Note:

- *Representative placement of sensors*
  - The placement of sensors is crucial for the system to function properly and collect useful data. We have all been to that one room in which you must jump around to get the sensors to notice you and turn on the light.
- *Follow the manufacturers' instructions*
  - Always follow the instructions from the manufacture. Although most control systems function similarly, the installation may be more or less complex.

Sensor placement

About DREEAM

DREEAM (Demonstration of an integrated Renovation approach for Energy Efficiency At the Multi building scale) aims to show that renovating at a larger scale opens the opportunity for better integration of renewable energy and is generally more cost-effective. The project demonstrates a multi-building and single owner renovation approach that can achieve a 75% reduction of total energy demand.

The DREEAM approach is implemented on pilot sites in the UK, Germany and Italy. These demonstration sites are to validate the DREEAM method in different climate, cultural and institutional configurations.

dreeam
scaling energy renovation

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CONTROL SYSTEMS

Why do we need control systems?

Efficient control and regulating systems in our house favour energy-efficient solutions and safety. This can reduce energy waste, cost and assist to maintain a comfortable indoor climate. The currently available techniques allow to steer and regulate the effect of our installations as we please - based on our needs or what we are prepared to invest. The control be simple *(e.g.* timers) or sophisticated and based on measurements.

Saving energy ≠ behavioural changes

When control systems are adapted in the house, energy can be saved without the need to change our behaviours. Examples of need-oriented installations are light fixtures that turn off in empty rooms, thermostats with the ability to shut on or off heating/cooling in a room, and ventilation that is regulated by the air quality. When some fluctuations in temperature is allowed, the thermal mass of the building can be used, and significantly reduce the energy needs.

Optimal regulation

All the control systems in a house must cooperate to be as energy efficient as possible, and there are already today systems available on the market that can communicate with one another.

Measurements are knowledge

To obtain optimal regulation of a building, we need to know about the operations of different appliances and installations.

What should we measure?

Multiple readers can measure parameters like temperature, airflow, and air quality. To gain optimal energy efficiency it is essential to asses all parameters. It is desirable to have separate readers for the energy use of different appliances.

Why should we measure?

Readings are monitored for regulation purposes. They may be used as proof of energy savings, or as a base for future modifications made to the system. Based on the measurements the installations can be adjusted and maintained and the building will become more intelligent.

How should we measure?

Readers can be either built into an appliance or detached. It is important to install the sensors in places that are representative of the space.

STATE OF THE ART

Smart Heating Control TRL 7*

The system uses sensors and Wi-Fi connection to communicate and regulate the heating in different rooms. The smart heating control system can assist in the optimization of energy and reduce energy costs.

A feature in using smart thermostats is the ability to change the heating from anywhere there are an internet connection. Other features may vary but often include multi-room control, draught detection and 'geofencing' to keep track of when you enter or leave your home. There are several types of smart heating controls, but the general function is the same.

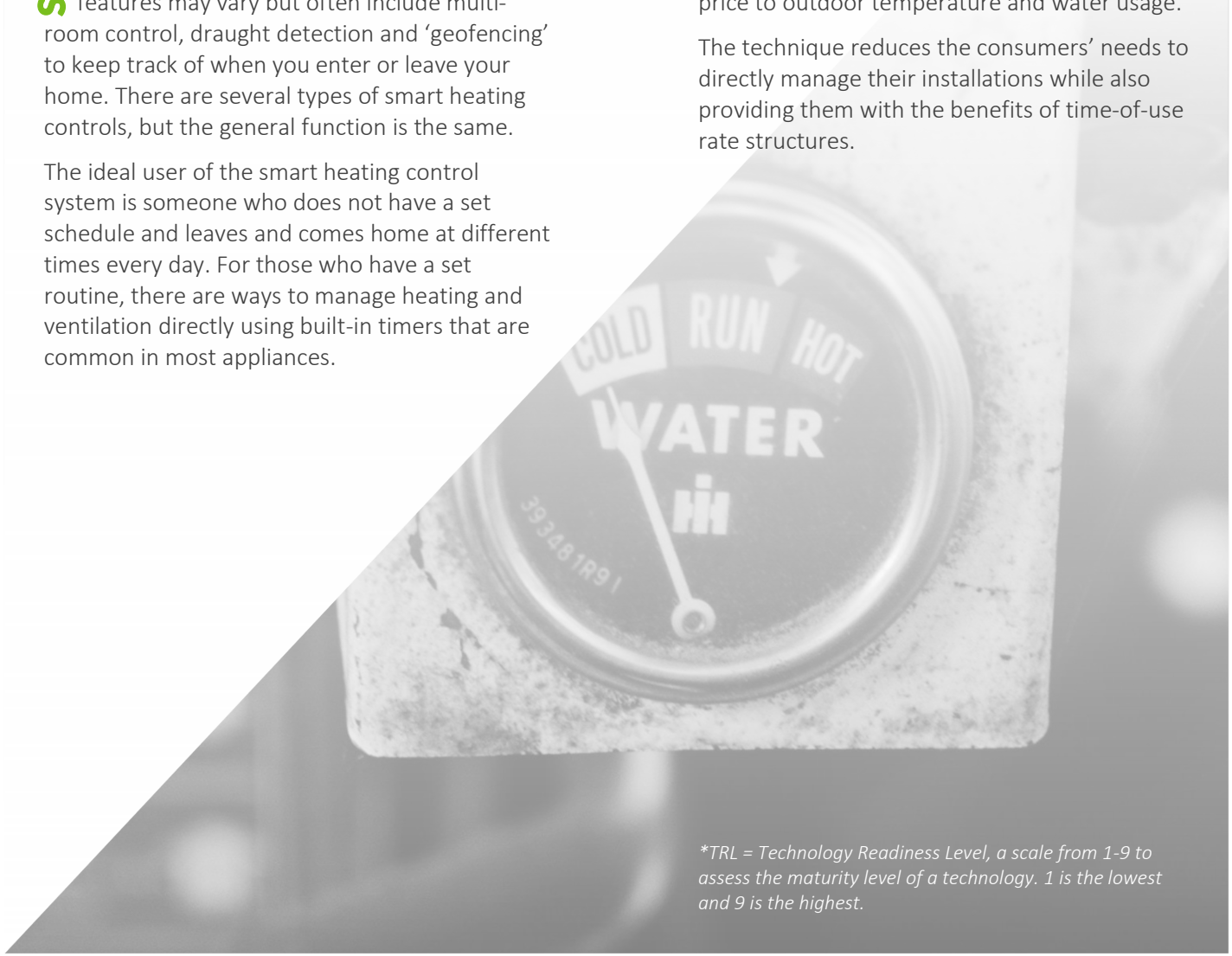
The ideal user of the smart heating control system is someone who does not have a set schedule and leaves and comes home at different times every day. For those who have a set routine, there are ways to manage heating and ventilation directly using built-in timers that are common in most appliances.

Stochastic Optimal Scheduling TRL 5*

The stochastic optimal scheduling system uses a software-based algorithm to schedule residential appliance usage. This By doing so, we can minimize the weighted sum of occupant discomfort, energy cost and carbon footprint.

The stochastic scheduling system regulates the stochasticity, using simulations, to account for uncertainties. These can range from electricity price to outdoor temperature and water usage.

The technique reduces the consumers' needs to directly manage their installations while also providing them with the benefits of time-of-use rate structures.



**TRL = Technology Readiness Level, a scale from 1-9 to assess the maturity level of a technology. 1 is the lowest and 9 is the highest.*