BIOENERGY REVIEW (2018) - CALL FOR EVIDENCE
RESPONSE FROM THE US INDUSTRIAL PELLET ASSOCIATION
FEBRUARY 4, 2018

Information on organisation submitting response

The US Industrial Pellet Association is a not for profit trade organization representing U.S. producers of industrial wood pellets that are exported to the European Union for renewable power generation. To manufacture wood pellets, our members use only sustainable low-grade wood fiber in the form of residues, tops and limbs, forest thinnings, and diseased or misshapen wood otherwise that is unused or underutilized in that particular region or wood basket. More information about our association can be found on our website at www.theusipa.org.

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.

   Since the timing of the previous bioenergy review from the UK Committee on Climate Change, sustainability and GHG regulations and reporting criteria have been implemented for solid biomass. The latest data released under the Ofgem sustainability reporting guidelines (2015/2016) shows an 89% emissions savings from biomass when compared to coal.

RO reporting period		*g CO_{2eq} / MJ*	*GHG saving compared to coal*
2015/16	*Weighted Average*	*28.28*	*89%*
	Average	*20.57*	*92%*
2014/15	*Weighted Average*	*32.60*	*87%*
	Average	*25.83*	*90%*
2013/14	*Weighted Average*	*36.94*	*85%*
	Average	*30.65*	*88%*

To test the carbon impacts of various biomass demand scenarios, the former UK Department of Energy and Climate Change (DECC) developed a Biomass Emissions and Counterfactuals (BEAC) modelling system. Following the publication of the modelling system, to further evaluate the tool's scenarios, DECC commissioned a study to test the model's accuracy and found that:

- ***The original BEAC model does not take economic drivers or the complexity of the US forest products market into account.***
- ***Of the 38 scenarios in the original model that could lead to high-carbon fuel sourcing, only 5 have any potential to occur in the US South and that each these 5 were either unlikely to happen at all, unlikely to happen as a result of pellet demand alone, or that existing sustainability requirements would prevent them from occurring.***
- ***There is no justifiable link between pellet demand and negative conservation impacts.***
- ***Financial return on sawtimber is significantly higher than pellet financial return, therefore pellet demand is unlikely to be the sole driver of harvesting decisions.***
- ***Even if prices for lower-value pulpwood were to double, it would not represent sufficient income levels to justify conversion of land or change of harvesting practices.***
- ***Pellet demand has not resulted in increased harvesting rates.***
- ***USDA Forest Service forest inventory data from the US South shows that growth exceeds removals for all forest types and regions each year.***

Modelling and reporting on carbon and sustainability relies heavily on appropriate and realistic scenarios and assumptions. Assessments of unrealistic scenarios only produce unrealistic results; therefore, it is critical to use accurate inputs for any carbon model. It is important to consider the following factors when assessing carbon impacts of biomass imported from the US South.

1) <u>Market Effects.</u> Forests in the US South are part of a complex system of land ownership, regulations, taxes/policy incentives, and forest products and land use markets. Forest management decisions are largely based upon market demands, meaning that forest growth and carbon stocks are directly influenced by these markets. Data that does not address market effects is incomplete and may not applicable to forests in the US South.

2) <u>Spatial Scale.</u> It is most appropriate to employ a landscape-scale approach when assessing forest carbon cycling, stocks, and flows. The landscape scale which provides a more complete picture of the carbon cycle and forest resources.

3) <u>Time Scale.</u> The academic community and the Intergovernmental Panel on Climate Change agree that climate change is caused by cumulative emissions over the long-term. Studies on short-term impacts are largely inconclusive. Biogenic carbon should be viewed over the long-term and should be compared to the permanence of fossil fuel emissions. This comparison should be used to assess the true impact bioenergy has on total, long-term atmospheric carbon concentrations.

4) <u>Assumptions</u>. Counterfactual scenarios and alternative fates should recognize the following realities regarding the biomass industry in the US South:

- ***Bioenergy feedstocks are sourced from forests that are managed and harvested to produce higher-value products such as sawtimber.***
- ***The existence of bioenergy markets has little influence on management or harvesting decisions, as bioenergy is a lower-value product, providing only a small financial incentive to small family landowners.***
- ***The biomass market uses lower-grade wood fiber to make pellets, such as thinnings, tops and limbs, and residues (sawdust, etc).***
- ***Bioenergy markets provide an alternative use for lower-value wood fiber that is harvested during a sawtimber harvest or as part of sustainable forestry best management practices, but is underutilized or has no active buyer in the region.***
- ***Diminished forest product markets leads to an aging forest resource, presenting forest health risks such as disease, pests, wildfire, and others.***
- ***In the absence of demand for forest products, landowners are less likely to maintain their forestlands, opting to convert to a land use that will provide the revenue needed to pay property taxes, such as agriculture or commercial development.***

5) <u>Technology Efficiency</u>. Bioenergy carbon analyses should include appropriate details on energy pathways, including accurate end use energy conversion technologies and efficiencies.

The importance of the above factors is supported in a US Journal of Forestry article by the Society of American Foresters on "Forest Carbon Accounting Considerations in US Bioenergy Policy." This piece analyses peer-reviewed research on biogenic carbon to find several insights necessary for developing bioenergy policies:

- ***As long as wood-producing land remains forested, wood products and bioenergy reduce fossil fuel use and its long-term carbon emission impacts.***
- ***Increased demand for wood can trigger investments and increase forest area and forest productivity.***
- ***Long-term, cumulative CO_2 emissions are correlated with negative environmental effects.***
- ***A 100 year time-frame should be used to assess biogenic carbon.***

These themes are also supported by over 100 researchers and academics from leading US university forestry resources programs who stated in a public letter that:

- ***The carbon benefits of sustainable forestry are well established.***
- ***Measuring the carbon benefits of forest biomass energy must consider cumulative carbon emissions over the long term.***
- ***An accurate comparison of forest biomass energy carbon impacts with those of other energy sources requires the use of consistent timeframes in the comparison.***
- ***Economic factors influence the carbon impacts of forest biomass energy.***

If these themes are not considered and analysed, the end result is inaccurate and not applicable to the complexity of most forest products markets, including those in the US South. A prime example of this is a recent Chatham House report on bioenergy, which was immediately rebutted by over 125 academics and researchers in the forestry, carbon, and bioenergy fields on the grounds that the work was "based on unsubstantiated claims and flawed arguments". The rebuttal identified these flawed arguments as:

- ***The unrealistic and inaccurate assumption that forests would remain unharvested in the absence of bioenergy.***
- ***A misguided focus on short-term carbon impacts.***
- ***A lack of recognition that bioenergy and lower-value industries are critical components of healthy forest management systems.***

Academic research that does consider market effects and appropriate time and special scale finds significant carbon savings in using biomass in place of fossil fuels for power production. A few examples:

- ***Dr. Madhu Khanna, former chair of the US EPA Scientific Advisory Board Panel on Biogenic Emissions, and colleagues specifically studied the carbon impacts of trans-Atlantic biomass trade and found significant reduction in carbon emissions when biomass from the US was used in place of coal to produce energy in Europe.***
- ***Dr. Christopher Galik (Duke University Nicholas Institute for Environmental Policy) and Dr. Robert Abt (North Carolina State University College of Natural Resources), through analysis of market responses to changes in supply and demand and consideration of historical and projected wood fiber prices in the US South, find a positive impact from new markets for lower-value wood fiber on forest growth and carbon storage.***
- ***Dr. Martin Junginger of Utrecht University and colleagues analysed greenhouse gas parity times for electricity produced from wood pellets from the US South and found a carbon parity of 0-6 years when biomass is produced from commercial thinnings, harvest residues, or mill residues.***

Resources:

- ***Biomass Sustainability Report 2015-16 dataset*, UK Ofgem**
- ***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**
- ***Response to Chatham House report 'Woody Biomass for Power and Heat: Impacts on the Global Climate'*, IEA Bioenergy**
  - ***Press Release: Over 125 academics join IEA Bioenergy urging Chatham House to reconsider flawed policy recommendations*, IEA Bioenergy**
- ***Forest Carbon Accounting Considerations in US Bioenergy Policy*, Society of American Foresters, published in the Journal of Forestry**
- ***Science Fundamentals of Forest Biomass Carbon Accounting*, letter from the National Association of University Forest Resources Programs, signed by over 100 academics and researchers**
- ***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.**

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?

See question #1 answer.

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 US is home to over 750 million acres of forestland, almost half of which is held in public interest (national parks, etc.). According to USDA Forest Service Forest Inventory and Analysis data, forest cover in the US has increased every year since 1950 despite record population growth and urban development.

As is evidenced by decades of forest growth, strong forest markets lead to more forests. 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. The presence of forest markets increase the economic attractiveness of forestry, which supports maintenance and expansion of forested lands and their carbon sink capacity.

In particular, high-paying sawtimber markets drive landowner decisions about harvesting and forest management by providing financial incentive for forest landowners to replant and sustainably-manage lands. Markets for lower-value wood fiber, like biomass, provide a small additional incentive and make it easier for landowners to clear their lands after harvest for replanting or natural regeneration.

Because biomass feedstocks draw from the lowest value byproducts in the US commercial forestry supply chain, the development of biomass energy markets in the US South can provide important outlets for otherwise unusable or underutilized materials. Since one of the strongest drivers of deforestation on privately owned lands is conversion for alternate use, such as agriculture or commercial development, the emergence of additional markets provides further incentive to landowners to keep their forests replanted and sustainably managed. A large body of research demonstrates that biomass energy markets lead to more forests and healthier forests overall.

The USDA Forest Service acknowledges the role that markets play in supporting forest health, recognizing that increased demand for wood products will lead to increased investments in forestry, helping to prevent forest loss and thereby also preventing loss of carbon storage. A recent study from the US Forest Service Southern Research Station found that an increase in demand specifically for bioenergy would result in an increase in both forest inventory and forested timberland area in the US South. USDA has also recognized the many benefits of the biomass

industry, which include increasing forested area, reducing greenhouse gas emissions, and improving US forest management practices, highlighting these attributes in a recent letter from former USDA Secretary Vilsack to former UK Secretary of State for Energy and Climate Change Amber Rudd (see Appendix).

Researchers from Duke University and North Carolina State University also found that increased demand for wood pellets elicits a positive forest market response, resulting in increased forest area and annual gains in forest carbon. Additionally, both the International Energy Agency and the International Panel on Climate Change agree that biomass production can lead to both sustainable forest management and increased carbon storage.

According to USDA Forest Service Forest Inventory and Analysis data over the last 15 years, during which time biomass for energy demand appeared in the marketplace, forest inventory in the US South has increased by almost 1.2 billion tons. As the amount of US forestland increases, so do the carbon stocks in those forests. These trends demonstrate that biomass is a sustainable energy source that can help support forest landowners and forest health.

Additionally, the overall impact of the biomass industry on the US's vast forest resources and strong forest products market is small. Wood pellet demand in 2014 made up less than 0.1% of overall forest inventory in the US South. A study done on the forest resource from 2002-2014 in the Chesapeake, Virginia area, home to US pellet producer Enviva, found an increase in both timberland volume and carbon pools in recent years and no evidence of a decrease in forest area.

Resources:

- ***Forest Inventory and Analysis Program*, USDA Forest Service**
- ***Forest Resources of the United States*, USDA Forest Service**
- ***Forest Carbon Accounting Considerations in US Bioenergy Policy*, Society of American Foresters, published in the Journal of Forestry**
- ***An Assessment of the Downturn of the Forest Products Industry in the Northern Region of the United States*, USDA Forest Service Northern Research Station**
- ***Effect of policies on pellet production and forests in the US South*, USDA Forest Service Southern Research Station**
    - ***Study Finds Increasing Wood Pellet Demand Boost Forest Growth, Reduces Greenhouse Gas Emissions, Creates Jobs*, USDA blog post by Robert Johansson, USDA Chief Economist**
- ***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)**
- ***Historical Perspective on the Relationship between Demand and Forest Productivity in the US South*, Forest2Market**
    - ***Forest2Market Report Shows Increased Demand for Wood Fiber Leads to Forest Growth*, Forest2Market blog post**
- ***Status and prospects for renewable energy using wood pellets from the southeastern United States*, US Department of Energy Oak Ridge National Laboratory**
- ***Ecological objectives can be achieved with wood-derived bioenergy*, US Department of Energy Oak Ridge National Laboratory**
- ***Wood Supply Trends in the US South, 1995-2015*, Forest2Market**
    - ***Forest2Market Study Shows US Wood Pellet Industry No Threat to US South Forests*, Forest2Market blog post**

- **Letter from former US Secretary of Agriculture Tom Vilsack to former UK Secretary of State for Energy and Climate Change Amber Rudd on the US wood pellet industry (see Appendix)**
- ***How is wood-based pellet production affecting forest conditions in southeastern United States?*, US Department of Energy Oak Ridge National Laboratory, published in the Journal of Forest Ecology and Management**

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)

No credible evidence exists that wood pellet production in the US South has caused adverse market effects or displacement and no correlation can be found between changes in pine or hardwood stumpage price and the presence of significant pellet production.

This same question has previously been answered by the European Commission who has investigated this topic twice (once for Drax and once for Lynemouth) and each time, after thorough year-long investigations, the Commission found no evidence of market distortion.

A Poyry analysis done for the Netherlands government of the risk of indirect wood use change (IWUC) also found that there is no strong evidence for an increased risk of IWUC in the US South due to the low paying capacity of pellet producers and the existing and persisting surplus of lower-value wood fiber in the US South.

Resources:
- **Wood fibre price trends and drivers in the US South, John Bingham, Hawkins Wright (see Appendix)**
- ***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**
- **SA.38760: Investment Contract for Biomass Conversion of First Unit of Drax Power Plant – Comments of the United States Industrial Pellet Association (see Appendix)**
- **SA.38762: Investment Contract for Lynemouth Power Station Biomass Conversion – Comments of the United States Industrial Pellet Association (see Appendix)**
- ***The Risk of Indirect Wood Use Change*, Poyry, prepared for the Netherlands**

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

The US pellet industry uses lower-value by-products from harvest and commercial sawtimber production that are unused or underutilized in that particular region or wood-basket. Sawtimber-quality wood is never used by US pellet producers. In most cases the wood fiber used by pellet producers has no other buyer in the area or is available as surplus feedstock. The most likely alternative for this fiber is to be left on the forest floor or burned on site.

Resources:
- ***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**
- ***The Risk of Indirect Wood Use Change*, Poyry, prepared for the Netherlands**
- ***Wood Supply Trends in the US South, 1995-2015*, Forest2Market**

- ***Forest2Market Study Shows US Wood Pellet Industry No Threat to US South Forests*, Forest2Market blog post**

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

As outlined in previous answers and in the resources provided with this response, multiple studies from the US government and academic researchers alike show that increased demand for wood pellets will result in an increase in forest growth and forest inventory.

Overall, wood pellet demand has a small impact on the 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 in the US South. Realistic future demand projections (including potential demand from Drax Unit #3, RWE Lynemouth conversion, MGT Teeside, and potential demand from Denmark, the Netherlands, and Belgium) would represent an additional just 0.1% of the existing inventory in the US South.

Further, there has been a decline in the pulp and paper market as a result of the 2008 recession and waning global demand for printed materials. As a result, there is an estimated surplus of an additional 20 million dry tons (40 million green tons) of lower-grade harvesting residues available in the US South per year. This is supported by Poyry's analysis of risk of indirect wood use change (IWUC) which found that there is no strong evidence for an increased risk of IWUC in the US South due to the low paying capability of pellet producers and the existing and persisting surplus of lower-value wood fiber in the US South.

Additionally, 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.

Resources:

- ***Effect of policies on pellet production and forests in the US South*, USDA Forest Service Southern Research Station**
  - ***Study Finds Increasing Wood Pellet Demand Boost Forest Growth, Reduces Greenhouse Gas Emissions, Creates Jobs*, USDA blog post by Robert Johansson, USDA Chief Economist**
- ***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 Supply Trends in the US South, 1995-2015*, Forest2Market**
  - ***Forest2Market Study Shows US Wood Pellet Industry No Threat to US South Forests*, Forest2Market blog post**
- ***2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy*, US Department of Energy**
- ***Forest Inventory and Analysis Program*, USDA Forest Service**
- ***The Risk of Indirect Wood Use Change*, Poyry, prepared for the Netherlands**

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)?

Sustainably-sourced biomass has positive effects on GHG emissions and forest health. According to USDA Forest Service Forest Inventory and Analysis data, forest cover in the US has increased every year since 1950 despite record population growth and urban development.

As is evidenced by decades of forest growth, strong forest markets lead to more forests. 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. The presence of forest markets increase the economic attractiveness of forestry, which supports maintenance and expansion of forested lands and their carbon sink capacity.

In particular, high-paying sawtimber markets drive landowner decisions about harvesting and forest management by providing financial incentive for forest landowners to replant and sustainably-manage lands. Markets for lower-value wood fiber, like biomass, provide a small additional incentive and make it easier for landowners to clear their lands after harvest for replanting or natural regeneration.

As mentioned in previous answers, overall wood pellet demand has a small impact on the 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 in the US South. Realistic future demand projections (including potential demand from Drax Unit #3, RWE Lynemouth conversion, MGT Teeside, and potential demand from Denmark, the Netherlands, and Belgium) would represent an additional 0.1% of the existing inventory in the US South.

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Resources:

- ***Forest Carbon Accounting Considerations in US Bioenergy Policy*, Society of American Foresters, published in the Journal of Forestry**
- ***Effect of policies on pellet production and forests in the US South*, USDA Forest Service Southern Research Station**
    - ***Study Finds Increasing Wood Pellet Demand Boost Forest Growth, Reduces Greenhouse Gas Emissions, Creates Jobs*, USDA blog post by Robert Johansson, USDA Chief Economist**
- ***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)

- ***Historical Perspective on the Relationship between Demand and Forest Productivity in the US South*, Forest2Market**
    - ***Forest2Market Report Shows Increased Demand for Wood Fiber Leads to Forest Growth*, Forest2Market blog post**
- ***Wood Supply Trends in the US South, 1995-2015*, Forest2Market**
    - ***Forest2Market Study Shows US Wood Pellet Industry No Threat to US South Forests*, Forest2Market blog post**
- **Letter from former US Secretary of Agriculture Tom Vilsack to former UK Secretary of State for Energy and Climate Change Amber Rudd on the US wood pellet industry (see Appendix)**
- ***2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy*, US Department of Energy**
- ***Forest Inventory and Analysis Program*, USDA Forest Service**
- ***The Risk of Indirect Wood Use Change*, Poyry, prepared for the Netherlands**

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?

Biomass imported from the US has multiple benefits for emissions, forest health, rural development, and UK grid security:

- ***Sustainably-sourced biomass has been shown to reduce emissions up to 90% when used in place of fossil fuels to produce energy. Biomass is also lower in SOx, NOx, and other harmful pollutants.***
- ***As discussed in previous responses, markets for lower-value wood fiber in the US South, such as biomass, support forest growth and health and incentivize small family landowners to replant and sustainably manage their lands.***
- ***Pellet producers in the US are mainly located in rural areas that were hit hard during the Great Recession and are still recovering. Producers are making investments in infrastructure, developing ports, and creating jobs in these communities.***
- ***Biomass is currently the only readily-available renewable fuel that provides baseload, on-demand power. Biomass can balance the grid alongside wind and solar, can increase grid flexibility, and can serve as back-up power to other intermittent sources of energy.***

Biomass can do all of this at a competitive cost, making it a smart investment across the board.

Resources:

- ***Minimising greenhouse gas emissions from biomass energy generation*, UK Environment Agency**
- ***Comparing costs of renewable technologies*, Aurora Energy Research (see Appendix)**
- ***Bigger picture, lower cost: lowering the cost of the energy transition through a whole system costs approach*, Biomass UK and US Industrial Pellet Association (see Appendix)**

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?

Currently the UK sustainability framework for bioenergy is the most stringent in the world. This framework was developed after many months of consultations and stakeholder input. The 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 fiber 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 by independent, third-parties on a routine basis to maintain these certifications.

Supply chain sustainability data and GHG emissions data for sourcing, production, and transport is then reported to Ofgem who determines compliance with UK regulations. As mentioned in question #1, this Ofgem data from the past several years shows over 80% emissions savings from using biomass in place of coal to produce electricity.

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. The biomass producers are then audited by independent, third-parties on a routine basis to maintain these certifications.

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, and hold both chain of custody and fiber sourcing certifications. Many of these standards have been used by forest products industries for decades to demonstrate sustainability and are revised on a routine basis. The UK Timber Procurement Policy was developed based on the FSC Control Wood and Controlled Sources and the SFI Fiber Sourcing certifications, which are widely-accepted methods of demonstrating supply chain sustainability and legality across many forest products industries.

US pellet producers also use Sustainable Biomass Program certificates 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.

Pellet producers sit on the bottom of the value chain and do not 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 small family landowner. Certifications 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 risk areas.

This approach has been endorsed by both the EU Parliament and the EU Council as they head into final negotiations on the Renewable Energy Directive for 2021-2030. If the current language is supported in the final version, then the EU will use a risk-based approached to evaluate the sustainability of all domestic and imported biomass for energy.

Resources:

- **SBP Framework**
- **FSC Controlled Wood Standard**
- **FSC Chain of Custody Standard**
- **SFI Fiber Sourcing Standard**
- **SFI Chain of Custody Standard**

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?

Currently the UK sustainability framework for bioenergy is the most stringent in the world. This framework was developed after many months of consultations and stakeholder input. The 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 fiber 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 by independent, third-parties on a routine basis to maintain these certifications.

Supply chain sustainability data and GHG emissions data for sourcing, production, and transport is then reported to Ofgem who determines compliance with UK regulations. As mentioned in question #1, this Ofgem data from the past several years shows over 80% emissions savings from using biomass in place of coal to produce electricity.

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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?

Besides using the forestry certifications listed in previous answers to demonstrate compliance with UK law, US pellet producers operate under a framework of US laws and regulations at the federal and state level that govern forests, water, and endangered species. At the federal level this includes the Endangered Species Act, the Clean Water Act, and the Clean Air Act, which are regarded as the highest global standards for environmental protection.

Best Management Practices (BMPs) are in place at the state level. BMPs are developed by state forestry and natural resources departments as guidelines for local foresters to comply with federal environmental protection laws. BMPs for forest management have over a 90% compliance rate across the southeastern US, however it should be noted that compliance is mandatory in order to obtain some forestry certifications, such as SFI.

This framework together with the economic incentive provided by forest products markets, ensures that bioenergy feedstocks sourced from the US remain sustainable. As a result of strong markets and the framework of laws and regulations, the US's forest inventory has increased over the last 60 years despite high population growth and urban development. Additionally growth exceeds harvest for both softwood and hardwood each year in the US.

Resources:

- ***Implementation of Forestry Best Management Practices*, Southern Group of State Foresters**
- ***Forest Inventory and Analysis Program*, USDA Forest Service**
- ***Historical Perspective on the Relationship between Demand and Forest Productivity in the US South*, Forest2Market**
    - ***Forest2Market Report Shows Increased Demand for Wood Fiber Leads to Forest Growth*, Forest2Market blog post**
- ***Wood Supply Trends in the US South, 1995-2015*, Forest2Market**
    - ***Forest2Market Study Shows US Wood Pellet Industry No Threat to US South Forests*, Forest2Market blog post**

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-based approaches allow for 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 developed based on the FSC Control Wood and Controlled Sources and the SFI Fiber Sourcing certifications, which are widely accepted methods of demonstrating supply chain sustainability and legality across many forest products industries.

Pellet producers sit on the bottom of the value chain and do not 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 risk areas.

This approach has been endorsed by both the EU Parliament and the EU Council as they head into final negotiations on the Renewable Energy Directive for 2021-2030. If the current language is supported in the final version, then the EU will use a risk-based approached to evaluate the sustainability of all domestic and imported biomass for energy.

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.

Additionally, BEIS just undertook analysis of this same question and released a report in early 2017 outlining the available biomass feedstock for the UK.

Resources:

- ***2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy*, US Department of Energy**
- ***Biomass Feedstock Availability*, Ricardo Energy and Environment, prepared for BEIS**

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?

For the US resource, overall wood pellet demand has a small impact on the 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 in the US South. Realistic future demand projections (including potential demand from Drax Unit #3, RWE Lynemouth conversion, MGT Teeside, and potential demand from Denmark, the Netherlands, and Belgium) would represent an additional 0.1% of the existing inventory in the US South.

Further, there has been a decline in the pulp and paper market as a result of the 2008 recession and waning global demand for printed materials. 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. This is supported by Poyry's analysis of risk of indirect wood use change (IWUC) which found that there is no strong evidence for an increased risk of IWUC in the US South due to the low paying capability of pellet producers and the existing and persisting surplus of lower-value wood fiber in the US South.

Additionally, 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.

Assumptions regarding resource availability and sourcing impacts should rely on appropriate and realistic scenarios and assumptions. Assessments of unrealistic scenarios only produce unrealistic results; therefore, it is critical to use accurate inputs for any model. It is important to consider the following factors when assessing the impacts of biomass imported from the US South.

1) Market Effects. Forests in the US South are part of a complex system of land ownership, regulations, taxes/policy incentives, and forest products and land use markets. Forest management decisions are largely based upon market demands, meaning that forest growth and carbon stocks are directly influenced by these markets. Data that does not address market effects is incomplete and may not applicable to forests in the US South.

2) Spatial Scale. It is most appropriate to employ a landscape-scale approach when assessing forest carbon cycling, stocks, and flows. The landscape scale which provides a more complete picture of the carbon cycle and forest resources.

3) Time Scale. The academic community and the Intergovernmental Panel on Climate Change agree that climate change is caused by cumulative emissions over the long-term. Studies on short-term impacts are largely inconclusive. Biogenic carbon should be viewed over the long-term and should be compared to the permanence of fossil fuel emissions. This comparison should be used to assess the true impact bioenergy has on total, long-term atmospheric carbon concentrations.

4) Assumptions. Counterfactual scenarios and alternative fates should recognize the following realities regarding the biomass industry in the US South:

- ***Bioenergy feedstocks are sourced from forests that are managed and harvested to produce higher-value products such as sawtimber.***
- ***The existence of bioenergy markets has little influence on management or harvesting decisions, as bioenergy is a lower-value product, providing only a small financial incentive to small family landowners.***
- ***The biomass market uses lower-grade wood fiber to make pellets, such as thinnings, tops and limbs, and residues (sawdust, etc).***
- ***Bioenergy markets provide an alternative use for lower-value wood fiber that is harvested during a sawtimber harvest or as part of sustainable forestry best management practices, but is underutilized or has no active buyer in the region.***
- ***Diminished forest product markets leads to an aging forest resource, presenting forest health risks such as disease, pests, wildfire, and others.***
- ***In the absence of demand for forest products, landowners are less likely to maintain their forestlands, opting to convert to a land use that will provide the revenue needed to pay property taxes, such as agriculture or commercial development.***

5) Technology Efficiency. Bioenergy carbon analyses should include appropriate details on energy pathways, including accurate end use energy conversion technologies and efficiencies.

The importance of the above factors is supported in a US Journal of Forestry article by the Society of American Foresters on "Forest Carbon Accounting Considerations in US Bioenergy Policy." This piece analyses peer-reviewed research on biogenic carbon to find several insights necessary for developing bioenergy policies:

- ***As long as wood-producing land remains forested, wood products and bioenergy reduce fossil fuel use and its long-term carbon emission impacts.***
- ***Increased demand for wood can trigger investments and increase forest area and forest productivity.***
- ***Long-term, cumulative CO_2 emissions are correlated with negative environmental effects.***
- ***A 100 year time-frame should be used to assess biogenic carbon.***

These themes are also supported by over 100 researchers and academics from leading US university forestry resources programs who stated in a public letter that:

- ***The carbon benefits of sustainable forestry are well established.***
- ***Measuring the carbon benefits of forest biomass energy must consider cumulative carbon emissions over the long term.***
- ***An accurate comparison of forest biomass energy carbon impacts with those of other energy sources requires the use of consistent timeframes in the comparison.***
- ***Economic factors influence the carbon impacts of forest biomass energy.***

If these themes are not considered and analysed, the end result is inaccurate and not applicable to the complexity of most forest products markets, including those in the US South. A prime example of this is a recent Chatham House report on bioenergy, which was immediately rebutted by over 125 academics and researchers in the forestry, carbon, and bioenergy fields on the grounds that the work was "based on unsubstantiated claims and flawed arguments". The rebuttal identified these flawed arguments as:

- ***The unrealistic assumption that forests would remain unharvested in the absence of bioenergy.***
- ***A misguided focus on short-term carbon impacts.***
- ***A lack of recognition that bioenergy and lower-value industries are critical components of healthy forest management systems.***

Resources:

- ***Wood Supply Trends in the US South, 1995-2015*, Forest2Market**
  - ***Forest2Market Study Shows US Wood Pellet Industry No Threat to US South Forests*, Forest2Market blog post**
- ***2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy*, US Department of Energy**
- ***Forest Inventory and Analysis Program*, USDA Forest Service**
- ***The Risk of Indirect Wood Use Change*, Poyry, prepared for the Netherlands**
- ***Forest Carbon Accounting Considerations in US Bioenergy Policy*, Society of American Foresters, published in the Journal of Forestry**
- ***Response to Chatham House report 'Woody Biomass for Power and Heat: Impacts on the Global Climate'*, IEA Bioenergy**
  - ***Press Release: Over 125 academics join IEA Bioenergy urging Chatham House to reconsider flawed policy recommendations*, IEA Bioenergy**

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 answers to questions #12 and #15.

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?

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 and supply chain 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. The lignin in woody biomass can be extracted 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?

Emissions from sourcing, production, and transport of wood pellets are reported to Ofgem as part of the UK's current regulatory scheme. The Sustainable Biomass Program, which is accepted as Category A compliance with UK sustainability regulations, requires reporting of GHG data as well as land-use change data and prevents use of wood fiber from any land that has been converted after 2008. All US producers of pellets for energy are certified to the SBP standard and SBP is accepted as a Category A compliance mechanism for UK sustainability standards.

Resources:

- **SBP Framework 2: Verification of SBP-compliant Feedstock, Sustainable Biomass Program**

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 Forest Inventory and Analysis (FIA) data. This

monitoring, which was first initiated in 1930, occurs irrespective of any international treaties or agreements.

The decision to be "in" or "out" of the Paris Agreement does not impact the sustainable practices of the pellet industry or the forest products industry as a whole. Markets ensure that forests are replanted and the studies mentioned in our previous answers reflect a positive forest response to increased markets for pellets and other products. Markets beget more forests, which in turn increases carbon storage.

Emissions from sourcing, production, and transport of wood pellets are reported to Ofgem as part of the UK's current regulatory scheme. The Sustainable Biomass Program, which is accepted as Category A compliance with UK sustainability regulations, requires reporting of GHG data as well as land-use change data and prevents use of wood fiber from any land that has been converted after 2008. All US producers of pellets for energy are certified to the SBP standard and SBP is accepted as a Category A compliance mechanism for UK sustainability regulations.

Additionally, regardless of the US federal government position, many states and cities across the US have made efforts to align their state or region with the Paris Agreement goals.

Resources:

- ***Forest Inventory and Analysis Program*, USDA Forest Service**
- ***US Cities, States, and Business Pledge to Measure Emissions*, New York Times**
- ***SBP Framework Standard 6: Energy and Carbon Balance Calculation*, Sustainable Biomass Program**

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

Biogenic carbon is a cycle where wood fiber absorbs carbon as it grows. This carbon is released when the wood is used for energy and reabsorbed by continuously-growing tree stands. This a recycling of carbon is unlike fossil fuels which take carbon that was stored underground and release it when burned for energy, putting additional carbon in the atmosphere.

As many of our answers and provided resources have indicated, the science shows that:

- ***Long-term, cumulative emissions are the main cause of climate change.***
- ***Biomass can reduce carbon emissions up to 90% when used in place of coal for power generation.***
- ***The US forest resource is growing year over year and carbon stocks are increasing.***
- ***The US is low-risk for indirect wood-use and land-use change as a result of the biomass industry.***

Resources:

- ***Forest Carbon Accounting Considerations in US Bioenergy Policy*, Society of American Foresters, published in the Journal of Forestry**
- ***Minimising greenhouse gas emissions from biomass energy generation*, UK Environment Agency**
- ***Forest Inventory and Analysis Program*, USDA Forest Service**
- ***The Risk of Indirect Wood Use Change*, Poyry, prepared for the Netherlands**

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?

Any indicators for bioenergy should:

- ***Rely on peer-reviewed research and data.***
- ***Be based on realistic assumptions of forest products markets.***
- ***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. As a result of this successful framework, the UK has been importing sustainable biomass from the US South 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 and the bioenergy industry has helped to support rural development and small family landowners.

Other

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

Additional Resources:

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- **Carter, J. 2013. Export Wood Pellet Facilities' Raw Material Delivered Cost Trends - US South. F2M Market Watch, August 16.(http://www.forest2market.com/blog/export-wood-pellet-facilities-raw-material-delivered-cost-trends)**
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