

FINANCING GEOTHERMAL DISTRICT HEATING

In a nutshell

CONTEXT:

- Geothermal District Heating (geoDH) is the use of geothermal energy (i.e. the energy stored in form of heat below the earth's surface) to heat individual and commercial buildings, as well as for industry and greenhouses, through a distribution network .
- In Europe, there are over 5,000 district heating systems, including 240 geoDH systems.
- Systems can be small (from 0.5 to 2 MWth) and larger with capacity up to 50 MWth.
- The hottest geoDH markets in Europe are:
 - ✓ France: Paris, with notable renewed activity in the Aquitaine basin,
 - ✓ Germany (Bavaria),
 - ✓ Hungary,
 - ✓ the Netherlands, which has seen development most recently ...
- ...But it has to be highlighted that geothermal district heating systems can be installed in all European countries.

MAIN CHALLENGES:

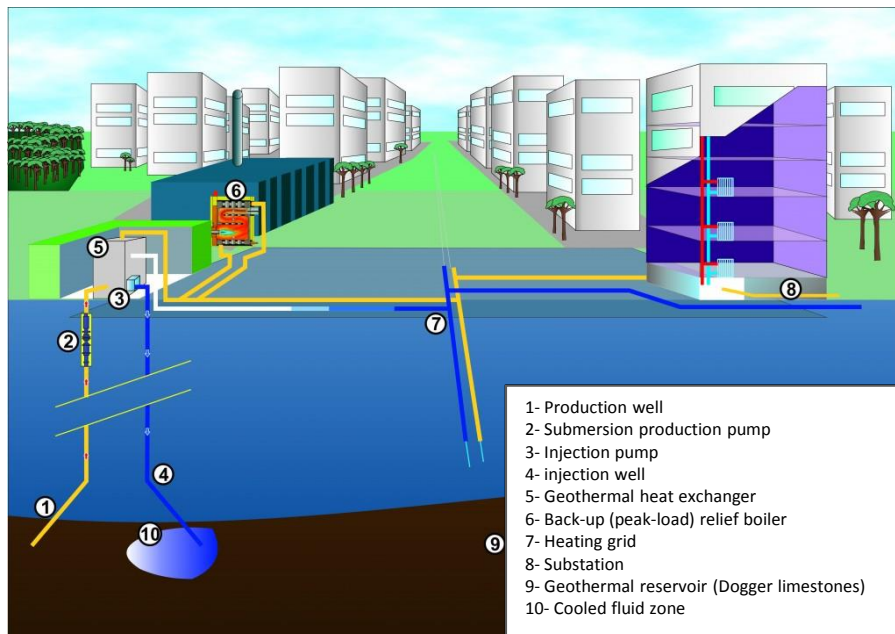
- Matching resources and demand
- Evaluating the thermal energy that could be generated at the surface
- Dealing with risk management linked to the geology
- Financing and refurbishing/developing new heat grid infrastructures
- Increasing profitability of geothermal district heating projects by developing systems which can also provide cooling



Technologies

GeoDH SYSTEMS:

- Doublet concept of heat extraction
- Modern doublet designs include two wells drilled in deviation from a single drilling pad.
- Current development are based on the utilisation of shallow geothermal resources, assisted by large heat pumps.
- Two scenarios are possible with DH to be adapted or to be created:
 - ✓ Cogeneration of electricity and heat with minimum geothermal temperature of 80°C
 - ✓ Heat production is possible with resources from ca. 150°C to 45°C. Very low temperature geothermal district heating systems can be used only for underfloor heating.

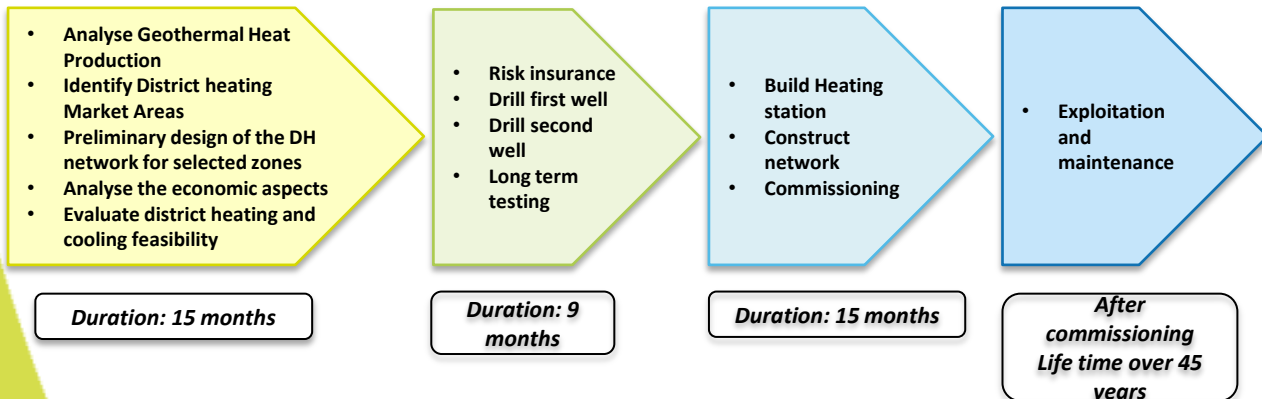


GeoDH project phases at a glance

Paris Basin geothermal district heating system, courtesy of GPC IP

GeoDH PLANNING:

- A Geothermal district heating system takes more than three years to build
- Four main phases can be considered:

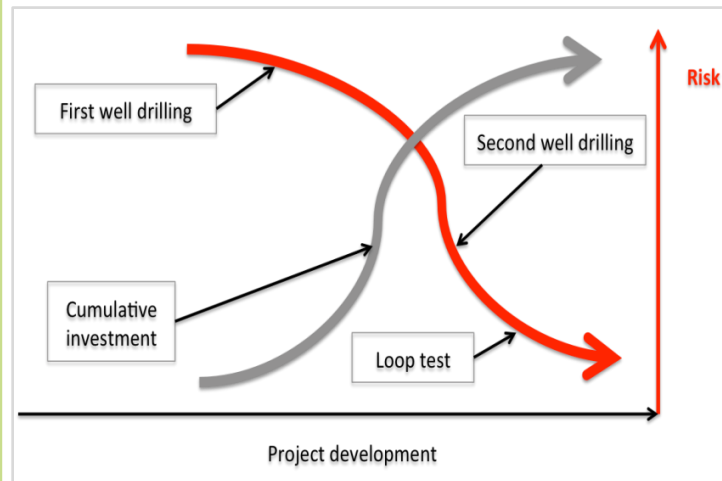


Key aspects of success

A geothermal DH project is based on the estimated geothermal heat that can be generated from the reservoir and an analysis of the heat demand. The estimation of costs and revenue streams are specific to each individual project. Because GeoDH projects involve uncertainties and risks, solid project planning and risk management are essential from the earliest stage.

Geological risk: a common issue all over Europe

- If the project is located in a favourable area where explorations have already taken place and where the geological and hydrogeological conditions are known, the risk is considered as small and can be covered by a private insurance system.
- When the project is located in areas where no deep wells have been drilled for water, mining, or oil and gas exploration, the geological risk is at its highest. The productivity of the geothermal reservoir is difficult to predict. In this case the drilling phase becomes risky and needs to be insured by public or public-private insurance system or repayable grants.



Geothermal district heating project risk characteristic

Risk insurance:

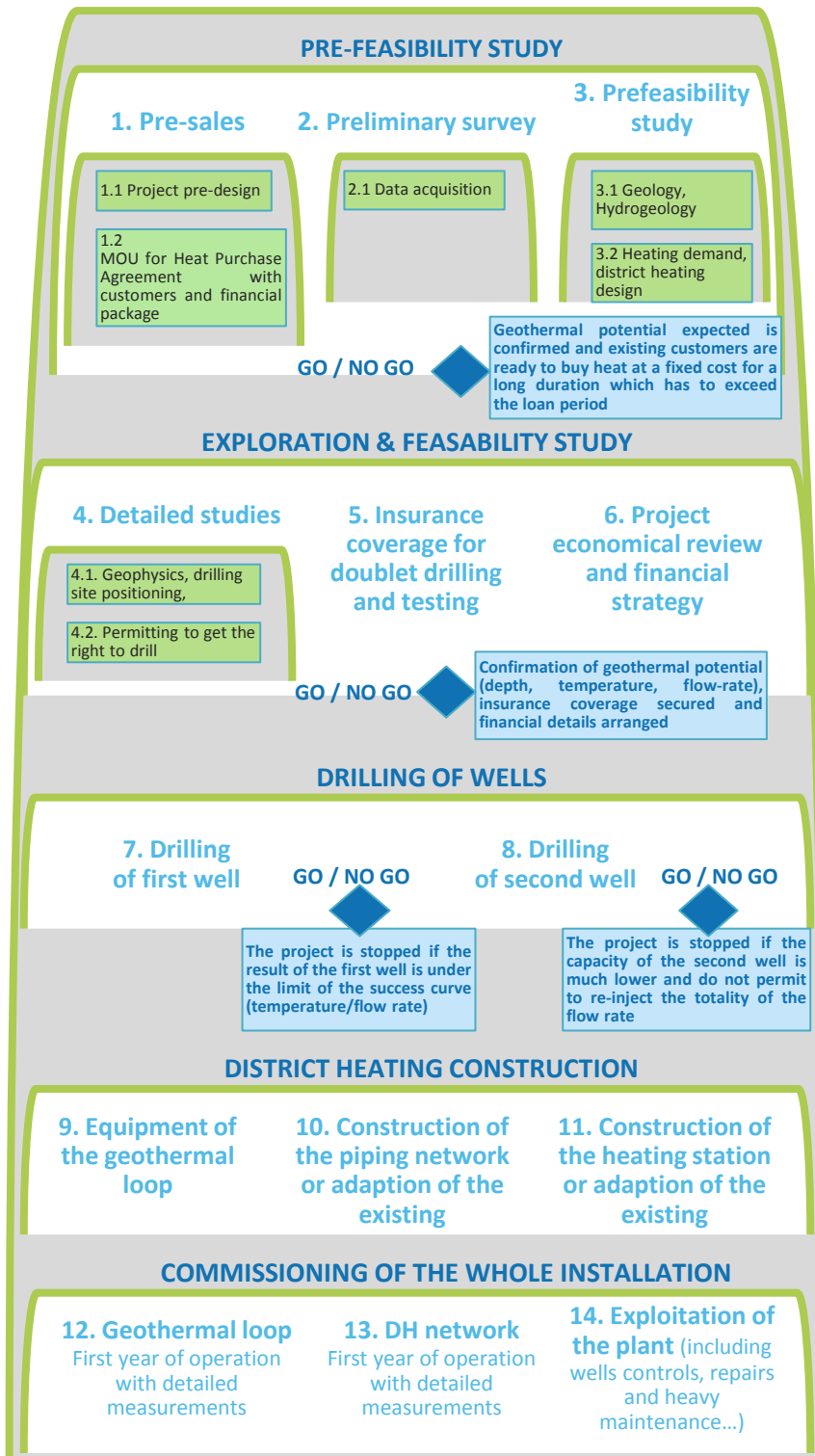
- Risk insurance funds for the geological risk already exist in some European countries: France, Germany, the Netherlands and Switzerland. The efficiency of these funds has been proven over the last 30 years in France.
- In the other countries with no system in place, repayable grants are a solution. The private sector can propose an insurance guarantee, but these guarantees are expensive, with restrictions, and high premiums. Private insurance systems are more appropriate for mature geoDH markets.

Heat purchase agreement (HPA):

Before the drilling of the first well, a contract has to be negotiated to sell the heat and cold to the customers. This step is of paramount importance; many projects cannot find any financial support if this type of HPA is not provided to the bank, before to begin the negotiation and after covering the geothermal risk. There are two different cases:

- If the district heating network already exists and some technical modifications are needed in the network or in the heating stations and substations, the client is clearly identified (public or private or a mix) and a pre-contract has to be negotiated. It aims at signing a minimum agreement to purchase a certain amount of heat per year during a sufficiently long period, usually comprised between 15 up to 30, in order to secure the reimbursement of the bank loan, depending the laws in force in the country.
- If the district heating network is to be built, the same type of agreement has to be signed and negotiated with guarantees of quantity, price and duration of the heat sales contract. Separate contracts will be requires if there are several clients

Geothermal District heating Go/ No-Go road



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