

Turning a building green is a question of control

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Credit: Peter Pearson

Sustainable buildings partly depend on control strategies to be energy efficient. Implementation of possible control systems are now under study for two of the three showcases buildings, developed under the EU funded DIRECTION project, namely the [CARTIF III building](#) in Valladolid, Spain and the [NuOffice](#) in Munich, Germany. The third showcase, based in Bolzano, Italy, which has not been built yet, is therefore offering more opportunities for potential change of control systems. "From an energy efficiency point of view the main installations to take into account are air conditioning and electricity," explains José Louis Alfranca, head of installation services at the Spanish construction

company [DRAGADOS](#), in Madrid, and one of the project partners.

"The [three] showcases will feature centralised control systems based on an architecture with distributed logic," Alfranca explains. Having a distributed logic means that each control acts autonomously while, at the same time, communicating with a central control site. This is the case, for example, of the type of controls used for air conditioning, dubbed DDC or direct digital control.

Generally, control relies both on a series of sensors measuring for example the temperature, humidity, lighting level and on various actuators, such as valves engine and lighting regulators. Incorporating buildings' automation within the [architectural design](#) and installations' planning stage is key to have effective control systems, according to Inés Alomar, free-lance [energy](#) consultant, based in Barcelona, Spain.

"Otherwise it can take a lot of time to run the building or there might be strategies and [technologies] that cannot be implemented [at later stage]," she says.

There is not a single possible strategy for implementing control systems. Existing state-of-the-art solutions are many. For example, one involves using data orchestration, where data coming from different sources are combined into a single output. Another approach includes binding the results of the probes with the dynamic modelling of the building through a so-called grey box. Other solutions involve using control systems that optimise energy consumption and energy bills by producing heat or cold at times when energy price is low, and storing it in inertia depositories so that it is ready to be used upon request. The preferred choice for each individual showcase building is still under study.

A possible additional control feature to ensure high energy efficiency and users' comfort, especially in office buildings, is to include access or presence control systems. This is the view of Kristian Fabbri, adjunct

professor of technical environmental physics at the University of Bologna and a freelance building energy performance consultant, based in Cesena, Italy. The office and test facilities areas in Valladolid and the common areas in Munich are due to have sensors that will work differently depending on whether people are present or absent, according to Sergio Sanz, DIRECTION coordinator. No information is available yet for the Bolzano building.

Users can also actively participate in improving energy efficiency through a feedback system informing them of the impact of their actions. "Control and automation are key to disclose the energy [use] we do not see. Once we start seeing it, we will be able to actually save it [by being proactive]," Alomar comments. Generally, systems combining at certain times of the day centralised and manual management would be preferred "to avoid users become slaves of [energy efficiency](#)," she adds. But giving users control has some limitations. "Of course users need to be informed, but giving them excessive freedom can be a real disaster since people tend not to manage control in a rational way", says Alfranca. Ultimately, Fabbri concludes, control systems will be more and more dynamic with energy consumption information regularly shared through social networks.

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