

Electro Pulse Boring (EPB): Low-cost Access to Deep Geothermal Energy Baseload Electricity + District Heat and Cool Almost Anywhere on Earth

The Leighty Foundation

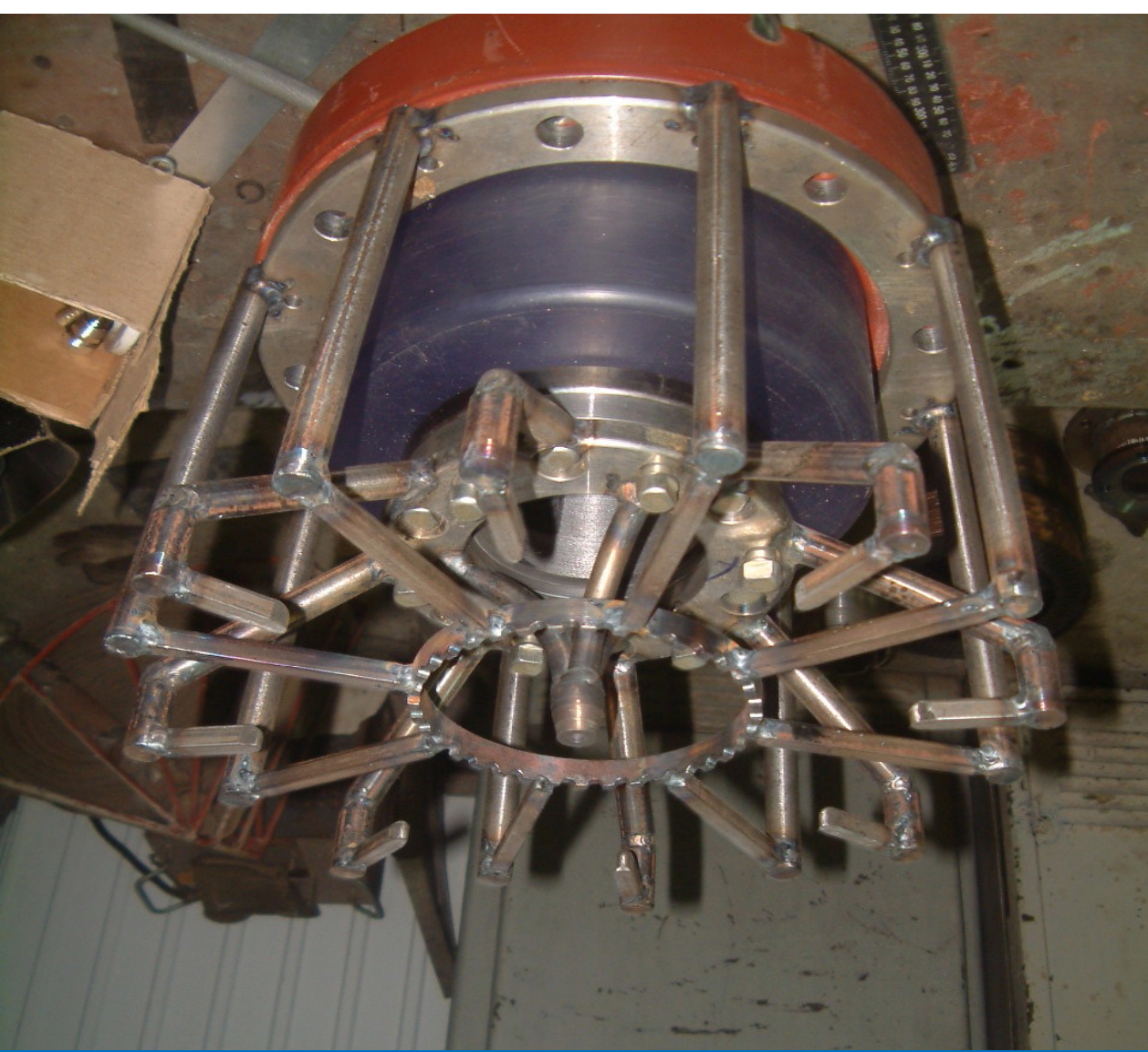
www.leightyfoundation.org/earth.php

Juneau, AK

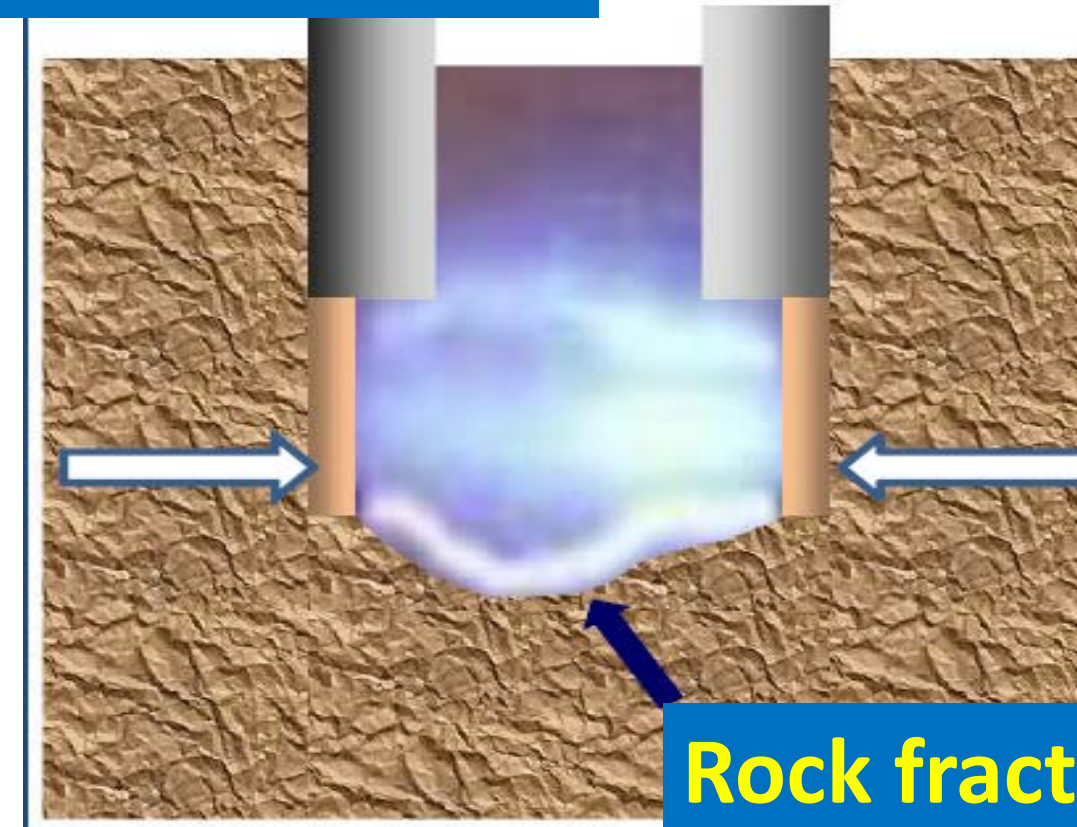
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Borehead: 50 cm diameter electrode array. Multiple fracture pathways for rock breaking in sedimentary or crystalline rock to depth



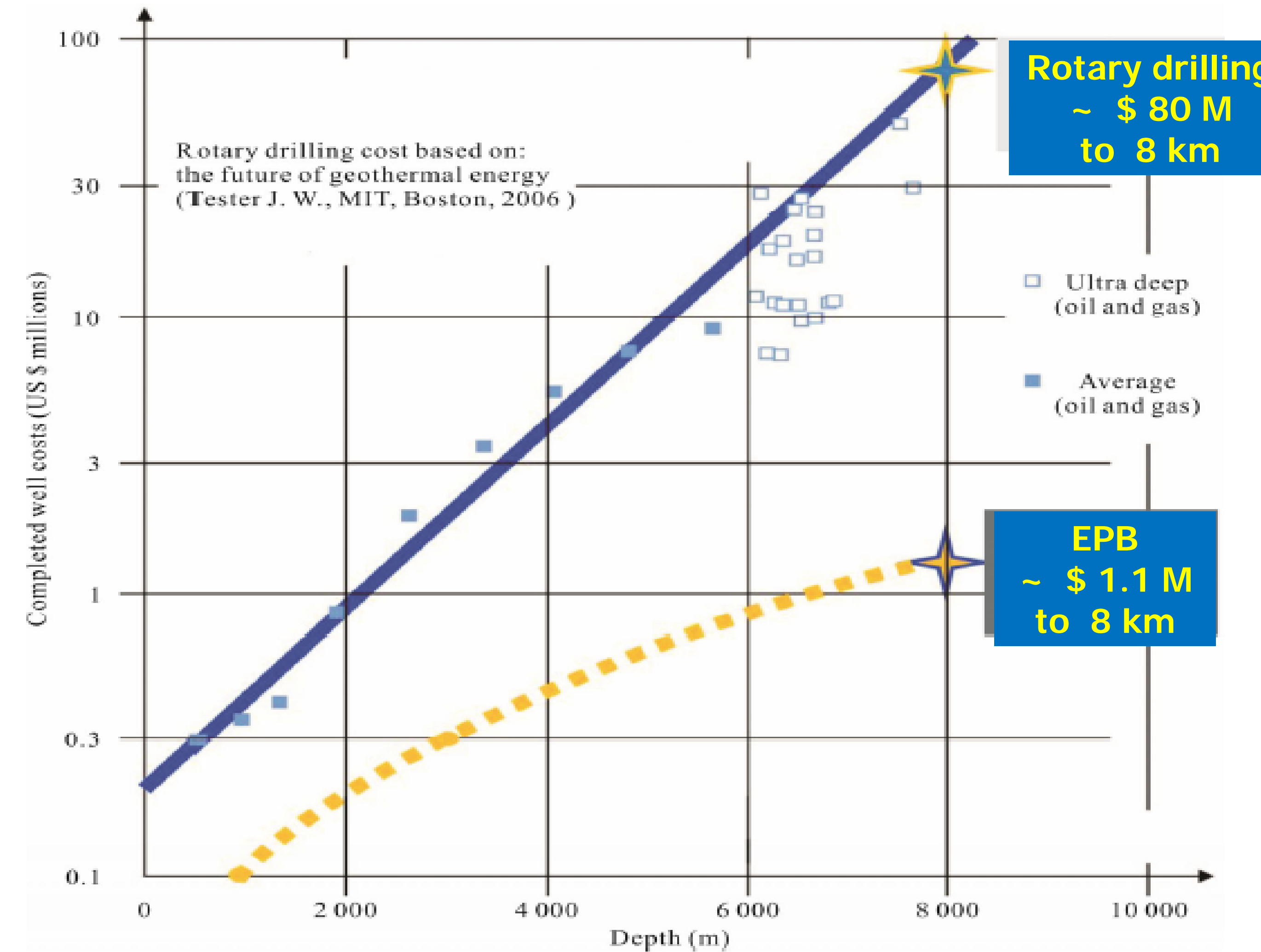
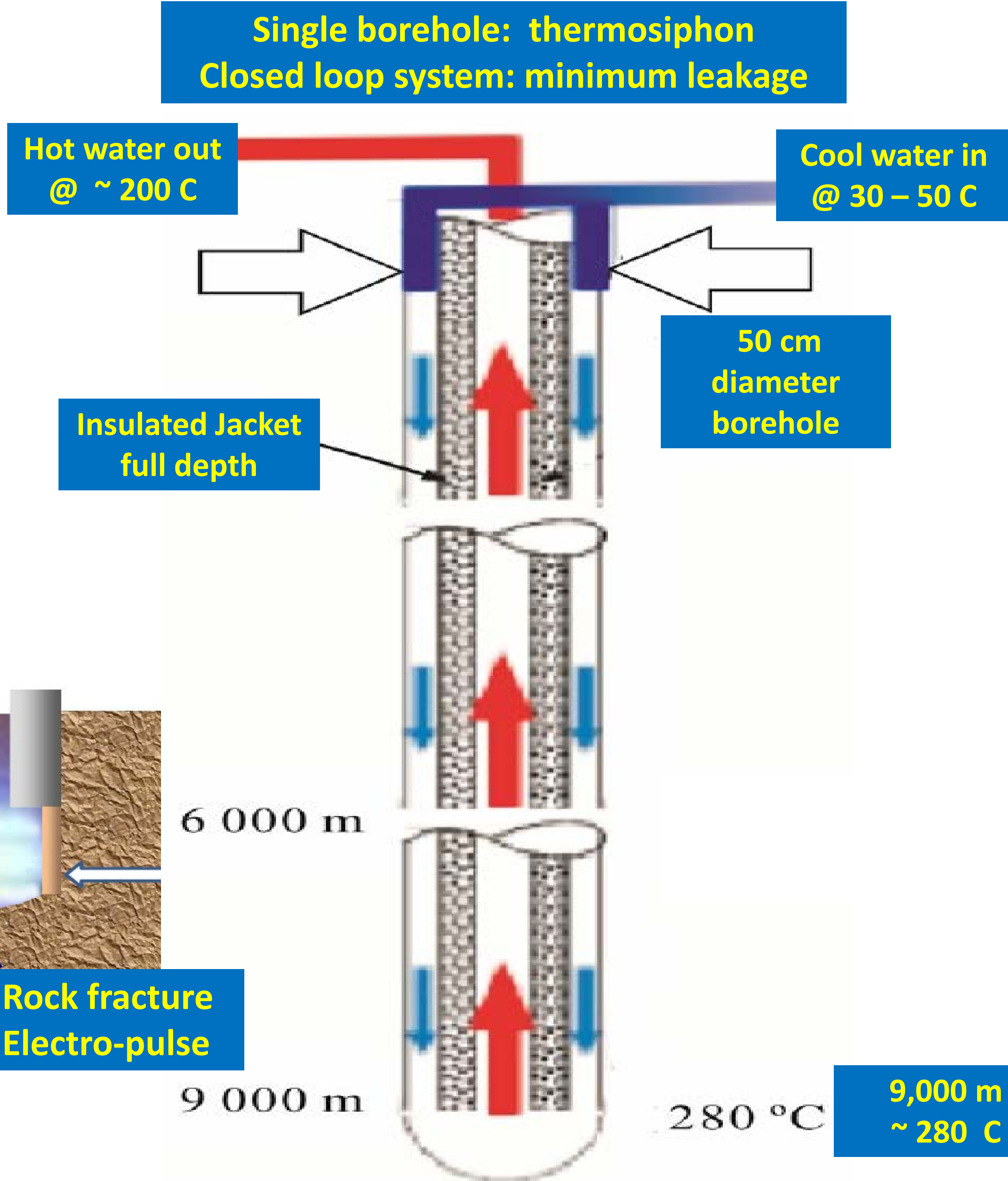
Rock fracture Electro-pulse

6 000 m

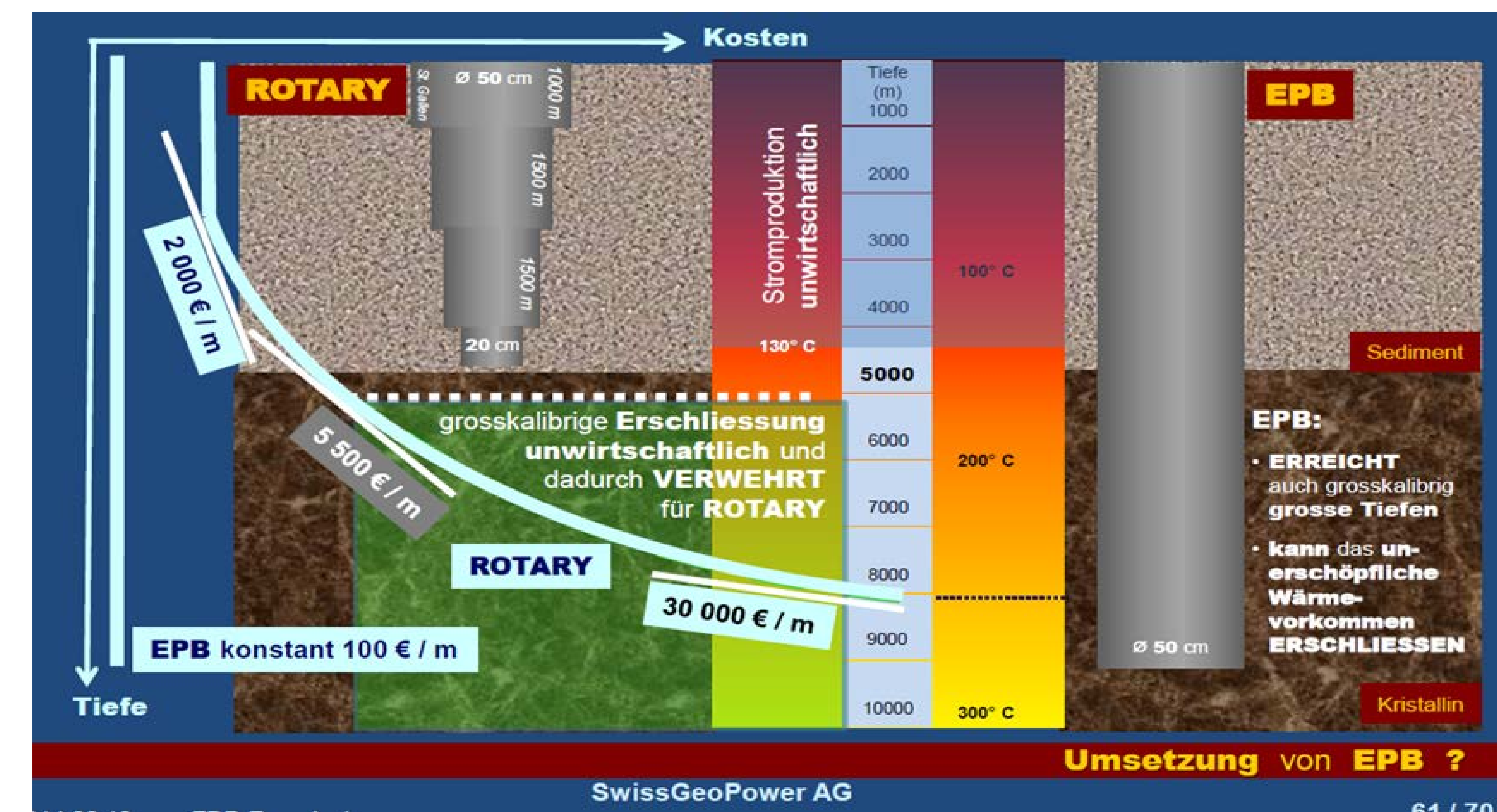
9 000 m

280 °C

9,000 m ~ 280 C



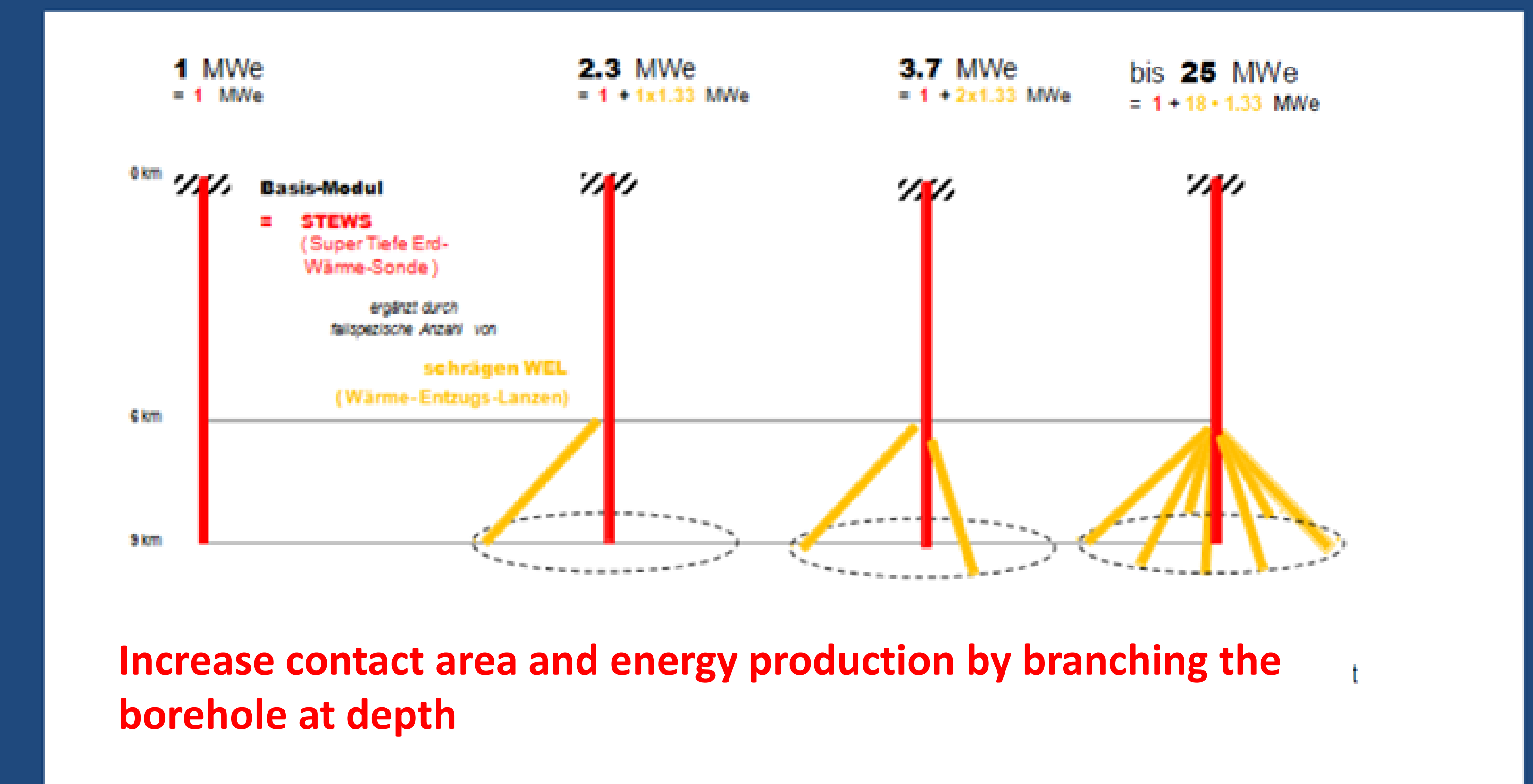
Drilling – boring cost comparison: EPB, conventional rotary abrasive: EPB is full diameter to depth; cased in topsoil & aquifers



Electro Pulse Boring (EPB)

- Deep geothermal heat: ~ 240 C @ 8 km
- Electricity + DHCS heat, anywhere
- Low-cost rock breaking
- Light equipment, deploy to remote areas
- No rotary abrasive drilling; no drill rig
- Goal: \$ 150 / m, 50 cm diam, 5-10 km
- Hose return: mud cuttings to surface
- Casing only through topsoil, aquifers
- Free energy storage: keep heat in rock
- Critical component needed: novel Down Hole Pulse Generator (DHPG)
- Worldwide IP is not advanced: DHPG plus boring R&D and systems design key
- Proof-of-concept to 200m in granite, by collaborative: NO, CH, RU in 2006 - 12
- MacArthur Foundation "100&CHANGE" funding application failed; no USDOE help

SUPER Tiefe Geothermie Ø : 50 cm Tiefe: > 4000 m ; Temp.: > 150° C
STROM aus KRISTALLIN GESHLOSSENER Wärmetauscher: S-TEWS & n WEL
 Super Tiefe Erd-Wärme-Sonde mit n schrägen Wärme-Entzugs-Lanzen



Critical path to commercialization from ~ TRL 3 today:

- » Design , build, test Down Hole Pulse Generator (DHPG) to operate at full depth T and P
- » \$ 25 million: proof-of-concept test borings to 3 km
- » \$ 150 million: test borings to 5 – 10 km; design revisions for commercialization; prove tech and econ value; pre-production EPB components: achieve TRL 8-9. Sale, lease, franchise

Goals:

- » \$ 150 per meter depth, constant, to 5 – 10 km: ~ \$ 2 million @ 10 km marginal cost
- » Rate Of Penetration (ROP) = 1 m / minute @ 10 – 20 pulses per second (pps)
- » \$ 0.02 / kWh (thermal) @ wellhead @ 200 C: Organic Rankine Cycle (ORC) electricity + hot water for District Heating and Cooling Systems (DHCS)
- » \$ 0.04 / kWh (electric) at Organic Rankine Cycle (ORC) generator, baseload, dispatchable
- » Affordable, inexhaustible, baseload, benign, equitable, energy almost anywhere on Earth

Free energy storage: Leave the heat in the rock until it is needed

