# BioPAD

Bioenergy Proliferation and Deployment

Case Study Policy Analysis

Northern Periphery Programme 2007–2013

Innovatively investing in Europe's Northern Periphery for a sustainable and prosperous future

European Union
European Regional Development Fund

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## Preface

The BioPAD project aims to improve our understanding of the links between supply and demand by looking at supply chains for a variety of bioenergy fuels and different ways of converting these fuels into sustainable energy. Understanding the supply chains and the ways bioenergy moves from fuel source to energy provision will help the establishment of robust and efficient supply services which can match local demand.

BioPAD is led by the Western Development Commission www.wdc.ie (Ireland) and is funded under the ERDF Interreg IVB Northern Periphery Programme (NPP) http://www.northernperiphery.eu. It has partners in Scotland (Environmental Research Institute, UHI http://www.eri.ac.uk/), Northern Ireland (Action Renewables http://www.actionrenewables.org/) and Finland (Finnish Forest Research Institute, Metla http://www.metla.fi/).

# Case Study Policy Analysis

## Background

The BioPAD bioenergy case studies have been an important part of the project. Case studies were prepared in each partner region, to provide examples of different bioenergy development issues and different supply chain solutions. Including examples from Rep. of Ireland, Northern Ireland, Scotland, Finland, and Iceland, the case studies provide important lessons and solutions regarding supply chain issues, and highlight the factors that drive bioenergy developments. This document provides a summary of the key policy features of each case study.

For the full case studies report, please access www.BioPAD.eu/case-studies.

In addition, the project organised a visit to Gussing in Austria, for partners and collaborative partners. The purpose of the visit was to see how Gussing had used policy initiatives to develop its bioenergy strategy. Gussing was selected as an appropriate place to visit, for Biopad policy learning, for the following reasons.

1. It is an exemplary success story of bioenergy development.
2. The project has evolved over a long period time, and the factors which have made it successful are clearly identifiable.
3. For those involved in Bioenergy Policy formulation and delivery, it is inspirational, showing the tremendous benefits that can accrue, if the policy framework is favourable.
4. The success factors which were identified, are dependent upon both natural resources, and careful policy development.

## Policy implications

- **Aligning the strategic vision of the project with the strategic objectives of the EU, thereby maximising the financial support available.**
- **Establishing the European Centre for Sustainable Energy provided a mechanism to focus attention on Gussing and to raise the profile of the scheme.**
- **Utilise and build on, what natural resources are present in the region. In this case wood in Burgenland.**
- **Integrate the education and training needs of the region with the output from the project.**
- **Recognise the value of the spin-off that can be achieved from developing complementary products and services.**
- **Sound and continuous political support for the project was instrumental in securing funding and support for the project.**
- **Using the success of the project to develop a related tourist industry.**
- **Valuing and demonstrating the value to the area, in terms of job and wealth creation.**
- **Ensuring that the needs of the local community are met and are aligned with the objectives of the project.**

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## Brook Hall Estate

Brook Hall Estate is located in Derry in Northern Ireland and owned by the Gilliland Family. The first renewable heating system was installed in 1988. The 300kW boiler cost £20,000 to install and generated savings of £6000 per year. The system was installed without grant aid or RHI (Renewable Heating Incentive), with a payback time of just over three and a half years.

The farm is 200ha in size, which includes: 120 ha willow coppice, 40 ha Cereals, 20 ha Grass and 20 ha Arboretum, Walled Garden and Woodlands. The award winning farm is now operated by Dr John Gilliland who has a holistic approach to his farm's bioenergy production.

The Brook Hall Estate has five biomass installations and one hybrid solar thermal system installed. All heat for the farm, the farm houses, and driers now comes from a 300kW big bale boiler and 100kW KWB boiler, using the under and oversized woodchip, from the woodchip grading process. All electricity is wind electricity. Work continues with AFBI assistance to reduce the heat and electricity inputs.

## Policy implications

- **Early adopters should not be penalised, for innovating before subsequent support measures are introduced.**
- **Capital grants for equipment are usually more appropriate for an immature market.**
- **Ongoing tariff support or heat incentives are more appropriate for a mature market.**
- **Bioenergy policy tends to be cross cutting across several Government Departments, including Agriculture, Environment and Energy. It needs cross departmental co-ordination.**
- **Biomass can be used for both heat and electricity generation.**

## AFBI Northern Ireland

Agri-Food and Biosciences Institute is a leading provider of scientific research and services to government, non-governmental and commercial organizations. Their focus in the field of Anaerobic digestion has been in performance of on-farm AD using dairy cow slurry, research methods for improving performance, research post AD treatments of digestate, determining the value of digestate as a biofertiliser and determining the lifecycle benefits of AD.

In Northern Ireland there is 777 000 ha of grassland (93% of total farmland, excluding hill and rough pasture). 10 Million tonnes of manure is potentially available which is equivalent to approximately 37 MW of continuous electricity (4% of requirement).

Northern Ireland had 134 planning applications of AD in 2013. Of those applications 86 have been approved and around 10 are operational. The biggest driver for the development has been government policy on renewable energy. When comparing to forestry, Northern Ireland has 86,000 ha of forested land (6%) therefore the AD from Agricultural residues is playing a crucial role in Northern Ireland.

AFBI has 300 dairy cattle, one single stage mesophilic system and range of feedstock e.g. silages. They have future plans to expand with a second stage digester and additional pre-treatment systems. AFBI also own Renewable Energy Centre who have their own biomass plantation (willow), PV panels, Biogas and CHP boiler, district heating and gas transfer facilities. It is estimated that approximately 50% of the energy usage at the AFBI, Hillsborough site will be derived from renewable energy within the future.

### Policy implications

- **This was incentivised initially by a dedicated fund for bioenergy development in Northern Ireland.**
- **It was promoted as a flagship project for the agricultural sector in Northern Ireland.**
- **Later AD plants, in Northern Ireland, were incentivised under the Renewable Obligations support scheme, but relied significantly on the expertise that had been built up at AFBI.**
- **The structure of the funding for this project de-risked some of the issues.**
- **Policy needs to recognise the value that research can contribute, at an early stage of market development.**
- **Policy needs to recognise the value of demonstration projects.**

## Iceland Forestry Development

The Icelandic forest service owns a sawmill in Hallormstadur, but wood size and quality are enabling only minor part of removal to be processed for lumber. Heat entrepreneurship has challenges in Iceland - like anywhere else. Competing energies are relatively cheap, especially electricity, although Hallormastadur has no geothermal heat available. New ferrocilicium industry needs fresh wood to its processes, but harvesting costs are high. Nevertheless, a new wood energy scheme is currently under planning in Grimsey Island, which is the only place in Iceland heated and powered by oil.

### Policy implications

- **Long term policy commitment from the Government, lead to reforestation that would otherwise not have taken place.**
- **Strong support for research element of policy development was critical.**
- **Using expertise and knowledge from outside the country to find sustainable solutions that are appropriate for Iceland.**
- **Co-ordinated policy development between the forestry and energy department to achieve a common goal.**

## Fortum Joensuu – Value adding by producing bio-oil from wood

In year 2000 installed fluidized-bed boiler and older heating plant unit are currently producing 95 % of the district heat need in Joensuu. This CHP unit is mainly using wood and peat as raw material and the production capacity is 50 MW for electrical power, 110 MW district heating power and 30 MW in separate heating plant unit.

In November 2013, fast-pyrolysis unit was integrated to the existing CHP- unit and is estimated to produce 50 000 tons per year bio oil (pyrolysis oil). After the installation the wood required increased from 300 000 cubic meters to 600 000 cubic meters annually. The new fast pyrolysis technology based bio-oil plant is the first of its kind in the world on an industrial scale.

One example is the pyrolysis oil plant in Joensuu which opened in November 2013. The plant is integrated to an existing CHP plant that provides district heating for Joensuu. In Joensuu, de-limbed stem wood is ground and dried to 10 % moisture content. This wood dust is mixed in a reactor with sand and gas stream that is separated from the 800 Celsius degree fluidised bed boiler. The wood dust changes to gas and carbon. Gas is separated from the sand-carbon mixture in its own separator, the gas is cooled to liquid. The carbon is combusted in the CHP boiler together with other fuel.

### Policy implications

- **Reliance on natural resources to add value downstream.**
- **Good example of a country which has a large wood resource to innovate, with a new technology.**
- **Good example of cascading, i.e. prioritising the use of wood.**
- **A strong, integrated supply chain which is suitable for the environment.**
- **Policy has been built on analysing the strengths and weaknesses of the entire supply chain and providing intervention where it is most needed.**
- **Supply and demand issues have been considered as part of the entire solution.**
- **Unusually (for a mature bioenergy market) there is capital support for the plant itself. This is because of the scale and innovative nature of the project.**

## Kuhmo – the perfect example of integration of bioenergy production and timber business

From 2008 to 2010 Kuhmo Lämpö Oy and Kuhmo Oy invested a total of 15 million euros in a new boiler, combustion gas heat recovery system, belt dryer and briquetting lines. A subsidy from the Ministry of Economy and Employment covered 25 % of the cost of the combustion gas heat recovery system.

The majority of buildings in the centre of Kuhmo are connected to the district heating network, with a total length of 28km. The total volume of buildings with district heating is more than 770 000 m3 including municipal (town hall, school, etc.) and privately owned buildings and residences.

Timber production: Kuhmo Oy (sawmill) founded in 1955, is the largest forestry company in Kainuu and it is privately owned. The company is a timber expert, using the latest sawing technology. It provides employment for 135 people.

Energy Production: Kuhmon Lämpö Oy (Energy Company) produces energy for Kuhmo Oy, district heat for the municipality of Kuhmo and electricity for the national grid using three boilers with an efficiency of 18, 12 and 10 MW, 246 GWh of wood-based fuel, and 0.7 GWh of heavy oil. Fuel handling employs three employees around the clock.

### Policy implications

- **Value of strong local policy initiatives that address local issues.**
- **Good example of cascading, i.e. prioritising the use of wood.**
- **Innovative policy solution to what was an issue of oversupply**
- **Integrated policy solution for a remote region**

## Kuittila farm, Small-scale CHP production: Toward self-sufficiency and lower costs

Kuittila farm, located in Nurmes, established a small-scale heat and power production (CHP) plant in December 2012. The aim is to reduce the energy cost, improve the security of energy supply and eventually become self-sufficient.

A company, Kuittila Power Ltd., was established to provide energy for the farm and co-located engineering works. In the Pielinen Karelia context, the farm is rather large having

160 dairy cows, the same number of young cattle and two milking robots. The CHP plant is based on the gasification of wood chips. The Volter 40 CHP plant with 140 kW (40 kW electricity and 100 kW heat) can produce annually up to 1200 MWh of energy. Woodchips are gasified to process gas (incl. CO, H2, CH4) that is used in a combustion engine (AGCO Sisu Power). The plant uses annually about 1400 loose cubic of wood chips that are dried by using natural drying and excess heat from the plant.

### Policy implications

- **Innovative solution, to what appeared at first, to be a situation without the possibility of financial support.**
- **Funding eventually came from TEM (Ministry of Employment and the Economy).**
- **Financial support for energy harvesting, which was a factor in making the scheme viable, may be withdrawn**
- **In this project the entrepreneur/developer found the capital grant preferable to a tariff payment option.**
- **Favourable taxation regime for this scale of development.**
- **Less rigorous environmental regime for development of this scale.**
- **Finnish policy regime does not support decentralised electricity production.**

## Sabhal Mòr Ostaig

We made a comparison of the likely GHG emissions resulting from the transport of either a. wood chips from Tormore forest, or b. wood pellets from Invergordon, to the Kilbeg village site of SMO.

The energy demand which is required to be met from biomass is 76 000 kWh per year, which could met through the annual provision of 20 540kg of local wood chips, or 16 170 kg wood pellets transported 102 miles from Invergordon to SMO.

Our report estimated the supply of wood chips rather than wood pellets to SMO would save over 800 kg CO2e from transportation per year, and after 25 years, the total emissions saved would exceed 20 000 kg CO2e (equivalent to the yearly CO2e emissions of 4 UK households). The GHG emissions associated with the delivery of wood chips to SMO are approximately 6.4% of that associated with the delivery of wood pellets from Invergordon.

### Policy implications

- **There are no incentivisation schemes to encourage reduced carbon footprints.**

## Wick district heating scheme

The Wick district heating scheme, located in the Highlands region of Scotland, uses locally sourced woodchip to generate heat by combustion, supplying steam to Pulteney Distillery and providing heating to around 200 homes and public buildings in the area. Its main objective was to use a renewable fuel source to lower fuel poverty in households predominantly heated using electric storage, coal, gas, or oil.

The original district heating scheme aimed to deliver heat and electricity using an experimental gasification plant. This high risk technology failed during commissioning, causing serious financial implications for the operating company (Caithness Heat and Power).

In April 2012 the company Ignis Biomass, noting the huge community support for the scheme, took over operation of the Wick district heating scheme, and invested in a new 3.5MW steam boiler from the company KIV, which was fuelled using wood chips. Importantly this represented a move towards using an established technology from an established company.

The scheme has gone from strength to strength and has been reported as a 'trailblazer' in Scotland by the Scottish Energy Minister Mr Fergus Ewing. The scheme now supplies a public performance venue, with future plans include the provision of heat to up to 1 000 households, a local hotel, Caithness General Hospital and all-new Wick High School.

### Policy implications

- **The success of the scheme was largely due to the perseverance of the client rather than policy initiatives.**
- **Community buy-in to the project was crucial.**
- **The project has socio-economic benefits that include the encouragement of forestry production as well as heat supply.**
- **The project benefits for the tariffs available for CHP production.**

## Údarás na Gaeltachta – public body switches to bioenergy

The Údarás na Gaeltachta head office consists of a number of buildings on one campus. This project was to replace the existing boiler with high efficiency duty (biomass) and standby (oil) boilers, and mains heating system.

The decision by Údarás na Gaeltachta to invest in a biomass heating system at the headquarters in Furbo, Co. Galway (Na Forbacha) was driven by a number of different types of factors. There was a policy pressure with a Government Directive to reduce Energy Use by 33% in Public Buildings by 2020. Údarás na Gaeltachta had established an 'Energy Management Bureau' as a pilot project in 2008 with the objectives of reducing energy consumption and $CO_2$ emissions in 15 of is buildings.

Údarás na Gaeltachta, a local economic, social and cultural development authority, felt that installing biomass heating would help to create an awareness of the availability of local indigenous renewable fuel, and show, by example, one of the options for its use. In turn this would help to promote local business and jobs and contribute to the overall remit of Údarás na Gaeltachta.

The 600 metre network is the Údarás na Gaeltachta complex of buildings in Furbo, Co. Galway, which houses about 100 employees. The network also includes three empty buildings on the campus which are being linked to the system, and previously heated with electric heaters. The fuel used is wood chip and the contract with the heat supplier, Clearpower. The boiler installation and building works and installation of the new pipework cost c.€360 000, which was funded with a grant under the SEAI Better Energy Workplace 2012, and capital reserves of Údarás na Gaeltachta, and assistance from WDC.

### Policy implications

- **Opening and closing of schemes, in an unpredictable manner, companies not sure if scheme will or will not be available.**
- **Very long delays between application and approval for grant which means more uncertainty and even tighter completion times.**
- **Tight timescale means that only those organisations which have completed most of the planning etc will be in a position to go ahead when they receive the grant.**
- **May also mean that those who would be going ahead anyway (even without the grant) could be the main beneficiaries of the grant (deadweight)**

## Donegal Woodland Owners' Society

Donegal Woodland Owners Society Limited (DWOSL) was registered as a cooperative Society on 27th March 2008. The main objective of the Society is to maximise returns to forest owners through good forest management. To be eligible for membership applicants must own woodland located in Co. Donegal, Ireland. Each member owns one share (value of €5) in the Society, irrespective of the size of their woodland.

The Society has been financed to date by membership fees, charges for goods & services provided and a start-up grant from the Forest Service of the Department of Agriculture, Fisheries and Food. The voluntary commitment of the members has resulted in huge cost savings to the group. To date the Society has over 150 members who between them own approximately 15,000 acres of woodland located in Co. Donegal. With members throughout Co Donegal, the DWOSL is dedicated to developing a sustainable approach to energy use by promoting the use of wood as a fuel.

At present, annually, over 200,000 tons (over 90%) of timber leaves Donegal unprocessed with little or no added value as it leaves the forest gate and County Donegal in the form of raw saw logs. Today, with the increasing volumes of timber coming onto the market from newly established forests in the private sector, Donegal Woodland Owners Society Limited (DWOSL) is determined to develop new and existing forestry enterprises and a forestry culture within Donegal.

### Policy implications

- **They are a business close to a territorial border. They have difficulty trading in two jurisdictions with different support mechanisms.**
- **There are different bioenergy support programmes in Northern Ireland and the Republic of Ireland which is causing distortions in the market demand.**
- **Northern Ireland has introduced a Renewable Heat Incentive, without considering where the fuel is likely to come from.**
- **Interesting contrast between the forestry policies in NI and RoI. While they have similar agronomic and climatic conditions, RoI has doubled is level of afforestation in the last 20 years, as result of planting grants and tax breaks. There has been no significant increase in the level of afforestation in NI.**






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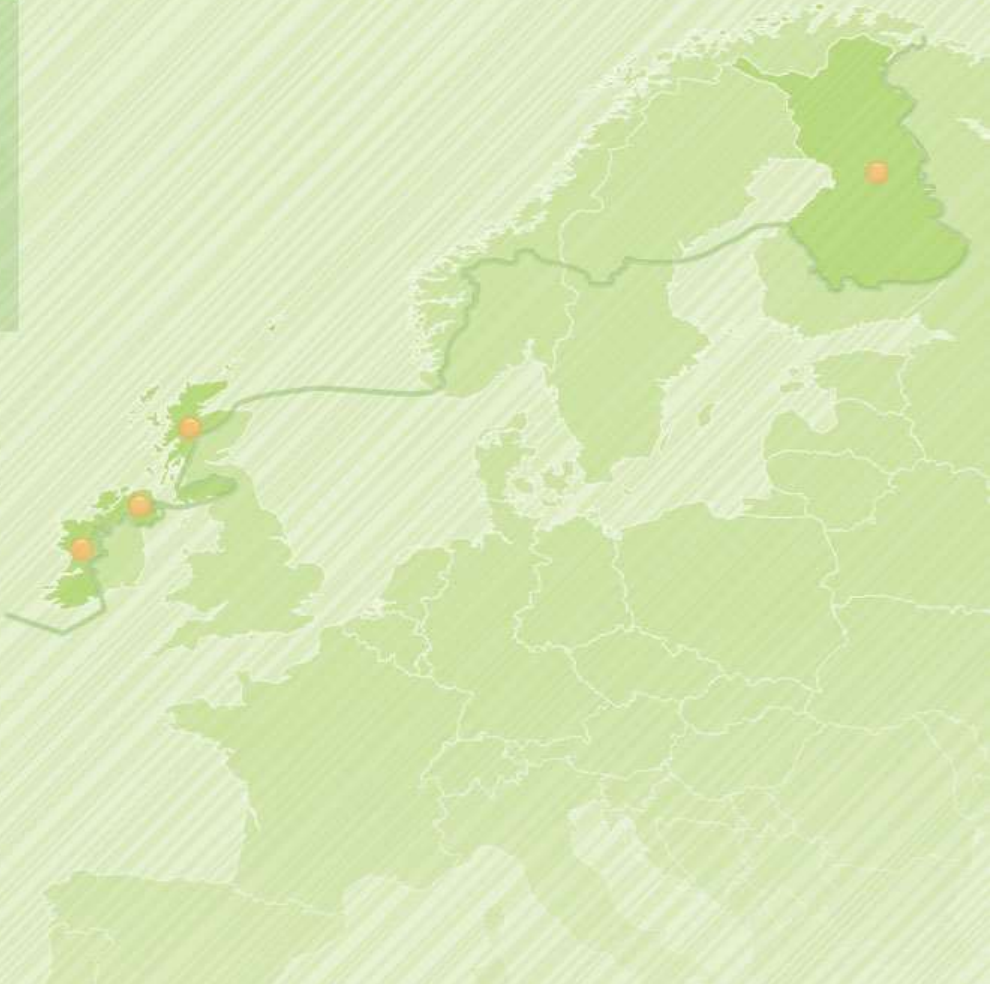

BioPAD is promoting the wider use of bioenergy and developing applications targeting the whole process from supplying fuel to producing energy.

The project is led by the Western Development Commission (Republic of Ireland) and brings together partners from Northern Ireland (Action Renewables), Scotland (Environmental Research Institute) and Finland (Finnish Forest Research Institute, Metla).


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