Biomass:

The Natural Solution for Net Zero

Why sustainably sourced wood fuel is a vital part of our low-carbon future and how AMP is making it happen.

amp CLEAN ENERGY

Why Biomass?

AMP's Approach to Sustainable, Low-Carbon Energy

At AMP, we believe in biomass. Done right, it's one of the most sustainable ways to generate heat. It's low-carbon, it makes the most of our natural resources, and it creates real value for rural communities – not just in theory, but in practice.

We're not the only ones saying this.

The IPCC[1] and EU[2] both recognise that when biomass is sustainably sourced and used to replace fossil fuels, it helps cut emissions and support climate progress. Here's why we're backing it – and what that looks like at AMP.

[1] https://www.ipcc.ch/site/assets/uploads/2018/03/SRREN_FD_SPM_final-1.pdf
[2] https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomass_en

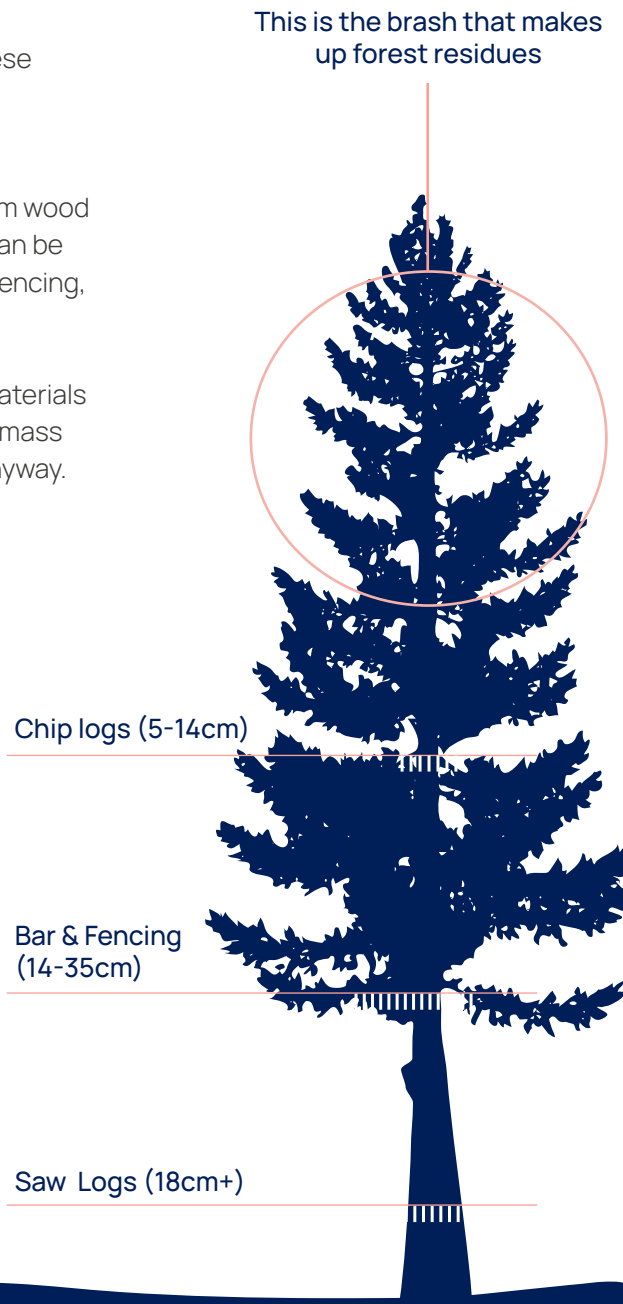
How Biomass Works

– and why it's sustainable

Biomass is often misunderstood – particularly the idea of using wood for energy. But when forests are well-managed, and wood is used smartly, the climate benefits are clear. In the UK and Europe, the vast majority of biomass comes from by-products of sustainable forestry and timber processing – not from cutting down whole trees just for fuel.

Here's how it works:

- Timber from the main trunk of a tree is used in long-life products like buildings and furniture and other construction materials. These materials lock in carbon for decades – and replace high-carbon alternatives like cement, steel, and plastic.
- The majority of the rest of the tree - the smaller, lower-grade stem wood – along with sawmill residues like wood chip, bark and sawdust, can be used to make lower value construction products like chipboard, fencing, and pallets.
- The remainder – branches , tops and typically the lowest value materials or the thinnings - can be used as biomass fuel. If not used for biomass these materials would otherwise decompose and release CO_2 anyway. Used for energy, they displace fossil fuels like gas and oil.



The diagram below shows the cross-section of a tree trunk, illustrating how sawmills square the circle to produce high-value timber. To create commercial products like furniture, square sections are cut from round logs - the navy areas represent this valuable wood. Typically only 50-55% of a saw long can be made into high value timber products. The remaining pink areas, make up the saw mill residues, and are chipped mainly for use in panel board manufacturing and energy generation.

This approach is rooted in the carbon cycle

Trees absorb CO_2 while they grow.

That absorbed carbon is stored either in wood materials, or temporarily in fuel. When biomass is burned, the carbon released is biogenic – meaning it was recently absorbed from the atmosphere – not fossil. And because forests are replanted or naturally regenerated, the released carbon is reabsorbed, maintaining a balance between uptake and release.

Sustainability isn't just about carbon, either.

Well-managed woodlands:

- Are more biodiverse than neglected ones
- Support jobs and the rural economy
- Are less prone to fire, disease and wind damage
- Remain productive, healthy, and resilient long-term

AMP's approach to biomass is built on these principles – and it's backed by regulation. All our fuels meet strict sustainability and greenhouse gas emission criteria such as BSL, FSC and PEFC.

AMP's Fuel

Sustainable, Low Carbon, and Highly Efficient

AMP believe that the best use of biomass as a fuel is to displace fossil fuels for heating – when we do this, we get the maximum amount of efficiency and displace the maximum amount of fossil fuels.

AMP's commercial portfolio of biomass projects all focus on displacing fossil fuels that were previously used to heat buildings, and the sustainability is underpinned by the wider sustainability of commercial forestry operations. This sustainability applies whether it's locally sourced woodchip or pellet imported from other European countries.

Biomass comes in various forms and from different sources. For our smaller commercial boilers, we use white or dried wood chip, or wood pellet, while our large industrial biomass boilers run on a custom industrial fuel blend.

AMP's Industrial Fuel Blend

Our industrial fuel blend comes from a range of sources, including urban, forestry, and sawmill residues. It contains materials such as twigs, bark, and brash.

White / Dried Chip

This higher-quality wood chip is used in AMP's smaller commercial boilers. It's made from roundwood that isn't suitable for sawmills, as well as from sawmill residues.

Wood Pellet

Our wood pellets are made from roundwood that isn't suitable for sawmills. The wood is compressed into pellets to increase its energy density, making it more economical to transport and ideal for boilers with limited storage space.

AMP's Industrial Fuel Blend

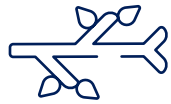
Our industrial projects go one step further.

This is because the AMP industrial biomass fuel blend has been designed to utilise very local biomass materials that don't have any other potential use cases. Instead of the wood decaying and releasing CO_2 we can instead combust it and displace fossil fuels delivering a genuine and substantial CO_2 reduction. The biomass fuel mix that we use is not made from recycled or treated waste. It's made from clean, untreated by-products of UK forestry and tree surgery operations.

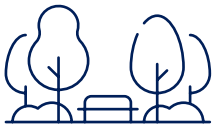
On average our industrial biomass fuel mix is:

- **55% forestry residues** which are from the brash and branches that were historically not utilised after commercial forestry operations. These were simply left on the ground to decay and emit CO_2. It is estimated that only 5% of this potential material is currently utilised in the UK.
- **40% from Urban residues.** This is the by-product of tree surgery operations like cutting down the small trees that grow at the sides of roads and on railway embankments. These residues regenerate naturally and were either previously chipped and left to decay or sent to landfill and emit CO_2.
- **Around 5% from sawmill residues** which are the chipped offcuts from the sawmill.

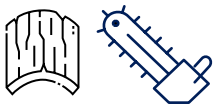
→ 55%



→ 40%



→ 5%



These materials are often referred to as "virgin" – meaning they're chemical-free, untreated, and never previously used. It doesn't mean they come from "virgin" forests – far from it! They come as a residue from UK sustainably managed forests or from trees on the side of roads or railways or other urban areas that need to be managed. Most would otherwise decompose naturally, releasing carbon without replacing fossil fuel use.

On average, our industrial fuel is sourced from within approximately 50 miles of each site – helping to reduce transport emissions and support the rural economy. This locally focused approach is central to how AMP delivers practical, sustainable energy every day.

What the Experts Say:

- The Intergovernmental Panel on Climate Change (IPCC) states that when biomass is produced sustainably and used to replace fossil fuels or high-carbon products, it contributes to meaningful carbon savings.

- The EU's Renewable Energy Directive confirms that woody biomass – when subject to strict sustainability criteria – is a valid and important part of the energy mix.

Lifecycle assessments show:

- Forest residues used for wood chip can deliver 93% CO_2 and wood pellet can deliver 91% CO_2 savings compared to fossil fuels *(EU data) and;

- Using wood instead of steel or concrete can cut emissions by over 2 tonnes of CO_2 per tonne of wood used*

Why This Matters

The UK needs to decarbonise heat and biomass is a solution that can deliver large-scale, cost-effective, low-carbon heat now.

At AMP, we're not just talking about the future. We're building it with smart, sustainable biomass that works for the climate, for communities, and for the long term.

*The calculations and references associated with these points are detailed in the FAQ section below.

AMP's Energy Centre at Bunnahabhain Distillery

Q&A →

AMP have produced the following **FAQs** to tackle head on some of the myths and misunderstandings around the use of Biomass as a sustainable fuel that can be used to replace fossil fuels.

Q: How can cutting down trees possibly be sustainable? Surely, it's much better for the environment for woodlands to be left alone.

A: It might seem counter-intuitive, but woodlands that are sustainably managed using well established forestry practices, involving thinning, regular harvesting and either replanting or natural regeneration can sequester more carbon than unmanaged forests in the long-term[3,4].

There are two main reasons for this. Firstly, because the main product of woodland management is timber which is used in long-lived products, such as building materials and furniture[5]. This locks-up significant quantities of carbon for long periods of time[6]. The second reason is because the growth rate of trees slows down when the woodland reaches maturity. Younger woodlands turn carbon into wood faster than older ones, so by continually replacing mature woodland with new woodland, carbon sequestration is higher, even when the emissions associated with harvesting, processing and haulage are taken into account.

Q: But if the wood you're harvesting is used in furniture or building materials, then it's not being burned. I don't understand.

A: Generating timber from sustainable woodland management produces a by-product known as forest residues. These residues consist of 'lop and top'—the parts of trees removed from the main trunk during harvesting that are unsuitable for timber production—and thinnings, which result from selectively removing certain trees a few years after planting or regeneration. Thinning reduces competition for light, nutrients, and water, allowing the best trees to grow into high-quality timber while removing weaker ones. Without thinning, trees grow taller with smaller diameters, making the entire stand less suitable for timber. Additionally, unthinned woodlands become more physiologically stressed, increasing their vulnerability to pests, diseases, and wind damage. As a result, failing to thin woodlands not only puts the entire stand at risk but also reduces its ability to store carbon in durable wood products[7].

After harvesting, when tree trunks or 'roundwood' arrive at the sawmills, another by-product known as sawmill residues is generated. This consists mainly of woodchip and sawdust produced from the portions of the trunk that must be removed to convert the cylindrical shape into planks of wood, along with bark and offcuts from the milling process.

These byproducts of the forestry industry are processed and used as sustainable feedstocks for a number of purposes including a fuel for heating, power generation and other biomaterials.

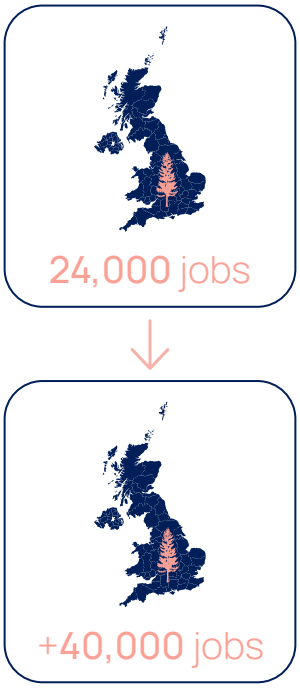
[3] https://academic.oup.com/forestry/article-abstract/90/1/125/2605858?redirectedFrom=fulltext
[4] https://www.mdpi.com/1999-4907/4/1/43
[5] https://efi.int/news/long-lived-wood-products-are-significant-carbon-capturers-2018-11-08#:~:text=Once%20wood%20is%20harvested%2C%20a,as%20wooden%20houses%20and%20furniture
[6] https://www.frontiersin.org/journals/forests-and-global-change/articles/10.3389/ffgc.2022.1055410/full
[7] https://www.sca.com/en/forest/scas-forests/responsible-forestry/managed-and-unmanaged-forest/

Q: Isn't it more sustainable to leave those residues on the forest floor, than to burn them?

A: When forest residues are left on the forest floor, there are a number of effects on the forest, soils and wildlife. Some of these are beneficial, such as providing habitat for small mammals and recycling of nutrients, and other which are not, such as an increased fire risk and suppression of regrowth on newly planted saplings[8]. The consensus is that it is acceptable to leave a small amount in the forest for wildlife habitat and nutrient recycling, but to remove the majority. But what is very clear is that, if the majority of those residues are not collected, they will naturally decompose and release CO_2 without having been used to offset fossil-based CO_2 emissions. **The EU calculates that woodchip from forest residues used for heat production saves between 67-93% CO_{2e} emissions compared to fossil fuels[9]. Therefore the benefits to the climate are clear.**

Q: I'm still not convinced that cutting down trees for energy is a good idea. What about the wildlife, is it really sustainable?

A: That's understandable, woodland management can appear to be very destructive, especially immediately after harvest, but it's important to take a long-term view. There are a number of other sustainability benefits of managing woodland that should be considered. Unmanaged or under-managed mature woodland is often lacking in light and structure at the ground level, making it a dark and cold environment, which is not attractive to wildlife. This results in poor biodiversity, particularly in insect and bird populations[10] in unmanaged woods. It can also lead to an increase of invasive species and a less resilient ecosystem[11].



In regions prone to forest fires—and increasingly in less susceptible areas as the climate warms—woodland management plays a crucial role in reducing fuel accumulation on the forest floor, thereby lowering the risk of wildfires.

Also, if forests are used to claim carbon sequestration credits, but the forest catches fire, or is lost through wind or snow damage, the stored carbon is lost, making woodland management essential.

Woodland management also offers several key social benefits, including the creation of stable local employment. **In the UK, the forest industry is estimated to support approximately 24,000 jobs[12] and is predicted to employ a further 40,000 as a result of government afforestation plans to tackle climate change[13].** Additionally, managed woodlands enhance recreational, educational, and well-being opportunities by maintaining access routes and reducing hazards from falling trees, making them safer and more enjoyable for visitors[14].

[8] https://academic.oup.com/forestry/advance-article/doi/10.1093/forestry/cpae041/7724962?login=false
[9] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001 Annex VI
[10] Hopkins and Kirby, 2007 https://onlinelibrary.wiley.com/doi/full/10.1111/j.1474-919X.2007.00703.x
and Mason, 2007 https://onlinelibrary.wiley.com/doi/full/10.1111/j.1474-919X.2007.00696.x
[11] https://forestrycommission.blog.gov.uk/2023/09/13/why-woodland-management-matters/
[12] https://forestrycommission.blog.gov.uk/2024/09/12/its-a-great-time-to-be-in-forestry/
[13] https://www.theccc.org.uk/wp-content/uploads/2023/05/CCC-A-Net-Zero-Workforce-Web.pdf
[14] https://rfs.org.uk/wp-content/uploads/2021/03/woodland-management-missed-opportunities.pdf

Q: You have mentioned the phrase "sustainable woodland management" several times. What does unsustainable woodland management look like and how is it policed?

A: Excessive or poor woodland management can be just as harmful to the climate, wildlife, and amenity value as neglecting woodland. Over-harvesting or too frequent harvesting can deplete nutrients and carbon, cause soil erosion, and ultimately lead to the degradation or loss of woodland. Additionally, ineffective management can result in low-quality tree growth, reducing their suitability for timber and diminishing their potential to be used in long-lasting wood products.

For this reason, the UK government has developed the UK Forestry Standard (UKFS)[15], which sets out guidelines, legal requirements, and best practices to ensure forests deliver environmental, economic, and social benefits. To meet the UKFS, woodland managers must develop management plans and in certain circumstances environmental impact assessments to ensure that timber production, biodiversity, soil and water protection, recreation, woodland health, climate mitigation and resilience, are all taken into account during woodland management activities.

While the UKFS is not a legal requirement, it underpins many of the certification and UK grant and incentives schemes relating to woodlands and the use of its products. For example to participate in the Environmental Stewardship or Countryside Stewardship Schemes, or achieve certification from the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC) compliance with UKFS is required.

But there are also legally binding requirements and in the UK, anyone felling more than 5 cubic metres of timber per calendar quarter must, at a minimum, obtain a felling license. In almost all cases, the license includes a requirement for restocking or natural regeneration, ensuring that woodland cover is maintained. In England, the Forestry Commission is responsible for issuing, monitoring, and enforcing felling licenses.

Q: When you burn wood it still releases CO_2 into the atmosphere and when you harvest and transport it, you use fossil fuels, so how can this save CO_2 emissions compared to, say, using gas?

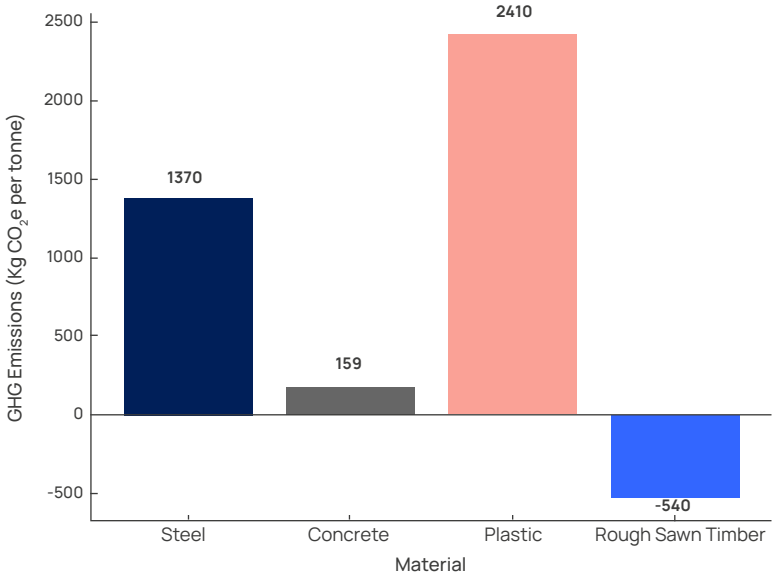
A: When assessing climate related actions, it's important to assess the impact of an action by comparing it to what would happen in its absence, or the 'counter factual' scenario and it is important to account for life cycle or cradle-to-grave emissions. Counter factual assessments help determine whether and to what extent a specific action has contributed to reducing emissions, enhancing carbon sequestration, or improving climate resilience.

A highly likely counter factual for when woodland is managed for timber and wood fuel production is where woodland is not managed, steel or concrete is used instead of wood as a building products or plastic is used instead in products such as furniture and natural gas, oil or grid electricity is used instead for heating[16,17]. The chart below shows the UK government emissions factors for these materials and fuels, taking into account cradle to grave emissions and shows that if wood is substituted for these high carbon intensity products, significant climate benefits can be achieved.

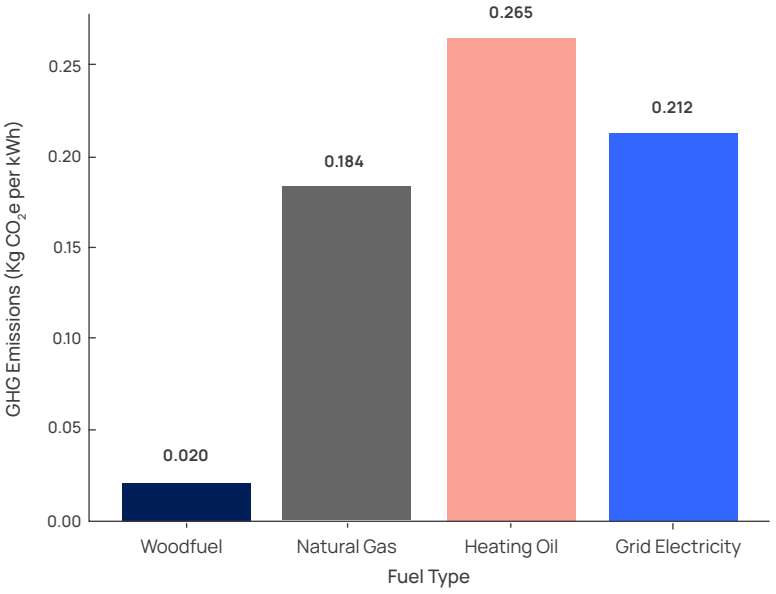
For example, if wood is used instead of plastic to make furniture and the residues, generated as a by-product are used instead of gas to create industrial heat, then over 2 tonnes of CO_2 is saved for every tonne of wood harvested.

[15] https://www.gov.uk/government/publications/the-uk-forestry-standard
[16] https://cdn.forestresearch.gov.uk/2012/05/fcrp018.pdf
[17] https://cdn.forestresearch.gov.uk/2021/07/frrn041.pdf

Embodied Carbon of Timber and Counterfactual Materials



GHG Emissions of Woodfuel and Counterfactual Fuels



Q: How can burning trees be considered low carbon, considering the timing differences between carbon sequestration (which takes around 30 years) and combustion (which happens within hours)?

A: Trees absorb CO_2 as they grow, and when they are burned, they release the same amount of CO_2 back into the atmosphere. If forests are managed sustainably - where new trees replace the harvested ones - the carbon cycle remains balanced over time.

Think of it like farming. A crop of potatoes takes an entire season to grow, yet it can be eaten in minutes. The fact that we consume food faster than it grows doesn't make farming unsustainable - it's the way the land is managed that determines long-term viability.

The same principle applies to well-managed forests. Extensive, rather than intensive, land management ensures that forests are harvested in a way that allows continuous regeneration. **In other words, if it takes 30 years for a forest to grow to full maturity, then sustainable woodland management practices ensure that in any one year, only 1/30th of all forest area is harvested and replanted.** By maintaining a balance, where new growth offsets what is harvested, woodland remains a renewable resource.

In contrast, fossil fuels release carbon with no renewal process, making their emissions permanent. Sustainable forestry, on the other hand, works within a cycle of regrowth, ensuring that carbon is continuously absorbed over time, just as agricultural land is used season after season to produce food.

It's not just about the timescale of individual trees, it's about how the whole system is managed over decades.

Deforestation does remain a significant global concern, with 27% of tree cover loss since 2000[18]. However, the primary drivers of this loss are agricultural expansion and urbanisation in specific regions. In contrast, areas with strict forest management regulations have seen an increase in woodland cover. **For example, Europe and the UK's forest area grew by 9% and 28% respectively between 1990 and 2020[19].**

In the UK, all woodfuel benefiting from government incentives, such as the Renewable Heat Incentive or Renewable Obligation, must meet rigorous, third-party-audited sustainability certification standards[20]. These standards ensure that woodfuel is sourced from areas with robust woodland management, where the risk of deforestation is minimal.

[18] https://www.globalforestwatch.org/dashboards/global/

[19] https://foresteurope.org/wp-content/uploads/2016/08/SoEF_2020.pdf

[20] https://www.gov.uk/guidance/sustainability-requirements-for-supplying-and-using-woodfuel#:~:text=In%20the%20case%20of%20woodfuel,were%20introduced%20in%20April%202014.

Q: I've heard that the rules are changing and it's going to be harder to use biomass in the future. Is that true?

A: The rules in Europe are tightening to make sure that biomass is truly sustainable. We welcome this move, because our fuel already meets these requirements.

The Renewable Energy Directive III (RED III)[21], adopted in October 2023, is the EU's latest framework for increasing renewable energy use as part of its climate targets. It raises the EU-wide renewable energy goal to 42.5% by 2030, with a push toward 45%, and introduces stricter rules around biomass sustainability, especially concerning forestry.

Under RED III, forestry residues, such as tops, branches, and other non-stem wood residues—are still allowed as renewable energy feedstock, but only when they are genuine residues that cannot be used for higher-value purposes. The directive reinforces the cascading principle, which prioritises material uses of wood (like construction or furniture) over energy use. Energy production should come from waste and residues rather than from high-quality timber.

To ensure sustainability, RED III bans subsidies for the direct burning of whole logs and stumps and introduces tougher sustainability and carbon accounting criteria. All biomass—regardless of the size of the installation—must be sourced from legally harvested forests and managed in a way that protects biodiversity and promotes regeneration. Biomass must not come from areas of high biodiversity or carbon stock, such as primary forests or peatlands.

Forestry and arboricultural residues can still play a valuable role in renewable energy production under RED III, provided they are part of a sustainable, waste-first approach and fully comply with new EU-wide monitoring and reporting requirements.

Although these rules have not yet been transposed into UK regulations, the UK government committed to developing a cross-sectoral common sustainability framework in the recent UK Biomass Strategy[22] and is expected to issue a consultation in the coming months. The UK rules are likely to be very similar to those of REDIII.

[21] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023L2413&qid=1699364355105
[22] https://assets.publishing.service.gov.uk/media/64dc8d3960d123000d32c602/biomass-strategy-2023.pdf

Q: Does wood fuel need to be locally produced to be classed as sustainable?

A: Using locally sourced fuel is generally preferable, as it minimises transport-related emissions and ensures that benefits—such as supply security, local job creation, and wildlife conservation—are retained within the area. However, as of 2024, approximately 43% of England's woodland (around 540,000 hectares) remains unmanaged[23].

Wood fuel is a by-product of the timber industry and heavily reliant on its viability. Over recent decades, UK timber producers have struggled to compete with cheaper imports, though this is improving as wood fuel provides an additional revenue stream. Despite this, UK-produced wood fuel is not always commercially viable.

When wood fuel needs to be transported over long distances, converting wood chips into pellets is more practical and efficient. Pelletisation—involving drying, grinding, and compressing wood into pellets—significantly increases energy density, allowing around 2.5 times more energy to be transported in the same space[24]. Wood pellets are also less susceptible to decomposition during transportation because they are dryer, so they can be transported with less losses than wood chips. However, by processing wood chip into wood pellets, the CO_2 emissions of the life cycle of wood fuel increases by at least 114%[25].

Even with this added processing, imported wood pellets still produce significantly lower CO_2 emissions than fossil fuels and remain well within regulatory CO_2 thresholds for heating fuels[26]. They are transported via dry bulk carrier ships, one of the most CO_2-efficient freight methods, emitting approximately 3.54 gCO_2 per tonne per kilometre[27]. This means that wood pellets can be shipped more than around the circumference of the world before the regulators CO_2 thresholds are met and more than 3 times around the world before the CO_2 emissions reach that of natural gas[28].

[23] https://assets.publishing.service.gov.uk/media/6673e4a3d427ab249955cea7/Forestry-Commission-Key-Performance-Indicators-Report-2023-24_.pdf

[24] https://www.forestresearch.gov.uk/tools-and-resources/fthr/biomass-energy-resources/reference-biomass/facts-figures/typical-calorific-values-of-fuels/

[25] https://www.forestresearch.gov.uk/tools-and-resources/fthr/biomass-energy-resources/reference-biomass/facts-figures/carbon-emissions-of-different-fuels/

[26] Ofgem RHI threshold is 34.8 gCO2e/MJ, which is equal to 125kgCO2e/MWh

[27] https://www.statista.com/statistics/1233482/carbon-footprint-of-cargo-ships-by-type-uk/

[28] Assumes: CO2e emissions of natural gas = 0.184 gCO2e/MWh, wood pellets = 0.091 gCO2e/MWh, energy density of wood pellets – 4.8 MWh/tonne.

Creating a smarter energy future

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