

Stadtwerke
München



What thrives an energy company in a big city like Munich to develop geothermal ?

M/Wasser M/Bäder M/Strom M/Wärme M/net MVG

Thomas Jahrfield

Roll-out of DGE in NW-Europe
23.09.2020

What thrives an energy company in a big city like Munich to develop geothermal?

Introduction

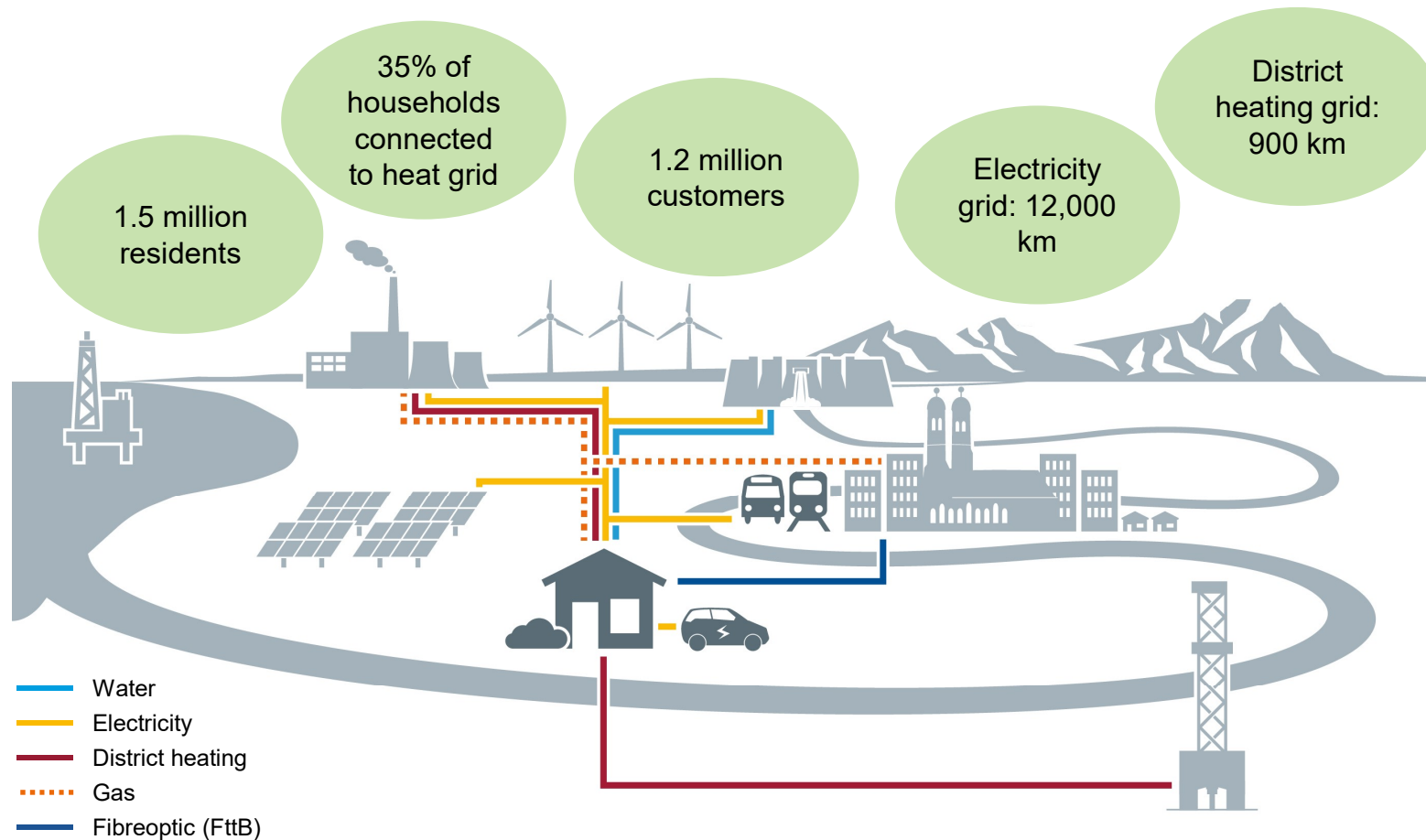
Thomas Jahrfeld

- ▶ Engineer for Physics
- ▶ 14 years expert for environmental measurements and technical evaluation
- ▶ 13 years geothermal project development – from green field to commissioning
- ▶ 2018 Stadtwerke München, „Geothermal Strategy“
- ▶ 2019 German Geothermal Association



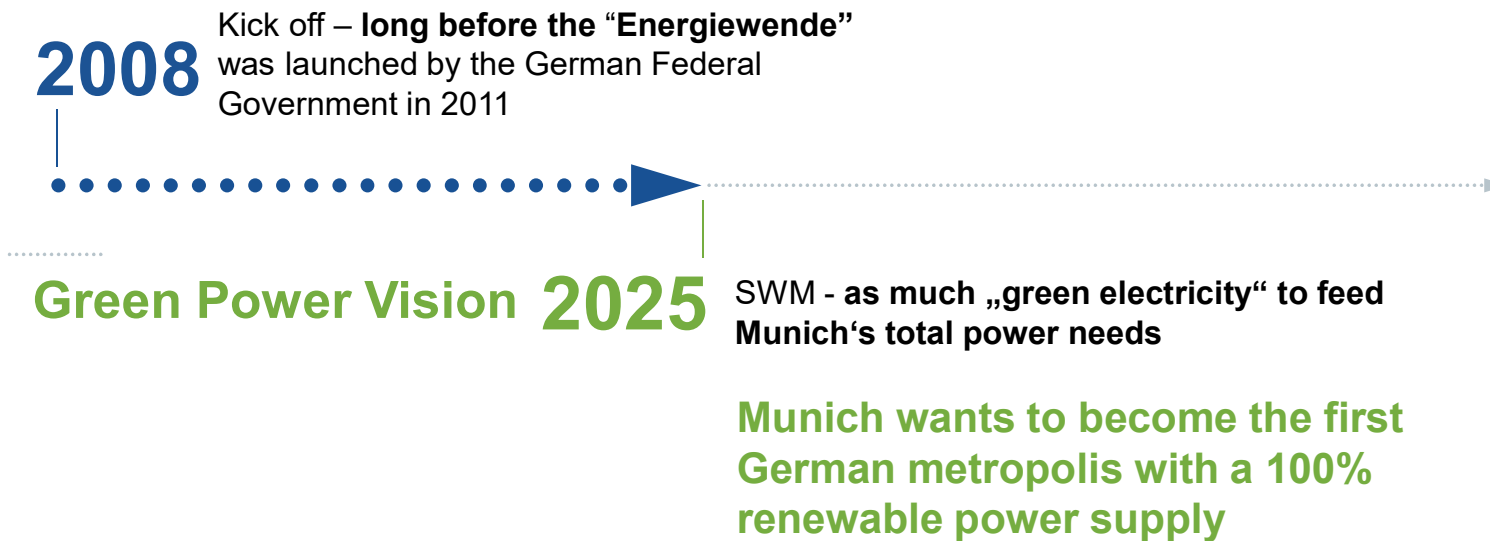
What thrives an energy company in a big city like Munich to develop geothermal?

Supplying climate-friendly electricity, heat, transportation & mobility solutions in Munich



What thrives an energy company in a big city like Munich to develop geothermal?

Renewable Energy Objectives



What thrives an energy company in a big city like Munich to develop geothermal?

Renewable Energy References for electricity



MUNICH AND REGION

- 13 hydroelectric power plants
- 1 windmill power plant
- 5 geothermal plants
- 1 biogas power plant
- 24 photovoltaic power plants

GERMANY

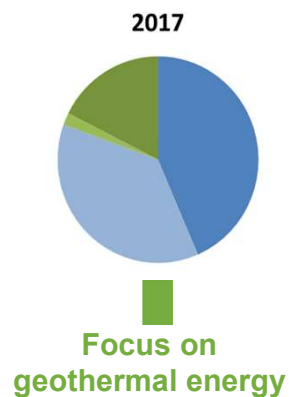
- 3 offshore-windfarms (North Sea)
- onshore-windfarms (Brandenburg, North Rhine-Westphalia, Rhineland-Palatinate and Saxony-Anhalt)
- 2 solar farms (Bavaria and Saxony)

EUROPE

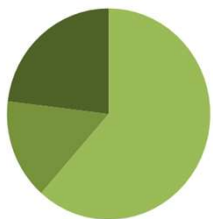
- 1 offshore-windfarms (United Kingdom)
- onshore-windfarms (Belgique, Finland, France, Croatia, Norway*, Poland, Sweden)
- 1 parabolic trough solar collector farm (Spain)

What thrives an energy company in a big city like Munich to develop geothermal?

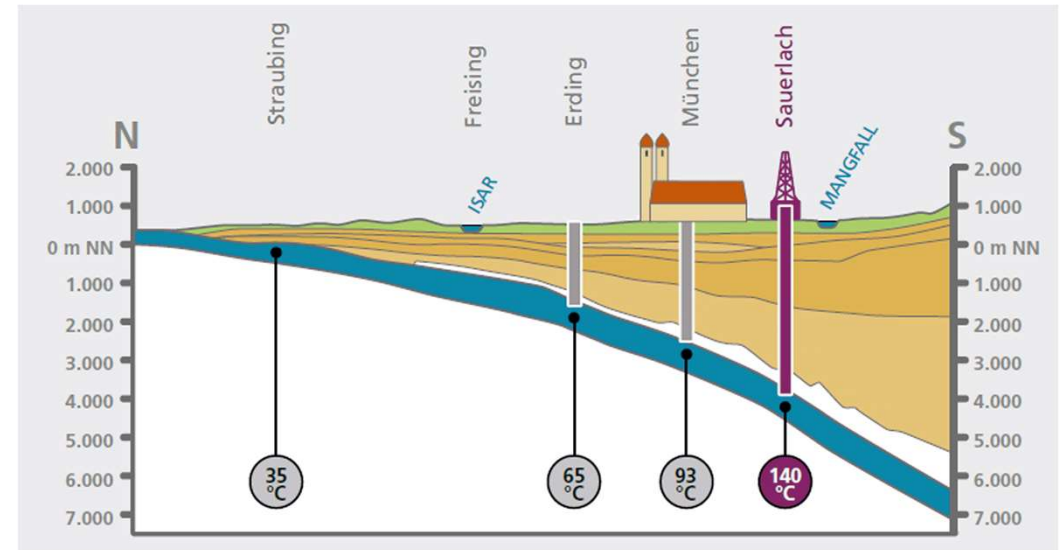
Renewable Energy Objectives



~~2040~~ 2035



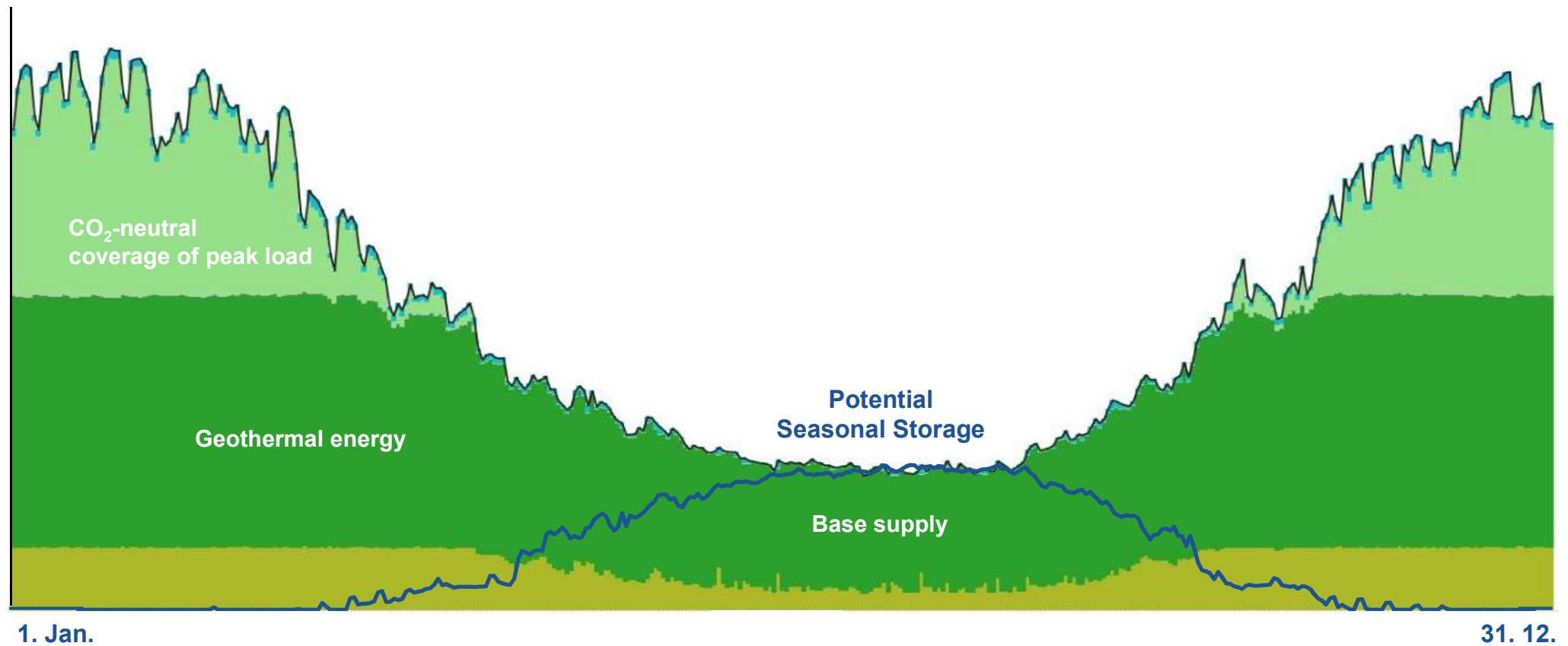
■ Gas & oil ■ Coal ■ Geothermal energy ■ Waste ■ Others



District Heating 2040

- ▶ The City of Munich is examining how to reach climate neutrality already by 2035.
- ▶ SWM's district heating vision will have a significant impact on achieving this goal.
- ▶ SWM's district heating vision builds on **deep geothermal energy** + CO2 neutral coverage of peak load.

Future composition of heat supply (in 2040)



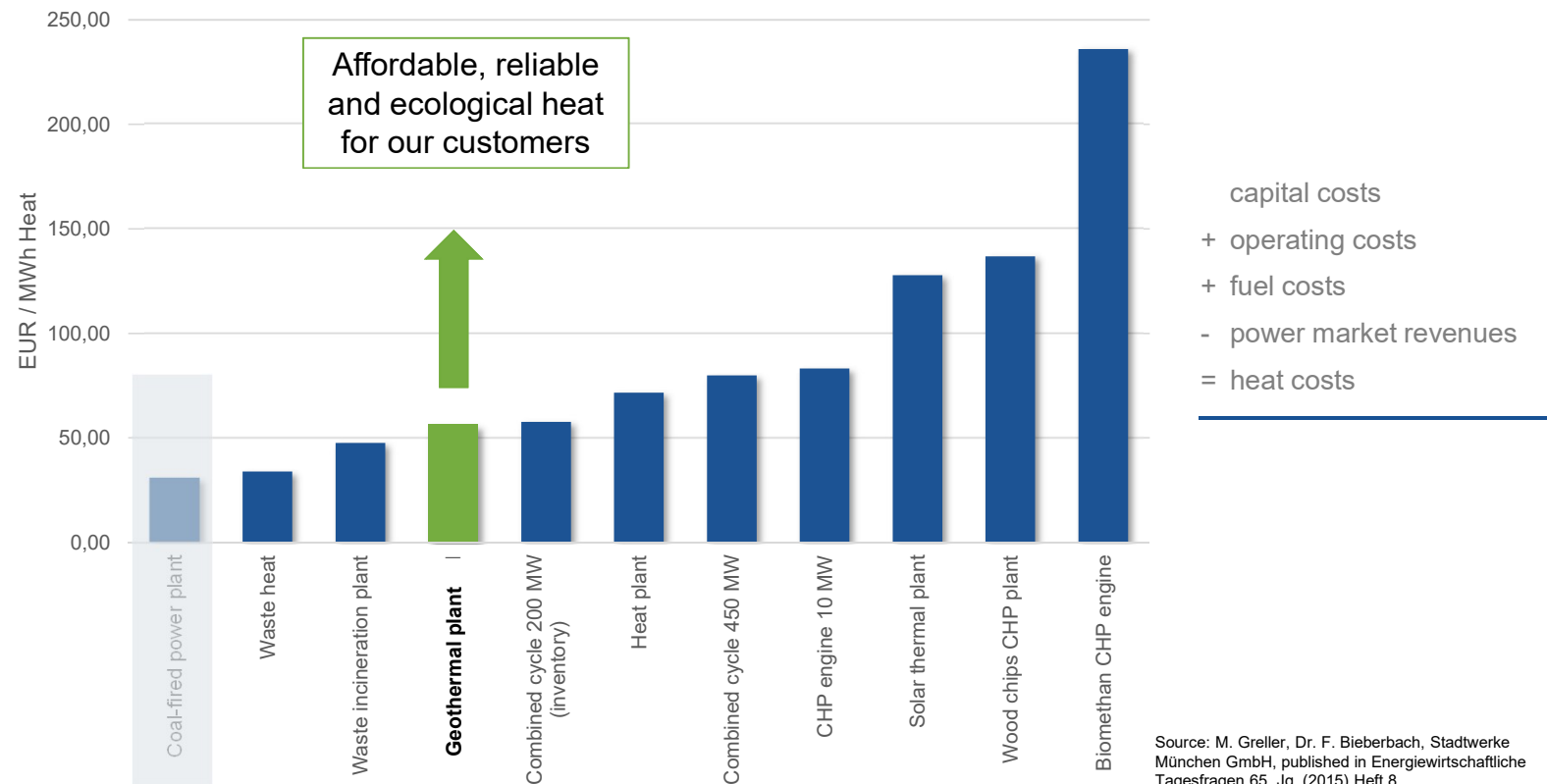
District heating networks are the backbone of renewable heating systems in cities.

- ▶ Big cities will continue to require a centralized heating supply due to limitations of decentralized solutions.
- ▶ District heating grids already exist in many big cities. This infrastructure is the basis for the energy transition of heating systems in cities as they enable the distribution of renewables.
- ▶ In cities, district heating networks are turning out to be the solution with the lowest costs.



Economic comparison

.....of technologies for district heating - Macro economic heat costs in 2040



Source: M. Greller, Dr. F. Bieberbach, Stadtwerke München GmbH, published in Energiewirtschaftliche Tagesfragen 65. Jg. (2015) Heft 8

Economic comparison

In 2015, a SWM study came to this conclusion:

“From a long term prospective, specifically with calculations for the year 2040, the importance of geothermal energy will continue to increase and will prove to be the most economical source of heat production ...

For geothermal heat production, initial investment costs are high, but from a long term prospective, the fuel costs of the other heat production technologies are of key importance for the resulting heat costs.

The bottom line of the study: The use of geothermal energy for district heating is crucial for a successful heat transition to renewable energy. In the Munich Larger Urban Zone (LUZ) there is an extraordinary potential for a CO₂-neutral heat supply from deep geothermal energy sources.”

“In the long term, deep geothermal energy proves to be the most economical source of heat production”

Experience based on our „lessons learned“

16 bore holes
Length:
2.500 - 5.500 m
Flow rates:
80 – 130 l/s ,
Temperature:
90 – 140 °C
Thermal
capacity
(dublette):
10 – 40 MW



Findings, requirements and challenges

- ▶ Holistic seismic data basis
- ▶ Reservoir management
- ▶ Integration of R&D
- ▶ Extension and intensification of monitoring measures
- ▶ High quality management / continuous improvement process
- ▶ Scale up of geothermal projects, redundant design
- ▶ Repowering and connection of sites
- ▶ Development of own products, where necessary

Development of Munich's grid and geothermal projects

Riem

- In operation since 2004
- Thermal capacity: 13 MW

Sauerlach

- In operation since 2014
- Electric capacity: 5 MW

Freiham

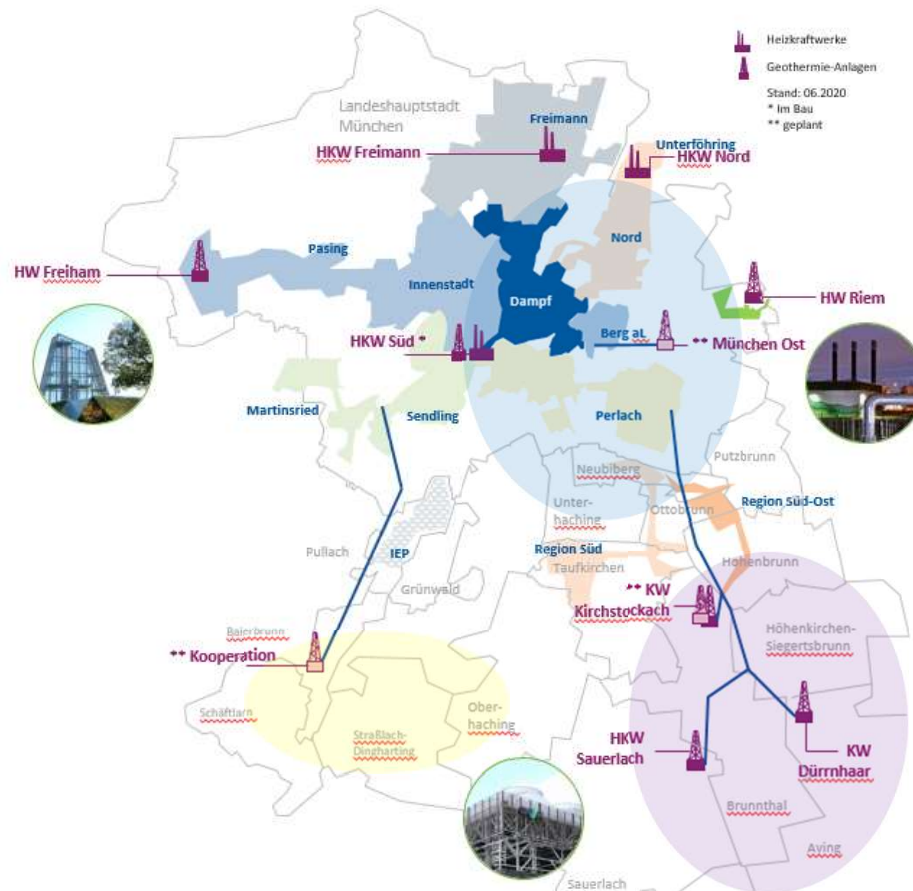
- In operation since 2016
- Thermal capacity: 12 MW

Dürrnhaar/Kirchstockach

- In operation since 2017
- Electric power: 10MW

Schäftlarnstrasse

- Commissioning 2020
- Thermal capacity: up to 80 MW

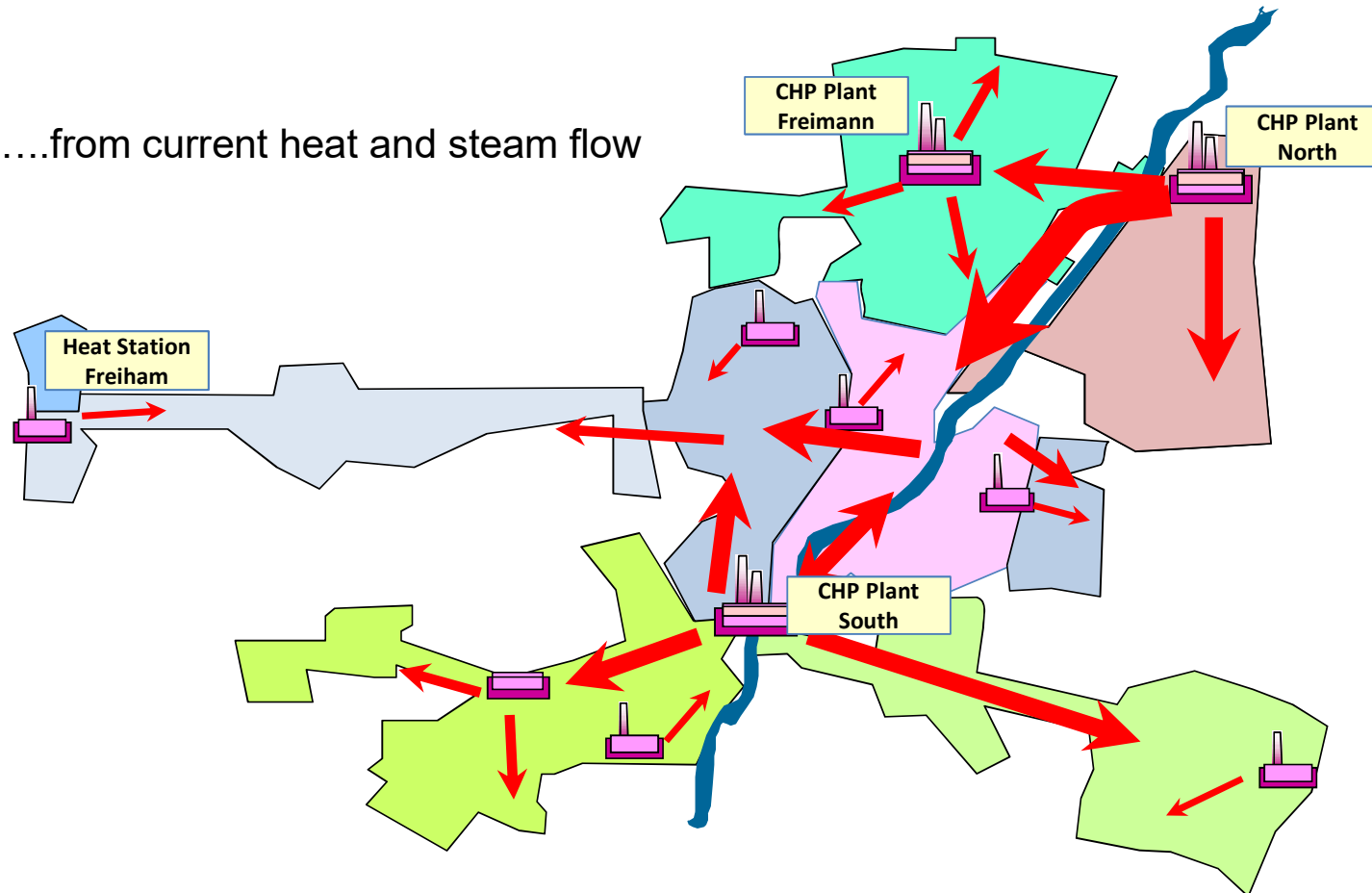


+ 400 MW th

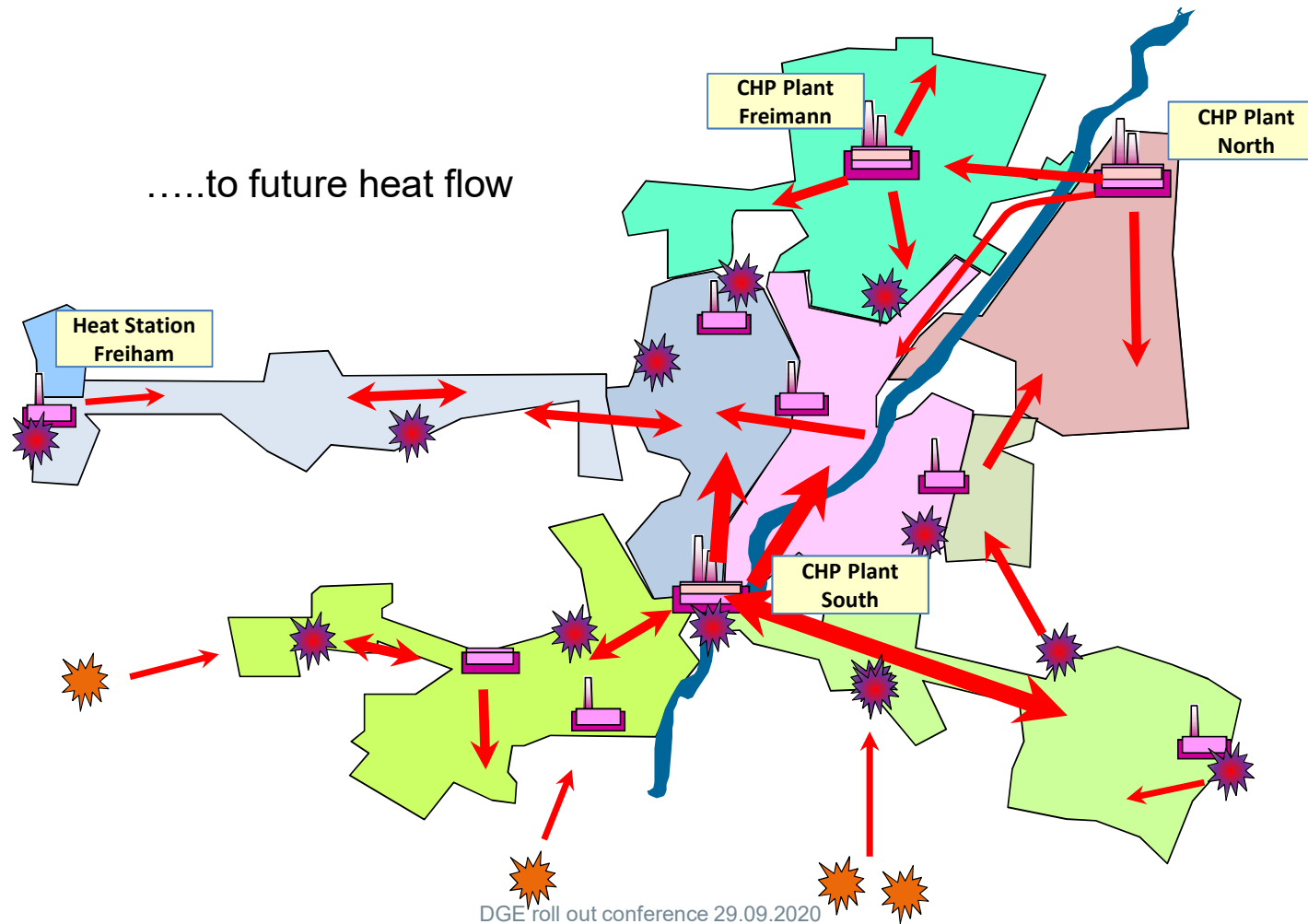
Additional
geothermal
supply within
the next 15-20
years

Development of Munich's grid and geothermal projects

.....from current heat and steam flow



Development of Munich's grid and geothermal projects



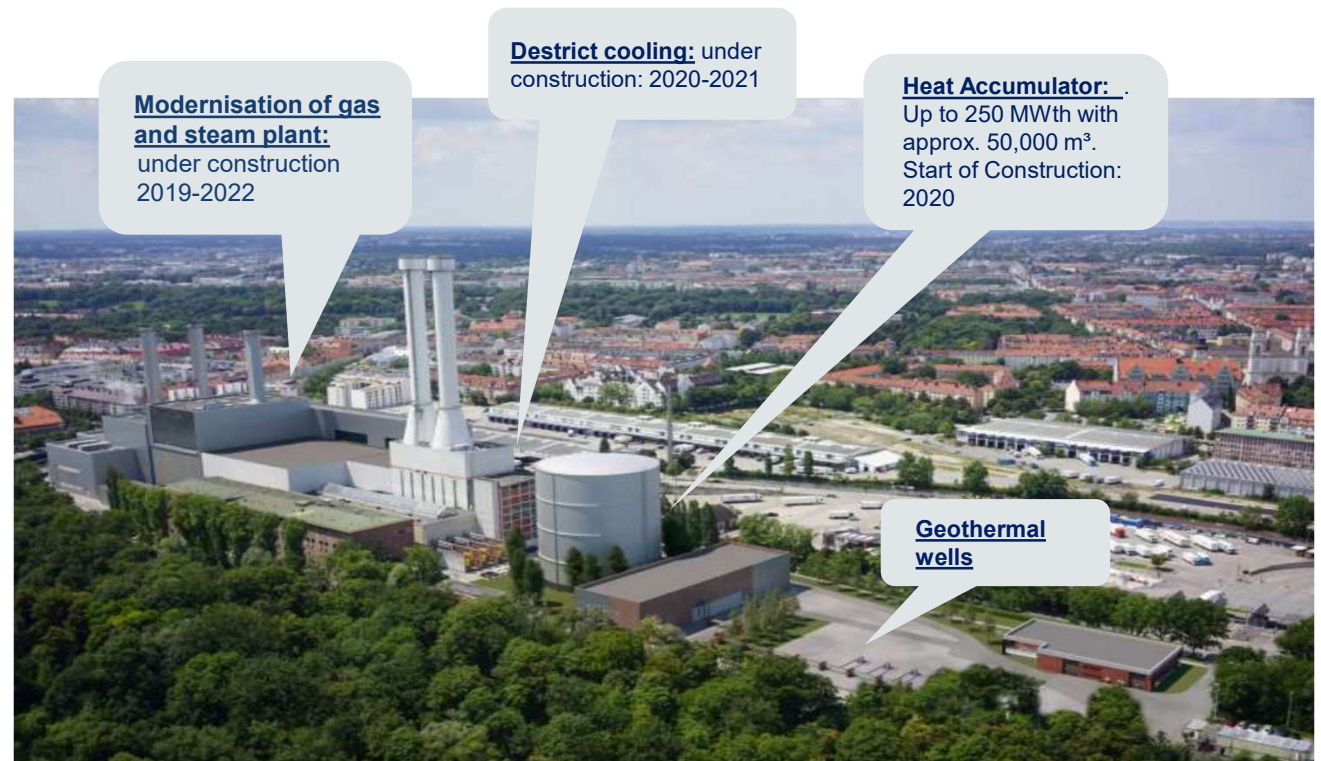
Multiple dublettes and multilateral drilling



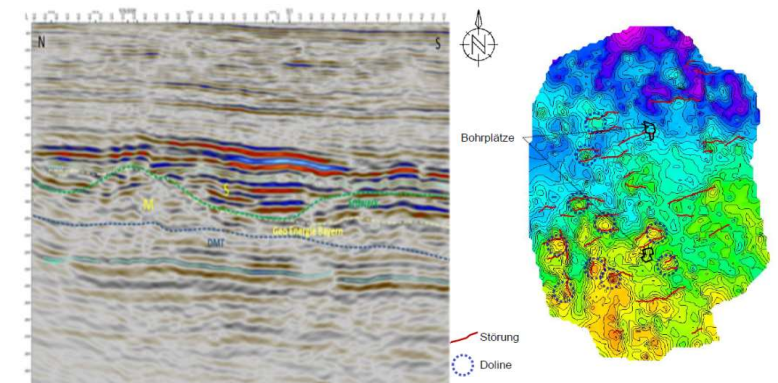
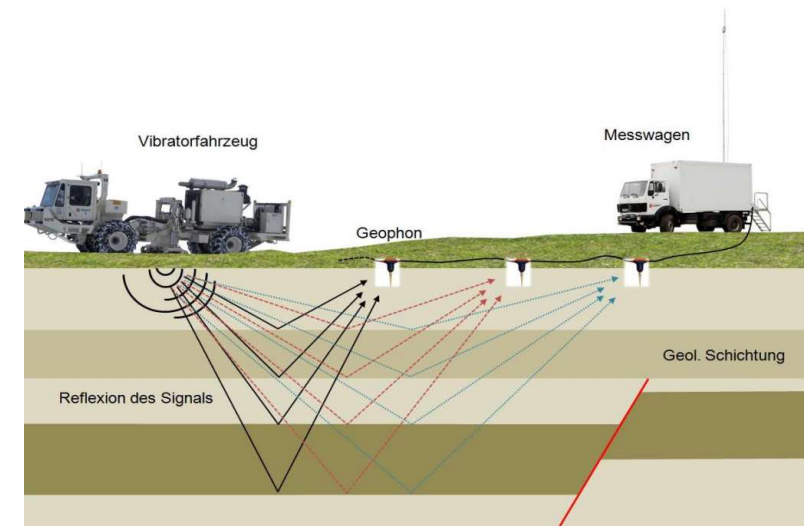
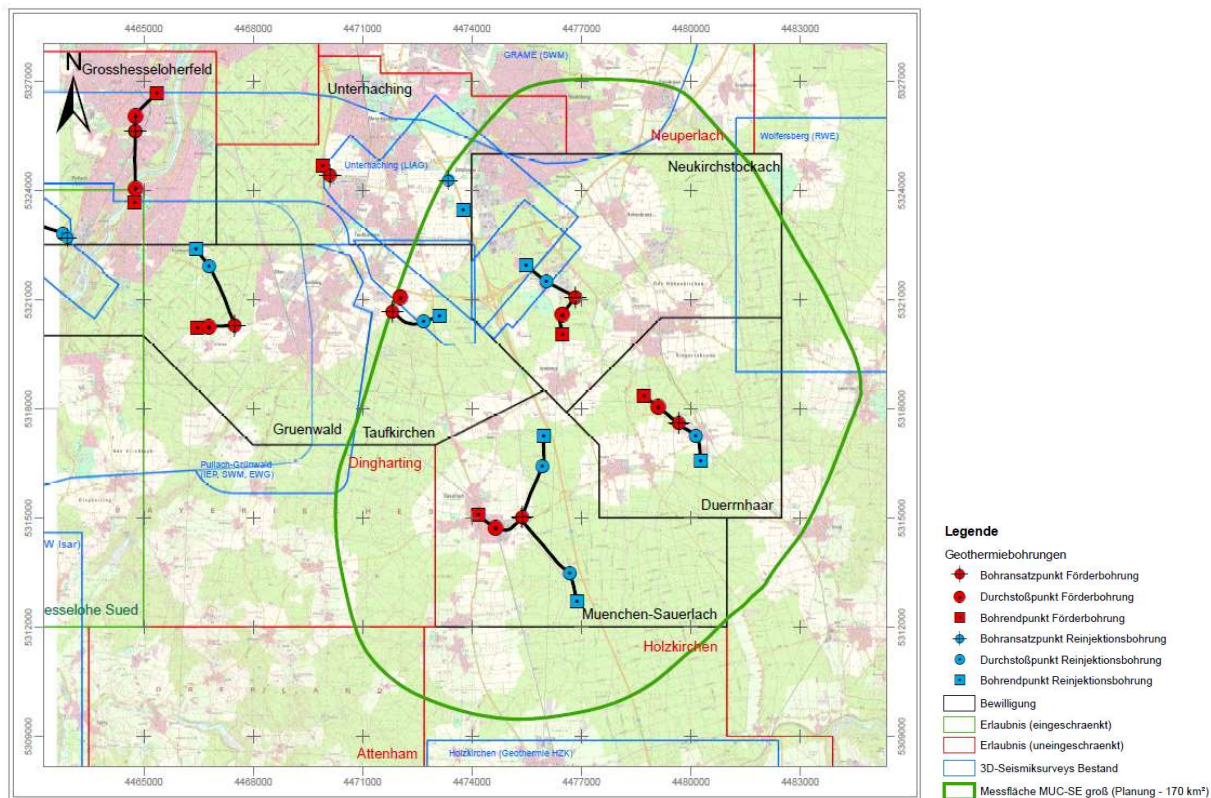
Utilisation and transformation of existing sites (2018-2021)



Visualisierung
SCG Architekten –
München / 04-2019



Seismic data campaign Munich South-East (Febr. 2020)



Research needs

Scope	Focal points
Energy	Optimisation of heat flows (storage and recuperation) Integration into network Hybrid systems Efficiency
Reservoir	Induced seismicity Interaction between wells Geological analysis of non successful wells
Hydrochemical impact	Scaling minimisation, application of inhibitors Data base Modeling Materials
Well, drilling and cognate techniques	Innovative well conception Noise minimisation (urban application)
Geothermal techniques	Monitoring (e.g. fibre optic cable) Flexible plant techniques Geothermal pump systems

SWM's geothermal ambition: applied research

Pump systems, rigs and other equipment



Glasfibre Measurements (INSIGHT)
Noise Protection (NEW)



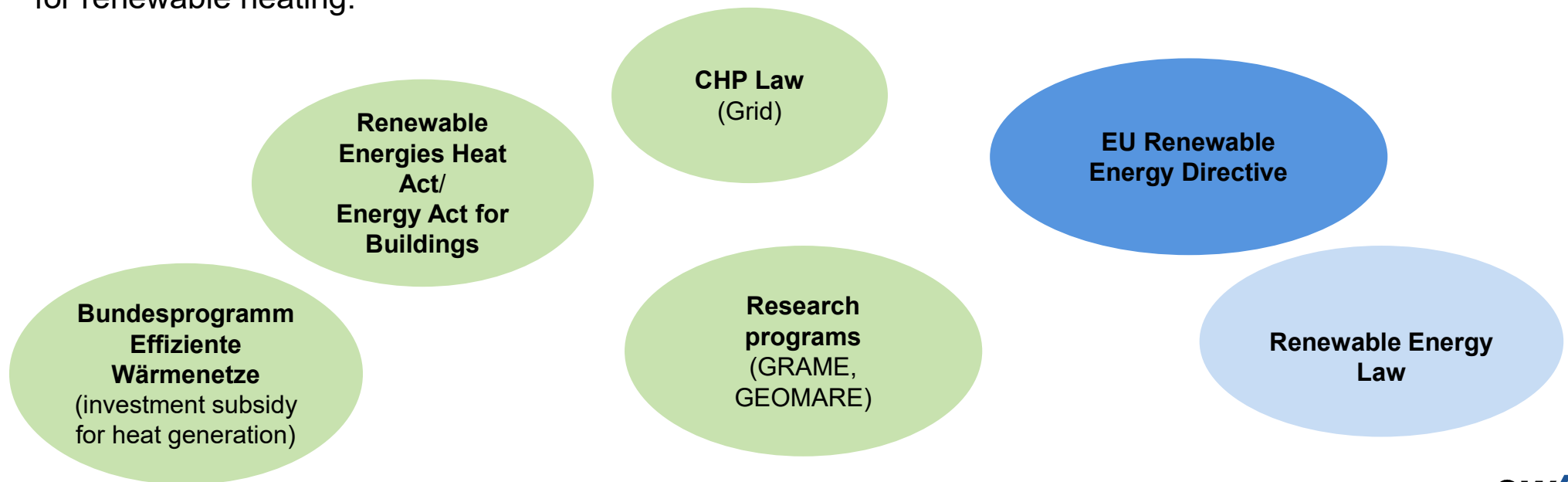
Workover rig
(EBIMA)



Innovations for
pump
systems

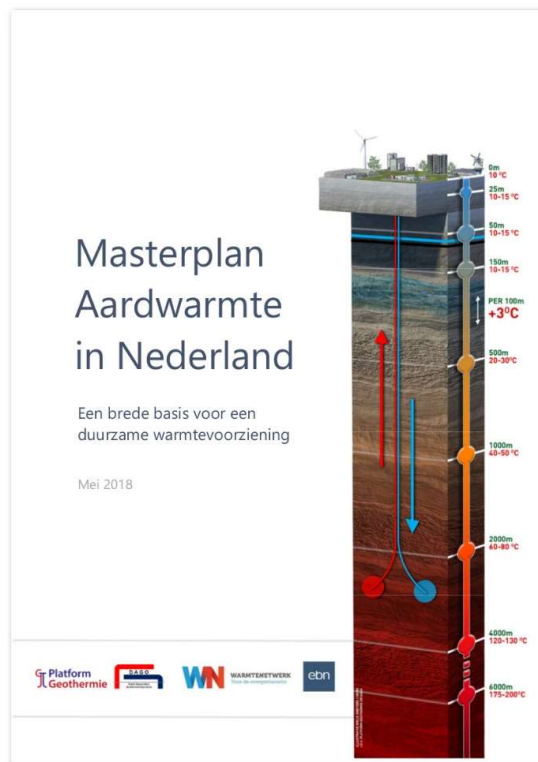
A stable framework, needed to make the heating transition a success.

- ▶ Due to the longevity of plants and networks, early-stage political decisions and a long-term framework are essential.
- ▶ The German government is currently working on developing a new comprehensive regulatory framework for renewable heating.



Geothermal Masterplan

....according to the Dutch pattern



WÄRMEWENDE
durch GEOTHERMIE

www.waermewende-durch-geothermie.de

German initiative to explain
and support geothermal
energy with the aim to reach
equal conditions

**German Geothermal
Masterplan - a MUST !**

As a political and
strategic instrument

Emphasis on core
geothermal regions

Scenario for district
heating and industrial
application

Necessary frame work

What thrives an energy company in a big city like Munich to develop geothermal?

Most important answers

- ▶ Geothermal utilisation is economically and environmentally the best option for Munich's CO₂ – neutral heat supply !
- ▶ Transition of existing heat supply grids and their connection are a real option to provoke the development of new grids !
- ▶ Conversion of former coal-fired sites !
- ▶ Repowering of geothermal sites !
- ▶ Especially seasonal heat storages are an important requirement in future !
- ▶ Geothermal R&D means improvement of state of the art !
- ▶ Acceptance of the public and political awareness
- ▶ Extension of geothermal network (German, European, worldwide), exchange of experience and ideas !



Stadtwerke
München



Thank you for your attention

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