

Geothermiegebiete in Deutschland



GeoThermal

ENGINEERING



German experience and technology applicable in the East African Rift System

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17. November 2009, Bochum

- I. Germanys Involvement in Geothermal in Africa**
- II. German Geothermal Experience**
Geothermal Background and Projects
- III. German Geothermal Technology**
Exploration
Drilling
Power Plants
- IV. German Geothermal R&D**

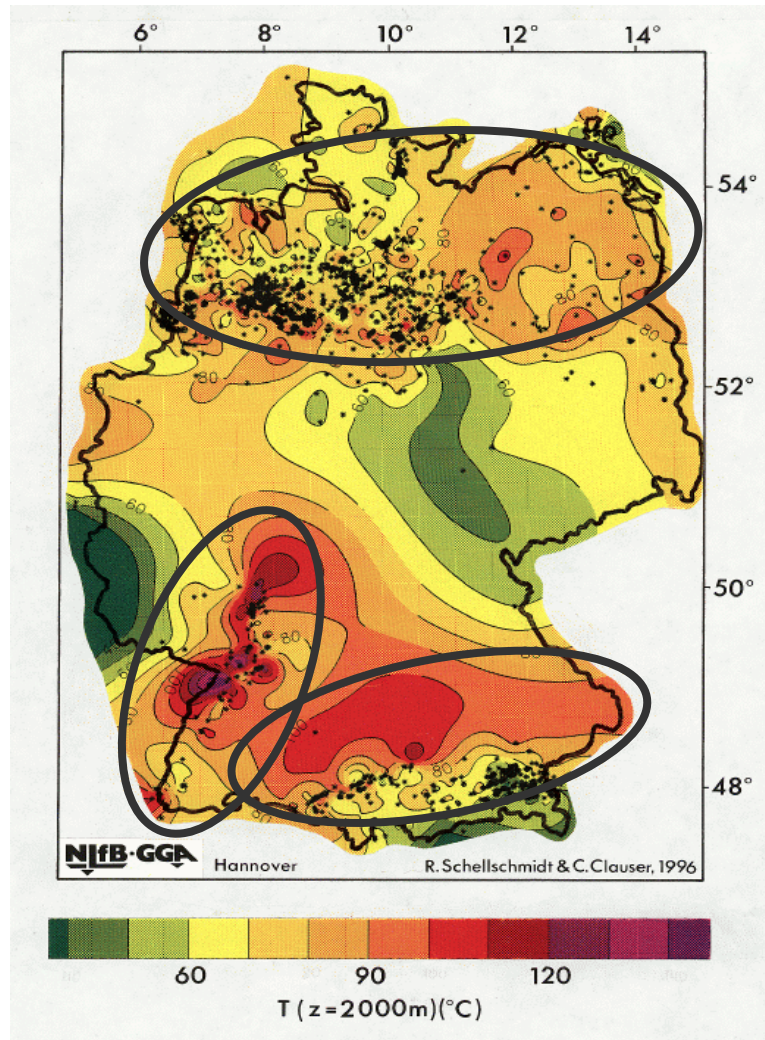
GEO THERMAL DEVELOPMENT

- **AFRICA**
 - **OLKARIA I POWER STATION** **1981** **45 MW**
- **GERMANY**
 - **NEUSTADT GLEWE** **2003** **250 KW**

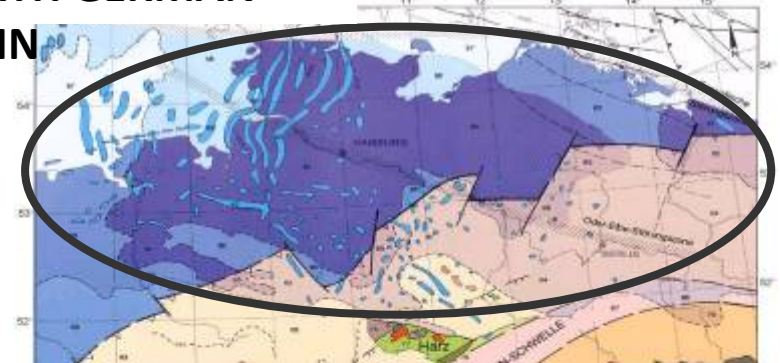


GERMAN INVOLVEMENT UP TO TODAY

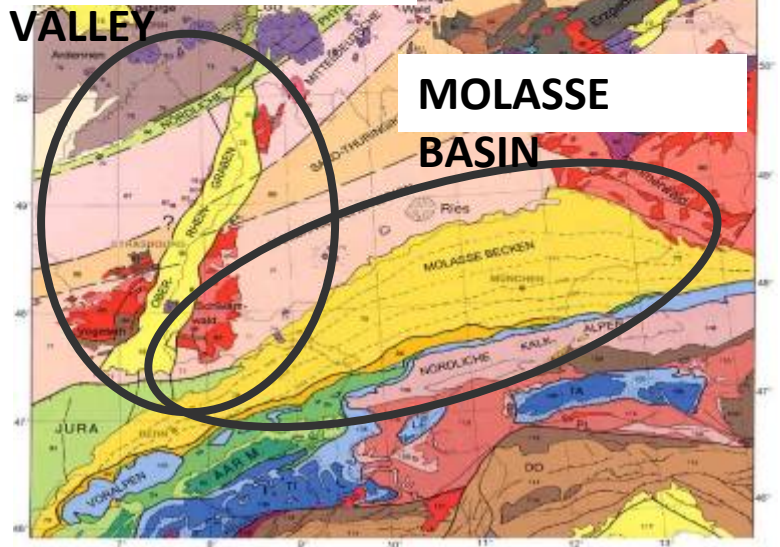
- **RESEARCH**
 - **GEOLOGY, ...**
- **FUNDING**
 - **KFW**
- **RISK MITIGATION**
 - **KFW**
- **TECHNOLOGY SUPPORT PROGRAM: GEOTHERM**
 - **BGR**
 - **SINCE 2003**



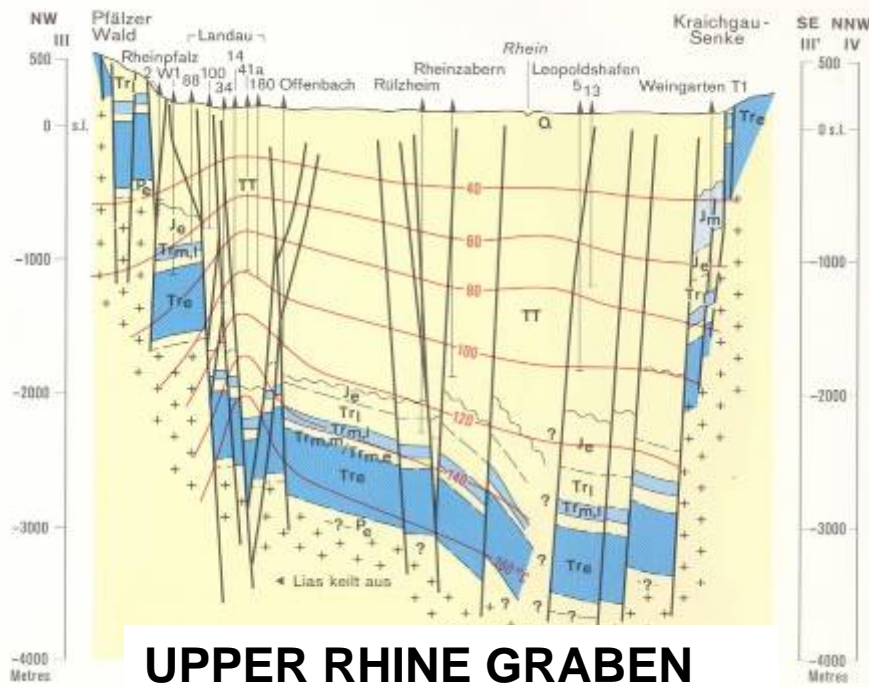
NORTH GERMAN BASIN



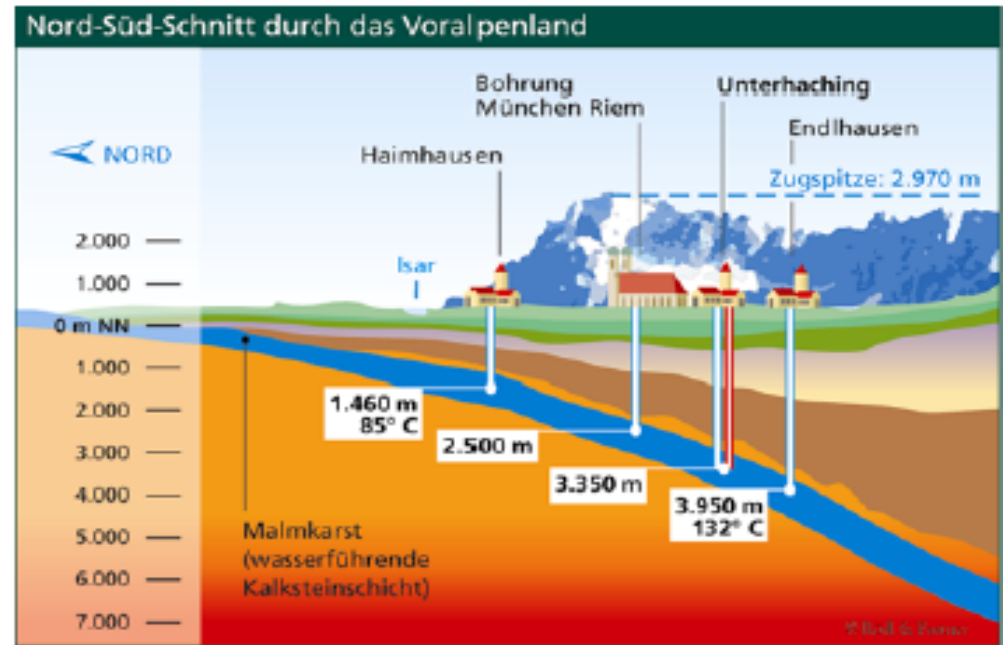
UPPER RHINE VALLEY



GEOLOGY

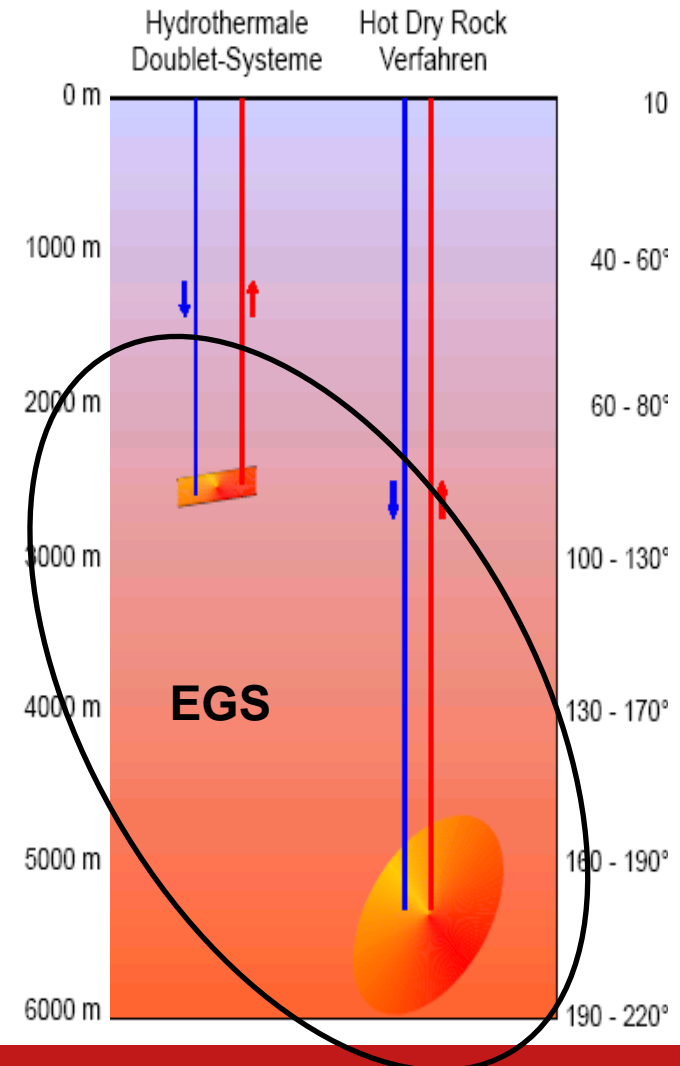


MOLASSE BASIN



© Rödl & Partner

- Hydrothermal
- EGS
Enhanced Geothermal Systems
- HDR
Hot Dry Rock
- Fracture Zones





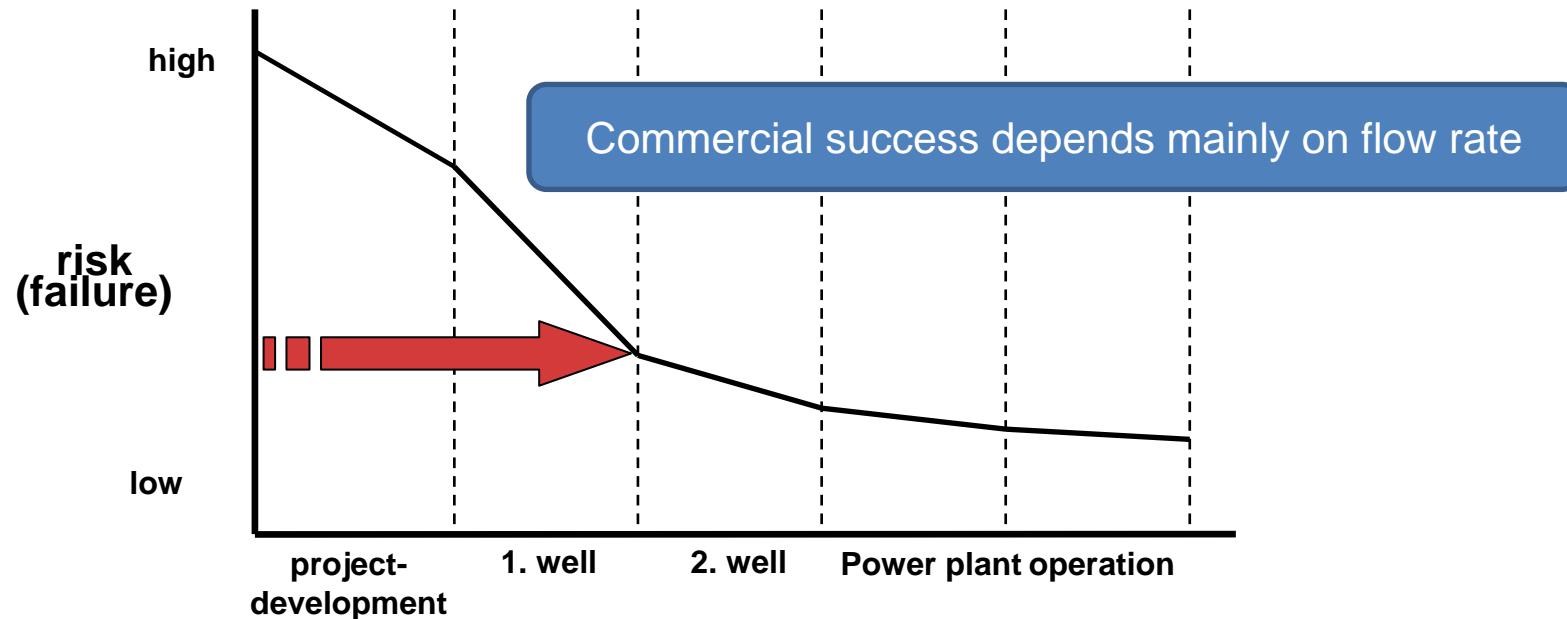
POWER PLANTS

- **NEUSTADT-GLEWE**
250 KW
- **LANDAU**
2,5 – 3 MW
- **UNTERHACHING**
3 MW
- **BRUCHSAL**
500 KW

- **DRILLING RISK**
 - **LOST IN HOLE**
 - **BLOCKED STRING**
 - ...
- **EXPLORATION RISK**
 - **TEMPERATURE**
 - **FLOW RATE**
 - **CHEMISTRY ?**
 - **LONG TERM ?**
- **TECHNOLOGY**
 - **HYDROTHERMAL YES**
 - **EGS (HDR,...) NO !**

- **UNTERHACHING (2003)**
 - **FIRST RISK MITIGATION FOR GEOTHERMAL EXPLORATION RISK IN GERMANY**
 - **INSURANCE**
 - **ONE TIMER**
 - **FEATURES: BAVARIAN SUPPORT AND „NON CLAIM BONUS“**
- **CONTRACTS**
 - **MOLASSE BASIN AND UPPER RHINE VALLEY**
- **TECHNOLOGY**
 - **HYDROTHERMAL YES**
 - **EGS NO**

- High financial risk

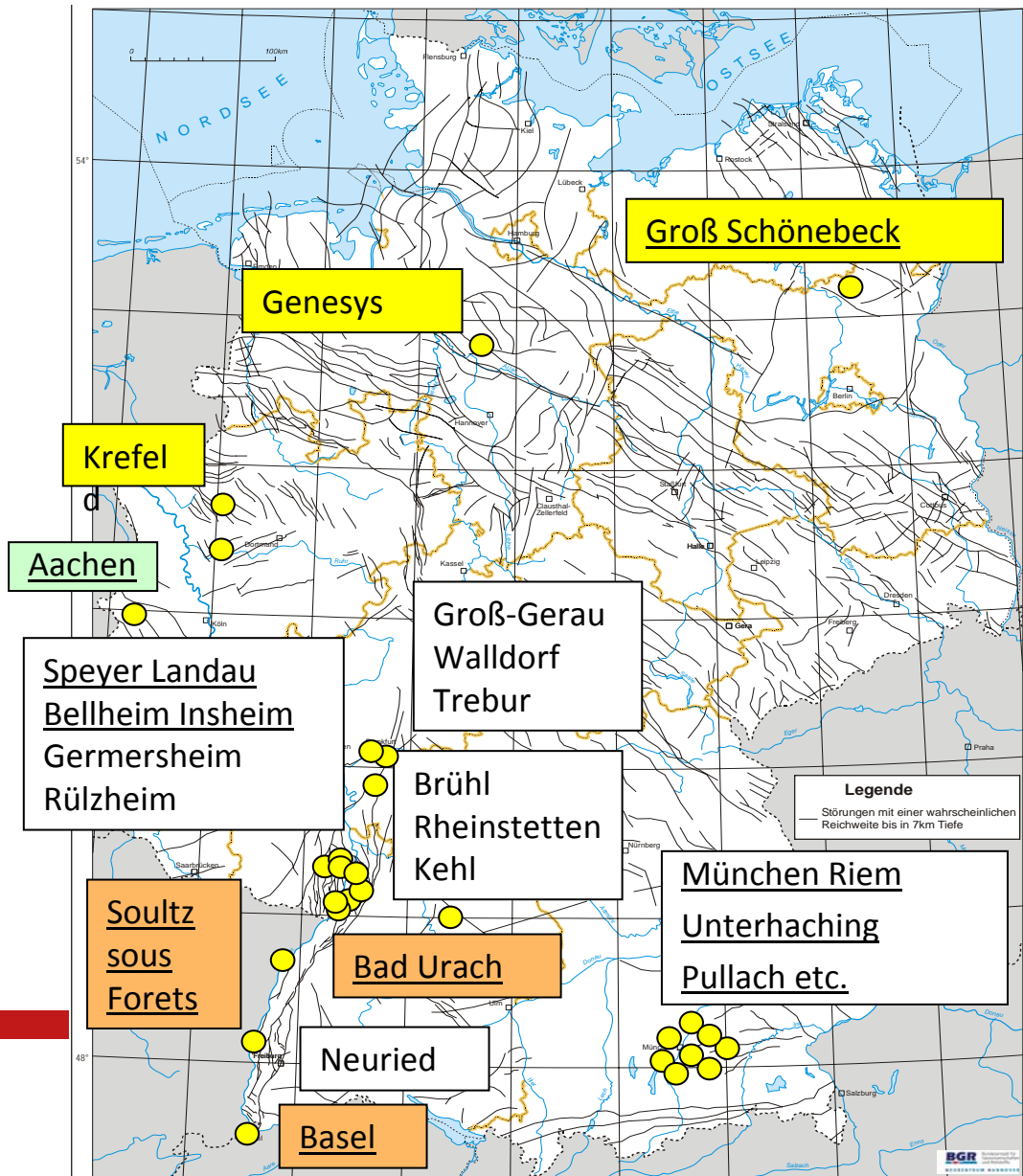


- Success = defined temperature & production with fixed drawdown of water level
- Definition on commercial basis



- **BERLIN**
- **HANNOVER**
- **GROß-GERAU**
- **FRANKFURT**
- **BRÜHL**
- **RÜLZHEIM**
- **KARLSRUHE**
- **ALL OF THE MOLASSE REGION**
(>20 PROJECTS)
- **KREFELD**
- ...

PROJECT DEVELOPMENT



- Enhanced Geothermal Systems
- HDR...
- Closed Loop
- Hydrothermal
- R&D projects



HISTORY (1999 – 2004)

- Communities
 - Unterhaching, Neuried,...
- PRIVATE INITIATIVES
 - HotRock
 - Requirement of Mining Law

Today

- Local Utility Companies
 - Munich, Mainz, Heidelberg,...
- Industry
 - Manufacturers (Siemens, M + W Zander, Evonik, Ferrostaal,...)
 - Big utilities (RWE, EnBW,...)

HISTORY (1999 – 2004)

- Consultants
 - Small (3 – 10 employees)
 - Highly specialized (deep geothermal applications)
 - GTN, GEOT, GEOTEC,...
 - Only in Germany

Today

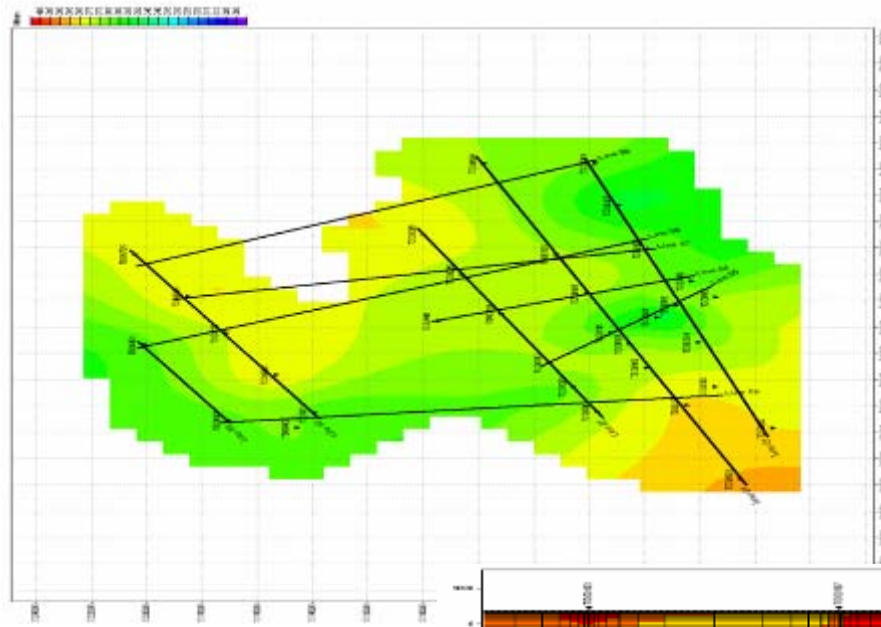
- Big Consulting Companies
 - Lack of Know-How ?
- Going International
 - Europe, Africa, South America, Asia,...

Goals

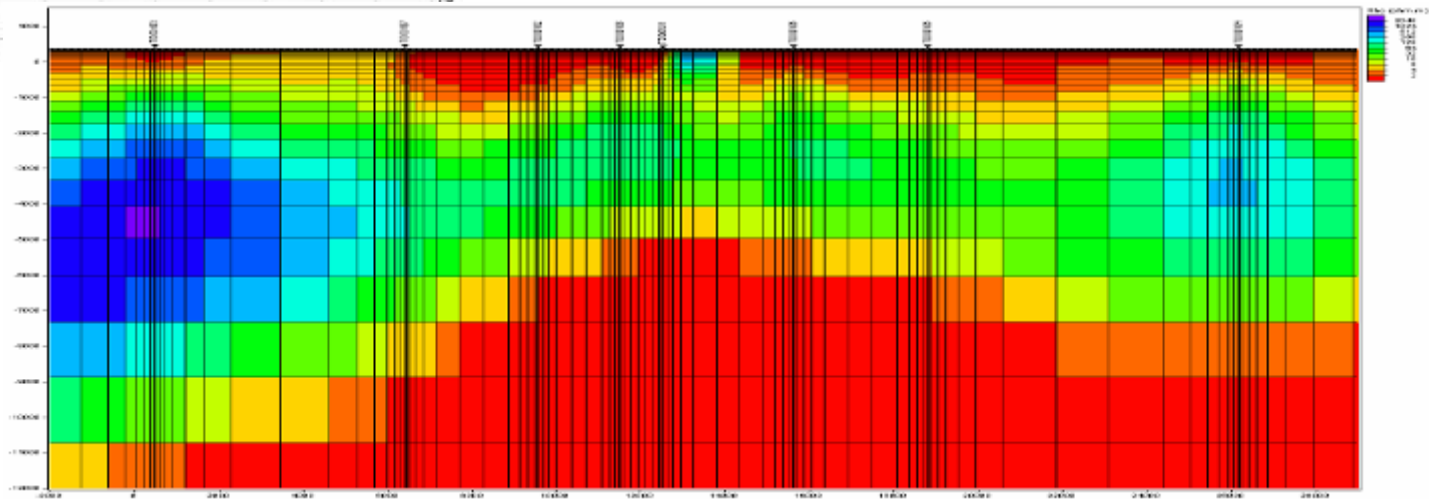
- Efficiency
- Risk Reduction

Topics

- EGS
- Pumps
- Drilling Technology
- Binary Power Plants
- Seismicity



BGR: Example
Tendaho, Ethiopia

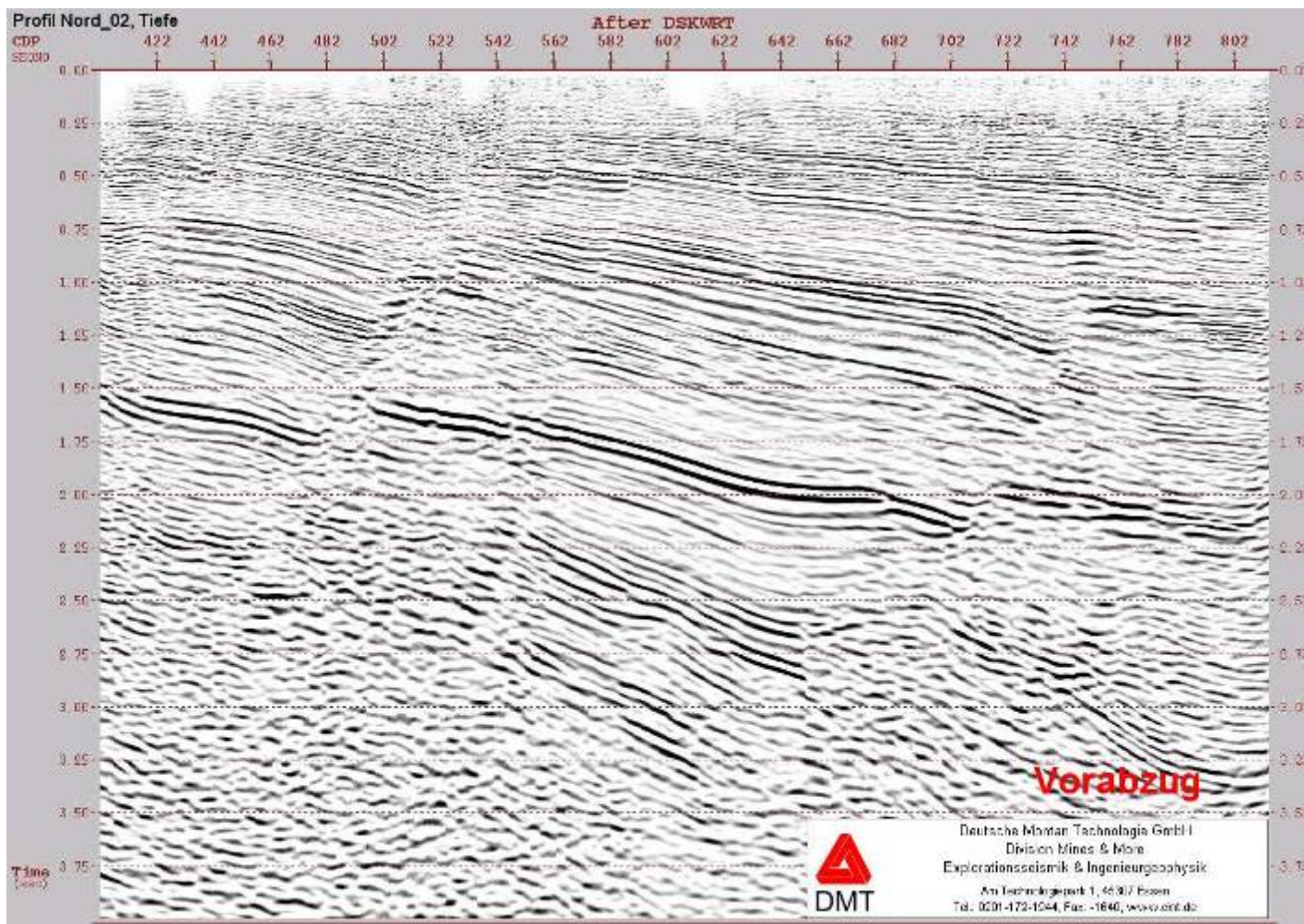


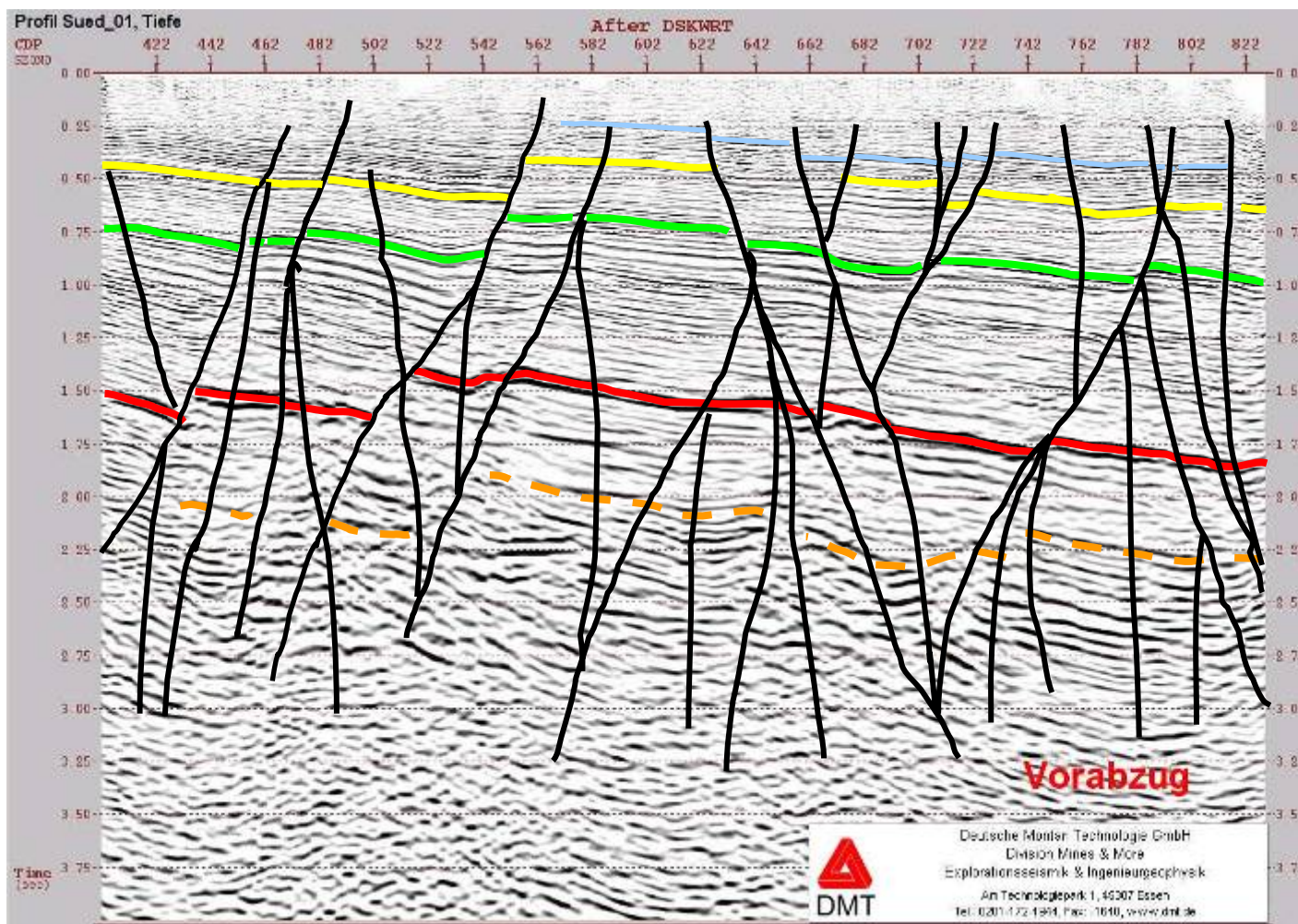
Seismic



Seismic













POWER PLANT LANDAU





POWER PLANT LANDAU



- **Geophysics**
 - BGR, Hannover; GFZ, Potsdam; DMT, Essen; GGD, Leipzig;...
- **Drilling**
 - Deutag, ITAG, Daldrup, Anger´s Söhne,...
- **Power Plant Technology**
 - Siemens, Erlangen (Kalina); GMK, Bargeshagen (ORC),...
- **Reservoir Engineering**
 - Qcon, ...
- **Finance**
 - KfW, DEG,...
- **Insurance**
 - MunichRe, ?



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THANK YOU FOR YOUR ATTENTION !

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