GREBE

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

Itikan–Tila Iisalmi, Finland
Hybrid Solutions

Introduction

The farm is located in a rural forest and agriculture dominated region very near to the city of Iisalmi in the region of Northern Savo, Finland. Currently energy production plays an important role in the farm´s business. The energy production on the farm includes an own biodiesel production unit, a wind turbine, solar panels and a ground source heat pump.

The Itikan farm is in a private family ownership since the year 1905. The farm was first operated as a cow farm and started with seed production in 1970's. Today, it includes approximately 350 ha forest, cottages for rent while at the same time producing hay seeds with a capacity of about 800 to 1000 tons annually.

The farm has a high annual energy consumption of approximately 150 000 kWh especially high needs for seed processing and drying. In 2005/2006, the owner attended a public event about renewable energy at the local school and became interested about biodiesel production as it was linked to the rapeseed production.

Following this, the owner constructed an own biodiesel production unit. At that time the feasibility of the production was better. However, a non-bio-oil is used as well in an existing oil-boiler to produce heat for heating of buildings and drying. The annual use is about 20 tons of oil.

Case Study Approach

The data on the market access of renewable energy technologies were collected both from the case studies in different renewable energy technology projects and from the secondary sources. To collect specific project data, a template was established with following subsections:

- **Technology description and a project summary**
  - Innovative characteristics
  - Technology readiness level
  - Available product / service supports from the manufacturer
  - Any standard procedures / requirements for integrating the technology into existing electricity networks, buildings and/or mainstream energy appliances / systems
- **Commercialisation of the technology**
  - Is the technology already a commercial solution?
  - Are there re-sellers of the technology, or is the technology available only from the manufacturer?
  - Identified main market area
- **Cooperation partners and networks**
  - Description of the roles of the co-operation partners and networks in the RE technology project.
  - How have they supported the market access of the technology?
- **Assessment of the technical and economic risks**
  - What kind of procedures have been made for assessing the technical and economic risks of the project
  - Who is bearing the risk of the investment (manufacturer, client, shared between them)?
  - Is the public sector involved in risk sharing? (e.g. co-financing, or platform for technology demonstration)
- **Drivers and barriers in the RE technology project**
  - Main drivers in carrying out the RE technology project
  - Barriers, and how they have been overcome (such as price of energy, availability of resource, specific expertise, policy enabling the technology)
- **Funding and support mechanisms**
  - The financial support received by the project: amount/support rate, type and purpose of the support, agency providing the support, significance of the support for the project
  - Types of soft support/advisories received during the project: the use of soft supports (advisory, training, mentoring etc.) during the technology development or implementation, and how successful these have been
- **Monitoring the performance**
  - How are the technical/non-technical aspects of the RE technology case monitored?
  - Information on the design, installation requirements and procedures, operational performance, and costs/financial arrangements
- **Conditions for the technology transfer & adaptation in different partner regions**
  - What are the main requirements/preconditions for transferring the technology and applying it in other partner regions?
  - Description of the main drivers and barriers for the technology transfer (such as. Energy price, resource needs, certain support etc.)
- **Project results**
  - Benefits & lessons learnt
  - Post- project benefits

Technology Description

There was already a wind turbine on the, which was complemented by a new 5 kW unit in 2015. The turbine employs Chinese technology and serves mainly for demonstration purposes. Nevertheless, the produced energy is used to heat the water of an existing accumulator.

The wind mill 25m high with a concrete basis and a rudder system that turns the plant to the optimal direction. Advantages of this turbine are the quiet operation and the small-scale. The scale allowed for the permit to be provided by a local officer without any impact assessment. The operation time is estimated at ten years.

Figure 1. Energy overview of Itikan tila by E-farm[1]

[1] Karelia University of Applied Sciences 2017.

Two years ago, the Itika farm invested into a solar photovoltaic (PV) plant with a capacity of 10 kW. The investment level was at 14 000 Euros plus value-added tax (VAT). The implemented technology is German, SMA Solar technology AG, with the Finnish reseller Oulun Energia. The estimated annual production based is 8700 kWh. Within the past two years, the produced energy has been 16 000 kWh with the main production starting in March. The energy produced is directly distributed to the grid through an inverter system. The estimated payback time for the solar PV system is 13 years.

Figure 1. Energy overview of Itikan tila by E-farm[2] Karelia university of Applied Sciences

Other low carbon technology systems in the farm include the favored LED light systems and heat recovery systems based on heat exchangers implemented in many points. For instance heat is recovered from the chimneys in several boilers. Another part of the hybrid energy solution in the Itika farm is a ground source geothermal system. The Finnish Lämpöässä 30 system is an elderly and proven ground heat pump running on the farm already for years.

A large contribution to the hybrid energy solution comes from the farm´s own biodiesel production. Approximately 40-50 tons annually are produced of rape seed oil and vegetable or frying oils from the industry in the region of North Savo. The produced biodiesel is used for heating in the existing oil boiler, for drying and as a fuel for the two farms tractors and combined harvesting machine. After minor modifications the biodiesel can be used in those machines for example mixed with fossil diesel oil.

[2] Karelia University of Applied Sciences 2017.

Figure 1. Energy overview of Itikan tila by E-farm[3] Karelia university of Applied Sciences

In addition to the mentioned energy production units, the Itika farm also has a production facility for briquettes. The briquette production uses straws, saw milling residues (cutter shavings and saw dust) from the local wood processing industry and residues of the seed production. The produced briquettes are being burned in the nearby municipal district heating plant in Maaninka.

Residues from rapes are also pressed to briquettes and used as cattle feed. Considering the flow of nutrients, the farm currently utilizes ash from a heating plant owned by a larger local saw mill as fertilizer. Straw residues are sold also as animal beddings, however, in future they could be considered to be used in a biogas plant.

There is also electricity production through a diesel generator but the generator is mainly used during power cuts or for special needs. The Spanish 55 kW Himoinsa diesel generator can use own biodiesel and produce back-up electricity for the farm. The investment cost was 10 000 Euros without taking subsidies into account. However, own electricity production with biodiesel is currently not profitable due to the low electricity price.

TRL and Technology Scale

TRL 9 – actual system proven in operational environment

The scale of the implemented technologies and energy flows can be best shown by the energy overview mapped for the Itikan tila by E-farm below. The graph includes the self-sufficiency rates

[3] Karelia University of Applied Sciences 2017.

regarding heat, electricity and transportation fuels and shows that the Itika farm is 100% self-sufficient on heat, covering approximately 5% of its own electric consumption as well as 50% of the transportation fuels.

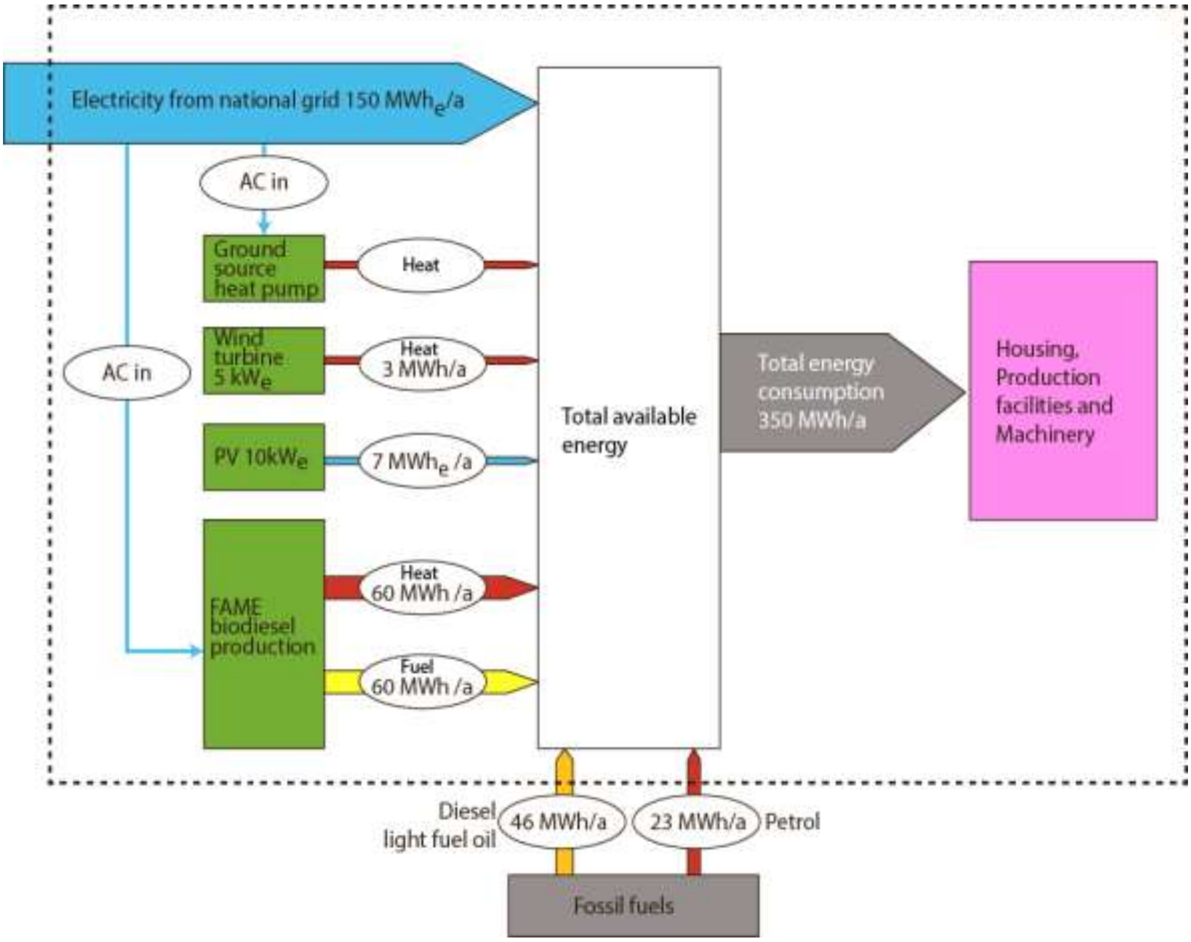

Figure 1. Energy overview of Itikan tila by E-farm[4]

Cooperation partners and networks

The Itika farm has cooperation with several local, regional and national stakeholders including cooperation with Envictepolis, Savonia University of Applied Sciences as well as a number of companies (both from Finland and abroad).

Risk assessments and supports received

Technology risk assessments are based on own economic modelling, as well as feasibility studies (of future projects) carried out together with the technology consultancy.

[4] Karelia University of Applied Sciences 2017.

Drivers and barriers

The system is driven by the objective of being self-sufficient by meeting the energy demand of the farm with local resource and moving away from fossil energy. Currently a self-sufficiency of about 50-70% is achieved. Own energy consumption (electricity, heat and fuels) of about 150 MWh, drives own production. The farm has available by-products that can be utilised in bio-oil and briquette production. There have not been major barriers; the economic profitability of different RE options used has changed over time.

Conditions for the technology transfer, adaptation and new market deployment

The technologies applied are already commonly deployed across the NPA market area. The biodiesel production system is a unique reference site and has received significant attention. The hybrid energy system is much based on integration to the farming activities and its by-products, and thus the system transfer could be challenging.

Project Results

Benefits

The established solar PV and wind mill were relatively easy-to-implement projects. The existing solar PV unit was basically a ready service package distributed via the energy providing company. The wind power turbine was ordered and transported on a low cost basis.

Nevertheless, the Itika farm currently employs three external employees with one being employed in the field of energy. The farm owner estimated the farm´s self-sufficiency rate at 50-70% with the objective to be 100% fossil-free in the future.

Lessons Learnt

Most barriers are related to the biodiesel production. It was difficult to get sufficient information on permits and it requires classification and environmental permission. The process is described in the environmental permit process (www.ymparisto.fi/download/noname/%7B8B4683AD-B09C-46EB-8C88.../82598).

Tax limitations are currently affecting the use of own biodiesel, hindering the profitability.

Post Project Benefits

The post project benefits include but are not limited to- the experience and confidence to expand existing systems. Currently, the energy farmer is considering a new investment for a 60 kW Solar PV unit. In addition, a feasibility study for a biogas plant in industrial scale is ongoing and the investment will be considered based on the results.

The Itika farm is also part of the E-farm network which among other services (including calculations, training etc.) organizes visits to energy producing farms. The Itika farm has several visitor groups each month. In addition, the farm has historical and cultural value associated with music and art.

There is already a long tradition of own product development since the 70's and staff members are encouraged to invent new products, such as machinery for biodiesel.

The Itika farm received the "Farm of the year 2001" award.

Contact Information

Antti Sarvela
Tell: +358 44 5916 400
antti.sarvela@savonsiemen.com
website: www.savonsiemen.com

PARTNERS

GREBE will be operated by eight partner organisations across six regions:

● Karelia University of Applied Sciences

Innovation Center Iceland

WDC Western Development Commission
Coimisiún Forbartha an Iarthair

Fermanagh & Omagh District Council
Comhairle Ceantair Fhear Manach agus na hÓmaí

Action Renewables
the future of energy, today

Karelia

Luke
Natural Resources Institute Finland

eri environmental research institute

FPN Forskningsparken i Narvik

Follow the GREBE Project on social media

@ GREBE_NPA

GREBEProject

Follow our Blog
www.greberenewableenergyblog.wordpress.com/