Housing Executive Low Carbon Programme Case Study

Overview

The Housing Executive is Northern Ireland's Strategic Housing Authority and its biggest landlord with over 82,000 social homes. Within its strategic role it is also Northern Ireland's Home Energy Conservation Authority, a role where it champions practical and cost-effective energy conservation measures (which includes information, advice and education, promotion, making grants and carrying out works), and subsequent greenhouse gas reduction across all the Northern Ireland housing sector.

The Low Carbon Programme (LCP) is a whole house retrofit programme led by the Housing Executive to retrofit up to 400 of its existing homes to implement improved energy efficiency measures, renewable power generation and storage, and a low carbon heating system.

The aim of the Low Carbon Programme is to provide a clear evidence base and key learning points to ensure that the Housing Executive can provide decarbonised retrofitted solutions via its landlord stock investment programme (subject to funding) and its private sector grants in which it delivers Northern Ireland's Affordable Warmth Scheme to owner occupiers and the private rented sector. This will align with the Climate Change Act (Northern Ireland) 2022 and significantly reduce household carbon emissions. The outcome will help address fuel poverty by reducing household energy bills and provide healthier homes.

Fabric

The household's fabric is improved by replacing old doors and windows in line with newer, more thermal efficient specifications. Cavity wall insulation is replaced, along with increased thermal loft insulation. These measures improve airtightness and reduce thermal heat loss, readying the property for the low carbon heating system.

Cavity Wall Insulation Installation

Heating System

The existing heating system is replaced with an air-to-water air source heat pump, which includes the installation of new, larger radiators to accommodate the lower flow temperatures, allowing for a more efficient heating system. The heating is controlled by a thermostat that maintains the temperature throughout the household, based on heating the house at a ‘low and slow’ setting to maintain thermal comfort with improved insulation and ventilation.

This contrasts with old heating systems where peaks and dips in heat are most common when the heating is only engaged for one to two hours a day. A benefit to maintaining the heat within the household is the ability to mitigate moisture build up, which can lead to damp and mould. This works in unison with passive extract fans in the bathroom and kitchen, removing most of the moisture generated in the house. In post installation reviews some tenants reported reduced damp and mould within the household due to the retrofit measures applied to their households.

Vaillant Heatpump used in the LCP

Renewable Power Generation and Storage via Solar Photovoltaic arrays and Electric Storage Battery

Each property is fitted with a 4kw solar array on the roof, and a 10kW battery pack to store electricity generated by the sun. The battery pack can also be charged using off peak electricity, which not only offsets the running cost of the heatpump, but can supplement the electricity use for the property, further benefiting the household.

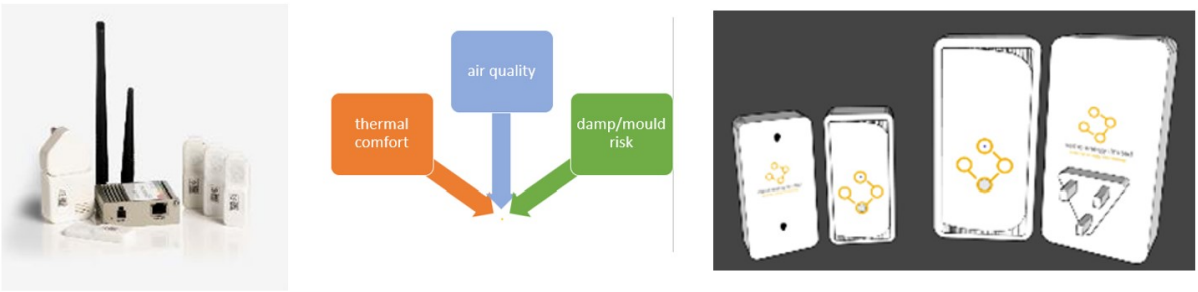
Typical Solar Arrangement for a Housing Executive property

Education Advice and Monitoring

Tenants are supported through the retrofit by energy advisors, who meet the householder before, during and after the installation process. They review the performance of the heat pump and solar array and advise tenants how to get the best of the system and can recommend changes to improve energy cost savings.

Additionally, data monitoring of the household systems is provided by a smart technology system developed and installed by NEMO Energy via a small business research initiative project. This monitors the environmental and power data from the household to better inform tenants of the best ways to run the system to maximise the cost savings.

Live data is gathered centrally into a dashboard which allows Housing Executive staff to understand the effectiveness of the retrofit measures and supports their tenants in using the heating and solar array.



NEMO Equipment Illustrated Interface

The programme is now nearly 50% complete and the initial data indicates that tenants are saving an average of 32% of their previous energy bills while maintaining an average internal temperature of 21°C, with a 68% reduction in household carbon emissions. Upon completion of this programme next year, the findings will inform future decarbonised heating policies across the Northern Ireland residential housing sector.