Sinikasvis
Biomass CHP

Introduction

Sinikasvis is a limited partnership, and a micro-enterprise, located in Sukeva, Northern Savo. The berry farm produces products of apple, domestic forest berries, and farmed strawberry and raspberry. The farm employs two people, as well as 8-10 pickers during the late summer. The main markets are professional kitchens in Northern Savo and Kainuu region. The farm has unique energy production system consisting of a biomass –based co-production of heat by Spanner Re^2 unit and 15 kW PV system.

The recently invested system, Spanner Re^2 (30 kW for electricity, 80 kW for heat) is the first of a kind in the region, but has number of references around Europe. The energy consumption (140 000 kWh/a) is highest in winter peak times, but also in late summer as berry farm needs energy for freezers and dryers.

Sinikasvis is part of the E-farm network demonstrating renewable energy solutions in Finland. The farm is also producer of Farmivirta – Farm Power – concept of Oulun Energia, selling renewable electricity produced by micro- and small-scale producers.

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

The Spanner Wood Cogeneration System is a downstream gasifier converting wood chips into electricity and heat with high efficiency. The systems run using high quality wood chips and can provide attractive cost advantages and/or increased power yields according to location and operational environment. Spanner has hundreds of reference sites located in Europe, Asia and North America in sectors of agriculture and forestry, hotels, restaurants and district heating grids.

Depending on the system of wood gasification, the biomass chp -plant generates electricity between 30 and 45 kW_e and a total heat power of 80 to 120 kW_{th}. Wood chip consumption is between 30 and 45kg/h equaling consumption of approx. 1kg/h wood chips per kWe output.

The woodchips used are high quality stem chips (below 10% moisture and even-sized) produced by the farmer from his own forest and chipped with co-owned chipper, as there is no suitable fuel available in the local market area. Stem wood is pre-dried naturally, chipped, dried at the bed dryer by blowing the heated air through the stack, and finally conveyed through sieve to the gasification. These quality assurance activities ensure the good system performance during the seasonal uses of the system, i.e. wintertime and berry freezing and drying in late summer. The system is planned to be in use approximately 8 months annually.

Figure 1. Drying of woodchips[1]

Total annual energy demand of Sinikasvis is approximately 120 000-150 000 kWh for electricity and 400 000 kWh for heat. So far, the electricity production has been 60 000 kWh since the start in late

[1] Karelia University of Applied Sciences 2017.

2015. The heat is delivered via micro district heating network to the farm, industrial buildings and a private house. There is also a conventional woodchip boiler in place.

The technical support and maintenance service is available via Latvian representative, who also provided the introductory trainings. The system performance is monitored online by the technology provided in Germany.

The PV system 15 kW (German SMA Solar technology AG), invested at the same time, produced so far about 4000 kWh. The PV system was acquired through Oulun Energia, in connection with the farm power concept.

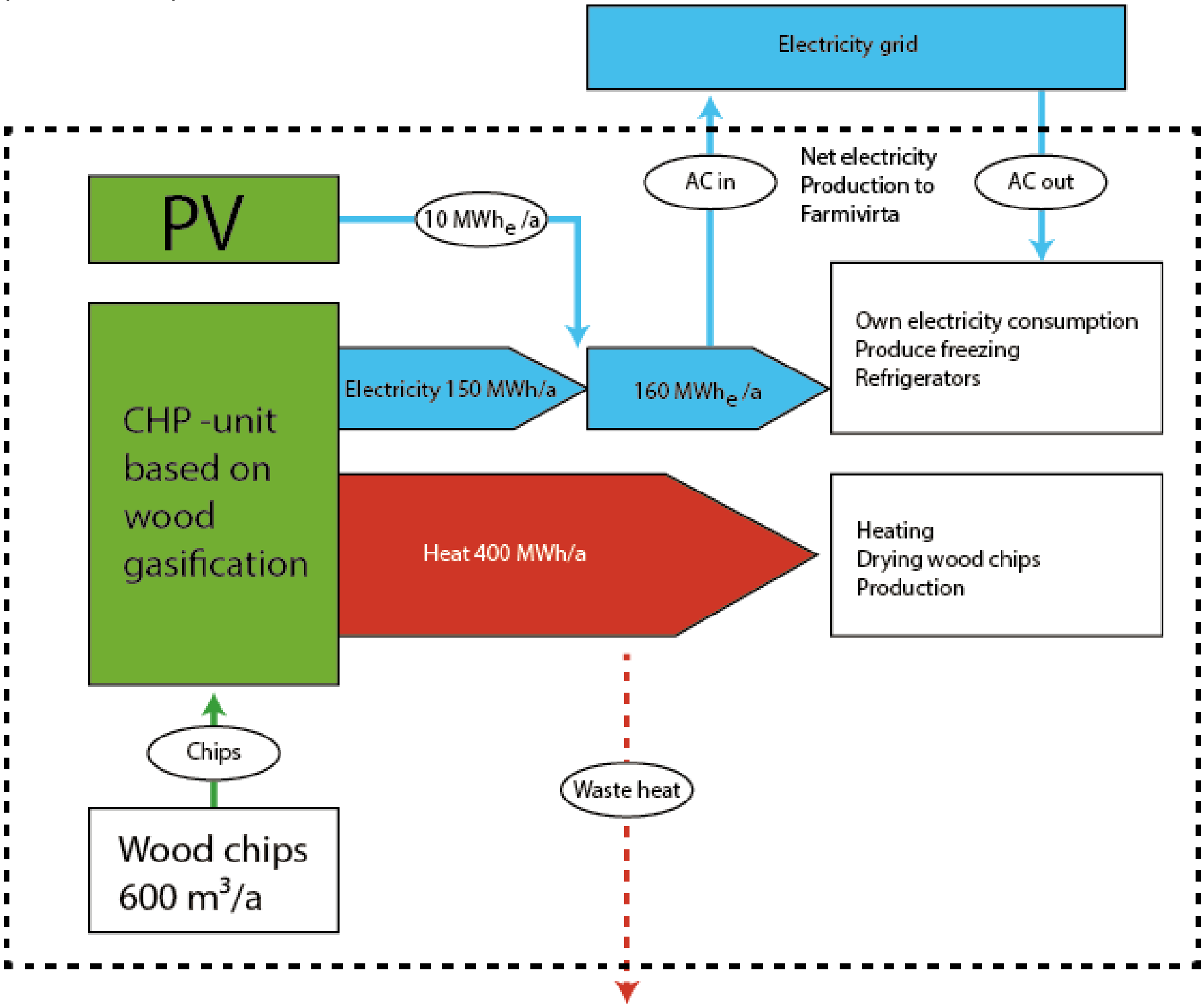


Figure 2. Energy Chart[2]

TRL and Technology Scale

TRL 9 – actual system proven in operational environment. There are number of reference sites in Central Europe and some in NPA region.

Spanner Re2, 30 kW$_e$ & 80 kW$_{th}$, 110 kW total.

[2] Karelia University of Applied Sciences 2017.

Cooperation partners and networks

Before the project initiation, the farmer visited a renewable energy themed excursions organized under an EU project in Denmark (Oulu UAS as organizer). Ideas for drying the fruits and berries were partly adopted from the excursion in Germany; berry production ideas from the excursion in Central Finland.

Cooperation network includes E-Farm (demonstration site), Oulun Energia (Farm Power concept), Centre for Economic Development, Transport and the Environment (co-financing), CHP service provider in Latvia, universities of applied sciences and rural development projects

Risk assessments and supports received

The farmer has also been active in comparing different options for a CHP, and visited both domestic and international reference sites (e.g. Volter Ltd. technology in Alpua and Nurmes). The number of Spanner Re2 reference sites in Germany (>40) convinced him about the system readiness. He has also experience in exports and German markets, which supported the cooperation with the manufacturer. The economic feasibility was assessed when the support funding was applied for the project.

The investment for the CHP plant was 138 000 + VAT with 33% of the investment support provided bythe Rural Development Fund via the regional Centre for Economic Development, Transport and the Environment. Planning for the building, boiler room and silo was made by the farmer, investment cost was about 26 000 €. The investment for the 15 kW (German SMA Solar technology AG) PV system is estimated to be about 15-20 000 €.

The electricity is sold to the grid as farm power (Oulun Energia), if additional electricity is needed it can be bought from the same company. The net metering is essential for balancing the energy supply/demand fluctuations and improving the overall efficiency.

Drivers and barriers

The main driver for the system was energy demand: heating of the farm, machine works and a household, and need of electricity for berry farm in mid- summer (freezers and dryers). CHP was needed especially for peak heat demands of cold winter months and for berry products manufacturing in summer.

Technology availability was a barrier, as there were limited number of suppliers in Finland. Technology was transferred from Central Europe and service is available in Latvia. There is not yet available supply of high quality woodchips for small-scale CHP in the region, so each system requires establishment of own supply-chains and dryers at site.

Conditions for the technology transfer, adaptation and new market deployment

This is a case of successful technology transfer to Finland. Technology transfer has been successful as the farmer had good experience of German markets and technological and planning knowledge. In addition, the fuel supply is established locally as the farmer has own forest machinery, cooperation with a comminution contractor, and a bed dryer integrated to the CHP-plant.

Project Results

Benefits

A key benefit is the ability to source locally the fuel supply and balancing the energy supply/demand fluctuations and improving the overall efficiency. There was a motivation to use wood from own forest to meet own energy demand. Farmer has own harvester, forwarder, and co-owned chipper that allowed the establishment of own supply-chain.

Lessons Learnt

Key lessons learn were identification of the suitable reference sites, visiting them, need of own project planning and management skills, cooperation with technology providers and financiers, and tailoring the solution to the specific local context. The market for the high-quality wood fuel required by the gasification system is limited, which requires own supply-chains and activities for the quality assurance.

Post Project Benefits

The investment provided energy for drying and freezing of the berry and fruit products, which was essential for extending the market area and avoiding challenges with fresh products.

Contact Information

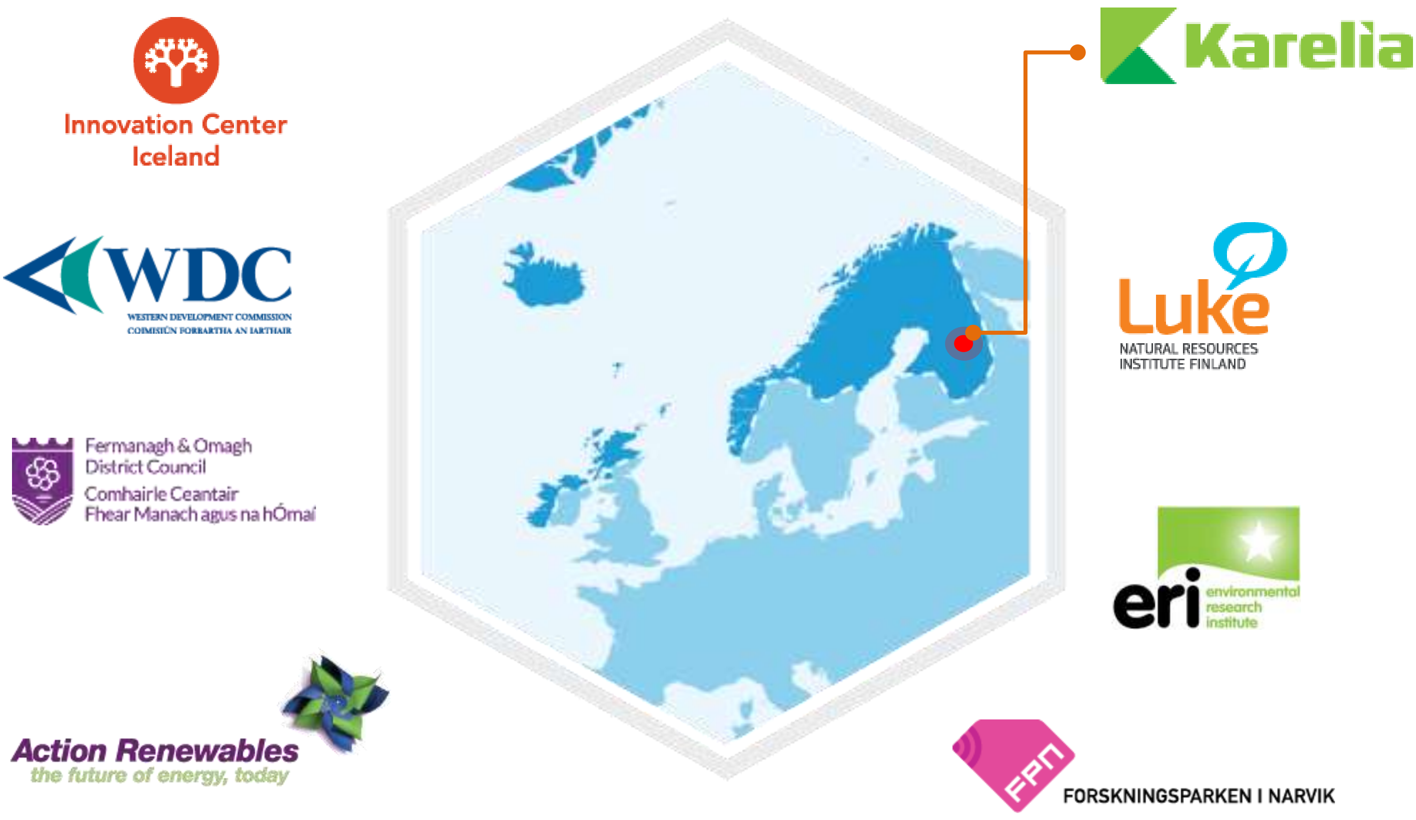
Contact via E-Farm: http://www.efarm.fi/yhteystiedot/

Technology Provider: Spanner Re^2

PARTNERS

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

● **Karelia University of Applied Sciences**



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