SUSTAINABLE PLACES

RELaTED

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# RELATED PROJECT: NEW DEVELOPMENTS ON ULTRA LOW TEMPERATURE DISTRICT HEATING NETWORKS.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768567

# Background

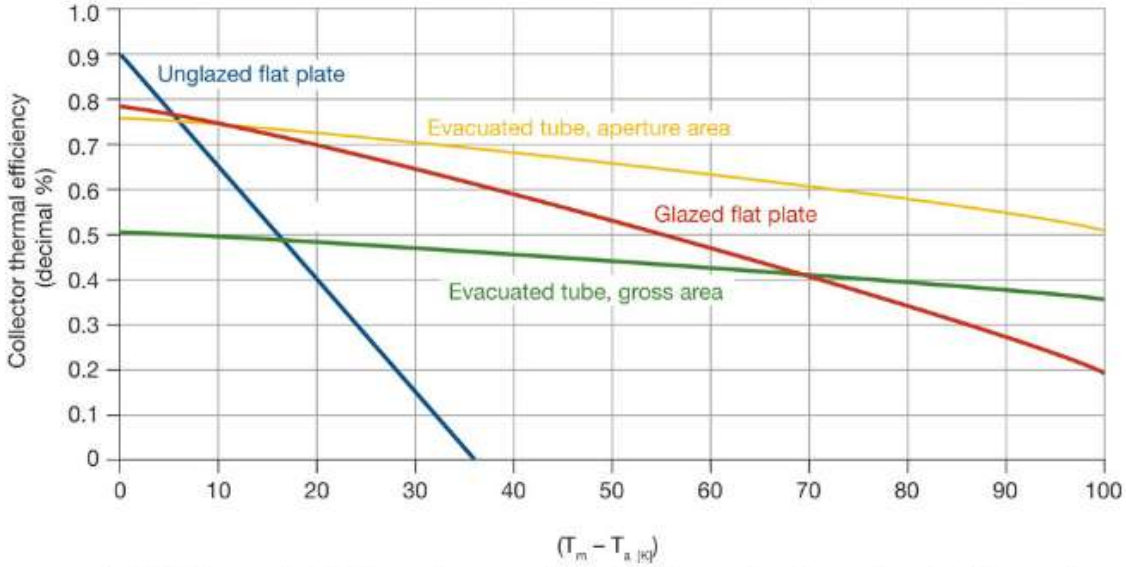
- Unprecedented performance levels on fuel-based heat production (CHP, HPs with carbon-intense electricity…)
- Improvements in efficiency levels → minimal impact to DH de-carbonisation
- Renewable and waste heat sources → de-carbonized heat sources, competitive energy costs, limited influence of supply price volatility
- Operation temperature reduction→ increase integration and performance of renewable systems

# Decarbonization on three pillars

- Production side
  - Renewable Energy Sources (RES) & Waste Heat
  - Improvement of performance
- Consumption side
  - Nearly Zero and positive Energy Buildings
- Distribution side
  - energy losses

- Reduction of supply temperature in DHs towards 4th Generation of DH with Ultra Low Temperature (45/30ºC)
- Buildings as energetic nodes with bidirectional substations
- Integration of HPs for DHW adequate thermal levels

# Decarbonization on three pillars




Inlet fluid parameter, °K; $T_m$ equals mean collector fluid temperature; $T_a$ equals ambient temperature.

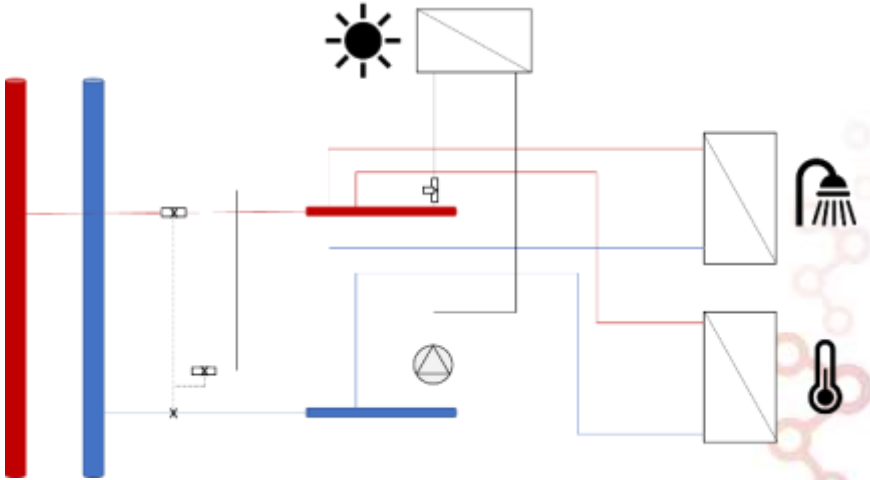
FIG. 1 Collector efficiency vs $(T_m-T_a)$. $G_T = 800W/m^2$. Source: Stickney, B. & Soifer, B, (2009).

# Cooling

- DC plays an important role in future sustainable energy systems
- Included in 4GDH
- Reversible Heat Pump systems, network as condensation sink
- 2012/27 European Energy Efficiency Directive in favour of the residential energy consumption from HPs
- Electrification of the demand with higher prices but better performance

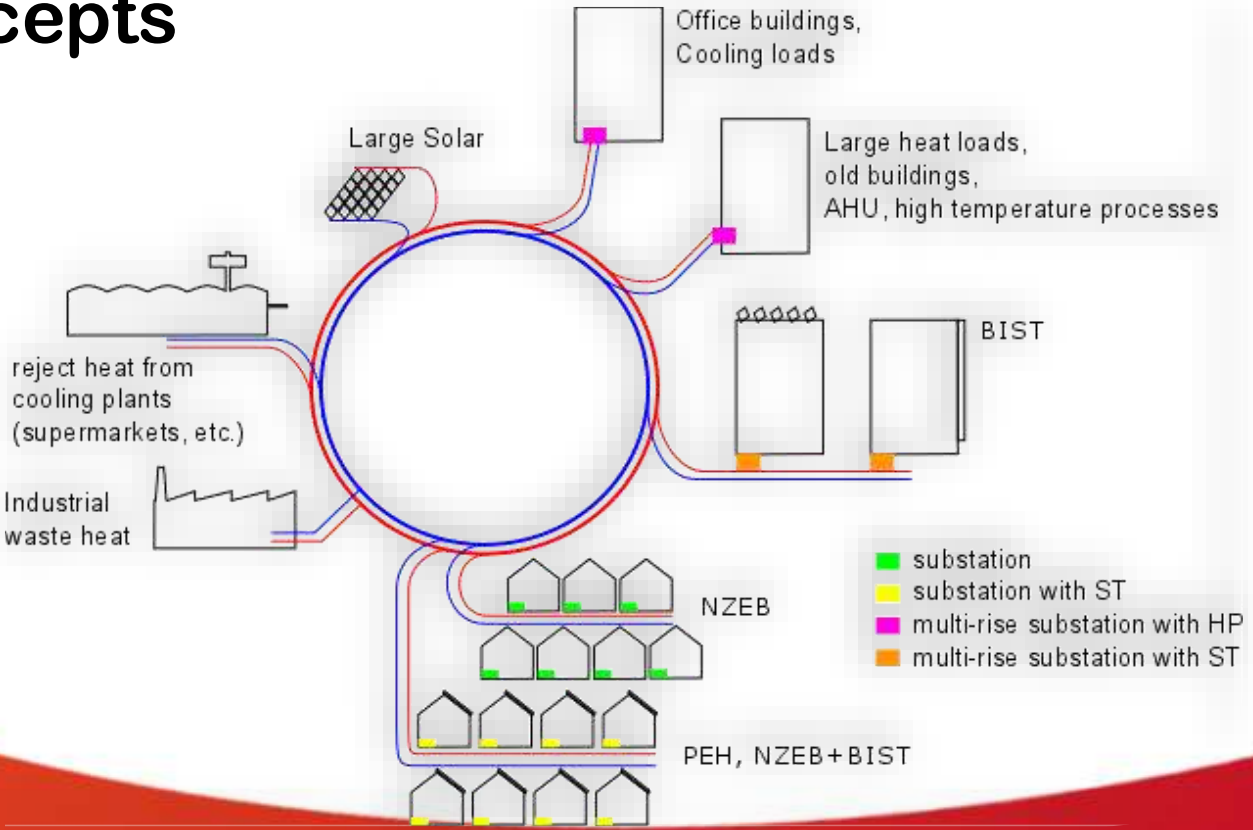
# RELaTED main concepts

- Reduction of DH operative temperature
- Building Integrated Solar Thermal Systems (BISTS)
- Combination of BISTS and ULT DH, with thermal storage and back-up
- District-heating connected Reversible Heat Pump systems



Novel 3 function-scheme (3FS) substation

# RELaTED main concepts



# Conclusions

- RELaTED project on the path of 4GDH and the de-carbonization of heat production
- ULTDH is a clear opportunity to operate the network as a decentralized system
  - distributed sources such as ST and WH
  - integration of BISTS with DH as both thermal storage and back-up
- 3FS substations improve the combination of BISTS and DH
  - Efficiency levels from 44% to 62% are achieved when connected to the return line with limited output temperature.
- DHRHP for:
  - recuperation of low exergy heat sources such as industrial processes
  - the incorporation of cooling services in DH networks

# Future work

- Demonstration of the presented concepts are under implementation within a controlled test environment.

- Four demos across Europe as experimental sites for the test, deploy, commissioning and assessment of:
  - ULT DH
  - BISTS
  - DHRHP
  - 3FS substations.

- Such work is expected to be finished in 2021.

# RELaTED Project: new developments on Ultra Low Temperature District Heating networks.

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**http://www.relatedproject.eu/**

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