GREENER

CLUSTERING REMOTE REGIONS FOR ENERGY RESILIENCE AND GROWTH

Sharing Energy Innovations through an International Network

The results of projects related to renewable energy and energy efficiency are now being highlighted in an international cluster project. On display are e.g., innovations and experiments related to waste recovery, wind power, heating and cooling. Cooperation between 9 countries and 20 implementers has been smooth and productive.

The **ERNACT network, Centria University of Applied Sciences and University of Oulu** jointly launched a project to promote regional energy efficiency and awareness in July 2021. The **GREENER (CLUSTERING REMOTE REGIONS for ENERGY RESILIENCE and GROWTH) project** aims to provide information on the **latest energy solutions and best practices to households, public bodies, businesses, and public authorities, increasing regional competitiveness and prosperity.**

The project is coordinated by the **ERNACT network**. In addition to **Centria** and the **University of Oulu**, the project involves 20 other partners from Sweden, Northern Ireland, Scotland, Iceland, the Faroe Islands, Norway, Germany and Canada. The aim is to connect end-users between regions and increase transnational cooperation through a partnership network.

The cluster project provides several examples of renewable energy experiments that reduce energy consumption and emissions, ensure energy supply in remote areas, save money, or even generate revenue. The experiments also reduce the carbon footprint or are carbon neutral or reduce the release of carcinogens, for example, into the environment. The project shares information e.g., about Finnish detached house residents' experience of geothermal energy and solar collectors. **The project also examines the challenges involved in the operation of the UK's largest community owned wind farm, built in Scotland and owned entirely by the village community. Furthermore, the project shows examples of a seasonal thermal energy storage pilot case at the Finn Spring factory in Toholampi, Finland.**

Image: *Northern Periphery and Arctic Programme*

Good cooperation

"*Working together is smooth. Finland and Ireland are similar in their democracies: small EU countries with a population living in small and medium-sized cities and in rural areas, with the exception of the capital regions. There are areas in both countries that are covered by the Northern Periphery and Arctic (NPA) programme. Tertiary education is also very similar. Finnish technical colleges are the same size as the corresponding institutes in the field of technology in Ireland. This allows us to collaborate on similar projects by pooling our resources. Technology production, tourism and culture are important to both countries*," says programme manager **Anne Marie McLaughlin** from **ERNACT**.

"*Our Finnish colleagues are reliable partners and very proactive in digital transformation and innovation. Finland has been an important source of good practice for ERNACT. We have obtained models, especially of how innovation ecosystems have been created in Finland, in which there is close co-operation between universities, companies and the public sector. The expansion of high-speed broadband in rural areas was also a good example for Ireland,*" says **McLaughlin**.

"*The aim of the cluster project is to disseminate the information gathered in the three projects to a wider audience than would be possible in a single project. This will further increase the international visibility of all partners. Following the procedures, research and good practices of other partners also gives a new perspective and a boost to our own activities. Networking is a lifeline in a researcher's work. The project also connects the networks of other partners to our network, either directly or indirectly*," says project manager **Markku Kananen** from the **University of Oulu**.

"*We were very happy and grateful to be invited to participate in a common project with ERNACT and the University of Oulu. It has been a pleasure to note that work performed in our previous NPA Interreg energy community project has been noticed and people have appreciated that work. It's important to transfer and spread information about good energy practices to foster activities in energy efficiency and to enhance the use of renewable energy. This is an excellent possibility to combine the results of three different projects and to reach stakeholders more widely*", says **R&D Coordinator Heidi Kanala-Salminen** from **Centria.**

"*It's interesting to hear examples about the renewable energy cases developed and performed by the other partners. We hope that target groups become inspired and can utilize that information in our own region too*," says **Heidi Kanala-Salminen** from **Centria**.

Spectrum of perspectives

The clustering project details several examples of renewable energy experiments that reduce energy consumption and emissions, ensure energy supply in remote areas, save money or even bring in revenue. The experiments decrease the carbon footprint or are carbon neutral as well as lower the release of carcinogens into the environment. For example, the project shares information the experiences about the geothermal energy and solar collectors of Finnish people living in detached houses. The project explores the challenges facing the operation of England's largest wind power park which is wholly owned by the local community in Scotland. At the Finn Spring plant in Central Ostrobothnia in Finland energy waisted in the summer is stored in the soil for heating during the winter.

"*In addition, there is a huge waste problem in Iceland, for example. This challenge has been addressed by a research team at the University of Iceland, which has built a mobile combined heat and power system based on the gasification of biowaste. A similar "wood-gas generator" has replaced the former oil heating system in a village school in Alpua, Finland. Sweden, on the other hand, is experimenting with storing snow and using it in the summer to cool premises. Centria University of Applied Sciences has a project underway to liquefy and transport agricultural biogas*," says **Kananen**.

Centria R&D specialist Matti Ojala is performing tests on the liquefaction of agricultural biogas.

Sustainable Heating

Markku Kananen has monitored the energy consumption of a detached house. After the installation of a ground source heat pump, the electricity consumption of the property in Oulu dropped to less than half the previous level. Thanks to solar collectors installed to the roof, hot water for the family of four living in Ylivieska does not have to be produced by other methods from late spring to early autumn. "*Before that, wood was burned in the boiler to produce hot water even in summer, and the burning unnecessarily raised the temperature inside the house. Thanks to the collectors, wood is also saved during the actual heating season*," says **Mika Puirava, the owner of the house**.

At the **"Finn Spring" water beverage plant** in Toholampi, Finland, a seasonal thermal energy storage was built as a pilot project by **Centria University of Applied Sciences**. A borehole thermal energy storage system, BTES, stores excess waste heat, collected from the factory, into the ground during the summer months. In winter, that same heat is extracted from the ground and used to heat up the factory building.

On hot summer days, an additional benefit is that the internal temperature of the factory building drops when the transfer of waste heat to the ground storage cools the property. The workers inside the factory highly appreciated this change. As a result of the pilot project, the company is considering giving up district heating.

View of the borehole thermal energy storage during the construction phase at the Finn Spring factory.

Electricity from biowaste to the whole village

A gasification plant, installed in a trailer at the University of Iceland, converts organic waste into synthesis gas. The gas uses an internal combustion engine that runs the generator, producing electricity for the needs of a small village. The heat generated by the internal combustion engine is utilized for space heating, unless there is a need for it, for example, to dry the waste for gasification. Before the project was established, waste was incinerated in remote areas. **Professor Rúnar Unnþórsson** says that Iceland's waste incineration plants have been closed for several years due to dioxin contamination. Dioxins have been found to cause e.g, liver damage and cancer and are very persistent in the environment.

"*These incinerators were located in so-called cold areas with little or no geothermal energy. They are in places like the Westman Islands, Kirkjubæjarklaustur and Ísafjörður. Incinerators were used to produce hot water. Nowadays it is important to tackle this problem here in Iceland and challenge communities to solve their waste problem locally outside Iceland*," says **Unnþórsson** from **University of Iceland**.

Gasification of waste at high temperatures reduces dioxin concentrations compared to waste incineration. To top it all off, the gasification process of waste is carbon negative - in the positive sense of the sentence - because the biochar, produced as a result of pyrolysis, can be used as a soil admixture, for example, in gardens and crops. Due to its permanent structure, biochar retains in the soil for a long time, increases soil looseness, equalizes moisture, and increases water retention.

The pilot gasifier of the University of Iceland ready to be transport for field tests.

Wind power generates profit for the needs of village communities

"*Point and Sandwick Power is an energy company that operates and maintains the largest 100% community owned wind farm in the UK, on the island of Lewis in Scotland. The company generates a profit of almost £1 million a year and invests it entirely in community projects through its charity, Point and Sandwick Trust. For example, the organization is funding a project in which more than 100,000 trees have been planted on the otherwise nearly treeless island of Lewis. In addition to the protection of the environment and heritage sites, support is provided for education, the disadvantaged, the arts, culture, and recreation. The 9MW carbon-neutral wind farm reduces annual carbon dioxide emissions by 12,000–25,000 tonnes*," says **Markku Kananen.**

International exchange of information based on information gathered in previous projects

The cluster project combines the results of three **Northern Periphery and Arctic Programme** funded projects and communicates them together.

The **SMARCTIC project** aims to increase the use of energy efficiency and renewable energy solutions in housing and public infrastructure in remote and sparsely populated areas through smart energy solutions. The three-year project will end in September 2022. The project is coordinated by ERNACT from Ireland.

The **LECO project** met the needs of remote municipalities and residential areas for sustainable energy supply. The aim was to combine new innovative technologies with locally available natural resources and to raise awareness of energy efficiency and the potential of renewable energy. The approach was based on the local circular economy model. The project was coordinated by Centria University of Applied Sciences. The project ended in December 2020.

The **H-CHP project** mapped low-cost combined heat and power (CHP) systems for detached houses using renewable biofuels. The project ended in December 2020. The purpose was to secure the supply of electricity in areas where the wood in the area is already used as logs, pellets, or wood chips to heat the house or space. The devices convert some of this energy used for heating into electrical energy. The development of the University of Iceland's biowaste gasification plant was part of the project.

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The aim of the program is to bring vitality and well-being to the outermost regions of the northern and arctic regions by helping and creating competitive and sustainable communities, applying innovation, expanding entrepreneurial capacity, and making efficient use of the unique growth resources and opportunities of the northern and arctic regions.

Basis for future projects

"*For sustainable development, we need more similar pilot projects for saving natural resources and reducing energy consumption. Sparsely populated areas in Finland have forests as an energy source, but this is not the case in Ireland, for example. Ireland is politically committed to phasing out the use of peat, and Finland is expected to halve its use for energy by 2030. In Finland, the energy security solution is nuclear power, but its commissioning has been severely delayed due to technical problems. In Ireland the solution is investing in wind power*," says **Markku Kananen**.

"*This winter, energy prices have risen sharply across Europe, partly for political reasons and inflation but also because of natural phenomena such as Norway's low hydropower production. The Covid pandemic taught us a lot about how fragile and vulnerable our society is in the end. For example, the availability of components has been unstable, and, as a consequence, the costs of technical building systems have almost doubled, compared to just a few years ago. As our challenges are global, we need international cooperation in energy solutions to ensure well-being in remote areas as well. This cluster project contributes to this. During the one-year project, a new multi-year project application will be submitted. By combining our expertise, different perspectives, and our network, it is more likely to receive funding*," **Kananen** envisions.