

# Heat scenarios in Geneva by 2035: which role for geothermal energy

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JASM workshop

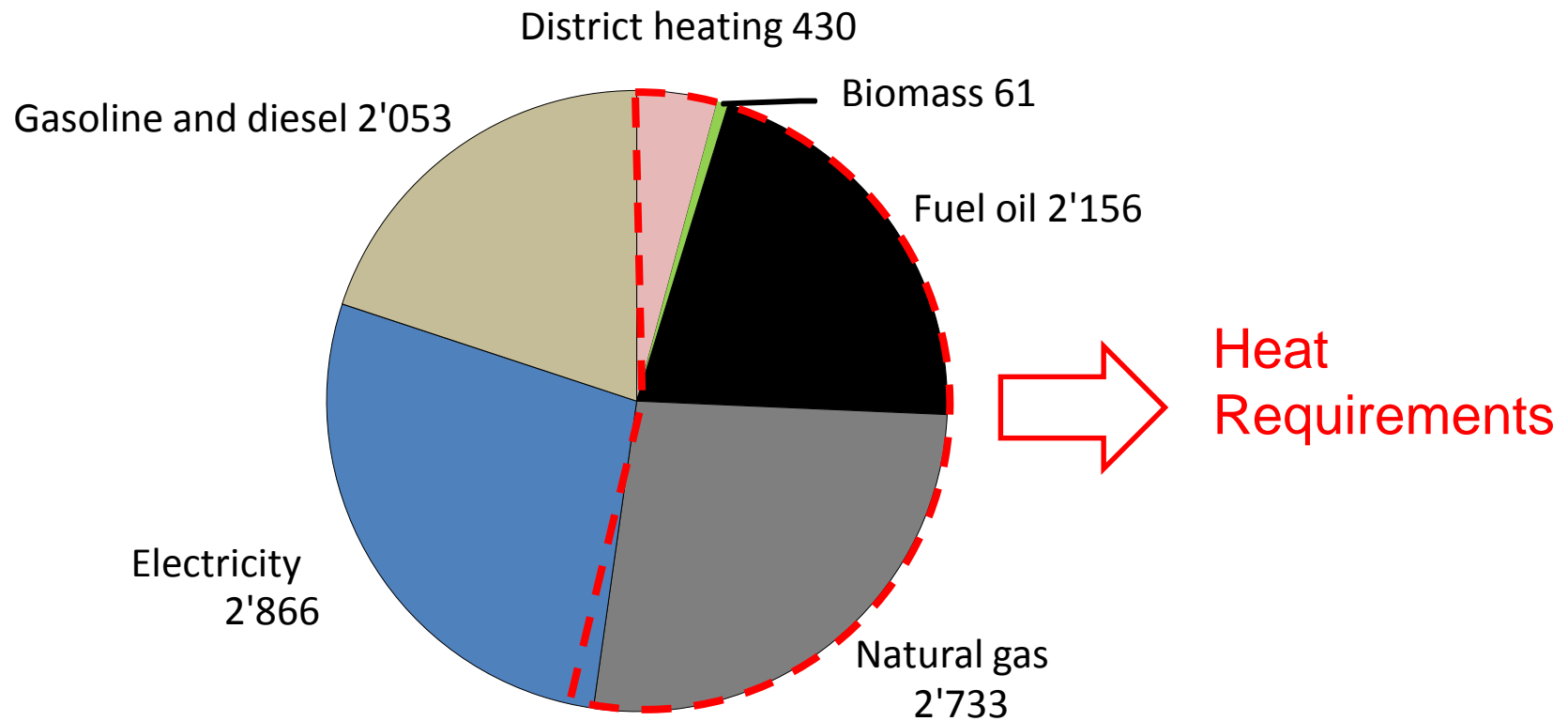
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Zurich



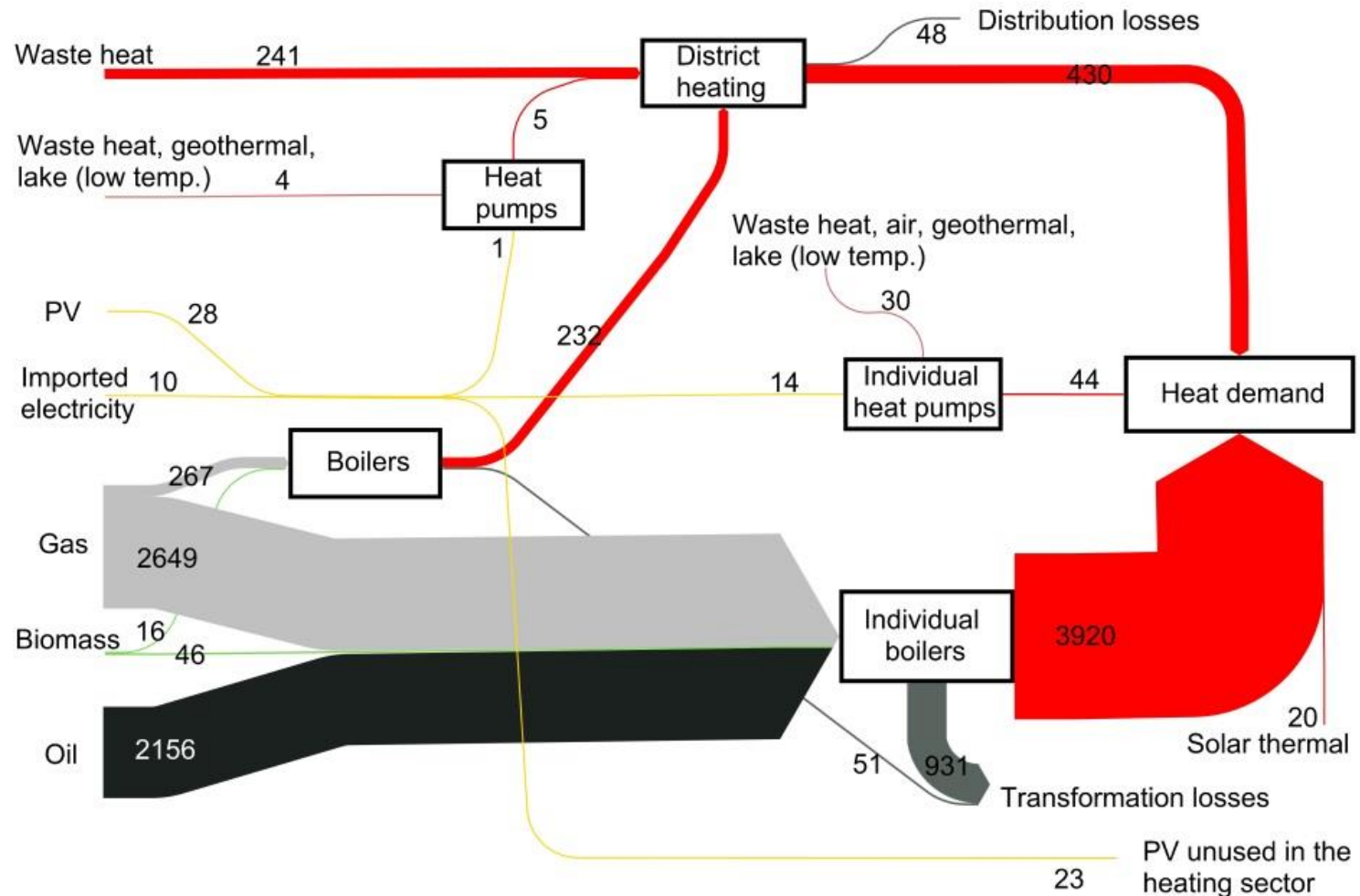
# Geneva energy context

## Final energy consumption in the Canton of Geneva in 2014 (GWh/yr)








# The heat sector in Geneva

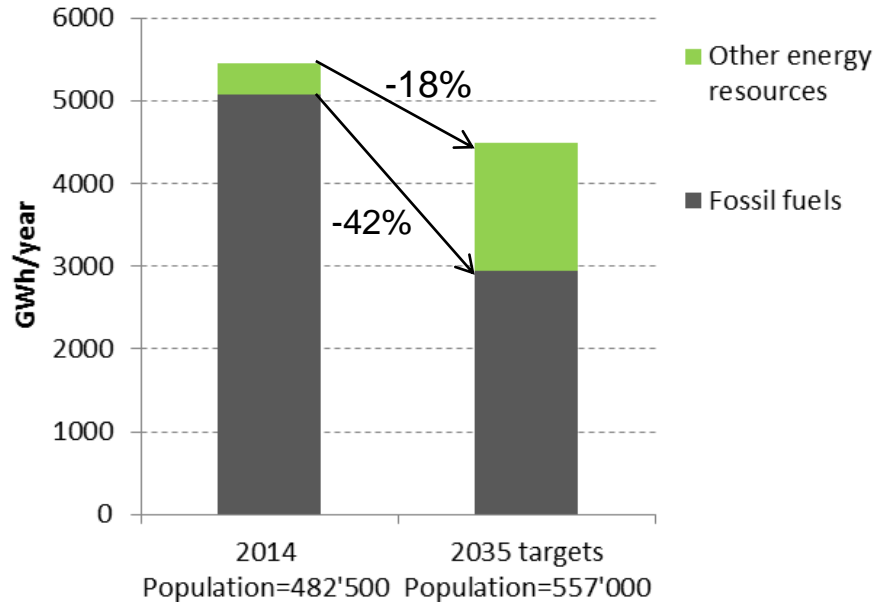
2014 GWh/yr  
Population: 482'500



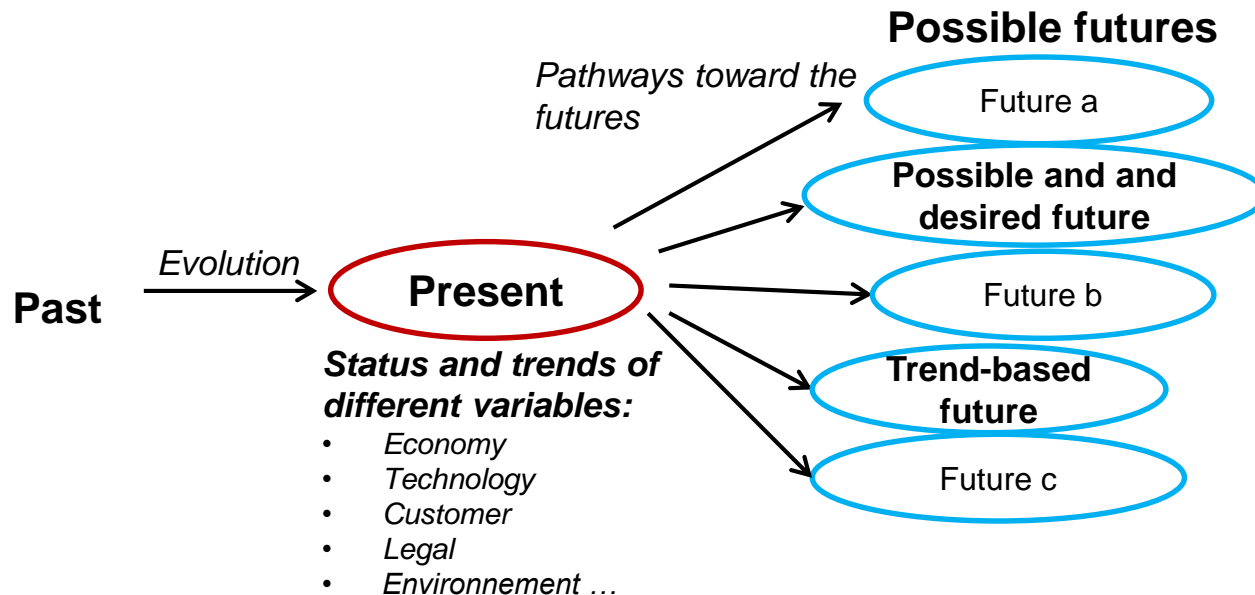
# The heat sector in Geneva

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**Cantonal targets for the heat sector by 2035:**
  - 
**- 18% reduction in energy consumption compared to 2014**
  - 
**- 42% reduction in fossil fuels consumption compared to 2014**

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**How could be designed a cantonal heating system that meet these energy targets ?**
- 
**What could be the role of geothermal and district heating ?**



**Realisation of a forward-looking analysis regarding the future heat market**



1. Building a **dynamic representation of the system** and identifying the main variables (with their current status and trends)
2. Building a **set of explorative scenarios** by combining hypothesis for each identified variables
3. Definition of a **possible and desired scenario**
4. **Quantification** of the possible and desired scenario to provide indicators (picture for 2035)

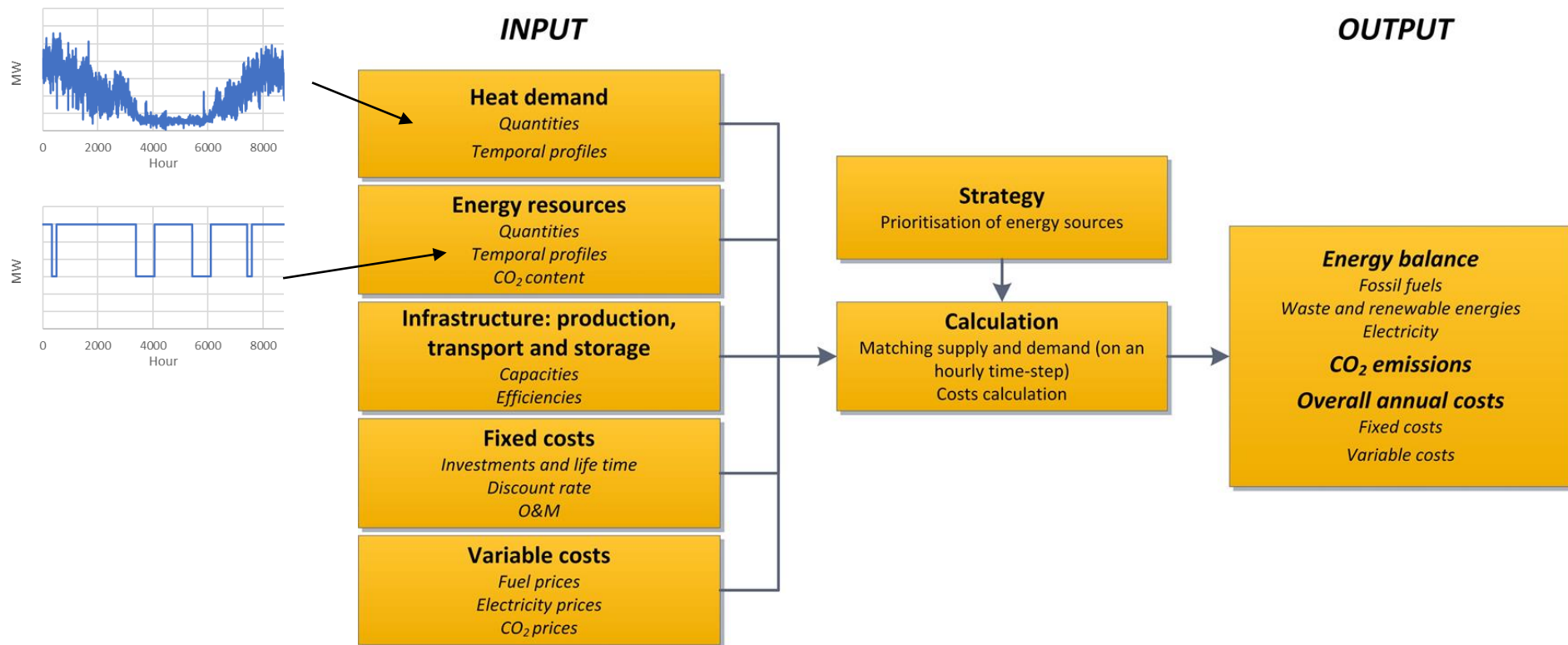
# Energy modeling



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Model used: “EnergyPLAN” model developed by  
Aalborg University (Deterministic input-output model)



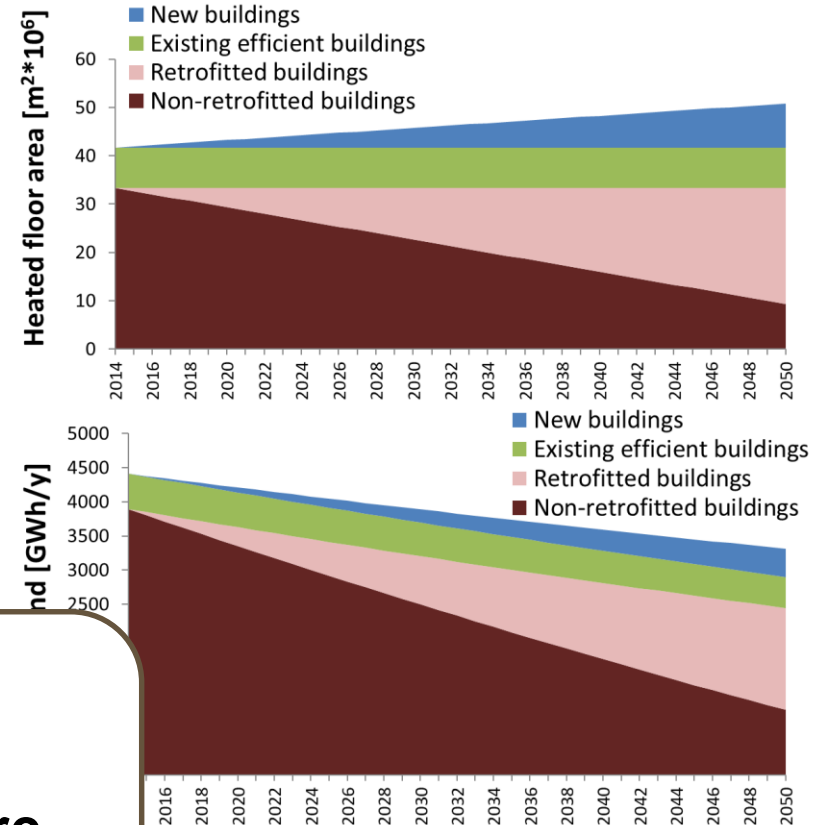
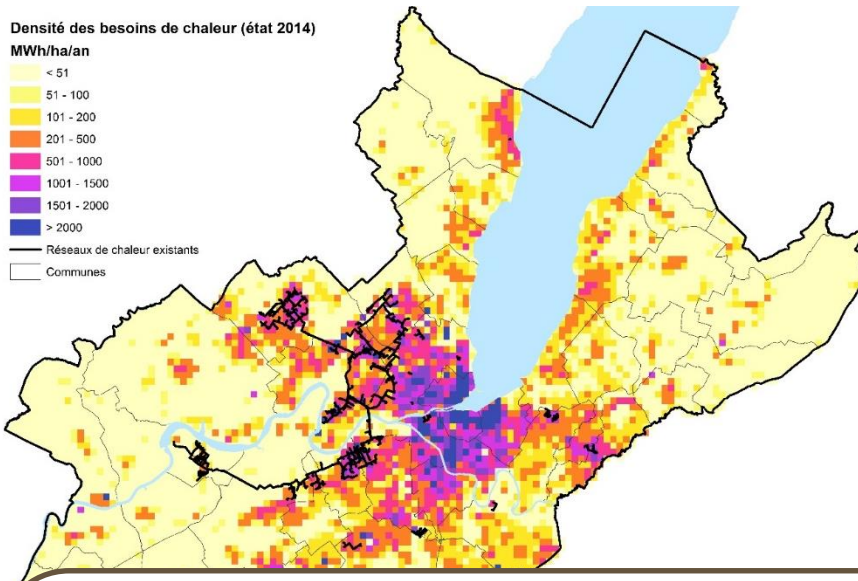
# Projection of the heat demand



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## Main variables taken into account: climate / buildings retrofitting/ demography



The canton is characterised by a very high heat demand density

We will still need heat in the future

➔ High potential for DH  
(50-70% of the total heat market)



# Buildings' technologies of supply implemented



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Buildings' technologies of supply implemented	2014 % of the heated floor area	2035 % of the heated floor area
District heating	10% →	30%
Ind. HP	1% →	20%
Ind. gas boilers	49%	38%
Ind. oil boilers	39%	10%
Ind. biomass boilers	1%	2%

+ solar thermal: 0.7m<sup>2</sup>/inhabitant

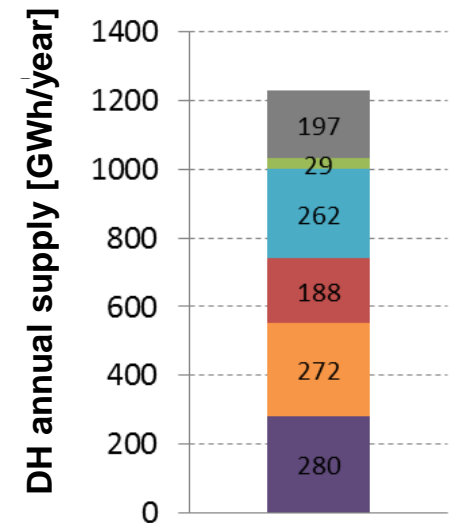
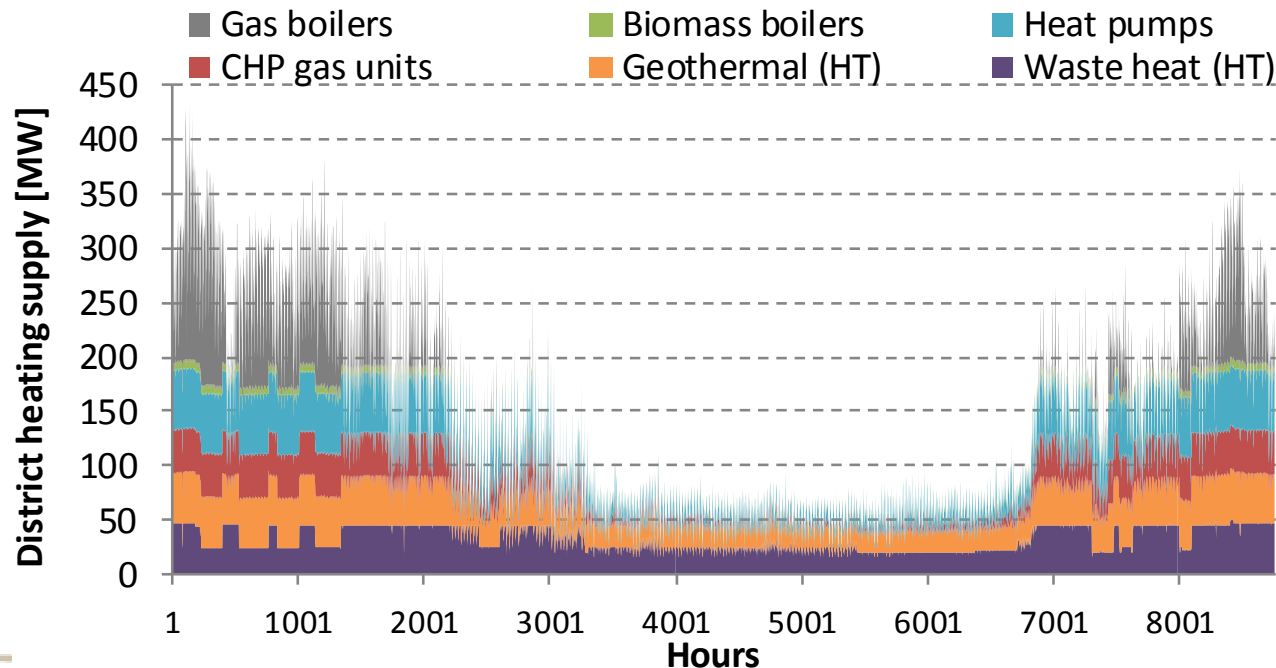


# Geothermal and district heating



DH supply units	Capacities MW
Waste heat (direct use)	45
Geothermal (direct use)	48
Gas CHP	40
Centralized HP	55
Wood boilers	8
Gas boilers	390 (also for back-up)

Equivalent to **8 doublets** at 2000m depth



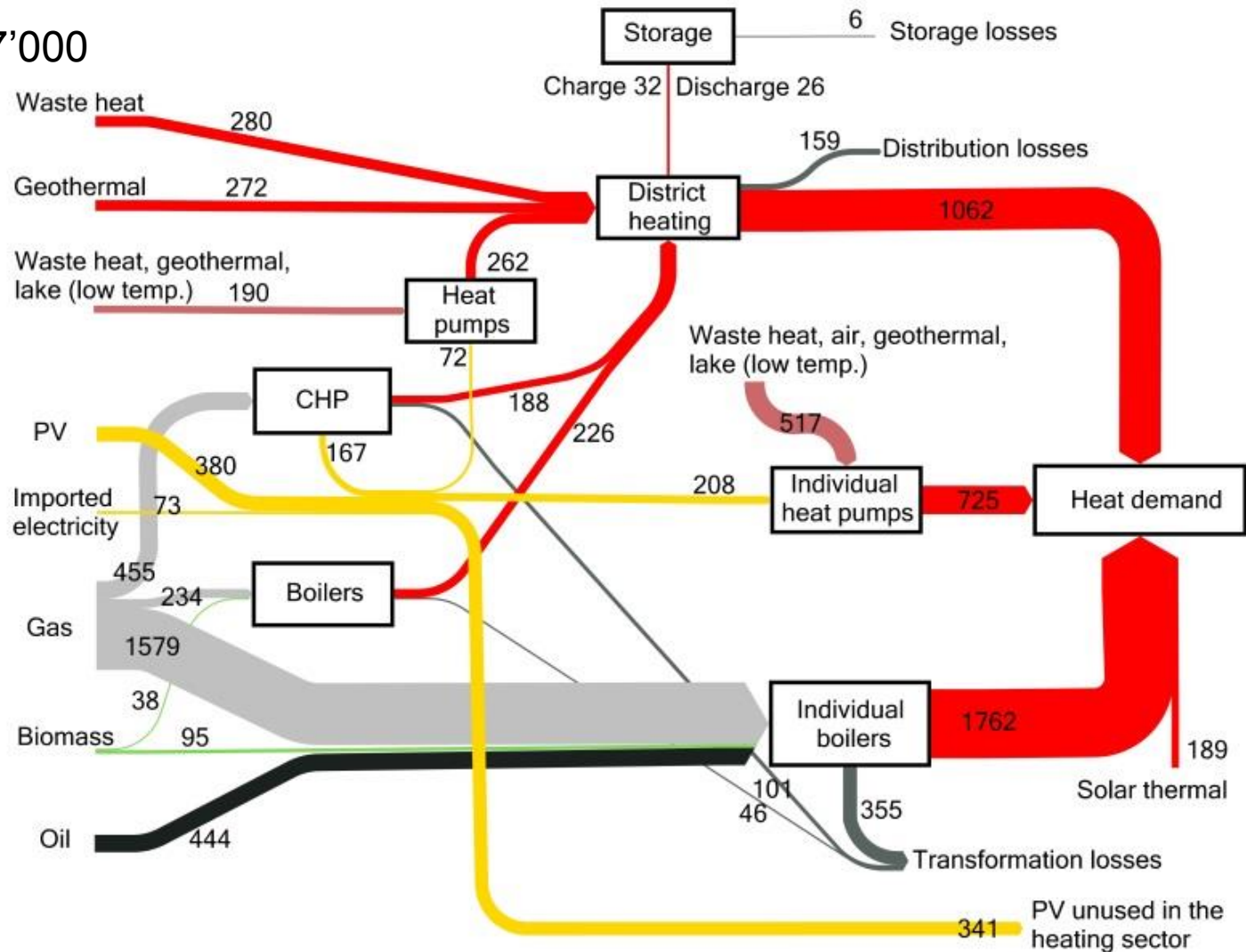
# Scenario EE&RES for 2035



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2035 GWh/yr  
Population: 557'000



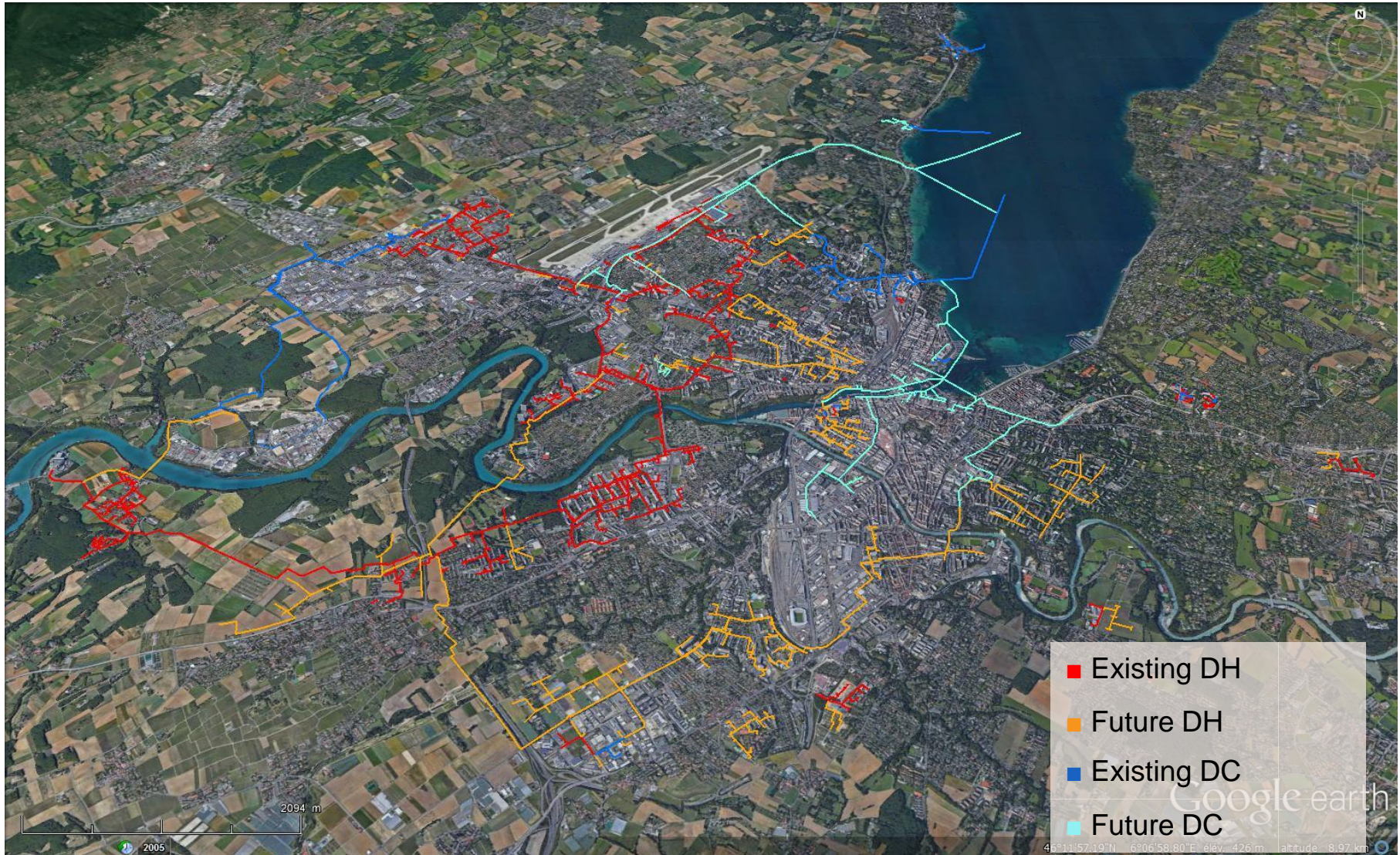
## Conclusions from the study

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- **We have built and then quantified a scenario that meet the 2035 energy targets**
  - **The 3 main strategic challenges identified:**
    - ▶ **Retrofitting** the existing buildings stock
    - ▶ Providing local **renewable heat**
      - > with large expectations considering geothermal energy (potential still under investigation)
    - ▶ Developing the **infrastructures** that enable their use
      - > an important development of DH networks is required
  - **We now need to support, to plan and to coordinate the deployment of these measures**
    - ▶ A master energy plan is now under elaboration
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# Thermal networks planning



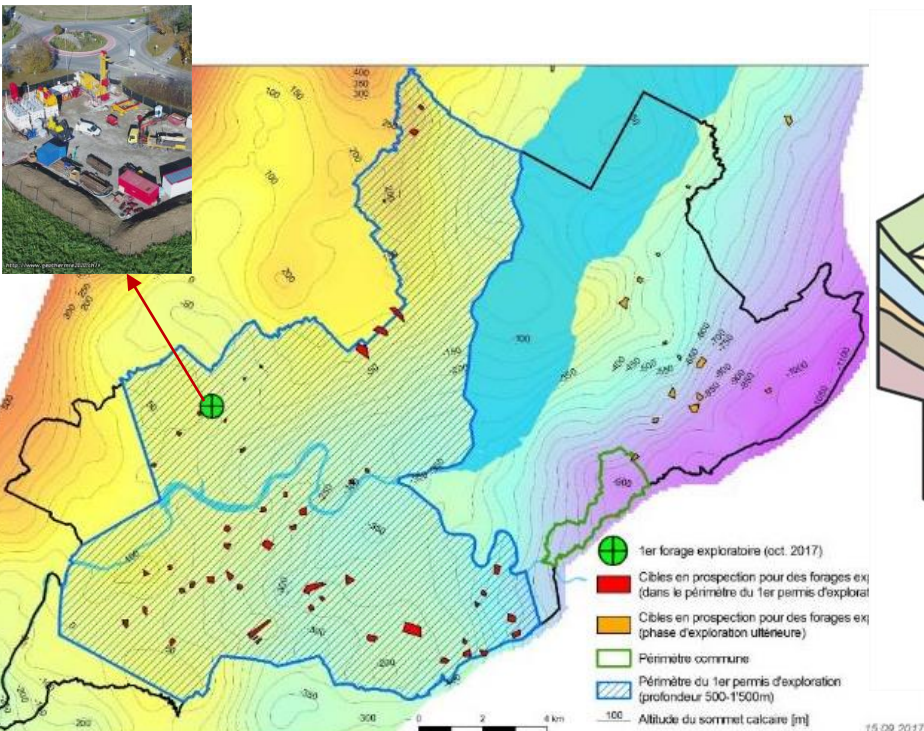


# Investigation of the geothermal potential

**Many potential targets identified and partially mapped**

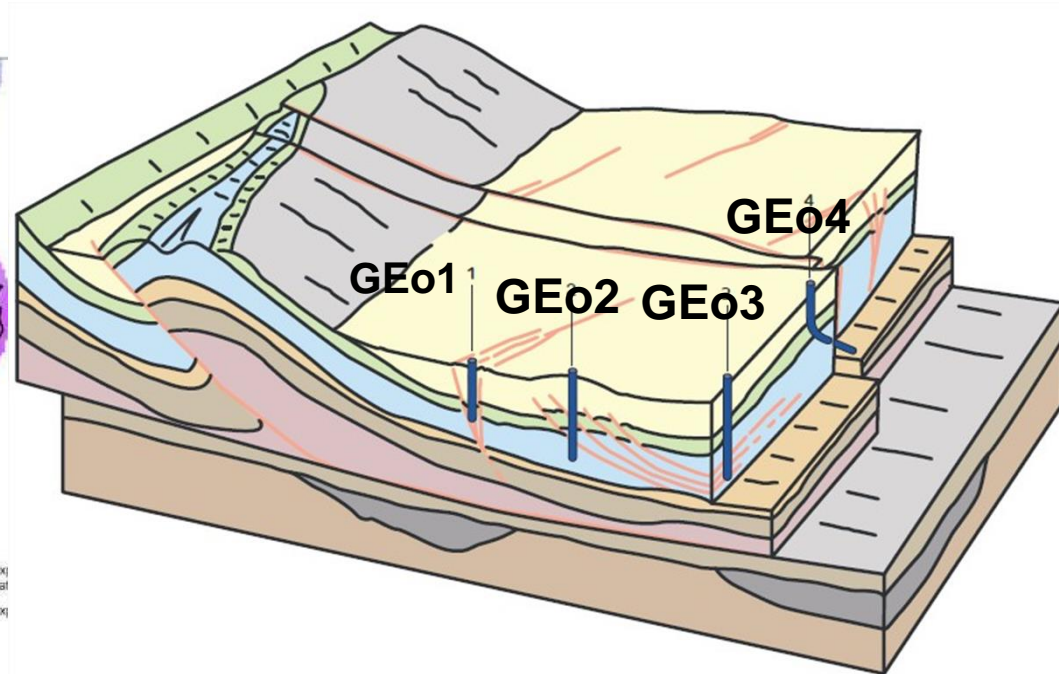
**A first exploration well (GE01) that confirms a good potential**

- 744m (upper jurassic)
- artesian flow of 50 l/s and 34°C



**Future operations (2019-2021)**

- 3D seismic survey (220km<sup>2</sup>)
- 3 exploration wells to test different structural contexts (GEO2-3-4) between 1'000 and 1'500m



# Thank you for your attention

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**For more information**

Paper available on: <https://archive-ouverte.unige.ch/unige:86876>

QUIQUEREZ, Loic *et al.* The role of district heating in achieving sustainable cities: comparative analysis of different heat scenarios for Geneva. In: *The 15th International Symposium on District Heating and Cooling*. Seoul (South Korea), 2016.