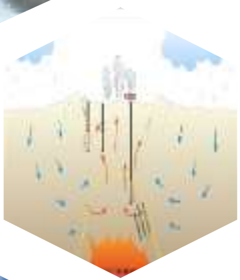
# Housing Association Kontiolahti Ground Source Geothermal

## Introduction



A housing association located in Kontiolahti, Finland, decided to move away from from fossil light fuel oil and explore renewable energy alternatives in 2010.

The motivation behind the decision back then was the rising and fluctuating price of fuel oil, as well as, emerging need of energy system renovation.

In 2010, a decision was taken to invest in a ground source geothermal system to substitute the annual consumption of 180 MWh of fuel oil with more sustainable option. Since, there has been significant cost and emission reductions. Once they overcame the initial challenges, that every new project is faced with, the system has performed as good as expected. This ground source geothermal system has proven to be reliable and convenient solution.

## 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

Ground source geothermal system with Alpha-InnoTec (SWP 500H) 48.9 kW heat pump. The system utilizes ground heat from four 200 meters deep drilled caves. There are three accumulators (500 l and 2*300 l) for the heat storage. The system includes also Bauer Water Technology water treatment device purifying the circulating water.
The local re-seller monitors the performance online and provides service and maintenance.

Figure 1. Ground source geothermal.

## TRL and Technology Scale

TRL 9 – actual system proven in operational environment.

Small-scale solution for residential sites, commerce and industry. The largest units (160 kW) manufacturer provides can be installed as cascade with total power of 640 kW.

## Cooperation partners and networks

The project was pre-planned with Karelia UAS, an engineering company and the housing association (managing company). The managing company providing property management services for housing associations ran project. Local companies provided the installations.

## Risk assessments and supports received

The heating solution of the housing association was prepared in cooperation with Karelia UAS and an engineering company. Firstly, main renewable energy options and their cost levels were assessed in general level. As the decision was made for ground source heat pump, a project plan was made by the engineering agency. The site suitability for GSHP system was assessed, the cost-levels were based on the three budget offers, and project risk margin of 10% was used.

The project was planned in 2010 and the investment took place in summer 2011. Total project was about 90 000 €'s, of which ground source geothermal technology and drilling of the heat caves was about 76 000 €'s. The remaining amount was spent on additional building renovations. Project received investment support of 8% from the energy support available for households and housing associations.

Previous heating based on light fuel oil (180 -190 MWh) had a total cost between the lowest 13 600 €'s (0.76 c/l) and highest 19 800 € (1.1 €/l), depending on the fluctuations in oil price. The energy cost after the investment is about 9000 - 10 000 €'s annually, consisting of the electricity needed for the system operation and supporting supply during the winter peak loads. For the technology, payback it is estimated 7 to 15 years depending on the fuel oil price.

## Drivers and barriers

The main driver was the economic costs of fossil oil based heating. In addition, the old heating system was approximately 25 years and new long-term solution was needed. The positive image of renewable energy, GSHP system reliability and user-friendliness were also drivers.

## Conditions for the technology transfer, adaptation and new market deployment

The technology has been deployed to markets across the NPA region. GSHP can be installed in areas, where ground-source heat wells (caves of 100-200 m) can be drilled without affecting ground waters.

## Project Results

## Benefits

After tendering, local supplier was chosen to provide comprehensive service and maintenance after the investment.

## Lessons Learnt

Firstly, investment in wood pellet system was considered due to lower investment cost. However, ground source geothermal was chosen as less employing and easy to maintain option. Reference was taken from other housing association that has invested in ground source geothermal. Supporting services were used for pre-planning.

## Post Project Benefits

The investment was successful in terms of the objectives of reduced energy costs and reliable system with no significant maintenance needs. Firstly, there were challenges in securing the heat supply, but after some service operations, the system has operated as expected. The economic benefit is dependent on the price of light fuel oil substituted, but evident in the long term. There are also carbon emission reductions as 18 000 l/a of fuel oil is replaced, even if there is increased electricity consumption.

## Contact Information

Contact via GREBE partner

Karelia University of Applied Sciences

Lasse Okkonen (lasse.okkonen@karelia.fi)

## 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

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