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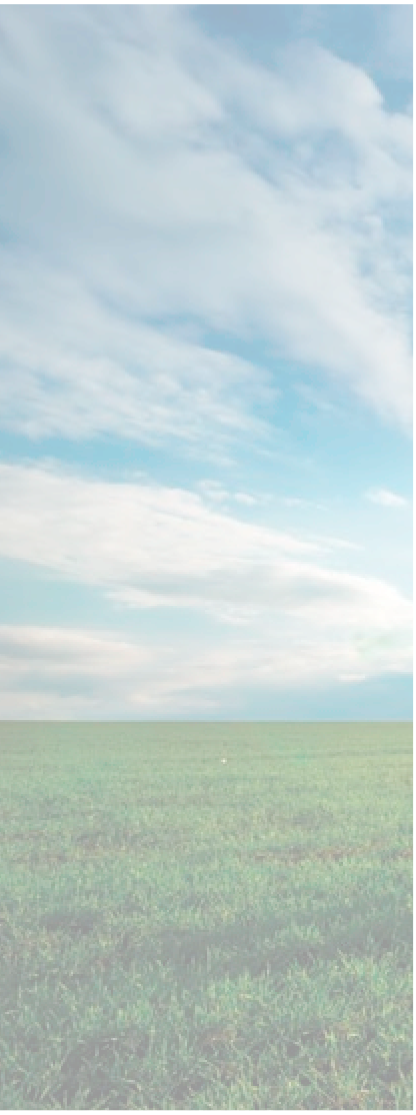

The Economic Benefits from the Development of BioEnergy in Ireland to meet 2020 Targets

Summary Version

Completed by **DKM Economic Consultants** and **RPS Consulting Engineers**

Supported by
SEAI Sustainable Energy Authority of Ireland

# Foreword by Tom Bruton, President, Irish Bioenergy Association	

I am pleased to introduce this, the first study of its kind, with a mandate to assess the socioeconomic benefits of developing the Bioenergy sector in Ireland over the coming years to 2020.

For some time there has been a need for a credible independent analysis of the investment required to develop the Bioenergy sector, the potential for job creation and the many positive socioeconomic benefits that accrue from switching from fossil fuels to indigenous sources of Bioenergy.

A key tenet of this work has been to use conservative, cautious and credible estimates. The Government 2020 projections were used as the baseline for the size of the various renewable energy sub-sectors, not-withstanding the fact there is potential to exceed these projections. Although agriculture will play a key role in delivering energy crops and farm residues for Bioenergy production, no net new employment is assumed in agriculture. The importation of a sizable part of the transport biofuels amount is built into the estimates. Also co-firing at a significant scale is only projected to happen at one of the three power plants presently fired with peat by 2020.

The study has confirmed the substantial economic benefits that can accrue by meeting the 2020 bioenergy targets, including:

- Over 3,600 new permanent jobs in the Bioenergy sector
- 1.5 billion direct investment in the sector
- 8,300 work years during construction and installation
- Sustain family farm incomes in Irish agriculture
- Reduce Ireland’s energy import bill by 7.5%
- Provide a secure and competitive energy source for Irish homes and business

A static policy environment has not been assumed. It is clear that there are still regulatory and policy barriers to overcome before the 2020 targets can be met, or indeed exceeded. There are also further opportunities which should not be missed, such as:

- To source more of our Bioenergy resources within Ireland and accrue the associated economic benefits.
- To develop export-led markets for Bioenergy resources and conversion technologies
- To create additional value-added products and industries based around biomass resources

I look forward to working with fellow members of IrBEA and other stakeholders in creating an environment where these projected jobs become real ones and where the Bioenergy sector supports a robust and sustainable economic growth in Ireland over the coming decades.

I would like to thank the independent consultants DKM and RPS Group for a professional service and completing the challenging project in the absence of good baseline economic data. The development of additional statistical reporting at national and regional level would be welcome to better understand the impact of policy initiatives to support Bioenergy.

I would especially like to thank my fellow steering group members (Joe O'Carroll, Noel Gavigan and Pearse Buckley) as well as the many members of IrBEA who contributed to this report. I gratefully acknowledge the funding received by Sustainable Energy Authority of Ireland to complete the project.

About the Irish Bioenergy Association

IrBEA (www.irbea.org) was founded in 1999. Its role is to promote the bioenergy industry and to develop this important sector on the Island of Ireland. The overall aim of IrBEA is to promote biomass as an environmentally, economically and socially sustainable indigenous energy resource, and also to promote its non-energy related benefits. The organisation is a self-governing association of voluntary members and is affiliated to Aebiom, the European Biomass Association. The geographical coverage of IrBEA is Northern Ireland and the Republic of Ireland.

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The Economic Benefits of the Development of Bioenergy in Ireland

January 2012

DKM ECONOMIC CONSULTANTS RPS

irbea irish bioenergy association

Extract Contents

Full Report available on www.irbea.org

Executive Summary

- This report, commissioned by the Irish BioEnergy Association (IrBEA) and the Sustainable Energy Authority of Ireland (SEAI), focuses on the potential economic benefits of developing the bioenergy sector in terms of employment creation, investment, trade and competitiveness.
- A two-stage approach has been adopted in undertaking this study. The first involved the development of a "technical" model of the sector to establish a baseline scenario of how the various targets under the EU's Renewable Energy Directive might be achieved and what this might mean in terms of the number and type of bioenergy facilities operating in Ireland by 2020.
- The technical model does exceed the various targets set; more detail can be found in Chapter 2.
- The industry has achieved a level of maturity through various policy supports. The technical model is based on the Government continuing to support the industry.
- The second stage involved the quantification of potential economic impacts. This was based on a combination of desk-top research of previous studies into the sector, information on facilities and projects that are already in place or planned nationally, and also from consultation with, and feedback from, market participants and industry experts. This approach was necessary because of the lack of comprehensive published information and statistics on the bioenergy sector.

Key Economic Indicators

- This study has confirmed that there are significant economic benefits that could be delivered as a result of the development of the bioenergy sector in Ireland.
- In total, it is estimated that almost **€1.5 billion** in direct investment in biomass processing infrastructure and equipment will be required over the period from 2011 to 2020 to deliver the output needed to meet the targets under RES-E, RES-H and RES-T.
- Of this, approximately 55% would be spent in the Irish economy (the balance being imported plant and equipment).
- In addition, once fully operational, almost €430 million (2011 money) would be spent annually on operating these facilities.
- In terms of employment, almost 8,300 work years would be generated throughout the domestic economy during the construction and installation of the various facilities required to deliver on the targets.
- Permanent ongoing employment generated by the sector would grow to over 3,600 FTEs by 2020. This includes employment in the facilities themselves, in supply industries and in the wider economy.
- These figures record the net or incremental employment impacts across the different sectors only. In some instances, for example, the net impacts may be relatively modest as they are to a large degree securing the employment associated with existing activities.

Impact on the Rural Economy

- A very significant proportion of the employment generated in the both the construction and operation of the bioenergy facilities and infrastructure will be in rural Ireland. Most of the facilities themselves will be based in rural areas, and most of the feedstock will be grown or produced there.

- The bioenergy sector can, therefore, offer farmers and other rural-based businesses new business opportunities and provide alternatives to traditional farming activities. Revenue generated from the production of bioenergy feedstocks or from the sale of energy produced from bioenergy can help to sustain farm incomes and, because the majority of this income will be spent locally, will help to maintain income and employment within the wider rural community.
- This will, in turn, contribute to sustaining rural communities and help deliver more balanced regional economic development.

Impact on Fuel Imports and Balance of Payments

- Security of energy supply is a critically important economic issue for an island nation such as Ireland.
- The production of bioenergy offers the opportunity to address energy import dependency (which currently stands at 90%) and also to protect against volatile oil and gas prices.
- In addition, by substituting for fossil fuel imports it will help to improve the country's balance of payment position.
- Ireland currently spends some €6.5 billion a year on imported gas, oil and coal. On the basis of the scenario outlined in this report, the bioenergy sector will contribute the equivalent of 850 ktoe per year by 2020. If this is domestically produced and is fully utilised, at today's prices, this would lead to a reduction in Ireland's import bill of €488 million a year. That is, Ireland's energy import bill would be reduced by approximately 7.5%.

Competitiveness

- The bioenergy sector also has the potential to contribute to Ireland's competiveness. This will depend in large part on the relative cost of producing bioenergy from the various sources, compared to the alternative of continuing to import conventional fossil fuels.
- While it would appear that, at least in the short-run, the cost of generating electricity from bioenergy sources will need to be supported through Feed In Tariffs (e.g. Renewable Energy Feed in Tariff – REFIT), usage of bioenergy for heating can reduce costs substantially for many Irish businesses (and Irish households).
- For example, the estimated saving from the use of biomass compared with gas oil in the 650 commercial and industrial boilers which are projected to be installed by 2020 is €208 million per year (in 2011 prices).
- Moreover, while the future path of fossil fuel prices is unknown, it is unlikely that they will return to the relatively low prices of a few years ago, and there is a strong possibility that they will continue to increase over the medium term as demand grows.
- The presence of a strong bioenergy sector in Ireland provides a valuable hedge against future energy price instability, as well as important security of supply benefits. Both of these will benefit Ireland's competitiveness.
- In addition, Ireland is legally obliged to meet the targets under the Renewable Energy Directive, and without the development of the sector and an appropriate supply base, Ireland will be forced to rely on imported bioenergy to meet the 2020 targets.
- Teagasc has warned that the price of imported bioenergy products is likely to increase substantially as 2020 approaches and Member States compete for resources to meet their targets. The development of an indigenous bioenergy sector and supply base will help to address these concerns and provide greater security of supply of energy to the Irish economy.
- While the overall economic benefit of this is difficult to measure, there would be a real economic cost if Ireland fails to meet the terms of the Renewable Energy Directive, as the European Court of

Justice can impose a range of fines on Ireland. These could be as high as €40 million per annum plus a lump sum fine (minimum €1.5 million).

Environmental Impacts

- The achievement of the biomass energy targets will also have a major impact on the environment by reducing Greenhouse Gas (GHG) emissions.
- It is estimated that the achievement of the targets will result in a saving of 3.14 million tonnes of CO_2 per annum by 2020. This is equivalent to roughly 5% of total GHG emissions in 2009, and would represent a significant contribution to the required reduction in GHG emissions to be achieved by 2020, under Ireland's international commitments.
- The value of the emissions reduction could be €94 million per annum by 2020, based on the level of carbon tax envisaged in the Government's *National Recovery Plan 2011-2014*.

Other Impacts

- While the development of the bioenergy sector in Ireland has the potential to support significant spending and employment creation in the domestic economy, a significant proportion is also expected to "leak" out of the economy in the form of imported equipment and professional services.
- There is, therefore, the potential for Ireland to secure an even greater share of the economic benefits through the development of a local supply base.
- This also offers an opportunity for the development and testing of new technologies, processes and skills, which could, in turn, be used to develop an export-focussed industry, as has happened in other countries.
- This will be dependent however on the growth of a critical mass of local activity in the bioenergy sector, as is envisaged under the baseline scenario presented here.
- The expectation under the baseline scenario is also that significant amounts of bioenergy will need to be imported to reach the required targets. Clearly, if this could be substituted by domestic production, further economic opportunities and benefits would accrue to Ireland.

Table 2.7 Technical Model Non-Imports Scenario

Facility	Technology / Size	Feedstock	Representative sizes	No. of facilities	Facility Electricity Output	Facility Heat Output	Biomass Contribution	Hours of Operation	Bioenergy Contribution to Electricity	Bioenergy Contribution to Heat	Bioenergy Contribution to Transport	TOTAL
UNITS			**Tonnes**		**MWe**	**MWth**	**%**	**hrs**	**ktoe**	**ktoe**	**ktoe**	**ktoe**
Biomass Heat Only	Domestic Boilers	100% Wood Pellet	5	14,000	0	0.015	100	1500	0.00	27.09		27.09
	Commercial Boiler	65% Wood Chip / 35% Pellet	379	450	0	0.4	100	3500	0.00	54.18		54.18
	Industrial Boiler	80%Wood Chip / 20% Pellet	4,245	200	0	2	100	7500	0.00	258.00		258.00
Biomass CHP	Small	100% Wood Chip	7,916	15	1	1.9	100	7500	9.68	18.38		28.06
Biomass CHP	Large	100% Wood Chip	63,325	5	8	15.2	100	7500	25.80	49.02		74.82
Biomass to Power	Large	100% Wood Chip	400,000	1 or more	55	0	100	7500	35.48	0.00		35.48
Poolbeg, Dublin	Incineration CHP	Municipal solid waste (MSW)	600,000	1	60	55	65	7500	25.16	23.06		48.21
Carranstown, Meath	Incineration Power Only	Municipal solid waste (MSW)	200,000	1	22	0	65	7500	9.22	0.00		9.22
Edenderry	Power only	100 kt willow, 10kt miscanthus, 100kt sawmill residue, 100kt forestry residue, 190kt dry materials (wood pellet, almond shell etc.)	500,000	1	117.5	0	50	7400	37.39	0.00		37.39
AD on-farm small	AD-CHP	1/2 grass silage, 1/2 slurry	13,825	30	0.25	0.25	100	7500	4.84	4.84		9.68
AD on-farm medium	AD-CHP	1/2 grass silage, 1/2 slurry	27,650	30	0.5	0.5	100	7500	9.68	9.68		19.35
AD on-farm Large	AD-CHP	1/3 grass, 1/3 slurry, 1/3 OFMSW/food waste	39,512	10	1	1	100	7500	6.45	6.45		12.90
Centralised AD	AD-CHP	1/2 Slaughter Waste, 1/2 OFMSW/food waste	24,518	4	1	1	100	7500	2.58	2.58		5.16
Municipal Sewage AD	AD-WWTP	Onsite Waste Water	215,000	4	1	1	100	7500	2.58	2.58		5.16
Landfill Gas	Small	Onsite Landfill	0	10	1.5	0	100	4000	5.16	0.00		5.16
	Large	Onsite Landfill	0	5	5	0	100	4000	8.60	0.00		8.60
Biomethane	**Technology**	**Feedstock**	**Representative sizes**	**No. of facilities**	**Biomethane Production per Facility (m3)**			**Total Biomethane Production (m3)**		**Bioenergy Contribution to Heat**		
AD on-farm Large	Biomethane for Injection	29,000 t grass silage, 21,000 t slurry	50,000	5	1,986,893			9,934,463		8.97		8.97
Centralised AD	Biomethane for Injection	1/2 Slaughter Waste, 1/2 OFMSW/food waste	50,000	5	4,167,725			20,838,625		18.81		18.81
Biofuels	**Technology**	**Feedstock**	**Representative sizes**	**No. of Facilities**	**Output**	**Energy per litre**	**Biofuel Output**				**Bioenergy Contribution to Transport**	
UNITS			**Tonne/yr**		**Million Litres**	**MJ/L**	**MWh**				**ktoe**	
Bioethanol												
Carbery Plant , Cork	Fermentation	Cheese Whey	30,000	1	10.5	21.2	61,838				5.32	5.32
Further Facilities	Fermentation	Wheat & Sugar Beet	700,000	1	120	21.2	706,723				60.78	60.78
Biodiesel												
Green Biofuels, New Ross	Esterification	Rapeseed oil, Tallow and RVO	25,500	1	30	32.8	273,355				23.51	23.51
Further Facilities	Esterification	Rapeseed oil, Tallow and RVO	102,000	1	120	32.8	1,093,421				94.03	94.03

TARGETS for BIOENERGY	TFC (ktoe)	% of TFC from Bioenergy	(ktoe) from Bioenergy
Electricity	2,613.2	2.0	52.3
Thermal	4,389.0	9.6	421.3
Transport for RES-T	4,257.0	3.0	127.7
TOTAL	**12,123.2**	**5.0**	**601.3**

	Bioenergy Contribution to Electricity	Bioenergy Contribution to Heat	Bioenergy Contribution to Transport	TOTAL
Bioenergy Target	52.3	421.3	127.7	601.3
Bioenergy Target % of TFC	2.0	9.6	3.0	5.0
Bioenergy Total	182.60	483.63	183.64	849.87
Bioenergy Achieved %	**7.0**	**11.0**	**4.3**	**7.0**
Biofuels Imports			199.49	
Bioenergy Total plus imports	183.24	483.63	383.13	1050.00
Bioenergy Achieved %	7.0	11.0	9.0	8.7

Section 4 Economic Impacts

The development of the Irish bioenergy sector offers a significant opportunity to address Ireland's challenging targets on renewable energy, emissions reductions and waste management. Over and above these, however, this study has confirmed that there are also significant economic benefits that could be delivered as a result of the development of the sector.

It will, however, require a significant capital investment in a wide range of bioenergy infrastructure if these targets are to be achieved. In total, it is estimated that almost €1.5 billion in direct investment in biomass processing infrastructure and equipment[1] will be required over the period to 2020 to deliver the output needed to meet the targets under RES-E, RES-H and RES-T.

This investment will deliver the following energy outputs, by 2020:

Table 4.1: Domestic Contribution of Biomass to Ireland's Energy Demand, 2020 (kTOE)

	Bioenergy Contribution to RES-E	Bioenergy Contribution to RES-H	Bioenergy Contribution to Res-T	Bioenergy Total Contribution
Biomass Heat Only		339.3		339.3
Biomass CHP	71.0	67.4		138.4
Waste to Energy	34.4	23.1		57.4
Co-firing	37.4	0.0		37.4
Anaerobic Digestion	23.5	23.5		47.1
Municipal Sewage	2.6	2.6		5.2
Landfill Gas	13.8	0.0		13.8
Biomethane		27.8		27.8
Biofuel			183.64	183.64
Total	**182.6**	**483.6**	**183.6**	**849.9**

If this is delivered, it will also generate significant economic impacts across a range of sectors. These are summarised in the following tables.

[1] This does not take account of the investment that will be required in the production of energy crops etc.

Table 4.2 : Summary of Investment in Bioenergy Infrastructure and Annual Spend in 2020							
	Investment (€ million)			Investment (€ million)			O&M Expenditure
	Total Cumulative Installed Capacity by 2020			2012-2020			Total
	Total	Domestic	Imports	Total	Domestic	Imports	Annual € million
Biomass (heat)	**373**	203.1	169.7	**276.4**	150.4	126.0	**130.2**
CHP	**325**	227.4	97.5	**285.9**	200.1	85.8	**82.0**
Co-Firing	**5**	5	0	**5**	5	0	**15.5**
WtE	**515**	206	309	**375**	150	225	**17**
AD/Biomethane	**332**	166	166	**332**	166	166	**23.3**
LFG	**60**	30	30	**10**	5	5	**2.8**
MSG	**12**	6	6	**0**	0	0	**0.6**
Biofuels	**246**	171.85	73.65	**198.9**	139.2	59.7	**155.7**
Total	**1,867**	**1,015.35**	**851.85**	**1,483.2**	**815.7**	**627.2**	**427.1**

As indicated in Table 4.2, total investment in bioenergy infrastructure could reach almost €1.5 billion (2011 money) over the period from now to 2020, of which approximately 55% is expected to be spent in the Irish economy (the balance being imported plant and equipment).

In addition, once fully operational, it is estimated that some almost €430 million (2011 money) would need to be spent annually on operating these facilities.

In terms of employment, (Table 4.3) it is estimated that almost 8,300 work years would be generated throughout the domestic economy during the construction and installation of the various facilities required to deliver the targets. Again, the focus is on the potential impact on employment associated with investment in the sector over the period from 2012 to 2020. It also only focuses on the impact of capital investment in the domestic economy only.

Permanent ongoing employment generated by the sector would grow to over 3,600 FTEs by 2020. This includes employment in the facilities themselves, in supply industries and in the wider economy. These figures record the net or incremental employment impacts across the different sectors. In some instances, for examples, the net impacts may be relatively modest as they are simply displacing the employment associated with existing activities.

Table 4. 3: Summary of Employment Impacts – Temporary and Permanent								
	Employment Construction and Installation – Temporary Work Years 2012-2020				Employment Operations – Permanent Full Time Equivalents			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Biomass (heat)	100	43	57	**200**	162	236	191	**589**
CHP	1,137	464	640	**2,242**	187	268	228	**683**
Co-Firing	29	11	16	**56**	0	185	93	**278**
WtE	855	345	480	**1,680**	110	165	431	**706**
AD/Biomethane	1,250	504	702	**2,456**	204	165	368	**737**
LFG	37.5	15.5	21	**74**	36	25	95	**156**
MSG	0	0	0	**0**	13	9	35	**57**
Biofuels	791	323	445	**1,559**	147	118	135	**400**
Total	**4,200**	**1,705**	**2,361**	**8,267**	**859**	**1,171**	**1,576**	**3,606**

Tables 4.4 and 4.5 outline what these economic impacts mean in terms of energy output (kTOE). The figures for co-firing have not been shown as the net or incremental economic impacts were found to be relatively minor as a result of substituting biomass for peat).

As can be seen, there are significant differences in both the investment and labour intensity between the different fuel types. Again it is important to note that the figures presented in this report focus on the “incremental” or additional impacts of the bioenergy sectors and therefore, where biomass is replacing existing fuels, the impacts will be reduced. In contrast, in the case of Waste to Energy, the full costs of constructing and operating the two WtE facilities, as well as the full employment impacts have been taken into account, even though energy production from biomass is only part of the plants overall function.

Table 4.4 : Investment and Annual Spending Multipliers		
	Total Cumulative Investment in Installed Capacity	O&M Spending
	€ 000 Per ktoe Output Per annum	€000 Per ktoe Output Per Annum
Biomass (heat)	1,099	384
CHP	2,347	592
WtE	8,972	296
AD/Biomethane	4,433	311
LFG	4,348	203
MSG	2,308	115
Biofuels	1,337	848

Table 4.5 : Employment Multipliers by Category				
	Construction Employment /Installation– Temporary Work Years 2012-2020		O&M Employment - Permanent	
	Per ktoe annual Output	Per €mn invested (2012-2020)	Per ktoe annual Output	Per €mn invested (Cumulative Installed Capacity)
Biomass (heat)	0.6	0.7	1.7	1.6
CHP	16.2	7.8	4.9	2.1
WtE	29.3	4.5	12.3	1.4
AD/Biomethane	32.8	7.4	9.8	2.2
LFG	5.4	7.4	11.3	2.6
MSG			11.0	4.8
Biofuels	8.5	7.8	2.2	1.6

Impact on the Rural Economy

A very significant proportion of the employment generated in the both the construction and operations of the bioenergy sector will be in rural Ireland. Most of the facilities themselves will be based in rural areas, and most of the feedstock will be grown or produced there. Indeed, with the exception of the WtE facilities and some of the LFG and sewage gas facilities, the vast majority of the employment impacts will be in rural areas. This will in turn make a significant contribution to sustaining rural communities.

As highlighted by the Irish Farmers Association (IFA) in their policy document on Ireland's Land-based Renewables Strategy[2] the development of the bioenergy sector offers major opportunities for Ireland's agricultural community. Agricultural crops, as well as farm by-products such as animal manures, have the potential to become a valuable and reliable source of energy. These in turn will allow farmers to reduce their energy costs and generate income from the sale of biomass products or from selling electricity or gas to the national grid. The renewable energy sector can offer farmers new business opportunities and provide alternatives to traditional farming activities. Revenue generated from renewable energy on the farm can help to sustain farm incomes and, because the majority of this income will be spent locally, will help to maintain income and employment within the wider rural community. As the bioenergy sector becomes more established, new opportunities will emerge in the supply chain which will help to create employment opportunities in harvesting, processing, transportation, and installation and maintenance.

Moreover, while an analysis of the spatial distribution impacts of the development of the bioenergy sector is outside the scope of the current study, it is clear given the location of forestry resources and the potential location of energy crop production that the development of the sector could also contribute to delivering more balanced regional economic development.

Impact on Fuel Imports and Balance of Payments

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[2] IFA, Ireland's Land Based Renewables Strategy, April 2011.

Security of energy supply is a critically important economic issue for an island nation such as Ireland. This has been noted consistently by the National Competitiveness Council (NCC) in its annual reports on Ireland's competitiveness. In the latest report the NCC again pointed to the fact that since the mid-1990s energy import dependence has grown significantly in Ireland, due to an increase in energy use and a decline in indigenous natural gas and peat production.

Ireland's overall import dependency now stands at 90% - which compares unfavourably with the EU-15 average of 56%.[3] The report also points to the fact that Ireland's share of energy derived from renewable resources, while growing quickly, is still only half the OECD average.[4]

While the global recession has slowed down the growth in world demand for oil, upward pressure on prices is expected to continue. Indeed, the ESRI in its Review of Irish Energy Policy[5] notes that

> *"there is little prospect of a return to low oil prices in the immediate future and further upward pressure on prices can be expected in the face of a prolonged world recovery. Temporary shocks, such as the current unrest in the Middle East, can also put prices under pressure".*

This exposes Ireland to a major risk of disruption which would significantly damage domestic economic activity. While some progress has been achieved in relation to the development of alternative renewable energy resources, to date this has focused heavily on the development of on-shore wind, which is unpredictable relative to bioenergy. The production of bioenergy using a range of technologies and exploiting Ireland's extensive indigenous resources, therefore, offers the opportunity to address import dependency and also to protect against volatile international oil and gas prices.

Moreover, Ireland is legally obliged to meet the targets under the Renewable Energy Directive. Without the development of the sector, and an appropriate supply-base, Ireland will be forced to rely on imported bioenergy to meet the 2020 targets. Teagasc has warned that the price of imported bioenergy products is likely to increase substantially as 2020 approaches and many Member States compete for material to meet their targets. In addition, they point to the fact that imports will largely have to come from outside the EU, in which case sustainability, security of supply and fluctuating prices are likely to be recurring issues.

The development of an indigenous bioenergy sector and supply base will help to address these concerns and provide greater security of supply of energy to the Irish economy. The economic benefit of this is difficult to measure, since it relates to the risk of something occurring or not occurring, the probability of which is uncertain. However, there is an economic impact if Ireland fails to meet the terms of the Renewable Energy Directive. The European Court of Justice can impose a range of fines on Ireland that can be as high as €40 million per annum plus a lump sum fine (minimum €1.5 million)[6].

In addition, by substituting imports it will help to improve the country's balance of payment position. Ireland currently spends some €6.5 billion a year on imported gas, oil and coal. The scenario outlined in this report indicates that the bioenergy sector has the potential to contribute the equivalent of 850 ktoe a year by 2020. On the basis that all of this is domestically produced and is fully utilised, at

[3] National Competitiveness Council: Annual Competitiveness Report 2010. http://www.competitiveness.ie/publications/featuredpublications/title,7075,en.php

[4] In addition, Ireland is among the highest carbon emitters in the OECD on a per capita basis, driven by significant increases in transport emissions over the last two decades.

[5] http://www.esri.ie/UserFiles/publications/RS21.pdf

[6] The annual figure of €40 million would apply for a serious breach of community law that had persisted for at least 2 ½ years subsequent to a European Court of Justice judgement.
http://ec.europa.eu/eu_law/docs/docs_infringements/sec_2010_923_en.pdf

today's prices, this would lead to a reduction in Ireland's import bill of €488 million a year[7]. That is, Ireland's energy import bill would be reduced by approximately 7.5%.

Competitiveness

The manifold competitiveness challenges facing the Irish economy are, as stated above, highlighted in the annual report of the National Competitiveness Council.

Particular issues exist with respect to energy. The ESRI's report on Irish Energy Policy notes that, against the backdrop of prolonged sluggishness in world economic growth, intense pressure is being put on the competitiveness of the Irish economy:

> "*Economic recovery requires a substantial reduction in the domestic price level relative to that of competitors. This enhances the need for policy to minimise the cost of energy for the economy*."[8]

The degree to which the bioenergy sector can contribute directly to Ireland's competiveness will depend in large part on the relative cost of producing bioenergy from the various sources, compared to the alternative of continuing to import conventional fossil fuels or of importing biofuels.

While it would appear that, at least in the short-run, the cost of generating electricity from bioenergy sources will need to be supported under the REFIT regime, usage of bioenergy for heating could reduce costs substantially for many Irish businesses (and Irish households).[9] The following table, for example, shows the relative cost of energy from different fuel types for commercial and industrial users. These figures are taken from the SEAI's regular publication "Fuel Cost Comparison"[10] and serve to illustrate the potential cost reduction that could be achieved for some commercial and industrial users from a switch from conventional fuels to biomass.

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[7] On the basis that, at the margin, all replaced fuel is imported. One tonne of crude oil equals 7.3 barrels of oil. Closing spot price for Brent Crude on 28th September 2011 is USD106.74 (Bloomberg), while the spot exchange rate to Euros on 28th September 2011 is 1.3631 (European Central Bank http://www.ecb.int/stats/exchange/eurofxref/html/index.en.html).
852 x 1,000 x 7.3 x 106.74 ÷ 1.3631 = €487.8 million.

[8] ESRI: Op cit.

[9] The REFIT scheme is funded through the Public Service Obligation (PSO) charged to all electricity consumers.

The Commission for Energy Regulation ('CER') calculates and certifies the costs associated with the PSO, including each of the relevant PSO schemes, and sets the associated levy for the required period. See for example, http://www.cer.ie/en/renewables-current-consultations.aspx?article=15340173-5b39-4c82-bb93-a123dd3245fc
Information on the potential impact of the biofuels obligation scheme can also be found at http://www.dcenr.gov.ie/NR/rdonlyres/771EE392-06E0-4B59-888D-E160FF10CD4B/0/EnergyBiofuelObligationandMiscellaneousProvisionsBill2010RIA.pdf

[10] http://www.seai.ie/Publications/Statistics_Publications/Fuel_Cost_Comparison/

Table: 4.6: Comparison of Energy Costs: Commercial/Industrial Fuels (July 2011)		
Fuel	**Form**	**Delivered Energy Cost Cent/kWh**
Coal	Industrial Fines	0.71
Oil (inc. Carbon tax)	Gas Oil Light Fuel Oil Medium Fuel Oil Heavy Fuel Oil	9.16 8.31 8.09 7.83
LPG (inc. Carbon tax)	Commercial Cylinders Bulk LPG (0-3 tonnes) Bulk LPG (3.1-40 tonnes)	13.95 11.33 10.33
Natural Gas (inc. Carbon tax)	Band I1 <1000 GJ per annum Band I2 >=1000<10000 GJ per annum Band I3 >=10,000<100,000 GJ per annum Band I4 >=100,000 <1 million GJ per annum	4.71 4.25 3.48 2.68
Electricity	Band IA <20 MWh per annum Band IB >=20<500 MWh per annum Band IC >=500<2,000 MWh per annum Band ID >=2,000<20,000 MWh per annum Band IE >=20,000<70,000 MWh per annum	19.32 15.25 12.75 9.76 9.01
Wood	Fuel Chips (35% moisture) Pellets Bulk Delivery Pellets Bagged	3.10 4.45 5.26

Source: SEAI

If, for example, it is assumed that the 400 commercial and 250 industrial biomass boilers which are projected to be installed by 2020 replace gas oil boilers, then the potential saving in terms of fuel costs is in the order of €208 million.[11] [12]

Moreover, while the future path of fossil fuel prices is unknown, most commentators agree that it is unlikely that they will return to the relatively low prices of a few years ago, and there is a strong possibility that they will continue to increase over the medium term as demand grows.

In this context, the presence of a strong bioenergy sector in Ireland provides a valuable hedge against future energy price instability, as well as important security of supply benefits. Both of these will benefit Ireland's competitiveness.

Environmental Impacts

The key environmental impact of the achievement of the biomass energy targets is the reduction in Greenhouse Gas (GHG) emissions as a result of the replacement of fossil fuels. Table 4.8 overleaf

[11] This is based on the relative cost per kWh of energy delivered – taking account of the assumptions about the relative use of woodchip and pellets contained in the baseline case. It is recognised that the savings would be significantly less if biomass was replacing natural gas (of the order of €7 million), or more if biomass was replacing electricity or LPG but given the fact that many areas of the country are not connected to the natural gas network, and the relative costs of the different fuels, the switch from gas oil to biomass seems the most likely scenario.

[12] Feedback from suppliers indicates that the annual cost saving could be as much as 66% or €84,600 for a commercial boiler and €906,800 for an industrial boiler.

sets out the calculations. We estimate that the achievement of the targets will result in a saving of 3.14 million tonnes of CO_2 per annum by 2020 and Table 4.7 below summarises the CO_2 reduction by category. This represents roughly 5% of total GHG emissions in 2009, and will represent a very significant contribution to the required reduction in GHG emissions to be achieved by 2020, under Ireland's international commitments.

Table 4.7 : CO_2 Avoided by Category (Per Annum)

	CO_2 Avoided '000 Tonnes	Fuels replaced
Biomass (heat)	1,254.9	Heating Oil (gasoil)
CHP	511.7	Heating Oil (gasoil)/Natural Gas
Co-Firing	138.3	Peat
WtE	212.4	Natural Gas
AD/Biomethane	276.9	Heating Oil (gasoil)/Natural Gas
LFG	50.9	Natural Gas
MSG	19.1	Natural Gas
Biofuels	679.2	Petrol/Diesel
Total	**3,143.4**	

One can place an economic value on this reduction in emissions by reference to the carbon tax avoided. The carbon tax in Ireland as of Budget 2012 is €20/tonne. At this rate, the value of the emission reduction would be €63 million per annum[13]. The Government's *National Recovery Plan 2011-2014*, published with Budget 2011[14], envisages the carbon tax doubling to €30/tonne by 2014. This would increase the value of the GHG emission avoided to would increase this value to €94 million per annum.

Other Economic Impacts

As demonstrated above, the development of the bioenergy sector in Ireland has the potential to support significant spending and employment creation in the domestic economy. Nevertheless, a significant proportion of this expenditure - mainly in terms of capital investment - is expected to be incurred on imported equipment and professional services.

There is, therefore, the potential for Ireland to secure an even greater share of the economic benefits through the development of a local supply base. The development of the sector could also offer an opportunity for the development and testing of new technologies, processes and skills, which could, in turn, be used to develop an export-focussed industry, as has happened in other countries. This will be dependent however on the growth of a critical mass of local activity in the bioenergy sector, as is envisaged under the baseline scenario presented here.

The expectation under the baseline scenario is also that significant amounts of bioenergy will need to be imported to reach the required targets. Clearly, if this could be substituted by domestic production, further economic opportunities and benefits would accrue to Ireland.

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[13] Note that the proportion of this saving that relates to heat only biomass is already included in the economic saving calculated under the Competitiveness heading above.
[14] http://www.budget.gov.ie/The%20National%20Recovery%20Plan%202011-2014.pdf

Table 4.8: GHG Emissions Avoided 2020									
	Based on Final Energy Demand (note 2)						Based on Primary Energy Demand (note 2)		
	RES-E kTOE	**RES-H kTOE**	**Res-T kTOE**	**Total KTOE**	**%age split**	**Total GWh**	**Total GWh**	**GHG Emissions Tonnes per GWh**	**Total GHG Emissions Avoided '000 Tonnes**
Total Biomass energy output	181	484	184	850		9,882	11,999		
Fuel Replaced									
Natural Gas	145	26		171	20.1%	1,987	3,368	206	692.5
Heating Oil (gasoil)		458		458	53.9%	5,325	5,325	264	1,405.4
Diesel			118	118	13.8%	1,367	1,367	264	360.7
Petrol			66	66	7.8%	769	769	252	193.6
Peat	37			37	4.4%	435	1,170	420	491.3
Total	**181**	**484**	**184**	**850**	**100.0%**	**9,882**	**11,999**		**3,143.4**
%age of total	21.5%	56.9%	21.6%	100.0%					

Notes:

1. Heat from municipal sewage AD and Waste to Energy is assumed to replace natural gas. All other heat energy is assumed to replace heating oil. All electricity with the exception of peat co-firing is assumed to replace natural gas, as the marginal fuel source in the powergen system.
2. Final energy demand is the total GWh of output or useful energy, while primary energy demand relates to the input energy. This relates specifically to electricity, whereby energy is lost in the conversion of primary fuels to electricity, depending on the conversion efficiency. Displaced natural gas and peat in electricity production are assumed to have conversion efficiencies of 55% and 37.2% respectively.

Sources:

http://cmt.epa.ie/Global/CMT/emission_factor_sources.pdf

http://erc.epa.ie/safer/downloadCheck.jsp?isoID=21&rID=10174&atID=2268

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