

*5 November 2021, European Energy Award Gold Event, Ravensburg*

# Winterthur Municipal Energy Planning

## 2021 revision

# Agenda

1. Winterthur's climate goals
2. Potentials
3. Transformation of the heat supply
4. Current status of energy planning
5. Outlook

# 1. Winterthur's climate goals

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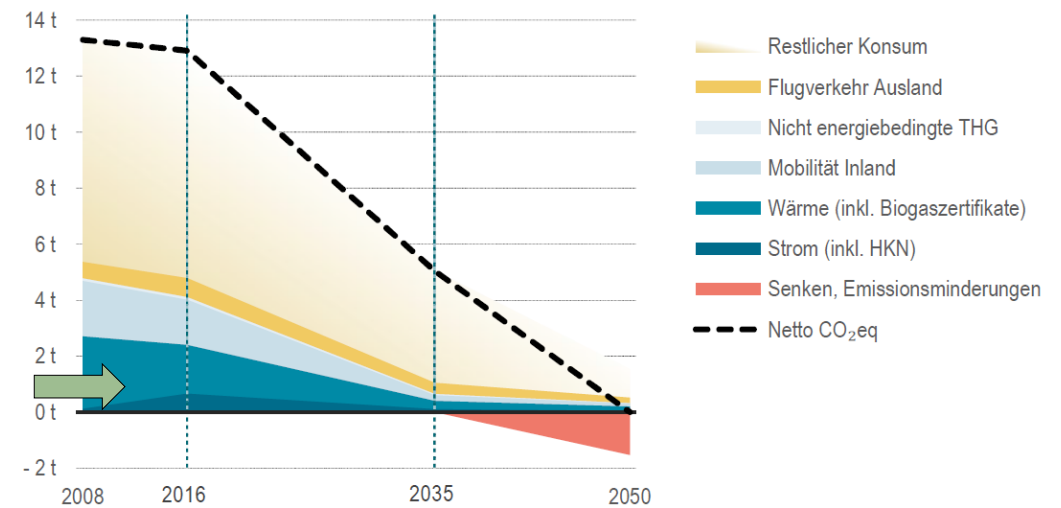
Forschung / Beratung / Evaluation / Recherche / Conseil / Evaluation / Research / Consulting / Evaluation /

Umwelt- und Gesundheitsschutz Winterthur

## Energie- und Klimakonzept 2050 Grundlagenbericht

Schlussbericht  
1. März 2021

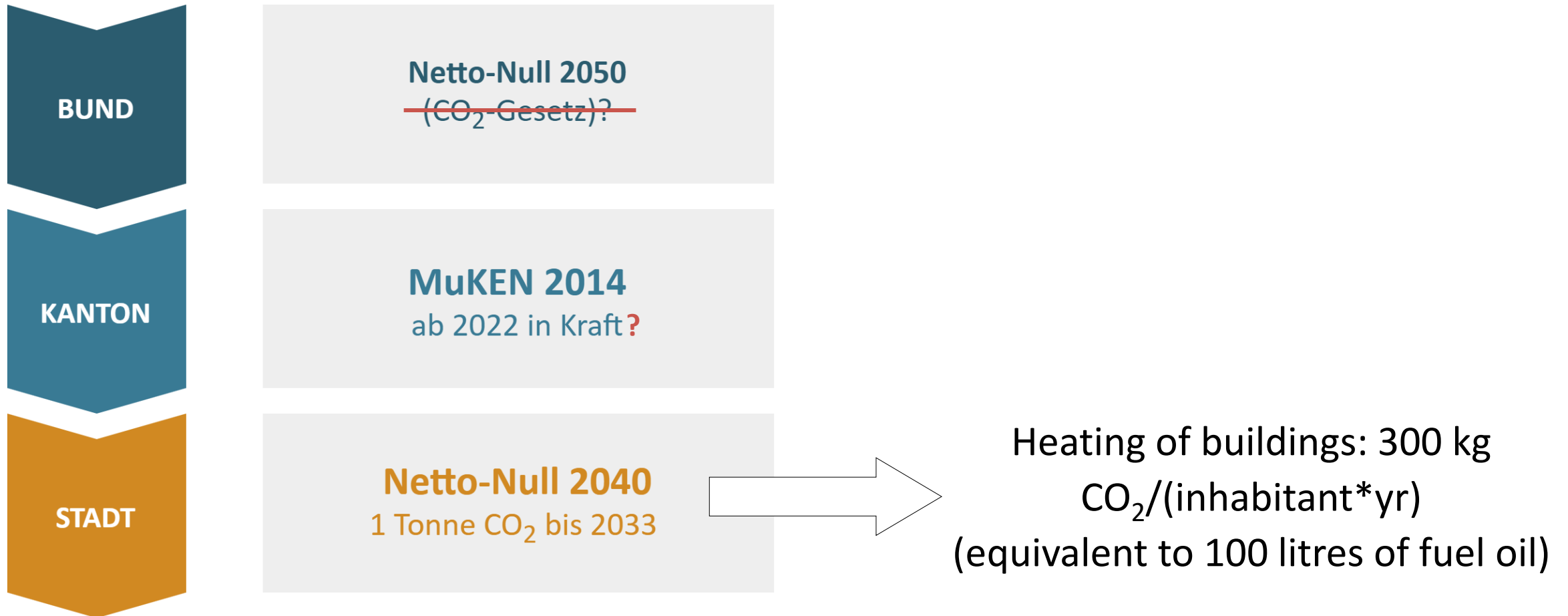
Absenkpfad NN2050 (CO<sub>2eq</sub>)



econcept

Abbildung 14: Absenkpfad für das Szenario NN2050 für Treibhausgase sowie Bilanzwerte 2008 und 2016. Die gesamte durch die Stadt und ihre Einwohner/innen verursachte Menge Treibhausgase entspricht der Fläche unter der Kurve. Je kleiner die Fläche, desto besser für das Klima.

# 1. Winterthur's climate goals



# 2. Potentials

Local winter electricity from solar systems\*

119  
Not stated

Winterthur waste incineration plant (WIP)  
(Incl. flue gas purification)

Waste heat from businesses

Waste heat from untreated waste water

Waste heat from treated waste water

Non-lignified biomass

Wood

Geothermal energy

Ambient heat air

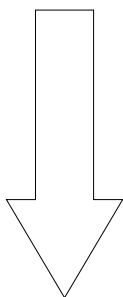
Ambient heat groundwater

Ambient heat geothermal heat

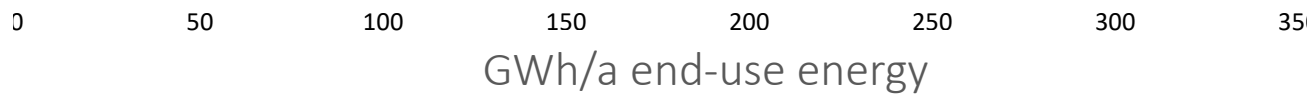
Sun (thermal)

- Potenzial regional
- Potenzial lokal
- Potenzial genutzt
- zukünftiges, unsicheres Potenzial

Heat demand approx. 900 GWh/a  
Potentials approx. 1,000 – 2,800 GWh/a



Available potential

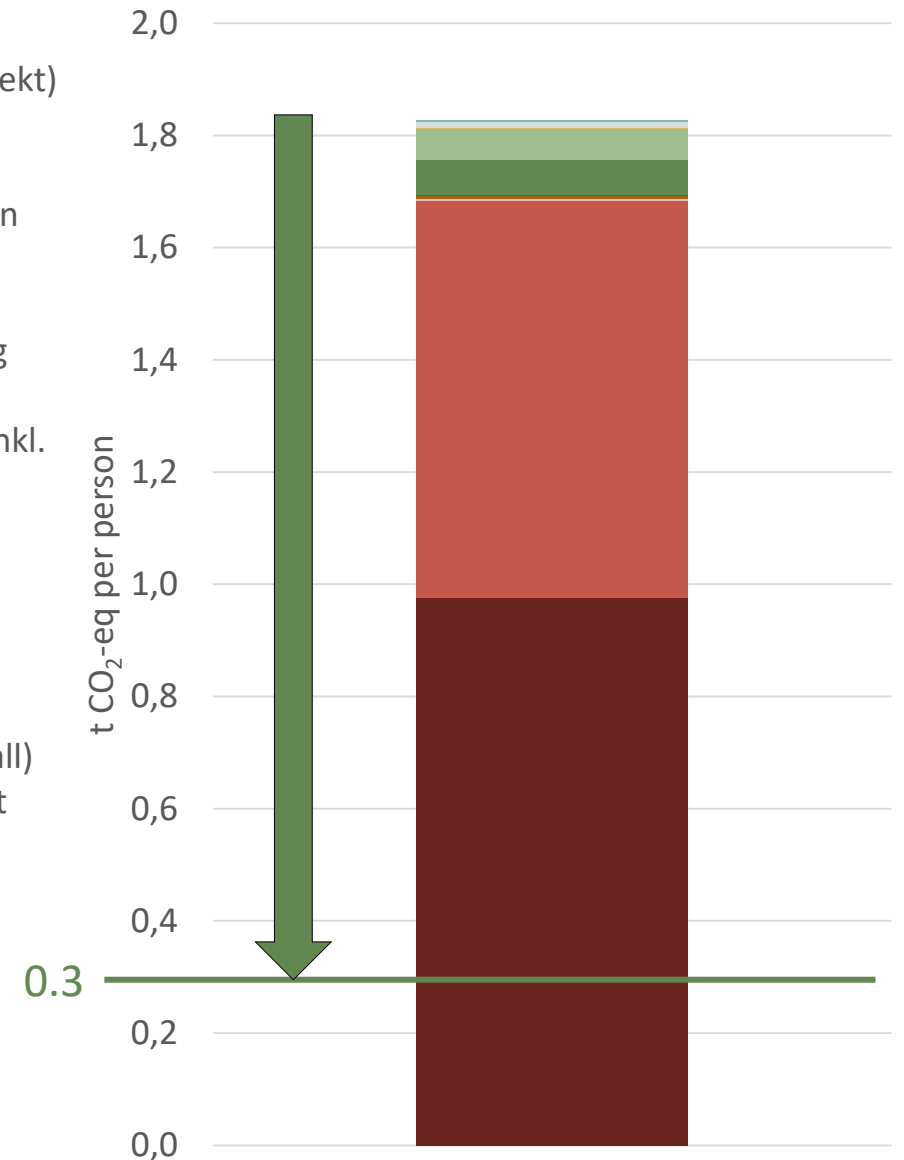


\* for operating heat pumps

# 3. Transformation of the heat supply

2019 greenhouse gas emissions from the heat sector

- Strom (Elektrodirekt)
- Sonstige Wärmeproduktion
- Sonnenenergie (thermisch)
- Abwärmenutzung
- Umweltwärme (inkl. Strom)
- Biogas
- Holz
- Fernwärme (erneuerbar/Abfall)
- Fernwärme (nicht erneuerbar)
- Erdgas
- Heizöl
- Kohle / Koks



Fuel oil down to 0% by 2033  
 Eliminate gas from heat supply,  
 by 2033 max. 10% natural gas, 30% biogas\*

\* Relative to 2019 heat demand

### 3. Transformation of the heat supply



Potential

Adequate availability



Time factor

11 years of transformation time  
Extension of existing networks  
Establishment of 7 new network areas



Costs

Network amortisation period: 30 years

Dependent on:

- Financial means
- Human resources
- Political support
- Legal framework

### 3. Transformation of the heat supply



Legal basis

CO<sub>2</sub> law and cantonal energy law



Financial support

Available subsidies from the Canton of Zurich and the City of Winterthur



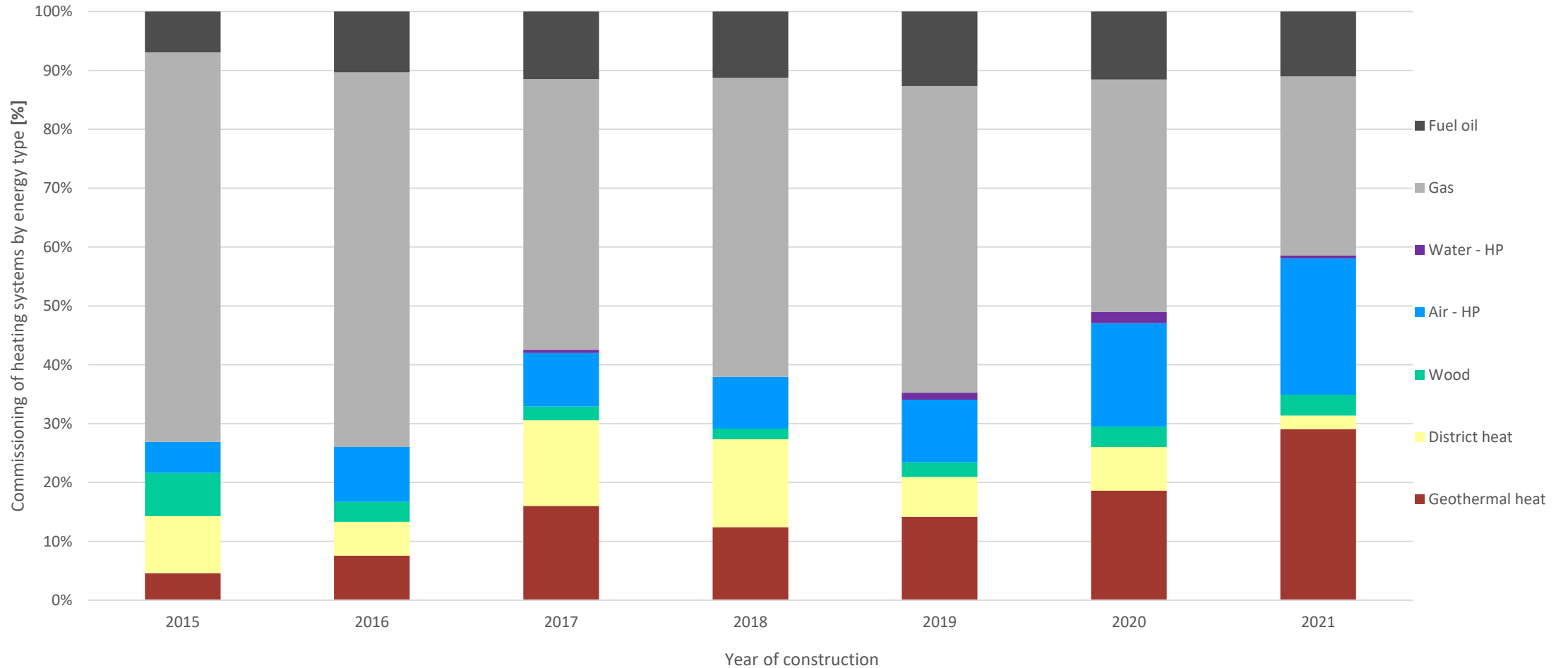
Consultancy and communication

Information on available consultancies and subsidies



# 3. Transformation of the heat supply

Commissioning of heating systems by year of construction and energy type in the City of Winterthur (January 2015 – August 2021)



## 4. Current status of energy planning



Fundamentals

2033 heat demand density

Potentials plan

Infrastructure plan



Approach

Zoning

Gas zones



Outlook

Subsequent steps

## 4. Fundamentals

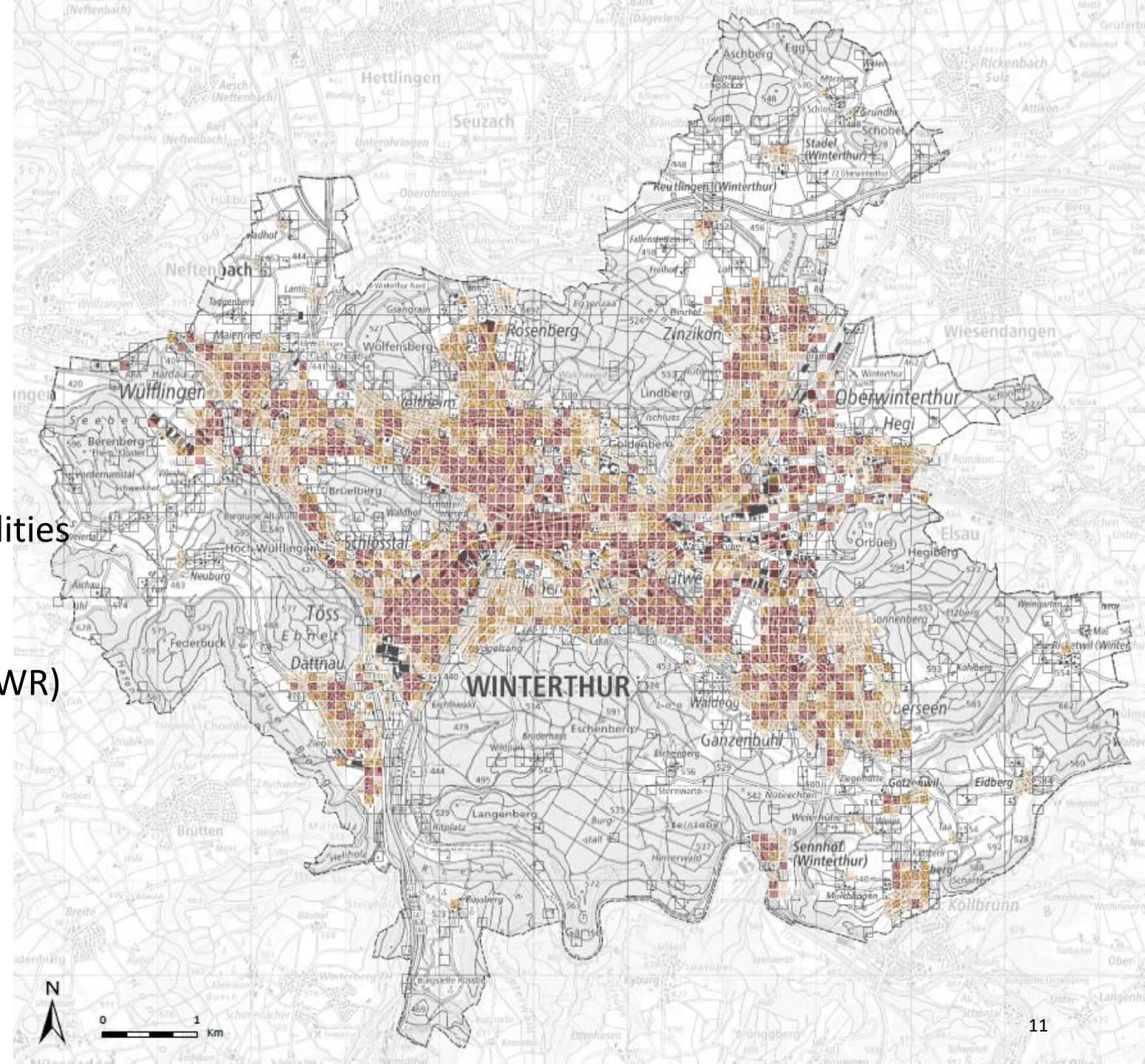
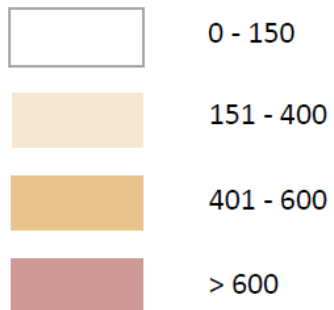
### Map of 2033 heat demand densities

- From 150 MWh/a: regeneration of geothermal probes
- From 400 MWh/a: network solution

### Data basis

- Values measured by the municipal utilities (gas, WIP, spring water supply)
- Installed burner capacity
- Register of buildings and dwellings (GWR)

Wärmebedarfsdichte pro Hektar in MWh/a





## 4. Fundamentals

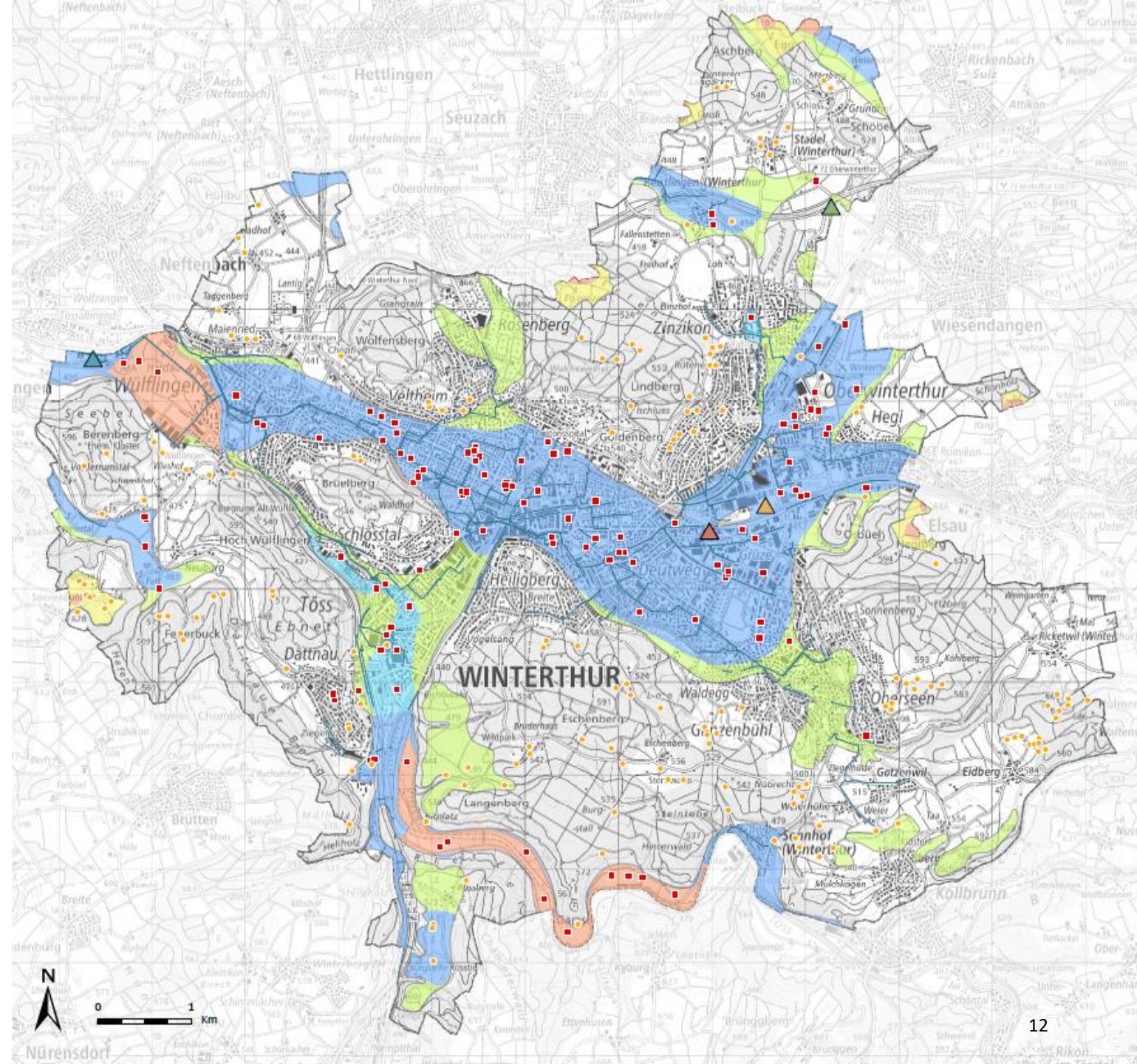
### Map of potentials

- Red: geothermal heat may not be used
- Blue: groundwater heat may be used (from 150 kW -> networks needed)
- Other\*: geothermal probes permitted

\* incl. areas not shown in colour

### Weitere Wärmequellen

- Grundwasserfassungen
- Quelfassungen
- Rohabwasser-Hauptleitungen >= 800 mm
- ▲ ARA
- ▲ KVA
- ▲ Geplantes Rechenzentrum
- ▲ Vergärungsanlage









# 4. Fundamentals

## Infrastructure map


### Existing networks

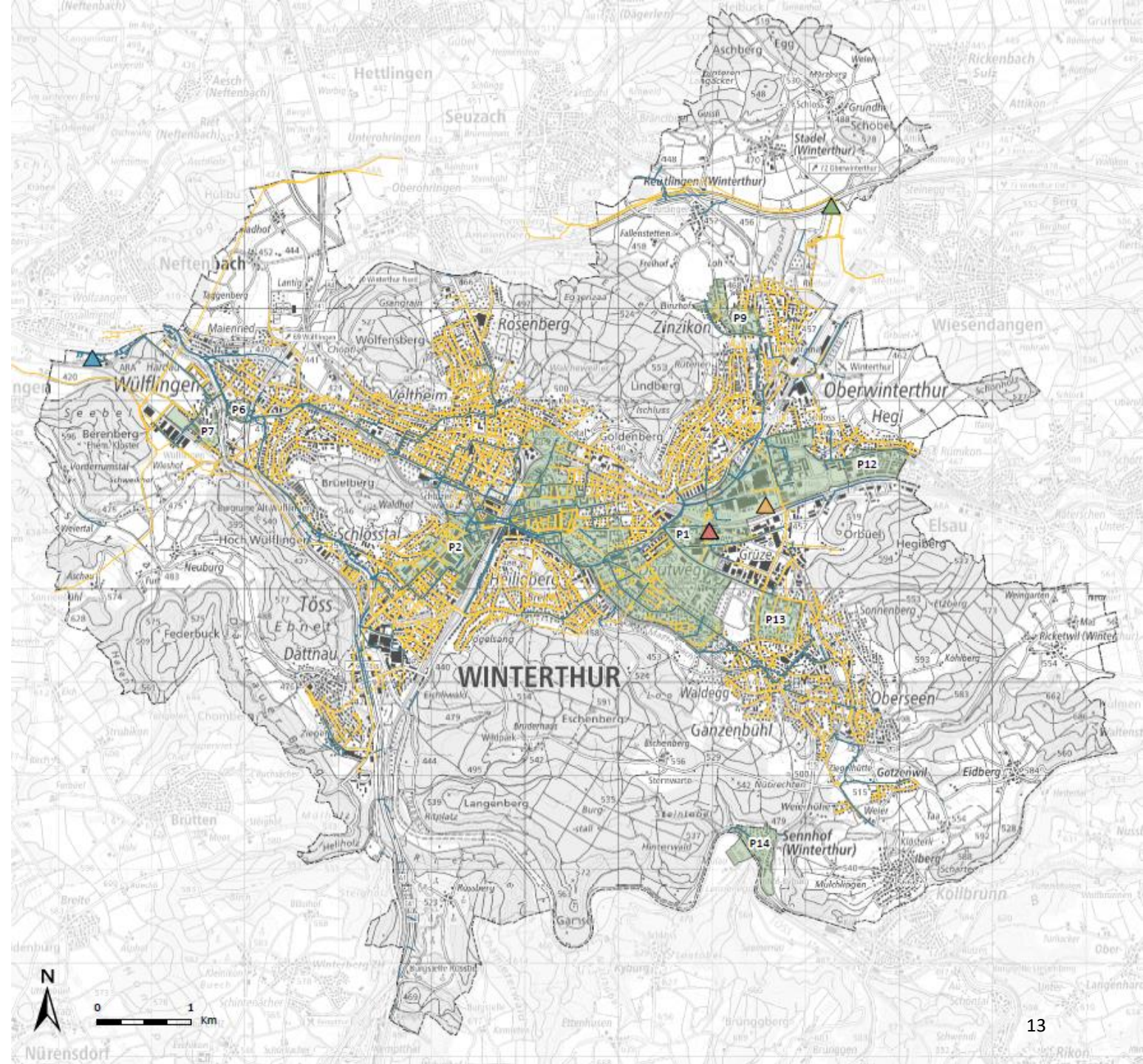
- P1: Use of WIP waste heat
- P2: Sulzer city centre heat network
- P6: Wässerwiesen waste heat network
- P7: Wyden wood network
- P9: Zinzikon wood network
- P13: Waser wood network
- P12: Gern wood network
- P14: Sennhof wood network

### Potenzielle Wärmequellen

-  ARA
-  KVA
-  Geplantes Rechenzentrum
-  Vergärungsanlage

### Leitungskataster

-  Gasnetz
-  Rohabwasser-Hauptleitungen >= 800 mm



## 4. Approach

Gas zones:

Scenarios for 2033 energy source mix and greenhouse gas emissions

Building refurbishment rate	Fuel oil	Natural gas	Biogas	Renewable energies	Greenhouse gas emissions (t/inhabitant*yr)
1%	0%	0%	30%	70%	0.32
1.2%	0%	0%	30%	70%	0.32
2%	0%	10%	30%	60%	0.31

Gas use for processes only



# 4. Approach

## Gas zones



## 4. Approach

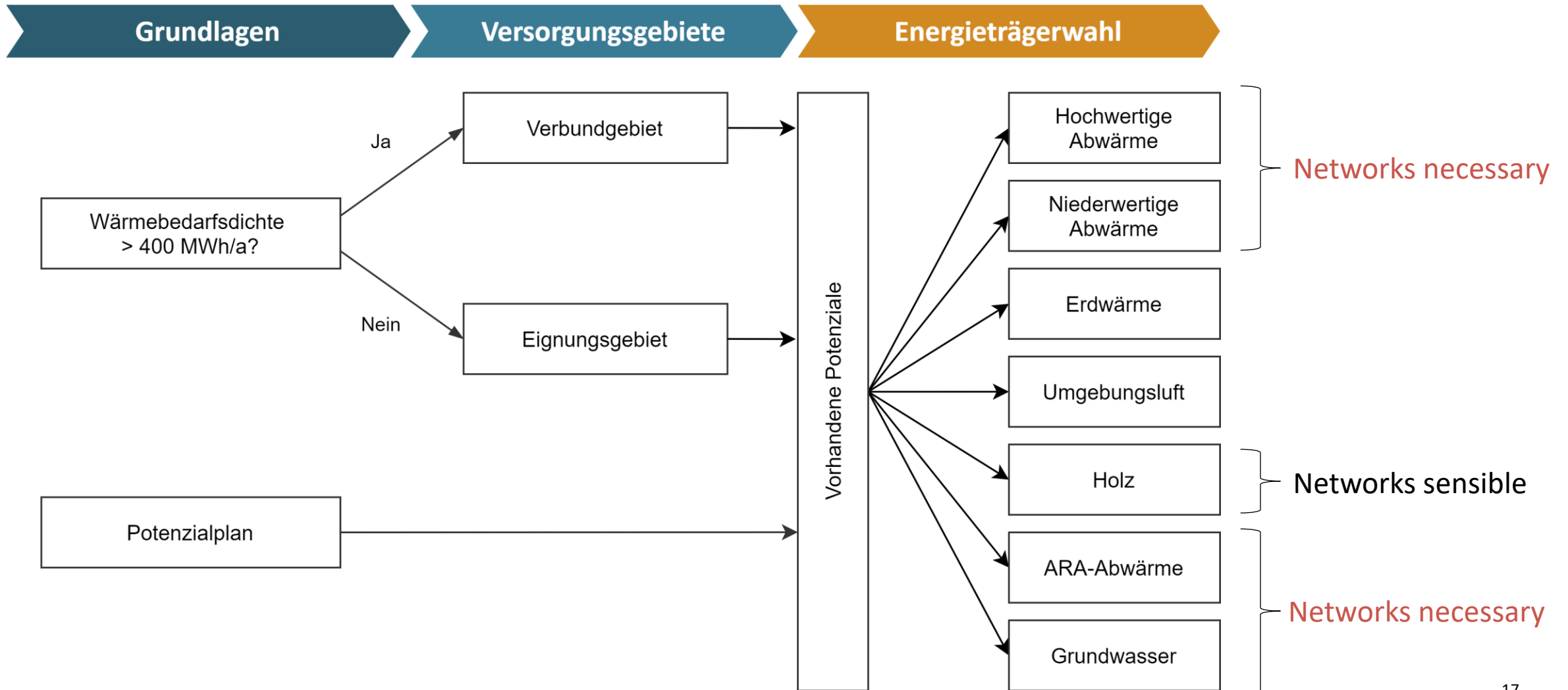
### Gas zones

- Remaining gas zones
  - Niederfeld, Oberwinterthur, Grüze industrial estates
  - Network coverage of peak demand
- Last gas supply for heating purposes
  - In suitable areas and currently existing network areas **end of 2033**
  - In remaining areas (planned networks) **end of 2040**



# 4. Approach

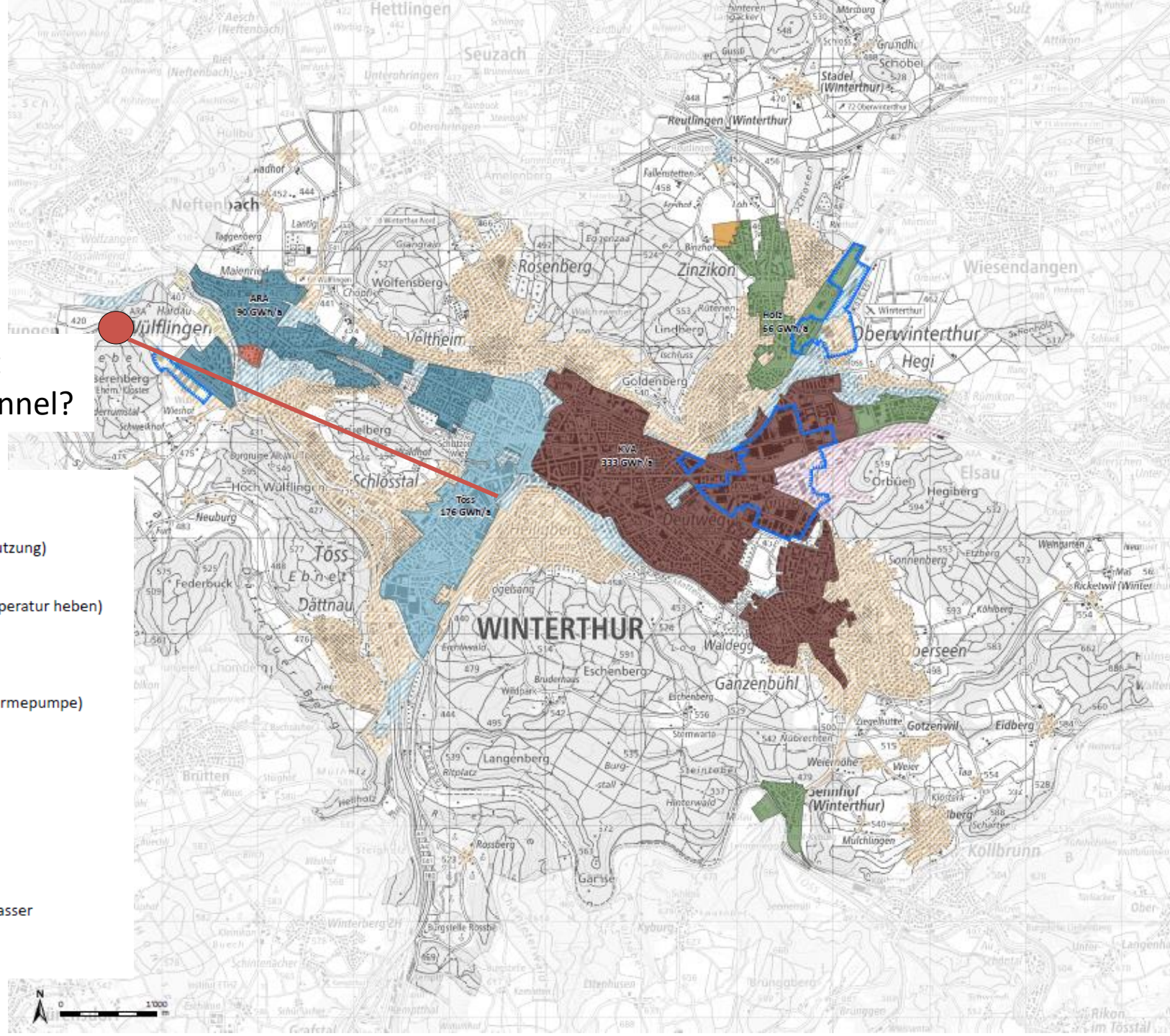
## Zoning



# 4. Current status of energy planning

Draft energy plan as per 8 July 2021

● Back-up for Waste Incineration Plant with connection to the Heiligberg tunnel?



Verbundgebiet

Eignungsgebiet

Wärmequelle



Hochwertige Abwärme (Direktnutzung)



Niederwertige Abwärme (mit Wärmepumpe auf Nutztemperatur heben)



Erdwärme



Umgebungsluft (Luft-Wasser-Wärmepumpe)



Holz



ARA-Abwärme / Grundwasser



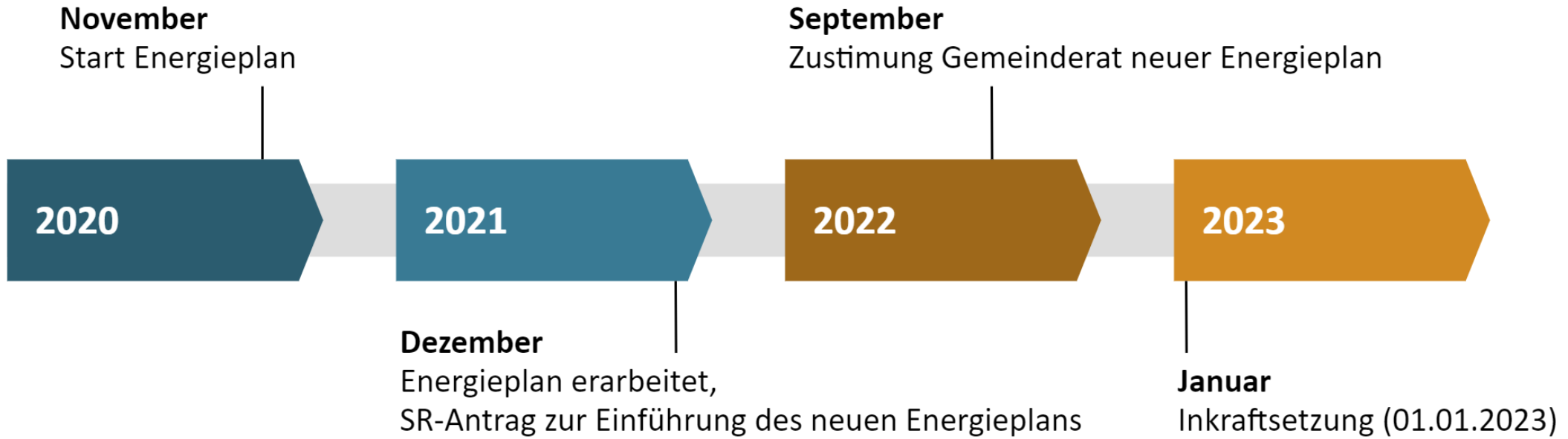
Grundwasser

Oberflächengewässer / Grundwasser

## 5. Outlook – municipal energy planning

- Idea of coupling networks with a view to utilising WIP energy optimally
  - More in-depth study required (engineering firm)
- Complete the energy plan (coordination with municipal utility) -> vision for development
- Action sheets (implementation tool)
  - Per zone
  - Creation of the requisite framework conditions: structural/organisational
- Implementation in the online Winterthur municipal plan

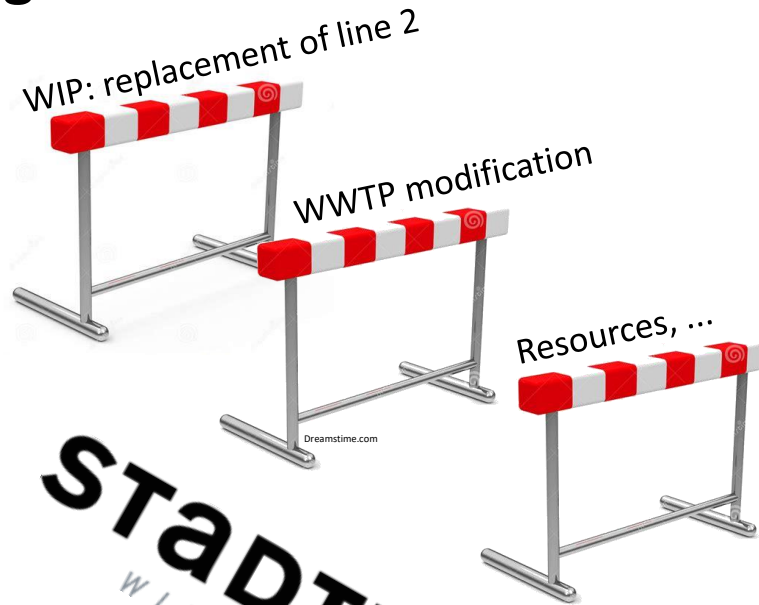
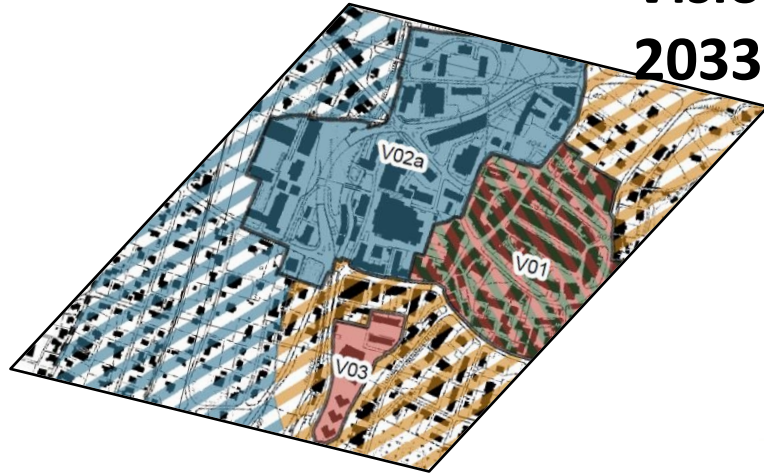
# 5. Outlook – municipal energy planning





# 5. Outlook – requirements for implementing the energy plan

Vision of the  
2033 goal



**STADTWERK**  
WINTERTHUR

100% renewable  
heat supply for  
Winterthur



Stadt.mein-coburg.de



Stadt Winterthur

# 5. Outlook – implementing the energy plan

Massnahmenblätter Energieplanung Illnau-Effretikon

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**V02 Riet**

Zielsetzung      Sicherstellen erneuerbare Wärme- und Kälteversorgung  
Effiziente Wärme- und Kälteversorgung im Verbund

Energieträger      – Grundwasser in Kombination mit Eigenstromerzeugung (Solar)  
– Erdwärme<sup>1</sup> in Kombination mit Eigenstromerzeugung (Solar)  
– Holz (V01)

Beschreibung       Bestehender Verbund     Geplanter Verbund

Riet Effretikon ist ein Arbeitsplatz-Entwicklungsgebiet, welches frühestens ab 2025 bebaubar sein wird. Die Nutzung von Grundwasser ist in einem Teilbereich zulässig, die Ergiebigkeit jedoch nicht gesichert. Im anderen Teil ist Erdwärme zulässig. Zudem kann auch ein Anschluss an den Verbund V01 geprüft werden.

Projektverantwortung      Stadt Illnau-Effretikon, Abteilung Hochbau

Vorgehen	Termine	Schritte	Federführung (weitere Akteure)
	Mittelfristig	Sicherstellen einer erneuerbaren, optimierten Wärmeversorgung des Gebietes im Verbund durch Grundwasser, Erdwärme oder Holz durch Vorgaben in Quartierplänen oder Beratung der Bauherren.	Abteilung Tiefbau

Zielkonflikte, Abhängigkeiten, Bemerkungen      Bei Bedarf an hohen Vorlauftemperaturen Anschluss an V01 oder V03 prüfen.  
Die Gemeinde besitzt in dem Perimeter ca. 2'750 m<sup>2</sup> Land, das ggf. für eine Energiezentrale für Strom und Wärme genutzt werden könnte.

Stand der Umsetzung      Grün      Gelb      Rot  
Umsetzung wie vorgesehen      Kritisch      Im Defizit

Letzte Nachführung      13.11.2020, PLANAR

Vollzugsjournal      (zur Fortschreibung gedacht)

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<sup>1</sup> Die Nutzung von Erdwärme ist unter der Voraussetzung von Regeneration der Sonden in dichten Gebieten zu verstehen

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## Action sheets on the network zones

- Gather as much information as possible (WIP works, WWTP, project plan)
- Approach, milestones, conflicting goals

## Action sheets for implementation

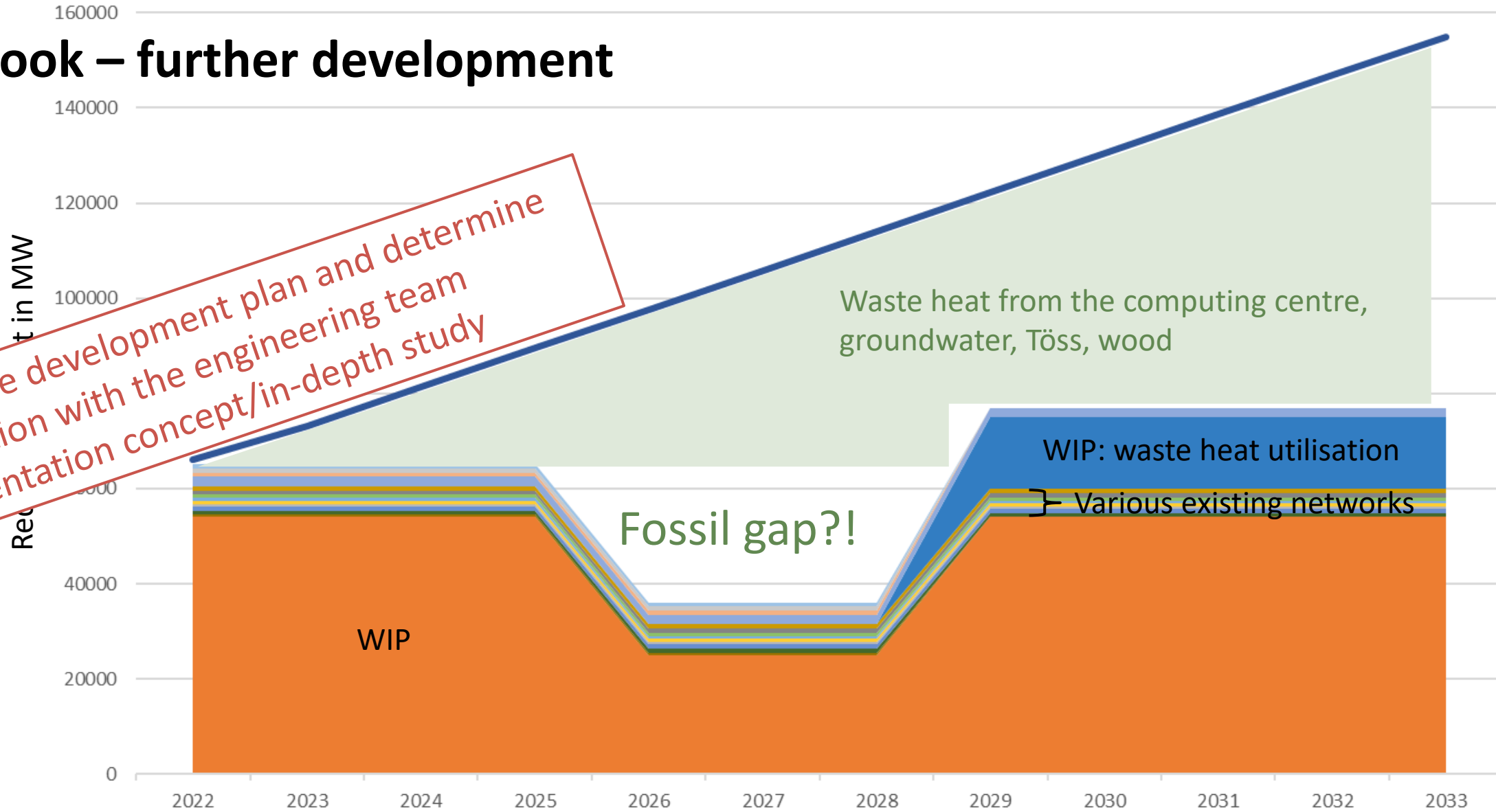
- **Create optimal framework conditions**

E.g. coordination with civil engineering, finance, ...

Monitoring of implementation and impacts

# 5. Outlook – further development

Expand on the development plan and determine the best option with the engineering team  
 -> Implementation concept/in-depth study



ErVel 2

WWTP modification and expansion

Linear development path

# What does the energy plan mean for the public utility

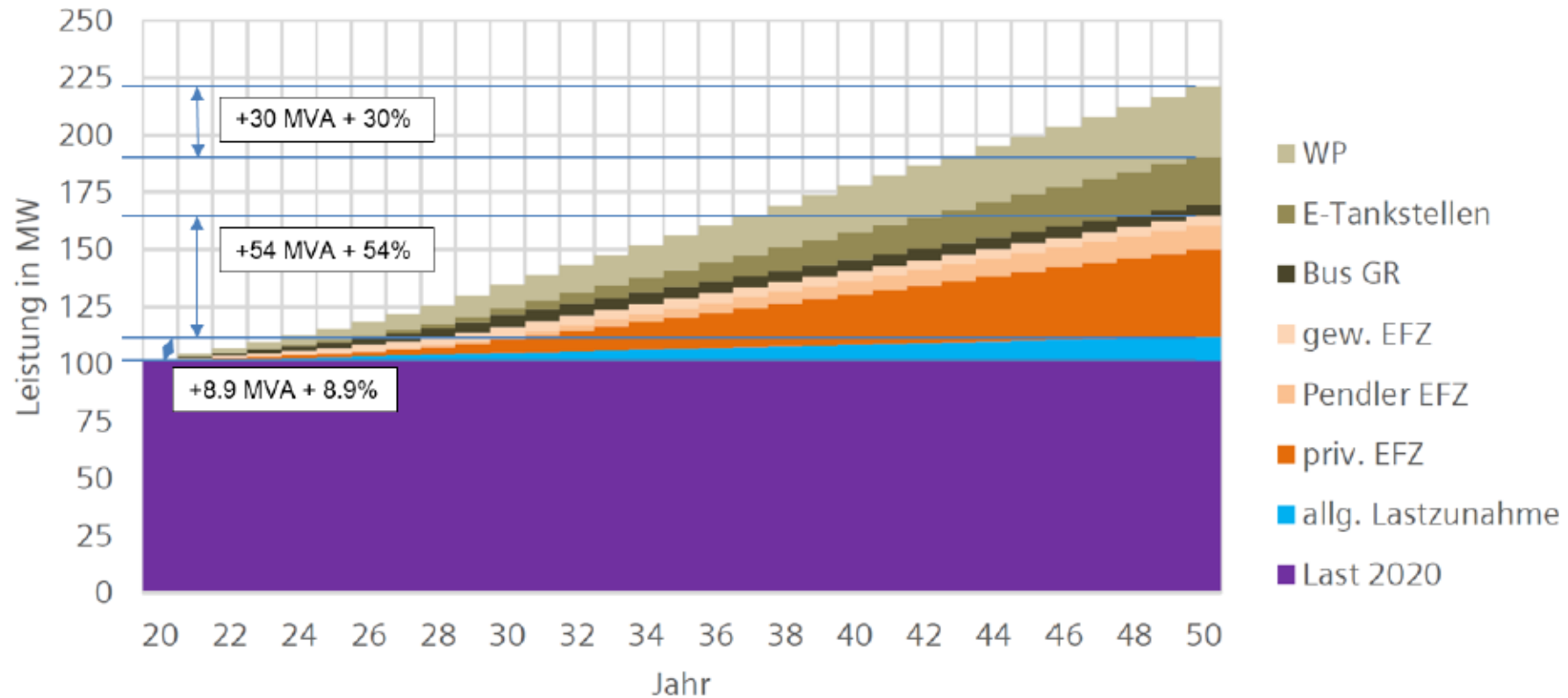
- Reduction of the gas network by ca. 100 km and 3000 connections
- Providing temporary transitional solutions
- Construction of heat networks of ca. 100 km and 2000 connections
- Construction of ca. 5 heating centers
- Grid reinforcement in the power grid (+ 7000 geothermal probes)



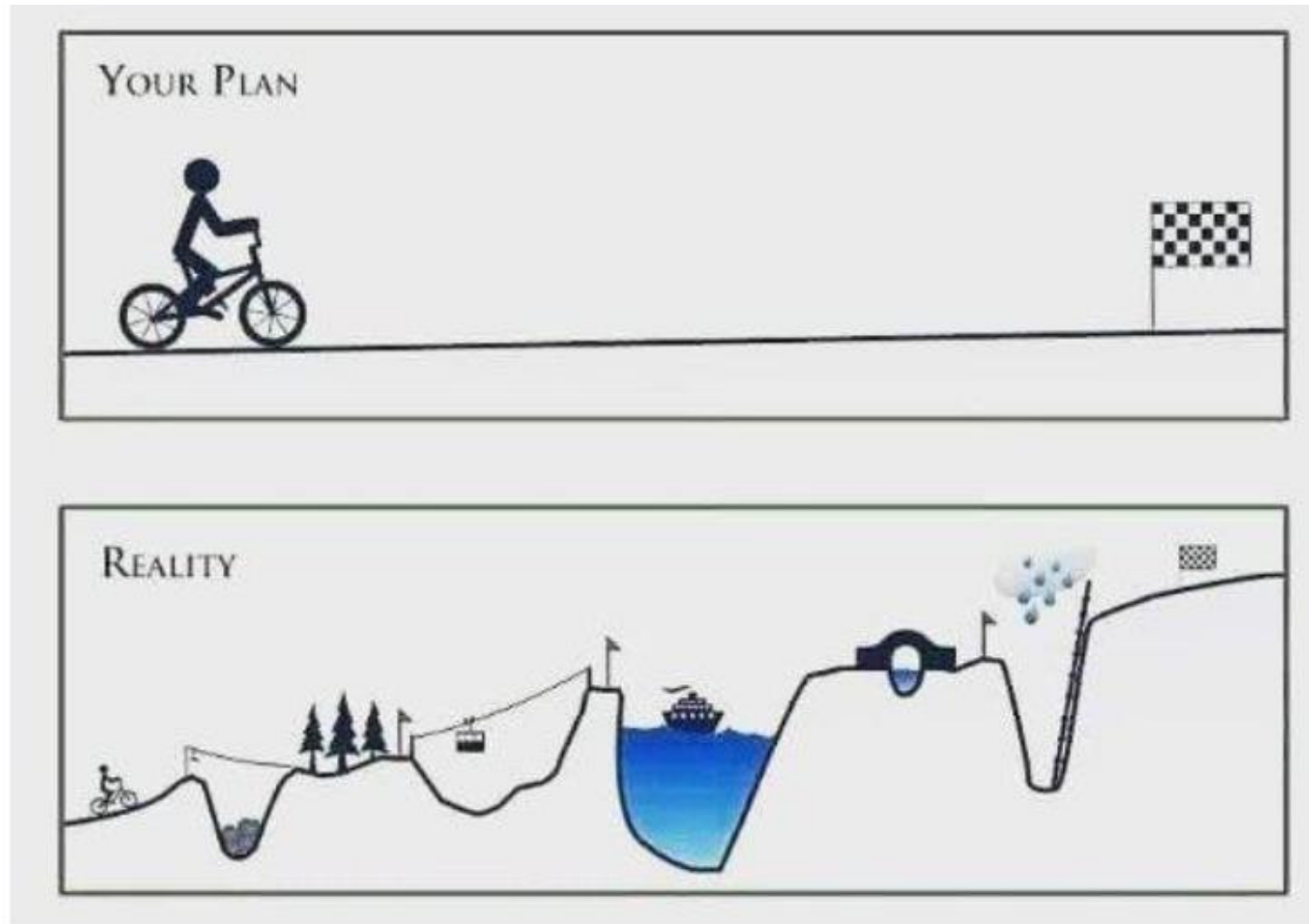


# Increase in electricity load due to heat pumps and e-mobility

- from the Siemens study on load increase until 2050 in Winterthur
- for the heat pump capacity, an additional load of 30MVA, and for e-mobility of 54 MVA was determined



## Conclusion: difficult but not impossible



Thank you for your attention!

*You can't do that.  
Someone came  
along who didn't  
know that and **just**  
**did it.***