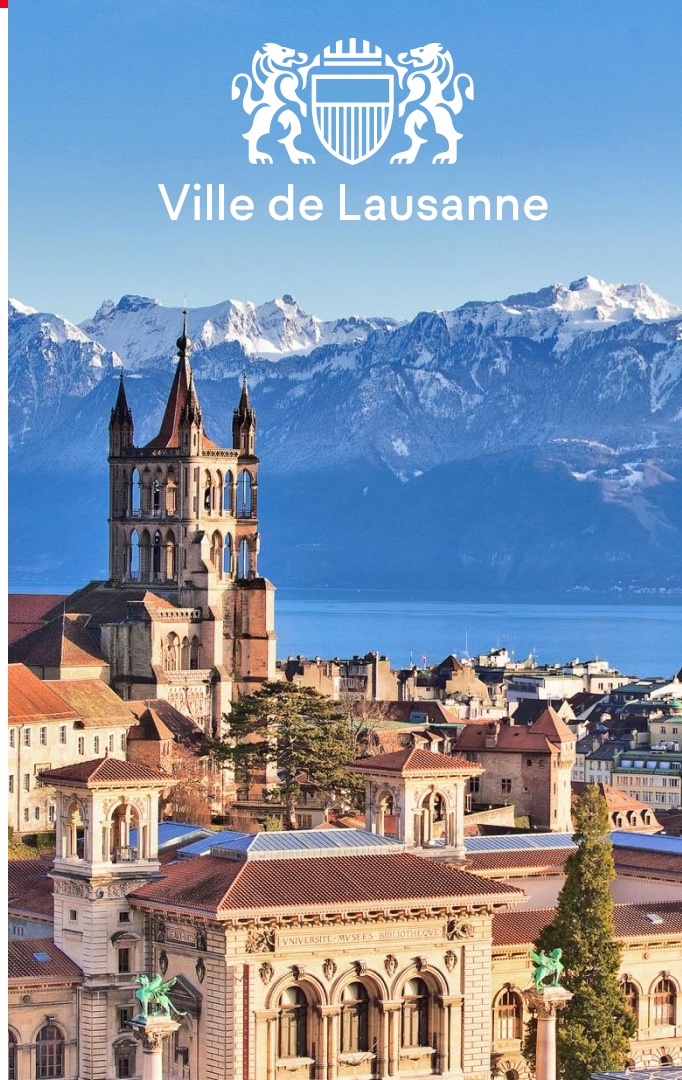
SERVICES INDUSTRIELS LAUSANNE

Ville de Lausanne

Integrating geothermal energy into the portfolio of an industrial plant

Economic and organisational aspects



04.10.2023

Niels Giroud

Thermique en chiffres

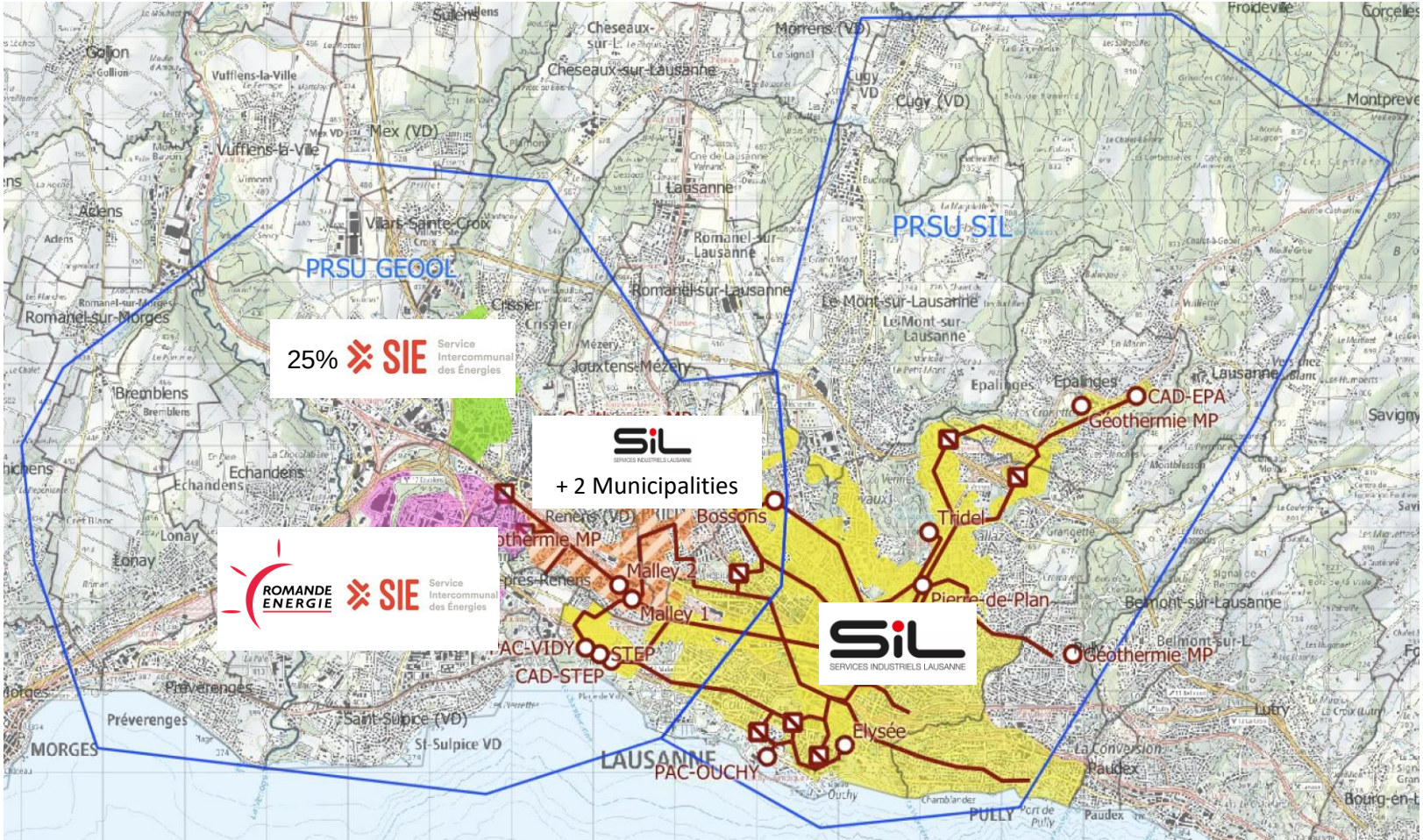
Objective 2 = 75% of thermal energy needs covered by carbon neutral DH

	2020	2050
Population	**137’000**	**175’000** (+28%)
Reference floor surface	**9.4 Mio m²**	**10.8 Mio m²** (+15%)
Thermal energy needs	**1’500 GWh**	**950 GWh** (-40%)

	2020	2050
District heating (SiL production)	**520 GWh** 66% renewable	**870 GWh** 100% renewable >2035 (+60%)
Natural gas	**750 GWh** <10% renewable	**200 - 350 GWh** 100% renewable (-60% to -70%)
Carbon footprint	**300 ktCO$_2$**	**20 ktCO$_2$** (-95%)

Objective 1 = 40% decrease of energy demand from buildings

Extension of DH Networks by 2050

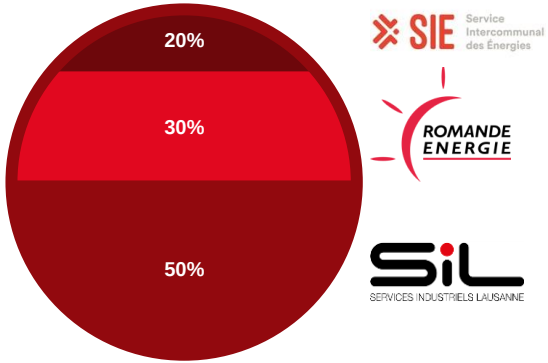


What is GEOOL ?

A company set up to develop geothermal energy exploitation in western Lausanne

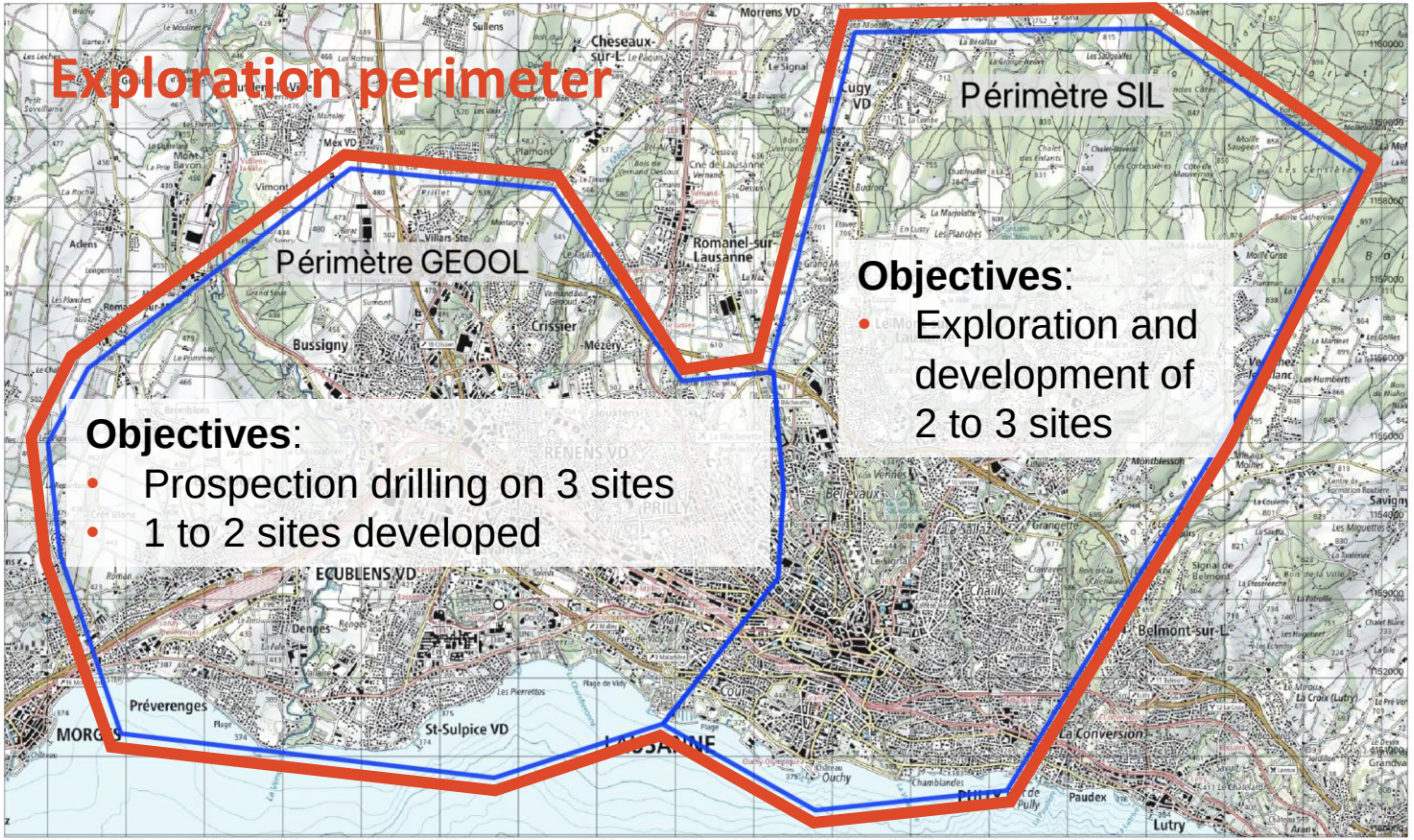
GEOOL
Géothermie de l'Ouest lausannois

Partners :

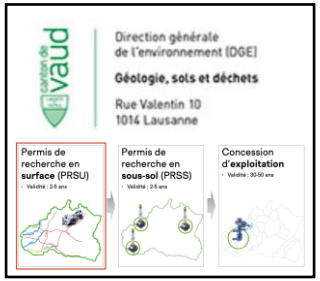


Mutualisation of competences and financial risks

GEOOL & SIL – Surface Exploration Licences



Stakeholders



4 Municipalities:
Renens, Chavannes-près-Renens, Crissier, Ecublens

City council

Municipal Board

SIE Service Intercommunal des Énergies

SIL SERVICES INDUSTRIELS LAUSANNE

SIX Swiss Exchange

ROMANDE ENERGIE

GEOOL Géothermie de l'Ouest lausannois

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN

Subsidy up to **60%** of project costs

Service Sismologique Suisse

energeô

agepp

Environnement

- Hydrogeology
- Forests
- Soil protection
- Land use and planning
- …

Communication

GEOOL SIL

- Media
- **Population**
- Neighbors

Infrastructures

- SiL
- Municipalities
- Public transport (CFF, TL)

Heat distribution

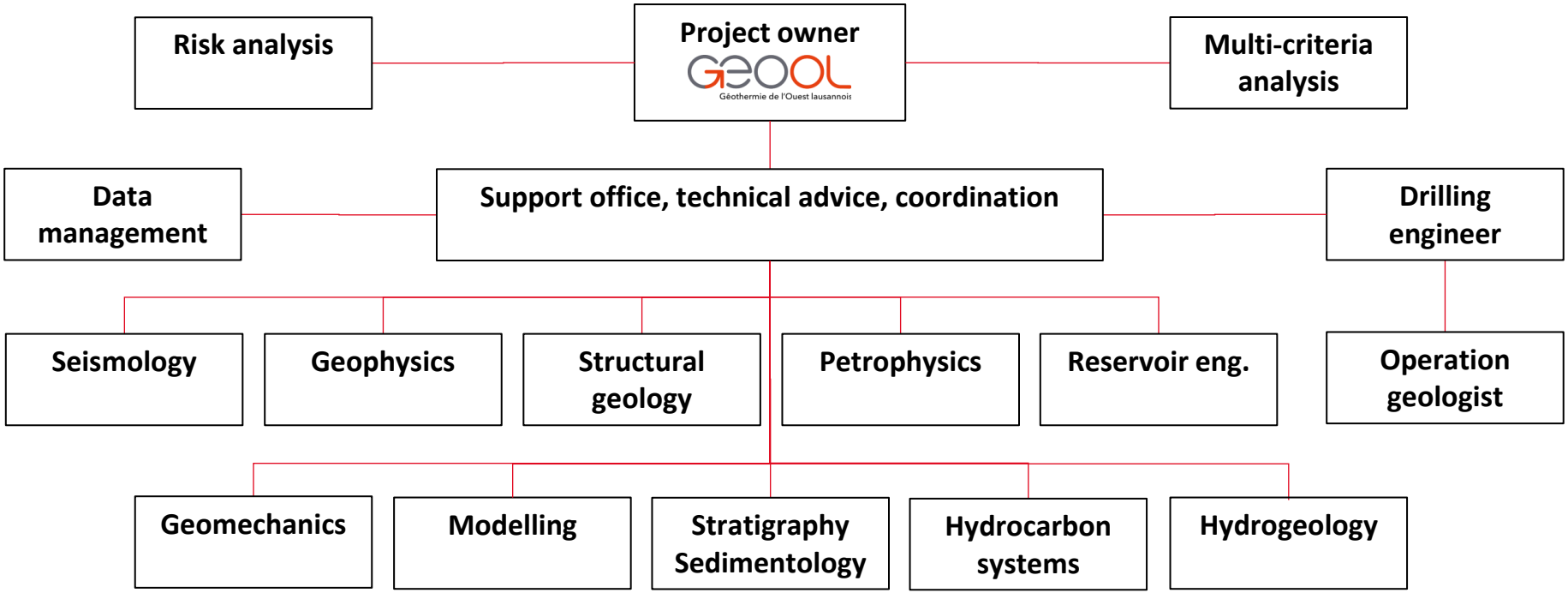
CAD SIL
CADOUEST
ECUCAD
CRICAD
EFPL

Municipalities

Land owners

Project Team

- 15 specialists from 8 different contractors



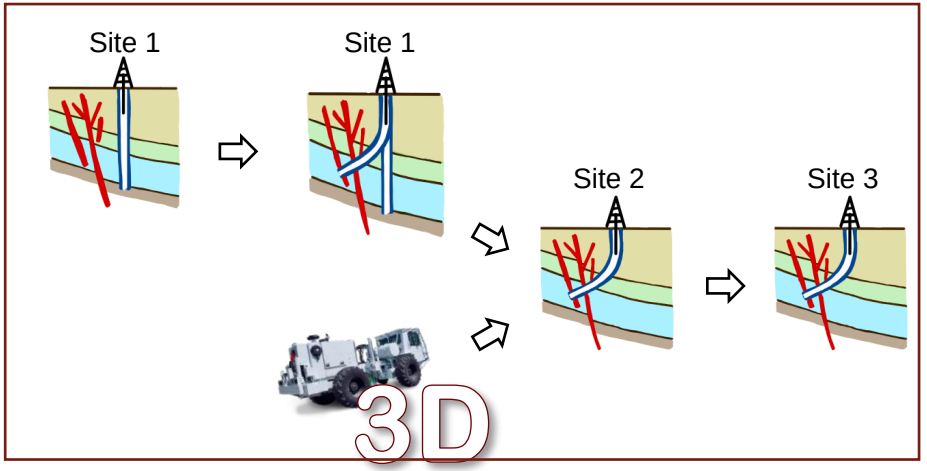
Business model: Prospection strategy

- Probability of success (POS) of a first well based on 2D seismics < 30 %
- POS can be increased by combining 3D seismics and several exploration BH

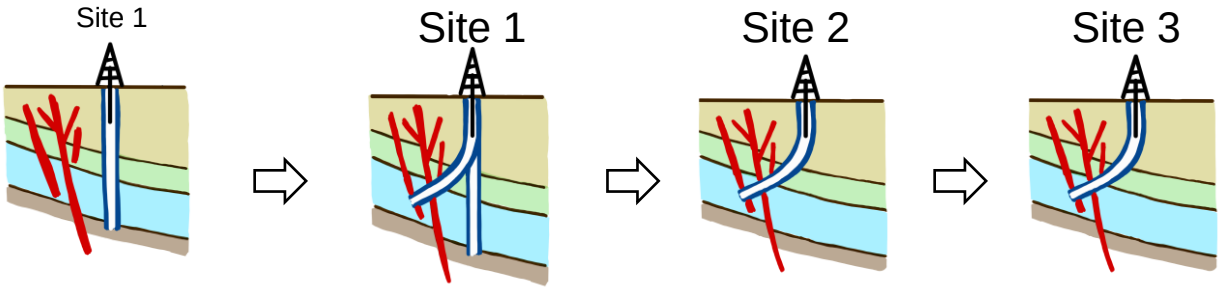
Strategy for GEOOL:

- **2 *unsuccessful* exploration boreholes included** in the business model

  - 1st exploration BH includes sub-vertical pilot hole and sidetrack into target
  - 2nd & 3rd BH deviated into potentially producing targets



Probability of success (POS)



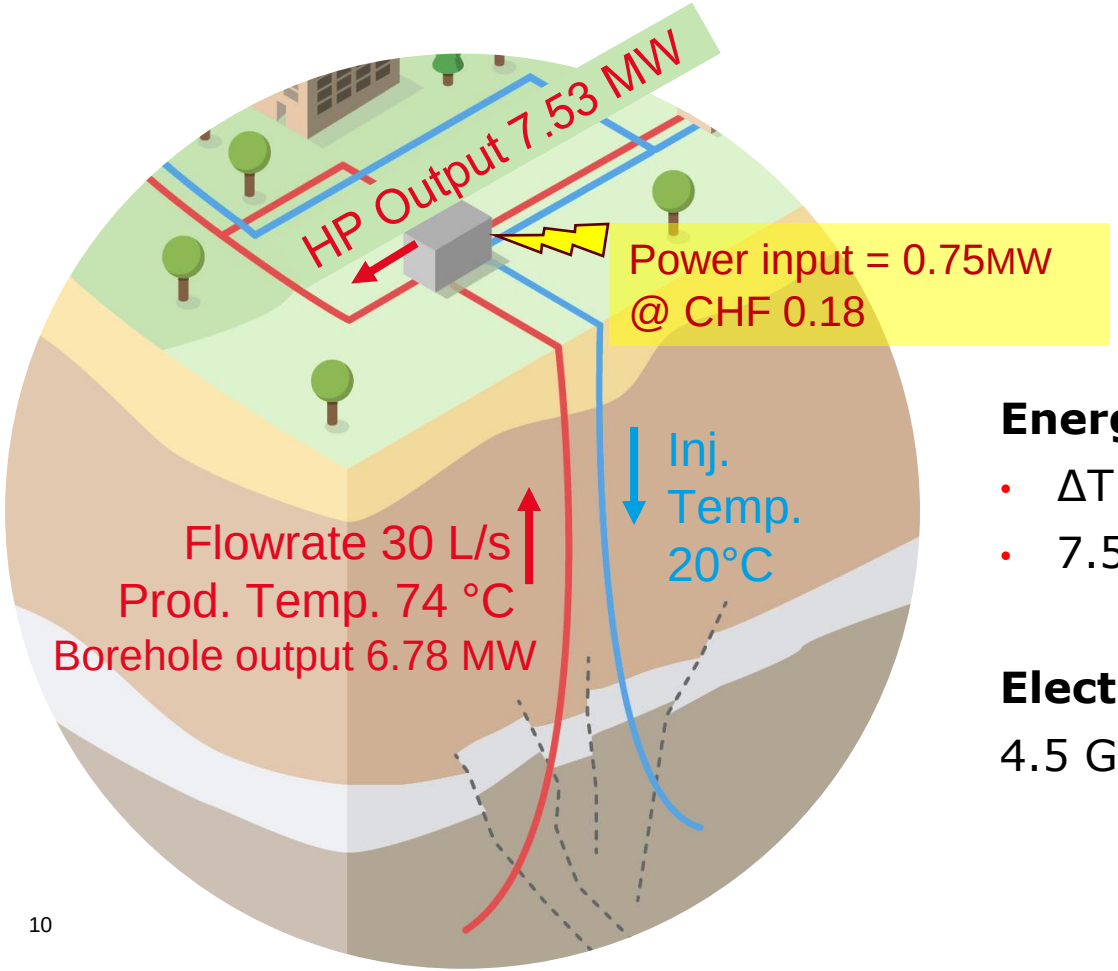
Objectives	Data acquisition	Data acquisition Heat production	Heat production Data acquisition	Heat production
POS heat production:		**27 %**	**63 %**	**84%**

As calculated for GEOOL's current prospection strategy
Only orders of magnitudes are relevant

- The primary objective of the first borehole is derisking of the project

Business model – Production Base case

- If temperature permits: direct use
- In any case: heat pumps to lower injection temperature



Energy output

- ΔT = 54 °C
- 7.53 MW x 6000 hours = 45.2 GWh

Electricity costs

4.5 GWh @ CHF 0.18 = 1.175 MCHF

Investment and return

Status March 2023

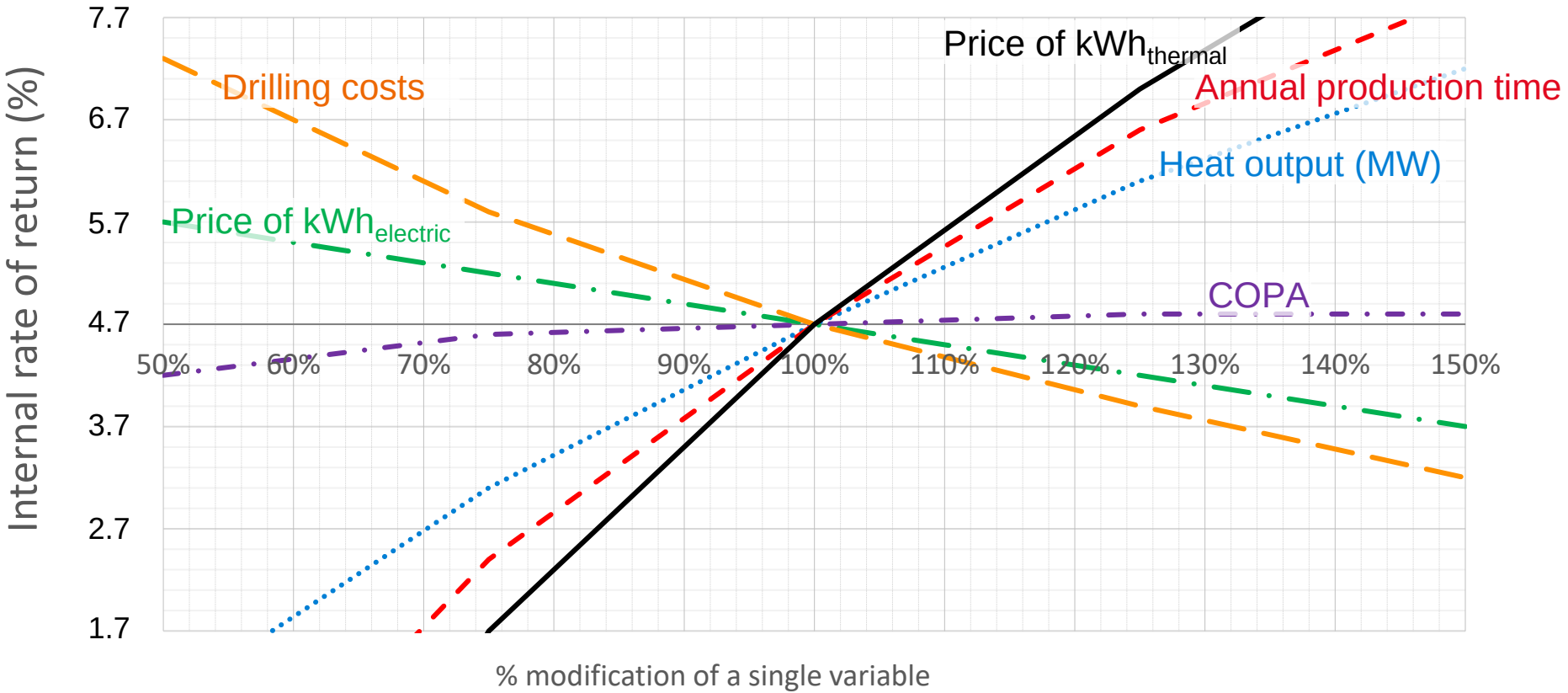
Total investment	90 MCHF
SFOE Subsidy	32 MCHF
Net investment	**57 MCHF**

- Selling price of $kWh_{thermal}$: CHF 0.12
- Amortisation: 40 years
- Return on investment: 25 years
- Minimum IRR for shareholders: 4.8%

- Selling price is competitive compared to other renewables
- Selling price has the highest influence on the IRR

☐ small variations can cover most uncertainties in model assumptions

Sensitivity analysis – Variation from the base case



Challenges and Summary

- Geological **uncertainties**
  - ➔ Complex planning of DH-networks
  - ➔ Only sufficient data acquisition leads to acceptable POS
- **SFOE subsidies limited to direct use**
- Important CAPEX, but limited sensitivity on financial return
- Communication
- Largest effect on financial return:
  - ➔ Production flowrate
  - ➔ Annual production time
  - ➔ Selling price

Thank you for your attention