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The Hon. Gina McCarthy
Administrator, U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

January 21, 2016

Attn: Docket ID No. EPA-HQ-OAR-2015-0199

Re: Supplemental Comments of Environmental Defense Fund on EPA's Proposed Federal Plan Requirements for Greenhouse Gas Emissions From Electric Utility Generating Units Constructed on or Before January 8, 2014; Model Trading Rules; and Amendments to Framework Regulations

Dear Administrator McCarthy:

We appreciate the opportunity to comment on EPA's proposed federal plan and model rules. The comments below are pertinent to the biomass provisions of the proposed rule.

Environmental Defense Fund (EDF) is a non-profit, non-governmental, non-partisan organization, with over one million members, dedicated to preserving the natural systems on which all life depends. Our comments reflect our longstanding interest in the biogenic accounting issue, as well as our commitment to using sound science to craft appropriate and workable environmental policy. EDF has been central to raising the importance of correct accounting for greenhouse gas (GHG) emissions from biogenic feedstocks in the scientific literature.[1] We have followed and provided comments to inform EPA's process for accounting for biogenic emissions from the beginning.[2] A robust and practical policy framework that accurately accounts for the climate impacts of bioenergy is essential to ensuring that bioenergy plays an appropriate role in our climate and energy policies.

Harvest of biomass removes carbon that has been stored on the landscape and the combustion of biomass for energy generation emits this carbon to the atmosphere. The

[1] See, for example: Searchinger, T., Hamburg, S., Mellilo, J., Chameides, W., Havlik, P., Kammen, D., Likens, G., Lubowski, R., Obersteiner, M., Oppenheimmer, W., Robertson, G.P., Schlesinger, W., Tilman, G.D. 2009. Fixing a critical climate accounting error. *Science* 326: 526-527.

[2] See, for example: EDF Comments (2010) in response to EPA's Call for Information on Greenhouse Gas Emissions Associated with Bioenergy and Other Biogenic Sources (Docket ID No. EPA-HQ-OAR-201-0560).

greenhouse effect of one ton of CO_2 from combustion of biomass is identical to that of one ton of CO_2 from the combustion of fossil fuel. On the other hand, the growth of biomass materials may recapture carbon to varying degrees over some period of time. There is strong justification for EPA to go beyond a consideration of the combustion emissions themselves and consider the proportion of biomass carbon combusted that may represent a reduction in carbon emissions on the landscape.

The primary potential GHG advantage from the use of biogenic feedstocks at stationary sources rests on its impact on the flux in emissions resulting from changes to carbon stocks in the economically active ("working lands") portion of the landscape of forest and farmland, where these materials are harvested. Bioenergy can result in net reductions in greenhouse gas emissions when the harvest of biomass spurs increased sequestration associated with biomass production on the land, or when biomass waste material that would have otherwise quickly decomposed to the atmosphere is used for energy. This increase in sequestration or reduction in emissions from the landscape can then provide a counterweight to the combustion emissions, resulting in a net reduction relative to the combustion emissions alone. Time is also an essential factor in this evaluation of the net flux of GHG emissions across the landscape. The time frame used in evaluating the net flux of GHG emissions from bioenergy must be clearly specified and aligned with the time frame of the policy goals.

We support EPA's effort to develop a rigorous framework for differentially treating and "qualifying" biomass energy as a compliance option under the CPP, taking into account the fundamental 2011 finding of EPA's Science Advisory Board (SAB) that "There are circumstances in which biomass is grown, harvested and combusted in a carbon neutral fashion but carbon neutrality is not an appropriate a priori assumption; it is a conclusion that should be reached only after considering a particular feedstock's production cycle. There is considerable heterogeneity in feedstock types, sources and production methods and thus net biogenic carbon emissions will vary considerably."[3] We note further that the system under development by EPA will be an important precedent for other countries seeking to develop regulatory frameworks for sourcing their own biomass domestically as well as for those sourcing directly from the US.

EPA's November 2014 "Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources" is another critical step in EPA's ongoing effort to understand, in quantitative terms, the actual net emissions to the atmosphere from the production, processing, and use of biogenic feedstocks. The science is complex and still evolving. The challenge is to build on the scientific foundation and apply it in a regulatory context in a way that is:

- simple to implement;
- transparent to the market; and
- predictable.

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[3] *From*: SAB Review of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources (November 2011), p. 3. Located at: http://yosemite.epa.gov/sab/sabproduct.nsf/0/57B7A4F1987D7F7385257A87007977F6/$File/EPA-SAB-12-011-unsigned.pdf

It must also be faithful to the actual situation on the ground: in other words, the regulatory framework must accurately reflect the true emissions to the atmosphere from the use of biogenic feedstocks.

Our comments are aimed at helping EPA to develop a framework that meets these criteria for treating biomass under the CPP. EDF finds that there are three pathways through which EPA could appropriately define a biomass feedstock as "qualified" in terms of generating net emissions reductions. We recommend that these are the ways in which EPA allows biomass to be qualified under the Federal Plan and model rules.

- First, fixed volumes of a mill/industrial waste feedstock whose use for bioenergy is demonstrated to reduce net GHG emissions, relative to combustion of fossil fuels, can be included on a predetermined list of qualified biomass.

- Second, certain volumes of biomass from working lands might be qualified via a regional determination of its atmospheric CO_2 reduction potential following the shifting historical baseline approach described below.

- Third, a landowner or facility might demonstrate the emissions reduction benefits of a particular feedstock via a rigorous emissions-based third-party certification system.

Our comments are divided into four parts. The first part describes the climatic risks from failing to properly treat biomass energy under the CPP. The second, third and fourth parts, respectively, describe how EPA could develop a rigorous framework for qualifying biomass feedstocks via each of the three pathways noted above.

Part I: Climate risk of inadequate biomass rules

1. There is significant atmospheric risk of inappropriate biomass rules.

EPA must develop a differentiated approach to evaluating the net emissions from the use of biomass feedstocks and must not simply assume that biomass feedstocks have zero net atmospheric impact. As the SAB's September 2012 Peer Review Advisory of the September 2011 Draft Accounting Framework for Biogenic CO_2 Emissions from Stationary Sources notes, biomass feedstocks need not have a net zero climate impact in order to have a lower impact on the climate than the use of a fossil fuel alternative.[4] However, even if there is a net climate benefit from biomass use compared to a fossil alternative, this climate benefit might be lower than that from an alternative renewable or compliance option under the CPP. Also, in some cases, bioenergy use could have even greater net emissions than a fossil alternative per unit of electricity and thus actually risk worsening emissions relative to a case with no policy if the net emissions are not properly accounted for. It is thus important for EPA to establish a system that correctly measures the net impacts on the atmosphere from biomass use to ensure that overall emissions reduction goals under the CPP are effectively achieved. The climate risk of failing to properly regulate biomass emissions is significant.

[4] Ibid., p. 4.

According to the Energy Information Administration's modeling of the proposed Clean Power Plan[5] using the AEO2015 Reference case as the underlying baseline, US annual emissions from fossil energy in the electric sector are projected to decline from 2,035 million metric tons of CO_2 ($MMTCO_2$) in 2012 to 1,596 $MMTCO_2$ in 2030 and 1,691 $MMTCO_2$ in 2040. Relative to 2012 annual emissions, this is a decline in annual emissions of 439 $MMTCO_2$ (22%) and 344 $MMTCO_2$ (17%) in 2030 and 2040, respectively. Relative to projected "business as usual" levels without the proposed Clean Power Plan, this change represents a reduction of 581 $MMTCO_2$ (27%) in 2030 and 503 $MMTCO_2$ (23%) in 2040.[6] EIA projects that under the proposed CPP total annual combustion emissions from biomass for electric power will more than triple from 16 million tons of CO_2 in 2012 to 52 million tons in 2030 and more than quintuple to 71 million tons in 2040.[7] This represents about 15% and 6% faster growth in this source of emissions than under the reference case through 2030 and 2040, respectively, indicating that the program (as proposed) would be expected to create incentives for expansion of biomass combustion emissions for electric power, rather than contraction as in the case of fossil fuel based electricity. These emissions estimates are for gross emissions from bioenergy combustion that only reflect the emissions from the smokestack or combustion and do not account for the potential change in landscape carbon stocks due to shifts in land use or land management. However, these counterbalancing emissions from the landscape are not guaranteed. Thus, if these bioenergy feedstocks are assigned emissions close to zero when in fact their emissions are more substantial, the overall expected impact of the measures taken under the CPP could be significantly eroded. For example, the figures from the EIA analysis of the proposed CPP suggest that, relative to 2012 levels, overall annual US heat and electric power emissions would fall by 12% and 21% less than expected in 2030 and 2040, respectively (i.e. if improperly accounted bioenergy emissions are truly 52 and 71 million metric tons of CO_2 per year compared to expected declines in power sector annual emissions, relative to 2012 levels, of 439 and 344 $MMTCO_2$ in 2030 and 2040, respectively).[8]

While these numbers are from EIA's projection, the downside climatic risk of from inadequate rules for bioenergy emissions is in fact much larger. We conducted an internal analysis that concludes that if all existing coal-fired power generation (based on 2013 data from EIA) adopted 10% and 20% cofiring, this would lead to 158 to 316 million tons of CO2e per year in gross combustion emissions from biomass, assuming no further change in coal-fired electricity production. If this growth of cofiring occurred by 2030, this would

[5] The timing and stringency of the final Clean Power Plan differs from the proposal, and would accordingly have different power sector impacts, but these numbers are nonetheless indicative of the direction and magnitude of projected impacts from the policy.
[6] See Table: Energy-Related Carbon Dioxide Emissions by Sector and Source from Energy Information Administration. 2015. *Analysis of the Impacts of the Clean Power Plan* and *Annual Energy Outlook 2015, with projections to 2040.* DOE/EIA-0383. U.S. Department of Energy, Washington , DC. Available at: https://www.eia.gov/beta/aeo/#/?id=17-CPP2015&cases=ref_cpp2015~rf15_111_all&sourcekey=0
[7] Considering a broader set of biogenic emissions that could be influenced by electricity prices under the CPP (given potential substitution between electric and non-electric energy for heat), EIA estimates the total emission from biomass, biogenic waste, and biofuels heat and coproducts will rise from 281 $MMTCO_2$ in 2012 to 325 and 350 $MMTCO_2$ by 2030 and 2040, respectively.
[8] These calculations are based on changes in the estimated annual emissions in these particular years, rather than based on changes in estimated cumulative emissions over 2015-30 and 2015-40.

represent 38 to 76% of the expected declines in annual emissions under the CPP, under the 10% and 20% cofiring scenarios, respectively. This represents a major share of the program's benefits that could be negated in principle under improperly designed rules that would incentivize greater use of biomass feedstocks that do not truly achieve net reductions in CO_2 within this time frame.

This means there is significant downside risk to failing to properly treat bioenergy emissions under the CPP. It is thus critical for EPA to establish a method to ensure that the net emissions reductions from bioenergy use are properly accounted for in the context of compliance. Failure to account for the landscape effects could also unintentionally harm farm and forest landowners, and might even cause harm to fledgling bioenergy markets by perpetuating skepticism that climate benefits will be achieved, even in situations where emissions reductions are legitimately possible and can be demonstrated.

We were thus pleased to read in the final Clean Power Plan that biomass is classified as a non-zero-emitting RE technology, and that only "qualified biomass" would be allowable as a feedstock eligible for emissions reductions. We note further that EPA has finalized the definition of "qualified" as being "a biomass feedstock that is demonstrated as a method to control increases of CO_2 levels in the atmosphere."[9] We also support EPA's determination that its evaluation of whether a state's planned use of biomass is qualified will need to depend on the extent to which the measures for qualified biomass and related CO_2 benefits are "quantifiable, verifiable, non-duplicative, permanent and enforceable."[10]

Part II: Defining mill/industrial waste feedstock volumes as qualified biomass

2. **EPA may create a limited, pre-approved list of qualified waste biomass feedstocks.**

EDF agrees with EPA that it is appropriate to develop criteria for determining which biomass feedstocks may be "qualified" for compliance purposes under either a rate or mass-based system. However, only in the case of certain mill and industrial waste by-products should a specific category of feedstock be categorically designated as qualified via a predetermined list. This should also be restricted to specific volumes, as described below.

These feedstocks initially may include landfill gas, mill residues, and industrial processing by-products such as black liquor. The criteria for automatically putting such waste feedstocks on a list of qualified types should be that they otherwise would have decomposed and released GHG emissions in the short term anyway.[11] We suggest that a duration of 5 to 10 years is short enough to fall within near-term emissions reductions targets. As a result, substituting combustion for decomposition emissions can be

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[9] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule. 40 CFR Part 60, October 23, 2015. Federal Register Vol. 80, No. 205, p. 64886.
[10] Ibid., p. 64886.
[11] Gaudreault, Caroline and Reid Miner. 2015. "Temporal Aspects in Evaluating the Greenhouse Gas Mitigation Benefits of Using Residues from Forest Products Manufacturing Facilities for Energy Production." *Journal of Industrial Ecology* 19(6): 994-208.

considered as having an approximately net zero effect on net emissions from the perspective of CPP compliance.

However, even in the case of such mill waste feedstocks, EPA must be cautious to require careful monitoring of the use of these feedstocks so as not to create potential loopholes in the definition of waste. In particular, EPA should limit the amount of black liquor and other mill waste that can be automatically defined as qualified to the current level of production for each of these by-products, so as to guard against creating perverse incentives to create black liquor and/ or mill residue solely for use as zero-emission feedstocks for electricity generation. While states and industry may be able to develop their own systems, EPA could help to establish and monitor such limits by creating a centralized registry that can keep track of production and use of available volumes of qualified waste (as well as other qualified feedstocks from working lands, described below).

For any potential qualification of such wastes above the limit, there should be a process for certifying that those wastes are truly economic without selling the waste byproduct and that the use of those products for energy use is truly reducing net emissions (see Section 10 below).

To allow for flexibility in the future, EDF suggests that EPA allow for additions to the list of qualified biomass feedstocks, provided that there is a demonstration that the new feedstocks are indeed "qualified" by virtue of their CO_2 emissions profiles based on the certification pathway described in Part IV. EDF has serious reservations about including other forest-derived material in the list of qualified pre-approved feedstocks.

Part III: Qualifying feedstock volumes from working landscapes based on a regional approach for certifying emissions reduction potential

3. **EPA must not simply allow states to define qualified biomass as coming from "sustainably managed lands."**

In its efforts to reduce the levels of CO_2 in the atmosphere, we strongly urge EPA to maintain its strict focus on net impacts on atmospheric CO_2 levels metrics to define qualified feedstocks rather than definitions of sustainability, which are loosely defined in many cases.

In the November 19, 2014 Memo from Assistant Administrator Janet McCabe to Division Directors entitled "Addressing Biogenic Carbon Dioxide Emissions from Stationary Sources," McCabe writes that "given the importance of sustainable land management in achieving the carbon reduction goals of the President's Climate Action Plan, the EPA expects that states' reliance specifically on sustainably-derived agricultural- and forest-derived feedstocks may also be an approvable element of their [state compliance] plans."[12] In the Final Clean

[12] Memo from Assistant Administrator Janet McCabe to Air Division Directors, November 19, 2014. http://www3.epa.gov/climatechange/downloads/Biogenic-CO2-Emissions-Memo-111914.pdf

Power Plan, EPA explains further that sustainability demands a demonstration of CO_2 benefit: "sustainably-derived agricultural and forest biomass feedstocks may also be acceptable as qualified biomass in a state plan, if the state-supplied analysis of proposed qualified feedstocks or feedstock categories can adequately demonstrate that such feedstocks or feedstock categories appropriately control increases of CO_2 levels in the atmosphere and can adequately monitor and verify feedstock sources and related sustainability practices."[13]

EDF agrees strongly with EPA that sustainability is not, in and of itself, an adequate condition for qualified biomass determination. While the term "sustainable land management" is generally used to refer to practices meant to ensure the continued provision of environmental services from natural landscapes,[14] sustainable land or forest management practices do not, in and of themselves, create biomass feedstocks that reduce CO_2 emissions from the atmosphere. In other words, just because a forest is managed in way that does not damage key environmental indicators and/ or maintains a certain sustained level of harvest over time does not guarantee that carbon stocks are being maintained or increased on net. The annual average level of carbon stocks in a forest or agricultural landscape could well decline under "sustainable" management. This reduction in carbon stocks on the landscape would result in a net transfer of carbon from the land to the atmosphere if that carbon is combusted for bioenergy.

Standard techniques used to verify sustainable land management, such as achieving third-party certification by bodies such as Sustainable Forest Initiative (SFI), Forest Stewardship Council (FSC), and American Tree Farm System (ATFS), do not currently require accounting for carbon stocks.[15] While sustainability of harvests and forest certification under these existing third-party certification systems may be desirable from a management perspective, they are neither necessary nor sufficient conditions for increased carbon sequestration benefits on the landscape as a result of sourcing a particular unit of biomass feedstock. These issues should not be conflated.

4. **Standing carbon stocks must be used to define qualified biomass on working lands across a region.**

EPA explains that certain biomass feedstocks may be demonstrated to control increases of CO_2 in the atmosphere, but that "these benefits can only be realized if biomass feedstocks are sourced responsibly and attributes of the carbon cycle related to the biomass feedstock are taken into account".[16] To determine whether biomass is "qualified," it is appropriate to

[13] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule. 40 CFR Part 60, October 23, 2015. Federal Register Vol. 80, No. 205, p. 64886.
[14] For example, see http://www.fao.org/nr/land/sustainable-land-management/en/
[15] Examining Carbon Accounting and Sustainable Forest Certification, December 2010. KMPG Carbon Advisory Group. White Paper prepared by KPMG Carbon Advisory Group for the Climate Action Reserve. http://www.climateactionreserve.org/how/protocols/forest/forest-protocol-white-papers/
[16] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units;

consider the landscape-scale carbon impacts associated with feedstock production and harvest on working lands.

The net atmospheric impact of a biomass feedstock is directly linked with the standing stocks of biomass on the land used to produce that feedstock. Following IPCC Good Practice Guidance for national-scale GHG Inventories in the LULUCF sector,[17] an increase in standing stock indicates a decrease in emissions to the atmosphere, and a decline in standing stock indicates that emissions to the atmosphere from that land have increased. To accomplish this most efficiently and effectively, measurement of all five biomass pools is most appropriate.

We recommend that EPA adopt a regional approach for qualifying biomass from working lands that, by virtue of its larger spatial scale, can literally "see the forest for the trees." This is important to evaluate impacts as changes in land use and land management in response to changing economic incentives for biomass feedstock production will play out across a landscape in a dynamic, economic system. In particular, we recommend that EPA adopt a landscape-scale approach that determines a quantity of biomass that may be qualified within a given feedstock-producing landscape based on observed incremental changes in carbon stocks over a 5 to 10 year period compared to a predetermined "business-as-usual" baseline based on historical data, updated over time (see more on the proposed "shifting historical baseline" approach in Section 6 below).

Viewed retrospectively, the historically observed increment of growth in carbon across a region against this baseline represents the best estimate of the "additional" growth of carbon over the preceding period (relative to business as usual levels) that can potentially be attributed to changes in economic and policy incentives. Viewed prospectively, it is also the best guess of the potential for future incremental growth over the next period.

The observed increase in carbon stocks over an initial interval since the initiation of the policy framework provides a total amount of biomass carbon from working lands that can be qualified in a region, until the time of the next re-measurement 5 years later. For example, EPA could consider 2012 or another year after 2010, when EPA's policy discussions of accounting for biogenic emissions in a regulatory context began with its Call for Information, as the beginning of the first measurement period. Volumes of biomass would then be qualified based on observed growth over a 5 year period (e.g. 2012-2017) and should continue to be qualified within a region on an ongoing basis, as long as overall carbon stocks across the region do not decline relative to the shifting historical baseline described below.

In particular, at the time of re-measurement (e.g. 2022), the same amount of bioenergy

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Final Rule. 40 CFR Part 60, October 23, 2015. Federal Register Vol. 80, No. 205, p. 64757.

[17] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4. Agriculture, Forestry, and Other Land Use. http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

feedstock can be qualified across the region for the next 5 years as long as carbon stocks were not declining over the preceding 5 years (e.g. 2017-2022); the qualified volume of biomass feedstocks may also be increased if the observed incremental growth is greater than in the previous period. If carbon stocks decline relative to the shifting historical baseline, however, no further biomass volumes should be qualified based on the regional approach until the time when carbon stocks rise back again to the last level of the baseline when stocks stopped rising. Additional volumes may still be qualified based on case and site-specific certification, as described in Section 11.

The measurement of regional changes in carbon stocks should specifically focus on those lands that are likely to be influenced by changes in management for the purposes of bioenergy feedstock production. In particular, public lands and other lands that are not economically active should be separated from the analysis. It is important to exclude reserved lands and other "non-working" lands from the baseline, as these are not relevant to evaluating the impacts of bioenergy feedstock production and, in many cases, would be increasing carbon stocks under "business as usual" (BAU). Continued monitoring of standing stocks in feedstock-producing landscapes is the best way to ensure that use of biomass feedstocks does not increase net emissions to the atmosphere.

As in the case for volumes of qualified mill and industrial wastes, states and industry may develop a system for allocating (e.g. via an auction) volumes of qualified volumes of biomass to facilities on an ongoing basis. To facilitate this, we recommend that EPA monitor changes in regional carbon stocks relative to the baseline based on the shifting historical baseline approach and, as noted above for the case of mill/industrial wastes, create a registry to track production and use of available volumes of qualified biomass across each region. This registry could also be opened to foreign buyers wishing to purchase qualified US feedstocks for their own use. In this way, consistency among standards can be assured so that foreign markets do not drive the use of forest and other biomass feedstocks in the US that is detrimental to the climate.

Carbon stock measurement should be conducted at scales no larger than Forest Inventory and Assessment (FIA)-based regions,[18] since the dynamics of feedstock accumulation and decay can differ substantially by region. and regions should not be so large as to mask the impact of the marginal economic actor using or expanding bioenergy use. Finer scale monitoring may be appropriate for states or entities that choose to invest in additional data collection, though a minimum area should be established that can meet the requirement for statistically accurate and regularly updated data (i.e. no smaller than permitted given FIA's sampling) in the estimation of stocks in all five forest carbon pools. If the region is too small, the data constraints emerge and shifts in existing forest product demand could also have a major impact on the estimated changes in carbon stocks independent of whether that change is the result of bioenergy actions (e.g. a single pulp mill closes as a result of market shifts unrelated to bioenergy). The region would ideally coincide with a bioregion

[18] Four or five FIA regions exist in the US; see http://www.fia.fs.fed.us/regional-offices/index.php for a map.

such that forest types are consistent across the region in order to harmonize silvicultural and market forces.

Standing stock data should be collected over temporal scales as short as possible, though time periods shorter than about 5 years may be difficult to accomplish using publicly-available data given current levels of funding.

The evaluation of the net flux of GHG emissions should clearly account for the time frame in question. When comparing activities over long periods, accounting for differences in the time profile of emissions and sequestration is vital to accurately determining the differences in the climate impacts of biogenic energy sources. For example, even if the regrowth of a forest eventually "pays back" the carbon lost during harvesting and combusting biomass at an initial point in the time, the associated emissions will still have a climatic effect (i.e. radiative forcing) during the time the emissions remained in the atmosphere as a net increase in GHG concentrations, which in many regions could be decades to centuries depending on average management rotations.

We recommend that EPA account for combustion emissions and any changes in emissions/sequestration on the land base within the time period in which they occur, in as close to real time as practicable, rather than projecting and comparing the effects on future trajectories of emissions and sequestration. For regulatory purposes and alignment with FIA data collection, a 5 to 10 year time period is appropriate.

5. **Forest-derived feedstocks must not be further subdivided and should include all woody material derived from the forest.**

The forest ecosystem is an integrated whole made up of five carbon pools: aboveground biomass, belowground biomass, dead wood, litter, and soil.[19] Via the processes of mortality and harvest, carbon-containing material is transferred from one pool to another; decay occurs from the non-live pools, releasing emissions from the forest over time. As forests age, a gradual accumulation of carbon in the overall forest system typically takes place. At steady state, the rate of growth (sequestration) equals the rate of decay (emissions) and the net carbon balance of the forest is zero.

When some component of the forest ecosystem is removed via harvest, that component is no longer available to contribute to the overall carbon balance in the forest. If the component is forest roundwood, then the tree is no longer growing and storing carbon so the overall rate of sequestration by the forest is reduced. If the component removed is logging residues, in the form of tree branches and tops, then that material is no longer available to add to the dead wood pool, so dead wood stocks are smaller than they would

[19] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4. Agriculture, Forestry, and Other Land Use. http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

have otherwise been. This means that decay from the dead wood pool is also smaller than it would have otherwise been, but note: in natural forests, decay occurs over many years, depends on climate conditions, and is not instantaneous.

While we agree that EPA may create a separate list of qualified biomass feedstocks for very specific "waste" feedstocks such as mill waste and industrial processing by-products (Section 2), EPA's list of pre-approved qualified biomass feedstocks must not include material derived directly from the forest. This is because the forest carbon system is an integrated whole made up of the five carbon pools described above, and carbon is transferred between pools when harvest, mortality, or disturbance occurs. Instead of separating the pools from one another by identifying specific forest components as being "qualified," EPA must consider the forest as an integrated whole, monitoring the overall standing carbon stock in all five pools together as they change through time. This can be accomplished simply and elegantly via the application of a shifting historical baseline. We explain below in more detail why this approach is both appropriate and preferable to approaches for defining qualified biomass that rely on separate and specific treatment for more narrowly defined forest-derived feedstock types.

6. A shifting historical baseline should be used as the basis for determining qualified biomass volumes for woody feedstocks across a region.

We recommend that EPA adopt a shifting historical baseline against which to evaluate changes in carbon stocks across the working lands in a region, rather than from all forest lands in a region, many of which may not be subject to management. Implementing a complex economic and biophysical modeling approach, like the FASOM approach used by EPA in the most recent 2014 draft of the Framework, is not the most suitable approach for evaluating changes in carbon stocks across a landscape in a regulatory context. This type of modeling – integrating market demand and supply conditions with biophysical conditions to quantify the effects of forest bioenergy harvest – is not required to predict "BAU levels of carbon stocks over the short time frames relevant to demonstrate compliance with the CPP. Rather, the best approximation of BAU over the near term is a shifting historical baseline, which projects prior carbon stock conditions (for the "managed" portion of the forest landscape) into the future and then updates it periodically to incorporate new data.

To apply the shifting historical level approach, historical measured data for a relevant subset of the landscape would be used to set the anticipated future baseline, and the baseline would be reset periodically based on remeasuring the carbon stocks on the landscape, using (for example) FIA data (see Figure 1 for a hypothetical illustration). By shifting the baseline up or down as a step function in response to measured changes in forest carbon stocks, we effectively ratchet the baseline up over time in order to remove any "headspace" between forest growth and allowable biogenic feedstock harvest. This could be done with new data every 5 to 10 years upon completion of one or more FIA inventory cycles, or could be updated on a rolling average basis, more frequently incorporating updated information as it becomes available.

The delta over a given time interval, perhaps 5 to 10 years, can be empirically measured based on observed changes relative to the baseline established at time 1. Results from each new measurement can be applied to qualify the use of biomass volumes over the next interval, as described above.

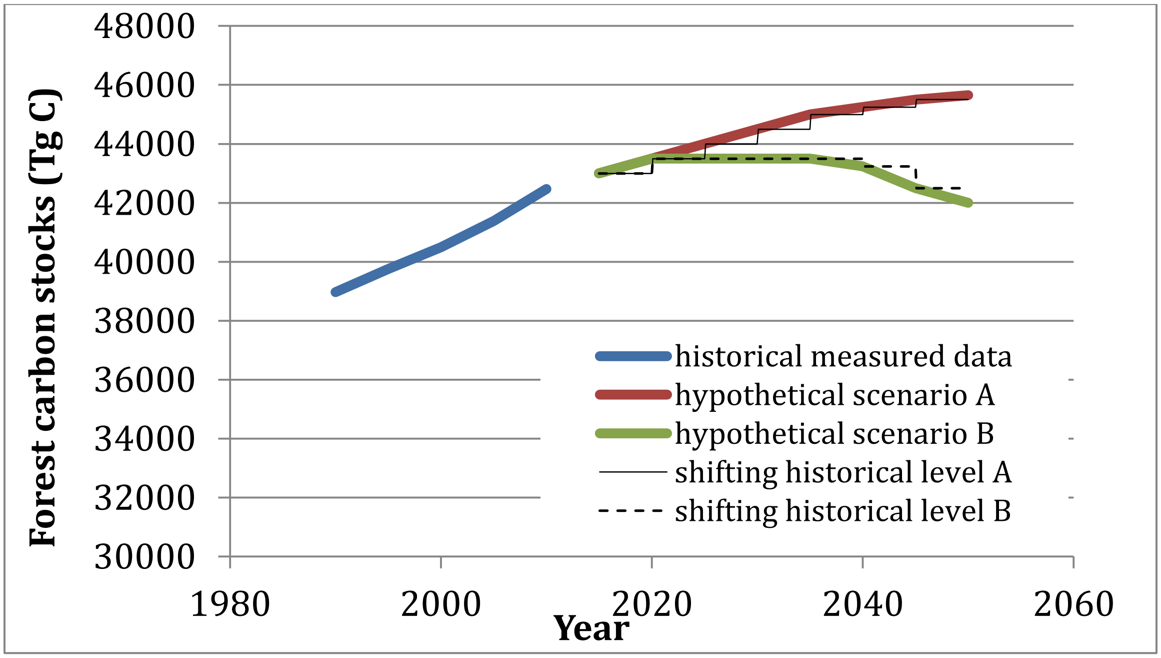

Figure 1. Graphic representation of the shifting historical baseline under two hypothetical future cenarios with different carbon stock trajectories. National scale historical inventory data (1990-2012) are used here for illustration of the scale only. The hypothetical Scenarios (A and B) are also only illustrative. Note that in this Figure, the historical level is set at the annual carbon stock level every time the baseline resets. In practice, robust carbon stock data may not be available annually, and the baseline could be set as an average or rolling average over some period of years (e.g. 5 years).

The approach is much simpler and more transparent and is demonstrably better at predicting actual trends in carbon stocks than complex modeling relying on numerous untestable assumptions, as suggested by the SAB and EPA. In fact, the available data suggest that, for the economically active part of the forest landscape, the best estimate for BAU carbon stocks given current policy and economic conditions is a flat projection of past historical carbon stock levels.[20] If applied to the "managed" part of the forest landscape, this is the most dependable estimate of BAU against which to measure the potential benefit associated with bioenergy use in a region. Adjusting the baseline using updated historical data over time ensures that the most recent data is being used and the analysis stays true to actual carbon stock changes on the land. In contrast, the use of a complex modeling approach to predict BAU and/or the associated "delta" under a hypothetical future bioenergy scenario de-links the policy discussion from actual measurements of carbon stocks on the ground. As the SAB Panel itself explains in its draft Advisory on the 2014 Framework (p. 3), while advocating for a deeper discussion of EPA's choice to use FASOM

[20] Buchholz, TB, S Prisley, G Marland, C Canham, and N Sampson. 2014. Uncertainty in projecting GHG emissions from bioenergy. *Nature Climate Change* 4: 1045- 1047.

in this context, "the carbon consequences of increased demand for biogenic feedstocks are likely to depend on the model selected to evaluate those consequences."[21] This will invariably lead to debates over the choice of model and why other alternative approaches with different modeling assumptions were not selected.

EPA's purpose is best served by a policy that is based on transparent, replicable, and predictable metrics, developed using the best available evidence. There is no need to implement a complex economic modeling approach in EPA policy to estimate the carbon impacts of forest-based bioenergy use. In this case, the simplest approach to estimating BAU that performs best given all the available information is the use of a historical baseline, periodically updated over time as new data become available.

We note that this approach, in which reference levels for tracking changes in forest emissions at landscape levels are set based on historical data rather than on complex forward modeling simulations, is similar to the approach adopted by the UN Framework Convention on Climate Change (UNFCCC) and other emerging policy frameworks for Reducing Emissions from Deforestation and forest Degradation (REDD+). The UNFCCC has agreed that reference levels for measuring reductions in forest emissions in developing countries under REDD+ will be established using average historical deforestation and associated emissions levels as the principal variables, with some flexibility for "adjustments" under unique and limited circumstances, subject to a process of scientific review to ensure robustness and transparency.[22]

7. EPA must not include logging residues on a list of preapproved qualified biomass feedstocks.

In Section 5 above, we explain why it is not appropriate to pull out specific forest-derived feedstocks in order to identify them as "qualified" without regard to the rest of the carbon-containing material in the forest.

Logging residues are essentially non-merchantable branches and tops of trees, and culls and non-merchantable boles of trees left behind after harvest. In some regions of the US this material is normally left to decay on the forest floor, and in other regions the standard practice is to burn the residues onsite. At steady state, the rate of detritus input to the forest floor equals its rate of decay from the forest floor and the net carbon balance is zero.

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[21] *Found at:* http://yosemite.epa.gov/sab/SABPRODUCT.NSF/81e39f4c09954fcb85256ead006be86e/BE340711E6D9B47385257EAE006ED147/$File/8-27-15+Draft+Advisory_changes+accepted.pdf

[22] For a discussion of issues regarding REDD+ reference levels, see: Meridian Institute. 2011. Guidelines for REDD+ Reference Levels: Principles and Recommendations. Prepared for the Government of Norway, by Arild Angelsen, Doug Boucher, Sandra Brown, Valerie Merckx, Charlotte Streck, and Dan Zarin. Available at:www.redd-oar.org/links/REED+RL.pdf. For a more practical application, see: Forest Carbon Partnership Facility (FCPF). 2013. *Carbon Fund Methodological Framework*. World Bank, Washington, DC. https://www.forestcarbonpartnership.org/carbon-fund-methodological-framework

If we divert logging residues by utilizing some portion of them as a feedstock, however, then there will be concomitant reductions in the mass of the litter pool because there are fewer additions to the pool over time. This will result in carbon emissions from the managed forest until a new steady state is reached.

For example, consider a forest with a constant annual litter input of 3 Mg/ha/yr, and a constant annual decay rate of 11 percent (approximate values for mixed conifer hardwood forests in the Northern region).[23] Using the approach described by Smith and Heath (2002)[24], at steady state the mass of litter (in the forest floor) would be 25.7 Mg/ha. If instead only 2 Mg/ha/yr reached the ground (i.e., diversion of 33 percent of the average annual litter input for use as a feedstock), the steady state mass of litter in the forest floor would be 17.2 Mg/ha (which is 66 percent of the mass expected without feedstock use).[25] Over time a new steady state would be reached, but until then there will be losses from the forest floor pool. The rate of loss depends on decay rates, which vary by region and range from 26.8%/ yr to 4.1%/ yr.[26] While carbon losses from the forest floor pool would eventually asymptote at zero should residue removal continue, in the policy-relevant timeframe we have identified of 5 to 10 years, losses from the forest floor pool due to logging residue removal would be significant.

8. EPA must not include thinnings and fuel treatments on a list of pre-approved qualified forest-derived biomass feedstocks.

Two other examples of forest-derived feedstocks that will likely be proposed as potential candidates for EPA's list of "qualified" biomass feedstocks are fuel treatments (meant to reduce fire risk in fire-prone regions) and intermediate thinnings. In Sections 5 and 7 above we explain, from an ecological perspective, why all forest pools must be treated together. In this Section we explain, from a practical perspective, why fuel treatments and thinnings should not automatically be listed as qualified feedstocks.

EDF agrees with EPA's decision in its 2011 Framework not to include a separate feedstock category for fuel treatments, which it explained as follows: "This accounting framework does not include a separate feedstock category for material removed during fuel

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[23] Smith, JE and LS Heath. 2002. *A Model of Forest Floor Carbon mass for United States Forest Types*. UISDA Forest Service Research Paper NE-722. Newtown Square, PA: USDA Forest Service Northeastern Research Station.

[24] The relevant equations are:

$$\boldsymbol{Mass\ remaining\ at\ time\ t\ = Input\ \times (1 - decay\ rate)t}$$

where:

$$\boldsymbol{decay\ rate = 1 - exp^{(-1/residence\ time)}}$$

and

$$\boldsymbol{residence\ time = \ detrital\ mass/annual\ input}$$

[25] C. Canham, Cary Institute of Ecosystem Studies, pers. comm.

[26] Smith, JE and LS Heath. 2002. *A Model of Forest Floor Carbon mass for United States Forest Types*. UISDA Forest Service Research Paper NE-722. Newtown Square, PA: USDA Forest Service Northeastern Research Station.

treatments. This is because: (1) as with any other harvest, the treatment itself reduces carbon storage, and (2) the net benefit of the treatment itself is uncertain, given the many factors that influence fire risk, fire severity, and forest recovery."[27] The Agency went on to explain that via the application of a retrospective baseline that measures landscape-scale changes in carbon stocks, the net effect of policies intended to reduce fuel loading and subsequent fire emissions would be reflected: "It is important to note…that the net effect of any policy to reduce fuel loading and enhance forest carbon storage will be reflected in the five-year retrospective analysis of carbon stocks on the landscape. If the policy performs as intended, the increase in forest carbon stocks will be reflected in subsequent years' analyses of standing stocks."[28]

Like fuel treatments, forest thinnings are also meant to remove non-merchantable trees, thereby enhancing growth and increasing productivity of the trees left behind. Since the net effect of forest management is to maintain or increase the standing stock of the forest, the shifting historical baseline will reflect the net positive effect of thinnings on forest productivity and there is no need to develop a complicated tracking system to account for a separate "thinnings" feedstock category. In fact, if an individual landowner wishes to include thinnings in a list of "qualified" biomass feedstocks, using our proposed approach that landowner can qualify thinnings based on the rigorous third-party certification system we describe in Section 11.

9. An exogenous decline in carbon stocks does not automatically disqualify biomass under the shifting historical baseline.

Using the shifting historical baseline approach, the incremental volume of forest biomass above the baseline can be "qualified" for a given time period. If forest stocks decline for any reason, then the regional approach does not allow for additional qualified biomass from these forest-derived feedstocks. Since it may not be clear what factors have caused the decline in carbon stocks (pest infestations, wildfire, storms, and land conversion, for example), it may be tempting to reject the shifting historical baseline approach in order to guard against the notion that bioenergy might be "blamed" for an exogenous decline in carbon stocks. This issue need not undermine the utility of the shifting historical baseline, however: using our approach it would be possible for landowners or groups of landowners who are managing their forest for constant or increasing carbon stocks to achieve certification such that their biomass would be qualified even if a regional decline in forest carbon occurred due to some exogenous factor.

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[27] *Accounting Framework for Biogenic CO2 Emissions from Stationary Sources*. September 2011. USEPA Office of Air and Radiation, Office of Atmospheric Programs, Climate Change Division. p. 43. http://www3.epa.gov/climatechange/Downloads/ghgemissions/Biogenic-CO2-Accounting-Framework-Report-Sept-2011.pdf

[28] Ibid., p. 44.

10. **For forest-derived feedstocks, this comprehensive approach to defining qualified forest-derived feedstocks simplifies the evaluation, measurement, and verification process.**

EPA has requested comment on the specific approach to evaluation, measurement and verification (EM&V) for the utilization of qualified biomass feedstocks. EDF suggests that at the facility level, facilities of any size must always be required to report on all of their emissions, whether they arise from fossil- or biomass-based feedstocks.

We have addressed EM&V for qualified waste feedstocks via a registry in Part II (Section 2) above. With respect to the forest-derived feedstocks discussed here in Part III (Sections 3 through 9), we emphasize that using the shifting historical baseline, EPA should focus simply on the trajectory in standing carbon stocks in all five forest carbon pools at the regional scale. This will simplify the EM&V process, as data are available from public sources such as FIA and states will not be required to verify and track specific feedstock types during and after removal from the forest. When entities choose to undergo third-party certification for qualified biomass on their specific lands, the requirements for measurement would be the typical measurement standards for carbon in forests and could borrow from existing protocols such as the forest offset protocol for US forest projects in place in California.[29]

Part IV: Certifying additional feedstocks

11. **Third-party certification is acceptable, but must use EPA's rigorous and specific guidelines on quantifiable and "additional" carbon stock change as basis for certification.**

We also recommend that EPA allow for rigorous third-party certification of emissions reductions from increased carbon sequestration and/or reduction in carbon emissions from land use and land management as a result of the production of biomass feedstocks. Sound oversight principles for third party verification must be applied as well (including public certification, appropriate training/qualifications, absence of conflicts, and the like).

Such certifications should follow similar rigorous requirements for quantification, "additionality," and consideration of emissions leakage (i.e. potential shifts in emissions from displaced production of other forest or agricultural commodities as a result of bioenergy use), which is particularly relevant at the smaller spatial scale, as the certification of carbon "offsets" in compliance carbon markets such as California and Quebec's and can adapt a variety of forestry and land management protocols developed to date. The amount of carbon emissions reductions that can be demonstrated would then be bundled into the bioenergy feedstocks. A power generating unit would have to demonstrate chain of custody for that biomass and its associated emissions reductions for purposes of compliance under the CPP. The amount of reductions would determine the

[29] http://www.arb.ca.gov/cc/capandtrade/protocols/usforest/usforestprojects_2014.htm

amount of units (or fraction of a unit) of biomass feedstock that could be "qualified" as having a net zero impact on emissions.

One difference is that while carbon market standards usually require assurances of "permanence" of demonstrated emissions reductions for indefinite periods of time, in the bioenergy context, permanence of reductions need only be demonstrated up until the time of harvest and combustion, at which point the carbon will be emitted again.

The use of third party certification will add transaction costs, but will enable qualification of other biomass feedstocks in addition to those which can be qualified through the mill/industrial waste and regional landscape certification pathways described above. This could include wastes from mills in excess of the limits described above and feedstocks from regions with declining landscape carbon volumes, as well as feedstocks from biomass types (e.g. algae) that are not measured under a regional carbon stock approach.

In the case of certification of feedstock types that are being measured at the regional level, EPA should track certified emissions reductions from biomass production in a registry (and subtract these from any amount qualified at the regional level) to ensure that emissions reductions are not being double counted.

Environmental Defense Fund appreciates the opportunity to provide input on these critical issues and looks forward to a continued dialogue with EPA as it considers how to address biogenic emissions under EPA's Clean Power Plan.

Respectfully submitted,

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