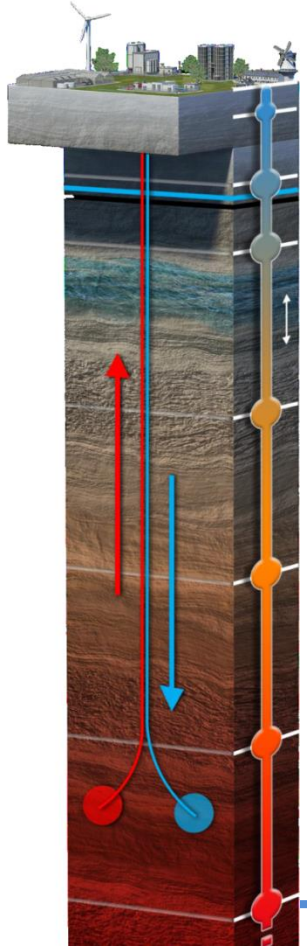
Exploring the geothermal potential of the Dinantian in North-West Europe: novelties from DGE-ROLLOUT

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

Interreg North-West Europe DGE-ROLLOUT
EUROPEAN UNION
European Regional Development Fund

Geothermal potential of the Dinantian



0 m: 10°C

150 m: 10-15°C

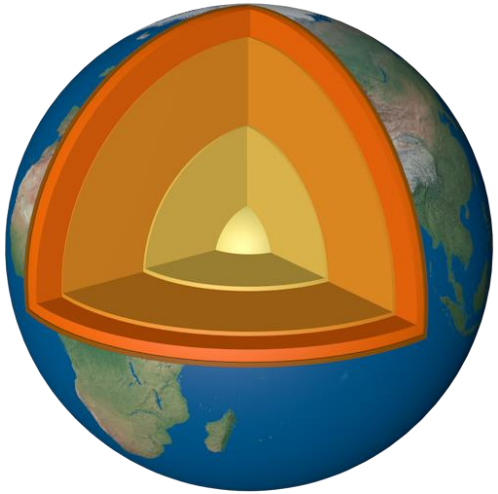
500 m: 20-30°C

1000 m: 40-50°C

2000 m: 60-80°C

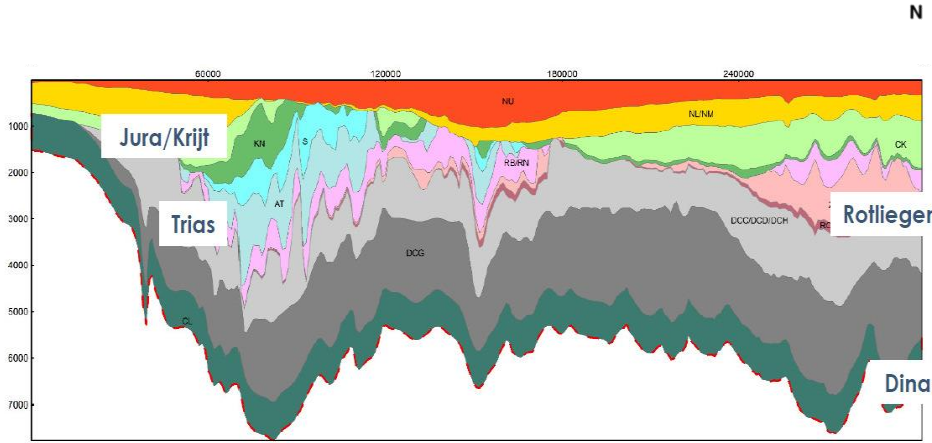
4000 m: 120-130°C

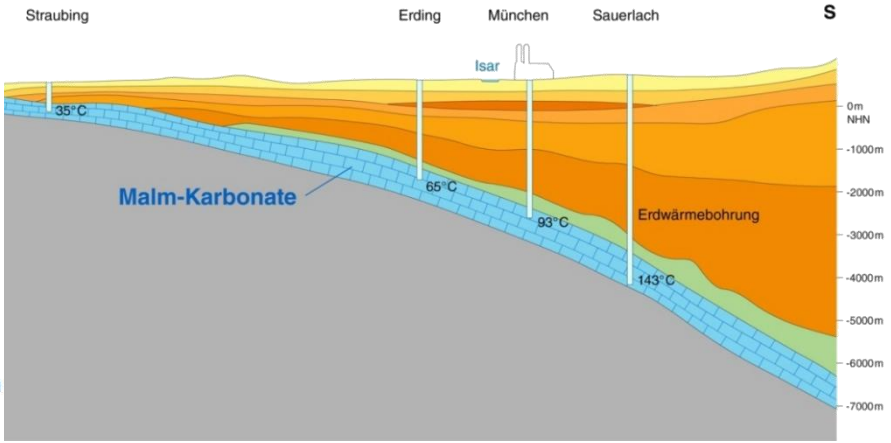
+3°C/100 m



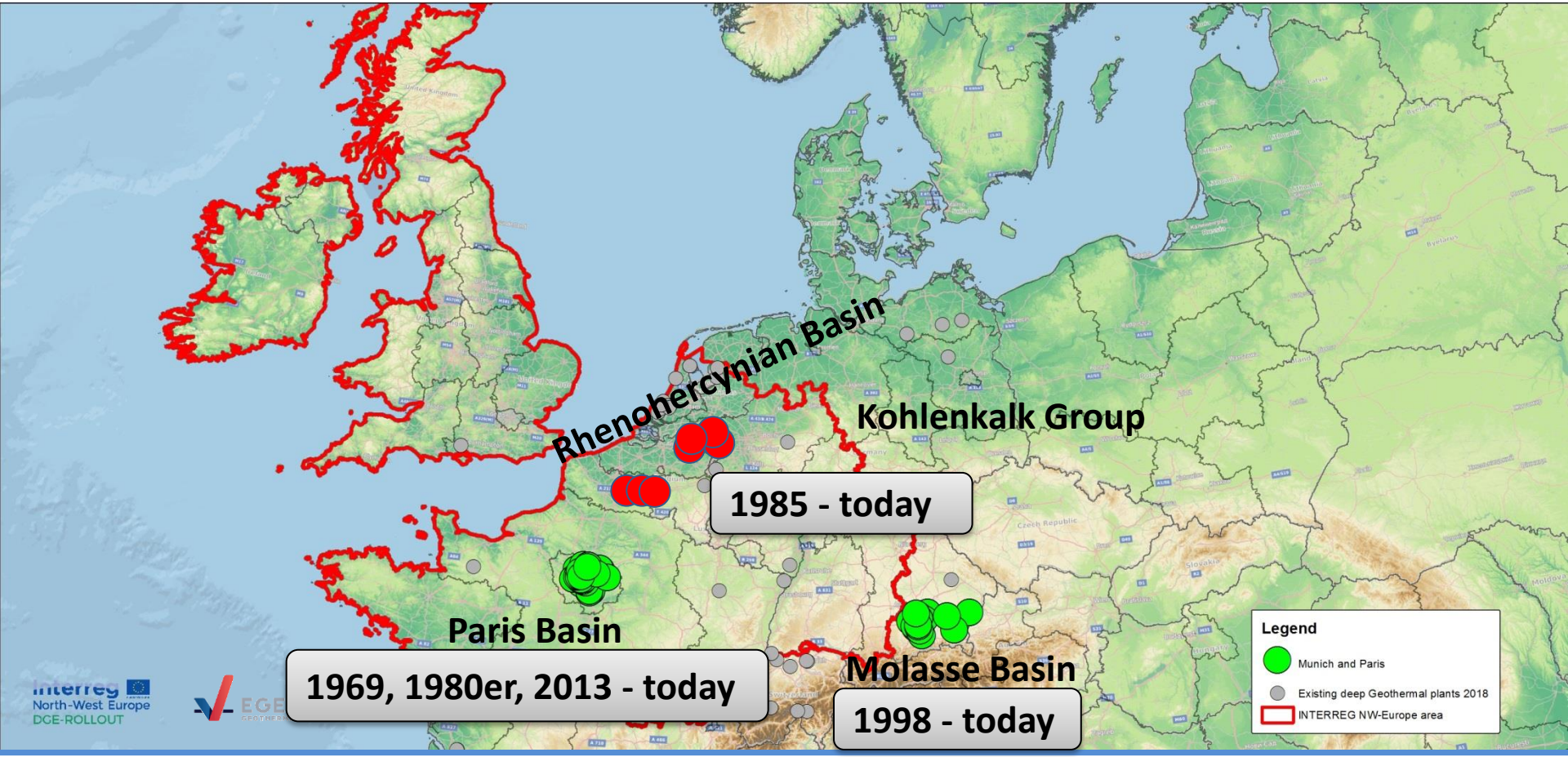
Geothermal potential of the Dinantian

- 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



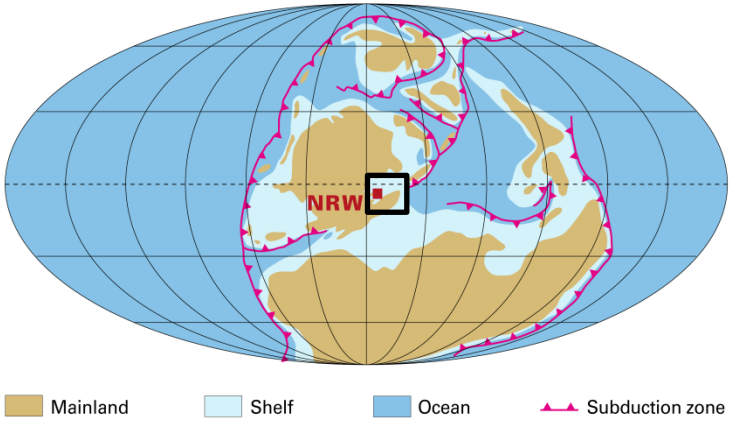


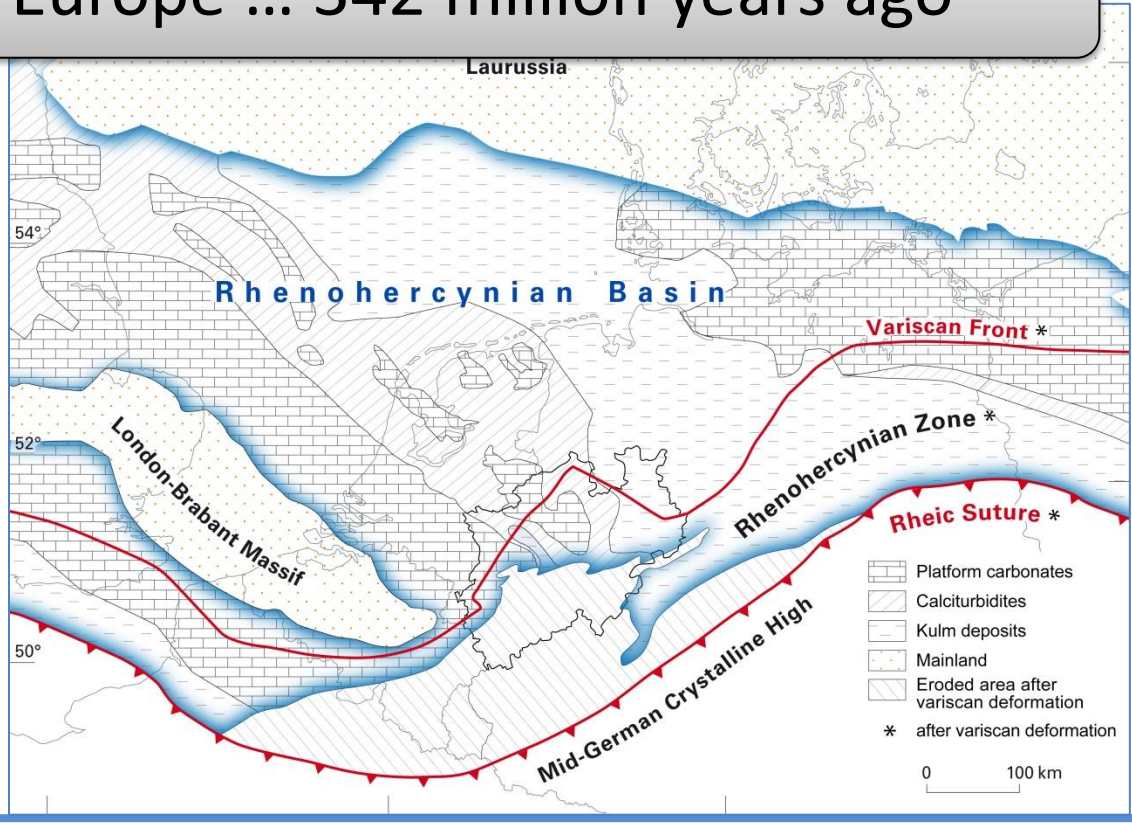
Geothermal potential of the Dinantian



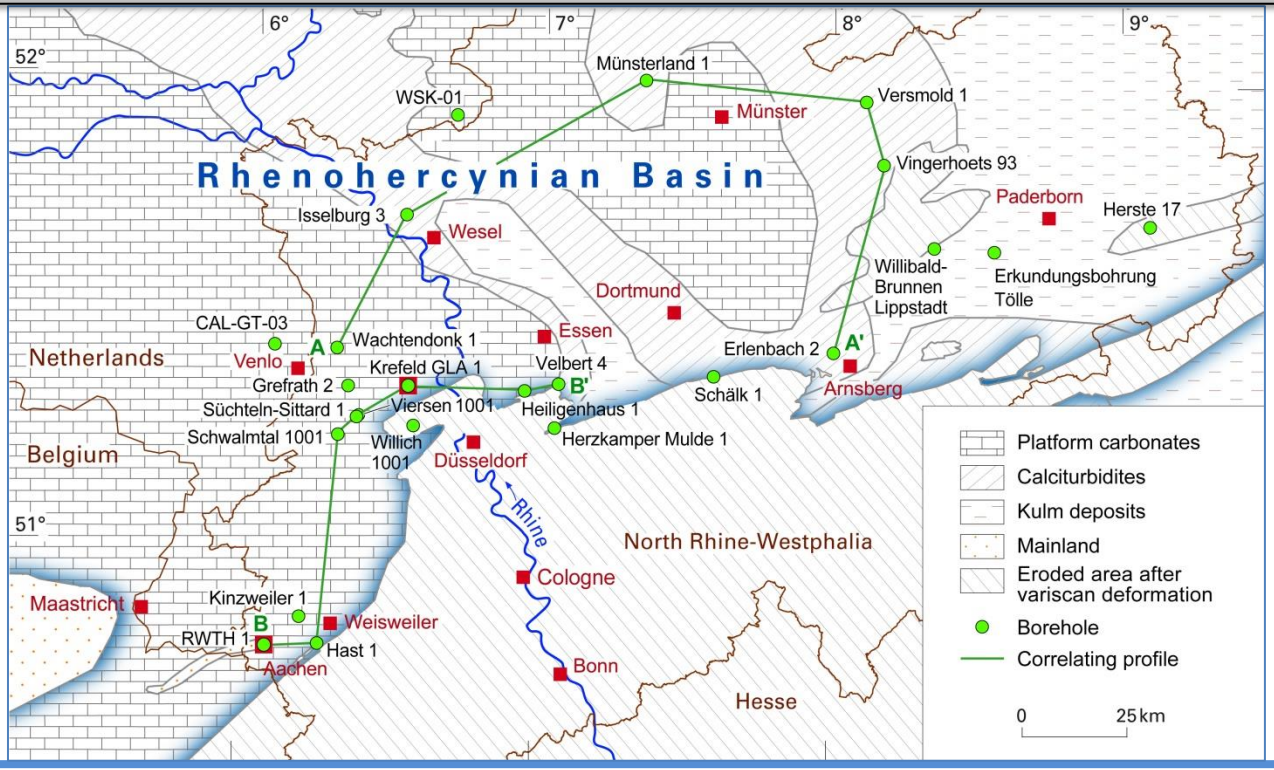
Geothermal potential of the Dinantian

Once upon a time in Europe … 342 million years ago



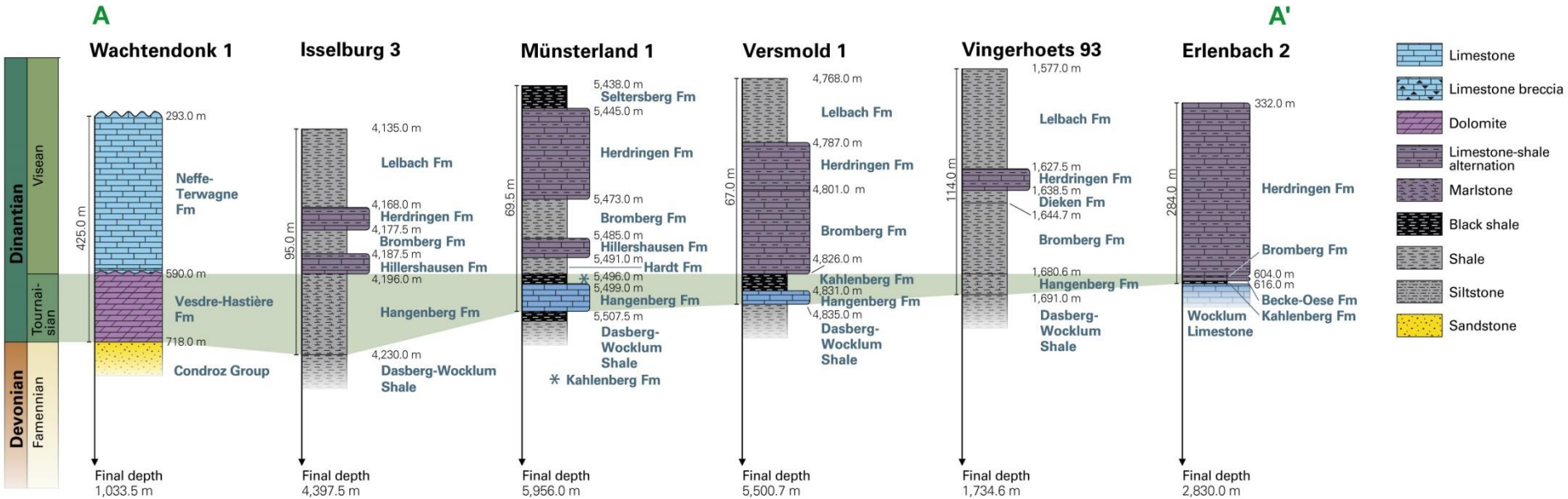


Dinantian facies distribution NRW

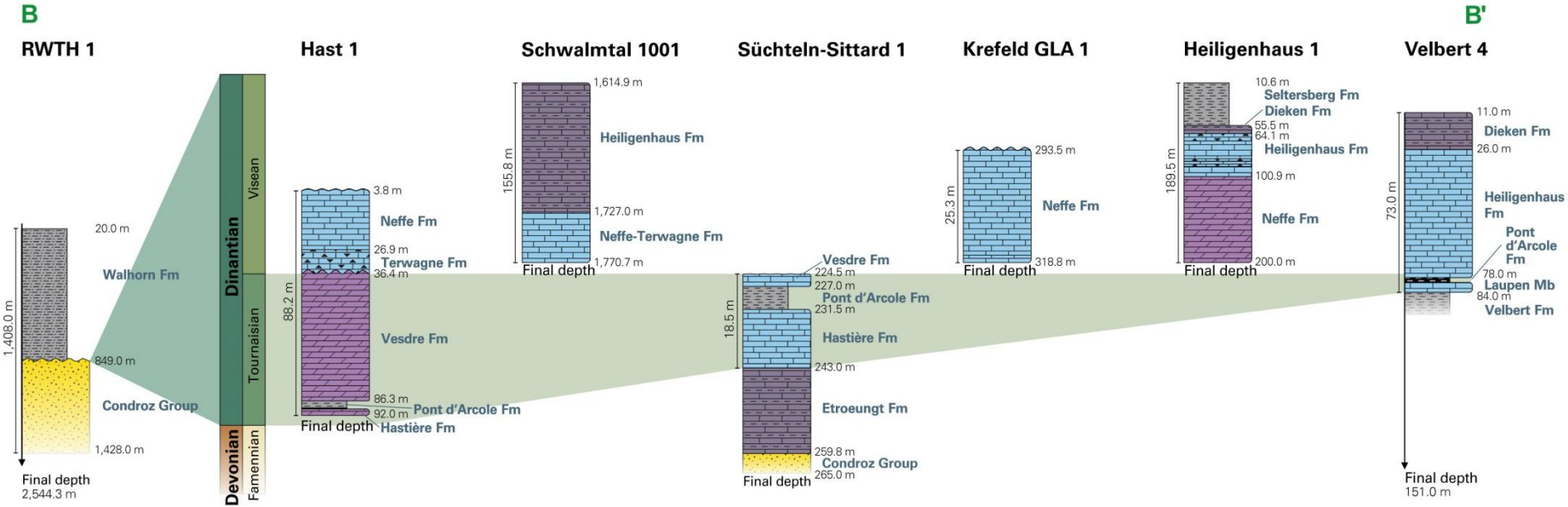


Geothermal potential of the Dinantian

Deep wells of NRW



Wells in the Lower Rhine Embayment of NRW



The DGE-ROLLOUT Project

Objektive: Promoting deep geothermal energy in NW-Europe

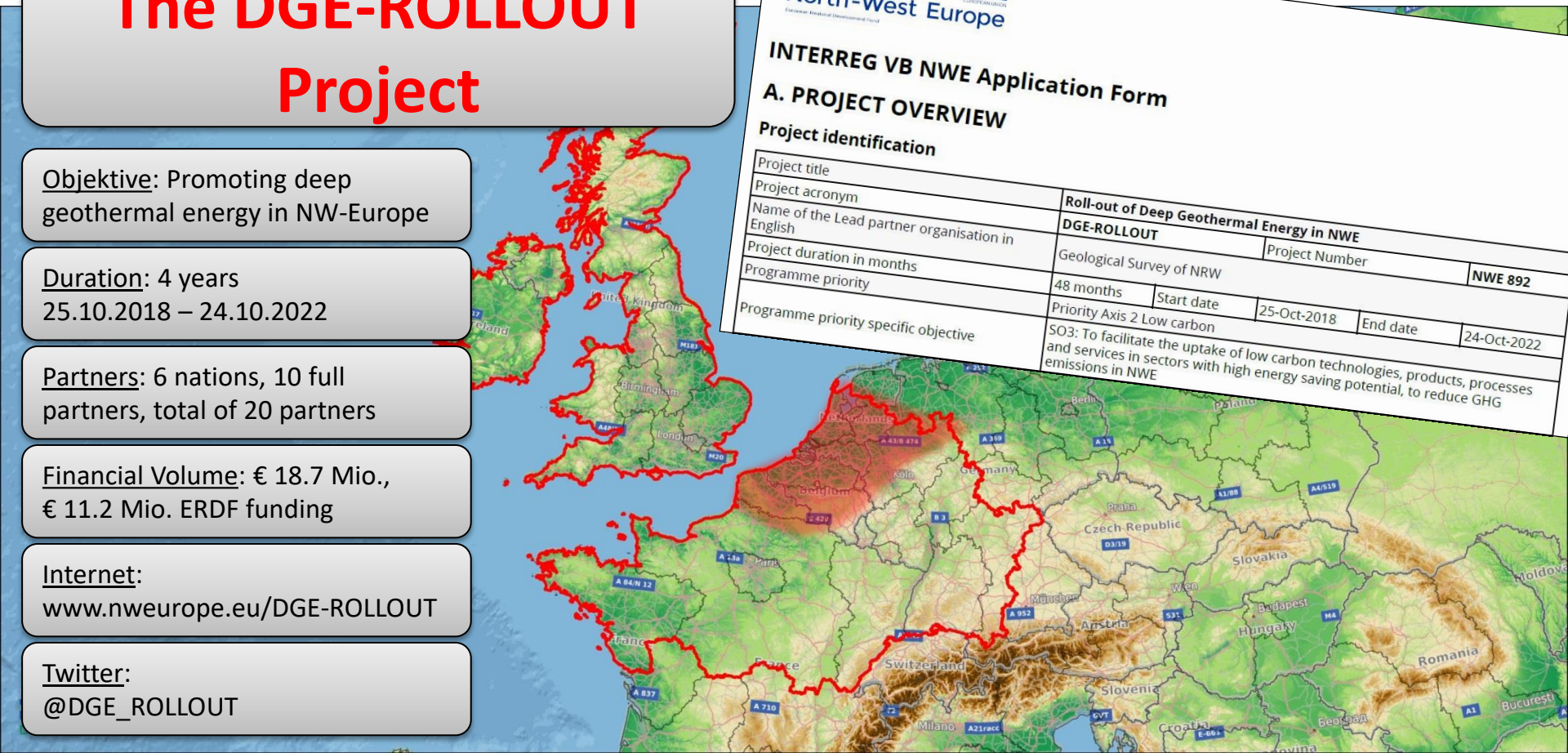
Duration: 4 years
25.10.2018 – 24.10.2022

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 – Deep Geothermal Energy for NW-Europe

DGE-ROLLOUT Projekt

Geological Surveys	Research	Industry and SME	Network, Education
GD NRW (DE)	Fh-IEG (DE)	DMT (DE)	DBM (DE)
BRGM (FR)	TUDa (DE)	EBN (NL)	EGEC (BE)
GSB (BE)	DU (GB)	RWE (DE)	
TNO (NL)	LU (FR)	DEW (DE)	Supported by
VITO (BE)	RUB (DE)	GeoT (DE)	europiZe (DE)
BGS (GB)		unique (DE)	
GSI (IR)			

DGE ROLLOUT – Deep Geothermal Energy for NW-Europe

Work packages

WPs Management

WP Management

Geologischer Dienst NRW

WP Communication

Fraunhofer IEG

WP Long Term Effects

Geologischer Dienst NRW

WPs Implementation

WP T1 Mapping and Networking

Geological Survey of Belgium

WP T2 Decision and exploration support

ebn

WP T3 Testing for production optimization

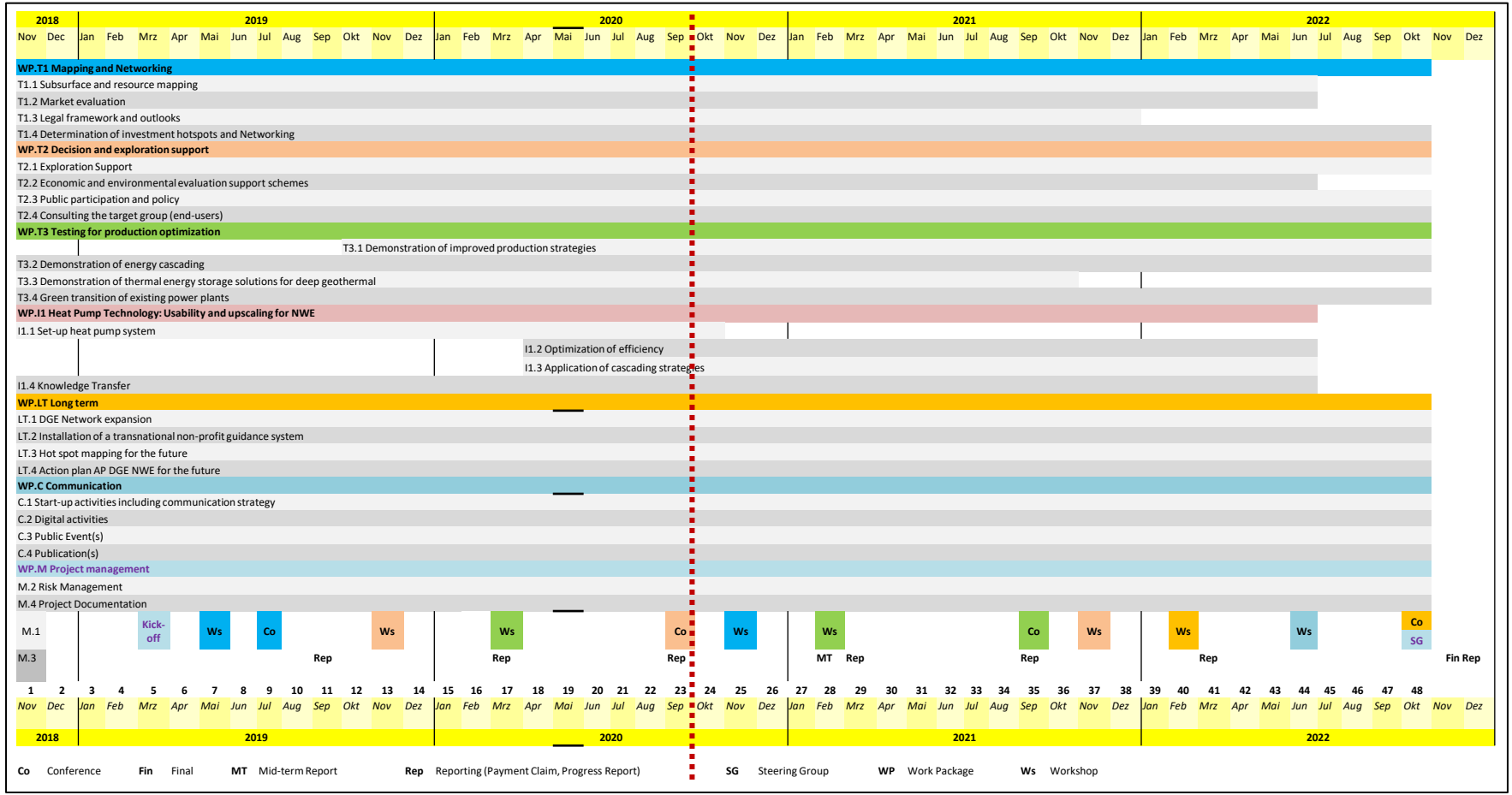
vito

WPs Investment

WP I Heat Pump Technology: Usability and upscaling for NWE

Fraunhofer IEG

DGE ROLLOUT – Deep Geothermal Energy for NW-Europe



What happened 2019?

Organisation & management

Geologischer Dienst NRW

europize realising projects

Communication & public relations

Fraunhofer IEG

europize realising projects

Geologischer Dienst NRW

Balmatt geothermal test site

vito

Weisweiler: from the idea to the 3D-model

Geologischer Dienst NRW

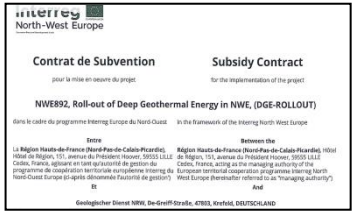
Trans-national mapping

TNO innovation for life

Geological Survey of Belgium

Geologischer Dienst NRW

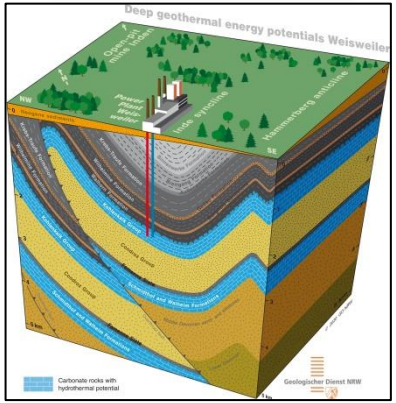
brgm

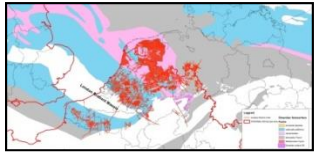

Interreg North-West Europe

Contrat de Subvention — Subsidy Contract

NWE892, Roll-out of Deep Geothermal Energy in NWE, (DGE-ROLLOUT)

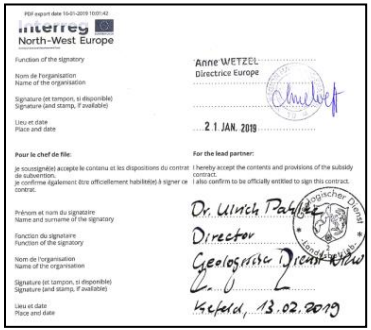
NRW connect EXTERN

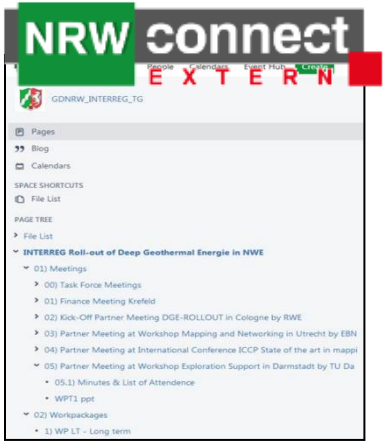




2019: Organisation & management

- Contracts, agreements
- NRW connect EXTERN: transnational data platform
- Finance controlling and reporting
- Minutes, minutes, minutes
- Four DGE ROLLOUT Partner Meetings including one int. conference





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

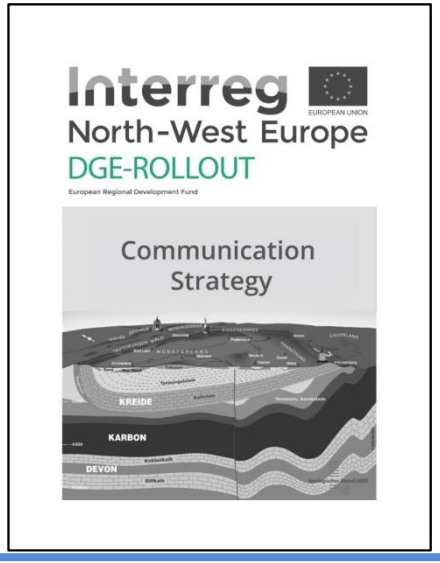
2019: Communication & public relations

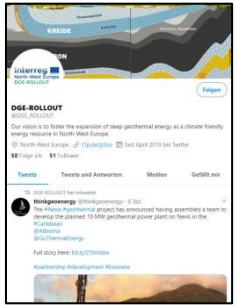
Communication Strategy

Exhibition at German Mining Museum

Homepage, Twitter

Networking





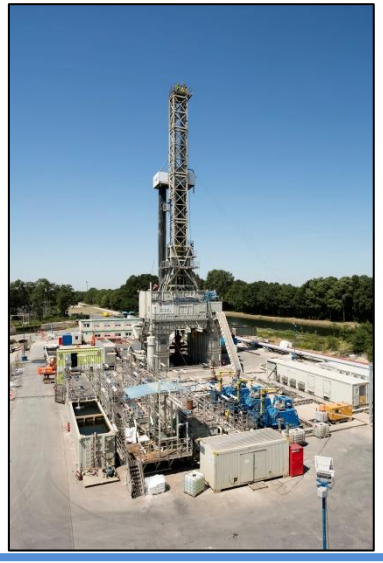
2019: Balmatt geothermal test site

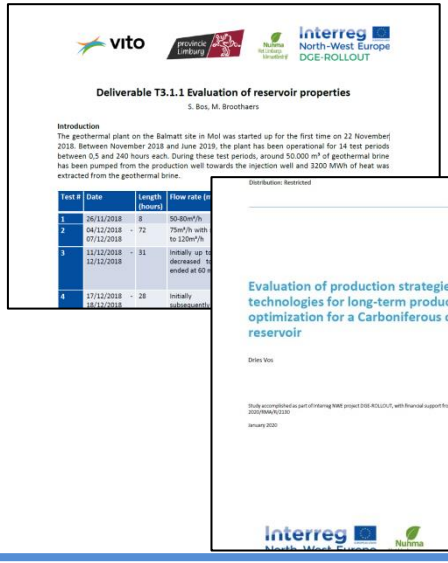
14 test periods

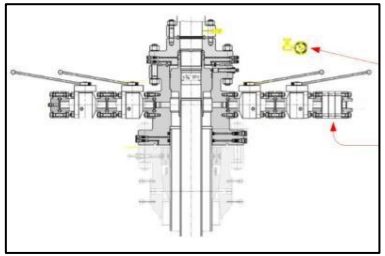
Evaluation of reservoir properties

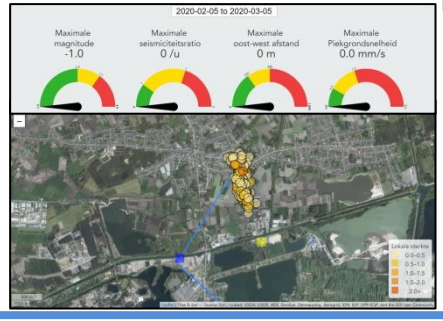
Seismometer Network

Challenges with gas in/out of solution



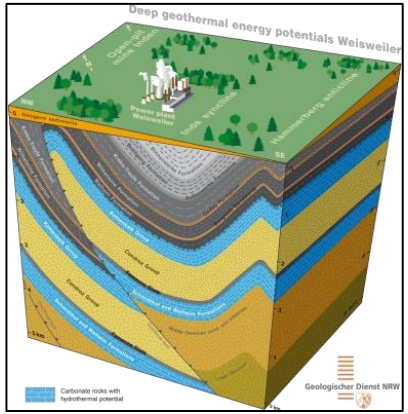


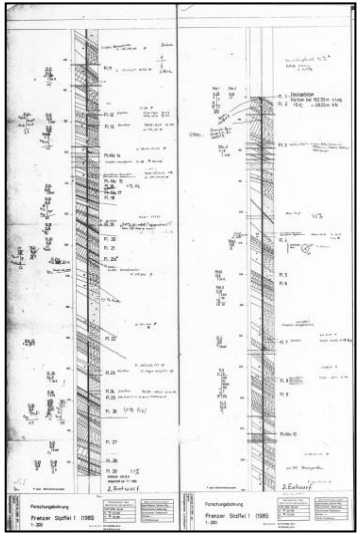


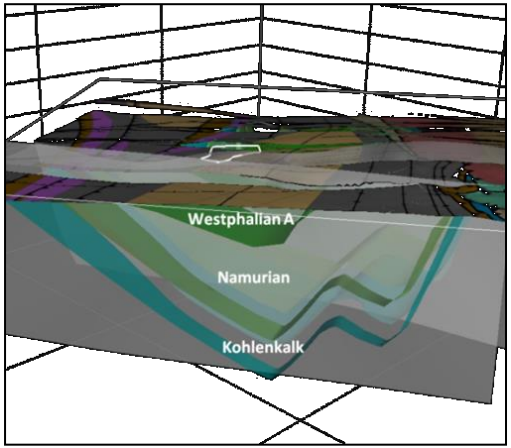


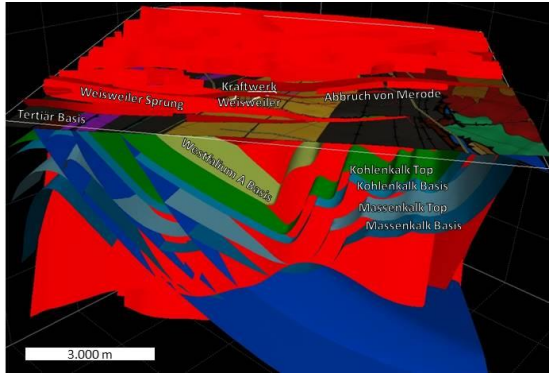
2019: Weisweiler: from the idea to the 3D-model

Idea	Data research	Processing	Finalised 3D-model





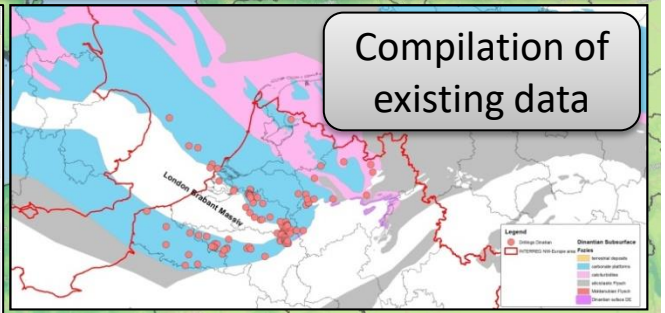




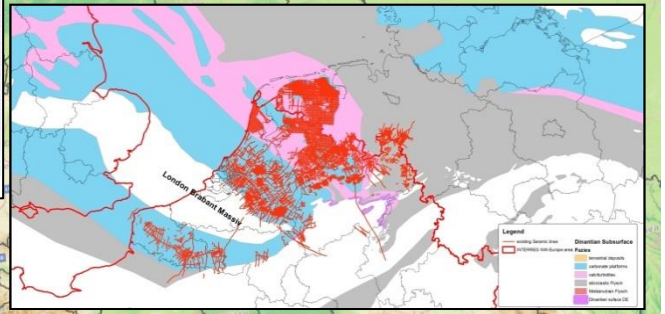
2019: Transnational mapping

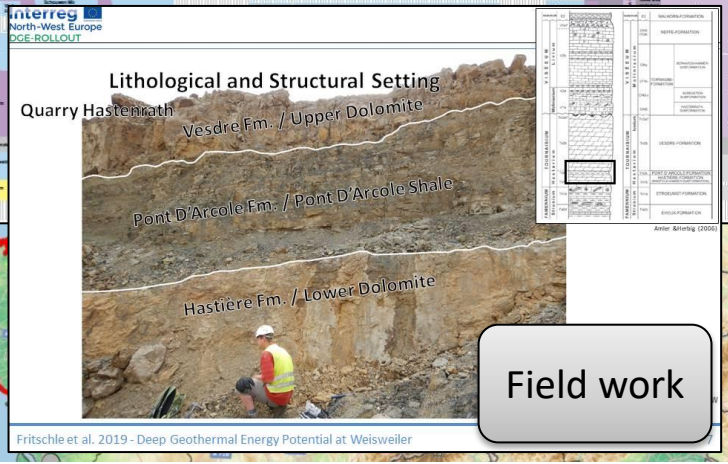
Data research

Preliminary results

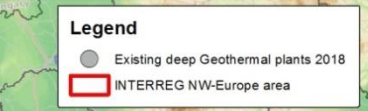


Compilation of existing data





Field work



What happens 2020?

Depth and thickness map of Dinantian lime-stone reservoir

TNO innovation for life, vito, ebn, Geologischer Dienst NRW, Geological Survey of Belgium, brgm, TECHNISCHE UNIVERSITÄT DARMSTADT

Heat pump system delivery

Fraunhofer IEG

Weisweiler: drilling and HEATFLOW 3D-model

Fraunhofer IEG, Geologischer Dienst NRW, DMT, RWE

Mapping moves east: DEKORP seismics

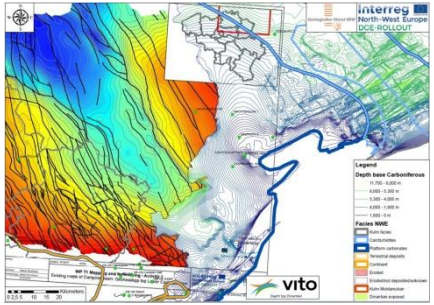
DMT

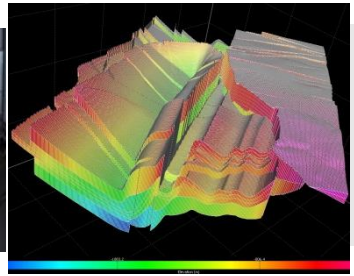
Geother-mal heat storage projects

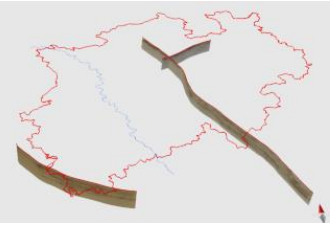
Fraunhofer IEG, TECHNISCHE UNIVERSITÄT DARMSTADT

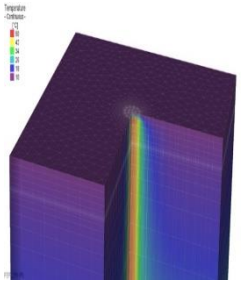
Drillings Heiligen-haus and Wupper-tal

Geologischer Dienst NRW



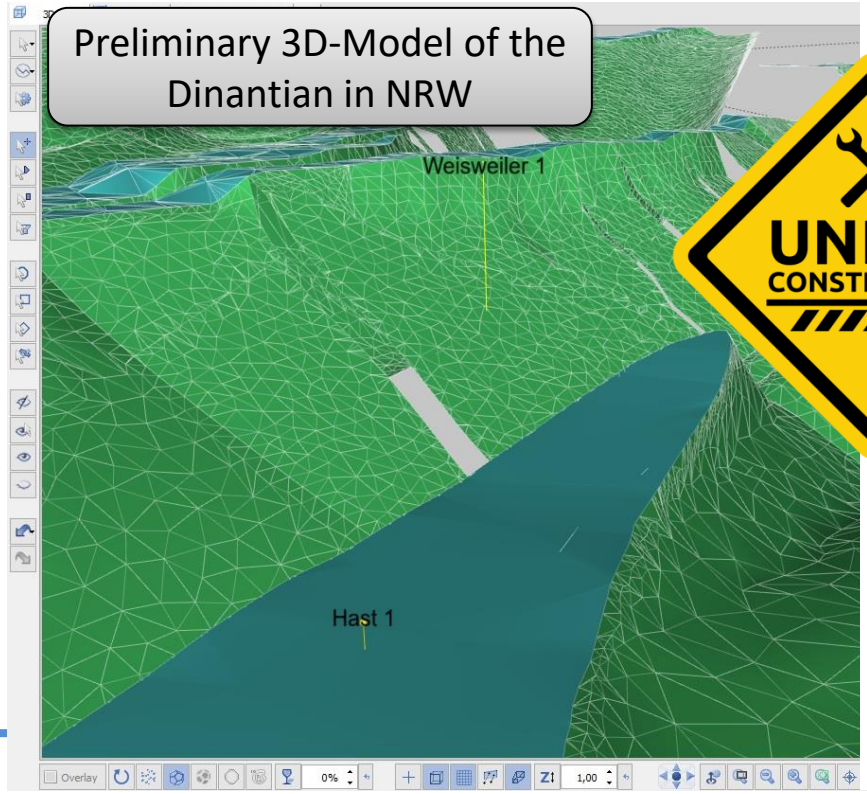


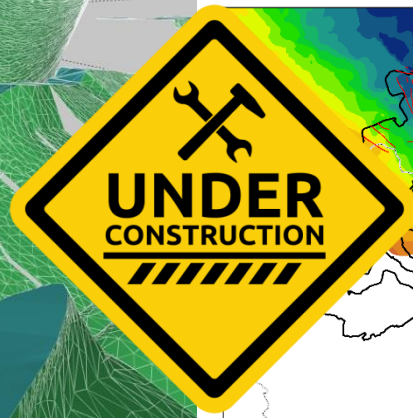




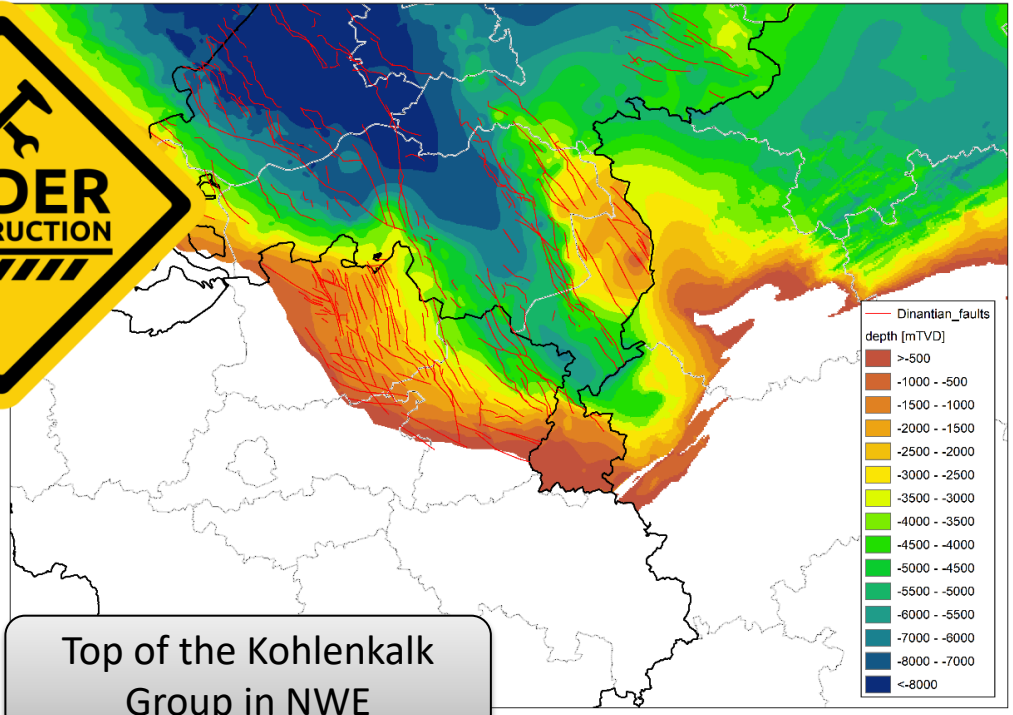
2020: Depth and thickness map of Dinantian limestone reservoir

Preliminary 3D-Model of the Dinantian in NRW



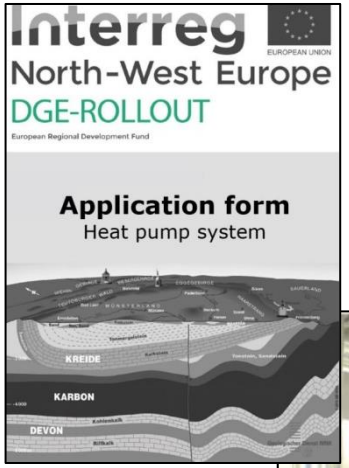


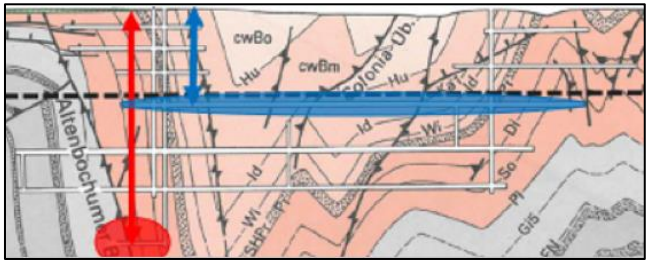
Dinantian: depth top and faults

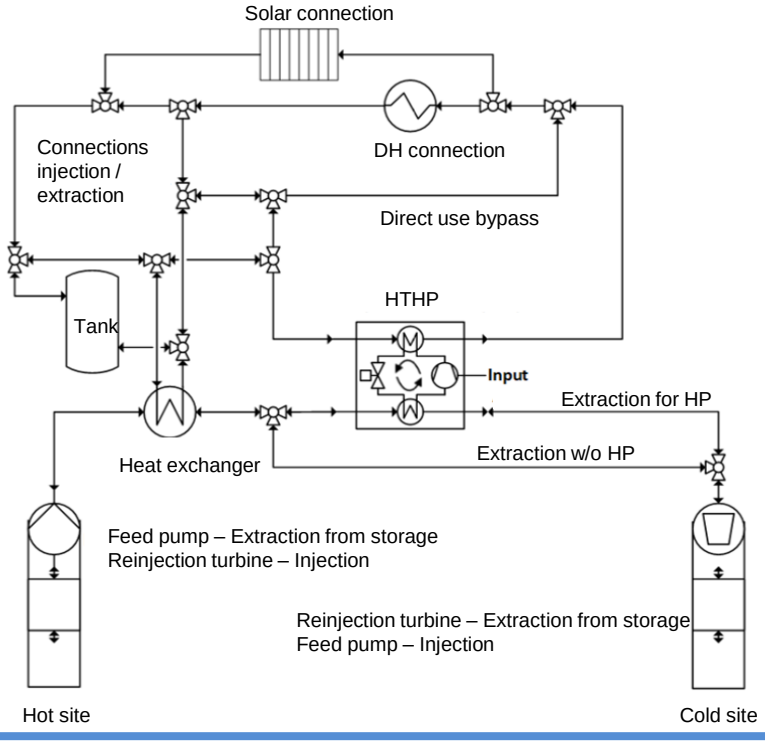


Top of the Kohlenkalk Group in NWE

2020: Heat pump system delivery







Outlook

2020: Weisweiler: drilling and HEATFLOW 3D-model

Fraunhofer IEG

Geologischer Dienst NRW

DMT

Section_15

Exploration borehole
Production borehole

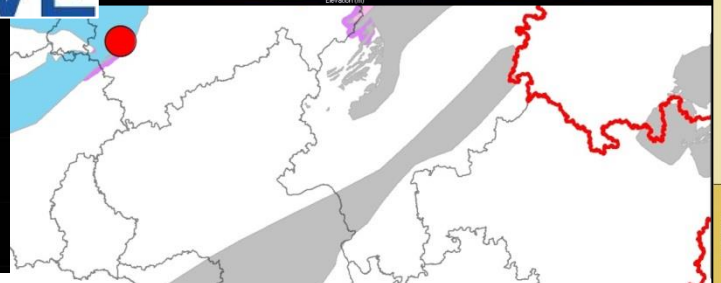
Weisweiler

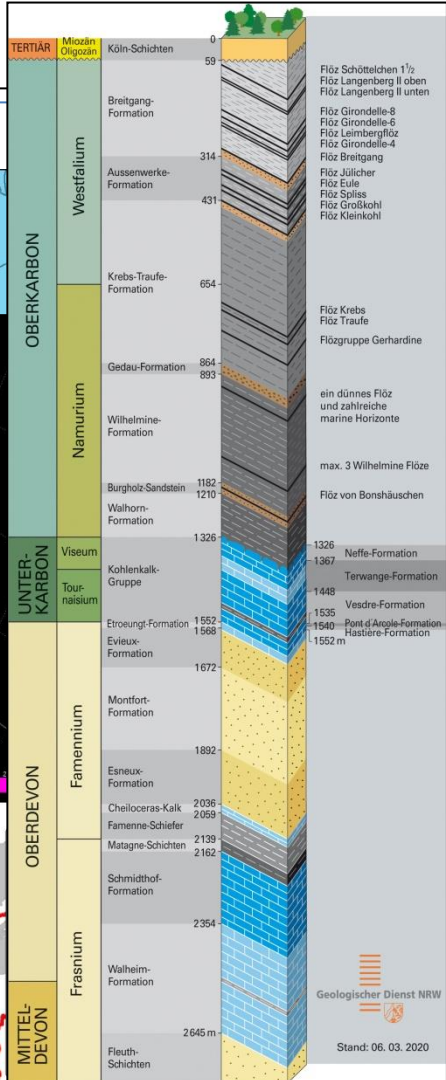
Kohlenkalk

Massenkalk

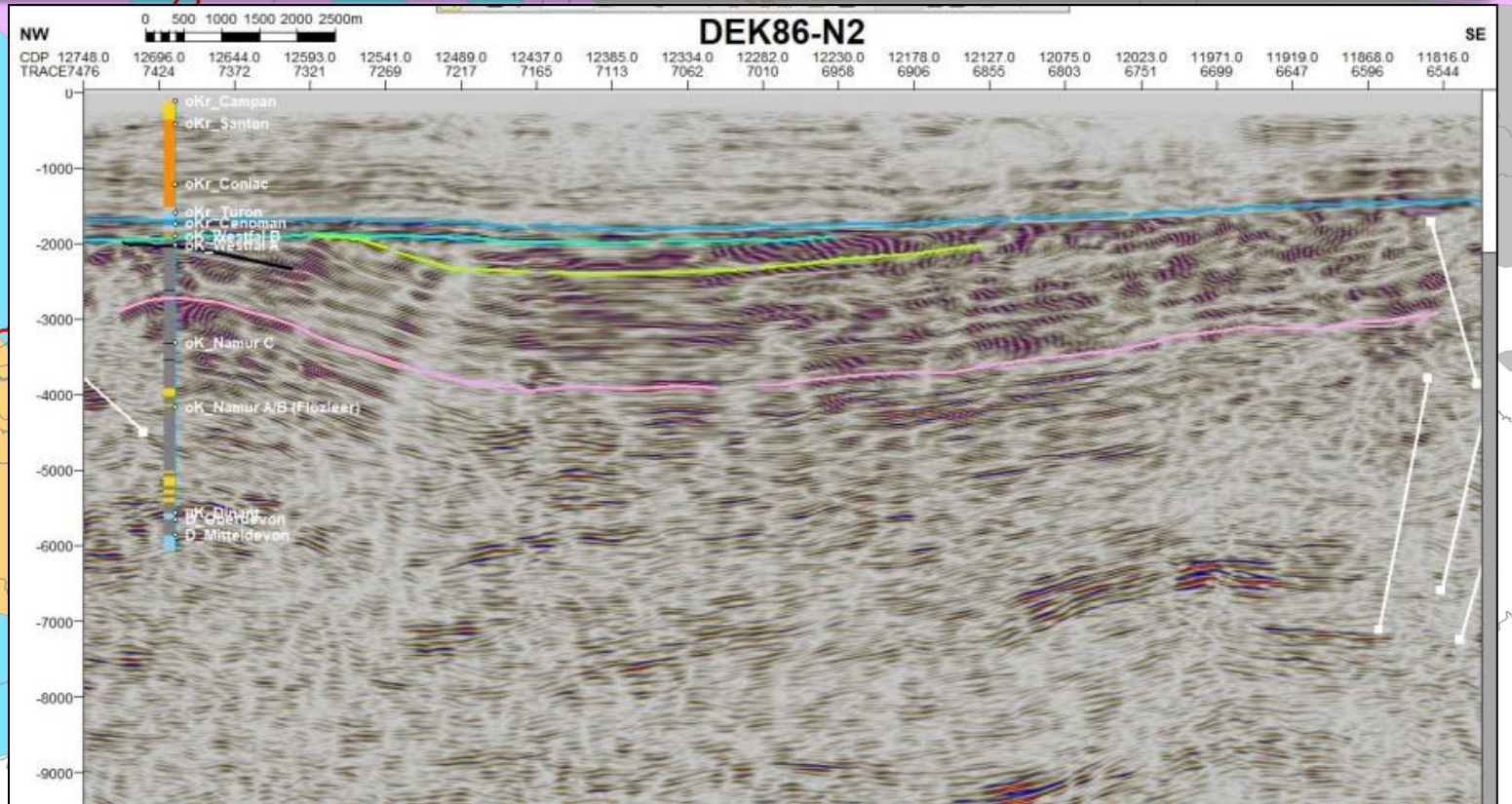
RWE

cn_b – 1200 m
cdk_b – 1400 m
dfa_b – 2000 m
dgfk_b – 2500 m



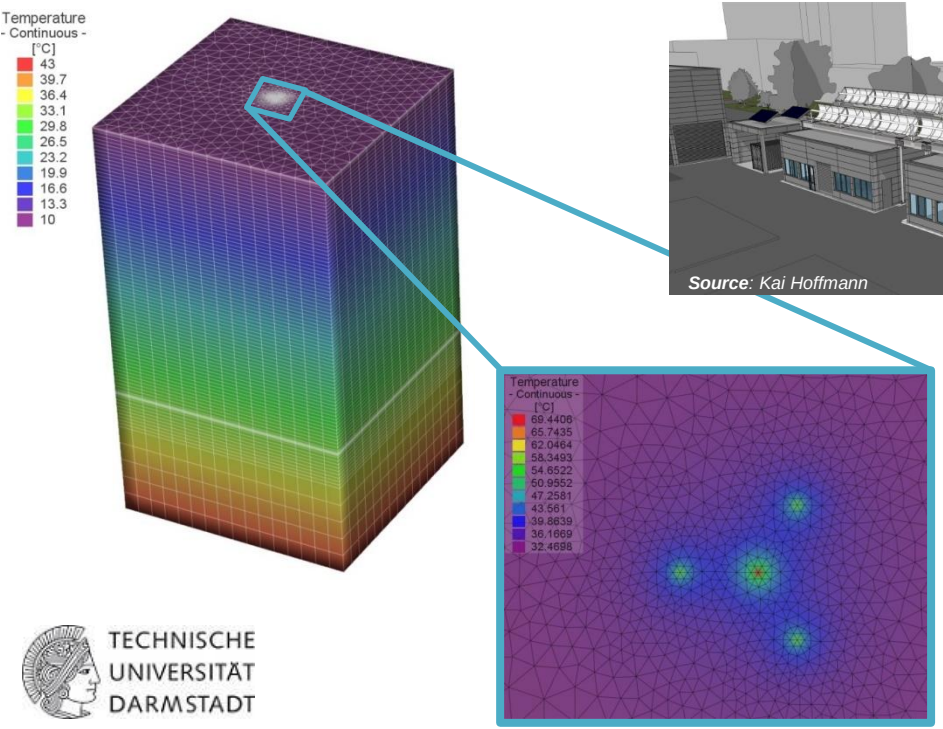


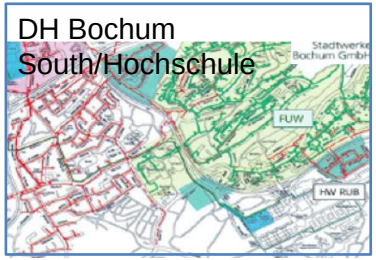
2020: Mapping moves east: DEKORP seismics



DMT

2020: Geothermal heat storage projects





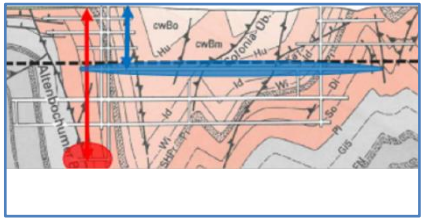
Fraunhofer IEG

Heating season

Concentrated solar @GZB

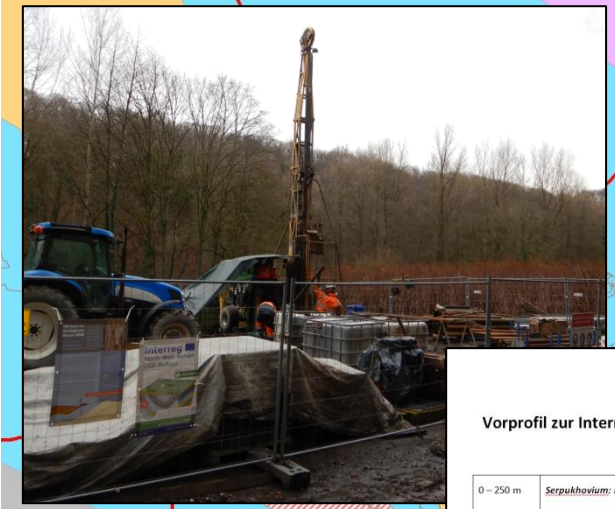
Summer

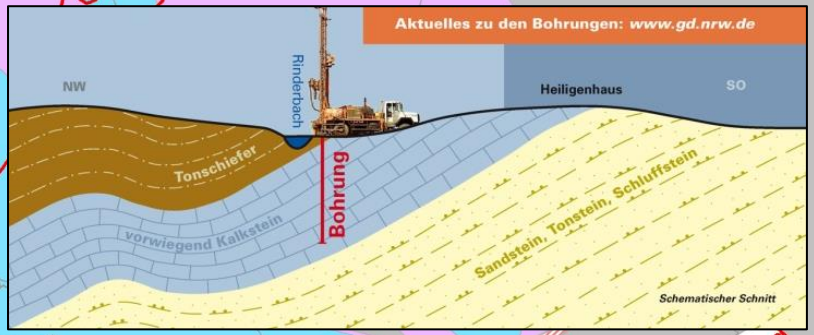
Heating season



TECHNISCHE UNIVERSITÄT DARMSTADT

2020: Drillings Heiligenhaus and Wuppertal



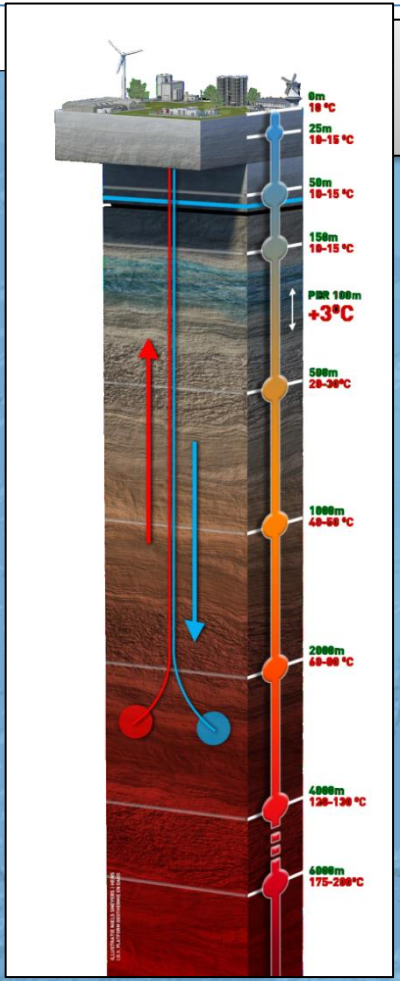


Vorprofil zur Interreg-Bohrung 2020: „Herzkamper Mulde“

(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 Preußen: Horizont der Hangenden Alaunschiefer]*** fein-laminierte, sehr fossilreiche und organisch-reicheTonsteine mit vulkaniklastischen Zwischenlagen und eingeschalteten dünnen kalkigen Horizonten von wenigen Millimetern Mächtigkeit. [Mächtigkeit: 5-20 m]
265 – 275 m	***Viseum: Bromberg-Fm. (ehemals Kalkbänderschiefer/Posidonienschiefer)*** Wechsellagerung 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 kieselige Sequenz können sporadisch wenige, maximal 15 cm mächtige Kalkstein-Bänke eingeschaltet sein. Diese sind im unteren Abschnitt splittrig 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 Preußen: Horizont der Lydite und Kieselkalke)***

Thank you!


0m
10 °C
25m
10-15 °C
50m
10-15 °C
150m
10-15 °C
PBR 100m
+3°C
500m
20-30°C
1000m
40-60 °C
2000m
60-90 °C
4000m
120-130 °C
6000m
175-200°C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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