Wood Energy Strategy for the Western Region

WDC
WESTERN DEVELOPMENT COMMISSION
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Foreword

The Western Region has abundant natural resources with significant potential for the development of the renewable energy sector. The Western Development Commission (WDC) has been working to identify how we can best capture the value of these resources to address regional and national energy needs. Wood fuel as an energy source has considerable potential in the Western Region, as forestry thinnings and residues are a potential significant source of wood fuel, and the region has 40% of Ireland's afforested land.

The WDC established and worked with the Regional Wood Energy Advisory Group, to develop the Wood Energy Strategy and Action Plan as set out in this report. The group, whose members are drawn from the public and private sectors, guided the development and coordination of the strategy. The White Paper on Energy (March 2007) notes the need for "sustained multi-agency collaboration, at national, regional and local level, working in strategic alliances to ensure that we realise this [renewable energy] potential". The strategy and action plan is a good example of a collaborative effort, facilitated by the WDC, to draw up a coordinated regional development framework for the wood energy sector.

The White Paper sets a national renewable heat energy target of 12% by 2020. The strategy demonstrates how significant regional growth in the sector is required, and that a proactive development approach is needed if this target is to be achieved. The corresponding action plan sets out how this growth can be achieved in the Western Region.

The implementation of the strategy and action plan has the potential to yield significant economic and environmental benefits for the Western Region, offering enterprise, diversity, wealth creation and employment in a sector in which the region has a natural competitive advantage. Achievement of the wood energy growth targets outlined in the strategy and action plan would generate an additional 477 MW of renewable heat energy (a regional target of 11% of the heat market), create a minimum of 900 full time jobs, be predominantly based in rural areas, and generate CO_2 savings of 619,000 tonnes per annum by 2020, the equivalent of taking 92,000 cars off the road.

On behalf of the WDC, I wish to thank members of the Regional Wood Energy Advisory Group, past and current, and those stakeholders from the public, private and community sectors who contributed to the development of this strategy.

Gillian Buckley
Chief Executive

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Executive Summary

The following report presents a Wood Energy Strategy and Action Plan for the Western Region. The Western Development Commission (WDC) supported by the Regional Wood Energy Advisory Group (RWEAG) commissioned this market research and lead on the development of the strategy and action plan based on a process of industry consultation. The report assesses the potential wood fuel resource, analyses the market opportunities in the region, estimates regional targets and presents the actions required to achieve the potential growth rate. It also examines the economic impact of the growth of the wood energy market.

The WDC initiated this wood energy research and consultation due to the potential that wood energy has to play in the energy supply mix of the region and consequently the role wood energy development will have in increasing regional economic growth and competitiveness. The sector's development will improve the security, sustainability and price competitiveness of the region's energy supply. As energy will be sourced locally it will use and consume an available resource that has limited viable markets, as well as develop new enterprise and employment opportunities in rural areas.

Rationale for wood energy development in the Western Region

- *Resource availability*

  The region is uniquely placed to develop a wood energy sector because it has the forestry resource required to supply market demands, now and in the future. The overriding argument for developing a strategy for wood fuel is that the region has a large and growing forestry resource that will be seeking viable local markets.

- *National policy*

  Ireland now imports over 90% of its energy[1] and is heavily, and increasingly, reliant upon imported fossil fuels. The Western Region can make a significant contribution to the national target of 12% renewable share in heat sector by 2020. Indeed it is unlikely that national policy targets can be achieved unless the sector develops in the Western Region as so much of wood resource is located in this region.

- *Market trends*

  Wood energy is the most significant source of renewable energy in the EU, where it is a technically mature, widely deployed and commercially viable sector. Examination of the market prospects shows the underlying economic attractiveness of certain types of wood energy investment in the region. Wood heat is viable and commercially attractive and its development can help improve regional competitiveness.

Wood fuel resource

In the Western Region 11.5% of land is afforested (approx 40% of Ireland's forestry), of this approximately 113,400 hectares are in private ownership and approximately 3,000 hectares of private forestry are being planted per annum. Our work has established that there will be a sustainable harvest of pulpwood and a related supply of co-product that, in 2020, is forecast to be 516,000 tonnes per annum[2].

1 Source: Sustainable Energy Ireland (SEI).

2 In this report only private sector forestry and its co-products have been considered in the resource estimate. It is acknowledged that over time new fuel streams will increase e.g. potential of energy crops.

Wood fuel production appears to be one of the most commercially sustainable options for growers and those involved in the harvesting, processing and haulage of forestry. The point at which it becomes viable for a forest owner to undertake thinning depends upon a complex set of factors. However, we conclude that a price for delivered wood fuel in the range €55.5 to €75 per tonne (delivered heat price of 2.8 to 3.8 cents kWh) should make it commercially viable to undertake thinning.

Market opportunity

There are four market sectors where it is possible to use wood fuel: power generation, Combined Heat and Power (CHP), co-firing and heat[3]. The main conclusion of the market analysis is that where medium and large (500kW+) woodchip boilers replace fossil fuel boilers the economics are likely to be the most attractive relative to any other wood energy technology.

Wood heating systems are more expensive to install than oil or gas heating systems. However, they are much cheaper to operate as the cost of wood fuel is lower than oil and gas. In simple terms, wood heating will gain market share where the fuel savings justify the capital investment. The range of typical applications includes installations such as large hotels, care homes, hospitals, leisure centres, secondary schools, shopping centres, commercial glasshouses, cement and chemical works, and large offices. The role of the public sector in early market development is a key one and an essential priority for action.

There are a limited number of locations in the region that could install CHP projects around the 5MW electrical scale. However, without significant grant aid small scale biomass CHP appears to be commercially challenging and while the technology is evolving, as yet there is relatively limited availability of commercialised technology.

Barriers to development

The focus of the strategy and action plan is on the medium and large users (500kW+) who could install woodchip boilers. While this is the market segment with most potential for development it faces constraints that mean that without the strategy the market segment will not achieve its full potential.

- *Market awareness and confidence*

  Many energy users are simply unaware of the technology and the wood fuel supply options. In addition there can be a lack of market confidence in the technology and fuel supply chain because it is new to the region. For the market to develop there needs to be greater confidence in the reliability and convenience of the technology.

- *Market development*

  In order to grow the market, technical, design and practical skills in the installation, operation and conversion of wood to energy must be developed. The business case and fuel supply models must be understood. The investment process is more complex than for a standard oil fuel boiler and specialist expertise is required. This investment is therefore more time consuming and risky than an investment in fossil fuel heating.

- *Integrated wood supply chain*

  There is a lack of awareness of the heat market opportunities, and limited knowledge and technical expertise of the wood fuel supply chain amongst growers. Many of the plantations that are most suitable for wood energy production are dispersed and small in scale and therefore must be 'clustered' to make market entry commercially viable. New investment in equipment and infrastructure will be required in order to respond to market opportunities.

[3] In reviewing the market options a price for delivered wood fuel in the range €55.5 to €75 per tonne was assumed.

- *Supportive policy, finance and regulation*

  Supportive planning polices will help to increase the rate of market development. For instance there is a lack of awareness among potential users as to the planning requirement for a wood heat facility. Similarly, better understanding of the benefits of wood heat systems and their operations is needed to improve their passage through the planning process.

Market scenarios and targets

Market growth scenarios were developed to illustrate the rate at which wood energy might be able to gain market share in different situations. A complex range of factors influence the level of market growth, including: energy prices; potential introduction of a carbon tax; capacity and skills in the sector; supply chain development; market confidence and awareness; CHP market growth; impact of the action plan.

Four different scenarios were developed for the implementation of the strategy. Targets for installed capacity of wood heat for each scenario and time were mapped out[4] and are summarised in table below. These figures represent newly installed capacity and are additional to the estimated baseline position for 2007 of 65.5MW.

Summary of the scenarios

Scenario by 2020	Do nothing	Low	Medium	High
Total New Heat Capacity	105MW	292MW	**477MW**	622MW
Wood heat energy by 2020	75.0	232.0	**402.0**	532.0
CHP heat energy by 2020	30.0	60.0	**75.0**	90.0
% of national 2020 heat target achieved	25.8%	54.2%	**82.2%**	104.2%
Tonnes of wood required per annum by 2020	120,000t	305,600t	**471,600t**	605,600t
% of Western Region heat market achieved	3%	7%	**10.7%**	13%

The medium scenario was selected as the most likely. We have based the action plan on the medium scenario as it represents a logical balance between the available resources, the national renewable heat targets and the likely way in which the external environment would impact upon the Western Region.

[4] More detailed analysis is available in the wood energy strategy and action plan available for download at www.wdc.ie.

Action plan

A three year action plan has been developed to stimulate the demand for wood energy among energy users and facilitate capacity building of installers and fuel suppliers to ensure an effective fuel supply chain. The action plan complements the existing regional and national support programmes, maps out the immediate steps required to address current barriers to development and stimulate the growth rates to achieve the regional heat target of 477MW by 2020 i.e. approx 11% of the region's heat market.

The action plan is based on a number of principles, including:

- partnership and collaboration between relevant players in the sector
- a full supply chain development approach (from fuel producer to end user)
- actions become self-sustaining or mainstreamed into relevant agencies as appropriate

The action plan is structured along four themes and the proposed actions are listed below.

1. Getting the message across:

- Establish a database of costs for installation and fuel supply
- Wood energy information campaign
- Regional wood energy conference/seminars
- Web portal for wood energy in the Western Region
- Develop a 'Wood energy trail'
- Publish case studies
- Organise learning journeys

2. Growing the market:

- Develop a model procurement contract
- Provide technical support to the project
- Regional strategy co-ordination and administrative resource
- Increase wood energy market development capacity and expertise
- Formalise the Regional Wood Energy Advisory Group
- Develop a database of approved installers
- Develop CHP market

3. Develop an integrated wood supply:

- Scope and pilot wood fuel producers groups
- Regional resource assessment
- Increase wood fuel advice capacity
- Publish a non-technical wood resources report
- Develop a wood fuel supplier database
- Workshops for growers and forest managers
- Develop supply-side database

4. Provide supportive policy, finance and regulation:

- Contribute to national policy and new local policy as needed
- Annual monitoring of wood energy strategy and targets
- Define, inform and guide local authorities on creation of supportive policy

A 'wood team', the RWEAG and the WDC will work together to deliver the action plan. A dedicated regional 'wood team' is the core element of the action plan. Given the barriers facing the development of the sector, the provision of active project development support at regional level is a critical driver of development in the sector. The wood team will be responsible for the implementation of the majority of the action plan deliverables and will secure the project budgets through existing support mechanisms, and work closely with the identified partner.

The RWEAG will oversee the delivery of the action plan over the next three years. The WDC will play a key role in the delivery of the action plan by: i) leading, facilitating and overseeing the development process required under the action plan; ii) providing policy analysis and ensuring regional strategy links to national policy.

Impact of strategy

The development of the wood heat sector in the Western Region is expected to result in significant economic benefits. The estimated gross impacts of wood heat under the medium scenario in 2020 include:

- 887 full time equivalents (FTE) jobs created
- increased annual gross value added (GVA) in the region of €15 million per annum
- increased regional timber usage providing €1.7 million to the farming sector per annum
- CO_2 emissions savings of 619,000 tonnes

There are other effects that are not accounted for, and non-quantified impacts of the implementation of the strategy and action plan are also important. They include wider socio-economic impacts arising from the development of the wood energy sector, which relate to increased incomes, transferability of knowledge and skills, or competition for resource.

- *Achievement of critical mass*

  Potentially the most important additional benefit of the strategy arises from its role in achieving critical mass in the wood heat industry. While each additional unit of activity has observed costs and benefits it is also its contribution to the achievement of the critical mass that makes wood heat competitive and sustainable. Indeed, this lack of critical mass is one of the most important market failures that the strategy is designed to address.

- *Contribution to development in rural areas*

  The strategy has a second potentially important impact arising from its possible longer term role in developing viable economic activity in rural areas. Wood heating has a number of advantages in this regard. It makes use of existing natural resources, most of the employment is rural, and the high costs of transport mean that the activities must be locally based, bringing benefits throughout the region. The increased viability of small farming business and associated community cohesion are also important in this regard.

- *On-going quality improvements*

  Developing a market for wood thinnings and by-products should improve the management of our forestry and woodlands and provide benefits in terms of not only the quality of wood at final harvest but of the wider environmental quality of the woods and forests themselves.

Finally, appropriate and planned development of the sector will give rise to greater awareness of the carbon economy and environmentally sensitive behaviours, both personal and corporate, including wider use of green technologies that in turn will benefit the wider economy and, of course, the environment.

1.0 Why is wood energy important?

Wood energy is a biomass fuel[5] and has the potential to deliver a number of development benefits:

- energy benefits including security and diversity of supply and the development of indigenous renewable energy sources
- environmental benefits such as greenhouse gas emissions reduction and waste management
- agricultural benefits offering new enterprise opportunities for farmers
- economic benefits such as employment generation in rural areas and enhancement of local economies

The Western Region has a significant forestry resource (approx 11.5% of the land area) and this is a potentially significant source of wood fuel. The region also has a high level of oil dependency and limited access to the gas network, which has a negative impact on regional competitiveness. The development of the wood energy sector will result in multiple economic benefits for the region including: increased viability of the existing forestry resource; reduced oil dependence; increased supply of indigenous, sustainable fuel; and creation of enterprise and employment opportunities in areas experiencing agricultural decline.

The Department of Communications, Energy and Natural Resources' (DCENR) White Paper on Energy, ***Delivering a Sustainable Energy Future for Ireland (March 2007)*** focuses on three core energy issues: sustainability; security; and competitiveness. This report will show how the development of a wood energy sector will play a role in addressing each of these issues.

The National Bioenergy Action Plan for Ireland (March 2007) established for the first time the renewable heat targets and specifically a national target of 12% renewable share in the heating sector by 2020. Currently 96% of the EU's renewable heat is provided by biomass[6], so based upon the evidence of more developed EU markets we expect biomass fuels to be the main contributor to these national targets going forward.

In the Western Region the wood energy sector is still very much an emerging market and barriers to development are evident including: limited market awareness and confidence; lack of capacity, skills and expertise in market and supply chain development; limited capacity of forestry sector to enter the sector e.g. small plantation size; and inadequate local policy and regulation framework.

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[5] Types of biomass that are used to provide bioenergy include: wastes streams, including residues from forestry and related industries; recycled wood; agricultural residues and agrifood effluents; manures; the organic fraction of municipal solid waste; separated household waste and sewage sludge; purpose-grown energy crops including short rotation forestry, miscanthus grass, etc.

[6] Eurostat

2.0 What is wood energy?

Wood can be burned to generate energy, mainly in the form of heat. The focus of this report is on the development of the wood heat sector.

For the Western Region there are four possible sources of wood biomass:

- forestry produced wood fuels
- co-products
- post-consumer wood waste
- purpose grown energy crops

Forestry produced wood fuels are mostly small diameter logs (small roundwood) that are extracted to roadside, air dried and then chipped and delivered to heat boilers. These are known as thinnings. At a larger scale whole tree chipping and chipping of brash and branches (usually in forest) can supply wood fuels to CHP and co-firing markets.

Co-products are woodchips, dust and bark produced by sawmills as logs are processed into product such as planks.

Post-consumer wood waste is recycled wood that is processed and chipped into clean woodchip by timber recycling companies.

Purpose grown energy crops are usually fast growing willow trees planted on agricultural land and harvested every three to five years. (Often referred to as short rotation coppice willow – SRC.) This source of woodchip is not used on a widespread commercial basis in the EU.

Throughout this report all references to wood and wood fuel are based on an assumption of 50% moisture content to allow common comparisons.

3.0 What wood do we have in the region?

In the Western Region the total amount of **private sector** timber available for harvesting is forecast to rise rapidly over the next 10 or 20 years. The existing market for this material is limited because of the current market prices and the economics of harvesting.

Some 280,000 hectares or 11.5% of the Western Region is afforested[7], of this approximately 113,400 hectares are in private ownership and approximately 3,000 hectares of private forestry are being planted per annum. The remaining 166,500 hectares are in public ownership but only about 60 hectares of public forestry are planted per annum.

Please see Appendix 1 for regional and county maps of the private forestry resource.

Wood fuel production appears to be one of the most commercially sustainable options for growers and those involved in harvesting, processing and haulage of this forestry.

In preparing the strategy a cautious approach was taken to estimate the resource[8]. Where it was considered that a wood fuel might not be commercially available it was excluded from our resource estimate. Wood committed to existing markets (including wood from publicly owned forests) was also excluded. For these reasons only private sector forestry and its co-products have been considered in the resource estimate. Should wood become available from another source this will add to the available resource, but it was considered prudent to exclude uncertain sources from the estimate of resources available to the wood heat sector.

3.1 Private sector forestry and co-product

Forestry and co-product resources are considered together as the two are linked in terms of supply and demand and via markets and prices. As more forestry is harvested, sawmills increase through-put of timber, which in turn produces greater quantities of co-products.

In the Western Region at present, thinning is the main harvesting activity because much of the forestry planted in the 1980s is coming to a stage of requiring thinning.

As mentioned above woodlands in private ownership comprised 113,400 hectares in 2004. Some 30,400 hectares[9] of this is mature woodland (planted prior to 1982) or amenity and scrub woodlands. This leaves 83,000 hectares of forestry (planted between 1982 and 2004) in private ownership that is highly suitable for wood fuel production. Over the next 20 years a substantial proportion of these 83,000 hectares will require thinning. The predominance of young conifers means that much of the harvest in the next 20 years will be the smaller diameter and lower value pulpwood. Market opportunities for pulpwood derived from the private sector are limited; hence there is a need for a new market for small diameter pulp wood. It is this forestry resource that we have considered for wood fuel production.

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7 Forest Service Irish Timber Growers Association (ITGA) Yearbook 2007

8 For more detail on the estimation of the resource and the methodology used please see the Wood Energy Strategy and Action Plan available for download at www.wdc.ie.

9 Forest Service Irish Timber Growers Association (ITGA) Yearbook 2007

There is no reliable and agreed forecast for timber production from privately owned forestry in the Western Region[10]. An appraisal of growth and production rates of a representative sample of plantations was undertaken and applied to all the private sector plantations[11]. From this it was concluded that about 64,600 hectares of privately owned plantations will be suitable for thinning. This forms the basis of the forecasts included in this report.

It is estimated that the combined volume of new to the market pulpwood and co-product in the Western Region will be 210,500 tonnes per annum by 2010, rising to 516,000 tonnes per annum by 2020.

The forest resource could remain unharvested as harvesting is dependant on the existence of a viable market.

3.2 Issues affecting the development of wood fuel supply

In order for a wood fuel market to develop it must be possible to sell the fuel close to the forest at a price that makes thinning commercially viable.

The point at which it becomes viable for a forest owner to undertake thinning depends upon a complex set of factors. In any thinning operation the harvest will comprise a mix of timber for different markets. The larger diameter material (not suitable for wood energy) will have the best price and be most viable to harvest. Owners are often happy just to cover costs in selling the lower value smaller diameter timber (pulpwood).

We conclude that a price for delivered wood fuel in the range €55.5 to €75 per tonne[12] should make it commercially viable to undertake thinning. Costs are based on 20km haulage distances between the forest and fuel process depot and 20km between that depot and the boiler site. Together these costs represent about 20% of the delivered fuel price. If the haulage distances were increased the fuel price would rise.

This price range means a delivered heat price of 2.8 to 3.8 cents kWh. This compares to oil heating at 5.3 cents kWh[13]. These figures demonstrate that price should not be a limiting factor in liberating the available wood resource for energy purposes.

Other constraints to supply chain development

During the consultation process for the development of the strategy it emerged that many of the forestry growers operated in isolation and were unsure of the process involved in harvesting and of the markets for timber products. If growers lack knowledge and understanding of the wood energy market, it will clearly result in low rates of participation in the market.

The size of plantations is also a factor in whether wood fuel could be produced on a commercial basis. Plantations of 10 hectares or less make up 5,260 individual cases or 30,671 hectares (with an average size of 5.8 hectares)[14]. This is about half of the total resource. As individual plantations these would be uneconomic to harvest as the harvestable volume is small relative to the cost of harvesting. Without action to overcome these factors the overall amount of wood fuel resource and the price of that resource could be adversely affected. One way to overcome these difficulties would be to group the plantations into clusters.

10 COFORD are currently addressing this issue through the FORECAST Project.

11 Prices based on analysis in May 2007. For further information see wood energy research report available for download at www.wdc.ie.

12 For further information see the Wood Energy Strategy and Action Plan available for download at www.wdc.ie.

13 Enercomm International, 2007. Full report available from the WDC.

14 Forest Service Irish Timber Growers Association (ITGA) Yearbook 2006

3.3 Conclusions

Our work has established that there will be a sustainable harvest of pulpwood and a related supply of co-product that, in 2020, is forecast to be 516,000 tonnes per annum.

All of this material could be supplied into an emerging wood energy market without affecting the supply of timber for other markets in the region or beyond. There should not be any price based constraints on its use in the heat market. The level of awareness among forest owners about wood energy and the small size of the plantations will influence the development of a supply chain.

The estimation provides a cautious view of the likely availability of wood for fuel. It does not assume any supply from the state owned forests nor does it rely on post consumer wood waste, energy crops or harvesting residues and it assumes that the larger diameter logs will not be used for energy. All this other potential material could be used for wood energy if the market expanded beyond the private sector/co-products materials.

As a supply chain infrastructure for wood fuel begins to develop, other sources of wood fuel will become more viable over time. This could be particularly important for energy crops in the medium term.

4.0 Why do we need a strategy?

There are a number of reasons why the Western Region should focus on the development of the wood energy sector. These are:

- availability of the wood resource
- energy policy
- market developments
- climate change benefits
- economic and social benefits

Climate change benefits and economic and social benefits are discussed in detail in the final sections of this report. In this section resource availability, policy and market developments are considered.

4.1 Resource availability

The overriding argument for developing a strategy for wood fuel is that the region has a large and growing forestry resource that will be seeking viable local markets. The Western Region contains 40% of Ireland's forestry. In addition to the concentration of timber in the region, timber production from this forestry is forecast to rise rapidly over the next 20 years because the forests are young and many are reaching a stage of first harvesting (thinning). This means the type of timber being produced is highly suitable for energy production as it is small diameter and well-suited to chipping for energy production. The existing market for this material is limited because of the current market prices and the economics of harvesting make it difficult to manage and harvest wood profitably.

Wood fuels are a low value commodity, disproportionately affected by transport costs. This means timber must be grown and consumed regionally if it is to be commercially viable[15]. This is another reason why the Western Region should develop a viable regional market.

The region is uniquely placed to develop a wood energy sector because it has the forestry resource required to supply market demands, now and in the future.

4.2 Renewable energy policy

Ireland imports over 90% of its energy[16] and is heavily reliant upon imported fossil fuels. Renewables are therefore set to play an increasingly important role if the reliance on imported energy is to be stabilised or even reduced over the long term.

There is already a clear national policy focus on the development of wood energy (discussed in section 5) and the Western Region can make a significant contribution to that national policy. Indeed it is unlikely that national policy targets can be achieved unless the sector develops in the Western Region as so much of wood resource is located in this region.

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[15] Pellets are traded as a commodity and transported over long distances due to their energy density, but wood chips are not a traded commodity and are always produced and used regionally in all energy markets.

[16] Source: SEI

4.3 Market trends

Wood energy is the most significant source of renewable energy in the EU, where it is a technically mature, widely deployed and commercially viable sector. Its development in the Western Region is an achievable and logical step. Examination of the market prospects (discussed in section 6) shows the underlying economic attractiveness of certain types of wood energy investment in the region. Wood heat is viable and commercially attractive and its development can help improve regional competitiveness.

4.4 Experiences of developing the wood heat sector in Europe and Ireland

It is useful to see how regions of Europe have developed their wood energy markets and what this implies for the Western Region and the development of its strategy and action plan.

Upper Austria

The development of wood energy in Upper Austria over the past 10 years provides a striking view of what can be achieved. Here, from a standing start, a clearly defined strategy for wood energy heating has been pursued via an effectively coordinated and properly resourced development programme since 1994.

The target for renewable energy uptake was 25% and by 2002 the actual figure had reached 30%, with wood energy providing 14%. It is instructive to note that support was sustained over 10 years and was delivered within an overall framework for renewable energy deployment. The critical importance of wood energy, which accounts for half of all the renewable energy, was recognised from the outset.

One difference between Upper Austria and the Western Region is the proportion of forested area. However, while significant, this difference is not necessarily a fundamental determinant, and in this regard it is telling that a wide range of other renewable technologies have also been successfully deployed in Upper Austria.

A key conclusion from a review of the experience in Upper Austria is the extent to which comprehensive and concerted actions, including a whole range of measures via policy to promotion and facilitation, can be effective in stimulating market development.

For Austria as a whole the annual investment in wood energy technology in 2006 alone was €320 million[17]. This illustrates how regional market development and national market development combine to create what is clearly a large energy sector over a period of around 13 years.

[17] Source Styria Energy Agency 2007

Finland

In 1998 approximately only 20MW of wood heating capacity were installed in Finland. The amount installed each year following rose gradually and by 2006 approximately 170MW were installed.

Market development in Finland is supported by a comprehensive network of 11 regional energy agencies[18]. These promote the efficient use of energy and renewable energy sources. The agencies are structured in a variety of ways; they may be operating in conjunction with another institution, or with government departments, some are working with a company and others operate as independent units.

The energy agencies typically have between one and four employees, who are experts in the energy sector. A management or steering group guides their activities.

The County Clare Wood Energy Project

The County Clare Wood Energy Project has been working to facilitate and stimulate the uptake of wood fuel energy in County Clare. The project is managed by Rural Resource Development in conjunction with Teagasc and is funded by the Forest Service. It commenced in late 2005.

The project has employed two part time specialist consultants who followed a programme of contacting and developing potential wood heat customers. So far 29 organisations have shown interest in the concept of wood heating. For some of these, outline business plans were developed and others were helped through a tender process for fuel supply and technology installation.

By early September 2007 three (approximately 500kW) systems had been installed and another three to five projects were in progress. The systems have been developed in the medium scale commercial sector supplying heat to organizations such as hotels, care homes and factories.

The project also focuses on wood fuel supply chain development with local growers and wood processors. Several new fuel supply companies were created and they provided the confidence for energy users to invest in wood projects.

The project will help deliver at least six and perhaps eight commercial scale (500kW) projects over two years from a standing start.

4.5 Conclusion

Wood energy can have an important place in the energy supply mix of the Western Region. Its development will improve the security, sustainability and price competitiveness of the region's energy supply. Wood energy tends to show reduced fuel costs when compared to fossil fuels energy solutions. Finally, as energy will be sourced locally it will use and consume an available resource that has no other viable market.

[18] Background and Present Situation of Energy Agencies in Finland (2003) by Mikko Ahonen, Central Finland Energy Agency

5.0 What are the targets and policies for renewable energy?

Targets and policies for renewable energy are set at both EU and national level. The national targets and policies come from the Energy White Paper and the Bioenergy Action Plan.

5.1 Energy White Paper

In March 2007 the Department of Communications, Energy and Natural Resources (DCENR) published the White Paper on Energy, ***Delivering a Sustainable Energy Future for Ireland***. The White Paper focuses on three core energy issues:

- **Sustainability**
- **Security of supply**
- **Competitiveness**

The development of a wood energy sector will play a role in addressing each of these issues.

Sustainability

Wood fuels can replace the use of finite fossil fuels. Wood energy production is a sustainable activity in the region because wood fuel is harvested from sustainably managed forests. The principal that underpins this is that no more than the total amount of biomass increase in a forest each year is harvested. In Ireland forestry is regulated so that overall the annual harvest must equal the annual increment, i.e. the annual amount of natural growth.

Security of supply

Fossil fuels are imported. In contrast wood fuels are owned, grown, managed and processed in the region. This is a crucial advantage and ensures that in proportion to the market share wood fuels secure, the security of energy supply is improved.

Competitiveness

Wood fuel is a low cost energy. This is a crucial advantage and ensures that as the wood energy market develops, the competitiveness of energy supply for the region is improved. It should also be noted that oil is the main heating fuel in the Western Region so heat energy costs are higher than in other parts of Ireland that have better access to the gas network.

5.2 Bioenergy Action Plan for Ireland

In March 2007 the Bioenergy Action Plan for Ireland was published. This established the following national targets (in line with the White Paper):

- 12% renewable share in heating sector by 2020
- 30% co-firing in peat stations by 2015
- 800MW_e of CHP by 2020 with an emphasis on biomass fuelled CHP

The Bioenergy Action Plan does not state the technologies and fuels that will deliver the targets. Clearly solar and geothermal technologies can provide renewable heat and may experience market growth in Ireland, thereby contributing to the achievement of the targets. Currently 96% of the EU's renewable heat is provided by biomass[19], so based upon the evidence of more developed EU markets we expect biomass fuels to be the main contributor to these national targets going forward.

5.3 EU Targets

The overall targets for renewable energy deployment in the EU as a share of total energy use were set in January 2007 by a communication from the Council of Europe to the European Parliament, and are:

- 12% of energy by 2010
- 20% of energy by 2020

[19] Source: Eurostat

6.0 What market segment should we target?

A defined focus for the strategy will allow better targeting of resources. There are four market sectors where it is possible to use wood fuel: power generation; Combined Heat and Power (CHP); co-firing; and heat. Each of these are considered below.

In reviewing the market options a price for delivered wood fuel in the range €55.5 to €75 per tonne was assumed. This price should make it commercially viable to undertake thinnings. If a market sector is to develop it must be capable of achieving at least that price level. Lower prices would not be commercially sustainable.

6.1 Power generation

Wood fired power generation is an unlikely area of market growth in the Western Region. Wood is not widely used for pure generation (unlike CHP) and it is not considered to be the most efficient use of the resource. A generation project would require massive capital investment by a major utility and probably significant state support to make it commercially viable. Power generation projects are unlikely to be able to pay a high enough price for the wood fuel to attract the wood resource.

6.2 Combined Heat and Power (CHP)

Most biomass CHP projects in commercial operation across the EU are large scale (30 to 50MW_e and above). CHP requires a heat load of three or four times the size of the electricity generation. At the moment there are unlikely to be any locations in the Western Region where such a large single thermal load can be found.

CHP projects could be developed around the 5MW_e electrical scale and it is likely that there are locations in the region that have heat and power requirements that would be suitable. However, without significant grant aid small scale biomass CHP appears to be commercially challenging and there is relatively limited availability of commercialised technology under 5MW_e although the technology is continually evolving.

While wood fired CHP will not be the focus of the strategy, developing this sector will create a big demand for the wood resource and so help to mature the supply chain.

6.3 Co-firing

The national target for co-firing biomass fuels in peat fired power stations is set at 30% of fuel input by 2015[20]. To meet the 30% co-firing target Bord na Mona Energy Ltd estimate that one million tonnes of biomass material (at 50% moisture content) are required.

It is unlikely that Western Region sourced wood fuel could be harvested, processed and delivered to the peat plants profitably at the price Bord na Mona considers viable. Even if it was to prove economical, only material harvested very close to the power plants would be used. This would effectively exclude supply from the vast majority of the Western Region where transport costs would be too high.

[20] This target appears to be based upon the technical capacity of the plants to accommodate biomass fuels without significant investment.

6.4 Heat

Wood heating technologies are likely to form the most important part of market growth in the Western Region. Wood heating systems are more expensive to install than oil or gas heating systems. However, they are much cheaper to operate as the cost of wood fuel is much lower than oil and gas. In simple terms, wood heating will gain market share where the fuel savings justify the capital investment.

For commercially viable paybacks to be achieved the price of wood fuel must be significantly lower than fossil fuels. The price at which wood is viable as a fuel depends on a variety of other costs. These comprise the costs of harvesting, chipping, haulage and the need for the forest owners and the contractors involved to cover overheads and secure a reasonable profit.

A price for delivered wood fuel in the range €55.5 to €75 per tonne should make it commercially viable to undertake thinnings. (We have shown that thinnings will form the bulk of supplied wood fuel in the region over the next 10 to 15 years.) We would expect the price of delivered wood heat to be around 3.2 cents kWh.

Wood heat market opportunities matrix

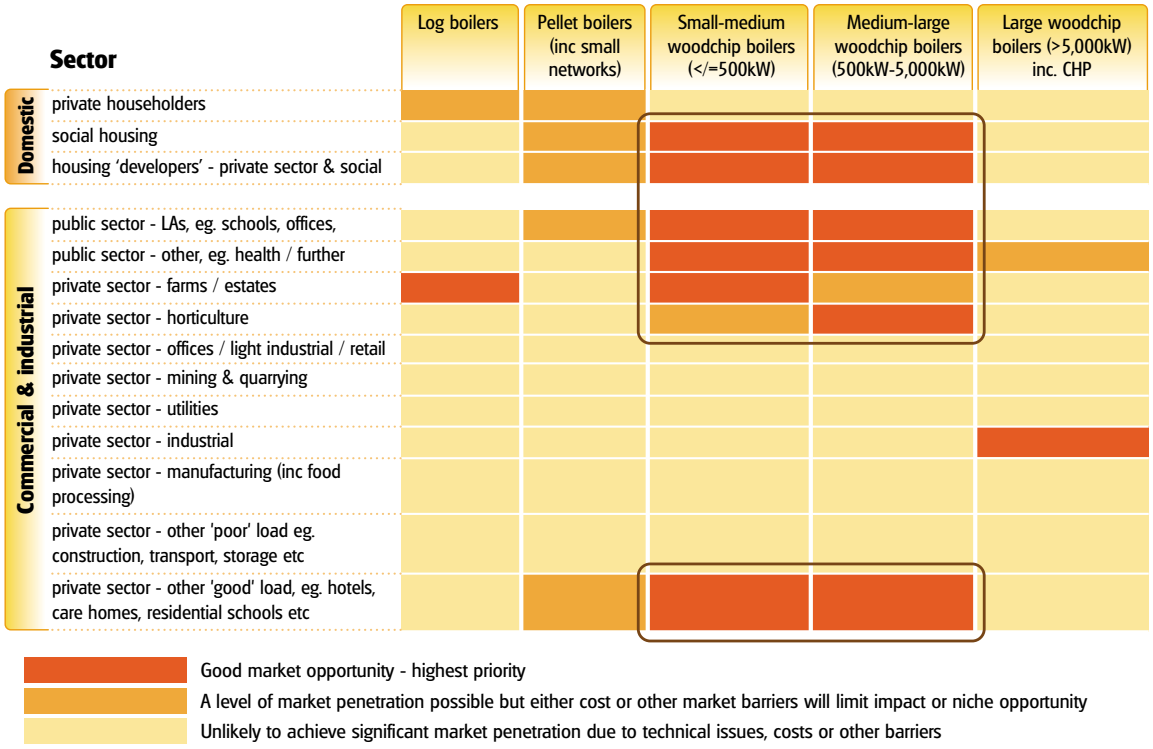
The technology used for providing wood heating may be categorised into a number of generic types according to fuel source, scale and market application:

- log boilers: domestic and small scale
- pellet central heating boilers: generally for single buildings such as large houses or small offices, but with some potential to serve mini-district heating networks
- small to medium sized woodchip boilers (≤~500kW): generally for single buildings / users, micro-networks or small-scale district heating
- medium to large sized woodchip boilers (~500-5,000kW): providing for a variety of applications, including district heating
- large-scale woodchip boilers (>5,000kW): generally for large process applications or, potentially, large district heating. Most viable CHP applications would fall within this category

The wood heat market opportunities are illustrated in the matrix below. All technologies have a role to play in a developed market, from log boilers at one end and large scale process heat applications at the other. At this stage of early market development it is desirable to focus only on the most attractive market situations in the region. These opportunities are highlighted by the dark orange boxes and enclosures in the matrix.

The matrix takes into account our price analysis of wood fuel and fossil fuel, and investment costs associated with wood energy. It highlights the heating market sectors most able to make investment in wood heating and secure a sound commercial return. To produce the matrix a price of delivered wood heat of 3.2 cents kWh and an oil heating price of 5.3 cents kWh was assumed.

Figure 6.1: Wood heat market segmentation by technology



The matrix indicates that wood heat supplied by wood chip boilers of up to 5,000kW provide the best opportunities for the development of the sector.

6.5 Conclusion

The key conclusion of this section is that where medium and large (500kW+) wood chip boilers replace fossil fuel boilers the economics are likely to be the most attractive relative to any other wood energy technology. The range

- large hotels
- care homes
- hospitals
- leisure centres
- secondary schools
- shopping centres
- airports
- commercial glasshouses
- cement and chemical works
- large offices

of typical applications includes, but is not limited to:

The role of the public sector in early market development is a key one and an essential priority for action. This includes not just county councils, but all of the public sector, including in particular 'high load' users such as hospitals, prisons and university campuses.

7.0 What are the barriers to market development?

The focus of the strategy and action plan is on the medium and large users (500kW+) who could install woodchip boilers. While this is the market segment with most potential for development it faces constraints that mean without the strategy the market segment will not achieve its full potential.

The main constraints to market development in the region are analysed under four headings:

- getting the message across
- growing the market
- developing an integrated wood supply
- providing supportive policy, finance and regulation

These headings are used again in the action plan.

7.1 Getting the message across

Many energy users are simply unaware of the technology and the wood fuel supply options. In addition there can be a lack of market confidence in the technology and fuel supply chain as it is new to the region. Fuel supply confidence can also be a constraint. The market is not confident that quality wood fuel can be supplied reliably and that it will not 'simply run out'. There may be market concerns over how stable wood fuel prices will be over the next few years. Finally, for the market to develop there needs to be greater confidence in the reliability and convenience of the technology.

These issues of market confidence need to be addressed by providing quality information on the sector, promoting wood heat and giving confidence in the sector's potential.

7.2 Growing the market

In order to grow the market, practical skills in the operation of wood boilers and the conversion of wood to energy must be developed. Experience in these areas will grow over time.

The business case for the use of wood as a fuel must be understood, with detailed knowledge of costs and the economics of the sector well established. Without this, inappropriate investments may be made.

The investment process is more complex than for a standard oil fuel boiler. In addition, it is new, involving procurement of wood fuel and technology. Specialist expertise is required for this type of investment, which is more time consuming and risky than for an investment in fossil fuel heating.

As the market develops the capacity of installers should improve. At present, with the market in the early stages of development, installers are gaining experience. The ability of installers to match the appropriate boiler with client needs and to install boilers correctly is essential to the development of the sector.

A range of technical and design skills are needed to install wood energy systems. The design and project management skills of installers need to be improved to provide a high-quality service which can compete with that available for fossil fuel boilers. Poor quality and badly specified projects can have a negative effect on early market development.

Similarly, aftercare and maintenance skills need to improve so that quality after sales service is provided in a reliable and cost effective way.

7.3 Developing an integrated wood supply

At present there is a lack of awareness amongst growers about wood heat market prospects and the possibilities of a substantial new market for thinning. This currently prevents participation in the market.

Many of the plantations that are most suitable for wood energy production are dispersed and small in scale. This makes it commercially difficult to undertake harvesting unless plantations are 'clustered'.

New investment in equipment and infrastructure will be required in order to respond to market opportunities. Knowledge of the appropriate equipment and the market requirements in terms of wood quality and size will need to become more developed.

7.4 Providing supportive policy, finance and regulation

Supportive planning polices will help to increase the rate of market development. There is a lack of awareness among potential users, as to the planning requirement for a wood heat facility. Similarly, better understanding of the benefits of wood heat systems and their operations is needed to improve their passage through the planning process.

Concerns over the combustion of wood and associated emissions to air can give rise to prejudice against wood as a heating fuel. Improved understanding of the issues associated with emissions and the regulations governing them must be actively addressed.

8.0 What scenarios and targets form the basis of the strategy?

A central part of this strategy is the setting of regional wood energy targets. The time frame for targets is 2020. This matches EU and national target dates, giving a 12 year horizon that is ideal for long-term planning and development within a sector. Incremental targets are mapped out for each year to achieve the 2020 target. This allows for annual monitoring and helps ensure adjustments are made in the light of progress.

The targets are set to cover the use of wood for energy production in the heat and CHP markets. The targets are expressed in both MWs of installed capacity and tonnes of fuel used. As the strategy is focused on heat, the heat element of energy generation from new CHP plants is included in the target scenarios; although it is assumed that wood energy CHP will be a relatively small market in the Western Region.

8.1 The baseline

The starting point for the development of annual targets for wood energy to 2020 is the current installed capacity of the market to supply and install systems and fuel. Installed or contracted wood energy capacity in the Western Region is approximately 65.5MW_{th}, or 11% of the installed renewable energy technologies[21]. This capacity is in three sectors:

- large industrial scale (1MW+) 52MW installed
- medium commercial scale (60kW to 1MW) 10.6MW installed
- domestic scale 2.9MW installed

Installers and suppliers

At the time of the preparation of the strategy there were 21 installers and suppliers operating in the region. These were small or start up companies although several have large companies backing them. The sector clearly has a market presence, but is tiny compared to the conventional fossil fuel sector.

Wood heat market share

If the Western Region is to become more aligned to most other EU energy markets it will mean aspiring to having biomass account for about 10% of its heat market, estimated at approximately 594MW_{th} of installed wood energy capacity[22]. This demonstrates that the wood heat sector has a large market into which it can grow and the size of the overall heat market is not a limiting factor for wood heat market growth.

CHP market share

In the Western Region it can be assumed that there will be a relatively small number of locations where large scale demand for heat and power use suitably combine to offer the potential for biomass CHP investment.

There are no installed wood CHP projects in the region and only two in the whole of Ireland.

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21 As at July 2007.

22 For further information see the Wood Energy Strategy and Action Plan available for download at www.wdc.ie

In 2007 a national target of 10MW_e[23] to 15MW_e of biomass CHP (2007 to 2013) was set. This suggests between 1.8MW_e and 2.7MW_e should be installed in the region by 2013 to make an equitable contribution to national targets.

8.2 Development of market growth scenarios

Market growth scenarios were developed to illustrate the rate at which wood energy might be able to gain market share in different situations. A complex range of factors influence the level of market growth. The key factors are:

- energy prices
- potential introduction of a carbon tax
- capacity and skills in the sector
- supply chain development
- market confidence and awareness
- CHP market growth
- impact of the action plan

Four different scenarios were developed for the implementation of the strategy. These were a counterfactual 'do nothing' position and three growth scenarios, representing the varying degrees of market penetration associated with different levels of public support and market conditions. These are defined as follows:

'Do nothing' scenario

Static market environment and no additional public intervention; the current SEI boiler installation grant scheme is discontinued in 2010 as the current programme ends.

Low scenario

A static market environment for wood energy but an action plan is implemented to promote market development; the current SEI grant support for boiler installation is continued after 2010.

Medium scenario

The action plan is implemented to support market development and fossil fuel prices continue to rise above the rate of general inflation in the economy. More supportive policy and regulation, and the current SEI grant support for boiler installation is continued after 2010.

High scenario

The action plan is implemented to support market development and fossil fuel prices rise even more rapidly. Carbon taxation is introduced with aggressive renewable energy targets, additional polices and very supportive regulations. The current SEI grant support for boiler installation is continued after 2010.

Targets for installed capacity of wood heat for each scenario and each time were mapped out[24] and are summarised in the following tables. These figures represent newly installed capacity and are additional to the estimated baseline position for 2007 of 65.5MW_{th}.

[23] MW_e refers to the installed capacity in terms of MW electrical. As in all cases a CHP project is capable of generating more heat than power it can be assumed that 1MW_e also represents 3MW_{th}. This means 3 MW of heat output.

[24] For more detailed analysis see the Wood Energy Strategy and Action Plan available for download at www.wdc.ie.

Summary of Growth Scenarios and Targets (from baseline) for 2010 and 2020

	'Do nothing' (MW)	Low Scenario (MW)	Medium Scenario (MW)	High Scenario (MW)
Wood heat energy by 2010	5.5	20.0	40.0	70.0
CHP heat energy by 2010	15.0	15.0	15.0	15.0
Total heat energy by 2010	**20.5**	**35.0**	**55.0**	**85.0**
Wood heat energy by 2020	75.0	232.0	402.0	532.0
CHP heat energy by 2020	30.0	60.0	75.0	90.0
Total heat energy by 2020	**105.0**	**292.0**	**477.0**	**622.0**

Summary of the scenarios for 2020

Scenario by 2020	Do nothing	Low	Medium	High
Total new heat capacity	105MW	292MW	**477MW**	622MW
% of national 2020 heat target achieved[27]	25.8%	54.2%	**82.2%**	104.2%
Tonnes of wood required per annum by 2020	120,000t	305,600t	**471,600t**	605,600t
% of Western Region heat market achieved	3%	7%	**10.7%**	13%

The medium scenario was selected as the most likely to occur. Under this scenario the action plan is implemented and we have assumed that fossil fuel prices continue to rise above the rate of general inflation in the economy. This means we have assumed that oil for heating rises by approximately 10% year on year. This would make oil for heating cost 7.5 cents kWh by 2010 (equal to approximately 72 cents per litre for oil)[26]. The gradual improvement of polices and more supportive regulations are assumed to develop year on year. Finally, we have assumed that the grant support for wood energy is continued after 2010 as the SEI current grant scheme ends.

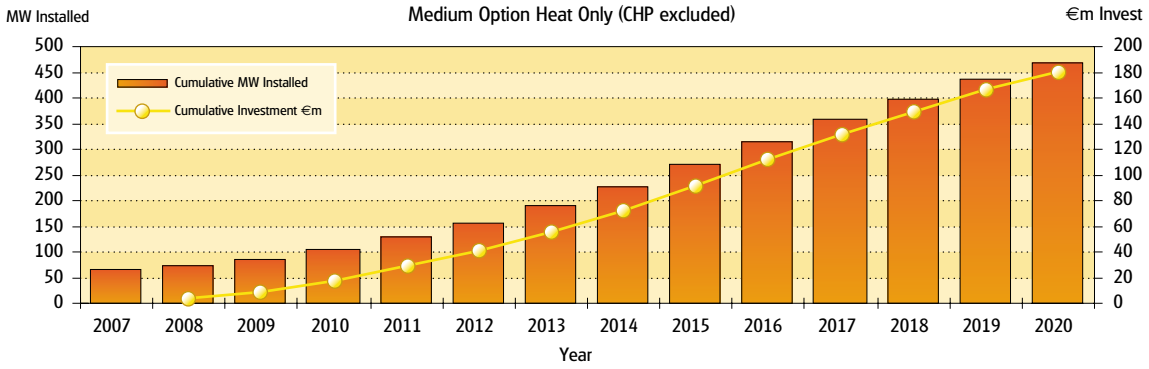
In this scenario the action plan provides support to market development and the external environment for wood energy gradually improves with more supportive policy and price advantages growing over the next 12 years.

[25] This includes the 65.5MW of installed capacity already achieved by 2007, and this is calculated on a pro rata basis.

[26] Please note that the scenarios were prepared in July 2007 and therefore reflect the oil price of that date.

The figure below illustrates our assessment of the possible rate of market growth under this scenario.

Figure 8.1: Rate of market growth under the medium scenario



Under this scenario we estimate:

- market growth will achieve 402MW of new installed heat capacity by 2020
- five 5MW$_e$ CHP projects could be developed in the region by 2020. This would add approximately 75MW of heat capacity and require 150,000 tonnes of wood fuel per annum (assuming a heat:electricity ratio of 3:1)
- the average annual rate of installed heat capacity is over 30MW$_{th}$. This equates to approximately 8 or 9,500kW projects per county per annum over the next 12 years[27]
- the use of fuel would be 471,600 tonnes per annum by 2020
- the medium scenario would allow the region to meet 82% of its equitable contribution[28] towards the national renewable heat target by 2020[29]. Solar thermal and other renewable technologies could provide the rest
- it would represent approximately 10.7% of the region's heat market

In the context of a more supportive environment envisaged and the implementation of the strategy and action plan we believe this scenario is achievable over the 12 years.

Scenarios compared to wood resources

We have compared these scenarios with our estimations of available wood energy resources. This report demonstrates that a cautious estimate of wood available for energy use in the region, by 2020, is 516,000 tonnes per annum. It is very important to note that this estimation of wood resource only includes new wood resources that are **surplus to any current market demands for wood** (in any of the wood markets) and that it is available sustainably and annually.

The medium scenario estimates a wood fuel requirement of 471,600 tonnes. This would create a market for most of the surplus wood forecasted for the region, without the likelihood of generating price or supply pressures in other wood markets.

Conclusions

We have based the action plan on the delivery of the medium scenario as it represents a logical balance between the available resources, the national renewable heat targets and the likely way in which the external environment would impact upon the Western Region.

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27 This is significantly above current trends in the region and higher than the levels of growth currently seen in County Clare.

28 The estimate of 'equitable contribution' is based on population. For more information see Wood Energy Strategy and Action Plan.

29 Including the 65MW already achieved.

9.0 What is the action plan?

A three year action plan has been developed to stimulate the demand for wood energy among energy users and facilitate capacity building of installers and fuel suppliers to ensure an effective fuel supply chain. The action plan complements the existing regional and national support programmes, mapping out the immediate steps required to address current barriers to development and stimulate growth rates. The regional heat target that is aimed at is 477MW_{th} by 2020, i.e. approximately 11% of the region's heat market.

In developing the action plan we consulted widely on the range of actions most essential to stimulating the development of the wood heat sector in our region, in accordance with the targets set out. The action plan detailed below is a reflection of the requirements of the stakeholders, partners and consultees.

The action plan is based on the following principles:

- partnership and collaboration between relevant players in the sector
- a full supply chain development approach (from fuel producer to end user)
- actions become self-sustaining or mainstreamed into relevant agencies as appropriate

The actions are organised into the four themes that were used to assess the constraints on the market's development. These are:

- getting the message across
- growing the market
- developing an integrated wood supply
- providing supportive policy, finance and regulation

The action plan will be implemented by a regional team as outlined below.

9.1 Getting the message across

Actions to get the message across:

- Establish a database of costs for installation and fuel supply
- Wood energy information campaign
- Regional wood energy conference/seminars
- Web portal for wood energy in the Western Region
- Establish a 'Wood energy trail'
- Publish case studies
- Organise learning journeys

Establish a database of costs for installation and fuel supply

A database of commercial and current market costs for the installation of wood energy systems and for the costs of wood heat, wood fuel and boiler maintenance will be compiled.

Why? Market data helps inform and promote more and better investment decisions.

Wood energy information campaign

Develop professional regional promotional campaign linking all the actions described in this 'getting the message across' section. This should include the development of a segmented database of potential wood energy users.

Why? This will help overcome the current lack of awareness of wood energy and its benefits. It will enhance the rate of market development.

Regional wood energy conference/seminars

Organise a conference to highlight the recommendations of this Wood Energy Strategy and Action Plan.

Why? This would be the first main task in the regional marketing campaign.

Web portal for wood energy in the Western Region

Develop a website that acts as a 'one stop shop' for information about wood energy in the Western Region.

Why? A web portal is an essential tool to communicate the key activities of the action plan. It would provide a place where market participants (suppliers, installers, energy users) could interact and seek information. It would promote the sector and help build awareness.

Establish a 'Wood energy trail' and publish case studies

Establish a 'wood energy trail' to highlight existing wood energy installations and to provide case studies on the technical and commercial aspects of installations.

Why? In an early market that lacks installed examples this activity is important to facilitate and promote wood energy investment decisions. This allows prospective wood energy users to locate and visit installations. This is often critical to their making an investment decision.

Organise learning journeys

Bring groups of potential wood energy users with similar interests (e.g. housing, schools, hotels and commercial) to see clusters of installations in mature markets such as Sweden, Austria and Finland.

Why? This allows prospective wood energy users to locate and visit installations that are not available locally and to see the workings of a mature market. It provides information and confidence that are critical to making an investment decision.

9.2 Growing the market

Actions to grow the market:

- Develop a model procurement contract
- Provision of technical support to the project
- Regional strategy co-ordination and administrative resource
- Increase wood energy market development capacity & expertise
- Formalise the Regional Wood Energy Advisory Group
- Develop a database of approved installers
- Develop CHP market

Develop a model procurement contract

Create a model form of contract that can be used by prospective wood energy users to specify and tender for the installation of technology.

Why? Energy users may have difficulty in procuring wood energy and lack the knowledge to develop a secure, effective contract.

Technical support

For wood energy projects that will have a significant impact (larger projects and CHP), it will be beneficial to offer more focused technical support. This support could include a detailed feasibility study, financial planning, help and support with tendering and procurement, and the development of commercial heat supply contracts for fuel supply.

Why? This would allow bigger and higher profile projects access to the support to help them proceed. Such projects would then act as case studies and examples of successful investments, thereby contributing to the further development of the sector.

Regional strategy co-ordination and administrative capacity

A regional manager will be resourced to coordinate the implementation of the action plan. The manger will act as the liaison with partners, regional projects and relevant state agencies and report back to the steering group. Administrative resources will be required to support the manager's co-ordination functions.

Why? The examples of successful market growth in other regions and countries establish the importance of suitably qualified staff to help deliver the strategy and actions to develop the market.

Wood energy market development capacity and expertise

Increased wood energy market development expertise will be a central component of the action plan. Development experts will provide prospective wood energy users with high-quality advice and support so that as many of the barriers to investment are removed as possible. They will also ensure that, as the market grows, best practice is replicated and built into procurement, installation and fuel supply.

Why? The examples of successful market growth in other regions and countries establish the importance of suitably qualified staff input to provide advice and information and to proactively develop the market.

Formalise the Regional Wood Energy Advisory Group

The Regional Wood Energy Advisory Group (RWEAG) should direct the implementation of the strategy and action plan, and meet approximately twice a year.

Why? This will offer strategic control and create confidence required to promote market development.

Develop a database of approved installers

Create a single regional database of companies who can design, supply and install wood energy technology. This will be the responsibility of the regional wood energy market development experts and be made available via the web portal. This action would build upon an 'installers' charter' being developed by SEI.

Why? This will improve customer confidence and help bring installers closer to market opportunities.

Develop a CHP market

Only the largest energy users in the region will benefit from wood CHP, but these will be significant wood users. A rapid appraisal will identify the 'best' wood CHP sites in the region. For each site the investment case will be reviewed and the commercial opportunities highlighted. If there is interest in making an investment, technical support could be provided to help develop the CHP project in more detail.

Why? Developing CHP will create a big demand for the wood resource and so help to drive the development of the supply chain.

9.3 Developing an integrated wood supply

Actions to develop an integrated wood supply are:

- Scope and pilot wood fuel producer groups
- Regional resource assessment
- Increase wood fuel advice capacity
- Publish a non-technical wood resources report
- Develop a wood fuel supplier database
- Workshops for growers and forest managers
- Develop supply-side database

Scope and pilot wood fuel producer groups

Local growers can co-operate to meet demand via producer groups. The process of developing the wood fuel suppliers' data base will provide evidence of the likely need for such groups. A full feasibility study will be conducted to investigate costs, benefits and mechanisms. From here pilot producer groups can be progressed and complement existing groups established under Teagasc and LEADER Programme initiatives.

Why? Producer groups can improve the rate of fuel supply chain development, which could be increasingly important following 2010 as demand rises.

Regional resource assessment

A resource assessment will overcome any uncertainty that potential users have about the availability of resources for wood fuel. This resource assessment will comprise a scoping survey to establish examples of clusters of woodland resource and a detailed stand-by-stand inventory. The results will be published on a cluster basis and include information regarding potential resources, with a detailed forecast over five years and an indicative 10 year forecast.

Why? There is consensus throughout the forest industry that a stand-by-stand inventory of private sector wood is urgently required. This would provide key planning information for all involved in the wood processing sector and provide a definitive estimate of wood fuel resources.

Wood fuel supply capacity

Wood fuel supply experts will be needed to coordinate and advise on wood fuel supply on a regional basis. They will develop forest clusters and assess the resources within each cluster. They will coordinate producer groups and help to develop a fuel processing model for each cluster. They will work in conjunction with both the Forest Service and Teagasc, liaising with producer groups and forest managers.

Why? The wood fuel supply experts will directly support the development of the supply chain which is essential to achieve market development.

Publish a non-technical regional wood resources report

A report on regional wood resources will create market confidence by giving prospective energy users an appreciation of the availability of fuel resources. This will be based on the work already completed by the WDC as part of the strategy and action plan.

Why? Confidence in resource availability is a key factor for investment in wood heat by energy users.

Develop a wood fuel supplier database

There are a number of wood fuel supply companies and a range of small businesses that are selling wood fuel in addition to other activities operating in the Western Region. Other companies are exploring the idea of becoming fuel supply companies in association with planned CHP and heating plant projects. A database of such companies should be created to provide information about potential suppliers and their locations. The wood fuel supply experts will manage and maintain the database.

Why? Confidence in resource availability is a key factor in market take-up by energy users.

Workshops for growers and forest managers

The cooperation and support of forest managers and growers will be a key element in the success of the action plan and the future of the wood energy market. Workshops on the wood energy market, the harvest process and harvest contracts, and the advantages of group harvesting will be held.

Why? This will increase awareness among growers and forest managers about the opportunities for bringing wood resources into the supply chain.

Development of supply-side information

A single source of supply-side information on the harvesting process, draft contracts (harvesting and heat supply agreements) and upcoming harvesting schedule will be delivered. It will also have information on clusters including contact details for growers and resources available in each cluster. This would be hosted on the wood energy web portal.

Why? Cooperation amongst growers and owners creates the opportunity to bring wood resource into the supply chain. Crucially it makes smaller, remote and less viable harvesting sites more commercially attractive as they can be clustered into a single contract.

Field training for wood fuel suppliers

Field training for wood fuel suppliers will be provided along with practical, technical and commercial support to potential fuel supply companies as they invest in chipping equipment, drying sheds, etc. This will complement existing initiatives such as the demonstration programme provided by Teagasc and COFORD.

Why? Supply chain development is hampered by lack of skills.

Set up a wood fuel quality testing service

A wood fuel quality testing service will be established to allow wood fuel to be independently tested against wood fuel supply specifications. Tests should include particle size and moisture content using a grader and specialist moisture meter.

Why? Poor quality standards reduce rates of market development, that testing can overcome.

9.4 Providing supportive policy, finance and regulation

Actions to provide supportive policy, finance and regulation:

- Contribute to national policy and new local policy as needed
- Annual monitoring of wood energy strategy and targets
- Define, inform and guide local authorities on creation of supportive policy

Contribute to national policy and local policy

The strategy and action plan will provide input into new national and regional wood energy policy. It will be a mechanism to link policy makers and the development of the sector. Policy issues can be raised via the RWEAG at both local and national level in an effective manner.

Why? Supportive and co-ordinated policy will help the rate of market development.

Annual monitoring of wood energy strategy and targets

The strategy and action plan contain explicit targets and these will require monitoring on an annual basis to see how market development relates to regional targets.

Why? This will allow the action plan to be adjusted and refined in the light of actual performance.

Role of local authorities

i) Produce guidance on planning for local authorities

A checklist will be prepared to provide non-technical guidance to planning officers allowing them to ensure appropriate checks are made on submitted planning applications.

Why? Local authorities will be better able to assess planning applications that include wood energy, or at a pre-planning stage promote consideration of wood energy by using the checklist.

ii) Work with local authorities to develop supportive policy

The expert team will work with local authorities to develop the strategy on a sub-regional basis. Each local authority will work with the regional strategy manager to develop local targets and work towards these using the resources and measures of the proposed action plan.

Why? Supportive and co-ordinated guidance to local authorities will help the rate of market development.

10.0 How will the action plan be delivered?

The 'wood expert team', the RWEAG and the WDC will work together to deliver the action plan. The roles of each are outlined below.

10.1 The Team

The putting in place of a dedicated regional 'wood team' is the core element of the action plan. Given the barriers facing the development of the sector, the provision of active project development support at regional level is a critical driver of development in the sector. The wood team will be responsible for the implementation of the majority of the action plan deliverables, will secure the project budgets through existing support mechanisms and work closely with the identified partners.

The wood team will comprise seven staff[30]:

- project/action plan manager
- wood fuel market development officers (3)
- wood fuel supply officers (2)
- administrator (1)

As partnership is a principle of the action plan, the team will work with relevant national and regional partners including:

- national programmes and government departments including the Department of Communications, Energy and Natural Resources, Forest Service of the Department of Agriculture, Fisheries & Food, and Sustainable Energy Ireland
- energy agencies and build on the current market development role of these sub-regional agencies
- county Clare Wood Energy Project and learn from the experience of this successful project
- donegal Forest Link Project and Teagasc Producer Groups and thereby link into existing fuel supply chain development
- local authorities in regard to both the policy framework and relevant local projects
- other projects as initiated by local development agencies such as LEADER Programme

The proposed structure for the delivery of the action plan and for the management of the wood team is illustrated overleaf.

30 For further information see the Wood Energy Strategy and Action Plan available for download at www.wdc.ie.

Figure 10.1: Proposed structure for delivery of the action plan

10.2 Roles of the RWEAG and steering group

The RWEAG[31] will oversee the delivery of the action plan over the next three years and bring together key public and private stakeholders. The group members worked with the WDC on the development of the strategy and action plan. The role of the RWEAG as an overseeing group will be formalised as one of the first stages of delivery of the action plan.

The RWEAG will fulfil a range of functions including:

- maintaining liaison with the partners who are responsible for implementing projects and ensure funding is in place for duration of the action plan
- building on the partnership approach between the various national, regional and local bodies, and identify new opportunities as appropriate
- providing guidance and leadership to the regional team to ensure ongoing effectiveness and relevance of the regional strategy
- ensuring projects and emerging proposals are strategic in nature and complement national policy
- sharing the experience and learning of the partners with national policy makers

The RWEAG will meet twice a year and publish an annual progress report. A separate steering group will be established to oversee operational issues including project plans and officer work programmes. This will be a sub-group of the RWEAG and meet on a quarterly basis.

10.3 Role of WDC

The WDC will play a key role in the delivery of the strategy and action plan by:

- leading, facilitating and overseeing the development process required under the action plan
- providing policy analysis and ensuring regional strategy links to national policy

The WDC will set-up the delivery structures described above and support the implementation of the action plan within the specified timeframe. The WDC will act as management support to the wood team and will facilitate the reporting to the steering group and RWEAG.

[31] RWEAG is the Regional Wood Energy Advisory Group which was established to work with the WDC in developing the Wood Energy Strategy and Action Plan.

11.0 What is the economic impact of the strategy?

The economic impact of the strategy was estimated in a report prepared for the WDC by ADAS Ltd[32]. It was assessed in terms of its contribution to economic activity or Gross Value Added (GVA) and to employment. The impacts of the medium scenario are presented below.

11.1 Gross Value Added

Using wages plus profits as a proxy for GVA, the financial impact of developing the wood energy sector was estimated.

Table 11.1: GVA impacts for wood energy medium scenario

	Direct output (€ million)	Indirect Output (€ million)	Induced Output (€ million)	Total (€ million)
		2010		
medium scenario	1.7	0.1	-	1.8
		2020		
medium scenario	14.5	0.8	-	15.3

Note: GVA is estimated at current prices

These are annual impacts (i.e. GVA in 2010 and 2020); for intermediate years, the impact will increase according to the capacity installed. The cumulative impact in terms of GVA up to 2020 from these installations is estimated at €75 million. On the assumption that the additional capacity is fuelled by private forestry, the annual value of thinnings to farmers under medium scenario in 2020 will be €1.7 million based on 477MW of new capacity installed and a farmer price of €3.50 per tonne.

11.2 Employment

The estimated employment impacts for the medium growth scenario in 2010 and 2020 are detailed in the following table.

Table 11.2: Employment impacts for wood energy medium scenario

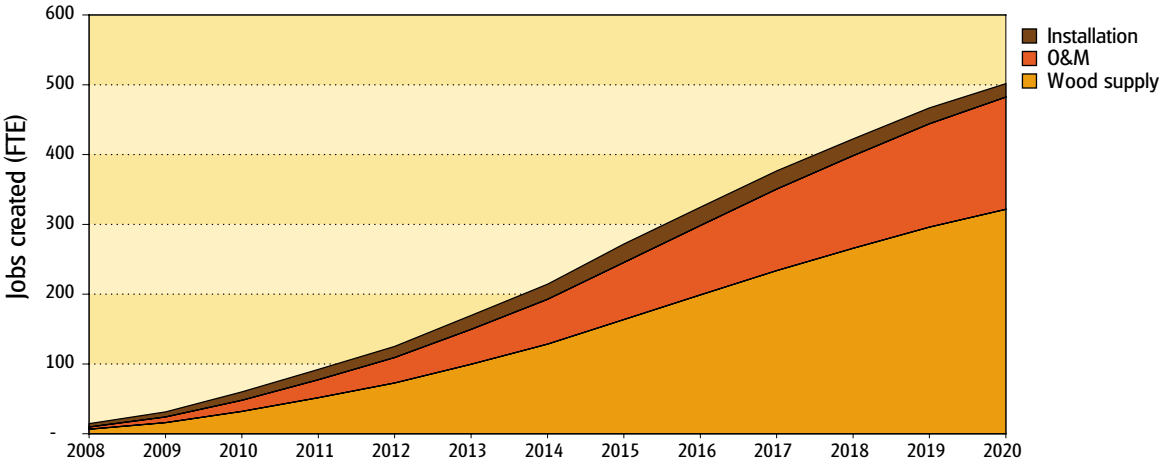
	Direct Employment (FTE)	Indirect Employment (FTE)	Induced Employment (FTE)	Total (FTE)
		2010		
medium scenario	73	3	26	102
		2020		
medium scenario	634	29	224	887

The employment effects are not dissimilar to other related studies (1.6 to 4.3 jobs per MW), although many of these have been based on single plant impacts, rather than a region-wide sector. As such, the analysis here reflects some economies of scale. The other factor limiting employment effects is the use of established forestry as feedstock rather than dedicated energy crops.

[32] For full economic impact report is available for download at www.wdc.ie.

The creation of jobs over time is relatively even but there is an exponential effect as installed capacity increases and the operational impacts build. It is important to note that while jobs created for operation and maintenance (O&M), and wood supply are ongoing, those for installation are temporary.

Figure 11.1: Direct jobs created under medium scenario over time (excluding CHP)



The data indicates substantial job creation levels and it is important to consider how these will be realised in practice. At least some of the jobs will be part-time additions to core employment for farmers and contractors. This does not undermine the headline data but suggests that rather than just a job creation effect, developing the sector would increase the viability of many existing rural businesses with further social and community benefits. Indeed, as marginal income for these households, it is more likely that wages for these workers will find its way into the local economy as spend on leisure activities and services.

In the context of total employment in the Western Region, the impact on the job market and wage rates would not be expected to impact on other sector or distort market rates. The small scale and local nature of the supply chain should also ensure impacts are dispersed.

11.3 Deadweight

The policy, economic and environmental drivers for expansion of the wood energy sector are substantial and it is reasonable to expect that there would be some sector development in the absence of further market intervention (the SEI grants for boiler installation will continue to 2010). The net impact of the strategy therefore relates to the net additional capacity installed relative to the 'do nothing' counterfactual position.

A modest level of growth is expected under the 'do nothing' scenario, leaving substantial net growth under the three scenarios. If the gross impacts are adjusted for deadweight on this basis, impacts are reduced. The net change or deadweight effect in terms of GVA in 2020 is a fall of €3.4 million while in terms of employment it represents 195 jobs.

Table 11.3: Impacts of growth scenarios net of deadweight (2020)

	GVA (€ million)	Employment (FTE)
low scenario	6.0	348
medium scenario	**11.9**	**692**
high scenario	16.6	962

11.4 Displacement

There are two potential displacement issues:

- jobs and GVA in the heating oil supply chain
- jobs and GVA in agriculture, relating to change of land use

While it is evident that (at constant heat demand) wood energy will directly displace heating oil, this is a real and substantive displacement. The scale of loss of GVA and jobs is difficult to estimate but on the assumption that the oil companies are based outside the region and would retain any profits, the main issue is oil distribution. The strategy report suggests the total Western Region heat energy market is equivalent to at least 600 million litres of oil. Assuming one tonne of green wood fuel replaces 300 litres of oil, the medium scenario represents displacement of 132 million litres of heating oil and an estimated 15 to 20 distribution jobs[33].

With respect to agriculture, it should be noted that the forestry is already planted and available for harvest. It has been assumed that in the absence of development of the wood energy sector, the forestry would not be thinned due to the cost of harvesting, relative to demand and returns from the pulpwood market. This would discourage an already marginal farming sector from using forestry. As such, a wood energy sector would not displace any existing agricultural activity.

One potential negative impact is competition for wood resources and consequent production cost increases for the sawmills or panel board mills.

11.5 Impacts over time

The analysis of impacts includes both the initial construction phase which is temporary and the operational phase which is ongoing. The construction impacts have been spread over a 20 year period in order to give an annual impact. In practice the effects will be uneven, with a concentration of construction in the early years of sector development but with an increasing operational impact as capacity builds towards 2020.

Unlike many economic development programmes, the construction impact is spread across the entire programme as capacity is increased. This has the effect of evening out the impact, making it easier for the local employment market to absorb and helping to retain benefits within the Western Region.

11.6 Sensitivity

The analysis is sensitive to prices at two levels:

- lower prices for heat energy or higher cost of woodchip would reduce the GVA through reduced profits and ultimately may stem sector growth. This would also impact on employment and induced impacts but seems unlikely in view of the differential between the price of heat energy and oil energy
- higher prices for heat energy or lower cost of woodchip would not be expected to drive sector growth significantly as the economic case is already strong and capacity/confidence is the main limiting factor. However, there would be some impact on GVA and induced impacts through increased profits. If sector growth were faster than the regional capacity to respond, some benefits would accrue outside the region from use of 'imported' labour

[33] DARE consultants

11.7 Conclusion

In summary, development of the wood heat sector in the Western Region is expected to contribute significant benefits in terms of GVA and employment.

Table 11.4: Net impacts of wood heat in the Western Region (medium scenario in 2020)

	Annual GVA (€ million)	Employment (FTE)
Direct sector impact	14.5	634
Less deadweight	3.2	140
Less displacement	0.6	20
Gross sector impact	10.7	474
Multiplier*	1.05	1.4
Net economy impact	11.3	672

** Type 1 multiplier for GVA, Type 2 for Employment*

The small-scale nature of wood boiler installations and organic development of the sector means that construction impacts are phased over the period to 2020. Thus, while these are one-off temporary impacts, the GVA and employment impacts are expected to be relatively even. This suggests that the sector can develop sustainably, building capacity as it does so, with minimal reliance on imported labour.

12.0 What is the value of the carbon emissions saved?

The use of wood fuel also produces environmental benefits, which may also have an economic value through the tradable value of carbon. We explore these issues in this section.

Using forestry products for carbon management

The principles behind using forestry and forest products as a way of combating climate change is well understood. CO_2 is taken up by plants through photosynthesis and stored in the wood and roots. The forest can then be left as a standing store of sequestered carbon (a sink) or it could be harvested as wood fuel and burned, offsetting the equivalent amount of CO_2 released by the burning of fossil fuel.

An introduction to carbon markets

Carbon markets currently consist of the regulated and unregulated markets. The regulated markets have been developed from the demands of the Kyoto Protocol and are principally the UN's Clean Development Mechanism (CDM) and Joint Implementation (JI) projects, and the EC's EU Emissions Trading Scheme (EUETS). The unregulated, voluntary or over the counter (OTC) markets have developed to provide, amongst other activities, carbon offsetting services.

Ireland's Kyoto target was to contain emissions within 113% of 1990 levels in the period 2008 to 2012. The latest figures for 2005 emissions placed national emissions at 25.4% higher than in 1990. Whilst some of this target will be met by National Allocation Plan limits on large industrial establishments, if Ireland is to remain compliant with Kyoto, emissions reductions will need to be sourced from other markets.

Carbon offset values

The value of carbon has varied significantly both within the EUETS and in the voluntary offset markets. Over the initial 28 month trading period from January 2005 to April 2007 the average price was €16 per tonne. Estimating the price in 2020 however is difficult. There are many factors that make such an exercise too open to be of much value.

12.1 Scenarios for carbon offset promoted by forestry use

The wood fuel resource in the region could be used for carbon offsetting either through a market trading approach or by reducing the number of allowances the Government needs to purchase to meet its Kyoto commitments, valued at €15 per tonne/credit for the 2008 to 2012 period[34]. These are discussed below for the 'do nothing' scenario and three levels of market penetration[35] for wood fuels in 2010 and 2020, at varying carbon prices.

As the price per tonne of CO_{2e} varies so will the value of the carbon saving due to the replacement of oil by wood in the different scenarios. The table shows the impact of a range of different carbon prices on each of the four market penetration scenarios outlined earlier. Low, medium and high penetration scenarios are adjusted for the 'do nothing' scenario to give the net additional effect of implementing the WDC strategy on the value of tradable carbon. The net figures are indicated in parenthesis beside the gross impact.

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[34] Department of the Environment, Heritage and Local Government, Personal Communication, 2007.

[35] Steve Luker Associates Ltd and DARE (2007) Wood Energy Strategy and Action Plan. Report for WDC. Luker et al expressed these tonnages in terms of 50% moisture content whereas wood chips would more typically have a moisture content of around 30% when sold for combustion. In this section, all figures have been adjusted to a dry weight basis.

Table 12.1: Gross and (net) value of carbon savings by using wood fuel

2010	'Do nothing' (34.4 kt wood fuel required per annum)	Low (46kt wood fuel required per annum)	Medium (62kt wood fuel required per annum)	High (86kt wood fuel required per annum)
CO_{2e} from wood	45,154	60,380	81,382	112,885
Price of carbon (€/t CO_{2e})				
10	451,540	603,800 (152,260)	813,820 (362,280)	1,128,850 (677,310)
15	**677,310**	**905,700 (228,390)**	**1,220,730 (543,420)**	**1,693,275 (1,015,965)**
20	903,080	1,207,600 (304,520)	1,627,640 (724,560)	2,257,700 (1,354,620)
50	2,257,700	3,019,000 (761,300)	4,069,100 (1,811,400)	5,644,250 (3,386,550)
100	4,515,400	6,038,000 (1,522,600)	8,138,200 (3,622,800)	11,288,500 (6,773,100)
2020	**'Do nothing' (120 kt wood fuel required per annum)**	**Low (306kt wood fuel required per annum)**	**Medium (472kt wood fuel required per annum)**	**High (606kt wood fuel required per annum)**
CO_{2e} from wood	157,513	401,659	619,552	795,442
Price of carbon (€/t CO_{2e})				
10	1,575,133	4,011,339 (2,436,207)	6,190,273 (4,615,137)	7,949,172 (6,374,047)
15	**2,362,695**	**6,017,005 (3,654,310)**	**9,285,405 (6,922,710)**	**11,923,765 (9,561,070)**
20	3,150,266	8,022,678 (4,872,414)	12,380,546 (9,230,274)	15,898,344 (12,748,094)
50	7,875,666	20,056,695(12,181,034)	30,951,366(23,075,684)	39,745,859 (31,870,234)
100	15,751,331	40,113,390(24,362,069)	61,902,732 (46,151,401)	79,491,718 (63,740,469)

12.2 Conclusions

The CO_2 savings arising from the use of wood instead of oil increase in proportion to the level of wood fuel market penetration. The medium scenario was the most sustainable option both in terms of the available resources, national renewable heat targets and the development of the wood fuel industry in the region. By 2010, the medium scenario could produce savings of 81,382 tonnes of CO_{2e} and by 2020 the same scenario could result in savings of 619,027 tonnes of CO_{2e}. This could be used to reduce the level of credits needed by the Government to meet their Kyoto commitments. Using the price provided for CO_{2e} of €15 per tonne for 2008 to 2012, the savings under the medium scenario would be worth €1,220,730 by 2010 and €9,285,405 by 2020.

As most of the installations are small to medium scale and below EUETS limits, the carbon cannot be traded through the EU trading mechanism but could perhaps be traded through voluntary markets.

The above benefits do not take account of carbon savings under a 'do nothing' scenario. By 2010, the medium scenario would result in a **net** saving of 36,228 extra tonnes of CO_{2e} per annum, which at a carbon price of €15 per tonne would be valued at €543,420. By 2020, the medium scenario would result in the additional saving of 461,514 tonnes of $CO_{2e,}$ which at a carbon price of €15 per tonne would be worth an additional €6,922,710. These are potentially significant benefits to the national government as well as to the environment and contribute to the strong socio-economic case for a proactive support strategy for the wood energy sector in the Western Region.

13.0 What are the other benefits?

Thus far we have only discussed those impacts of the strategy and action plan that can be quantified in money values. In other words, only what can be measured is included. Clearly, there are other effects that are not accounted for and non-quantified impacts of the implementation of the strategy and action plan are also important. They include wider socio-economic impacts arising from the development of the wood energy sector, which relate to increased incomes, transferability of knowledge and skills or competition for resource.

13.1 The achievement of critical mass

Potentially the most important additional benefit of the strategy arises from its role in achieving critical mass in the wood heat industry. While each additional unit of activity has observed costs and benefits it also contributes to the achievement of the critical mass that makes wood heat competitive and sustainable. Indeed, this lack of critical mass is one of the most important market failures that the strategy is designed to address.

In addition to the increase in the critical mass of the wood heat sector, developments will also improve the capacity of workers in terms of engineering and other skills which are transferable to other sectors such as food and manufacturing.

13.2 Contribution to development in rural areas

The strategy also has a second potentially important impact arising from its possible longer term role in developing viable economic activity in rural areas.

Wood heating has a number of advantages in this regard. It makes use of existing natural resources; most of the employment is rural, and the high costs of transport mean that the activities must be locally based, bringing benefits throughout the region. The increased viability of small farming business and associated community cohesion are also important in this regard.

13.3 On-going quality improvements

Developing a market for wood thinnings and by-products should improve the management of our forestry and woodlands and provide benefits in terms of the quality of wood at final harvest and in terms of the wider environmental quality of the woods and forests themselves.

Finally, appropriate and planned development of the sector will give rise to greater awareness of the carbon economy and environmentally sensitive behaviours (both personal and corporate), including wider use of green technologies, which in turn will benefit the wider economy and, of course, the environment.

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