Iceland Liechtenstein Norway grants

Norway grants

Introduction to the project

Improving the energy efficiency of geothermal energy utilisation by adjusting the user characteristic

User4GeoEnergy

Annual Seminar 2021
Round table

13:45 – 13:55 The introduction to geothermal energy

07.12.2021

EEA and Norway Grants Fund for Regional Cooperation

Common Challenges – Shared Solutions

Project Index No.: 2018-1-0502

The project consortium members

Lead partner:

Mineral and Energy Economy Research Institute, PAS, **Poland**

Expertise partners:

National Energy Authority, **Iceland**

NORCE Norwegian Research Centre, **Norway**

Beneficiary partners:

InnoGeo Research and Service Nonprofit Public-benefit Ltd, **Hungary**

SLOVGEOTERM a.s., **Slovakia**

The Project summary

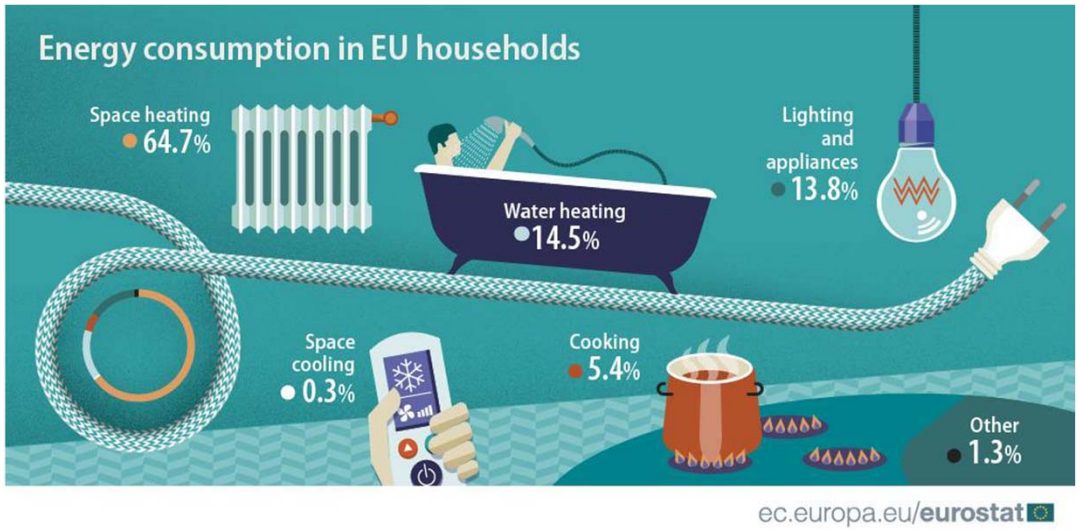
The Project background

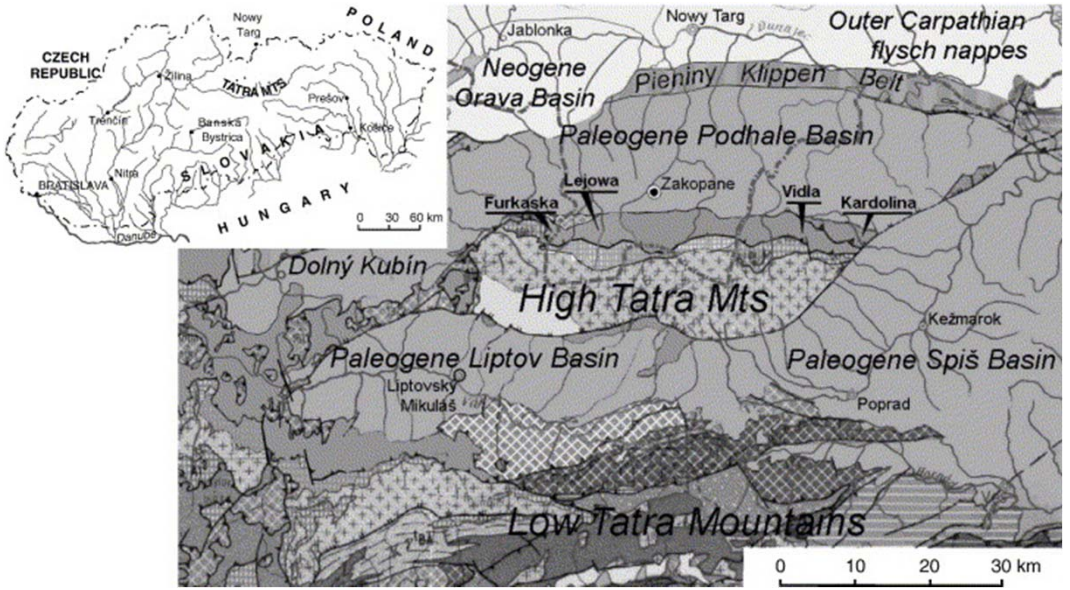
Direct utilization of geothermal energy covers a wide range of energy usage. Direct utilization is efficient and common.

The share of heating in household consumption is over 70% of energy used in Europe, 81% of this is generated from fossil fuels, large scale integration of Earth's energy into heating is a major step towards a low carbon economy.

With systems tapping crossborder reservoirs, overexploitation of local resources becomes a transnational problem.

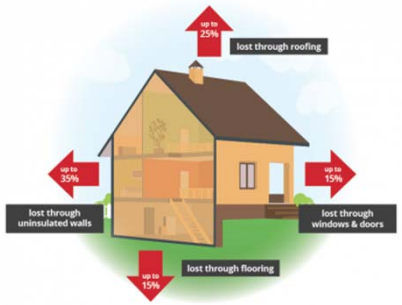
Producing as much water as possible then dumping it, without utilizing its full heat content is standard procedure in all 3 beneficiary countries.
The reason for this is transnational: the vast majority of **DH systems in Poland, Slovakia and Hungary were designed for fossil fuel use.**

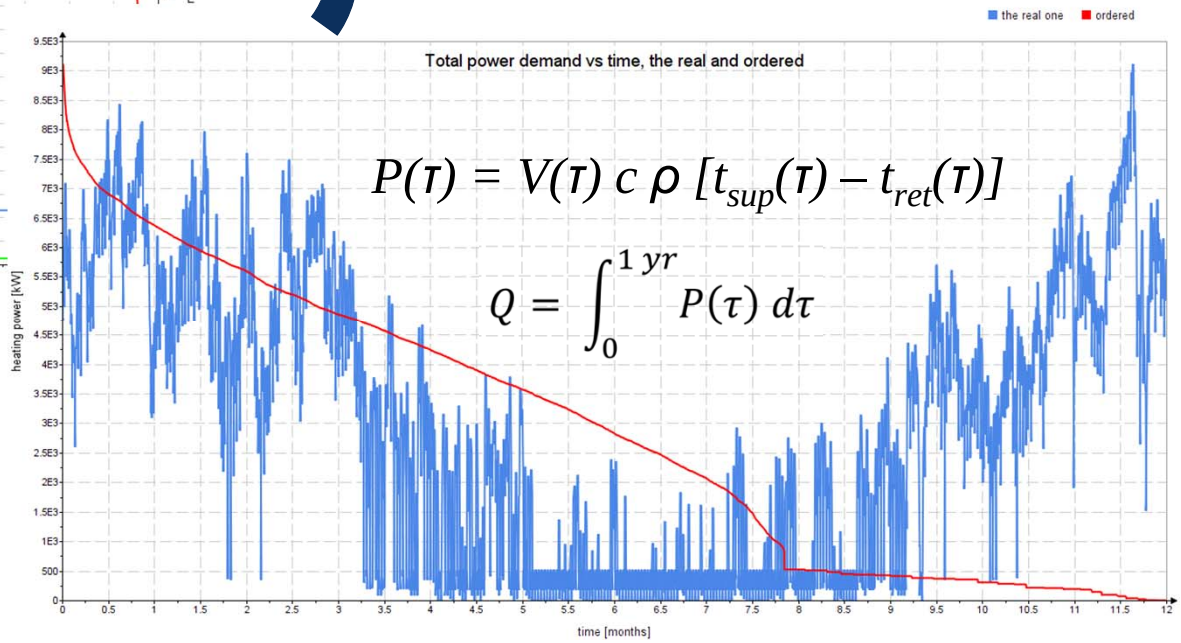




The Project summary

The Project background, what is the characteristic of a user?





The Project summary

Why and how geothermal differs from fossil fuels?

The conventional source specified installed power.

A decrease in the return temperature while keeping constant value of supply temperature results in a increase of power. If maximum power is already reached the supply temperature decrease.

Geothermal always gives a stable temperature t_{sup}, independently of the return temperature and the recipient characteristic.

You will not exceed the maximum power, you will always get constant water supply temperature □ for geothermal t_{sup} = const.

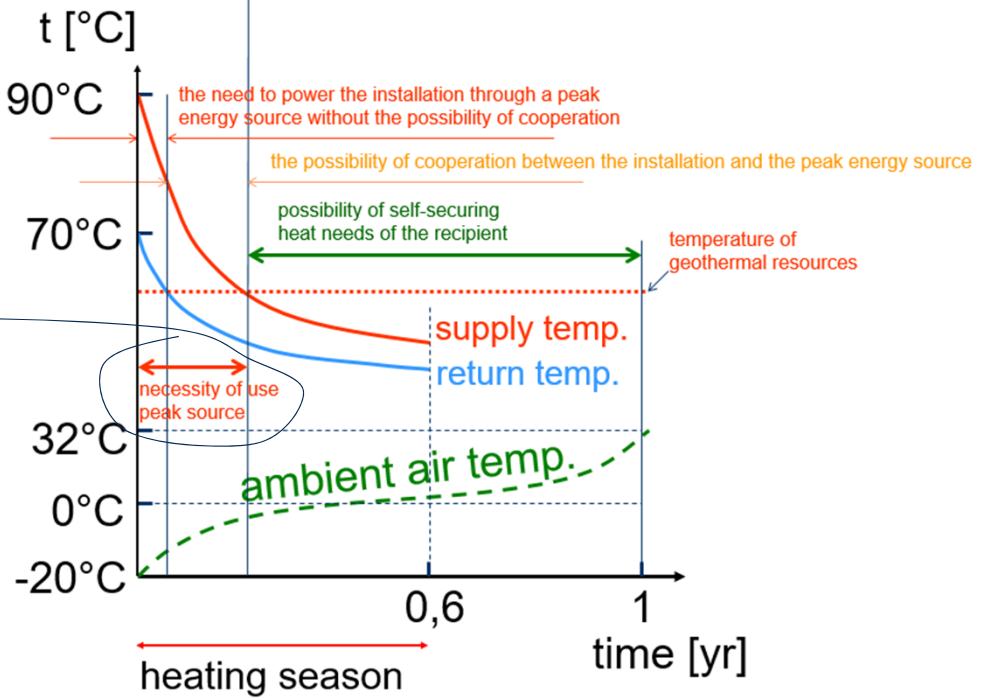
Maximum power depends on the return temperature – the lower value of tret the higher power P.

The lower return temperaturę t_{ret}, the lower geothermal water discharge V.

The Project summary

The Project background

- The inability to reach the temperature required by the energy user (the installation that the user uses) results in the need to use additional, supporting heat sources (peaking sources).
- The peaking sources generate additional investment outlays and their use occurs when the supply temperature isn't high enough.



Emission factors of selected pollutants generated during the production of heat unit from [kg / GJ]

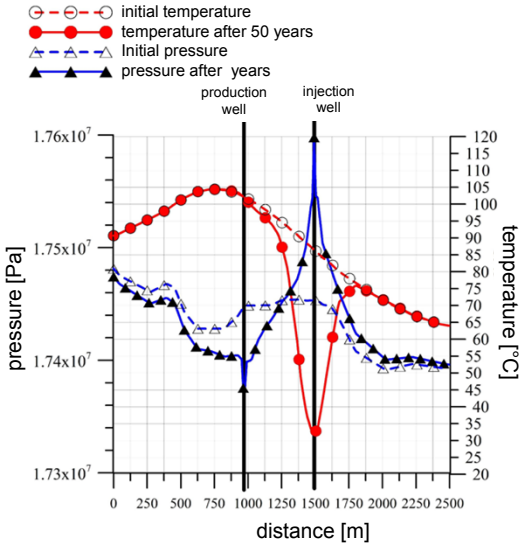
Polutant	Yellow Straw	Gray straw	Wood	Hard coal	Heating oil	Natural gas	Electricity (in Poland)
B(a)P	b.d.	b.d.	b.d.	0,001	$5{,}340 \cdot 10^{-8}$	0,000	$5{,}288 \cdot 10^{-5}$
Soot	b.d.	b.d	b.d.	0,514	0,000	0,000	0,005
Total dust	0,148	0,147	0,143	2,057	0,053	0,000	0,106
CO_2[14]	128,079	119,816[15]	123,81	105,714	48,954	60,475	290,851
CO	2,463	0,249	0,295	5,714	0,018	0,011	0,661
NO_2[16]	0,591	0,599	0,524	0,057	0,148	0,039	0,529
SO_2	0,128	0,129	0,095	0,731	0,113	0,000	1,798
polycyclic arom. HC	0,128	0,120	0,142	0,286	0,007	0,003	0,033
aliphatic HC				0,286	0,003	0,001	0,033

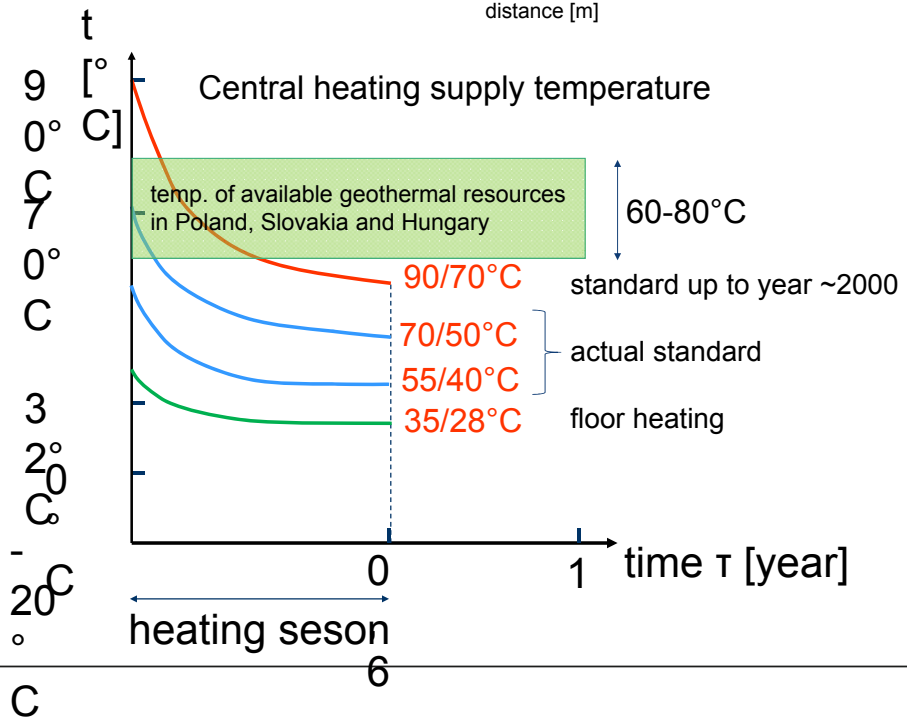
The Project summary

The Project background

- **Geothermal energy is renewable – but it is not infinite, nor free.** Overexploitation can deplete a reservoir while inefficient use of the water. This can cause operation to be uneconomical.
- Still, **40-60°C thermal fluids are being discarded without further use in many geothermal systems**, even new ones.

We have the technology that allows use of geothermal water with temperature even as low as 35°C for space heating.





The Project summary

The Project objectives

Main activities within the project:

- **Exchange of good practice in the management of geothermal district heating between the donor countries** (Iceland, Norway) **and the beneficiary countries** (Poland, Slovakia, Hungary), that will increase economic as well as environmental and climate benefits for all.
- **Mathematical modelling of geothermal systems** (energy source – heat distribution – end users), **in order to identify optimal solutions for the supply of geothermal heat in the beneficiary countries**, considering geothermal conditions and heat prices on domestic markets.
- The **focus will be on individual customers in their homes by providing knowledge, experience, and technical solutions to improve the efficiency of geothermal heating**. This will be based on data utilisation and the roles of public and individual sustainable solutions. The project will also focus on encouraging customers to modify heating installations in their homes in order to increase their heating efficiency.

The Project background: goals & target groups

The Project target groups

The target groups of our activities **are:**

- the **researchers and scientists** of the beneficiary partners,
- the general scientific community, **DH system operators, energy users** throughout Europe.

The end-beneficiary of our project **is the environment**.

The Project summary

The Project objectives

- Our **objectives are a long-term improvement in the efficiency of geothermal operations and a decrease in their environmental footprint:** direct contributions to a **less carbon-intensive and more energy secure economy in Europe.**

- Our **goal is to increase the economics of geothermal DH systems and to support their environmental sustainability simultaneously.** We wish to achieve this goal by expanding the knowledge of our staff and by providing innovative solutions to operators.

- Moving towards **low-carbon and energy secure economies requires the use of renewables** on the one hand, **and, maintaining a good status of the environment** on the other**.**
  These objectives can be achieved simultaneously.

Thank you