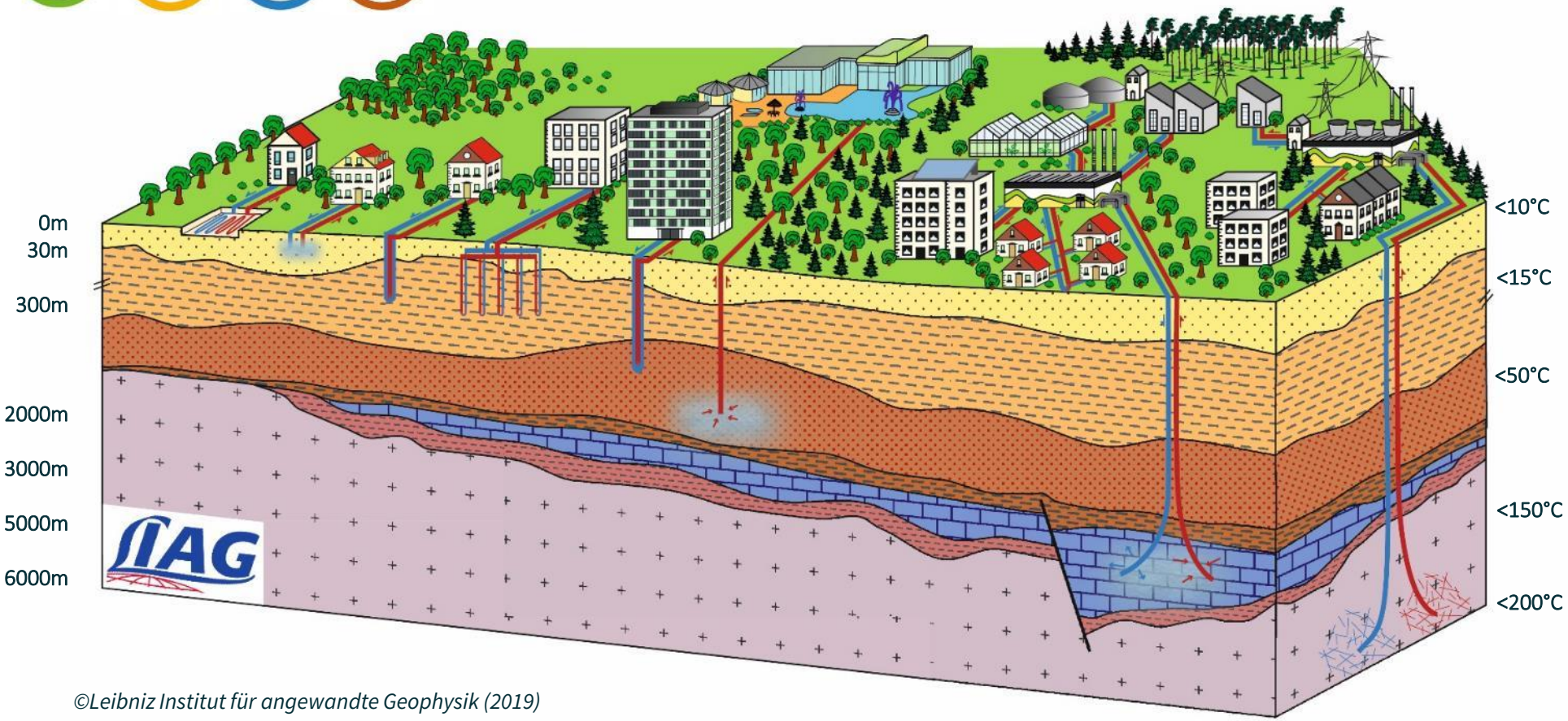
QM Fachtagung Wärmenetze als Energiedrehscheibe

Einbindung von Geothermie in Wärme- und Kältenetze

Kompetenzeinheit Geoenergie
Stefan Hoyer
Stefan.hoyer@geosphere.at

22. Juni 2023

Alleskönner Geothermie



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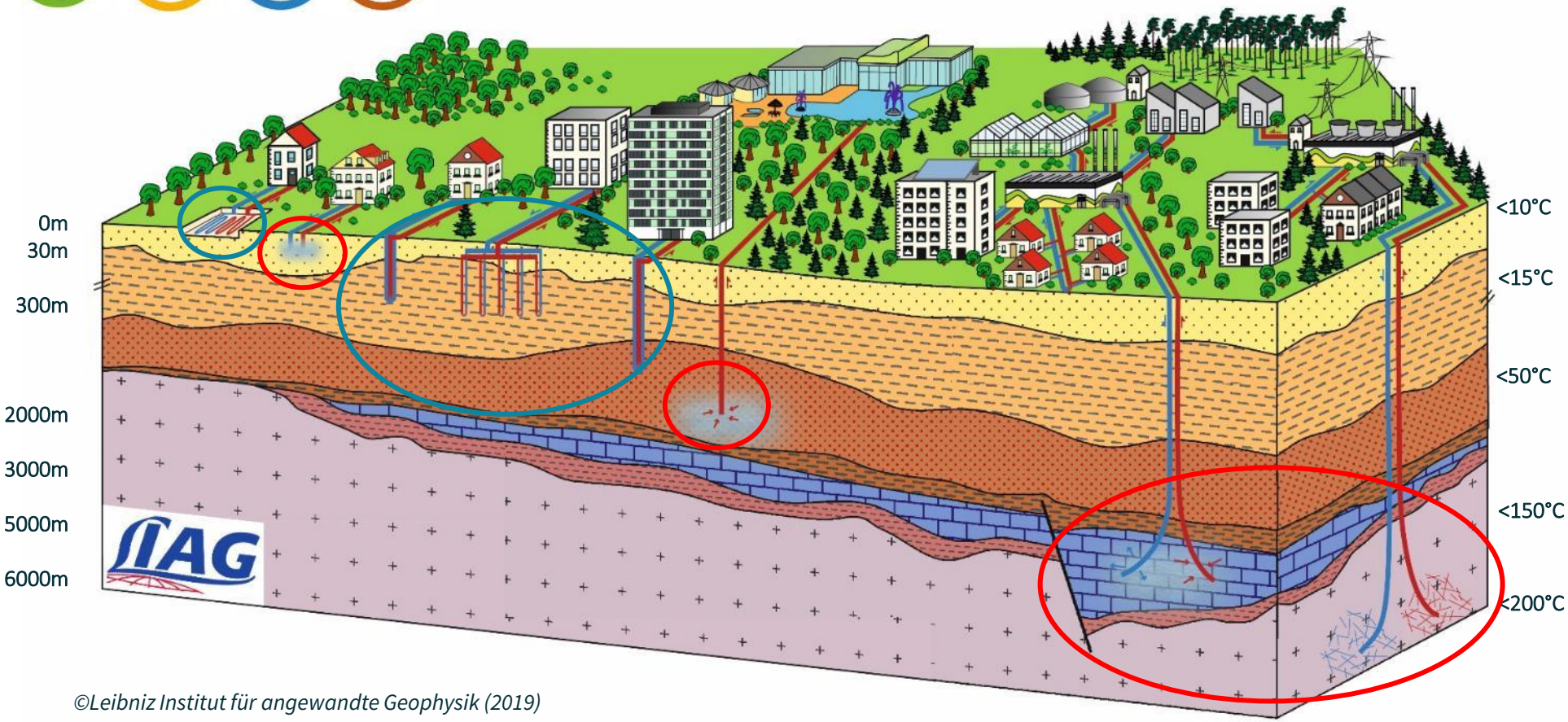
Alleskönner Geothermie



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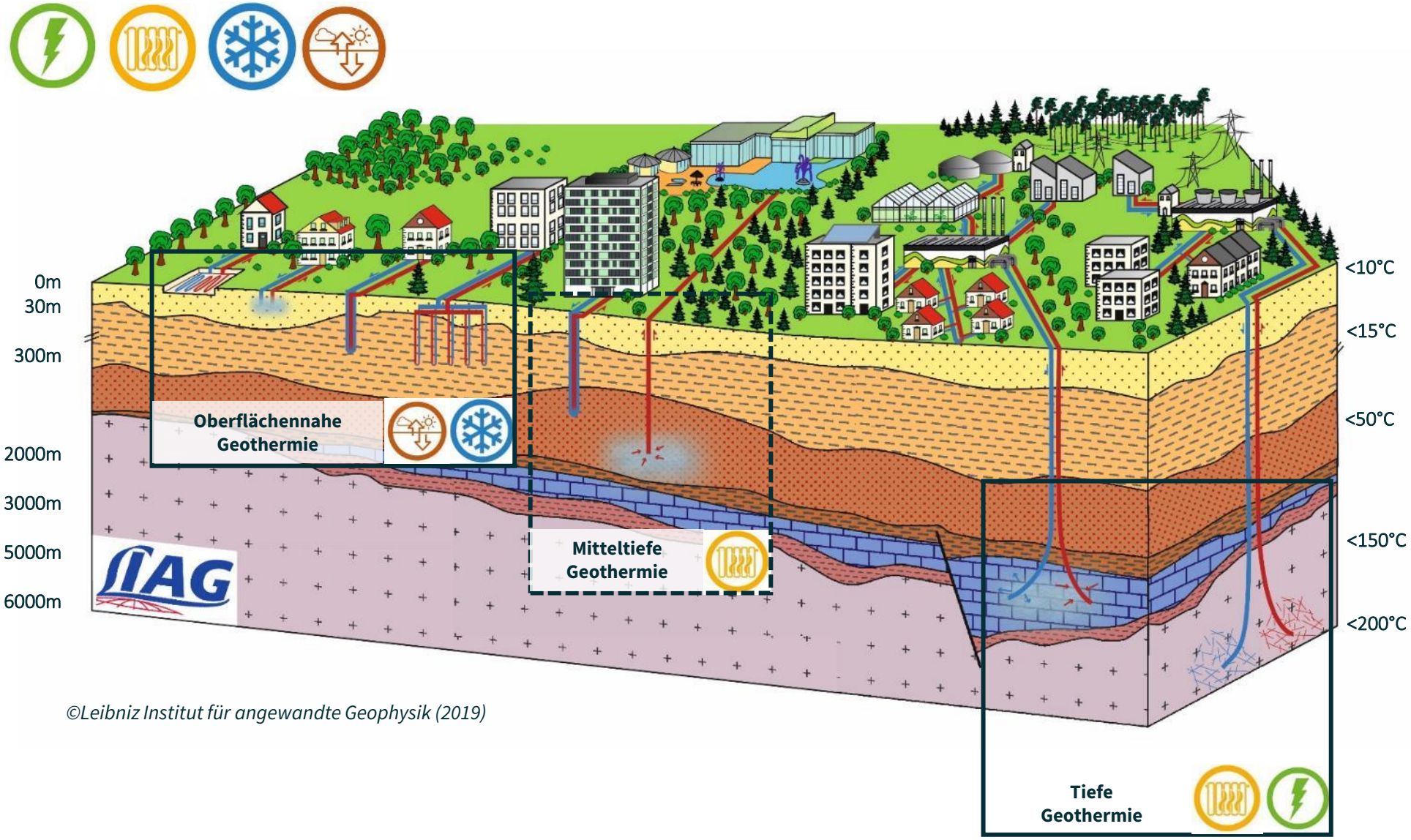
Offene Systeme

Geschlossene Systeme

Alleskönner Geothermie



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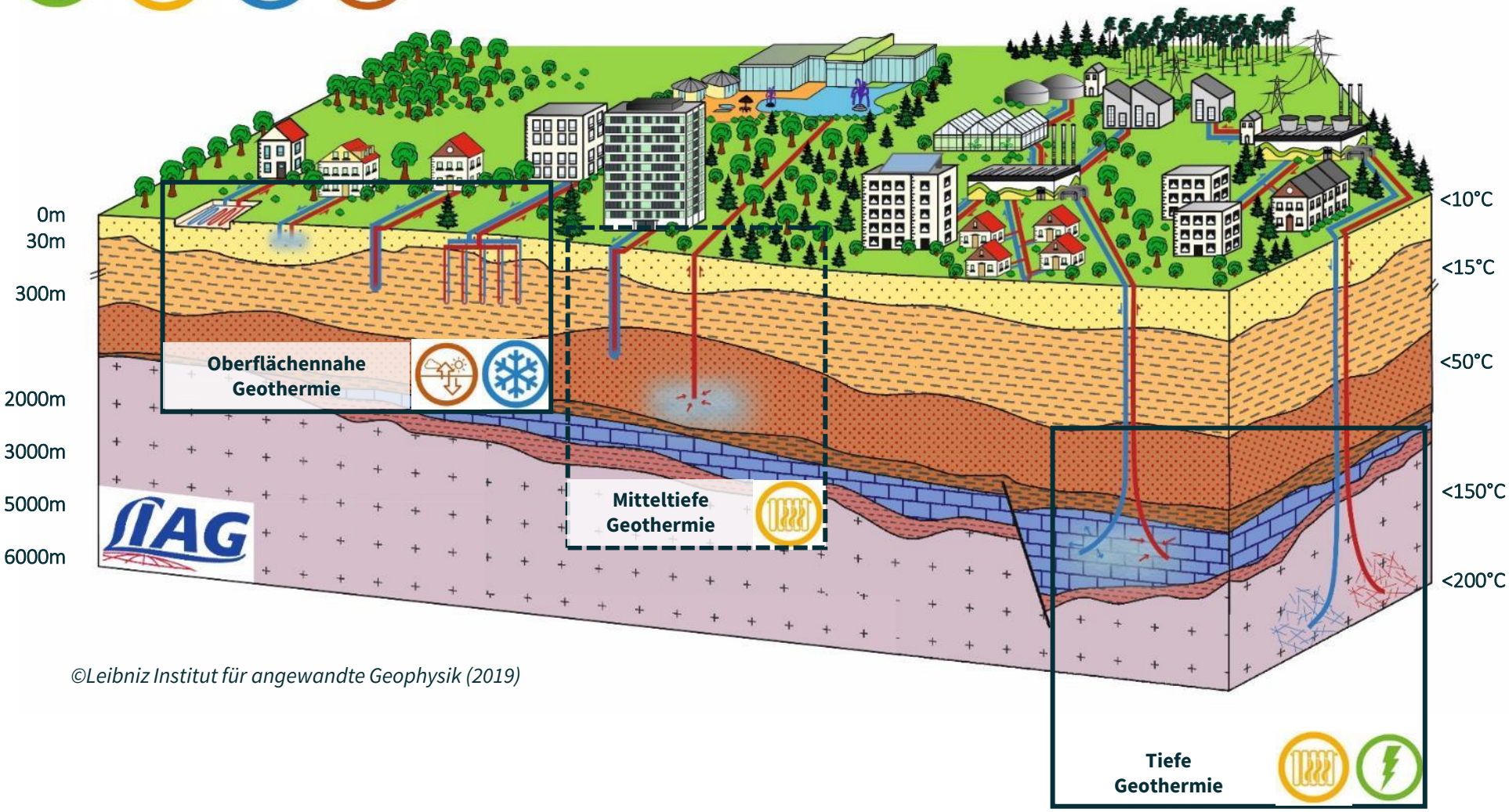
Alleskönner Geothermie



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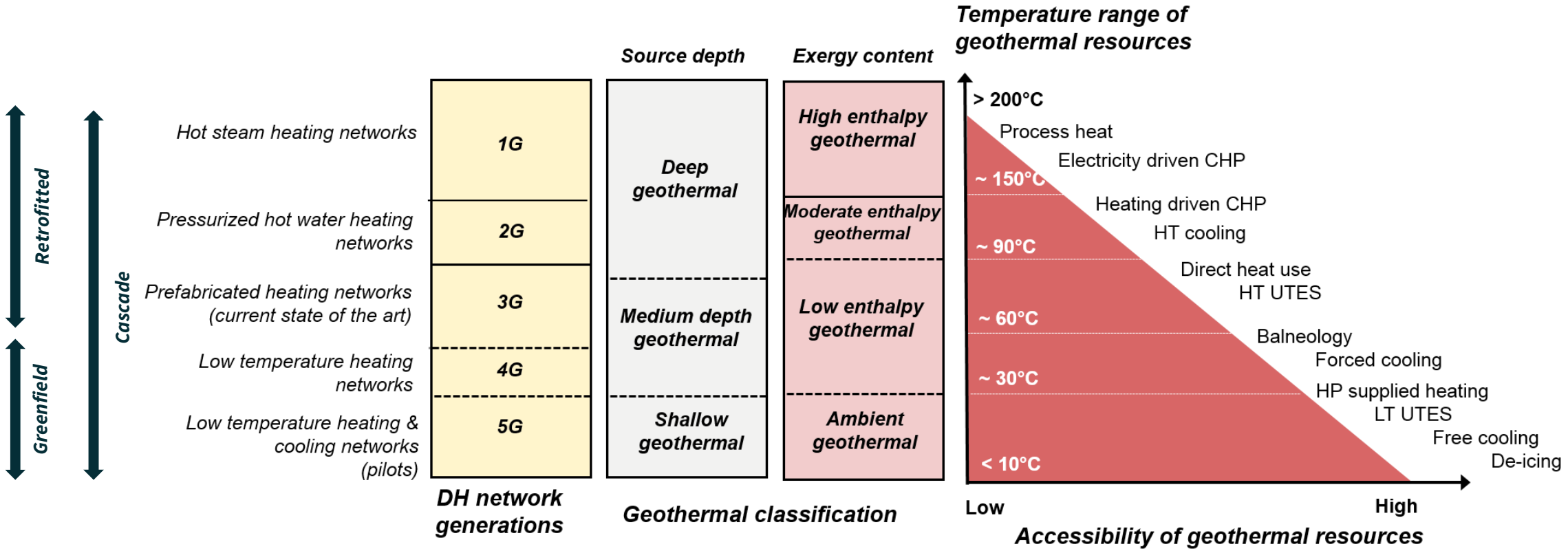
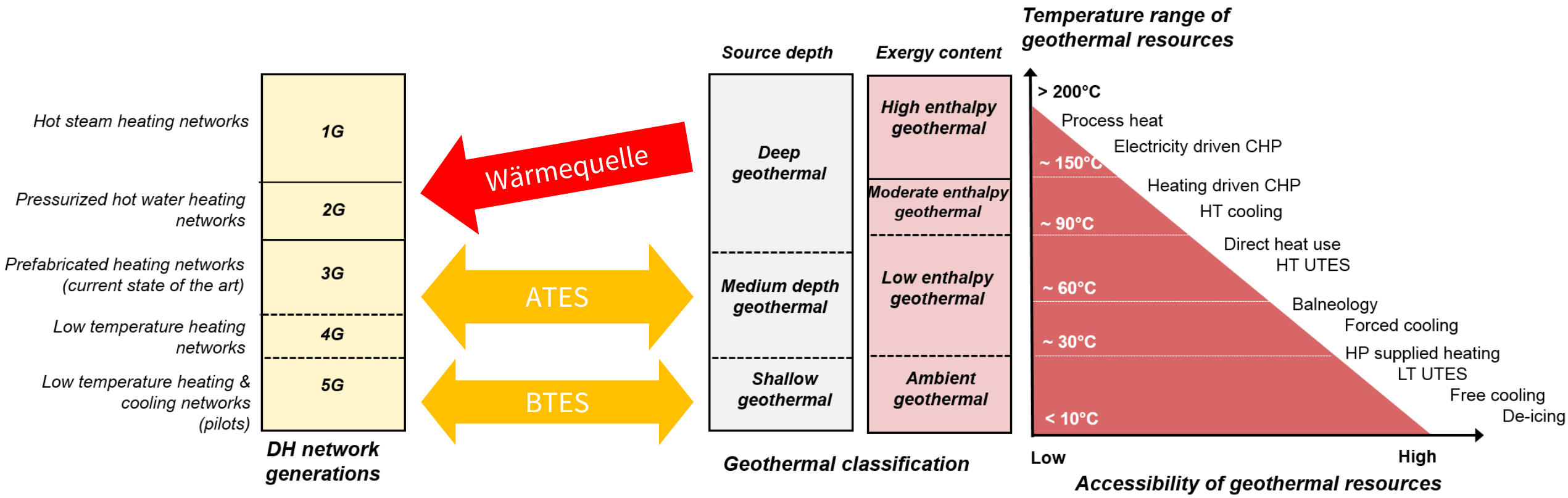
- Oberflächennahe Geothermie
  - 0 – 30 °C
- Mitteltiefe Geothermie
  - 25 – 90 °C
- Tiefe Geothermie
  - Hydrothermal: 80 – 140 °C
  - (petrothermal bis 200 °C)

Gegenüberstellung Geothermie und Wärmenetze



Roadmaps for integrating geothermal energy in its full technological spectrum into heating and cooling networks across Europe;
Götzl et al., European Geothermal Congress 2022, 19 October, Berlin

Gegenüberstellung Geothermie und Wärmenetze



Roadmaps for integrating geothermal energy in its full technological spectrum into heating and cooling networks across Europe;
Götzl et al., European Geothermal Congress 2022, 19 October, Berlin

Potentielle Anwendungsformen

Hydrothermale, Tiefe Geothermie als Wärmequelle

- Temperaturniveau ca. 80 – 120 °C
- Leistung pro Anlage / Dublette ca. 10 MW

Mitteltiefe Geothermie (ATES)

- Temperaturniveau ca. 40 – 80 °C
- Leistung pro Anlage / Dublette ca. 10 MW
- Speicherkapazität bis 10 GWh

Oberflächennahe Geothermie (BTES)

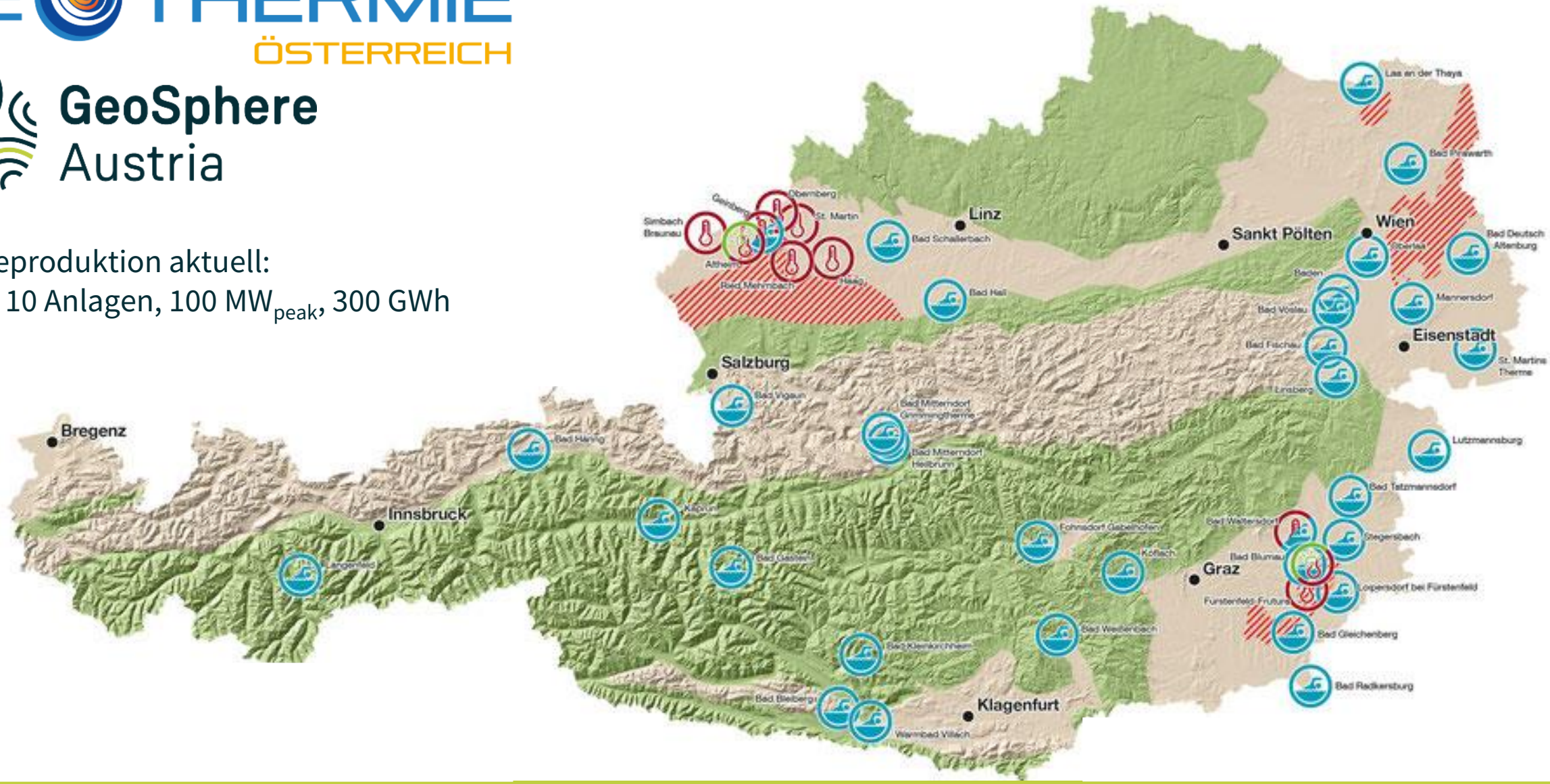
- Temperaturniveau ca. 0 – 30 °C
- Leistung pro Bohrung (150 m) ca. 4,5 kW
- Speicherkapazität pro Bohrung (150 m) ca. 9 MWh

GEOTHERMIE ÖSTERREICH

GeoSphere Austria

Wärmeproduktion aktuell:

10 Anlagen, 100 MW_{peak}, 300 GWh

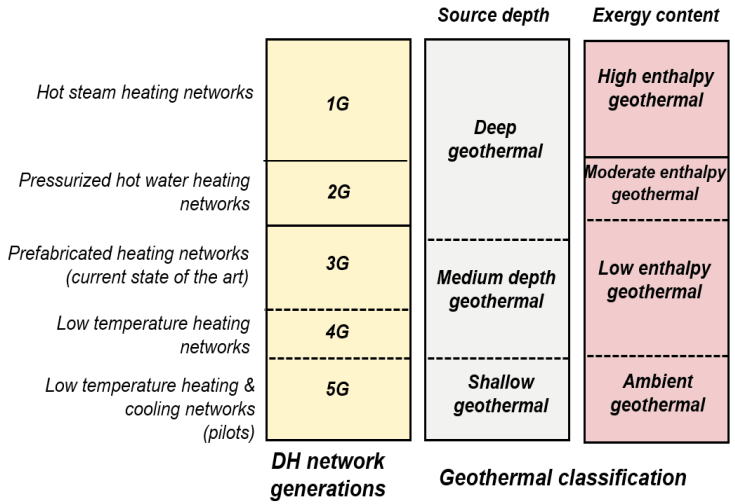


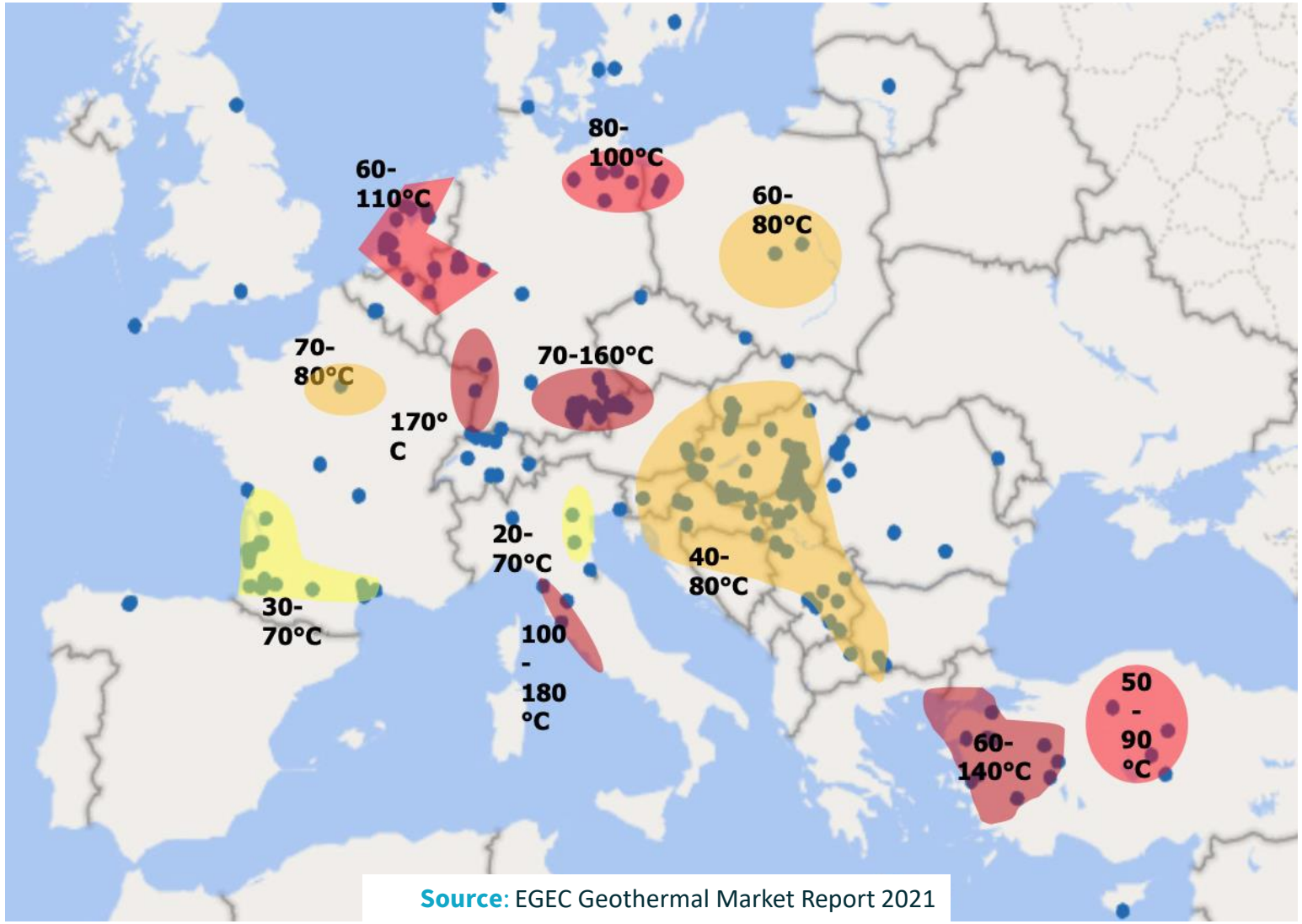
Geothermie als Wärmequelle: Status in Europa

GeoSphere Austria

EGEC Geothermal Market report:

- In Europa 364 Geothermie-gestützte Fernwärmenetze, in Summe ~ 5.6 GW Leistung





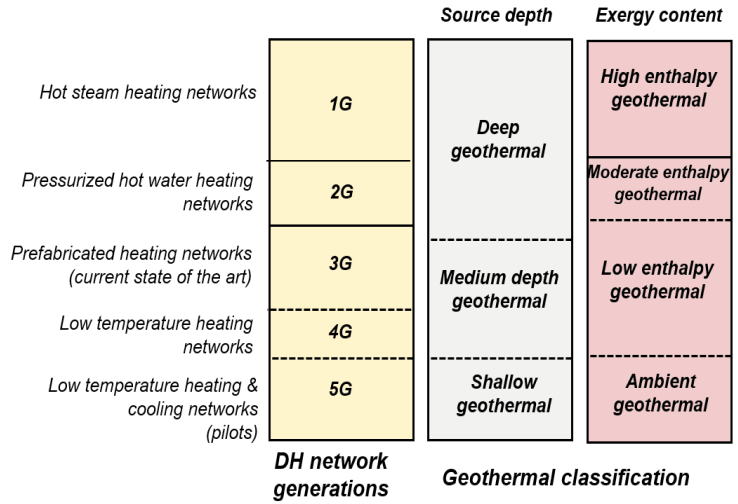
Source: EGEC Geothermal Market Report 2021

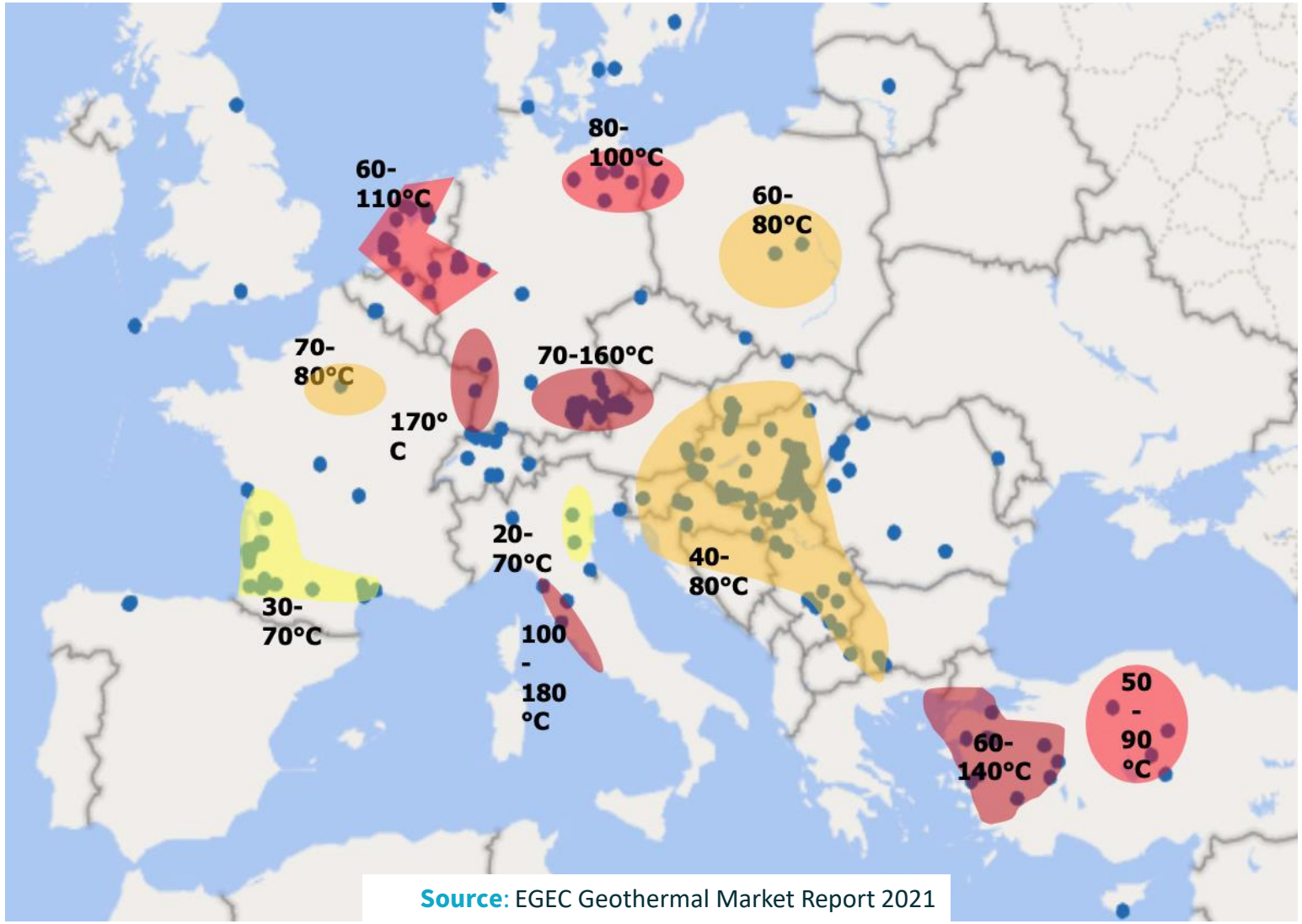
Roadmaps for integrating geothermal energy in its full technological spectrum into heating and cooling networks across Europe; Götzl et al., European Geothermal Congress 2022, 19 October, Berlin

Geothermie als Wärmequelle: Status in Europa

EGEC Geothermal Market report:

- In Europa 364 Geothermie-gestützte Fernwärmenetze, in Summe ~ 5.6 GW Leistung
- Zusätzlich etwas > 100 5G Netze in Europa mit oberflächennaher Geothermie zur saisonalen Speicherung

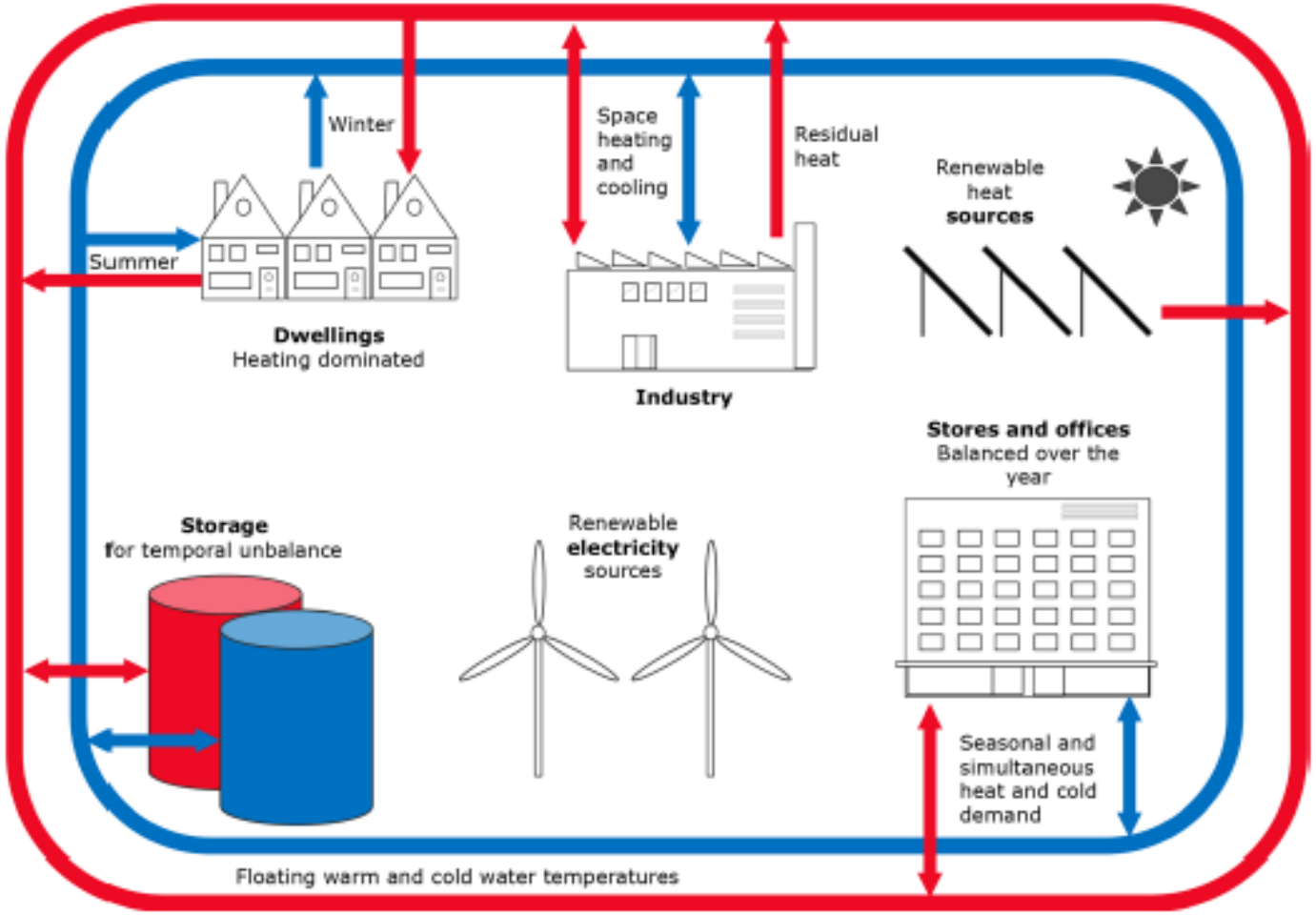




Source: EGEC Geothermal Market Report 2021

Roadmaps for integrating geothermal energy in its full technological spectrum into heating and cooling networks across Europe; Götzl et al., European Geothermal Congress 2022, 19 October, Berlin

Wärmenetze: 5. Generation

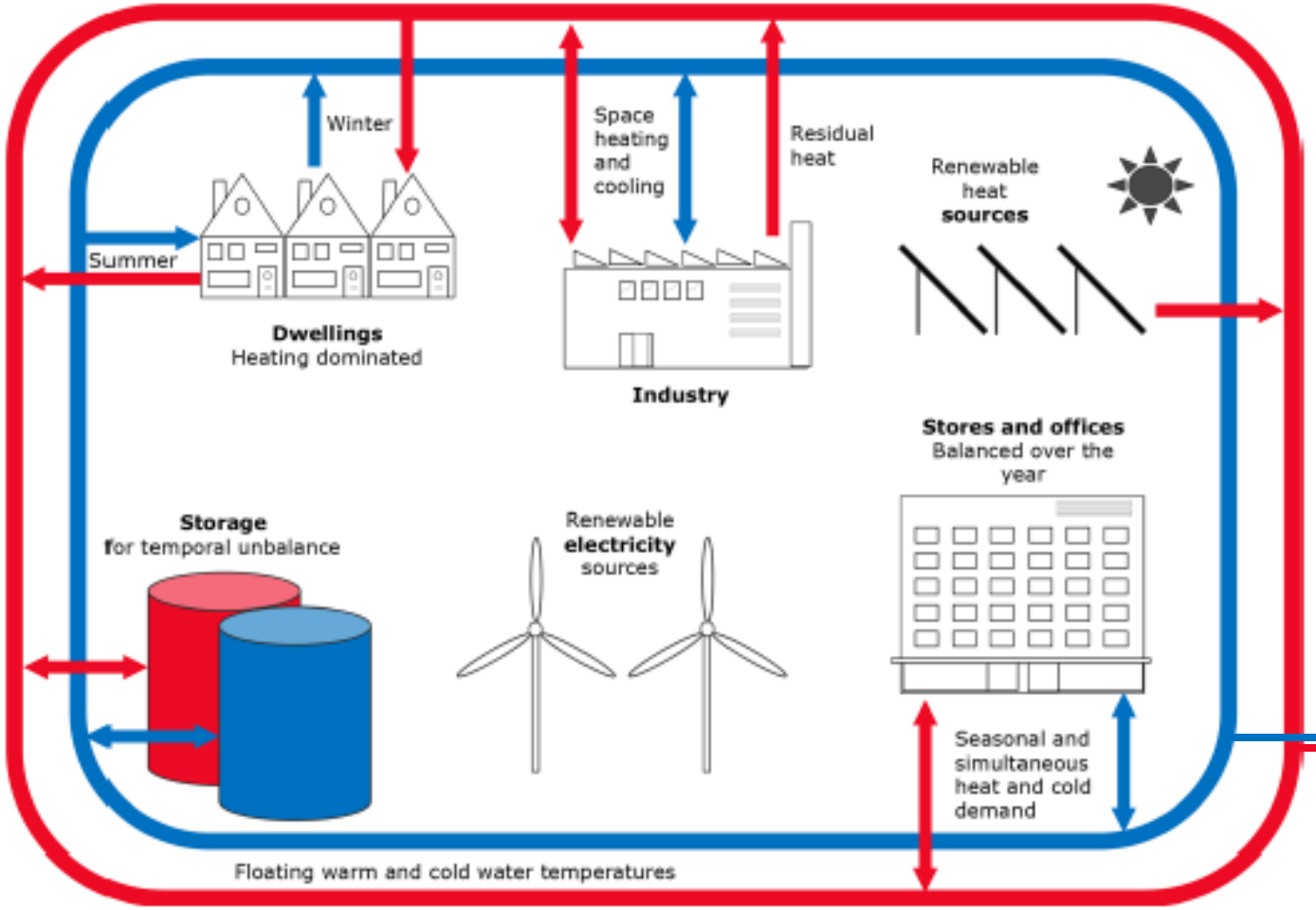


Einleiter- und Zweileitersysteme

Netztemperaturen: 10 – 30 °C

Stef Boesten, Wilfried Ivens, Stefan C. Dekker, Herman Eijdems - Stef Boesten, Wilfried Ivens, Stefan C. Dekker, Herman Eijdems: 5th generation district heating and cooling systems as a solution for renewable urban thermal energy supply. Adv. Geosci., 49,

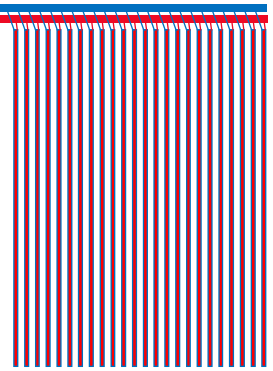
Wärmenetze: 5. Generation



Einleiter- und Zweileitersysteme

Netztemperaturen: 10 – 30 °C

Erdwärmesonden als saisonaler Speicher



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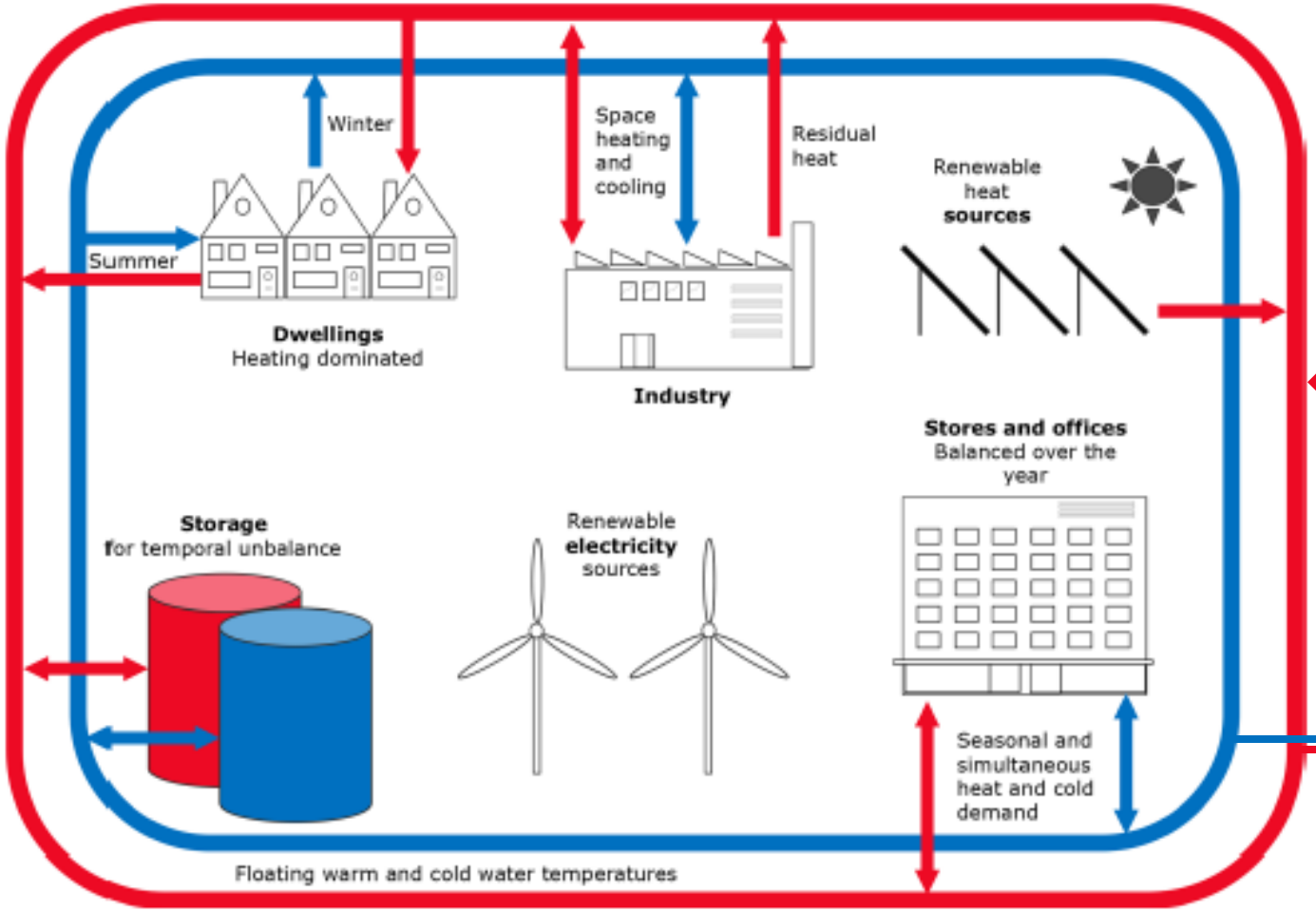
Wärmenetze: 5. Generation

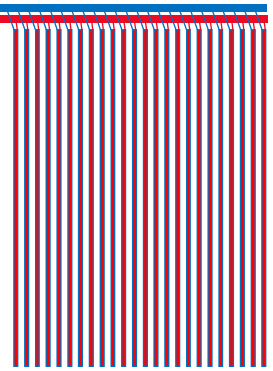


Einleiter- und Zweileitersysteme

Netztemperaturen: 10 – 30 °C

Anbindung an Netz 1.-4. Generation

Erdwärmesonden als saisonaler Speicher



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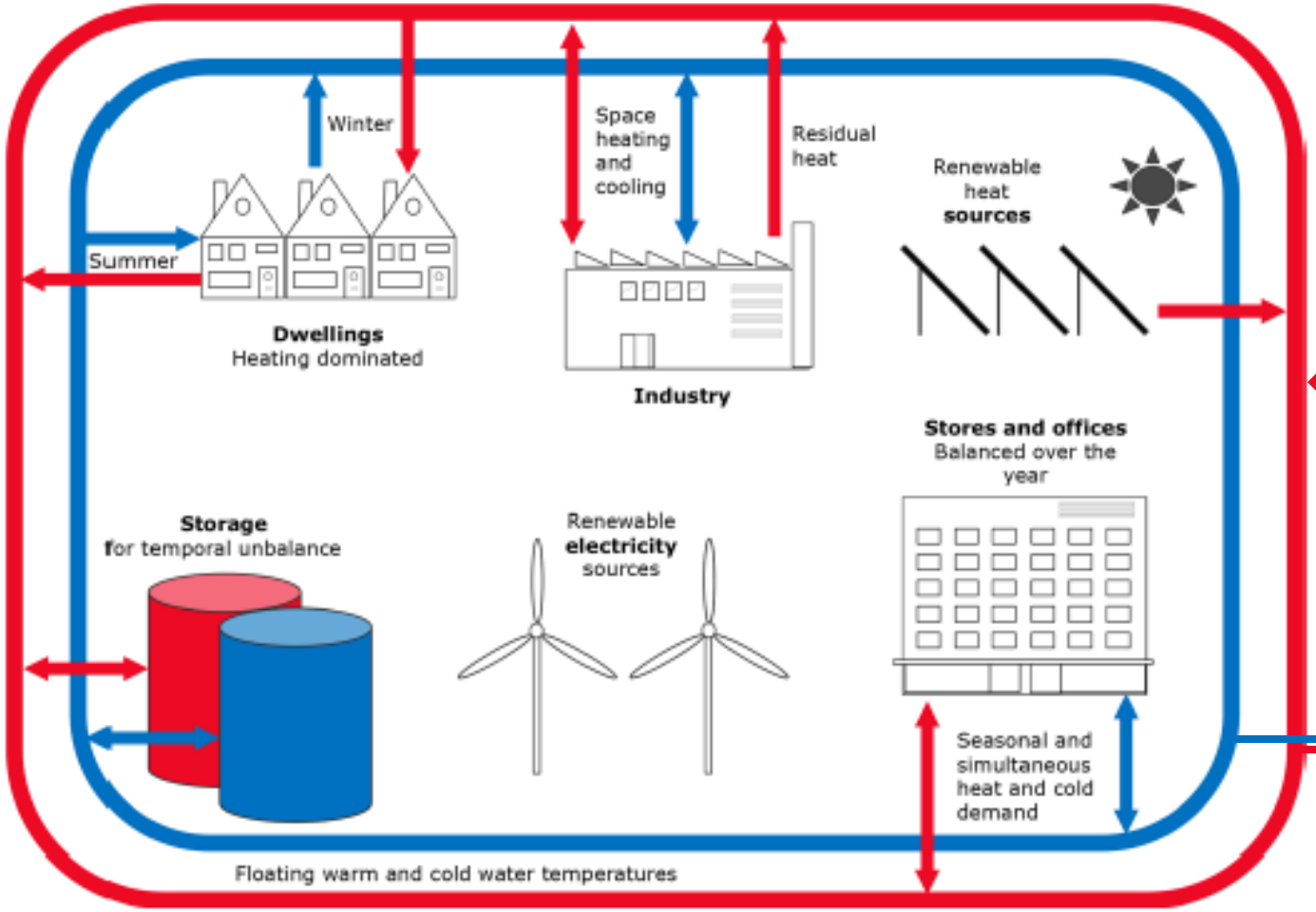
Wärmenetze: 5. Generation



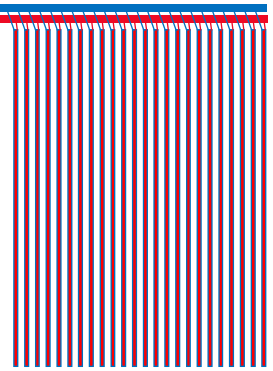
Einleiter- und Zweileitersysteme

Netztemperaturen: 10 – 30 °C

Anbindung an Netz 1.-4. Generation

Aus Fernwärme(-rücklauf) zusätzlich regenerieren (im Sommer/Herbst)

Erdwärmesonden als saisonaler Speicher



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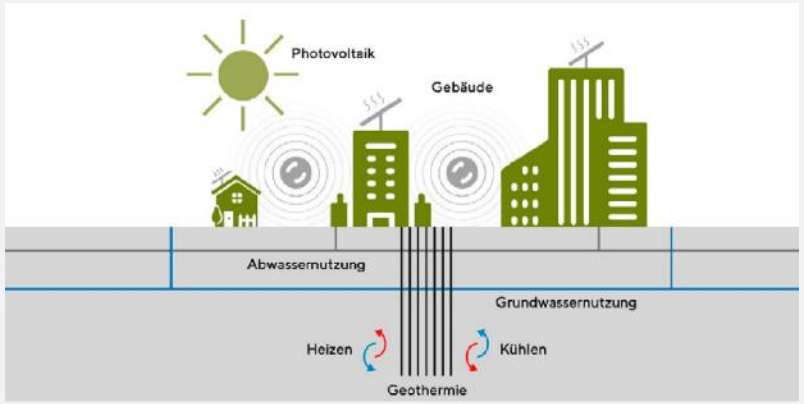
Anergienetze: Aktuelle Beispiele

Viertel Zwei, Krieau



„Smart Block“
Geblergasse

Village im Dritten

250.000 m² BGF

- 500 Erdwärmesonden
- Kombiniert mit Fernwärme

Das Versorgungsgebiet im Viertel Zwei.

- **600 Wohneinheiten**
- **2** denkmalgeschützte Tribünen
- **21.000 m²** Bürofläche
- **2.350** Menschen

- Wärmequellen:

Erde
Sonne
Abwärme des Gebäude
Abwasser
Grundwasser

- Erdwärmesonden als Speicher
- Anergienetz

Village im Dritten

500 Erdwärmesonden

Annahmen:

- 150 m Tiefe (75.000 Bohrmeter)
- 30 W/m
- 2000 Betriebsstunden / Jahr

➢ 4,5 GWh Speicherkapazität

Village im Dritten

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➢ Entspricht etwa 140.000 m^3 Wasserspeicher

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Aktuelle Projekte

SAPHEA

INTEGRATING GEOTHERMAL HEATING AND COOLING NETWORKS IN EUROPE

cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

GEOTHERMAL DHC

Towards Decarbonized Heating and Cooling!

GeoSphere Austria

ethink ENERGY RESEARCH

AGH

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Technical University of Munich

EGEC GEOTHERMAL

VIA University College

ENGIE Solutions

GEL Geothermal Engineering Ltd

Funded by the European Union

Funded under the Grant Agreement number 101075510

GeoSphere Austria

Projektinhalte

SAPHEA

- Einbindung von Geothermie in Wärmenetze
- Identifikation von Marktbarrieren
- Bereitstellung niederschwelliger Informationen und Entscheidungsgrundlagen („Market uptake Hub“ und „Decision support Tools“)

COST Geothermal DHC

- Aufbau eines interdisziplinären Netzwerks von WissenschaftlerInnen in Europa
- Aktuell Mitglieder aus über 30 Ländern

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INTEGRATING GEOTHERMAL HEATING AND COOLING NETWORKS IN EUROPE

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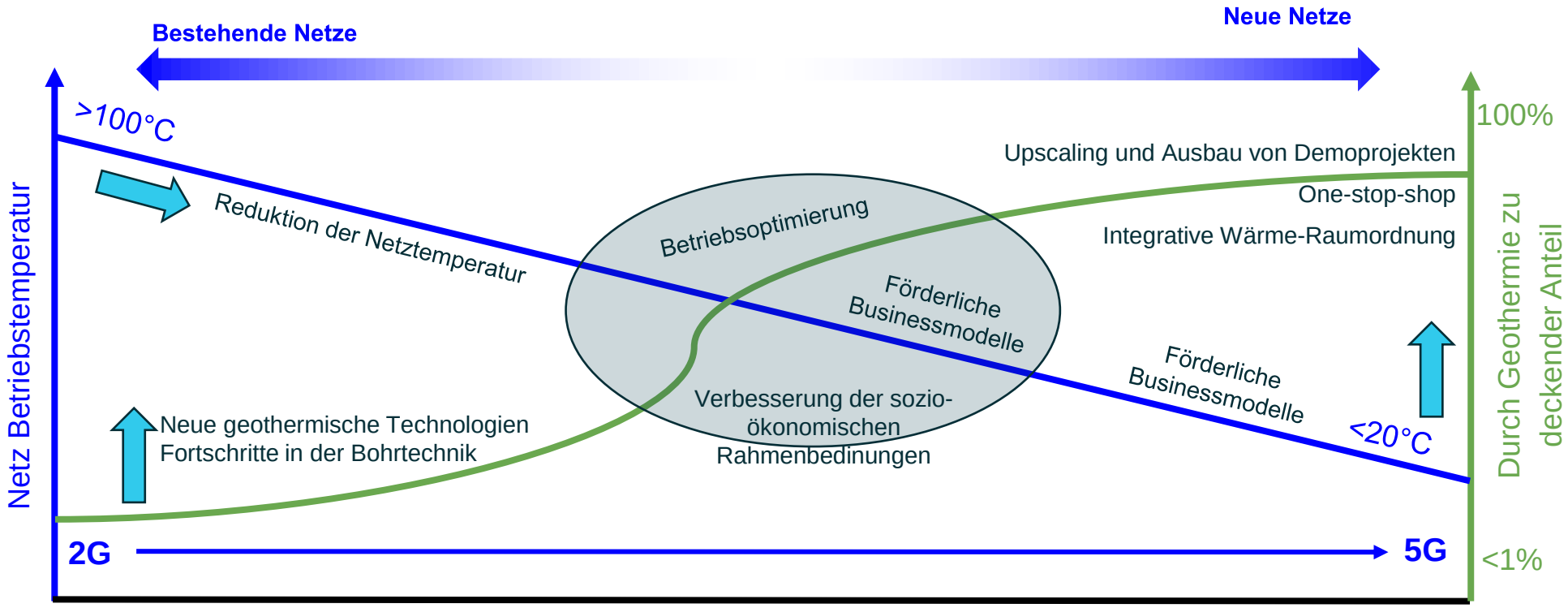
GEOTHERMAL DHC
Towards Decarbonized Heating and Cooling!

Funded under the Grant Agreement number 101075510

Projekt SAPHEA: Kernfrage

Wie kommen wir zu einem höheren Anteil an Geothermie in Wärmenetzen?



Source: Goetzl et al., 2022b

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INTEGRATING GEOTHERMAL HEATING AND COOLING NETWORKS IN EUROPE

Funded by the European Union

Funded under the Grant Agreement number 101075510

Projekt SAPHEA: Market driver report


SAPHEA
INTEGRATING GEOTHERMAL HEATING AND COOLING NETWORKS IN EUROPE

Status report on key market drivers related to the implementation of geoHC network

07 April 2023

Author: Philippe Dumas (EGEC) / Madeline Vander Velde (EGEC)

Deliverable: D2.1 Status report on key market drivers related to the implementation of geoHC network **/ Version:** 4 **/ Status:** V1
Revision Team: G. Goetzl (Geological Survey of Austria) / Kai Zosseder (TUM)
Submission date: 07 April 2023
Verified by: Kai Zosseder (WP2 lead)**/ Approved by:** WP2 partners
Confidentiality level: Public
Contact: G. Goetzl gregor.goetzl@geologie.ac.at

www.saphea.eu

Funded by the European Union

This article/publication is based upon work from the project SAPHEA, funded by the European Union's HORIZON EUROPE research and

Wird demnächst veröffentlicht

- Identifikation der wichtigsten Markttreiber (positive sowie negative)

Projekt SAPHEA: Market driver report


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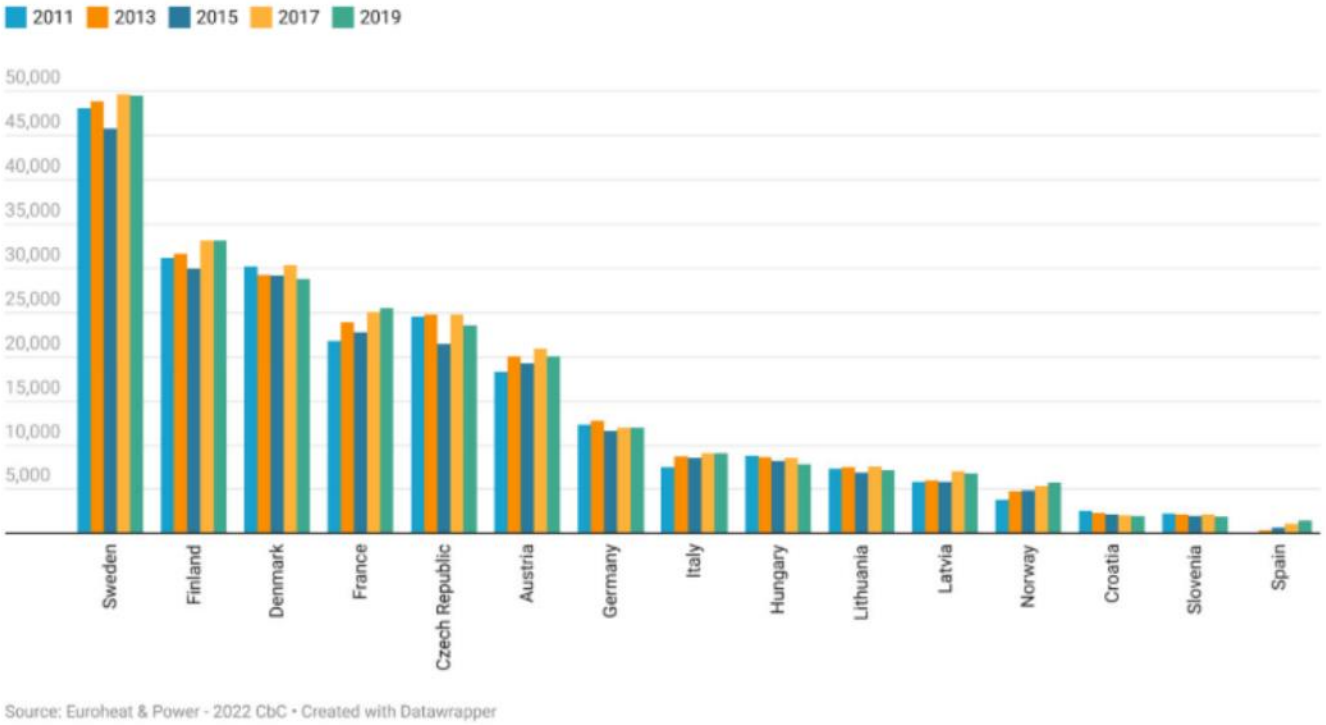
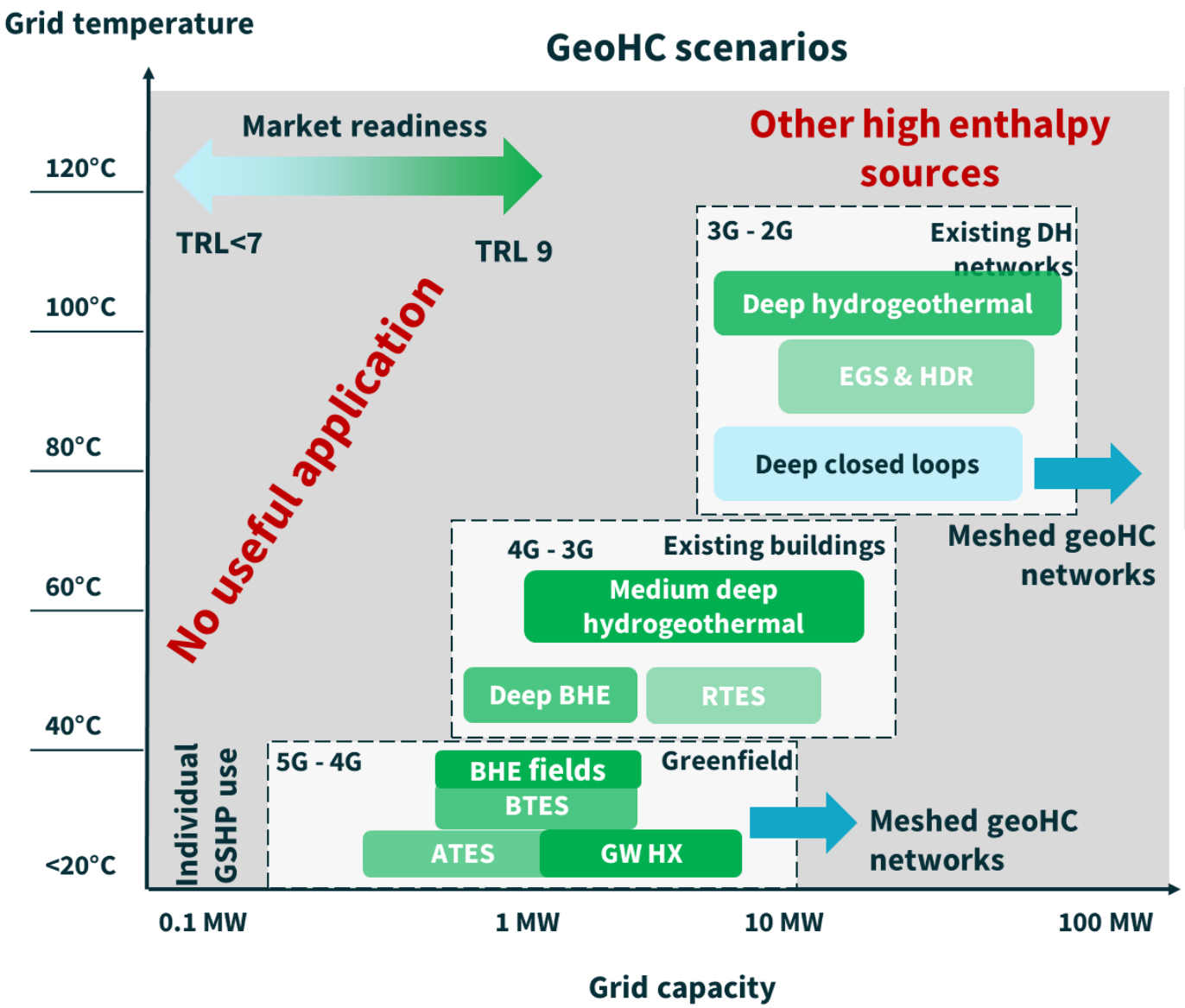
Wird demnächst veröffentlicht

- Identifikation der wichtigsten Markttreiber (positive sowie negative)



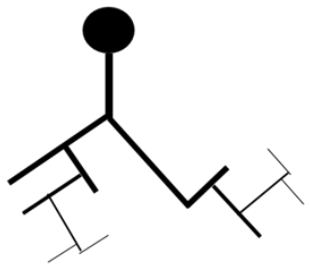
Source: Euroheat & Power - 2022 CbC • Created with Datawrapper

Projekt SAPHEA: Erhebung von Szenarien



Network / grid scenarios

"Tree pattern"

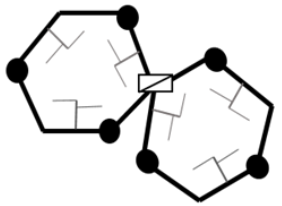


- Central heat source – high capacity
- Hierarchical network
- Capacity controlled by pipe diameter

"Ring pattern"

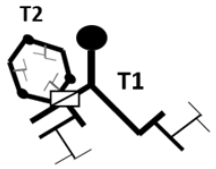
- More than heat source connected – low to moderate capacities
- Hierarchical and non-hierarchical networks possible
- Capacity controlled by network
- One- and bidirectional flow possible

"Mesh pattern"



- More than one individual networks connected
- Unstructured and non-hierarchical compounds
- Organic growth possible
- Energy balance via heat exchangers (no hydraulic connection)

"Cascade pattern"



- More than one individual networks connected in a cascade order
- Hierarchical compounds controlled by temperature levels (T1>T2)
- Organic growth possible
- Energy balance via heat exchangers (no hydraulic connection)


GEOTHERMAL DISTRICT HEATING AND COOLING DAYS 2023
2 days event + excursion
19-21 SEPTEMBER
AARHUS (DENMARK)
SAVE THE DATE!
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VIA University College
GEOTHERMAL DHC
SAPHEA
INTEGRATING GEOTHERMAL HEATING AND COOLING NETWORKS IN EUROPE

Zusammenfassung

- Tiefe Geothermie als Quelle für Wärmenetze 1. – 3. Generation
- Wärmespeicherung Kerntechnologie für die Dekarbonisierung von Wärmenetzen
  - Erdwärmesondenspeicher als saisonaler Speicher für Netze 5. Generation (kalte Nahwärme)

Steigerung des Anteils von Geothermie in Wärmenetze

- Aquiferspeicherung (ATES) als saisonaler Speicher für Wärmenetze 3. und 4. Generation
- Senkung der Netztemperaturen förderlich
- Ausbau von Sekundärnetzen, Kaskadische Verbindung von Netzebenen
- Weiterentwicklung im Bereich Hochtemperaturwärmepumpen

GeoSphere Austria

DANKE

Kompetenzeinheit Geoenergie
Stefan Hoyer
Stefan.Hoyer@geosphere.at