Northern Periphery and Arctic Programme
2014–2020

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Local Energy Communities

Summary report on support provided by Energy village experts

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Summary report on support provided by Energy village experts

Support provided by local and international experts to working groups of rural community members developing LECo project ideas will be outlined in a summary report. This will include details of best practice from other NPA regions and non-NPA regions.

The support that local and international experts provided to working groups of rural community members in developing LECo project ideas were evident through the following project activities.

Contents

1. Building awareness and leadership around sustainable community energy

The LECo project comprised of sustainable awareness raising activities such as workshops, seminars, webinars, on-line training forums and study trips as well as campaigning and building awareness among local/ regional decision makers, stakeholders and the public.

COMMUNICATION AND DISSEMINATION: The LECo project incorporated components of broader communication and dissemination based around the LECo website, the LECo learning platform, production of newsletters, press releases, flyers at events, international conferences and various other media.

CAPACITY BUILDING AND KNOWLEDGE SHARING: Each region organised several seminars, workshops and events often involving peer-to-peer learning in order to raise awareness. Events were held in Hakkas, Purkijaur, Porjus, Jokkmokk, Korpilombolo and Vuollerim in Sweden. Events were also held in Donegal, Sligo, Mayo, Galway, Leitrim, Roscommon, Clare and Kerry in Ireland. Events typically had a particular technical focus and involved presentations from peers, technical experts including local and international experts. The LECo project provided a platform through which stakeholders could exchange experiences and disseminate information about their sustainable energy activities. There was no charge for participating and participants gained expertise and experience on sustainable energy with the other stakeholders. For example, recently in Ireland the Western Development Commission and Tippeary Energy Agency in association with the Dept. of Communication, Climate Action and Environment hosted a Community Consultation Workshop for the new Renewable Electricity Support Scheme (RESS).

ENERGY EFFICIENCY TRAINING WEBINARS: Energy efficiency webinars were focused on communities and community buildings and solutions could also be applied to households. The webinars focused on the practical changes that can be made to reduce energy consumption and lower energy costs. All the webinars can be found on the on-line training platform.

STUDY TRIPS: Example of project activity outside NPA region: The LECo project in conjunction with community energy groups from all the partner regions participated in two study trips to Germany. The trips were organized by Renewables Energies Agency and in 2018 the group visited the Rhein-Hunsruck District and in 2019 the Aller-Leine-Tal region was visited. These study tours allowed participants to engage in transnational workshops and visit regions of best practice and exemplar 'energy villages' and meet experts in a formal and informal setting during meetings and site visits. The main component of the project activity involved on-site visits and exchange of experience with public authorities and community groups in Germany. The group became acquainted with various community-led energy projects, including community owned wind farms, an electric car sharing energy co-operative and a community owned biogas plant.

COMMUNITY ENERGY CONFERENCE: Example of project activity outside NPA region and other NPA regions: The Western Development Commission hosted a community energy conference entitled "Community Owned Energy in Ireland: Lessons Learnt from Germany and Denmark". The conference focused on best practice and lessons learnt from other NPA and non-NPA regions. The conference was chaired by **Paul Kenny** CEO of the Tipperary Energy Agency and featured speakers including **Craig Morris** Renewable Energy Agency Germany, **Dr Louise Krog** Aalborg University Denmark, Enda **Gallaghe**r Dept. Communications Climate Action & Environment, **Ian Kilgannon** Gas Networks Ireland, **Xavier Dubisson** XD Consulting and **Prof Jerry Murphy** and **Dr Richard O'Shea**, MaREI centre, ERI, UCC.

2. Technical support and tools for Community Sustainable Energy Action Plans (cSEAP) and Community energy system modelling

The provision for technical support and tools for developing Community Sustainable Energy Action Plans (cSEAP) was a characteristic of the LECo project. Activities included workshops, peer-to-peer learning, sustainable energy planning and facilitating access to energy data and knowledge exchange to support SEAP development and implementation.

DEVELOPMENT AND PROMOTION: The LECo project was involved in the development and promotion of guidelines, tools and roadmaps to help community energy groups develop cSEAPs, identify investment opportunities and share best practice. These include reports on the results of the community energy assessment, interviews and statistical data, handbook, factsheets, report on best practice, financing and renewable energy strategic plans which is available on the LECo website and learning platform.

ENERGY SYSTEMS IN COMMUNITIES – FREE TRAINING ON THE ADVANCED ENERGYPLAN TOOL – IRELAND: Following the very successful community energy study trip to Germany, the LECo project delivered FREE Energy PLAN training to Irish communities. Robert Fischer from the Luleå University of Technology (a partner in LECo) travelled to Ireland to deliver the training, where he was assisted by Xavier Dubisson. Over the two days, 15 community members learnt how to model the energy systems in their communities by learning how to use the advanced tool EnergyPLAN.

ACTIVITIES TO SUPPORT cSEAP IMPLEMENTATION: Many of our community groups completed Energy Master Plans during this process while developing a cSEAP and collecting baseline energy usage data with the support of the LECo project.

3. Feasibility Studies & Pilot projects

Energy feasibility studies were carried out in each of the three partner regions. These feasibilities provided expert advice on sustainable renewable energy projects and the potential for energy efficient upgrades and renewable energy solutions for the community. One pilot from each region was then selected and a business model for local energy was prepared.

FEASIBILITY STUDY ON ANAEROBIC DIGESTION FOR THE DINGLE PENINSULA IRELAND:
The feasibility study assessed the viability of an anaerobic digestion plant on the Dingle Peninsula in Ireland. The Dingle Energy Master Plan commissioned by the Dingle Hub determined that the Dingle Peninsula consumes around 315 GWh per year. Initial feedstock analysis indicates that silage, cattle slurry, food waste, sewage sludge and fish waste could provide 305 GWh of energy to the region.

Highlights and conclusions of the Feasibility Study:

- 66% of farmers on the peninsula are close to or above retirement age
- A community-ownership (co-operative) model is the most desirable to all stakeholders
- The most economical pathway includes food waste and animal by-products
- Anaerobic digestion can support eco-tourism and innovation on the Peninsula

FEASIBILITY STUDY ON THE SUSTAINABLE ENERGY POTENTIAL OF LECo PILOT COMMUNITY VUOLLERIM, SWEDEN: The feasibility study assessed current use of final energy for buildings for the whole village of Vuollerim and compared it with the potential for energy efficiency and renewable energy for Vuollerim, Sweden. Vuollerim is situated at the Arctic Circle in Norther Sweden's inland and is today a village with 760 inhabitants (2017). Vuollerim was and is an important hub for hydropower production in Lule River.

Highlights and conclusions of the Feasibility Study
The total energy use for buildings in Vuollerim in 2016 has been estimated to be 11 575 MWh. When standard energy efficiency measures are applied for the whole village, energy use could decrease to about 9270 MWh in 2025.

- It is assessed that 30% of the private homes have roofs suitable for photovoltaic (5kW) and about 10 buildings for a PV-plant of 13 kW. In addition, one bigger plant (80KWo has been taken into account. In this case, a production of 816 MWh per year is possible.
- Today, about 15 companies and 30 private households are interested in Photovoltaic, both in joint procurement for individual plants and in a cooperative owner bigger plant.
- Investment in additional heat pumps (air-to-air and ground source) could deliver another 643 MWh a year.
- Investment in wood or pellets stoves as complement to direct electric heating could produce another 450 MWh/ year.
- Wind Power has a big potential, however, due to the lack of wind measurement data for specific spots, legal limitations and the high sum of investment, no further investigations have been done in this field.

FEASIBILITY STUDY ON THE POTENTIAL FOR PHOTOVOLTAIC SYSTEMS FOR DAIRY FARMS IN FINLAND: This feasibility study rewired the feasibility of utilizing a PV-system for energy production on a large dairy farm in Sykäräinen Finland. This feasibility study examined the dairy farm's hourly electricity demand and the coverage of the potential solar energy generation with different PV -systems. The study estimated the viability of different size PV-configurations from 30 to 70 kWp.

Highlights and conclusions of the Feasibility Study:

- High grade of self-consumption due to good production and consumption profile correlation
- Approximately 90-95 % self-utilization of PV -production when system size was 60 – 70 kWp
- Good potential for PV –utilization on dairy farms that utilizes robotic milking systems in Finland
- Moderate payback period of 10 years for a 60 kWp system, including 40% ELY-investment support

BUSINESS PLANS: Business plans were also implemented for our pilot community groups. These plans were practical plans tailored for each community taking into account the best use of natural resources available.

PRACTICAL EXAMPLES OF BEST PRACTICE (LECo Project)

1. Project Partner: Jokkmokk

- **Name of energy Practice:** Energy efficiency in district heating, Sweden
- **Region Where Practice is Active:** Jokkmokk, Norrbottten, Sweden

Short Description of the function, product or service
Jokkmokk municipality has about 5000 inhabitants on an area of 19 334 km². Jokkmokk's disctrict heat plant sells about 34 GWh heat annually. The heat is delivered to 522 customers, of which 332 are households. About 99% of the heat is produced with wood chips, bark and wood pellets. 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.

Innovativeness or relevance to the practice
Jokkmokk district heating company successfully works with increasing the performance in district heating sub-stations. 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.

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.

By installing new meter at the customer's facility Jokkmokk district heating is now able 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.

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.

Asset owner: Jokkmokk district heating, Sweden
Used assets: District heating network and its sub-station
Cost saving potential: 14 815 €/year
Environmental benefits: + 3,5% energy efficiency; - 210 kg NOx/yr; - 100 kg CO/yr
Investment costs: 10 200 €
Payback time: less than 1 years

2. Project Partner: Centria University of Applied Sciences

- **Name of energy Practice:** Motiva Energy Audit
- **Region Where Practice is Active:** Finland

Short Description of the function, product or service
A Motiva Energy Audit is a publicly supported service that aims to improve the energy efficiency of buildings and promote the use of renewable energy.

Innovativeness or relevance to the practice
An Energy Audit analyses the current energy consumption of a property, and determinates the overall efficiency by comparing the results to similar properties in Finland.

The audit then contains practical proposals on how the property owner can improve the energy and cost –efficiency of the building, and how to reduce the carbon footprint. The audit also assesses the status of the HVAC –systems, and explores the potential for utilizing renewable energy sources, including profitability calculations and CO2 impact analyses.

The implementation of an Energy Audit is eligible for government aid if the audit is carried out by a certified actor. The Ministry of Economic Affairs and Employment grants aid for the Energy Audits.

The Energy Audit -concept has been developed by the Finnish company Motiva. Motiva is a public utility that provides businesses and municipalities information, solutions and services related to resource-efficiency.

Motiva also has other Audit –models, for instance: · Energy audits of transport chains · Municipal renewable energy audit

For more information:
https://www.motiva.fi/en/public_sector/energy_auditing

3. Project Partner: Údarás na Gaeltachta

- **Name of energy Practice:** Better Energy Communities Project
- **Region Where Practice is Active:** Gaeltacht Regions (Irish speaking regions), Ireland

Short Description of the function, product or service
Údarás na Gaeltachta's better energy communities project in conjunction with supports from the Sustainable Energy Authority of Ireland (SEAI) have increased the energy efficiency of community buildings, business and buildings occupied by our client companies.

The work undertaken includes boiler upgrades, roof insulation, attic insulation, tank insulation, window replacement, PV and solar panels, internal dry lining, LED lighting upgrades, heating controls and zoning, community owned wind turbines, air-compressor and fan upgrades.

Since the establishment of our better energy communities scheme energy upgrades and efficiency measures have been brought to approximately 70 buildings in the Gaeltacht regions.

Innovativeness or relevance to the practice
Approximately €3million has been invested in the Gaeltacht in community, private enterprises and public sector projects and has resulted in a saving of €600,000 on energy costs in the last number of years and a reduction of 20% in Co2 emissions. Údarás na Gaeltachta will continue its efforts on implementing a programme of energy conservation in the Gaeltacht and helping communities and businesses make more efficient use of energy by lowering their energy usage and costs

For more information:
https://www.seai.ie

Best Practice from other NPA and non-NPA regions

DENMARK & GERMANY (Non-NPA region)

Denmark is one of the most prominent countries regarding CE projects and has a long tradition of active energy policy with support from government for RE projects. Decentralised energy production was always a key policy factor with a dominant role for municipal government. These municipal governments work together with local citizens and companies regarding energy policy (Oteman et al., 2014). As a result of high energy prices in the 1970 Denmark's clear energy policy with the assistance of specific energy policies allowed communities to collectively invest in CE projects.

By 2000 with the assistance of favourable energy policies and generous feed-in tariffs Denmark reached a peak regarding CE projects (Mey and Disendorf, 2018). Around 80% of Denmark's wind energy was owned by individuals and cooperatives during this time (Bauwens et al., 2016). The Danish Renewable Energy Act, which can into effect in 2009 and contained may measures to encourage the development of on-shore community wind turbines promoted local ownership through subsidy schemes for co-operatives and gave residents the option to purchase shares in wind turbins. In 2013 70-80% of wind turbines were owned by communities (Basse, 2013). By and large Denmark is focused on wind energy perhaps due to the topography of the country and the success of CE projects was largely based on the feed-in tariff. However, some small-scale district heating projects exist and solar energy has started to be used due to the advances in technology and the price reduction. (Oteman et al., 2014). Denmark is still however, on target in achieving electricity and heat supply solely from renewables by 2035.

Denmark also has a number of other mechanism in order for communities to benefit from the projects. KommuneKredit allows CE projects to avail of favourable loans including 'green loans' under the scheme.

However, in recent times Denmark has had some difficulties and challenges regarding CE. The legal framework changed from feed-in tariff for RE electricity to premium and then returned back to feed-in tariff. This in term contributed to long term uncertainty both financially and from a planning perspective. Changes in legislation in 2019 removed the monopoly of municipals regarding heat provisions and this made it difficult for homeowners to agree on planning moving forward. Financial support for these projects is also lower that it was 20 years ago (Ruggiero et al., 2019).

Wind energy technologies is also moving towards larger and more expensive projects with a bigger financial burden been placed on community group.

Germany is also a leading country regarding CE and has ambitious targets regarding greenhouse gas emissions and climate targets (Agora, 2015). As in Denmark, a feed-in tariff system and the German public banks have contributed to the success of the projects in providing long term financial security and low cost financing (Gancheva, et al. 2018). An established energy movement and a tradition of cooperatives and as will as municipal autonomy are also factors contributing to the success. (Gancheva, et al.) Germany also had little resistance from the public regarding RE projects and this support is also a contributing factor. The government has also been instrumental in the energy transition by legislating by targeting specific technologies and incentives for CE projects. These include the Renewable Energy Act, the Roofs Solar Programme and Preferential Loan Programme (Ruggiero et. Al, 2019). Other key legislation included the guaranteed minimum purchase price for energy from renewable resources when CE projects connected to the grid. The feed-in tariffs were reviewed and improved in 2000 and priority access to the grid for CE projects through amendments to the Renewable Energy Sources Act in 2004 & 2008. The legislation supporting CE projects also affords municipal autonomy which allows local governments to take charge of planning, energy supply and prioritising renewables at a local level. Therefore, allowing local community input and local commercial input.
However, Germany has also encountered some difficulties recently. An alternative auctioning system has replaced the feed-in tariff and in turn a reduction in the number of CE projects is evident. (Agentur für ErnerueFrbare Energien, 2018). The introduction of bidding is proving to be a barrier to CE projects due to the complexity and cost involved.

Best practice identified from Denmark & Germany

Stable policy framework and eliminating regulatory barriers: It is clear that many of Denmark's and Germany's successful CE projects were dependant on government and municipal policy. Legislation provided for favourable feed-in tariffs and tax incentives together with guaranteed and priority grid connection. A simplification of the process of granting grid connections and granting building permits or planning were also crucial factors in particular the granting of same in a more expeditious manner.

Long-term and low interest investment schemes and loans: Stability and certainty to allow for investment was also a key factor in the successful of CE projects. It is obvious that CE projects need specific and dedicated financing in order to succeed. Also of note is that early stage funding is necessary in order to conduct feasibility studies and avail of specialist technical experts. Dedicated early stage funding was also a factor in order to complete feasibility studies and to assist communities in the planning and establishment stage.

Community engagement: Constant, honest and open communication is key to ensuring community engagement. Expert presentations on technical aspect of certain technologies are a good way to communicate with local communities. Projects under the ownership of communities are often more aligned to community acceptance. Thus, in turn engagement and ownership reduced opposition to projects.

Cooperation: The success of CE projects involved an element of cooperation between community groups and technology suppliers and funders. For example, companies providing the RE equipment supply the technical knowhow to community groups where they lack the expertise. A good example of this is a community-owned wind farm on the Danish Island AERO. Cooperation was also evident between community groups and local network companies or energy retailers.

Examples: Ærø - a renewable energy island Denmark

Ærø is situated on one of the southern islands of Denmark, Northern Europe and has for the past 30 years worked actively to encourage the use of renewable sources. Today, over 55% of the island's total energy from solar, wind and biomass, and ultimately, the goal is that Aero will be self-supplied with renewable energy.

The Ærø Wind Energy project is a great example of how the creation of a local foundation allowed for direct communication with the community which in turn strengthened community spirit and had a positive impact on the community.

Faroe Islands (Other NPA region) Best Practice Examples

1. Energy Efficiency Service

The government in the Faroe Islands aims to reduce energy consumption and transform 50% of the heating of houses from oil to renewable energy. There are approximately 18,000 on the Faroe Islands. A company, called Spf Byggitrygd (building security) supply a service whereby they analyse a building or house and make recommendations as to ways to reduce heating costs but at the same time create maximum value for the home-owner in the future.

The company philosophy is based on the Kyoto pyramid which has the following principals.

- Reduce heat loss
- Ensure efficient electricity use
- Use solar energy
- Show and control consumption
- Select energy source (SECURE Project, 2018)

2. Heat Recovery From Waste Water

Every year 3000 TWh is used in Europe for heating water, which is then flushed out as wastewater. This is the equivalent of 600 million tonnes of CO_2 emissions. Defined Energy is a local company in the Faroe Islands that focuses on recovery of energy from wastewater. Warm water from showers passes through a heat exchanger, which feeds the recovered heat into the boiler. A good example of this system is Torshavn one of the largest swimming pools on the Island. In 2013, the annual energy consumption for heating the shower water was 327 MWh. This was reduced by 58% to 139 MWh per year by installing four DE-5 heat exchangers from Defined Energy. (Saramäki [ed.], 2018)

3. Thermal Imaging of Buildings

A company called Hitamyndir (Heatpictures) based on the Faroe Islands examines the airtightness of buildings to pinpoint where cold air may enter the building. The company uses thermal imaging and powerful blower door test equipment. Measures can then be taken to reduce the amount of cold air entering the building. This in turn makes the building more energy efficient, comfortable and avoid condensation problems. (Saramäki [ed.], 2018)

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Project Partners

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*Outside the NPA Programme area