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biofuelwatch

BIOMASS FAQS

This briefing is intended to provide detailed information about the effects of wood-based biomass electricity, and about the scale of and the subsidies for it in the UK. We focus primarily on biomass electricity rather than biomass heating because, in the UK, the vast majority of wood burned for energy is burned in power stations, and because most imported wood is burned for electricity. If anything is not clear or your need information on something else we haven't discussed, please drop us an email at biofuelwatch@ymail.com.

WHAT IS BIOMASS?

Biomass refers to any organic matter derived from organisms which are or recently were alive. In the context of energy, the EU defines biomass as *"the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste"* (Renewable Energy Directive, Article 2(e).

The term 'biomass' is commonly used to describe solid biomass used for energy, such as wood, straw, or grasses, rather than liquid fuels made from biomass, which are called biofuels (when used for transport) or bioloqiuids, nor biogas, which is produced through anaerobic digestion of biomass. Bioenergy can come from biomass, biofuels/bioliquids, or biogas.

DOES BURNING BIOMASS DESTROY FORESTS? HOW?

On the current scale that we are demanding biomass, yes – and if demand rises as expected, it would destroy forests on a far a greater scale than today. Excessive demand for wood – especially in the global North - is one of the main underlying causes of deforestation and forest degradation worldwide. [1] Anything that further drives up the demand for wood is going to worsen this situation.

Negative impacts may be direct or indirect. Perhaps the strongest evidence of direct impacts on forests comes from the southern US, and specifically from Drax's main US supplier, Enviva. Enviva is the biggest pellet producer in the US. Conservation NGOs such as Dogwood Alliance and Natural Resources Defense Council (NRDC), as well as journalists, have documented how Enviva is sourcing wood for pellet plants from the clearcutting of highly biodiverse coastal wetland forests.

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Experience with the global pulp and paper industry shows that clearcutting of biodiverse forests is often followed by the establishment of monoculture tree plantations. Rich forest ecosystems, which provide habitat for thousands of species and play an important role in nutrient cycling and in regional rainfall cycles are thus lost forever. Industrial tree plantations on the other hand provide habitat for very few species, deplete soils and freshwater, and often require aerial spraying with agro-chemicals.

Clearcutting of coastal swamp forests in North Carolina, which supplies wood to an Enviva pellet mill. Dogwood Alliance

Indirect impacts are, by their nature, more difficult to prove. However, a greater demand for wood will always drive up wood prices, which encourages more intensive and extensive logging, and more land conversion to tree plantations worldwide. Sawmill residues or waste wood that are burned for energy might otherwise have been used to make paper, panel board, or other products. This can force those other industries to resort to more destructive logging instead.

WHAT ABOUT BURNING BIOMASS OTHER THAN WOOD, E.G. STRAW OR MISCANTHUS?

The vast majority of biomass burned for electricity in the UK, the EU and worldwide is wood. Most converted coal power stations, including Drax and in future Lynemouth Power Station can only burn high-quality wood pellets, which means wood pellets made from slow-growing trees with little bark. [2]

Agricultural residues and 'energy crops' have long been promoted as bioenergy, but there are serious problems with using such sources on a large scale. Agricultural residues are of great importance for maintaining soil carbon and soil fertility and thus future crop yields. Removing too many of them depletes and erodes soils and stops them from holding enough water, thus making crops more vulnerable to drought. Agricultural residues serve other purposes, too: In parts of the England, for example, pig farmers rely heavily on purchasing straw from cereal farmers. There are serious concerns that burning of straw in power stations could push up straw prices so much that some pig farmers would go out of business. [3] This could harm forests and the climate too: if small-scale pig farmers who keep free-range pigs are forced out of business, they will ultimately be replaced by industrial factory farming, which relies heavily on imported soya, which is a major driver of deforestation in South America.

Perennial grasses and short-rotation coppicing, for example of willow and poplar, are often promoted as a sustainable source of bioenergy. However, all of them rely on land and compete with either food production or wildlife habitats – just as biofuel plantations do already. Despite subsidies, farmers have been reluctant to convert land to short-rotation 'energy crops'. Less UK land is used for miscanthus or short-rotation coppicing today than it was in 2009. [4] There is no evidence that similar plantations have been successful in other countries either.

ISN'T IT JUST WASTE WOOD OR RESIDUES WHICH ARE BEING BURNED?

Whole logs used by Enviva to make pellets, many of which are burned by Drax in the UK, Photo: Dogwood Aliance

Energy companies and proponents of large-scale biomass burning often claim that only waste wood and residues are being burned, but evidence shows otherwise.

Across the EU, burning **waste wood** is regulated in the same way as burning other forms of waste. The term refers to wood which has been used for another purpose in the past, for example for construction. Much of it will have been chemically treated. Almost 700,000 tonnes of waste wood were burned in the UK in 2014/15, out of a total of 15 million tonnes of wood. [5] **Waste wood thus accounts for less than 5% of the UK's electricity from wood**. Not all power stations burning wood are technically capable and/or permitted to burn waste wood, and no converted coal power station in the UK could burn it.

In 2012, the Government department Defra published a review of research into the UK's waste wood market. [6] It found that the UK is a net importer of waste wood and showed that the fact that a small and reduced proportion of waste wood still ends up in landfill is due to insufficient segregated collections, not to a lack of demand for waste wood. The wood panel industry was the largest consumer of waste wood until 2013, when it was overtaken by the energy companies.

The term **'residues'**, on the other hand, is **far more ambiguous and thus open to abuse**. When conservation NGOs started publishing photographic evidence that pellet mills supplying Drax were using huge quantities of whole logs, [7] Drax and their supporters, including in the UK's Green Investment Bank, continued to class those logs as 'residues' or 'low-grade timber'. They now argue that it is the demand for high-quality and high-value timber by sawmills which is responsible for the clearcutting of forests such as southern US wetland forests. They argue that all of the wood used for biomass electricity effectively constituted residues, left over after sawmills have taken and used the wood they need. [8] However, as the US conservation NGO Dogwood Alliance has explained, **what Drax calls 'residues' accounts for 70% of a clearcut forest in the southern US**. Without the demand for wood which sawmills cannot use, there would be no incentive for forest owners to clearcut entire forests. [9] **And out of the 30% of wood that might go to sawmills, up to 50% will be discarded as become a 'sawmill residue' which may also be used for biomass energy.** [10] **Interestingly, Drax, in its report to the electricity regulator Ofgem, classifies nearly all of its pellet use as 'residues' but, at the same time, states that 76-100% of them were made from saw logs!**

The UK follows the European Commission's guidance which defines processing residues as "*a substance that is not the end product(s) that a production process directly seeks to produce. It is not a primary aim of the production process and the process has not been deliberately modified to produce it.*" In relation to 'forestry residues', it simply states: "*forestry residues are residues that are directly produced by ... forestry; they do not include residues from related industries or processing*". [11]

Effectively, the term 'forestry residues' is not defined at all! This is why industry is getting away with classing the wood they burn – most of which comes from whole trees – as 'low grade' and 'residues'.

ISN'T BIOMASS CARBON NEUTRAL OR AT LEAST LOW-CARBON?

Biomass is widely classed as inherently 'carbon neutral'. This is the result of what scientists have described as a serious 'carbon accounting error'. [12]

It goes back to negotiations preceding the Kyoto Protocol, when it was decided that all emissions associated with logging, deforestation and other land conversion associated with bioenergy should be attributed to the land use and forestry sector, rather than to the energy sector. This was to avoid the same emissions being counted twice. But in reality, it has led to them being ignored altogether: policies aimed at reducing emissions from the energy sector only look at emissions in that particular sector. So allowing energy companies to class biomass burning as carbon neutral opened the door to massive subsidies for bioenergy. Meanwhile, systems accounting for emissions from logging or land use change are notoriously poor and flawed, and there are no incentives for reducing emissions related to imported biomass at all.

In reality, biomass electricity always results in greater smokestack carbon dioxide (CO_2) emissions than electricity from coal (for the same amount of electricity generated). 'Carbon neutrality' means that those emissions are ignored entirely, based on the assumption that future plant growth will sequester all of that CO_2 again: but this is a false assumption for several reasons: [13]

1. For the climate, it makes no difference at all what the different sources of CO_2 emissions are. The CO_2 emitted from bioenergy causes global warming in the same way as CO2 emitted from burning fossil fuels. Ignoring any type of greenhouse gas emissions might help companies and policymakers, but it can never help the climate;

2. If trees were not cut down for bioenergy then they would continue to grow and to sequester CO_2. Yes, trees and other vegetation might grow back and absorb CO_2 in future – as they would have continued doing in the absence of any logging or land conversion for bioenergy. Overall, bioenergy still results in

more CO_2 in the atmosphere and less CO_2 sequestered;

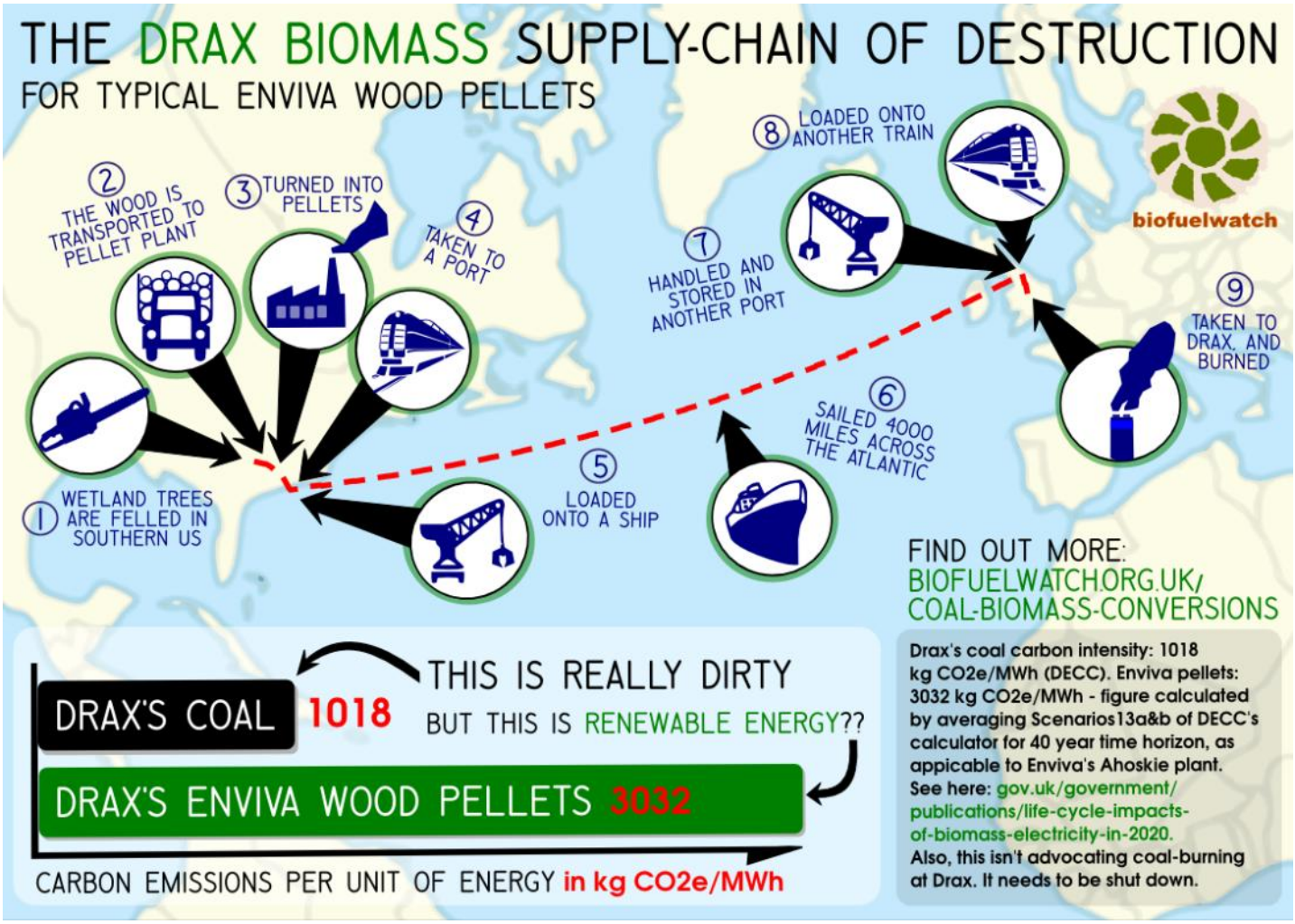
3. Even in the most optimistic scenario, it takes decades for a new tree to grow back and re-absorb all of the carbon emitted when burning an existing tree. So when trees are logged for energy, there will always be extra CO_2 in the atmosphere for a period of several decades. This is called the 'carbon debt', and it is a debt which we cannot afford because climate science shows that we must drastically reduce carbon emissions now if we want to have any chance of avoiding the worst impacts of climate change;

4. When forests are logged, they may not fully recover for a much longer period, if ever. A lot of carbon sequestered in forests is found in soils, and soil carbon is lost when forests are logged and especially when they are clearcut. Even when forests are left to regenerate, rather than being logged again and again, this can take a very long time, even centuries. In reality, logged forests are often converted to other land uses, including to monoculture tree plantations, which store far less carbon;

5. Healthy forests play a major role in regulating the rainfall cycle, storm tracks and the nitrogen cycle too, all of which are vitally important for a stable climate. Industrial tree plantations on the other hand deplete soils and freshwater.

There are often significant fossil fuel emissions associated with biomass energy: It takes a lot of energy to chip wood and far more still to turn it into wood pellets. Logging machines rely on diesel, and shipping or trucking biomass relies on fossil fuels, too. However, those fossil fuel emissions are acknowledged by the UK government and have to be accounted for, while the smokestack CO_2 emissions and the emissions associated with logging are ignored.

A list of scientific articles about the climate impacts of wood-based biomass can be found at biofuelwatch.org.uk/biomass-resources/resources-on-biomass/.



CAN BIOMASS EVER BE SUSTAINABLE AND LOW-CARBON?

The impacts of biomass energy depend both on the sourcing of the biomass and, even more importantly, on the scale. Burning biomass will always emit carbon into the atmosphere. However, there is a big difference between an inefficient power station such as Drax, which burns wood sourced from clearcutting large forests on the one hand, and coppicing trees to provide efficient local heating for a rural community on the other hand.

Small-scale use of local biomass by local rural communities can have a lower-impact than the alternatives, i.e. fossil fuel burning – especially when used for heating in off-grid areas. But there is no way that biomass can sustainably replace a significant proportion of fossil fuel use. That's because biomass, especially biomass electricity, has a much higher land footprint than any other form of energy. [14] It has such a high land footprint because photosynthesis is an extremely inefficient way of capturing solar energy. Even fast-growing trees convert just 1% of the solar energy they receive into biomass energy [15] - and the majority of that is then lost as uncaptured heat when the biomass is burned in power stations. On the other hand, a 15% conversion efficiency of sunlight to energy would be considered relatively low for a solar PV system. [16]

IS BIOMASS ELECTRICITY RENEWABLE ENERGY?

The EU Renewable Energy Directive defines all biomass as renewable, regardless of how it is produced or procured. [17] Biomass is therefore also classified as renewable energy in the UK, and currently accounts for a large share of the UK's so called 'renewable energy'. [18] In reality, biomass allows energy companies to attract vast subsidies for dirty energy falsely classed as 'renewable', rather than having to invest in genuinely renewable energy such as sustainable wind and solar power.

However, the classification of biomass as renewable energy cannot be reconciled with the International Energy Agency's definition of renewable energy, which is: *"energy derived from natural processes (e.g. sunlight and wind) that are replenished at a faster rate than they are consumed"*. [19] Clearly, trees take far longer to grow than they take to cut down and burn for energy.

Biofuelwatch has joined 131 other civil society groups in calling on the EU to exclude biomass (as well as biofuels) from the scope of the EU Renewable Energy Directive: biofuelwatch.org.uk/2016/bioenergyout-declaration/.

DOES BIOMASS POLLUTE? HOW DOES IT AFFECT PEOPLE'S HEALTH?

Yes. Biomass power stations emit a similar range and volume of air pollutants as coal power stations, albeit more of some pollutants and less of others. Compared to coal burning, biomass burning emits more Volatile Organic Compounds but less sulphur dioxide and less mercury. [20]

These are some of the effects of the pollutants released by biomass combustion on human health:

• **Nitrogen dioxide (NO_2):** can affect lung metabolism, structure, function, inflammation and host defence against pulmonary infections

• **Carbon monoxide (CO):** inhibits the blood's ability to carry oxygen to vital organs such as the heart and brain.

• **Particulates:** PM exposure affects the respiratory and cardiovascular systems in children and adults and extends to a number of large, susceptible groups within the general population. There are no safe levels for small particulates PM2.5, meaning that the slightest emissions of PM2.5 from a power station can harm health.

• **Sulphur Dioxide:** Can result in breathing problems for asthmatic children and shortness of breath.

• **Heavy Metals and Dioxins and Furans:** Toxic and carcinogenic to human health. Even 'clean' untreated wood can contain high concentrations of heavy metals which when burnt can release dioxins and furans. Dioxin emissions are particularly high

when power plants are shut down and fired up

Burning chemically treated waste wood emits more different pollutants and much greater concentrations of some pollutants compared to burning virgin wood. This is discussed in detail in Chapter 3 of our report: Biomass – the Chain of Destruction: biofuelwatch.org.uk/2013/chain-of-destruction/.

Biomass power stations pose a clear risk to local communities who live nearby, and especially to vulnerable groups, i.e. people with underlying health problems such as asthma, children, pregnant women, and elderly people. However, across the whole of the EU and UK population, the health impacts of domestic wood stoves are especially severe. An article published in the British Medical Journal, warns: *"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."* [21]

HOW EFFICIENT IS BIOMASS ELECTRICITY?

Electricity from biomass is **extremely inefficient**. According to the International Renewable Energy Agency, conventional biomass power stations are typically just 23-25% efficient, [22] which means that they waste 75-77% of the biomass energy as uncaptured waste heat. Efficiency increases with the size of a plant, so large biomass power stations tend to be more efficient than smaller ones and may reach efficiency rates as 'high' as 35%, which still means wasting 65% of the energy in the wood. Drax probably achieves the highest conversion efficiency of any biomass burning power station that doesn't make use of heat: around 38%. On the other hand some small plants, in particular small biomass gasification units which have been proposed in the UK would reach efficiency rates of just 20% or even less.

Note that under EU Renewable Energy Directive the UK is meant to be promoting biomass technologies which provide at least 70% efficiency rates. [23]

It is worth being aware that 'conversion efficiency' only looks at the efficiency of the power station itself. It takes no account of the energy used, for example, to chip wood or to turn it into pellets.

WHAT ABOUT COMBINED HEAT AND POWER WITH BIOMASS? IS THIS MORE EFFICIENT AND SUSTAINABLE?

Most of the energy generated by power stations is wasted as uncaptured heat. Capturing and using some or all of that heat will therefore make plants more efficient. An efficient Combined Heat and Power (CHP) plant can achieve 80% efficiency or even more. [24]

However, just because a biomass plant is classified as 'CHP', it does not mean that it will be efficient.

It is important to **look at how much of its heat actually gets used**. Using just a small fraction of the waste heat will make little difference to the plant's overall capacity. **The Government classifies medium-size and large biomass power stations as 'Good Quality CHP" if they achieve as little as 35% overall efficiency**. This is just half the efficiency level which the EU's Renewable Energy Directive says governments should be promoting. Smaller power stations can qualify as 'Good Quality CHP' with even lower efficiencies. Once a biomass power plant is classed as 'Good Quality CHP', it automatically qualifies for a higher rate of subsidies if built before March 2017, and it can apply for even more generous subsidies if built after that date, which electricity-only biomass plants will not get.

35% efficiency is lower than the efficiency of many coal power stations which don't use any heat at all. And it is much lower than the average efficiency of a modern gas power station. The 'Good Quality CHP' definition basically allows any operator of a biomass power station to take advantage of 'CHP' subsidies by using a tiny amount of heat, possibly just for drying the woodchips they are going to burn in the plant.

In planning applications, many developers make optimistic claims about the amount of heat they could supply. It is important to scrutinise these claims closely: A 'Heat Supply Feasibility Assessment' is not the same as a commitment to actually supply heat to anybody. Any power station is technically capable of supplying heat. The questions are whether there are nearby industries and properties with a demand for this heat, and whether anybody is going to pay for the heat pipes. Heat pipes are not cheap and in the UK, there has been very little investment in district heating networks. If an energy company does not promise to install such heat pipes, then they cannot be expected to actually supply any heat.

It is also important to remember that **efficient is not the same as sustainable**. Degrading and destroying forests for biomass energy will never be sustainable, regardless how efficiently the wood is burned.

HOW MUCH BIOMASS IS CURRENTLY BEING BURNT FOR ELECTRICITY IN THE UK?

According to the most recent Ofgem data, pellets and woodchips made from almost 15 million tonnes of wood were burned in UK power station. [25] By comparison, the UK's total wood production is 11 million tonnes a year. [26]

• Just over 3 million tonnes of **virgin wood from the UK** were burned for electricity, which is 29% of the UK's entire annual wood production;

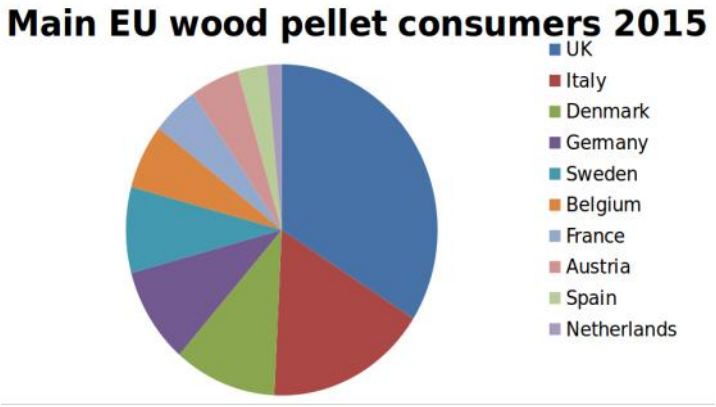
• Nearly 700,000 tonnes of **UK waste wood** were burned for electricity. Since 2013, biomass has overtaken panelboard production as the single biggest use for waste wood; [27]

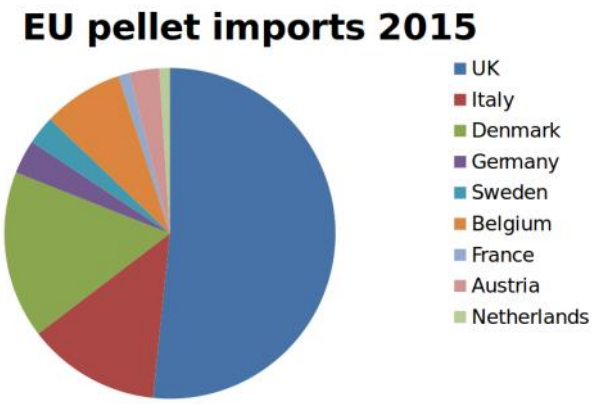
• **All imported wood burned for electricity** has so far been burned in converted coal power stations. In 2014/15, Drax burned imported pellets made from 9.1 million tonnes of wood. Most of those came from the southern US, with Canada and the Baltic States a joint second. Ironbridge Power Station burned pellets made from just over 2 million tonnes of wood, most of them from the southern US. Ironbridge Power Station has since been closed, but large new import-reliant power station projects are underway (see below).

• **Drax power station** continues to burn more biomass than any other company. In 2015, they burned pellets made from around 12

million tonnes of wood (even more than during the period 2014/15), as well as 6 million tonnes of coal. For full details about Drax, their biomass and coal burning, their subsidies, and the campaign to #AxeDrax, see: biofuelwatch.org.uk/axedrax-campaign/.

In 2015, Drax burned more than one-fifth of the global wood pellet production. The EU is by far the biggest consumer and importer of wood pellets for energy in the world, and, in turn, the UK is the largest consumer in the EU. [28]





HOW MUCH WOOD COULD BE BURNED FOR ELECTRICITY IN THE UK IN FUTURE?

In addition to the 2014/15 figures summarised above, biomass power station projects which, between them, could burn over 23 million tonnes of wood a year have been approved or have recently opened – not including smaller plants of less than 15 MW capacity (i.e. ones that would burn less than 150,000 tonnes of wood annually). Not all of the biomass plants that have been approved are likely to be built. However, capacity for burning over 6 million tonnes of wood a year has recently been opened, is under construction, or will start being constructed shortly. More projects could be proposed and approved at any time.

The biggest and most imminent new developments are:

• The conversion of the mothballed Lynemouth Power Station to biomass by the Czech energy company EPH. They will be burning pellets made from around 3 million tonnes of wood a year. Much of the wood will come from Enviva, who also supply Drax, and who have been shown to use wood from clearcut biodiverse coastal swamp forests. See here for more details about this project: biofuelwatch.org.uk/2016/lynemouth-briefing/;

• A massive 299 MW power which UK company MGT Power is about to build at Teesport. This will burn up to 3 million tonnes of wood a year. Up to two-thirds of this will be supplied by Enviva, who're supplying Drax and who will supply Lynemouth Power Station, too.

Three very large biomass power plants are proposed in Wales:

• Orthios Energy has announced that they want to build two massive biomass power stations which would each be as big as the one being built by MGT Power at Teesport, though one media report says that one of the two plants may be even larger. One of the power stations would be built in Port Talbot, the other in Holyhead, Anglesey. Planning permissions for biomass power stations this size were granted in the past, but it is not clear in how far they correspond with Orthios Energy's plans. See here for more information: biofuelwatch.org.uk/2015/welsh-biomass-proposals/;

• A Cypriotic-Welsh company called Egnedol Ltd has announced plans for what ultimately be a 350 MW biomass power station using gasification technology. This would be built in Milford Haven. Egnedol is applying for planning consent for a first 50 MW unit in the first

instance, but has said that it wants to scale it up seven-fold within three years (for which they'd need new planning consent). They state that they want to use both wood and waste-derived fuel. Biofuelwatch believes that the proposal is not technically credible, but is concerned about the local impacts of any attempts to operate such a plant. See here for more details: biofuelwatch.org.uk/2016/blackbridge-report/.

Please see our UK map of existing, approved, proposed, closed and abandoned biomass power stations projects of 15 MW or greater capacity here: biofuelwatch.org.uk/wp-content/maps/uk-biomass.html.

HASN'T THE GOVERNMENT INTRODUCED RULES UNDER WHICH ONLY SUSTAINABLE AND LOW-CARBON BIOMASS WILL BE SUBSIDISED?

On 1st December 2015, the UK government introduced greenhouse gas and sustainability standard. [29] Biomass electricity and heat which does not meet the standards is not eligible for renewable energy subsidies. [30] However, there are so many loopholes in these standards that Biofuelwatch considers them to be meaningless. [31] See here for a critical debate of the principle of bioenergy sustainability standards: biofuelwatch.org.uk/2014/biomass-sustainability-standards-briefing/.

The **greenhouse gas standards** sets a maximum level of greenhouse gas emissions which must not be exceeded by biomass electricity or heat. Until 2020, two different levels exist for biomass electricity: One which must be met by biomass power stations built after March 2013, the other for older biomass plants and for converted coal power station units, such Drax's converted units. The maximum emissions figure will be reduced in 2020 and again in 2025. **Until 2025, biomass can be subsidised as 'low carbon' even if the carbon emission attributed to it are much higher than those from burning natural gas!**

However, an even more serious flaw is the fact that the vast majority of greenhouse gas emissions associated with biomass energy are simply ignored. All of the carbon emissions emitted when biomass is burned are ignored. The only emissions which must be declared are those arising from fossil fuel burning during logging, wood processing (e.g. pellet production), and transport, emissions from fertiliser use on tree plantations, and carbon emissions from 'land use change'. However, clearcutting a forest is not classed as 'land use change', as long as the forest is not converted to agriculture or the land is used for construction. Converting a biodiverse carbon-rich forest to a sterile industrial tree plantation is not classed as 'land-use change' either. Nearly all of the emissions associated with logging are therefore ignored.

At first sight, the **sustainability standards** – or 'land criteria' – might appear more comprehensive than the greenhouse gas standards. For example, they state that biomass must come from forests (or plantations) where the 'health and vitality of ecosystems' is maintained, where biodiversity is maintained, and where harm to ecosystems is 'minimised'. On closer inspection, however, these standards are deeply flawed, too: Firstly, they emphasise the need for plans and policies for 'managing' forests and plantations, rather than the need to observe, for example, biodiversity is actually protected. And secondly, **developers can demonstrate compliance with both sets of standards by paying a consultant of their choice to 'confirm' that all of the standards are met. There is no independent verification or auditing at all. This is a recipe for fraud.** For example, in 2013, the government admitted, in relation to biofuels for transport which have been subject to greenhouse gas and sustainability standards since 2010: "*the Administrator noted that the volumes of used cooking oil (UCO) derived biofuel being reported as coming from the Netherlands were implausibly high based on the population size.*" In other words, companies must have wrongly declared the origin of their biofuels. For all we, or the government, know, some of the supposed 'used cooking oil from the Netherlands' may have been virgin palm oil from Indonesia.

Energy companies have yet another option for 'proving' compliance with the sustainability standards, one which does not require energy

companies to pay their own consultants to provide reports on all biomass consignments: They can show that wood has been certified by an "accredited voluntary certification scheme". Remarkably, **the only scheme recognised in guidance to the legislation as 'proving' 100% compliance with the sustainability standards is a scheme set up and administered exclusively by European energy companies: The Sustainable Biomass Partnership (SBP).** [32] The SBP Board is chaired by none other than Drax's CEO, Dorothy Thompson. Not surprisingly, Drax has already been granted an SBP certificate which qualifies all of the pellets produced by their own pellet mills in the southern US as meeting the UK's sustainability standards. [33] The SBP claims 'independence' because their members and board members are not directly involved in the certification assessments. But this is a spurious: The standards and all of the rules are set by the SBP themselves, so they effectively guarantee the SBP members the certificates they want.

There is plenty of scope for the UK's biomass sustainability and greenhouse gas standards to be improved. However, the fundamental problem with the idea of sustainability standards and certification is that is for what is ultimately an artificial market - a new market for wood created and maintained through public subsidies. After all, the most serious impacts of biomass energy relate to its scale. No standards can ever make an unsustainable demand sustainable -standards cannot credibly address the indirect impacts of biomass energy. Finally, any genuinely meaningful standards are likely to be challenged through the World Trade Organisation and may thus not be enforceable. See here for a critical debate of the principle of bioenergy sustainability standards: biofuelwatch.org.uk/2014/biomass-sustainability-standards-briefing/.

WHY AND HOW IS BIOMASS ELECTRICITY SUBSIDISED IN THE UK?

The United Kingdom government has a target to provide 15% renewable energy by 2020, and is bound by EU law to do so. The government predicts most of the overall target will be met through renewable electricity. Subsidies are the main instrument used to try and meet this target. There are currently three subsidy schemes for renewable electricity that apply across the UK:

Feed-in Tariffs (FiTs): Those are available for small-scale generation, up to a capacity of 5 MW, or 2kW for micro combined heat and power using bioenergy. Feed-in tariffs have been particularly important for solar PV, but they have hardly ever been used for biomass; [34]

Renewables Obligation Certificates (ROCs): Any electricity generating project classed as renewable automatically qualifies for ROCs, provided that it is commissioned by March 2017 (with a limited extension of that period in some cases). This includes all biomass power plants provided that they meet the sustainability and greenhouse gas standards discussed above. So far, ROCs have been by far the biggest driver behind the expansion of biomass electricity in the UK. Under the Renewables Obligation, electricity companies are obliged to supply a percentage of their electricity from renewables, which increases year on year. A penalty is imposed on those suppliers who do not meet the targets. Correspondingly, Ofgem issues ROCs to electricity generators for every unit of eligible renewable electricity which they supply. The market value of ROCs varies slightly. On average, one ROC was worth £42.69 in 2015. [35] Different renewable electricity technologies are eligible for different amounts of ROCs. In 2015/16, coal-to-biomass conversion attracts one ROC per MWh. So to calculate how much subsidy a biomass-burning power plant attracts, one has to multiply the number of Megawatt hours generated per year by the number of ROCs for which the particularly technology is eligible.

Energy suppliers pass the cost of ROCs onto customers via a surcharge on electricity bills. The government estimated the total surcharge for ROCs as £36. a year out of an average annual electricity bill of £627 a year - however that includes ROCs for wind and solar projects which are genuinely renewable and low-carbon. [36]

Contracts for Difference (CfDs): CfDs were introduced through the Energy Act 2013 as part of the then government's Energy Market Reform. A CfD takes the form of a 'strike price'. This is a fixed price which generators of renewable

electricity (as well as nuclear power), are guaranteed per unit of electricity. Strike prices are substantially higher than the market price for the electricity. The difference between the strike price and the market price is the subsidy.

There are two main differences between ROCs and CfDs:

• Companies need to compete for CfDs and only a small number of schemes will be awarded them, whereas companies have an automatic entitlement to ROCs provided they generate renewable electricity that falls within the scope of ROCs;

• CfDs are more generous than ROCs and they give energy companies long-term price guarantees and thus protect them from market fluctuations.

From April 2014 to March 2017, companies generating renewable electricity can apply either for ROCs or for a CfD. If they are refused a CfD then they can still apply for ROCs instead. However, they cannot get both ROCs and a CfD for the same scheme.

From April 2017 onwards, ROCs will no longer be available for new schemes (though there are provisions for extending this period for schemes already under construction at that time). Companies which already receive ROCs will continue to do so until 2027, but new ones have to apply for a CfD instead.

CfDs are awarded through a competitive process, in which companies have to put a closed bid for the lowest strike price they are happy to accept into an auction. The lowest proposals are then chosen. Before each auction, the government announces which types of schemes (i.e. which technology groups) can compete. There may be separate auctions for different technology groups at the same time. However the first awards of CfDs, made in 2014, were not subject to competition, and strike prices for those awards had been set by the government in advance.

So far, CfDs have been awarded to three large biomass electricity projects:

• The conversion of one of Drax's six power station units to biomass (the other two converted units are subsidised through Drax)

• MGT's large new biomass power station which has now attracted enough investment for construction to start, and which will burn pellets from a US company shown to use wood from clearcut biodiverse coastal swamp forests;

• The conversion of the mothballed Lynemouth Power Station to biomass, which will use pellets from hat same US company (Enviva).

The CfD award to Drax is currently being investigated by the European Commission, which means that Drax has not yet received this particular subsidy. Further CfD allocations are expected later in 2016.

HOW DOES THE UK'S SUPPORT FOR BIOMASS COMPARE TO THAT FOR WIND AND SOLAR POWER?

UK governments have long supported biomass electricity as a key component for meeting the renewable energy target. Since the Conservative Government came to power in 2015, they have significantly cut support for onshore wind and solar PV. Onshore wind is currently the single biggest contributor to renewable electricity generation in the UK (unless biomass is added together with biogas and all types of electricity from waste, in which case it surpasses onshore wind). [37] However, the Government has announced that no new Contracts for Difference will be granted for onshore wind and solar power, and it has also stopped developers from applying for ROCs for such schemes since April 2016. Feed-in-tariffs for solar PV and onshore wind have been cut. And in England, changes to planning policy make it far easy for local objectors to stop onshore wind turbines [38] - 'community rights' which do not extend to communities objecting to waste incinerators, biomass plants and other polluting developments. All of those policies are expected to drastically curtail the expansion of onshore wind and solar PV in the UK in future. This means that the Government will have to rely even more heavily on biomass electricity if they want to meet renewable energy targets.

HAVE LOCAL CAMPAIGNS AGAINST BIOMASS POWER STATIONS BEEN SUCCESSFUL IN THE UK?

Several biomass power station application have been rejected or withdrawn in response to local campaigns against them.

Those include large import-reliant power stations in Leith (Edinburgh) and Dundee, which had been proposed by Forth Energy, a (now dissolved) partnership of SSE and Forth Ports, two biomass power stations proposed by the no longer existing company Bio E Plc in Wales, and a proposal that involved a bioliquid and a biomass combined heat and power plant as well as a pellet mill in Anglesey, Wales.

In another case, a company called Prenergy obtained planning consent for what would still be the world's largest purpose-built biomass power station in Port Talbot. However, Prenergy went out of business after local campaigners persuaded planners to refuse a change of their planning consent which would have allowed them to burn pellets as well as woodchips.

Planning policies across the UK are heavily biased in favour of developers, and it can be difficult and often impossible to stop applications through the planning process. Nonetheless, there is strong evidence that active local campaigns can succeed even if the planning consent they oppose is granted: several developments that were strongly and very publicly opposed by local residents have been abandoned despite getting planning consent, while others have been quietly shelved. Those include the two other large biomass power stations proposed by Forth Energy, in Grangemouth and Rosyth, as well as a large biomass power station proposed by Helius Energy . Some investors are reluctant to get involved in highly contentious projects. And in some cases, highlighting particular risks and problems associated with a proposal might put off other investors.

Biofuelwatch offers support and advice to any local residents concerned about a biomass (or bioliquid) power plant proposal in their area.

REFERENCES & NOTES

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[2] This is due to the fact that other types of biomass contain more alkali salts, which corrode coal power station boilers: biofuelwatch.org.uk/docs/DECC%20FoI%20EIR%2013-0340%20Q1%20Documents%20Drax%20etc%209May%202013.pdf. It applies to all subcritical pulverised fuel coal power stations, which means to all coal power stations in the UK and most worldwide (albeit not to the Gardanne power station which is being converted to biomass by E.On in France). This doesn't apply to limited co-firing of biomass with coal in the same power station unit, only to coal-to-biomass conversions.

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[7] dogwoodalliance.org/wp-content/uploads/2012/11/Whole-Tree-Wood-Pellet-Production-Report.pdf

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[9] See interview with Danna Smith, Executive Director of Dogwood Alliance in Biofuelwatch's report Biomass: The Chain of Destruction, 2013, biofuelwatch.org.uk/2013/chain-of-destruction/

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[21] Another misguided policy – wood stoves: as many PM2.5 as roads & increased global warming, Dorothy L Robinson, British Medical Journal, June 215, bmj.com/content/350/bmj.h2757/rr-0

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[23] Article 18 (6), Renewable Energy Directive 2009, eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN

[24] https://www.iea.org/publications/freepublications/publication/essentials3.pdf

[25] See ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2014-15. Note Biofuelwatch has calculated the total figures as comprising green tonnes of virgin wood plus tonnes of waste wood. This is based on the following assumptions:
• One tonne of wood pellets requires two green tonnes of wood;
• One tonne of sawdust or woodchips requires 1.17 green tonnes of wood;
• Waste wood is not converted to green wood because it is wood which has been previously used for example as construction or fencing material.
• A green tonne of wood refers to the weight of freshly logged wood.

[26] Annual UK wood production was 11 million green tonnes in 2015: forestry.gov.uk/forestry/beeh-a9zjnu

[27] letsrecycle.com/news/latest-news/biomass-is-now-largest-market-for-waste-wood/

[28] Based on figures in the US Department of Agriculture's Global Agricultural Information Network report "EU 28 Biofuels Annual 2016": gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_The%2

[29] See legislation.gov.uk/uksi/2015/1947/pdfs/uksi_20151947_en.pdf for the Statutory Instrument and gov.uk/guidance/sustainability-standards-for-electricity-generation-from-biomass

[30] for the guidance document Some forms of biomass are exempt from either the greenhouse gas or the sustainability standards or both, however nearly all virgin wood used for biomass energy is covered

[31] biofuelwatch.org.uk/2016/uk-biomass-standards-briefing/

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