Northern Periphery and Arctic Programme 2014–2020

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Local Energy Communities

Report on Best Practice Case Studies for Community Energy Projects

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Report on Best Practice Case Studies for Community Energy Projects

Contents

The following case studies will present different examples of community energy projects from the LECo NPA regions. They will describe the community involved, the type of technology used, the ownership structure used, the financial model used, how the project was implemented and finally describe the lessons learnt and also the post- project benefits.

1.0 INTRODUCTION

The involvement of communities in energy initiatives can take various forms from project initiation, administration, development, decision making and financial support. Projects can be fully community owned & develop out of grassroots actions, may be developed between communities, NGOs & local government or may be developed under co-ownership arrangements with the private sector. This report will review the forms of ownership available to communities, and also demonstrate the benefits and weaknesses of each.

Role of communities in the Energy Transition: Within the context of an energy transition to a low carbon economy, new roles for local communities are emerging, whereby they are transitioned from being passive consumers to active prosumers with the possibility of local generation, demand response and energy efficiency measures. The energy transition will require significant mainstreaming of niche social and technical innovations to succeed at the community level, for example electric vehicles, heat pumps, smart meters, sustainable energy communities, domestic PV, and battery storage.

Community led initiatives based on local collaborative solutions that can be set up by individuals, groups of individuals, households, small businesses or local authorities that operate individually or in an organised way are often referred to as 'local energy communities'. These communities are expected to play an important role in the energy transition as they can enable the development of sustainable energy technologies and bring a variety of benefits to local communities.

Commission for the Environment, Climate Change and Energy, 2018.

Role of the LECo Project in community energy initiatives: The LECo project shall respond to the needs of remote communes and settlements for a sustainable energy supply. For this purpose an approach shall be developed to use as far as possible existing renewable resources for the energy supply improving building stock standards by combining new innovative technologies with locally available natural resources. The approach is based on the model of local cycle economy taking also in consideration the use of waste from households, agriculture and industries as potential source of energy. The project shall deliver a set of locally adapted concepts for Community based energy solutions in remote areas. These concepts will be modelled, developed and implemented in selected test communities in each participating country. The methodology for setting up such local adapted concepts and their implementation will be made available in form of a practical guideline which can be used for transferring the results to other locations.
Barriers to community energy: The LECo policy paper has identified common barriers to community energy projects (see below). It is essential that communities are able to participate in the energy transition to a low carbon economy.
The barriers are:

Societal, cultural, political and/or organizational:
- Lack of historic experience with cooperatives and civic activism.
- Low trust in the cooperative model as a viable alternative.
- Lack of political support from local representatives.
- No experience with setting up cooperatives.
- Organisational challenges – pre-planning stage barriers.

Legal, administrative, bureaucratic:
- Complicated legal framework, high levels of bureaucracy to acquire licenses.
- Lack of national community energy strategy; lack of national targets for community energy projects, which then are broken down in Local Energy Action Plans by local authorities.
- Bureaucratic barriers to grid connection (complicated application procedures, uncertainty of approval, costs, time consuming).
- Not allowed to operate micro-grids - producing, own-use, selling within community, selling to third-parties – as compared to only: sell it to the grid and buy it back (often with low financial returns to the community – profits are again made by companies outside the community, which defeats the idea to keep revenue within the community).
- Lack of supportive local authorities and/or local energy agencies.
- Generally no support schemes for RES projects.

Technical:
- Technical challenges – lack of expert knowledge to design, plan, procure, implement, commission a project.
- Lack of expert knowledge for operation and maintenance.
- Size of energy project.

Financial:
- Financial challenges in the initial stages of project development; access to finance, grants, etc.
- Fair and secure payments for energy generated (insufficient Feed-in-tariffs, F-i-T only for wind, but not for Solar PV, no standardized PPAs, third-party-offtake not possible.
- Insufficient incentives for renewable heat projects: replacing fossil fuel heating with biomass boilers or solar thermal, heat pumps.
- Complicated tax rules, no tax exemptions.
- Generally no tax incentives for RES projects, lack of guarantees.

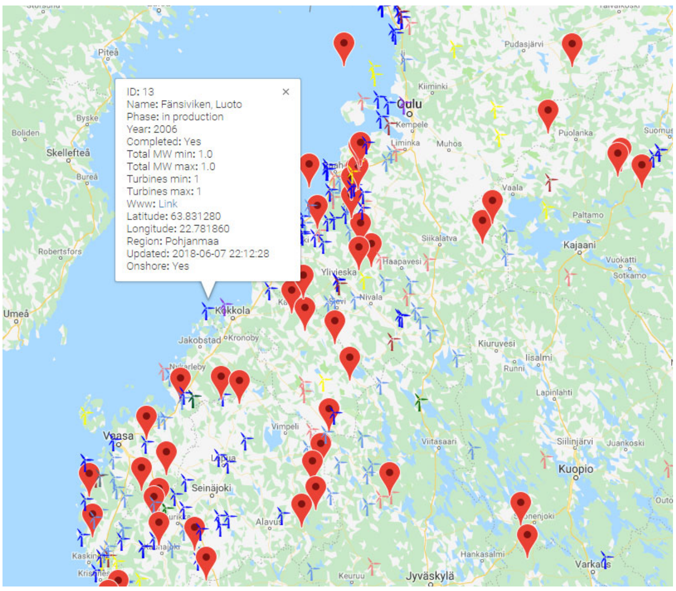
Challenges in mature cooperatives:
- Expansion of power generation, of number of members – how shall older and new membership shares be valued?
- Re-investment into existing installations.

1.1 FINLAND: CASE STUDY 1. LARSMO VINDKRAFT AB

Case study report for Finland: Community owned energy project from initiation to completion
Centria University of Applied Sciences
Larsmo Vindkraft Ab

1 Introduction

Larsmo Vindkraft Oy was founded in 2001 by a few private individuals from the Larsmo area, which is located near Kokkola in western Finland. The goal was to gather founds for wind measurements and eventually to build a Wind Power plant in the Larsmo region. The idea originally came from a local resident Lars-Erik Östman, a forest engineer who is interested in sustainability issues and renewable energy.



2 Description of community

Larsmo is a municipality of Finland, located in the Ostrobothnia region. The municipality is bilingual with Swedish as the majority language and Finnish as the minority language. The municipality consists of an archipelago of about 360 islands. Larsmo Vindkraft Oy owns one wind power plant and consists of around 200 shareholders most of which are private individuals from the region.

3 Renewable Energy Project

The project consists of one privately owned wind power plant located in Larsmo:

- Wind turbine: 1MW
- Supplier: Winwind Oy
- Hub height 65m
- Rotor diameter 60m
- Estimated production 2.2 million kWh, which corresponds to the consumption in 110 electric heated houses
- The power plant starts at 3.0 m/s
- Achieves maximum power 1000 kW at 11 m/s
- Remote control and monitoring from Oulu

There have been some technical difficulties in the last couple of years and therefore the production has been slightly lower.

4 Ownership structure and financial model used

When the limited company was originally established in 2001, there were only a few shareholders and the initial capital was 15 200 €. The focus was to find a suitable location for the power plant, conduct wind measurements and find a power plant supplier. Only after that, they would start to seek new shareholders and investors.

After a suitable location and supplier was found, the entrepreneurs managed to raise 20% of the needed capital from shareholders and the rest was financed with a 20-year loan of 540 000 €. The company later received around 65 000 € in investment aids from the Finnish Ministry of the environment. The company eventually consisted of 200 shareholders, most of which are private individuals from the Larsmo area. The municipality of Larsmo is also a shareholder in the company.

5 Implementation Process

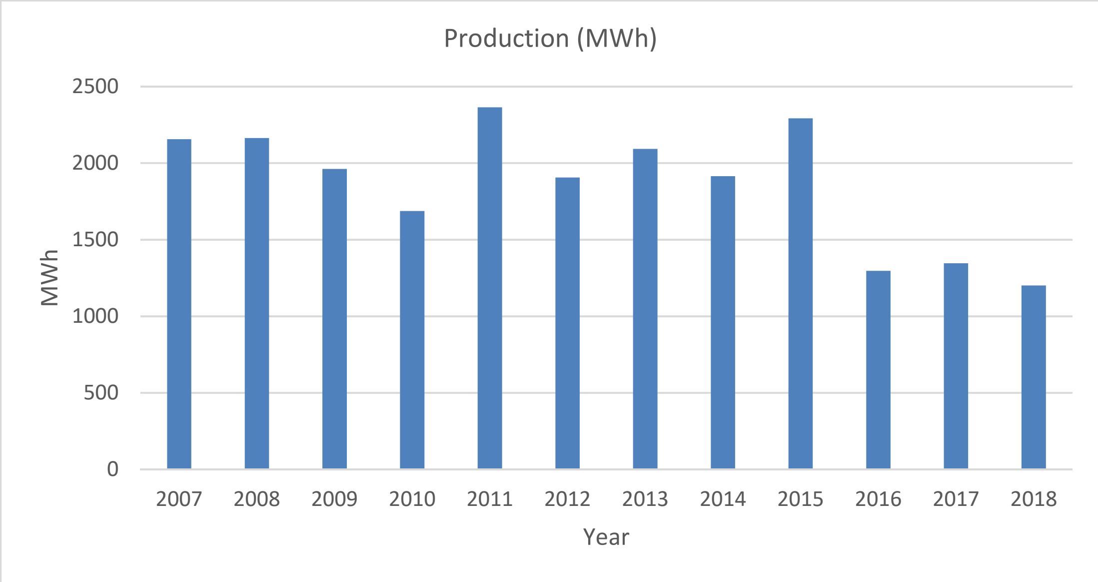
Wind measurements were made around Larsmo, and an area in Fränsviken was chosen due to good wind conditions. After a suitable location was found, the plants construction permit was applied in 2004 from the local municipality. The permit was granted later that year, but was immediately appealed by local residents. Resistance from local residents was intense throughout the whole construction process, and continued after the wind power plant was in operation.

The Administrative Court in Vaasa handled the appeal, and found the construction permit to be eligible. The opponents then appealed to the Supreme Administrative Court but their case was dismissed. When the building permit was finally granted, a fundraising campaign was started and eventually the company obtained a total of shareholders 200.

The construction work started in 2005 and in September the road and land construction work was finished. Local entrepreneurs did all the harvesting and roadwork. All the construction and installation work regarding the power plant was the responsibility of Winwind Oy. The power plant construction work was finished in June of 2006 and after some testing and adjustments, the supply of electricity to Jakobstad Energiverk began a few days before midsummer in 2006.

When the plant had been running for some months, residents near the plant complained about the noise. Larsmo Vindkraft then had to carry out noise measurements in addition to the environmental permit. A company named Pöyry Oy conducted the noise measurements, and the levels were found to be below the limit values.

The power plant has now been running for over 12 years, and has mostly needed only regular maintenance work. However, in recent years since 2016, the plant has had some technical issues and therefore the energy sales has been slightly less than in the previous years.



6 Project results: Lessons learnt & post- project benefits

The proceeds from the sale of energy have mainly gone to loan repayments. The company has not reviewed any tariff subsidies for energy sales because the minimum total power requirements are not met. Due to the low price of electricity in recent years, the plant has not been as economically profitable as expected. In 2011, the company paid out a small dividend to the stakeholders, in addition to this, stakeholders have not financially benefited from the project.

Things entrepreneurs would do differently now:

- More info events for local residents, this could reduce resistance
- Choose a more secure supplier
- Raise a larger share of own equity, 30-40%
- Do not assume that the price of electricity will rise
- It would be good if the company could use some of the electricity themselves or find customers from the region
- You should use a third-party consulting company, who acts as a technical advisor

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1.2 FINLAND: CASE STUDY 2. LOHTAJA COOPERATIVE

Case study report for Finland: Community owned energy project from initiation to completion
Centria University of Applied Sciences

1 Introduction

In the beginning of the 21st century, there were plenty of potential heating customers in Finland's rural village communities. Suitable targets included community residential areas, municipal buildings, and industrial buildings with outdated heating systems, in many cases oil-heated. These outdated heating systems combined with the rising oil price relative to woodchips, fueled the emergence of energy cooperatives. Outsourcing of the heating process became a simple and economically sensible solution for the property-owners.

The more sophisticated and versatile plant solutions that began to enter the market, automation, and more advanced combustion technology made the plants more functional and easier to maintain. The available technology, business climate and heat demand, fueled the formation of **Lohtaja Heat Cooperative** (Fi=Lohtajan energiaosuuskunta).

2 Description of community

Lohtaja Heat Cooperative was founded in 2001 and its aim was to collect mostly stem wood from the forests of its 40 members, chip it, run a member owned heat plant and supply energy for few buildings near the plant. Lohtaja Heat Cooperative operates in the village of Lohtaja, which is located in the city of Kokkola on the west coast of Finland.

3 Renewable Energy Project

The cooperation's goal was to build a 300 kW wood chip heating plant in the area of Lepola located near Lohtaja. The heat plant was going to provide 750-800 MWh annually to three different properties, and the biomass would come from a maximum distance of 20km. The total amount of wood chips required was 500m3, and there was plenty of biomass available from the member's own forest areas. This was the first energy-cooperation in the area, and would replace 100 000 liters of oil used to heat the properties.

4 Ownership structure and financial model used

The co-op acquired the 300kW wood ship boiler (Ariterm Oy, Arimax Bio 300S boiler) and constructed the 50-meter long heating network with external capital. The cooperation took out a loan that required all members to write a personal guarantee to the bank. The cooperation did receive 30% refund in form of energy aid from the state when the plant was in operation. The co-op members did a large amount of the plant and heating network construction and installation work, and therefore labor costs was not a significant part of the total investment.

The cooperation has five board members and a secretary and consists of municipality residents and local forest owners. After the formation of the cooperation, new co-op members are required to pay a membership fee and resigning members will receive the current co-operative payment. Members can also be paid separate compensations for construction and maintenance work done.

When establishing the cooperative, the new entrepreneurs received valuable help from the Finnish Forest Center in the form of consulting. This was of great help in establishing the cooperative. There were also significant subsidies for plant investments, including subsidies for harvesting machines and choppers. Certain subsidies were directed only to energy cooperatives, which in part contributed to their formation. The Finnish state also supported the efforts of the forest owners to improve forestry when it was poorly profitable. This so-called Kemera support was available for the management of young forests and improved the profitability of the cooperative.

5 Implementation Process

The heat plants were quite small regarding thermal power, therefore the licensing process was more straightforward and no environmental permit was required. In smaller thermal plants, no special training is needed for plant managers, which made recruiting staff easier.

300kW heating plant

The wood chipping process, handling and transportation are outsourced and the costs are paid centrally with the cooperative's funds. Wood chip deliveries are well documented, and compensated to the specific member. One wood ship delivery can consist of 40-50 m3 (loose cubic meters). The co-op has two price levels. A high quality chips and moisture content below 35 % and low quality chips or moisture content well over 35 %. The moisture content of the wood chips is measured regularly. The price of higher-class chips is 12 % higher than class lower-class chips.

6 Project results: Lessons learnt & post- project benefits

Total heat sales and maintenance costs have met expectations. The cooperative-model has proven to be a good form of conducting this kind of business in Finland. The co-op board actively leads the organization, but decision-making is collectively in the hands of the members. The members are kept up to date and the, and are continually informed about new projects. The cooperative has also proven to be a good platform to jointly acquire forests and land areas.

A couple of things that the co-op would now do differently, would be to build a larger storage warehouse for the wood chips and a larger boiler room. This would reduce the need for single biomass chippings, and would make it easier to do maintenance work in the boiler area. The co-op had to expand the premises afterwards.

Heat entrepreneurship in Finland has become more challenging in recent years. Investment costs have increased and profitability has deteriorated. It has grown more difficult to act solely as a supplier of woodchips without owning the thermal plant due to the low price of peat. New heating solutions such as heat pump-based technologies have increased their market share and partly weakened the popularity of woodchip heating. Wood chip heating is no longer considered a current technology and consumers are poorly aware of the benefits that the usage of local energy sources brings to the municipal economy. The relatively low price of electricity and oil has not actively pushed consumers to seek more cost-effective heating systems.

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1.3 GERMANY: CASE STUDY
1. OUTDOOR-POOL SOCIETY OF DINGDEN

Case study report for Germany: Community owned energy project from initiation to completion
Outdoor-pool society of Dingden

1 Introduction

In Dingden, a district of the city of Hamminkeln (27,000 inhabitants) a citizens' volunteer initiative found to support the public outdoor-pool's operation now uses public rooftops for solar PV. The electricity sales revenue allows the society to financially support the municipality in order to maintain the pool's conditions.

2 Description of community

The outdoor-pool society of Dingden (Freibad-Verein Dingden e.V.) has 3,100 members (as of March 2019) and was found in 2000 in order to support the operation of the public outdoor-pool. It is a "registered society" (German: eingetragener Verein, abbrev.: e.V.), which is a non-profit legal entity in Germany.

At this time, the municipality had to close the pool outside of the summer vacations due to tight budgets. Local citizens affected by the closing volunteered to maintain the pool's operation during May and July. Since 2001, the society provides all operational staff for rescue, ticket sales and cleaning in May and June, while the municipality remains responsible for the maintenance of all facilities and green areas. With start of the summer vacation, the municipality takes over the entire pool operation.

For their membership fee (6 € per year for adults over 16 years, children for free), the society's members are eligible to purchase season swimming passes (adults 25€, students and children 10 €).

In 2012, the society started to install solar PV panels on municipal rooftops, including the pool's building. Electricity sales turnovers allow the society to pay 20,000 € per year into the municipal budget, earmarked for pool maintenance purposes.

3 Renewable Energy Project

As of March 2019, the outdoor-pool society operates photovoltaic panels on six municipal rooftops: the pool's building, the local fire station, two schools, a gymnasium and a kindergarten. The facilities have a total installed capacity of 245 kWp with an annual power production of more than 200.000 kWh.

The latest PV installation at the pool delivers electricity that is self-consumed in pumps and lighting, the rest is injected into the public grid.

4 Ownership structure and financial model used

The outdoor-pool is entirely in municipal ownership. It is only leased to the society to carry out its "swimming activities", in return for a rent of 1,500 € per year.

All photovoltaic facilities are in ownership of the outdoor-pool society. The used rooftops are leased from the municipality for an annual rent of 3,500 €. The total investment amount of 480,000 € was entirely loan-financed by the local savings bank, while the municipality provided guarantees of 150,000 €. Since all installations are eligible for the national Feed-in Tariff scheme which provides a fixed and guaranteed price for the electricity produced over 20 years, default risks are low. The grid-injection of electricity generates an annual turnover of about 50,000 € in a sunny year. After deducting loan repayments, interests, rooftop rents and operational costs, the society is still able to pay a surplus of 20,000 € annually to the municipal budget. The payment is entitled as expense allowance for pool maintenance, that is carried out by the municipality. Therefore, it is earmarked for corresponding investments, only.

The self-consumed electricity at the pool is being metered separately and, on balance, sold to the municipality at a market-based price for green electricity.

5 Implementation Process

In 2012, Helmut Wisniewski, the outdoor-pool society's chairman, attended an information event by the city treasurer. The municipality of Hamminkeln was aiming to lease its own rooftops to private investors, after an unsuccessful attempt for own installations. According to the motto "Whether you make one or you make seven – it's the same work", Wisniewski – already chairman in his 12th year – convinced his society to exploit as many rooftops as possible. Taking out the loan of initially 430,000 € was relatively easy, since the society and the local savings bank were well acquainted through earlier investment cases such as a water slider. With the municipality – also in long standing partnership with the society – backing up with 150,000 € of guarantees, the entire investment could be financed by loans.

6 Project results: Lessons learnt & post- project benefits

Initially found to voluntarily help out, the outdoor-pool society of Dingden now even provides financial aid to maintain and develop the public pool. The case demonstrates how active citizens can contribute not only to the local quality of life, but also to the sustainable development of the entire community. In 2013, the society was awarded the Climate Protection Award by RWE, a large power company, and in 2014 it bore the Climate Protection Flag of the County of Wesel.

A key success factor for the society's development is the low entry threshold for members. At only 6 € per year for an adult, membership fees are more than affordable, providing access to an important recreational facility for the local community. After being found with 85 members, the society grew tenfold within a year and now has 3,100 members, making it a considerable stakeholder in the local society.

On this basis, a long-standing and successful cooperation with the municipality could evolve, eventually enabling the photovoltaic installations.

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1.4 GERMANY: CASE STUDY 2. ENERGY COOPERATIVE KAPPEL

Case study report for Germany: Community owned energy project from initiation to completion
Energy Cooperative Kappel

1 Introduction

Kappel is a 470-inhabitant village in the state of Rhineland-Palatinate, Germany. The local energy cooperative (Energiegenossenschaft Kappel eG) operates a district heating network based on local bioenergy.

2 Description of community

As of end 2018, the Energiegenossenschaft Kappel eG has about 100 members who are also shareholders. The three board members and five members of the supervisory board are elected by the general assembly. Following the German Co-Operative Act, each member has one vote, regardless of the number of shares held.

Any customer (=member) of the cooperative deposits a minimum of 2500 € (5 shares) and needs to contribute another 4600 € to the construction cost. The latter however is completely subsidised from the municipal budget.

3 Renewable Energy Project

The district heating network started operation in November 2015 and, as of January 2019, has a total length of 4.4 km and supplies heat to 93 buildings. Among them are 88 residential buildings, two community halls, a bakery and a poultry farm with butchery. Roughly 80% of the annual heat demand is supplied by a 600 kW biogas CHP. Two wood chip boilers of 500 kW each serve as peak load and back up capacities. In case one of the heat sources fails, the two remaining have enough capacity to cover the heating load of about 750 kW.

The biomass for the biogas plant is locally supplied manure and maize, while the wood chips are made from waste timber of the approx. 600 hectares of local forests.

The entire heating grid saves 600-700 tons of CO_2 emissions annually compared to oil-based heating systems.

4 Ownership structure and financial model used

The biogas plant is owned and operated by three local farmers, who sell the heat to the cooperative. The cooperative owns and operates all facilities in the heating centre (boilers, buffer tank, wood chip storage, pumps etc) and the heating grid itself. The heat transfer stations and all heating facilities on the customer side are in ownership of each customer.

Of the total invest of 2.1 million €, roughly one third is equity capital, put up by the cooperative members with a minimum deposit of 2500 € each as well as building cost subsidies of 4600 € per customer, which was provided by the municipality. Roughly half of the debt capital is covered with grant aids and repayment grants by the state-owned KfW bank and from the state of Rhineland-Palatinate. The remaining are loans to be repaid from the heat sales revenues.

In the annual balance of the cooperative, repayments and interests amount to little over 50% of the total cost, while the purchase of wood chips and heat from the biogas plant accounts for about 20%. The rest are running costs and reserves.

In order to finance these costs, each consumer pays a basic charge of 280 € per year plus a kilowatt-hour rate of currently 8,9 Cent. Since the cooperative operates on a non-profit basis, profits exceeding the required reserve will be equally refunded to all members. This financing model puts the emphasis on annual turnovers rather than equity capital, enabling the participation of citizens with less financial reserves.

5 Implementation Process

Before the cooperative's foundation, local citizens were looking for opportunities to utilise excess heat from a farmer-owned biogas plant in the village as well as residual wood from the approx. 600 ha of local forests. In January 2013, an initial town hall meeting revealed large citizen interest in district heating. A local working group was established in order to put the project in concrete terms and issued a feasibility analysis by an engineering office. In order to provide insights to interested citizens, three study visits to similar, already established projects were organised.

In February 2014, the municipal council passed a resolution to subsidise all customers connecting to the heating grid with the amount of 4600 €. In march, 70 initial members founded the cooperative, the first construction phase started in July. In November 2015, the last grid section was finished and put into operation. In December 2018, 5 more buildings were connected. The cooperative is still looking for further members.

6 Project results: Lessons learnt & post- project benefits

The case of the energy cooperative Kappel demonstrates, how local citizens, businesses and the municipality can cooperate to establish an efficient and sustainable heat supply infrastructure with stable and affordable prices.

Along with the financing model, the municipal subsidies for the project proved effective, lowering the participation threshold substantially. It is part of the larger subsidy directive "Energy Saving for Everyone", which provides grant aids for investments in efficient heating systems and thermal building insulation, the renewal of white goods as well as energy consulting to all inhabitants of Kappel. Doing so, the municipal policy does not only promote renewable energy and energy saving, but also bolsters the local economy and quality of life in a rural area.

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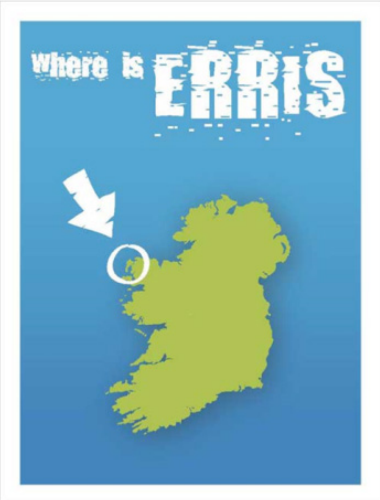
1.5 IRELAND: CASE STUDY 1. ERRIS SUSTAINABLE ENERGY COMMUNITY

Case study report for Ireland: The Erris Community: Becoming an Sustainable Energy Community
WESTERN DEVELOPMENT COMMISSION

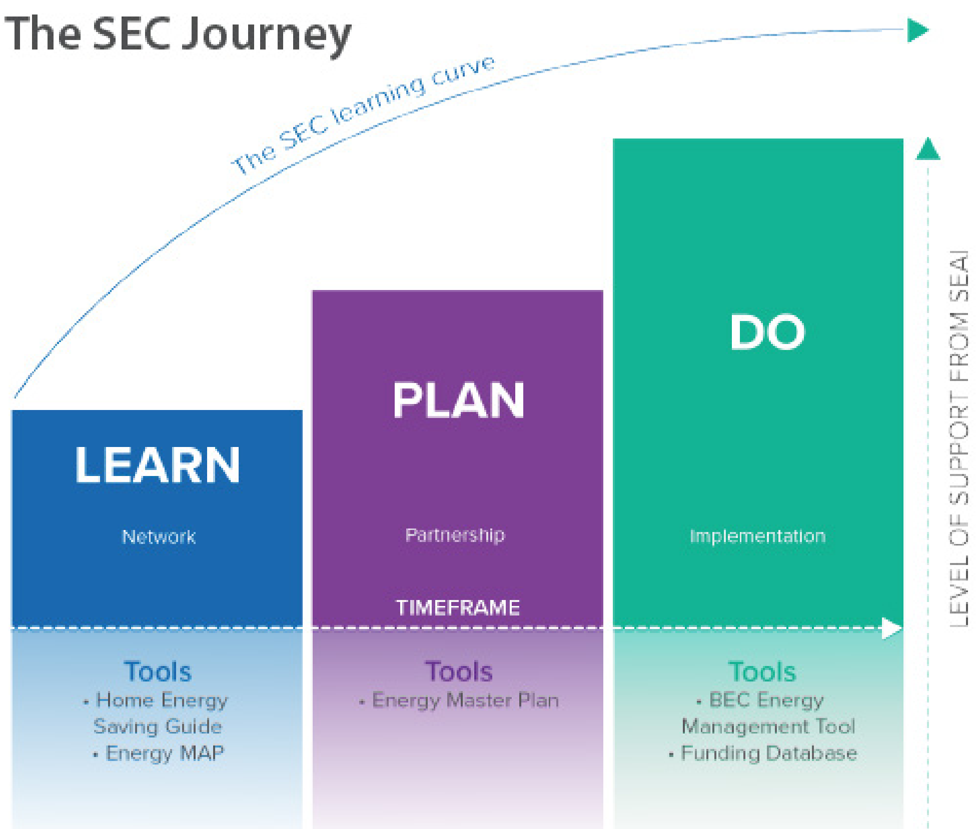


The chosen case study is the Sustainable Energy Community in Erris, Co Mayo. They started their energy transition in 2014 with both energy efficiency upgrades and renewable energy installations. This case study will include details on the process followed by the community, their structure, how they were financed, how their projects developed using the best use of RE resources in their regions and how they are implemented.

1 Introduction

Sustainable Energy Communities (SECs) were initiated in 2015 by the Sustainable Energy Authority of Ireland (SEAI [1]). An SEC is a community that works together to develop a sustainable energy system. To do so, they aim to: be energy-efficient, use renewable energy, and to consider smart energy solutions. The Irish SEC programme is a three stage model consisting of "learn", "plan", and "do" phase . The Learn phase is effectively the SEC network that SEAI has established as a support framework designed to enable a better understanding of how communities use and save energy across all sectors. The second phase is Plan. This consists of the SEC partnership agreement and the Energy Masterplan (EMP). The SECs who are already in the SEC Network are now encouraged to enter into a three year Partnership Agreement with SEAI where they can access SEAI technical supports to help establish a baseline EMP, identify energy saving opportunities, implement a tailored programme of activities for the community, monitor the programme's progress and review accordingly. The third phase is Do. This phase is where the SECs take action and develop projects identified in the opportunities register, and bring them to fruition through SEAI's Better Energy Community (BEC) Programme [2] or other SEC grant funding.

The Erris community used the BEC programme to become an SEC!



2 Description of community

Erris is located in the North West region of County Mayo. It covers an area of 850 km2 and has a population of only 10,000 people, giving it the lowest population density in Western Europe (Erris is a similar size to Rome which has a population of 2.5m). It is a small rural area with huge natural resource potential due to an abundance of wind, wave, solar, and seaweed. There is a strong community spirit that is evident in all aspects of daily life here.

3 Renewable Energy Projects

The community of Erris in Co Mayo has engaged in energy saving measures since 2014 including the following: installation of energy efficient upgrades for buildings in the area (including all types of insulation, fabric upgrades, heating upgrades); adoption of renewable energy technologies (photo voltaic (PV) cell arrays to produce electricity, solar hot water panels, heat pumps, electric vehicles, wind turbines); distributive generation (micro grid demo site to include PV/wind); and smart grid technologies (smart meters, intelligent building controls).

Year	Projects completed
2014 14 Community Groups	2 electric vans for local "Meals on Wheels" 2 x 7kW Photovoltaic arrays 10 buildings insulated 9 buildings heating system upgrades 7 buildings LED lighting 28 Quantum storage Heaters
2015 10 Community Groups	Western Care (Adults with Intellectual Disabilities) 3 building upgraded Irish Wheelchair Association 11kW Photovoltaic array 6 National Schools retrofitted Micro grid incorporating 11 kW Photovoltaic, 6 kW battery, 3 x Glen Dimplex storage heaters
2016 50 home owners in energy poor homes	Doors and windows replaced LED lighting replacements Attic, cavity, internal and external insulation New heating systems Solar hot water systems €19,000 per year saved overall with an average of €380 per house

4 Ownership structure and financial model used

The community groups involved used the Local Authority, Mayo County Council to draw down the grant aid funding. At that time, there was a community gain fund established as part of the Corrib Gas Project in North Mayo. The community used the Corrib fund to finance 40% of the overall projects in 2014 and 2015. This enabled significant projects to be implemented at a **10% cost to the community group** when SEAI's 50% BEC funding was also used.

Year	Total Cost	No. of Groups	Structure of Funding	KWhs Saved	Annual Electrical Savings (15c/kWh)	Annual Thermal Savings (5c/kWh)
2014	€340,163	14	50% SEAI BEC 40% Community Gain Fund 10% Community Groups	194,143	€29,121	n/a
2015	€385,729	10	50% SEAI BEC 40% Community Gain Fund 10% Community Groups	323,624	€48,543	n/a
2016	€402,777	50 homes	80% SEAI BEC 20% Home Owners	373,470	n/a	€18,673

5 Implementation Process

There were several collaboration partners: Sustainable Energy Authority of Ireland, Údarás na Gaeltachta, Mayo County Council, Community groups, Primary schools, Retrofit Energy Ireland Ltd, GREAT Project & INTERREG funding programme, Corrib Community gain fund. Each one was essential to both the implementation process and the grant application process.

6 Project results: Lessons learnt & post- project benefits

The biggest lesson learnt for communities in Ireland is that the Irish SEC model addresses the majority of barriers that exist for communities in Ireland that are trying to transition to a low carbon future.

Barriers to Overcome	Irish SEC Model
Community Ownership	Ownership (Community Charter and Master Plan)
Community/Stakeholder Engagement	Addressed throughout the entire process Bottom up approach, grassroots approach SECs are community led, and community focussed 3 year partnership agreements in place
Overcome local mistrust.	Addressed throughout the entire process Community mentors in place SECs are community led, and community focussed 3 year partnership agreements in place
Financial support	Addressed throughout the entire process Financial support: (look at funding available in Table 3) Access to Expertise: technical mentors are available throughout Core competency Skills development
Access to technical expertise and knowledge	Addressed throughout the entire process Access to Expertise: technical mentors are available Core competency Skills development
Lack of capacity	Addressed throughout the entire process Community mentors in place Access to Expertise: technical mentors are available Core competency Skills development

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Sources

[1] SEAI is Ireland's national sustainable energy authority. They are leading Ireland's transition to a sustainable energy future.

[2] SEAI's Better Energy Community (BEC) Programme was initiated in 2012 as a pilot project with a budget of €3m; in 2017, the Programme provided €25m in direct funding to a total investment in energy efficiency of almost €100m.

1.6 IRELAND: CASE STUDY 2. ARAN ISLANDS ENERGY COOPERATIVE

Case study report for Ireland: Community owned energy project from initiation to completion
Comharchumann Fuinnimh Oileáin Árann Teoranta

1 Introduction

Comharchumann Fuinnimh Oileáin Árann Teoranta (CFOAT or Aran Island Energy Co-Op) is a community based, not-for-profit Energy Cooperative representing the 3 Aran Islands, County Galway.

2 Description of community

CFOAT has just under 100 shareholders as of January 2019 and 12 elected directors. It has a manager who is full-time employed. Its aims are to drive the transition on the Aran Islands to carbon neutrality. Part of this challenge is to insulate all the buildings to a high standard, replace oil and coal with heat pumps, solar pv and battery storage, promote electric vehicles, and tap the sources of green energy on the islands to produce enough power to make the islands self-sufficient. Aran aims to develop its own micro-grid with a 'sprioc-dáta' of 2022.

3 Renewable Energy Project

The Better Energy Communities (BEC) scheme funded by the Sustainable Energy Authority Ireland (SEAI) has been the backbone of funding for retrofitting of buildings on the islands and we have drawn from it since 2012. More recently, we have become partners in a number of European projects (RESPOND, GEOFIT, SEAFUEL) and this is opening up other possibilities, developing the islands as a research laboratory, and providing extra funds. Up to 50% of the buildings on the islands have had some retrofitting done. A large number of heat pumps have been fitted, as well as solar PV. The number of electric cars on Inis Mór is now at 10. Barriers to further development are mainly related to planning restrictions, e.g. for a wind turbine or solar pv farm. Other barriers include the availability of good contractors who are willing to take contracts on the islands, where they experience a lot of extra hassle with boat times, weather, etc.

4 Ownership structure and financial model used

CFOAT is registered as a cooperative. Its rules prevent it from distributing any profits to shareholders. Membership is open to all residents and businesses located on the 3 islands. Grant aid comes from SEAI and from European funding (Interreg, H2020). CFOAT is a Sustainable Energy Community (SEC) and receives a lot of support through this network. It is also engaged with National University of Ireland Galway (NUIG), Galway-Mayo Institute of Technology (GMIT), Trinity College Dublin (TCD), and other institutions that provide a lot of assistance and support. In the future, it is the aim of CFOAT to have at least 50% ownership of the major sources of RE on the islands. It hopes to use the profits from these ventures to fund other RE related activities and through that to build up the local economy and create sustainable employment.

5 Implementation Process

CFOAT grew out of Comharchumann Forbartha Árann (Aran Development Co-Operative). At first, it was a project within this Comharchumann (Co-Operative) (1990 – 2003). Then it became a sub-committee of the Comharchumann (Co-Operative) (2003 – 2012). Finally, in 2012 it registered as an independent co-operative in its own right. However, CFOAT still regards itself as connected and working together with the Comharchumainn (Co-Operatives) on all 3 islands.

6 Project results: Lessons learnt & post- project benefits

CFOAT strongly recommends the structure we have created for other communities also. It works very well for us. Every resident of the Aran Islands has the opportunity of becoming involved and belonging as a shareholder. The benefits will be for the whole community and there is no opportunity for private gain. When we were given a standard set of rules for a cooperative from the Cooperative Society of Ireland, we tweaked these rules to suit ourselves, so our rules are not standard, but adapted to our particular situation and goals.

The most important thing for us was the setting of clear goals. We have a set of Aims and Objectives which are just one page long and have 10 points. We return to these all the time and they keep us on the straight and narrow. At no point in our 7 years of existence have we needed to change these. They provide us with cohesiveness and also with inspiration.

The other important lesson is the value of constant communication with our shareholders and with the Aran island communities in general. We are still working on improving this, but we see it as most important, not just from the point of view of information, but also of education. The energy transition requires a new way of thinking, changes to our behaviour, and offers positive opportunities to those who can spot them.

We use every form of communication possible, including, posters, newsletters, email, Facebook, Twitter, Instagram, YouTube, and regular interviews and announcements on Raidió na Gaeltachta.

We also believe that could achieve more if we had more support from public sector bodies, local authorities or local development committees that are responsible for the management of local development on the Aran Islands. These groups should be allocated specific funding for RE projects in order to have a more structured supportive approach that would benefit energy communities both technically and financially.

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1.7 SWEDEN: CASE STUDY 1. DISTRICT HEATING PLANT JOKKMOKK MUNICIPALITY

JOKKMOKKS KOMMUN
JÅHKÅMÅHKE KOMMUVNNA
JÅHKÅMÅHKI SUOHKAN

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

Case study report for Sweden: Community owned energy project from initiation to completion
District heating energy plant, Jokkmokk municipality

1 Introduction

Jokkmokk municipality has about 5,000 inhabitants on an area of 19,334 km² and is situated in the inland of Norrbotten, Northern Sweden, at the Arctic Circle.

Jokkmokk is a Swedish Eco-Municipality and a signatory of the EU Covenant of Mayors. It has developed its Sustainable Energy Action Plan and is committed to reduce its greenhouse gas emissions by at least 20% until 2020, compared to 2005.

2 Description of community

Jokkmokk district heating supplies public buildings in Jokkmokk settlement as well as private households and companies, in total 522 buildings. In 2017, 34 GWh of heat were delivered. A 17 MW wood chip boiler is used during the main part of the year. A pellet boiler of 3 MW is used end of May to mid-September. The district heating company currently has eight employees.

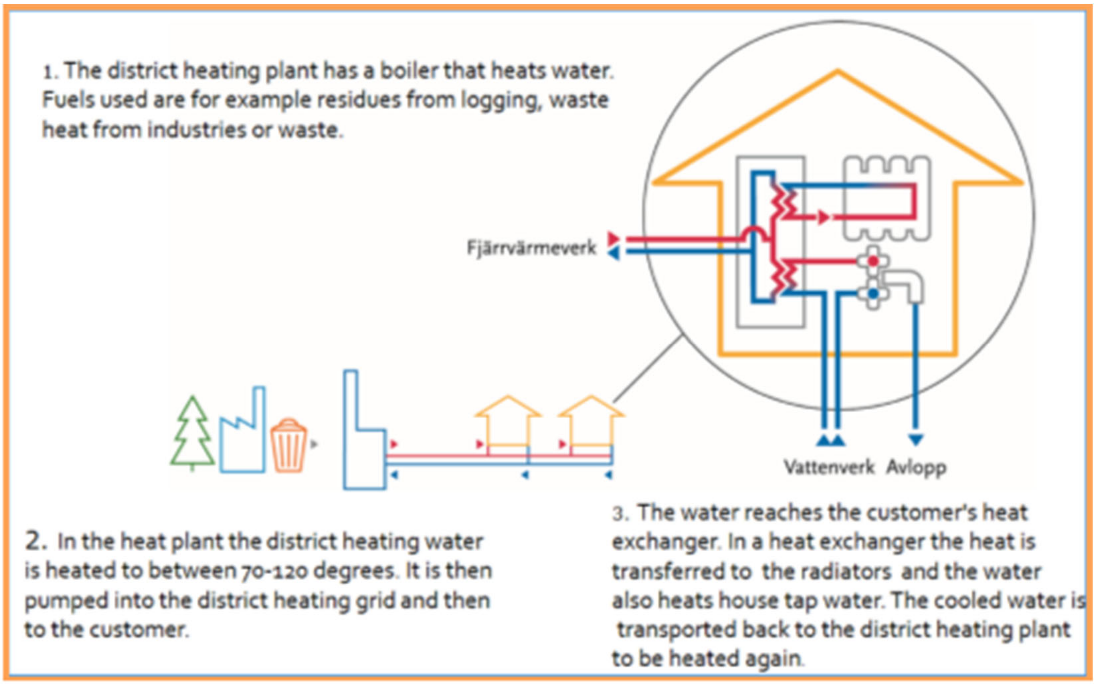
Up to 99% of the delivered energy is produced by bioenergy; however, successfully energy efficiency is important both economically and ecologically.

3 Energy efficiency and renewable project

Jokkmokk district heating company successfully works with increasing the cooling performance in district heating sub-stations. A sub-station with poor cooling extracts less energy per unit volume of water. That means an overconsumption of flow to meet the consumers' heat demand. The positive effects of increased cooling are particularly reduced heat losses in the district heating network and efficiency increase for flue gas condensation. The energy efficiency campaign focuses on the return temperature of the water coming back from the customers. This is a key indicator of heat network efficiency.

Low return temperature results in a larger delta T, which means lower flow rates are required for the same kW delivered. In this way, pumps and pipes will work safer and more efficiently. A cooler return pipe also lowers heat losses. An important economic factor is the need to use reserve capacities for winter time's peak load. Those use oil an electricity, which makes it very expensive. There are significant economic savings to be made if the need for reserve heat production reduces. By installing new meter at the customer's facility will enable to find out where problems exist and to fix the problems, often by adjusting the customer's heat exchanger.

In Jokkmokk's case the fuel demand has decreased by about 435 MWh due to efficiency increase in flue gas condensation. The pipeline losses have been reduced by about 570 MWh, but more energy for pumping was needed, approximately 6 MWh.



4 Ownership structure and financial model used

Jokkmokk district heating is to 100 % owned by Jokkmokk municipality. The investment costs for material were about 1200 € and labour costs about 9000 €, while the cost saving is about 14 815 €/year. However, it is important to notice that the most economic projects for maintenance of sub-stations have been done now, next projects will most likely be less profitable.

5 Implementation Process

The first step in this and similar projects on energy efficiency is to measure, control and analyse how much energy is used in which facility and how much energy is needed to produce the final energy. In analysing the data it becomes obvious that some substations were not working properly. These needed to be checked, overhauled or possibly changed. An important next step is to review whether the taken steps were successfully. In the long run, a proper and continuously working controlling system and a strategic efficiency plan are needed.

6 Project results: Lessons learnt & post- project benefits

Energy efficiency projects are considered as most attractive projects for the municipalities because of their short payback period and economic, environmental and social benefits. In addition, the project will develop and maintain the current pipeline infrastructure leading to fewer maintenance needs and easily monitored network. A great challenge for small northern communities is the recruiting of educated staff capable of developing and implementing this type of projects successfully. The higher efficiency will lead to lower fuel costs and will save forests which is important as forests are essential, e.g. for preserving biodiversity and as Co_2 storage.

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1.8 SWEDEN: CASE STUDY 2. WASTE WATER HEAT PUMP, VILHELMINA MUNICIPALITY

JOKKMOKKS KOMMUN
JÅHKÅMÅHKE KOMMUVNNA
JÅHKÅMÅHKI SUOHKAN

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
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Case study report for Sweden: Community owned energy project from initiation to completion
Waste Water Heat Pump, Vilhelmina municipality

1 Introduction

Vilhelmina is the largest municipality in Västerbotten County when it comes to the area (8795 km2). The number of inhabitants is about 6,800. More than half of the population lives in or near the main community Vilhelmina and the other half lives across a very large geographic area in many small and medium sized villages. Ensuring a cost-efficient and reliable municipal service even in the smaller communities is important.

2 Description of community

The western part of Vilhelmina municipality consists of a mountain range with various valleys. One of them is called Kittelfjäll, which has outstanding on- and off-piste skiing opportunities in a beautiful nature. The small village itself is becoming more and more attractive to people who want to have a holiday home there. The current detailed land use plan comprises an approximately 100 hectare area in which a maximum of 350 residential properties can be built. The rising number of inhabitants made it necessary to build a new sewage plant, as the old one is designed for only 900 pe. The new one is able to deal with up to 4000 pe and should be highly flexible due to the high share of part-time inhabitants.

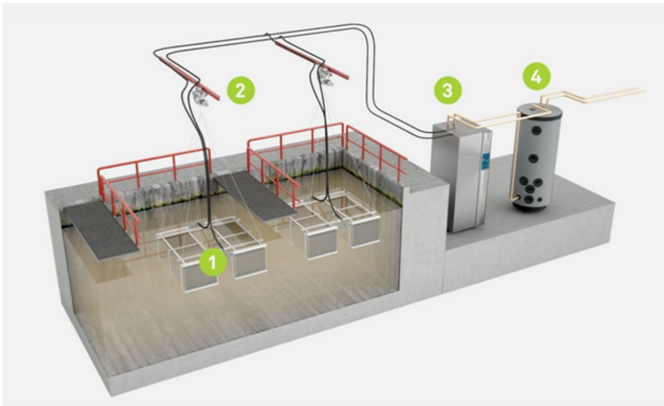
3 Energy efficiency and renewable project

Like a refrigerator or air conditioner, a heat pump forces the transfer of heat energy from the ground, water or air to the application. Using motive power to run the heat pump's process effects the transfer of several times as much energy to the application, be it heating, hot water or even cooling. In theory, heat can be extracted from any source, no matter how cold, but a warmer source allows higher efficiency. The relationship between how much power we use versus how much energy is delivered is known as a COP or Coefficient of Operating Performance. If a heat pump uses 3kW of power and delivers 12kW of energy then its COP is 4 (=12 /3).

There are specific challenges when it comes to make use of the heat of wastewater. One major issue is the harsh environment as the wastewater due to its nature fret at the heat collector. Fats, oils and grease floats on water surface and can encrust on pipe walls and mechanical equipment. Service for and cleaning of the appliance need to be easy as the process of wastewater treatment cannot be stopped for too long.

The standard design for the wastewater treatment plan would be direct electric heating. Instead, a heat pump has been installed (23 kW), which is tested with good results in similar plants. It will deliver about 57 000 kWh per year and use about 12 000 kWh electricity, which gives a COP of 4.75.

The collectors use a polymeric special material to maximize the area to take up the heat from the water, which makes them more effective than standard ones. They are also compact, easy to install and to clean. An important environmental advantage is is that these collectors use very little cooling liquid compared to standard solutions.



Waste Water Heat Pump System (Evertech), design chosen for Kittelfjäll pilot site

1: Heat Collector, to be placed in the waste water
2: Possibility for hanging collectors in the water to avoid problems with operation
3: Heat Pump
4: Heat Boiler

4 Ownership structure and financial model used

The waste water plant is built and owned by the municipality of Vilhelmina. The use of the waste water heat makes the operational costs of the plant significant lower:
Total investment: 47 250 Euro
Electricity price: 0.15 Euro / kWh
Saved electricity per year: 45.000 kWh = 6 750 Euro
Pay-Off: 7 years.
The investment is economic by given lifetime of heat pump of ca 15 years.

5 Implementation Process

Vilhelmina municipality has used this technology in an earlier project and has been convinced by its advantages. Therefore, the use of heat pump technology has been part of the planning from the beginning.

6 Project results: Lessons learnt & post- project benefits

Energy efficiency projects are considered as most attractive projects for the municipalities because of their short payback period and economic, environmental and social benefits. However, it is important to consider operational or life-time-costs already in the planning stage and not only on possibly lower investment costs for standard technology. It is also essential that decision makers have the chance to see new efficient technology in place and to learn from best practice examples.

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LECo

Local Energy Communities

Project Partners

Centria University of Applied Sciences (Finland),
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Renewable Energies Agency (Germany)*, Jokkmokk municipality (Sweden),
The Gaeltacht Authority (Ireland), Lohtaja Energy Cooperative (Finland),
UiT – the Arctic University of Norway (Norway)

*Outside the NPA Programme area