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

Copper makes buildings a climate solution

European Copper Institute
Copper Alliance

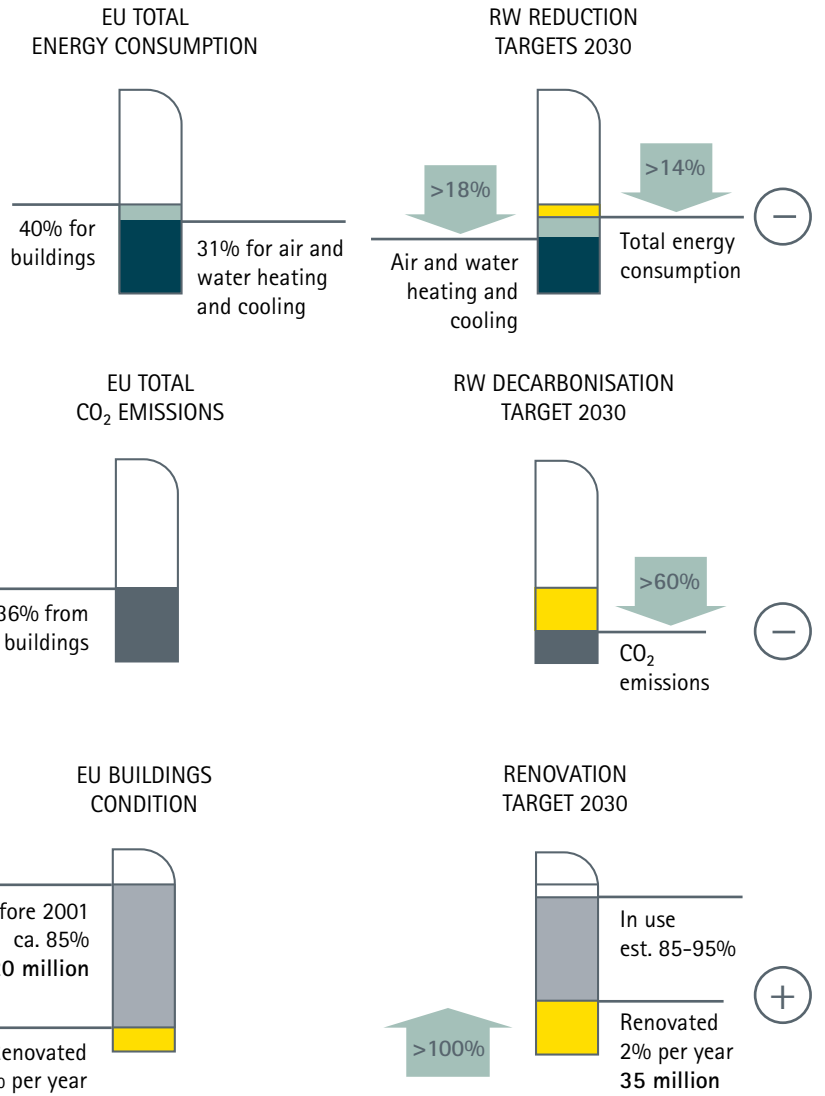
Decarbonisation of heating and cooling Detached houses

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 keep global warming well below 2°C as put forward in the Paris Agreement.

Nearly one fifth (18.6 percent) of the EU population live in semi-detached houses and over one third (34.7 percent) in detached houses. 66.4 percent of EU28 dwellings were built before 1980 and only 9.8 percent after 2001, roughly 75 percent of buildings are energy inefficient.

KEY TARGETS OF THE RENOVATION WAVE

- By 2030 the EU should reduce buildings' greenhouse gas emissions by 60%, their final energy consumption by 14% and energy consumption for heating and cooling by 18%.
- The RW addresses the low rate of energy renovation, around 1% across the EU, with the aim to at least double this for both residential and non-residential buildings by 2030, fostering deep energy renovation.
- Mobilising forces at all levels towards these goals will result in the renovation of 35 million units by 2030.



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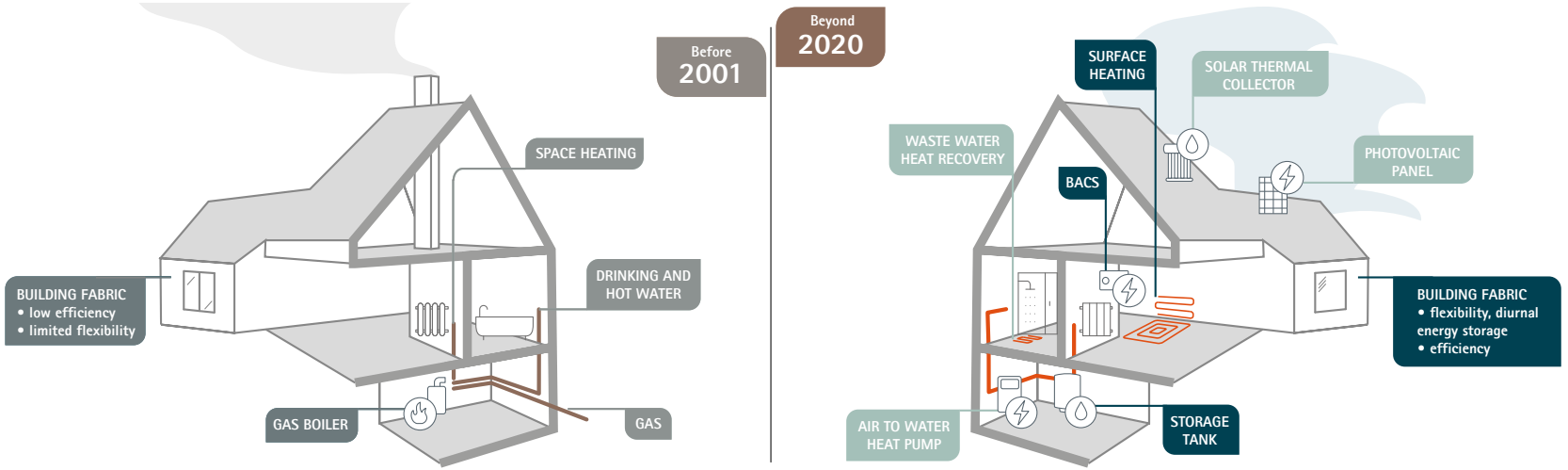

Energy generation

Energy management

low energy buildings

Energy efficiency

tariffs for load shifting

35kg storage tank

low temperature surface heating

Flexibility

5kg home automation

4kg wastewater heat recovery

16kg photo-voltaics

19kg solar thermal

On-site renewables

21kg heat pumps

Electrification

Masses represent copper contents of different technologies applied in deep energy renovation of a 120m² family house - explained on the next pages.

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Energy management

ENERGY EFFICIENCY

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 an enabler of buildings that are electrified to act as a flexible resource, and an enabler of low and zero-carbon heating systems operating at higher performance.

Reduce heat demand and thereby the investment required to decarbonise heat.

HOME AUTOMATION

Home automation prevents poor energy performance of heating and cooling systems of individual buildings by e.g. room-level heat control.

Home automation ensures continual energy performance monitoring, enables control and fault detection of heating & cooling systems, and drives optimal user behaviour.

Deploy home automation as a complementer to deep renovation to optimise the use of on-site renewables, sustainable heating and cooling and the smart grid.

Home automation systems are the missing links between near-zero energy buildings and the smart grid: they harvest the savings potential offered by smart meters, facilitate the use of renewable energy sources, and provide the building stock with load shifting and storage management capabilities.

5 kg

Copper is used in sensor and control wires and actuators. Copper content of heating and cooling automation and control systems is not so significant but home automation is an enabler of copper-intensive technologies (e.g. renewables).

LOW TEMPERATURE SURFACE HEATING

Proper wall insulation and energy efficient windows will ensure that existing radiators will satisfy heat demand at lower hot water temperature. Optionally, surface heating might be the solution.

Satisfy heat demand at lower temperature with proper insulation and renewable energy based heat generators, such as heat pumps or solar.

Surface (underfloor, wall, ceiling) heating (and cooling) systems operate with very low water temperatures. The building structure becomes a draught-free low-temperature radiator, which emits warmth as gentle radiant heat and provides a pleasant living environment. Enhanced temperature uniformity of the wall surfaces and direct heat emission by radiation allow the air temperature in the room to be lowered by 2 to 3 degrees without reducing comfort. It is estimated that each 1°C reduction in temperature results in savings of around 6% in heating costs.

In summer, the system is reversible, i.e. it can be used for cooling and enables a reduction in temperature in the order of 2 to 3 degrees.

35 kg

High efficiency surface heating systems rely on copper tubes thanks to the metal's excellent thermal conductivity (low wall thickness tubes).

FLEXIBILITY

STORAGE

With integration of electricity and heat, heat flexibility becomes highly relevant. To avoid an increase in peak load, load shifting is critical. At times of abundant electricity production from renewable sources, heat generated by a heat pump can be stored in the structure of the building or in a thermal energy storage tank.

ENCOURAGE LOAD SHIFTING WITH TARIFFS

Electricity tariffs should encourage the use of electricity when this is the most beneficial for the power system and positively affects carbon emissions. Electricity pricing is a key strategy to encourage flexibility and deliver economic benefits to consumers, in return for providing such flexibility.

Store heat as hot water, or in the existing thermal mass of buildings as a lower cost alternative to storing electricity.

Enabler of copper-intensive solutions

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Cu

Energy generation

WASTE WATER HEAT RECOVERY (WWHR)

While most energy efficiency efforts in homes currently focus on space heating, the energy needed to heat domestic hot water is gaining importance as it can represent up to 45% of energy consumption in new buildings.

Harvest heat from building shower drains to save around 40 percent of wasted energy and CO_2 emissions.

This heat ends up in the drain still hot and wasted. Harvesting heat from shower drains in buildings could be a simple and cost-effective way to save at least 40 percent of wasted energy and CO_2 emissions.

4 kg

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

ELECTRIFICATION

Heating and cooling account for nearly 80% of the energy consumption of buildings, with 83% of this energy currently produced from carbon-intensive fuels such as heating oil and fossil gas.

Facilitate direct electrification of heating and cooling of buildings to urgently transition away from carbon-intensive fossil-based heating solutions toward full decarbonisation by 2050.

HEAT PUMP

Heat pumps constitute market-ready solutions that can be deployed at scale and which can produce up to 4 units of heat for each unit of electricity consumed. They take a major share of the useful energy out of the environment, and the carbon emissions of the electricity used will gradually evolve to zero with the decarbonisation of the electricity sector.

21 kg

Copper is used in air source heat pump evaporator, condenser, compressor, piping, connection, control, and sensor cabling.

ON-SITE RENEWABLES

A deep renovation should seek to use the full potential of on-site, cost-effective, zero-carbon emission renewable energy generation.

SOLAR THERMAL

Solar radiation is collected and the resulting heat conveyed to a heat transfer medium such as a liquid or air. Systems are long-lasting, reliable, require very low maintenance and have stable energy costs over lifetime of 20 to 25 years.

Deploy solar thermal as a decentralised, highly efficient (capturing 70% of the incident radiation) technology with no fuel requirements and zero carbon emissions in use.

19 kg

According to a 2020 worldwide survey, 99% of piping inside flat-plate collectors is copper. Copper is used in collector and system piping, electrical and sensor cables and in pumping station.

PHOTOVOLTAIC

Photovoltaic power systems are installed in locations with high solar exposure, such as on rooftops.

16 kg

An average PV installation of 4kWp on the roof of a family house contains 16kg of copper. Copper is used mostly in cables.

Deploy solar rooftop systems to save 680TWh, equivalent to 24.4% of current electricity consumption, two thirds of which (467TWh) could be generated at a cost lower than today's residential tariffs.