



IEA Geothermal



# Large scale BTES

## Bern (as well some examples ATES)

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Energie Wasser Bern - Switzerland

28.02.2024 - 11.45 - 12.00h - Offenburg



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*Mechanical engineer HTL, NDS economics,  
CAS EPFL GES (Gouverning Energy Transitions)*

*Planning, simulation and optimisation of energy and  
infrastructure systems from centralised and  
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*Member of the Geothermal Switzerland  
Steering Committee*



# Contents

- **Introduction @ Overview:**
  - *Overview of thermal activities and environmental energy*
  - *Discuss key features, scale, and achievements, emphasising relevance in the commercial sector.*
- **Exemple 1: Geo-storage Forsthaus**
- **Exemple 2: Geo-storage Buech**
- **Outlook:** future plans/next steps/repeating potential/upscaling (for a decarbonised Heat System)

# Overview of thermal activities and environmental energy Bern CH

## Existing production facilities

EZF: Energy production Forsthaus (under expansion)

EZR: Energy production Rehlgang (under construction)

## New facilities in concept study

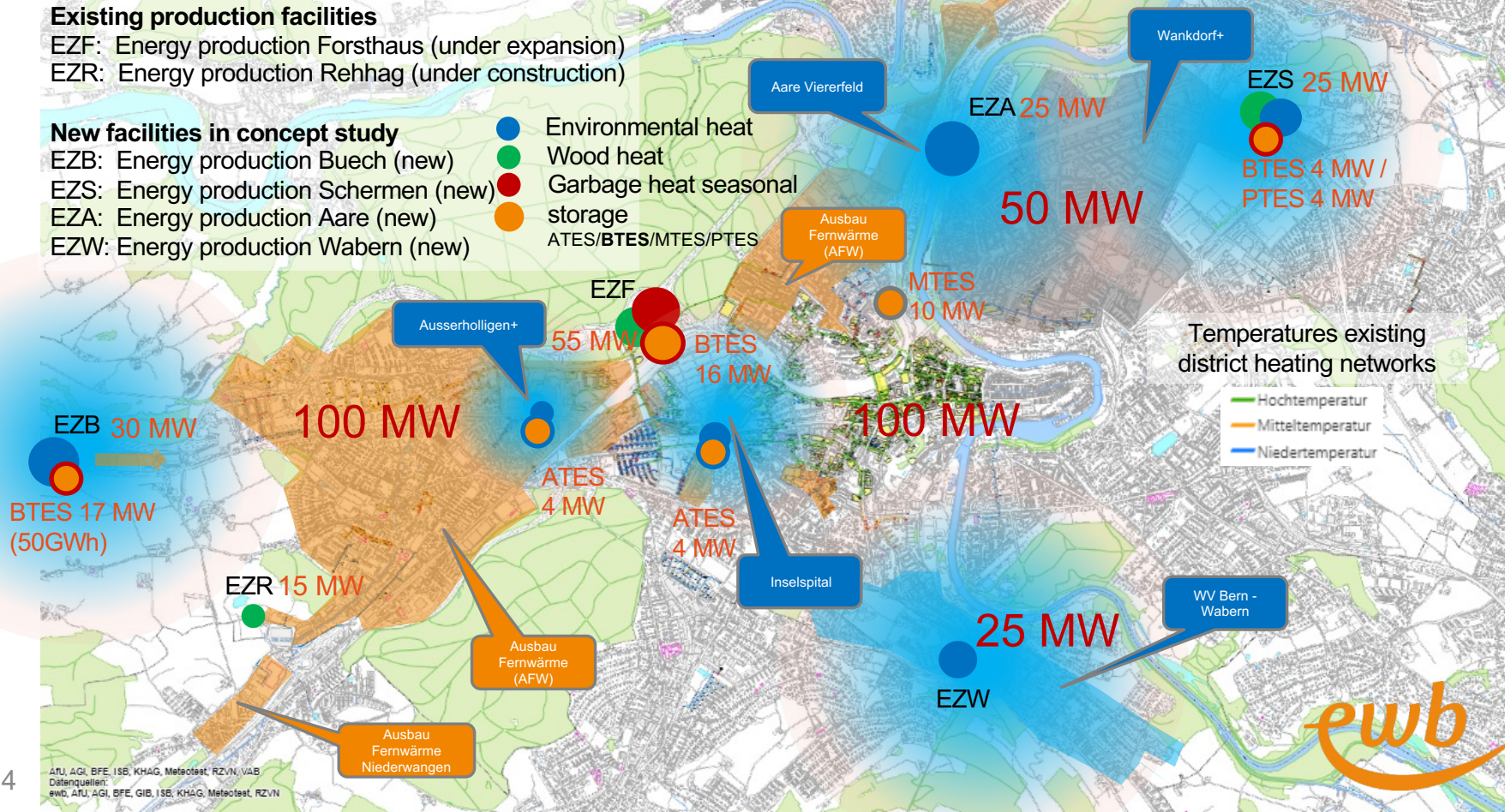
EZB: Energy production Buech (new)

EZS: Energy production Schermen (new)

EZA: Energy production Aare (new)

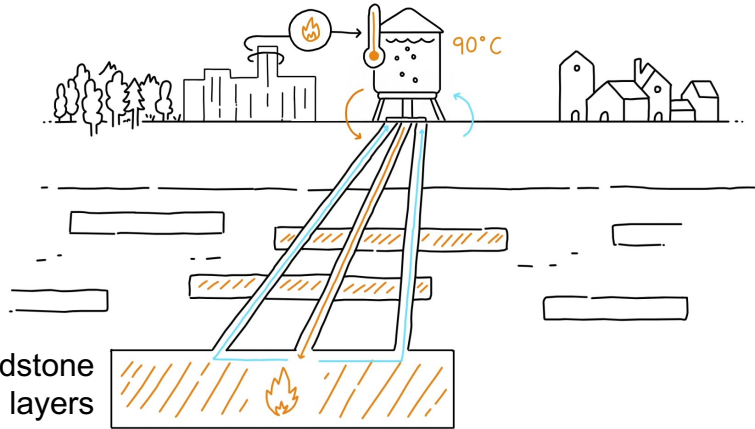
EZW: Energy production Wabern (new)

- Environmental heat
- Wood heat
- Garbage heat seasonal storage
- ATES/BTES/MTES/PTES

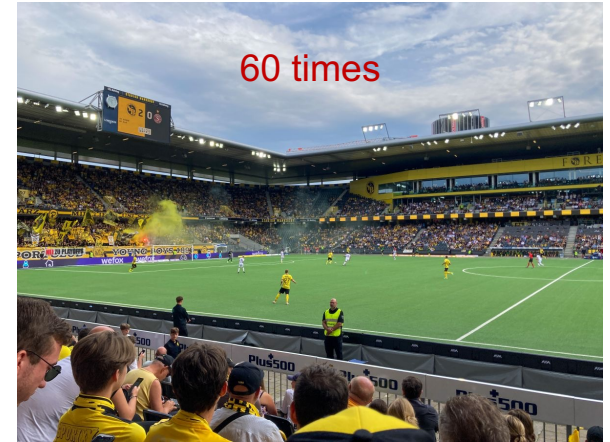




# Storage technology - volume and capacity



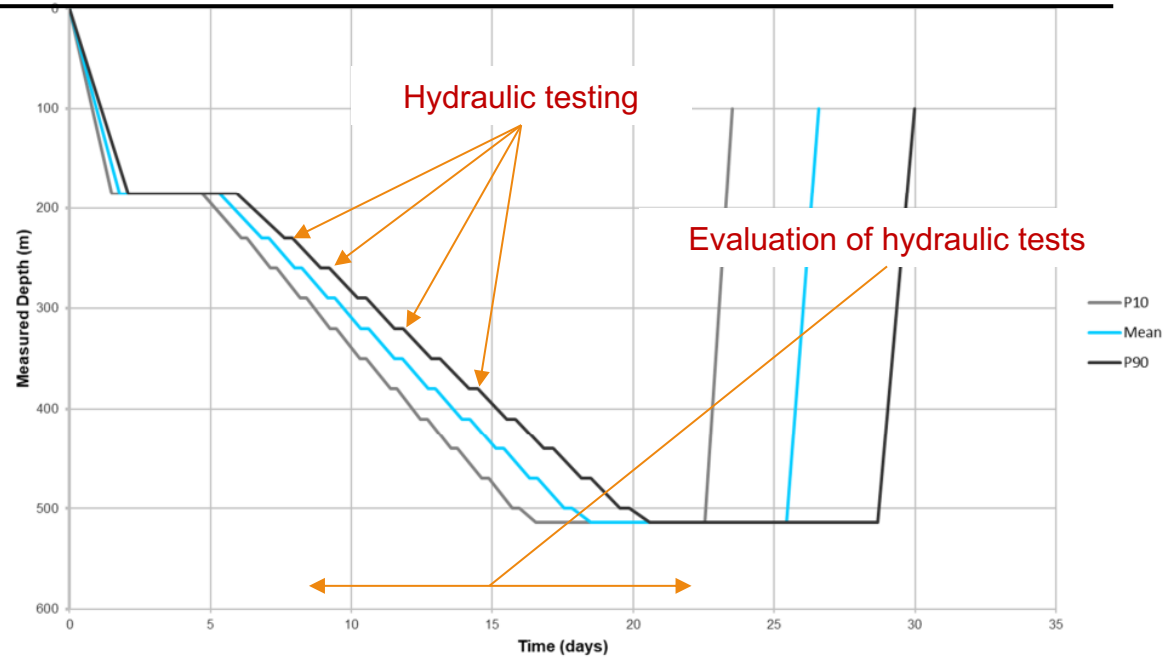
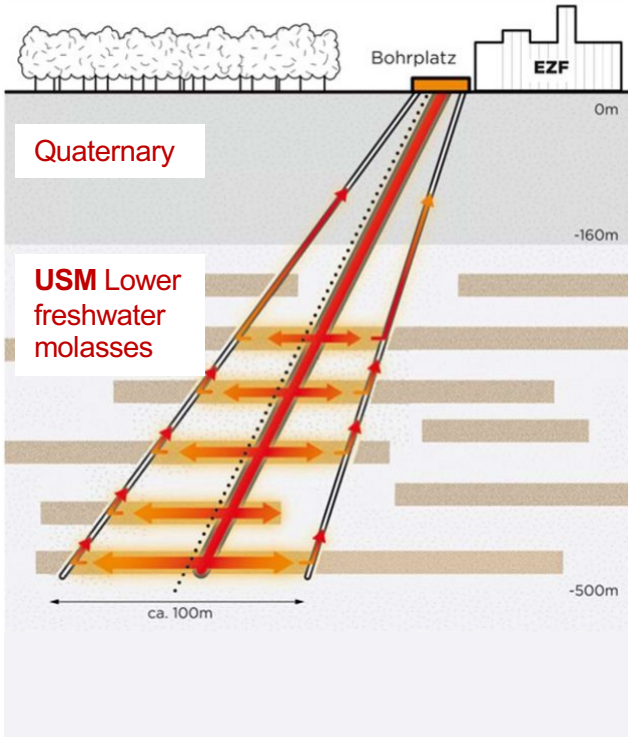
15 GWh ( $\Delta T = 30K$ )



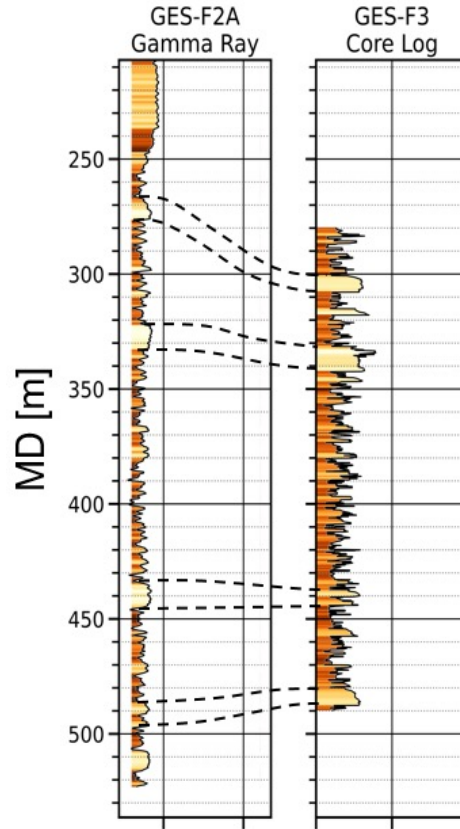
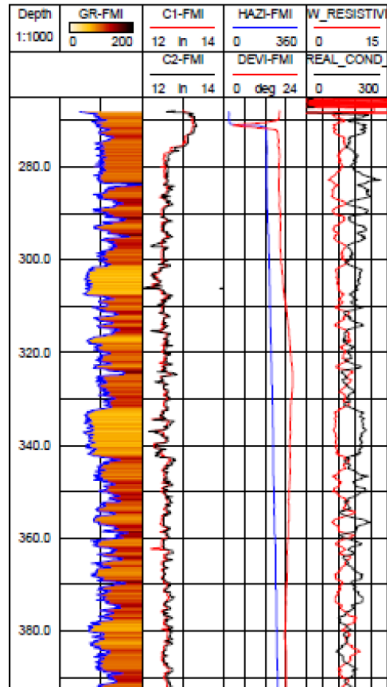
15 GWh ( $\Delta T = 30K$ )  
430'000 m<sup>3</sup> equivalent  
in the underground  
= 105 x 68 x 60 m



# Planning drilling



# Status of work - geology



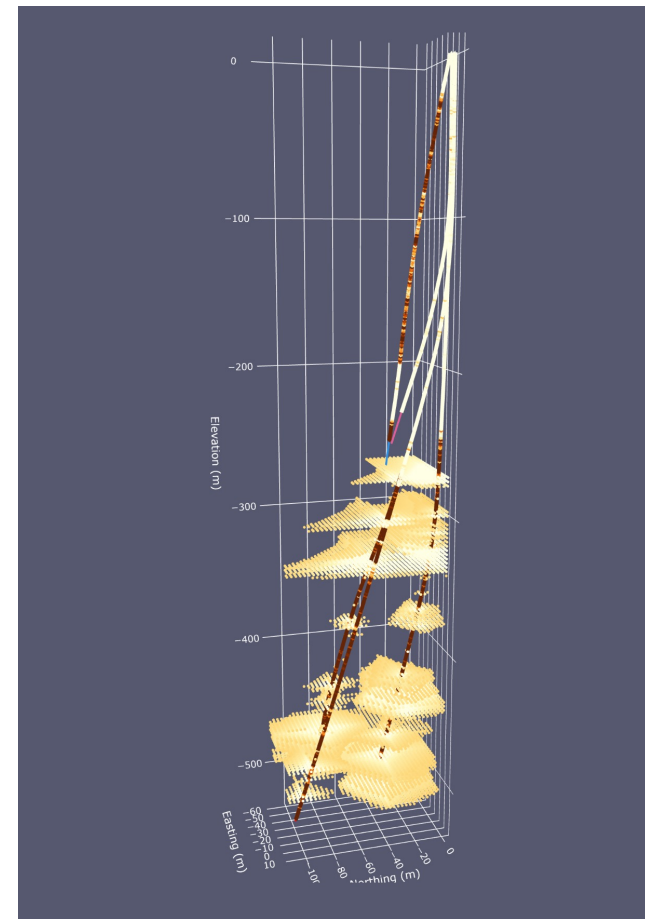
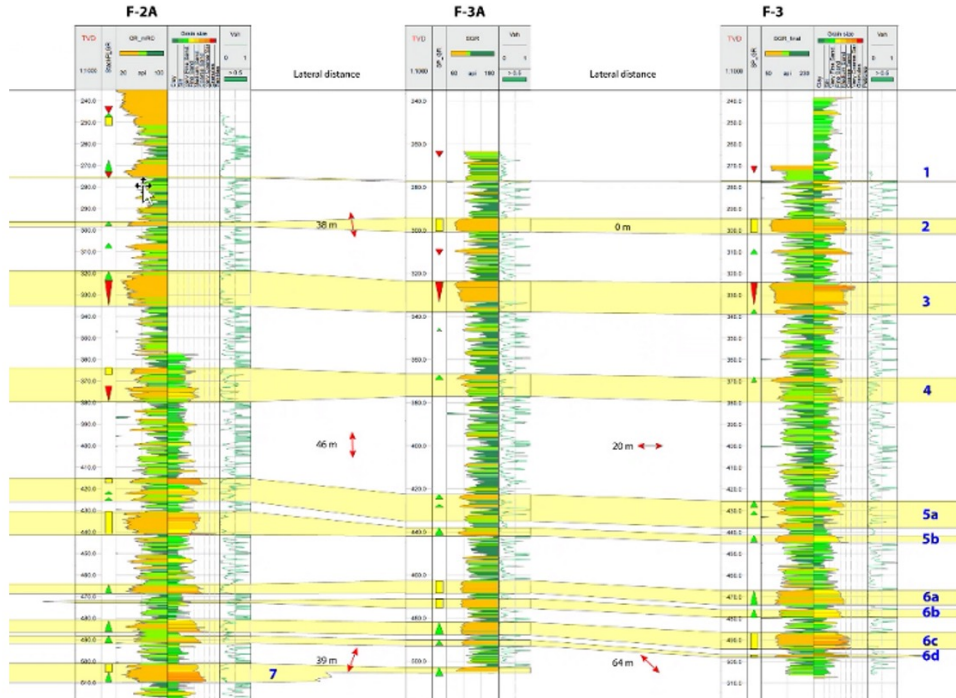
Many meters of earth material were recovered and documented.

Numerous **samples** of these cores were handed over to scientists for **in-depth analysis**.

In addition, each borehole was measured and documented using several methods.

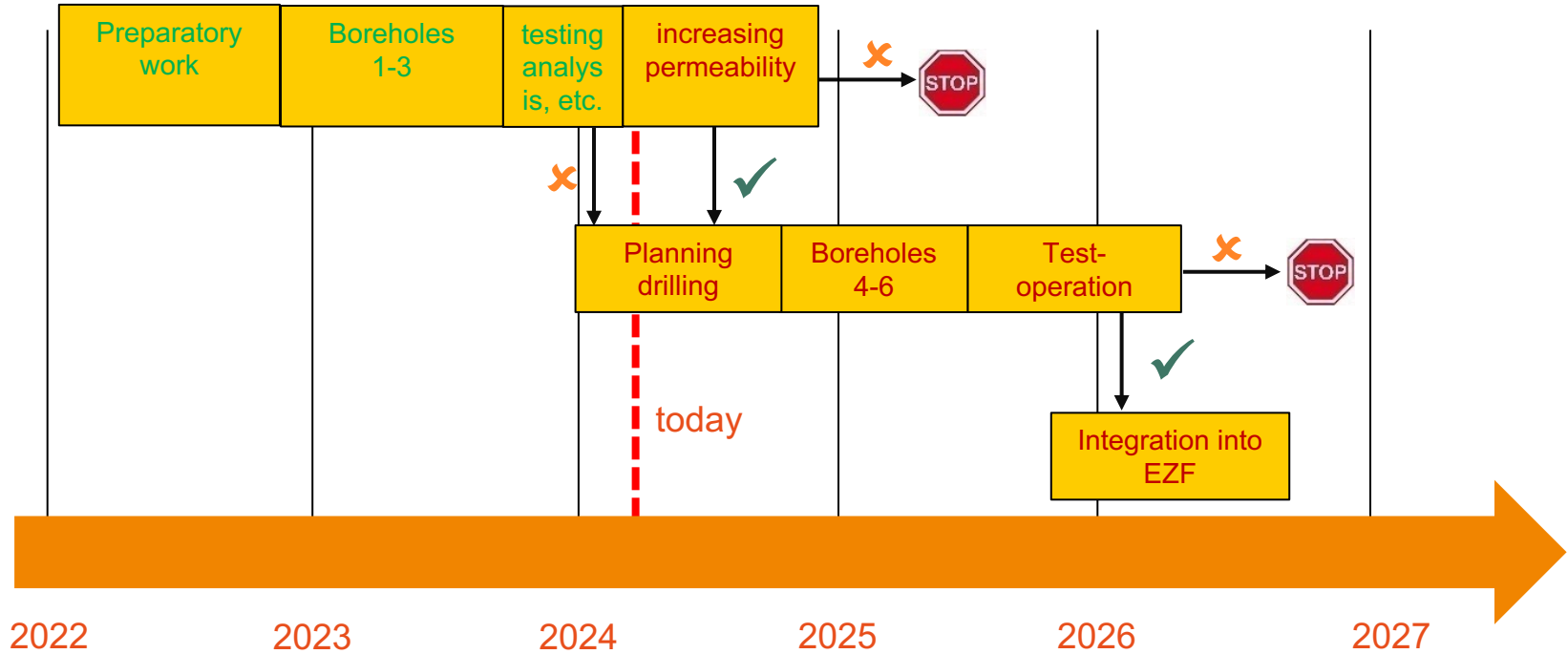
The evaluation of this amount of data has already begun and will provide us with new **models of the subsurface** and information for the coming test phase.

# Geological model





# Time schedule



# Actual status of the work



MTD – Micro Turbine Drilling



# Overview of drilling site



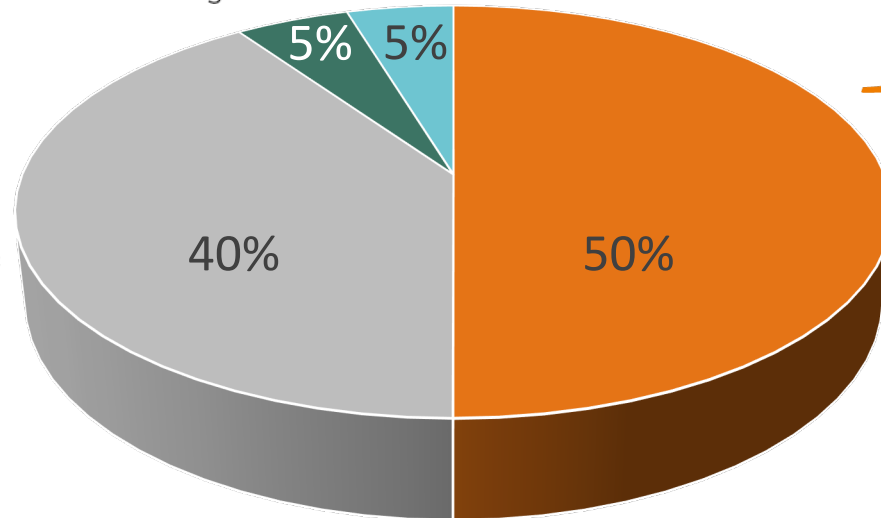
Project costs CHF 33 million



CHF 80.- / m<sup>3</sup>  
CHF 0.11 / kWh (\*20 a)

**ökofonds**  
Fonds für erneuerbare Energien

**heatstore**  
High Temperature  
Underground Thermal Energy  
Storage



*ewb*

*ewb*

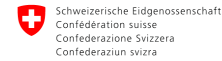


Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Bundesamt für Energie BFE  
Office fédéral de l'énergie OFEN



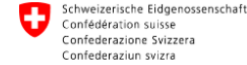
# One project – many faces



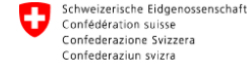
Bundesamt für Landestopografie swisstopo



Kanton Bern  
Canton de Berne



Bundesamt für Energie



blessesh

nagra.



u<sup>b</sup>



tbfpartner



UNIVERSITÄT  
BERN



P | T | S

PTS Attorneys at Law Ltd

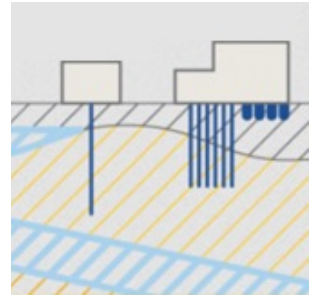


Stadt Bern



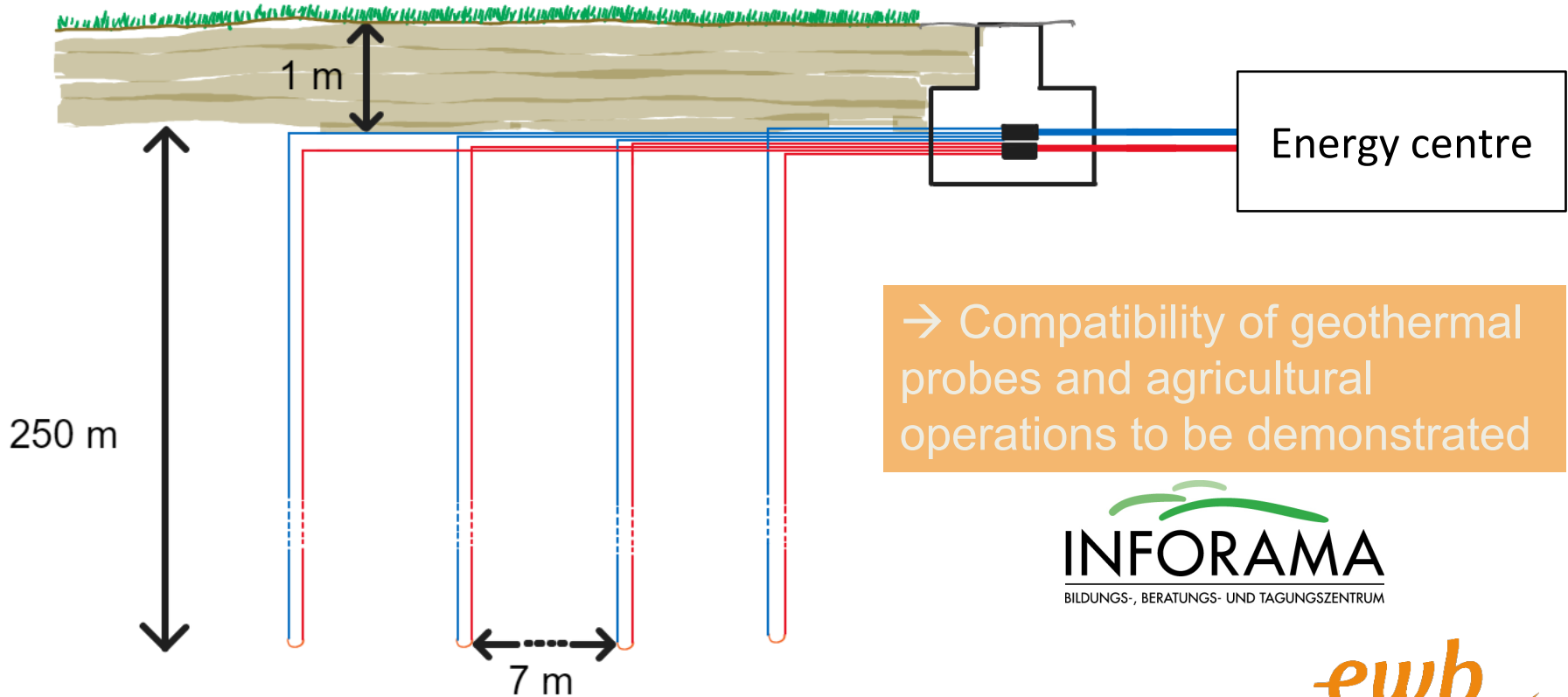
Marriott  
DRILLING GROUP

# Exemple 2: Geo storage idea



- 1 The Forsthaus energy center (EZF) feeds heat into the district heating network
- 2 The district heating network supplies properties, businesses and industry with climate-friendly heat
- 3 In summer, the Buech energy centre (EZB) stores surplus heat from the district heating network 90°C in an underground geothermal probe field. In winter, the storage facility feeds back into the district heating network.

# Schematic of borehole fields

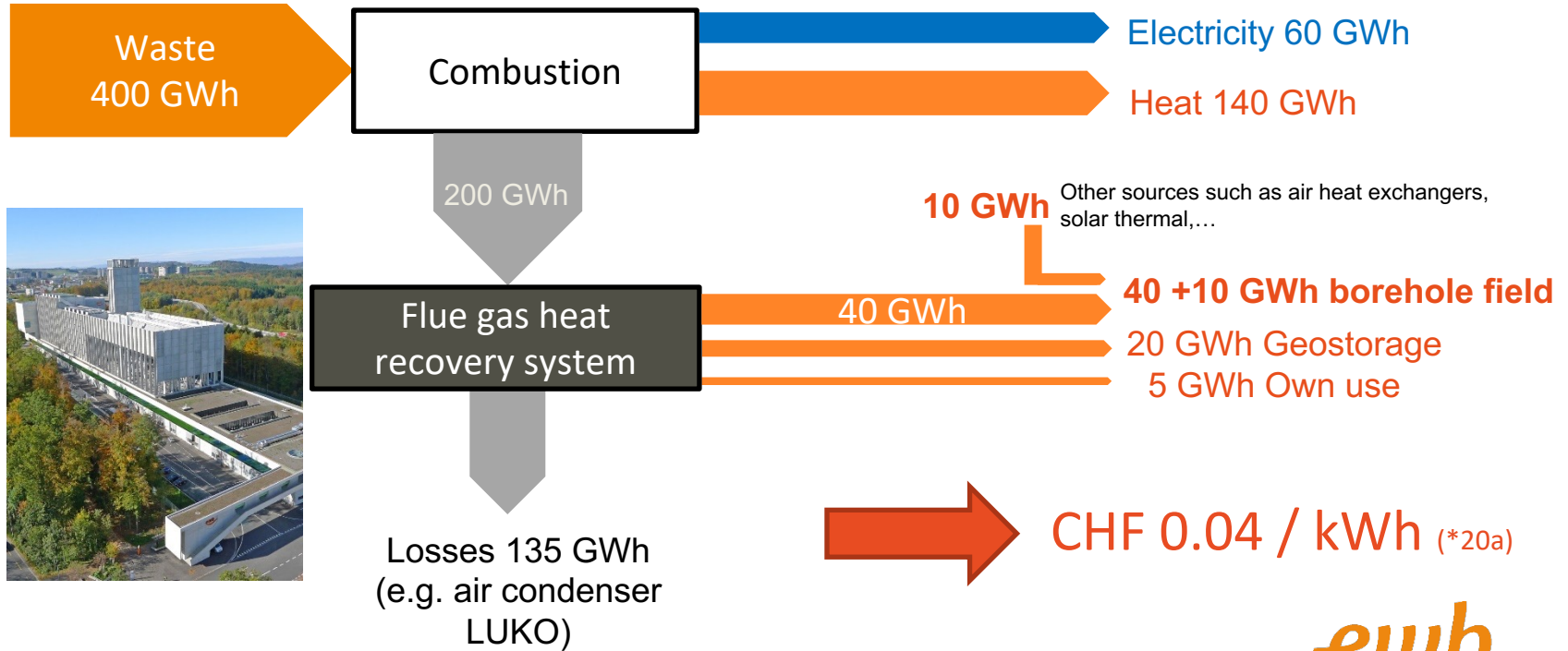


**INFORAMA**  
BILDUNGS-, BERATUNGS- UND TAGUNGSZENTRUM

*ewb*

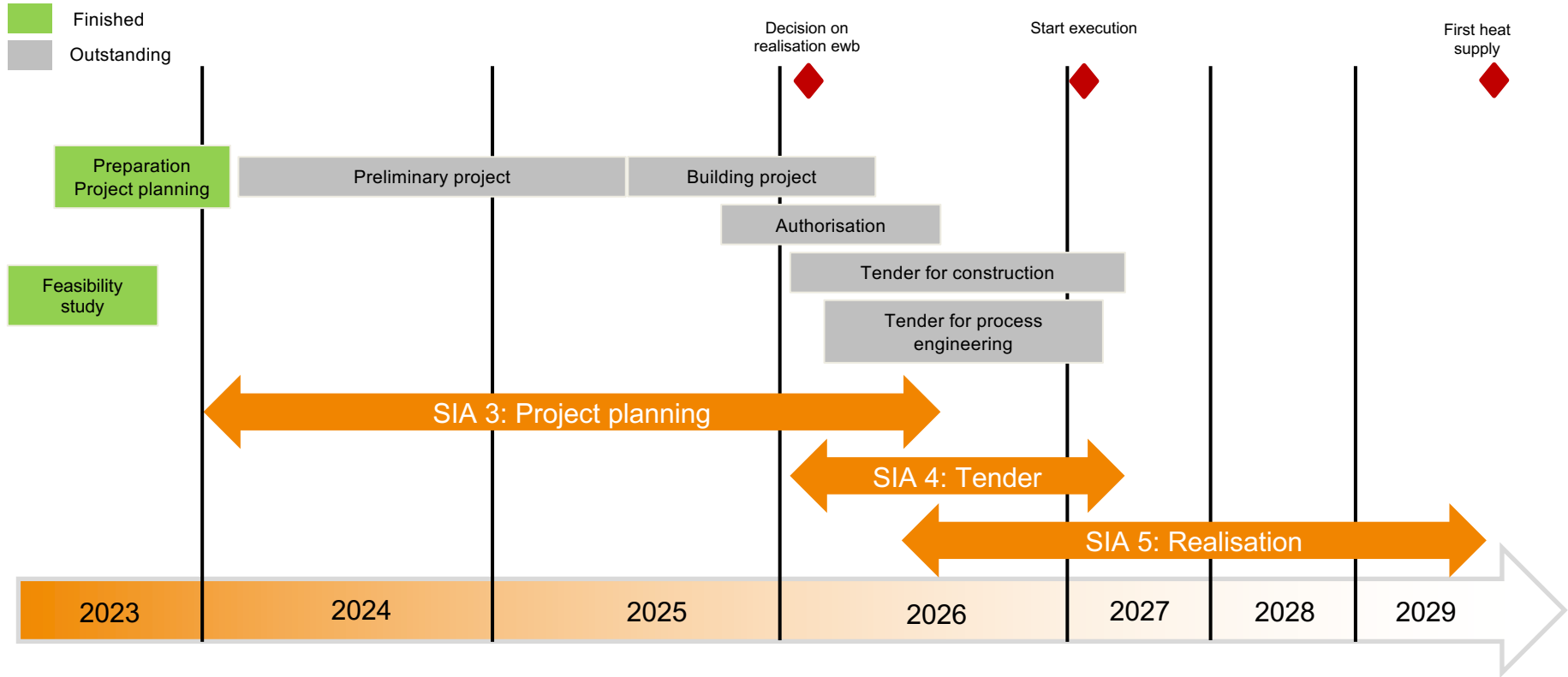
# Regeneration of the borehole field

Project costs store an **CHF 40 million**  
(Storage field and heat pumps)





# Timeline for the overall project



# Conclusion - what to take away

## BTES

- Geostuctures in an **open system** are little tested and the presence and permeability of the sandstone layers must be investigated.
- Geothermal probe fields in a **closed system** are a proven technology that can be generated in large areas without overbuilding.
- The creation is relatively complex and expensive, but the **process is reliable**. The temperatures are limited.

## ATES

- Groundwater structures are **very cost-effective** storage systems with a very large capacity. The costs are very low.
- The only way to ensure a suitable location is to carry out **many test drillings**

## MTES

- There are often **large spaces** in cities that are not used (e.g. disused tunnels)