SOLID BIOMASS CAPACITY STATEMENT

Demonstrating the capacity of the sector to deliver decarbonised heating solutions using solid biomass

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FOREWORD

Ireland has set very ambitious 2030 targets for greenhouse gas emission reductions and climate action. In this context, cutting emissions and the displacement of fossil fuels in the heating sector is a significant challenge and opportunity. To date, the sector has proven to be particularly difficult to decarbonise. According to the Sustainable Energy Authority of Ireland (SEAI), heating accounted for 33% of energy-related carbon dioxide emissions in 2022. According to Eurostat figures, Ireland has the lowest level of deployment of renewable heat in the European Union (EU) at 5.2%.This sets out the scale of the challenge facing Ireland in order to decarbonise the heating sector.

The Government's renewable heat policy focus to date has been overly focused on a limited number of renewable heating solutions, particularly on the electrification of heat. Electrification solutions for heating provide a decarbonisation option for some but not all heat users. The scale of the challenge necessitates that all feasible and cost-effective technologies, including sustainable bioenergy-based fuels such as biomass and biogas/biomethane, play a significant role in the decarbonisation of heating across the domestic, commercial and industrial sectors.

Solid biomass represents the lowest cost decarbonisation option for heating in terms of c/kWh or €/tCO_2 abated compared to other renewable heat technologies. Ireland's integrated National Energy and Climate Plan[1] 2021-2030 published in July 2024 states that "Biomass heating is more cost effective than heat pumps in terms of cost per square metre (€/m^2) and cost per tonne of carbon emissions saved (€/tCO_2)." This statement needs to be followed up with a wider and enhanced policy measures to support the more widespread deployment of biomass technology at all levels of use.

Recently the Department of Enterprise, Trade and Employment published its 'Roadmap for the decarbonisation of industrial heat'. This document recognises the potential of, and places a strong emphasis on, solid biomass as a renewable heat technology solution for industry. This recognition of the need for an enhanced role for solid biomass industrial heat solutions is welcome and is in line with the evidence from a number of recent studies.

It follows therefore, that the rapid deployment, support and promotion of solid biomass heating technology solutions in all sectors through SEAI's Support Scheme for Renewable Heat (SSRH) needs to be enhanced. This is best achieved by open and informed conversations about the heat decarbonisation challenge in Ireland where all sustainable and cost-effective technologies can be recognised for their potential. This needs to be followed by extended policy measures, such as the expansion of the SSRH to cater for larger industrial applications and the widespread promotion by Government and Agencies of all technologies and fuel options that can be rapidly deployed to decarbonise heat and contribute to emission reduction and renewable energy targets.

[1] Ireland's National Energy and Climate Plan 2021-2030.(NECP)
https://www.gov.ie/pdf/?file=https://assets.gov.ie/299744/9a308db2-cbd5-46e8-8674-e939dca87263.pdf#page=null

Biomass is regulated under the sustainability and greenhouse gas saving criteria of the renewable energy directives and by national and EU fuel quality and emission limit values. Biomass from forests - forest-based biomass - is complementary to sustainable forest management. The main objective of commercial forestry in Ireland and across Europe is to produce high quality timber for use in the construction sector as low embodied carbon building materials. Production of sawlog sized material involves practices such as thinning and the production of smaller size logs that have a number of markets, including for energy use, once existing boardmill and other solid wood uses have been satisfied. Forest-based biomass also arises from sawlog and boardmill conversion processes, and this often has an in-situ use for drying and sometimes energy use.

This solid biomass capacity statement outlines the extent of resource and supply-chain capacity that exists in Ireland. It also clearly outlines that there is well established capacity and know-how to design, install, operate and maintain reliable and cost-effective biomass-based heating solutions across all scales.

The overall objective of this solid biomass capacity statement is to provide confidence and certainty to heat users and all stakeholders that the sector has the capacity to deliver and contribute significantly as a heat decarbonisation solution now and into the future.

IrBEA would like to thank the authors of this report for their contributions and work and to the many IrBEA members and broader stakeholders who provided information and case studies of solid biomass installations across a wide range of sectors which are included in this report.

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IrBEA President

Eugene Hendrick
Chairman IrBEA Solid Biomass Group

Seán Finan
IrBEA CEO

EXECUTIVE SUMMARY

Bioenergy is a reliable, proven, globally deployed technology and in 2021, it was the largest source of renewable energy in the EU, accounting for 59% of all renewable energy generated of which 71% was comprised of solid biofuels. Renewable heat deployment in Ireland is the lowest in the EU at 5.2%, compared to an EU average of 22.9%. Organisations such as the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) has acknowledged the need to urgently ramp-up modern bioenergy deployment, as well as bioenergy with carbon capture and storage (BECCS), in the move to carbon neutrality by 2050.

The objective of this statement is to demonstrate the potential of the sector to deliver decarbonised heating solutions using solid biomass to a wide variety of heat users across many sectors. Solid biomass in the context of this statement refers to the use of woody material, and this statement defines the capacities of the solid biomass resource, the supply-chain, of biomass heating technology providers and outlines the training, knowledge and skills levels within the sector.

The Irish Bioenergy Association (IrBEA) is the representative body for the bioenergy industry on the island of Ireland. IrBEA includes within its membership the full solid biomass supply chain from forest owners to heat users and all stakeholders in between. IrBEA manages and administers the Wood Fuel Quality Assurance (WFQA) scheme. The WFQA scheme certifies the suppliers of wood fuel including woodchip, pellets, wood briquettes and firewood to the quality standard I.S. EN ISO 17225 Solid biofuels - Fuel specifications and classes. IrBEA is a national supporting body for the Sustainable Resources Verification Scheme GmbH (SURE), a European certification body which provides sustainability certification services to WFQA members.

Solid biomass used for renewable heat is derived from sustainably managed forests, with woodchip and pellet generally used in industrial and commercial heating.

Two studies on the heating sector have been published recently including the Renewable Energy Ireland (REI) '40by30' – A 40% Renewable Heat Vision by 2030' and the SEAI National Heat Study. They are both contributing to the advancement of heat energy policy in Ireland.

The 40by30 report, published in 2021, is an industry vision for how a 40% heat target by 2030 could be achieved. The report outlines that heat demand in Ireland is projected to increase to approximately 51TWh/yr by 2030.

The SEAI National Heat study, published in 2022, outlines the various energy sources, availability and deployment options for renewable heating. This heat study will be used as the evidence base for the development of future Government heat policy.

In Ireland, the Council for Forest Research and Development (COFORD) collates the All Ireland roundwood production. The detailed methodology for calculating the supply of forest-based biomass is outlined in this statement. The solid biomass resource has the potential to increase from the current level of approximately 9.5 PJ/year to 15-16 PJ/year by the middle of the next decade. To put this in context in volume terms, 1PJ is the equivalent of 85,000 tonnes of woodchip at 35% moisture content.

In addition to the solid biomass resource potential outlined above, there is potential to sustainably increase Irish biomass production further through the establishment of Short Rotation Coppice (SRC) such as willow and Short Rotation Forestry (SRF) such as poplar and eucalyptus. This could be further supplemented with residual biomass recovery from agricultural management practices. It is estimated that all the additional sources outlined above could sustainably grow future biomass production by 300,000 to 400,000 tonnes per annum.

Mobilisation of the private forest estate, which has an average parcel size of 8.5 hectares (21 acres), is both a challenge and opportunity for the forest owners and the sector. Ireland has very low levels of imported biomass. In 2022, indigenously sourced forest-based biomass accounted for 93% of all biomass supply.

Ireland has a well-established, modern and efficient network of forestry harvesting contractors. A number of these have specialised forest-based biomass operations. There is an established nationwide network of woodchip suppliers. There is significant capacity for expansion of this network to supply increasing quantities of woodchip and other wood fuels as market demand increases. The WFQA suppliers map outlines the nationwide network of certified solid biomass providers.

Ireland also has significant skills, knowledge and capacity to design, install, operate and maintain biomass heating systems. There are many different Irish, European and international technology options available. IrBEA operates separate registers for both biomass system designers and installers. Eligible companies can join the registers once the criterion to join is fulfilled. To join these registers a specifically designed biomass practitioners course run by IrBEA is a mandatory requirement and must be attended. Participation in this two-day course is also open to energy users and broader stakeholder with an interest in the sector.

The biomass fuel requirement of a boiler depends on the boiler size, energy content of the fuel, boiler efficiency and hours of operation. Details of how to calculate the annual biomass requirements for woodchip and pellet boilers is included in this document.

Solid biomass sustainability is strictly governed by the Renewable Energy Directive. The industry is committed to sustainability in the sourcing and use of biomass. Solid biomass used for renewable heat is derived from sustainable forest management practices and techniques which involves forest thinning, and the removal of specified biomass as part of forestry harvesting operations.

Air quality is an often-cited concern regarding the use of solid biomass fuels. Distinction needs to be made between the several types of wood fuels being used and the scale of the equipment in which they are combusted. Strict EU regulations exist regarding emissions from large scale commercial and industrial biomass installations. The thermal input/output of the heating system determines which legislative instrument governs the specific emission and air quality standards. The Industrial Emissions Directive, the Medium Combustion Plant Directive and the Ecodesign Directive are the relevant legislative instruments.

Initiating and delivering a biomass project includes many different stages including system design, planning, selecting a contractor, installation, commissioning operation and maintenance. There are several types of supply and contractual arrangements available to heat users. These arrangements include owner operated, owner operated with an external maintenance contract or Energy Supply Contract (ESCO). An ESCO is preferred by many heat users as it takes responsibility for fuelling, operating and maintaining the biomass heating system with the heat user paying for the units of heat delivered.

For heat users, the Support Scheme for Renewable Heat (SSRH) is an SEAI administered operational support for biomass heating systems. The biomass SSRH support provides a 15-year payment to those businesses who move from fossil fuel heating systems to biomass heating systems. For farmers, a 40% capital support grant is available for the installation of biomass boilers to heat agricultural buildings through the Department of Agriculture, Food and the Marine administered Targeted Agriculture Modernisation Scheme (TAMS).

In addition to the support schemes outlined above, there are many Government policy documents and strategies which are relevant to the solid biomass sector. Examples of these include the Climate Action Plan, National Energy and Climate Plan, the Forest Strategy and the Roadmap for the Decarbonisation of Industrial Heat.

There are several hundred biomass heating systems operating successfully across Ireland. Numerous case studies are included covering biomass installations in the dairy processing, healthcare, industrial manufacturing, education, horticulture, public building, leisure/fitness, poultry, animal nutrition, pharmaceutical and tourism sectors.

In summary, the solid biomass capacity statement provides information and market certainty relating to energy users considering deploying biomass fuelled heating systems.

3. Objectives of the Solid Biomass Capacity Statement

The objectives of this capacity statement are to:

- Provide evidence to the heat market and users regarding the capacity of the sector to deliver decarbonised heating solutions using solid biomass.
- Address the current and future availability of solid biomass in Ireland and the supply network that exists to mobilise the solid biomass resource across Ireland.
- Outline the supply chain capacity in terms of chipping and mobilisation of the solid biomass resource.
- Show the capacity that exists in the sector including solid biomass systems design, installation and maintenance, technology availability and industry expertise, knowledge and skills.
- Address sustainability and air quality in the use of solid biomass.
- Highlight the financial models and supports which exist and are in operation for the sale and supply of renewable heat using solid biomass.
- Show examples of the successful deployment of solid biomass heating solutions at different scales of use and across sectors.

4. About the Irish Bioenergy Association (IrBEA)

IrBEA was founded in 1999 and is the representative body for the bioenergy industry on the island of Ireland. The association covers the bioenergy sectors of solid biomass, liquid biofuels, biogas/biomethane, biochar, energy crops and wood fuels. Its role is to promote the bioenergy industry and to develop this important sector on the island of Ireland. The diverse membership includes: farmers and foresters, fuel suppliers, energy development companies, equipment manufacturers and suppliers, engineers, financiers and tax advisers, legal firms, consultants, planners, research organisations, local authorities, education, and advisory bodies.

IrBEA is recognised by government and state agencies as the voice of the bioenergy industry. The association's main objectives are to influence policy makers, to support the development of bioenergy and to promote the interests of members. Improving public awareness of bioenergy, networking, knowledge and information sharing, addressing technical queries and liaising with similar interest groups are other key areas of work of the association in promoting bioenergy as an environmentally, economically and socially sustainable renewable energy.

IrBEA is affiliated to Renewable Energy Ireland (REI), Bioenergy Europe and the European Biogas Association (EBA). The organisation's activities are managed by the CEO assisted by a small executive staff team. The association is governed by a board of Directors which includes an elected President and Vice President. Policy direction is provided by a council of members and specific policy group on solid biomass, biogas/biomethane, bioenergy in transport and biochar/ carbon products.

Further information on the association is available at www.irbea.org

5. Wood Fuel Quality Assurance Scheme

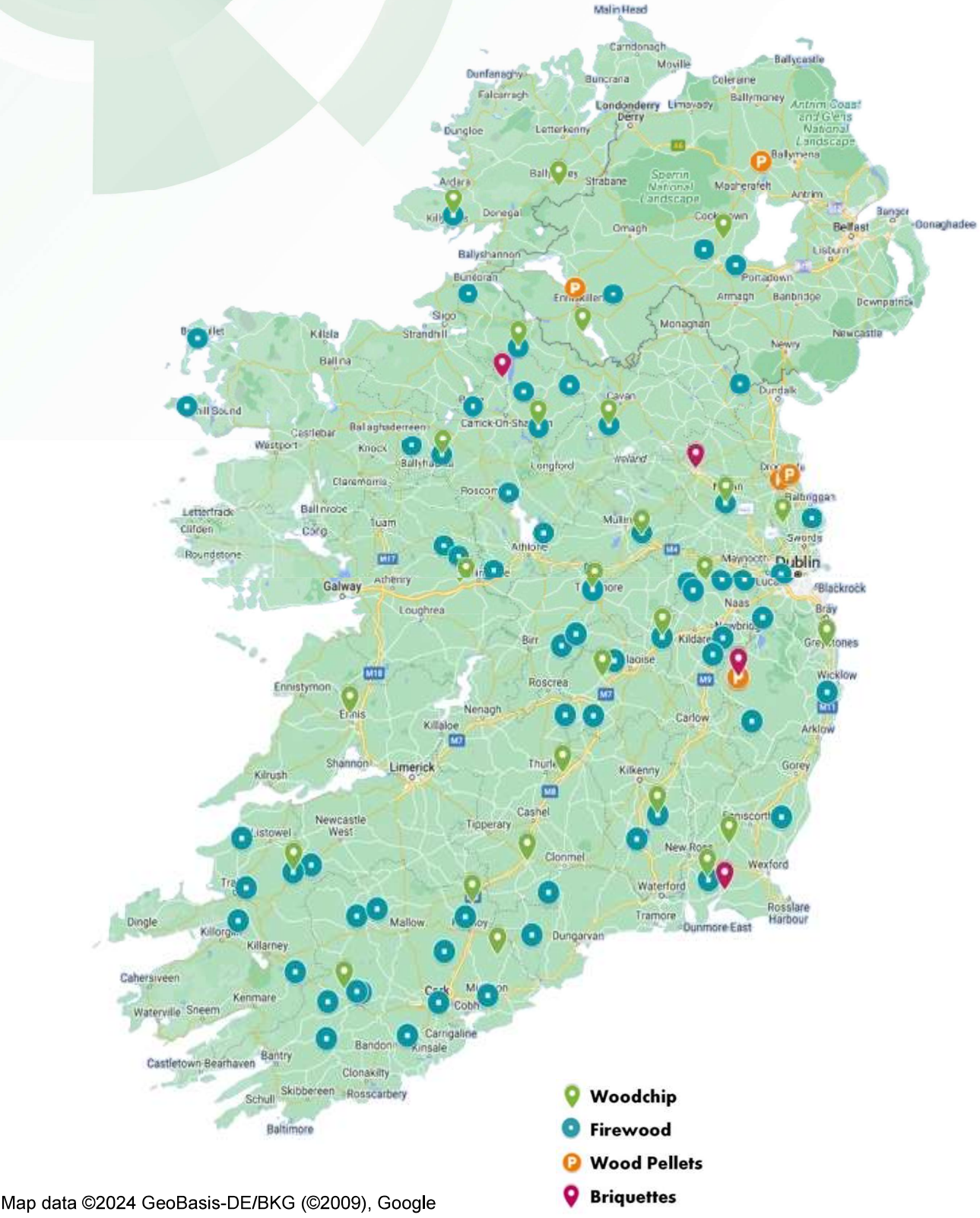
The Wood Fuel Quality Assurance (WFQA) scheme was established by IrBEA and a number of others to increase consumer confidence in the quality of wood fuel products being sold in Ireland. The scheme is now managed and administered by the Irish Bioenergy Association and is funded through membership subscriptions. Promotion of the scheme has been supported to date through grant aid provided by the Department of Agriculture, Food and the Marine (DAFM).

The WFQA is all-island in scope. Suppliers of wood fuels including firewood, woodchip, pellets, and wood briquettes are certified under the scheme to the quality standard I.S.EN ISO 17225 Solid biofuels - Fuel specifications and classes. The 17225 standard is widely used across the globe to support specification, trade and regulation of wood fuels.

The WFQA is governed by a steering committee made up of elected representatives of the WFQA membership, IrBEA industry members, DAFM, and SEAI. WFQA members' production facilities and systems are audited and certified annually according to the Scheme Rules which are periodically reviewed and revised as needed. The objective of the I.S. EN ISO 17225 is to provide clear classification principles for solid biofuels. The WFQA annual audit verifies the source of the biomass supply. The supply must be fully traceable through the DAFM felling licence system. WFQA certification satisfies the requirements for wood fuels under the Support Scheme for Renewable Heat (SSRH) & the Air Pollution Act 1987 (Solid Fuels) Regulations 2022.

IrBEA is a national supporting body for the Sustainable Resources Verification Scheme GmbH (SURE), a European certification body which provides sustainability certification services to WFQA members who are supplying biomass to installations of a total rated thermal input equal to or exceeding 7.5 MW and which come under the scope of the renewable energy directive.

5.1 Certified WFQA Suppliers



Data are continually updated as new suppliers become certified. To view the updated map, visit, www.wfqa.org

5.2 Source and types of wood fuel

There are four main types of wood fuel: firewood, woodchip, wood pellet and wood briquette. Wood fuels for residential use are best used in high efficiency, low emission wood stoves and boilers that meet the requirements of the Ecodesign Regulations[2] which are now mandatory for all new stoves and boilers. Both softwoods and hardwoods are suitable as firewood. Their suitability for use is determined by the appliance, customer requirement and type of heating needed. Solid biomass use for renewable heat is derived from sustainably managed forests, from willow coppice and other specified sources. Further information on sustainable forest management practices is provided in this statement. Most biomass used in Ireland is indigenously produced with very low levels of imported biomass material.[3]

Woodchip: Woodchip is mainly produced from forest thinning and from specified biomass harvest of felling residues. Woodchip is primarily used for industrial and commercial heating and process heating. As a fuel, it is suitable for all temperature demands up to several hundred degrees Celsius. Boilers range in size upwards from 100kW to several MW. Woodchip is a well specified low-cost fuel which can replace existing fossil fuel uses, or for new developments such as commercial and industrial heating, combined heat and power and district heating systems.

Woodchip

Wood pellets: Wood pellets are produced from sawdust, normally from sawmilling. Wood pellets are a convenient and reliable fuel and are produced worldwide and by companies on the island of Ireland. Due to their high energy density, pellets can be shipped over long distances and as a result the fuel is traded globally. Pellets are suited to heating systems ranging from domestic stoves and boilers to industrial scale use. Wood pellets must be stored in dry conditions to maintain their quality.

Wood Pellets

Wood briquettes: Wood briquettes are made from a range of materials including compressed sawdust, wood shavings, energy crops and other solid biomass materials. Briquettes are well suited to domestic heating due to their convenient size, high energy density and efficient burning properties.

Wood Briquette

Firewood: Firewood should be combusted in Ecodesign stoves and boilers. All firewood for sale must comply with the Solid Fuel Regulations and have a moisture content on a wet weight basis of 25% or below. This is to promote efficient and clean combustion. Firewood is usually produced from small sized forest thinning. It is primarily used for residential heating. Both softwoods and hardwoods are suitable as firewood.

Firewood

[2] https://www.seai.ie/publications/Ecodesign-compliant-stoves-leaflet-for-consumers.pdf
[3] Currently over 93% of biomass used is sourced on the island of Ireland.

6. The Role of Bioenergy in a Net Zero Future – the Global and Local Context

To constrain global surface temperature rise to 1.5°C in line with the Paris Agreement, the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) have re-emphasised the need to urgently reduce fossil fuel carbon emissions in the move to carbon neutrality by mid-century. Among the measures identified is a ramping-up of modern bioenergy[4] deployment, as well as bioenergy with carbon capture and storage (BECCS).

The 2019 IPCC report - Climate Change and Land (Summary for Policymakers B.7) states: "Future land use depends, in part, on the desired climate outcome and the portfolio of response options deployed (high confidence). All assessed modelled pathways that limit warming to 1.5ºC or well below 2°C require land-based mitigation and land-use change, with most including different combinations of reforestation, afforestation, reduced deforestation, and bioenergy (high confidence)."

The recent IEA report, World Energy Outlook 2023, refers throughout to the essential role of modern bioenergy in divesting energy generation of fossil fuel dependency on the road to net zero emissions by 2050.

For example, in relation to total final energy consumption in industry it projects that "In all scenarios, electricity is the fuel that increases the most in non-energy-intensive industries, and sustainable bioenergy takes second place. Increased electrification plays a significant part in decarbonising energy-intensive industries, whether through direct electrification or through the use of hydrogen produced using electrolysers."

Our contention is that climate change policy in Ireland has not recognised these imperatives. Ireland's climate action plan must cater for a substantially expanded role for modern bioenergy, to deliver the level of decarbonisation of heat and power needed for Ireland to reach net zero by 2050.

This is in the context of a rising supply of sustainable biomass on the island of Ireland, which can be underpinned by the deployment of proven woody biomass systems such as short rotation coppice and forestry, which will add to energy security and decarbonisation heat policies.

6.1 Bioenergy as the largest source of renewable energy at EU level

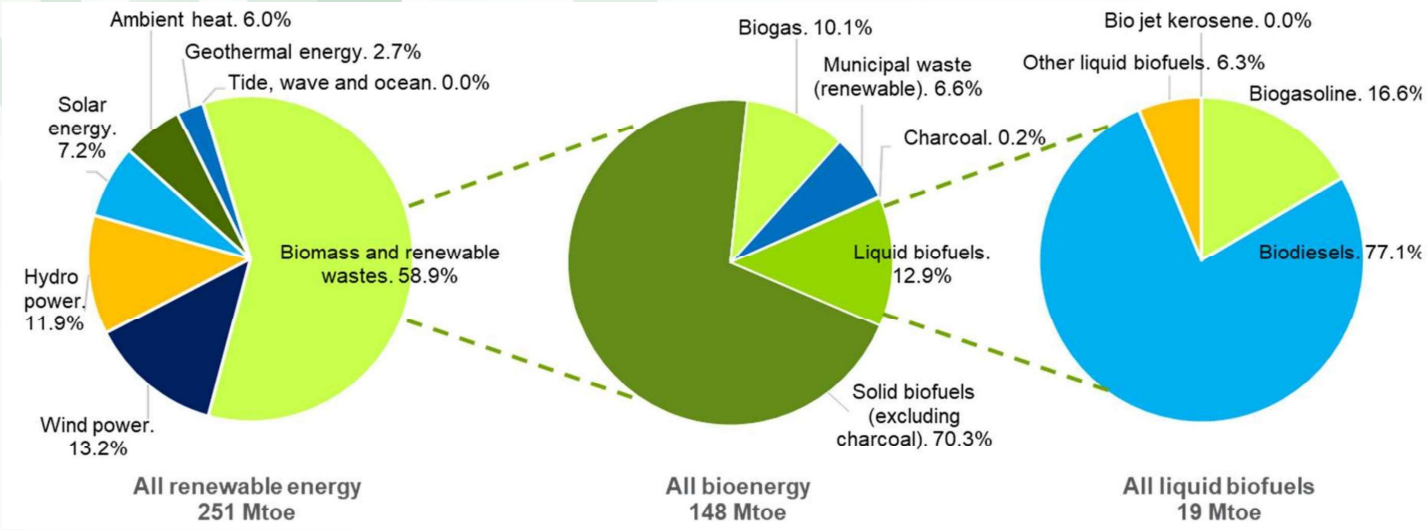
Bioenergy is a reliable, proven and globally deployed renewable energy technology. According to Eurostat and the European Commission, bioenergy (biomass and renewable waste) is the largest contributor of renewable energy in the EU at 59% over 70% of which is solid biofuels.

6.2 Renewable heat in Ireland

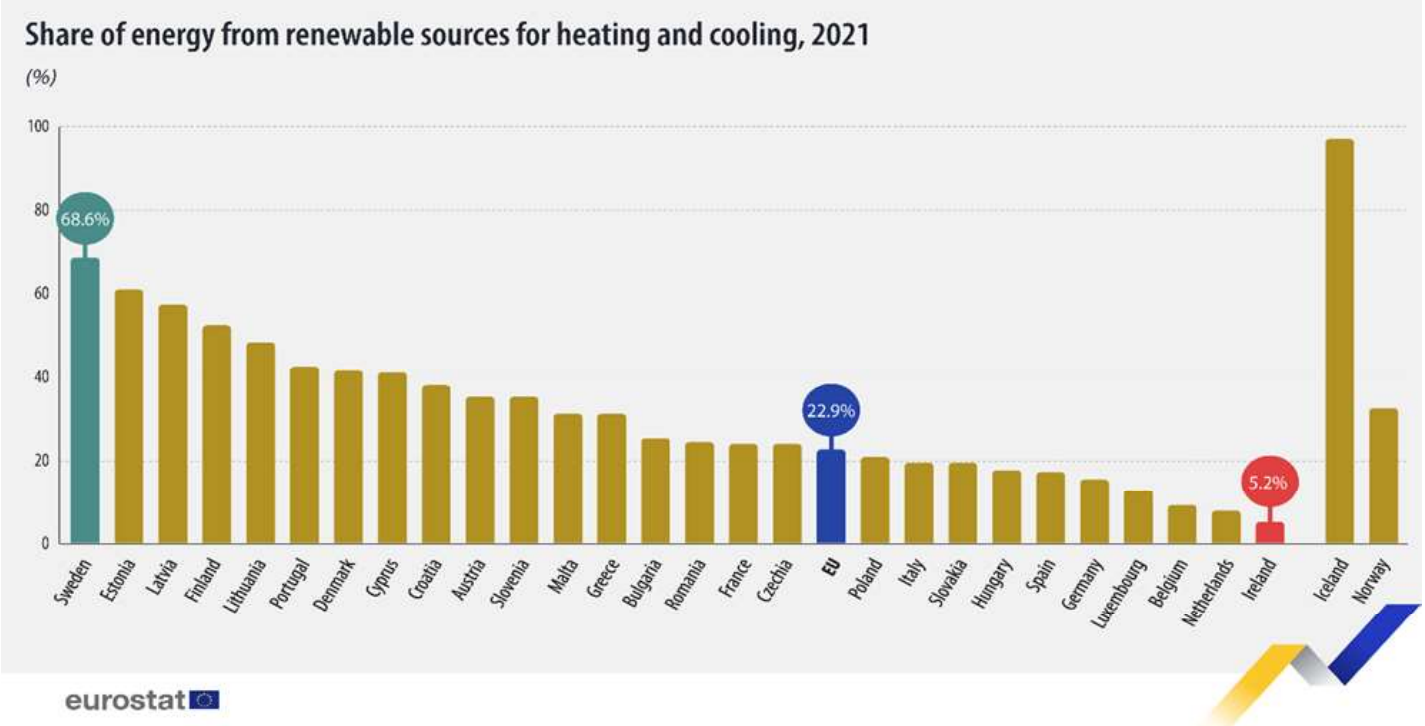
According to SEAI figures,[5] heat in 2022 accounted for 32.7%[6] of energy related CO_2 emissions by mode. According to Eurostat[7] Ireland had the lowest level of deployment of renewable heat in Europe at 5.2% from renewable sources. This sets out the scale of the challenge Ireland faces to decarbonise heating.

[4] In this context modern bioenergy refers to clean and efficient wood fuel combustion, and excludes inefficient and polluting wood fuel use, principally residential use in open fires.
[5] https://www.seai.ie/data-and-insights/seai-statistics/key-statistics/co2/
[6] https://www.seai.ie/publications/Energy-in-Ireland-2023.pdf
[7] https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230203-1

Gross EU consumption of renewable energy per type (2021, % and Mtoe)



Source: European Commission - Union Bioenergy Sustainability Report. Study to support reporting under Article 35 of Regulation (EU) 2018/1999 Final report (December 2023)[8]



Source: Eurostat [9]

[8] https://op.europa.eu/en/publication-detail/-/publication/96d671c9-c719-11ee-95d9-01aa75ed71a1/language-en

[9] https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230203-1

7. Heat Energy Policy Inputs and Projections

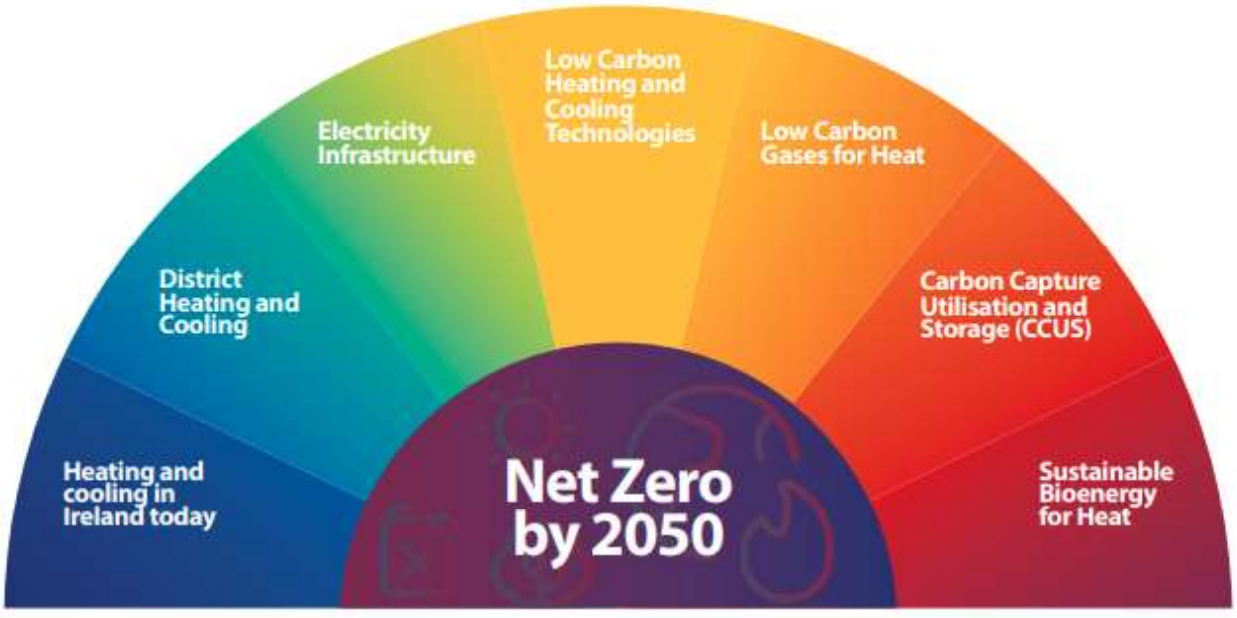
Two studies have been conducted recently on the heating sector in Ireland.

In 2021, Renewable Energy Ireland (REI) published '40by30' – A 40% Renewable Heat Vision by 2030.[10] The report is an industry vision for how a 40% heat target by 2030 could be achieved. Achievement of the target was projected to reduce carbon dioxide emissions by 7% annually in line with the Climate Action Plan.

In 2022, the SEAI published the National Heat study[11] which looked at the various energy sources, availability, deployment options for renewable heating. The study sought to address the technical, economic and policy-based measures that would be needed to transition to a low carbon heat market. Some of the key findings of the report outlined detailed heat demand assessments, both current and future, the various technical options for decarbonisation, an exploration of economic and environmental impacts as well as infrastructure and supply chain considerations.

The study consisted of the following reports:

- Net Zero by 2050
- Heating and cooling in Ireland today
- District heating and cooling
- Electricity Infrastructure
- Low carbon heating and cooling technologies
- Low carbon gases for heat
- Carbon capture utilisation and storage (CCUS)
- Sustainable bioenergy for heat



Technical reports from the seven workstreams of the National Heat Study

[10] https://renewableenergyireland.ie/wp-content/uploads/2021/05/Renewable-Energy Ireland_Renewable-Heat-Plan_-Final.pdf

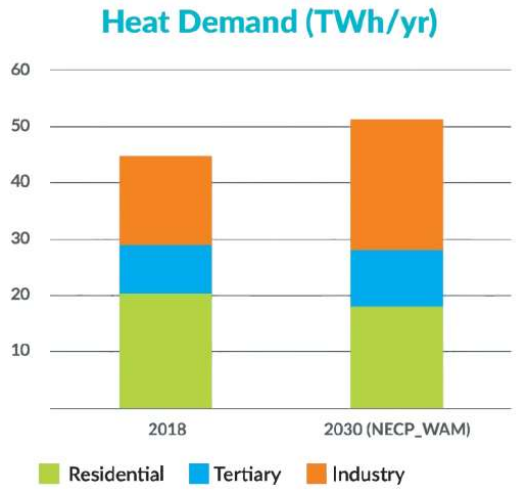
[11] https://www.seai.ie/data-and-insights/national-heat-study/

7.1 40by30 - A 40% renewable heat vision by 2030

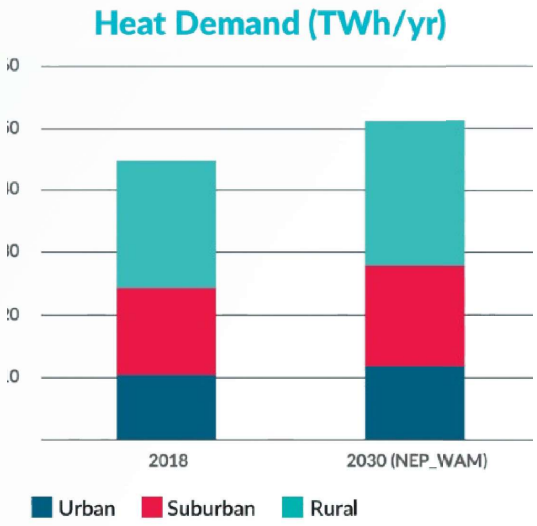
This report clearly shows that 40% of Ireland's heat by 2030 can be provided by renewable sources primarily from bioenergy, heat pumps, renewable gas and district heating networks. There is no single solution to decarbonising our heating system, but Ireland can heat our homes, schools, farms hospitals and businesses using a combination of several different renewable heating technologies.

40by30[12] is an agreed vision from across the renewable energy sectors and a call to action for the Government to set an ambitious 40% renewable heat target by 2030 similar to the way renewable electricity has its own target by 2030.

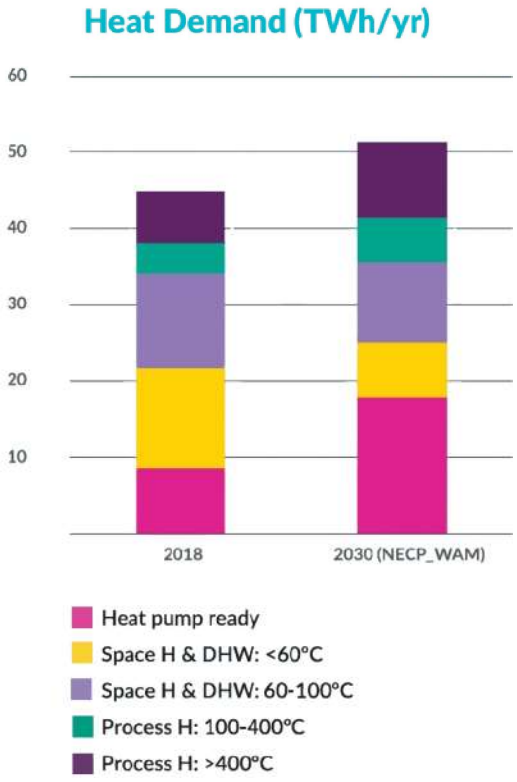
The report sets out projections of heat demand by Sector, Density and Temperature profiles 2018 - 2030. The chart below set out the main findings:



Ireland's heat demand by 2030 is expected to increase based on 2018 levels up to approximately 51TWh/yr compared to approximately 43TWh/yr in 2018. This increased demand is projected to be in the industry sector.



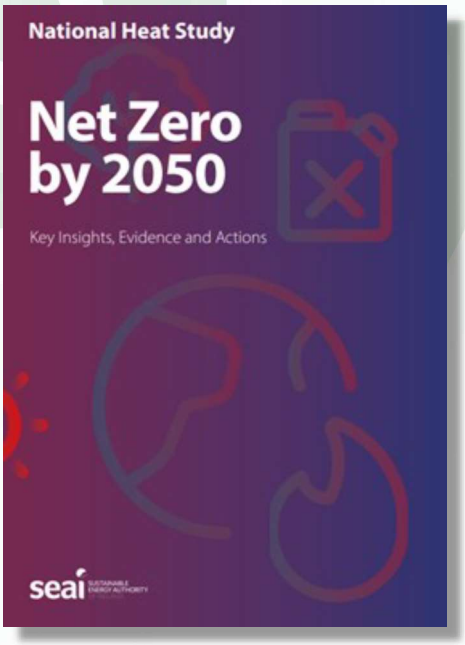
Ireland's heat demand is spread across urban, suburban and rural areas.

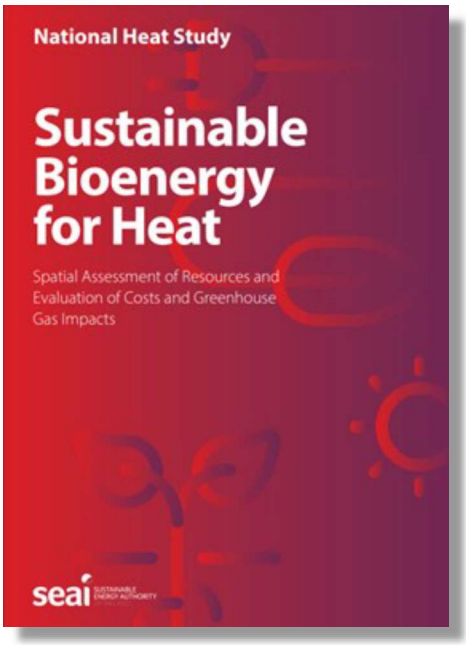


The report breaks down the heat demand across the various temperature ranges. Different heating technology solutions are available at different temperature ranges. By 2030, the number of heat pump ready buildings and the heat demand above 400^{O}C are projected to increase.

[12] https://renewableenergyireland.ie/wp-content/uploads/2021/05/Renewable-Energy Ireland_Renewable-Heat-Plan_-Final.pdf

7.2 SEAI National Heat Study





The study[13] highlighted bioenergy including solid biomass as being a crucial component for decarbonising the heat sector while also highlighting the need for sustainably sourced biomass to feed the demand. Biomass is highlighted as a versatile, renewable and sustainable option that can be integrated into various heating systems, contributing to Ireland's climate targets. The study underscores the need for supportive policies, sustainable practices, and ongoing research to maximise the potential of bioenergy in the heating sector and how it might contribute to Ireland meeting its climate targets. The National Heat Study suggests that between 7%.-17% of heat demand is supplied by bioenergy by 2030 and a similar proportion in 2050.

[13] https://www.seai.ie/publications/National-Heat-Study-Summary-Report.pdf

8. Defining Capacity

Solid biomass resource

Solid biomass bioenergy resource available for renewable energy from 2024-2040.

Supply-chain

The network of solid biomass/wood fuel suppliers and the availability of equipment and processing technology to mobilise the solid biomass resource.

Biomass heating technology

The availability of competent and experienced biomass design specialists and biomass install contractors who work with a broad and extensive Irish, UK, European and global network of biomass heating technology suppliers.

Training, knowledge and skills providers

The network of training, knowledge and skills providers and stakeholders operating across Ireland, UK and Europe.

8.1 Solid Biomass Resource Capacity

In Ireland, the Council for Forest Research and Development (COFORD) is responsible for collating the All Ireland roundwood production forecast. It is updated every five years.

The All Ireland Roundwood Production Forecast 2021-2040, includes a separate annual forecast of forest-based biomass potentially available for wood energy in the Republic of Ireland up to 2040. The forecast is based solely on existing forest, without assumptions about future afforestation rates. Harvesting estimates are derived from various inputs, primarily the modelled growth of the national forest estate using empirical growth and yield models.

The forest-based-biomass forecast excludes current and anticipated future demand from the sawmilling and wood-based panel sectors. The forecast also considers the generation of sawmilling residues, their utilisation, and the use of harvesting residues at the forest level. There is no guarantee that all or any of this material will be used for energy.

Sawmill residues in particular have a number of potential end uses. Price-paying potential for biomass will be a key consideration. As part of a paper developed by COFORD (*COFORD. 2024. Forest-based biomass and modern bioenergy, moving to net zero: COFORD. Dublin.*) on the impact of energy, climate change and other policies on the future role of forest-based biomass, a sensitivity analysis around future levels of supply was undertaken in order to gain a clearer understanding of current and future resource availability and its potential for use forest-based biomass energy. (*COFORD. 2024. A sensitivity analysis of wood fibre potentially available for wood energy 2021-2040. COFORD. Dublin.)*

A number of supply streams were examined:

- Levels of first thinning
- Biomass recovery rates at thinning, including systems that harvest all above-ground biomass (excluding foliage)
- Recovery rates following specified biomass harvesting (SBH) at final felling (which involves planned harvesting of separately piled tops and branches on clearfell sites in accordance with good practice).

All analyses assumed the use of existing, proven technologies, sustainable levels of additional harvest, and expert judgement to select the most realistic options. The work involved allocating the harvest, measured in cubic meters by the forecast engine and then converted to green tonnes at specified moisture contents, for specific power generation/industrial heating, commercial, and residential heating uses.

Green tonne normally refers to the weight of freshly felled roundwood before any natural or artificial drying has taken place. For the purposes of the sensitivity analysis of forest-based biomass supply, it was decided to express forecasted volumes in green tonnes with moisture consents specific to the end uses envisaged. This conversion also facilitated the calculation of energy values. The full methodology is outlined in the sensitivity analysis. Proportionate allocation to end uses was based on current and projected levels of use, driven by their moisture content requirements. Detailed methodologies and underlying data are available in the sensitivity analysis.

The results indicate that the supply of forest-based biomass has the potential to increase from the current level of approximately 9.5 PJ/year to 15-16 PJ/year by the middle of the next decade. After this peak, supply is projected to decline to around 14 PJ by 2040.

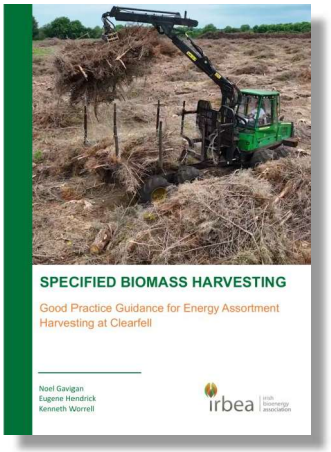
To put the projected volume of biomass supply available per year into perspective, IrBEA estimates that 1PJ is the equivalent of approximately 85,000 tonnes of woodchip at 35% moisture content.

Forecasted production of forest-based biomass over the period 2024 - 2040.

(Source: Adopted from COFORD. 2024. Forest-based biomass and modern bioenergy, moving to net zero).

Year	Green tonnes 000							Energy PJ
	Round-wood 7 – 13 cm	Down-grade + Wood Res-idues	Speci-fied bio-mass harvest	Harvest 50% SBH (60 t/ ha)	20% thinning increase	20% whole tree thinning	Total	
2024	175	1,018	86	77	55	82	1,493	9.5
2025	207	1,047	95	77	54	82	1,562	9.9
2026	244	1,035	145	80	57	86	1,647	10.4
2027	246	1,122	164	80	48	72	1,731	11.0
2028	213	1,125	153	83	39	59	1,673	10.6
2029	255	1,235	145	77	35	53	1,800	11.4
2030	317	1,404	146	63	31	46	2,007	12.7
2031	355	1,555	91	93	32	47	2,173	14.0
2032	441	1,695	98	88	31	46	2,399	15.5
2033	346	1,669	86	82	26	38	2,248	14.5
2034	443	1,631	96	98	27	40	2,335	15.1
2035	378	1,897	96	89	27	41	2,528	16.3
2036	244	1,785	55	126	29	44	2,283	14.7
2037	221	1,796	47	130	32	48	2,274	14.7
2038	177	1,788	32	63	27	41	2,128	13.7
2039	160	1,794	35	75	31	46	2,142	13.8
2040	151	1,790	45	69	37	55	2,147	13.9
Totals	4,574	25,386	1,616	1,449	617	926	34,567	221.7

Specified Biomass Harvesting (SBH)



Forests are mostly grown for roundwood production, while during felling operations, especially at clearfelling, considerable amounts of tops and branches arise, most of which is left in situ. Specified Biomass Harvesting (SBH) refers to the planned and specified harvesting of this material for an energy or other use according to market demand. SBH also facilitates forest regeneration, more efficient subsequent crop management, and more uniform and higher quality crops on regeneration. In 2024, IrBEA published[15] a technical guide aimed at foresters, forest owners, environmentalists which outlines SBH good practice.

[15] https://www.irbea.org/wp-content/uploads/2024/02/Specified-Biomass-Harvesting.pdf

8.1.1 Potential options to sustainably increase biomass production

The forest-based projections outlined can be supplemented through:

- Short Rotation Coppice (SRC) such as willow and Short Rotation Forestry (SRF) such as poplar, eucalyptus etc.
- Agricultural green wastes including residual biomass recovery from agricultural management practices using specialist contractors.

It is estimated that these sources, in conjunction with increased levels of harvesting in the forest sector (at the upper end of the sensitivity analysis) could add 300,000 to 400,000 tonnes/yr to the forecasted level shown above.

Short Rotation Coppice (SRC) and Short Rotation Forestry (SRF)

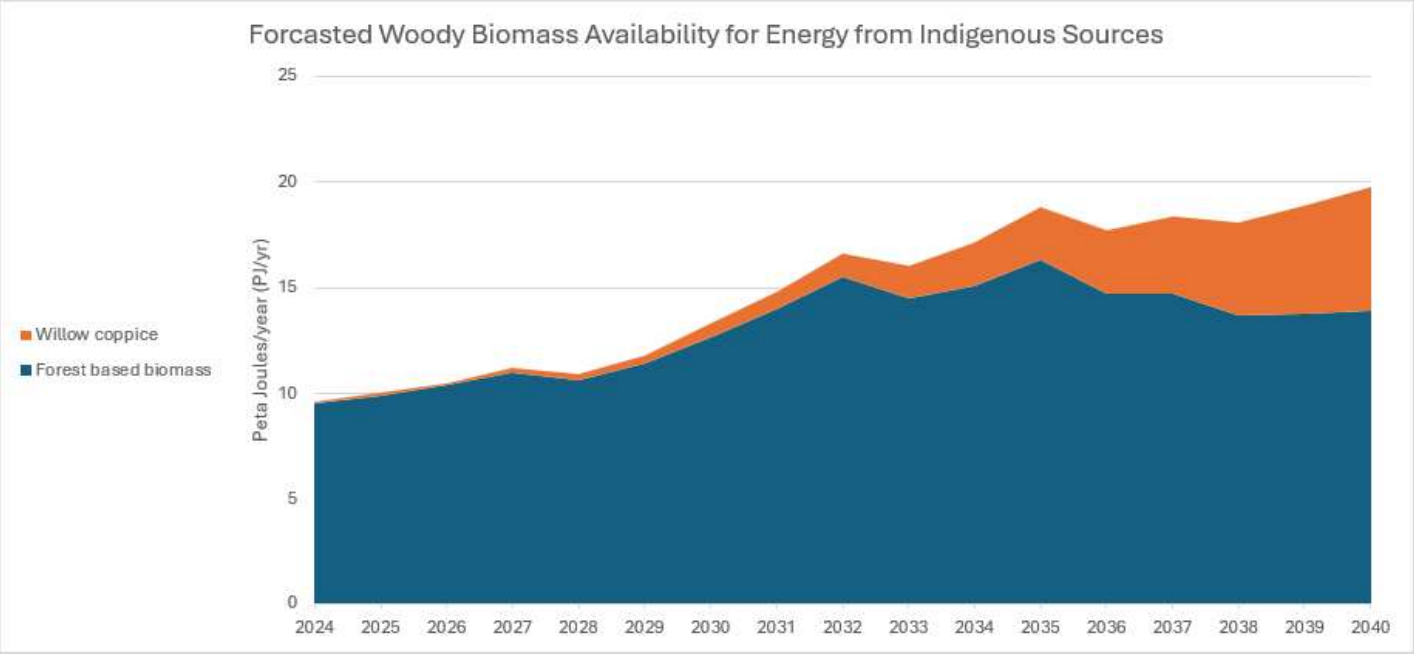
Given the time frame of a decade and half to harvest of thinning from afforestation to first harvest, and the current low level of planting, options around short rotation forestry and willow coppice, generated through the agricultural sector, merit consideration. The DAFM biomass establishment scheme ran from 2007 to 2015 and supported the establishment of 3,500 hectares of biomass crops including 1,100 hectares of willow coppice. In 2010, uptake of the biomass establishment scheme reduced significantly following the discontinuation of support for biomass boiler installations under the SEAI ReHeat scheme. It was expected that the ReHeat scheme would be replaced soon after with the SSRH.

In 2015, the DAFM biomass establishment scheme was withdrawn due to lack of demand for biomass establishment, while the SSRH was eventually opened in 2019. While there are several potential barriers to the reintroduction of a biomass coppice scheme, an imperative to develop large scale biomass heat markets could provide the necessary policy incentive. Potential supply from a renewed willow biomass scheme has been estimated for the COFORD modern bioenergy paper using the SEAI heat study supply scenario, adjusted to allow for the time taken to introduce a new grant-aid scheme and for material to flow. The analysis also considers the current supply of willow coppice of some 16-17,000 tonnes /yr (at 50% moisture content this converts to about 0.14 PJ/yr).

Taking these factors into account, and combining the resulting estimated supply with the forest-based biomass stream, the table below shows that by 2040 the potential availability of biomass from forests and coppice could be close to 20 PJ/yr. The underlying assumption is an annual average level of willow coppice establishment of 2,100 hectares over the period to 2040. There is also potential to reactivate a short rotation forestry measure, which could be used in conjunction with conventional forestry and coppice to reach a desired level of supply, 20 PJ/yr by 2040.

Forecasted (forest-based biomass) and potential (willow coppice) woody biomass availability 2024-2040. (Source: Adopted from COFORD. 2024. Forest-based biomass and modern bioenergy, moving to net zero).

Year	Forest-based biomass	Willow coppice	Total
	PJ		
2024	9.5	0.1	9.6
2025	9.9	0.1	10.0
2026	10.4	0.1	10.5
2027	11.0	0.2	11.2
2028	10.6	0.3	10.9
2029	11.4	0.4	11.9
2030	12.7	0.6	13.3
2031	14.0	0.8	14.9
2032	15.5	1.1	16.6
2033	14.5	1.5	16.0
2034	15.1	2.0	17.0
2035	16.3	2.5	18.8
2036	14.7	3.0	17.8
2037	14.7	3.7	18.3
2038	13.7	4.4	18.1
2039	13.8	5.1	18.9
2040	13.9	5.9	19.8



Agricultural green waste resource and residual biomass recovery from agricultural management practices using specialist contractors

Agriculture green waste and residual biomass recovery from agricultural management practices using specialist contractors offer opportunities for further sustainable biomass utilisation. The exemption for the practice of burning cut agricultural green waste ended on the 1st of January 2023. A feasibility study[16], carried out by IrBEA on behalf of DAFM investigated sustainable alternative management practices to the burning of cut agricultural green waste in Ireland – arising primarily from the maintenance and management of farm hedgerows (as field boundaries, for stock enclosure or shelter) and land maintenance activities, as covered by waste management legislation.

The study explores and considers sustainable alternative uses for this material, including the broader circular economy and potential alternative uses. The resource appraisal was confined to cut agricultural green waste arising on farmland only. Recovery of the material for energy is a sustainable alternative identified, with much suitable for use.

There are circumstances where large quantities of branch material and/or large diameter woody material is available following hedgerow maintenance activities, land clearance and as a result of windthrow of old and diseased trees along boundaries. Depending on the quantity it may be worthwhile for the land-owner to contract a specialist biomass contractor to gather and process the material into woodchip and firewood. The material has an economic value which can potentially offset the cost of hiring-in the specialist biomass contractor.

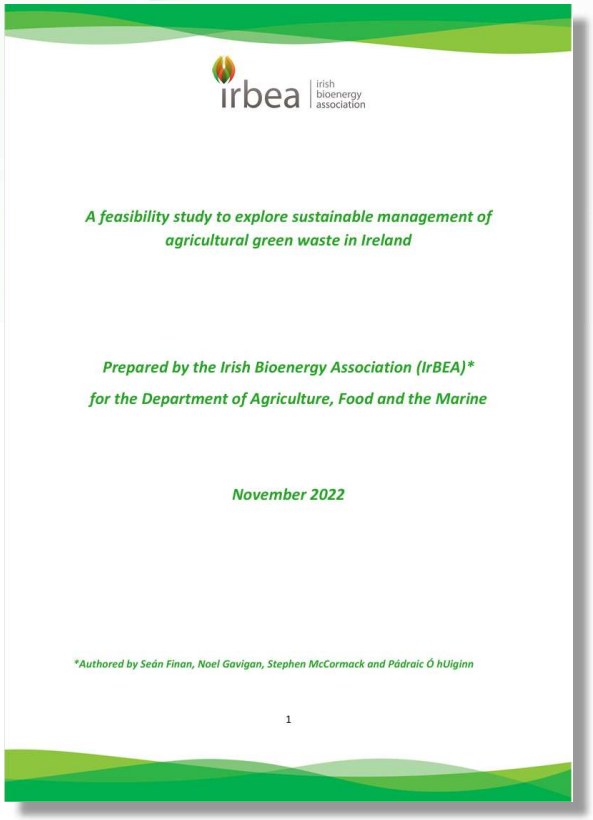
Residual biomass recovery during agricultural maintenance activities

[16] https://www.irbea.org/wp-content/uploads/2023/07/Feasibility-study-to-explore-sustainable-management-of-agricultural-green-waste-Final.pdf

It is important to carefully harvest and pile the material to avoid soil contamination as far as possible in order to facilitate effective operation and avoid damage to chipper blades from stones.

The normal farm practice of pushing green waste material into large piles with a tractor loader or other farm equipment will inevitably contaminate the green waste material with soil or stones. Contractor techniques utilising specialist equipment that picks the green material directly off the ground, will reduce the potential for contamination.

Material gathered in this manner will be largely free of contamination. As a result, it can be converted and used as a woodchip or hog fuel which is lower quality fuel such as arises from small diameter branches that is not capable of chipping. Suitable material can be chipped directly into road trucks and transported for use.


irbea irish bioenergy association

A feasibility study to explore sustainable management of agricultural green waste in Ireland

*Prepared by the Irish Bioenergy Association (IrBEA)**
for the Department of Agriculture, Food and the Marine

November 2022

**Authored by Seán Finan, Noel Gavigan, Stephen McCormack and Pádraic Ó hUiginn*

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The feasibility of green waste recovery for energy depends on:

- Accessibility of the site
- Ground bearing capacity
- Weather conditions
- Proximity to the energy user

Careful consideration should be given to the level and nature of green waste recovery for energy from agricultural lands to avoid incentivisation at the expense of biodiversity.

8.1.2. Mobilisation of the private forest resource – challenges, solutions and opportunities

Issues around mobilisation of roundwood from the forest estate have been highlighted in several COFORD reports.[17] Many of these issues have in the meantime been addressed, including the turnover of felling licensing which has greatly improved. Teagasc has an active campaign to encourage private landowners to thin their forests, and Teagasc events such as 'Talking Timber' have been highly successful in attracting attendances from forest owners.

There are many companies in the market to buy and harvest thinning and clearfell. The supply chain for all assortments is well developed. It is worth noting that across several look back studies the forecasted volumes from the private forest estate, using the same methodologies as current, have been achieved. The recently released 2024 annual forest statistics[18] shows that DAFM supported the construction of 78 km of private forest roads during 2023, an increase of 8 km over 2022. This is essential for mobilising the projected increase in harvesting, which is expected to double by 2030.

Parcel size distribution of the forest resource

According to DAFM's forest statistics 2024 the average size of private grant-aided parcels of land afforested between 1980 and 2023 was 8.5 hectares (c 21 ac), while the area threshold for economic thinning is generally held to be at around 1-2 hectares. Hence, the great majority of holdings, they come into the thinning window from an economic perspective. In addition, forest owners if so minded, can use motor-manual methods using a chainsaw and quad or small tractor to fell and remove first thinning from small areas. For final felling, areas of as low as 1 hectare and less, if carrying 400+ cubic metres of saleable roundwood will almost always attract a buyer. These areas can also generate small non-sawlog roundwood and other biomass, of 100+ green tonnes which if properly organised using IrBEA's specified biomass harvesting document makes ideal material for energy uses and can be sold on as part of the harvesting offering.

Indigenous biomass use for energy purposes and low levels of imports

Total biomass for primary energy purposes has increased steadily over the past three decades, from around 4-5 PJ/yr over the 1990s, to 10.5 PJ by 2022 (SEAI annual energy balances). Indigenously sourced forest-based biomass is estimated to have accounted for 9.7 PJ, or 93% of the 2022 biomass supply.

[17] http://www.coford.ie/media/coford/content/publications/2018/4COFORDMobilisingIrelandsForest121218.pdf

[18] https://www.gov.ie/en/collection/15b56-forest-statistics-and-mapping/#annual-forest-sector-statistics

8.2 Supply Chain Capacity

Ireland has a well-established, modern and efficient network of forestry harvesting contractors, with a number of specialised forest-based biomass operations. There are in addition a number of companies that specialise in the supply of woodchip from dedicated depots at a number of locations across the country. Locations of these and other wood fuel suppliers are indicated on the WFQA suppliers map. The capacity has expanded in response to the growth in woodfuel use and is capable of further expansion to supply increasing quantities of woodchip and other woodfuels such as pellets and briquettes. Many WFQA certified facilities have automated weighbridges, as well as storage and drying areas. Quality testing facilities are in place at almost all facilities and these can be used to test for compliance with relevant aspects of standard 17225.

8.2.1 Wood Fuel Quality Assurance (WFQA) Certified Supplier Network

The map in chapter 5 shows the location and nature of a growing network of WFQA certified suppliers of solid biomass across the country. Locations are identified according to the type of fuel they provide: woodchip, pellet, firewood or briquettes. The map is regularly updated on the WFQA website. It also provides the names and contact details of all the suppliers. It is worth noting that while this map shows those suppliers certified to standard 17225, as part of the WFQA scheme, many also go on to supply wood fuels to retail such as hardware stores, across the country.

8.3 Biomass Heating Technological Capacity

There is sufficient capacity in Ireland to design, install, operate and maintain biomass heating systems. Many different technology options exist at all scales and sizes across the domestic, industrial and commercial sectors, with variations in thermal outputs, fuel selections, operational requirements and technology providers.

While there are Irish biomass technology manufacturers, most of the mainstream internationally available biomass heating equipment providers have sales agents and representatives located and based in Ireland. This means that those looking to install modern biomass heating appliances have access to a wide and varied selection of quality equipment choices and associated technical know-how. Modern biomass heating technologies increasingly rely on automation, remote monitoring and sensing as well as ancillary systems that enable cost-effective operation and maintenance.

8.3.1 Biomass Systems Designer Capacity

The design of biomass heating systems is a particularly important first step at project initiation. This design should be completed by a suitably qualified and experienced biomass design engineer.

Issues have arisen in the past where biomass systems which have been inadequately and incorrectly designed, leading to perception issues with the technology. The critical elements of a biomass design are as follows:

- Correctly sizing of system to match requirements
- The boiler technology and associated infrastructure such as storage, hopper, feeder etc.
- The boiler house
- Controls, automation, emissions, flue design
- Operation and Maintenance (O&M) requirements

IrBEA maintains a register of biomass system designers.

Full details are available at: https://www.irbea.org/designers/

8.3.2 Biomass Systems Installer Capacity

The installation of a biomass heating system in line with the system design is crucial for successful project delivery. Any installation should be completed by a suitably qualified and experienced biomass installation contractor. Issues have arisen in the past where biomass systems which have been inadequately and incorrectly installed, leading to perception issues that the technology does not work. Every project once installed should have a maintenance regime/schedule in place. Maintenance of biomass systems is crucially important to ensure it operates at its optimum and at the highest efficiency possible.

Each biomass installation contractor typically acts as an agent for a UK or European based biomass boiler manufacturer. Being an agent of a manufacturer normally requires that the installer has undertaken training with the manufacturer on the specifics of their boiler and its correct installation.

IrBEA maintains a register of biomass system installers.

Full details are available at: https://www.irbea.org/installers/

Biomass Designer Register and Biomass Installer Register Criteria

To join the Registers applicants must:

- Be IrBEA members under the same name as they will be listed on the Register
- Have attended a 2-day Biomass Practitioners training course run by IrBEA
- Confirm they will hold:
  - ⇒ the appropriate level of professional indemnity and public liability insurance for each project they work on
  - ⇒ a tax clearance certificate.

Biomass Systems Designer Register

To join the Designer Register, applicants must be a member of IrBEA and must comply with the requirement to act as a 'Designer Certifier' as described in 'Code of Practice for Inspecting and Certifying Buildings and Works' published by the Department of Housing, Planning, Community and Local Government in September 2016.

The code of practice states that a 'Designer Certifier' must be one of the following:

a) **Architects** that are on the register maintained by the RIAI under Part 3 of the Building Control Act 2007; or

b) **Building Surveyors** that are on the register maintained by the SCSI under Part 5 of the Building Control Act 2007; or

c) **Chartered Engineers** that are on the register maintained by Engineers Ireland under section 7 of the Institution of Civil Engineers of Ireland (Charter Amendment) Act 1969

Biomass System Installers Register

To join the biomass installer register, an applicant must provide the following information to IrBEA:

- A list of boilers (make and model) they install, and:
- For each boiler under 500kW, evidence that it is EN 303-5:2012 certified
- Evidence that all boilers that they are installing are CE marked and confirmation from the boiler manufacturer that the installer is an approved supplier/installer of the boiler and information on the areas (Republic of Ireland and/or Northern Ireland) where they are approved to supply/install the boilers.
- Have attended a Biomass Practitioners training course run by IrBEA
- Hold the following:

  ⇒ Public Liability insurance
  ⇒ Employers Liability insurance
  ⇒ A Tax Clearance Certificate

Northern Ireland Companies need to be tax compliant in NI and have a tax clearance certificate in Republic of Ireland and:

⇒ Can provide documentary evidence of the above requirements on request
⇒ Sign a declaration to confirm that they agree to the rules and criteria for this register

An installation company which undertakes its own design and installations must be listed on both the Designers' and Installers' Registers. To be listed on the Installers' Register a new company must have an Installer who has worked on a minimum of five biomass installations. They must provide evidence to verify these installations including client reference contact details etc.

8.4 Training, Knowledge and Skills Capacity

IrBEA has completed four biomass practitioner training courses. These courses have been delivered by Mr. David Palmer, who is a leading UK based biomass design and installation expert. Courses were run in February and July 2019, in February 2020 and in July 2024.

The course modules include:

Module 1: Introduction to biomass boiler systems.

Module 2: Biomass boiler features, some engineering design fundamentals, biomass fuels and biomass combustion.

Module 3: Analysing boiler houses, biomass boiler operation with buffer vessels & thermal stores, load patterns and heat demand modelling.

Module 4: The biomass boiler system sizing tool, biomass boiler sizing & hydronics part 1.

Module 5: Hydronics part 2 and biomass flue systems.

Module 6: Biomass emissions, airflow over buildings and flue design for emissions dispersal.

Module 7: Case studies, biomass fuel storage, delivery & extraction.

Module 8: Biomass electrical power & controls, heat metering & problem solving.

Module 9: Biomass sizing tool.

To date, these courses have been completed by personnel from thirty-five different biomass system design and installation companies based in Ireland and Northern Ireland. This course is highly rated and serves to ensure that the skill level and knowledge base is maintained and enhanced to service this sector.

8.5 Indicative annual biomass requirement for woodchip and wood pellet boilers

Large biomass boilers require substantial quantities of woodchip or wood pellets annually. Wood pellets, being more energy-dense, require less volume compared to woodchips for the same heat output. The exact biomass fuel requirement will vary based on boiler performance, operational hours, and the quality of the biomass. The table below gives an indication of the volumes of biomass resources needed for different boiler sizes, from smaller industrial setups to large-scale heating plants.

Formula to calculate the annual biomass fuel requirement

$$\text{Biomass Requirement (tonnes)} = \frac{\text{Boiler Size (kW)} \times \text{Annual Hours}}{\text{Fuel Energy Content (kWh/tonne)} \times \text{efficiency}}$$

Indicative Annual Woodchip and Wood Pellet Requirement for Wood Fuel Boilers

Boiler Size, installed capacity	Woodchip tonnes	Wood pellet tonnes
250 kW	670	450
500 kW	1,350	900
750 kW	2,000	1,350
1 MW	2,700	1,800
2 MW	5,400	3,600
3 MW	8,000	5,400
5 MW	13,450	9,000
10 MW	26,900	18,000
15 MW	40,350	27,200
20 MW	53,800	36,200

Key Assumptions:

Woodchip Energy Content: 3,500 kWh per tonne (assuming 30% moisture content)

Wood Pellet Energy Content: 4,800 kWh per tonne (assuming low moisture content)

Boiler Efficiency: In the table above, boiler efficiency for woodchip is assumed at 0.85 and boiler efficiency for wood pellets is assumed at 0.92.

Annual Operation: Smaller biomass plants are generally used for space heating applications and therefore tend to run for 2-3000 hours per year. Industrial applications are generally associated with continuous operations with the plants running for up to and more than 8,000 hours per year. In the table above, 8000 hours of operation is assumed for the purpose of the biomass requirement calculation.

9. Sustainability and Air Quality Considerations

9.1 Sustainability

Use of sustainable solid biomass is widely recognised as one of the key enablers in the pathway to global net zero. As the bioenergy industry expands, it remains committed to sustainability in the sourcing and use of biomass.

The EU Deforestation Regulation (EUDR) (2023/1115) will replace the EU Timber Regulations (No. 995/2010) on 31st December 2024. Under the EUDR, operators must ensure relevant commodities and products placed on the EU market are deforestation-free and have been produced in accordance with the relevant legislation in the country of production.

In Ireland, solid biomass used for renewable heat is derived from sustainable forest management practices and techniques which involve forest thinning, and the removal of specified biomass as part of forestry harvesting operations. This material usually goes to produce firewood or woodchip. The felling licence system in Ireland is mandatory and is used by IrBEA and WFQA as a key element in wood fuel quality certification.[19] Thinning and energy wood removal enhances the overall productivity of the forest by allowing for the faster production of sawlog trees and their harvest for the production of long-lived solid wood products for use in the construction industry to displace higher carbon intensity materials such as concrete and steel and to store carbon over extended periods.

This important but often overlooked point is at odds with a misconception that solid biomass that is used for renewable heating in many European countries and elsewhere is derived from the logging of whole forests or in some way displaces the use of wood for use in the construction sector. In fact, the opposite is true, wood fuel harvest where sustainable forest management is legislated and practised, is fully compatible with and enhancing of the production of solid wood products. Production of sawn timber uses about half the log volume, the remainder, being offcuts, chip and sawdust. All co-product streams have potential energy uses, and in the case of sawdust, as has been outlined, it is ideal for wood pellet manufacture.

9.2 Air quality

Air quality is an often-cited concern regarding the use of solid biomass. Distinction needs to be made between the several types of wood fuels being used and the scale of the equipment in which they are combusted. The Irish Government introduced the amended Solid Fuel Regulations in 2022[20] which set out the specific requirements for the moisture content of wood fuels to be used for domestic heating (25% by September 2023, with a proposed 20% by September 2025). There is a direct link between the moisture content of firewood used at a domestic level and the volume of particulate emissions (PM 2.5, PM 10) emitted, with significant multiple reductions following the use of dry wood fuels. Strict EU regulations exist and are enforced regarding the level of particulate and other polluting emissions from large scale commercial and industrial installations including requirements for emissions monitoring and reporting as well as the use of best available techniques for pollution prevention.[21] A brief outline of the two relevant legislative instruments are detailed below and have been provided from the IrBEA report, “Study on Biomass Combustion Emissions, 2016”.

The Industrial Emissions Directive (IED)

The Industrial Emissions Directive (IED) is a key piece of European Union legislation aimed at reducing harmful industrial emissions across member states. Implemented in 2010, the IED sets stringent standards for emissions of pollutants such as sulphur dioxide (SO_2), nitrogen oxides (NOx), particulate matter, and volatile organic compounds (VOCs) from large industrial installations. The directive promotes the use of Best Available Techniques (BAT) to minimise environmental impacts.

[19] https://www.gov.ie/en/publication/19b8d-tree-felling-licences/

[20] https://www.irishstatutebook.ie/eli/2022/si/529/

[21] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02010L0075-20110106

The IED also establishes a permit system requiring industrial operators to meet emission limit values, contributing to cleaner air, water, and soil across the EU.

Medium Combustion Plants Directive (MCPD)

The Medium Combustion Plants Directive (MCPD) is an EU directive that covers the control of air pollution from combustion plants with a thermal input between 1 and 50 MW. Introduced in 2015, the MCPD sets emission limits for pollutants such as sulphur dioxide (SO_2), nitrogen oxides (NOx), and dust from medium-sized industrial plants, power generators, and heating systems. It fills the regulatory gap between smaller units covered by national regulations and larger plants regulated under the Industrial Emissions Directive. The MCPD requires operators to obtain permits, monitor emissions, and meet strict standards, helping to reduce air pollution and protect public health across the EU.

Katestone Air Emission Study

In 2022, IrBEA developed a report titled the Katestone Air Emissions Study[22] following licensing issues that arose through the roll out of the Support Scheme for Renewable Heat (SSRH) regarding the use of biomass on certain EPA licensed intensive agriculture sites. The issues on licensed sites proved to be a barrier to entry to the SSRH scheme as the installation of the biomass boiler triggered the need for a full EPA licence review for these sites. IrBEA, in conjunction with the EPA, worked alongside Katestone Global to develop an air quality modelling tool for use at licensed sites that confirmed that the installation of a biomass boiler up to 1MW had no impact on air quality based on the fulfilment of a number of parameters which removed the need for full licence review on these sites, and facilitated the installation of a biomass heating system and entry to the SEAI SSRH programme.

Application of EU Directives dealing with emissions limit values (ELVs) based on plant and appliance size

EU Directive	*Description*	*Thermal input/output*	*Regulation*
Directive 2010/75/EU	Industrial emissions – the IED Directive	> 50MW thermal input	-
Directive 2015/2193/EC	Medium Combustion plants – the MCP Directive	≥ 1 MW to < 50 MW Thermal input	-
Directive 2009/125/EC	The Ecodesign Directive	Solid fuel local space heaters ≤ 50 kW thermal output	2015/1185 In operation from 1st January 2022
		Solid fuel boilers ≤ 500 kW thermal output	2015/1189 In operation from 1st January 2020[23]

Ecodesign Directive and Ecodesign Compliant Stoves

The Ecodesign Directive is an EU framework established to improve the environmental performance of energy-related products throughout their lifecycle, from design to disposal. First adopted in 2009, the directive sets mandatory energy efficiency and environmental criteria for products such as household appliances, heating systems, and industrial equipment.

[22] https://www.irbea.org/katestone-report-screening-framework-air-quality-assessment-biomass-boilers/

[23] *Wood as a Fuel.* 2021. E.Hendrick, P.Kofman.

Ecodesign Directive and Ecodesign Compliant Stoves[24]

By focusing on energy consumption, resource efficiency, and emissions, the Ecodesign Directive aims to reduce environmental impacts and promote sustainability.

Manufacturers must ensure that their products meet these standards before being sold in the EU, contributing to energy savings, reduced greenhouse gas emissions, and more sustainable product design across industries. The Ecodesign Directive also encompasses wood-burning stoves and biomass boilers, setting specific requirements for their energy efficiency and emissions to promote environmentally friendly heating solutions. As shown in the table above, all newly sold wood-burning stoves and biomass boilers in the EU must comply with stricter standards under the Ecodesign Regulation. For wood-burning stoves, the directive focuses on reducing harmful emissions such as particulate matter (PM), carbon monoxide (CO), organic gaseous compounds (OGC), and nitrogen oxides (NOx), while also improving combustion efficiency.

This ensures that stoves consume less fuel, emit fewer pollutants, and provide cleaner and more efficient heating for residential and commercial use. Similarly, biomass boilers must meet stringent criteria for efficiency and emissions. These standards are intended to reduce the environmental impact of using wood pellets, woodchips, or logs for heating. By complying with the directive, biomass boilers are required to operate at high levels of efficiency, minimising waste and emissions, particularly during incomplete combustion. Ecodesign-compliant wood-burning stoves and biomass boilers contribute to cleaner air by drastically cutting emissions, enhancing energy efficiency, and supporting the EU's goals of reducing greenhouse gas emissions and transitioning towards sustainable energy sources. These standards also encourage innovation in the design and manufacturing of heating appliances, driving the development of advanced, cleaner-burning technologies.

Emissions limit values (ELVs) for new plant coming under the scope of the MCP Directive

Total rated thermal input MW	*Dust*	*NO_x*	*SO_2*
	Mg/Nm^3		
≥1 & ≤ 5	50	500	200[25&26]
> 5 & ≤ 20	30	300	
> 20 & < 50	20		

[24] https://www.seai.ie/publications/Ecodesign-compliant-stoves-leaflet-for-consumers.pdf

[25] Value does not apply where plants are solely combusting solid woody biomass

[26] *Wood as a Fuel.* 2021. E.Hendrick, P.Kofman.

10. Steps to Consider When Initiating a Biomass Project

As with any project, there are several steps and considerations once a decision has been taken to initiate a biomass project. While circumstances will vary from project to project, there are steps which can be followed to ensure that financial appraisal models that may be employed are based on current costs for capital equipment, fuels and so on, that combustion systems will be designed and installed to meet the customer's needs, that appropriate equipment and fuelling choices are made, that work is delivered by competent professionals and that maintenance requirement are fully costed and understood. The following steps outline the key criteria to keep in mind when initiating a biomass project.

Designing the Biomass Heating System

Assess Your Heating Needs

⇒ Heat demand calculation: Calculate your building's heating requirements (in kWh) based on size, insulation, and usage patterns. This work should be carried out by competent professionals.

⇒ Fuel availability: Determine which type of biomass fuel (pellets or woodchips) is readily available and cost-effective in your area.

Planning and Installation

Feasibility Study

- Conduct a feasibility study to evaluate the technical and economic viability, considering factors like fuel cost, supply logistics, and potential savings.

Permits and Regulations

- Local regulations: Check with local authorities regarding planning permission requirements, building regulation codes, emissions regulations, and necessary permits- this will often be determined by size of an installation, whether the facility is subject to EPA licence etc.

Incentives and Grants

- Research available incentives such as the Support Scheme for Renewable Heat (SSRH), can significantly offset costs, and for larger installations the avoidance of carbon tax.
- Application process: Prepare and submit any necessary applications for these incentives.

Budgeting

- Cost estimates: Obtain estimates for equipment, installation, and maintenance.
- Contingency: Include a contingency fund for unexpected expenses.

Selecting a Contractor

Research and Recommendations

- **Experience:** Consult the IrBEA Biomass systems installers register and look for contractors with a strong track record in biomass heating installations. Verify their experience with projects similar in scale to yours.

- **Certifications:** Check for certifications or membership in professional organisations

- **References:** Request and follow up on references from previous clients to assess satisfaction and reliability.

Request for Proposals (RFP)

- Prepare an RFP outlining your requirements and distribute it to several contractors. Compare their proposals based on:
  - ⇒ System design and proposed technology
  - ⇒ Installation timeline
  - ⇒ Warranty and after-sales service
  - ⇒ Cost estimates

Evaluation Criteria

- Technical expertise: Assess their understanding of your needs and the proposed system's suitability.
- Financial stability: Ensure the contractor has the financial resources to complete the project.
- Customer service: Evaluate their responsiveness and willingness to provide ongoing support.

Biomass System Components

- Boiler size: Choose a boiler that meets or slightly exceeds your calculated heat demand.
- Storage: Plan for adequate access to the fuel storage area from trucks and other delivery vehicles and plan the fuel storage capacity carefully in relation to seasonal fuel demand, and the need for safe access for maintenance of cranes and other fuel conveyancing equipment.
- Biomass systems are often designed to deal with base loads – which are supplemented by oil or gas peaking plants – this is key aspect in a biomass heating system and needs very close attention.
- Distribution system: Design of the heat distribution system, which might include radiators, underfloor heating, or a heat exchanger for air or water systems, pipework for process heat etc.

Site Visit

- Site inspection: Arrange for shortlisted contractors to visit your site, discuss your specific needs, and verify logistical aspects.

Contract Agreement

- Terms: Ensure the contract covers all agreed terms, including scope, payment schedule, deadlines, warranties, and liabilities.
- The nature of the contract will ultimately depend on which model is chosen- i.e. an ESCO style contract, is SSRH being applied for etc.
- If the SSRH is a feasible option, make sure the letter of offer from SEAI has been received prior to any commencement of works/installation.
- Payment plan: Structure the payment plan to include milestones that protect your investment.
- There are number of heat supply models from an energy supply contact (ESCO) to providing a turnkey plant for customer operation, and intermediate models. See Section 11.1

Installation and Commissioning

Installation Process

- Scheduling: Plan the installation to minimise disruption to your operations or home life.
- Coordination: Ensure clear communication between the contractor, fuel supplier, and any other parties involved.

Commissioning

- Testing: After installation, the system should be thoroughly tested to ensure it operates efficiently and safely across a range of loads, and that the fuel system is fit for purpose.
- Training: : If the project is a self-operated system ensure you or your staff receive training on operating and maintaining the system.

Ongoing Operation and Maintenance

- Maintenance plan: Set up a maintenance plan, either through a service contract with the installer or by training in-house staff.
- Monitoring: Regularly monitor system performance to detect and address any issues early.

11. Biomass Heating and Supply Contractual Arrangements

There are various contractual arrangements available to heat users regarding biomass installations, ongoing fuelling requirements including procurement, operations and maintenance.

Owner operator approach:

This is where the building owner/heat user takes responsibility for fuelling, operating and maintaining their own system. This approach depends on availability of technical expertise and personnel in-house/on-site and may not suit all scenarios.

Owner operator approach with external maintenance contract:

This is where the building owner/heat user takes responsibility for fuelling and operating their own system with maintenance contracts in place with the installer/supplier/third party for regular servicing and maintenance requirements.

ESCO: Energy Supply Contract:

This is where the building owner places the responsibility for fuelling, operation and maintenance of the biomass system to a specialist third party and where the building owner purchases heat at the heat meter. This model is explained in detail below. Webinar No 29 in the IrBEA bioenergy webinar series covers the ESCO topic. Details are available at: IrBEA Webinar No. 29 -ESCOs

11.1 ESCO: Energy Supply Contract

An Energy Supply Contract (ESCO) model using solid biomass as fuel typically involves the ESCO taking responsibility for providing energy services to a client, such as heating, cooling, or electricity, using biomass chip or pellet as the primary energy source.

Key Components and Steps of the ESCO Model:

Initial Assessment and Contracting:

- Site Assessment: The ESCO conducts a thorough assessment of the client's site to determine the energy needs and the feasibility of using biomass chips as a fuel source.
- Contract Agreement: An agreement is reached between the ESCO and the client detailing the terms of service, including the duration of the contract, cost savings guarantees, and performance metrics.

System Design and Installation:

- Design: The ESCO designs a customised energy system that uses solid biomass. This system could include biomass boilers, combined heat and power (CHP) units, or other relevant technologies.
- Installation: The ESCO manages the installation of the biomass energy system, which includes setting up the necessary equipment and ensuring that the infrastructure is in place for the delivery and storage of woodchip or pellet.

Fuel Supply Management:

- Sourcing Biomass: The ESCO is responsible for sourcing high-quality biomass. This can involve contracts with local suppliers or the ESCO might produce the woodchip/pellet themselves from sustainable sources.
- Logistics and Storage: The ESCO manages the logistics of transporting biomass to the client's site and ensures proper storage to maintain fuel quality and ensure a consistent supply.

Monitoring and Verification:

- Performance Monitoring: The ESCO continuously monitors the performance of the biomass energy system using advanced metering and analytics to ensure it meets the agreed-upon performance standards.
- Reporting: Regular reports are provided to the client detailing energy savings, system performance, and any maintenance activities. This transparency helps in building trust and demonstrating the value provided by the ESCO.
- Financial Management: Upfront Investment: Often, the ESCO covers the initial capital investment for the biomass energy system, reducing the financial burden on the client.
- Cost Savings: The client benefits from reduced energy costs due to the high efficiency of the biomass system and the typically lower cost of biomass compared to fossil fuels.
- Payment Structure: Payments to the ESCO are typically structured as a portion of the achieved energy savings, aligning the ESCO incentives with those of the client.

12. Financial Supports for Biomass Heating Systems

12.1 Support Scheme for Renewable Heat (SSRH)

The Support Scheme for Renewable Heat (SSRH) is a program established by the Irish government and administered by the SEAI to promote the adoption of renewable heat technologies. It provides financial incentives to commercial, industrial, agricultural, district heating, and other non-domestic heat users to switch from fossil fuels to renewable sources for heating. The scheme specifically targets technologies such as biomass boilers, biomass CHP (Combined Heat and Power), and anaerobic digestion (biogas) heating systems. The primary goal of the SSRH is to incentivise the use of renewable energy sources for heating purposes, thus reducing dependence on fossil fuels and lowering greenhouse gas emissions. The scheme aligns with Ireland's commitments under EU Renewable Energy Directive and national climate action plans, contributing to the transition towards a low-carbon economy. By promoting renewable heat technologies, the SSRH aims to stimulate the green energy sector, create jobs, and boost local economies.

Key Features of the SSRH

- **Financial Incentives:**

  ⇒ The SSRH provides ongoing operational support for up to 15 years to eligible applicants who install and use renewable heat technologies. The payment is based on the amount of eligible heat produced and used.

- **Eligibility Criteria:**

  ⇒ The scheme is open to various sectors including commercial, industrial, agricultural, and public sectors, but not to domestic users.

  ⇒ Eligible technologies include biomass boilers, biomass CHP systems, and anaerobic digestion heating systems. The technology must meet certain efficiency and sustainability criteria to qualify.

- **Application Process:**

  ⇒ Interested parties must apply to the SSRH with a detailed proposal of their renewable heat project. The application process includes technical assessments to ensure compliance with scheme requirements.
  ⇒ Once approved, the project will receive ongoing payments based on the verified amount of renewable heat produced and used.

- **Sustainability Requirements:**

  ⇒ To ensure environmental benefits, the biomass fuel used must meet specific sustainability standards. This includes criteria for sourcing, greenhouse gas savings, and efficient resource use.

Monitoring and Verification:

⇒ Participants in the SSRH are required to install metering equipment to accurately measure the amount of heat produced and consumed. Regular audits and reporting are mandatory to ensure compliance and proper allocation of funds.

Tier	Lower Limit (MWh/yr)	Upper Limit (MWh/yr)	Biomass Heating System Tariff (c/kWh)	Anaerobic Digestion Heating Systems(c/kWh)
1	0	300	5.66	2.95
2	300	1,000	3.02	2.95
3	1,000	2,400	0.50	0.50
4	2,400	10,000	0.50	0.00
5	10,000	50,000	0.37	0.00
6	50,000	N/A	0.00	0.00

SSRH Tiered tariffs. For full details on the SSRH, see www.seai.ie

12.2 Targeted Agriculture Modernisation Scheme (TAMS) for Farmers

The Targeted Agriculture Modernisation Scheme (TAMS) is administered by the Department of Agriculture, Food and the Marine (DAFM). The TAMS scheme is available to farmers registered with the DAFM. A 40% capital support is available for the installation of biomass boilers.

The reference cost of the biomass boiler is calculated based on the rated capacity of the unit in kilowatts (kW). A capital support grant is also available to farmers for biomass drying sheds and for biomass chipping equipment.

13. Policy Measures

There are several Government, agency and industry policy document and strategies which are relevant to the solid biomass sector. This section summarises the key documents including:

Roadmap for the Decarbonisation of Industrial Heat[27]
In June 2024, The Department of Enterprise, Trade and Employment published their roadmap for the decarbonisation of industrial heat. This policy document is designed to translate the policies in the Climate Action Plans and EU regulations into a clear and coherent decarbonisation pathway for businesses and industry. The document outlines the positive role and strong potential for biomass as a renewable technology for decarbonising industrial heat.

Climate Action Plan[28]
The purpose of the Climate Action Plan (CAP) is to outline a roadmap of actions to help Ireland to meet its national climate objectives. The CAP sets out the role of biomass in heat decarbonisation and notes the utilisation of biomass and low and zero emission gas as key fuels for decarbonisation. It advocates for continuing to support sustainable production of wood biomass for energy contributing to the reduction in use of fossil fuels. The document outlines the role for bioenergy with carbon capture and storage (BECCS) through the removal of biogenic carbon dioxide from renewable biomass power plants.

National Energy and Climate Plan 2021 - 2030[29]
In accordance with the Governance of the Energy Union and Climate Action Regulation, the updated National Energy and Climate Plan (NECP) 2021-2030 was submitted to the European Commission in July 2024. It outlines the energy and climate policies in detail for the period from 2021 to 2030 and looks onwards to 2050. Biomass receives prominent recognition in the NECP. The NECP recognises that solid biomass represents the lowest cost decarbonisation option for heating in terms of C/kWh or € per tonne of CO_2 abated compared to other renewable heat technologies and states that biomass heating is more cost effective than heat pumps in terms of cost per square metre (€/m^2) and cost per tonne of carbon emissions saved (€/tCO_2).

Heating: a cost and carbon abatement analysis[30]
This analysis was developed by XD Consultants on behalf of IrBEA. A cost and carbon abatement comparative analysis for renewable heating technologies to replace fossil fuels was conducted. Analysis was completed on the costs of the various decarbonisation options for heating our homes, commercial buildings, and industrial processes. The focus of this report was to examine the financial cost as a function of capital and ongoing expenditure, while examining the effective greenhouse gas emission reductions achieved using different renewable fuels. The financial cost per tonne of CO_2 equivalent saved over an extended period is also explored. Biomass, as a renewable fuel option is competitive from a cost and carbon abatement perspective, across all scenarios modelled.

Ireland's Forest Strategy 2023 – 2030[31]
This strategy developed by the Department of Agriculture, Food and the Marine recognises the role of the biomass and wood fuel sector as an outlet for thinning and residue material created through sustainable forest management. This strategy recognises the potential for use of sustainable biomass as a local fuel source to displace fossil fuels in the energy sector.

[27] https://enterprise.gov.ie/en/publications/publication-files/roadmap-for-the-decarbonisation-of-industrial-heat.pdf
[28] https://www.gov.ie/en/publication/79659-climate-action-plan-2024/
[29] https://www.gov.ie/en/publication/a856a-national-energy-and-climate-plan-necp-2021-2030/
[30] www.irbea.org
[31] https://www.gov.ie/en/publication/89785-irelands-forest-strategy-2023-2030/

14. Useful Resources

This section contains details of some useful resources and links including :

The WFQA Animation Video:
https://www.youtube.com/watch?v=kZhAwmQ2Wg0

40by30 – A 40% Renewable Heat Vision by 2030:
https://irbea.org/press-release-40by30-renewable-heat-plan-launched/

The SEAI Heat study – Sustainable bioenergy for heat:
https://www.seai.ie/data-and-insights/national-heat-study/sustainable-bioenergy-for/

Department of Enterprise Trade and Employment – Roadmap for the Decarbonisation of Industrial Heat
https://assets.gov.ie/296982/663e749b-80a6-4069-9758-c25c220183ba.pdf

IrBEA Webinar Series
https://irbea.org/webinarseries2023/

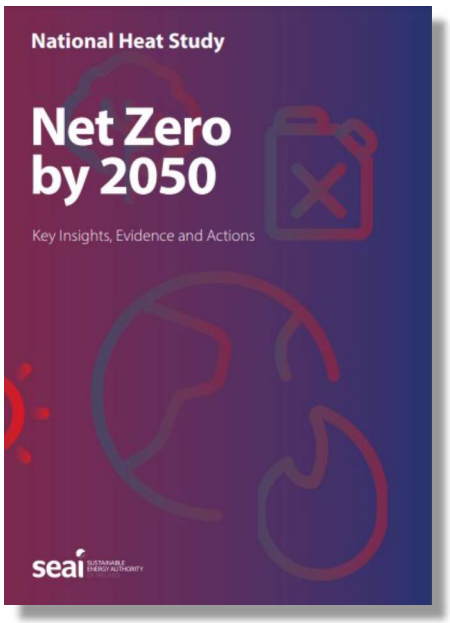
Global Bioenergy Statistics 2023 10th Addition
https://www.worldbioenergy.org/uploads/231219%20GBS%20Report.pdf

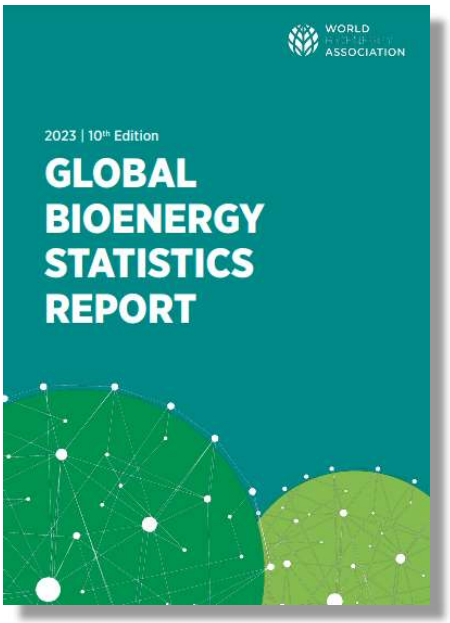
International Energy Agency Bioenergy Review 2023
https://www.ieabioenergyreview.org/

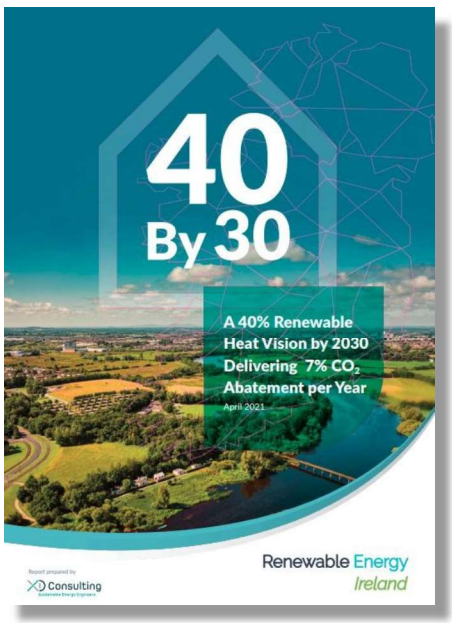
State of the Union Energy Report 2023
https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2023%3A650%3AFIN&qid=1698237100377

SEAI National Heat Study
https://www.seai.ie/publications/National-Heat-Study-Summary-Report.pdf

SEAI Large Industry Energy Network
https://www.seai.ie/business-and-public-sector/large-business/lien/our-members/







CASE STUDIES

15. Case Studies

This section contains several biomass case studies to showcase biomass heating installations of varying sizes, scales and technologies across a number of sectors:

	Name of Facility	Sector
1	Aurivo Dairy Ingredients	Dairy Processing
2	HSE Primary Care Centre	Healthcare
3	CJ Sheeran	Industrial Manufacturing
4	Horeswood Nurseries/Wexford Tomatoes	Agricultural - Horticulture
5	St. Marys College, Drumcondra	Education
6	O'Hanlon's Herbs	Agricultural -Horticulture
7	Teagasc Oak Park	Public Sector
8	Watershed Leisure Centre	Leisure/fitness
9	Tom O'Sullivan	Agricultural - Poultry sector
10	Sealac	Agriculture - Animal nutrition
11	Astellas Ireland	Pharmaceutical
12	An Chuirt Hotel	Tourism

Aurivo Dairy Ingredients

Case Study 1

Name of the company	Aurivo Dairy Ingredients
Company Profile	
Location	Ballaghaderreen, Co Roscommon, F45 WK33
Sector	Dairy Ingredients Manufacture
No of employees	110 employees
Website	www.aurivo.ie
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Produces thermal energy only, approximately 35% of the site thermal demand Used in the processing of milk to powder
Year of development	Installed a biomass boiler in 2014
Boiler technology	
Type	Water Tube boiler The biomass boiler is a 12 MW high pressure steam output boiler
Size	15 tonnes of steam per hour 17 bar steam output pressure.
Manufacturer	HDS Energy
Designer/installer	HDS Energy, Kells, Co. Meath designed and installed the biomass boiler
Fuel specification	
Woodchip or pellet	Woodchip supplied by Worrell Woodchip
Quantities	Approximately 100 tonnes of woodchip per day
Current supply chain considerations	Woodchip moisture content of 40% to 50%
Storage capacity	Storage for 700 tonnes of woodchip on site in a purpose-built storage area adjacent to the biomass boiler.

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	Cent/kWh delivered. Woodchip supply specification is in place
Overall investment involved	
Grant or state support provided.	Investment of €5.5 million in 2014 No grant funding received.
Savings	
Carbon emissions savings	Saving of approximately 15,000 tonnes of carbon annually
Financial savings	Approximately €1.3 million/yr carbon cost saving because of using woodchip
Fossil fuel replaced	Part of the EU ETS Scheme. Woodchip replaces approx.5,000,000 litres of Heavy Fuel Oil (HFO)

HSE Primary Care Centre

Case Study 2

Name of the company	HSE Primary Care Centre
Company Profile	
Location	College St, Town parks, Ballyshannon, Co. Donegal, F94 TPX4
Sector	Primary HealthCare
Website	https://www2.hse.ie/services/primary-care-centres
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Produces thermal energy only, hot water and space heating for both HSE offices and Primary Care Centre
Year of development	Installed a biomass boiler in 2015
Boiler technology	
Type	Viessmann (KOB) Pyrot boiler with 10 tonne pellet silo
Size	220kW
Manufacturer	Viessmann (KOB) Pyrot boiler
Designer/installer	Clearpower
Fuel specification	
Woodchip or pellet	Pellets Local fuel supply contract

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	cent/kWh delivered.
Overall investment involved	
Grant or state support provided.	n/a
Savings	
Carbon emissions savings	Annual CO_2 savings of approximately 150 tonnes
Financial savings	Stable fuel price

CJ Sheeran

Case Study 3

Name of the company	CJ Sheeran
Company Profile	
Location	Shannon Street, Mountrath, Co. Laois, R32 RRX8
Sector	CJ Sheeran is Ireland's largest manufacturer of timber packaging and pallets, fencing, gates and wood mulch/ animal bedding.
No of employees	170 employees
Website	www.cjs.ie
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Heat treating timber pallets using 3 high speed kilns.
Year of development	2020
Boiler technology	
Type	Moving Grate
Size	2.5MW
Manufacturer	Hargassner
Designer/installer	Enerpower
Fuel specification	
Woodchip or pellet	Woodchip
Quantities	2000 Tonnes/Year
Current supply chain considerations	250m^3 onsite capacity
Transport distances	On Site

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	Tonnes
Overall investment involved	
Grant or state support provided	€500,000 No grant aid support received
Savings	
Carbon emissions savings	19 million kgs of CO_2/Annum
Financial savings	€250,000 Euro/Year
Fossil fuel replaced	365,000 litres of diesel oil displaced

Horeswood Nurseries

Case Study 4

Name of the company	Horeswood Nurseries/ Wexford Tomatoes
Company Profile	
Location	Horeswood Nurseries Ballinamona, Campile, WexfordY34 PP90
Sector	Horticulture- Wexford Tomatoes
Website	www.horeswood.ie
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Heating
Year of development	2020
Boiler technology	
Type	Moving Grate Boiler
Size	2 MW
Manufacturer	Hargassner
Designer/installer	Enerpower
Fuel specification	
Woodchip or pellet	Woodchip
Quantities	1500 Tonnes per year
Transport distances	Fuel supplied from 5km away
Storage capacity	250m^3

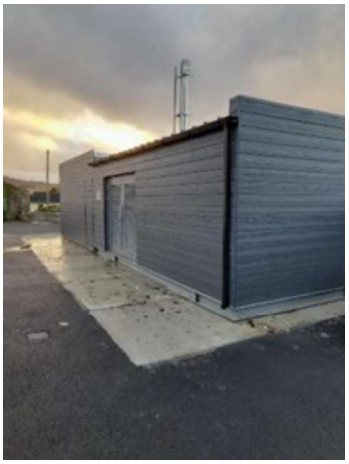
Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	C/kWh
Overall investment involved	
Grant or state support provided.	€500,000 No grant aid received
Savings	
Carbon emissions savings	14,000 tonnes of CO_2 saved annually
Financial savings	€200,000 per year
Fossil fuel replaced	Marine Fuel Oil (MFO)

Maryfield College

Case Study 5

Name of the company	Maryfield College
Company Profile	
Location	Maryfield College Glandore Road, Drumcondra, Dublin 9, Ireland D09AE64
Sector	Secondary school for girls
Website	https://maryfieldcollege.ie/
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Heat Usage 200MWh
Year of development	Project completed in 2023
Boiler technology	
Type	Supermax Woodco wood pellet boiler
Size	200kW
Manufacturer	Installed & Manufactured by Woodco Energy
Designer/installer	Installed & Manufactured by Woodco Energy
Fuel specification	
Woodchip or pellet	WFQA certified wood pellets
Quantities	41 tonnes of wood pellet per annum
Current supply chain considerations	Wood pellet is sourced from a manufacturer on the island of Ireland.
Storage capacity	Storage capacity is 10 tonnes.

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	ESCO Agreement: College pays for the heat as used, they incurred no capital cost from installing the pellet boiler system, and the supplier covers all maintenance costs.
Overall investment involved	
Grant or state support provided.	ESCO Agreement: they pay for the heat they use only, This heating system is supported by the SSRH Scheme.
Savings	
Carbon emissions savings	This results in a savings of 40 tonnes of CO_2 per annum.
Financial savings	Renewable heat is benchmarked against current gas prices and is guaranteed to be cheaper than gas. The college only pays a flat rate per unit of heat used, this means that they have no capital cost.



O'Hanlon Herbs

Case Study 6

Name of the company	O'Hanlon Herbs
Company Profile	
Location	Chestnut Glen, Ballyknockan More, Glenealy, Co. Wicklow , A67 CF68
Sector	Horticulture- Herbs
Website	https://ohanlonherbs.ie/
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Produces thermal energy for heating greenhouses
Year of development	Installed a biomass boiler in 2013
Boiler technology	
Type	Viessmann (KOB) Pyrtec woodchip boiler with scraper chain conveyor and ancillary equipment.
Size	720kW woodchip boiler
Manufacturer	Viessmann (KOB) Pyrtec
Designer/installer	Clearpower
Fuel specification	
Woodchip or pellet	Woodchip
Current supply chain considerations	Local fuel supply contract with Clearpower
Storage capacity	120m^3 woodchip silo

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	System maintenance and supply of wood fuel
Overall investment involved	
Grant or state support provided.	No grant funding received
Savings	
Financial savings	Payback of 5 years
Fossil fuel replaced	Oil replaced

Teagasc Oak Park

Case Study 7

Name of the company	Teagasc Oak Park
Company Profile	
Location	Pollerton Little, Co. Carlow, R93 XE12
Sector	National centre for arable crops research
Website	https://www.teagasc.ie/contact/offices/oak-park-crops-research-centre/
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Produces thermal energy for heating greenhouses
Year of development	Installed a biomass boiler in 2008
Boiler technology	
Type	The biomass boiler is a Heizomat boiler
Size	300kW
Manufacturer	Heizomat biomass woodchip boiler
Designer/installer	Clearpower
Fuel specification	
Woodchip or pellet	Woodchip
Quantities	170 tonnes of woodchip annually
Current supply chain considerations	Local fuel supply contract with Clearpower
Storage capacity	Woodchip housed in separate annex extracted using a rotating arm and auger mechanism

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	€ per kWh rate Supply fuel and maintenance to Teagasc Oak Park biomass in the form of a "heat agreement"
Overall investment involved	
Grant or state support provided.	No grant funding received.
Savings	
Carbon emissions savings	Displacing 156 tonnes of CO_2
Fossil fuel replaced	Oil replaced

Watershed Leisure Centre

Case Study 8

Name of the company	Watershed Leisure Centre
Company Profile	
Location	The Watershed, Leisure Centre, Kilkenny , R95 HFH1
Sector	The Watershed is a sport and leisure facility. The multiple usage and visitor numbers which have grown from 350,000 to 600,000 per annum are testimony to the wisdom of the initial investment decision
Website	https://www.thewatershed.ie/
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Heat Usage 1650 MWh
Year of development	Project completed in 2023
Boiler technology	
Type	Supermax Woodco woodchip boiler
Size	500kW
Manufacturer	Supermax Woodco woodchip boiler
Designer/installer	Installed & Manufactured by Woodco Energy

Fuel specification	
Woodchip or pellet	WFQA certified woodchip
Quantities	Woodchip using 500 tonnes per annum
Current supply chain considerations	Woodchip is sourced locally within 1 hours drive
Storage capacity	Storage capacity is 30 tonnes.
Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	ESCO Agreement- they pay for the heat they use with no capital expenditure cost.
Overall investment involved	
Grant or state support provided.	Capex €0 (ESCO Agreement) ESCO Agreement- they pay for the heat they use only. This installation is supported by the SSRH scheme
Savings	
Carbon emissions savings	Renewable heat is benchmarked against current gas prices and is guaranteed to be cheaper than gas. The Watershed only pays a flat rate per unit of heat used, this means that they have no capital cost.
Financial savings	This results in savings of 300 tonnes of CO_2 per annum.

O'Sullivan's Poultry

Case Study 9

Name of the company	O'Sullivan's Poultry
Company Profile	
Location	Tom O'Sullivan Poultry, Foynes, Limerick
Sector	Poultry production
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Heating needed for poultry production/ chicken sheds Sheds heated intermittently due to batch processes involved with poultry production
Year of development	2020
Boiler technology	
Type	Meridian Vortex Twig e-Grate
Size	500kw
Manufacturer	Meridian Vortex
Designer/installer	Meridian Vortex
Fuel specification	
Woodchip or pellet	WFQA certified woodchip
Quantities	Approximately 115 tonnes/yr at 20% moisture
Current supply chain considerations	Owner stores in shed and loads into day hopper with capacity to run for 24 hours.
Transport distances	Delivery by 90m^3 walking floor trailer

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	n/a
Overall investment involved	
Grant or state support provided.	SSRH received
Savings	
Fossil fuel replaced	Oil and LPG

Sealac

Case Study 10

Name of the company	Sealac
Company Profile	
Location	Kiltimagh, Co.Mayo
Sector	Sealac is one of the leading manufacturers and suppliers of Ascophyllum Nodosum seaweed that Ireland has to offer to its farmers – for agriculture, cattle, livestock and equine.
Website	https://sealac.ie/
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Heat Usage 747,066kWh The heat is needed for drying seaweed to be used in animal nutrition.
Year of development	Project completed in 2023
Boiler technology	
Type	Supermax Woodco woodchip boiler
Size	350kW
Manufacturer	Woodco
Designer/installer	Installed & manufactured by Woodco Energy
Fuel specification	
Woodchip or pellet	WFQA certified woodchip
Quantities	Woodchip usage is 213 tonnes per annum
Current supply chain considerations	Woodchip is sourced locally
Transport distances	Within 1 hours drive
Storage capacity	Storage capacity is 20 tonnes.

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	This biomass boiler system was sold to the customer, and they were able to claim 100% capital allowances in year 1 against taxable profits.
Overall investment involved	
Grant or state support provided.	This is on the SSRH Scheme (€34,500 in SSRH income per annum).
Savings	
Financial savings	Payback of 2 years. They will save €58,500 per annum including €34,500 in SSRH income per annum. Savings in carbon tax of €153,000 between now and 2030.
Fossil fuel replaced	68,854 litres of Gas Oil replaced per year.

Astellas

Case Study 11

Name of the company	Astellas
Company Profile	
Location	Killorglin, Co Kerry
Sector	Pharmaceutical manufacturing
Website	www.astellas.com/ie/innovation/manufacturing-in-ireland
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	A single steam boiler with an output of 800kW generates around 1,600MWh of heat per year for the production facilities heating and hot water systems.
Year of development	Steam boiler installed in 2012 providing process heat requirements
Boiler technology	
Type	Steam boiler
Size	1.6 MW
Manufacturer	WEISS Boiler
Designer/installer	Design and build directly managed by Astellas
Fuel specification	
Woodchip or pellet	Woodchip Coillte's local biomass fuel supply processing hub in Cahersiveen, Co Kerry supplies the Astellas plant.
Current supply chain considerations	Woodchip fuel to an agreed specification is processed locally
Transport distances	Delivered in 100m^3 moving floor trailers.

Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	The client is invoiced per gigajoule (€/GJ) of energy delivered from Coillte
Overall investment involved	
Grant or state support provided.	No grant funding received.
Savings	
Carbon emissions savings	2,600 tonnes of CO_2 savings per year
Fossil fuel replaced	800,000+ litres of oil displaced annually

An Chuirt Hotel

Case Study 12

Name of the company	An Chuirt Hotel
Company Profile	
Location	An Chuirt Hotel, Gweedore, Co Donegal
Sector	Hospitality/tourism sector
Website	www.anchuirthotel.com/
Project background	
Energy needs (heat/cooling, steam, electricity, temperature profile etc.)	Hotel was heavily reliant on gas and wanted to upgrade their current heating system to make it more efficient whilst also reducing their carbon footprint. The hotel required the installation and maintenance of a highly efficient and fully automated biomass heating system which could be integrated with its current heating system.
Year of development	2023
Boiler technology	
Type	WFQA certified woodchip
Size	499 kW
Manufacturer	Herz
Designer/installer	Installed in 2023 CHP Mechanical Services Ltd

Fuel specification	
Woodchip or pellet	woodchip
Quantities	323 tonnes
Current supply chain considerations	Wawe & A Ltd Supplier of chip
Transport distances	65 km
Storage capacity	34 tonnes
Contract type	
(units of sale, €/GJ, c/kWh, tonnes, ESCO etc.)	n/a
Overall investment involved	
Grant or state support provided.	SSRH
Savings	
Carbon emissions savings	Approximate carbon emissions savings – 248 Tonnes CO_2
Financial savings	Approximate energy cost savings - €79,905
Fossil fuel replaced	Gas 150,237 litres

APPENDIX

16.1 List of Abbreviations, Acronyms and Units

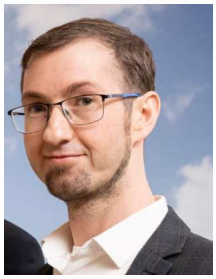
BAT	Best Available Techniques
BECCS	Bioenergy with carbon capture and storage
BioLPG	Bio Liquefied Petroleum Gas
CAP	Climate Action Plan
CCUS	Carbon capture utilisation and storage
CHP	Combined heat and power
CO	Carbon monoxide
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent (a term for describing different greenhouse gasses in a common unit.)
COFORD	National Council for Forest Research and Development
DAFM	Department of Agriculture, Food and the Marine
EBA	European Biogas Association
ELVs	Emission limit values
ESCO	Energy Supply Contract
EU	European Union
EUDR	EU Deforestation Regulation
GHG	Greenhouse Gas
IEA	International Energy Agency
IED	Industrial Emissions Directive (EU instrument to regulate industrial pollution)
IFA	Irish Farmer's Association
IPCC	Intergovernmental Panel on Climate Change
IrBEA	Irish Bioenergy Association
ITGA	Irish Timber Growers Association
kWh	Kilowatt-hour (a unit of energy use)
MCPD	Medium Combustion Plants Directive (EU instrument to regulate emissions from medium combustions plants)
MSW	Municipal solid waste
NOx	Nitrogen Oxides (emissions produced from combustion)
NPWS	National Parks and Wildlife Service
NZE	Net Zero Emissions
O&M	Operation and Maintenance
OGC	Organic gaseous compounds
PJ	Petajoule (1,000 terajoules or 1,000,000 gigajoules)
PM	Particulate Matter (solid or liquid particles in the air)
RED	Renewable Energy Directive
REI	Renewable Energy Ireland
SBH	Specified Biomass Harvest
SEAI	Sustainable Energy Authority of Ireland
Sox	Sulphur Oxides
SRC	Short Rotation Coppice
SRF	Short Rotation Forestry
SSRH	Support Scheme for Renewable Heat
TAMs	Targeted Agriculture Modernisation Scheme
TWh	Terawatt-hour (1,000 GWh or 1,000,000 MWh)
VOCs	Volatile organic compounds
WFQA	Wood Fuel Quality Assurance Scheme

16.2 About the Authors

A multi-disciplinary team within the Irish Bioenergy Association has authored this report.

Mr Seán Finan

Seán Finan is the Chief Executive Officer of the Irish Bioenergy Association (IrBEA). He is a Chartered Engineer and holds a Bachelor of Civil Engineering (Hons) Degree from National University of Ireland, Galway. Seán joined IrBEA as CEO in October 2018 and has a broad ranging experience in engineering, management, lobbying and advocacy and agriculture. He is responsible for the day to day running of IrBEA and manages a multi-disciplinary IrBEA executive team. He works with the IrBEA members and broader stakeholders for a sustainable future in bioenergy and to strategically position the Biomass, Biogas, Biofuels, Biochar, Wood fuels and Energy crop sectors to play a key role in Ireland's Sustainability Renewable Energy Roadmap. Prior to joining IrBEA, Seán worked for 12 years in the construction industry with Irelands largest building contractor John Sisk & Son Ltd. He served as the 35th National President of the Irish Young Farmers Association, Macra na Feirme, from 2015 – 2017 and Vice President of the European Council of Young Farmers (CEJA) from 2017 – 2021.



Mr Stephen Mc Cormack

Stephen McCormack is the IrBEA Project Executive. He holds a Bachelor of Environmental Science Degree from Institute of Technology Sligo and a Post Graduate Diploma in Environmental Sustainability from UCD. Stephen has a background in energy, sustainability and environmental science. As part of the executive team at the Irish Bioenergy Association, he is responsible for the day-to-day delivery and implementation of transnational Interreg Northwest Europe funded projects as well as acting in a support role for the association and the other projects and programmes. Project work to date has been focused on the conversion and utilisation of low value and residual biomass streams, for the provision of energy and value-added carbon products such as biochar and activated carbon. Through these transnational project consortiums, knowledge exchange features heavily, where examples of integrated biomass and carbon management systems are well developed. The areas of resource efficiency, the circular economy and the bioeconomy have also featured throughout. He is also tasked with seeking new opportunities for the association and its members as well as liaising with external stakeholders, both nationally and internationally.

Dr Eugene Hendrick

Dr Eugene Hendrick is a forestry graduate of University College Dublin and holds a PhD in forestry from the same institution. Dr Hendrick started his career as a forester with the Forest Service, he switched to the research area in the late 1970s, and then moved to Coillte on its establishment, where he was involved in several roles. He joined COFORD, the National Council for Forest Research and Development on its foundation, becoming Director in 2000. From 2010 until his retirement in 2018 he led Forest Sector Development Division within the Department of Agriculture, Food and the Marine, and was responsible for national reporting and accounting on forests and climate change, including bioenergy. He also provided input to national climate change policies and processes as well as international negotiations on forests and climate change, including the role of forest products and energy use of wood. He currently chairs the Wood Fuel Quality Assurance Scheme on behalf of IrBEA.

Mr Noel Gavigan

Mr Noel Gavigan holds a Bachelor of Agricultural Science Degree from University College Dublin, a Graduate Diploma in Management Practice from Dublin Institute of Technology and a Postgraduate Diploma in Environmental Protection from Sligo Institute of Technology. With 10 years' experience in the Agricultural & Horticultural industry and 18 years' experience in renewable energy and the bioeconomy he joined IrBEA in 2010 as Technical Executive. His work includes development of renewable energy, sustainable materials, and environmental protection. He is the auditor of the Wood Fuel Quality Assurance scheme since 2014. He is chair of EcoEd4All, a dedicated group of researchers and environmental professionals developing educational material for all ages from primary school to CPD students.

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