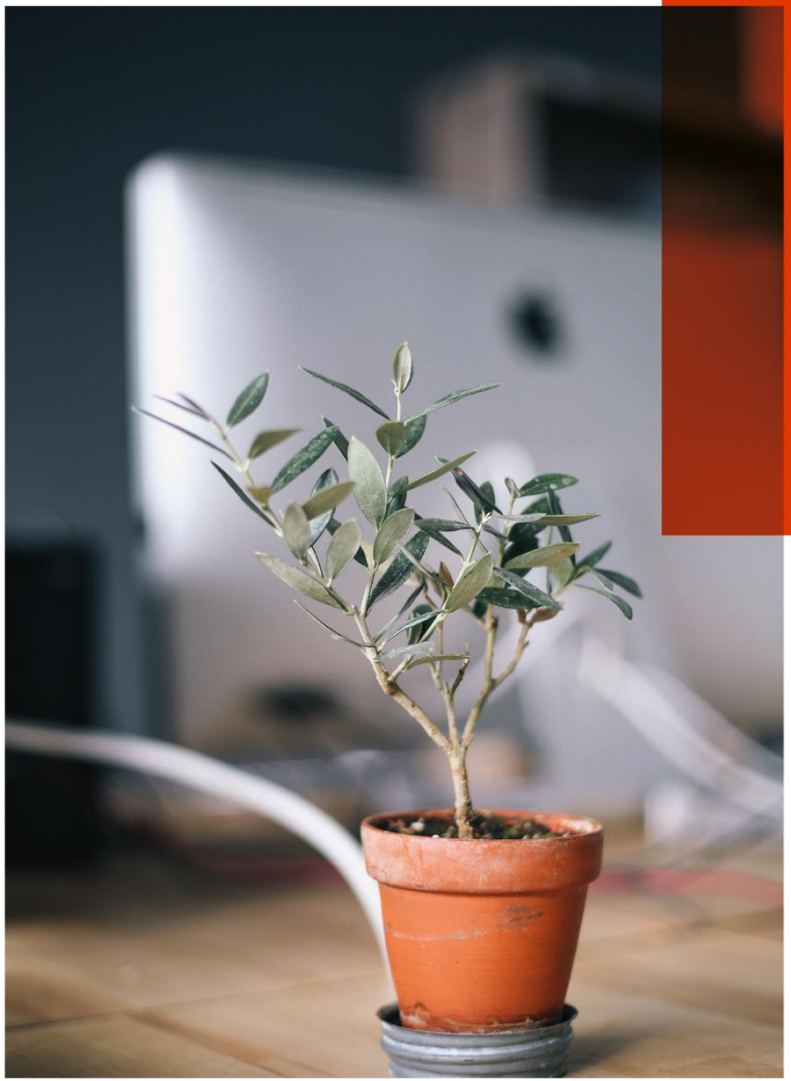


Energy in Buildings

EDF R&D contribution to Climate Change Mitigation, Economic Growth & Job Creation

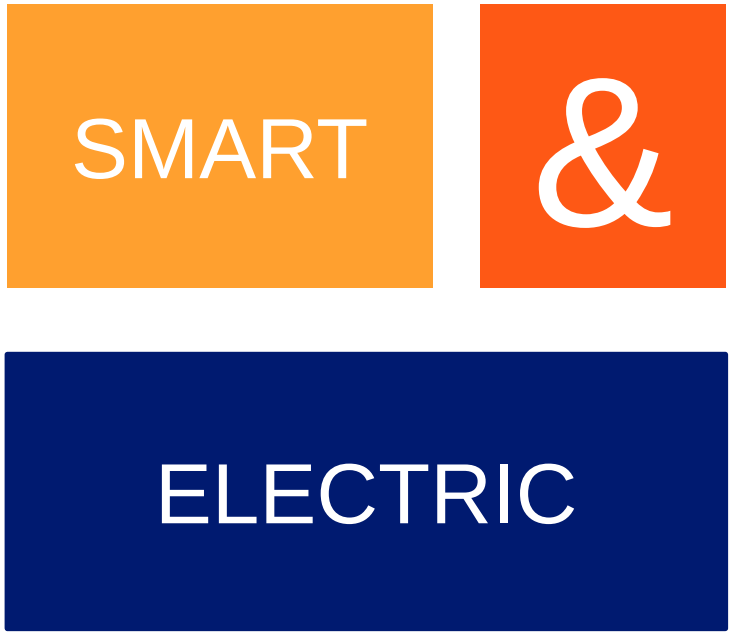
EDF Group's Commitments

EDF Group is committed to accompany Energy Transitions and prevent Climate Change in order to meet European targets of a reduction in CO_2 emissions by a factor of 4 in 2050.

→ leading in low-carbon electricity generation with a carbon content in France of **15 g/kWh in 2015**, among the lowest in Europe.

→ promoting the efficient use of energy in buildings.

The House of Tomorrow will be



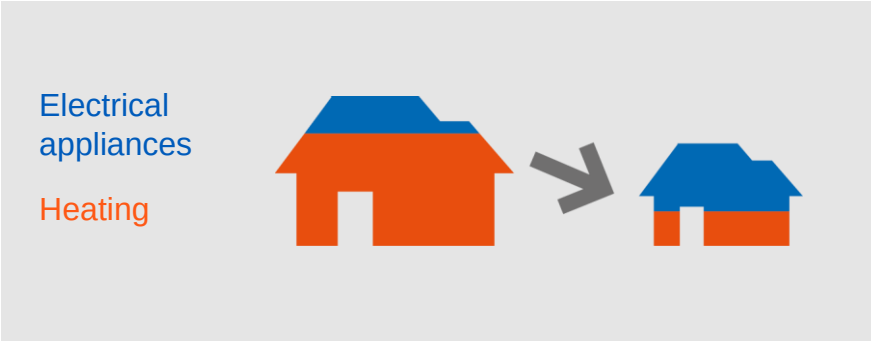
- Energy-efficient
- Environmentally friendly
- Affordable
- Comfortable and desirable

The House of Tomorrow will be an energy-efficient building

In answer to new environmental regulations, buildings will reduce their energy needs and gain more energy from their environment.

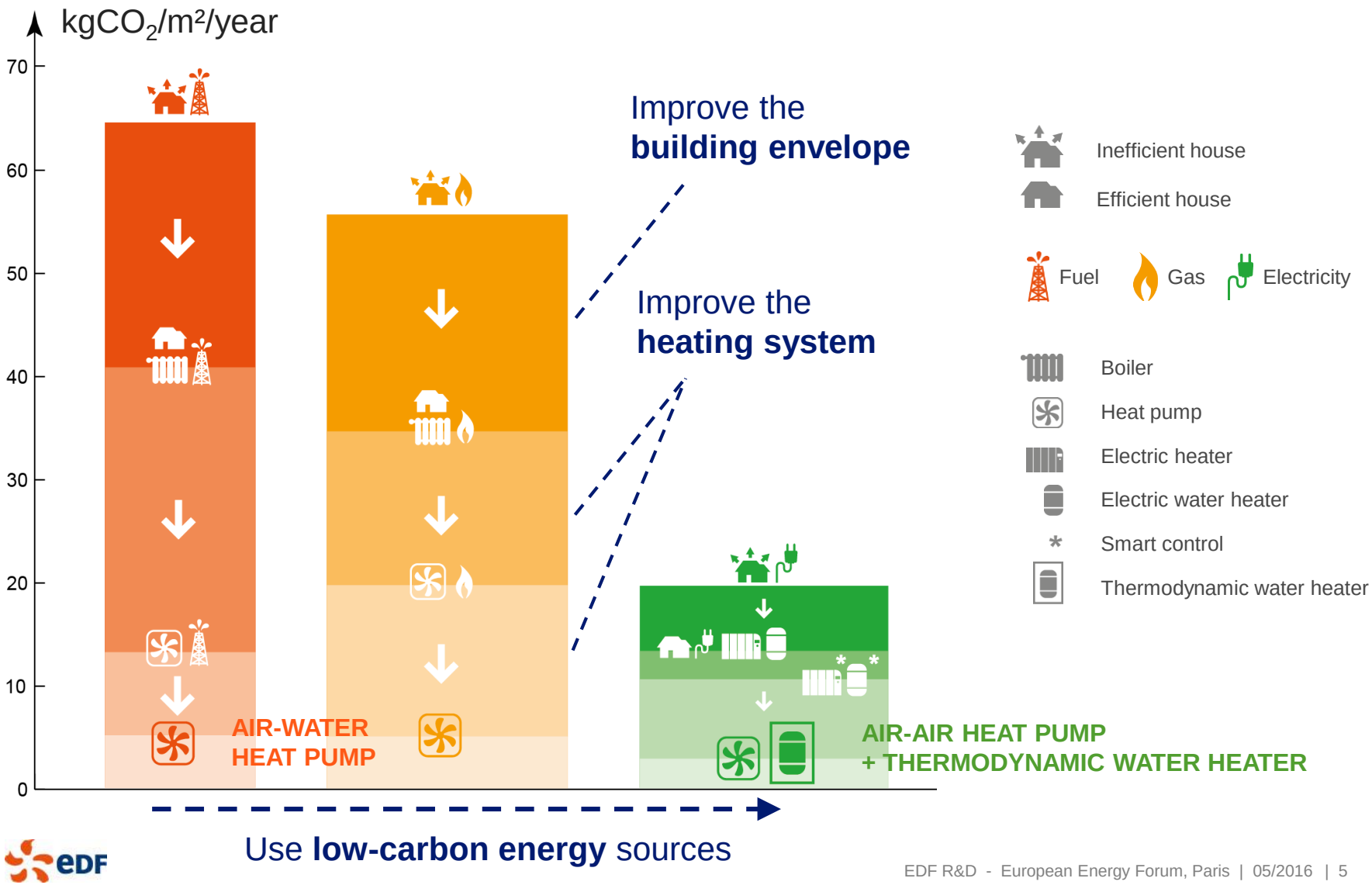
Today, heating represents 2/3 of the energy consumption of an household

Building consumption

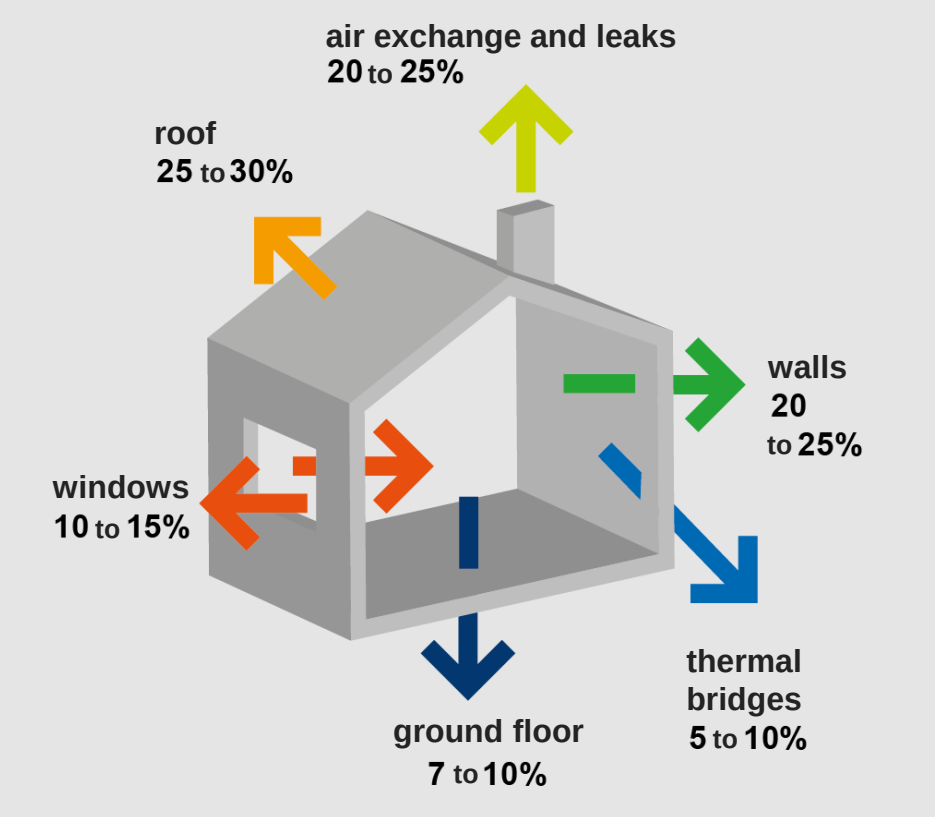


They will be built from new and highly effective construction materials and thus lower their energy needs for heating purposes.

Actions to reduce CO_2 emissions



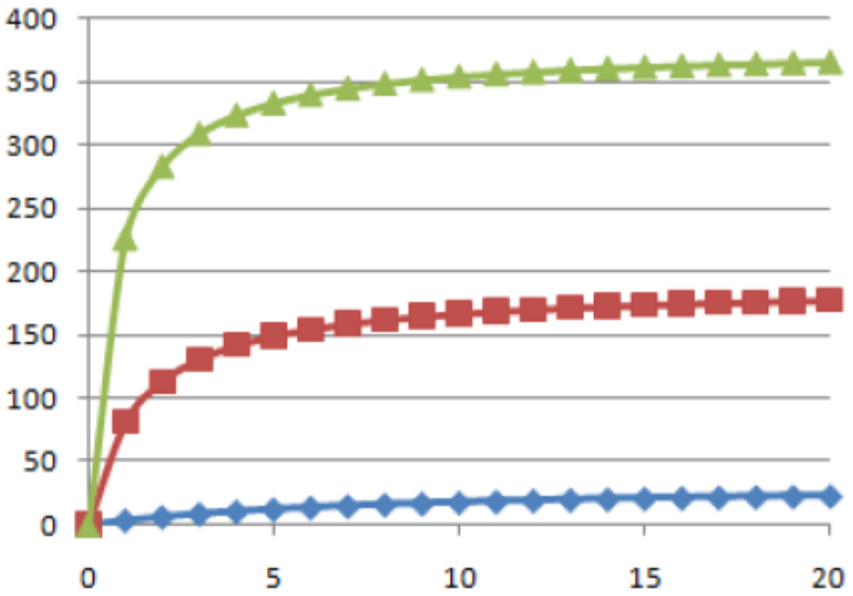
Focus on the building envelope



Energy losses in a building

Focus on the building envelope
the role of insulation in existing buildings

Annual energy loss reduction
(kWh/m²/year)



Insulation material thickness (cm)

Low performance
Ui=6 W/(m²K)

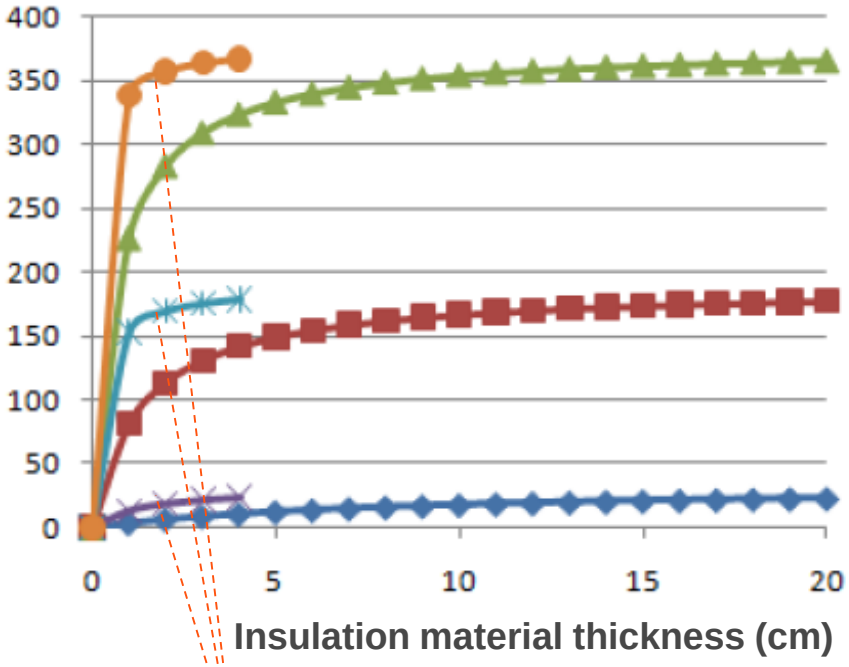
building wall material

High performance
Ui=0,5 W/(m².K)

→ Loss reduction highly depends on the initial thermal performance of the wall: the less performant is the wall the more loss reduction can be expected from thermal insulation.

→ Insulation thickness is not all, as above a couple of centimeters, much less loss reduction is to be expected.

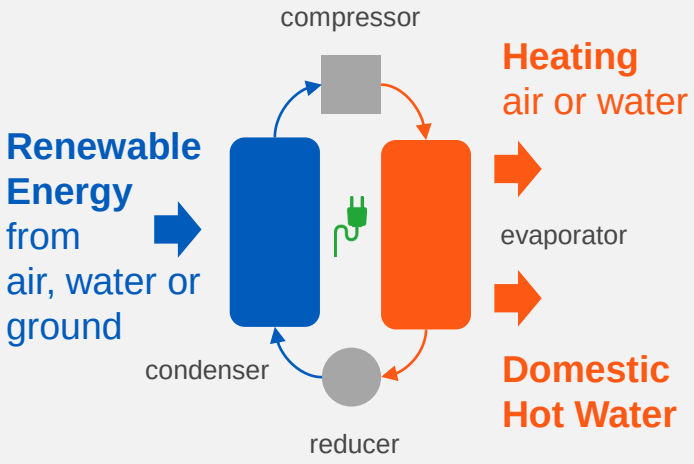
Focus on the building envelope
« super-insulating » materials

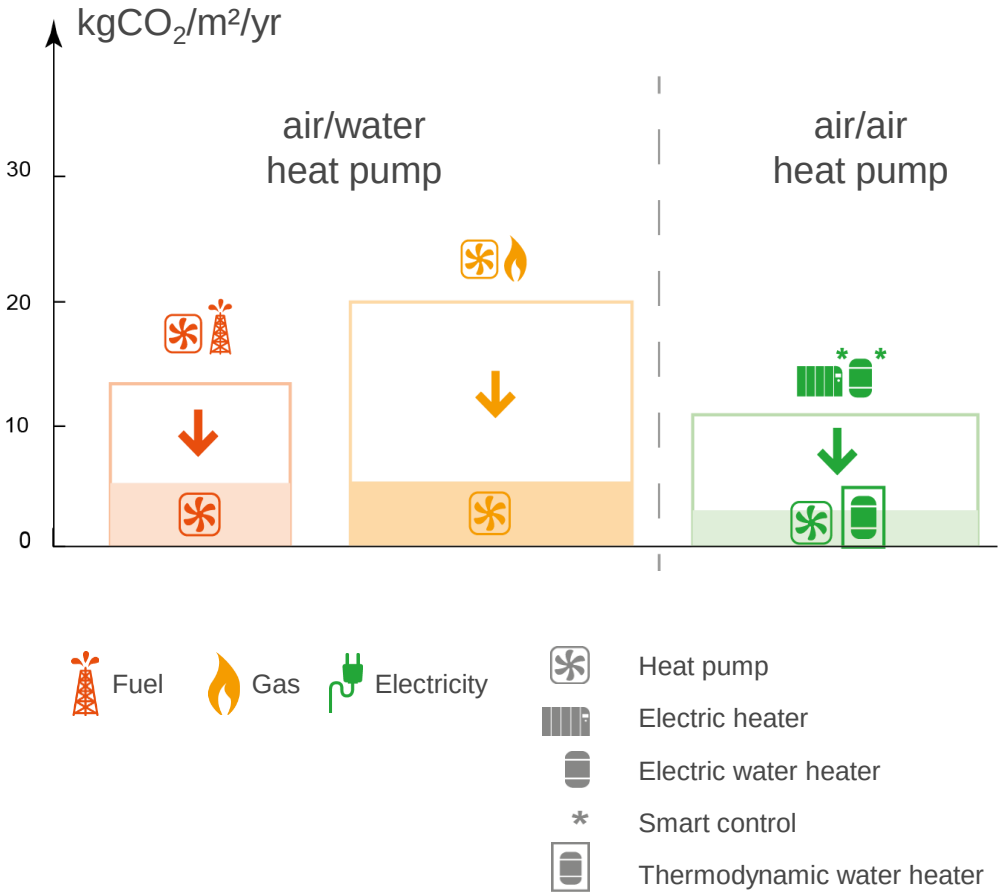


EDF R&D is working on « super-insulating » materials that let reach the maximum thermal performance from the first few centimeters.

« super-insulating » silica vacuum panel (right) is **x8 thiner** than fibreglas (left) for the same performance

Focus on the heating system
heat pumps

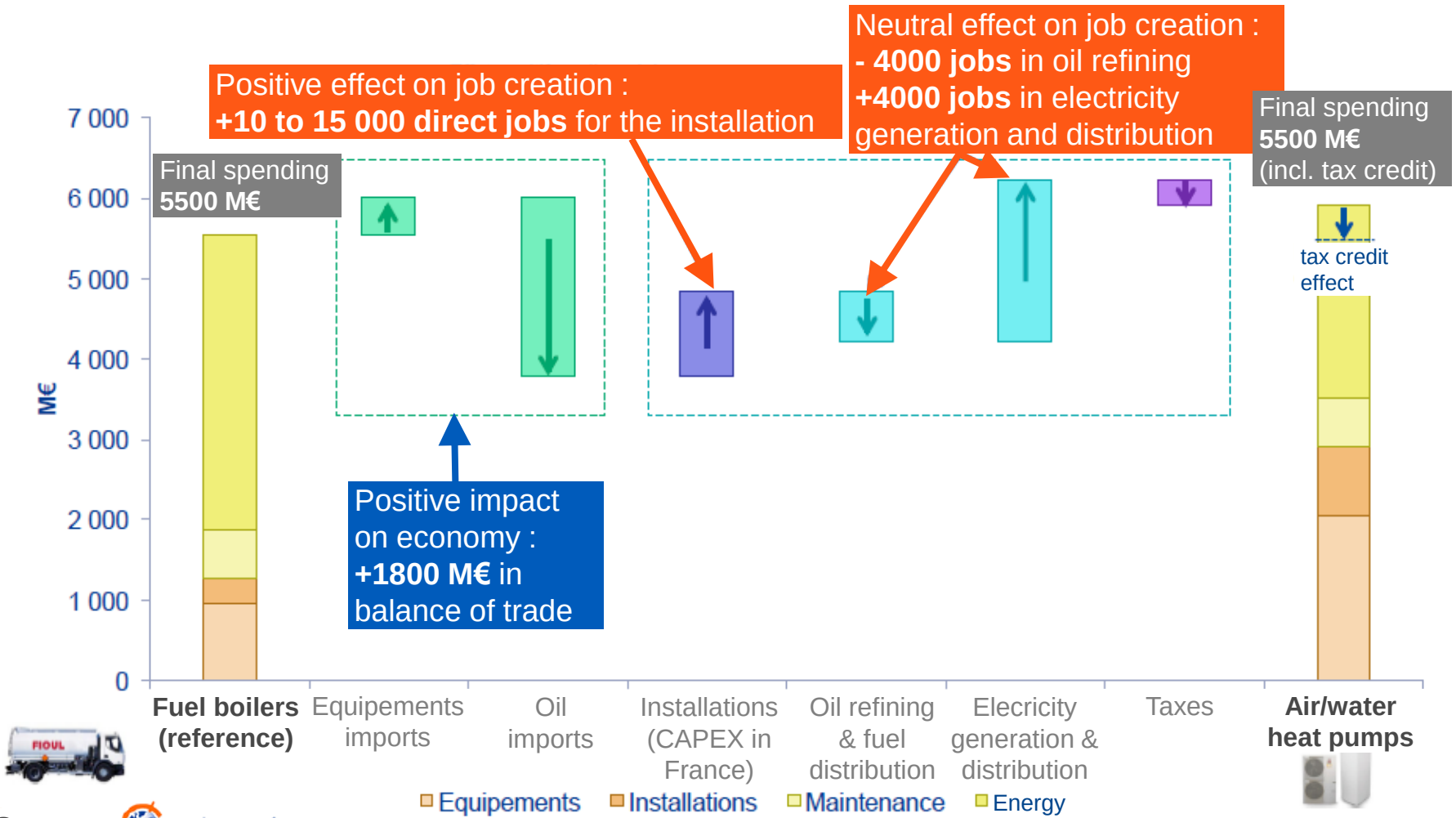




→ Heat pumps allow the gain of renewable energy directly from the building's environment.

Impacts on job creation & economic growth

example of 3M fuel boilers **replaced by** 3M air/water heat pumps



Source: carbone 4

Conclusions

- Energy efficiency in buildings is key to meet CO2 reduction objectives
- Heat pumps allow the gain of renewable energy directly from the building's environment.
- R&D efforts are needed on new types of insulation materials as well as on higher efficiency heat pumps
- Electricity generated in France has a low CO2 content, which makes heat pumps even more low carbon.
- Jobs created through building insulation and conversions to heat pumps are located in Europe

Conclusions