THE DEEP HEAT MINING PROJECT

Status February 2006

by

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DHM PILOT PROJECT

The DHM Association was set up at the request of the Federal Office of Energy (FOE) and started work in 1996, a Swiss R & D group having been active already then for 20 years. It defined and undertook the following tasks:

- It would discover how feasible EGS now really was ..... and if it might probably become useful in Switzerland.
- If yes, it would find several possible EGS sites and choose one for a pilot plant,
- It would initiate, obtain finance for and plan this first pilot plant, ensuring that EGS technology has the best possible chance to prove itself.
- If the technology proves itself, DHMA would continue to promote it and to encourage the necessary R & D and the motivation of young specialists.

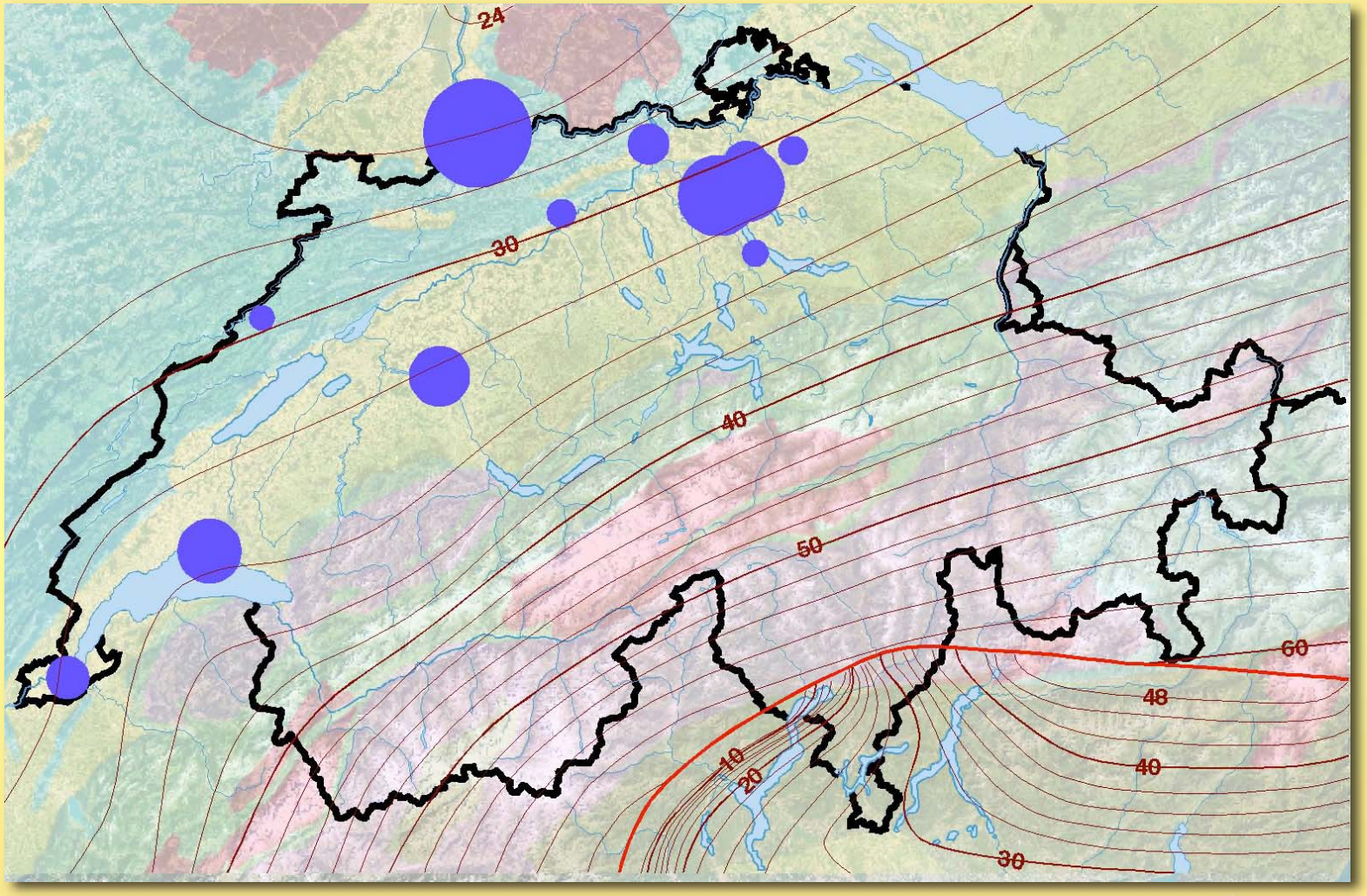
The FOE would provide “seeding money” for these tasks. Power plant construction and operation must be financed from private sources.

SITE SELECTION

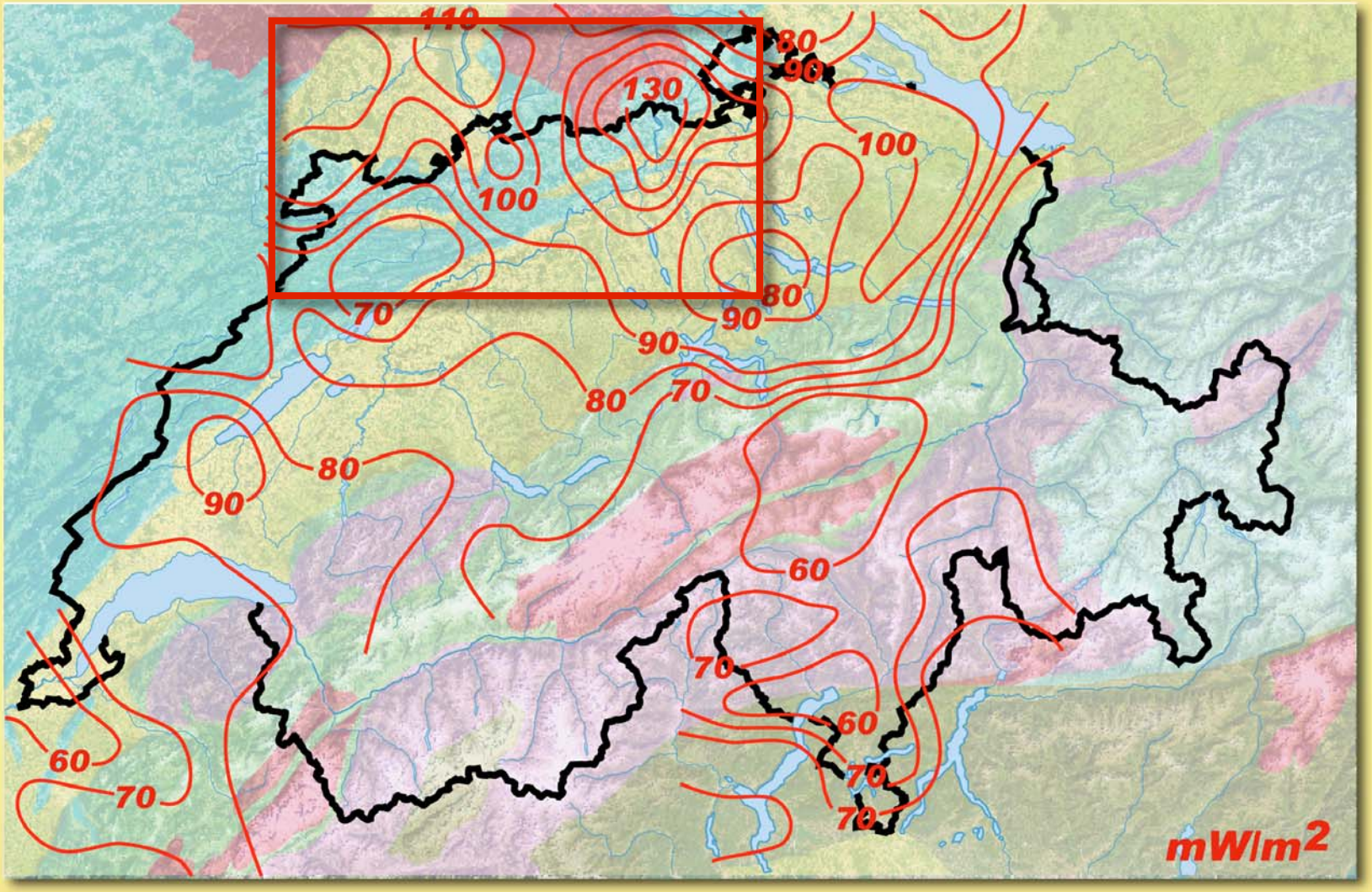
Criteria for site selection for the PILOT PLANT:

- Do the local utilities and population need its energy production and do they welcome the plant in their midst?
- Are the geological and geothermal conditions as favourable as they can be to maximize the chance of success?
- Is land available?
- Is water available?
- Will the project be environmentally acceptable in construction and in operation?

SITE SELECTION - superposed maps of site-critical parameters: geology, crustal thickness and regions of large scale heat demand



SITE SELECTION - Heat flow map



Data from: "Geothermal map of Switzerland", Medici & Rybach 1995

SIGNIFICANT DECISIONS

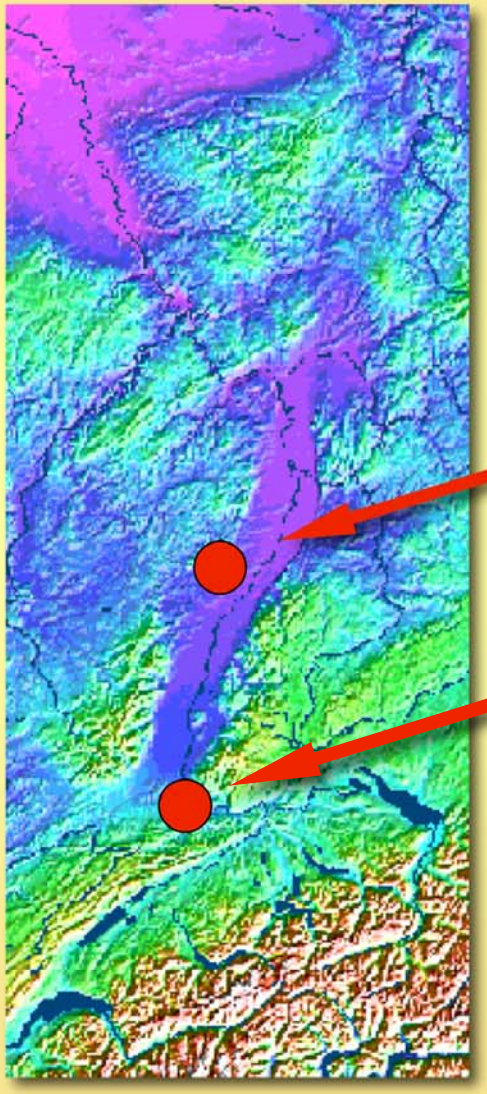
IN ORDER TO HELP MAKE EGS MORE ATTRACTIVE EVEN AT THE PILOT STAGE :

1. To aim for co-generation of electrical energy and heat to ensure greater income
2. To use a hybrid surface plant if possible, combining geothermal and other sources

These two decisions point to Basle as first and Geneva as second choice

- Both have expanding District Heating networks currently:
  - Basle: covering a maximum demand already over 300MW
  - Geneva: covering a maximum demand of ca. 45MW
- Both offer additional energy sources (eg. incineration plants)
- Aims for GEOTHERMAL generation alone in the first pilot plant:
  - 3MW(e) & 20 MW(th)

Two sites in the Rhine graben



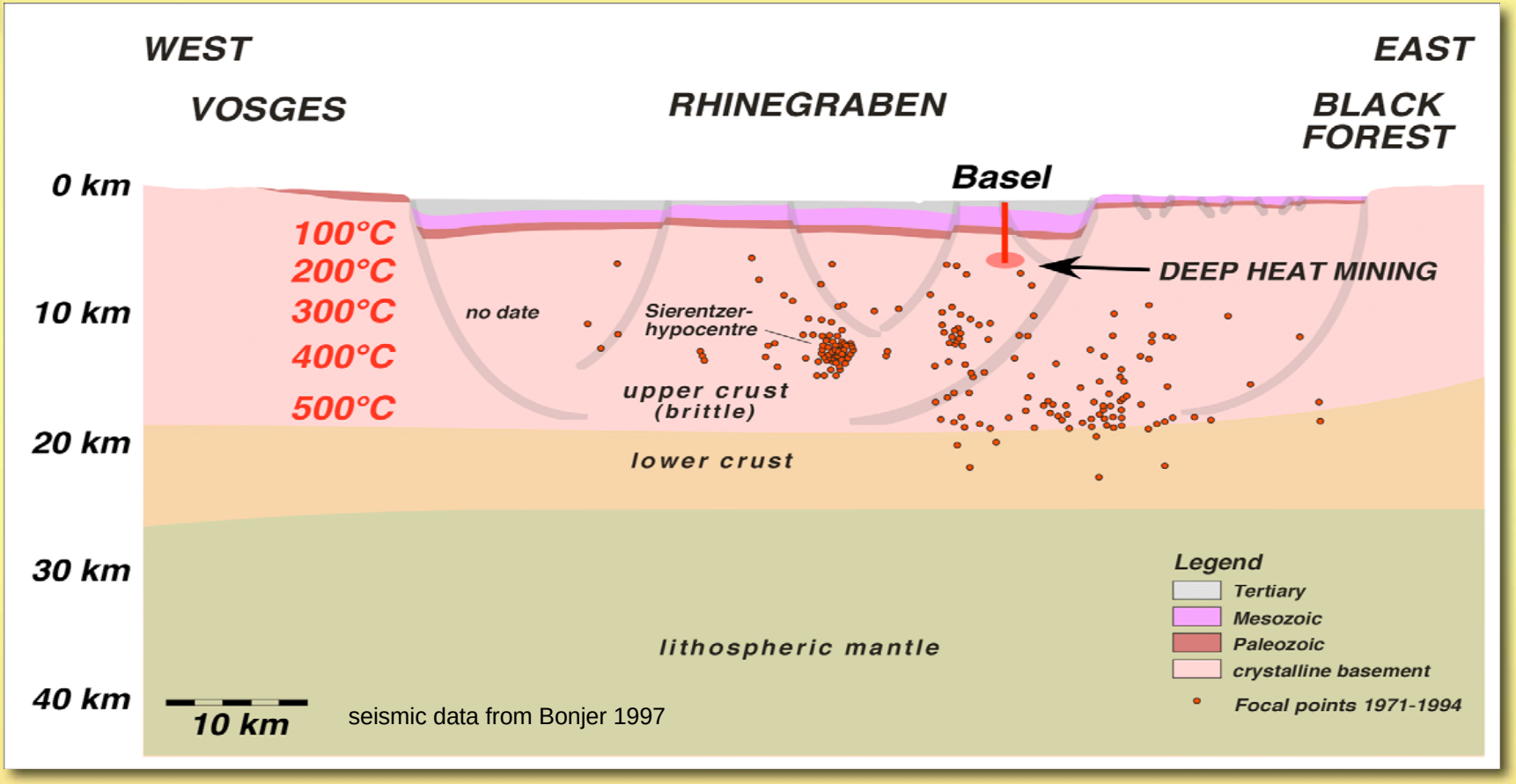
EU Project Soultz-sous-forêts

DEEP HEAT MINING Project, Basel

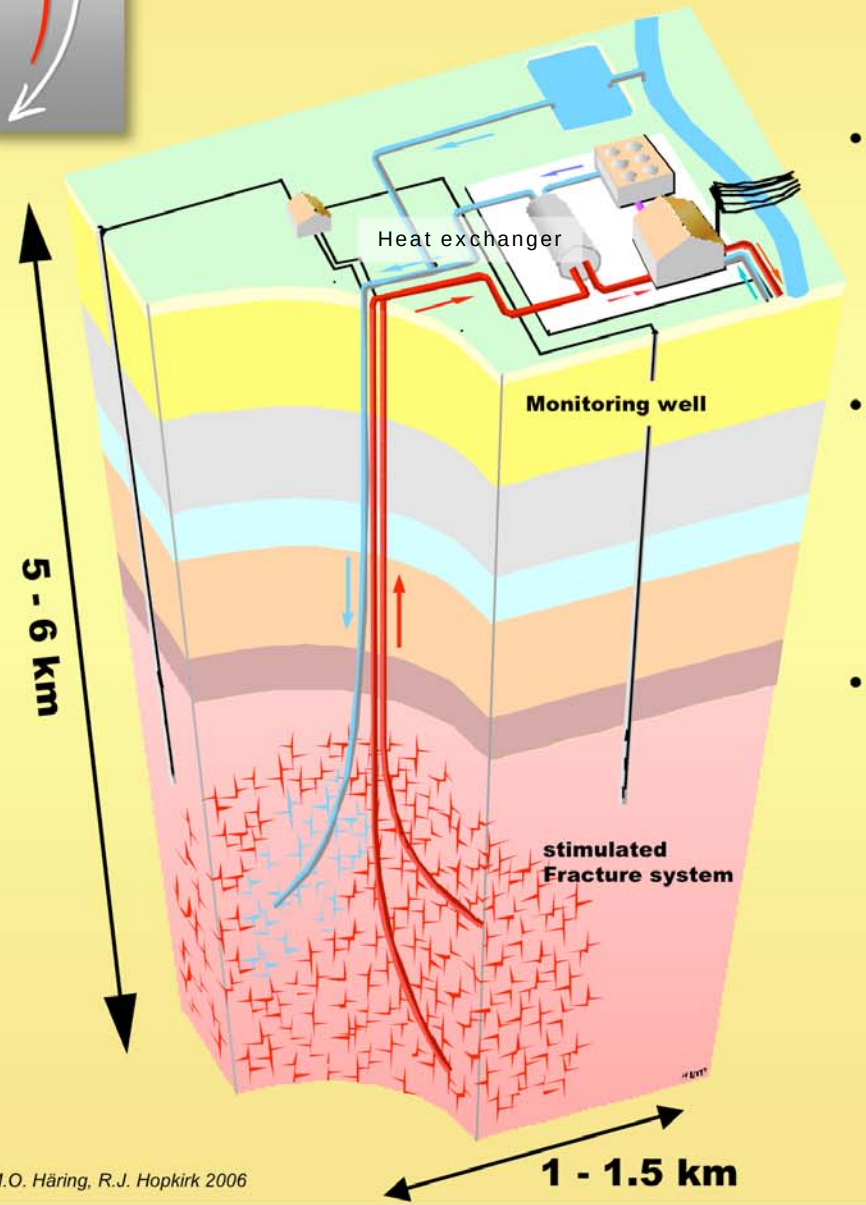
Some similarities are likely between these two sites

SITE SITUATION

E-W section across the southern Rhine Graben



DEEP HEAT MINING Basel



- geothermal power plant using EGS technology for co-generation of electricity and heat
- electricity und heat for 5'000 households:
  - 20 MW thermal power
  - 3 MW electrical power
- annual reduction of CO_2 emissions:
  - 40'000 t

POLYDYNAMICS ENGINEERING

HÄRING GEO-PROJECT

DHM Basel - how it fits in

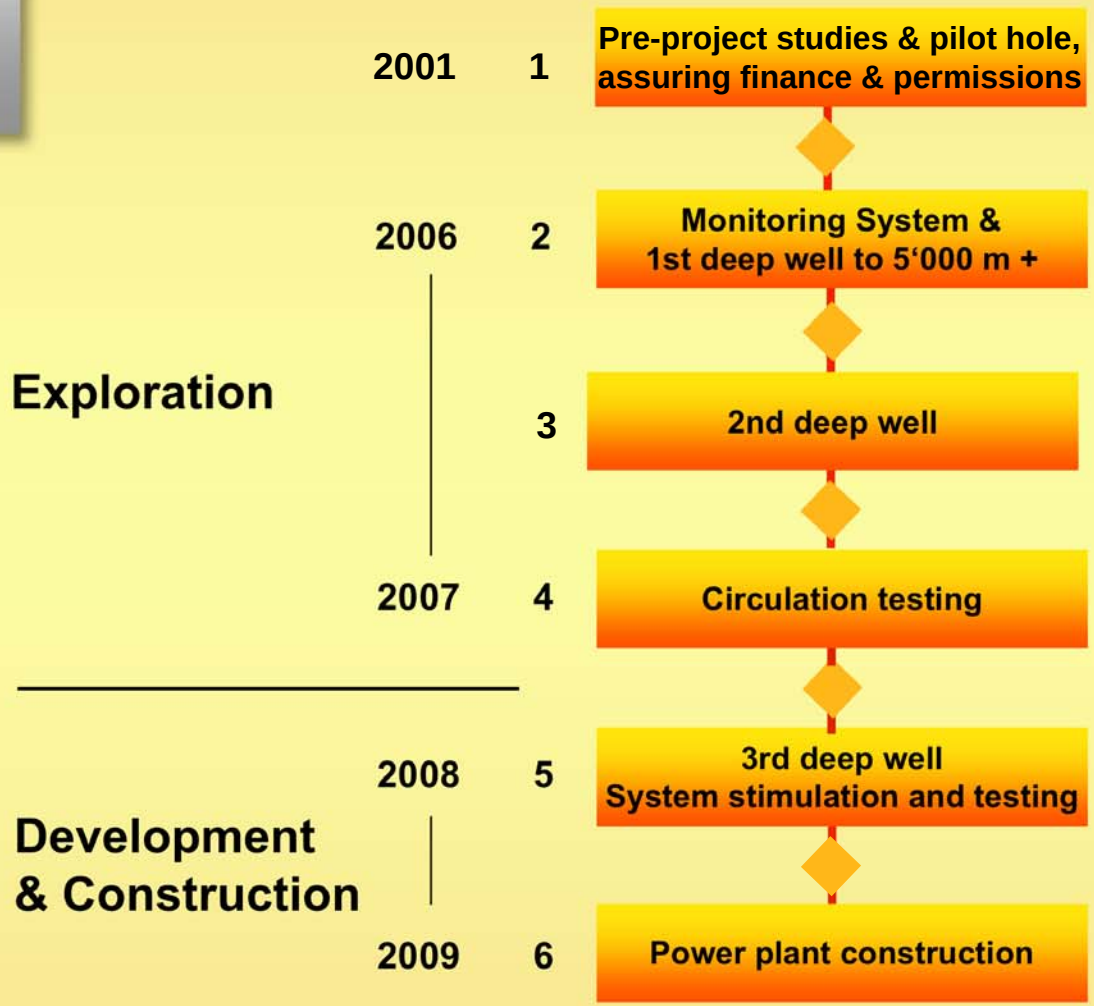
Minimum target output:

- geothermal power plant using EGS technology for co-generation of electricity and heat for 5'000 households:
  - 20 MW thermal power
  - 3 MW electrical power
- annual reduction of CO_2 emissions 40 kt/a

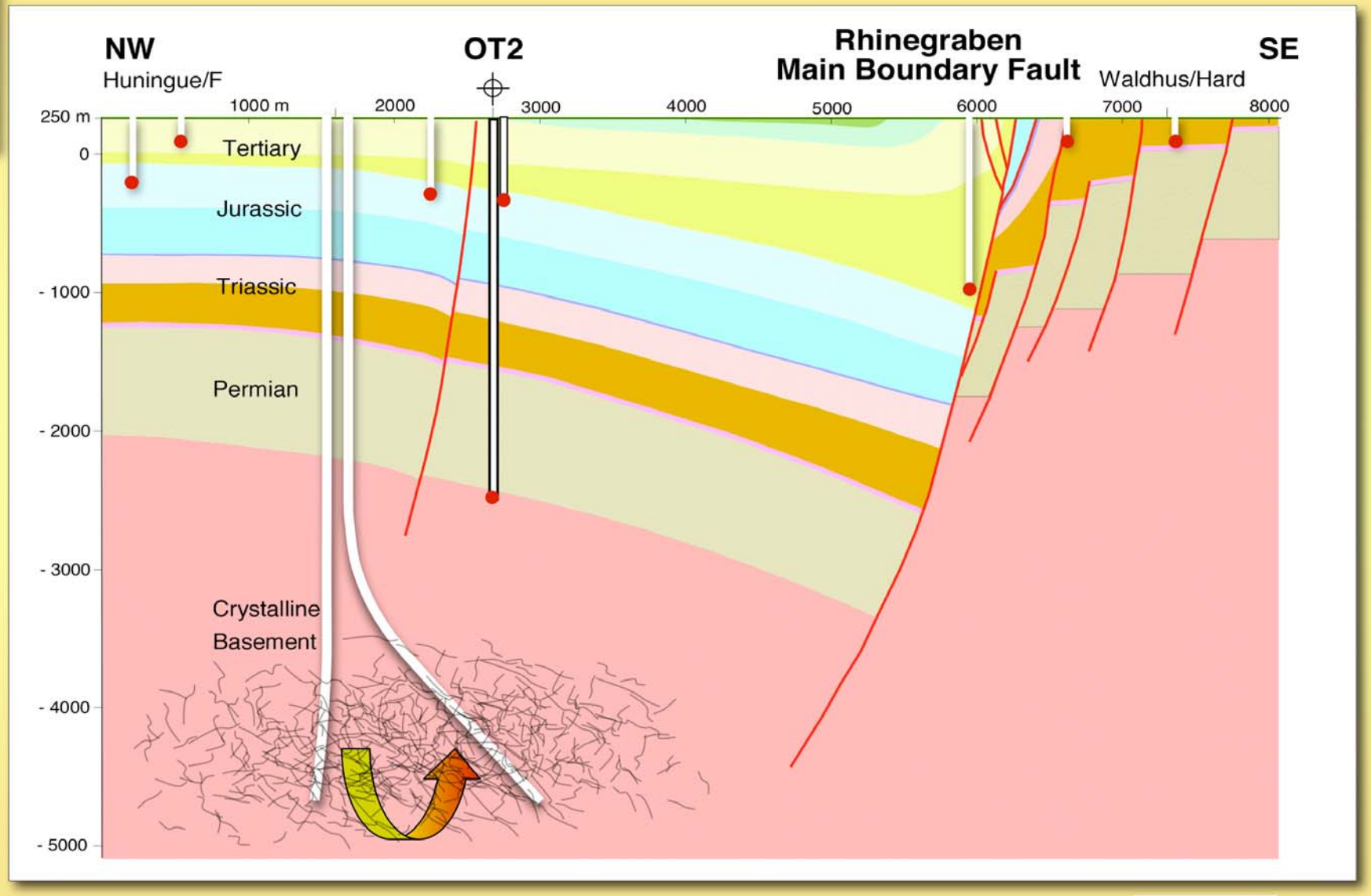
Desired rock heat exchanger:

- Initial rock temperature 200 - 230°C
- Probable depth 5-6 km
- Three-well unit system - well spacing at bottom-hole 700 - 1000 m

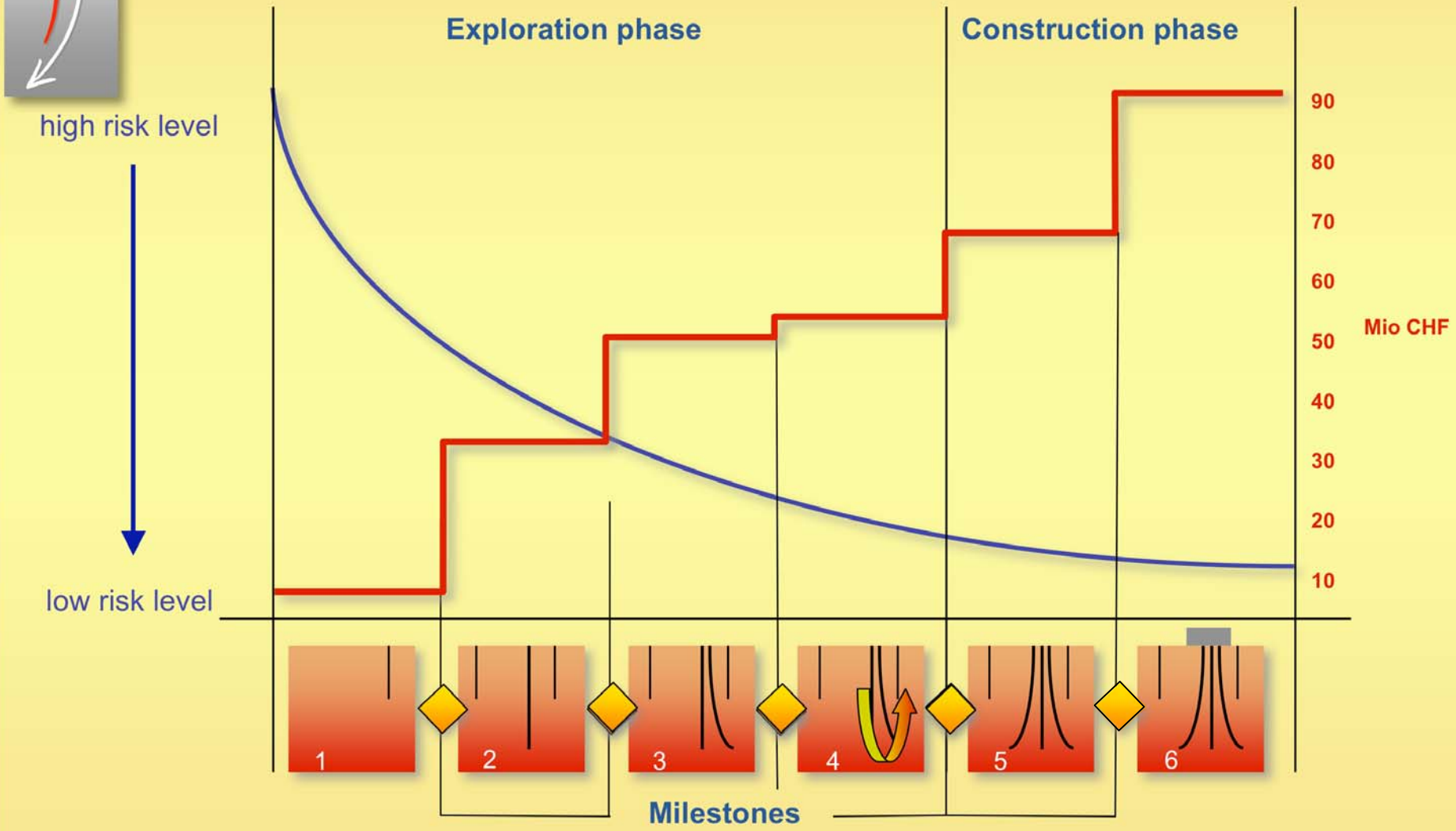
Project plan



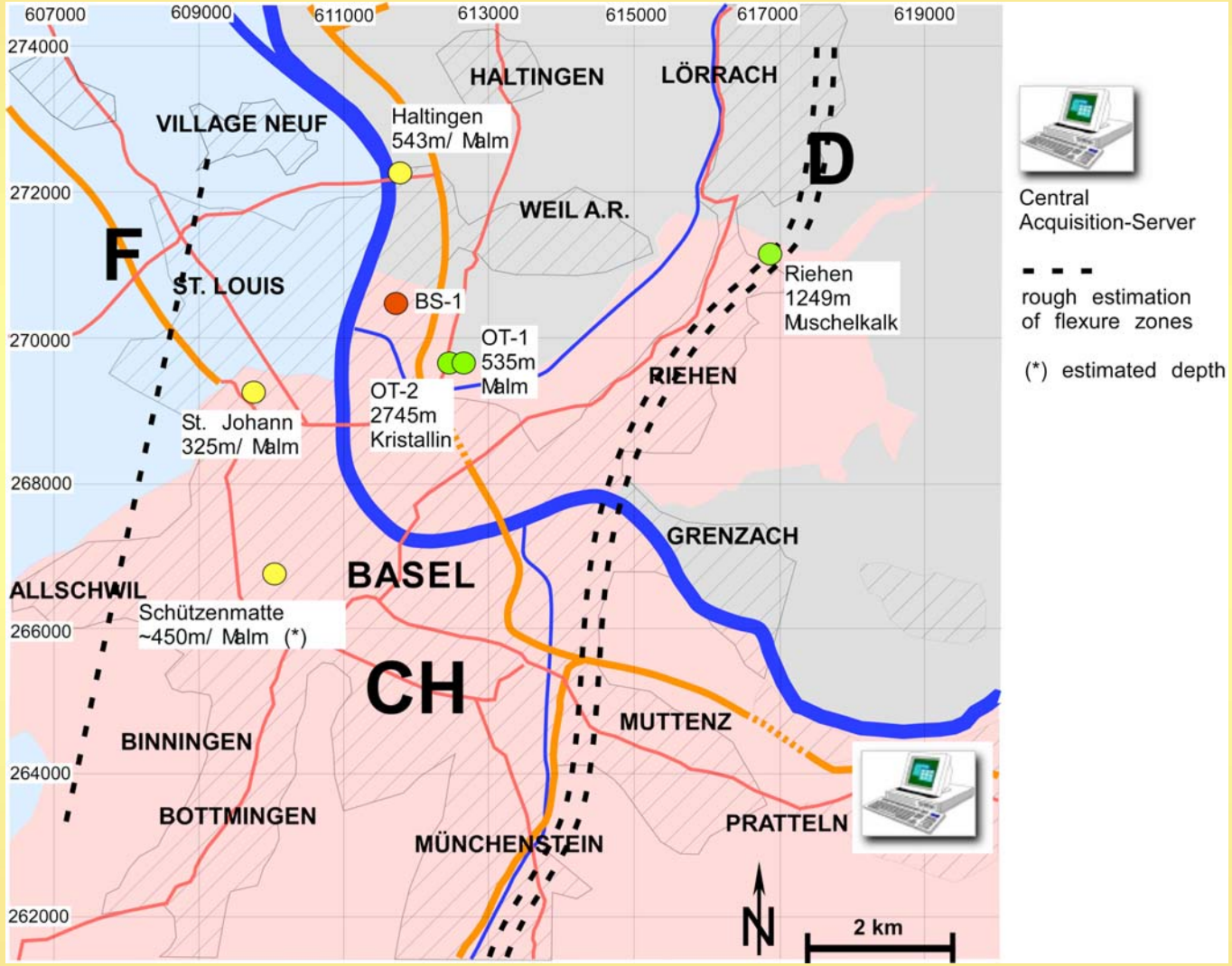
Exploration Concept



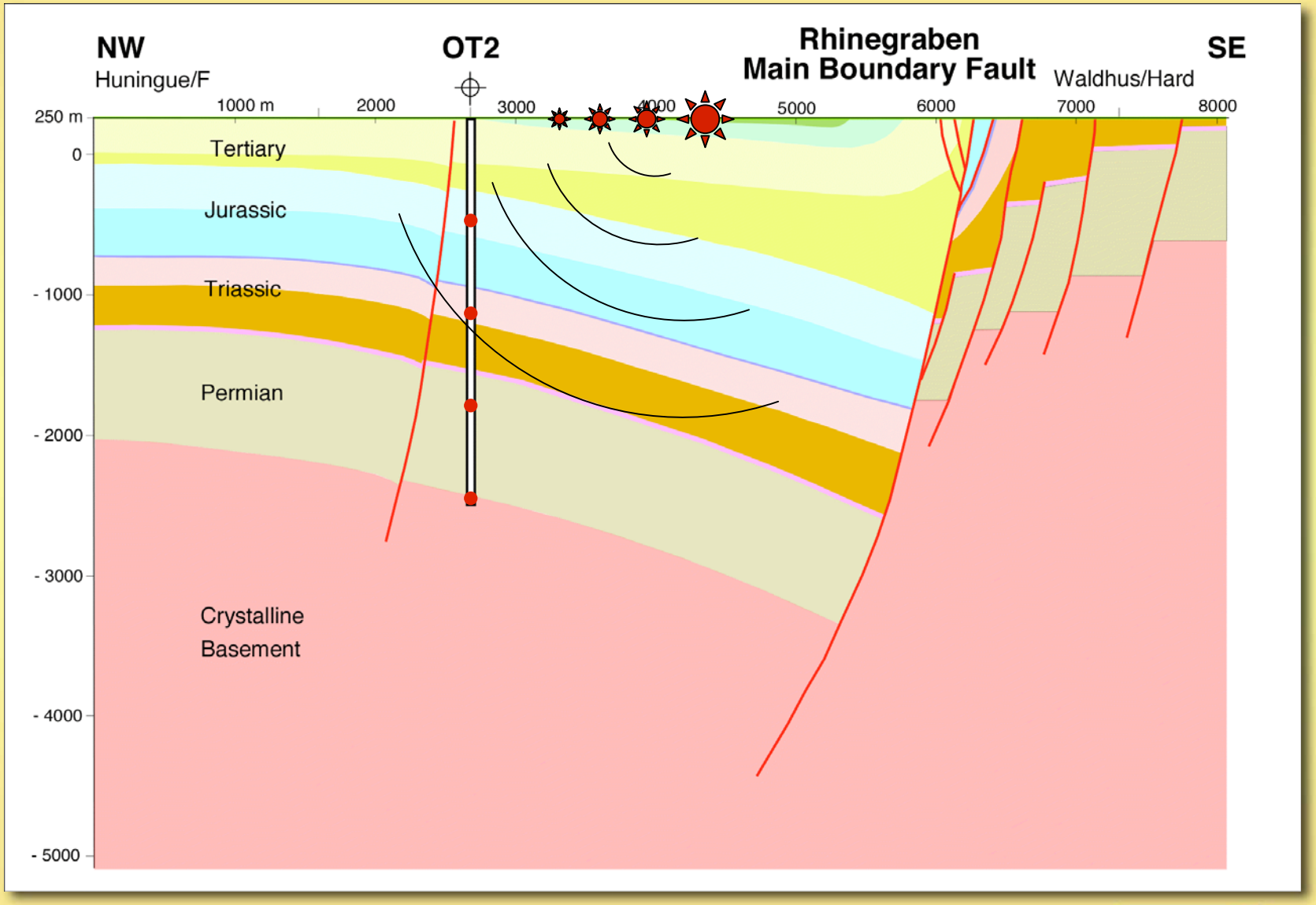
Financial Risk Management



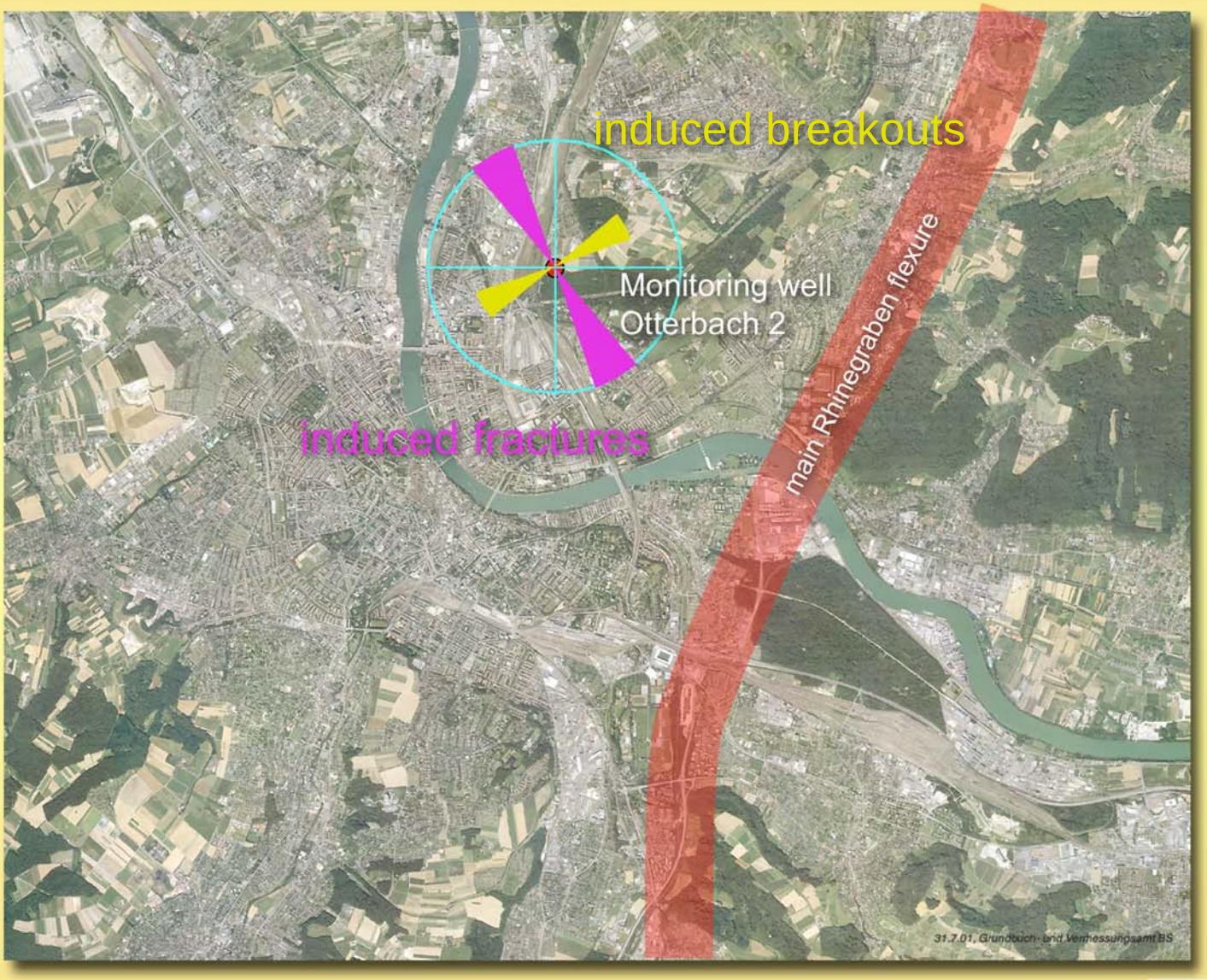
Geothermal & monitoring well sites



Vertical Seismic Profile (VSP) in OT2 Dec. 2004



First indications of Basement stress field orientation



The main site at Kleinhüningen

Summer 2004 - Before site preparation

January 2006 - concreting rig foundation

DHM Basel - some more numbers


KCA-Deutag T45 Drill Rig

Exploration phase:

2 geothermal wells 5'000 - 6'000 m

3 new monitoring wells 250 - 600 m

3 monitoring stations in existing holes

600 - 2'750 m

Main (geothermal) wells:

April 2006 - November 2007

All monitoring wells but one are complete

Instrumentation is being tested & installed

Budget limit for exploration phase:

ca. 60 Mio CHF = Risk capital

Budget estimate for entire pilot plant:

ca. 100 Mio CHF

Vision for the future: Swiss EGS power plants

Up to several tens of plants by 2050

- varying sizes, varying depths according to site characteristics and local energy demands .....

• Heat exchanger depth ranges	4	-	7	km
• Source temperatures	150	-	250	°C
• Number of wells per site	3	-	20	
• Power outputs from geothermal energy alone				
- if for el. generation only	5	-	40	Mwe (i.e.: without hybrid cycles)
- if for heat production only	30	-	200	MWth
• Specific Investment	2	-	3	Mio CHF/MW installed
• Generating costs				
- electrical energy	0.1	-	0.2	CHF/kWh
- heat	0.03	-	0.06	CHF/kWh
• CO2- Reduction (heat prod. only)	10	-	200	kt/a

Closing remarks - a caution

Use of EGS technology outside geothermal anomalies is itself still a vision

Nothing is certain until EGS is proven to be commercially viable

Several successful pilot plants are needed so that:

underground heat exchangers can be created

- at any promising site;
- of the right size to fulfill a local energy demand.

Much depends upon “getting it right first time” in these pilot plants and DHM Basel is one of these - for Switzerland it is all-important.

Only then can EGS become accepted as an Available Energy Source

THE END

Thank you for your patience and attention!

For the current status of DHM Basel see www.geothermal.ch
For other aspects see www.dhm.ch