



BioPAD



Bioenergy Proliferation and Deployment



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Údarás na Gaeltachta - public body switches to bioenergy

Introduction

This case study of the Údarás na Gaeltachta investment in a biomass heating system at their headquarters in Furbo, Co Galway. It highlights the stages in the process, the model used, the benefits of biomass heating and the lessons learned from the process.

The Údarás na Gaeltachta head office consists of a number of buildings on one campus. A mains heating system, made of a steel pipe in a concrete duct, linked all buildings to the boiler house. A large oil boiler, installed in the 1970s, heated all buildings until 2012. This project was to replace the existing boiler with high efficiency duty (biomass) and standby (oil) boilers. The existing mains heating system was also replaced.

The case study is reported under the following headings.

- Why is public sector use of bioenergy important?
- Údarás na Gaeltachta- background
- What drove the investment in bioenergy?
- Design considerations
- Procurement and contracts
- The Biomass Heating System in Furbo
- How was it funded?
- Savings made
- Lessons learned

The aim of this BioPAD case study is to share the experience of Údarás na Gaeltachta investment in a bioenergy heating system so that other potential bioenergy users might learn from the process.

Why is public sector use of bioenergy important?

Bioenergy use in the public sector will help drive the uptake of biomass as a heat source, and in turn drive the development of an effective bioenergy market. The public sector is well positioned to support the renewable energy market by acting as a demonstration of practice and also providing a secure market for biomass.

The promotion of biomass use in the public sector was an important element of the RASLRES¹ project (which was also led by the Western Development Commission²). This

¹ RASLRES, **R**egional **A**pproaches to **S**timulating **L**ocal **R**enewable **E**nergy **S**olutions, was a Northern Periphery Programme project which aimed to increase the use and uptake of locally produced renewable bio-energy solutions in rural areas in the NPP region.. See www.raslres.eu for more information.

has continued in the BioPAD project as there are key benefits to be captured through use of bioenergy within the public sector.

Biomass use provides significant benefits to the organizations using it by helping to control energy costs and future proofing building stock.

However it also provides wider benefits by providing a demonstration site for biomass use, helping to stimulation local biomass supply, positioning an area as pro renewable energy and showing leadership in relation to sustainability and climate change mitigation.

Public sector use of biomass will also aid local supply chain development, increase the profile of bioenergy use and improve market confidence. In 2001, the public sector accounted a third of the biomass heat use in the Western Region³.

Údarás na Gaeltachta- background

The switch to bioenergy early 2013 was made in the Údarás na Gaeltachta headquarters in Furbo, Co. Galway (Na Forbacha). Údarás na Gaeltachta (the Gaeltacht Authority) was established in 1980. It is the Regional Authority responsible for Economic, Social and Cultural Development in Gaeltacht (Irish speaking) areas. The overall objective of Údarás na Gaeltachta is to ensure that Irish remains the main communal language of the Gaeltacht and is passed on to future generations.

The authority endeavours to achieve that objective by funding and fostering a wide range of enterprise development and job creation initiatives and by supporting strategic language, cultural and community based activities.

A governing board of 12 members and a staff of 86 people implement the agency's development brief and over 7,000 people are employed in Údarás na Gaeltachta Client Companies

What drove the investment in bioenergy?

The decision by Údarás na Gaeltachta to invest in a biomass heating system was driven by a number of different types of factors.

Firstly the existing boiler was old, inefficient and needed replacement. There were significant problems with leaks in the existing district heating network.

² The Western Development Commission (WDC) is a statutory body promoting economic and social development in the Irish counties of Donegal, Sligo, Leitrim, Roscommon, Mayo, Galway and Clare. The WDC works in co-operation with national, regional and local bodies involved in western development and is involved in European projects in a variety of areas, including renewable energy and creative industries. For more information see www.wdc.ie

³ <http://www.rasres.eu/wp-content/uploads/2011/06/Wood-Energy-Installations-WR-2011.pdf>

Alongside these 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'⁴ as a pilot project in 2008 with the objectives of reducing energy consumption and CO₂ emissions in 15 of its buildings. There was also consciousness of the need to reduce energy imports in Ireland and biomass heating was seen as making a contribution to this.

Finally 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.

Design Considerations

Once the decision was taken to install biomass energy the following questions had to be considered.

- What would be the appropriate biomass boiler size?
- What back-up system should be used?
- Where could the buffer tanks be located?
- What size fuel store is required and where should it be?
- What size will fuel deliveries be, is there sufficient space, is it accessible for the truck size, is there enough room for turning and manoeuvring?
- What are the options for the District Heating piping? Should factory insulated plastic pipe be used or rigid steel?
- What system of heating control is most appropriate?
- Will Údarás na Gaeltachta buy in fuel and run the heating system or will an Energy Supply contract (ESCO) be used?
- If an ESCO is selected what kind of contract should be used?

Údarás na Gaeltachta went through a rigorous assessment of the options (with expert consultant support provided by the RASLRES project) in order to decide on the most suitable installation and management systems.

⁴ http://www.seai.ie/Publications/Your_Business_Publications/Public_Sector/Udaras_na_Gaeltachta.pdf

These decisions and the information needed in the early stages of the design and contracting for biomass heating systems are covered in the guidance notes developed in the RASLRES project⁵.

Procurement and contracts

It was decided that there would be two contracts tenders, one for the Biomass Boiler Capital Works & ESCO and the other for the District Heating up-grade and installation of a wet heating system.

The public procurement process was used to tender and procure contracts for the new biomass heating system. Under EU Procurement Guidelines notice was given in the official EU Journal under the competitive dialogue process. Under this the contractors returned an expression of interest.

In 2011, Údarás ran a competitive dialogue process and pre-qualified four companies to tender for the works described above. In May 2012, Údarás issued an Invitation to Tender (ITT) for the project to the 4 pre-qualified companies. These four contractors were then invited to visit the site and prepare a proposal.

The ITT provided the performance criteria for the heat supply, but Tenderers were required to design what they felt to be the most economical and efficient project. A 6 year fuel, operation and maintenance contract was offered to the same tenderer.

These four contractors were then invited to tender for the Biomass Boiler Capital Works & ESCO.

The District heating upgrade became an emergency requirement and the contract had to be issued urgently. In March 2012 as the external piping was now showing rapid signs of decay once exposed with new leaks in the system occurring on a daily basis it was decided to negotiate a price for the removal of all external piping and the installation of new external heating mains with a local mechanical contractor. Temporary boilers were installed at a number of points on the site to maintain heat to the space while this work was being carried out.

Energy Supply Contract (ESCO) Process

The Western Development Commission, under the RASLRES project, had developed a model ESCO Contract and guidance notes. The WDC, again under the RASLRES project, provided help in the preparation of a Works Contract for the biomass installation in Údarás na Gaeltachta.

⁵ See <http://www.raslres.eu/wp-content/uploads/2013/01/Contract-Templates-Biomass-Guidance-Notes-Nov-2012-Final.pdf>

In order to develop the contracts certain important decisions had to be made. These included:

1. The length of the contract
2. Whether the contract would be for the capital cost + heat supply or heat supply only⁶
3. Size of minimum energy take
4. Means of Heat supply measurement
5. Operation and Maintenance responsibilities
6. Payment procedures for the ESCO
7. Biomass fuel supply, source, type and quality requirements.
8. Delivery of fuel, requirements, timings and other associated factors.
9. Penalties (size and type) for non delivery of heat

The contract was based on the model ESCO Contract developed by the RASLRES project. Information, draft contracts and guidance notes can be found at the address below⁷.

The biomass heating system in Furbo

Network characteristics

The 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. These were previously heated with electric heaters. It is intended that these will be leased to a third party, and the occupants of the buildings will be charged for heat used. There is a meter in the boiler house, and sub-meters in different buildings and parts of buildings to measure the amount of energy.

The network is 600 metres in length, and is zoned for the different buildings in the complex. The peak demand is in the morning. Two 5000 litre buffer tanks installed are used to store thermal energy and are employed to compensate for peak heat demands on cold mornings when the demand for heat exceeds the maximum thermal output of the biomass boiler, if further heat demand is required the oil fired boiler will assist to maintain the required flow temperature within the heating fluid. The efficiency of the biomass boiler is maintained by ensuring it operates at maximum output.

The existing gun barrel pipework was replaced with new similar pipes and which were then insulated. Pre-insulated pipe work was not used as this installation was done on an emergency basis and the procurement and delivery of the pre-insulated pipework

⁶ The contract is for capital works and heat supply only,

⁷ <http://www.raslres.eu/2013/01/raslres-esco-model-contracts-and-guidance-notes/>

would not have been available on time. The cost of the installed pipework was c.€53,000 and the pre-insulated pipes would have cost about €75,000 plus additional costs on changes to the existing ductwork to compensate for the wider radius bends on the pre-insulated plastic pipes.

Fuel

As an ESCO is used this fuel supply is the responsibility of Clearpower, the heat supplier, rather than Údarás na Gaeltachta.

Clearpower are responsible for the procurement and delivery of the heat. The wood fuel are provided by Clearpower, from a forest in Moycullen (9.6 miles from Údarás na Gaeltachta headquarters). They are delivered to a timber contractor in Spiddal to chip and deliver the fuel to the Údarás site (c.3.6 miles).

The fuel is delivered in 5 tonne loads. . In Autumn, this is delivered every once every 10 days, and in Winter, twice per week. Clearpower check that this is sufficient.

A storage shed was converted into a fuel store in September 2012 as part of the contract with Clearpower. This has a capacity of 12.5 tonne. The storage shed probably is used at 50-75% capacity. When the fuel is delivered by truck it is then tipped into a hopper and is blown up a chute into the store.

The fuel used is wood chip and the contract with the heat supplier, Clearpower, states that the moisture content of the wood chip should not exceed 30%.

The renewable heat market has the potential to create considerable levels of employment across the Western Region and to provide long-term stable markets for low value wood fuels which can compete with fossil fuels and so reduce and fix energy prices for end users. Local wood biomass resources are finite, however, and as demand for biomass increases in a variety of markets, a greater understanding of the available resources at both a county and regional level is required.

Under the RASLRES project a number of county resource assessments were conducted to provide interested parties with an overview of the potential supply of wood based biomass and estimated demand for renewable heat market within each county. They also highlight the issues regarding the potential impacts of large scale projects such as Bio-Refineries and/or Combined Heat and Power (CHP) plants on county and regional supply chains.⁸

Ownership

Údarás own the boiler and the district heating network. In July / August 2012, they replaced the existing gun barrel network with similar pipework and replaced the existing oil fired boiler with the 300kW Herz biomass boiler and a 500kW oil boiler for back-up purposes.

⁸ The study for Galway is available here. <http://www.raslres.eu/wp-content/uploads/2011/06/RASLRES-Resource-Assessment-Galway.pdf> and those for other counties are here: <http://www.raslres.eu/publications/>

This new oil boiler was purchased by Údarás na Gaeltachta and installed by Clearpower. This provides 10% of the heat, and is used as back up to the biomass boiler. If there is particularly cold weather this also gives extra heat. Clearpower are responsible for the maintenance of this boiler as well as the biomass boiler.

Clearpower are responsible for the maintenance of both boiler. Clearpower have full remote access to Údarás na Gaeltachta's energy management system and Údarás na Gaeltachta also alert them if there is a problem.

Potential future development of the system

There is a potential energy customer with a neighbouring building. The Office of Public Works (OPW) share the boiler house with Údarás. They currently heat their building using an oil boiler. Progress on this may made be made in future

How was it funded?

The boiler installation and building works cost c.€210,000 and the installation of the new pipework in the district heating network cost including repairs to external ductwork covers and piping supports and brackets c.€150,000. This also included landscaping costs etc.

Údarás na Gaeltachta received a grant under the SEAI Better Energy Workplace 2012. This grant was driven by a policy to reduce energy use by 33% by 2020. A large inspection was carried out at the end. The timescale for doing the work in order to drawdown the grant, was very tight. The scheme was announced in August and the works had to be complete by October. . Under the contract with Clearpower, heating by oil was required by September 2012 and by biomass 6-8 weeks later.

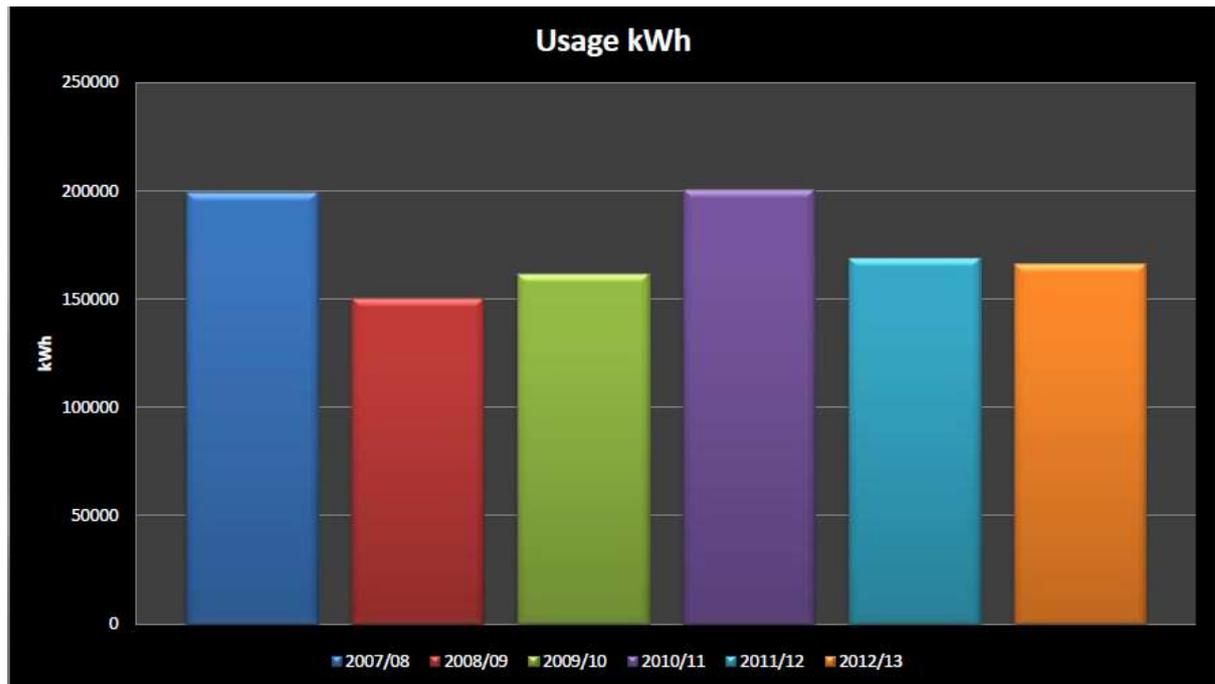
The rest of the funding came from Údarás na Gaeltachta capital reserves and the WDC provided some assistance, as it was a pilot project in RASLRES, with the district heating pipework installation.

Údarás na Gaeltachta believes that it would not have been possible for them to proceed with this project without the assistance from the SEAI and the WDC.

Savings made

Given the significant heat usage in the headquarters in Furbo, significant savings were be made by switching to bioenergy. The following chart shows the energy use since 2007.

Fig.1: Heat usage (?) in Údarás na Gaeltachta Headquarters from 2007/08 to 2012/13



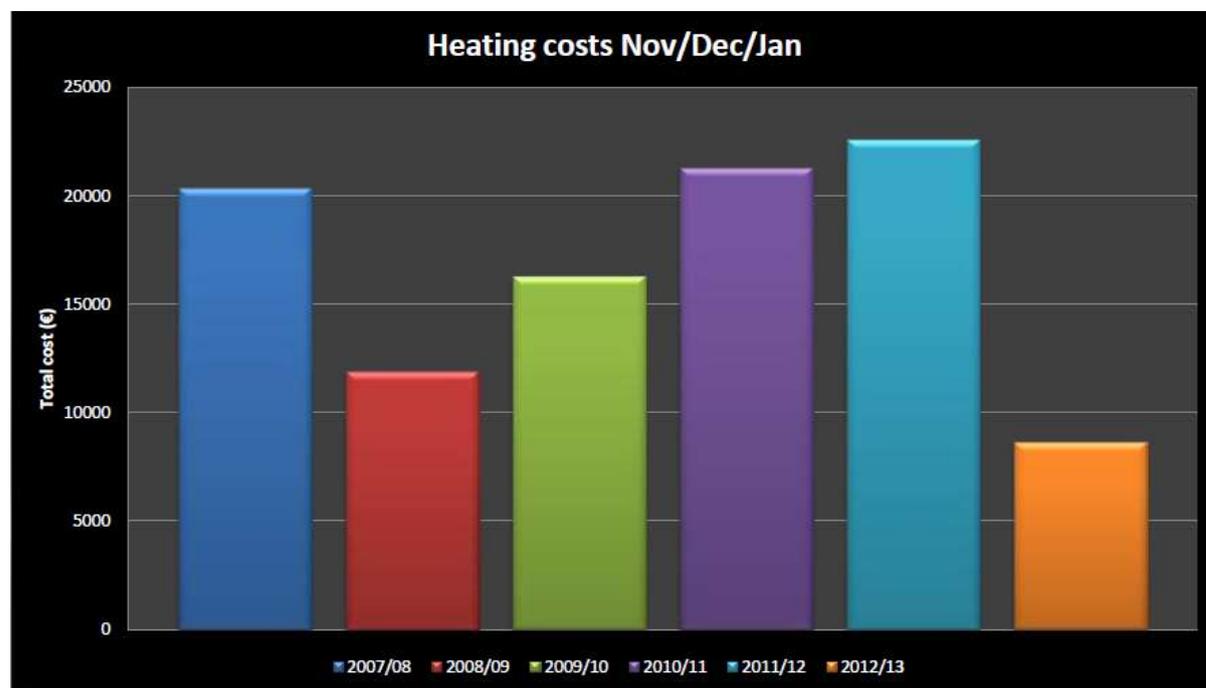
Source: Gerry Darcy, Údarás na Gaeltachta, presentation IrBEA annual conference 2013.

Údarás na Gaeltachta has a six year fixed price contract with Clearpower for the supply of heat at €0.052c (5.2cent) per unit per kWh. The agreement guarantees that the price of heat will not increase over this period this certainty is factored into the cost.

The unit price for oil heating before the installation of the biomass boiler was €0.11 (11 cent) per unit per kWh.

In 2011/2012, the annual heating bill was €23,000. In 2012/2013, this reduced to €8,500. However the bill for 2011/2012 was artificially high, and the average over the previous three years to installing the biomass boiler was c.€16,000. The means there is a saving of almost €8,000 annually. The figure below shows the significant savings on heating costs for the winter period (November to January) for 5 years to 2013.

Fig.1: Heat cost in Údarás na Gaeltachta Headquarters from 2007/08 to 2012/13



Source: Gerry Darcy, Údarás na Gaeltachta, presentation IrBEA annual conference 2013.

The biomass heating system was installed before winter 2012/13 and the savings since then are very impressive.

These cost savings benefit Údarás na Gaeltachta, but it should also be remembered that by switching from imported oil to a locally grown renewable fuel there are significant local economic benefits in terms of employment and spend in the locality.

Lessons learned

As biomass heating is relatively unknown in Ireland (certainly when compared to fossil fuel systems) it is useful to highlight what can be learned from Údarás na Gaeltachta on the installation of their heating system.

- Having expert advice and knowledge of bioenergy systems (as was provided through the RASLRES project) was very helpful to the decision making and design of the project.
- The availability of grant aid was very important, but it imposed very tight deadlines and a significant additional level of administration to the project.
- Fuel delivery arrangements, especially in relation to parking and turning could have been improved.

- A delay in start-up of the oil fired boiler is triggered by a drop in return temperature. This requires constant monitoring initially to ensure maximum efficiency.
- Fuel quality is very important. A load of poorer fuel affected the biomass boiler in January 2013 and the oil boiler was running full time for three weeks while this issue was being resolved.
- A well designed back up system is essential.
- Continual improvements in efficiency are being made. Údarás na Gaeltachta are working to enhance the air handling unit installed in one of our larger offices by improving the level of heating control and eliminating wastage. CO₂ monitoring installed has allowed for better quality ventilation and a much improved working environment..
- Previous involvement in an 'Energy Management Bureau' made Údarás na Gaeltachta more conscious of energy use and efficiency and these are now integral to the culture of the organisation. This was important to the decision to switch to a more sustainable energy system.

Údarás na Gaeltachta found that the ESCO model has worked well for them and they are very happy with the cost savings achieved using the biomass boiler.

Conclusion

This investment in bioenergy by Údarás na Gaeltachta, a leading rural based public sector organisation, is an important example of the benefit of bioenergy use. The installation shows that bioenergy is a viable option, giving significant cost savings and using local resources. An ESCO contract ensures that the appropriate expertise is available and the supply chain is managed by specialists.

In summary, the benefits for Údarás na Gaeltachta include:

- Reduced peak load on the system
- More efficient district heat distribution
- Lower running cost
- The new 300kW high efficiency biomass boiler replacing a 700kW oil fired unit
- With grants a pay-back will be achieved in 3.5 years
- Overall the response from staff members on the new heating system has been positive
- Switching from using imported oil to a locally grown renewable fuel has brought economic benefits in terms of employment and spend in the locality.

More information and acknowledgements

For more information about this case study please contact:

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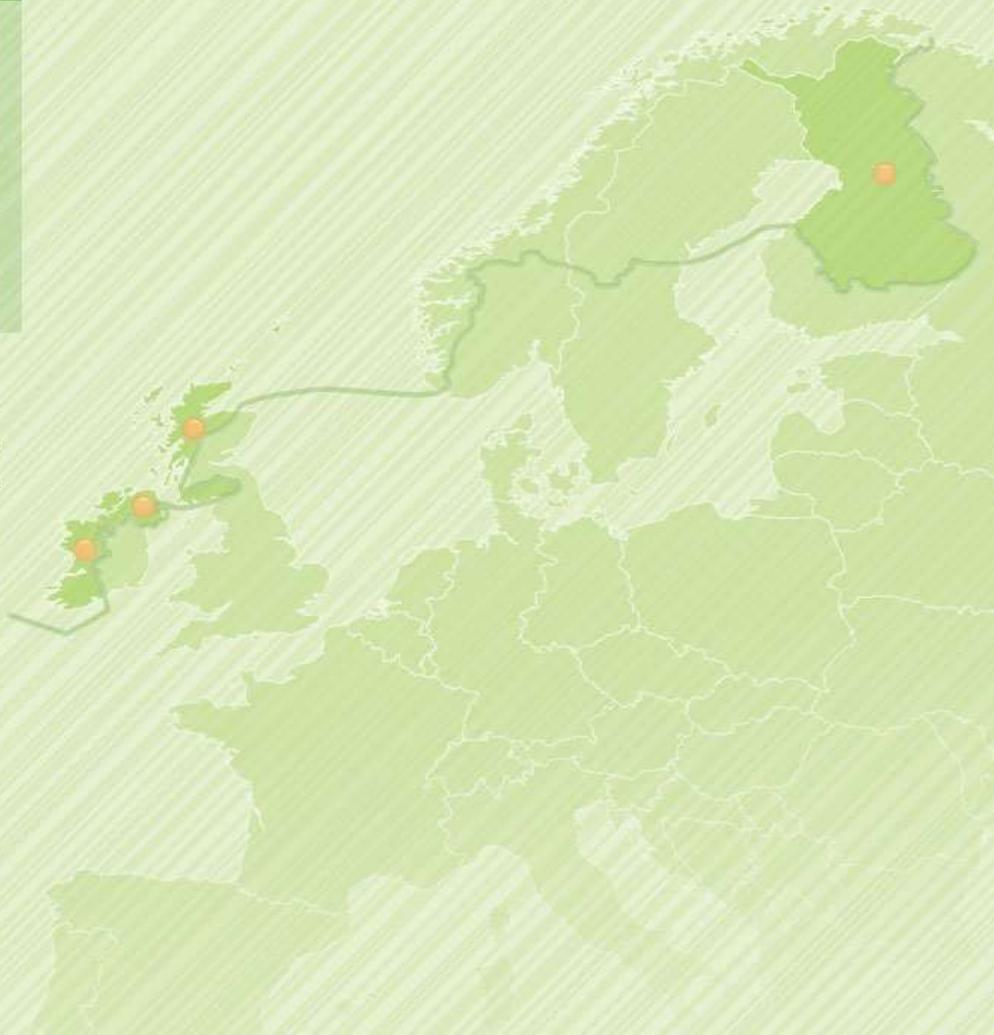
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BioPAD is promoting the wider use of bioenergy and developing applications targeting the whole process from supplying fuel to producing energy.

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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