

Exploring the geothermal potential of the Dinantian in North-West Europe: novelties from DGE-ROLLOUT

Martin Arndt · Dr. Tobias Fritschle · Dr. Martin Salamon (Geological Survey of North Rhine-Westphalia)

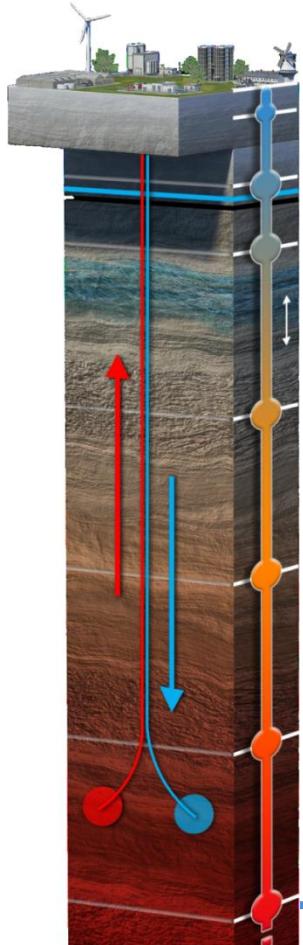
Geothermal potential of the Dinantian

The DGE-ROLLOUT Project

Achievements

Outlook

Geothermal potential of the Dinantian



0 m: 10°C

150 m: 10-15°C

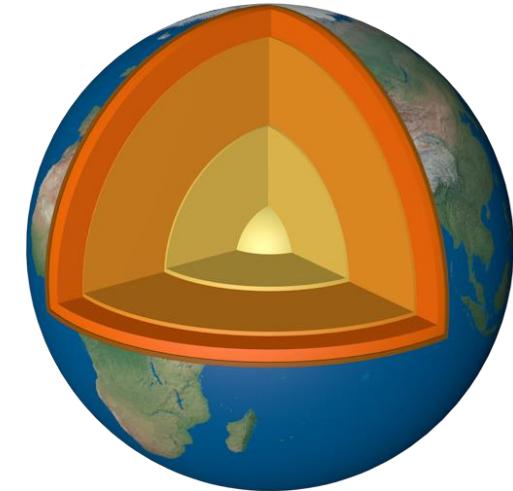
500 m: 20-30°C

1000 m: 40-50°C

2000 m: 60-80°C

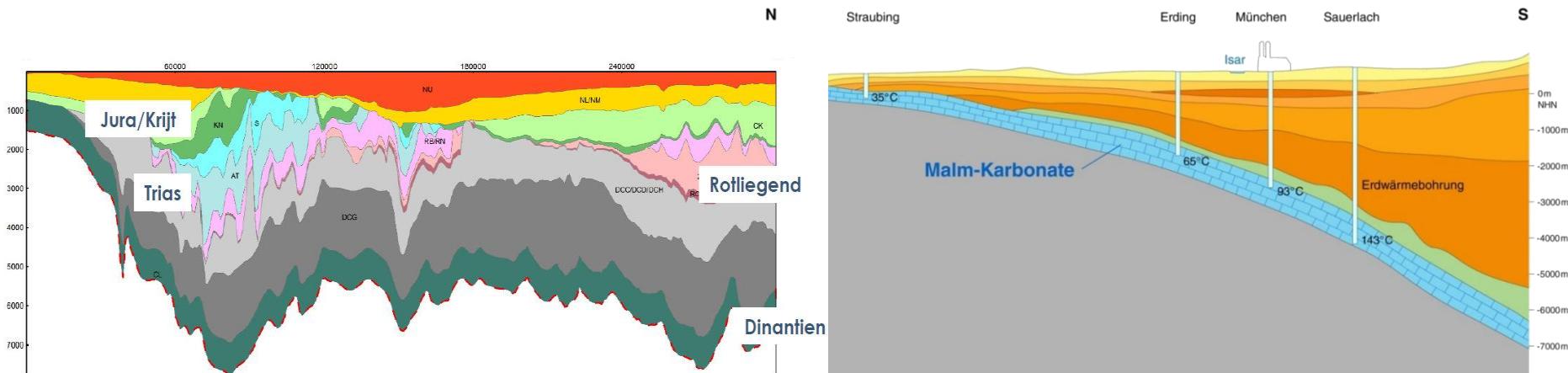
4000 m: 120-130°C

+3°C/100 m

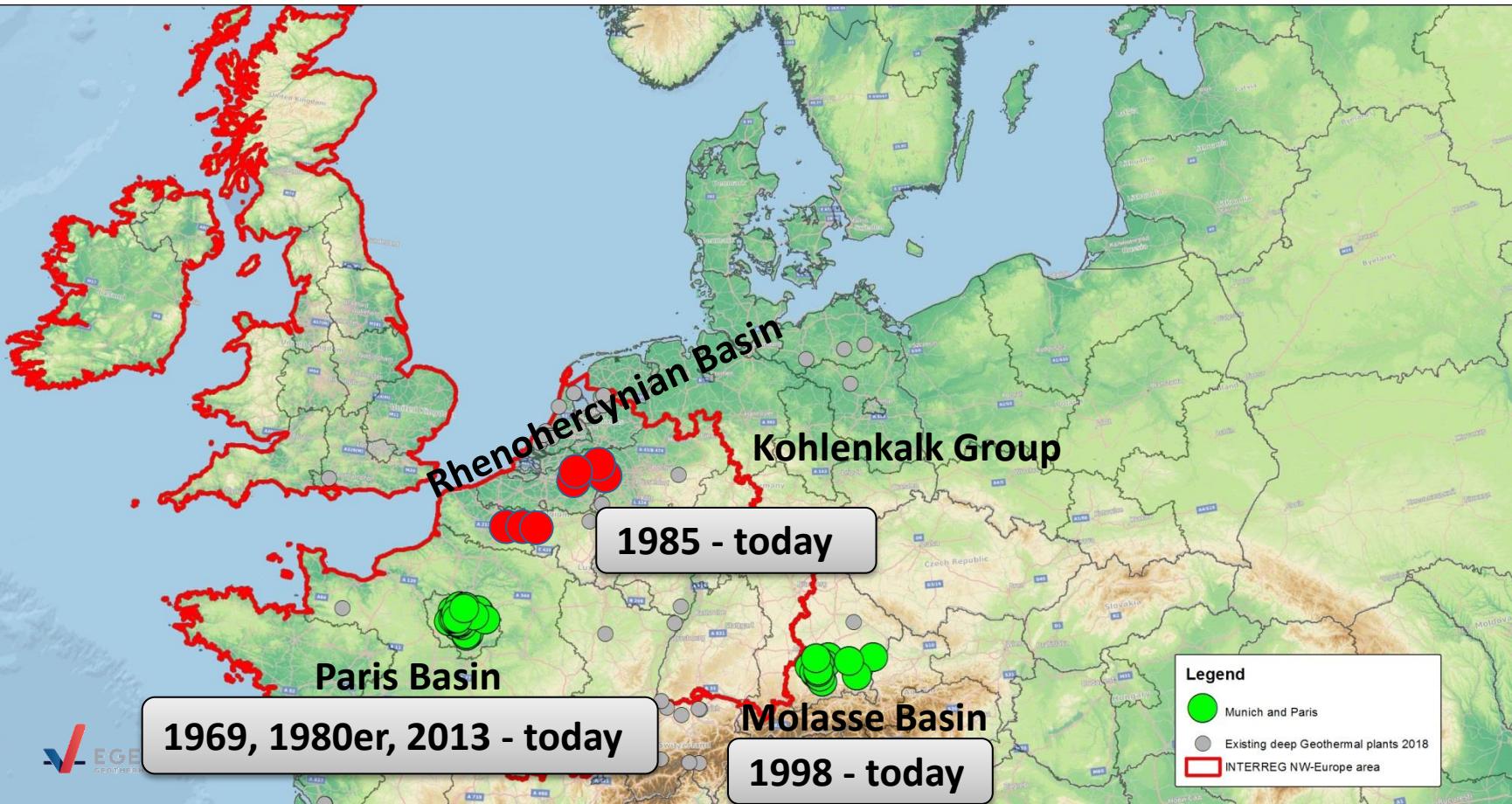


Geothermal potential of the Dinantian

- The original idea was to make use of the **Dinantian and Devonian carbonates** in NWE as a source for **hydrothermal energy exploitation**
- This concept is based on the use of Jurassic carbonates in both the Munich and the Paris basins

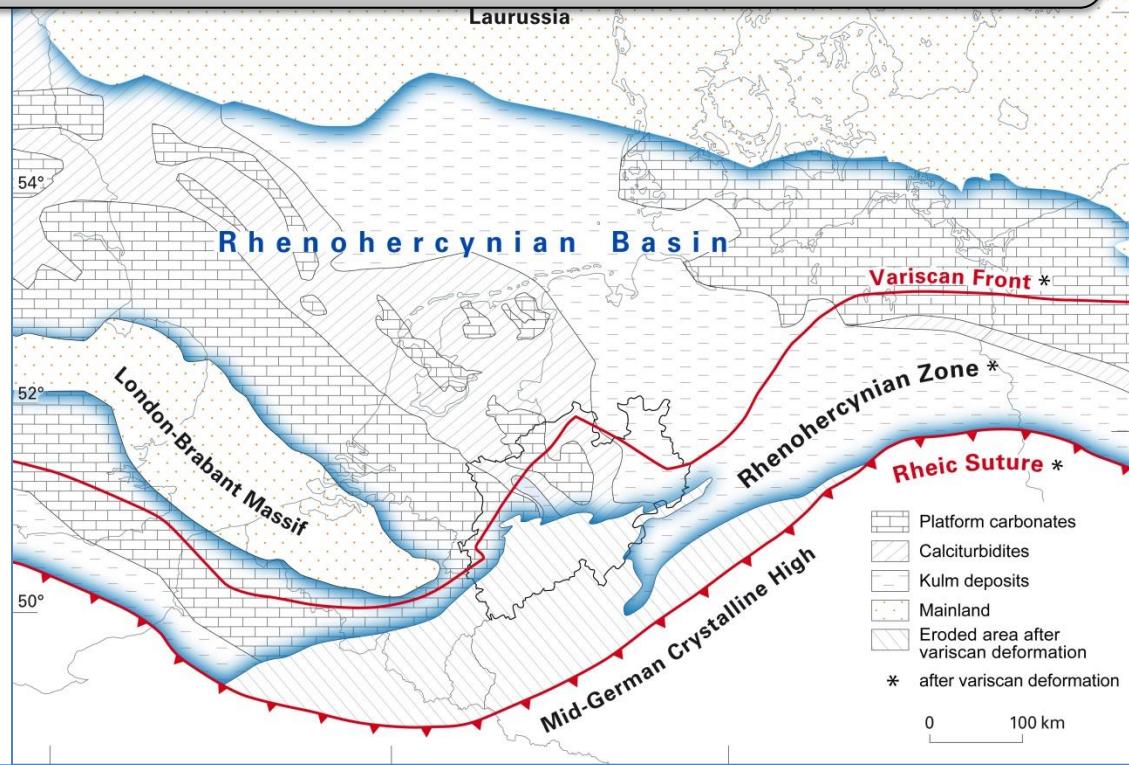
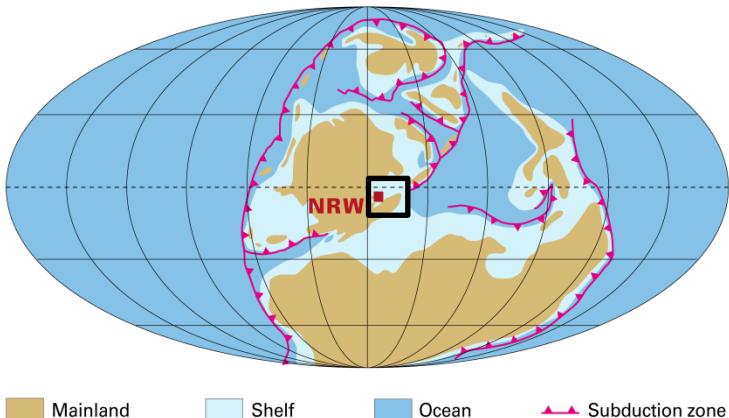


Geothermal potential of the Dinantian



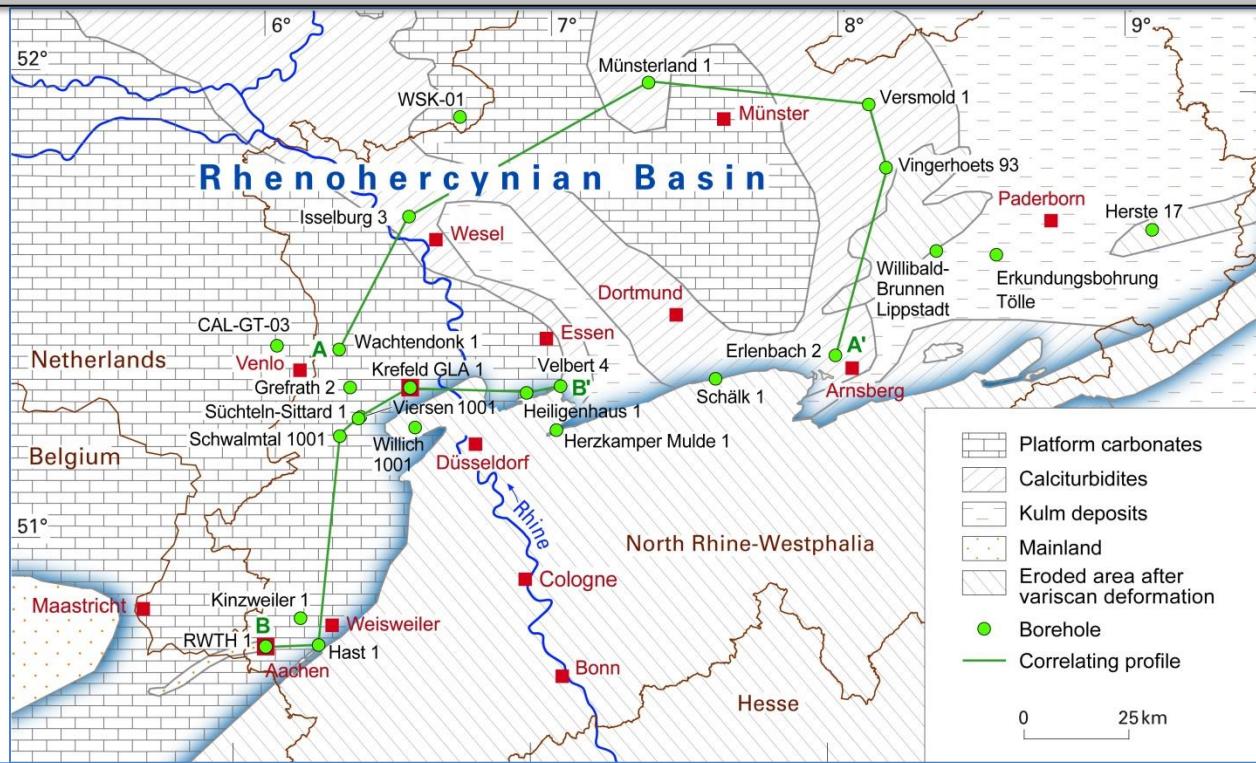
Geothermal potential of the Dinantian

Once upon a time in Europe ... 342 million years ago



Geothermal potential of the Dinantian

Dinantian facies distribution NRW



Geothermal potential of the Dinantian

Deep wells of NRW

A

Wachtendonk 1

Isselburg 3

Münsterland 1

Versmold 1

Vingerhoets 93

Erlenbach 2

Limestone

Limestone breccia

Dolomite

Limestone-shale alternation

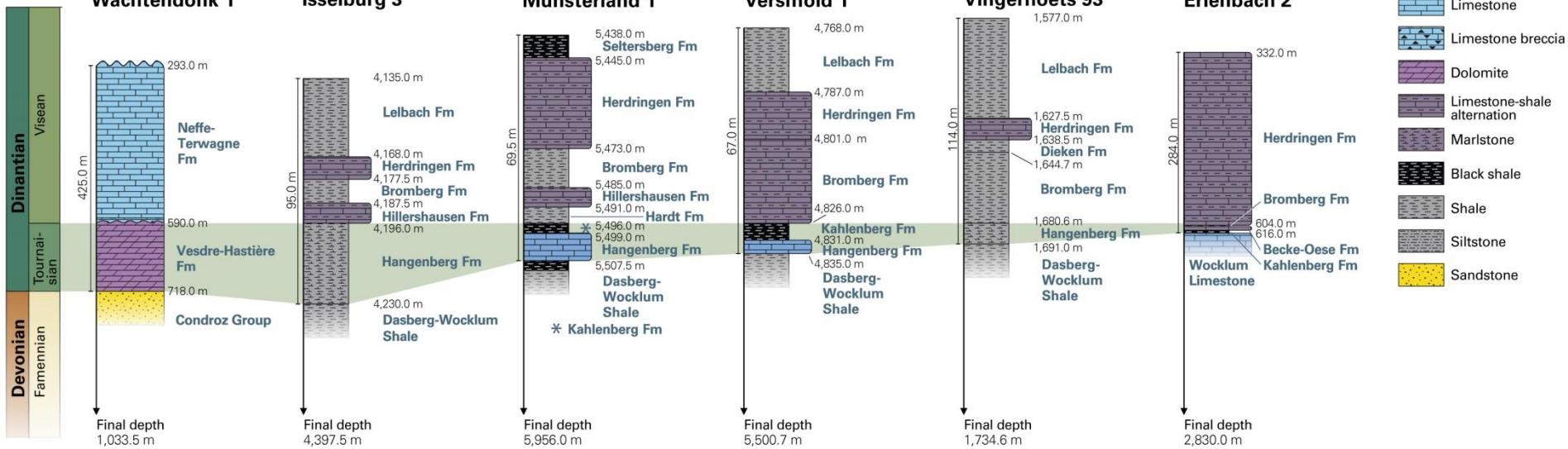
Marlstone

Black shale

Shale

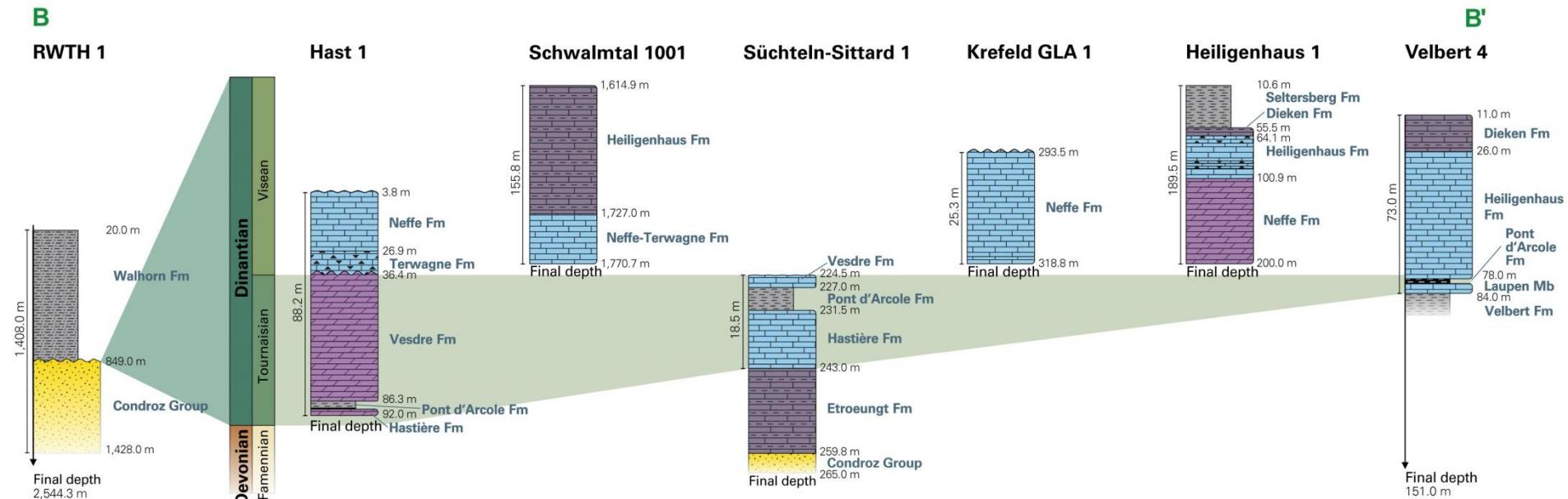
Siltstone

Sandstone



Geothermal potential of the Dinantian

Wells in the Lower Rhine Embayment of NRW



The DGE-ROLLOUT Project

Objektive: Promoting deep geothermal energy in NW-Europe

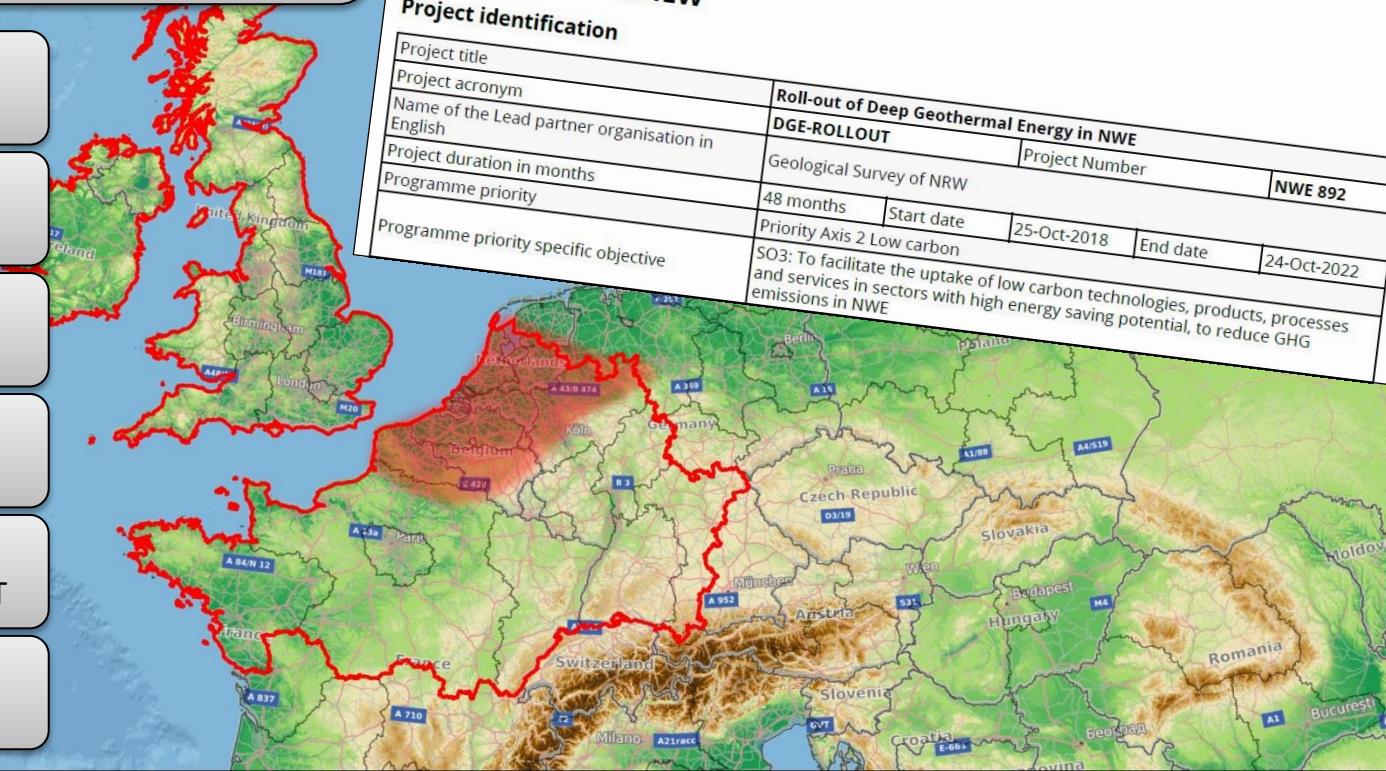
Duration: 4 years
25.10.2018 – 24.10.2022

Partners: 6 nations, 10 full partners, total of 20 partners

Financial Volume: € 18.7 Mio.,
€ 11.2 Mio. ERDF funding

Internet:
www.nweurope.eu/DGE-ROLLOUT

Twitter:
@DGE_ROLLOUT



DGE-ROLLOUT Projekt

Interreg
North-West Europe
DGE-ROLLOUT

Geological Surveys

GD NRW (DE)



BRGM (FR)



GSB (BE)



TNO (NL)



VITO (BE)



BGS (GB)



GSI (IR)



Research

Fh-IEG (DE)



TUDa (DE)



DU (GB)



LU (FR)



RUB (DE)

RUHR
UNIVERSITÄT
BOCHUM



Industry and SME

DMT (DE)



EBN (NL)



RWE (DE)



DEW (DE)



GeoT (DE)



unique (DE)



Network, Education

DBM (DE)



EGEC (BE)



Supported by

europiZe (DE)



Work packages

WPs Management

WP Management



WP Communication



WP Long Term Effects



WPs Implementation

WP T1 Mapping and Networking



WP T2 Decision and exploration support

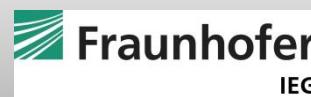


WP T3 Testing for production optimization

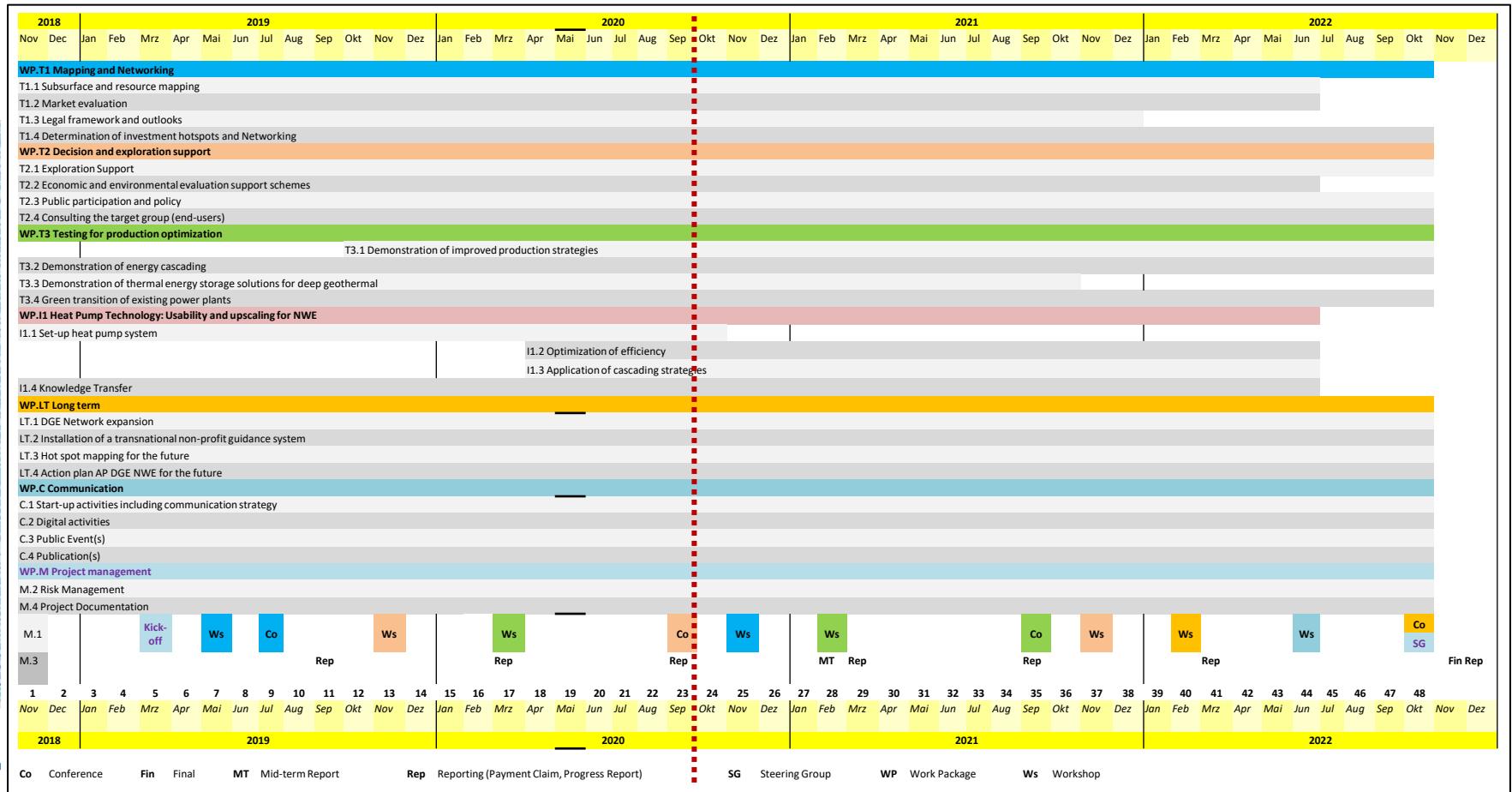


WPs Investment

WP I Heat Pump Technology: Usability and upscaling for NWE



DGE ROLLOUT – Deep Geothermal Energy for NW-Europe



What happened 2019?

Organisation & management



europize
realising projects

Communication & public relations



europize
realising projects



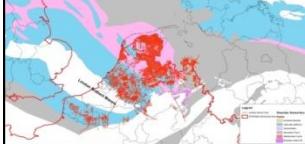
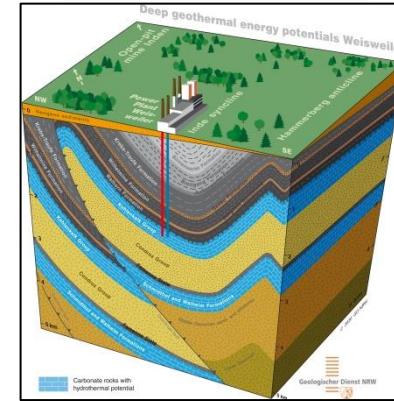
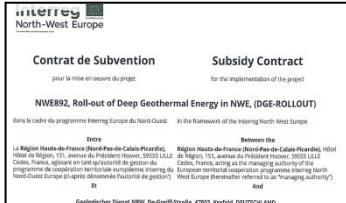
Balmatt geothermal test site



Weisweiler: from the idea to the 3D-model



Trans-national mapping



2019: Organisation & management

Contracts,
agreements

NRW connect
EXTERN:
transnational
data platform

Finance
controlling
and
reporting

Minutes,
minutes,
minutes

Four DGE ROLLOUT
Partner Meetings
including
one int. conference



NRW connect EXTERN
GONRW_INTERREG_TG

- Pages
- Blog
- Calendars
- SPACE SHORTCUTS
- File List

PAGE TREE

- INTERREG Roll-out of Deep Geothermal Energie in NWE
 - 01) Meetings
 - 00) Task Force Meetings
 - 01) Finance Meeting Krefeld
 - 02) Kick-Off Partner Meeting DGE-ROLLOUT in Cologne by RWE
 - 03) Partner Meeting at Workshop Mapping and Networking in Utrecht by EBN
 - 04) Partner Meeting at International Conference ICCP State of the art in mapping
 - 05) Partner Meeting at Workshop Exploration Support in Darmstadt by TU Da
 - 05.1) Minutes & List of Attendance
 - WPT1 ppt
 - 02) Workpackages
 - 1) WP LT - Long term

First Level Control

Before submission to the Joint Secretariat, each program is validated by an independent controller.

This process is carried out by a qualified first level certified public accountants - to verify that the entity implementing the project complied with the relevant institutional and programme rules as well as with the contract and the approved application form.

EMS electronic monitoring system developed by cpb software

INTERACT

Independent First Level Control Certificate

Project title
Project acronym
Project number
Reporting period
Report number

Partner Meeting
“Exploration Support. Pilots, knowledge and needs”
– Minutes –
27th to 29th November 2019, Darmstadt

Daniel Zerweck, Anna Thiel, Tobias Fritschle, Martin Arndt



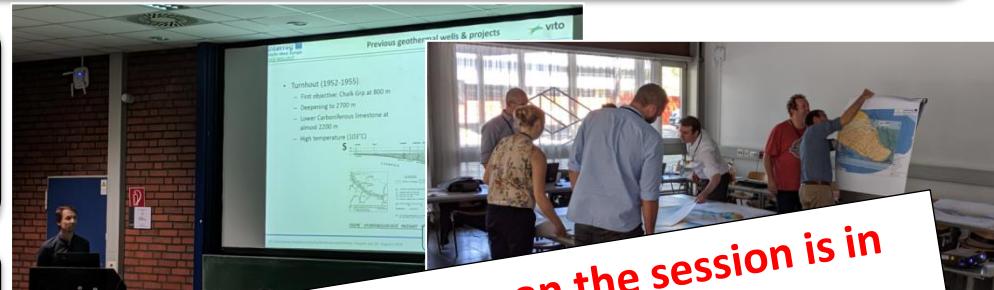
2019: 19th International Congress on the Carboniferous and Permian (XIX ICCP 2019)

After Nanjing (2007), Perth (2011) and Kazan (2015) again in Germany (Cologne) after 48 years (Krefeld, 1971)

Complete session on DGE-ROLLOUT

Partner meeting and working groups

Knowledge exchange on the Carboniferous with experts from all over the world



Special publication on the session is in preparation



2019: Communication & public relations

Communication Strategy



Exhibition at German Mining Museum



Homepage, Twitter



Networking



2019: Balmatt geothermal test site

14 test periods



Evaluation of reservoir properties

vito    **Interreg**  North-West Europe
DGE-ROLLOUT

Deliverable T3.1.1 Evaluation of reservoir properties
S. Bos, M. Broothers

Introduction
The geothermal plant on the Balmatt site in Moers was started up for the first time on 22 November 2018. Between November 2018 and June 2019, the plant has been operational for 14 test periods between 0.5 and 240 hours each. During these test periods, around 50,000 m³ of geothermal brine have been pumped from the production well towards the injection well and 5200 kWh of heat was extracted from the geothermal plant.

Test #	Date	Length (hours)	Flow rate (m ³ /h)
1	26/11/2018	8	50-80m ³ /h
2	04/12/2018 - 07/12/2018	72	75m ³ /h with 120m ³ /h
3	11/12/2018 - 12/12/2018	31	initially up to 100m ³ /h decreased and ended at 60 m ³ /h
4	17/12/2018 - 18/12/2018	28	initially 100m ³ /h

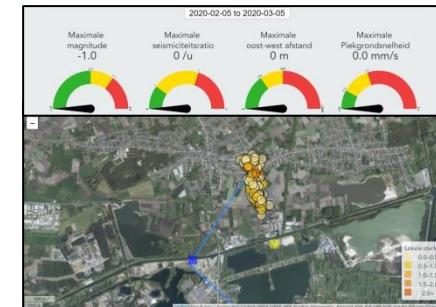
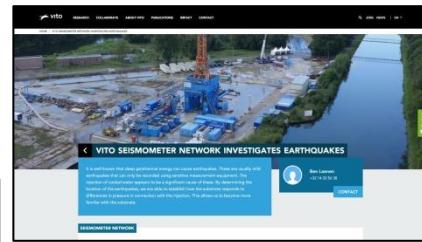
Evaluation of production strategies and technologies for long-term production optimization for a Carboniferous carbonate reservoir

Dries Bos

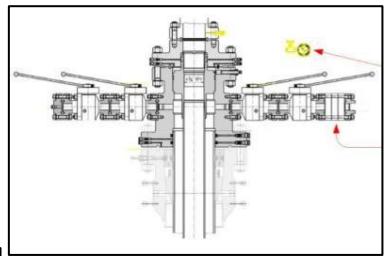
This study was conducted as part of Interreg NWE project DGE-ROLLOUT, with financial support from Nuhma and Province Limburg 2018/2019/2020 January 2020

vito   **Interreg**  North-West Europe
DGE-ROLLOUT

Seismometer Network



Challenges with gas in/out of solution



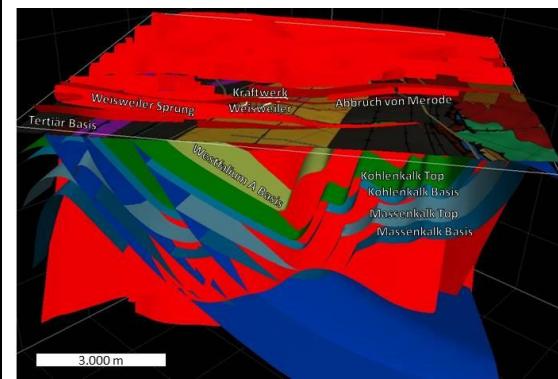
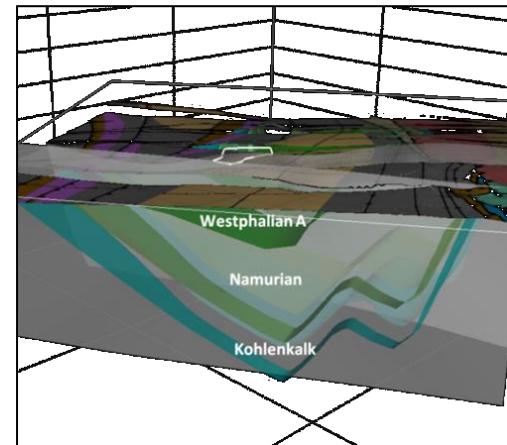
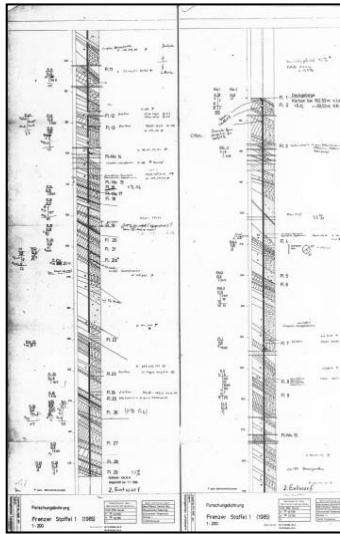
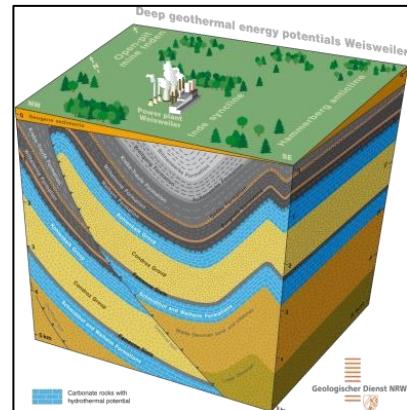
2019: Weisweiler: from the idea to the 3D-model

Idea

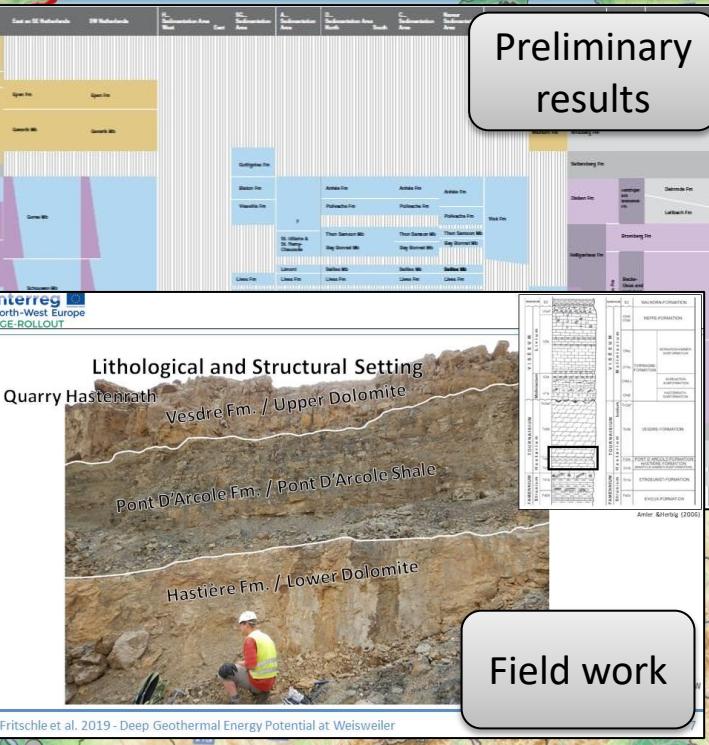
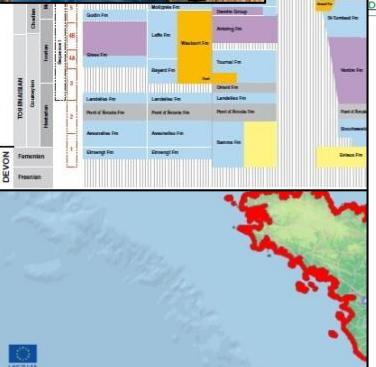
Data research

Processing

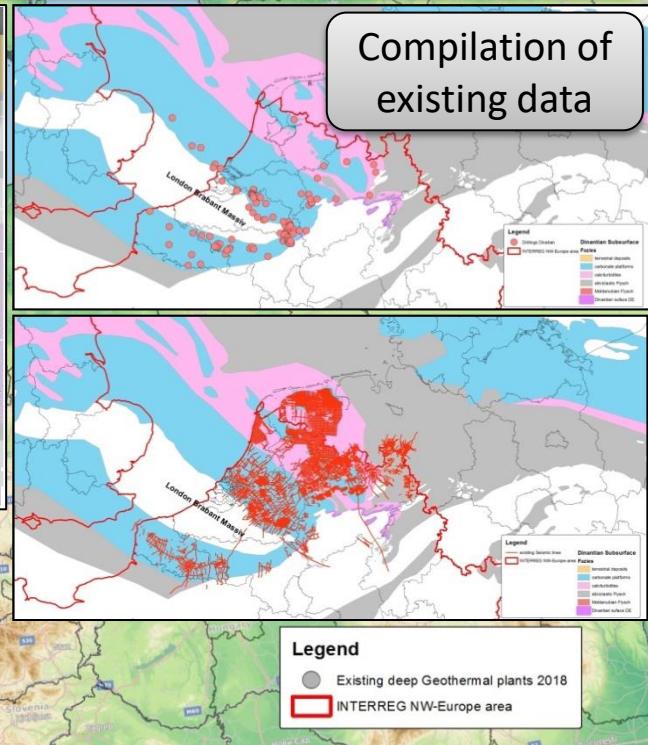
Finalised
3D-model



2019: Transnational mapping



Preliminary results



Compilation of existing data

Field work

What happens 2020?

Depth and thickness map of Dinantian limestone reservoir



Heat pump system delivery



Weisweiler: drilling and HEATFLOW 3D-model



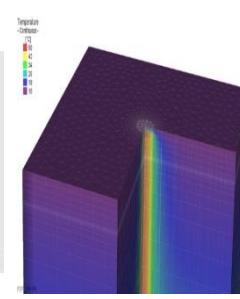
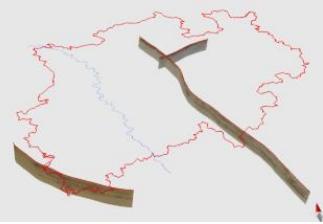
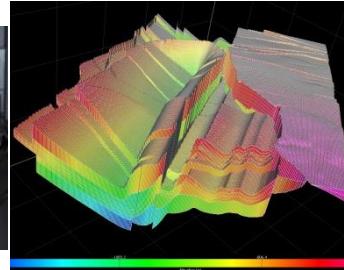
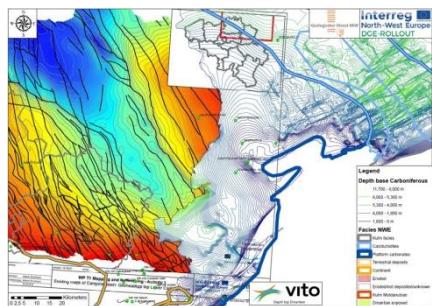
Mapping moves east: DEKORP seismics



Geothermal heat storage projects

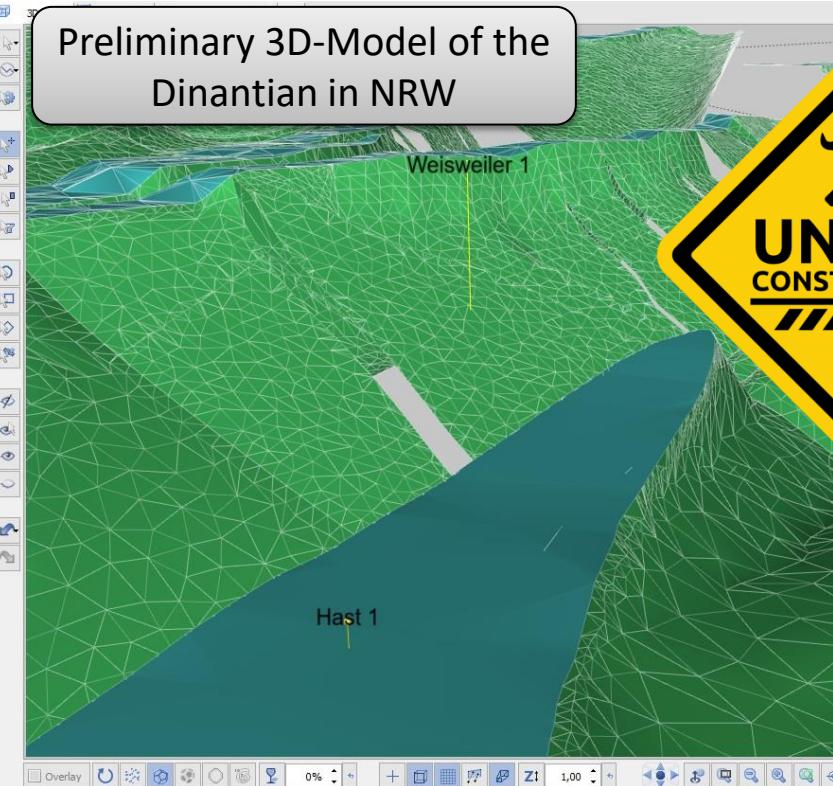


Drillings Heiligenhaus and Wuppertal



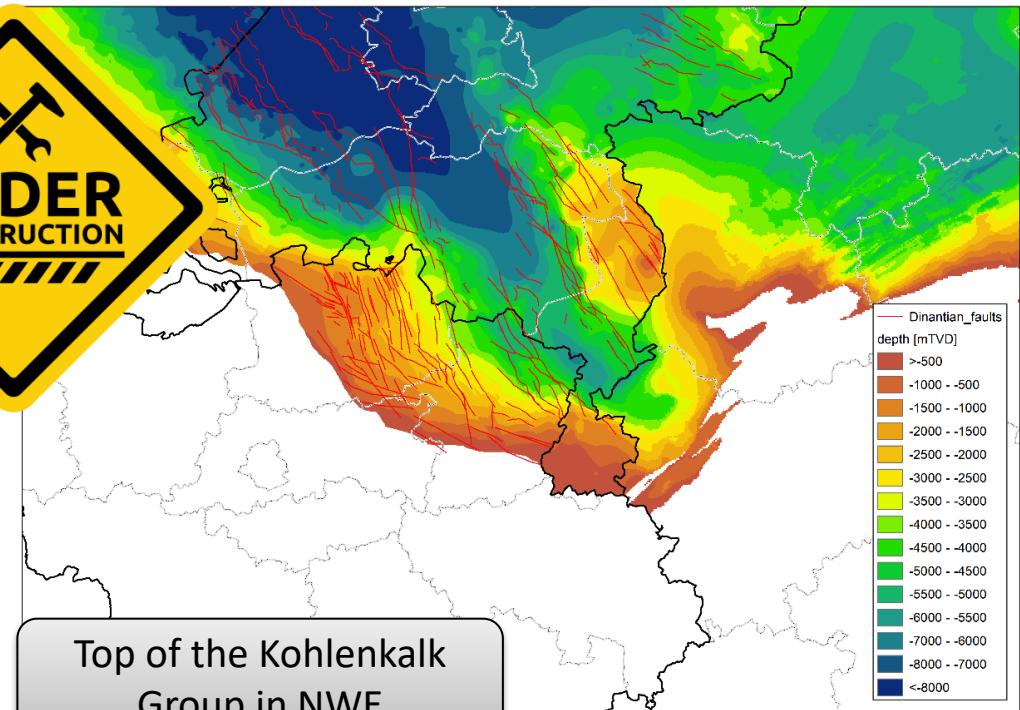
2020: Depth and thickness map of Dinantian limestone reservoir

Preliminary 3D-Model of the
Dinantian in NRW

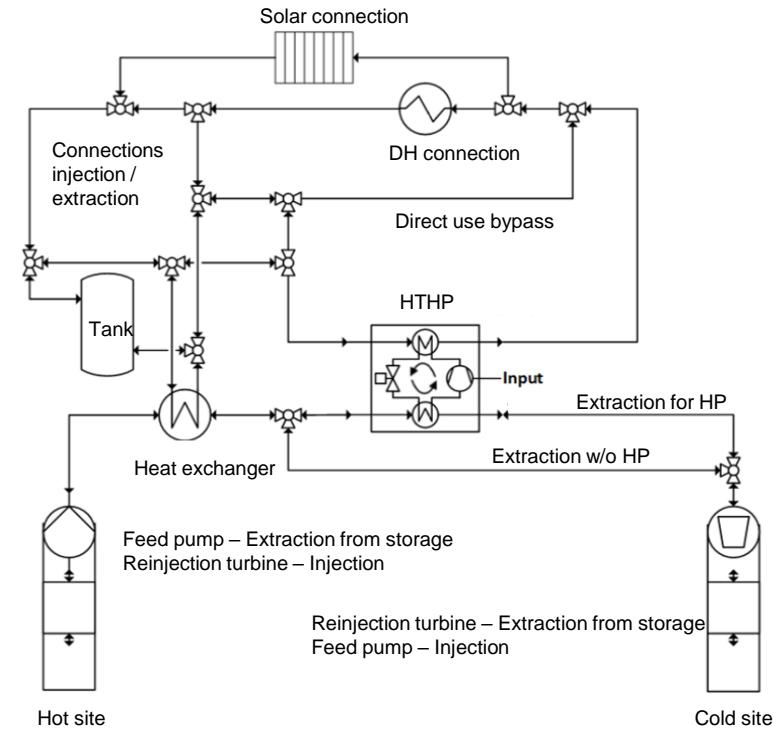
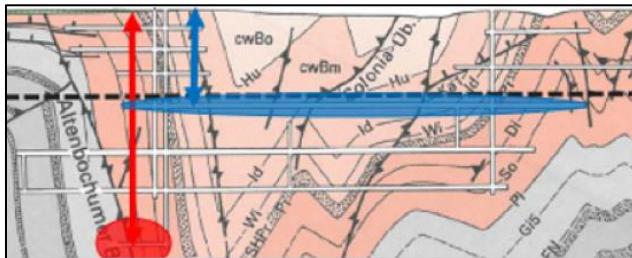
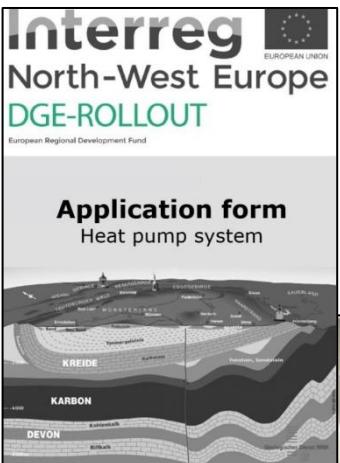


Dinantian: depth top and faults

Top of the Kohlenkalk
Group in NWE

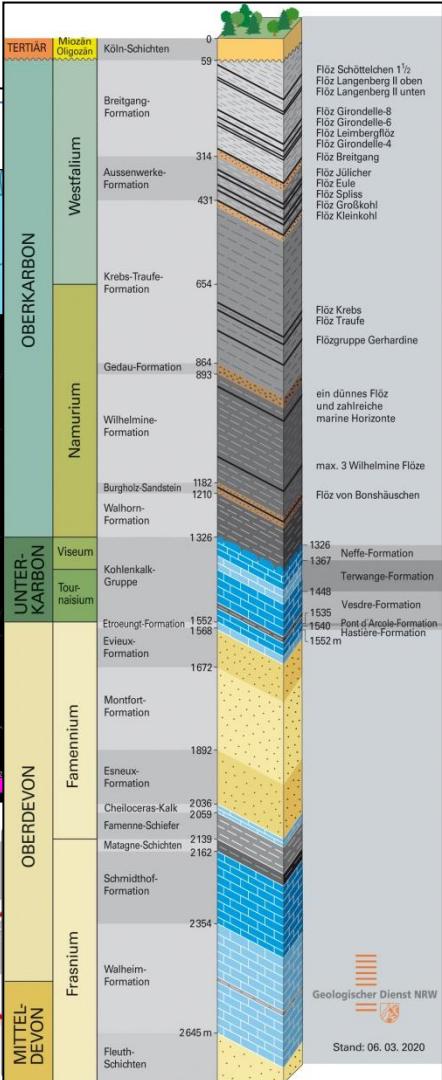
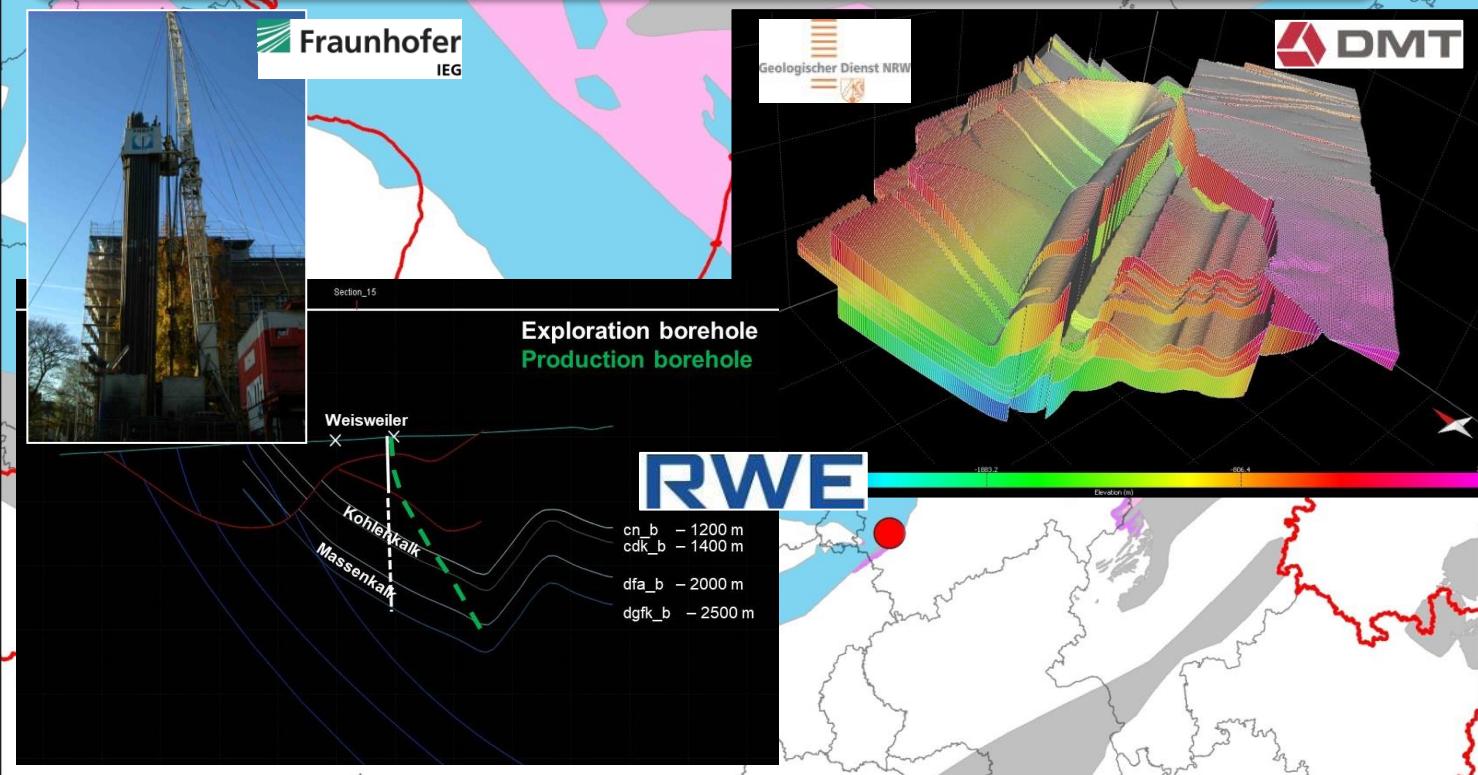


2020: Heat pump system delivery

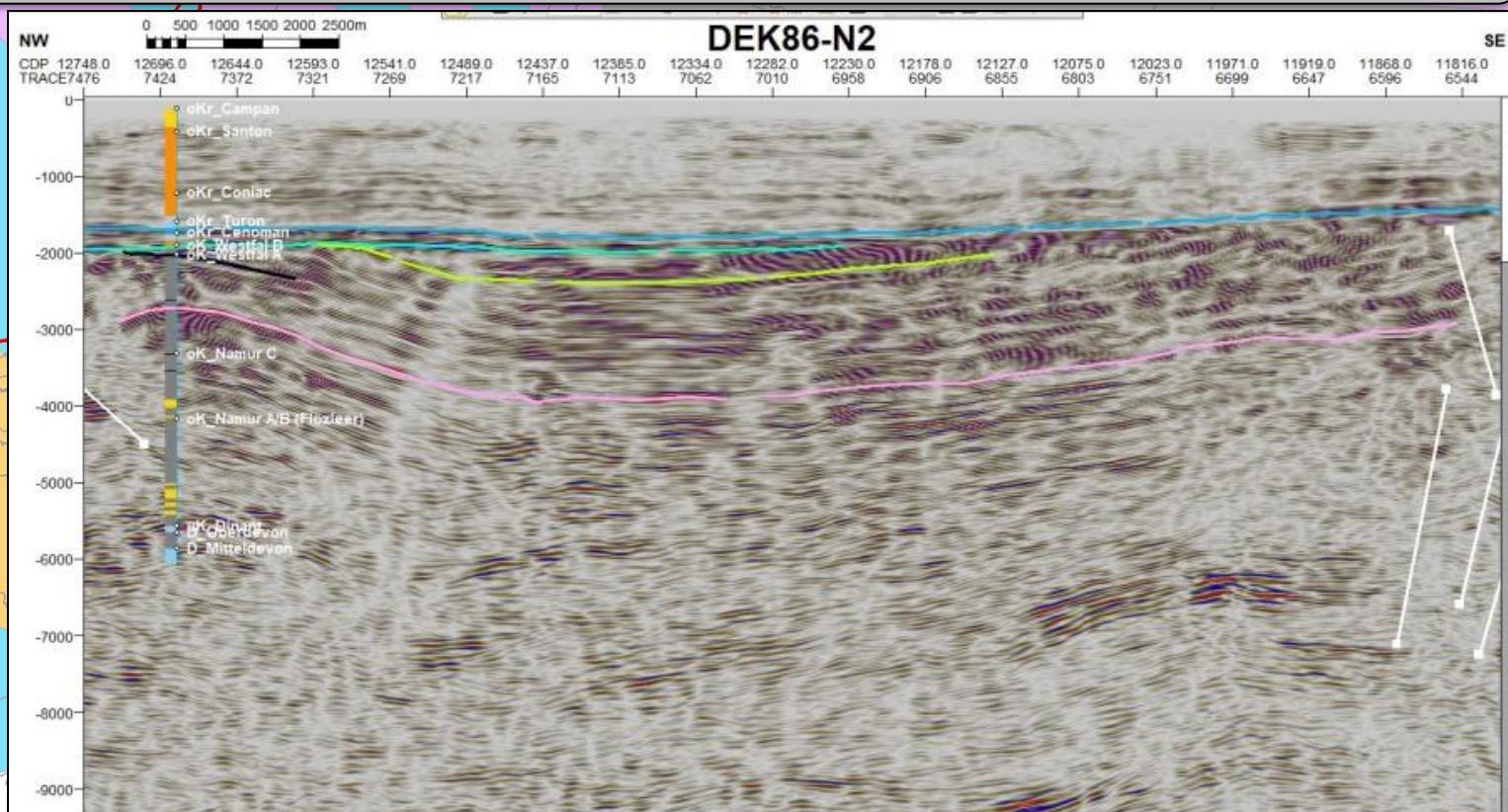


Outlook

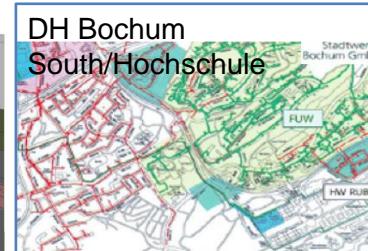
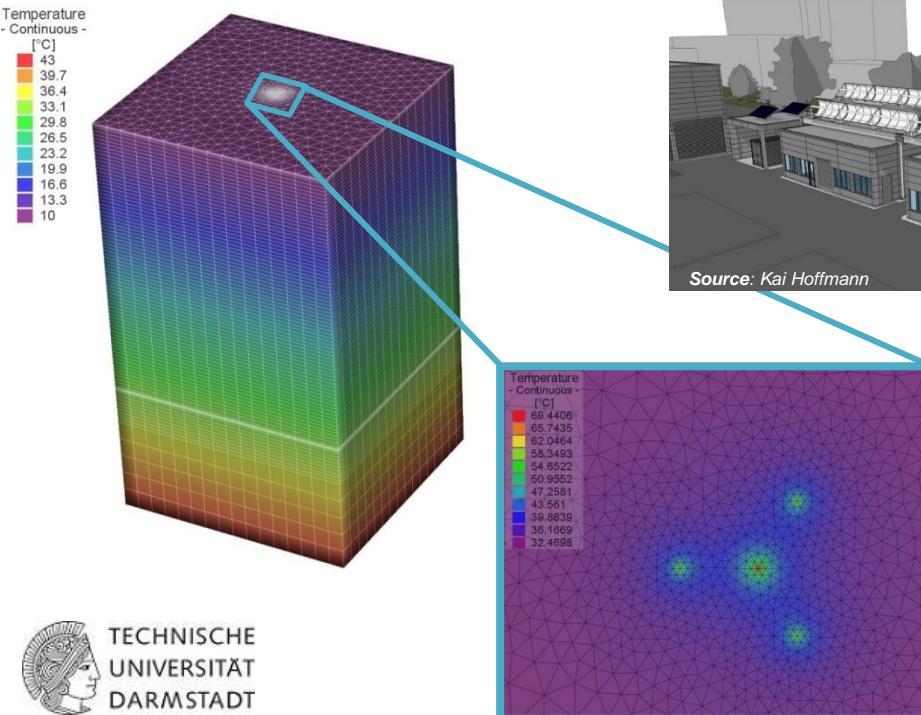
2020: Weisweiler: drilling and HEATFLOW 3D-model



2020: Mapping moves east: DEKORP seismics



2020: Geothermal heat storage projects



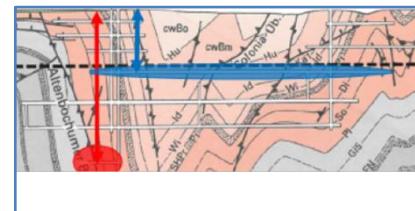
Fraunhofer
IEG

Heating season

Concentrated
solar @GZB

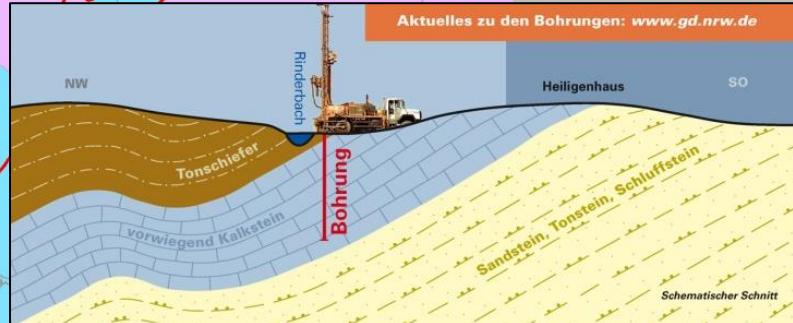
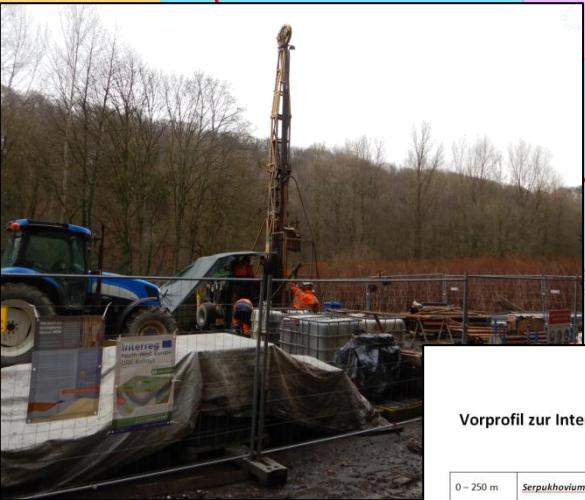


Summer Heating season



TECHNISCHE
UNIVERSITÄT
DARMSTADT

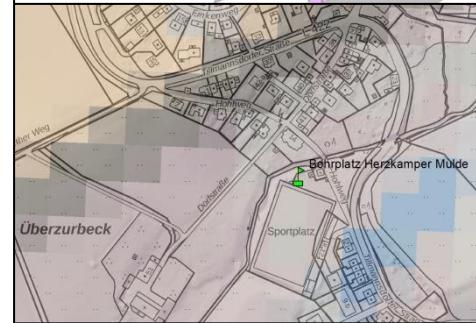
2020: Drillings Heiligenhaus and Wuppertal



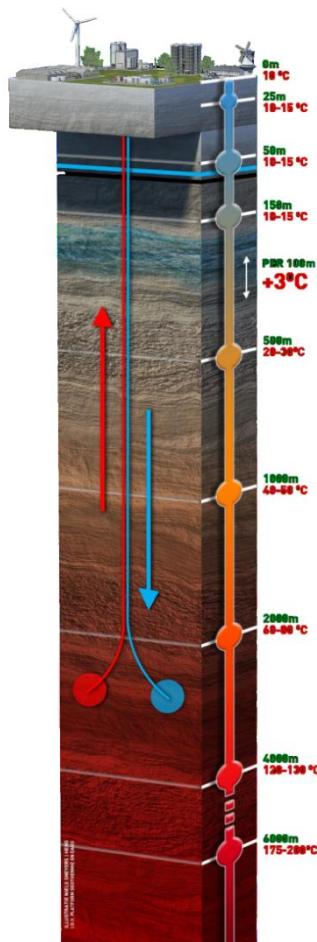
Vorprofil zur Interreg-Bohrung 2020: „Herzkamper Mulde“

(UTM 32 364254 5680475)

0 – 250 m	Serpukhovium: Eisenberg-Fm. (ehemals „Hangende Alaunschiefer“): Schwarze Alaunschiefer und schwarze Tonsteine mit mächtigem Alaun-Schiefer Paket an der Basis. [Mächtigkeit: 50-70 m]
250 – 265 m	Viseum: Dieken Fm. (bei Preufen: Horizon der Hangenden Alaunschiefer) fein-laminierte, sehr fossilreiche und organisch-reiche Tonsteine mit vulkaniklastischen Zwischenlagen und eingeschalteten dünnen kalkigen Horizonten von wenigen Millimetern Mächtigkeit. [Mächtigkeit: 5-20 m]
265 – 275 m	Viseum: Bromberg-Fm. (ehemals Kalkbändernschiefer/Posidonienschiefer) Wechsellagierung aus 0,4 bis 1,20 m mächtigen, kieseligen, splitterigen oder feinlaminierten Alaunschiefer und dunkelgrauen bis grünlichgrauen kieseligen Tonsteinen mit insgesamt niedrigem Carbonatgehalt. In die kieseligen Sequenzen können sporadisch wenige, maximal 15 cm mächtige Kalkstein-Bänke eingeschaltet sein. Diese sind im unteren Abschnitt spilitig und bituminös; im oberen Abschnitt hingegen grobkörnig. Außerdem können bis zu 10 cm mächtige Tuffit- und Metabentonit-Lagen auftreten. [Mächtigkeit: 10-12 m]
275 – 295 m	Viseum: Hillershausen-Fm. (bei Preufen: Horizon der Lydite und Kieselkalke)



Thank you!



Further reading ...

- www.nweurope.eu/DGE-ROLLOUT
- Arndt, M.; Fritschle, T.; Salamon, M.; Thiel, A. (2020): Das Rhenoherzynische Becken – ein hydrothermales Reservoir für NRW und Nordwesteuropa? – scriptumonline, **16**: 11 S., 3 Abb.; Krefeld.
https://www.gd.nrw.de/pr_bs_scriptumonline.htm
- Arndt, M.; Fritschle, T.; Salamon, M.; Thiel, A. (2020): Grüne Energie für NRW und Nordwesteuropa – gd report, **2020/1**, S. 4-8; Krefeld.
https://www.gd.nrw.de/zip/gd_gdreport_2001s.pdf