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**"Progression of District Heating – 1st to 4th generation"**

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Energy efficiency / temperature level

**1G: STEAM**

Steam system, steam pipes in concrete ducts

DH flow < 200 °C

DH return < 80 °C

Energy efficiency

**2G: IN SITU**

Pressurised hot-water system  
Heavy equipment  
Large "build on site" stations

> 100 °C

< 70 °C

**3G: PREFABRICATED**

Pre-insulated pipes  
Industrialised compact substations (also with insulation)  
Metering and monitoring

< 100 °C

< 45 °C

**4G: 4th GENERATION**

Low energy demands  
Smart energy (optimum interaction of energy sources, distribution and consumption)  
2-way DH

50-60 °C (70 °C)  
(ULTDH < 50 °C)

~ 25 °C

District heating grid

District cooling grid

Steam storage

Coal Waste

Local District Heating

1G / 1880-1930

Heat storage

CHP coal  
CHP oil

Coal Waste

District Heating

2G / 1930-1980

Heat storage

CHP waste  
CHP coal  
CHP oil

Gas, Waste  
Oil, Coal

District Heating

3G / 1980-2020

Heat storage

Industry surplus

CHP waste  
incineration

Heat storage

Centralised district cooling plant

Centralised heat pump

Also low energy buildings

District Heating

4G / 2020-2050

Data center

Seasonal heat storage

Large scale solar

Biomass  
CHP Biomass

Industry surplus

Heat storage

CHP waste  
CHP coal  
CHP oil

Gas, Waste  
Oil, Coal

Large scale solar

Geothermal

PV, Wave  
Wind surplus  
Electricity

Heat storage

Industry surplus

CHP waste  
incineration

Future energy source

Biomass conversion

2-way District Heating  
e.g. supermarket

CHP biomass

Centralised district cooling plant

Centralised heat pump

Also low energy buildings

**Development**  
(District Heating generation) /  
Period of best available technology

