storengy

Une société de ENGIE

GEMex

GEMex Webinar Series
December 2019

Geothermal by Storengy

Geothermal energy at the heart of the energy transition

Carlos CHALBAUD
Business Development Manager

Laurent ESCARÉ
Technical Project Lead

storengy

Une société de ENGIE

Who is Storengy and how do we face today's energy challenges?

Storengy – A 100% subsidiary of the ENGIE group

Committed to energy transition through 3 main activities

STORE NATURAL GAS AND OFFER FLEXIBILITY TO YOUR CUSTOMERS

INNOVATE IN PRODUCTION AND HE WAREHOUSING OF RENEWABLE ENERGIES

DEVELOP SOLUTIONS BASED ON GEOTHERMAL ENERGY

Innovative partner for a new energy world

Storengy **differentiates itself from its competitors** through **unique technical expertise** and a **value-creating commercial offering**

Project development through the provision of **services** or as an **investor**

Storengy – Key figures

1st
underground storage operator in Europe

4th
underground storage operator worldwide

1st
biomethane producer in France

4,5 / 5
Glassdoor rate

LTIF= 1.1
Lost time injury frequency rate in 2018

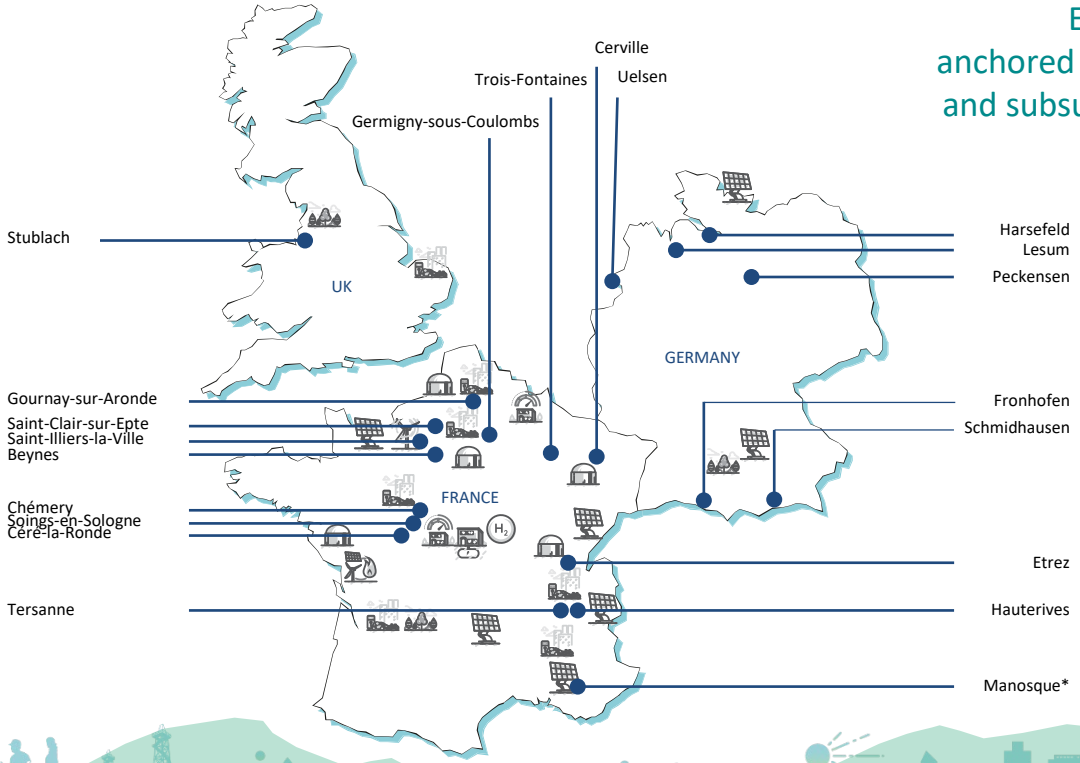
38
Net Promoter Score (NPS) in UK

France : 43 / Germany : 50

+1,000
employees

Storengy – Sites deeply rooted in their regions

- Energy efficiency
- Biodiversity
- Photovoltaic panel
- Wind power
- Hydrogen
- Methanation
- Energy transformed into gas
- Green mobility
- Energy storage



Energy innovation anchored in solid industrial and subsurface experience

* 50% share and site operation

Storengy – Multiple skills

Making Storengy an open reference company geared towards energy solutions of the future

ENGIE Mexico – Key figures


20 years of operations in the country

1,236 MW of installed capacity including more than 900 MW or solar and wind energy

435,000 residential clients

5000 commercial and industrial clients

10,500 kms of gas distribution network

1,290 kms of gas transmission network

ENGIE Mexico – Corporate Social Responsibility

Renewable Area

- Installation of wood saving stoves
- Installation of solar luminaires
- First aid training courses
- Donation of water storage tanks and family and community water purification filters
- Rehabilitation of community spaces

Natural Gas Distribution and Transport Area

- First aid training courses
- Training courses for the development of family and community backyard gardens
- Donation of natural gas to institutions serving vulnerable groups
- Donation of personal protection equipment for civil protection authorities.
- Training for the development of productive projects

storengy
Une société de ENGIE

Technical challenges of geothermal energy

Geological diversity of geothermal systems

Low temperature

< 100 °C (~30°C/km)

District heating/heat networks

High temperature

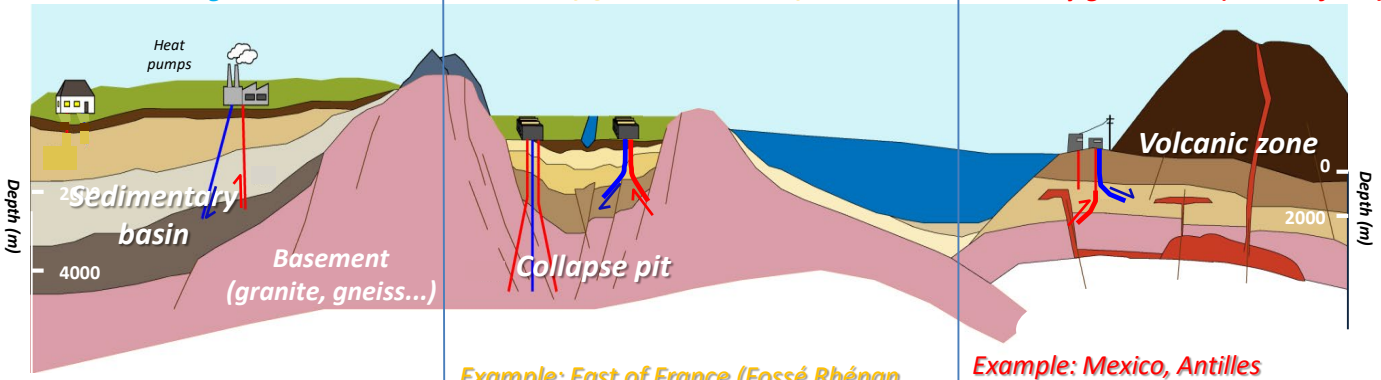
100 - 200 °C (~50°C/km)

Electricity generation (binary techno.)

Very high temperature

> 200 °C (>100°C/km)

Electricity generation (techno. flash)



Example: Paris Basin

Little exploration required
Known sedimentary basin

Example: East of France (Fossé Rhénan, Alsace)

Exploration program adjusted to local complexity

Example: Mexico, Antilles

Complete scan program required
Little known areas

Increasing geological complexity

Life stages of a geothermal project

Exploration Permit
2-6 years

Production Concession
20-30 years old

Preliminary studies → **Exploration** → **Construction** → **Production**

Identification of areas of interest

- ❑ Analysis of available geological information
- ❑ Identification of areas of interest
- ❑ Market analysis - Economic studies - Technical feasibility - Environmental studies
- ❑ Permit / concession application

Evaluation of the resource

- ❑ Acquisition of additional data
  - ➢ *Geology, geophysics and geochemistry campaigns*
  - ➢ *Exploratory drilling*
- ❑ **Decision whether or not to continue the project**

- ❑ Drilling of production / injection wells
- ❑ Construction of surface installations
- ❑ Commissioning

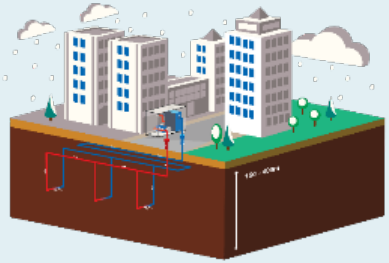
- ❑ Maintenance of installations
- ❑ Geothermal reservoir monitoring
- ❑ Possible extension of the concession

Geothermal usage models
Storengy projects worldwide

Non-intermittent renewable energy

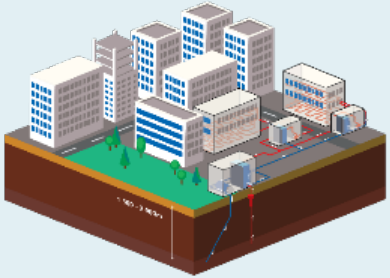
adapted to multiple uses and markets

Low temperature geothermal energy (heat pumps)



- Residences and shopping centres
- Eco-cities (model city)
- Sports facilities

Heating and cooling networks



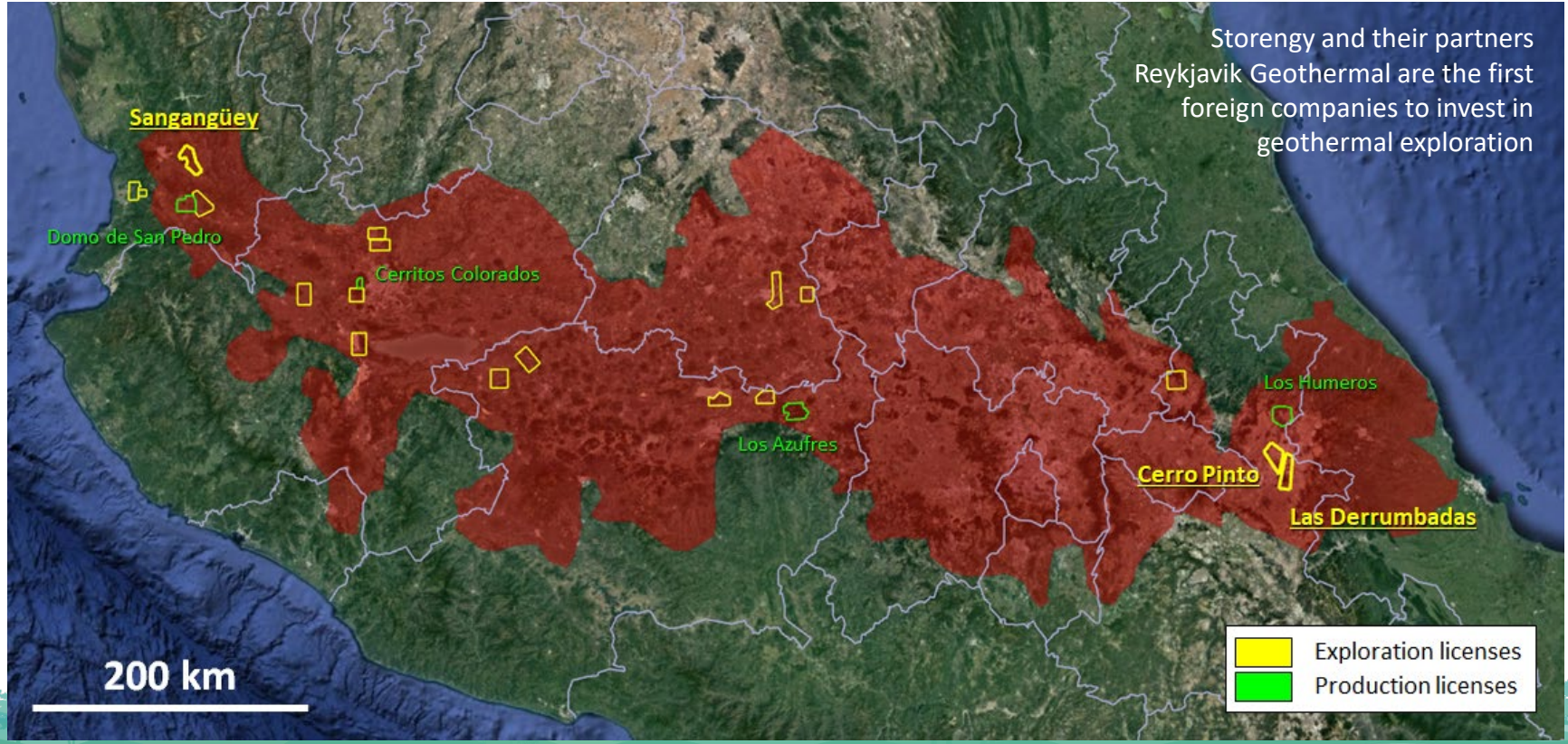
- Cities and states
- Industrial and agrifood complexes
- Sports facilities and complexes

Electricity production

- Electrical networks
- Data Center

Geothermal licenses in Mexico

Trans Mexican Volcanic Belt



Mexico - First very promising results

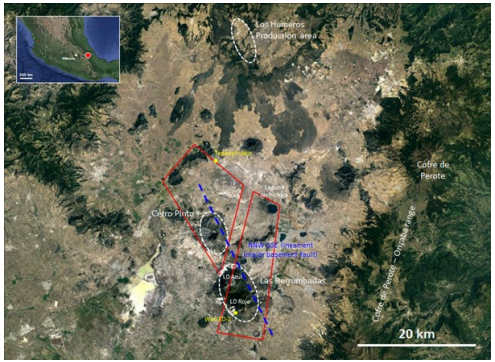
Las Derrumbadas

Sampling and geo-chemistry of fumaroles

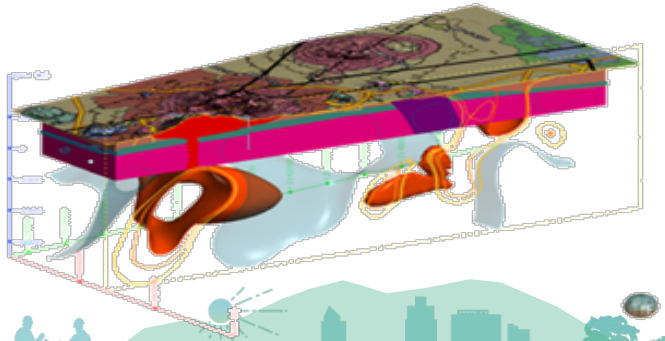
Geothermometers suggest a reservoir temperature of more than **250 °C** and possibly higher.

Acquisition of geophysical data

The interpretation of magneto-telluric (MT) data suggests the presence of a geothermally altered clayey seal covering a **deep, high temperature basement reservoir** with the possible presence of a deep magmatic chamber or an intrusion acting as a heat source.



Presentation of results expected in an international conference in 2020



Mexico – Key scientific and technical cooperation

CeMIEGeo
Centro Mexicano de Innovación en Energía Geotérmica

Universidad Nacional Autónoma de México

With fruitful contacts initiated with the University of Michoacan San Nicolás de Hidalgo

Pilot projects to demonstrate innovative concepts

Once the pilot projects are completed, the concepts can be replicated.

Italy Tuscany

"Zero emission“ plant

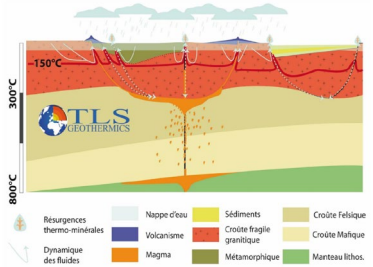
- → Challenge: The geological context leads to a high level of non-condensable gases present in geothermal fluid
- → Solution: Development of an innovative technology in the well which allows the total reinjection of CO_2

Pilot project:
Castelnuovo Val Di Cecina
5 MW
Commissioning 2022

French Massif Central

Metamorphic Core Complexes

- → Identification of faults from surface measurements and subsurface data processing
- → Reduction of risks and costs of the exploration phase and identification of new areas

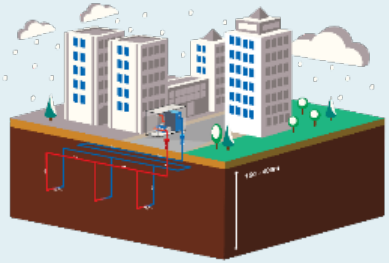


Pilot project:
La Sioule
5 MW
Commissioning 2022

Non-intermittent renewable energy

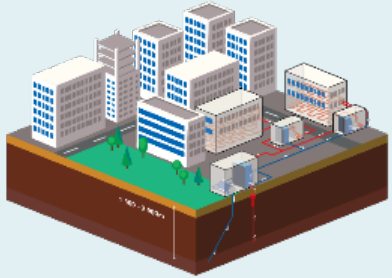
adapted to multiple uses and markets

Low temperature geothermal energy (heat pumps)



- Residences and shopping centres
- Eco-cities (model city)
- Sports facilities

Heating and cooling networks



- Cities and states
- Industrial and agrifood complexes
- Sports facilities and complexes

Electricity production

- Electrical networks
- Data Center

Geothermal and district heating

Project PGE Bordeaux, France

Public-Private Partnership:

- Purpose: design, construction and operation of a heat distribution network and production plant
- Drilling of a geothermal doublet
- Duration of contract: 30 years

Key Figures

- The ENGIE Group was selected as the winner of the tender launched by the municipality of Bordeaux: **2/3 ENGIE Cofely - 1/3 Storengy**
- 51 M€ total investment
- 70 MW capacity
- **16 MW** from geothermal energy and heat pumps
- 28 000 households served
- 36 km of pipelines
- 19 000 tonnes of CO2 avoided per year
- 80 % of the heat demand covered by renewable energies

storengy

Une société de ENGIE

Thank you for your attention