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Kilowatt House: Deep retrofit of Art Moderne home including heat pumps, solar PV, batteries and slimline double glazing

Overview

Age/Period:	1938
Type:	Detached Art Moderne
Years in residence:	9
Fabric:	Concrete, Crittall Style Windows
Area:	Claverton Down
Status	Grade II listed

Key Features

- Heat Pumps
- Solar PV and Batteries
- Flat roof insulation
- Slimline double glazing
- Energy efficient LED lighting

Introduction

Kilowatt House is a Grade II house built in 1937-1938 for the acoustic engineer Anthony Greenhill and designed by Bath architect Molly Taylor. It is Bath's only example of an Art Moderne house, which was a successor to the Art Deco movement, characterized as a horizontal aesthetic, with asymmetrical facades, large windows with curved edges, corner windows, portholes and railings.

When Andraea and Andy moved into the house in 2015, they found it to be extremely cold and energy inefficient. The solid concrete walls and single-glazed metal windows made it nearly impossible to heat and keep dry during the winter. Determined to reduce their energy costs and make the property vastly more environmentally friendly, the couple began a series of renovations. Andy, a founder of the Carbon Copy charity, is passionate about promoting decarbonization and sustainable living.

Over the past eight years, Andraea and Andy have successfully and sympathetically transformed their 1930s home into a much more energy-efficient space. Through careful renovations, they have reduced their annual energy bills by 75% from £6,800 to £1,700, improving the property's Energy Performance Certificate (EPC) rating from 'E' to 'A.' This extensive deep retrofit demonstrates the potential for sustainable home improvements. By making these changes, they have also dramatically reduced their carbon emissions, likely by at least 90%.

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Features

Heat Pumps

The size of the property required three air source heat pumps, two on the roof and one in the grounds. Additional radiators have been added so the heat pumps can run efficiently with lower central heating flow temperatures.

Switching from gas boilers to heat pumps can significantly reduce carbon emissions for heating and hot water, typically by at least 70%. As the national electricity grid becomes cleaner due to increased renewable energy sources, these emissions will continue to decrease.

Solar PV and heat pumps on the roof of Kilowatt House:

Hwam Wood Burners

Andy and Andraea have added two Hwam wood burners to their home for supplementary low-carbon heating in the living rooms. They discovered these efficient wood burners while living in Denmark. Hwam wood burners feature advanced automatic controls that optimize airflow for efficient wood burning. One of their wood burners has an external air intake, making it particularly efficient.

Slimline Double Glazing

Perhaps the most iconic and unique architectural feature of Art Moderne homes are their large, often curved, metal-framed windows with horizontal fenestration. However, large metal-framed single-glazed windows provide the least insulation of any building material and consequently leave homes very cold in the winter.

To preserve the building's architectural integrity, the replacement slimline double-glazed windows were carefully designed by Techniglaze to match the original horizontal fenestration. This was particularly challenging due to the curved shape of some of the panes.

Solar PV, batteries and roof insulation

To complete the refurbishment, the flat roofs of Kilowatt House were externally insulated using a 'warm roof' system. 30 solar panels were then installed on top, linked to two Tesla batteries.

Andraea and Andy are enrolled in the Octopus Flux tariff, which offers time-of-use pricing. This allows them to charge their batteries at a discounted rate of 25% overnight. During the day, they can use the stored energy from their batteries and solar panels to reduce their reliance on the main electricity grid, powering their home, heat pumps, and plug-in hybrid car.

Recommended installers

- Techniglaze (windows)
- Solarsense (ASHPs, PV and batteries)
- R & J Groves (Builders)
- Luke Angel Roofing, Nova Plastering

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