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 CO₂ 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

SMART & ELECTRIC

- 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 CO₂ emissions

- Improve the building envelope
- Improve the heating system
- Use low-carbon energy sources

Diagram showing the reduction of CO₂ emissions from different sources and systems, such as inefficient and efficient houses, fuel, gas, electricity, boiler, heat pump, electric heater, electric water heater, smart control, and thermodynamic water heater.
Focus on the building envelope

Energy losses in a building
Focus on the building envelope
the role of insulation in existing buildings

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.

Annual energy loss reduction (kWh/m²/year)

Low performance
\( U_i = 6 \, \text{W/(m}^2\text{K)} \)

building wall material

High performance
\( U_i = 0.5 \, \text{W/(m}^2\text{K)} \)

Insulation material thickness (cm)

« super-insulating » silica vacuum panel (right) is x8 thinner than fibreglas (left) for the same performance.
Focus on the heating system

heat pumps

Renewable Energy from air, water or ground

Heat pump

Domestic Hot Water

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

Positive effect on job creation:
+10 to 15,000 direct jobs for the installation

Neutral effect on job creation:
- 4000 jobs in oil refining
+4000 jobs in electricity generation and distribution

Final spending 5500 M€ (incl. tax credit)

Positive impact on economy:
+1800 M€ in balance of trade

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

R&D efforts on Energy Efficiency

- Performant Insulation
- Gain Local Renewable Energy (HP)
- Low Carbon Electricity

Energy Savings
Energy Independence
Job Creation in Europe
Fossil Fuels
CO2 Emissions
Trade Balance Deficit