Our innovative solution consists of a **predictive energy management system** supported by artificial intelligence, that learns the energy profiles of a building infrastructure, to forecast its real energy demand with the end of an autonomous and optimized operation of the HVAC systems. Thanks to that, we can **reduce the inefficiencies of up to 30%** for each building in terms of energy (i.e., kW), costs (i.e., €), and polluting emissions (i.e., CO_2). Moreover, as our technology is based on self-learning algorithms it can detect the smallest machine's faults before they become a major issue. Therefore, we also provide a **support to the predictive maintenance** of the HVAC machines. This solution can be applied to any non-residential building (i.e., offices, hospitals, schools, universities, etc..).

The great advantage of our solutions is that that we do **not require any new installation of devices.** We simply use the information available by connecting to the BMS (Building Management System), SCADA, or available IoT platform. We simply perform an exchange of the data where we extract the internal data of the building. We combine that information with external variables we provide ourselves (i.e., weather forecast, humidity, solar incidence, etc..). We create a **data based digital twin**, and a precise prediction of the energetic need of the building. That prediction is key in order to optimize operations of the HVAC machines in terms of buildings comfort and COP (Coefficient Of Performance) maximization.

The modelling and prediction of time series such as demand in air conditioning & heating is a field that has been widely studied over the last two decades. However, the high complexity of the equipment that makes up these systems (often resulting in non-linear systems), and the high dependence on factors such as meteorology, occupation, or more subjective values such as the comfort of the occupants, causes precision of the models is only sustained for certain regimes of action. That is why the data-based predictive control methodology proposed by The Predictive Company is an algorithm that combines deep-learning technology, known for its ability to generate representations of complex non-linear systems, with a diffuse logic layers system, which allows the introduction of subjective aspects into the model, such as the comfort threshold, due to its formulation based on lexical rules. This technology is known as fuzzy deep networks and is presented as one of the techniques with the highest precision in the state of the art applied to the specific field of building energy management due to the before mentioned points.

The **solution has been developed at the Technical University of Catalunya**, UPC, Barcelona, Spain, during more than 10 years by a team of engineers, specialists in energy efficiency and artificial intelligence reaching a TLR 7. This technology has been transferred to the spin-off The Predictive Company through a tech-transfer contract granting worldwide exclusivity for the next 15 years in exchange of royalties.

To quantify our impact, we could base ourselves on the experience of the investigation center where the AI technology comes from and our initial learnings out of our pilot projects. Our scientists from the investigation center of the UPC have been involved in many EU consortium were big multinationals (i.e., Seat, Grupo Soler, etc..), were paying the investigation center to achieve certain goals in sustainability or efficiency. Out of their experience on average the estimation was around a 20% of effective savings in kWh/year, and 18% reduction in CO_2 emissions eq./year per nonresidential building.

We have learned that other value added is the **comfort** provided indoors; this is a subjective experience, difficult to quantify, but it is known that lack of proper energy management brings lack of comfort. Therefore, our technology integrates such data into the provided artificial intelligence algorithmic.

Another value added of our solution is the **support to the facility managers work**, allowing them to automate certain task and be able to manage more buildings. The estimation so far is that 40%-60% of their tasks could be taken over by the AI solution, but most of all we should consider that we humans cannot consider all the variables that come into play to be efficient in every moment, **AI can do it for us.**