Bioenergy Review (2018) - Call for Evidence
Response from Enviva
February 5, 2018

Information on organisation / individual submitting response

Enviva was founded in 2004 with a clear purpose in mind: We wanted to develop a cleaner energy alternative to fossil fuels. In particular, we wanted to offer electric utilities a fuel to replace coal, enabling them to generate power without interruption while reducing their greenhouse gas emissions. More than a decade later, Enviva has become the world's largest producer of wood pellets – a small and seemingly ordinary product that is addressing these big challenges and delivering real results.

Enviva owns and operates six plants strategically located in the southeastern United States that produce nearly 3 million metric tons of wood pellets annually. We export our pellets primarily to power plants in the United Kingdom and Europe that previously were fueled by coal, enabling them to reduce their lifetime carbon footprint by about 80%. We make our pellets using sustainable practices that protect Southern forests. And we employ about 600 people and support many other businesses in the rural South, where jobs and economic opportunity are sometimes scarce.

Enviva conducts its activities primarily through two entities: Enviva Partners, LP, a publicly-traded master limited partnership (NYSE: EVA), and Enviva Development Holdings, LLC, a wholly-owned private company.

The respondent is Enviva's Chief Sustainability Officer, Dr. Jennifer Jenkins. As CSO, Dr. Jenkins leads the team responsible for ensuring that Enviva's wood sourcing is carried out responsibly and sustainably.

GHG emissions and sustainability of bioenergy imports

Our 2011 Bioenergy Review concluded that UK and EU regulatory approaches should be strengthened to better reflect estimates of the full lifecycle emissions of bioenergy feedstocks, taking into account both direct and indirect land-use change impacts. Whilst changes have been made to these regulatory frameworks, both life-cycle emissions and the wider sustainability impacts of bioenergy remain highly contested issues, particularly in relation to bioenergy imports. Given the potential role for bioenergy in the UK's low-carbon transition, and the potential increase in bioenergy feedstock production in the future, it will be essential that policy is based on the latest available evidence and that bioenergy is genuinely sustainable.

The term 'sustainable' here is used to cover a wide-range of issues relating to GHG emissions, biodiversity, water use, land-use, land-rights, air-quality and other social and environmental issues.

1. What is the latest evidence on lifecycle GHG emissions of biomass and other biofuels imported into the UK? How could this change over time as a function of scaling up supply? We are particularly interested in evidence that considers the full range of relevant issues including changes to forest and land carbon stocks, direct and indirect land-use change and wider market effects.

   Imports to the UK from Enviva facilities achieve average GHG emissions reductions of over 85% compared to coal, as calculated using the Ofgem methodology and the Solid and Gaseous Biomass and Carbon Calculator, and the energy contained in those pellets is nearly 7 times greater than the energy required to manufacture and deliver them. Increasing the scale of biomass production would enable further GHG emissions reductions from biomass imports, as economies of scale would enable more efficient supply chains (e.g. larger capacity ships, reduced per-ton energy requirement for pellet production, etc.).

   A number of peer-reviewed studies have assessed the full lifecycle carbon impacts of wood pellets from the US South, and experts in bioenergy and Southern forestry and land use have repeatedly concluded that demand for biomass feedstocks promotes retention and efficient management of privately owned Southern working forests, leading to significant GHG savings in comparison to fossil fuels.[1] While this issue has been debated in the UK, the ultimate conclusion from the former Department of Energy and Climate Change (DECC) on the Biomass Emissions and Counterfactual (BEAC) biomass LCA was that the high-carbon scenarios included in the original model were either based on flawed assumptions or unlikely to occur.[2]

   Assessments of unrealistic scenarios will only generate unrealistic outputs, and studies that do not properly consider market forces, the magnitude of the Southern forest resource, and the relative roles of the various players in the forest products industry in the SE US do not accurately characterize the climate impacts of bioenergy.

2. Under what circumstances can imported biomass and other biofuels deliver real GHG emissions savings (considering full life-cycle emissions and indirect/wider market effects)? Conversely, what evidence is there for ruling out certain sources on the grounds of lifecycle GHG emissions or sustainability risks?

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[1] Peer-reviewed studies:
Carbon savings with transatlantic trade in pellets: accounting for market driven effects, Dr. Madhu Khanna, et al.; *Sustainability guidelines and forest market response: an assessment of European Union pellet demand in the southeastern United States*, Christopher Galik (Professor at Duke University Nicholas Institute for Environmental Policy Solutions) and Robert Abt (Professor at NC State University College of Natural Resources); *Wood pellets, what else? Greenhouse gas parity times of European electricity from wood pellets produced in the south-eastern United States using different softwood feedstocks*, Dr. Martin Junginger et al.; *Forest Carbon Accounting Considerations in US Bioenergy Policy*, Society of American Foresters, published in the Journal of Forestry

[2] *Use of North American woody biomass in UK electricity generation: Assessment of high carbon biomass fuel sourcing scenarios*, Ricardo Energy and Environment, report for DECC

See response to Question 1 for evidence of real GHG savings achieved by biomass imports from the US. These studies all properly portray Southern working forestlands as being influenced by a system of land ownership and forest product and land use markets in which there is a proven positive relationship between forest harvest and forest growth, mediated by landowner behavior.

There are certainly feedstocks which should not be used for bioenergy applications, including biomass from forests being harvested at unsustainable rates, high-quality logs such as sawtimber that can be manufactured into solid wood products, and biomass from High Conservation Value (HCV) ecosystems. The website for Enviva's Track and Trace™ supply chain transparency program presents statistics on positive historical trends in US Southern forest area and inventory, data on our feedstock sources, as well as details our sourcing policies which ensure we aren't sourcing wood from HCV areas or forests which will be converted to a non-forest land use.

3. Currently the UK imports a significant proportion of wood pellets for biomass electricity production from North America, particularly the south-east USA.

    a) What are the wider market impacts of demand for wood pellets on forestry management practices and carbon stocks at the landscape level in North America?

The market for wood pellets is small relative to the rest of the forest products industry, and so biomass demand does not drive management decisions on the landscape. However, this market's marginal demand strengthens and diversifies overall forest product demand in the US South, incentivizing active and efficient management of privately-owned timberlands, which leads to more productive use of naturally-managed working forests and enhanced landscape carbon storage.[3]

    b) What evidence is there that wood pellet production displaces other uses of forestry products in North America? (e.g. panel board or lumber production)

There is no evidence that wood pellet production displaces other uses of forest products. The US South produces one sixth of the global wood supply[4] and is growing faster than it's being harvested. The European Commission has twice investigated this matter (once for Drax and once for Lynemouth) and each time, after thorough year-long investigations, the EC has found no evidence of market distortion.[5]

    c) What are the most likely alternative/counterfactual uses of forestry products used for wood pellet production?

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[3] *Historical Perspective on the Relationship between Demand and Forest Productivity in the US South*, Forest2Market

[4] *Prestemon, Jeffery P., David N. Wear and Michaela O. Foster. 2015. The Global Position of the US Forest Products Industry. e-Gen. Tech. Rep. SRS-204. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 24 p.*

[5] *State aid: Commission authorises UK support to convert unit of Drax power plant from coal to biomass*, press release from the European Commission; *State aid: Commission authorises UK support to convert Lynemouth power station to biomass*, press release from the European Commission

Wood pellets are made from low-grade wood that is a byproduct of a traditional timber harvest, and in most cases, there is no other buyer of these products in the area. In the absence of bioenergy demand, these small, low-quality, irregular trees, branches, tops, and limbs would likely still be harvested and left to be burned or to decay onsite, or forests would be high-graded, a detrimental practice in which only high-value trees are harvested from a site, and the remaining forest is left with diminished economic, ecological, and carbon storage potential.

d) How are these wider market impacts (sub-questions a-c) likely to change over time if demand for wood pellets significantly increases?

Wood pellet demand, while on the rise, has a small impact on the SE US's vast forest resource and strong forest products market. Wood pellet demand in 2014 made up less than 0.1% of overall forest inventory and 2.4% of total harvest volume in the US South.[6] Further, the US Department of Energy estimates that an additional 1 billion tons of forest and agricultural resources per year are available for a variety of uses, including for energy, without any adverse environmental effects.[7] At the same time, US demand for pulpwood from the pulp & paper sector has permanently declined due to a shrinking manufacturing sector and the emergence of electronic media.[8] As a result, there is an estimated surplus of an additional 20 million dry tons (40 million green tons) of low-grade harvesting residues available in the US South per year.

4. Aside from GHG emissions, what evidence is there of other sustainability impacts associated with imported biomass or other biofuels? What evidence is there for how these might change as a function of scaling up supply (from the US, and internationally)?

Biomass feedstocks in the US South are sourced from working forestlands that have been managed for timber since European settlement, and the trees growing on the landscape today make up the 5th or 6th generation of these forests.[9] In the US, statutory protections mandate that forestry practices do not harm threatened and endangered species or soil and water quality. In addition, federal and state monitoring as well as independent sustainability certifications from the Sustainable Forestry Initiative (SFI), Forest Stewardship Council (FSC), and Sustainable Biomass Program (SBP) obtained by biomass producers monitor adherence to these laws and successfully demonstrate compliance with European biomass sustainability requirements.

In addition to these protections, Enviva has made a commitment to transparency via our Track & Trace ™ program. The website for Enviva's Track and Trace™ supply chain transparency program presents statistics on positive historical trends in US Southern forest

[6] *Effect of policies on pellet production and forests in the US South*, USDA Forest Service Southern Research Station

[7] *2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy*, US Department of Energy

[8] The Global Position of the US Forest Products Industry. Jeffrey P. Prestemon, David N. Wear, and Michaela O. Foster, US Department of Agriculture.

[9] Wear, D. N., & Greis, J. G. (2012). The Southern Forest Futures Project: Summary Report. Research Triangle Park: United States Department of Agriculture Forest Service Southern Research Station.

area and inventory, data on our feedstock sources, as well as details our sourcing policies which ensure we aren't sourcing wood from HCV areas or forests which will be converted to a non-forest land use. We are proud of our demonstrated track record of leadership in sustainable wood sourcing.

5. Are there any benefits resulting from importing biomass or other biofuels into the UK (e.g. development benefits)? How might these vary internationally? What are the conditions required for any benefits to be realised?

As discussed in preceding responses, sustainably-sourced biomass has positive effects on forest health and carbon storage. Strong markets for forest products lead to increased forest growth and reduce the likelihood of forest conversion to nonforest uses. Empirical data and modelling show that increased demand for forest products leads to investments in forestry that increase forest area, improve forest management, and increase forest carbon stocks.

Further, the supply of biomass imports play an important role in providing stability and security to European energy markets. Over 40% of the biomass used in the UK is produced in North America.[10] In the absence of these imports, market liquidity would disappear and feedstock costs would rise, causing distortions in European bioenergy markets that would negatively affect consumers and taxpayers as well as threaten progress towards meeting renewable energy goals.

Sustainability policy and certification

The sustainability framework for bioenergy in the UK has evolved significantly since 2011. Changes have included the tightening over time of lifecycle GHG emissions limits for bioenergy supported under Government incentive schemes, changes to EU rules on liquid biofuels and the development of certification schemes. Nonetheless questions remain regarding the current framework's capacity to guarantee high sustainability standards.

The term 'sustainability framework' refers here to the policies, regulations and incentives in place to promote bioenergy sustainability in the UK.

6. What are the strengths, weaknesses and gaps of the current sustainability framework for bioenergy in the UK? How could the current sustainability framework for bioenergy in the UK be improved to address these issues?

The UK sustainability framework for bioenergy is the most stringent in the world and was developed after many months of consultations and stakeholder input. These current requirements ensure sustainability while also working within the private landownership framework that exists in the US and the varying national laws on land-use change and GHG emissions that exist around the world.

To comply with UK regulations, US pellet producers hold chain of custody and feedstock sourcing certifications from internationally-recognized forestry certification schemes such as FSC, SFI, PECF, SBP, and others. These certifications allow pellet producers to evaluate and demonstrate sustainability throughout their supply chains. US pellet producers are audited

[10] *Biomass Sustainability Report 2015-16 dataset*, UK Ofgem

by independent, third-parties on a routine basis to maintain these certifications. Supply chain sustainability and GHG emissions data for sourcing, production, and transport is reported to Ofgem who determines compliance with UK regulations.

7. Ofgem has identified a number of certification schemes that it considers appropriate for demonstrating compliance with the 'Land Criteria' under the Renewable Obligation sustainability standards. Are these certification schemes adequate? Why/why not? How could they be improved?

The current Ofgem requirements employ a regional approach and ensure sustainability while also working within the private landownership framework that exists in the US and the varying national laws on land-use change and GHG emissions that exist around the world. The certification schemes accepted under these standards assess sustainability using risk-based assessments of the supply chain and wood-basket or sourcing region. This allows a full landscape-level picture of forest growth and carbon stocks within that area. Risk-based assessments also remove the financial and administrative burden from the small family landowner and places it on the biomass producer instead.

8. What certification schemes currently represent 'best practice'? Why?

US pellet producers use internationally-recognized forestry certification schemes, such as FSC, SFI, SBP, and PEFC. Many of these schemes have been used by forest products industries for decades to demonstrate sustainability and are revised on a routine basis. Pellet producers also use Sustainable Biomass Program certifications to provide additional sustainability evidence covering land-use change and greenhouse gas emissions. This additional evidence meets and often exceeds UK requirements and SBP is considered a Category A compliance mechanism for UK sustainability regulations.

9. Ofgem has set out approaches to calculating bioenergy GHG emissions for demonstrating compliance with the 'GHG Criteria' under the Renewable Obligation sustainability standards. Are these approaches adequate? Why/why not? How could they be improved?

Supply chain sustainability data and GHG emissions data for sourcing, production, and transport are reported to Ofgem who determines compliance with UK regulations. Biomass producers use certification schemes like SBP, which include standards that guide the collection and communication of GHG and energy data for reporting to end users who then report to the regulator.

While the Ofgem methodology is clear and easy to understand, the Solid and Gaseous Biomass Carbon Calculator could be improved so that it more accurately reflects actual biomass supply chain emissions and to provide greater transparency into the model's calculations. For example, the emissions factor for using "Wood chips from forestry residues" for biomass drying is two times greater than the one for "Wood chips from long rotation forestry (broadleaf) in North America," and there is no explanation for this difference. There are also several significant conservative factors that have been applied throughout the model without much justification. As emissions reduction thresholds become stricter, biomass producers will be paying closer attention to ensuring that GHG calculations accurately represent the energy use they report from their supply chains.

10. Please highlight any further measures you feel are required to ensure bioenergy feedstocks used in the UK are sustainable and deliver significant life-cycle GHG emissions savings. Why are these measures needed?

11. Some large UK users of imported biomass use a risk-based approach to assess the sustainability risks associated with importing biomass from specific jurisdictions. What is the role for these approaches?

Risk assessments allow for robust and comprehensive sustainability assurances while also working within the private landownership framework and complex forest market that exists in the US.

The risk-based approach found in the UK Timber Procurement Policy and UK sustainability regulations was based on the FSC Controlled Wood and Controlled Sources and the SFI Fiber Sourcing certifications, which are widely accepted methods of demonstrating supply chain sustainability and legality across forest products industries. With their position at the bottom of the value chain, pellet producers cannot provide enough financial incentive for private forest owners to obtain costly certifications year after year. Instead, US pellet producers hold the certification, which removes the burden from the family landowner.

Certification schemes accepted under the UK standards, such as FSC, SFI, PEFC, and SBP assess sustainability using risk-based assessments of the supply chain and wood-basket or sourcing region, which allows a complete picture of forest growth and carbon stocks within the region. The pellet producer then has a complete view of their supply chain and the wood basket in which they operate and can demonstrate low-risk of non-compliance or mitigate any potential risks.

Supply of bioenergy feedstocks

In our 2011 Bioenergy Review we considered scenarios for the amount of sustainable bioenergy resource available to the UK over the coming decades. Our central 'Extended Land Use' scenario suggested that around 10% of the UK's primary energy demand could be met from bioenergy in 2050, with over half coming from domestic feedstocks. We are now looking to develop new supply scenarios through to 2050 to reflect the latest evidence on sustainability and different assumptions about the potential future availability of imported and domestically produced bioenergy resources.

To support the development of these scenarios and our wider work, the CCC is currently undertaking new analysis on how the use and management of land in the UK can deliver deeper emissions reduction and increased sequestration. This analysis will provide updated data on the potential supply of non-waste and non-food bioenergy resources from UK sources. For projections of international bioenergy resources and waste-based UK bioenergy resources we will review the latest evidence and publicly available literature. We are particularly interested in quantitative estimates of resource potential, broken down by feedstock type, that are underpinned by explicit assumptions relating to sustainability.

12. What are the most credible and up-to-date estimates for global bioenergy resource potential through to 2050, broken down by feedstock type? What key assumptions underpin these estimates?

    Please provide details of any assessments of global bioenergy resource explicitly tied to sustainability standards (covering GHG emissions, biodiversity, water use, land-use, land-rights, air-quality and other social and environmental issues)

    For the US, the US Department of Energy estimates that 1 billion tons of forest and agriculture resources per year are available for a variety of uses, including for energy, without any adverse environmental effects.[11]

13. What is the latest evidence relating to the availability of 'marginal' and abandoned agricultural land for growing bioenergy crops (where possible, reflecting broader sustainability requirements e.g. water stress, biodiversity, social issues)? Is this evidence adequately reflected in global resource estimates?

14. What are the most credible and up-to-date estimates for the amount of bioenergy resource that could be produced from UK waste sources through to 2050? Where possible please state any assumptions relating the reduction, reuse and recycling of different future waste streams.

15. What factors (opportunities, constraints, assumptions) should the CCC reflect in its bioenergy resource scenarios through to 2050?

    The CCC should consider the factors outlined in detail in responses to questions 1 – 5 above, including the long history of timber management in the US South, the effects of private property rights and market forces on forest management, the relatively small size of biomass markets in comparison to other forest product industries, shifts in demand from the pulp and paper sector, and the potential for Southern forests to sustainably meet substantial additional annual demand.

16. What should be the assumptions on the share of international resource which can be accessed by the UK (e.g. per capita, current or future energy demand)?

    See response to question 15 for the US. When considering potential for developing capacity for additional international supply, the availability of existing supply chain infrastructure, access to capital and credit to develop currently under-developed supply chains, and ability of any potential new biomass sources to provide the level of assurance required to comply with the UK's legality and sustainability requirements.

17. What are the prospects for the development and commercial production of 3rd generation bioenergy feedstocks (e.g. algae)? What are the timescales, costs, risks, opportunities and abatement potential of using algae to make biofuels?

[11] *2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy*, US Department of Energy

Scaling up UK sustainable supply

An objective of our current work on bioenergy is to better understand and reflect the potential for scaling-up of the supply of sustainably produced domestic (UK) bioenergy resources through to 2050. We aim to identify and develop policy recommendations for 'low-regrets' measures/strategies that can be implemented in the near term.

18. What are the main opportunities to scale-up the supply of sustainably-produced domestic bioenergy supply in the UK? Where possible please provide details on the scale of opportunity.

19. What risks are associated with scaling-up domestic supply and how can these risks be managed?

20. What 'low-regrets' measures should be taken now (e.g. planting strategies) to increase sustainably-produced domestic bioenergy supply?

21. What international examples of best-practice should the UK should look to when considering approaches to scaling-up domestic supply?

22. What policy measures should be considered by Government to help scale-up domestic supply?

Best-use of bioenergy resources

Our 2011 review developed a hierarchy of appropriate uses for bioenergy feedstocks based on minimising costs and maximising abatement. We concluded that if CCS technology is available it is appropriate to use bioenergy in applications with CCS, making it possible to achieve negative emissions under the right circumstances. This could include power and/or heat generation, hydrogen production, and biofuels production for use in aviation and shipping. If CCS is not available, bioenergy use could be skewed towards heat generation in energy-intensive industry, and to biofuels in aviation and shipping, with no appropriate role in power generation or surface transport. In either case, we concluded the use of woody biomass in construction should be a high priority given that this can potentially secure negative emissions through a very efficient form of carbon capture.

We are now looking to update this analysis to reflect the latest technological and market developments. We are particularly interested in technologies such as biomass gasification, CCS and advanced second and third generation biofuels as well as the potential role of hydrogen to support decarbonisation across the economy. To support our consideration of these areas, the CCC is currently undertaking analysis into the potential of the hydrogen economy and we are planning to undertake further investigation into non-energy uses of bioenergy resources.

23. Gasification has been identified as a potentially important technology for unlocking the full potential of bioenergy to support economy-wide decarbonisation.

a) What are the likely timescales for commercial deployment of gasification technologies?
b) What efficiencies and costs are likely to be achieved? What scope is there for improvement and/or cost reductions over time? Please differentiate between feedstocks where possible/necessary.
c) What are the main barriers and uncertainties associated with the development, deployment and use of gasification technologies?
d) What risks are associated with gasification technologies and how can these be managed?
e) What policies and incentives are required to facilitate commercial deployment?

24. Bioenergy with Carbon Capture and Storage (BECCS) has been identified as a key potential mechanism for achieving the UK's 2050 carbon target due to the 'negative emissions' it could offer.
    a) What are the potential timescales for commercial deployment of BECCS technologies?
    b) What are likely to be the optimal uses of BECCS (e.g. electricity generation, hydrogen production)?
    c) What efficiencies and costs are possible?
    d) How will performance and cost differ according to feedstock type? What are likely to be the optimal feedstock types for BECCS? What are the implications for domestic supply vs imports (e.g. feasibility, considerations in scaling up over time)?
    a. What are the main barriers and uncertainties associated with the development, deployment and use of BECCS?
    b. What are the risks associated with the pursuit of BECCS that go beyond the risks that relate to supplying sustainable feedstocks and CCS more generally? How can these be managed?

    BECCS is supported by the Intergovernmental Panel on Climate Change as a method for achieving negative emissions and reducing costs. For BECCS to be successful, a strong biopower industry must already exist and must be fully supported by government regulatory programs.

25. Once developed BECCS is a technology that could be deployed in many different countries around the world. What principles and mechanisms should be used to determine where BECCS is deployed and how any associated negative emissions are accounted for? Should any UK participation in any international BECCS scheme be counted as additional to efforts to meet domestic carbon budgets?

26. There is currently substantial interest in the development of 'advanced' biofuels for use in sectors such as aviation, shipping and/or heavy duty transport.
    a) What are the most promising technologies/processes for advanced biofuel production up to 2050? Please provide details on each technology/process including advantages/disadvantages, timescales for commercial deployment, feedstock type, fuel type and end-user.

b) What efficiencies and costs are likely to be achieved? What scope is there for improvement and/or cost reductions over time? Please differentiate between technologies/processes.
c) What are likely to be the optimal feedstock types for advanced biofuel technologies?
d) What are likely to be the optimal end-uses of advanced biofuel technologies?
e) What are the main barriers and uncertainties associated with the development, deployment and use of advanced biofuel technologies?
f) What risks are associated with the pursuit of advanced biofuel technologies and how can these be managed?
g) What policies and incentives are required to facilitate commercial deployment of advanced biofuels?

27. In 2015 the Government published the Industrial Decarbonisation and Energy Efficiency Roadmaps to 2050. These Roadmaps explored decarbonisation options across multiple industrial sectors and the estimated deployment potential, timescales, cost data and abatement for each option (including bioenergy). Are there any substantial changes from these estimates that the CCC should consider when assessing abatement options in industry? If so please provide your reasoning and details of any recent evidence that relates to these changes.

28. In our 2011 review we identified wood in construction as a potentially effective method of CCS and a high priority 'non-energy' use in our best-use hierarchy.
    a. What lifecycle GHG emissions savings can be achieved by using WIC? Under what circumstances does WIC fail to deliver GHG emissions savings? Please consider the full range of impacts associated with using WIC including substituted product emissions (e.g. cement), product equivalence (impacts on co-products), end-of-life options and biogenic carbon storage.
    b. What is the potential for increasing the amount of wood used in construction in the UK? What are the barriers and how can they be overcome?
    c. What is the potential for using UK-produced timber in construction rather than imports? What are the barriers and how can they be overcome?
    d. What is the expected lifetime of different wood products in construction (e.g. cross-laminated timber)?
    e. What currently happens to wood in construction at the end of its useful life? What other viable options should be developed?

29. There are also a number of other potential non-energy uses of bio-feedstocks including bio-based plastics and bio-based chemicals.
    a. What other non-energy uses of bio-feedstocks have the most potential through to 2050 in terms of GHG abatement, cost, timescales and market size?
    b. What are the barriers to increasing these non-energy uses and how can these barriers be overcome?
    c. What risks are associated with the pursuit of other non-energy uses of bio-feedstocks and how can these be managed?

Bio-based plastics and chemicals have real growth potential between now and 2050 and have a role to play in development of a bioeconomy. Sugars can be extracted from woody biomass and converted into chemicals used to make plastics and a multitude of other products. The remainder of the biomass has potential to then be used to produce low-carbon energy or heat for the manufacturing plant. As outlined in previous answers, the US forest resource has the capacity to serve multiple markets sustainably.

GHG emissions reporting and accounting

GHG emissions reporting rules for bioenergy are different to those for other forms of energy. Emissions relating to the use (combustion) of bioenergy resources are not reported in the country of use but rather in the country where bioenergy resources are produced. Only Annex 1 countries under the Kyoto Protocol currently account for land-use emissions as part of binding emission reduction targets. In addition under Paris Agreement rules emissions (as under the Kyoto Protocol) will be reported against land-use baselines that may already assume a degree of land-use change. For these reasons and others, bioenergy GHG accounting has been criticised for not properly reflecting the impacts of bioenergy.

30. What are the strengths and weaknesses of the current approach to GHG emissions accounting for bioenergy in the UK and internationally? Specifically, what are the main gaps in the current land use emissions accounting rules?

See response to question 9. The current approach to emissions accounting which focuses on supply chain emissions and requires monitoring of land use since 2008, as well as forest inventory and forest carbon stocks, is an appropriate policy instrument.

31. What are the risks, in terms of GHG emissions, associated with importing biomass or other biofuels from countries that have not committed to limiting or reducing emissions under the Kyoto Protocol or Paris Agreement? How can these risks be managed?

In the US, forest carbon stocks and forest inventory are monitored on a regular basis at the national level by the USDA Forest Service through the Forest Inventory and Analysis (FIA) program. This monitoring, which was first initiated in 1930, occurs irrespective of any international treaties or agreements. Regardless of the federal government position, many states and cities across the US have made efforts to align their state or region with the Paris Agreement goals.

The decision to be "in" or "out" of the Paris Agreement will not impact the US government's obligation to conduct and publish GHG Reporting, including the LULUCF sector, under the UN Framework Convention on Climate Change. This decision also does not affect the sustainable practices of the pellet industry or the forest products industry as a whole.

32. What alternative method(s) for bioenergy emissions accounting should be considered? What would the implications of these alternative method(s) be?

Indicators

As part of the 2018 Bioenergy Review the CCC is planning to develop a set of indicators to track progress towards key bioenergy outcomes. We envisage these will cover key areas such as sustainability, policy development, supply and best-use.

33. What key areas should be reflected in these indicators?

Indicators should:

- ***Rely on peer-reviewed research and data***
- ***Be based on realistic assumptions of the forest products market.***
- ***Continue to support sustainable biomass as a low-carbon, baseload replacement for coal and other fossil fuels.***
- ***Recognize the value that forest markets bring in supporting healthy forest management and small family landowners.***
- ***Work within the framework of international trade agreements, private landownership rights, and forestry laws and regulations of governments around the world.***

34. Please provide details of any examples of international best-practice in the area of bioenergy indicators.

The UK regulatory framework has proven to be the most successful in both ensuring sustainability and in recognizing the complexity of forest products markets. The UK has been successfully importing sustainable biomass from the US for many years, taking coal off the energy system and reducing carbon emissions. At the same time, US forest and carbon stocks have been increasing. No credible evidence exists of negative forest impacts due to the biomass industry in the US South.

Other

35. Please submit any further evidence that you would like us to consider.