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Geothermal Energy

Geothermal energy for heat production : the french experience

Geolac 2019

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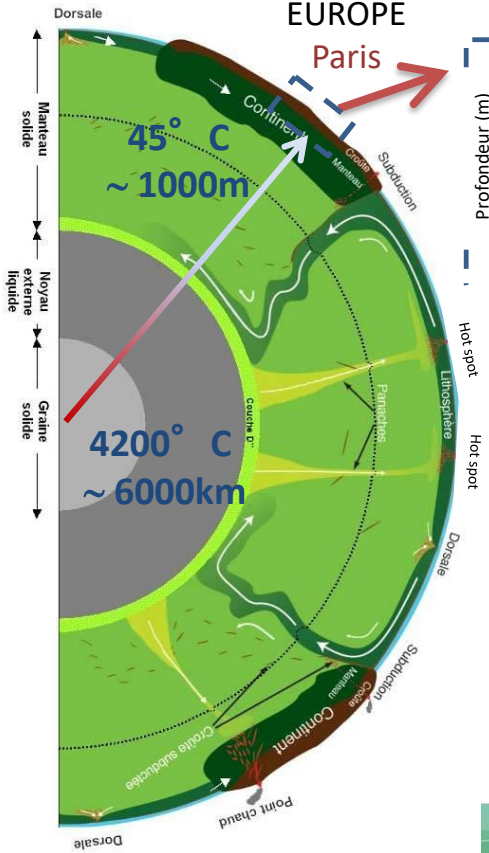
Introduction

The french case for geothermal heat

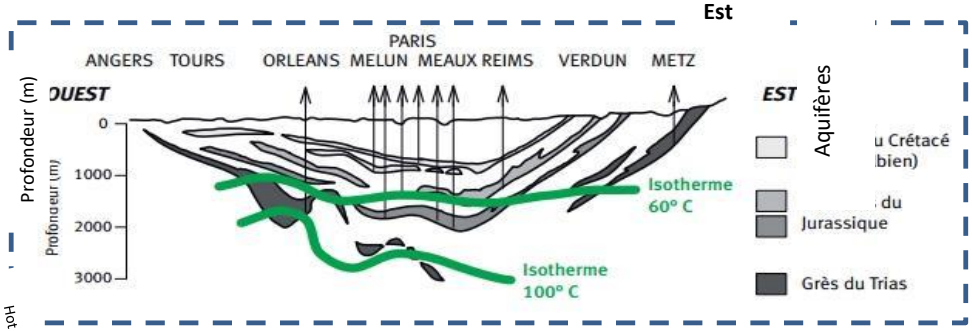
Geothermal can do much more than power generation…



EUROPE

Paris

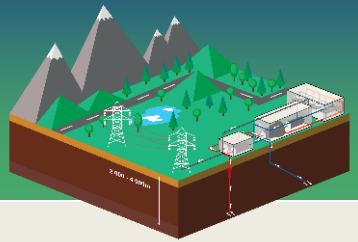
Sedimentary basin



- Low/medium geothermal energy can be used for heat and cold production in many places around the world

Geothermal solutions for all market segments

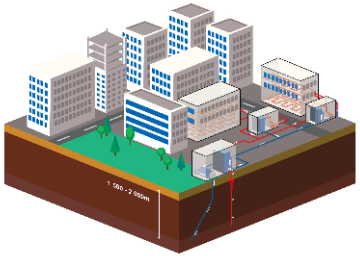
Power production and cogeneration



Power producers
Industry

Deep geothermal
High temperature

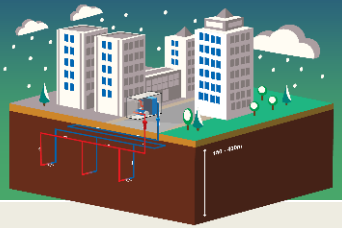
Heating and cooling networks



Cities, leisure centres
Industrial sites

Deep geothermal
Medium temperature

Ground Source Heat pumps on aquifers or boreholes



Buildings, campuses
Eco-districts

Shallow geothermal
Low temperature

Still a great untapped potential for geothermal heat in the energy transition

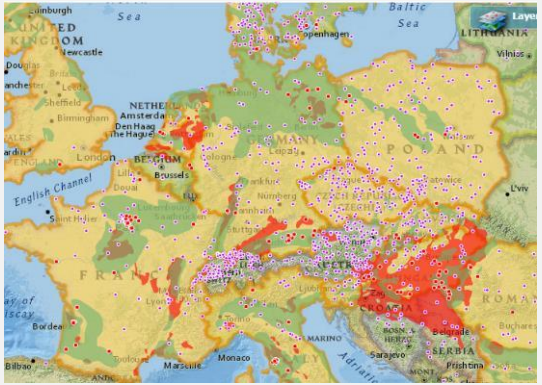
Heating and cooling networks

- **In Europe:** 10% of today's district heating in Europe
- **Strong need for development** to improve air quality in the cities

Decentralised solutions for eco-districts and sustainable buildings

- **Major success** in northern Europe
- **High development potential** in the rest of Europe and the world

- Geothermal urban heating
- Cities equipped with district heating
- Other potential reservoirs
- Hot sedimentary aquifers

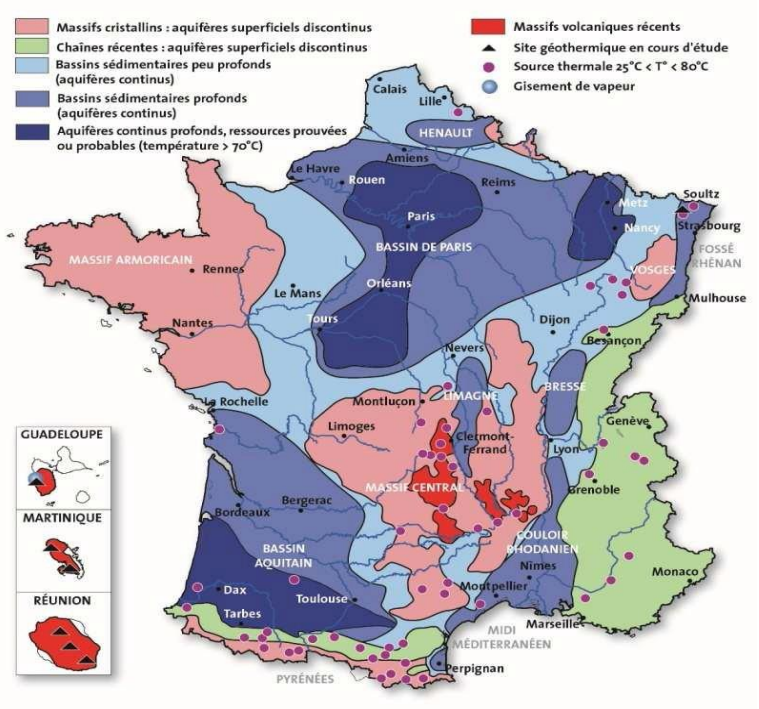


In France: essential contribution to the objectives of the Law on Energy Transition for Green Growth

38% of renewable heat in 2030

(<20% end 2018, including 4.3% of geothermal energy)

Focus on deep geothermal for heat production in France



- 71 geothermal facilities in operation in France for 1,6 TWh :
  - 49 in Paris area
  - 21 in western France (Aquitaine)
  - 90% for district heating
  - 8% for agrobusiness
  - 2% for thermal application

- Current development path is not enough to achieve 2019-2028 Pluriannual Plan for Energy (PPE) :
  - 5,2 TWh in 2028
  - 10 new operations per year

Key success factors for the geothermal development in France

- **Stable Policy** and Energy plan setting targets over the long term (PPE)
- **Priority given to geothermal energy** when available over other renewables (biomass,…)
- **Support to investment** (geothermal wells, district heating network) to make the geothermal solutions competitive compared to fossil fuel (gas) : HEAT FUND from ADEME
- **Specific insurance schemes** (« SAF Mechanism » with public and private funding) :
  - Geothermal ressources risk mitigation (short term insurance)
  - Geothermal operation (long term insurance)

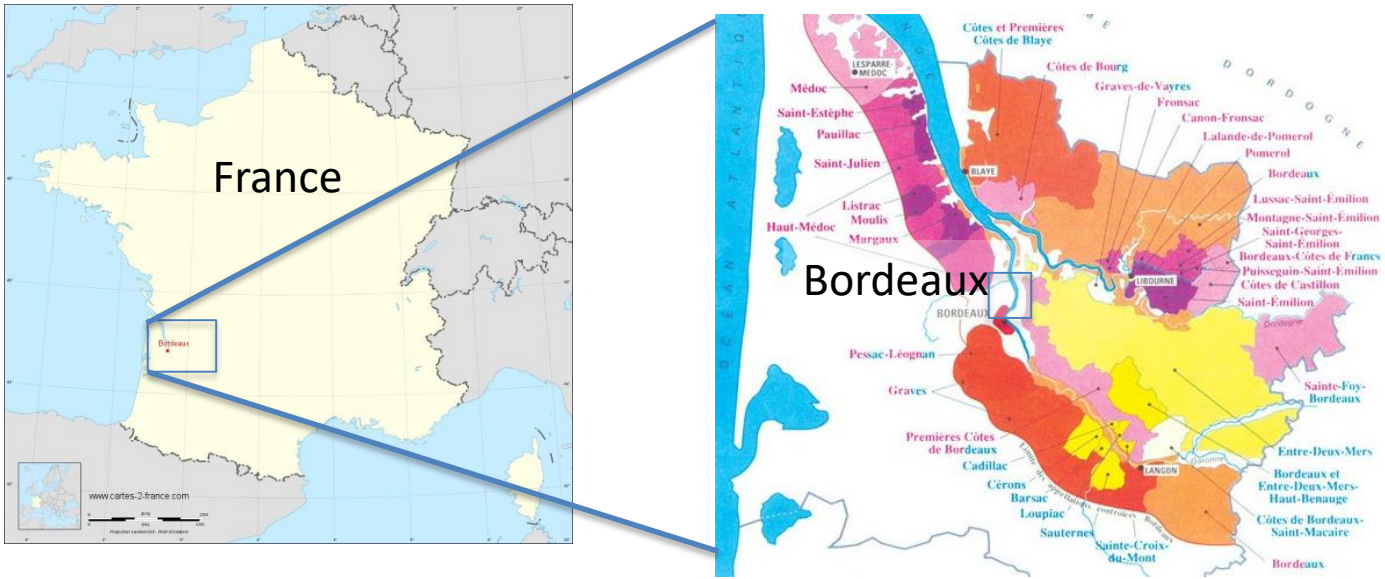
- **Specific contactual framework** for private investment :
  - « Public service delegation » : the private operator invests and operates
  - Long term contract : 20 to 30 years

- **Revised measures to achieve 2028 targets** :
  - Increase the financial support to investment (Heat Fund)
  - Specific schemes to explore unknown aquifers (support to surface exploration studies, new insurance mechanism)
  - Increase communication

Illustration

A new geothermal development in France

Plaine de Garonne Energies (PGE) : Project Overview
District Heating from Geothermal Energy



PGE main features

PGE project : 30 years
Energy supplier (start 2019)

- District heating network and production facility
- Drilling of a geothermal doublet (deep 1700m)

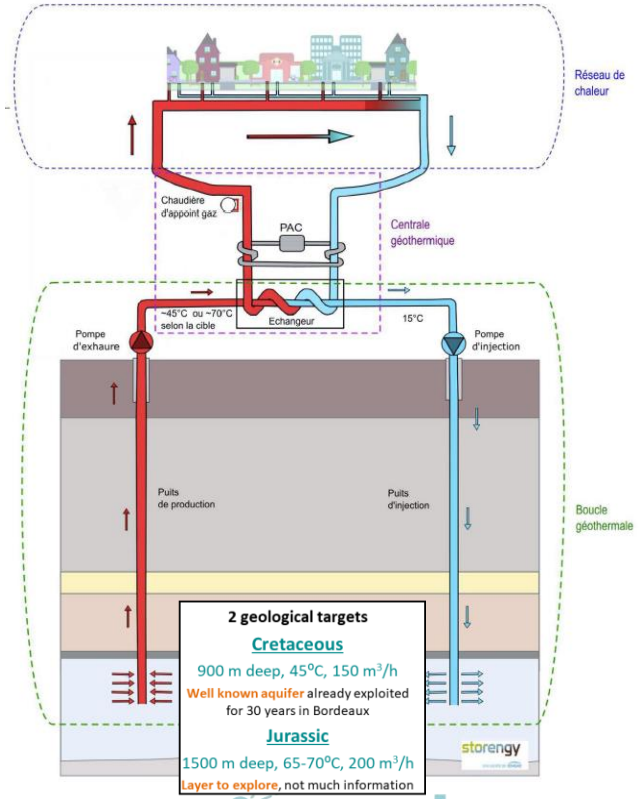
Key figures

- Shareholder : Engie Cofely, Storengy
- **43 M€ Total costs**
- 70 MW total needs
- **16 MW** from Geothermal and heat pumps

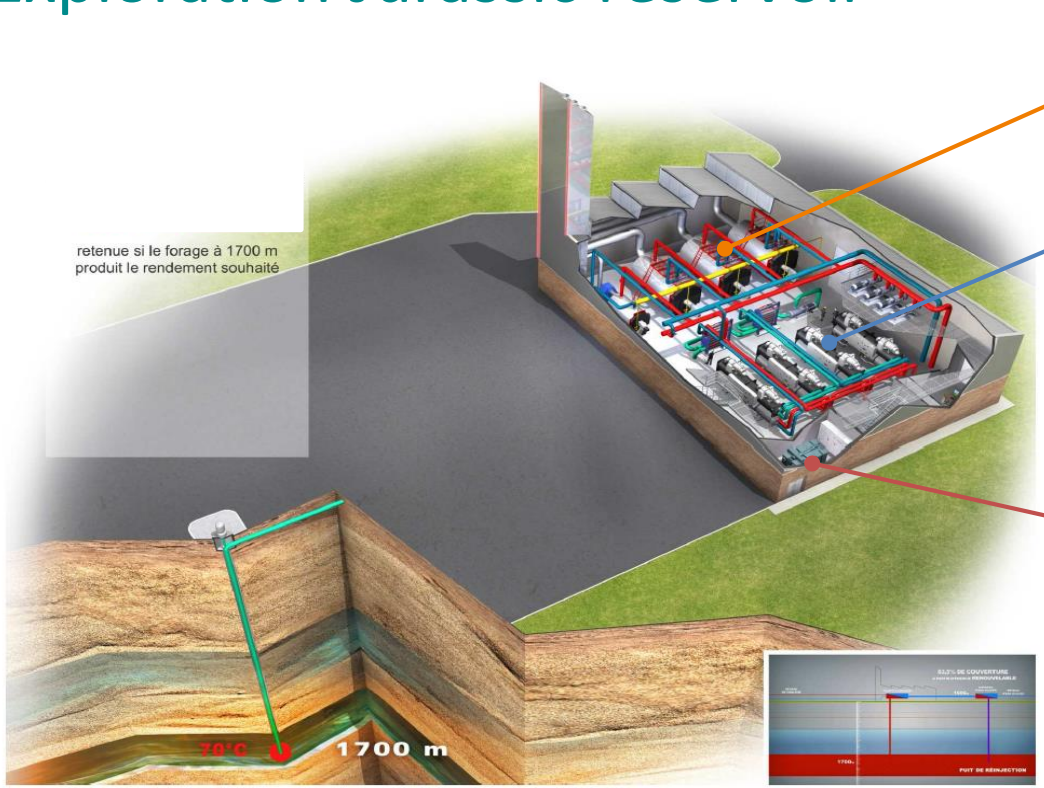
- 28 000 homes served
- 25 km of network
- 19 000 tones of CO_2 avoided per year
- 80 % of heat demand covered with renewables (55 % to 70 % with geothermal energy)

Key aspects of PGE project

- Bordeaux Municipality launched a tender for a new district heating **(30 year public service delegation)** including geothermal and exploration of an unknown aquifer
- PGE proposed to the Municipality of Bordeaux a competitive heat price that included the exploration of a deep reservoir **(Heat fund support for investment)**
- The solution allows the exploration of a deeper geothermal reservoir (Jurassic: Depth=1700 m, T=70°C, 16 MW) with the possibility to fold back to a proven reservoir in case of exploration failure (Cretaceous: Depth=980 m, T=45°C, 8 MW).
- **90% of the costs related to exploration (deepening of the wells) and to fallback operation are covered by SAF mechanism.**



Exploration Jurassic reservoir

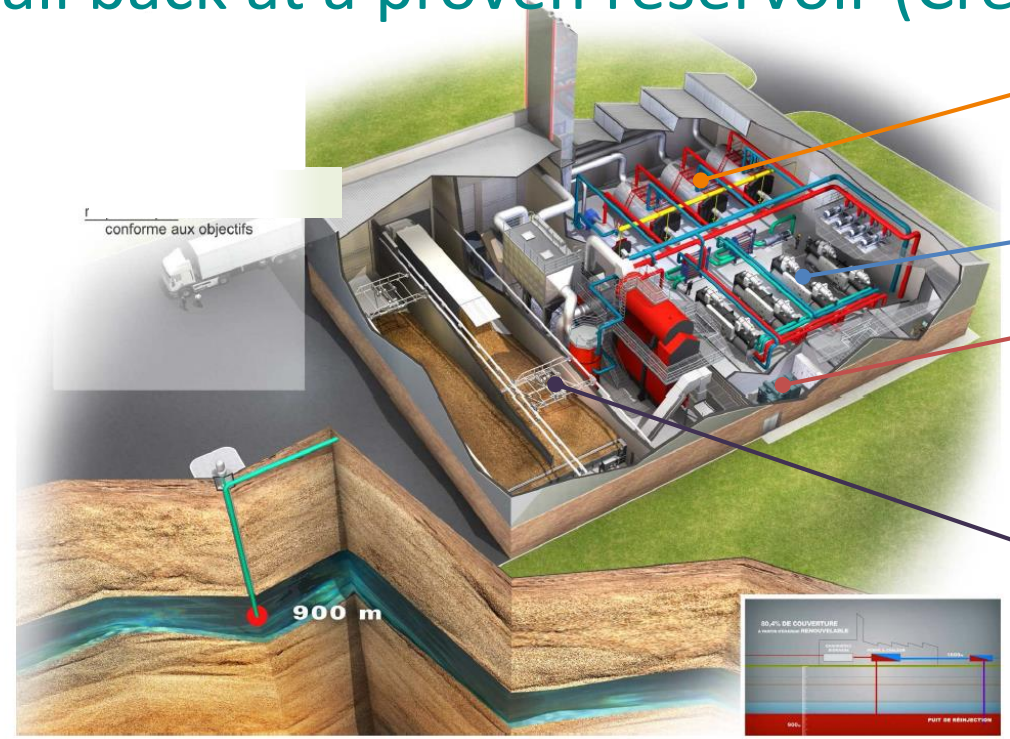


Gas Boilers

Heat Pumps

Geothermal heat exchangers

Fall back at a proven reservoir (Cretaceous)



Gas Boilers

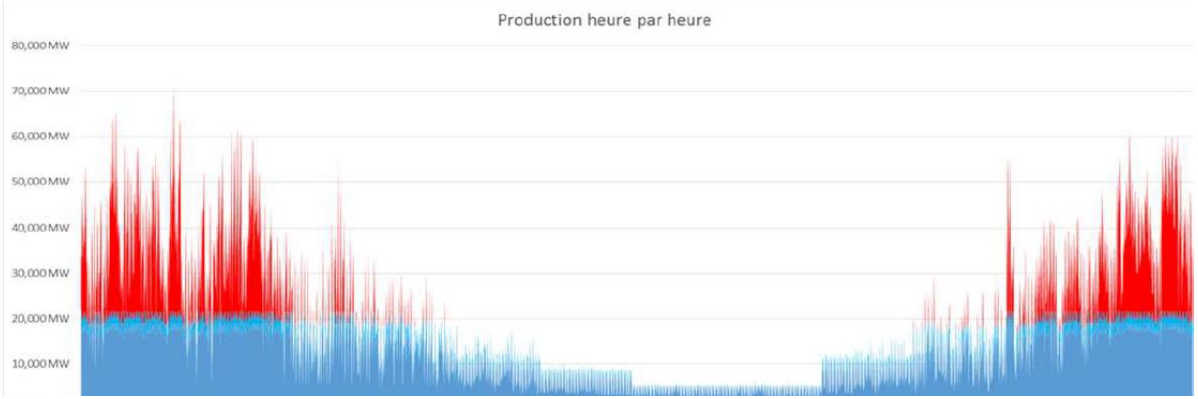
Heat Pumps

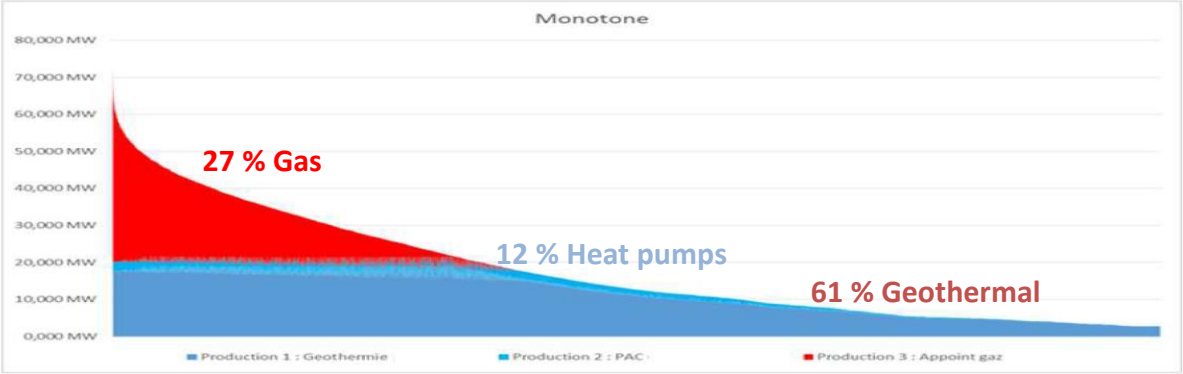
Geothermal heat Exchangers

Biomass Boiler 8 MW

Production facility – Architectural Project

Production profiles at year 2020





Civil Works at production facility

- Siteworks start on April 2018 (foundation construction)
- Civil work in progress (building structure finished)
- First equipements (boiler) on site beginning September

District heating construction

- Works start on March 2018
- 1st network underground phase tested
- Next underground phase on going

Storengy outlook

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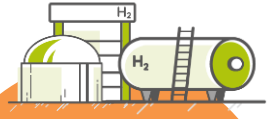
AN INNOVATIVE PARTNER in a new energy landscape

Natural gas storage



Carbon-free energy production and storage

Geothermal energy solutions

Offering flexibility: a long tradition of expertise

Innovating and developing alternative solutions

UNIQUE TECHNICAL EXPERTISE + A COMMERCIAL OFFER CREATING VALUE = COMPETITIVE EDGE

Multiple skills

Making Storengy an innovative company for energy solutions of the future

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Thank you !