CASE STUDY

Sustainable Living

The problem

The clients were looking to build a home that was both constructed sustainably and could be run sustainably.

In collaboration with the innovative and forward thinking Studio Bark, their U-Build construction system and No Building As Usual initiative, their aims were achieved.

REDUCING ENERGY DEMAND AND COSTS

To build a house with very low levels of embodied carbon is challenging, especially if costs need to be kept down.

With improved levels of fabric performance and airtightness comes a range of issues that are not apparent in traditionally built buildings. More complex mechanical systems are required to keep energy costs low and the internal environment at an optimal level.

AT A GLANCE

Location	Wye Valley, England
Project Description	Sustainable eco home
atBOS Control Apps	Metering, Heating, Lighting, Ventilation
atBOS Cloud Apps	Analysis, Alerts, Responses, MessageMe
Mechanical systems	IR Heaters Demand Controlled Ventilation Mechanical Extract Ventilation Battery Storage

The Atamate Solution

To achieve the operationally most sustainable outcome, Nest House is an all-electric building.

AN ALL ELECTRIC AFFORDABLE HOME

The high levels of insulation and air tightness mean that the Atamate Building Operating System (atBOS) system controls the Infrared panels that are used to heat the whole house. These panels use far IR, and are all low voltage. Some of them run off 24Vac generated from the 230Vac mains, and some off 24Vdc from the battery storage. The heaters are controlled by occupancy and temperature readings, reducing the amount of time energy is used for heating and so reducing the overall demand.

The building also makes use of a photovoltaic array and battery system to generate and store electricity. These 6 x solar PV panels are installed alongside a solar inverter panel which has a battery capability of 230Ah (Amp/hrs) at 24V (Lithium Iron - LiFePO4). This can be used either for the 240v mains or for the heating.

atBOS, the lighting, internet, fridge freezer and microwave are all powered off an inverter charger so can be used in a power cut. There is no return to grid facility so all electricity is used on site.

VENTILATION

Ventilation is provided by an atBOS demand-control system that only ventilates spaces when carbon dioxide (CO2), humidity, temperature or volatile organic compounds (VOC) levels drift out of range. atBOS control minimises the amount of ventilation provided, which reduces the amount of energy needed to run the house.

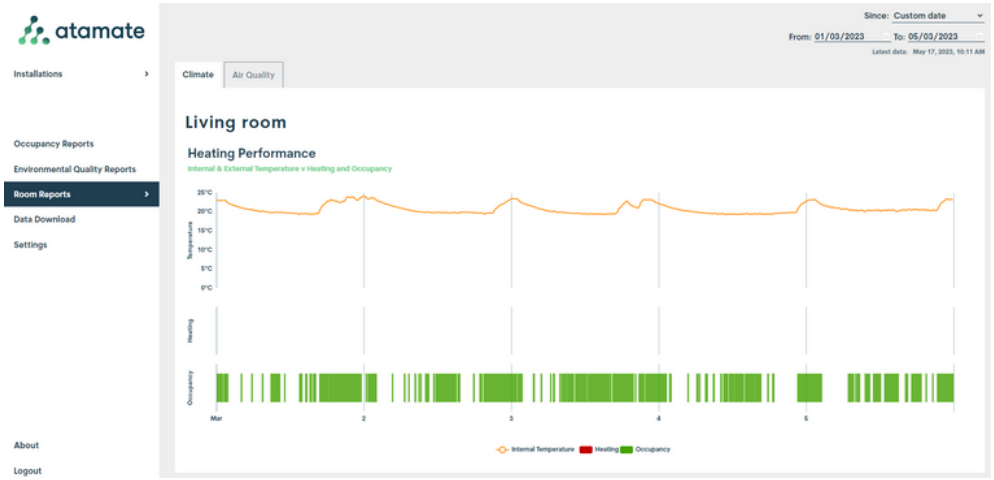

Figure 1.The fabric is of a standard that even in colder months heating is not required. Here the relationship between occupancy and temperature can be clearly seen. This can contribute to overheating in the summer months and can be mitigated using controlled passive cooling techniques.

Figure 2. atBOS tracks the indoor air quality and uses this data to control the internal environment. To reduce energy, ventilation systems are only run when zones are occupied and the quality to below the set point.

Fresh air is provided to the habitable rooms such as bedrooms and living rooms by automated trickle vents in the façade. Air is extracted from the dwelling by a fan integral to an exhaust air heat pump. This provides mechanical extract ventilation via a ducted system from wet rooms such as bathrooms and kitchens and discharges air to the façade. In the process it takes the heat out of the air and uses it to heat the hot water tank.

This unit also generates and stores hot water by performing a heat pump cycle on the extracted warm air stream and ensures that heat is recovered all year round, and hot water is generated at a high coefficient of performance.

COOLING

The output from the exhaust air heat pump is cold air once the heat has been transferred to the hot water. atBOS can recycle this cold air and use it for cooling the bedrooms. This helps to prevent overheating in the summer months without using any additional air conditioning systems. The atBOS system is so flexible that if needed during a very hot period, hot water can be dumped to enable it to provide more cool air to keep occupants comfortable.

LIGHTING

Lights are non-dimmable throughout, and are controlled either using switches in each room or on occupancy sensors housed in the Atamate sensor unit. The switches are energy harvesting. They convert the mechanical energy from pressing the switch into electrical energy - used to generate a wireless signal to the atBOS in this case.

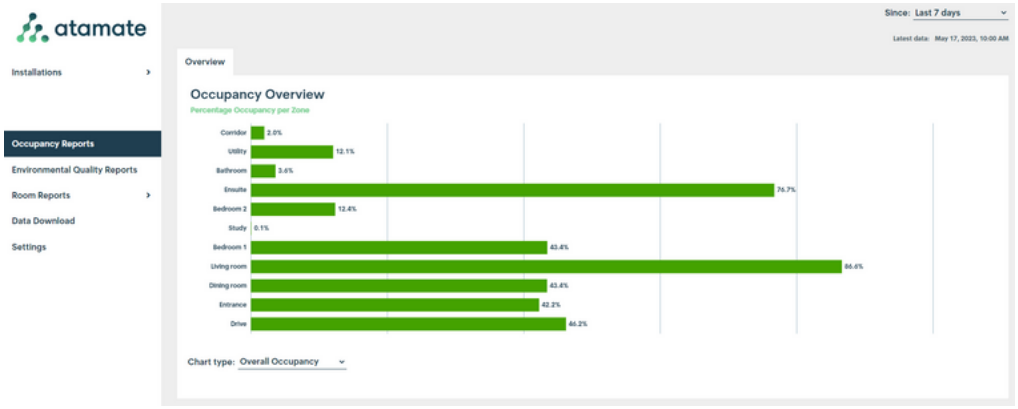

Figure 3. Average patterns of occupancy can be viewed on a daily, weekly or monthly basis.

The Result

An sustainable low embodied carbon home that will continue to be operationally environmental low impact ongoing.

Heating and hot water load - 50.85 kWh/m2/yr
Total energy load - 73.44 kWh/m2/yr

For more information or to get in touch about this project, please call 01865 920101 or email us on info@atamate.com