A RENOVATION WAVE FOR EUROPE – Greening Our Buildings, Creating Jobs, Improving Lives

Copper makes buildings a climate solution

European Copper Institute
Copper Alliance

Decarbonisation of heating and cooling
District heating in high density urban areas

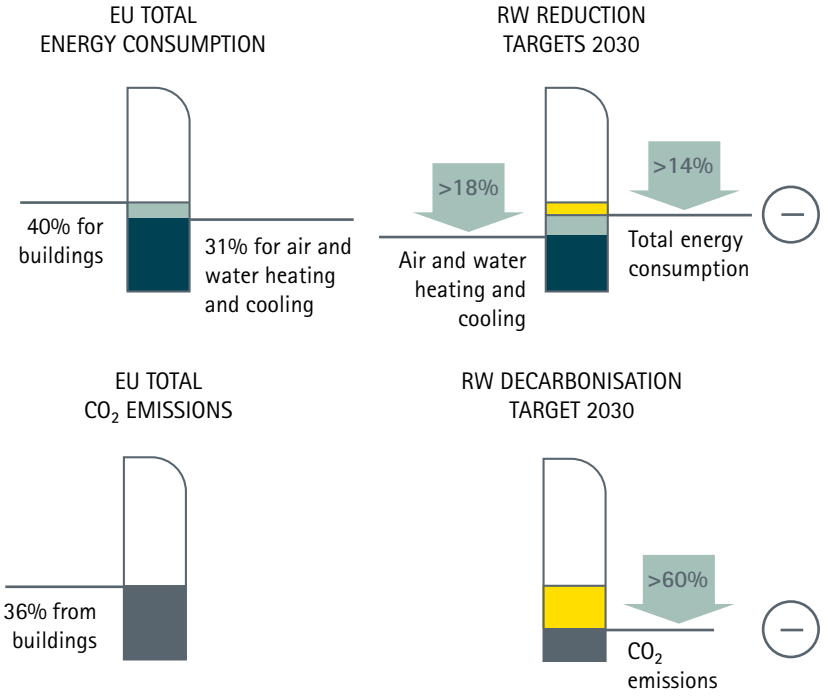
In Europe, 31 percent of energy consumed is used for space and water heating and the vast majority of this heat is still generated from fossil fuels. Without decarbonising heating, it will be impossible to reduce carbon emissions to the level needed to prevent dangerous rises in global temperature.

Given that roughly 75% of Europe's population lives in cities – and the level of urbanisation is expected to increase to approximately 83.7% by 2050 - urban areas are important contributors to the EU's energy consumption and greenhouse gas emissions, which have a huge impact on climate change. District heating networks, supplying 12% of heat in the EU, are currently dominated by fossil fuel supply, such as coal and gas. There is significant potential to upgrade existing systems and create new, decentralised networks using solar thermal, ambient heat, geothermal technologies, industrial excess heat and sustainably produced biofuels, with significant benefits for energy security, human health and climate change mitigation.

4th generation district heating

The 4th Generation District Heating (4GDH) system is defined as a coherent technological and institutional concept, which by means of smart thermal grids assists the appropriate development of sustainable energy systems. 4GDH systems provide the heat supply of low-energy buildings with low grid losses in a way in which the use of low-temperature, renewable based heat sources is integrated with the operation of smart energy systems.

Member States should set specific targets for efficient, renewable-based district heating and cooling energy and create a level playing field between conventional and renewable heating and cooling options.



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Energy management

SERVE AREAS WITH MANY LOW-ENERGY BUILDINGS

Whichever low-carbon heat technology is adopted energy efficiency remains critical. It reduces heat demand, and thereby the investment required to decarbonise heat. It is also an enabler of lower supply temperatures and low/zero-carbon heating technologies operating at higher performance.

RUN AT LOWER TEMPERATURES, REDUCING HEAT LOSSES

4GDH networks, which operate at about 60°C supply side temperature, reduce heat losses, extend pipe life and create the best conditions for clean energy use.

IMPROVE SUPPLY CHAIN MANAGEMENT

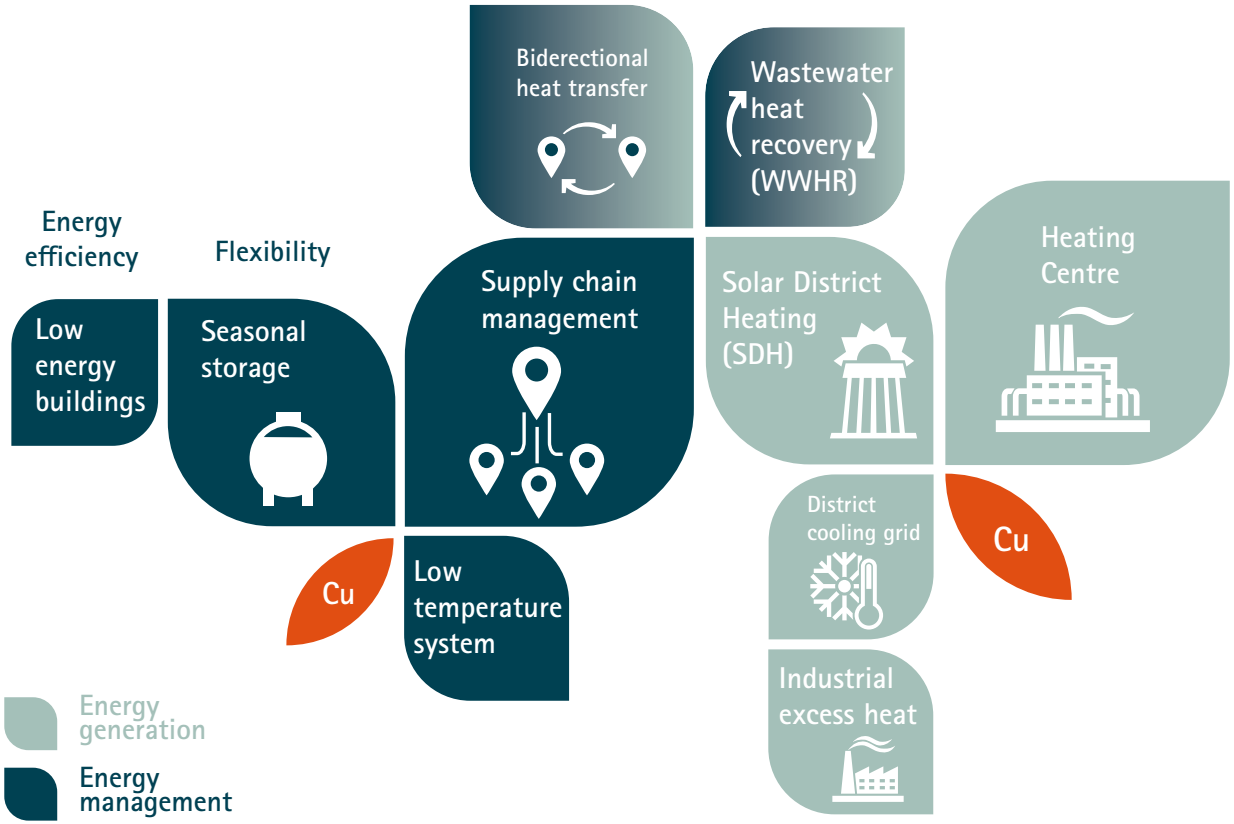
Interaction of diverse energy sources, distribution and consumption needs to be optimised based on digitalised, real time energy performance data of dwellings.

Copper is used in sensor and control wire of supply chain management.

FLEXIBILITY

SEASONAL STORAGE

In Europe, demand for heat is usually around 10 times higher in winter than in summer, when solar irradiation reaches its peak. Seasonal pit heat storage can store surplus energy from summer for use in winter and can increase the solar fraction of annual heat demand to 60%.



Copper improves efficiency of heat exchangers in heat pumps, solar thermal and waste heat recovery systems and is used in electrical installations, sensor & control cables, actuators as well as renewable power generation.

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ENSURE PROSUMER RIGHTS

FEED RENEWABLE HEAT

Bidirectional district heating allows renewable heat produced by solar thermal collectors on rooftops of buildings (supermarkets, multifamily houses) to be fed into the system.

Make it possible for consumers to feed renewable heat into the network (prosumer rights).

The average copper content of a rooftop flat plate collector installation is 4.66kg/m^2. Copper is used in the collector and system piping, electrical and sensor cables and in the pumping station.

RECOVER WASTE HEAT

Harvesting heat from shower drains in buildings could be a simple and cost-effective way to reduce hot water demand and save at least 40 percent of wasted energy and CO_2 emissions.

Copper is used in highly efficient heat exchanging pipes in heat recovery systems.

Energy generation

MULTI-SOURCE LOW CARBON AND RENEWABLE ENERGY

INDUSTRIAL EXCESS HEAT

The economically feasible supply of industrial excess heat can cover up to 14% of district heating (DH) production. Investment in infrastructure of DH networks to capture economically feasible industrial excess heat is needed to safeguard clean energy supply and improve system resilience.

Innovative regulations should ensure that industrial excess heat is available at prices competitive with fossil fuel-based heat sources.

A district heating system in Hamburg receives excess heat from the local Aurubis copper plant. A heat recovery system saves natural gas and feeds the district heating of The Hafencity East, delivering primary energy savings and cutting CO_2 emissions by 20,000 tons per year.

SOLAR DISTRICT HEATING (SDH)

SDH is a large field of solar thermal collectors supplying solar energy to a district heating network. In typical cases, solar energy contributes up to 20% of annual heat demand and can cover 100% of the demand over the summer months. In Europe, 2,375 small cities in 22 countries are already connected to district heating networks and, in addition, have sufficient land on which to build solar fields that could meet 20% of their heat demand. A total of 33.9 GW solar thermal power (48 million m^2) could be installed.

The average copper content of a flat-plate collector amounts to 3kg/unit and evacuated-tube collectors use 3.25kg/unit.

A switch to renewable energy sources for DH networks can help meet rising urban energy needs, improve efficiency, reduce emissions and provide cost-effective temperature control.

HEATING CENTRE

In heating centres, technologies relying on fossil fuels such as coal and gas should be replaced with low or zero carbon solutions, such as heat pumps, cogeneration plant, sustainably produced biofuels and geothermal or any future energy source.

Copper is used extensively in heat pumps, in the evaporators, condensors, compressors, piping, connectors, controls and sensor cabling.

DISTRICT COOLING GRID

Cooling will contribute to an increasing proportion of energy use as modern glazed buildings absorb large amounts of solar energy and temperatures rise to unacceptable levels. A district cooling grid can provide cooling via a centralised district cooling plant (ground or water source heat pumps, solar chillers) and cold storage.

Deploy large scale heat pumps supplying heat in a highly efficient manner, and provide a valuable link with the electricity sector through their use of (variable) renewable resources.

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