



Unia Europejska. Europejski Fundusz Rozwoju Regionalnego: Inwestujemy w waszą przyszłość/
Europäische Union. Europäischer Fonds für regionale Entwicklung: Investition in Ihre Zukunft

Geothermal mapping – a tool to support development of shallow geothermal energy sources.

Example of Polish-Saxon transboundary project TransGeoTherm

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Państwowy Instytut Geologiczny – Państwowy Instytut Badawczy, Oddział Dolnośląski

PolSCA meeting, 06.11.2013, Brussels



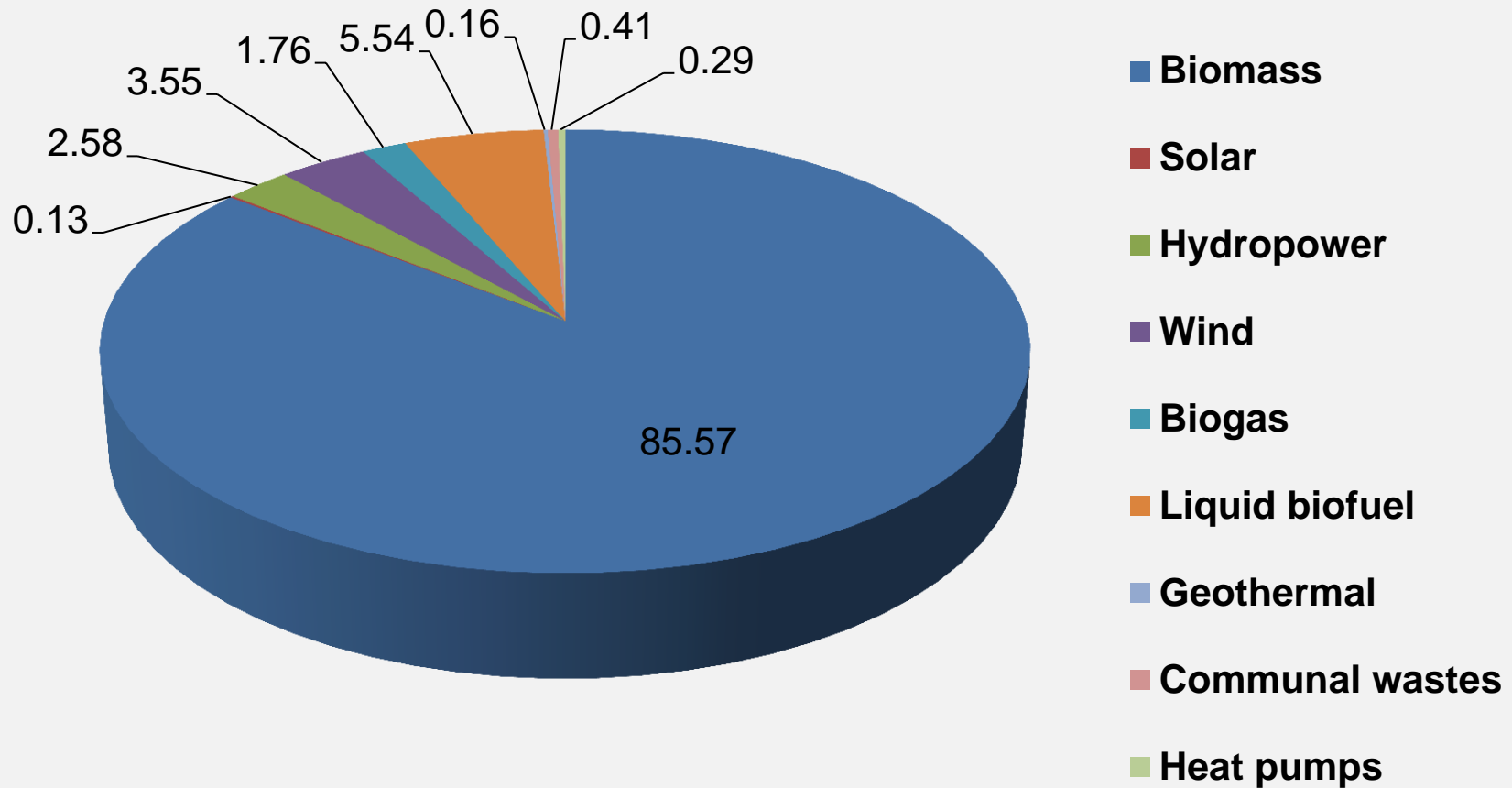
**Państwowy Instytut Geologiczny
Państwowy Instytut Badawczy**

www.pgi.gov.pl

Outline of presentation:

- Renewable energy in Poland
- Low temperature geothermal energy as a renewable energy source
- Geological and hydrogeological settings
- Geothermal mapping
- Basic information about the TransGeoTherm project
- Practical application of project results
- Dissemination of project results

Production of renewable energy in Poland in 2011 in %

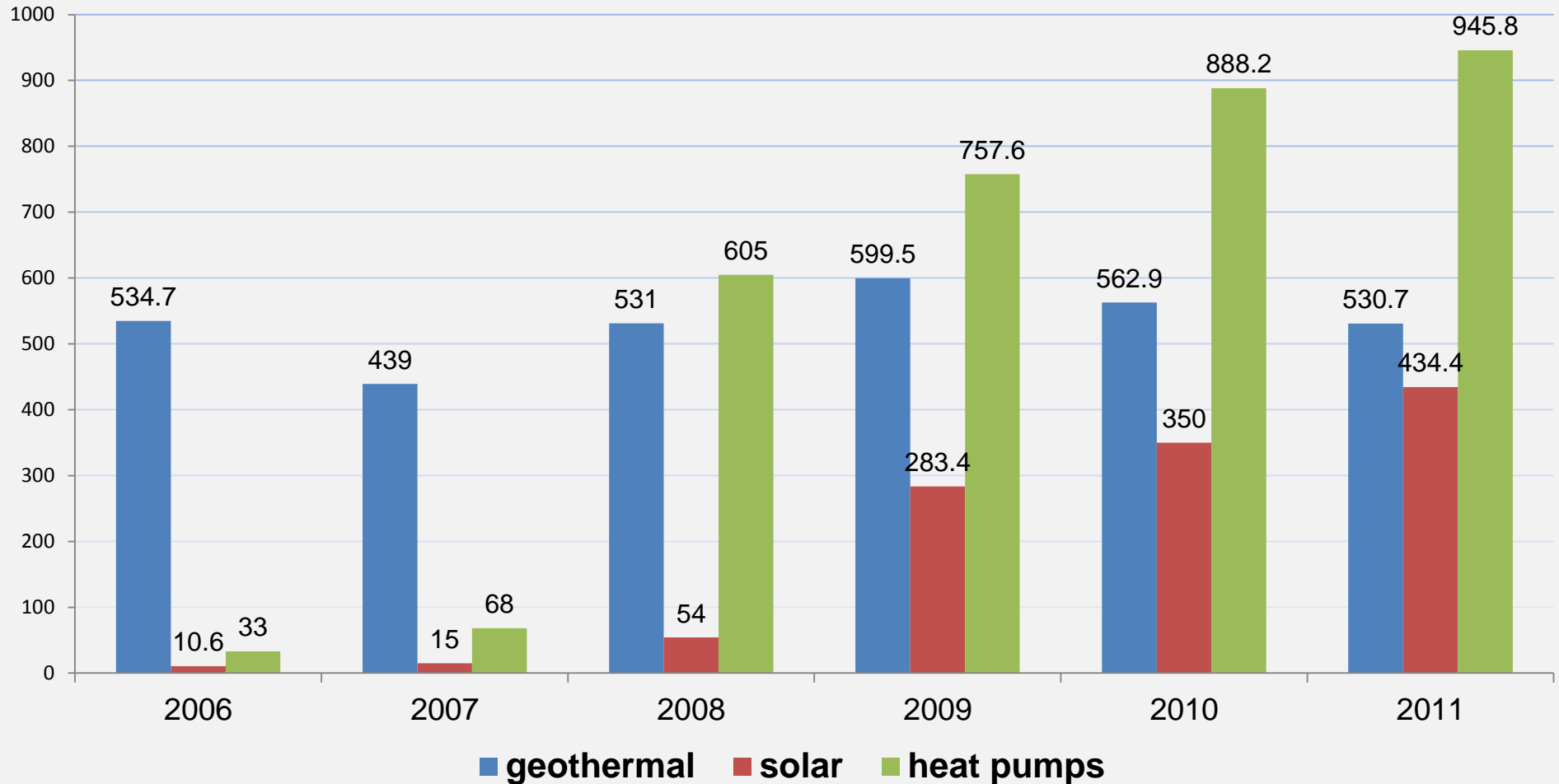


In 2011 renewable energy in Poland was 11.2% of total energy production



Renewable energy in Poland in 2006-2011

Total amount of heat in TJ



Ground source heat pumps in Poland in 2012

Amount of GSHP installations	Total power [MW]	Total Production [GW / year]	Power per unit [kW / unit]	Annual operating time of an average GSHP unit
ca. 30 000	330,0	470,0	11,0 (est.)	1 424



Low temperature geothermal energy

Low temperature geothermal energy
20-30 deg. C

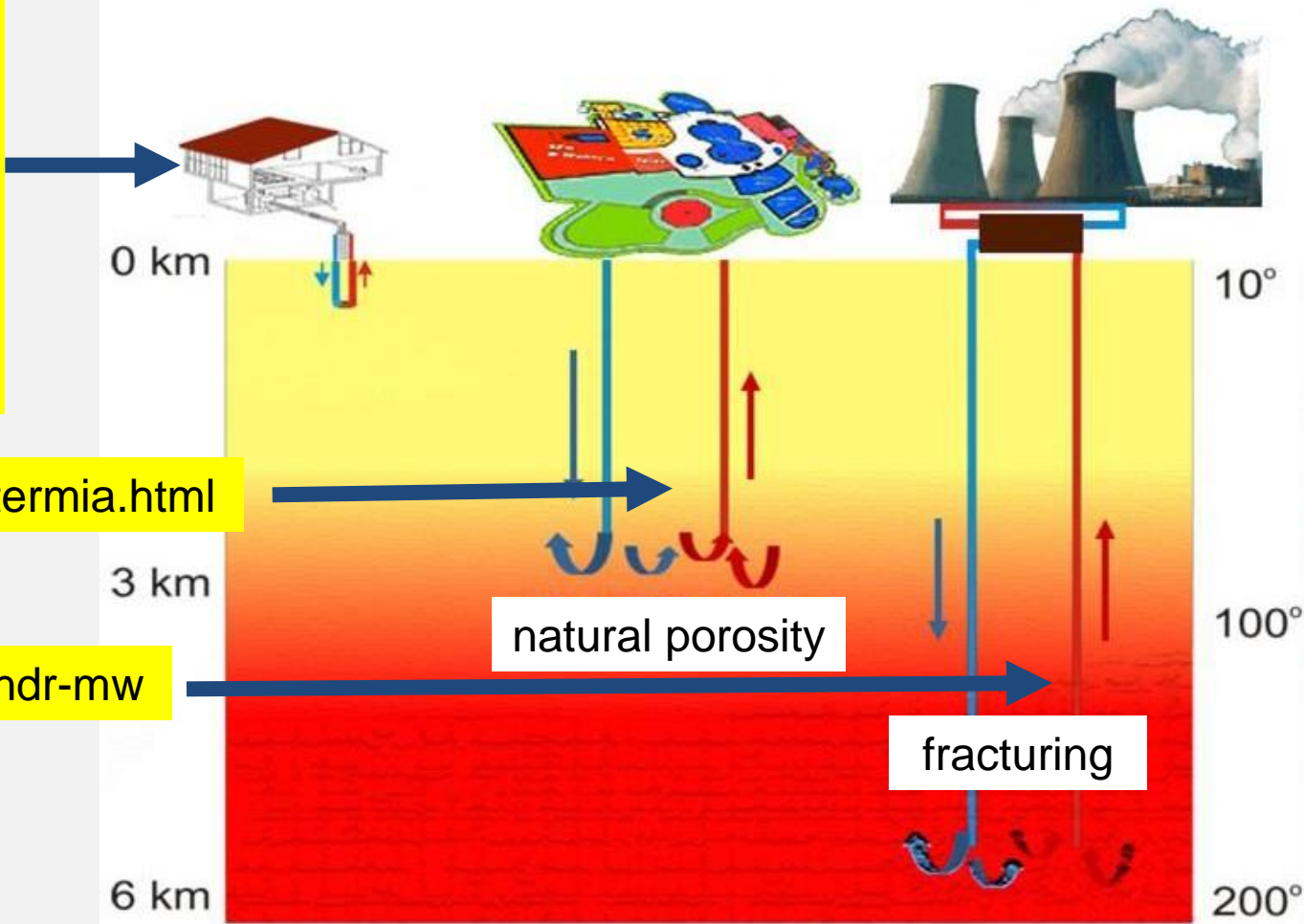
High temperature hydrogeothermal energy
up to 100 deg. C

Hot Dry Rock

Low temperature geothermal energy is used in heat pumps installations equipped with a vertical heat exchanger and closed circulation system

<http://mineralne.pgi.gov.pl/geotermia.html>

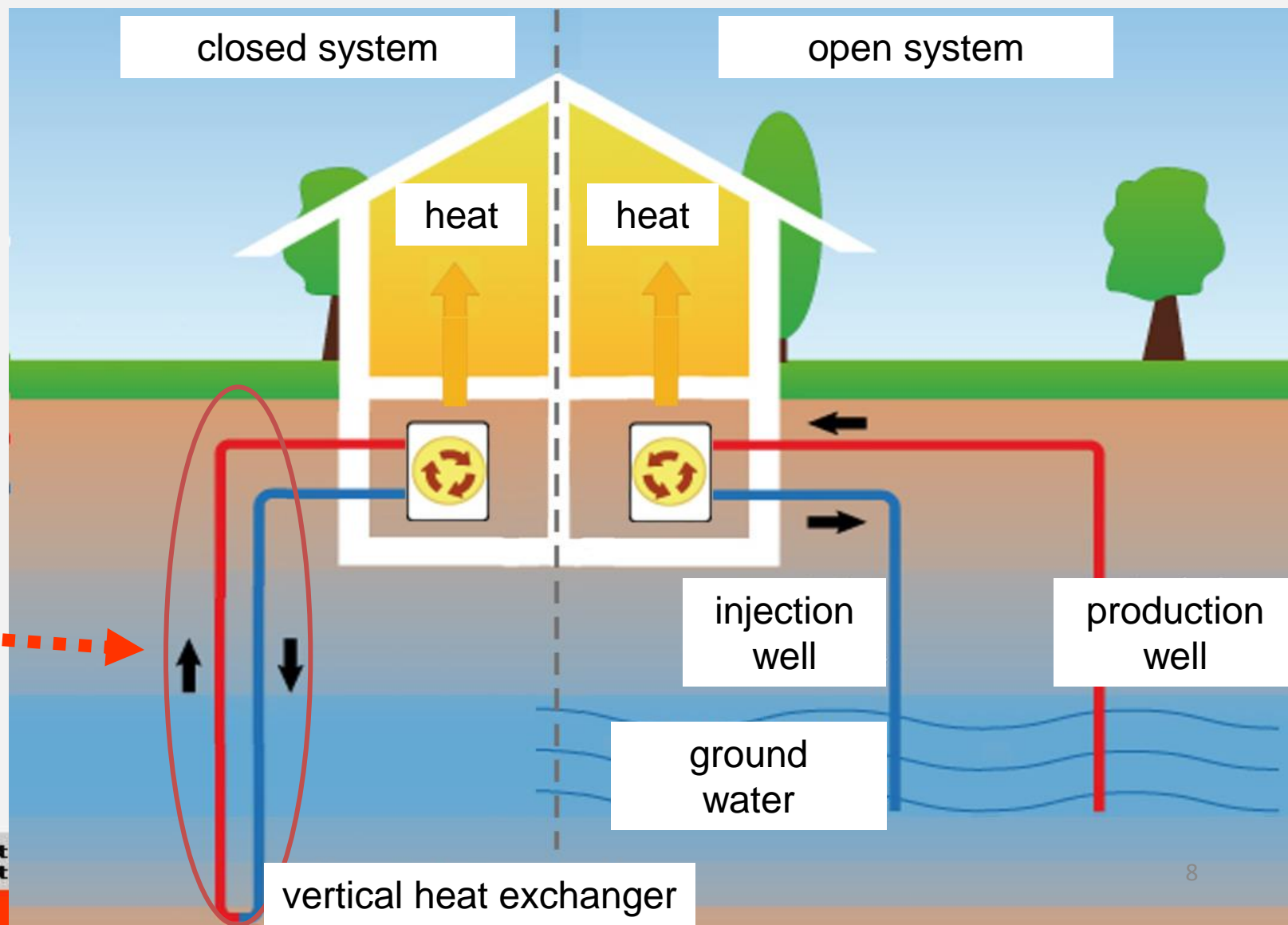
<http://www.pgi.gov.pl/pl/wstep-hdr-mw>



Types of heat pump installations

Attention!

For the closed system the most crucial factors are: type of rock and its physical properties and presence of groundwater



Geological and hydrogeological settings

Basic geothermal property of a rock is its **THERMAL CONDUCTIVITY**.
Calculation of this property has a crucial meaning for setting a heat pump installation.

Values of **THERMAL CONDUCTIVITY** of rocks vary normally between 0.4 to 7.0 **W/m*K**. These values are normally calculated based on laboratory analyses of the selected rock samples.

The highest values of **THERMAL CONDUCTIVITY** show the rocks with high quartz content as well as the heavily groundwater saturated rocks.

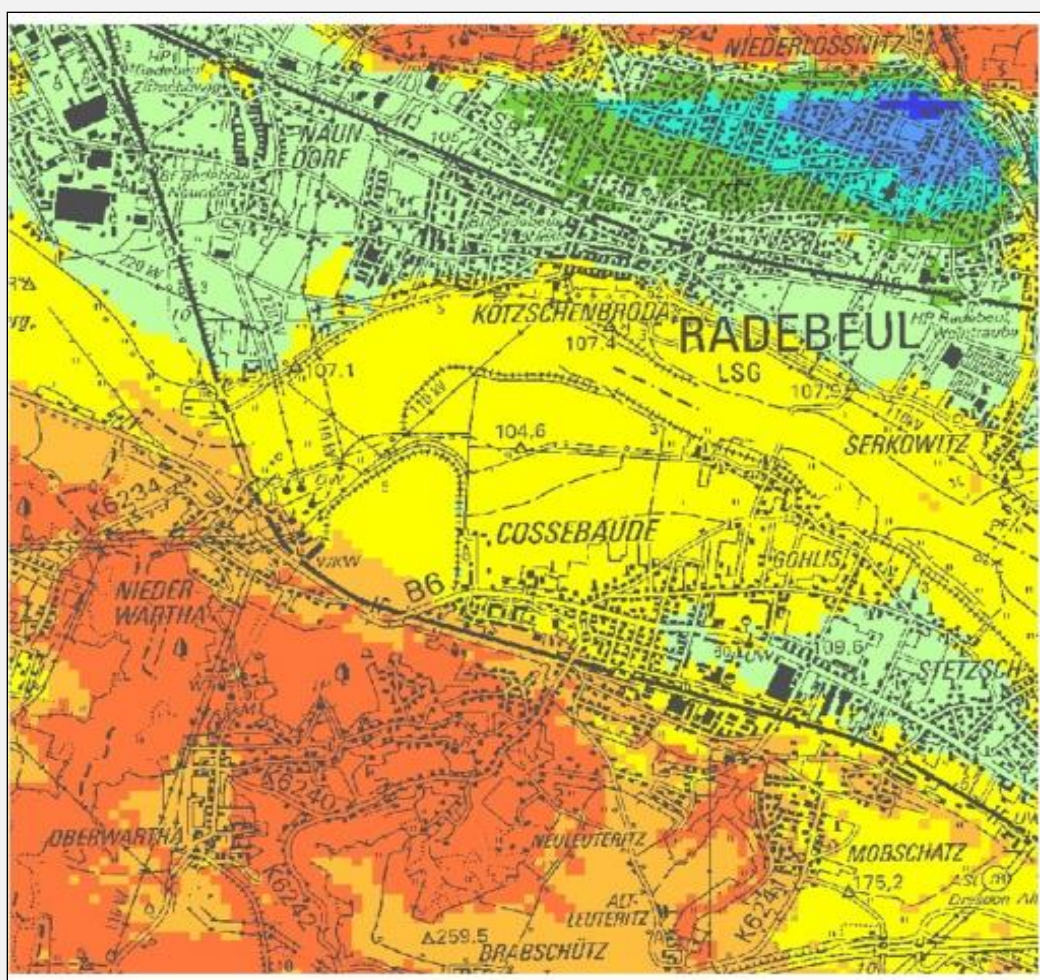
Geological and hydrogeological settings

A valuable practical indicator of geothermal properties of underground (rocks) is so-called **COEFFICIENT OF GEOTHERMAL HEAT EXTRACTION** as obtained from 1 meter of a borehole and expressed in **W/m**.

The **COEFFICIENT** is calculated with respect to average annual operating time of a heat pump installation in a family house per year – 1 800 hours (hot water) or 2 400 hours (hot water and heating)

Type of rock	Geothermal power coefficient W/m / Average annual operating time of a heat pump	
	1 800 hours	2 400
Dry gravels and sands	<25	<20
Clays, tills	35-50	30-40
Magmatic rocks (i.e. basalts)	40-65	35-55
Limestones	55-70	45-60
Water saturated gravels and sands	60-80	55-65
Sandstones	65-80	55-65
Acid magmatic rocks (i.e. granites)	65-85	55-70
Gneisses	70-85	60-70
Heavily water saturated gravels and sands	80-100	80-100

Geothermal mapping in Saxony



Geothermisches Kartenwerk 1:50.000 (GTK 50)

Blatt L4946 Meißen



Herausgeber:
Sächsisches Landesamt
für Umwelt, Landwirtschaft
und Geologie

0 0,5 1 2 Kilometer



Mean geothermal heat extraction in watts per meters (W/m)

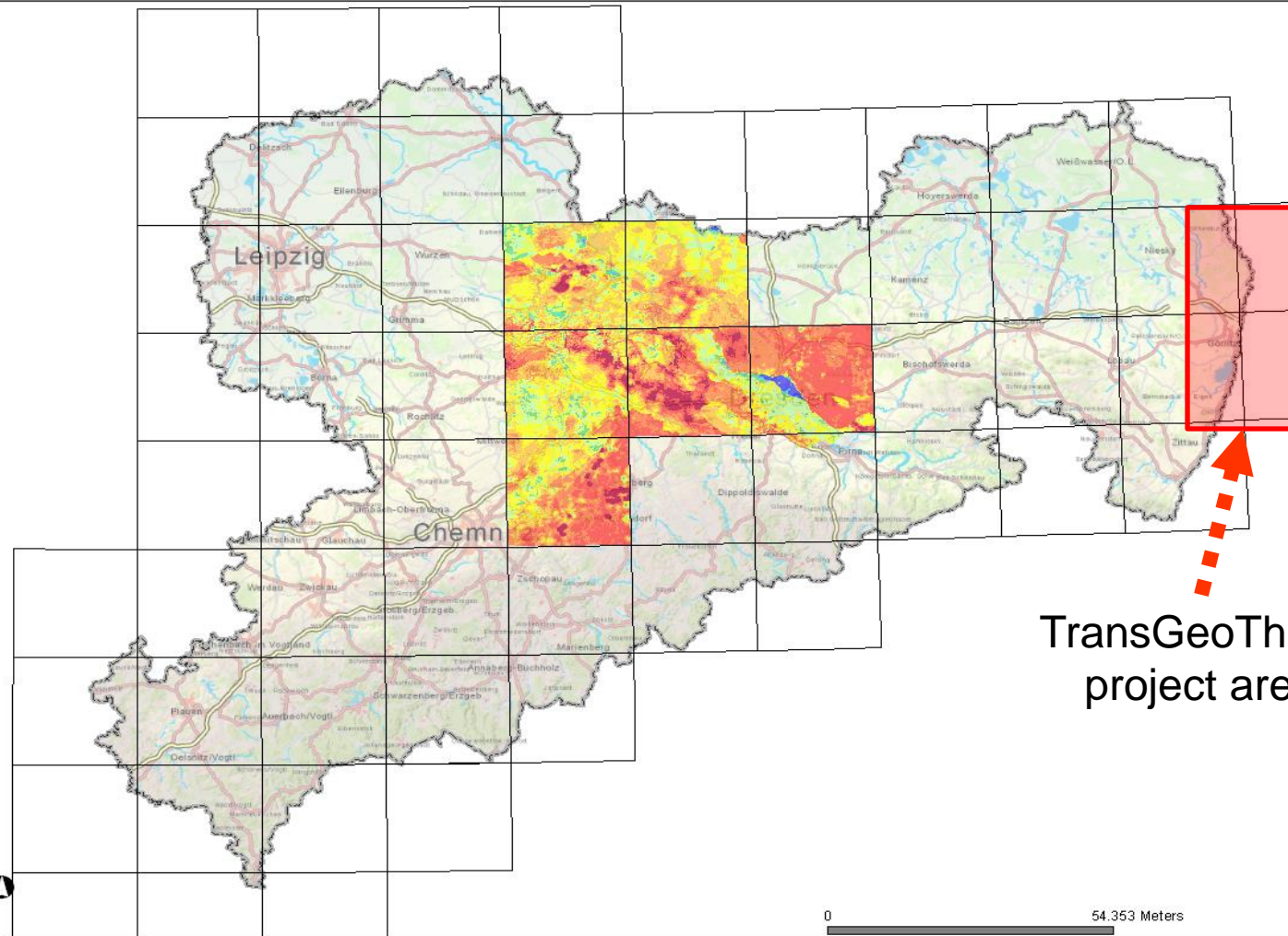
Depth: 0 to 40 m

Annual operating time of heat pump: 1800 h



Geothermal mapping in Saxony

GTK50 Geothermische Potenzialkarte



TransGeoTherm
project area

Thema

Die Themen der Entzugsleistungen sind aufgrund der fachlichen Korrektheit nur einzeln zu aktivieren.

Sichtbar Aktiv

- Blattschnitt TK50
 - Entzugsleistung in Watt pro Meter für 1800 Betriebsstunden - bis 40m Bohrtiefe
 - Entzugsleistung in Watt pro Meter für 1800 Betriebsstunden - bis 70m Bohrtiefe
 - Entzugsleistung in Watt pro Meter für 1800 Betriebsstunden - bis 100m Bohrtiefe
 - Entzugsleistung in Watt pro Meter für 1800 Betriebsstunden - bis 130m Bohrtiefe
 - Entzugsleistung in Watt pro Meter für 2400 Betriebsstunden - bis 40m Bohrtiefe
 - Entzugsleistung in Watt pro Meter für 2400 Betriebsstunden - bis 70m Bohrtiefe
 - Entzugsleistung in Watt pro Meter für 2400 Betriebsstunden - bis 100m Bohrtiefe
 - Entzugsleistung in Watt pro Meter für 2400 Betriebsstunden - bis 130m Bohrtiefe
- Kreise
- Gemeinden
- Grundkarte
- Bundesstrassen
- Siedlung

Karte aktualisieren

Erläuterungen zur GTK50

- Erstinformation zur Nutzbarkeit oberflächennaher Geothermie.
- Kein Rechtsanspruch aus diesen Informationen!
- Haftungsausschluss!

Ansprechpartner:

Karina Hofmann

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E-Mail: karina.hofmann@smul.sachsen.de

Geobasisdaten:

© Landesvermessungsamt Sachsen

Geofachdaten:

© Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie

<http://www.umwelt.sachsen.de/umwelt/geologie/18992.htm>

Vergößern



www.pgi.gov.pl

Geothermal mapping in Saxony

GTK50 Geothermische Potenzialkarte

selectable Layer
 - e.g.: selected layer is „heat extraction“ until 40 m depth and 1800 h operating time
 - layer „drinking water zones / groundwater“ is selected

available features

legend
 heat extraction in watts per meters for 1800 annual operating hours - until 40 m depth

≤40
40,0 - 42,5
42,5 - 45,0
45,0 - 47,5
47,5 - 50,0
50,0 - 52,5
52,5 - 55,0
55,0 - 57,5
57,5 - 60,0
>60,0

query, informations
 with ● you can get informations about existing drinking water zones in form of a list.

Thema

- Blattschnitt TK50
- Kreisgrenze
- Grundkarte 1:100.000
- Vegetation (nur mit Grundkarte)
- Trinkwasserschutzgebiete (Grundwasser)
- Trinkwasserschutzgebiete (Oberflächenwasser)
- Trinkwasserschutzgebiete (Talsperren)
- Heilquellenschutzgebiete
- Entzugsleistung in Watt pro Meter für 1800 Betriebsstunden - bis 40m Bohrtiefe
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Karte aktualisieren

Erläuterungen zur GTK50

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Geobasisdaten:
 © Landesvermessungsamt Sachsen

Geofachdaten:
 © Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie

Trinkwasserschutzgebiete (Grundwasser)

Rec	FID	Zone	Teilzone	Name
1	1301	II-Q1		WW I Riesa-Gohla

Identifizieren

source: Karina Hofmann, LfULG

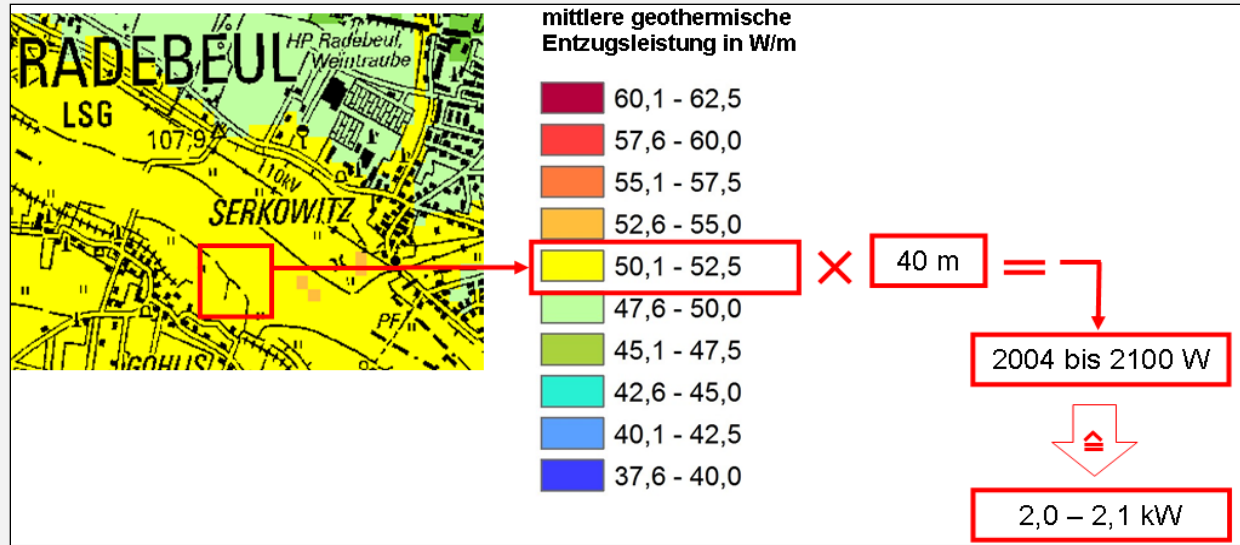
Geothermal mapping in Saxony

example: one family house, 12 kW heating demand, only heating



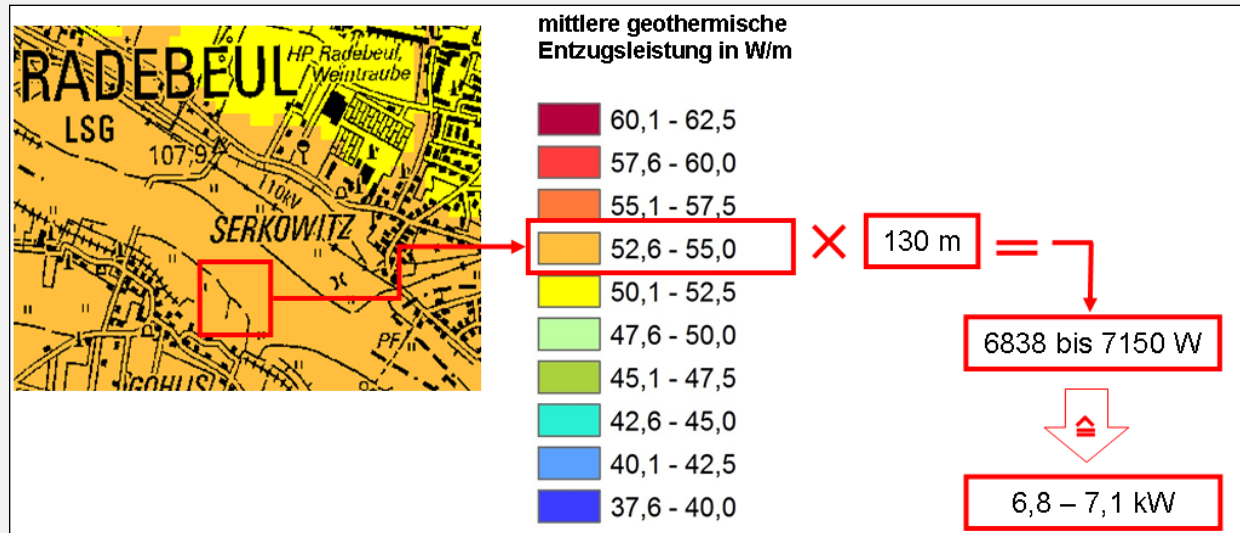
6 boreholes with 40 m depth

1800 annual operating hours, until 40 m drilling-depth



2 boreholes with 130 m depth

1800 annual operating hours, until 130 m drilling-depth



Basic information about the project

Title: TransGeoTherm – Geothermal energy for transboundary development of the Neisse region. Pilot project

Co-operation of two partners:

Lead partner: Polish Geological Institute – National Research Institute
Lower Silesian Branch



Project partner:

LANDESAMT FÜR UMWELT,
LANDWIRTSCHAFT
UND GEOLOGIE



Freistaat
SACHSEN

Project is co-financed from the EU financial sources within the framework of the Operational Programme for Transboundary Co-operation Poland-Saxony 2007-2013

- agreement no: 100114097
- project life time: 01.10.2012 – 30.06.2014

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LANDESAMT FÜR UMWELT,
LANDWIRTSCHAFT
UND GEOLOGIE



Freistaat
SACHSEN

Project personnel:

Wiesław Kozdrój*, Maciej Kłonowski*, Adam Mydłowski*, Małgorzata Ziółkowska-Kozdrój,
Janusz Badura*, Bogusław Przybylski*, Dorota Russ*, Karol Zawistowski*, Ottomar Krentz**,
Karina Hofmann**, Peter Riedel**, Silke Reinhardt**, Mario Bretschneider**

Project goals:

- The main goal is to made available the results of geothermal modelling and mapping as a tool to support development of low temperature geothermal installations
- Secondary goal is to increase and popularise use of the low temperature geothermal energy as one of the sources of renewable energy with respect to reduction of CO₂ emissions
- Accomplishment of the project is based on innovative and advanced technology of analysis and interpretation of geological, geothermal and hydrogeological data as well as preparation of a 3D numerical model of subsurface

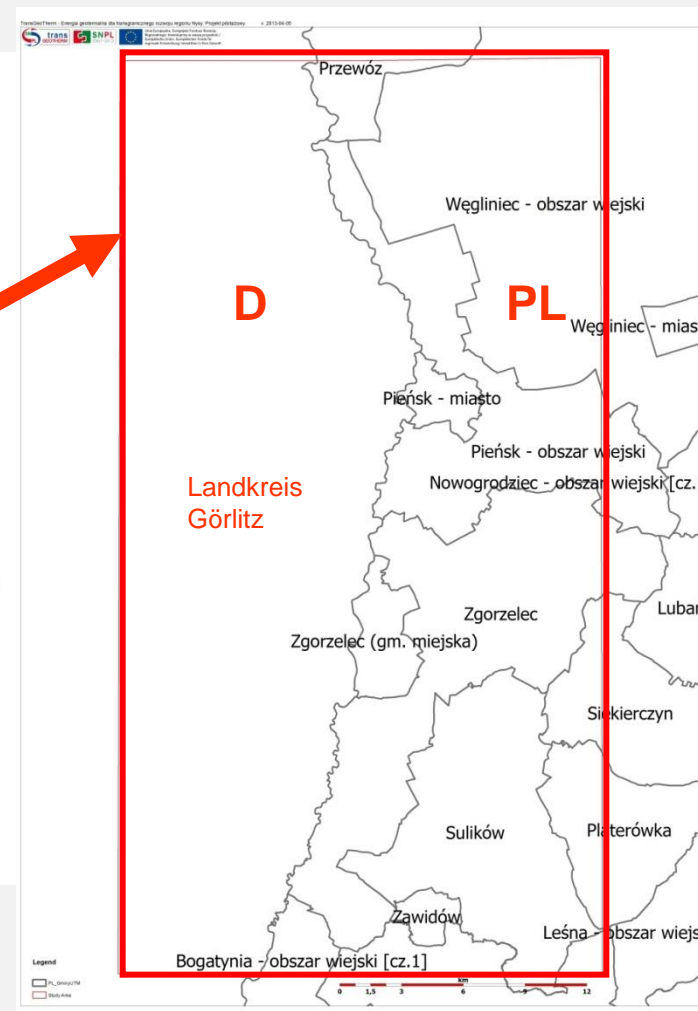
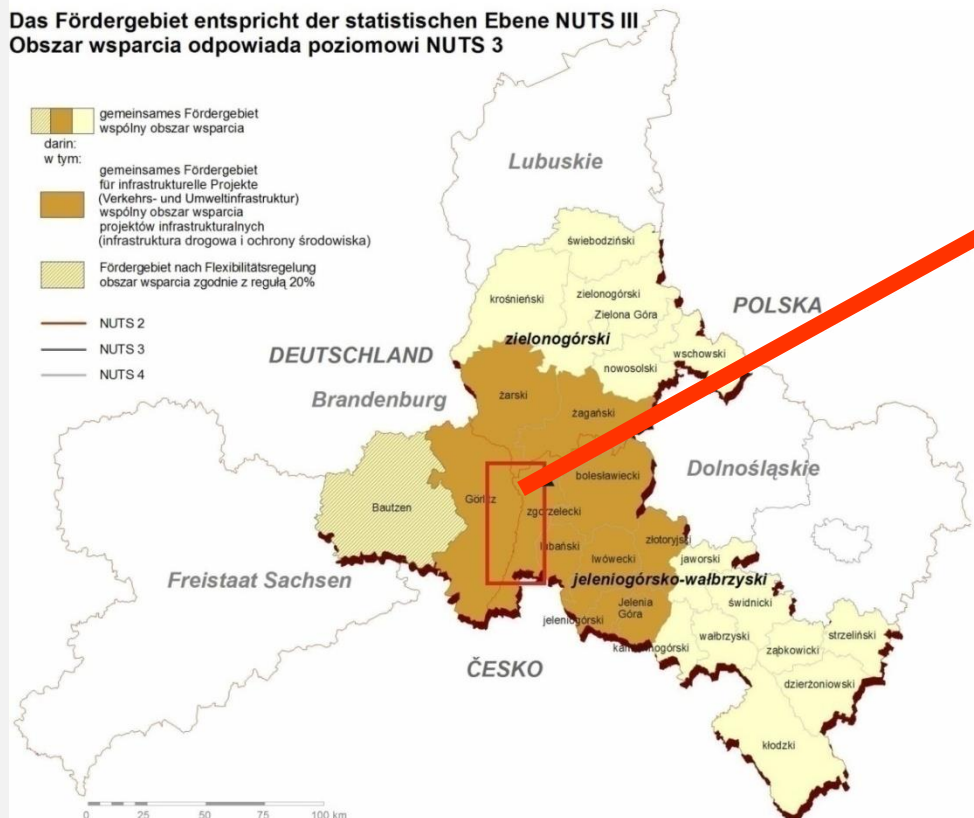
Planned results:

- A series of geothermal maps for the depths of 40, 70, 100 and 130 m
- A project website with embedded map browser

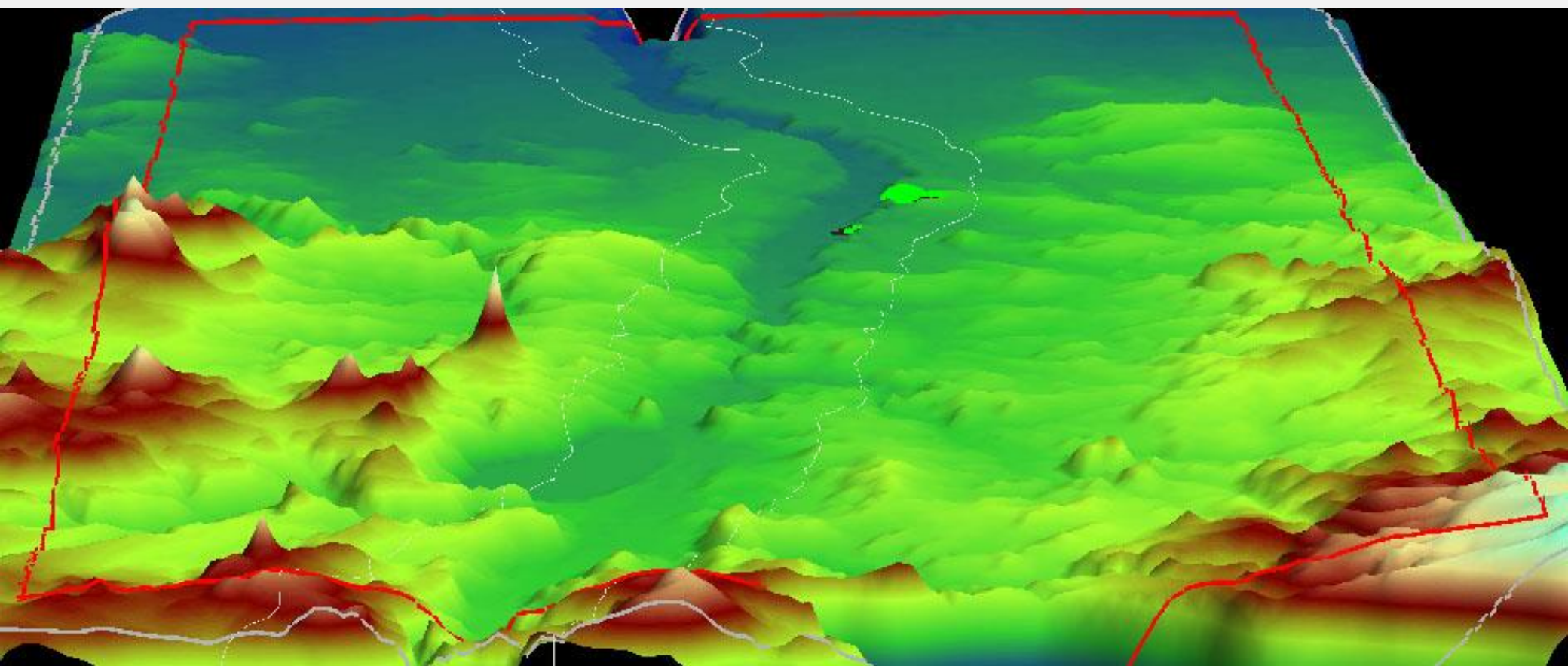
Project area:

Das Fördergebiet entspricht der statistischen Ebene NUTS III
Obszar wsparcia odpowiada poziomowi NUTS 3

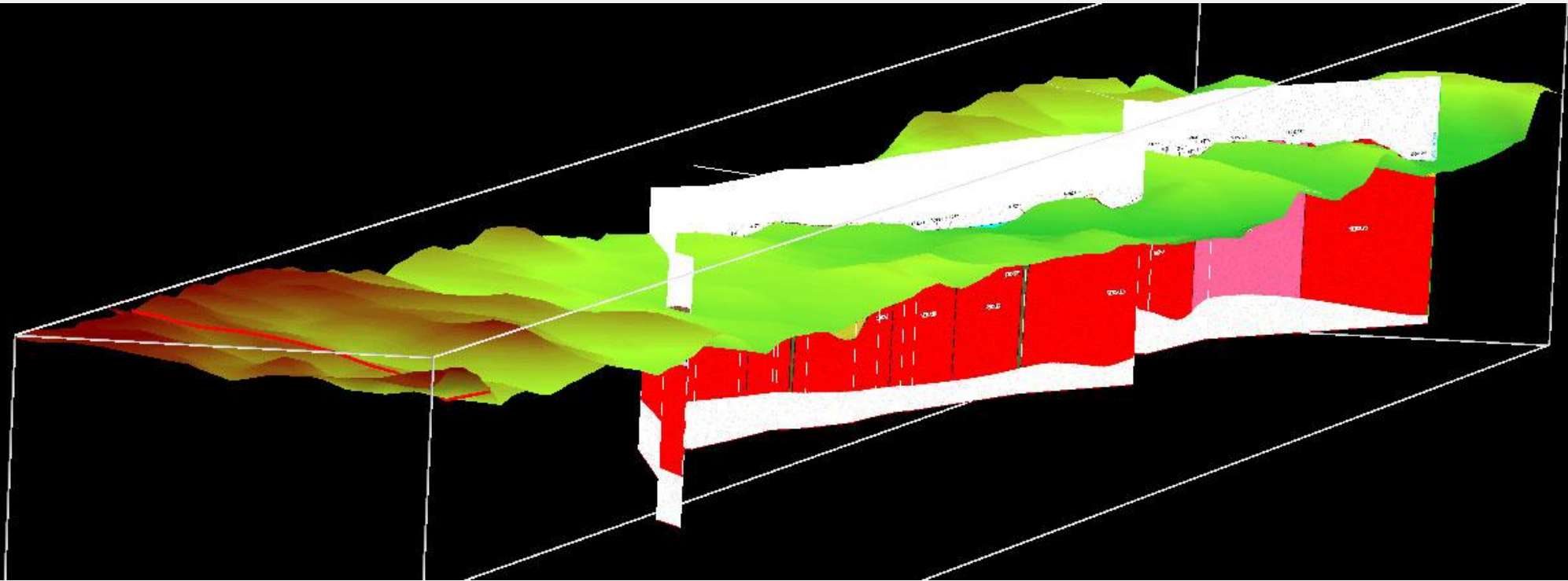
- gemeinsames Fördergebiet
wspólny obszar wsparcia
- darin:
w tym:
- gemeinsames Fördergebiet
für infrastrukturelle Projekte
(Verkehrs- und Umweltnfrastruktur)
wspólny obszar wsparcia
projektów infrastrukturalnych
(infrastruktura drogowa i ochrony środowiska)
- Fördergebiet nach Flexibilitätsregelung
obszar wsparcia zgodnie z regułą 20%
- NUTS 2
- NUTS 3
- NUTS 4



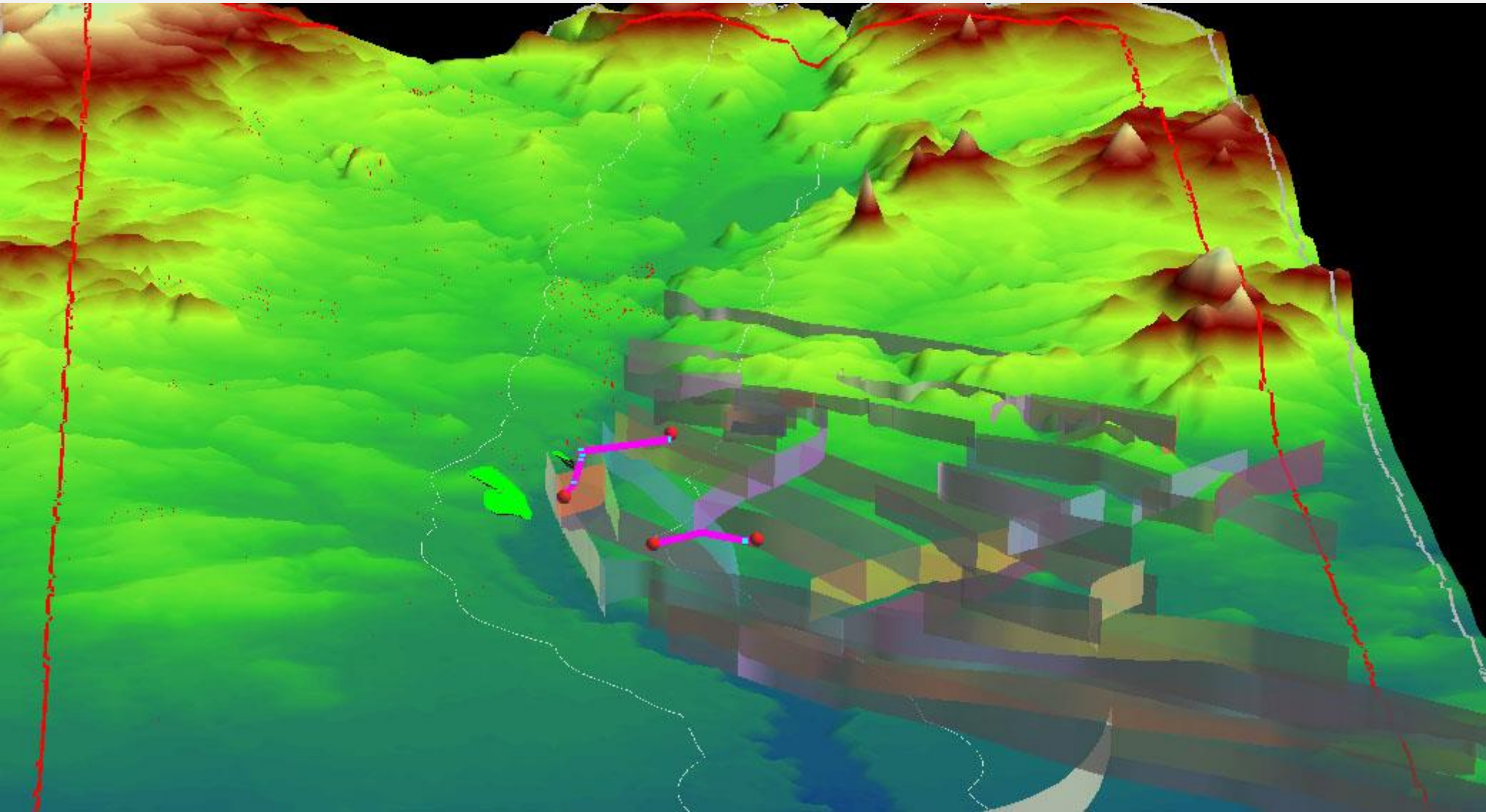
3D numerical modelling with GOCAD software – first results



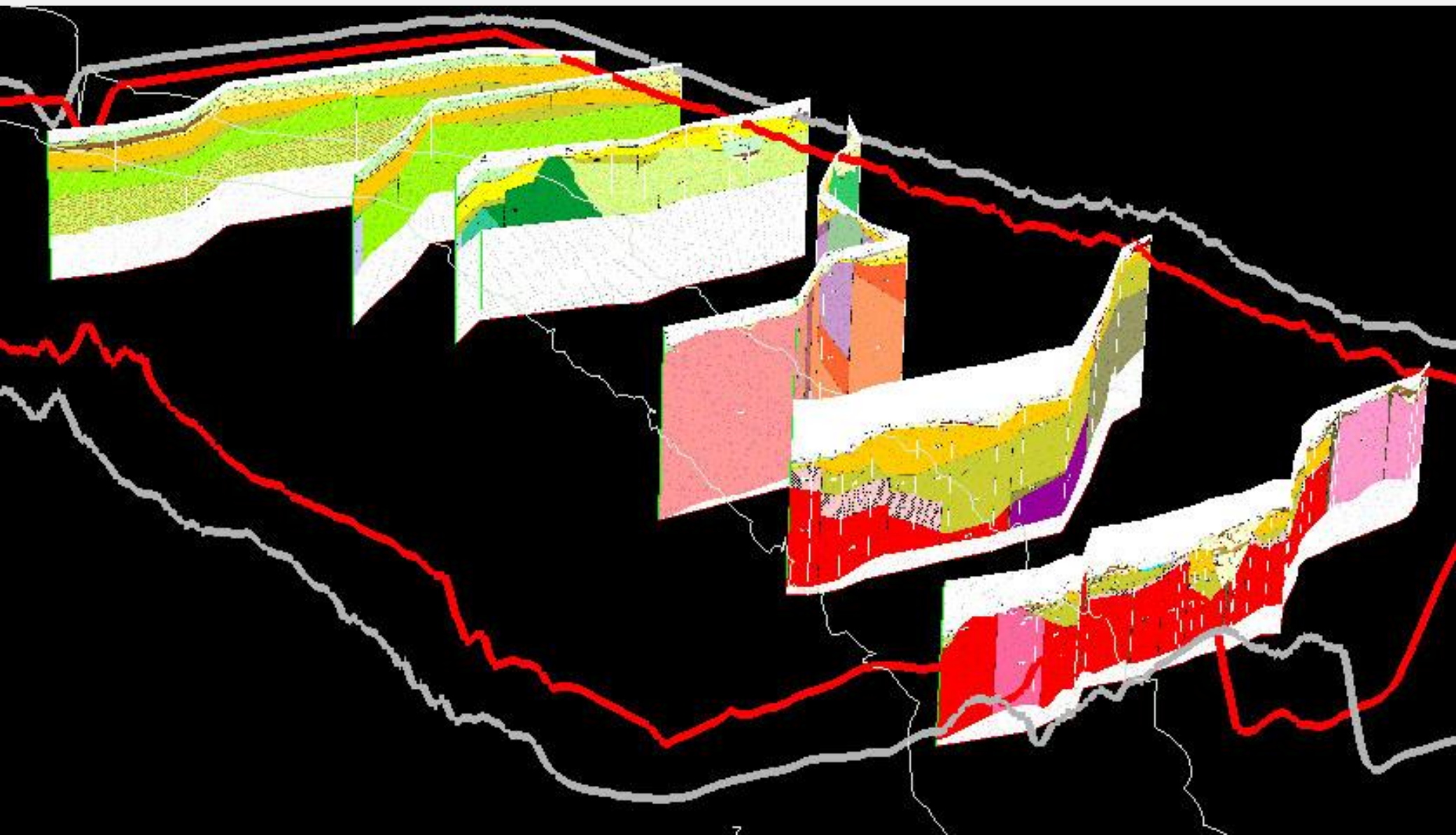
3D numerical modelling with GOCAD software – first results



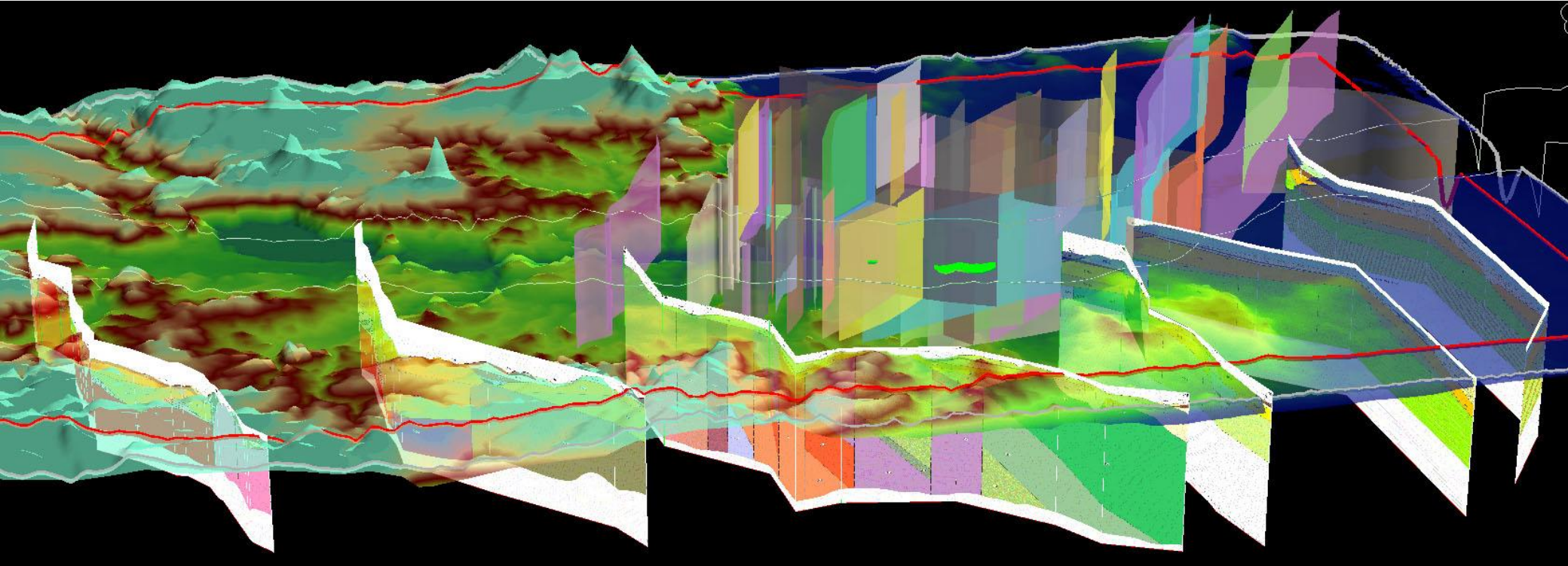
3D numerical modelling with GOCAD software – first results



3D numerical modelling with GOCAD software – first results



3D numerical modelling with GOCAD software – first results



Dissemination of the project results – selected activities:

- Project website: www.transgeotherm.eu
- Websites of the project partners:
www.pgi.gov.pl and www.smul.sachsen.de/lfulg/
- Project flyer
- Press announcements
- Papers and posters
- Mid-term seminars including the study visits to the heat pump installations:
 - ✓ 04.06.2013, Zgorzelec, Miejski Dom Kultury
 - ✓ 24.09.2013, Görlitz, Senckenberg Museum
- Final seminar:
 - ✓ 06.2014, Görlitz, Senckenberg Museum

Thank you very much for your attention

Any questions?

Contact:

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www.transgeotherm.eu