Building’s stock in Europe accounts for 40% of overall energy consumption and 36% of CO2 emissions. It is a challenge for research and development to bring solutions to increase drastically this low environmental efficacy to secure climate stability and global energy resources for the future. Building energy efficiency is usually improved with more environment-friendly thermal systems and envelope multiple functions with high-performance materials. Electric mobility, thanks to reduced CO2 emissions, has been growing very strongly in recent years. This transition will be a success if we can increase the autonomy of battery systems while maintaining a very high level of safety, minimise the environmental impact of batteries and fuel cells systems by offering efficient and low-cost recycling circuits, and finally take advantage of the mass storage offered by electric vehicles to support the grid and accompany the increase in electricity production by renewable energies.

Industry is involved for many years in reducing the energy consumption with two different objectives: improving production costs and reducing CO2 emissions with fossil energies. To achieve this it is necessary to reduce waste heat with most efficient processes and to maximize heat recovery and reuse. For further progress breakthroughs in these three fields will require several new disruptive technologies. For instance: numerical and cloud-based tools for demand/response control algorithm and grid connection; renewable energy sources integration at component, building or district scale; energy storage systems with various technologies as thermal, electrochemical or hydrogen generation; interoperability of various energy vectors (electricity, heat, hydrogen…); integration of various usage in an intelligent energy network (residential, commercial, industrial, transportation…). All these topics will contribute to build a safe future for citizens with wise energy and carbon use for human activities.

**WHY A PHD RELATED TO ENERGY EFFICIENCY AT CEA TECH?**

In order to tackle energy efficiency, CEA Tech set up differentiating experimental technology platforms fuelled by massive skills. Buildings energy efficiency shows a very high impact on energy and CO2, with energy systems at various scale, high-efficiency active envelopes (roof, windows and façades) and global integration in district energy grids. The activity relies on an exceptional set of lab-scale structures and experimental loops, up to real-scale buildings and large industrial demonstrator. Multiscale simulation and interoperable software tools are either developed as internal codes or based on widely used numerical platforms. Beside buildings and industries, our innovative approaches include electrical mobility as a major player in the global and complex network of energy and service providers. From energy components (as battery cells) to integration (as a mobility service for persons and goods), CEA Tech offers great opportunities for research, connected to industrial major players on one side and to academics laboratories on the other side.