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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

District heating grid

2G: IN SITU

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

> 100 °C

< 70 °C

2G / 1930-1980

3G: PREFABRICATED

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

< 100 °C

< 45 °C

3G / 1980-2020

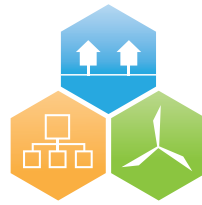
4G: 4th GENERATION

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

4G / 2020-2050



4DH
www.4dh.dk

Steam storage

Coal Waste

Local District Heating

1G / 1880-1930

Heat storage

CHP coal
CHP oil

Coal Waste

District Heating

2G / 1930-1980

Large scale solar

Biomass
CHP Biomass

Industry surplus

Heat storage

CHP waste
CHP coal
CHP oil

Gas, Waste
Oil, Coal

District Heating

3G / 1980-2020

Data center

Seasonal heat storage

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

District Heating

4G / 2020-2050

District cooling grid

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