Biofuelwatch Consultation Response to "Consultation on Scottish Energy Strategy: The future of energy in Scotland"

Thank you for the opportunity to respond to the consultation about a new Scottish Energy Strategy. Biofuelwatch is a non-profit organisation which provides information, advocacy and campaigning in relation to the climate, environmental, human rights and public health impacts of large-scale industrial bioenergy. Our response therefore focuses primarily on the future role of bioenergy in Scotland's energy strategy.

We welcome the Scottish Government's strong commitment to ongoing greenhouse gas reductions and to transitioning towards a low-carbon energy system. We particularly welcome the Scottish Government's ongoing support for wind and solar power as well as small scale hydro power and the development of wave technology. We welcome the emphasis on community renewable energy. And we strongly welcome the commitment to improve energy efficiency, especially in buildings.

We believe that the 1.5°C target set out in the Paris Agreement – and endorsed by the Scottish Government – requires fossil fuel burning to be rapidly phased out, while natural ecosystems, including forests and healthy soils, must be protected, allowed to naturally regenerate, and, where appropriate, be actively restored. Natural ecosystem regeneration and restoration is the only proven way of increasing carbon sequestration, i.e. removing any CO_2 from the atmosphere. Without this, it will likely be impossible to stabilise global warming even at 2°C, let alone 1.5°C.

Renewable energy – together with energy conservation and efficiency - can and must play a major role in reducing and ultimately ending fossil fuel burning. However, while wind and solar power almost always result in major life-cycle greenhouse gas reductions compared to fossil fuels[1], a large and growing number of scientific studies and reports show that the same is not true for bioenergy. We provide a summary of the scientific findings and about the key concerns related wood-based bioenergy below. Based on that evidence, we would urge the Scottish Government to substantially review its position on bioenergy and to ensure that energy generation support is reserved solely for renewable energy sources which are proven to significantly reduce greenhouse gas emissions compared to fossil fuels.

Furthermore, biomass combustion results in similar levels of air pollution as coal combustion. An expansion of biomass burning is therefore not compatible with the Scottish Government's aim to improve air quality and public health.

We have answered the consultation questions most relevant to our work and focus underneath our discussion about the climate impacts and the air quality and impacts of wood-based bioenergy.

Climate impacts of wood-based bioenergy:

The vast majority of bioenergy for heat and electricity is generated from burning wood.

Generating a unit of energy from burning wood results in higher upfront CO_2 emissions than generating it from burning coal. The difference can be as high as 50%, or even higher, for biomass burning in power stations.

Under UNFCC reporting rules, those upfront CO_2 emissions are not accounted for. Those reporting rules were drawn up not to inform energy policies but to prevent double-counting of carbon emissions, based on the assumption that reductions forest and soil carbon stocks linked to bioenergy would be accounted for in the forestry and land use sector[2].

The UK Bioenergy Strategy 2012 states:

> Policies that support bioenergy should deliver genuine carbon reductions that help meet UK carbon emissions objectives to 2050 and beyond. This assessment should look – to the best degree possible – at carbon impacts for the whole system, including indirect impacts such as ILUC, where appropriate, and any changes to carbon stores."[3]

It further explains that any carbon sequestration that would have happened in the absence of additional logging for bioenergy must be taken into account. It highlights:

> The use of the entire tree for bioenergy is undesirable as it is generally associated with sub-optimal carbon scenarios and can result in increased greenhouse gas emissions.

Figure 4 of the Bioenergy Strategy shows that generating electricity from burning woodchips or pellets made from whole domestically sourced trees would result in no greenhouse gas benefits compared to electricity from natural gas when considered over a 100 year period. The underlying data reveals that even compared to coal, electricity from burning processed whole UK conifers results in a 49% increase in CO_2 emissions over a period of 40 years, and an 80% increase over 20 years[4].

Climate science findings show that greenhouse gas emissions must be rapidly brought down if we want to have any chance of avoiding the worst impacts of climate change.

In Scotland, the operators of the CoRDE biomass CHP plant in Rothes, of the Land Energy Girvan biomass CHP plant, of the Caledonian biomass CHP plant, and of the Steven's Croft biomass power station have all declared sourcing roundwood that is not a residue for some of their supplies, while the operators of the Markinch power station and the Balcas Biomass CHP plant have been using a proportion of virgin wood which also appears not to be sourced from residues but instead from whole trees[5]. Sourcing information for wood pellets and woodchips for heat-only use is not publicly available, however photographic evidence of pellet mills shows that whole trees rather than residues are routinely used, whether in the UK or abroad[6].

We understand that no imported virgin wood is currently being burned in power plants in Scotland, however pellets made from some 13 million tonnes of virgin wood were burned in Drax power station in Yorkshire last year. The vast majority of those were sourced from the southern US. A report published by the Department for Energy and Climate Change in 2014, co-authored by its chief science advisor David MacKay at the time, showed that depending on sourcing scenarios, the life-cycle carbon impacts of burning North American wood pellets for electricity can be higher than that of burning coal (per unit of electricity) over a period of 40-100 years[7]. US conservation NGOs have investigated supply chains for some of the largest southern US pellet plants exporting to the UK and have found them to heavily rely on clearcutting on carbon rich and highly biodiverse bottomland hardwood forests, which results in particularly steep carbon emissions, and which correlates with worst-case scenarios outlined in the DECC report[8]. The southern US is by far the largest pellet exporting region and the main pellet exporter to the UK. This means that any significant expansion of wood-bioenergy use in Scotland would likely result pellets from that region being burned.

The potential for using genuine wood residues without competing for existing demands (e.g. by the wood panel industry), is very limited. Based on figures by the UN Food and Agriculture Organisation (FAO) for estimating residue availability from wood harvest volumes, the UK as a whole could meet a maximum of 1.3% of electricity or 0.5% of primary energy[9].

We have compiled a list of key scientific studies which refute the assumption that wood-based bioenergy is inherently carbon neutral (except for carbon emissions associated with fossil fuel use during logging, processing and transport)[10]. Findings contained in some of those studies include:

- Increased logging and greater removal of forest residues across managed European forests could release 18.3 - 62.3m t CO_2 annually as a result of soil carbon emissions alone[11];
- Methane emissions from woodchip storage (incl. for pellet production) can be so high that they alone can result in biomass energy having greater ghg emissions than coal[12];
- Increased removal of forestry residues for bioenergy reduces total and available soil nutrients, resulting in 3-7% lower tree growth for up to 33 years, thus reducing the level of carbon sequestration by new trees[13].

Two high-profile studies published this year warn summarise the scientific findings and warn strongly against policies based on the assumption of inherent biomass carbon neutrality:

- A report by the independent UK think-tank Chatham House[14];
- A report by the European Academies Science Advisory Council[15].

Unfortunately, the UK biomass greenhouse gas standards relies on a methodology which ignores the majority of carbon emissions associated with bioenergy to be ignored, thus contradicting the main principles set out in the 2012 UK Bioenergy Strategy. We believe that the UK Government's support for

wood-based bioenergy regardless of its climate impacts reflects their wider failure to prioritise reducing carbon emissions and transitioning towards a genuinely low carbon economy. In fact, subsidies for biomass electricity stand in direct competition against subsidies for wind and solar power, which have been abolished for the vast majority of new schemes (with the exception of those for offshore wind).

We believe that the Scottish Government can and must adopt a different policy on bioenergy within the scope of its devolved powers, one which is informed by science and by its commitment to remain at the vanguard of tackling climate change.

Wood-based bioenergy: Impacts on air quality

Burning wood for energy emits similar levels of pollutants as burning coal, albeit less of some pollutants and more of others. Compared to coal, biomass combustion releases less sulphur dioxide and less mercury, but more particulates and more Volatile Organic Compounds[16]. Comparative emissions of oxides of nitrogen vary according to combustion technology. Thus, the partial conversion of Drax power station from coal to wood pellets resulted in lower emissions of oxides of nitrogen, but in significantly higher emissions of particulates (PM10)[17]. This is particularly concerning because PM10 pollution is strongly associated with greater illness and death rates[18].

Air quality and thus public health impacts are serious concerns in relation to biomass electricity and biomass heating like. A World Health Organisation report about residential solid fuel burning in Europe and North America concludes:

> Each year 61 000 premature deaths are attributable to ambient air pollution from residential heating with wood and coal in Europe, with an additional 10 000 attributable deaths in North America…It will be difficult to tackle outdoor air pollution problems in many parts of the world without addressing the combustion of biomass for heating at the household level along with other sources of air pollution[19].

According to a feature article in the British Medical Journal, published in 2015:

> Emissions from domestic wood burning are increasing in the UK. They accounted for 17% of PM2.5 emissions in 2013, only marginally less than the 18% from all road transport…There is much concern about the NO2 standard, yet fine particles (PM2.5) are believed to affect more people than any other pollutant, with chronic exposure causing the most deaths from serious disease. The estimate of 29,000 UK deaths from air pollution is for PM2.5 (not NOx) pollution[20].

<u>Question 1: What are your views on the priorities presented in Chapter 3 for energy supply over the coming decades? In answering, please consider whether the priorities are the right ones for delivering our vision</u>

We believe that, in relation to electricity supply, all support should go towards genuinely low-carbon forms of renewable energy, namely sensibly sited wind power, solar power, and small-scale and community hydro

power, as well as research and development support for wave power. We strongly support a focus on community-based renewable energy. We also believe that energy storage, including new pumped hydro storage, must be developed far more rapidly in order to allow for a major expansion in wind and solar energy.

In the heat sector, we believe that the emphasis must be on home energy conservation and energy efficiency (including stricter building standards) in the first instance, and that remaining demand should be increasingly met through electrification (including through heat pumps), with electricity being provided from renewable energy sources which do not rely on burning carbon, though solar heating has a role to play, too.

In the transport sector, we believe that the emphasis needs to primarily be on shifting from individual car use towards active travel and public transport. We are focussing on bioenergy for heat and electricity rather than on transport biofuels in our submission, given that the Renewable Transport Fuel Obligation (i.e. biofuel mandates) is not devolved to Scotland. However, we would like to point out that there is strong science-based evidence that land-based biofuels (i.e. all existing commercially available biofuels except for those from genuine wastes and certain residues, e.g. Used Cooking Oil) result in life-cycle greenhouse gas emissions which are as high or higher than those off the oil they replace, once all direct and indirect land use change impacts are accounted for[21].

Question 2: What are your views on the actions for Scottish Government set out in Chapter 3 regarding energy supply? In answering, please consider whether the actions are both necessary and sufficient for delivering our vision.

See comments above. We believe that any support for fossil fuels, including oil and gas, is incompatible with the Scottish Government's aim to act in accordance with overall aim of the Paris Agreement. We further believe that instead of supporting bioenergy, all support measures must focus on genuinely low-carbon renewable energy.

Question 3: What are your views on the proposed target to supply the equivalent of 50% of all Scotland's energy consumption from renewable sources by 2030? In answering, please consider the ambition and feasibility of such a target.

We support a high overall renewable energy target, and for Scotland to move towards 100% renewable energy as soon as possible. However, we believe that this will only be effective in mitigating climate change if it is met through no-burn renewable energy technologies, i.e. if it does not lead to greater use of wood-based bioenergy and liquid biofuels. In this context, we would like to point to a declaration signed by 132 civil society organisations worldwide which calls for bioenergy to be excluded from the scope of the EU Renewable Energy Directive: biofuelwatch.org.uk/2016/bioenergyout-declaration/. The evidence and arguments set out in the declaration are clearly relevant to individual countries' energy policies, too.

Question 4: What are your views on the development of an appropriate target to encourage the full range of low and zero carbon energy technologies?

See comments above. We further believe that Carbon Capture and Storage (CCS), whether based on fossil fuels or bioenergy, should not have a role play in a Scottish energy strategy. CCS has not been proven to be commercially viable, and CCS with bioenergy has not even been demonstrated at a small scale anywhere in the world. Only two operational power stations with CCS exist worldwide: A converted unit of the Boundary Dam power station in Saskatchewan, Canada, and a carbon capture facility at the WA Parish Generating Station in Texas. Both rely on the sale of CO_2 for Enhanced Oil Recovery for their economic viability. In both cases the CO2 emissions associated with Enhanced Oil Recovery are or will be greater than CO2 emissions avoided[22]. The facility in Texas is still in the commissioning phase. However, experience from Boundary Dam shows that 30-31% of the power station unit's energy are now needed for carbon capture and compression and that the project cannot financially break even despite CO2 sales for Enhanced Oil Recovery[23]. Worldwide, there have been many very costly failures of CCS projects, including the Kemper County CCS project in Mississippi, which has cost over $7 billion and which is now burning natural gas without any carbon capture[24]. We believe that Scottish funding for energy and climate change mitigation must focus on technologies with a proven potential to reduce greenhouse gas emissions, not on speculative ones which are already associated with many extremely costly failures, and with no evidence of any genuinely successful outcome.

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[1] The only exceptions we are aware would be wind power projects sited on peat, causing large carbon losses from peat soils;

[2] There are serious concerns that no adequate reporting of those emissions is happening in the land use and forestry sector either, however this topic goes beyond the scope of this consultation.

[3] www.gov.uk/government/uploads/system/uploads/attachment_data/file/48337/5142-bioenergy-strategy-.pdf

[4] Sound Principles and and Important Inconsistency in the 2012 UK Bioenergy Strategy, Tim Searchinger, September 2012, www.rspb.org.uk/Images/Searchinger_comments_on_bioenergy_strategy_SEPT_2012_tcm9-329780.pdf

[5] www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2015-16

[6] See for example Land Energy's pellet plant in Girvan: http://www.land-energy.com/uk-pellet-production - or evidence of whole tree use for pellet production in the southern US (including for export to the UK): www.dogwoodalliance.org/wp-content/uploads/2012/11/Whole-Tree-Wood-Pellet-Production-Report.pdf .

[7] Life-cycle impacts of biomass electricity: Scenarios for Assessing the Greenhouse Gas Impacts and Energy Input Requirements of Using North American Woody Biomass for Electricity Generation in the UK, Dr Anna L Stephenson Professor David J C MacKay FRS, DECC, July 2014, www.gov.uk/government/publications/life-cycle-impacts-of-biomass-electricity-in-2020

[8] See for example www.nrdc.org/sites/default/files/bioenergy-modelling-IB.pdf and www.nrdc.org/sites/default/files/wood-pellet-biomass-pollution-FS.pdf

[9] Letter by Timothy Searchinger of Princeton University to the Office of Renewable Energy Deployment, February 2013, www.biofuelwatch.org.uk/wp-content/uploads/Searchinger-Letter-to-Bulkin.pdf

[10] www.biofuelwatch.org.uk/biomass-resources/resources-on-biomass/

[11] Forest soil carbon is threatened by intensive biomass harvesting, David L. Achat et al, Scientific Reports, October 2015, www.nature.com/articles/srep15991

[12] How certain are greenhouse gas reductions from bioenergy? Life cycle assessment and uncertainty analysis of wood pellet-to-electricity supply chains from forest residues, Mirjam Röder et.al., Biomass and Bioenergy, August 2015, www.sciencedirect.com/science/article/pii/S0961953415001166

[13] Quantifying consequences of removing harvesting residues on forest soils and tree growth - A meta-analysis, D.L.Achat et.al., Frest Ecology and Management, July 2015, www.sciencedirect.com/science/article/pii/S0378112715001814

[14]The Impacts of the Demand for Woody Biomass for Power and Heat on Climate and Forests, Duncan Brack, Chatham House, February 2017, www.chathamhouse.org/publication/impacts-demand-woody-biomass-power-and-heat-climate-and-forests

[15] Multi-functionality and sustainability in the European Union's forests, European Academies Science Advisory Council (EASAC), May 2017, www.easac.eu/fileadmin/PDF_s/reports_statements/Forests/EASAC_Forests_web_complete.pdf

[16] www.pfpi.net/air-pollution-2 and www.saveamericasforests.org/Forests%20-%20Incinerators%20-%20Biomass/Documents/Briefing/index.html

[17] Drax Annual Report 2016, www.drax.com/wp-content/uploads/2017/03/Drax-Group-plc-annual-report-and-accounts-2016-Smart-Energy-Solutions.pdf

[18] www.who.int/mediacentre/factsheets/fs313/en/

[19] Residential Heating with Wood and Coal: Health Impacts and Policy Options in Europe and North America, World Health Organisation, 2015, www.euro.who.int/__data/assets/pdf_file/0009/271836/ResidentialHeatingWoodCoalHealthImpacts.pdf

[20] Air pollution in UK: the public health problem that won't go away, British Medical Journal, May 2015, www.bmj.com/content/350/bmj.h2757/rr-0

[21] See for example: Avoiding Bioenergy Competition for Food Crops and Land: Creating a Sustainable Food Future, World Resources Institute, Tim Searchinger and Ralph Heimlich - January 2015, www.wri.org/publication/avoiding-bioenergy-competition-food-crops-and-land

[22] In the case of the WA Paris Generating Station, the US Department of Energy predicts that up to 5,000 tonnes of CO_2 a day will be captured and that this will allow an additional 14,500 barrels of oil a day to be produced (breakingenergy.com/2017/04/24/secretary-perry-celebrates-successful-completion-of-petra-nova-carbon-capture-project/). Burning this additional oil would emit 6,279 tonnes of CO2 per day. In the case of the Boundary Dam Power Station, an investigation by Saskatchewan Wind shows that the additional CO_2 emissions associated with Enhanced Oil Recovery (EOR), will be higher than those saved through carbon capture. In the case of Boundary Dam, figures which we have studies and analysed show that, at full capacity, the process will cause the net emission of 0.8 million tonnes of CO2 a year, compared no carbon capture and EOR (www.biofuelwatch.org.uk/wp-content/uploads/BECCS-report-web.pdf).

[23] www.saskwind.ca/boundary-ccs and static1.squarespace.com/static/5394a3cbe4b032d797fe179c/t/55142e0ee4b06a02803077d1/1427385870286/150326-BoundaryCCS-Report.pdf

[24] energydesk.greenpeace.org/2017/02/28/kemper-southern-clean-coal-trump/