# 21- Large heat pumps -Integration of multiple heat sources & flexibilisation of DH-systems

1 Introduction – heat pump temperature levels

- Generally heat pumps can be distinguished or rather described as
    - **High-temperature heat pumps**
    - **Low-temperature heat pumps**
- Both types are used within housing units & the DH-sector
- **However, no clear definition or distinction possible!**
    - High-temperature heat pumps are usually used within the DH-sector
    - Low-temperature heat pumps in single-family houses & apartment buildings

2 Heat pump designs

- **Compression heat pump (electrical)** is mostly used within the heat sector
- **Other heat pump designs:** adsorption heat pump, absorption heat pump, rotary heat pump


Source: AGFW
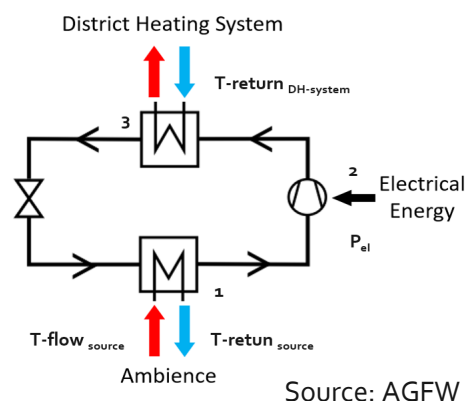
3 Possible heat sources

- Heat pumps rely on an **existing heat source**
- Most important considerations are the **high availability** on-site and the range of **technical exploitation possibilities** (source temperature & availability)
- **In general, there is a wide range of CO_2-neutral heat sources available:**
    - **Air**
    - River and lake waters
    - Ground water
    - Sewage & pure water
    - near-surface geothermal energy
    - industrial waste & surplus heat

Heat source	Typical source temperatures	Temperature fluctuations	Typical availabilities	Further information
Ambient air	0 °C – 40 °C	High	April – September	Local (own) weather stations
Lakes and rivers	2 °C – 20 °C	Medium	April – October	Local, competent water authority
Groundwater	3 °C – 15 °C	Low	All year round	Competent water authority
Wastewater/ pure water	7 °C – 20 °C	Medium	All year round[4]	Operator of the relevant sewage treatment plant
Shallow geothermal energy	0 °C – 19 °C	Medium	All year round	-
Industrial waste heat	14 °C – 50 °C	Individual	Individual	Corresponding industrial enterprise
Industrial flue gas/waste gas	30 °C – 50 °C	Low	Individual	Corresponding industrial enterprise

Table 1 Overview of heat sources [large heat pumps, supplemented] (AGFW)

4   Integration of Heat pumps into DH-systems

Different possible ways to integrate a large heat pump - supply-pipe feed-in (left) and return flow temperature increase (right) [own illustration; AGFW]:

Source: AGFW
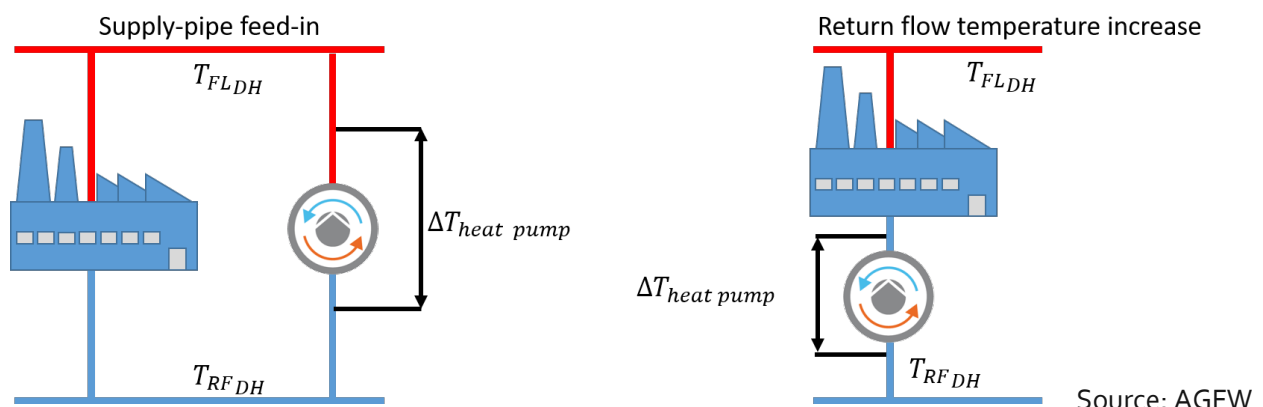
Supply-pipe feed-in:
- Generally, **LHP can feed directly** in the supply pipe of a DH-System, if **required Δ T** can be met
- Heat pump must be designed for the max. flow temperature*
- (*since T_{FL} is increasing when outside temperature decreases)

Return flow temperature increase:
- integration into an **existing generation** of a DH-system more easy
- Possible **future use** for feed-in scenario into supply pipe, since there is a general tendency to reduce T_{FL}