biogenic emission accounting should be consistent with emissions accounting for fossil fuels for other emissions accounting categories—including losses, international leakage, and fossil fuel use during feedstock extraction, production and transport. Including some emissions accounting elements for biomass and not for fossil fuels would be a policy decision without the underling science to support it.”).

- Schlamadinger, B., *et al.*, *Towards a standard methodology for greenhouse gas balances of bioenergy systems in comparison with fossil energy systems*, *Biomass and Bioenergy* 13(6): 359-75 (1997) (finding that biomass-based fuels produce climate benefits when compared to fossil fuels).
- Abbasi, T. and S. Abbasi, *Biomass energy and the environmental impacts associated with its production and utilization*, *Renewable and Sustainable Energy Reviews* 14: 919-37 (2010) (finding that biomass-based fuels produce climate benefits when compared to fossil fuels).
- Froese, R.E., *et al.*, *An evaluation of greenhouse gas mitigation options for coal-fired power plants in the U.S. Great Lakes States*, *Biomass and Bioenergy* 34: 251-62 (2010) (finding that, in the Great Lakes region, co-firing 20% forest residuals in coal-fired power plant reduced GHG emissions by 20%).
- DOE, *Ethanol Benefits*, available at <http://www.afdc.energy.gov/afdc/ethanol/benefits.html> (“Cellulosic ethanol would reduce GHGs by as much as 86%.”).
- EPA, *Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, Final Rule*, 75 Fed. Reg. 14,670 (Mar. 26, 2010) (finding that cellulosic ethanol reduces lifecycle GHG emissions by more than 60% when compared to conventional fuels).
- EPA, *Renewable Fuel Standard Program, Draft Regulatory Impact Analysis* at 191 (Sept. 2006), EPA420-D-06-008 (finding that cellulosic ethanol reduces lifecycle GHG emissions by 92.7% when compared to conventional fuels).
- Mann, M.K. and P.L. Spath, *A life cycle assessment of biomass cofiring in a coal-fired power plant*, *Clean Production Processes* 3: 81-91 (2001) (finding that cofiring 15% wood residuals in coal-fired power plant reduced GHG emissions by 18.4%).

- Robinson, A.L., *et al.*, *Assessment of potential carbon dioxide reductions due to biomass – Coal cofiring in the United States*, *Environmental Science and Technology* 37(22): 5081-89 (2003) (concluding that cofiring forestry and agricultural residuals with coal reduce CO2 emissions by as much as 95% when compared to fossil fuel combustion).
- Pehnt, M., *Dynamic life cycle assessment (LCA) of renewable energy technologies*, *Renewable Energy* 31: 55-71 (2006) (finding that combustion of biomass feedstocks such as forest wood, short rotation forestry wood, and waste wood for energy could reduce life cycle GHG emissions by between 85 and 95% when compared to fossil fuels).
- Cherubini, F., *et al.*, *Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: Key issues, ranges and recommendations*, *Resources, Conservation, and Recycling* 53: 434-47 (2009) (finding that combustion of forestry residuals for energy reduce life cycle GHG reductions by between 90 and 95%).
- Zhang, Y., *et al.*, *Life cycle emissions and cost of producing electricity from coal, natural gas, and wood pellets in Ontario Canada*, *Environmental Science and Technology* 44(1): 538-44 (2010) (finding that combustion of wood harvest specifically for energy production reduced lifecycle GHG emissions by 91% relative to coal and by 78% relative to natural gas).
- Raymer, A.K.P., *A comparison of avoided greenhouse gas emissions when using different kinds of wood energy*, *Biomass and Bioenergy* 30: 605-17 (2006) (concluding that combustion of biomass feedstocks such as fuel wood, sawdust, wood pellets, demolition wood, briquettes, and bark for energy production reduced lifecycle GHG emissions by between 81 and 98%).
- Heller, M.C., *et al.*, *Life cycle energy and environmental benefits of generating electricity from willow biomass*, *Renewable Energy* 29: 1023-42 (2004) (finding that cofiring 10% willow, a short rotation woody biomass feedstock, with coal reduced GHG emissions by 9.9%).
- Heller, M.C., *et al.*, *Life cycle assessment of a willow bioenergy cropping system*, *Biomass and Bioenergy* 25: 147-65 (2003) (finding that cofiring 10% willow, a short rotation woody biomass feedstock, with coal reduced GHG emissions by 9.9%).
- Bowyer, J., *et al.*, *Life Cycle Impacts of Forest Management and Bioenergy Production* 1-13 (July 2011), *available at* <http://www.dovetailinc.org/files/DovetailLCABioenergy0711.pdf> (finding that on a life cycle basis, biomass energy reduces GHG emissions by 96% in comparison to coal).
- Gaudreault, C., *et al.*, *Life cycle greenhouse gases and non-renewable energy benefits of kraft black liquor recovery*, *Biomass and Bioenergy* 46: 683-92 (2012) (finding that combustion of black liquor from Kraft pulping operations for energy reduced lifecycle GHG emissions by 90% relative to coal).

- Hall, D.O., *et al.*, *Alternative roles for biomass in coping with greenhouse gas warming*, *Science & Global Security* 2: 113-51 (1991) (finding that combustion of woody biomass for energy produces substantial GHG benefits over time when used as a substitute for coal).
- Marland, G. and B. Schlamadinger, *Forests for carbon sequestration or fossil fuel substitution: A sensitivity analysis*, *Biomass and Bioenergy* 13: 389-97 (1997) (concluding that the use of woody biomass as a substitute for coal in energy production yields substantial GHG emissions reductions over time).
- Schlamadinger, B. and G. Marland, *The role of forest and bioenergy strategies in the global carbon cycle*, *Biomass and Bioenergy* 13: 275-300 (1996) (concluding that the use of woody biomass as a substitute for coal in energy production yields substantial GHG emissions reductions over time).
- Abt, R.C. *et al.*, Climate Change Policy Partnership, Duke University, *The near-term market and greenhouse gas implications for forest biomass utilization in the Southeastern United States* (2010) (concluding, in a study of forests in the southeastern United States, that the harvest and combustion of biomass for energy “generat[es] net GHG reductions relative to the baseline” when used as a substitute for coal).
- Zanchi, G., *et al.*, *Is woody bioenergy carbon neutral? A comparative assessment of the emissions from consumption of woody bioenergy and fossil fuel*, *GCB Bioenergy* 4: 761-72 (2012) (finding that combustion of biomass for energy produces long-term reductions in cumulative GHG emissions when compared to combustion of fossil fuels)
- Nabuurs, G.J., *et al.*, *Forestry*, Chapter 9 in *Climate change 2007: Mitigation Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, (B. Metz, *et al.*, eds.) (2007) (“In the long-term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest, will generate the largest sustained mitigation benefit.”)
- Ryan, M.G., *et al.*, *A synthesis of the science on forests and carbon for U.S. forests*, *Issues in Ecology* 13: 1-16 (2010) (“[T]he maximum potential benefit from a project that reestablished forest increases if the stand is periodically harvested and the wood is used for substitution and the biomass used for fuel.”)
- Gaudreault, C. and R. Miner, *Greenhouse Gas and Fossil Fuel Reduction Benefits of Using Biomass Manufacturing Residues for Energy Production in Forest Products Manufacturing Facilities*, Technical Bulletin No. 1016, National Council for Air and Stream Improvement (2013) (finding that combustion of mill residuals for energy reduces lifecycle GHG emissions by 86 to 99% when compared to fossil fuels)

- Electric Power Research Institute, *Biopower Generation: Biomass Issues, Fuels, Technologies, and Opportunities for Research, Development, and Deployment* (Feb. 24, 2010), available at <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001020784> (“Direct firing of biomass is the only proven carbon-neutral generation technology that is both suitable for baseload operation and available for immediate deployment to support capacity expansion.”).
- Interlaboratory Working Group, Oak Ridge, TN and Berkeley, CA: Oak Ridge National Laboratory and Lawrence Berkeley National Laboratory, *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy-Efficient and Low-Carbon Technologies by 2010 and Beyond*, ORNL-444 and LBNL-40533 (1997) (concluding that cofiring biomass with fossil fuels was the single largest potential contributor to near-term GHG emissions reduction of any renewable energy strategy).
- Matthews, R. and K. Robertson, EIA Bioenergy Task 38, *Answers to Ten Frequently Asked Questions about Bioenergy, Carbon Sinks and Their Role in Global Climate Change* (2nd ed. 2005), available at www.ieabioenergy-task38.org/publications/faq/ (finding that between 25 and 50 units of bioenergy are produced for every unit of fossil fuel energy consumed in production) (citing Börjesson (1996), Boman and Turnbull (1997), McLaughlin and Walsh (1998), Matthews (2001). and Elsayed *et al.* (2003)).
- Jones, G., *et al.*, *Forest treatment residues for thermal energy compared with disposal by onsite burning: Emissions and energy return*, *Biomass and Bioenergy* 34: 737-46 (2010) (finding that, for forest residues in western Montana, an average of 21 units of bioenergy are produced for every unit of fossil fuel energy consumed in production).
- Walker, T., *et al.*, Manomet Center for Conservation Sciences, *Biomass Sustainability and Carbon Policy Study* (2010) (“All bioenergy technologies, even biomass electric power compared to natural gas electricity, look favorable when biomass waste wood is compared to fossil fuel alternatives.”).
- Heath, L., *et al.*, *Greenhouse gas and carbon profile of the U.S. forest products industry value chain*, *Environmental Science and Technology* 44: 3999-4005 (2010) (explaining that active forest management that produces forest products and biomass energy reduces overall atmospheric GHG concentrations).
- Morris, G., Pacific Institute, *Bioenergy and Greenhouse Gases* (May 15, 2008), available at [http://www.pacinst.org/reports/Bioenergy and Greenhouse Gases/Bioenergy and Greenhouse Gases.pdf](http://www.pacinst.org/reports/Bioenergy%20and%20Greenhouse%20Gases/Bioenergy%20and%20Greenhouse%20Gases.pdf) (finding that the California biomass energy industry produces significant GHG emission reduction benefits by displacing fossil CO₂ emissions from energy production and by avoiding GHG emissions otherwise associated with alternative disposal options for biomass).

- Werner, F., *et al.*, *National and global greenhouse gas dynamics of different forest management and wood use scenarios: A model based assessment*, *Environmental Science and Policy* 13: 72-85 (2010) (finding that the contributions of the forestry and timber sector to mitigate climate change can be optimized when sustainable harvests are maximized and harvested wood is processed in accordance with the principles of cascade use including the use of “waste wood” residues to generate energy).

C. Net CO₂ emissions from biomass energy must be evaluated over broad spatial and time scales.

Accounting for net CO₂ emissions from biomass energy is scale-dependent, and much of the controversy surrounding biogenic CO₂ emissions has arisen from studies relying on inappropriate spatial and time scales. This is particularly true for forest-based biomass, which is managed on longer rotation cycles. With respect to spatial scales, studies repeatedly demonstrate that a broad, landscape-based approach is necessary to account for the harvest and regrowth that happen simultaneously in different stands over time. Moreover, such an approach is consistent with the spatial scales over which working forests are managed. Likewise, accounting for net CO₂ emissions from biomass requires a long time scale that captures the longer rotation lengths over which forests are managed. A longer time scale is also consistent with climate science because cumulative net emissions, not near-term annual emissions, will determine peak warming.

- O’Laughlin, J., University of Idaho, College of Natural Resources Policy Analysis Group Report No. 31, *Accounting for Greenhouse Gas Emissions from Wood Bioenergy* (Sept. 13, 2010), *available at* <http://www.uidaho.edu/~media/Files/orgs/CNR/PAG/Reports/PAGReport31> (explaining why a landscape-based approach to carbon accounting is required to reflect that emission and sequestration occur simultaneously, while a stand-based accounting approach misses this point).
- Malmshimer, R.W., *et al.*, *Managing Forests Because Carbon Matters: Integrating Energy, Products, and Land Management Policy*, *Journal of Forestry* 109(7S) (2011) (explaining that bioenergy offers long-term GHG reduction benefits compared to continued sequestration because forest carbon stocks will eventually reach equilibrium, while bioenergy production continually displaces fossil fuel emissions).
- Lippke, B., *et al.*, *Life cycle impacts of forest management & wood utilization on carbon mitigation: knowns and unknowns*, *Carbon Management* 2(3): 303-33 (2011) (explaining that bioenergy offers long-term GHG reduction benefits compared to continued sequestration because forest carbon stocks will eventually reach equilibrium, while bioenergy production continually displaces fossil fuel emissions).
- Sedjo, R. *Carbon Neutrality and Bioenergy: A Zero-Sum Game?*, *Resources for the Future Discussion Paper* 1-9 (Apr. 2011), *available at* <http://www.rff.org/documents/RFF-DP-11-15.pdf> (explaining that a broad, landscape-based spatial scale for carbon accounting is necessary to appropriately reflect the simultaneous regrowth and harvest that take place on individual stands of forested land).

- Strauss, W., *How Manomet got it backwards: Challenging the “debt-then-dividend” axiom* (May 2011), available at <http://www.futuremetrics.net/papers/Manomet%20Got%20it%20Backwards.pdf> (explaining that a broad, landscape-based spatial scale for carbon accounting is necessary to appropriately reflect the simultaneous regrowth and harvest that take place on individual stands of forested land).
- Bowyer, J., et al., Dovetail Partners, *Carbon 101: Understanding the Carbon Cycle and the Forest Carbon Debate* (Jan. 2012), available at <http://www.dovetailinc.org/files/DovetailCarbon101Jan2012.pdf> (explaining that a broad landscape-based spatial scale demonstrates that overall forest carbon stocks remain stable when harvests take place at different times on different forest stands).
- Lucier, A., National Council for Air and Stream Improvement, Inc., *NCASI Review of Manomet Biomass Study*, (2010), available at <http://www.mass.gov/Eoeea/docs/doer/renewables/biomass/study-comments/lucier.pdf> (explaining that stand-based carbon accounting approaches fail to reflect the simultaneous harvest and regrowth that occurs across a sustainably-managed forested landscape).
- Galik, C.S. and R.C. Abt, *The Effect of Assessment Scale and Metric Selection on the Greenhouse Gas Benefits of Woody Biomass*, *Biomass & Bioenergy*, 44: 1-7 (2012) (concluding that “state, procurement area, and landowner assessment scales most closely approximate the actual GHG emission implications” of biomass energy).
- Meinshausen, M., et al., *Greenhouse-gas emission targets for limiting global warming to 2°C*, *Nature* 248: 1158-62 (2009) (concluding that a long time frame is appropriate to assess climate impacts of alternative GHG emission scenarios because cumulative net emissions, rather than near-term annual emissions, will determine peak warming).
- Allen, M., et al., *Warming caused by cumulative carbon emissions: Toward the trillionth ton*, *Nature* 458: 1163-66 (2009) (concluding that a long time frame is appropriate to assess climate impacts of alternative GHG emission scenarios because cumulative net emissions, rather than near-term annual emissions, will determine peak warming).
- Helin, T., et al., *Approaches for inclusion of forest carbon cycle in life cycle assessment – a review*, *GCB Bioenergy* 5: 475-86 (2013) (concluding that the climate effects of biogenic CO₂ emissions are best characterized by analyzing cumulative radiative forcing over 100-year period).
- Ryan, M.G., et al., *A synthesis of the science on forests and carbon for U.S. forests*, *Issues in Ecology* 13: 1-16 (2010) (explaining that GHGs are global pollutants with centuries-long effective lifespans and, therefore, must be analyzed over long periods of time and large areas).
- Nechodom, M., U.S. Department of Agriculture, U.S. Forest Service, Pacific Southwest Research Station, *Biomass to Energy: Forest Management for Wildlife Reduction, Energy*

Production, And Other Benefits, CEC-500-2009-080 (modeling forest vegetation growth over 40-year period in assessment of biomass energy)

- Miner, R., National Council for Air and Stream Improvement, Inc., *Biomass Carbon Neutrality* (Apr. 15, 2010), available at <http://www.nafoalliance.org/wp-content/uploads/NCASI-Biomass-carbon-neutrality.pdf> (explaining that a landscape-based approach is necessary for carbon accounting because the emissions from harvesting certain forest stands are offset by the sequestration of carbon through new growth in other stands that will be harvested in the future).
- Lippke, B. & E. Oneil, CORRIM, *Unintended Consequences of the Proposed EPA Tailoring Rule Treatment of Biomass Emissions the Same as Fossil Fuel Emissions* (2010), available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.189.3736&rep=rep1&type=pdf> (explaining that when forests are managed sustainably, carbon neutrality is observed at the stand level over multiple rotations, and at the landscape level at any given point in time).

D. Forest carbon stocks are stable or increasing across the United States.

Stability in forest carbon stocks is an essential prerequisite for establishing that biogenic CO₂ emissions do not increase net atmospheric CO₂ concentrations. If forests are converted to other land uses after harvest, the forest carbon cycle is broken. Thus, while some stand-based changes are inevitable, given urban development and other external pressures, it is essential to ensure that, at a broader landscape level, forest carbon stocks are not depleted as a result of biomass energy. Whether viewed nationally, or on a regional basis, studies consistently find that forest carbon stocks have remained stable—and in many cases increased significantly—over the past 60 years, and this stability has occurred despite significant increases in demand for forest products. Further, projections by the U.S. Forest Service and others suggest that this stability will continue for decades to come.

- Field, C.B., *Primary production for the biosphere: integrating terrestrial and oceanic components*, *Science* 281: 237-40 (1998) (finding that forests sequester 25-30 billion metric tons of carbon per year).
- Sabine, C.L., *et al.*, *Current status and past trends of the carbon cycle*, in *The global carbon cycle: integrating humans, climate, and the natural world* 17-44 (C.B. Field & M.R. Raupach, eds. 2004) (finding that U.S. forests are a carbon sink).
- Society of American Foresters, *The State of America's Forests* (2007), available at <http://www.safnet.org/publications/americanforests/StateOfAmericasForests.pdf> (noting a 50% increase in forest carbon stocks over second half of the 20th century).
- U.S. Climate Change Science Program and the Subcommittee on Global Change Research, NOAA, *The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle* (King, A.W., *et al.*, eds., 2007) (finding that forests are the largest carbon sink in North America).

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- EPA, 2009 US Inventory of Greenhouse Gas Emissions and Sinks: 1990-2007 (stating that U.S. forests capture 10-15% of annual GHG emissions).
- Haynes, R.W., USDA Forest Service, Pacific Northwest Research Station, *The 2005 RPA timber assessment update*, Gen. Tech. Rep. PNW-GTR-699 (2007) (finding that private forests are a net carbon sink and sequester 131 metric tons of CO₂ per year).
- Heath, L.V., *Greenhouse Gas and Carbon Profile of the U.S. Forest Products Industry Value Chain*, Environmental Science and Technology (2010) (projecting that private forests will continue to be a net carbon sink through at least 2040).
- EPA, 2010 US Inventory of Greenhouse Gas Emissions and Sinks: 1990-2008 (“[I]mproved forest management practices, the regeneration of previously cleared lands, and timber harvesting and use have resulted in net uptake (i.e. net sequestration) of [carbon] each year from 1990 through 2008.”).
- Smith, W., *et al.*, U.S. Department of Agriculture, U.S. Forest Service, *Forest Resources of the United States 2007 – General Technical Report WO-78* (2007) (concluding, based on data from 1980 to 2007, that forest carbon stocks are stable or increasing in the Rocky Mountain, Pacific Coast, South, and North regions, and for the U.S. as a whole).
- Walker, T., *et al.*, Manomet Center for Conservation Sciences, *Biomass Sustainability and Carbon Policy Study* (2010) (finding that forest carbon stocks in New England are increasing).
- Heath, L.S., *et al.*, *Managed Forest Carbon Estimates for the U.S. Greenhouse Gas Inventory, 1990-2008*, *Journal of Forestry* 109(3): 167-73 (2011) (finding that overall forest sequestration is increasing and projecting that forest carbon stocks will remain stable for the foreseeable future).
- Pan, Y., *et al.*, *A Large Persistent Carbon Sink in the World’s Forests*, *Science* 333(6054): 988-93 (Aug. 19, 2011) (reporting that United States forest carbon stocks increased by 33% from 1990 to 2007).
- Bowyer, J., *et al.*, Dovetail Partners, *Carbon 101: Understanding the Carbon Cycle and the Forest Carbon Debate* (Jan. 2012), available at <http://www.dovetailinc.org/files/DovetailCarbon101Jan2012.pdf> (noting that between 1950 and 2010 forest carbon stocks increased nationally and across the North, South, Rocky Mountain, and Pacific Northwest regions).
- *More Parkland for Massachusetts*, *Northern Woodlands* 21 (Summer 2012) (reporting forest carbon stocks in Massachusetts are stable).
- Ince, P.J. and P. Nepal, U.S. Department of Agriculture, U.S. Forest Service, *Effects on U.S. Timber Outlook of Recent Economic Recession, Collapse in Housing, and Wood Energy Trends*, General Technical Report FPL-GTR-219 (Dec. 2012) (projecting that domestic forest carbon stocks will grow through 2060).

- Nepal, P., *et al.*, *Projection of U.S. forest sector carbon sequestration under U.S. and global timber market and wood energy consumption scenarios, 2010-2060*, *Biomass and Bioenergy* 45: 251-64 (2012) (projecting that U.S. forest carbon stocks will increase annually until at least 2045 and will have net growth from current levels until at least 2060).
 - Alavalapati, J.R.R., *et al.*, *Forest Biomass-Based Energy*, in *The Southern Forest Futures Project: technical report*, United States Department of Agriculture (2013) (projecting that increased demand for biomass energy will not reduce forest carbon stocks because increased harvest rates will be offset by increased productivity of fast-growing plantation species).
 - Alvarez, M. *The State of America's Forests*, Society of American Foresters (2007) (finding that the amount of forested land in the United States has been essentially constant since 1900).
 - Birdsey, *et al.*, *Forest carbon management in the United States: 1600-2100*, *Journal of Environmental Quality* 35: 1461-69 (2006) (finding that U.S. forests and forest products have been a consistent carbon sink since at least the early 1950s).
 - The Heinz Center for Science, Economics, and the Environment, *State of the Nations Ecosystem Report* (2008) (“Since 1953, the amount of carbon stored in live trees—the largest carbon pool in forests reported here—has increased by 43%.”).
 - Lippke, B., *et al.*, Letter from 113 Scientists to Sen. Boxer and Rep. Waxman (July 20, 2010) (explaining that forested acres have been stable for 100 years, while forest carbon stocks have increased by 50%).
 - Forisk Consulting, *Woody Biomass as a Forest Product: Wood Supply and Market Implications* (Oct. 2011) (projecting an adequate supply of woody biomass to meet estimated bioenergy demands through 2022).
 - Forisk Consulting, *Three Realities of Wood Bioenergy and Forest Owners* (2010), available at <http://backup.forisk.com/UserFiles/File/Three%20Realities%20of%20Wood%20Bioenergy%20and%20Forest%20Owners%20final.pdf> (“Timber per acre in the US has increased nearly one-third since 1952 and US forest growth has exceeded harvest since the 1940s.”).
- E. Increased demand for biomass energy feedstocks will not deplete forest carbon stocks.

Despite the stability in forest carbon stocks over time, some have expressed concern that increased demand for biomass energy will reduce the amount of carbon that would otherwise be stored in forests. However, these concerns are inconsistent with the market factors that influence forest management decisions. Studies have repeatedly found that forest owners will respond to increased demand for biomass energy (or any other forest product) by increasing production, and

thereby increasing forest carbon stocks. In the case of biomass energy, such responses can take several forms, including (1) increased consumption of existing harvest residuals, (2) increased productivity through investments in forest management practices, and (3) land use changes such as afforestation, reforestation, or avoided deforestation.

- Science Advisory Board, *Review of EPA's Accounting Framework for Biogenic CO₂ Emissions from Stationary Sources* at 7, EPA-SAB-12-011 (Sept. 22, 2012) (“Some research has shown that when a future demand signal is strong enough, expectations about biomass demand for energy (and thus revenues) can reasonably be expected to produce anticipatory feedstock production changes with associated changes in land management and land use . . .”).
- Nechodom, M., U.S. Department of Agriculture, U.S. Forest Service, Pacific Southwest Research Station, *Biomass to Energy: Forest Management for Wildlife Reduction, Energy Production, And Other Benefits*, CEC-500-2009-080 (Jan. 2010) (finding that the transition from passive to active management can occur without “carbon debt” due to reduced carbon losses from wild fire).
- Zhang, J., *et al.*, U.S. Department of Agriculture, U.S. Forest Service, Pacific Southwest Research Station, *To Manage or Not to Manage: The Role of Silviculture in Sequestering Carbon in the Specter of Climate Change* RMRS-P-61 / (2010) (showing that active forest management increased carbon sequestration and decreased fire-caused mortality).
- Clutter, M., *et al.*, *A Developing Bioenergy Market and its Implications on Forests and Forest Products Markets in the United States* (prepared for NAFO, 2010) available at <http://www.nafoalliance.org/wp-content/uploads/NAFO-Executive-Summary-Clutter-Et-Al-Final.pdf> (concluding that capacity exists to increase forest productivity by as much as 150% in South and Pacific Coast regions in response to increased market demand).
- James, C., *et al.*, *Carbon Sequestration in Californian Forests; Two Case Studies in Managed Watersheds* (2007) available at http://www.spi-ind.com/html/forests_research.cfm (concluding that implementing optimal policy incentives could double the amount of carbon sequestered by forests).
- Wear, D.N. and J.P. Prestemon, *Timber market research, private forests and policy rhetoric*, in *Southern Forest Science: Past, Present, and Future* General Technical Report SRS-75, Southern Research Station, USDA Forest Service, Asheville, NC (H.M. Raucher and K. Johnsen, eds. 2004) (explaining that economic return for forest products creates incentives for private forest stewardship).
- Lubowski, R.N., *et al.*, Economic Research Service, U.S. Department of Agriculture, *Environmental Effects of Agricultural Land-Use Change: The Role of Economics and Policy*, Economics Research Report No. 25, (Aug. 2006) (concluding that in the absence of market incentives, many working forests would be converted to non-forest uses).

- Ince, P.J., *Global Sustainable Timber Supply and Demand*, in *Sustainable Development in the Forest Products Industry*, Chapter 2, 29-41 (2010) (finding positive correlation between markets for forest products, including bioenergy, and annual increases in forest carbon stocks).
- Sedjo, R. *Carbon Neutrality and Bioenergy: A Zero-Sum Game?*, Resources for the Future Discussion Paper 1-9 (Apr. 2011), available at <http://www.rff.org/documents/RFF-DP-11-15.pdf> (explaining that bioenergy contributes to strong markets for forest products and creates incentives for forest owner to invest in forests rather than alternative land uses).
- Innovative Natural Resources Solutions LLC, *Identifying and Implementing Alternatives to Sustain the Wood-Fired Electricity Generating Industry in New Hampshire* (Jan. 2002), available at http://www.inrsllc.com/download/wood_fired_electricity_in_NH.pdf (explaining that biomass energy markets provide incremental value from low-grade forest products and help ensure that forests remain an economically competitive land use option in New Hampshire).
- Kingsley, E., *Importance of Biomass Energy Markets to Forestry: New England's Two Decades of Biomass Energy Experience* (June 2012), available at http://www.usendowment.org/images/Importance_of_Biomass_Energy_Markets_to_Forestry_6.2012.pdf (explaining that biomass energy markets provide incremental value from low-grade forest products and help ensure that forests remain economically competitive with other land uses).
- Maine Forest Service, *Maine Forest Service Assessment of Sustainable Biomass Availability* (July 17, 2008), available at http://www.maine.gov/dacf/mfs/about/state_assessment/downloads/maine_assessment_and_strategy_final.pdf (projecting that forest productivity in Maine could be increased by 88-273% through additional investments in site preparation, planting, competition control, and thinning).
- Sedjo, R. and X. Tian, *Does Wood Bioenergy Increase Carbon Stocks in Forests?*, *Journal of Forestry* 110: 304-11 (2012) (concluding that when "demand [for biomass] is greater than the sustainable harvest of the forest, prices will rise, total forest area will expand to meet the increasing demand, and in the process, will capture and store more carbon").
- Sedjo, R. and B. Sohngen, *Wood as a Major Feedstock for Biofuel Production in the United States: Impacts on Forests and International Trade*, *Journal of Sustainable Forestry* 23: 195-211 (2003) (explaining that strong market signals supporting future demand for forest products will cause forest owners to make anticipatory changes to ensure that the demand will be met).
- Wear, D.N. and J.G. Greis, *The Southern Forest Futures Project: Summary Report* (May 12, 2011), available at http://www.srs.fs.usda.gov/futures/reports/draft/summary_report.pdf (explaining that

strong timber markets (1) encourage landowners to retain forests rather than converting them to other land uses and (2) encourage continued investment in forest management).

- MacCleery, D., *American Forests: A History of Resiliency and Recovery* (1996) (concluding that biomass energy can be an important new market that replaces other markets with declining demand and adds economic value to private forest ownership).
- Alavalapati, J.R.R., *et al.*, *Forest Biomass-Based Energy, in The Southern Forest Futures Project: technical report, United States Department of Agriculture* (2013) (projecting that under high biomass energy demand scenarios forest owners will increase productivity and expand the number of forested acres to meet demand).
- Daigneault, A., *et al.*, *Economic approach to assess the forest carbon implications of biomass energy*, *Environmental Science and Technology* 46: 5664-71 (2012) (explaining that strong markets for biomass keep land forested and encourage the planting of new forests).
- Lubowski, R., *et al.*, *What drives land-use change in the United States? A National Analysis of Landowner Decisions*, *Land Economics* 84: 529-50 (2008) (explaining that demand for wood produces investments by landowners that prevent forest loss through land use change and encourage afforestation).
- Hardie, I., *et al.*, *Responsiveness of rural and urban land uses to land rent determinations in the U.S. South*, *Land Economics* 76: 659-73 (2000) (explaining that demand for wood produces investments by landowners that prevent forest loss through land use change and encourage afforestation).
- Abt, R.C. *et al.*, *Climate Change Policy Partnership, Duke University, The near-term market and greenhouse gas implications for forest biomass utilization in the Southeastern United States* (2010) (“Forest harvest and planting decisions are affected by an uptick in demand for biomass, which in turn affects net carbon storage over time.”).

F. Increased demand for biomass energy will not result in the harvest of high-grade mature trees for energy.

Despite its promise as a renewable energy source that does not increase atmospheric CO₂ concentrations, biomass energy relies on low-cost biomass feedstocks to remain competitive with other types of energy. Thus, biomass energy feedstocks are commonly composed of mill residues, harvest residuals, thinning treatments, and other low-grade feedstocks. In contrast, high-grade trees are reserved for saw timber and other similar products that command higher prices. Given the price differential between low-grade biomass energy feedstocks and saw timber, it is unlikely that high-grade, mature trees would ever be harvested exclusively for biomass energy production. While increased demand for biomass energy could increase prices to some degree, even the most optimistic projections for biomass energy would not raise feedstock prices to the point that landowners would begin managing forests for biomass energy instead of high-value saw timber. Thus, concerns over carbon stock depletion due to the harvest of high-grade, mature trees for biomass energy are misplaced.

- Forisk Consulting, *Woody Biomass as a Forest Product: Wood Supply and Market Implications* (Oct. 2011) (finding that a 435% increase in biomass energy demand by 2016 would be required to make forest management exclusively for biomass energy as profitable as management for saw timber).
- Ince, P.J., *Global Sustainable Timber Supply and Demand, in Sustainable Development in the Forest Products Industry*, Chapter 2 29-41 (2010) (explaining that biomass energy feedstocks are among the lowest value forest products).
- Innovative Natural Resources Solutions LLC, *Identifying and Implementing Alternatives to Sustain the Wood-Fired Electricity Generating Industry in New Hampshire* (Jan. 2002), available at http://www.inrslc.com/download/wood_fired_electricity_in_NH.pdf (explaining that biomass energy relies on low-cost, low-grade feedstocks, not high-grade feedstocks that command higher prices in the market).
- Kingsley, E., *Importance of Biomass Energy Markets to Forestry: New England's Two Decades of Biomass Energy Experience* (June 2012) (explaining that biomass energy relies on low-cost, low-grade feedstocks, not high-grade feedstocks that command higher prices in the market).
- Maine Forest Service, *Maine Forest Service Assessment of Sustainable Biomass Availability* (July 17, 2008) (concluding that Maine has 9.69 million green tons per year of unutilized biomass available for biomass energy).
- U.S. Department of Energy, *Billion-ton update: biomass supply for a bioenergy and bioproducts industry* (2011) (projecting that a goal of replacing 30% of U.S. fossil fuel consumption with biomass resources can be achieved without using current pulpwood or saw timber supplies).
- MacCleery, D., *American Forests: A History of Resiliency and Recovery* (1996) (explaining that biomass energy can be an important new market that can replace other declining markets and add economic value to private forest ownership).
- Forisk Consulting, *Wood Bioenergy Markets and Forestland Owner Decisions: 2010-2013* (2014) (finding that projected demand for bioenergy feedstocks will not alter current forest management practices that are focused on saw timber production).
- U.S. Department of Agriculture, U.S. Forest Service, *Future of America's Forest and Rangelands: Forest Service 2010 Resources Planning Act Assessment*, Gen. Tech. Rep. WO-87 (2012) (projecting that large, mature trees are unlikely to be used for bioenergy due to price competition from higher value forest products).
- Abt, K.L. et al., *Effect of Bioenergy demands and supply response on markets, carbon, and land use*, *Forest Science* 58: 523-39 (2012) (projecting that price increases associated with biomass energy demand in the southern United States will remain far below prices for saw timber).

- Abt, R.C. and K.L. Abt, *Potential impact of bioenergy demand on the sustainability of the southern forest resource*, Journal of Sustainable Forestry 32: 175-94 (2013) (projecting that price increases associated with biomass energy demand in the southern United States will remain far below prices for saw timber).
- Timber Mart-South, Univ. of Georgia, *Southeastern Timber Market News and Price Reports* (2013) (projecting that price increases associated with biomass energy demand in the southern United States will remain far below prices for saw timber).
- Haq, Z., *Biomass for Electricity Generation*, EIA (July 2002), available at <http://www.eia.gov/oiaf/analysispaper/biomass/pdf/biomass.pdf> (projecting that by 2020, agricultural residues, energy crops, forestry residues, and urban wood waste/mill residues will provide as much as 7.1 quadrillion BTUs of biomass at a price of \$5 per BTU or less).

Conclusion

It is clear that EPA has the legal authority, the record support, and the discretion to exclude biogenic CO₂ emissions from the CAA and/or the PSD permitting program or, in the alternative, to differentiate between biogenic CO₂ emissions and other GHG emissions. As EPA reconsiders the treatment of biogenic CO₂ emissions in the Tailoring Rule, it must reconcile the Tailoring Rule with both sound science and policy regarding renewable energy. By regulating CO₂ emissions from biomass combustion identically to fossil fuel GHG emissions, the Tailoring Rule both ignores well-settled principles regarding the balance of biogenic CO₂ emissions and CO₂ sequestration in the United States and removes any regulatory incentive to utilize biomass in place of coal and other fossil fuels.