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The Right Honorable Edward Davey MP
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Dear Secretary Davey and Professor Loughhead:

I would like to share with you Science Fundamentals of Forest Biomass Carbon Accounting, a summary of four carbon science recommendations for policymakers seeking to develop a science-based approach to forest biomass energy production. I believe it will be helpful as the United Kingdon develops forest biomass and carbon accounting policy.

The summary is based on a recent peer-reviewed article in the *Journal of Forestry* (112(6):591-606) by myself and eight other leading U.S. forest carbon experts that assembled, assessed, and summarized more than 135 scientific peer-review articles. The summary was produced by the National Association of University Forest Resources Programs (NAUFRP) and endorsed by more than 100 U.S. university experts and researchers. NAUFRP consists of 80 of the leading U.S. universities that have programs devoted to forest resources. These universities share a common purpose of advancing the health, productivity, and sustainability of U.S. forests.

A key point that is critical for policymakers to understand is set out in Fundamental 4 of the summary. Namely, that in the U.S., unlike some other countries, increased demand for wood triggers forest landowners to make investments that increase forest area and forest productivity. These investments: (1) offset the carbon impacts associated with increased harvesting, and (2) reduce the conversion of forests to other land uses. In fact, the U.S. Forest Service has repeatedly noted that strong markets for U.S. wood products reduce the greatest threat to U.S. forests: conversion to other land uses such as human housing.

I invite you to review the fundamentals supported by these leaders in forestry and carbon science, and hope it will enable the development of bioenergy policies that are based on sound and relevant science, and that are also practical and reasonable in application.

I would welcome the opportunity to discuss these fundamentals with you if you have any questions or need additional information.

Sincerely,

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Science Fundamentals of Forest Biomass Carbon Accounting

Policy makers are increasingly considering the use of forest biomass energy to meet national, regional and state energy and carbon emissions objectives. As they do so, it is imperative that their policy decisions be informed by current peer-reviewed science on the carbon impacts of woody biomass as an energy source. Some studies on the subject offer views with stringent assumptions that may be confusing to decision-makers.

Peer-reviewed literature examining the net emissions from the wide spectrum of forest-based activities reveals a number of important fundamentals policy makers should consider when characterizing the carbon impacts of the increased use of forest biomass for energy.[1] While these fundamentals do not address all of the issues policy makers confront, they help clarify those most directly affecting the potential role forest biomass energy can play in energy and climate policy.

As experts in forest science, we recommend the following four science fundamentals to policy makers and others seeking to develop a science-based approach to biomass energy production.

Fundamental 1: The carbon benefits of sustainable forest biomass energy are well established.

> The long-term benefits of forest biomass energy are well-established in science literature. As stated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, "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.[2]" Most debates regarding the carbon benefits of forest biomass energy are about the timing of the benefits rather than whether they exist.

Fundamental 2: Measuring the carbon benefits of forest biomass energy must consider cumulative carbon emissions over the long term.

> The most effective carbon mitigation measures are those which reduce carbon accumulation in the atmosphere over time. Forest biomass energy yields significant net decreases in overall carbon accumulation in the atmosphere over time compared to fossil fuels. Comparisons between forest biomass emissions and fossil fuel emissions at the time of combustion and for short periods thereafter do not account for long term carbon accumulation in the atmosphere and can significantly distort or ignore comparative carbon impacts over time.

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[1] Miner, R.A., R.C. Abt, J.L. Bowyer, M.A. Buford, R.W. Malmsheimer, J. O'Laughlin, E.E. Oneil, R.A. Sedjo, and K.E. Skog. 2014. Forest Carbon Accounting Considerations in U.S. Bioenergy Policy. *Journal of Forestry* 112(6): 591-606.

[2] p. 543. Nabuurs, G.J., O. Masera, K. Andrasko, P. Benitez-Ponce, R. Boer, M. Dutschke, E. Elsiddig, et al. 2007. 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, Metz, B., O.R. Davidson, P.R. Bosch, R. Dave, and L.A. Meyer (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. P. 541-584.

Fundamental 3: An accurate comparison of forest biomass energy carbon impacts with those of other energy sources requires the use of consistent timeframes in the comparison.

The most common timeframe for measuring the impacts of greenhouse gases is 100 years, as illustrated by the widespread use of 100-year global warming potentials.[3] This timeframe provides a more accurate accounting of cumulative emissions than shorter intervals. Measuring the net cumulative carbon emissions from forest biomass energy over a 100 year timeframe, as is done for fossil fuels, more accurately captures and more appropriately demonstrates the cumulative carbon benefits of biomass energy compared to fossil fuels.

Fundamental 4. Economic factors influence the carbon impacts of forest biomass energy.

Research demonstrates that demand for wood helps keep land in forest and incentivizes investments in new and more productive forests, all of which have significant carbon benefits. This is particularly true when landowner investments are made in anticipation of future market demand. Likewise wood markets significantly influence both the availability of wood and the kind of wood used for biomass energy. For example, large trees better suited for higher value markets are typically not used for energy. The consideration of landowner response to the marketplace is essential to fully accounting for the long-term carbon impacts of using forest biomass for energy.[4] Failing to consider the effects of markets and investment on carbon impacts can distort the characterization of carbon impacts from forest biomass energy.

Research on the use of forest biomass as an energy source to mitigate GHG emissions dates back to the late 1980's. Changes in technology, forest conditions, and markets and global economics will influence forest biomass utilization now and in the future. A commitment to continuing research on forest biomass utilization is necessary to quantify the risks and benefits associated with its use, encourage dialogue and debate, and drive innovation and investment in new technologies.

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[3] Forster, P., V. Ramaswamy, P. Artaxo, T. Berntsen, R. Betts, D.W. Fahey, J. Haywood, et al. 2007. Changes in atmospheric constituents and in radiative forcing. Chapter 2 in *Climate Change 2007: The physical science basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[4] Alavalapati, J.R.R., P. Lal, A. Susaeta, R. Abt, and D. Wear. 2013. Forest biomass-based energy pp213-260. A chapter In Southern Forest Future Project edited by D. Wear and J. Griess, U.S. Forest Service General Technical Report SRS-178, 1318 pages.

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