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- ▶ Ireland has significant potential to develop its bioenergy resources and to partially displace fossil fuel, particularly in the generation of heat.
- ▶ This COFORD Connects Note examines the market for wood biomass in Ireland.
- ▶ The inputs and outputs of the sector are discussed.
- ▶ Support measures are outlined.

An overview of the Irish wood-based biomass sector

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Ireland has significant potential to develop its bioenergy resources to generate electricity, for use as transport fuels, heating and cooling of buildings, and for conversion to bio-chemicals as industrial raw materials.³

This COFORD Connects Note examines the wood-based biomass market in Ireland.

Irish biomass output for 2006

In mid 2007, COFORD undertook a survey of the production and use of wood biomass in Ireland. The feedstocks used to supply the wood biomass requirements of the Irish forestry sector are shown in Table 1.



- ▶ Young ash and other broadleaved crops will benefit from early thinning, providing opportunities for wood biomass production.

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³ BioEnergy Action Plan for Ireland. www.dcmnr.gov.ie/NR/rdonlyres/4FFF6234-26CA-46B5-878A-AA04A7288DA4/0/FinalBioenergyReport.pdf

Table 1: Feedstocks used in the wood-based biomass sector in Ireland (2006).

Item	Unit	Output
Fuelwood	m ³ underbark	17,498
Short rotation coppice (SRC)	m ³ underbark	3,654
Wood residues ⁴ for energy generation	m ³ underbark	210,000
Bark used for energy generation	m ³	125,000
Wood residues used for domestic heating	m ³ underbark	5,218
Post-consumer recovered wood for energy generation	Air dry tonnes	114,930

Based on Eurostat Joint Wood Energy Enquiry (JWEE) Return for Ireland (2006).

Use of wood biomass for energy generation is dominated by the sawmilling and wood-based panel (WBP) sectors, where wood is used to generate heat and electricity for drying and processing. Table 2 shows the heat and electricity output generated by biomass use within the Irish forest products sector.

Wood pellets

Wood pellets are increasingly used for domestic heating. The Balcas Group produces wood pellets⁵ at its sawmill near Enniskillen, Co Fermanagh. Annual production is up to 50,000 tonnes.

In 2006, just over 1,000 tonnes of wood pellets were recorded as being imported into Ireland. This market is likely to grow as demand for renewable fuel increases. A list of wood fuel suppliers (including suppliers of wood pellets) in Ireland is available on the Sustainable Energy Ireland (SEI) website.⁶

Table 2: Heat and electricity generated by the forest products sector in the Republic of Ireland for its own use (2006).

Item	Annual output
Heat generated	5,015 TJ
Electricity generated	18.6 GWh
Total energy produced	119,778 TOE

Source: Eurostat Joint Wood Energy Enquiry (JWEE) Return for Ireland (2006).



- ▲ A harvester processing early thinnings for wood energy production in a Sitka spruce stand.



⁴ Wood waste from secondary timber processing used for domestic fuel.

⁵ www.balcas.com/site/default.asp?CATID=315

⁶ www.sei.ie/index.asp?locID=1049&docID=-1

The economics of wood pellet use

A study undertaken in January 2007 in France by La Direction Générale de l'Énergie et des Matières Premières (DGEMP),^{7,8} shows that the use of wood pellets for domestic heating offers significant savings over the use of electricity, propane and gas oil (Figure 1).

Other findings of the DGEMP study were:

- A wood burning boiler used to heat a home of 150 m² (1,615 square feet) will use an average of 6 tonnes of pellets per annum; and
- Two kilogrammes of wood pellets replace 1 litre of gas oil.

A survey by Sustainable Energy Ireland (SEI)¹⁰ found that the costs of wood biomass in Ireland (for domestic fuel supply) to be as shown in Table 3.

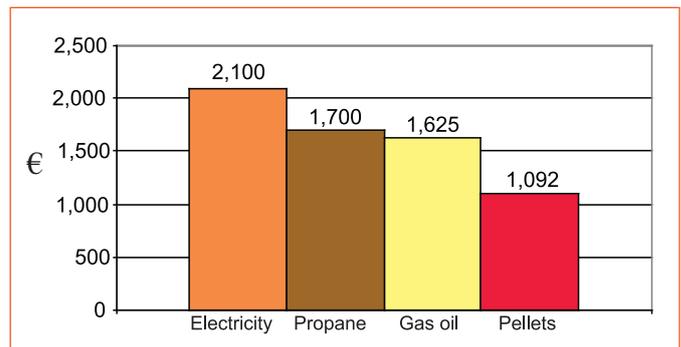


Figure 1: A comparison of annual domestic heating costs in France.⁹

Table 3: Energy costs for wood fuel in Ireland (10/2007).

Fuel	From	Unit	Average price € per unit	Delivered energy cost Cent/kWh ¹¹
Wood	Pellets bulk delivery	kg	€0.19	4.06
Wood	Pellets bagged	kg	€0.31	6.49
Wood	Wood briquettes	kg	€0.37	7.68

Source: Sustainable Energy Ireland www.sei.ie



◀ Early thinnings extracted to roadside for wood biomass production.

⁷ www.industrie.gouv.fr/energie/

⁸ General Directorate for Energy and Raw Materials (DGEMP) of the French Ministry of the Economy, Finance and Industry.

⁹ Based on heating requirement of 2,500 litres of oil per annum.

¹⁰ Domestic Fuels, A Comparison of Energy Costs; 1st October 2007; www.sei.ie

¹¹ kWh: kilo Watt hour

Promoting the uptake of biomass in Ireland

The drivers related to biomass in Ireland include:

Biomass and the National Development Plan (NDP) [2007-2013]

Over the next seven years, the NDP will invest €184 billion in the Irish economy. Areas in which the NDP will influence the Irish biomass sector include:

- ▶ Provision of support for the cultivation of fast-growing species, for the purposes of biomass production;
 - ▶ The mitigation of climate change; and
 - ▶ Investment in sustainable energy with a view to meeting the target of 15% of electricity produced from renewable sources by 2010.
- By 2015, a target has been set to achieve 30% co-firing with biomass in the three peat-fired power stations.

- A target has been set for biomass to supply 12% of the renewable heat market by 2020.

*National Climate Change Strategy (2007 – 2012)*¹²

The Irish forestry sector has a key role to play in addressing climate change, through carbon sequestration and through the development of renewable energy resources.

Forest areas established as a result of grant aid under State/European Union (EU) funded afforestation schemes since 1990 are expected to contribute an annual average emission reduction of 2.074 million tonnes of carbon dioxide (CO₂) over the Kyoto first commitment period (2008 – 2012).

There is also a significant potential for wood fuel to displace fossil fuel, particularly in the generation of heat in industrial, commercial, domestic and institutional markets.



- ◀ Wood chip produced in the forest being extracted for energy production.

¹² www.environ.ie/en/PublicationsDocuments/FileDownload,1861,en.pdf

Energy Policy – Energy White Paper¹³

In 2006, a Green Paper on energy policy was published by the Irish government. Following a consultation process, the White Paper on energy policy was introduced in early 2007. This outlines energy policy for the period 2007-2020. Its primary objectives are security of supply, environmental sustainability and economic competitiveness. From a forestry perspective, the sustainable energy sub-programme outlines how the renewable energy sector is to be developed.

Sustainable Energy Sub-Programme

At least €276 million will be invested in the Irish sustainable energy sector over the period of the NDP. This is in support of the targets for sustainable energy, including the promotion of renewable energy, improved energy efficiency and innovation. Key objectives include a commitment to delivering significant growth in the use of renewable energy in power generation.

A target of producing 33% of electricity consumption from renewable sources by 2020 has been set. The ESB and Bord na Móna¹⁴ will work with the biomass sector to develop the potential of co-firing (with biomass) at the three state owned peat-fired stations.¹⁵ Annual fuel requirements and carbon emissions from these stations are shown in Table 4.¹⁶

Biomass firing is set to commence at the Moneypoint generating station by 2010.

Biomass power generation projects will be supported through the Renewable Energy Feed-in Tariff (REFIT) scheme²². Under this scheme, the tariff price for biomass generated electricity is set at 7.2 c per kWh compared to 5.7 c per kWh for wind.

The use of biomass in power generation will also be supported by means of technology transfer, by investment in specific research and development programmes and by tackling supply issues.

The need to develop Combined Heat and Power (CHP) and District Heating Schemes has been identified as an area

Table 4: Installed generation capacity, annual fuel requirement and expected carbon emissions from peat-fired power stations.

Site name and location	Capacity Megawatts	Fuel requirement energy tonnes/annum	Emissions ¹⁷ tonnes CO ₂ /annum
Edenderry Power, Ballykilleen, Edenderry, Co Offaly ^{18,19}	120	1,000,000	904,604
Lough Ree Power, Lanesborough, Co Longford ²⁰	100	835,000	755,345
West Offaly Power, Shannonbridge, Co Offaly ²¹	150	1,245,000	1,126,232
Total	370	3,080,000	2,786,181

Source: Environmental Protection Agency (EPA)

¹³ www.dcmnr.gov.ie/Energy/Energy+Planning+Division/Energy+White+Paper.htm

¹⁴ Bord na Móna supply milled peat to four thermal power plants, owned by the Electricity Supply Board and by Edenderry Power Ltd., for the generation of electricity. www.bnm.ie

¹⁵ Edenderry Power, Lough Ree Power and West Offaly Power

¹⁶ Submission from Bord na Móna on Ireland's Draft National Allocation Plan (2008 – 2012) www.epa.ie/downloads/pubs/air/etu/nap2submissions/epa_nap2_submission_bord_na_mona.pdf

¹⁷ Based on 0.5% of input carbon remaining unburned and being disposed of in the ash.

¹⁸ www.edenderrypower.ie

¹⁹ Since October 2006, Edenderry Power has been operated by Bord n Móna

²⁰ www.esb.ie/main/downloads/news_events/lough_ree.pdf

²¹ www.esb.ie/main/downloads/about_esb/west_offaly.pdf

²² www.irbea.org/index.php?option=com_content&task=view&id=178&Itemid=44

where energy efficiency could be improved. The government White Paper targets for biomass CHP output are shown in Table 5.

Table 5: Combined heat and power (CHP) output targets to 2020.

Item/year	2010	2020
Target for biomass generated electricity	400 MW	800 MW
Target for biomass generated heat	5%	12%

BioEnergy Action Plan for Ireland²³

The National BioEnergy Action Plan aims to increase the use of renewable energy in three key sectors, namely transport, heat generation and electricity.

The objective is that by 2020, a third of the electricity consumed in Ireland should be generated from renewable sources. Another objective is that by 2015, all peat fired power generation stations will be co-fired with 30% biomass. The aim is to reduce carbon dioxide (CO₂) emissions by 900,000 tonnes per annum (Table 4).

Another element of the plan includes the introduction of additional ‘top up’ payments of €80 per hectare for energy crops. This is in addition to the EU energy crops premium payment of €45 per hectare.²⁴ The additional payment of €80 will apply for three years.

Other elements include:

- ▶ The introduction of a bioenergy scheme to encourage farmers to plant new energy crops such as miscanthus and willow.
- ▶ A Research Stimulus Fund Programme,^{25,26} will fund research into biofuels and energy crops.
- ▶ The introduction of a grant scheme for wood biomass harvesting machinery²⁷ to include wood chippers and forest residue bundlers.
- ▶ The encouragement of a rate of afforestation that is sufficient to meet increased market demand for wood fibre in the medium to long term.
- ▶ The development of an efficient wood energy supply chain to facilitate the delivery of quality wood fuel at competitive prices.



▲ Fuel wood (left) and wood chips (right) harvested from Irish forests.

²³ www.dcmnr.gov.ie/NR/rdonlyres/4FFF6234-26CA-46B5-78AA04A7288DA4/0/FinalBioenergyReport.pdf

²⁴ ec.europa.eu/agriculture/capreform/infosheets/energy_en.pdf

²⁵ www.client.teagasc.ie/louth/docs/minister_wallace_urges_farmers_to_grasp_bioenergy.pdf

²⁶ www.coford.ie/iopen24/pub/pub/vol7no8august07.doc

²⁷ www.agriculture.gov.ie/forestry/woodbiomassscheme/biomassscheme.pdf

Promoting wood energy in Ireland

In 2006, the Irish government introduced a five year capital programme to underpin the growth of the renewable heat sector. The grant schemes for this programme have been developed in conjunction with Sustainable Energy Ireland (SEI). The total funding package for this programme is €89 million. The grant schemes contained within this programme are:

*Greener Homes Scheme (GHS)*²⁸

This grant scheme was established in 2006. It allows householders to obtain grants for the installation of renewable heat technologies including wood pellet stoves, boilers, solar panels and geothermal heat pumps. By August 2007, 16,000 grants to a value of €47 million were approved under the GHS. Five and a half thousand wood chip and pellet stoves have been approved under the programme, with an estimated heat output of 175-225 MW. A second phase grant scheme was introduced in October 2007.

*ReHeat Programme*²⁹

This grant support scheme enables community groups, commercial sector, public sector and industrial sector organisations to obtain grants for the installation of wood chip and wood pellet boilers. Grant aid is up to 30% of overall cost. By June 2007, 21 projects had been completed with a total output of 9.47 MW.³⁰

*Combined Heat and Power (CHP) Grant Scheme*³¹

This programme will provide grant-aid for the installation of CHP units. It aims to develop small-scale CHP units (up to 1 MW) fired by fossil fuels, which can be deployed in buildings having a substantial heat requirement. A second strand, yet to be launched, covers grant aid for biomass fired CHP. This programme aims to deliver 10-15 MWe Biomass CHP, and 10-20 MWe of electricity from small-scale fossil

fuel CHP. There is no limit on the size of installations that can be grant-aided if they are fuelled by biomass. To date, no biomass CHP projects have been commissioned under this scheme. However, a number are in the early stages of development.

Biomass for households and medium sized businesses

In recent years, wood biomass systems have been promoted and developed for use in households and in medium-sized industrial premises. An example of such a system is described in the case study below.

Case Study One: Imperative Energy³²/Donegal VEC

Client: Donegal VEC

Location: Abbey Vocational School, Donegal Town

Background: The Abbey Vocational School in Donegal Town is a large post-primary school with approximately 800 pupils. It comprises a large single storey building and a separate gym and leisure centre. The use of renewable energy at the school had been under discussion for many years. However, capital cost was a barrier to its implementation. Imperative Energy Ltd. teamed up with the local LEADER Company to cover the cost of the installation. Imperative Energy now operates and services the boiler, providing Donegal VEC with clean renewable energy from wood chips supplied from the forests managed by GreenBelt Ltd.

Energy usage and emissions: An analysis of the historical oil usage at the school determined the approximate annual energy requirements. On average, the school used approximately 50,000 litres of imported oil. This led to the emissions of approximately 130 tonnes of carbon dioxide (CO₂) per annum.

The solution: The old heating system in the school consisted of three oil-fired boilers. Two of these were located in the main boiler room with a third in the leisure centre boiler

²⁸ www.sei.ie/greenerhomes/

²⁹ www.sei.ie/reheat/

³⁰ <http://www.sei.ie/index.asp?docID=1003>

³¹ www.sei.ie/chpgrants/

³² This case study is provided by permission of Imperative Energy Ltd.

room. The oldest of these boilers – a 950 kW boiler – was removed and was replaced with an efficient 220 kW woodchip boiler. District heating piping was laid to connect the leisure centre to the main boiler room. A heat exchanger was installed at the leisure centre and this effectively displaces the oil boiler there. A large hot water buffer tank and a heat meter completed the installation along with a woodchip store (5 x 5 m) and a new stainless steel flue. Wood chip is delivered every month and is blown into the fuel store. Ash is removed every six months and is later recycled as fertiliser in the forest.

The outcome: The system has been operating successfully since February 2007 with the following benefits:

- ▶ The wood biomass system installed and operated by Imperative Energy is more cost effective than the oil system it replaced;
- ▶ The installation demonstrates that locally sourced woodchip can be used as an effective alternative to imported fossil fuel;
- ▶ Wood chip replaced 50,000 litres of imported oil.
- ▶ Greenhouse gas emissions have been reduced by over 100 tonnes of CO₂ equivalent per annum;
- ▶ Wood energy provided a new market for forest thinnings.

Biomass for commercial projects

Biomass can also be used to fuel large commercial projects, one of which is detailed in the case study below:

Case Study Two: Wartsila

Client: SWS/Grainger Sawmill.

Location: Enniskeane, Co Cork

Background: In 2004, Wartsila installed a biomass CHP plant at the Grainger sawmill at Enniskeane, Co Cork. This uses sawdust, bark and woodchips, together with forest

thinnings, to generate heat for timber drying. As a result, all the hot water necessary for kiln drying timber is now produced on site, while the electrical energy is sold to the national grid. By consuming these products on site rather than transporting them to often distant markets, energy is saved and CO₂ emissions are reduced. The use of local bio-fuels increases energy independence and minimises environmental emissions due to the high total efficiency, which can exceed 90%. The plant produces 2 MW of electricity and 4 MW of thermal energy. It is designed to ensure a highly efficient combustion process, with flue gas emissions below the most stringent limits.

Benefits: The benefits of this CHP installation include:

- ▶ It demonstrates the viability of using locally available wood biomass for the generation of heat and electricity;
- ▶ It contributes towards energy policy and Kyoto commitments by bringing Ireland closer to its targets for renewable energy and emissions reduction;
- ▶ Carbon dioxide (CO₂) emissions are reduced;
- ▶ It produces sufficient green electricity to power 3,000 homes.

Weblinks

Biomass Grant Schemes: www.agriculture.gov.ie/forestry/woodbiomassscheme/biomassscheme.pdf

Sustainable Energy Ireland: www.sei.ie

Wood Energy: www.woodenergy.ie

For information and a free on-line advisory service on the wood energy supply chain, the quality of wood fuels and internal handling visit www.woodenergy.ie